# ARCHITECTURAL E-BINDER

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Click any of the links to navigate to the section of the E-Binder you would like to view. You can also use the PDF’s bookmarks to navigate through the document.

For more information about our products, please contact Branch River Plastics at www.branchriver.com or call us at 401-232-0270.
R-CONTROL SIPs
STRUCTURAL INSULATED PANELS

www.r-control.com
Life Cycle Benefits

When choosing R-Control SIPs you are getting a material with built-in features that provide environmental benefits.

Building materials and their impact on the environment should be considered over the full life of the building structure. This is considered the “life cycle” of the building. This includes inventorying the cost to the environment from material production, transportation, installation, use, and end of life reuse, recycling, or disposal. Research has shown that for both residential buildings and commercial buildings that operations contribute to over 90% of the building’s impact on global warming. Reducing energy use is the best way to reduce our impact on the environment.

The energy savings from R-Control SIP structures can translate into emission reductions of tons of carbon dioxide per year

R-Control SIPs improve the energy efficiency over the full operating life of the building resulting in a positive impact on the environment.

R-Control SIP Materials

R-Control SIPs reduce their impact on the environment by using component materials that are earth friendly:

- The wood facings are from rapidly renewable wood species
- Foam-Control EPS does not contain CFCs, HFCs, HCFC’s
- R-Control SIP construction minimizes the use of traditional lumber
- The Foam-Control EPS is fully recyclable
- Waste is minimized by providing factory fabrication of complete building packages

R-Control SIP R-values

<table>
<thead>
<tr>
<th>Panel Thickness</th>
<th>R-value at 75° F</th>
<th>R-value at 40° F</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 1/2”</td>
<td>14.9</td>
<td>16.0</td>
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<td>6 1/2”</td>
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<td>39.9</td>
</tr>
<tr>
<td>12 1/4”</td>
<td>44.7</td>
<td>48.3</td>
</tr>
</tbody>
</table>

Green Building Programs

The selection of R-Control SIPs for your building makes it easy to comply with various national green building programs.

USGBC – LEED

The U.S. Green Building Council developed the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ to promote green buildings. The LEED system provides a yardstick for measuring the environmental impact of buildings. “Certified”, “Bronze”, “Silver”, and “Platinum” levels can be achieved based upon a point system. R-Control SIPs have been used in many LEED buildings, including buildings with the highest Platinum rating. For more information on the LEED program, please visit www.usgbc.org.

ENERGY STAR®

The U.S. Department of Energy established the ENERGY STAR program which many consumers are aware of from their everyday purchases of electronics and appliances. The ENERGY STAR program also provides a method for ENERGY STAR rating a structure. R-Control SIPs are deemed to comply with the program without conducting on-site blower door testing. For more information on the ENERGY STAR program, please visit www.energystar.gov.

NAHB Green Building

The National Association of Home Builders created a building program for use by builders to help advance green building. As part of the NAHB program, SIP panels are given points for the increased effective R-value for the building envelope. For more information on the NAHB Green Building program, please visit www.nahbgreen.org.

Whole Wall R-Value

There’s more to most walls than meets the eye, and the R-value of a whole wall can be considerably lower than the R-value of the insulation. Whole wall R-value calculation procedures factor in all of the effects of additional structural members at windows, doors, and exterior wall corners.
National Tests Verify R-Control SIPs Outperform Conventional Framing

An R-Control SIP test room significantly outperformed a 2x6 stick-framed and fiberglass-insulated room in testing under identical laboratory conditions at Oak Ridge National Laboratories (ORNL). Results from a carefully monitored and instrumented study in ORNL’s climate simulation laboratory showed that R-Control SIP construction is more energy efficient and far more airtight than stick-frame construction.

Testing Method

The ORNL test setup created identical climate conditions and measured the airtightness and the heating energy requirement of the two rooms. ORNL testing demonstrated that R-Control SIP connections created a structure which was virtually air tight. This contrasted to stick built walls which had considerable air leakage. Dramatically reducing air infiltration provides a more comfortable interior environment, an advantage in building with R-Control SIPs.

Blower Door Testing

The room with 4 1/2-inch SIP walls, a SIP ceiling, a window, a door, pre-routed wiring chases, and electrical outlets showed 90% less air leakage than an otherwise identical room built with 2x6 studs, OSB sheathing, fiberglass insulation, and drywall. At 50 pascals of negative pressure, the stick-built room leaked 126 cubic feet of air per minute (CFM), while the R-Control SIP room loss was a mere 9 CFM.
Energy Use

The ORNL room with 4 1/2” SIP walls used 9% less heating energy than the 2x6 stick-built room under identical conditions (an indoor temperature of 70°F and an outdoor temperature of 0°F). Based upon this testing, a 6 1/2” SIP (50% more R-value than a 4 1/2” SIP) will dramatically outperform 2x6 stick construction. Building with SIPs will more effectively meet energy code requirements than building with 2x6 stick walls.

WHOLE-ROOM AIR ENERGY USE, ORNL TESTING

Lower watts = lower energy cost

![Energy Use Graph](graph.png)

Ready to take control? Start here.

If you’re wondering how R-Control SIPs can work on your next project, just contact your nearest R-Control supplier. They’ll be happy to collaborate on design, walk you through R-Control SIP installation, provide test data, pricing, and answers to all your questions. Start by visiting our web site: www.r-control.com.
Foam-Control® EPS with Perform Guard®

Prevent damage to your insulation and preserve your structural integrity and R-value.

Foam-Control EPS with Perform Guard is a termite resistant expanded polystyrene insulation for all types of construction. It is used in Structural Insulated Panels (SIPs), Perimeter and Under-slab Foundation Insulation, Exterior Insulation and Finish Systems (EIFS), Geofoam, Insulated Concrete Forms (ICFs), and other EPS Building Products and Systems.

- Meets code requirements for ground contact use
- Resistant to termite damage
- Incorporates EPA registered additive
- Safe for handling and noncorrosive

Insulation helps keep people comfortable. Unfortunately, insulations are susceptible to termite infestation.

Foam-Control EPS with Perform Guard is an important component in preventing this problem. It’s made by a process that incorporates a termite resistant additive into the insulation during the manufacturing process. The additive is registered with the Environmental Protection Agency (EPA) for this application. Foam-Control EPS with Perform Guard has been thoroughly tested, is safe for handling, and noncorrosive. And termites hate it.

Proven to meet, or exceed, building codes.

Foam-Control EPS is manufactured to Quality Control Program standards monitored by Underwriters Laboratories Inc. and recognized by national building codes. Foam-Control EPS manufacturers offer product warranties that ensure thermal performance, physical properties, and termite resistance. Foam-Control EPS with Perform Guard has been evaluated for below grade use by the ICC ES and meets ICC ES AC239 requirements. Please see ICC ES ESR-1006. Foam-Control EPS can stand up to all industry tests—and has. No other EPS can say that.

Foam face-off: Choosing Foam-Control EPS with Perform Guard over XPS, Polyiso, and untreated EPS.

- Foam-Control EPS with Perform Guard is recognized in an ICC ES report as termite resistant and others are not
- Meets ICC ES AC239 requirements for termite resistance foam plastic
- Suitable for use in all areas of termite risk
- Meets requirements of IBC Section 2603.8
- Meets requirements of IRC Section 320.5

*Perform Guard is not a barrier, but should be used in conjunction with a total Pest Management Program available from a reputable Pest Control Operator.
Problem.
Termites love to live, work, and eat in comfortable and protected surroundings. All untreated insulations can potentially provide this environment. Most of the U.S. is susceptible to termite activity. It is important that insulation products and systems account for the potential of termite infestation.
- Termites reduce insulation & system performance
- Termites cause problems for structural systems
- Costs to control termites can continue indefinitely

Testing.
AFM Corporation has conducted extensive research to:
- find an effective additive that would deter termites,
- develop processes for the incorporation of the additive into EPS,
- and “test prove” and “field prove” the efficacy of the Foam-Control EPS with Perform Guard.

Termite exposure tests have been conducted by industry recognized institutions following industry recognized test standards of ICC ES AC239. Product performance testing has shown how Foam-Control EPS with Perform Guard resists termite infestation when installed following our recommendations.

Termite Infestation Risk.

Applications.
Foam-Control EPS with Perform Guard must be used in conjunction with Do-All-Ply® to ensure optimum performance. Do-All-Ply was specifically developed for use with Foam-Control EPS with Perform Guard insulation. Do-All-Ply is used to adhere Foam-Control EPS with Perform Guard to substrates and fill board joints.

Foam-Control EPS with Perform Guard is a termite resistant insulation. Foam-Control EPS with Perform Guard is not a barrier system, but should be used in conjunction with a total insect management program available from a reputable pest control operator.

Ready to take control? Start here.
If you’re starting to wonder how Foam-Control EPS with Perform Guard can contribute to your next project, here’s how to find out: Just contact your nearest Foam-Control EPS manufacturer. They’ll be happy to give you a design consultation, information about Foam-Control EPS products, pricing, and the answers to all your questions. Contact a sales rep and download Foam-Control EPS documentation at www.foam-control.com.
R-Control® SIPs Life Cycle Analysis

Life Cycle Benefits.
When choosing R-Control SIPs you are getting a material with built-in features that provide environmental benefits for the life of the product.

Building materials and their impact on the environment must be considered over the life of the building structure. This is considered the “life cycle” of the building.

Assessment Study.
The Expanded Polystyrene Molders Association (EPSMA) commissioned industry leading Franklin Associates to conduct a life cycle assessment of SIPs with EPS insulation. The study quantified the energy use and emissions associated with SIP production and compares this with the savings in energy and greenhouse gas that result from the use of SIPs compared to stick framed construction. The life cycle stages evaluated include: all steps in the production of R-Control SIPs with EPS insulation from raw material extraction, through manufacturing, shipment to the project site and finally electricity and natural gas consumption for heating and cooling of the building over its 50 year life use.

Payback.
Energy and greenhouse gas savings are determined by comparing the heating and cooling energy requirements for a typical stick framed house to the same house built with R-Control SIPs. The typical stick framed house is 2x6 wood frame construction with R-19 fiberglass insulation.

<table>
<thead>
<tr>
<th>Energy and GWP Investment</th>
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<tbody>
<tr>
<td>SIPS vs. Stick Frame</td>
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<tr>
<td></td>
</tr>
<tr>
<td>SIP</td>
</tr>
<tr>
<td>Stick Frame</td>
</tr>
<tr>
<td>Investment</td>
</tr>
</tbody>
</table>

Average U.S. saving in energy use and global warming potential.

<table>
<thead>
<tr>
<th>SIPS vs. Stick Frame</th>
<th>Energy Savings</th>
<th>GWP Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Millions Btu’s</td>
<td>tons CO₂ Equiv.</td>
</tr>
<tr>
<td>SIP Annual Savings</td>
<td>13.2</td>
<td>0.99</td>
</tr>
<tr>
<td>SIP Savings over 50 yrs.</td>
<td>660</td>
<td>49.6</td>
</tr>
</tbody>
</table>

Investment Payback Period  5.1 years  3.8 years

Summary.
Results of the study proved the significant energy savings achieved over the long-term by the use of R-Control SIPs and showed substantial reductions in greenhouse gas emissions.

R-Control SIPs improves the energy efficiency over the full operating life of the building resulting in a positive impact on the environment.

- SIPs reduce air leakage
- Lower air leakage results in lower energy consumption and reduced global warming potential
- EPS insulation reduces energy consumption
- Lower energy consumption reduces carbon dioxide emissions

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RC34-11/10
R-CONTROL SIPs
STRUCTURAL INSULATED PANELS
Labor Case Study 1

**Project:** Labor time estimate for setting R-Control SIP wall panels used to build the structural and insulated envelope of a 3978 square foot duplex.

**R-Control SIPs:** Panels were supplied from factory: Cut to length and width. Spline and plate pockets were factory cut.

**Scope of work - Walls:**

1. 312 lineal feet of 8 ft. high walls - installing 2X plate material in factory cut openings and header openings, top plate.
2. Bottom sill plate over conventional floor system, as in SIP-105.
3. R-Control SIP was set over sill plate, as in SIP-105.
4. Panel to panel connection was done using surface spline, as in SIP-102 and SIP-102d.
5. Corner connection was done, as in SIP-103.
6. Door, window openings field plated, as in SIP-114 and SIP-115.
7. 4 man crew was used to hand set panels and execute details with assistance of crane.

**Results - Walls**

- 4 men spent 9 hours 45 minutes or 39 man hours to set 312 lineal feet of wall.
- 8 lineal feet of installed R-Control SIP per man hour.
- 64 square feet of installed R-Control SIP per man hour.

Labor Case Study 2

**Project:** Labor time estimate for installing R-Control SIP wall panels used to build the structural and insulated envelope of a 3652 square foot single story home.

**R-Control SIPs:** Panels were supplied from factory: Cut to length, width, and gable configuration. Door and window openings were cut. Spline and plate pockets were factory cut.

**Scope of work - Walls:**

1. 348 lineal feet of 8 ft. high walls - installing 2X plate material in 14 factory cut openings and 9 header openings, top plate.
2. Treated plywood with bottom sill plate, as in SIP-104a.
3. R-Control SIP was set over sill plate, as in SIP-104a.
4. Panel to panel connection was done using surface spline, as in SIP-102.
5. Corner connection was done, as in SIP-103. (16 corners)
6. Door, window openings field plated, as in SIP-114, SIP-115 and SIP-112c.
7. 4 man crew was used to hand set panels and execute details.

**Results - Walls**

- 4 men spent 12 hours or 48 man hours to set 348 lineal feet of wall.
- 7.3 lineal feet of installed R-Control SIP per man hour.
- 65 square feet of installed R-Control SIP per man hour.
**Labor Case Study 3**

**Project:** Labor time estimate for the setting of R-Control SIPs for wall and roof panels used to build the structural and insulated envelope of a 28' x 22' structure.

**R-Control SIPs:** Panels were supplied from factory: Cut to length, width, and gable configuration. Door and window openings were cut. Spline and plate pockets were factory cut.

**Scope of work - Walls:**
1. Treated lumber at top of concrete for capillary break, as in SIP-104.
2. Sill plate was installed top of treated plate, as in SIP-104.
3. R-Control SIP was set over sill plate, as in SIP-104.
4. Panel to panel connection was done using block spline, as in SIP-102g.
5. Corner connection was done, as in SIP-103.
6. Door, window openings field plated, as in SIP-114 and SIP-115.
7. 4 man crew was used to hand set panels and execute details.

**Results - Walls**
- 4 men spent 3 hours or 12 man hours to set 100 lineal feet of wall.
- 8.33 lineal feet of installed R-Control SIP per man hour.
- 84 square feet of installed R-Control SIP per man hour.

**Scope of work - Roof:**
1. Preparation of R-Control SIP roof panels on ground, block spline male side installed, as in SIP-102g.
2. Attachment at eave wall, as in SIP-102g.
3. Attachment at gable wall, as in SIP-122c.
4. Attachment at ridge, as in SIP-121a.
5. Eave and gable edge plating, as in SIP-119b and SIP-119d.

**Results - Roof:**
- Preparation: 2 men spent 1 hour to install 180 lineal ft. of block spline in 4’ wide x 15’ long roof panels, as in SIP-102g.
- 90 lineal feet of spline per man hour.
- 2 men on roof, 1 man on the ground, set 900 sq. ft. of roof in 2 hours, 6 man hours, plus 2 man hours prep.
- 2 hours of crane time.
- 113 square feet of installed R-Control roof panels per man hour.
Ready to take control? Start here.

If you're wondering how R-Control SIPs can work on your next project, just contact your nearest R-Control supplier. They'll be happy to collaborate on design, walk you through R-Control SIP installation, provide test data, pricing, and answers to all your questions. Start by visiting our web site: www.r-control.com.
Q. WHAT ARE R-CONTROL SIPs (STRUCTURAL INSULATED PANELS)?

A. An extremely strong super insulated structural panel building component used for exterior walls, roof/ceilings, and floors. R-Control SIPs are made from mold/termite resistant wood facings laminated with structural grade adhesives to termite resistant expanded polystyrene rigid insulation.

Q. WHAT TYPE OF STRUCTURES CAN BE BUILT WITH R-CONTROL SIPs?

A. R-Control SIPs can be used in all designs: custom homes, engineered homes, restaurants, office buildings, schools, churches...the options are endless. Homeowners, builders, and designers who want to use a superior building technology can all benefit from R-Control SIPs.

Q. WHY SHOULD I CONSIDER USING R-CONTROL SIP OVER CONVENTIONAL STICK BUILT METHODS?

A. If you plan to own or occupy the building or house, there are several excellent reasons to consider R-Control SIPs.

Comfort — One of the most exciting features of an R-Control SIP structure is the comfort benefit to the homeowner. R-Control SIPs create an inside home environment that is more easily and economically controlled. In addition to superior physical comfort, R-Control SIP structures are also very quiet and clean.

Thermal Performance — Stick built walls were originally designed to be structural, not insulated. With R-Control SIPs, the insulation is not an afterthought, but an integral part of the structure. The insulation is solid, so there is no air movement within the wall, nor are there studs acting as thermal breaks that reduce energy efficiency and homeowner comfort.

Strength — Structural testing and real world storms and earthquakes have challenged R-Control SIP strength performance. In tests of strength, R-Control SIPs have proven stronger than stick framed construction methods.

Quality — R-Control SIPs assure you of straight, flat walls with no bulging framing members. Straight walls are virtually impossible to achieve with stick framing. Attraction of dirt particles to thermal shorts caused by framing members is eliminated. A continuous wood surface provides a sound nailing base for conventional exterior finishing materials. This is also an advantage for interior finishing, as well as hanging cabinets and pictures.

Speed of Construction — R-Control SIPs are a faster method of construction. Many R-Control SIP contractor users report 30% to 50% increased productivity in their framing.

Q. WHAT IS THE COST OF R-CONTROL COMPARED TO A CONVENTIONAL STICK BUILT STRUCTURE?

A. The cost of any home or building is significantly dependent upon design. Basically, R-Control SIPs offset small additional material costs through labor savings. However, R-Control SIPs produce significant savings to the owner over the life of the structure when lower utility bills arrive.

Q. WHAT IS THE R-VALUE AND WHY DO R-CONTROL SIP STRUCTURES OUTPERFORM CONVENTIONALY CONSTRUCTED BUILDINGS AND HOMES WITH THE SAME R-VALUE?

A. R-Control SIPs are manufactured in various thickness with values of R-15, R-23, R-30, R-37, and R-45. The R-value of a material or wall assembly was not intended to be the measure of thermal efficiency of a home. R-value only measures resistance to heat loss by conduction. Other forms of heat loss are convection, radiation and especially infiltration (leakage). Conventional framing with batt insulation promotes convection, radiant and infiltration heat loss. Testing at Oak Ridge National Laboratories (ORNL) showed that R-Control SIP walls are far superior to conventional stick frame and batt insulated walls. A 4-1/2” R-Control SIP panel was 45% better than 2x4’s with R-13 batt insulation and in fact was also better than 2x6’s with R-19 batt insulation.
Q. WHAT IS THE AIR LEAKAGE OF R-CONTROL SIP STRUCTURES?

A. ORNL tested R-Control SIPs side by side with stick construction. The results were impressive – the air leakage from the R-Control SIP construction was less than 10% of the stick construction. This translates into a more comfortable structure with fewer drafts and lower utility bills.

WHOLE-ROOM AIR INFILTRATION, ORNL TESTING

Lower cfm = higher comfort + lower energy cost

Q. SINCE R-CONTROL STRUCTURES ARE SO AIR TIGHT, DO THEY REQUIRE ADDITIONAL HVAC CONSIDERATIONS?

A. Yes. The increased R-value and lower air leakage means that heating and cooling equipment must be designed for a high performance structure. This translates into lower capacity heating and cooling units and most importantly lower cost units. Since R-Control SIP structures are so air tight, air exchangers are required as part of the HVAC system to bring fresh air into the structure while simultaneously exhausting air from the structure to ensure optimum indoor air quality. Comfort to the occupants is unparalleled.

Q. HOW DO R-CONTROL SIPs RESIST TERMITES, MOLD, MILDEW, AND DECAY?

A. R-Control SIPs are no more susceptible to insect infestation than other forms of construction. However, R-Control has identified and thoroughly researched two products to provide protection of your investment. First, the insulation core of an R-Control SIP is Foam-Control EPS with Perform Guard®. Foam-Control EPS with Perform Guard is manufactured with an additive to provide termite resistance and is recognized as meeting ICC-ES requirements for termite resistance.

R-Control SIPs are protected with FrameGuard Coating™. FrameGuard coating protects the OSB facings from termites, mold, mildew, and decay. Most importantly, this includes a 20 year warranty.

Q. HAVE R-CONTROL SIPs BEEN THOROUGHLY TESTED, AND DOES IT HAVE BUILDING CODE ACCEPTANCE?

A. Yes. Extensive testing has been performed by many independent laboratories. R-Control SIPs have been evaluated by the International Code Council Evaluation Service (ICC-ES) and conform to the requirements of the International Building Code (IBC) and International Residential Code (IRC). R-Control SIPs are manufactured under quality control program monitored by PFS Corp., a leading Third Party Inspection agency.
Q. DO R-CONTROL SIPs MEET FIRE CODES?
A. Yes. R-Control SIPs have been fully tested for surface burning characteristics and smoke development, corner room fire test, thermal barrier, and hourly fire tests on wall, ceiling and roof assemblies. All results are in compliance with building code requirements.

Q. HAVE R-CONTROL SIPs BEEN PROVEN STRUCTURALLY IN EARTHQUAKES AND STORMS?
A. Yes. R-Control SIPs have exceptional strength to resist seismic activity and high winds. R-Control has documentation of homes which used R-Control SIP’s that withstood the 7.2-magnitude earthquake in Kobe, Japan in January 1995. These homes were located just miles from the quake’s epicenter and stood solidly against the tremendous force of the earthquake. R-Control SIP structures have also withstood tornados in Tennessee and straight line winds and tree trunks crashing into them in Michigan.

Q. HOW ARE WINDOWS AND DOORS INSTALLED IN R-CONTROL SIPs?
A. Openings for windows and doors can be built right into the R-Control SIP at the factory, or cut in during field construction. Boundary framing is then installed and the window or door is conventionally set. The R-Control SIP Construction Manual is available with complete construction details.

Q. WHAT EXTERIOR OR INTERIOR FINISH CAN BE USED WITH R-CONTROL SIPs?
A. All types of sidings, claddings and roofing materials can be applied to R-Control SIPs. The continuous wood facing of R-Control SIPs provides an excellent nailing base and eliminates stud searching.

Q. HOW IS ELECTRICAL WIRING INSTALLED IN R-CONTROL SIPs?
A. Vertical and horizontal electrical chases can be provided in the foam core making electrical installation simple. Wiring is pushed through chases during construction. Electrical boxes screw mount to the face of the R-Control SIP.

Ready to take control? Start here.
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R-CONTROL SIPs
STRUCTURAL INSULATED PANELS

Note: Information deemed reliable at time of printing.
Please visit www.r-control.com for latest information. June 2012

www.r-control.com
When you choose R-Control SIPs, you’re collaborating with a team of experts who work with you every step of the way. We’re here to answer your questions, solve your problems, and do everything we can to make sure your project proceeds smoothly—and ends successfully.

R-Control SIPs are manufactured by a network of licensed manufacturers throughout North America and the world. R-Control SIP licensed facilities adhere to strict, consistent standards to ensure high-quality custom-made R-Control SIPs.

This network allows us to offer architects, engineers and builders the best of both worlds: the resources of the country’s largest provider of SIP products and systems, and the superior attention and customer service of a local supplier.

R-Control SIPs are structural components for use in load bearing wall, roof, ceiling, or floor assemblies. An R-Control SIP Construction Manual, technical bulletins, and a building techniques video are available with additional information. These documents should be reviewed in detail prior to design and installation of R-Control SIPs. You can download these documents from www.r-control.com.
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Architect/Engineering Review

The Load Design Charts for R-Control SIPs have been developed from national testing standards, testing at independent laboratories, and qualified structural engineers. These charts cover most common construction requirements. Each building project should be reviewed by an architect/engineer to determine the suitability of R-Control SIPs.

Evaluation Reports

The International Code Council Evaluation Service (ICC-ES) has reviewed the independent testing, structural engineering, PFS Corporation third party inspections, and QC program for R-Control SIPs and has issued evaluation report ESR-2233. NTA Inc has also issued assembly report AFM031809-18.

Building Codes

R-Control SIPs are recognized as being in compliance with the 2006, 2009, and 2012 International Building Code and 2006, 2009, and 2012 International Residential Code. R-Control SIPs should be designed to comply with the deflection limits of the applicable building code.

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<th>SIP THICKNESS</th>
<th>WEIGHT (psf)</th>
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<td>3.2</td>
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<table>
<thead>
<tr>
<th>SIP THICKNESS</th>
<th>R-VALUE @ 75°F</th>
<th>R-VALUE @ 40°F</th>
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<tbody>
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<td>4-1/2”</td>
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<tr>
<td>8-1/4”</td>
<td>29.3</td>
<td>31.7</td>
</tr>
<tr>
<td>10-1/4”</td>
<td>37.0</td>
<td>40.0</td>
</tr>
<tr>
<td>12-1/4”</td>
<td>44.7</td>
<td>48.3</td>
</tr>
</tbody>
</table>
Wall-Unity Equation

This wall-unity equation is used to determine design suitability. The equation takes into account the ultimate load for a SIP subjected to both axial and transverse conditions:

\[
\frac{\text{design axial load}}{\text{allowable axial load}} + \frac{\text{design transverse load}}{\text{allowable transverse load}} \leq 1
\]

(SEE LOAD DESIGN CHART #2B)  (SEE LOAD DESIGN CHART #4)
### Load Design Charts

#### Wall - Point Axial Loads - LBS

**LOAD DESIGN CHART #2C**

**DETAILS SIP-101c, SIP-101d, or SIP-101e**

<table>
<thead>
<tr>
<th>POINT LOAD WIDTH</th>
<th>SINGLE TOP PLATE</th>
<th>W/SPACER PLATE1</th>
<th>W/CAP PLATE2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/2&quot;</td>
<td>2000</td>
<td>2100</td>
<td>4000</td>
</tr>
<tr>
<td>3&quot;</td>
<td>2150</td>
<td>3000</td>
<td>4150</td>
</tr>
</tbody>
</table>

1. MINIMUM 3/8" CDX PLYWOOD OR EQUIVALENT
2. MINIMUM SPF #2 2X OR EQUIVALENT

**GENERAL NOTES:**
- CHART VALUES ARE POUNDS.
- LOADS LIMITED BY DEFLECTION OR ULTIMATE FAILURE LOAD DIVIDED BY A FACTOR OF SAFETY OF THREE.
- WALL AXIAL LOADS SHALL BE DESIGNED TO THE LESSER OF THE POINT AXIAL LOADS OF LOAD DESIGN CHART #2C OR THE UNIFORM AXIAL LOADS OF LOAD DESIGN CHART #2B.
- FOR POINT LOADS EXCEEDING THESE CAPACITIES, USE POSTS TO TRANSFER LOADS AS REQUIRED.

---

**Diagram:**

- **Note:** OSR terminations must be fully supported by foundation system.
- **Note:** Use minimum grade SPF #2 or equivalent equivalent for SPF framing.
- **Note:** Minimum grade SPF #2 or equivalent equivalent for SPF framing.
- **Note:** Minimum grade SPF #2 or equivalent equivalent for SPF framing.
### Wall - Transverse Loads - PSF

**LOAD DESIGN CHART #4**

**DETAIL SIP-101c**

<table>
<thead>
<tr>
<th>SIP THICKNESS</th>
<th>DEFLECTION LIMIT</th>
<th>SIP HEIGHT (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>8WAB¹</td>
</tr>
<tr>
<td>4-1/2&quot;</td>
<td>L/360</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>56</td>
</tr>
<tr>
<td>6-1/2&quot;</td>
<td>L/360</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>56</td>
</tr>
<tr>
<td>8-1/4&quot;</td>
<td>L/360</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>56</td>
</tr>
<tr>
<td>10-1/4&quot;</td>
<td>L/360</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>56</td>
</tr>
<tr>
<td>12-1/4&quot;</td>
<td>L/360</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>56</td>
</tr>
</tbody>
</table>

¹ WAB = SIPS INSTALLED WITH THE STRONG AXIS OF THE OSB FACINGS PERPENDICULAR TO SIP HEIGHT.

**GENERAL NOTES:**

- CHART VALUES ARE POUNDS PER SQUARE FOOT.
- CHART VALUES ARE APPLICABLE TO ANY SPLINE CONNECTION.
- SURFACE, BLOCK, OR LUMBER BLOCK SPLINE CONNECTED TO SIP FACING WITH 8d BOX (0.113) @ 6" O.C.
- SIP FACING CONNECTED TO TOP AND BOTTOM PLATE WITH 8d BOX (0.113) @ 6" O.C.
- VALUES ARE FOR TOTAL LOAD (DEAD LOAD + LIVE LOAD).
- LOADS LIMITED BY DEFLECTION OR ULTIMATE FAILURE LOAD DIVIDED BY A FACTOR OF SAFETY OF THREE.
### Load Design Charts

**Wall - Shear Loads - PLF**

**LOAD DESIGN CHART #6**

**SPLINE DETAILS**

SIP-102, SIP-102g, SIP-102m, or SIP-102k

<table>
<thead>
<tr>
<th>SPLINE TYPE</th>
<th>CONNECTIONS</th>
<th>SHEAR STRENGTH (PLF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface or Block</td>
<td>8d Box</td>
<td>6&quot; o.c.</td>
</tr>
<tr>
<td>1X Lumber Block</td>
<td>8d Cooler</td>
<td>Two staggered rows 4&quot; o.c.</td>
</tr>
<tr>
<td>4X Lumber</td>
<td>8d Cooler</td>
<td>Two staggered rows 4&quot; o.c.</td>
</tr>
<tr>
<td>4X Lumber</td>
<td>8d Cooler</td>
<td>Two staggered rows 3&quot; o.c.</td>
</tr>
<tr>
<td>4X Lumber</td>
<td>8d Cooler</td>
<td>Two staggered rows 2&quot; o.c.</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**
- Chart values are pounds per lineal feet.
- Chart values are applicable to any thickness SIP.
- Loads limited by deflection or ultimate failure load divided by a factor of safety of three.
- Required connections must be made on both sides of spline joint, bottom plate, top plate, and each side of the SIP.
- Top plate joints must be staggered a minimum of one foot from spline joints.
- Plates, chords, holdowns, and connections to other structural elements must be designed by a registered design professional in accordance with accepted engineering practice.
Wall - Header Loads - PLF
LOAD DESIGN CHART #5
DETAILS SIP-112 through SIP-114

<table>
<thead>
<tr>
<th>HEADER DEPTH</th>
<th>DEFLECTION LIMIT</th>
<th>HEADER SPAN (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>12&quot;</td>
<td>L/480</td>
<td>524</td>
</tr>
<tr>
<td></td>
<td>L/360</td>
<td>703</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>708</td>
</tr>
<tr>
<td>18&quot;</td>
<td>L/480</td>
<td>762</td>
</tr>
<tr>
<td></td>
<td>L/360</td>
<td>773</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>773</td>
</tr>
<tr>
<td>24&quot;</td>
<td>L/480</td>
<td>837</td>
</tr>
<tr>
<td></td>
<td>L/360</td>
<td>837</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>837</td>
</tr>
</tbody>
</table>

GENERAL NOTES:
- CHART VALUES ARE POUNDS PER LINEAL FOOT.
- LOADS LIMITED BY DEFLECTION OR ULTIMATE FAILURE LOAD DIVIDED BY A FACTOR OF SAFETY OF THREE.
- POSTS SUPPORTING HEADER, WHEN REQUIRED, MUST BE DESIGNED BY A REGISTERED DESIGN PROFESSIONAL IN ACCORDANCE WITH ACCEPTED ENGINEERING PRACTICE.

Refer to R-Control SIP Construction Manual for additional header details.
**Load Design Charts**

### Roof/Floor - Transverse Loads - PSF

**LOAD DESIGN CHART #1**

**SPLINE DETAILS SIP-102, SIP-102g, or SIP-102m**

<table>
<thead>
<tr>
<th>SIP THICKNESS</th>
<th>DEFLECTION LIMIT</th>
<th>SIP SPAN (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>4-1/2&quot;</td>
<td>L/360</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>127</td>
</tr>
<tr>
<td>6-1/2&quot;</td>
<td>L/360</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>131</td>
</tr>
<tr>
<td>8-1/4&quot;</td>
<td>L/360</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>135</td>
</tr>
<tr>
<td>10-1/4&quot;</td>
<td>L/360</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>140</td>
</tr>
<tr>
<td>12-1/4&quot;</td>
<td>L/360</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>138</td>
</tr>
</tbody>
</table>

1 **VALUES FOR 8FT SPAN ARE APPLICABLE TO SIPS INSTALLED WITH THE STRONG AXIS OF THE OSB FACINGS PARALLEL OR PERPENDICULAR TO SIP SPAN.**

**GENERAL NOTES:**

- CHART VALUES ARE POUNDS PER SQUARE FOOT.
- SURFACE, BLOCK, OR LUMBER BLOCK SPLINE CONNECTED TO SIP FACING WITH 8d BOX (0.113) NAILS 6" O.C.
- CONTINUOUS SUPPORT WITH A MINIMUM BEARING OF 1-1/2" AT EACH END REQUIRED.
- CHART IS BASED UPON UNIFORM LOADS.
- LOADS LIMITED BY DEFLECTION OR ULTIMATE FAILURE LOAD DIVIDED BY A FACTOR OF SAFETY OF THREE.
- FLOORS MUST HAVE A MINIMUM 7/16" THICK OSB OR EQUIVALENT OVERLAY.
- FOR SLOPED SIPS, THE LOADING CONDITIONS AND SIP CAPACITIES SHOULD BE REVIEWED BASED UPON THE INCLINED SIP LENGTH. REFER TO R-CONTROL SIP TECHNICAL BULLETIN SIP NO. 2042.
- VALUES ARE FOR TOTAL LOAD (DEAD LOAD + LIVE LOAD).
- DEFLECTION BASED UPON \( K_a = 1.0 \), FOR LONG TERM DEFLECTION UNDER SUSTAINED LOAD (CREEP), ADDITIONAL DEFLECTION MUST BE EVALUATED.
### Load Design Chart #3

#### DOUBLE 2X SPLINE DETAILS SIP-102d and SIP-108

<table>
<thead>
<tr>
<th>SIP THICKNESS</th>
<th>DEFLECTION LIMIT</th>
<th>SIP SPAN (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L/360</td>
<td>10 12 14 16 18 20 22 24</td>
</tr>
<tr>
<td>6-1/2&quot;</td>
<td>L/360</td>
<td>53 40 30 24 19 15</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>79 59 45 35 28 22</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>105 79 60 47 37 30</td>
</tr>
<tr>
<td>8-1/4&quot;</td>
<td>L/360</td>
<td>89 65 48 37 28 22</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>109 91 72 55 42 33</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>109 91 73 68 56 44</td>
</tr>
<tr>
<td>10-1/4&quot;</td>
<td>L/360</td>
<td>150 111 84 65 51 41 33 27</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>174 145 124 98 77 61 49 40</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>174 145 124 109 97 82 66 54</td>
</tr>
<tr>
<td>12-1/4&quot;</td>
<td>L/360</td>
<td>177 148 115 89 70 56 45 37</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>177 148 127 111 99 84 68 55</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>177 148 127 111 99 89 81 74</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

- Chart values are pounds per square foot.
- Double 2X spline must be continuous, spaced 4" O.C., and connected to SIP facing with 8d box (0.113) nails 6" O.C.
- Continuous support with a minimum double 2X spline bearing of 1-1/2" at each end required.
- Chart is based upon uniform loads.
- Loads limited by deflection or ultimate failure load divided by a factor of safety of three.
- Floors must have a minimum 7/16" thick OSB or equivalent overlay.
- For spans greater than 22' and for all 12-1/4" SIPs, double 2X spline is required to be #2 Douglas Fir or better.
- For sloped SIPs, the loading conditions and SIP capacities should be reviewed based upon the inclined SIP length. Refer to R-Control SIP technical bulletin SIP No. 2042.
- Values are for total load (dead load + live load).
- Deflection based upon $k_{oc}=1.0$. For long term deflection under sustained load (creep), additional deflection must be evaluated.
Roof/Floor - Transverse Loads - PSF
LOAD DESIGN CHART #3A
I-BEAM SPLINE DETAILS SIP-102b and SIP-108a

<table>
<thead>
<tr>
<th>SIP THICKNESS</th>
<th>DEFLECTION LIMIT</th>
<th>SIP SPAN (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-1/4&quot;</td>
<td>L/360</td>
<td>118</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>118</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>118</td>
</tr>
<tr>
<td>12-1/4&quot;</td>
<td>L/360</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>131</td>
</tr>
</tbody>
</table>

GENERAL NOTES:
- CHART VALUES ARE POUNDS PER SQUARE FOOT.
- I-BEAM SPLINE MUST BE CONTINUOUS, SPACED 4’ O.C., AND CONNECTED TO SIP FACING WITH 8d BOX (0.113) NAILS 6” O.C.
- CONTINUOUS SUPPORT WITH A MINIMUM 7/16” THICK OSB OR EQUIVALENT OVERLAY.
- CHART IS BASED UPON UNIFORM LOADS.
- LOADS LIMITED BY DEFLECTION OR ULTIMATE FAILURE LOAD DIVIDED BY A FACTOR OF SAFETY OF THREE.
- FOR SLOPED SIPS, THE LOADING CONDITIONS AND SIP CAPACITIES SHOULD BE REVIEWED BASED UPON THE INCLINED SIP LENGTH. REFER TO R-CONTROL SIP TECHNICAL BULLETIN SIP NO. 2042.
- VALUES ARE FOR TOTAL LOAD (DEAD LOAD + LIVE LOAD).
- DEFLECTION BASED UPON Xₖ = 1.0. FOR LONG TERM DEFLECTION UNDER SUSTAINED LOAD (CREEP), ADDITIONAL DEFLECTION MUST BE EVALUATED.

---

**SECTION/PLAN**

---

---

**ISOMETRIC PLAN**
### Roof/Floor - Transverse Loads - PSF

**LOAD DESIGN CHART #3C**

**R-CONTROL LVL SPLINE DETAIL SIP-102a**

<table>
<thead>
<tr>
<th>SIP THICKNESS</th>
<th>DEFLECTION LIMIT</th>
<th>SIP SPAN (feet)</th>
<th>R-CONTROL LVL SPLINE WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>8-1/4”</td>
<td>L/360</td>
<td>81</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>L/240</td>
<td>81</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>L/180</td>
<td>81</td>
<td>68</td>
</tr>
</tbody>
</table>

**R-CONTROL LVL SPLINE WIDTH**

- **1-3/4”**
- **2-1/2”**

**GENERAL NOTES:**
- CHART VALUES ARE POUNDS PER SQUARE FOOT.
- LVL SPLINE MUST BE CONTINUOUS, SPACED 4” O.C., AND CONNECTED TO SIP FACING WITH 8d BOX (0.113) NAILS 6” O.C.
- CONTINUOUS SUPPORT WITH A MINIMUM LVL SPLINE BEARING OF 1-1/2” AT EACH END REQUIRED.
- CHART IS BASED UPON UNIFORM LOADS.
- LOADS LIMITED BY DEFLECTION OR ULTIMATE FAILURE LOAD DIVIDED BY A FACTOR OF SAFETY OF THREE.
- FLOORS MUST HAVE A MINIMUM 7/16” THICK OSB OR EQUIVALENT OVERLAY.
- FOR SLOPED SIPS, THE LOADING CONDITIONS AND SIP CAPACITIES SHOULD BE REVIEWED BASED UPON THE INCLINED SIP LENGTH. REFER TO R-CONTROL SIP TECHNICAL BULLETIN SIP NO. 2042.
- VALUES ARE FOR TOTAL LOAD (DEAD LOAD + LIVE LOAD).
- DEFLECTION BASED UPON $K_L = 1.0$. FOR LONG TERM DEFLECTION UNDER SUSTAINED LOAD (CREEP), ADDITIONAL DEFLECTION MUST BE EVALUATED.

---

**SECTION/PLAN**

- **R-Control LVL SPLINE WIDTH**
- **R-Control SIP**
- **Nail E-Continuity**
- **Engineered Wood**
- **SIP-102a**
## Roof - Uplift Loads

Load Design Charts

### Load Design Chart #8

Maximum Spacing of R-Control Wood Screws At Supports - INCHES

<table>
<thead>
<tr>
<th>ROOF PITCH</th>
<th>SIP SPAN (FT)</th>
<th>2009 IBC&lt;sup&gt;3&lt;/sup&gt; WIND SPEED, $V_{ASD}$</th>
<th>2009 IRC/2012 IRC WIND SPEED, $V_{ASD}$</th>
<th>2012 IBC&lt;sup&gt;4&lt;/sup&gt; WIND SPEED, $V_{ULT}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90 MPH</td>
<td>115 MPH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5:12</td>
<td>8</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>12</td>
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<td>12</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>3:12</td>
<td>8</td>
<td>12</td>
<td>12</td>
<td>12</td>
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<td></td>
<td>12</td>
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<tr>
<td></td>
<td>16</td>
<td>8</td>
<td>8</td>
<td>8</td>
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<tr>
<td></td>
<td>20</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>6:12</td>
<td>8</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>12</td>
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<td></td>
<td>16</td>
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<td></td>
<td>20</td>
<td>8</td>
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</tr>
<tr>
<td></td>
<td>24</td>
<td>6</td>
<td>6</td>
<td>6</td>
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<tr>
<td>9:12</td>
<td>8</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>12</td>
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<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

1. Fastener spacing is based on fastener head pull-through and withdrawal strength of R-control wood screws tested in accordance with ASTM D1037. The allowable withdrawal strength and pull-through strength were taken as the average ultimate load divided by a factor of safety of 5.0 and a load duration factor of 1.6 (allowable pull-through strength = 179 LBF, allowable withdrawal strength = 200 LBF).

2. Table values apply to simply supported SIP roof members having an overhang not to exceed 24-inches. Wood support to have a minimum specific gravity, $G = 0.42$ (Spruce-Pine-Fur). Screw shall have sufficient length and be installed so that it penetrates the wood support a minimum of 1.5-inches.

3. Three-second-gust wind speed based on a building height of 40-feet, Zone 2E, importance factor, $L_i = 1.0$ and topographic factor, $K_t = 1.0$, internal pressure coefficient, $G_c = 0.18$ in accordance with ASCE 7, 2005 Edition, Section 6.5.12.2.2 (Main wind force resisting system, low-rise building).

4. Three-second-gust wind speed; based on a building height of 40-feet, Zone 2E, importance factor, $L_i = 1.0$ and topographic factor, $K_t = 1.0$, internal pressure coefficient, $G_c = 0.18$ in accordance with ASCE 7, 2010 Edition, Chapter 28 (Wind Loads on Building - MFRS (Envelope Procedure)). A minimum roof assembly dead load of 10 PSF is considered in the tabulated values (uplift pressure reduce by 0.6 times 10 PSF).

**General Notes:**
- Chart values are in inches.
- In high wind speed areas, please refer to R-control SIP technical bulletins for spacing requirements.
### Roof/Floor - Diaphragm Loads - PLF

**LOAD DESIGN CHART #7**

**CONNECTION DETAILS**

**SIP 139, SIP-139a, SIP-140 and SIP-141**

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<td>R-CONTROL SCREWS3</td>
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<tr>
<td>6&quot;</td>
<td>3&quot; @ top and bottom</td>
<td>3&quot;, two rows each side of joint and staggered</td>
<td>12&quot;</td>
<td>500</td>
</tr>
<tr>
<td>4&quot;</td>
<td>3&quot; @ top and bottom</td>
<td>3&quot;, two rows each side of joint and staggered</td>
<td>12&quot;</td>
<td>750</td>
</tr>
<tr>
<td>3&quot;</td>
<td>3&quot; @ top and bottom</td>
<td>3&quot;, in two rows each side of joint and staggered</td>
<td>12&quot;</td>
<td>850</td>
</tr>
</tbody>
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1 DIAPHRAGM BOUNDARY ELEMENTS MUST CONSIST OF FULL-DEPTH, SOLID-SAWN LUMBER, 2-INCH MINIMUM NOMINAL WIDTH, MINIMUM SPECIFIC GRAVITY OF 0.50, INSERTED IN SIP CORE, CONTINUOUS ACROSS PANEL JOINTS. PANEL EDGES PARALLEL TO APPLIED SHEAR SHALL BE REINFORCED WITH SOLID-SAWN LUMBER, 4-INCH MINIMUM NOMINAL WIDTH, AND MINIMUM SPECIFIC GRAVITY OF 0.50.

2 NAILS CONNECT SIP FACINGS AT JOINTS TO OSB SURFACE SPLINES LOCATED UNDER TOP FACE AT ALL PANEL EDGES, AT THE TABULATED SPACING.

3 DIAPHRAGM SECURED TO SUPPORT MEMBERS WITH R-CONTROL SCREWS AT THE TABULATED SPACING A AND MINIMUM 1-5/8 INCH PENETRATION INTO THE RECEIVING MEMBER.

**GENERAL NOTES:**

- CHART VALUES ARE POUNDS PER LINEAL FOOT.
- SURFACE, BLOCK, OR LUMBER BLOCK SPLINE.
- LOADS LIMITED BY ULTIMATE FAILURE LOAD DIVIDED BY A FACTOR OF SAFETY OF THREE.
Ready to take control? Start here.

If you’re wondering how R-Control SIPs can work on your next project, just contact your nearest R-Control supplier. They’ll be happy to collaborate on design, walk you through R-Control SIP installation, provide test data, pricing, and answers to all your questions. Start by visiting our web site: www.r-control.com.
**R-Control® SIPs FrameGuard® Coated**

Make sure your building plans include built-in mold, mildew, and termite protection.

R-Control SIPs are heavyweights against the destructive agents of mold, mildew, and termites. The Foam-Control® EPS in R-Control SIPs is treated with Perform Guard® termite protection. And the entire SIP, when treated with the FrameGuard Coating prevents mold, mildew, and termite damage to its wood components.

**Safe and Effective.**

R-Control SIPs FrameGuard Coated are protected with organic fungicides and a borate compound tested to be effective. The organic compounds remain close to the surface to provide protection against mold; moldicides inhibit the enzymes’ ability to break down the wood and consume the sugars and starches mold needs for growth. Meanwhile the borate component penetrates into wood providing protection against both fungi and termites.

**Built-in Protection.**

When you specify R-Control SIPs FrameGuard Coated, there is built-in protection against future costly repairs due to mold, fungi, and termites. From the time the building materials arrive on the job site, throughout construction and after occupancy of the structure, FrameGuard Coating continues to protect the R-Control SIP structure and the owner’s investment. Using FrameGuard Coated R-Control SIPs and wood components makes good economic sense.

**Go Green.**

You will know R-Control SIPs FrameGuard Coated when you see them. A distinctive green colorant identifies wood treated with FrameGuard Coating.

Note: In order to achieve complete mold, mildew, and termite resistant structures, R-Control recommends that the plating/spline material used in conjunction with the R-Control SIP System and other structural wood materials of the structure also be treated with FrameGuard Coating or an equivalent treatment system.

**Advantages**

- Protects against mold
- Protects against fungi/mildew
- Protects against termite damage

You’re designing a new building for your client. This is your one chance to specify mold-resistant framing and prevent mold problems in the future. R-Control SIPs FrameGuard Coated is your solution. FrameGuard Coated mold-resistant wood gives your client an added level of protection; plus, it’s backed by a warranty.
R-Control SIPs are made exclusively with Foam-Control EPS. R-Control SIPs and Foam-Control EPS are manufactured by AFM Corporation licensees.

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R-Control, Foam-Control, Perform Guard, and Control, Not Compromise are trademarks of AFM Corporation, Lakeville, MN.

FrameGuard is a registered trademark of Arch Wood Protection, Inc.

Note: FrameGuard treated SIPs and wood materials are for indoor use and can not be used in ground contact applications and must be protected from weather within six months of their field installation.

Ready to take control? Start here.

If you're wondering how R-Control SIPs FrameGuard Coated can work on your next project, just contact your nearest R-Control manufacturer. They’ll be happy to collaborate on design, walk you through R-Control SIP installation, provide technical support, pricing, and answers to all your questions. Start by visiting www.r-control.com.

- Testing proves FrameGuard Coated wood effective.
- Field installations and laboratory tests show FrameGuard Coated wood to be highly effective for inhibiting the growth of mold. FrameGuard Coated wood also protects against fungi and termites.

Untreated Wood

FrameGuard Coated Wood
Low VOC Do-All-Ply® Sealant

R-Control® Low VOC Do-All-Ply® Sealant is a premium quality, low VOC, extremely flexible, high movement sealant for use in R-Control SIP and Foam-Control Nailbase construction.

- VOC compliant (<10 g/l)
- Low perm rating
- Accommodates joint movement
- Resistant to moisture, dampness, and temperature
- Retains its flexibility with age
- Unaffected by freeze-thaw cycles
- EPS foam compatible

Application Instructions

To assure positive adhesion of the sealant to substrate surfaces, make certain surfaces are clean, dry, and free of dirt and foreign materials.

Remove cap and nozzle from applicator gun. Place sausage into the barrel of the gun and cut crimped end of sausage. Trim nozzle to an 1/2” opening. Replace nozzle and cap to applicator gun.

R-Control SIPs:

Apply in 1/2” diameter straight continuous bead to connections such as splines, top and bottom plates, and boundary terminations at ridges, gables, eaves, roof, and wall openings as shown in the R-Control Construction Manual. Consult the R-Control Construction Manual for proper location and application of Low VOC Do-All-Ply Sealant.

Foam-Control Nailbase:

Apply in 1/2” diameter straight continuous bead to splines, joints, and boundary terminations at ridges, gables, eaves, roof, and wall openings as shown in the Foam-Control Nailbase Construction Manuals. Consult the Foam-Control Nailbase Roof and Wall Construction Manuals for proper application of Low VOC Do-All-Ply Sealant.
Cold Weather

For best performance in cool or cold weather, store R-Control LOW VOC Do-All-Ply Sealant at room temperature for at least 24 hours before using.

Safety

Refer to R-Control Low VOC Do-All-Ply Sealant MSDS for complete safety information.

Clean-Up

Dispose of spent sausages properly. Immediately after use, clean equipment with the appropriate solvent. Use proper precautions when handling solvents. Use solvents in a well ventilated area. Dispose of solvent and cleaning rags in a proper manner. Remove cured sealant by cutting with a sharp-edged tool. Remove thin films by abrading.

Coverage Rate

• 1/2” bead from 20 oz. sausage = 15 lineal feet

Shelf Life

Shelf life is 9 months when stored at temperatures not exceeding 80°F.

Storage

Store in original, unopened containers in a cool, dry area. Protect unopened containers from heat and direct sunlight. Storing at elevated temperatures will reduce shelf life.

Accessory Availability

Your nearest R-Control SIP or Foam-Control Nailbase supplier will be happy to collaborate with you to determine your needs for R-Control SIP or Foam-Control Nailbase Accessories as part of your complete material package. For additional information on R-Control SIPS or Foam-Control Nailbase and to contact your nearest supplier visit the www.r-control.com or www.foam-control.com websites.
Fasteners

**Wood Screw**

R-Control® Wood Screws are used to attach R-Control SIPs (Structural Insulated Panels) to wood structural members and substrates. The R-Control Wood Screw is strong and costs less than other systems using screws and stress plates or spikes.

- Significant savings over “screw and plate”
- Stronger than spikes or nails
- One step for easy installation
- 6 lobe drive head for less stripping
- Sits tight to the R-Control SIP surface
- Superior wind up lift strength
- Available in lengths from 3” - 18”

**Metal Screws**

R-Control Metal screws are used to attach R-Control SIPs to metal structural members and substrates. Installation is direct and fast - no wood nailers needed.

- Self drilling into steel
- No wood nailers needed
- One step for fast installation
- 6 lobe drive head for less stripping
- Sits tight to the R-Control SIP surface
- Superior wind up lift strength

R-Control Heavy Duty Metal Screws can self drill into 3/16” steel without pilot hole predrilling.

- Available in lengths from 6” - 13 3/4”

R-Control Light Duty Metal Screw are used to attach R-Control SIPs to light duty (up to 18 gauge) metal substrates.

- Available in lengths from 3” - 18”

R-Control SIP fasteners are engineered and manufactured to give you control over every aspect of your project installation.

- Easy to install
- Large head size makes it easy to see for job verification
- Heat treated steel for high strength and durability
- Coated for superior corrosion resistance
- Superior wind up lift strength
Wood Screw

Head Style: Pancake head with internal 6 lobe drive
Head Diameter: 0.625"
Drive Style: T-30, 6 lobe
Thread Diameter: 0.255"
Shank Diameter: 0.190"
Point Style: Thread Point

Screw lengths vary

Metal Screw - Heavy Duty

Head Style: Pancake head with internal 6 lobe drive
Head Diameter: 0.625"
Drive Style: T-30, 6 lobe
Thread Diameter: 0.245"
Shank Diameter: 0.212"
Point Style: Drill Point

Screw lengths vary

Metal Screw - Light Duty

Head Style: Pancake head with internal 6 lobe drive
Head Diameter: 0.625"
Drive Style: T-30, 6 lobe
Thread Diameter: 0.255"
Shank Diameter: 0.190"
Point Style: Drill Point

Screw lengths vary

Specifications/Installation

Wood and/or Metal Screws as shown on plans and in specifications shall be supplied by the R-Control supplier.

Use R-Control SIP Wood and/or Metal Screws per R-Control SIP recommended installation guidelines. Refer to R-Control SIP Load Design Charts, Construction Manual, and Technical Bulletins showing proper design and applications.

R-Control SIP Accessory Availability

Your nearest R-Control supplier will be happy to collaborate with you to determine your needs for R-Control SIP Accessories as part of your complete R-Control SIP package. For additional information on R-Control SIPS and to contact your nearest supplier visit our website at www.r-control.com.
SIP Tape

R-Control SIP Tape consists of a synthetic pressure sensitive adhesive laminated to a woven and coated polyolefin membrane. It is well-suited as an interior seam tape for SIP construction.

Warm, moist interior air escaping into SIP joints can become trapped and condense when it comes into contact with cold exterior surfaces. Sealing the interior joints of walls, wall to roof panels, as well as roof panel to roof panel, will reduce the potential for moisture collection.

Application Instructions:

All tape application at panel joints should be in accordance with R-Control SIP Construction Manual.

All surfaces must be clean, dry, and free of dust, dirt, grease, oil, and any other contaminants that may interfere with adhesion.

Position tape so that it is centered over panel joint. While unrolling tape along center line of joint, remove release film at a 45° angle and continue to press tape into place. To ensure a tight seal and minimize air bubbles and wrinkles, tape must be pressed firmly by hand to OSB at the center, working outward with a smoothing motion to the edges. A roller or similar tool must then be used to roll over the entire surface of the SIP Tape to firmly mate the tape to the OSB surface.

Installation Sequence:

Wall to roof or ridge to roof tape should be installed before ceiling panel joints are taped. Intersections of ceiling panel tape with tape at the roof or wall should be detailed so that the ceiling panel tape overlaps by a minimum of 3”. Press overlaps firmly and carefully to assure an airtight seal.

When the end of a roll is encountered, the new roll should be started by overlapping at least 3” of previously installed tape. Press overlaps firmly and carefully to assure an airtight seal.

R-Control SIP Tape is engineered and manufactured to give you control over every aspect of your project installation.

- High peel and shear strength
- No VOC; meets air quality criteria for use as an interior sealing tape
- Applies in extreme weather - down to -15°F (-26°C)
- Smooth, even film assures a correct application every time
- Quick and easy installation – no priming required
**Safety, Storage and Handling.**

When R-Control SIP Tape is stored indoors, out of direct sunlight, and in its original, unopened container between 60°F and 80°F (15°C and 26°C), the shelf life is 12 months. Please review MSDS for product handling procedures.

**Size and Availability.**

**Widths:** 4", 6", 9", 12", 18"

**Length:** 75' Rolls

**R-Control SIP Accessory Availability**

Your nearest R-Control supplier will be happy to collaborate with you to determine your needs for R-Control SIP Accessories as part of your complete R-Control SIP package. For additional information on R-Control SIPS and to contact your nearest supplier visit our website at www.r-control.com.

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### SIP Tape Properties

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<td>Adhesive Thickness</td>
<td>0.007&quot;</td>
<td>(0.18mm)</td>
</tr>
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<td>Moisture Vapor Transmission Rate (72°F/50% RH)</td>
<td>&lt;0.1 perm</td>
<td>ASTM E96</td>
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<tr>
<td>Interior Emission, Total Volatile Organic Compounds</td>
<td>&lt; 1 mg/m²-hr</td>
<td>AQS-006 Standard</td>
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<td>Adhesion to OSB</td>
<td>3.5 lbs per lineal inch</td>
<td>ASTM D3330</td>
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<tr>
<td>Sealability around Nail</td>
<td>Pass</td>
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<tr>
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<td>Pass</td>
<td>ASTM D1970</td>
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<td>Waterproof Integrity of Lap Seam</td>
<td>Pass</td>
<td>ASTM D1970</td>
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When you choose R-Control SIPs, you’re collaborating with a team of experts who work with you every step of the way. We’re here to answer your questions, solve your problems, and do everything we can to make sure your project proceeds smoothly—and ends successfully.

R-Control SIPs are manufactured by a network of licensed manufacturers throughout North America and the world. R-Control SIP licensed facilities adhere to strict, consistent standards to ensure high-quality custom-made R-Control SIPs.

This network allows us to offer architects, designers and builders the best of both worlds: the resources of the country’s largest provider of SIP products and systems, and the superior attention and customer service of a local supplier.

**Note:** Information deemed reliable at time of printing. Please visit www.r-control.com for the latest information. January 2015.
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- Fiber Cement Siding from CertainTeed  sip no. 2073
- Fiber Cement Siding from James Hardie  sip no. 2072
General Recommendations

**R-Control SIP Sizes**

R-Control SIPs are made in a variety of sizes, most commonly from 4’ x 8’ up to 8’ x 24’. Consult the R-Control SIP Manufacturer for sizes and fabrication services available in your area.

**Environmentally Safe**

The core material for R-Control SIPs, Foam-Control EPS with Perform Guard, contains no CFCs, HCFCs, HFCs or formaldehyde and is recyclable. Foam-Control EPS with Perform Guard is inert, non-nutritive and highly stable. Your R-Control SIP Manufacturer encourages you to support recycling and energy conservation.

**Warranty**

R-Control SIP Manufacturers provide a 20-year warranty covering structural strength and thermal performance. Contact the R-Control SIP manufacturer for details regarding the warranty program.

**Engineering**

R-Control SIPs are engineered structural components. Please refer to the R-Control SIP Load Design Charts for structural capacities. Each structure designed with R-Control SIPs must be reviewed by a qualified design professional.

**Mechanical Ventilation**

R-Control SIP construction effectively eliminates air infiltration and exfiltration in a structure. Energy robbing air changes are greatly reduced. For this reason R-Control SIP Manufacturers recommends that your structure be analyzed by a qualified HVAC representative to determine proper ventilation design. Refer to R-Control SIP Technical Bulletins sip no. 2000 and sip no. 2051.

**Handling - Storage - Protection**

R-Control SIPs should be stored in a fully supported manner and protected from weather. Cover stored SIPs with tarps or similar protective wraps. Exposure 1 OSB facings are used in R-Control SIP manufacture; however, panels used for roof systems must have temporary roofing applied at the time of installation. Apply finished roofing when immediately practical.

Metal roof systems have inherent properties that may cause R-Control SIP roofs covered with these materials to become hotter than other roof systems. When installing metal roof systems on R-Control SIPs, additional design considerations may be necessary to protect the roofing underlayment and the SIP from excessive temperatures. These design precautions may include the use of a ventilated air space above the SIP to minimize tempera-
ture exposure. Consult with the R-Control SIP Manufacturers for local recommendations. Refer to R-Control SIP Technical Bulletin sip no. 2064.

SIP walls must have code approved weather-proof cladding system (underlayment plus siding/cladding) applied when immediately practical. If wall cladding application is delayed (more than three weeks or an anticipated repeated exposure to precipitation is expected) apply temporary breathable weather-proof underlayment to the exterior wall prior to permanent finish materials. Refer to R-Control SIP Technical Bulletin sip no. 2050.

EPS contains a flame retardant additive. However, the EPS should be considered combustible and used with code approved thermal barriers and should not be stored near any open flame or source of ignition. Do not install or use EPS with coal-tar pitch or highly solvent extended mastics, adhesives or sealants. Consult the R-Control SIP Manufacturer for suggested adhesives, sealants, and assembly specifications not otherwise detailed in this manual. Refer to R-Control SIP Technical Bulletin sip no. 2048 and sip no. 2064.

**SIP Handling and Placement**

R-Control SIPs may be complete roof, wall, or floor sections in the building design. R-Control SIPs may be placed on foundations, conventionally framed structural systems, or they may be the structural systems themselves. They may be erected by hand or with the use of a crane or lift truck. Panel weight and contractor preference will dictate the erection method used. Regardless of the erection method or the framing system used to support R-Control SIPs, place, secure and attach the panels following the details and guidelines shown in this manual.

**SIP Splines**

All spline connections of R-Control SIPs using Double 2X’s and I-Beams must be continuous members.

**SIP Fastening**

R-Control SIPs are connected by nails and R-Control Low VOC Do-All-Ply®. R-Control Low VOC Do-All-Ply must be used together with all fastening techniques. When R-Control Wood Screw or Metal Fasteners are used, they require a minimum of 1” penetration into the support.
Low VOC Do-All-Ply and SIP Tape

R-Control Low VOC Do-All-Ply is a sealant which is safe for expanded polystyrene foam insulation. Apply the R-Control Low VOC Do-All-Ply in a continuous 1/2” diameter bead as shown in the R-Control SIP details. This size bead will result in the optimum coating when plates and splines are installed.

R-Control SIP Tape is a sealing tape for use on R-Control SIPs. R-Control SIP Tape is used in conjunction with R-Control Low VOC Do-All-Ply. When properly applied, the use of R-Control Low VOC Do-All-Ply and SIP Tape will augment the overall tightness of the structure.

Vapor Retarders

R-Control requires the use of SIP Tape or an equivalent vapor retarder at SIP connections per climate conditions or code requirements to ensure long term durable structures. Refer to R-Control SIP Technical Bulletin sip no. 2022, sip no. 2048, and sip no. 2057.

Thermal Barriers

All interior surfaces of the R-Control SIP must be finished with a code approved 15-minute thermal barrier, such as 1/2” gypsum board, Blazeguard or 1X wood paneling. Apply code approved thermal barriers according to the manufacturer’s specification. Buildings with automatic sprinklers as part of their designs may not require a thermal barrier. Consult your local building code department for special uses.

Hourly fire rated systems can be achieved using high performance thermal barriers such as type X and C gypsum board, spray applied fire proofing, etc. Refer to R-Control SIP Technical Bulletin sip no. 2018.

Special Treatments

R-Control SIPS are produced with Foam-Control EPS with Perform Guard that protects the core insulation from potential termite damage. In addition, the OSB facings can be coated with FrameGuard that protects the OSB from mold, mildew and termite damage. Please contact your R-Control SIP manufacturer to learn about specifications for these special treatments.
Disclaimer

Details, illustrations, pictures and guidelines provided herein give basic information and illustrate examples of R-Control SIP installation. The basic information provided herein is not intended to cover every potential use and application of R-Control SIPs. It is the responsibility of the installer to become familiar with his specific application and determine if R-Control SIPs are suitable. By commencing work, the installer accepts full responsibility for the proper and safe installation of R-Control SIPs at his job site. Adding an insulation component may change the behavior of a wall assembly with regard to air movement, water vapor transmittance, bulk water management and heating, cooling and ventilation systems. It is the responsibility of the owner or the owner’s representative to design the insulated wall assembly to perform in a manner ensuring function and durability. Furthermore, it is the sole responsibility of the installer to meet all federal and local regulatory requirements for job site safety for himself, his workers and any others on the job site while in the execution of all phases of R-Control SIP installation.
R–Control SIPs Do’s

1.) Handle SIPs with appropriate care.
2.) Store SIPs fully supported off the ground.
3.) Protect SIPs from weather with breathable covering.
4.) Lift and place SIPs with appropriate equipment.
5.) Provide level and square foundations or supporting floors.
6.) Install SIPs in accordance with approved drawings.
7.) Separate SIP facings and untreated plates from contact with concrete.
8.) Support both SIP facings fully on foundation or floors.
9.) When using cap or sill plates, use equal to full SIP width and offset plates joints from spline joints.
10.) Provide adequate bracing of SIPs during installation.
11.) Use factory provided electrical chases in SIP core.
12.) When using 2X, engineered wood, or I–Beam splines, use only continuous members.
13.) Provide appropriate end bearing for roof SIPs.
14.) Install fasteners flush to SIP facing surface.
15.) Protect SIPs from weather as soon as practical after installation.
16.) Use code approved flashings and exterior wall & roof coverings.
17.) Use code approved thermal barriers on interior.
18.) Have SIP structural requirements reviewed by a qualified design professional.
19.) Have any field modifications to SIPs, such as openings/penetrations reviewed by a qualified design professional.

Updated 1–16–12
R-Control SIPS Don’ts

1.) Don’t drop SIPs on corners.
2.) Don’t store SIPs directly on the ground.
3.) Don’t leave SIPs exposed to weather for an extended period of time.
4.) Don’t lift or place SIPs without appropriate equipment.
5.) Don’t overcut OSB facings at openings.
6.) Don’t have SIP facings and untreated plates in direct contact with concrete.
7.) Don’t have unsupported SIP facings.
8.) Don’t have cap or sill plates less than full SIP width or have plate joints aligned with spline joints.
9.) Don’t install SIPs without adequate bracing.
10.) Don’t cut SIP facings for electrical chases, use factory provided chases in SIP core.
11.) Don’t have cuts in 2X or I-Beam splines.
12.) Don’t overdrive fasteners into SIP facings.
13.) Don’t have unsupported horizontal joints in walls.
14.) Don’t install plumbing in SIPs.
15.) Don’t install recessed lights in SIPs.
16.) Don’t install SIPs without structural review by a qualified design professional.
17.) Don’t make any field modifications to SIPs, such as openings/penetrations, without review by a qualified design professional.

Updated 1–16–12
Don’t have unsupported OSB facings.

Don’t have additional cap plate less than full panel width.

Don’t have cuts in 2X or I-beam splines.

Don’t overcut OSB facings at openings.

Don’t have OSB facings and untreated plates in direct contact with concrete.

Note: Please refer to R-Control SIP details for proper installation techniques.

Updated 1–16–12
R-Control Do–All–Ply and SIP Tape

1.) Make certain surfaces are clean, dry, and free of dirt and foreign materials prior to placement of R-Control Do–All–Ply or SIP Tape.

2.) Store R-Control Do–All–Ply and SIP Tape in a warm area prior to installation during cold weather.

3.) Place R-Control Do–All–Ply in straight CONTINUOUS 1/2 in. diameter beads as shown in details.

4.) Place R-Control SIP Tape at joints between SIPs as shown in details.

5.) After SIP Tape installation, use a hard roller to apply pressure to the SIP Tape surface to promote adhesion.

6.) Apply SIP Tape or equivalent vapor retarder on interior or exterior of SIP per climate conditions or code requirement.

7.) Refer to R-Control Do–All–Ply and SIP Tape material safety data sheets.

NOTE: It is the responsibility of the installer to apply R-Control Do–All–Ply and R-Control SIP Tape properly.

Failure to install R-Control Do–All–Ply and R-Control SIP Tape in accordance with instructions and as shown in details will reduce the durability of the SIP structure.
Top Plate.

R-Control Do-All-Ply 1/2” diameter continuous bead.

R-Control SIP.

R-Control Do-All-Ply 1/2” diameter continuous bead.

Bottom Plate
See SIP-101a for Do-All-Ply at top and bottom plates.

- Top Plate.
- R-Control SIP.
- R-Control Do-All-Ply 1/2” diameter continuous bead.
- R-Control Do-All-Ply 1/2” diameter continuous bead.
- Factory electrical chase.
- Bottom Plate
8d box (0.113) nails @ 6” o.c. each side, or equivalent. Typical top & bottom.

Factory electrical chase.

R-Control Do-All-Ply 1/2” diameter continuous bead top & bottom plate, see SIP-101a.

NOTE: OSB facings must be fully supported by foundation system.

NOTE: Use minimum grade SPF #2 or engineered equivalent for 2X plating.

SECTION
Scale: NTS

R-Control® SIP
TITLE: Plate Connections
NO. SIP-101c

Updated 1–16–12
R-Control Do-All-Ply
1/2” diameter continuous bead.

Full SIP width spacer board for wall height adjustment.

8d box (0.113) nails @ 6” o.c. each side, or equivalent. Typical top & bottom.

8d box (0.113) nails as req’d by design.

Factory electrical chase.

R-Control Do-All-Ply
1/2” diameter continuous bead top & bottom plate, see SIP-101a.

1 1/2”

NOTE: OSB facings must be fully supported by foundation system.

NOTE: Use minimum grade SPF #2 or engineered equivalent for 2X plating.

SECTION
Scale: NTS

R-Control® SIP
TITLEx Plate Connection with Spacer Board NO.
SIP-101d

Updated 1–16–12
NOTE: OSB facings must be fully supported by floor/foundation system.

NOTE: Use minimum grade SPF #2 or engineered equivalent for 2X plating.
8d box (0.113) nails in two staggered rows, 2” o.c. each side of panel.

Factory electrical chase.

R-Control Do-All-Ply 1/2” diameter bead top & bottom plate, see SIP-101a.

NOTE: OSB facings must be fully supported by foundation system.

NOTE: Use minimum grade Douglas-fir larch #2 or equivalent.

SECTION
Scale: NTS

R-Control® SIP
TITLE: High Load Shear Wall
4X Plate Connections

Updated 1-16-12
NO.
SIP-101f
Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

R-Control
Do-All-Ply 1/2” diameter continuous bead.
Factory electrical chase.

R-Control SIP.

8d box (0.113) nails @ 6” o.c. both sides of panel joint or equivalent. Typical each side of panel.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

SECTION/PLAN
Scale: NTS

Updated 3-16-12

R-Control® SIP

TITLE: Spline Connection
Surface Spline

NO. SIP-102
Width as required to meet structural requirements.

Continuous Engineered wood spline.

R–Control SIP.

R–Control Do–All–Ply 1/2” diameter continuous bead, each side.

Factory electrical chase.

8d box (0.113) nails @ 6” o.c. both sides of panel joint or equivalent. Typical each side of panel.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

SECTION/PLAN
Scale: NTS

R–Control® SIP
TITLE: Spline Connection Engineered Wood
NO. SIP–102a
Updated 1–16–12
R-Control® SIP

TITLE: Spline Connection
I-Beam Spline

NO. SIP-102b

8d box (0.113) nails @ 6” o.c. both sides of panel joint or equivalent. Typical each side of panel.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

SECTION/PLAN
Scale: NTS

Updated 3-26-12
R-Control Do-All-Ply 1/2" diameter continuous bead each side.

R-Control SIP.
Continuous Double 2X spline.

Factory electrical chase.

8d box (0.113) nails @ 6" o.c. both sides of panel joint or equivalent. Typical each side of panel.

10d box (0.128) nails @ 12" o.c. two rows staggered.

R-Control Do-All-Ply 1/2" diameter continuous bead.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.
Note: Spline to be of material conforming to DOC PS2, min thickness 7/16".

R-Control
Do-All-Ply 1/2" diameter continuous bead.

Factory electrical chase.

8d box (0.113) nails @ 3" o.c. both sides of panel joint or equivalent.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.
**SECTION/PLAN**

Scale: NTS

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**R-Control® SIP**

**TITLE:** Spline Connection
**NO.:** SIP-102g

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**Block Spline.**

**R-Control SIP.**

**R-Control**

Do-All-Ply 1/2” diameter continuous bead each side.

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**Factory electrical chase.**

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8d box (0.113) nails @ 6” o.c. both sides of panel joint or equivalent. Typical each side of panel.

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SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

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Updated 1-16-12
R-Control® SIP

TITLE: Spline Connection
I-Beam Spline

NO. SIP-102h

SECTION/PLAN

Factory electrical chase.
R-Control SIP.
Continuous R-Control I-Beam Spline.

R-Control Do-All-Ply 1/2” diameter continuous bead.

8d box (0.113) nails @ 6” o.c. both sides of panel joint or equivalent. Typical each side of panel.
SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Scale: NTS

Updated 1–16–12
8d box (0.113) nails in two staggered rows, 2” o.c. both sides of joint.

Note: Use minimum grade Douglas-fir larch #2 or equivalent.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

R-Control® SIP

TITLE: Spline Connection
4X – 2” o.c.  
NO. SIP–102k

Updated 1–16–12
R-Control Do-All-Ply 1/2" diameter continuous bead, each side.
Continuous Double 2X spline.

R-Control SIP.

10d box (0.128) nails @ 6" o.c. two rows, staggered.
R-Control Do-All-Ply, 1/2" diameter continuous bead.
Factory electrical chase.

8d box (0.113) nails @ 2" o.c. both sides of panel joint or equivalent. Typical each side of panel.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

NOTE: Use min. grade douglas fir #2 or engineered equivalent for 2X spline.
R-Control
Do-All-Ply 1/2" diameter continuous bead each side.

R-Control SIP.

Factory electrical chase.

1X SPF #2.

8d box (0.113) nails @ 6” o.c. both sides of panel joint, or equivalent. Typical each side of panel.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

SECTION/PLAN
Scale: NTS

Updated 1-16-12
R-Control
Do-All-Ply 1/2" diameter continuous bead each side.

1X SPF #2.

R-Control SIP.

Factory electrical chase.

8d box (0.113) nails in staggered rows, 2" o.c. both sides of joint, top and bottom.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

SECTION/PLAN
Scale: NTS

R-Control® SIP

TITLE: Spline Connection
1X Lumber Block 2" o.c.

NO. SIP-102n

Updated 1-16-12
**SECTION/PLAN**

Scale: NTS

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R-Control
Do-All-Ply 1/2" diameter continuous bead each side.

Block spline.

Factory electrical chase.

R-Control SIP.

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8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent.

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SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

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**R-Control® SIP**

TITLE: Spline Connection
Block Spline Top Side Only

NO. SIP-102p

Updated 1-16-12
Nail top plate to vertical plate with three 16d box (0.135) nails.

**PLAN**

Scale: NTS

1 1/2" R-Control Wood Screw @ 24" o.c.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

**SECTION**

Scale: NTS

1 1/2" R-Control Do-All-Ply 1/2" diameter continuous bead.

8d box (0.113) nails @ 6" o.c. each side or equivalent.

Updated 1-16-12
Nail top plate to vertical 2X with three 16d box (0.135) nails.

Top plate.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Continuous double 2X spline, bevel cut, with 10d box (0.128) nails @ 12” o.c. two rows, staggered; & R-Control Do-All-Ply 1/2” diameter continuous bead between 2X’s.

R-Control Do-All-Ply 1/2” diameter continuous beads each side.

8d box (0.113) nails @ 6” o.c. both sides of panel joint or equivalent. Typical each side of panel.

SIP Tape.

updated 1-16-12
Note: wall covering & water resistive barrier as req’d by code.

R-Control
Do-All-Ply
1/2” diameter continuous bead.

Field installed bottom plate.

Sill sealer.

Insect clip or flashing.

Sealant.

R-Control
Do-All-Ply
1/2” diameter continuous bead.

Protective covering.

Full SIP width Treated sill plate.

Concrete slab.

R-Control SIP wall.

10d box (0.128) nails as req’d.

8d box (0.113) nails @ 6”o.c. each side or equivalent.

Anchor bolt as req’d by code.

Foam-Control EPS with Perform Guard.

SECTION
Scale: NTS

Updated 1-16-12

R-Control® SIP

TITLE: Slab Foundation Framing
NO. SIP-104
Note: wall covering & water resistive barrier as req’d by code.

R-Control SIP wall.

8d box (0.113) nails @ 6”o.c. each side or equivalent.

Full SIP width 3/8” min. treated plywood.

Concrete slab.

Field installed bottom plate.

Sill sealer.

Insect clip or flashing.

Sealant.

R-Control Do-All-Ply 1/2” diameter continuous bead.

Protective covering.

Anchor bolt as req’d by code.

Foam-Control EPS with Perform Guard.

SECTION
Scale: NTS

Updated 1-16-12

R-Control® SIP

TITLE: Slab Foundation Framing
NO. SIP-104a
Note: Wall covering & water resistive barrier as req’d by code.

R-Control SIP wall.

16d box (0.135) nails into floor joist as req’d by code.

R-Control Do-All-Ply 1/2” diameter continuous bead.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

Field installed bottom plate.

Subfloor.

EPS insulation or similar.

R-Control Do-All-Ply 1/2” diameter continuous bead.

Treated sill plate.

Nail as req’d by code.

Floor joist.

Rim joist.

Treated sill plate.

Insect clip or flashing.

Sill sealer.

Sealant.

Anchor bolt as req’d by code.

Protective covering.

Concrete or Masonry foundation wall.

Foam-Control EPS with Perform Guard.
Note: wall covering water resistive barrier as req’d by code.

R-Control SIP wall.

R-Control Do-All-Ply 1/2” diameter continuous bead.

10d box (0.128) nails into sill plate as req’d.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

Field installed bottom plate.

Insect clip or flashing.

Sealant.

Protective covering.

Subfloor.

Floor joist.

Rim joist.

Nail as req’d by code.

Full SIP width treated sill plate.

Sill sealer.

R-Control Do-All-Ply 1/2” diameter continuous bead.

Anchor bolt as req’d by code.

Concrete or Masonry foundation wall.

Foam Control EPS with Perform Guard.

SECTION
Scale: NTS

Updated 1-16-12

R-Control® SIP

TITLE: Foundation Framing – Joist
NO. SIP-105a
Note: wall covering & water resistive barrier as req’d by code.

R-Control Do-All-Ply 1/2” diameter continuous bead.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

Field installed bottom plate.

Insect clip or flashing.

Sealant.

Protective covering.

R-Control Do-All-Ply 1/2” diameter continuous bead.

R-Control Wood Screw @ 12” o.c.

10d box (0.128) nails into sill plate as req’d.

R-Control Wood Screw, see SIP-135 for spacing.

R-Control SIP floor.

Treated sill plate.

Sill sealer.

Anchor bolt as req’d by code.

Concrete or Masonry foundation wall.

Foam-Control EPS with Perform Guard.

SECTION
Scale: NTS

R-Control® SIP

Updated 3–26–12

TITLE:
Foundation Framing – SIP

NO.
SIP-105b
Water resistive barrier as req’d by code.
Air space, 1/2” min.

Exterior brick.

R-Control
Do—All—Ply
1/2” diameter continuous bead.

8d box (0.113)
6” o.c. each side
each side or equivalent.

Field installed bottom plate.

Flash and weep per code.

Insect clip or flashing.

Sealant

Protective covering.

R-Control Wood Screw @ 12” o.c.

10d box (0.128) nails into sill plate as req’d.

R-Control Wood Screw, see SIP—135 for spacing.

R-Control SIP floor.

Treated sill plate.

Sill sealer.

R-Control Do—All—Ply
1/2” diameter continuous bead.

Anchor bolt as req’d by code.

Concrete or Masonry foundation wall.

Foam—Control EPS with Perform Guard.

SECTION
Scale: NTS

R—Control® SIP

TITLE: Foundation Framing
Brick Ledge

Updated 3–26–12

NO. SIP—105c
Note: wall covering & water resistive barrier as req’d by code.

R-Control
Do-All-Ply
1/2" diameter continuous bead.

Field installed bottom plate.

R-Control
Do-All-Ply
1/2" diameter continuous bead.

OSB cap nailed to floor truss as req’d.

Insect clip or flashing.

Sealant.

Protective covering.

16d box (0.135) nails into floor truss as req’d by code.

8d box (0.113) nails @ 6" o.c. each side or equivalent.

Subfloor.

EPS insulation or similar, not shown.

Floor truss.

Treated sill plate.

Sill sealer.

Anchor bolt as req’d by code.

Concrete or Masonry foundation wall.

Foam-Control EPS with Perform Guard.

SECTION
Scale: NTS

Updated 3–26–12

R-Control® SIP

TITLE:
Foundation Framing – Truss

NO.
SIP-106
Note: wall covering & water resistive barrier as req'd by code.

R-Control SIP wall.

Finished flooring.

See SIP-109 for notes & information.

See SIP-104 for notes & information.

Floor joist.

Concrete slab.

Subfloor.

Concrete or Masonry foundation wall.

Concrete slab.
Note: wall covering & water resistive barrier as req’d by code.

Finished flooring.

Subfloor.

EPS insulation plug not shown.

See SIP-109a for notes & information.

Floor truss.

See SIP-104 for notes & information.

Concrete slab.

Concrete or Masonry foundation wall.
Continuous double 2X spline or engineered equivalent. See SIP-102d (or SIP-102a) for spline connection & fastening information.

R-Control SIP, see Load Design Chart #3 for load capacity.

Note:
SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

ISOMETRIC PLAN
Scale: NTS

Updated 1-16-12
Continuous R-Control I-Beam Spline. See SIP-102b for spline connection & fastening information.

R-Control SIP, see Load Design Chart #3A for load capacity.

Note:
SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

ISOMETRIC PLAN
Scale: NTS

Updated 1-16-12
Note:
Minimum 3" end bearing required on structural supports

Continuous Double 2X spline or engineered equivalent. See SIP-102d (or SIP-102a) for spline connection & fastening information.

R-Control SIP, see Load Design Chart #3 for load capacity.

Note:
SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Edge plating material, 2X lumber or engineered equivalent.

ISOMETRIC PLAN
Scale: NTS

Updated 1-16-12
Note:
Minimum 3" end bearing required on structural supports.

Continuous R-Control I-Beam Spline. See SIP-102b for spline connection & fastening information.

R-Control SIP, see Load Design Chart #3A for load capacity.

Note:
SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Edge plating material, 2X lumber or engineered equivalent.

ISOMETRIC PLAN
Scale: NTS

Updated 1-16-12

R-Control® SIP
TITLE: Floor/Roof SIP I-Beam Connection Edge Plating NO. SIP-108d
Note: wall covering & water resistive barrier as req’d by code.

R-Control SIP wall.

R-Control Do-All-Ply 1/2” diameter continuous bead.

16d box (0.135) nails into floor joist as req’d by code.

8d box (0.113) nails @6” o.c. each side or equivalent.

Field installed bottom plate.

Subfloor.

R-Control Do-All-Ply. 1/2” diameter continuous bead.

Nail as req’d by code.

Rim joist.

For connection information, and sealant, see wall above.

Full SIP width spacer board when required for wall height adjustment. (optional)

Note:
Cap plate (optional) where required for point loads (not shown).
Note: wall covering water resistive barrier as req’d by code.

R-Control SIP wall.

R-Control Do-All-Ply 1/2” diameter continuous bead.

Field installed bottom plate.

Subfloor.
R-Control Do-All-Ply. 1/2” diameter continuous bead.

Rim joist.

Nail as req’d by code.

For connection information, and sealant, see wall above.

16d box (0.135) nails into floor truss as req’d by code.

Floor truss.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

Finished floor, min 7/16”.

Note: Optional full SIP width cap plate not shown.

EPS insulation or similar not shown.

SECTION
Scale: NTS

Updated 1-16-12

R-Control® SIP

TITLE: Floor Truss Bearing on SIP Wall

NO. SIP-109a
Note: wall covering & water resistive barrier as req’d by code.

R-Control SIP wall.

R-Control Do-All-Ply 1/2” diameter continuous bead.

16d box (0.135) nails into floor panel as req’d by code.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

Field installed bottom plate.

R-Control Do-All-Ply. 1/2” diameter continuous bead.

Finished floor, min 7/16”.

R-Control Wood, Screw see SIP-135 for req’d spacing.

R-Control SIP floor.

10d box (0.128) nails

Spacer board (optional) where required for standard 8’ drywall application, nail as req’d.

2X blocking
Note: single 2X blocking may be acceptable per design requirements.

For connection information, and sealant, see wall above.

Note: Optional full SIP width cap plate not shown.
Note: wall covering & water resistive barrier as req’d by code.

R-Control SIP wall.

16d box (0.135) nails into floor joist as req’d by code.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

Field installed bottom plate.

Finished floor.

Subfloor extended to outside of wall panel. Nail to top plate with 8d box (0.113) nails at 12”o.c., staggered.

Floor joist.

Joist hanger with nailable top flange.

For connection information, and sealant, see wall above.

Note:
Cap plate (optional) where required for point loads (not shown).
Note: wall covering & water resistive barrier as req’d by code.

Ledger beam as req’d by specific design.

R–Control Wood Screw spaced as req’d by specific design.

Continuous R–Control SIP wall.

Subfloor & finished floor.

Floor joist.

Joist hanger, nail as req’d.
Note: wall covering & water resistive barrier as req’d by code.

See SIP-101 for connection information.

R–Control Wood Screw @ 12” o.c.

Continuous R–Control SIP wall.

R–Control Wood Screw spaced as req’d by specific design.

Finished floor, min 7/16”.

R–Control SIP floor.

Note: Interior finish not shown.

R–Control Wood Screw spaced as req’d by specific design.

3” min. ledger beam as req’d by specific design.
Note: wall covering & water resistive barrier as req’d by code.

See SIP-101 for connection information.

R-Control Wood Screw @ 12” o.c.

Continuous R-Control SIP wall.

R-Control SIP floor.

Finished floor, min 7/16”.

Screw spaced as req’d by specific design.

Bolts spaced as req’d by specific design.

3” x 3” min. angle as req’d by specific design.
Top plate.

Electrical chase.

Bottom plate.

#10 wood screws @ 8” o.c.

Interior wall framing, gypsum board not shown.
R–Control SIP infill below window openings, install prior to headers.

NOTE: Diagram represents headers in a wall assembly. Refer to detail SIP–112a. Minimum dimensions are not required between openings, but the posts supporting the header must extend to the floor. The bottom plate of the header must extend to the outside of the post.
Continuous top plate over openings.

8'-0" max. span for R-Control SIP header, See Load Design Chart #5.

R-Control SIP Header.

R-Control SIP wall.

R-Control SIP wall.

See SIP-102d for connection of 2X's.

King stud.

Jamb stud.

Trimmers.

R-Control SIP infill.

Bottom plate.

Note: The numbers indicate sequencing for installation.

ISOMETRIC
Scale: NTS

Updated 1-16-12

R-Control® SIP
TITLE: Headers
NO. SIP-112a
Continuous top plate over openings.

2X or engineered header as required.

R-Control SIP wall.

See SIP-102d for connection of 2X’s.

R-Control SIP infill.

King stud.
Jamb stud.
Trimmers.

Bottom plate.

Note: The numbers indicate sequencing for installation.

ISOMETRIC
Scale: NTS

Updated 1-16-12

R-Control® SIP

TITLE: Headers—Traditional w/ SIP Infill

NO. SIP-112b
R-Control SIP used as header.

8d box (0.113) nails @ 6” o.c. each side, top & bottom or equivalent.

R-Control Da-All-Ply 1/2” diameter continuous bead.

See Load Design Chart #5 for allowable depths, spans & capacities of R-Control SIP used as a header.

Panel Width
R-Control
Do-All-Ply
1/2" diameter continuous bead.

Built up header.

EPS as req’d.

8d box (0.113) nails @12" o.c. Typical top & bottom, each side.

OSB cap, 7/16” thickness, typical each side of header.

1-1/2” minimum.

R-Control
Do-All-Ply
1/2" diameter continuous bead.

Slide panel up.

R-Control SIP used as infill.

NOTE:
See SIP-101 for connection information not shown.

SECTION
Scale: NTS

R-Control® SIP

TITLE: Header
Built Up 2x’s

Updated 1-16-12

NO. SIP-113b
Continuous top plate over openings.
Surface splines.

Continuous bottom plate.

8'-0" max. span for R-Control SIP header. See Load Design Chart #5.

2X plating around window and door openings. Numbers indicate sequencing for installation. Refer to SIP-115 for connection of 2X’s to OSB facings.

NOTE: Diagram represents headers in a monolithic wall assembly. Splines may occur above & below openings. Minimum panel dimension of 12” must be maintained over openings.
R-Control SIP wall.

Rough Opening

1 1/2"

8d box (0.113) nails @ 6” o.c. each side or equivalent.

R-Control Do-All-Ply 1/2” diameter continuous bead.

Note:
This detail is applicable for horizontal or vertical panels.
R-Control SIP wall.

Note: Wall covering & water resistive barrier as req’d by code.

See SIP–115 for connection information.

Flashing at head & around window as reqd. by code.

NOTE:
See window mfg’s literature for details. Fasten in accordance with window mfg’s recommendations.

See SIP–115 for connection information.

R-Control SIP wall.

NOTE:
Typical casement window detail shown. All styles can be used with R-Control SIPs.
Note: Wall covering & water resistive barrier and flashing as req’d by code.

R-Control SIP.

Optional 2X for additional hinge & strike plate support.

Typical Head Detail

Typical Jamb Detail (plan)

Note: Refer to SIP–116 for notes and detail information.

Typical Exterior Sill Detail

R-Control SIP.

SECTION
Scale: NTS

Updated 3–26–12
**RAFTER SYSTEM**
SIPs supported by rafters spanning from ridge beam to eave walls.

**RIDGE BEAM SYSTEM**
SIPs supported by ridge beam, mid-span beams and eave walls.

**TRUSS SYSTEM**
SIPs supported by trusses.

**ISOMETRIC**
Scale: NTS

Updated 1–16–12
Note: See Technical Bulletin SIP no. 2029 for capacities and panel limitations.

**CASE I**

Continuous I-Joist or double 2X spline.

Ridge beam.

**CASE II**

8' Backspan.

2' 4' max

**ROOF PLAN**

Scale: NTS

**R-Control® SIP**

**TITLE:**
Roof Framing – Cantilever

**NO.:**
SIP-118a

Updated 1-16-12
R-Control SIP roof.

Strap tie.

Note: As req’d, extend ice and water shield from fascia.

Drip edge.

2X Framing Member

2X Framing Member

Soffit vent as req’d.

Fascia

Eave wall. See SIP-122, SIP-122a, or SIP-122b for support of roof panel.

Note: Design member sizes and connections as req’d for each condition and/or project.
Note: Design member sizes and connections as req’d for each condition and/or project.

R-Control SIP roof.

Note: As req’d, extend ice and water shield from fascia.

Drip edge.

2X Framing Member

Soffit vent as req’d.

Fascia Eave wall. See SIP-122, SIP-122a, or SIP-122b for support of roof panel.

4’ Max Cant

See Technical Bulletin sip no. 2029 for cantilever capacities and panel limitations.

SECTION
Scale: NTS

R-Control® SIP

TITLE: Roof Eave Plumb Cut – Cant. SIP
NO. SIP-119a

Updated 1–16–12
Note: Design member sizes and connections as req’d for each condition and/or project.

Note: As req’d, extend ice and water shield from fascia.

R–Control SIP roof.

Drip edge.

Soffit board.

Fascia.

Eave wall. See SIP–122, SIP–122a, or SIP–122b for support of roof panel.

See SIP–119a for soffit framing option.

4’ Max Cant
See Technical Bulletin sip no. 2029 for cantilever capacities and panel limitations.

SECTION
Scale: NTS

Updated 1–16–12
Note: As req’d, extend ice and water shield from fascia.

Drip edge.

Strap tie, engineer as reqd.

2X Framing Member

Fascia.

Soffit vent as req’d.

Gable wall. See SIP-122c for support of roof panel.

Note: Design member sizes and connections as req’d for each condition and/or project.

SECTION
Scale: NTS

R-Control® SIP

TITLE: Roof Gable Built Up – Ladder Framed
NO. SIP-119c

Updated 1–16–12
Note: Design member sizes and connections as req’d for each condition and/or project.

Note: As req’d, extend ice and water shield from fascia.

R-Control SIP roof.

Drip edge.

Soffit board.

Fascia.

Gable wall. See SIP-122c for support of roof panel.

4’ Max Cant

See Technical Bulletin SIP no. 2029 for cantilever capacities and panel limitations.
Note: roof covering & underlayment as req’d by code.

8d box (0.113) nails @ 6” o.c. both sides of panel joint or equivalent. Typical each side of panel.

R-Control Do-All-Ply 1/2” diameter continuous bead, each side. Valley flashing.

R-Control SIP roof.

R-Control Wood Screw, see SIP-135 for spacing requirements.

Optional factory electrical chase.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Double 2X spline, bevel cut, with R-Control Do-All-Ply 1/2” diameter continuous bead.

Structural support member with min 3” bearing for panels each side of joint.
8d box (0.113) nails @ 6” o.c. both sides of panel joint or equivalent. Typical each side of panel.

R–Control Wood Screw, see SIP–135 for spacing requirements.

R–Control SIP roof.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

R–Control Do–All–Ply 1/2” diameter continuous bead each side.

Optional factory electrical chase.

Double 2X spline, bevel cut, with R–Control Do–All–Ply 1/2” diameter continuous bead.

Structural support member with min. bearing width per spline and screw requirements, each side.

Note: roof covering & underlayment as req’d by code.
8d box (0.113) nails @ 6” o.c. both sides of panel joint or equivalent. Typical each side of panel.

R-Control Wood Screw, see SIP-135 for spacing requirements.

EPS ridge filler piece.

R-Control Do-All-Ply 1/2” diameter continuous bead each side.

Optional factory electrical chase.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Do-All-Ply continuous along ridge line.

Structural support member with min. bearing width per spline and screw requirements, each side.

Note: roof covering & underlayment as req’d by code.

SECTION
Scale: NTS

Updated 1-16-12

R-Control® SIP

TITLE:
Roof Ridge – Square Cut

NO.
SIP-121a
8d box (0.113) nails @ 6” o.c. both sides of panel joint or equivalent. Typical each side of panel.

2 rows of 10b box (0.128) nails at 6” o.c., staggered.

R-Control Do-All-Ply 1/2” diameter continuous bead each side.

Optional factory electrical chase.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Continuous Double 2X spline, bevel cut, with R-Control Do-All-Ply 1/2” diameter continuous bead.

Note: Structural support members max. of 4’ from center line of ridge. Support members run parallel to ridge. Panels must have double 2X’s or I-Beam Spline @ 4’ o.c. See Technical Bulletin sip no. 2029 for cantilever capacities and panel limitations.

SECTION
Scale: NTS

R-Control® SIP

TITLE: Roof Ridge Plumb Cut/Cantilever Ridge
NO. SIP-121b

Updated 3-26-12
8d box (0.113) nails @ 6” o.c. both sides of panel joint or equivalent. Typical each side of panel.

R-Control Wood Screw, see SIP-135 for spacing requirements.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Note: roof covering & underlayment as req’d by code.

R-Control  
Do-All-Ply 
1/2” diameter continuous bead

Optional factory electrical chase.

R-Control  
Do-All-Ply 
1/2” diameter continuous bead.

Structural support member with min. bearing width per spline and screw requirements, each side.
Note: roof covering & underlayment as req’d by code.

Note: wall covering & water resistive barrier as req’d by code.

Continuous R–Control SIP wall.

R–Control Wood Screw spaced as req’d by specific design.

R–Control Do–All–Ply 1/2” diameter continuous bead.

See SIP–101 for connection information.

R–Control Wood Screw @ 12” o.c.

R–Control Wood Screw spaced as req’d by specific design.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

3” min. ledger beam as req’d by specific design.
Note: roof covering & underlayment as req’d by code.

Note: wall covering & water resistive barrier as req’d by code.

Continuous R–Control SIP wall.

R–Control Do–All–Ply 1/2” diameter continuous bead.

See SIP–101 for connection information.

R–Control Wood Screw @ 12” o.c.

Bolts spaced as req’d by specific design.

R–Control SIP roof.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Screw spaced as req’d by specific design.

3” x 3” min. angle as req’d by specific design.
R-Control SIP roof.

R-Control Wood Screw, see SIP-135 for spacing requirements.

Note: roof covering & underlayment as req’d by code.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

R-Control Do-All-Ply 1/2” diameter continuous bead.

Beveled 2X top plate.

R-Control SIP wall.
Note: roof covering & underlayment as req’d by code.

Beveled 2X blocking, toe nail with 10d box (0.128) nails @ 12” o.c. top and bottom.

R-Control SIP roof.

R-Control Wood Screw, see SIP-135 for spacing requirements.

EPS wedge infill piece.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

R-Control Do-All-Ply 1/2” diameter continuous bead.

R-Control SIP wall.

2X top plate.

R-Control Do-All-Ply continuous along eave line.
R-Control SIP roof.

R-Control Wood Screw, see SIP-135 for spacing requirements.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Note: roof covering & underlayment as req’d by code.

Beveled blocking, predrill for R-Control screw. Use 10d box (0.128) nails as required.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

R-Control Do-All-Ply 1/2” diameter continuous bead.

2X top plate.

R-Control SIP wall.

SECTION
Scale: NTS

Updated 1-16-12

R-Control® SIP

TITLE: Beveled Wedge Blocking
NO. SIP-122b
Note: roof covering & underlayment as req’d by code.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirements.

R-Control SIP roof.

R-Control Wood Screw, see SIP-135 for spacing requirements.

8d box (0.113)nails @ 6” o.c. each side or equivalent.

R-Control Do-All-Ply 1/2” diameter continuous bead.

2X top plate.

R-Control SIP wall.

SECTION
Scale: NTS

Updated 3-16-12

R-Control® SIP

TITLE: Gable End
NO. SIP-122c
SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

R-Control SIP roof.

R-Control Wood Screw, see SIP-135 for spacing requirements.

Beveled blocking, predrill for R-Control screw. Use 10d box (0.128) nails into top plate as required.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

R-Control Do-All-Ply 1/2” diameter continuous bead.

R-Control SIP wall.

2X top plate.

Note: roof covering & underlayment as req’d by code.

SECTION
Scale: NTS

R-Control® SIP
TITLE: Plumb Eave Beveled Wedge Blocking
NO. SIP-122d

Updated 3-26-12
Optional factory fabricated electrical chase.

R-Control SIP roof.

UL listed NM-B rated wire.

Low expanding foam sealant.

Field fabricated electrical chase.

Electrical box rated for support of ceiling fan. Fasten to blocking as req’d.

Min 3/4” blocking screwed to R-Control SIP with min. six #6 2” drywall screws, and wood adhesive. Drill hole through blocking for wiring.

Finish as required.
Provide truss anchorages as req’d for each specific design. Truss anchors not shown in detail.

Plated wood truss.

Roof decking.

2X top plate.

Soffit vent as req’d.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

R-Control Do-All-Ply 1/2” diameter continuous bead.

R-Control SIP wall.

Note: Design member sizes and connections as req’d for each condition and/or project.
Plated wood truss.

Provide truss anchorages as req’d for each specific design. Truss anchors not shown in detail.

10d box (0.128) nails into cap plate as required.

2X top plate.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

R-Control Do-All-Ply 1/2” diameter continuous bead.

Soffit vent as req’d.

R-Control SIP wall.

Note: Design member sizes and connections as req’d for each condition and/or project.
Provide truss anchorages as req’d for each specific design. Truss anchors not shown in detail.

Roof decking.

For soffit framing see SIP–124.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

2X plate.

R–Control Do–All–Ply 1/2” diameter continuous bead.

R–Control SIP wall.

2X spacer, attached with 16d nails as required.

R–Control SIP.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

R–Control Do–All–Ply 1/2” diameter continuous bead.

R–Control Wood Screw, see SIP–135 for spacing requirements.

Note: Design member sizes and connections as req’d for each condition and/or project.
Provide rafter anchorages as req’d for each specific design. Rafter anchors not shown in detail.

Roof decking.

For soffit framing see SIP–124.

2X spacer, attached with 16d box (0.135) nails as required.

R–Control SIP.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

R–Control Do–All–Ply 1/2" diameter continuous bead.

R–Control Wood Screw, see SIP–135 for spacing requirements.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

2X plate.

R–Control Do–All–Ply 1/2” diameter continuous bead.

R–Control SIP wall.

Note: Design member sizes and connections as req’d for each condition and/or project.
Note: For openings bigger in size than shown above or for openings that cut through splines, provide additional framing to support panel edges. This additional framing is to be located under the panels and framed into the main structural members.
Note: review all openings for impact to structural requirements.

Note: Recessed lights are not allowed in R-Control SIPs.

Note: Blocking not req’d for openings less than 12” square. See SIP-115 for openings requiring blocking.
SECTION
Scale: NTS

Roof sheathing with min 24/16 span rating.

2x2 @ 24” o.c., maximum spacing.

R-Control SIP Roof.

SECTION A
Scale: NTS

SECTION B
Scale: NTS

Updated 1–16–12

R-Control® SIP

TITLE: Ventilated Roof Eave with 2X Sleepers
NO. SIP–127a
Roofing system as req’d by code.

Continuous ridge vent.

R–Control SIP roof.

See SIP–121 for roof ridge information.

SECTION
Scale: NTS

Roof sheathing with min 24/16 span rating.

2x2 @24” o.c. maximum spacing.

R–Control roof panel.

SECTION
Scale: NTS

Updated 1–16–12

R–Control® SIP
TITLE:
Ventilated Roof — Ridge
NO.
SIP–127b
Optional factory electrical chase.

R-Control SIP roof.

R-Control screw, see SIP-135 for spacing requirements.

Beam.

Gypsum board.

Sheet metal as req’d by code.

Electrical chase with UL listed NM-B rated wire.
Note: See SIP-121 for connection and Do-All-Ply information.

Optional factory electrical chase.

R-Control SIP roof.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Ridge beam.

Electrical chase with UL listed NM-B rated wire.

Gypsum board.

Sheet metal as req'd by code.

SECTION
Scale: NTS

Updated 1-16-12
R-Control SIP roof.

Optional factory electrical chase.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Electrical chase with UL listed NM-B rated wire.

EPS wedge infill piece.

R-Control SIP wall.

Note: See SIP-122a for connection and Do-All-Ply information.
Notes:
1. Factory provided electrical chases must be pre-arranged with the R-Control SIP Manufacturer prior to fabrication of the panels.
2. SIP installer shall provide field drilled holes in top plates, sill/base plates, vertical plates and through floors to access electrical chases.
3. Follow local code requirements for electrical installation.
Field cut out for electrical box.

Factory provided electrical chase.

Gypsum board.

Switch or outlet.

Cover plate.

Surface mounted electrical box with wire clamp.

Low expanding foam sealant around box and in chase.

UL listed NM-B rated wire.

Note: Follow local code requirements for electrical installation.

SECTION
Scale: NTS

Updated 1-16-12

R-Control® SIP

TITLE:
Box for Switch or Outlet

NO.
SIP-129a
For typical cabinet loadings fasten cabinet to panels following cabinet manufacturer’s recommendations.

For heavily loaded cabinets mount 4” wide strips of OSB to panels prior to hanging of cabinet. Use adhesive and 2 rows of #8 screws @ 6” o.c. Fasten cabinets to nailing strips following cabinet manufacturer’s recommendations.
R-Control SIP wall.

Gypsum board.

Plumbing.

Plumbing chase.

Furring studs for plumbing chase.

Gypsum board.

R-Control SIP wall.
Note: roof covering & underlayment as req’d by code.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent. Top side of panel only.

R-Control SIP.

Surface spline (see SIP-102)

R-Control Wood Screw, see SIP-135 for spacing requirements.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

R-Control Do-All-Ply 1/2” diameter continuous bead.

Structural support member with min 1 1/2” bearing for panels each side of joint.
Note: roof covering & underlayment as req’d by code.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent. Top side of panel only.

R-Control SIP.

R-Control Wood Screw, see SIP-135 for spacing requirements.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Surface spline (see SIP-102)

R-Control Do-All-Ply 1/2” diameter continuous bead.

Structural support member. Minimum 3” wide.

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SECTION
Scale: NTS

R—Control® SIP

TITLE: Surface Spline
At Dimensional Lumber

NO. SIP-133a

Updated 1-16-12
Note: roof covering & underlayment as req'd by code.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent. Top side of panel only.

R-Control SIP.

Surface spline (see SIP-102)

R-Control Wood Screw, see SIP-135 for spacing requirements.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

R-Control Do-All-Ply 1/2” diameter continuous bead.

2X Blocking lag screwed to top chord of steel joist.

Structural support member (steel joist).

Design as req’d by engineer. Predrill flange for screw application.

SECTION
Scale: NTS

R-Control® SIP

TITLE: Surface Spline At Steel Joist
NO. SIP-133b

Updated 1–16–12
Note: roof covering & underlayment as req’d by code.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent. Top side of panel only.

R-Control SIP.

Spline.

R-Control Wood Screw, see SIP-135 for spacing requirements.

R-Control Do-All-Ply 1/2” diameter continuous bead.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Structural support member with min 1 1/2” bearing for panels each side of joint.

SECTION
Scale: NTS

R-Control® SIP

TITLE:
Surface Spline (Top) @ Truss

NO.
SIP-133c

Updated 1–16–12
Note: roof covering & underlayment as req’d by code.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent. Top side of panel only.

R-Control SIP.

Spline.

R-Control Wood Screw, see SIP-135 for spacing requirements.

R-Control Do-All-Ply 1/2” diameter continuous bead.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Structural support member. Minimum 3” wide.
Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent. Top side of panel only.

R-Control SIP.

Spline.

R-Control Wood Screw, see SIP-135 for spacing requirements.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

R-Control Do-All-Ply 1/2” diameter continuous bead.

2X Blocking lag screwed to top chord of steel joist.

Structural support member (steel joist).

Design as req’d by engineer. Predrill flange for screw application.

SECTION
Scale: NTS

Updated 1-16-12

R-Control® SIP

TITLE: Surface Spline (Top)  NO.
At Steel Joist  SIP-133e
Note: roof covering & underlayment as req’d by code.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent. Top side of panel only.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Design as req’d by engineer. Predrill flange for screw application.

R-Control SIP.

Surface spline (see SIP-102).

R-Control Do-All-Ply 1/2” diameter continuous bead.

Structural support member (steel joist).
Note: roof covering & underlayment as req’d by code.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent. Top side of panel only.

R-Control SIP.

Spline.

R-Control Wood Screw, see SIP-135 for spacing requirements.

R-Control Do-All-Ply 1/2” diameter continuous bead.

2X Blocking lag screwed to top chord of steel joist.

Structural support member (steel joist).

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Design as req’d by engineer.
Note: roof covering & underlayment as req’d by code.

R-Control SIP.

R-Control Wood Screw, see SIP-135 for spacing requirements. Stagger screws each side of top flange.

Structural support member with min 1 1/2” bearing for panels.
Note: roof covering & underlayment as req’d by code.

R-Control SIP.

R-Control Wood Screw, see SIP-135 for spacing requirements.

Structural support member. Minimum 1 1/2” wide.
Note: roof covering & underlayment as req’d by code.

R-Control SIP.

R-Control Wood Screw, see SIP-135 for spacing requirements.

Design as req’d by engineer. Predrill flange for screw application.

2X Blocking lag screwed to top chord of steel joist.

Structural support member (steel joist).
Connection pattern for R–Control Screws 12” on center in accordance with Load Design Chart #8 for single span condition.

Single span condition.

Alternate connection patterns for multispans conditions based on R–Control Screws 12” on center in accordance with Load Design Chart #8 for single span condition.

Two span condition.

Three span condition.

Four span condition.

Five span condition.

Notes:
1. Fastening patterns for uplift only. See Load Design Chart #8 for complete information.
2. For diaphragm connection requirements, see to Load Design Chart #7.

PLAN
Scale: NTS

Updated 6–18–13
Connection pattern for R−Control Screws 8” on center in accordance with Load Design Chart #8 for single span condition.

Single span condition.

Alternate connection patterns for multispans conditions based on R−Control Screws 8” on center in accordance with Load Design Chart #8 for single span condition.

Two span condition.

Three span condition.

Four span condition.

Five span condition.

Notes:
1. Fastening patterns for uplift only. See Load Design Chart #8 for complete information.
2. For diaphragm connection requirements, see to Load Design Chart #7.

PLAN
Scale: NTS

R−Control® SIP
TITLE: SIP Roof Fastening Pattern – 8” o.c. NO. SIP−135a

Updated 6–18–13
Connection pattern for R–Control Screws 6” on center in accordance with Load Design Chart #8 for single span condition.

Single span condition.

Alternate connection patterns for multispans conditions based on R–Control Screws 6” on center in accordance with Load Design Chart #8 for single span condition.

Two span condition.

Three span condition.

Four span condition.

Five span condition.

Notes:
1. Fastening patterns for uplift only. See Load Design Chart #8 for complete information.
2. For diaphragm connection requirements, see to Load Design Chart #7.

## PLAN
Scale: NTS

Updated 6–18–13
Tension/compression post in end of shear wall as required by design.

Fasteners as req’d by design to attach OSB to post.

R-Control SIP.

Fasteners as req’d to attach strap to post.

Anchor bolt as req’d by code.

Hold-down strap or similar as req’d by design.

Bottom plate.

Treated plate.

Sill sealer.

Concrete wall or slab on grade.

SECTION
Scale: NTS

Updated 1-16-12

R-Control® SIP

TITLE:
Post to Concrete Anchorage
NO.
SIP-136
2X with holes to countersink nuts from bolts of hold down anchor.

Tension/compression post in end of shear wall as required by design.

R—Control SIP.

Edge of cut away OSB facing.

Bolts as req’d to attach post to hold down anchor.

HD anchor as required by engineer.

2X blocking for OSB attachment.

Epoxy type anchor.

Bottom plate.

Treated plate.

Sill sealer.

Concrete wall or slab on grade.

Note: Cut panel facings to place HD type anchor, post and 2X plate. Use expanding foam to fill in area around hold down anchor. Insulate cavity with low expanding foam. Replace OSB facing and nail to 2X blocking.
2X with holes to countersink nuts from bolts of hold down anchor.

Edge of cut away OSB facing.

Bolts as req’d to attach post to hold down anchor.

12d box (0.128) nails
See SIP—101c

HD anchor as required by engineer.

Joist hanger with nailable top flange.

R-Control SIP.

Edge of cut away OSB facing.

R-Control SIP.

Tension/compression post in end of shear wall as required by design.

R-Control SIP.

2X blocking for OSB attachment.

Bottom plate.

Floor joist.

Threaded rod with nuts to attach to HD type anchor.

Top plate.

R-Control SIP.

Note: Cut panel facings to place HD type anchor, post and 2X plate. Use expanding foam to fill in area around hold down anchor. Replace OSB facing and nail to 2X blocking.

SECTION
Scale: NTS

Updated 3–26–12

R-Control® SIP

TITLE: Post to Post through Floor

NO. SIP–137
Note: roof covering & underlayment as req’d by code.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent. Top side of panel only.

R–Control SIP.

R–Control Heavy Duty Metal Fastener, see SIP–135 for spacing requirements.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

R–Control Do–All–Ply 1/2” diameter continuous bead.

Surface spline (see SIP–102).

Structural support member (steel joist, I–Beam, C–channel, Z–channel or similar).

SECTION
Scale: NTS

Updated 1–16–12
Note: roof covering & underlayment as req’d by code.

R-Control SIP.

R-Control Heavy Duty Metal Fastener, see SIP-135 for spacing requirements. Stagger screws each side of joist top flange.

Structural support member (steel joist, I-Beam, C-channel, Z-channel or similar).

SECTION
Scale: NTS

R-Control® SIP

TITLE: Continuous Panel At Steel Member
NO. SIP-138a

Updated 1-16-12
Note: roof covering & underlayment as req’d by code.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent. Top side of panel only.

R-Control SIP.

R-Control Heavy Duty Metal Fastener, see SIP–135 for spacing requirements.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Spline.

R-Control Do–All–Ply 1/2” diameter continuous bead.

Structural support member (steel joist, I–Beam, C–channel, Z–channel or similar).
8d box (0.113) nails in two rows 3” o.c. both sides of joint.

R-Control SIP.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

Updated 1–16–12
Top Spline:
8d box (0.113) in two rows
3” o.c. both sides of joint.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Bottom Spline:
8d box (0.113) nails 6” o.c. in single row both sides of joint.
Note: roof covering & underlayment as req’d by code.

1 1/2"

R-Control Wood Screw.

R-Control
Do-All-Ply
1/2" diameter continuous bead.

Member designed by others.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

min. 1 5/8” penetration.

SECTION
Scale: NTS

Updated 1-16-12
Note: roof covering & underlayment as req'd by code.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16”.

8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent. (See SIP–139)

R-Control SIP.

R-Control Wood Screw, min. 1–5/8” penetration, see Load Design Charts for spacing requirements.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Surface spline (see SIP–102).

R-Control Do–All–Ply 1/2” diameter continuous bead.

Structural support member. Minimum 3” wide.

SECTION
Scale: NTS

Updated 1–16–12
Note: fastener/adhesive attachment of 2X’s to SIP as specified by engineer. Please refer to Tech Bulletin sip no. 2033 (screws), sip no. 2038 (nails), or sip no. 2055 (Senco nails/staples) for additional information on fastener capacity.

Note: 2X to be sized as required for cavity depth. 2X may be placed flat against R-Control SIP.

Sprinkler system supported by 2X’s or as specified by sprinkler manufacturer.
Note: fastener/adhesive attachment of I-Beam to SIP as specified by engineer. Please refer to Tech Bulletin sip no. 2033 (screws), sip no. 2038 (nails), or sip no. 2055 (Senco nails/staples) for additional information on fastener capacity.

Note: I-Beam to be sized as required for cavity depth.

Sprinkler system supported by I-Beam's or as specified by sprinkler manufacturer.
Note: fastener/adhesive attachment of 2X’s to SIP as specified by engineer. Please refer to Tech Bulletin sip no. 2033 (screws), sip no. 2038 (nails), or sip no. 2055 (Senco nails/staples) for additional information on fastener capacity.

R-Control SIP.

Recessed lighting.

Gypsum board as required.

2X.

Note: 2X to be sized as required for cavity depth.
Note: fastener/adhesive attachment of I-Beams to SIP as specified by engineer. Please refer to Tech Bulletin sip no. 2033 (screws), sip no. 2038 (nails), or sip no. 2055 (Senco nails/staples) for additional information on fastener capacity.

Note: I-Beam to be sized as required for cavity depth.

SECTION
Scale: NTS

Updated 1-16-12

R-Control® SIP

TITLE: Soffit Detail—Can Light
NO. SIP-143a
8d box (0.113) nails @ 6” o.c. each side or equivalent.

Nail top plate to vertical plate with 3–16d (0.135) nails.

**PLAN**

Scale: NTS

1 1/2”

R-Control Wood Screw @ 12” o.c. or as required.

R-Control Do-All-Ply 1/2” diameter continuous bead.

R-Control Wood Screw @ 12” o.c. or as required.

**SECTION**

Scale: NTS
8d box (0.113) nails @ 6" o.c. each side or equivalent.

R-Control Wood Screw @ 12" o.c. or as required.

R-Control SIP wall.

R-Control Do-All-Ply 1/2” diameter continuous bead.

Spacer material or gypsum board as req’d.

Timber frame.
Note: wall covering & water resistive barrier as req’d by code.

R-Control
Wood Screw @ 12” o.c. or as required.

R-Control
Do-All-Ply 1/2” diameter continuous bead each side.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

Subfloor.
Floor joist.
Rim joist.
Nail as req’d by code.
Treated sill plate.
Sill sealer.

R-Control
Do-All-Ply, ea. side.

Anchor bolt as req’d by code.
Concrete or Masonry foundation wall.

Foam-Control EPS with Perform Guard.

SECTION
Scale: NTS

Updated 1–16–12

R-Control® SIP
TITLE:
Foundation Framing – Joist
NO.
SIP–203
Note: wall covering & water resistive barrier as req’d by code.

R-Control Wood Screw @ 12” o.c. or as required.

8d box (0.113) nails @ 3” o.c. both sides of panel joint or equivalent. Outside of panel only.

R-Control Wood Screw @ 12” o.c. or as required.

R-Control SIP wall.

Timber frame.

Floor decking.

R-Control Do-All-Ply 1/2” diameter continuous bead.
Note: As req’d, extend ice and water shield from fascia.

Drip edge.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

R-Control SIP roof.

R-Control Wood Screw @ 12” o.c. or as required.

R-Control Do-All-Ply 1/2” diameter continuous bead.

Fascia
Soffit board.

R-Control Wood Screw @ 12” o.c. or as required.

Timber frame.

4’ Max Cant

Note: roof covering & underlayment as req’d by code.

See Technical Bulletin sip no. 2029 for cantilever capacities and panel limitations.

SECTION
Scale: NTS

Updated 3–26–12
R-Control Wood Screw @ 12” o.c. or as required.

Note: As req’d, extend ice and water shield from fascia.

8d box (0.113) nails @ 6” o.c. each side or equivalent.

R-Control Do-All-Ply 1/2” diameter continuous bead.

Drip edge.

Fascia.

Soffit board.

R-Control Wood Screw @ 12” o.c. or as required.

4’Max Cant

R-Control SIP roof.

Timber frame.

See Technical Bulletin sip no. 2029 for cantilever capacities and panel limitations.

SECTION

Scale: NTS

Note: roof covering & underlayment as req’d by code.

Updated 3–26–12
Reducing air leaks in a structure is central to achieving maximum energy performance. Many building strategies such as house wraps, vapor retarders, rigid insulation sheathing, tapes, and sealants are designed to reduce air leakage. R-Control SIPs are one of the best building systems available to provide low air leakage and overall building energy efficiency.

Moisture, fumes from adhesives, smoking, and other gases and particulants can become trapped within the structure. When these pollutants accumulate to high levels they could potentially contribute to an unhealthy living environment.

Heat Recovery Ventilators (HRVs) allow a structure to remain efficient while also providing fresh air at a low operating cost. Indoor air pollutants are continuously being taken away and replaced with fresh air. This provides a healthier living environment while retaining energy savings.

A brief synopsis of how HRVs work to effectively improve indoor air quality follows:

**What Is An HRV?**

An HRV is a unit that can continually exchange stale inside air for fresh outside air, while also using the heat (or cold) from the exhaust air to raise or lower the temperature of the incoming air. A large percentage of the heat in the exhausted air can be recaptured. This efficiency allows a constant flow of fresh air, but doesn't require a separate heating unit to heat all the fresh incoming air.

**What Installation is Required?**

HRVs require some planning before construction. The main unit should be placed in a temperature controlled area, basement, mechanical room, etc. Ductwork is typically run from rooms such as bathrooms, laundries, and kitchens to the HRV. These areas are chosen for their typically high levels of odor and humidity. Insulated ductwork is then run from the HRV to the exterior of the building. A separate system of fresh air ductwork is run from the exterior of the building to the unit and continued to the fresh air drop, often a return air of a furnace.

**How Do They Work?**

Stale air is drawn from the bath, laundry, and kitchen to the HRV, and is ducted through the HRV to the outdoors. Meanwhile, fresh outside air is drawn to the HRV, then ducted to the inside fresh air drop point. As the two separate streams of air pass each other within the HRV, they are separated by a medium that provides a conductor for the heat to be exchanged from the hot air to the cold air. The incoming fresh air is warmed by the transfer of heat from the inside air and is then ducted into the living area or furnace air supply.

Excessive moisture can also be controlled with an HRV. As the air streams pass the medium, condensate will appear on the exhaust side of the medium. The condensate forms because the warm moisture-laden exhaust air cannot hold as much moisture after its heat has been drawn through the medium. The excess moisture is removed and drained away.

**How Can They Benefit The Sunbelt?**

In areas where warm, humid outside air exists, an HRV will allow fresh air to be introduced to the building while controlling the humidity level. The two airstreams will follow the same routes as before, but as they pass within the unit, heat is drawn from the warm, humid outside air. Its ability to hold moisture decreases as it cools. Condensate is left behind as before, except that the condensate forms on the opposite side of the medium. Thus, the fresh incoming air is cooled and dried before being introduced into the living area. The air exchanger must be equipped with a desiccant system for sunbelt areas.

**R-Control Warranty and Ventilation**

The R-Control warranty requires that a mechanical ventilat-
ing system be installed in the R-Control structure in order for the R-Control warranty to be valid.

The humidity level in a structure should be controlled to <40% in winter and <60% in summer. Higher levels of moisture could lead to condensation problems.

The information in this bulletin is being provided to assist you in achieving proper design, installation and operation. Please consult a local HVAC engineer and contractor, or reference ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) Standards for design and installation of HRVs as part of a complete HVAC design. Refer to Technical Bulletin sip no. 2051 for additional information on HVAC system design.
R-Control SIPs can be wired using standard “Romex” type wire that is labeled NM-B, having sufficient wire gauge size required for the anticipated maximum amperage loading designed for the structure.

UL tests and lists non-metallic sheathed cable under test method UL-719.

UL NM-B has a maximum conductor temperature of 90°C (194°F) and is labeled NM-B. The conductor temperatures under normal conditions will not exceed 60°C, due to the restrictions on amperage loading, and is suitable for use in R-Control SIPs.
R-Control SIPs have been tested to determine the effects of long duration loading.

A 4-1/2" thick 4' X 10' R-Control SIP was placed on supports at the 4' ends of the panel, creating a 10' span. The R-Control SIP was uniformly loaded to full design load @ L/180 continuously for 30 days (Refer to R-Control SIP Load Design Chart #1). During the 30 day period, mid-span deflection was monitored daily. After 30 days, the load was removed and the mid-span deflection was measured immediately and again 24 hours later. This determined the R-Control SIPs recovery and permanent set. After the 24 hour recovery period, the R-Control SIP was again loaded to full design load for a 30 day monitoring period, which included recovery at the end of the test.

After reviewing the data from the test report the following conclusions were drawn:

The deflections for both 30 day periods were similar.

The deflection for the second thirty day period showed a maximum deflection of .703 inches, slightly over the L/180 deflection value of .667 inches.

When the R-Control SIP was unloaded after each 30 day loading period, the R-Control SIP recovered to within approximately 1/8" of the original position.

This testing demonstrates the performance of R-Control SIPs under long duration loading.
R-Control SIPs

SIP No. 2010

Subject: OSB Orientation

Date: November 2007 (Revised January 2015)

Oriented Strand Board (OSB) as the name implies is manufactured in a process that results in properties that are dependent upon the orientation of the wood strands. An OSB panel is stronger in the machine direction versus the cross machine direction. The machine direction is easily discernible on OSB, as the majority of the strands visible will be parallel to the machine direction. Manufacturers indicate with markings which direction the machine direction is on a panel.

R-Control SIPs are normally used in the machine direction. For example, a 4’ x 10’ R-Control SIP is manufactured with the OSB machine direction parallel to the 10’ length. This ensures the performance of R-Control SIPs as shown in the R-Control SIP Load Design Charts.

In limited wall applications, R-Control SIPs can be used with the machine direction of the OSB perpendicular to SIP wall height. Please refer to R-Control SIP Load Design Chart #2B and #4.
Impact tests have been conducted on R-Control SIPs. The tests consist of supporting a panel on its short ends, and dropping a 60 pound, 10" diameter, lead shot filled leather bag from various heights.

A 4-1/2" thick 4' x 10' R-Control SIP was tested. A 60 pound bag was dropped from 1-1/2 feet which equals a force of 90 foot pounds - no damage occurred. Dropping the 60 pound bag from 4 feet applied an impact force of 240 foot pounds, again causing no damage.

To further demonstrate the strength of R-Control SIPs, the same 60 pound bag was dropped from a height of 10 feet to create a force of 600 foot pounds of impact.

The R-Control SIP showed no signs of damage even after having been subjected to repeated impact testing.
Subject: Formaldehyde Levels

Date: November 2007 (Revised January 2015)

The Oriented Strand Board (OSB) used as the facings for R-Control SIPs include very low levels of formaldehyde. The formaldehyde is present in very small amounts due to phenol formaldehyde adhesives which form the structural bond between the wood strands.

Note: Formaldehyde related concerns in wood products are associated with some urea formaldehyde adhesives but not with phenol formaldehyde adhesives. OSB contains no added urea formaldehyde resin.

APA, the Engineered Wood Association, has researched the formaldehyde emissions from APA trademarked products thoroughly and has conducted tests using a large-scale test chamber method for measuring formaldehyde emissions. In this test, OSB is placed within a heated chamber and monitored for formaldehyde emission on both newly produced OSB and OSB several months after production. The OSB concentration within the test chamber was significantly greater than that utilized in a typical structure.

The results of testing by the APA and other laboratories are that less than 0.1 parts per million (ppm) are emitted within the large scale chamber. This is for both new and aged OSB. Formaldehyde that is emitted by OSB is below HUD standards for emissions.

Attached, please find a bulletin authored by the APA concerning formaldehyde and engineered wood products.
Formaldehyde is a naturally occurring organic airborne chemical that can be synthesized for use in certain industrial uses such as adhesives used for wood products and in the manufacture of many other household goods such as medical products, carpets and cosmetics. Because elevated levels of formaldehyde may lead to health concerns, regulations exist to limit exposure. These include limits on formaldehyde emissions from some types of wood products. In addition, some green building specifications create preference for low emitting products. This Technical Note provides facts on formaldehyde and regulations applicable to engineered wood products.

**FORMALDEHYDE**

At room temperature, formaldehyde is a colorless gas which has a pungent smell at higher concentrations. Small amounts of formaldehyde are naturally produced by humans, animals and plants and may be emitted by fruits, vegetables, trees and raw wood. Formaldehyde is naturally present in outdoor air. Compared to rural air, urban outdoor air concentrations of formaldehyde are typically higher due to human activities such as traffic and other combustion sources. Indoor air may contain formaldehyde from products that emit formaldehyde as well as from combustion sources such as cigarette smoking, cooking or heating fuels. Table 1 shows levels of formaldehyde exposure measured from some typical household activities.

When formaldehyde is emitted into air, it is broken down into carbon dioxide, usually within hours. Formaldehyde is naturally attracted to water, where it is readily absorbed and breaks down. Formaldehyde does not build up in humans or plants. Further information on formaldehyde is cited in the reference section of this publication.

**WHAT IS FORMALDEHYDE?**

Formaldehyde is a simple chemical made of hydrogen, oxygen, and carbon. It occurs naturally, and is the product of many natural processes. It is made by human bodies and is in the air. Plants and animals also produce formaldehyde. It is in many fruits and vegetables, and is a byproduct of cooking certain vegetables, such as brussel sprouts and cabbage. This chemical breaks down quickly and is metabolized to simple carbon dioxide. Our bodies readily break down the low levels to which people are exposed everyday.

Formaldehyde is also a product from combustion associated with the burning of kerosene and natural gas; automobile emissions; and cigarettes. It is an important industrial chemical used in the manufacture of numerous consumer products, including permanent press fabrics and even toothpaste.
TABLE 1

VARIOUS FORMALDEHYDE EXPOSURE LEVELS

<table>
<thead>
<tr>
<th>Source/Description</th>
<th>Expected Exposure, parts per billion (ppb)</th>
<th>Footnote (see below)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Painting a 12 ft x 12 ft x 9 ft room</td>
<td>968</td>
<td>(a)</td>
</tr>
<tr>
<td>Wallpapering a 12 ft x 12 ft x 9 ft room</td>
<td>2051</td>
<td>(a)</td>
</tr>
<tr>
<td>Walk-in closet with 20 permanent press shirts (washed)</td>
<td>231</td>
<td>(b)</td>
</tr>
<tr>
<td>Broil fish using a gas or electric range</td>
<td>105</td>
<td>(c)</td>
</tr>
<tr>
<td>Gas range in self-clean mode</td>
<td>337</td>
<td>(c)</td>
</tr>
<tr>
<td>Electric range in self-clean mode</td>
<td>183</td>
<td>(c)</td>
</tr>
<tr>
<td>One cigarette in small room</td>
<td>49</td>
<td>(d)</td>
</tr>
<tr>
<td>Human breath</td>
<td>Around 2</td>
<td>(e)</td>
</tr>
<tr>
<td>Typical indoor air</td>
<td>10-30</td>
<td>(f)</td>
</tr>
<tr>
<td>Urban air</td>
<td>5-100</td>
<td>—</td>
</tr>
<tr>
<td>Rural air</td>
<td>0.8-5</td>
<td>—</td>
</tr>
<tr>
<td>Raw wood (emission chamber)</td>
<td>20</td>
<td>—</td>
</tr>
</tbody>
</table>

(a) Calculated from data taken from the Batelle report for the California Air Resources Board, Determination of Formaldehyde & Diisocynate Emission from Residential Indoor Sources, Contract No. 93-9315, Final Report 1996.
(b) This example is calculated from data for washed permanent press shirts from the Batelle report for the California Air Resources Board, Determination of Formaldehyde & Diisocynate Emission from Residential Indoor Sources, Contract No. 93-9315, Final Report 1996.
(f) Interim Findings on Formaldehyde Levels in FEMA-Supplied Travel Trailers, Park Models and Mobile Homes from the Centers for Disease Control and Prevention, February 29, 2008.

FORMALDEHYDE STANDARDS AND REGULATIONS OF WOOD PRODUCTS

Because some adhesives used to produce composite wood products contain formaldehyde, limits on emissions from pressed wood products have been developed in product standards and state and national regulations. In the U.S., formaldehyde regulations of composite wood products began in the early 1980s for particleboard and decorative plywood panels used in mobile homes (HUD CFR 3280.308). Data indicated that emission levels from moisture resistant phenol formaldehyde adhesives used for structural plywood were very low; therefore the HUD regulations explicitly excluded plywood made with phenol formaldehyde adhesives.
This Technical Note provides information on formaldehyde regulations that apply to U.S. structural engineered wood products. For purposes of this Technical Note, engineered wood products are defined as wood products recognized in U.S. model code for structural applications. Because the vast majority of U.S. construction involves site-built conditions where exposure to weather is expected, the standards for engineered wood products require moisture resistant adhesive systems. The inherent structural and moisture durability of these adhesive systems naturally results in very low formaldehyde emissions. Table 2 provides definitions of the standards, adhesive systems and applications for engineered wood products.

### Table 2

**DESCRIPTION OF U.S. ENGINEERED WOOD PRODUCTS**

<table>
<thead>
<tr>
<th>U.S. Engineered Wood Products</th>
<th>Applicable Standard(s)(a)</th>
<th>Adhesives</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oriented Strand Board (OSB)</td>
<td>U.S. Voluntary Product Standard PS 2-10 Performance Standard for Wood-Based Structural-Use Panels, and CSA O325, Construction Sheathing</td>
<td>Phenol formaldehyde, pMDI(b)</td>
<td>Sheathing for walls, floors, roof and industrial uses</td>
</tr>
<tr>
<td>Structural Glued Laminated Timbers</td>
<td>ANSI A190.1 Structural Glued Laminated Timber and CSA O177 Qualification Code for Manufacturers of Structural Glued Laminated Timber</td>
<td>Phenol resorcinol formaldehyde (PRF), melamine, polymer isocyanate(c)</td>
<td>Beams, headers, columns, trusses</td>
</tr>
<tr>
<td>Prefabricated Wood I-joists</td>
<td>ASTM D5055 Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists</td>
<td>Phenol formaldehyde, melamine, polymer isocyanate(d)</td>
<td>Floor joists, roof rafters</td>
</tr>
<tr>
<td>Structural Composite Lumber (SCL)(e)</td>
<td>ASTM D5456 Standard Specification for Evaluation of Structural Composite Lumber Products</td>
<td>Phenol formaldehyde, pMDI(f)</td>
<td>Beams, headers, studs, flanges of I-joists</td>
</tr>
</tbody>
</table>

(a) Complete citation of standards is provided in the reference section at the end of this publication

(b) pMDI = Polymeric Methylene Diphenylene Diisocyanate

(c) ANSI A190 adhesives must also meet ANSI 405 and ASTM D2559

(d) Adhesives used to adhere components must meet ASTM D2559

(e) SCL includes laminated veneer lumber (LVL), parallel strand lumber (PSL), oriented strand lumber (OSL) and laminated strand lumber (LSL)

(f) Adhesives must meet ASTM D2559 and D5456
U.S. FORMALDEHYDE REGULATIONS APPLICABLE TO OTHER WOOD PRODUCTS

   This standard specifies a 0.20 ppm emission limit for plywood and a 0.30 ppm limit for particleboard when tested with the ASTM E1333 Large Chamber Method. The intent was to regulate the specific nonstructural panel types. Testing during development of the regulation confirmed PS 1 structural plywood readily meets the plywood emission limit; therefore the regulation explicitly exempts phenolic bonded plywood from ongoing testing and certification. Therefore, the engineered wood products in Table 2 are either not covered by, or are explicitly exempt from, the HUD regulation.

2. California Air Resources Board (CARB) Air Toxic Control Measure (ATCM) for Composite Wood Products
   This regulation was developed by a division of the California EPA and took effect in 2009. The scope of the standard covers particleboard, MDF and hardwood plywood. The demonstrated low emission levels of the engineered wood products listed in Table 2, led the CARB regulation to explicitly exempt structural plywood specified to PS 1, structural panels specified to PS 2, OSB specified to PS 2, structural composite lumber specified to ASTM D5456, structural glued-laminated timber specified to ANSI A190.1 and prefabricated wood I-joists specified to ASTM D5055.

3. U.S. Formaldehyde Standards for Composite Wood Products Act
   This Federal Act was signed into law July, 2010 and instructs the EPA to publish implementation rules by January 2013. The act mirrors the standard previously established by the California Air Resources Board and it explicitly exempts structural plywood specified to PS 1, structural panels specified to PS 2, OSB specified to PS 2, structural composite lumber specified to ASTM D5456, structural glued-laminated timber specified to ANSI A190.1 and prefabricated wood I-joists specified to ASTM D5055.

INTERNATIONAL REGULATIONS FOR ENGINEERED WOOD PRODUCTS

Wood product standards in other countries often group structural and nonstructural panel types into a common standard, whereby the moisture resistance and formaldehyde emission characteristics are evaluated to specific criteria. Some U.S. Engineered Wood Products have been evaluated to these international formaldehyde emission standards. Following are summary conclusions.

1. Japanese Agricultural Standards (JAS). The JAS standards use the JIS A1460 test method that measures the emissions for wood products when enclosed in a desiccator. The most stringent formaldehyde limit is the F**** designation whereby the product must have average emission level below 0.30 mg/l. U.S. structural plywood (PS 1 or PS 2), OSB (PS 2), structural glued-laminated timber (ANSI A190.1) and Laminated Veneer Lumber (LVL) easily and consistently meet the F**** requirements when evaluated to the respective JAS standard. This formaldehyde regulation is considered one of the most stringent limits in the world.

2. OSB and plywood panels sold into Europe for construction uses must meet the specific product standard for the panel type (such as EN 300 for OSB and EN 636 for plywood) and the general panel standard EN 13986 used for construction applications throughout the European Union. The European standard for formaldehyde emissions is EN 717-1 which uses a one cubic meter chamber to measure emission levels. U.S. structural plywood (PS 1 or PS 2) and OSB (PS 2) easily meet the 0.124 mg/m³ limit of the E1 class, the most stringent formaldehyde class based on EN 717-1.
3. Laminated Veneer Lumber (LVL), is regulated in Australia by evaluation of formaldehyde emissions using the AS/NZS 4357.4 test method. This method is very similar to the JIS A1460 test method used in the JAS standards. U.S. LVL made to ASTM D5456 has easily and consistently met the 0.5 mg/l limit which qualifies it for the E0 rating, the most stringent rating in AS/NZS LVL standards.

In summary, when tested to international formaldehyde emission limits, U.S. Engineered Wood Products have consistently met the most stringent emission regulations.

GREEN BUILDING SPECIFICATIONS

Green building rating systems often include criteria to address indoor air quality goals, including mitigation of formaldehyde concentrations or formaldehyde-emitting products. Some of these specifications are relevant to Engineered Wood Products as follows:

1. LEED 2009
This popular rating system uses a point rating system for green buildings. Indoor Environmental Quality Credit 4.4 covers “Low-Emitting Materials – Composite Wood and Agrifiber Products.” The section criteria specifies products that “contains no added urea formaldehyde resin”. All of the products within Table 2 meet the criteria for this section and thereby are eligible for the point. As with other green building rating systems, final approval is subject to verification by the designer or approved professional that assesses LEED compliance.

This national green rating program was developed as a consensus standard and adopted by the International Code Council as a reference standard for adoption by member code groups for residential construction. The criteria for formaldehyde emissions from composite wood products are similar to the LEED 2009 and CARB. The Engineered Wood Products listed in Table 2 are eligible for the points in Section 901.4(5) which require that a minimum of 85 percent of material within the product group is manufactured from composite wood products that contain no added urea-formaldehyde or are in accordance with the CARB regulations.

3. CALGreen
This standard has been adopted into California State building law as a method to verify structures meeting state environmental goals for buildings. The third edition of CALGreen (effective July 1, 2012) requires all new buildings (residential and nonresidential) as well as all remodels and additions to existing nonresidential buildings exceeding 2,000 square feet or $500,000 must meet the mandatory requirements of CALGreen. CALGreen specifies that composite wood products used in the interior or the exterior of a building meet the CARB regulations. Similar to the CARB regulation, all structural engineered wood products are explicitly exempt from the requirement. The engineered wood products in Table 2 are not within the scope of the CALGreen formaldehyde limits and are therefore permitted – (see also the above section on CARB).
REFERENCES

**Engineered Wood Product Standards**

U.S. Voluntary Product Standard PS I-09 Structural Plywood, Form L870

U.S. Voluntary Product Standard PS 2-10 Performance Standard for Wood-Based Structural-Use Panels, Form S350

ANSI A190.1 Structural Glued Laminated Timber

ANSI 405 Standard for Adhesives for Use in Structural Glued Laminated Timbers


ANSI/APA PRR-410: Standard for Performance-Rated Engineered Wood Rim Boards, Form PRR-410

ASTM D2559 Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions


CSA O121 Canadian Douglas-fir Plywood

CSA O151 Canadian Softwood Plywood

CSA O177 Qualification Code for Manufacturers of Structural Glued Laminated Timber

CSA O325 Construction Sheathing

*ASTM publications are available at [www.astm.org](http://www.astm.org)*

**Formaldehyde Regulations**


CARB: [www.arb.ca.gov/toxics/compwood/compwood.htm](http://www.arb.ca.gov/toxics/compwood/compwood.htm)

EPA Federal Act: [www.epa.gov/oppt/chemtest/formaldehyde/](http://www.epa.gov/oppt/chemtest/formaldehyde/)


**Formaldehyde Guidance**

EPA Integrated Risk Information System: [www.epa.gov/iris/subst/0419.htm](https://www.epa.gov/iris/subst/0419.htm)

U.S. EPA: [www.epa.gov/iaq/formaldehyde.html](http://www.epa.gov/iaq/formaldehyde.html)


ACC website: [www.formaldehydefacts.org](http://www.formaldehydefacts.org)
Formaldehyde and Engineered Wood Products

We have field representatives in many major U.S. cities and in Canada who can help answer questions involving APA trademarked products. For additional assistance in specifying engineered wood products, contact us:

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Form No. J330A/Revised June 2013
GAF, a leader in the manufacture of shingles, has examined the use of their asphalt shingles with R-Control SIPs and have authored the attached Technical Advisory Bulletin. GAF has served notice that their products applied directly over R-Control SIP substrates are acceptable and that no restrictions will be placed on their warranty.

**GAF shingles are recommended as the preferred asphalt shingle product for use with R-Control SIPs.**

When using shingles other than GAF, please contact your asphalt shingle manufacturer to clarify their warranty coverage when applied over R-Control SIP substrates.
Why Is The Substrate So Important?

A shingle roof substrate is the “foundation” for your roofing system. The substrate provides the smooth structural base on which asphalt shingles are installed. If the substrate is inferior, the integrity of the roofing system may be compromised.

What's Considered A "Standard Deck" For Shingles?

Standard decks include:
- Plywood or OSB… 3/8” minimum thickness, exterior grade as recommended by APA – The Engineered Wood Association
- Wood planking... Nominal 1” thick (min.) x 6” wide (max.) wood planking, with a maximum 1/8” spacing at the ends and sides

Note: For existing older installations, if spacing is > 1/8", install a double layer of underlayment. If the spacing is greater than 1/4", install a layer of 3/8” minimum thickness APA labeled exterior grade plywood or OSB over the wood planking.

Can The Other Substrates Be Used Without Prior Approval?

When properly installed using the fasteners and construction design recommended by the deck manufacturer, the following substrates may be used:
- GAF Cornell ThermaCal® 1 Ventilating Roof Insulation Panels
- GAF Cornell ThermaCal® 2 Ventilating Roof Insulation Panels
- Loadmaster Shingle Deck
- Tech Shield or equivalent Radiant Barrier Decking systems with vapor permeable, perforated foil backing
- Ainsworth's Thermastrand Radiant Barrier
- 2” Minimum Homasote or Thermasote (Homasote Co.)
- 2” Minimum Span Rock Gypsum Plank (USG) – fasteners must have a minimum 40 lbs. of pullout
- Vented-R (Atlas)
- Vented Nail-Line (Apache)
- Hunter Vented Nail Base
- Foam-Control Nail Base (AFM Corp. Licensed Mfr.)
- Tectum III, Tectum E and Tectum NS (Tectum, Inc.)
- Huber Zip Deck System – A waterproof underlayment such as StormGuard™ leak barrier must be used at eaves as required by code or for certain warranty considerations and additional underlayment may be needed on slopes less than 4:12 or on re-roofing projects.

Note: GAF shingles are not approved for applications directly over any insulation or fiberboard.

What About Structural Insulated Panels (SIP)?

SIP may be used when:
- Approved/rated by UL for use as a shingle roof deck
- With the minimum thickness of plywood or OSB as recommended above installed in accordance with the SIP panel manufacturers recommendations for use as a shingle roof deck

What About Codes?

Roof decks must meet local codes... and approval from the local building department should be obtained to confirm the deck construction and ventilation meets local code requirements.

Is The Substrate Or Workmanship Covered Under GAF Warranties?

Only GAF Cornell ThermaCal® 1 & 2 Ventilating Roof Insulation Panels are covered by GAF under the GAF Cornell ThermaCal® Nail Base Roof Insulation Limited Warranty. See this limited warranty for complete coverage and restrictions.

All substrates must be installed in accordance with the deck manufacturer’s specifications. Roof deck installation instructions, including the need for a vapor retarder, for specific deck types must be obtained from the respective manufacturer. GAF does not warrant the installation method, the performance of the decking or problems with the shingles caused by the deck or substrate, including but not limited to: physical movement, thermal bridging and/or moisture migration at the joints.

Where Can I Get More Information?

GAF Technical Services can assist you... with these and other questions you may have regarding your new roof installation. GAF Technical Services can be contacted at 800-ROOF-411 (800-766-3411). Also, the GAF website is a great resource for just about any question you may have or for additional information you may require. Please visit: www.gaf.com.
Subject: Shear Walls

Date: November 2007 (Revised January 2015)

Racking shear tests have been conducted on R-Control SIPs to demonstrate the capabilities of R-Control SIPs as shear walls.

8’ x 8’ walls were constructed with R-Control SIPs connected with a surface spline joint. The wall assembly was subjected to racking shear loads as specified by ASTM E 72. The 8’ long R-Control SIP wall assembly resisted an average ultimate load of 8357 pounds. This equals a loading of 1045 plf.

A design shear of 335 plf is recommended based upon the average ultimate divided by a factor of safety of three. In addition, the 335 plf result is less than 1/8” deflection as required by the ICC ES acceptance criteria for sandwich panels.

The design value of 335 plf is for standard applications following standard recommended R-Control SIP details.

Design shear values up to 920 plf can be obtained using additional fasteners. Please refer to R-Control SIP Load Design Chart #6 for additional information.
R-Control SIP structures can be designed to resist most wind loading conditions. The chart contained in this bulletin can be used as an estimate for wind loading, based upon wind speed.

The formula for approximating pressure is $p=0.00256w^2$ or the constant of 0.00256 times the windspeed squared. The graph presents this formula. It should be noted that the graph is based upon atmospheric pressure of 14.7 psi, a temperature of 60°F and air which is at 0.0764 lbs/ft³. Project values will vary with building design, elevation, atmospheric conditions and geographic location.

**EXAMPLE:**

Windspeed of 135 mph.

\[
p = 0.00256 \times (135 \text{ mph})^2 \\
p = 0.00256 \times 18225 \\
p = 46.6 \text{ lbs/ft}^2
\]

Information for this bulletin was obtained from Farm Structures, by H.B. Barre L.L. Samett. The graph and formula are to be used for approximating only. As always, the building plans and the calculations associated with this design should be reviewed by a registered design professional.
ASTM E 119 (UL 263) tests have been conducted on R-Control SIPs to develop fire resistance assemblies.

**Wall: Twenty Minute Rating**

An R-Control SIP wall section faced with 1/2” gypsum board with an electrical outlet and wiring in place was tested. A foam sealant was placed around the outlet opening following R-Control SIP detail SIP-129a.

The results from ASTM E 119 testing showed that an R-Control SIP having electrical outlets, wiring and factory precut chases detailed per SIP-129a and with 1/2” gypsum board complies as a twenty minute fire rating per the ASTM E 119 test standard.

**Wall: 1-Hour Rating**

An R-Control SIP with two layers of 5/8” Type X gypsum board applied to the face, having an outlet and wiring in place and an intumescent caulk placed around the outlet opening complies as an hourly wall assembly per the criteria of ASTM E 119.

Please refer to PFS Corporation Fire Resistive Design AFM Assembly 1.

**Wall: 1-Hour Rating**

An R-Control SIP with one layer of 5/8” Type C gypsum board applied to the face and connected using 2X dimensional lumber splines complies as an hourly wall assembly per the criteria of ASTM E 119.

Please refer to PFS Corporation Fire Resistive Design AFM Assembly 2.

**Roof/Ceiling: 1-Hour Rating**

An R-Control SIP with two layers of 5/8” Type X gypsum board applied to the face complies as an hourly roof/ceiling assembly per the criteria of ASTM E 119.

Please refer to PFS Corporation Fire Resistive Design AFM Assembly 3.

**Roof/Ceiling: 1-Hour Rating**

An R-Control SIP with sprayed fireproofing and supported by steel joists complies as an hourly roof/ceiling assembly per the criteria of ASTM E 119.

Please refer to PFS Corporation Fire Resistive Design AFM Assembly 4.
1. Panels - R-Control SIPs consisting of a polystyrene foamed plastic core faced on both surfaces with min 7/16 in. thick oriented strand board. Min 3-3/8 in. thick polystyrene core. R-Control SIPs loaded to 1800 lb. per linear foot.

2. Splines - Nom 4 in. wide by 7/16 in. thick oriented strand board splines installed between vertical joints, in pre-cut channels in the Panels (Item 1). Splines secured to face in contact with oriented strand board with R-Control Do-All-Ply and 1-5/8 in. long Type S steel screws spaced 6 in. OC along the edges of each adjoining face.

3. Gypsum Board - 5/8 in. thick, 4 ft wide, Type X applied vertically in two layers. First layer installed with 1-5/8 in. long Type S steel screws spaced 24 in. OC vertically and 16 in. OC horizontally. First layer vertical joints offset min 16 in. from vertical spline joints of Panels (Item 1). Second layer installed with 2 in. long Type S steel screws spaced 12 in. OC vertically, offset 12 in. from first layer screws, and 16 in. OC horizontally, offset 8 in. from first layer screws. Second layer vertical joints offset min 16 in. from first layer vertical joints. Outer layer wallboard joints covered with joint tape and joint compound. Screw heads on outer layer of wallboard covered with joint compound.

4. Plates (Not Shown) - Nom 2 in. thick (width determined by panel thickness) No. 2 lumber installed at top and bottom of Panels (Item 1) in pre-cut channels. Plates secured with 8d box nails spaced 8 in. OC along the edges of both faces and R-Control Do-All-Ply to faces in contact with oriented strand board and on the face in contact with the polystyrene core.
1. Panels - R-Control SIPs consisting of a polystyrene foamed plastic core faced on both surfaces with min 7/16 in. thick oriented strand board. Min 5-3/8 in. thick polystyrene core. R-Control SIPs loaded to 1800 lb. per linear foot.

2. Splines - Two Nom. 2 by 6 in. thick No. 2 lumber installed in Panels (Item 1) in pre-cut channels. End stud and bearing plate secured to the oriented strand board with 1-5/8 in. long ring shank nails spaced 12 in. OC along the edges on both faces.

3. Gypsum Board - 5/8 in. thick, 4 ft. wide, applied vertically installed with 1-5/8 in. long high/low bugle-head steel screws spaced 8 in. OC along the edges and 12 in. OC in the field. Vertical joints over vertical joints of Building Units* (Item 1). Gypsum Board joints covered with joint tape and joint compound. Screw heads covered with joint compound.

AMERICAN GYPSUM CO - Type AG-C
CANADIAN GYPSUM COMPANY - Type C.
LAFARGE NORTH AMERICA INC - Types LGFC-C/A.
TEMPLE-INLAND FOREST PRODUCTS CORP - Type TG-C
UNITED STATES GYPSUM CO - Type C.
USG MEXICO S.A DE C.V - Type C.

4. Plates (Not Shown) - Nom 2 in. thick (width determined by panel thickness) No. 2 lumber installed at top and bottom of Panels (Item 1) in pre-cut channels. Plates secured with 8d box nails spaced 8 in. OC along the edges of both faces and R-Control Do-All-Ply to faces in contact with oriented strand board and on the face in contact with the polystyrene core.
1. Wood Beam - Min 4-1/2 in. wide by 9-1/2 in. deep size wood beam spaced in accordance with manufacturer's specifications.

2. Panels - R-Control SIPs consisting of a polystyrene foamed plastic core faced on both surfaces with min 7/16 in. thick oriented strand board. Min 3-3/8 in. thick polystyrene core.

3. Splines (not shown) - Nom 2 in. thick wood members, installed in accordance with manufacturer's design specifications.

4. Gypsum Board - Min 5/8 in. thick, 4 ft wide, Type X. For ceiling, two layers of 5/8 in. thick by 48 in. wide sheets installed with long dimension perpendicular to wood beams. Inner layer attached to Panels using 1-1/4 in. long Type S bugle-head steel screws spaced 8 in. OC along the joints and located 1/2 in. from the edges. Joints of inner layer of wallboard to be staggered from joints of panels. Outer layer attached to building unit using 2 in. long bugle-head steel screws spaced 8 in. OC and located 3/4 in. from the edge, and 12 in. OC in the field. Joints of outer layer to be staggered from joints of inner layer. For beam two layers of 5/8 in. gypsum wallboard fastened to wood beam using 1-1/4 in. long Type S bugle-head steel screws spaced 8 in. OC and outer layer fastened to wood beam using 2 in. long Type S bugle-head steel screws.

1. Steel Joist - Type 10K1 min size spaced in accordance with manufacturer’s installation specifications.

2. Panels - R-Control SIPs consisting of a polystyrene foamed plastic core faced on both surfaces with min 7/16 in. thick oriented strand board. Min 3-3/8 in. thick polystyrene core.

3. Spline - Nom 4 in wide by 7/16 in. thick spline installed between the building units in accordance with building units manufactures installation instructions.

4. Metal Lath (not shown) - Diamond mesh 3/8 in. expanded galv steel weighing 3.4 lbs per sq yd. Secured to one side of joist using No. 20 SWG steel tie wire located at the midheight of every other web member. Additional lath, installed to bottom surface of building units and secured by means of 1 in. wide by 1-1/2 in. long staples spaced 7 in. OC.

5. Spray-Applied Fire Resistive Materials - Applied to wetted surfaces of steel joist bottom surface of building unit and metal lath which are free of dirt, oil or loose scale by spraying with water to achieve a min 2-1/4 in. thickness. Min avg density of 13 pcf with min ind density of 11 pcf for Types DC/F and II. Min avg density of 22 pcf with min ind density of 19 pcf for Type HP.

**ISOLATEK INTERNATIONAL** - Types DC/F, II or HP. Type EBS or Type X adhesive/sealer, optional.

5A. Spray-Applied Fire Resistive Materials - Applied to wetted surfaces of steel joist bottom surface of building unit and metal lath which are free of dirt, oil or loose scale by spraying with water to achieve a min 2-1/4 in. thickness. Min avg density of 13 pcf with min ind density of 11 pcf for Type PBS2.

CAFCO FRANCE - Type PBS2
R-Control SIPs exhibit code required fire-performance as confirmed through extensive fire testing. These tests include ASTM E 84, ASTM E 119, UL 263, UL 1715, and UL 1256. These tests are designed to measure fire resistance but are not meant to provide a hazard assessment. This bulletin provides basic information on the combustion products of R-Control SIPs.

R-Control SIPs are manufactured from components that are organic in composition. When organic compounds burn, the major combustion by-products generated are Carbon Monoxide (CO) and Carbon Dioxide (CO₂). These gases are the primary by-products in most fires.

R-Control SIPs, when sheathed with gypsum board, meet or exceed the requirements for fire safety as mandated by building codes. However, should an R-Control SIP become involved in a fire situation, the combustion gases given off are similar to those produced through the combustion of common building materials such as wood.
SIPs

SIP No. 2021

Subject: SIP Fasteners

Date: November 2007

R-Control Wood Screws and R-Control Metal Fasteners are available from your R-Control SIP supplier for attachment of R-Control SIPs to wood or metal substrates. These screws were developed to provide an engineered fastener to meet the needs of R-Control SIP installation.

Please find attached engineering properties for the R-Control Wood Screw, Metal Fastener, and Light Duty Metal Fastener. The properties include withdrawal, shear, pull through, and tensile strength.

The values provided for the R-Control Screws and Fasteners are maximum values. As determined by the project architect/engineer, appropriate safety factors should be used in design.

Wood Screw

R-Control Wood Screws are used to attach R-Control SIPs to wood structural members and substrates.

Metal Fastener

R-Control Metal Fasteners are used to attach R-Control SIPs to metal structural members and substrates. R-Control Heavy Duty Metal Fasteners can self drill into 3/16” steel without pilot hole predrilling. Installation is direct and fast - no wood nailers needed. This eliminates the need for wood nailers that would otherwise be required for the wood screw in metal building components. This results in time savings for the contractor and material savings for the building owner.

The metal fastener should be driven with a low rpm (<1500 rpm) high torque drill. Firm but not excessive pressure should be applied. This allows the drill point to engage the surface of the metal and drill through. Excessive pressure and/or rpm will dull the drill point and render the fastener ineffective.

Metal Fastener - Light Duty

R-Control also supplies a Light Duty Metal Fastener.

R-Control Light Duty Metal Fasteners are used to attach R-Control SIPs to light duty (up to 18 gauge) metal substrates.
### R-Control Wood Screws

#### Table 1: Withdrawal Strength

<table>
<thead>
<tr>
<th>Withdrawal</th>
<th>lbs./in. penetration</th>
<th>Wood specific gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Control Wood Screw</td>
<td>1429</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>1173</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>1067</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>981</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>917</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>768</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>661</td>
<td>0.31</td>
</tr>
</tbody>
</table>

#### Table 2: Shear Strength

<table>
<thead>
<tr>
<th>Shear</th>
<th>lbs.</th>
<th>Wood specific gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Control Wood Screw / R-Control SIP assembly</td>
<td>790</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td>780</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>720</td>
<td>0.38</td>
</tr>
<tr>
<td>R-Control Wood Screw</td>
<td>2900</td>
<td></td>
</tr>
</tbody>
</table>

#### Table 3: Pull Through Strength

<table>
<thead>
<tr>
<th>Pull Through</th>
<th>lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Control Wood Screw / R-Control SIP assembly</td>
<td>630</td>
</tr>
<tr>
<td>R-Control Wood Screw / 7/16” OSB</td>
<td>545</td>
</tr>
</tbody>
</table>

#### Table 4: Tensile Strength

<table>
<thead>
<tr>
<th>Tensile Strength</th>
<th>lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Control Wood Screw</td>
<td>3380</td>
</tr>
</tbody>
</table>

The values provided for the R-Control Screw Fastener are maximum values. As determined by the project architect/engineer, appropriate safety factors should be used in design.
### R-Control Metal Fasteners

The values provided for the R-Control Metal Fastener are maximum values. As determined by the project architect/engineer, appropriate safety factors should be used in design.

<table>
<thead>
<tr>
<th>Withdrawal</th>
<th>lbs.</th>
<th>Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Control Metal Fastener</td>
<td>770</td>
<td>16 ga.</td>
</tr>
<tr>
<td>R-Control Metal Fastener</td>
<td>1130</td>
<td>13 ga.</td>
</tr>
<tr>
<td>R-Control Metal Fastener</td>
<td>1690</td>
<td>12 ga.</td>
</tr>
<tr>
<td>R-Control Metal Fastener</td>
<td>3100</td>
<td>3/16&quot;</td>
</tr>
<tr>
<td>R-Control Metal Fastener</td>
<td>4500</td>
<td>1/4&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shear</th>
<th>lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Control Metal Fastener / R-Control SIP assembly</td>
<td>790</td>
</tr>
<tr>
<td>R-Control Metal Fastener</td>
<td>3400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pull Through</th>
<th>lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Control Metal Fastener / R-Control SIP assembly</td>
<td>630</td>
</tr>
<tr>
<td>R-Control Metal Fastener / 7/16&quot; OSB</td>
<td>545</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tensile Strength</th>
<th>lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Control Metal Fastener</td>
<td>6000</td>
</tr>
</tbody>
</table>
## R-Control Light Duty Fasteners

<table>
<thead>
<tr>
<th>Withdrawal</th>
<th>lbs.</th>
<th>Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Control Light Duty</td>
<td>510</td>
<td>22 ga.</td>
</tr>
<tr>
<td>Metal Fastener</td>
<td>645</td>
<td>20 ga.</td>
</tr>
<tr>
<td></td>
<td>920</td>
<td>18 ga.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shear</th>
<th>lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Control Light Duty</td>
<td>2900</td>
</tr>
<tr>
<td>Metal Fastener</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pull Through</th>
<th>lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Control Light Duty</td>
<td>630</td>
</tr>
<tr>
<td>Metal Fastener / R-Control SIP assembly</td>
<td></td>
</tr>
<tr>
<td>R-Control Light Duty</td>
<td>545</td>
</tr>
<tr>
<td>Metal Fastener / 7/16” OSB</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tensile Strength</th>
<th>lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Control Light Duty</td>
<td>3380</td>
</tr>
<tr>
<td>Metal Fastener</td>
<td></td>
</tr>
</tbody>
</table>

The values provided for the R-Control Screw Fastener are maximum values. As determined by the project architect/engineer, appropriate safety factors should be used in design.
Subject: Water Vapor

Date: November 2007 (Revised January 2015)

Water vapor is not normally a problem in construction, but when it is allowed to condense, problems can develop. There are two issues that must be considered:

1. air infiltration
2. diffusion of water vapor

In a building envelope the primary cause of condensation within a wall or roof is due to air infiltration - warm, moist air meeting a cool surface. Stick buildings, which utilize fiberglass batts, rock wool or blown cellulose are at risk of having condensation occur because the structure has a tendency to leak air. Consequently, vapor retarders, such as polyethylene sheets, are used frequently in stick construction.

R-Control SIPs utilized and installed per R-Control details reduce building air infiltration to a very low level. Therefore, the potential for condensation due to air leakage in R-Control SIP buildings is greatly minimized.

Due to the air infiltration resistance properties of R-Control SIPs and its safe vapor diffusion profile, R-Control SIPs deny the opportunity for condensation to occur. Proper spline and plate application sealing using R-Control Low VOC Do-All-Ply and SIP Tape is required.

Vapor diffusion contribution to moisture problems needs to be understood and addressed when looking at a construction assembly. For condensation to occur, an air temperature must be reached at which water vapor in the air reaches saturation.

A vapor analysis of R-Control SIPs in both hot climates and cold climates determined that the vapor pressure curve typical for R-Control SIPs does not reach or exceed the saturation curve or dew point curve (See attached graph).

Structures housing swimming pools, refrigeration/freezer, or buildings humidified beyond 50% RH during the winter may require additional design considerations. These structures need to be reviewed on an individual basis as to whether a special vapor control design (including vapor retarders or other strategies) is required.
NOTE: Since vapor pressure through the R-Control SIP does exceed saturation curve, condensation does not occur.
Subject: Concentrated Floor Load Testing

Date: November 2007

Building codes have specific requirements for materials used to create floor assemblies. In residential applications, the floor system must be able to carry a uniform load of 40 psf. Commercial floor assemblies such as those found in churches, schools, banks, hotels, etc., have more stringent requirements. These include the capacity to support uniform loads greater than 40 psf and the ability to support specific concentrated loads. The concentrated load requirement for most commercial structures is 1000 or 2000 pounds over a 30” X 30” area.

Two typical R-Control SIP floor assemblies have been subjected to concentrated floor load testing. In these tests a 30” X 30” steel plate was placed over the floor system at several locations on the assembly. In each of the locations where the loaded plate was placed, the R-Control SIP floor panel assembly did not exceed the deflection limitations at a 2000 pound load. The panel assembly also performed adequately when 3 times the 2000 pound load, or 6000 pounds of pressure was applied to the steel plate.

The results from this testing demonstrate that R-Control SIP floor assemblies meet the code requirement for commercial floors of 2000 pound concentrated loads, while providing a factor of safety of three.
R-Control SIPs used as roofs are often extended beyond the building wall line to create overhangs. Overhangs result in the R-Control SIP being placed in a cantilever condition. Engineering analysis and full scale loading tests have been used to determine the design recommendations for R-Control Roof SIPs placed in these cantilever roof conditions.

### Roof Cantilevers - Transverse Loads - PSF

**LOAD DESIGN CHART #9**

**SPLINE DETAILS SIP-102, SIP-102g, or SIP-102m**

<table>
<thead>
<tr>
<th>SIP THICKNESS</th>
<th>DEFLECTION LIMIT</th>
<th>SIP CANTILEVER (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L/240</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>4-1/2”</td>
<td></td>
<td>43 43 43</td>
</tr>
<tr>
<td>6-1/2”</td>
<td></td>
<td>66 65 60 42</td>
</tr>
<tr>
<td>8-1/4”</td>
<td></td>
<td>68 68 65 42</td>
</tr>
<tr>
<td>10-1/4”</td>
<td></td>
<td>69 69 60 49</td>
</tr>
<tr>
<td>12-1/4”</td>
<td></td>
<td>69 63 52 46</td>
</tr>
</tbody>
</table>

1. VALUES ARE APPLICABLE TO SIPs INSTALLED WITH THE STRONG AXIS OF THE OSB FACINGS PARALLEL TO SIP SPAN AND WITH AN 8’ BACKSPAN.
2. LIVE LOAD AT L/240 AND TOTAL LOAD AT L/180.

**GENERAL NOTES:**
- CHART VALUES ARE POUNDS PER SQUARE FOOT.
- SURFACE, BLOCK, OR LUMBER BLOCK SPLINE CONNECTED TO SIP FACING WITH 8D BOX (0.113) NAILS 6” O.C.
- CONTINUOUS SUPPORT WITH A MINIMUM BEARING OF 1-1/2” AT EACH SUPPORT REQUIRED.
- CHART IS BASED UPON UNIFORM LOADS.
- LOADS LIMITED BY DEFLECTION OR ULTIMATE FAILURE LOAD DIVIDED BY A FACTOR OF SAFETY OF THREE.
- FOR SLOPED SIPS, THE LOADING CONDITIONS AND SIP CAPACITIES SHOULD BE REVIEWED BASED UPON THE INCLINED SIP LENGTH. REFER TO R-CONTROL SIP TECHNICAL BULLETIN SIP NO. 2042.
- VALUES ARE FOR TOTAL LOAD (DEAD LOAD + LIVE LOAD).
- THE DEAD LOAD SHALL NOT EXCEED 20% OF THE TOTAL LOAD.
R-Control SIPs have been evaluated for use as diaphragms in structures. Diaphragm applications include both wall and roof assemblies that are subjected to seismic or wind loads.

Through large and small scale testing conducted at the APA laboratories using an independent structural consultant, it was determined that R-Control SIPs can develop design diaphragm capacities of up to 850 lbs/ft. Please refer to Load Design Chart #7 for R-Control Wood Screw and nail spacing required to obtain this capacity.

These tests have allowed for the determination of design capacities for R-Control Wood Screws and nails when used in diaphragms. The following lateral load capacities are recommended:

- R-Control Wood Screws 250 lbs.
- 8d nails @ surface splines 62.5 lbs.

These design values include a factor of safety of three on the ultimate load.

In all diaphragm applications the design of the lateral load resisting system must be engineered to provide a load path for the forces that the structure will develop. This is provided by the engineer of record on the specific project.
SIPs

SIP No. 2032

Subject: Staples

Date: November 2007 (Revised March 2012)

R-Control SIP details primarily require the use of 8d box (0.113) nails for attachment of splines and plates. On occasion 10d box (0.128) and 12d box (0.135) nails are also shown.

Some contractors request the substitution of staples as an alternative to the nails. The substitution of staples or other fasteners for nails in the R-Control Construction Details is acceptable when the alternate fastener and spacing is such that the structural capacity meets or exceeds the nails as specified in the detail.

Note: The use of staples in Seismic Design Category D, E, and F regions is not recommended as staples do not have an equivalent ductility to nails as required for seismic resistance.
A test program was conducted to obtain data that characterizes pullout and shear capacities for various fasteners in 7/16” OSB.

Fifteen repetitions of each combination of variables were completed. A summary of the ultimate pullout and shear results are below.

The data in this bulletin is average ultimate pullout value. No factor of safety has been applied. An appropriate factor of safety should be used in design calculations.

The data is representative of the OSB tested. Results will vary with OSB source and lot. Data is based on dry OSB.

This data allows specifiers and manufacturers of finishing products and systems to determine correct fastener placement required for their materials.

### Pullout (lbs)

<table>
<thead>
<tr>
<th>Screw Size</th>
<th>7/16” OSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>#6 Deck Screw</td>
<td>175</td>
</tr>
<tr>
<td>#8 Deck Screw</td>
<td>180</td>
</tr>
<tr>
<td>#10 Deck Screw</td>
<td>200</td>
</tr>
<tr>
<td>#12 Roofing Screw</td>
<td>190</td>
</tr>
<tr>
<td>#14 Roofing Screw</td>
<td>175</td>
</tr>
</tbody>
</table>

### Shear (lbs)

<table>
<thead>
<tr>
<th>Screw Size</th>
<th>7/16” OSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>#6 Deck Screw</td>
<td>200</td>
</tr>
<tr>
<td>#8 Deck Screw</td>
<td>120</td>
</tr>
<tr>
<td>#10 Deck Screw</td>
<td>140</td>
</tr>
<tr>
<td>#12 Roofing Screw</td>
<td>435</td>
</tr>
<tr>
<td>#14 Roofing Screw</td>
<td>465</td>
</tr>
</tbody>
</table>
Combined axial and transverse (bending) testing has been conducted on R-Control SIPs. The testing was performed as outlined in ASTM E 72, “Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.” The testing involved simultaneously loading the panel to both an axial load and a transverse load. The axial load was applied eccentrically to the panel at a location one-third of the panel thickness from the interior OSB facing. A uniform transverse load was applied to the exterior OSB facing.

R-Control SIPs can be designed to carry simultaneously both the maximum axial load and maximum transverse (bending) load in Load Design Chart #2 or #2A.

### Wall - Combined Axial & Transverse Loading

#### Load Design Chart #2
(See Detail SIP-101)

<table>
<thead>
<tr>
<th>R-Control Structural Insulated Panels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel Height</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Axial Load [PLF]</td>
</tr>
<tr>
<td>8’-0”</td>
</tr>
<tr>
<td>10’-0”</td>
</tr>
<tr>
<td>Transverse (Bending) Load [PSF]</td>
</tr>
<tr>
<td>8’-0”</td>
</tr>
<tr>
<td>10’-0”</td>
</tr>
</tbody>
</table>

---

[1] R-CONTROL SIPs can carry both the maximum axial load and maximum transverse (bending) load simultaneously. (No unity equation analysis is needed)

[2] Design values are limited by the lower of transverse deflection or ultimate failure load divided by a factor of safety of three (3).
Wall - Combined Axial & Transverse Loading

### Load Design Chart #2A
(See Detail SIP-108c)

<table>
<thead>
<tr>
<th>R-Control Structural Insulated Panels</th>
<th>SIP Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 1/2”</td>
</tr>
<tr>
<td></td>
<td>6 1/2”</td>
</tr>
<tr>
<td>Axial Load [PLF]</td>
<td></td>
</tr>
<tr>
<td>12’-0”</td>
<td>2200</td>
</tr>
<tr>
<td>16’-0”</td>
<td>2200</td>
</tr>
<tr>
<td>20’-0”</td>
<td>2200</td>
</tr>
<tr>
<td>Transverse (Bending) Load [PSF]</td>
<td></td>
</tr>
<tr>
<td>12’-0”</td>
<td>27</td>
</tr>
<tr>
<td>16’-0”</td>
<td>41</td>
</tr>
<tr>
<td>20’-0”</td>
<td>20</td>
</tr>
</tbody>
</table>

[1] R-CONTROL SIPS CAN CARRY BOTH THE MAXIMUM AXIAL LOAD AND MAXIMUM TRANSVERSE (BENDING) LOAD SIMULTANEOUSLY. (NO UNITY EQUATION ANALYSIS IS NEEDED)

[2] DESIGN VALUES ARE LIMITED BY THE LOWER OF TRANSVERSE DEFLECTION OR ULTIMATE FAILURE LOAD DIVIDED BY A FACTOR OF SAFETY OF THREE (3).
Subject: Nail Pullout

Date: November 2007

Pullout tests have been conducted on nails driven into R-Control SIP facings. Pullout values were determined by driving nails into and through the 7/16" OSB used to manufacture R-Control SIPs and extracting the nail. The following results are ultimate pullout values for R-Control SIPs using various nail types.

<table>
<thead>
<tr>
<th>Nail Type</th>
<th>Ultimate Pullout Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4D Drywall</td>
<td>96 Lbs.</td>
</tr>
<tr>
<td>6D Galvanized</td>
<td>69 Lbs.</td>
</tr>
<tr>
<td>Galvanized Roofing</td>
<td>61 Lbs.</td>
</tr>
<tr>
<td>8D Smooth</td>
<td>51 Lbs.</td>
</tr>
<tr>
<td>8D Galvanized</td>
<td>80 Lbs.</td>
</tr>
<tr>
<td>8D Coated</td>
<td>90 Lbs.</td>
</tr>
<tr>
<td>8D Ring Shank</td>
<td>156 Lbs.</td>
</tr>
<tr>
<td>10D Spiral Shank</td>
<td>38 Lbs.</td>
</tr>
<tr>
<td>16D Smooth</td>
<td>52 Lbs.</td>
</tr>
<tr>
<td>16D Galvanized</td>
<td>75 Lbs.</td>
</tr>
</tbody>
</table>

The data in this bulletin is average ultimate pullout value. No factor of safety has been applied. An appropriate factor of safety should be used in design calculations.

The data is representative of the OSB tested. Results will vary with OSB source and lot. Data is based on dry OSB.

This data allows specifiers and manufacturers of finishing products and systems to determine correct fastener placement required for their materials.
Blazeguard is a factory applied coating manufactured from specialized concrete and fiberglass strands. Blazeguard is applied directly to the OSB facing of R-Control SIPs. Blazeguard provides a code recognized thermal barrier for the panel, just like gypsum board. Blazeguard adheres tenaciously to the wood face. It is also very impact and moisture durable, due to the fact that concrete technology is used.

**Where is it used?**

Blazeguard is most commonly used as the interior side of an R-Control SIP in commercial and industrial buildings. Some applications have also been used for the outside of the panel where extra fire protection is needed, but only when the Blazeguard is additionally covered by a code approved exterior weather resistant barrier and cladding system.

**What type finish is available?**

The Blazeguard finish is relatively smooth and reminiscent of hand troweled plaster coat that was common in years past. This finish is used in applications where the design calls for a lightly modeled smooth appearance.

**How are joints treated?**

Building designs that hide or blind the joints are best for R-Control SIPs with Blazeguard. Also, designs that allow for the panel joints to be seen as a reveal joint from panel to panel work well. Another application that works for many designs is to cover panel joints with batten systems that blend into the field color or texture of the panel, or compliment the design scheme.

**Does Blazeguard Meet Code Requirements?**

Blazeguard is a proprietary fire resistive finish that can be applied to R-Control SIPs. This product results in an R-Control SIP which meets and exceeds the code requirement for an Index 15 Thermal Barrier.

R-Control SIPs with Blazeguard have been tested in accordance to the following code required tests:

- **UBC 26-2** (a modified ASTM E119 test) “Test Method for Evaluation of Thermal Barrier”.
  - Results - Blazeguard qualifies as a Thermal Barrier

- **UBC 26-3** (Corner Room Burn) “Room Fire Test Standard for Interior of Foam Plastics Systems”.
  - Results - R-Control SIPs with Blazeguard remained in position for the duration of the test and exhibited very light smoke, while protecting the EPS core from char outside the area of the ignited crib.

- **ASTM E-84** “Tested Method for Surface Burning Characteristics of Building Materials”.
  - Results - The Blazeguard material has a flame spread of 5 and a smoke develop of 10-35.

The results of these tests demonstrate that R-Control SIPs with Blazeguard meet code requirements for a thermal barrier and can be installed without fire protection.

For more information on Blazeguard, please refer to ICC ES ESR-1365 available from www.icc-es.org.
Subject: Load Design Chart Adjustments for Sloped Roofs

Date: November 2007

R-Control SIP Load Design Charts are based upon tests and calculations using flat panel installations. In many applications, the panels will be installed at a slope. When installed at a slope, the building designer must make adjustments in the design procedure to ensure that R-Control SIPs with sufficient load capacity are chosen. This bulletin includes a worksheet to adjust the panel length and load based upon the roof slope. The correct panel length and loading are critical for proper panel selection.

LOAD ADJUSTMENT FOR PITCHED ROOF

Dead Load __________(3)
Correction Factor __________(4)
Net Dead Load (3)÷(4) __________(5)
Live Load __________(6)
Correction Factor __________(7)
Net Live Load (6)÷(7)÷(7) __________(8)
Total Load, (5)+(8) ______

SPAN ADJUSTMENT FOR PITCHED ROOF

Horizontal Span __________(1)
Correction Factor __________(2)
Panel Length, (1)x(2) ______

The actual panel length and loading should be calculated as follows:

- Determine the actual panel length by multiplying the horizontal span by the correction factor.
- Determine the actual dead load by dividing the dead load (including panel weight plus ceiling finish plus roofing) in psf by the correction factor.
- Determine the appropriate live (snow) load in accordance with the appropriate building code (considering sliding or snow drifting snow load increases or sliding snow load decreases where appropriate) and divide that load by the square of the correction factor.
- Compare the sum of the dead and live loads to the load design chart for the panel length required. It must be less than the allowable load for the desired total load deflection.

<table>
<thead>
<tr>
<th>Roof Slope</th>
<th>Correction Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/12</td>
<td>1.05</td>
</tr>
<tr>
<td>5/12</td>
<td>1.08</td>
</tr>
<tr>
<td>6/12</td>
<td>1.12</td>
</tr>
<tr>
<td>7/12</td>
<td>1.16</td>
</tr>
<tr>
<td>8/12</td>
<td>1.20</td>
</tr>
<tr>
<td>9/12</td>
<td>1.25</td>
</tr>
<tr>
<td>10/12</td>
<td>1.30</td>
</tr>
<tr>
<td>11/12</td>
<td>1.36</td>
</tr>
<tr>
<td>12/12</td>
<td>1.41</td>
</tr>
</tbody>
</table>
R-Control SIPs are suitable for designs requiring control of sound transmission.

Sound Transmission is measured by ASTM E 90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions. The test measures the sound transmission loss for sound with frequencies from 125-4000 Hz. This range is the most important part of the hearing range. The results of the test are further classified into a Sound Transmission Class (STC) which is useful in comparing different building systems.

The significance of STC ratings can be seen by a review of the following information on STC ratings.

**STC rating**

<table>
<thead>
<tr>
<th>STC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Normal speech can be understood quite clearly.</td>
</tr>
<tr>
<td>30</td>
<td>Loud speech can be understood fairly well.</td>
</tr>
<tr>
<td>35</td>
<td>Loud speech audible but not intelligible.</td>
</tr>
<tr>
<td>42</td>
<td>Loud speech audible as a murmur.</td>
</tr>
<tr>
<td>45</td>
<td>Must strain to hear loud speech.</td>
</tr>
<tr>
<td>48</td>
<td>Some loud speech barely audible.</td>
</tr>
<tr>
<td>50</td>
<td>Loud speech not audible.</td>
</tr>
</tbody>
</table>

R-Control SIP testing has resulted in four different assemblies:

**NOTE:** STC ratings do not include the impact of airborne noise which penetrates common openings in construction. These include poor assembly, heating and ventilation ducts, electrical boxes, and other imperfectly sealed penetrations that allow for building systems to “leak” airborne noise. R-Control SIPs are assembled without the common problems associated with site built construction and eliminate many of the openings which reduce sound transmission performance. Reports from R-Control SIP building owners confirm the improved sound control performance of R-Control SIP structures.

- **R-Control SIP Assembly with STC - 28**
  - R-Control SIP with 1/2” gypsum board attached to one side.

- **R-Control SIP Assembly with STC - 38**
  - R-Control SIP with two layers 5/8” Type X gypsum board on both sides.

- **R-Control SIP Assembly with STC - 39**
  - R-Control SIP with 1/2” gypsum board attached to one side using USG RC-1 resilient channel (24” o.c.). Fiberglass (1/2”) was placed between the RC-1 channel and the gypsum board.

- **R-Control SIP Assembly with STC - 51**
  - R-Control SIP with two layers 5/8” Type X gypsum board attached to one side. The opposite side has one layer 5/8” Type X gypsum board, 1-1/2” Z furring channels and 1 USG Sound Attenuating Fiberglass batt, and an additional layer of 5/8” Type X gypsum board.
R-Control SIP structures can be finished with any code approved weather covering. Exterior Insulation Finish Systems (EIFS) are one type of code recognized weather covering. EIFS provide water tight protection and have been used successfully over R-Control SIP structures for many years. It is recommended that EIFS intended for use over OSB substrates be used. EIFS system installers must follow the EIFS Manufacturer’s installation guidelines to achieve a warranted outcome.

Various code jurisdictions require that the EIFS be installed include a water drainage system. Many EIFS Manufacturers have systems that meet this requirement.

Sto System:
Sto Corp. has developed, StoTherm® ci, a water managed EIFS, utilizing an air/moisture barrier system, that works exceptionally well with R-Control SIPs. The Sto system features benefits that enhance the long term performance of R-Control SIPs:

1. R-Control SIP OSB skins and penetrations are moisture protected.
2. StoTherm ci is adhesively applied - fastener penetrations are not made into the R-Control SIP OSB facing.
3. Incidental water that may get behind the EIFS is drained outside the system.

This Technical Bulletin gives guidelines for the application of the StoTherm ci with StoGuard® Moisture Protection, when applied over R-Control SIPs.

General Caution:
StoGuard protects the R-Control SIP OSB facing from moisture damage during the construction phase, as well as in service protection in the event of a moisture breach in the EIFS wall cladding. Proper application is required of the installer. Application of the StoGuard over R-Control SIPs is not intended to correct faulty workmanship. It is essential that proper flashing and details be integrated into the design that direct water to the outside of the cladding system. Defective components of construction, such as leaky windows and doors, should not be used.

Application Recommendations:
Sto Corp. publishes complete specifications for the installation of their StoGuard and StoTherm ci. The following recommendations are being provided as they apply to installations over R-Control SIPs. Prior to starting any work, completely read all specifications and installation guidelines.

Step 1:
Clean R-Control SIP OSB facing surfaces that are to receive the StoGuard Moisture Protection System. R-Control SIP OSB surfaces must be in good condition, free of dirt and all bond inhibiting contaminates. Surfaces must be dry, with the ambient air temperature at 40°F and rising before application can occur.

Step 2:
Apply Sto Gold Coat® to the entire R-Control SIP OSB facing receiving the Sto EIFS. Using a 3/4” (19mm) nap roller, apply Sto Gold Coat in a uniform wet thickness coating of 10 mils. Protect from weather and temperature until dry.

Step 3:
R-Control SIP joints, rough openings, corners and tops of wall parapets are filled and covered with Sto Gold Fill® and StoGuard Mesh, embedded into the Sto Gold Fill (additional Sto joint and rough-opening material options are listed at www.stocorp.com). Fastener and surface defects must be spot filled with Sto Gold Fill. Application is by trowel with maximum thickness on the R-Control SIP OSB surface being 1/16”. Joints require a 4” minimum width mesh. Rough openings, corners and parapets require a 9” minimum width mesh detail.
Step 4:

Re-apply a second coat of Sto Gold Coat over the entire R-Control SIP OSB facing receiving the Sto EIFS, including all surfaces previously covered with Sto Gold Fill. Using a 3/4” (19mm) nap roller, apply Sto Gold Coat in a uniform wet thickness coating of 10 mils. Protect from weather and temperature until dry.

Step 5:

Coordinate the proper installation of flashing and other moisture protection components, such as windows, doors, fireplaces, chimneys, and other like penetrations that impact the water tightness of the StoTherm ci applied over the R-Control SIPs.

Step 6:

Install the StoTherm ci per the manufacturer’s detailed specifications and installation guidelines including all accessories such as, but not limited to: Starter Track, Window/Door Head Flashing, Side Wall Step Flashing, Backwrapping, Adhesive and EPS Insulation Board, Trim and Reveals, Base Coat and Reinforcing Mesh, Primer, and Finish Coat.

This Technical Bulletin presents applications using Sto Gold Fill and StoGuard Mesh. Information regarding other Sto joint and rough opening product options is available at www.stocorp.com.
StoTherm® ci
System Components: R-Control® SIP

ATENTION

Property of Sto Corp. All Rights Reserved.

IMPORTANT: Components not identified as Sto are furnished by other manufacturers and are not necessarily installed by trades who install the Sto products. Refer to project specific contract documents.

1) Detail shows the components of a StoTherm ci Exterior Insulation and Finish System (EIFS) with StoGuard Moisture Protection installed on an R-Control® SIP.

2) StoGuard detail component options:
   a) StoGuard RapidFill
   b) Sto Gold Fill and StoGuard Mesh
   c) Sto Gold Coat with StoGuard Fabric

3) StoGuard joint treatment options:
   a) StoGuard RapidFill
   b) Sto Gold Fill and StoGuard Mesh
   c) Sto Gold Coat with StoGuard Fabric
   d) StoGuard RapidSeal with StoGuard Mesh

4) StoGuard door and window rough opening options:
   a) StoGuard RapidSeal
   b) Sto Gold Fill and StoGuard Mesh
   c) Sto Gold Coat with StoGuard Fabric

5) See Sto specification A1000G and individual Sto product bulletins for additional information regarding selection and installation of Sto products.

6) See additional Sto details at www.stocorp.com for rough opening preparation and penetration details.

Notes:

System Components: R-Control® SIP

StoGuard sheathing joint treatment
Sto Gold Coat
Sto adhesive
Sto insulation
Sto base coat and mesh
Sto Primer (optional)
Sto finish
StoGuard detail component
Starter track with weep holes

Detail No.: 10.00sip
Date: Dec. 2014
Subject: Roof Ridge Detailing

Date: November 2007 (Revised January 2015)

Standard R-Control SIPs roof ridge details provide for a tight and sealed design. R-Control SIP roof ridge details rely on the tight fit of all component materials, the liberal and specific location application of R-Control Low VOC Do-All-Ply sealant and the proper placement of SIP Tape or vapor retarders.

There may be special conditions or difficult project applications that require additional considerations to enhance the long-term performance of the roof ridge. These special conditions may be: steeply sloped roof planes, converging multiple roof slopes, hard to access work areas on the roof, ill fitting roof panels caused by miss set beams, purlins, walls or miss cuts of the SIP roof panel.

When SIPs do not fit tightly at the roof ridge, they may be difficult to seal properly with R-Control Low VOC Do-All-Ply. Undue levels of moisture can then invade these non-sealed areas over time, eventually causing damage to the SIP and other components of the structure. Field applied expanding foams help to insulate roof ridge spaces, but do not provide adequate protection against moisture passage and build up.

Therefore, it is essential to follow exactly all application recommendations for R-Control SIP roof ridge installation.

If it is determined that project conditions could possibly compromise the integrity of the roof ridge detail, the installation of a ventilated roof over the R-Control SIP is recommended.
R-Control SIP connection details rely on the tight fit of all component materials and the specific application of R-Control Low VOC Do-All-Ply sealant as shown in R-Control SIP details.

This bulletin describes the tested performance of these materials with respect to moisture vapor transmission. ASTM E 96, “Standard Test Methods for Water Vapor Transmission of Materials,” was used to measure the performance of Do-All-Ply and SIP connection details.

R-Control SIP connection details rely on the tight fit of all component materials and the specific application of R-Control Low VOC Do-All-Ply sealant as shown in R-Control SIP details.

R-Control SIP connection details rely on the tight fit of all component materials and the specific application of R-Control Low VOC Do-All-Ply sealant as shown in R-Control SIP details.

R-Control Low VOC Do-All-Ply

R-Control Low VOC Do-All-Ply was tested as a thin film. R-Control Low VOC Do-All-Ply had a water vapor transmission rate of less than 0.1 perm.

A material with a perm rating of less than 1.0 perms is considered a vapor retarder.

R-Control SIPS

R-Control SIP (6-1/2” thick) sections were tested as follows:

- No joint
- w/surface spline joint
- w/block spline joint

R-Control SIP surface spline (detail SIP-102) and block spline (detail SIP-102g) are the most commonly used R-Control SIP connection details.

The results of the testing were as follows:

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Perms</th>
</tr>
</thead>
<tbody>
<tr>
<td>No joint</td>
<td>&lt; 1.0</td>
</tr>
<tr>
<td>w/surface spline joint</td>
<td>&lt; 1.0</td>
</tr>
<tr>
<td>w/block spline joint</td>
<td>&lt; 1.0</td>
</tr>
</tbody>
</table>

1 Perm = grains/h x ft x ft x in. Hg

These results clearly demonstrate that the use of R-Control surface spline or block spline connection details with proper application of R-Control Low VOC Do-All-Ply maintains suitable control of moisture transmission.

Following the R-Control details provide for a tight and sealed design.

As point of interest, the R-Control SIP sample with a surface spline connection was also tested without the application of R-Control Low VOC Do-All-Ply. The results from this testing were dramatic.

The moisture transmission through a surface spline joint with no R-Control Low VOC Do-All-Ply was over 100 times that of the joint with R-Control Low VOC Do-All-Ply.

These results clearly demonstrate the need for proper application of R-Control Low VOC Do-All-Ply as shown in R-Control details.
R-Control SIPs are a high performance building material. In order to provide maximum comfort, energy savings, and durability, R-Control SIPs must be installed in compliance with R-Control SIP details. A key component of a R-Control building envelope is the proper use and application of R-Control Low VOC Do-All-Ply, SIP Tape and foam sealants.

R-Control Low VOC Do-All-Ply

R-Control Low VOC Do-All-Ply was specifically designed for application to R-Control SIPs.

R-Control Low VOC Do-All-Ply is the only recommended sealant product for installation between the R-Control SIP core, splines, wood plating, and internal wood members.

Other adhesive or sealants have been shown to cause damage to the EPS core or become brittle over time. R-Control Low VOC Do-All-Ply is EPS foam compatible and will retain flexibility. In addition, some products cannot be applied under damp or cold conditions. Again, R-Control Low VOC Do-All-Ply was developed to meet these needs. R-Control Low VOC Do-All-Ply can be applied under damp conditions, is water washout resistant, and can be applied at low temperatures.

Of key importance, R-Control Low VOC Do-All-Ply prevents the passage of water vapor due to its low water vapor permeability (see Technical Bulletin sip no. 2047).

R-Control Low VOC Do-All-Ply must always be installed in a continuous unbroken pattern and applied in sufficient amounts to ensure that contact is maintained with the core, splines, wood plating, and internal members.

Failure to apply the R-Control Low VOC Do-All-Ply in a continuous pattern or maintain contact with adjacent materials will provide paths for moisture vapor to pass through panel joints causing eventual moisture problems.

SIP Tape

R-Control SIP Tape was specifically designed for application to R-Control SIPs.

R-Control SIP Tape is the only recommended Tape product for installation on the surface of R-Control SIPs.

Other tapes are often manufactured with asphalt adhesives which are not suitable for use in interior environments.

Expanding Foam Sealants

R-Control does not recommend the use of expanding foam sealants in the critical area of joint detailing between the R-Control SIP core, splines, wood plating, and internal wood members.

The field installation of expanding foam sealants can be difficult under typical construction site environments such as cold or damp weather conditions. In addition, the long term volume stability and flexibility of foam sealants cannot be guaranteed. Field inspection of past foam sealant panel applications has shown that problems with foam sealant performance are common.

However, the use of low expanding foam sealants in the application of filling voids around electrical boxes and window and door openings is recommended (see R-Control SIP details SIP-116, SIP-117, SIP-123, SIP129a). These applications take place in the controlled environment on the inside of a standing SIP structure.
R-Control SIPs are manufactured from 3 basic components:

1. Exposure I Rated OSB for the outer faces
2. Foam-Control EPS (Expanded Polystyrene) with Perform Guard foam for the core
3. Crosslinked exterior rated adhesives

The Foam-Control EPS core and the adhesives are capable of withstanding long term exposure to moisture. Thus, the exposure to moisture for the OSB is the key to the durability of an R-Control SIP.

Construction Issues:

Exposure I Rated OSB is designed for limited exposure to moisture that can occur during construction.

R-Control SIPs must be covered during storage to protect from exposure to rain, snow and other elements.

After installation, the R-Control SIPs should be covered with a secondary weather resistive system as soon as possible. This is required to protect the OSB from exposure to moisture long term.

Note: Installation of R-Control SIPs and the secondary weather resistive system should not occur during periods of heavy rain or snow.

Long term Issues:

Installation details must ensure that the OSB facings and other wood components of the SIP construction are not subjected to moisture over the life of the structure. Moisture exposure could be exterior by means of bulk water making its way through the siding system or from the interior of the structure in the form of water vapor. In order to manage these potential sources of moisture, proper detailing must be accomplished.

By following these key detailing considerations, the long term durability of R-Control SIPs is achieved:

1. Application of R-Control Low VOC Do-All-Ply at panel joints. R-Control Low VOC Do-All-Ply must always be installed in a sufficient amount and applied in a continuous unbroken fashion.
2. Proper use of SIP Tape or vapor retarders as required by R-Control SIP details.
3. Proper use of code recognized exterior weather resistant systems which must include both a primary AND secondary system. The cladding must provide a rain screen design which provides an avenue for water that penetrates the primary weather resistive system to drain from the wall.
   a. Vinyl, aluminum, cement and wood sidings are typical types of primary systems approved for use over R-Control SIPs. These systems MUST BE INSTALLED OVER SECONDARY SYSTEMS that are rated as weather resistant, such as building paper or house wrap products (i.e. Tyvek, housewrap, etc.).
   b. Stucco is another common type of primary system. Stucco must be applied over a secondary weather resistive system.
   c. Exterior Insulated Finish Systems (EIFS) can be applied over R-Control SIPs. For example, see Technical Bulletin sip no. 2045 for application of STO’s system which includes a field applied secondary system.
4. Proper flashing and detailing of all window openings and penetrations. Ensure that the detailing of openings is consistent with forming a drainage plane which works in conjunction with the exterior weather resistive system.
All buildings should be analyzed by a HVAC professional to properly specify the heating, cooling, and ductwork to ensure desired performance.

Design factors to be considered include:

- Size of Building (each floor analyzed individually)
- Orientation of Building
- Type of Wall Construction (and associated R-value)
- Window information (number, location, insulation value, fenestration rating)
- Door information (number, location, insulation value, fenestration rating)
- Duct location (in heated space, in unheated space, in attic, in crawl space)
- Fireplaces (number, type)
- Air Infiltration

All these factors must be analyzed to provide an accurate HVAC design.

A rule of thumb approach is not suitable for HVAC design, especially with high performance systems such as SIPs.

A process for the accurate design of HVAC systems is available from the American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE). Detailed information on HVAC design is available in the ASHRAE Fundamentals Handbook.

ASHARE publishes the ASHRAE Manual J procedures which are used to design the HVAC system.

R-Control SIPs provide inherent energy savings when used for walls and/or roof components on buildings. The energy savings can be attributed to two main factors:

1. Increased R-value
2. Lowered air infiltration

Applying Manual J calculations provides for the increased R-value and the reduced air infiltration of building with R-Control SIPs. These two factors will allow for downsizing of the heating and cooling equipment. This will provide immediate cost savings at the time of construction. In addition, proper sizing of the HVAC system will provide a more comfortable environment.

Architects/engineers, builders, building owners, and other building professionals have learned from experience that the energy savings for a typical SIPs structure can be 30-50%.

Note: Please also review Technical Bulletin sip no. 2000 for information on heat recovery ventilator requirements.
The building industry is continually learning about the growth of mold in homes. Homeowners and building professionals are concerned over the potential for mold growth and the impact on the living environment. This bulletin is designed to provide a basic overview of mold in structures.

Mold problems in structures are normally directly related to a moisture problem. Common moisture problems are the result of water leaks and/or the lack of attention to flashing and building details.

Molds are a type of fungi in the same family as mushrooms and yeasts. Molds need the right conditions to grow. This is typically a temperature between 40°F and 100°F and 20% moisture content in the product they are attacking. Thus, an area of a building with a water problem is an ideal environment for mold growth. Under warm and humid conditions, they can quickly multiply and spread over wall surfaces and building materials.

Molds are an essential part of the world with the function of breaking down the basic components of plants and other natural organic materials. The molds of concern to the building industry get their nutrients from the starches and sugars in wood and paper products.

R-Control SIPs are a composite of Foam-Control Expanded Polystyrene (EPS) and Oriented Strand Board (OSB). Foam-Control EPS provides no nutrient value to plants, animals, or microorganisms. The OSB which is part of R-Control SIPs is organic and could be attacked by mold in the presence of excessive moisture.

R-Control SIPs can be manufactured with the FrameGuard® treatment, thereby reducing the opportunity for mold growth to occur within the OSB skin. Regardless of the OSB requested by the customer, code approved water management design should always be used in R-Control SIP construction.

R-Control SIP details provides for the proper installation of R-Control SIPs. R-Control Low VOC Do-All-Ply sealant and SIP Tape are critical components for the installation of R-Control SIPs (See Technical Bulletin sip no. 2047 and sip no. 2057). This is coupled with HVAC design (See Technical Bulletin sip no. 2051 and sip no. 2000) to ensure sufficient air changes and humidity control within the building. Following R-Control SIP details and proper HVAC design will help control moisture which could lead to a mold issue.

Moisture issues that occur in buildings should be addressed immediately. The list below shows many of the common items that could lead to the development of a moisture problem and subsequent mold issues.

1. Plumbing leaks
2. Ice Dams
3. Sky lights
4. Foundations (basements and crawl spaces)
5. Unvented combustion appliances
6. Improperly sized air conditioners
7. Leaky heating and air conditioning ducts
8. Excessive interior humidity
9. Lack of attention to flashing and building details.

If a mold problem is encountered in a structure, a building professional should be consulted immediately.
SIPs

SIP No. 2054

Subject: Recessed Lights

Date: November 2007

The primary considerations for the installation of recessed lighting in R-Control SIPs include potential excessive cutting of the structural facing and excessive heat (refer to Technical Bulletin sip. no. 2064).

Since the R-Control SIP facing is a key structural component, excessive cutting of the facing along with the foam core will lead to a reduction in the structural capacity of the R-Control SIP.

Heat buildup with recessed lights is the result of being installed in a fully insulated cavity. Although some recessed lights are designated for insulated cavities, these lights are not designed for the superior performance of the solid core of Foam-Control EPS (Expanded Polystyrene) within the R-Control SIP.

R-Control recommends the installation of surface mount or track lighting for R-Control SIP ceiling applications. If a flush appearance is required, a cavity or soffit application is recommended. A cavity or soffit is created through the installation of framing material attached to the surface of the R-Control SIP before the installation of gypsum board. This creates a cavity or soffit in which lighting can be installed without cutting the face of the R-Control SIP (see SIP-143 & SIP-143a).

The use of recessed lighting is not recommended for application within R-Control SIPs.

However, if recessed lights are desired to be installed in an R-Control SIP, the engineer of record for the project should be consulted with regard to the number and location of planned cuts in the R-Control SIP. The engineer must review these cuts to ensure the structural integrity of the R-Control SIP. In addition, since the core of the R-Control SIP is EPS, the opening into the R-Control SIP will expose EPS. A minimum of 2X dimensional lumber blocking or 1/2” gypsum board must be installed over the exposed EPS prior to the installation of the fixture.
Subject: SENCO Nail and Staple Pullout

Date: November 2007 (Revised May 2013)

Senco staple and nail products driven into the OSB (oriented strand board) facing of R-Control SIPs were tested for pullout. Pullout values were determined by driving nails or staples through the 7/16" OSB and extracting the nail or staple. The staples were left exposed above the surface 1/4".

The following pullout values were obtained for 7/16" OSB faced R-Control SIP.

The data in this bulletin is average ultimate pullout value. No factor of safety has been applied. An appropriate factor of safety should be used in design calculations.

The data is representative of the OSB tested. Results will vary with OSB source and lot. Data is based on dry OSB.

This data allows specifiers and manufacturers of finishing products and systems to determine correct fastener placement required for their materials.
R-Control SIP walls are used in combination with various types of roof systems. These include R-Control SIPs, rafter and ridge beam systems, and roof trusses.

Roof systems, such as roof trusses, often result in the need to transfer a point load from the roof system uniformly onto the wall. R-Control has evaluated the point load capacity of R-Control SIPs as shown in the attached Wall-Point Loading Chart. The total load should never exceed the lesser of the point load capacity or the R-Control SIP axial and transverse capacity from the R-Control wall load design charts. If the design load exceeds these point loads, the R-Control SIP can be fabricated to accept 2X posting or other posting as determined by the engineer of record.

**Wall - Point Loading**

<table>
<thead>
<tr>
<th>Load Design Chart #2C</th>
<th>(See Detail SIP-101)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R-Control Structural Insulated Panels</strong></td>
<td></td>
</tr>
<tr>
<td>Point Load Width</td>
<td></td>
</tr>
<tr>
<td>1 1/2”</td>
<td>3”</td>
</tr>
<tr>
<td>Single Top Plate</td>
<td></td>
</tr>
<tr>
<td>w/Spacer Board</td>
<td></td>
</tr>
<tr>
<td>w/Optional Cap Plate</td>
<td></td>
</tr>
<tr>
<td>2000 lbs.(^3)</td>
<td>2150 lbs.(^3)</td>
</tr>
<tr>
<td>2100 lbs.(^3)</td>
<td>3000 lbs.(^3)</td>
</tr>
<tr>
<td>4000 lbs.(^3)</td>
<td>4150 lbs.(^3)</td>
</tr>
</tbody>
</table>

\(^1\) MINIMUM 3/8” CDX PLYWOOD OR EQUIVALENT
\(^2\) MINIMUM SPF#2 2X OR EQUIVALENT
\(^3\) ULTIMATE LOAD DIVIDED BY SAFETY FACTOR OF THREE OR 1/8” DEFLECTION, WHICHER IS LOWER.
\(^4\) WALL Loadering SHALL BE DESIGNED TO THE LESSER OF THE POINT LOAD CAPACITY OF LOAD DESIGN CHART #2C OR THE R-CONTROL SIP AXIAL CAPACITY FROM THE WALL LOAD DESIGN CHARTS.
\(^5\) FOR POINT LOADS EXCEEDING THESE CAPACITIES, SPECIFY POSTING AS DESIGNED BY THE ENGINEER.
\(^6\) ALL VALUES ARE FOR NORMAL DURATION LOADS. NO INCREASES FOR OTHER LOAD DURATIONS ARE ALLOWED.
SIP No. 2057

Subject: SIP Tape

Date: November 2007 (Revised January 2015)

R-Control SIP joint detailing is commonly accomplished with R-Control Low VOC Do-All-Ply, SIP Tape, or vapor barriers. The proper sealing of joints during the installation of R-Control SIPs is an essential aspect to ensure both energy efficiency and long term durability of the structure.

R-Control has conducted extensive testing on the performance of R-Control Low VOC Do-All-Ply used to seal SIP joints. Testing has shown that the use of R-Control Low VOC Do-All-Ply installed according to the R-Control SIP details will provide long term durable joints.

This bulletin describes using SIP Tape for the sealing joints of R-Control SIPs when used in roof/ceiling panel applications. The method consists of using R-Control SIP tape along with R-Control Low VOC Do-All-Ply sealant.

R-Control SIP Tape is an adhesive tape product developed specifically for use with SIPs. The adhesive is designed specifically for use indoors and does not impact indoor air quality. Many other construction tapes are available, such as asphalt based adhesive, but these products are not suitable for indoor applications.

R-Control SIP details show the placement of R-Control SIP Tape on the interior of the structure. The basis for placement is the building science practice of placing vapor barriers on the warm in winter side of the roof/ceiling. However, in hot/humid climates the R-Control SIP Tape may be placed on the exterior of the structure as the cooling season dominates (the warm side of the roof/ceiling is the exterior).

Advantages of the R-Control SIP Tape installation are that the R-Control SIP Tape eliminates the application of a separate vapor barrier and provides for an external visual inspection.

Testing by R-Control has shown that the performance of the R-Control SIP Tape details along with R-Control Low VOC Do-All-Ply or the use of R-Control Low VOC Do-All-Ply and vapor barriers are both acceptable methods of construction for R-Control SIPs.
R-Control SIPs are a high performance building material. In order to provide maximum comfort, energy savings, and durability for the building envelope, the selection of high performance windows are required to complement the performance of R-Control SIPs.

Regardless of window type selected, proper installation of window flashing materials is required. Window flashing consists of the following basic steps for installation of integral flanged windows in new construction:

1. Installation of weather-resistant barrier on wall.
2. Proper cutting of weather-resistant barrier to conform to window openings. The weather resistant barrier at the head opening is held up temporarily.
3. Installation of sill flashing.
4. Installation of caulk to jambs and head of window opening (not sill) or to window directly.
5. Fasten window into opening according to manufacturer’s instructions.
6. Install jamb and head flashing over window flange.
7. Install weather resistant barrier over head flashing.

These basic steps above are a general outline of the process that must be completed to properly flash a window opening.

Many commercial products are available which are suitable for use as flashing products with R-Control SIPs. Regardless of product selected for your flashing of R-Control windows, the flashing manufacturers’ and window manufacturers’ guidelines must be followed completely.
In 2004, the treated wood industry halted production of lumber pressure-treated with Chromated Copper Arsenate (CCA) for residential applications in response to EPA concerns about arsenic (a known carcinogen). The primary product replacing CCA is Alkaline Copper Quaternary or ACQ. While ACQ is deemed safer because of its non-arsenic content, studies have shown it may be more corrosive to metal fasteners than CCA.

The corrosive nature of ACQ and its impact on metal fasteners has created concern in the construction industry. Initial efforts by the manufacturers of ACQ treated lumber to identify acceptable metal fasteners resulted in the recommendation that stainless steel fasteners or hot-dipped galvanized fasteners be used with ACQ treated wood products.

R-Control also recommends that 8d nails or staples used with R-Control SIPs be stainless steel or hot-dipped galvanized fasteners when ACQ lumber is used.

In light of the ACQ issue, R-Control SIP Wood Screws and Metal Fasteners have been evaluated by an independent, third party to perform accelerated corrosion resistance tests in ACQ treated lumber.

These independent test results indicate that the R-Control SIP Screws and Fasteners barrier coating performs well in ACQ treated lumber and even out performs hot-dipped galvanized. As a result of these performance tests, we can recommend that R-Control SIP Wood Screws and Metal Fasteners are “compatible for ACQ” treated wood applications.

As with any fastener in an ACQ treated lumber application, estimates of its service life cannot be provided due to the many variables that the fastener is exposed to, including (but not limited to) the chemical retention level in the wood, species of wood, and environment.

Note: R-Control SIP screws are intended for use with R-Control SIPs as described in the R-Control SIP details and are not intended for other applications.
Subject: Building Green and LEED v4 New Construction

Date: November 2007 (Revised January 2015)

The United States Green Building Council (USGBC) publishes the Leadership in Energy and Environmental Design (LEED) rating system. The latest LEED, version v4, includes new market sector adaptations for data centers, warehouses and distribution centers, hospitality, existing schools, existing retail and mid-rise residential projects.

LEED v4 establishes requirements for design components that impact sustainable design. Credits or points are earned for meeting specific milestones in various categories. These categories include Location and Transportation (LT), Sustainable Sites (SS), Water Efficiency (WE), Energy and Atmosphere (EA), Materials and Resources (MR), Indoor Environmental Quality (EQ), Innovation (IN), and Regional Priority (RP). A minimum number of available points are required to achieve a LEED Certified rating. Silver, Gold, and Platinum levels are also available by meeting higher point thresholds.

R-Control SIPs are an ideal structural and insulation choice for inclusion into LEED certified building designs. The key benefit of using R-Control SIPs is a reduction in energy consumption.

The following are the key categories associated with the use of R-Control SIP in LEED certified building.

**Energy & Atmosphere**

*Minimum Energy Performance*
R-Control SIPs help reduce the environmental and economic harms of excessive energy use by achieving a minimum level of energy efficiency for the building and its systems.
(required)

*Optimized Energy Performance*
R-Control SIPs are a key building envelope component to achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic harms associated with excessive energy use.
(up to 20 points)

**Innovation in Design:**

*Innovation in Design*
R-Control SIP are an innovative product used to achieve exceptional or innovative performance.
(1 point)
Subject: ICC ES Evaluation Report

Date: November 2007 (Revised January 2015)

R-Control SIPs have a long history of complying with the model building codes of the U.S. The most common method to demonstrate compliance with a building code is to work with the International Code Council Evaluation Service (ICC ES) to develop an evaluation report. ICC ES is recognized as the leader in the evaluation of building products.

ICC ES developed AC04, “Acceptance Criteria for Sandwich Panels” as a method to evaluate SIPs. A SIP manufacturer must meet the requirements of AC04 to be recognized in an ICC ES evaluation report.

R-Control SIPs have been evaluated by ICC ES and are recognized by ICC ES evaluation report ESR-2233. ESR-2233 covers the use of R-Control SIPs in compliance with the 2012 International Building Code® (IBC) and 2012 International Residential Code® (IRC).

For more information on ICC ES, please visit their website at www.icc-es.org. A current copy of the R-Control SIP evaluation report is also available on their website.
SIPs

SIP No. 2063

Subject: Low Slope Roofing Installation

Date: November 2007

R-Control SIPs are commonly used as a structural roof decking component due to the fact that they provide both insulation and structure in a single component. Although R-Control SIPs are manufactured with Exposure I rated Oriented Strand Board (OSB), the panel should be covered as soon as possible with temporary weather protection after installation. R-Control SIPs are a key load bearing structural element of the roof assembly and the OSB must be protected from weather and damage for the intended life of the structure.

R-Control SIPs can be covered with traditional roof coverings, including shingles, tile, metal, as well as low slope roofing systems. This bulletin describes the steps for proper installation of low slope roofing systems over R-Control SIP roof decks.

When installed in low slope roof designed buildings, R-Control SIPs are typically covered with single ply, modified bitumen, or built up roofing materials. These various roofing covering systems all offer excellent protection for the R-Control SIP roof deck from weather. These roofing materials may include 10, 20, 30 year, or longer periods of warranty protection offered by the Low Slope Roofing System Manufacturer. Inevitably, all roof covering systems age and wear out and need to be replaced. When the roof covering system is removed for re-roof replacement, the OSB top facing of the SIP must be protected to ensure it maintains its integrity.

Mechanically Attached Systems

Mechanically attached low slope roof systems shall be installed in accordance with the Low Slope Roofing Manufacturer's recommendations for application to a 7/16'' OSB deck.

Fully Adhered Systems

If the roof covering system is adhered directly to the OSB top facing, the removal of the roof covering system in the future would likely lead to damage of the R-Control SIP OSB facing and possible structural compromise of the R-Control SIP roof deck.

Therefore, R-Control requires that a Dens-Deck (1/4'' thickness or greater) or wood fiber board (1/2'' or greater), or similar coverboard, in the type and style approved by the Low Slope Roofing System Manufacturer, be attached on top of the R-Control SIP roof deck prior to the installation of fully adhered low slope roof covering systems. Mechanical attachment of the coverboard shall be installed in accordance with the Low Slope Roofing Manufacturer's recommendations for application to a 7/16'' OSB deck.

In addition to the foregoing, R-Control requires that low slope roofing systems which approve the use of adhesives for the attachment of their system to approved coverboards, use a water based adhesive approved by the Low Slope Roofing System Manufacturer. The use of solvent based adhesives could lead to damage of the expanded polystyrene (EPS) foam core of the R-Control SIP (see Technical Bulletin sip no. 2065).

Note: The use of water based adhesives, sealants, coatings, cleaning solutions, etc. help to meet the ever growing need to eliminate solvent based VOC emitting materials used in construction. Water based materials also further Green building practices to improve air quality performance in buildings. R-Control supports these important initiatives.
R-Control SIPs are commonly used as a structural component due to the fact that they provide both insulation and structure in a single component. R-Control SIPs are manufactured with Exposure I rated Oriented Strand Board (OSB) facings and a Foam-Control Expanded Polystyrene (EPS) foam core. The Foam-Control EPS provides the structural connection between the OSB facings and must be protected for the life of the structure from exposure to excessive heat that may damage the EPS.

Temperature:

The maximum recommended use temperature for Foam-Control EPS is 165°F (75°C). The temperature that the R-Control SIPs are exposed to is a function of exterior temperature, building orientation relative to the sun, building elevation, and the type of roof covering material(s) used. In most locations across the United States and with the use of standard roof covering material(s), the R-Control EPS will not be exposed to temperatures over 165°F.

Peak temperatures typically occur under the following conditions: south facing, low or medium slope, and dark colored roofs. In these situations, roof surface temperatures have been documented to reach temperatures of 200°F or higher on sunny days in the southern U.S. Roof designs which includes wall/roof intersections oriented toward the sun may also result in high roof temperatures.

If the roof temperature is anticipated to exceed 175°F a ventilated roofing system is recommended over R-Control SIPs.

Metal roof systems have inherent properties that transfer and build heat that potentially could cause an R-Control SIP roof deck to exceed a safe use temperature. When installing metal roof systems over R-Control SIPs, additional design considerations may be necessary to protect the roofing underlayment and the R-Control SIP from excessive temperatures. These design strategies may include the use of a ventilated air space above the R-Control SIP to minimize temperature exposure. Consult your local R-Control representative for specific recommendations for your geographical location and building design.

In addition, temporary roof, wall or floor coverings must be breathable to ensure that R-Control SIP structures are not subjected to excessive temperatures. For example, the use of clear poly (not breathable) as a temporary roof covering may lead to a greenhouse effect that could damage the SIP structure.
R-Control SIPs are commonly used as a structural component due to the fact that they provide both insulation and structure in a single component. R-Control SIPs are manufactured with Exposure I rated Oriented Strand Board (OSB) facings and a Foam-Control Expanded Polystyrene (EPS) foam core. The Foam-Control EPS provides the structural connection between the OSB facings and must be protected for the life of the structure from exposure to solvents that may damage the EPS.

**Solvents:**

Foam-Control EPS may be attacked and damaged by some solvents and/or their vapors. The installation of roof coverings, wall covering, or other materials attached to R-Control SIPs must be completed with water based materials as materials containing solvents could lead to damage of the Foam-Control EPS.

In addition, temporary roof, wall or floor coverings must be breathable to ensure that any solvent vapors present in the construction of the R-Control SIP structure are able to breathe quickly through the temporary covering materials.

For example, the use of clear poly (not breathable) over asphalt paper may lead to a trapping of solvents that could damage the SIP structure.

Note: The use of water based adhesives, sealants, coatings, cleaning solutions, etc. help to meet the ever growing need to eliminate solvent based VOC emitting materials used in construction. Water based materials also further Green building practices to improve air quality performance in buildings. R-Control supports these important initiatives.
R-Control SIP roofs can be finished with a wide range of roofing products. Metal Roofing is one type of roof covering that has been used successfully over R-Control SIPs for many years. Metal roofing provides a water tight roof system and has a long life expectancy when compared to many other roofing systems. One major advantage of metal roofing is that minimal maintenance is required over the life of the roof.

As with all roofing materials, the installation must be in compliance with the metal roofing manufacturer’s recommended installation details. The primary consideration when installing metal roofing over R-Control SIPs is to ensure the roofing manufacturer provides installation recommendations for installation into the 7/16” OSB facing of the R-Control SIP. Some metal roofing manufacturer’s may request an increase in the R-Control OSB facing thickness to 5/8” to meet their installation requirements or alternatively the installation of wood nailers on the R-Control SIP. The reason for this is that their installation recommendations and engineering is based upon the thicker substrate that the 5/8” deck or nailers provide.

MBCI, a leader in the metal roofing industry, has reviewed their roofing products and can provide installation recommendations for the installation of their roofing products directly into the 7/16” OSB facing of R-Control SIPs. Following these installation recommendations provides assurance that the roofing materials will provide the long term durability that is expected when metal roofing is selected.

An additional consideration when installing any roofing material is to ensure that excessive temperatures are not transferred to the R-Control SIP roof deck. While metal roofing has a higher emissivity rating than other roofing materials and is available with paint finishes that have a higher reflectivity than most other roofing materials, under some conditions there is a potential for excessive temperatures between the SIPS roof deck and the roof membrane. This could cause an R-Control SIP roof deck to exceed its safe use temperature. When installing metal roof systems over R-Control SIPs, additional design considerations may be necessary to protect the roofing underlayment and the R-Control SIP from excessive temperatures. These design strategies may include the use of a ventilated air space above the R-Control SIP to minimize temperature exposure. Consult your local R-Control representative for specific recommendations for your geographical location and building design.
R-Control SIPs have a history of performance in seismic events. In particular, a number of R-Control SIP structures were located close to the epicenter of the magnitude 6.9 earthquake that struck Kobe, Japan in 1995 (please refer to R-Control SIP Project Profile on the Kobe Earthquake). A review of these structures after the earthquake demonstrated that the inherent performance of R-Control SIPs in seismic events is exceptional.

R-Control SIPs develop their shear strength from the use of outer facings of 7/16” OSB manufactured in conformance with the PS2 standard for sheathing. Each R-Control SIP wall panel is connected to base plates, top plates, and vertical boundary members with fasteners, typically 8d nails. The 8d nails provide for the transfer of the shear loads from the OSB facings to the wood plating materials while the adhesive bond of the OSB to the Foam-Control EPS core provide resistance for the OSB from buckling. This performance is identical to conventionally built OSB sheathed shear walls where the OSB provides shear resistance by using fasteners to transfer shear loads to the framing members.

In order to ensure the performance of R-Control SIPs in seismic events, R-Control SIPs have been evaluated side by side with OSB sheathed conventional walls. The testing was conducted by the leader in the development of shear wall design data for light frame walls, APA – The Engineered Wood Association. The testing consisted of building a high capacity conventional OSB sheathed 2X shear walls and comparing the performance to R-Control SIPs.

The conventional wall consisted of 2X framing members spaced 24” o.c., 4X bottom and top plates, and 4X vertical boundary members. The walls were sheathed on both sides with 7/16” OSB attached with 8d cooler nails in two staggered rows with spacing at 2” o.c. The 4X members were necessary due to the high capacity that was anticipated for the testing. The 4X6’s were No. 2 Douglass-fir larch.

In a similar fashion, R-Control SIP walls were built using the same 4X bottom and top plates and 4X vertical boundary members. The R-Control SIP spline also consisted of a 4X. Please refer to R-Control SIP details SIP-101b for the plate connection and SIP-102k for the spline connection. The intention of the testing was to compare side by side the performance of conventional OSB sheathed shear walls and R-Control SIPs.

Since the International Building Code has a restriction on the application of adhesives for attachment of shear wall sheathing, the application of R-Control Low VOC Do-All-Ply Sealant was modified to ensure that the R-Control SIP facing was only attached to the plating lumber with fasteners. The modified R-Control Low VOC Do-All-Ply application consisted of sealant being applied between the 4X plating and the Foam-Control EPS instead of between the 4X plating and the OSB facing of the R-Control SIP.

The testing was conducted following a seismic test protocol developed by the Structural Engineering Association of Southern California (SEAOSC). The test consists of imposing a simulated seismic event to a shear wall and recording the response. The test protocol consists of 72 cycles of loading for the shear wall. A sample of the test data is shown in Figure 1. Note that the resulting loads and deflection for the conventional shear wall and the R-Control SIP wall appear nearly identical.

To further analyze the results, a “backbone” curve was extracted from the test data. The backbone curve is used to compare two tests to each other by comparing the load versus deflection performance of the walls. The backbone test data is shown in Figure 2. The load versus deflection of the conventional shear wall and the R-Control SIP wall appear very similar.

A final check on the comparative results was to calculate the cumulative dissipated during the testing (see Figure 3). Again the performance of R-Control SIPs is nearly identical to the performance of the conventional shear wall.
A structural review of the APA testing and the deflection requirements for shear walls as stated in ICC-ES AC04 acceptance criteria for Sandwich Panels suggests a design limit of 920 plf for the R-Control SIP assembly as described in this bulletin.

It is recommended that R-Control SIPs be treated as equivalent to conventional light frame shear walls with OSB sheathing for performance in seismic events.

Please refer to the R-Control SIP Load Design Chart #6 for information on wall shear loads.

**Figure 1**

![Chart 1]

![Chart 2]
R-Control I-Beam splines are a companion product that provide additional strength and span capacity to R-Control SIPs assemblies. When the I-Beam splines are used with R-Control SIPs the composite panel/spline engineering data is detailed in the R-Control Load Design Charts.

However, on occasion it may be necessary to engineer a portion of a structure using the design capacities of the I-Beam. This bulletin provides the design capacities of the R-Control I-Beam for use in these instances.

### R-Control I-Beam Spline Reference Design Values

<table>
<thead>
<tr>
<th>Joist Depth (in)</th>
<th>Joist Weight (plf)</th>
<th>EI (10^6 lbs-in^2)</th>
<th>K</th>
<th>Moment (ft-lb)</th>
<th>Shear (lb)</th>
<th>End Reaction (lb)</th>
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</thead>
<tbody>
<tr>
<td>9-1/4”</td>
<td>3.3</td>
<td>246</td>
<td>5.3</td>
<td>5050</td>
<td>1685</td>
<td>1375</td>
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<tr>
<td>11-1/4”</td>
<td>3.5</td>
<td>395</td>
<td>5.3</td>
<td>6545</td>
<td>2120</td>
<td>1375</td>
</tr>
</tbody>
</table>

1 Please refer to ICC-ES ESR-2994 for general design information
2 Moment and shear values and end reactions are for normal duration of load
3 Maximum end reaction is based 1-3/4” (44 mm) bearing length
4 The formula below shall be used to determine total deflection of uniformly loaded simple span.

\[
\text{Defl.} = \frac{(22.5WL^4/EI) + (12WL^2/Kdx10^5)}{12}
\]

Defl. = Deflection in inches.
W = Uniform Load (plf).
L = Clear Span (ft).
D = Out to Out depth of joist in inches.
The United States Green Building Council (USGBC) publishes the Leadership in Energy and Environmental Design (LEED) rating system to help encourage sustainable design.

The LEED for Homes Rating System has been specifically designed to help advance sustainable design in the construction of residential homes. Credits or points are earned for meeting specific milestones in various categories. A minimum number of available points are required to achieve a LEED Certified rating. Silver, Gold, and Platinum levels are also available by meeting higher point thresholds. The categories covered by the LEED for Homes Rating System include:

- Innovation & Design Process
- Location & Linkages
- Sustainable Sites
- Water Efficiency
- Energy & Atmosphere
- Materials & Resources
- Indoor Environmental Quality
- Awareness & Education

**LEED Point Potential when using R-Control SIPs**

**Innovation & Design Process**

ID3: Innovation or Regional Design  
R-Control SIP use can be shown to be an innovative design measure for 1 point.

**Sustainable Sites**

SS5: Nontoxic Pest Control  
R-Control SIPs with FrameGuard are protected with a borate product that can qualify as a non toxic pest control strategy for 1/2 point.

**Energy & Atmosphere**

EA1: Optimize Energy Performance  
R-Control SIPs can help build a Energy Star qualified home and a suitable HERS Index that will provide numerous points (up to 34).

EA2: Insulation  
R-Control SIPs can be selected with an R-value 5% higher than the Energy code to achieve 2 points for enhances insulation.

EA3: Air Infiltration  
The tight construction of R-Control SIPs make it easy to meet the minimal envelope leakage requirement (3 points).

**Materials & Resources**

MR1: Material-Efficient Framing  
R-Control SIPs can be provided fully fabricated to a home plan. The framing efficiencies of R-Control SIPs meet the requirement of Credit 1.4 (up to 3 points) or Off-Site Fabrication (4 points).
Materials & Resources - cont’d

MR2: Environmentally Preferable Products
R-Control SIPs are available FSC Chain of Custody certified when manufacture with FSC certified OSB (up to 1 point).

MR3: Waste Management
R-Control SIPs can be provided fully fabricated to reduce on-site waste (up to 3 points).

Indoor Environmental Quality

EQ4: Outdoor Air Ventilation
As part of the airtight construction with R-Control SIPs, a ventilation design to incorporate outdoor air ventilation is part of the process when building with R-Control SIPs (up to 3 points).

For more information on LEED for Homes, please visit www.usgbc.org
SIPs

SIP No. 2070

Subject: Mold Resistant SIPs - FrameGuard® Coating

Date: October 2008 (Revised January 2015)

R-Control SIPs when coated with FrameGuard provide protection against mold, mildew, and termite damage to the oriented strand board (OSB) facings. An important aspect of choosing a mold, mildew, and termite resistant coating for a SIP panel is to understand the regulatory, manufacturing, testing, air quality, and warranty details of the system.

EPA Registration

A critical regulatory issue is that all chemicals and components claiming to provide protection against mold and termites must be registered with the Environmental Protection Agency (EPA).

The moldecide component of FrameGuard coating is covered by EPA registration # 72616-1-62190 and the termite resistant component is covered by EPA registration # 64405-1-62190. Other products may use an EPA registered component recognized for termites, but we recommend that you verify their registration with the EPA to ensure it includes recognition for mold resistance.

Quality Controlled Manufacturing

FrameGuard coating is a blend of components factory applied with advanced manufacturing equipment and processes to provide thorough coverage to the surface of R-Control SIPs. Quality control records are maintained and ongoing tests are conducted to ensure proper treatment.

Independent Testing - Mold

The FrameGuard coating has been tested side by side with many other wood protection products claiming protection against mold. Testing was conducted by Forintek, an independent third party agency recognized as a leader in wood protection testing. The testing followed ASTM D3273, “Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber”. This mold growth study examined coated and uncoated samples over eight weeks, at a temperature of 77 °F, and a relative humidity of 100%. The product performance was rated on a scale from 0 (no mold) to 5 (complete mold coverage). The FrameGuard formulation was the clear leader in performance when compared against competitive products used to treat the wood facings of SIP panels.

Mold Control Study
Third Party Testing1

Mean Mold Rating after 8 weeks

<table>
<thead>
<tr>
<th>RATING</th>
<th>Complete Mold Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>untreated OSB</td>
<td>2.8</td>
</tr>
<tr>
<td>FrameGuard coated OSB</td>
<td>1.3</td>
</tr>
<tr>
<td>competitive product</td>
<td>0</td>
</tr>
</tbody>
</table>

1 Independent testing by Forintek Canada Corporation, using ASTM D-3273, Project 4528
Warranty Coverage

R-Control sources the FrameGuard coating exclusively from Arch Wood Protection, Inc. The FrameGuard limited warranty (see the warranty document for details) is backed by your R-Control supplier and Arch Wood Protection, Inc. You can be assured the warranty protection is backed by companies with a long history of performance servicing the SIP and wood protection markets. Lonza, the parent company of Arch Wood Protection, is an international leader in biocides with over $3.5 billion in sales.

There is no cost for your FrameGuard limited warranty nor are there any special registration requirements. Some other competitive products may charge a fee for their warranty and require registration.
The ventilation of metal roofing when installed over R-Control SIPs is a recommended procedure that provides a number of building science benefits.

The primary benefit of venting above an R-Control SIP roof is the removal of unintended moisture vapor that may emanate from the interior of the building from misapplication of R-Control Do-All-Ply and R-Control SIP tape at joints. The venting of moisture vapor between the roof covering and the top of the R-Control SIP reduces the risk of condensation and the potential of moisture damage. In addition to the venting of interior moisture, any rainwater or melting snow that circumvents the metal roofing materials is also removed by virtue of the ventilation space.

Additional benefits of a ventilation cavity is the reduction in the temperature of the R-Control SIP upper surface which reduces the cooling loads for a roof system in the summer. Some metal roofing systems, particularly Zinc and Copper, can expose R-Control SIP roof decks to high temperatures and this reduction of temperature is required. In winter, the ventilated space assists by reducing ice dams when the depth of snow is significant. Impact noise of rain and hail are mitigated as well.

R-Control has investigated a unique product that is compatible and works well with R-Control SIP for above deck ventilation - Colbond’s Enkamat 7020. Enkamat 7020 is commonly used in roofing applications to provide the ventilation, drainage, and thermal separation needed for a long service life.

Enkamat 7020 is a three-dimensional mat made of continuous nylon filaments fused at their intersections. The 95% open structure of the entangled filaments facilitates drying of condensed water vapor from the building interior while giving full support to the metal roof. The nylon filaments do not fail under the load of the roof and the rigors of the construction environment, including construction foot traffic. The space created between the R-Control SIP roof deck and the roof covering will allow moisture to flow away or evaporate.

Testing has been conducted on the temperature difference that an R-Control SIP experiences when ventilated with Enkamat 7020 compared to no ventilation. A standing seam metal roof on a small scale R-Control SIP roof structure was constructed specifically for this evaluation. Dark standing seam metal roof panels were fixed to the roof over the Enkamat 7020/roofing underlayment combination and this was compared to the metal roof panels over roofing underlayment alone.

The top surface of the metal roofing was brought to a temperature of 194°F (90°C) with the use of infrared heat lamps. This temperature was held for 6 hours to ensure the temperatures through the assembly would stabilize.
The temperature recorded on the top surface of the R-Control SIP was significantly lower with the use of the Enkamat 7020.

These results clearly demonstrate the effect of an air space on the temperature of an R-Control SIP roof deck when metal roofing is exposed to high temperatures and solar exposure.

**R-Control recommends Colbond’s Enkamat 7020 as a product that provides the important benefit of easy, cost effective installation with R-Control SIPs and the additional building science benefits of ventilation.**

<table>
<thead>
<tr>
<th>SIP Ventilation</th>
<th>Temp Reduction From Metal Roof to Top Surface of R-Control SIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>10°F</td>
</tr>
<tr>
<td>Enkamat 7020</td>
<td>43°F</td>
</tr>
</tbody>
</table>
Subject: Fiber Cement Siding from James Hardie

Date: February 2010 (Revised January 2015)

James Hardie, a leader in the manufacture of fiber cement siding, has examined the use of their products with R-Control SIPs. James Hardie has served notice that their products applied directly over the 7/16” OSB facing of R-Control SIPs are acceptable following their recommended attachment patterns.

James Hardie’s siding is recommended as a premium fiber cement siding product compatible with R-Control SIPs.

Information on the attachment requirement for James Hardie fiber cement siding is included in ICC-ES Evaluation Report ESR-2290 and ESR-1844. For further information on James Hardie siding products, please visit www.jameshardie.com

Allura, a leader in the manufacture of fiber cement siding, has examined the use of their Fiber Cement Siding with R-Control SIPs and have authored the attached Allura Product Compliance Memo. Allura has served notice that their products applied directly over R-Control SIPs are acceptable following their recommended attachment patterns.

Allura’s siding is recommended as a premium fiber cement siding product compatible with R-Control SIPs.

Information on the attachment requirement for Allura’s fiber cement siding is attached to this bulletin. For further information on Allura’s siding products, please visit www.allurausa.com
Based on testing in accordance with ASTM E330 (wind load) and ASTM D1037 (fastener withdrawal and pull through), below are siding attachment methods along with their allowable windload capacities for Allura Fiber Cement Siding over Structural Insulated Panels (SIPs).

Structural Insulated Panels (SIP) are a manufactured wall system, and as such, installation of the SIP’s and application of siding should be in accordance with the specific SIP manufacturer’s instructions.

**Lap Siding (up to 8-1/4")**
1-3/4" Roofing nails, Double HD Galvanized with 3/8" dia. head.
Blind nailed 8" o.c.
Allowable wind pressure: 40.44 psf, 125 mph in ‘B’ Exposures up to 30 ft.

1-3/4" Roofing nails, Double HD Galvanized with 3/8" dia. head.
Blind nailed 12" o.c.
Allowable wind pressure: 27.0 psf, 105 mph in ‘B’ Exposures up to 30 ft.

**Lap Siding (9-1/4")**
1-3/4" Roofing nails, Double HD Galvanized with 3/8" dia. head.
Blind nailed 8" o.c.
Allowable wind pressure: 32.22 psf, 110 mph in ‘B’ Exposures up to 30 ft.

6d 2" Siding nails, Double HD Galvanized
Face nailed 12" o.c.
Allowable wind pressure: 24.4 psf, 100 mph in ‘B’ Exposures up to 30 ft.

**Vertical Siding**
6d 2" Siding nails, Double HD Galvanized
6" o.c. edges, 12" o.c. ea. way field.
Allowable wind pressure: 18.67 psf, 85 mph in ‘B’ Exposures up to 30 ft.

Refer to the Allura Installation Instructions for additional installation requirements. All state and local building code requirements must be followed, and where found more stringent than Allura installation instructions or this memo, state and local code requirements will take precedence.

For questions and or additional information, please contact your local sales representative or Allura Sales Support Group at (844) 4 ALLURA.

(signature)

Tim Larson
Applications Specialist
Allura Fiber Cement Products by Plycem USA

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1. Allowable Wind Load Capacities based on 2009 IBC / IRC, Wall Zone 5, Effective Wind Area 10, Importance factor 1.0.
2. Minimum 7/16" APA Rated OSB skin. The SIP system must be capable of supporting the imposed loads from the siding, including dead load and windloads.
Louisiana-Pacific, a leader in the manufacture of Engineered-Wood lap siding, has examined the use of their Smartside Precision Treated Engineered-Wood lap siding with SIPs. Louisiana-Pacific worked with APA who authored the attached APA Product Report. Louisiana-Pacific has served notice that their products applied directly over R-Control SIPs are acceptable following their recommended attachment patterns. Louisiana-Pacific siding is recommended as a premium Engineered-Wood lap siding product compatible with R-Control SIPs. Information on the attachment requirement for Louisiana-Pacific’s Engineered-Wood lap siding is attached to this bulletin (see Tables 4a and 4b). For further information on Louisiana-Pacific siding products, please visit www.lpsmartside.com.
1. Basis of the product report:
   - 2012 and 2009 International Building Code: Section 104.11 Alternative Materials
   - 2012 and 2009 International Residential Code: Section R104.11 Alternative Materials
   - ANSI/AF&PA SDPWS-2008 Special Design Provisions for Wind and Seismic
   - ASCE 7-10 and ASCE 7-05 Minimum Design Loads for Buildings and Other Structures
   - ICC-ES Acceptance Criteria for Treated-Engineered-Wood Siding, AC321
   - APA PRP-108 Performance Standards and Qualification Policy for Structural-Use Panels
   - NES Evaluation Protocol for Determination of Flood-Resistance Properties of Building Elements

2. Product description:
   Louisiana-Pacific Corporation (LP®) SmartSide® Precision Treated-Engineered-Wood Lap and Panel siding is overlaid with a resin treated paper and is available with either a smooth or embossed surface texture. The siding is available as laps or panels. The siding is treated with Zinc Borate for decay and insect resistance. All edges are factory sealed with a primer.

   LP® SmartSide® Precision Series Treated-Engineered-Wood lap siding is available in 3/8 and 7/16 Performance Categories, in nominal widths of 6, 8 and 12 inches and in lengths up to 16 feet.

   LP® SmartSide® Precision Series panel siding is available in 3/8, 7/16 and 19/32 Performance Categories, 4-foot width and in lengths of 8, 9, and 10 feet. The 3/8 Performance Category panels are available without grooves or with grooves spaced 8 inches on center. The 7/16 and 19/32 Performance Category panels are available without grooves or with grooves spaced either 4 or 8 inches on center. Minimum thicknesses at the groove and shiplap are documented in the plant Quality Manual.

3. Design properties:
   Allowable racking loads for LP® SmartSide® Precision Series panel siding are listed in Table 1. For 3/8 Performance Category panels nailed at shiplap edges, use 5/16 Performance Category shear values. For 7/16 and 19/32 Performance Category panel sidings nailed at shiplap edges, use 3/8 Performance Category shear values. Design wind loads LP® SmartSide® Precision Series lap and panel siding are listed in Tables 2 and 3, respectively.

4. Product installation:
   LP® SmartSide® Precision Series Treated-Engineered-Wood Lap and Panel sidings shall be installed in accordance with recommendations provided by the manufacturer (www.lpcorp.com/smartside/lap/ and www.lpcorp.com/smartside/panel/) and APA Engineered Wood Construction Guide, Form E30 (www.apawood.org/publications).
maximum span shall be in accordance with the Span Rating shown in the trademark. The LP® SmartSide® Precision Series lap siding shall be permitted to be installed over the facer of structural insulated panels (SIPs) in accordance with Table 4.

5. Fire-resistant construction:
Wood structural panels that are not fire-retardant-treated have been shown to meet a Class III (or C) category for flame spread. Unless otherwise specified, fire-resistant construction shall be in accordance with the recommendations in APA Fire-Rated Systems, Form W305 (see link above).

6. Flood resistance evaluation:
Selected properties critical to flood resistance of 3/8 and 7/16 Performance Category panel siding, including uniform loads, concentrated static loads, concentrated hard body and soft body impact loads, fastener performance, wall racking resistance, edge thickness swell, linear expansion, hygroscopicity, exterior bond performance and large panel and small specimen bending properties were evaluated at a 16 o.c. Span Rating in accordance with NES Evaluation Protocol for Determination of Flood-Resistance Properties of Building Elements. Test results in the dry (as-received) condition and after moisture cycling in accordance with the NES protocol were compared to the requirements specified in ICC Evaluation Service (ICC-ES) Acceptance Criteria for Treated-Engineered-Wood Siding (AC321).

7. Limitations:
a) LP® SmartSide® Precision Series Treated-Engineered-Wood Lap and Panel siding used outdoors must be finished in accordance with recommendations provided by the manufacturer (see links above) and APA Engineered Wood Construction Guide, Form E30 (see link above).
b) LP® SmartSide® Precision Series Treated-Engineered-Wood panel siding is flood resistant on the following properties: uniform loads, concentrated static loads, concentrated hard body and soft body impact loads, fastener performance, wall racking resistance, edge thickness swell, linear expansion, hygroscopicity, exterior bond performance and large panel and small specimen bending properties. This evaluation applies to 3/8 and 7/16 Performance Category panel siding at a 16 o.c. Span Rating.
c) LP® SmartSide® Precision Series Treated-Engineered-Wood Lap and Panel siding is produced at Louisiana-Pacific Corporation facilities at Hayward, WI, Newberry, MI, Tomahawk, WI, and Two Harbors, MN under a quality assurance program audited by APA.
d) This report is subject to re-examination in one year.

8. Identification:
LP® SmartSide® Precision Series Treated-Engineered-Wood Lap and Panel siding described in this report is identified by a label bearing the manufacturer's name (Louisiana-Pacific Corporation) and/or trademark, the APA assigned plant number (357 for the Hayward plant, 416 for the Newberry plant, 435 for the Tomahawk plant, or 399 for the Two Harbors plant), the product Performance Category, the Span Rating, the Exposure Rating, the APA logo, the report number PR-N124, and a means of identifying the date of manufacture.
Table 1. Allowable Racking Shear (plf) for LP® SmartSide® Precision Series Treated-Engineered-Wood Panel Siding – Sheathing Shear Walls with Framing of Douglas-Fir-Larch or Southern Pine for Wind or Seismic Loading(1,2,3)

<table>
<thead>
<tr>
<th>Performance Category</th>
<th>Minimum Nail Penetration In Framing (in.)</th>
<th>Panels Applied Directly to Framing</th>
<th>Panels Applied over 1/2-inch or 5/8-inch Gypsum Sheathing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nail Size (Common or Galvanized Box)</td>
<td>Nail Spacing at Panel Edges (in.)</td>
<td>Nail Size (Common or Galvanized Box)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>5/8(5,6)</td>
<td>1-1/4</td>
<td>6d</td>
<td>180</td>
</tr>
<tr>
<td>3/8(5,6)</td>
<td>1-1/2</td>
<td>8d</td>
<td>220</td>
</tr>
<tr>
<td>7/16(5)</td>
<td>1-5/8</td>
<td>10d</td>
<td>240</td>
</tr>
<tr>
<td>19/32(5)</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m.

(1) For framing of other species: (a) Find specific gravity for species of lumber in AF&PA National Design Specification; (b) find shear value from table for nails size; (c) multiply value by 0.82 for species with specific gravity greater than or equal to 0.42 but less than 0.49, or 0.65 for species with specific gravity less than 0.42.

(2) All panel edges must be backed with 2-inch nominal or wider framing. Panels must be installed with the long dimension oriented in the vertical direction. Space nails 6 inches o.c. along intermediate framing members for 3/8 and 7/16 Performance Category panels installed on studs spaced 24 inches o.c. For other conditions and panel Performance Categories, space nails 12 inches o.c. on intermediate supports.

(3) Framing at panel edges must be 3 inches nominal or wider and nails must be staggered where nails are spaced 2 inches o.c. and where 10d nails having penetration into framing of more than 1-5/8 inches are spaced 3 inches or less, o.c. Exception: Unless otherwise required, 2-inch nominal framing may be used where full nailing surface is available and nails are staggered.

(4) Except as noted in Footnote 7, panel thickness at point of nailing at panel edges determines applicable shear values, except that 3/8 Performance Category panels nailed at shiplap edges use 5/16 Performance Category shear values, and 7/16 and 19/32 Performance Category panel sidings nailed at shiplap edges use 3/8 Performance Category shear values.

(5) Shiplap edges must be double-nailed; one nail must be placed in the underlap and a second nail must be placed in the overlap at the nail spacing specified for the applicable shear value.

(6) Fasteners must not be installed in panel siding grooves in the field of the panel siding or when the panel siding grooves occur at cut edges of the panel siding.

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### Table 2a. Lap Siding – **Maximum nominal (allowable) design wind speed, $V_{asd}(1)$**

<table>
<thead>
<tr>
<th>Performance Category</th>
<th>Maximum Wall Stud Spacing (in.)</th>
<th>Siding Width (in.)</th>
<th>Maximum Allowable Wind Pressure (psf)</th>
<th>Maximum Nominal (Allowable) Wind Speed, $V_{asd}(3)$ (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>80</td>
<td>170</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>79</td>
<td>170</td>
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<tr>
<td></td>
<td></td>
<td>12</td>
<td>50</td>
<td>140</td>
</tr>
<tr>
<td>3/8</td>
<td>16</td>
<td>6</td>
<td>80</td>
<td>170</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>8</td>
<td>76</td>
<td>170</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>49</td>
<td>140</td>
<td>120</td>
</tr>
<tr>
<td>7/16</td>
<td>16</td>
<td>6</td>
<td>71</td>
<td>170</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>8</td>
<td>51</td>
<td>145</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>32</td>
<td>110</td>
</tr>
</tbody>
</table>

*For SI: 1 inch = 25.4 mm, 1 psf = 47.88 Pa, 1 mph = 0.447 m/s.*

(1) One fastener per stud located 3/4 inch from the top edge of the siding. Each successive course of lap siding must overlap a minimum of 1 inch. Fastener must have a minimum head diameter of 0.297 inch, a minimum shaft diameter of 0.113 inch and a minimum length of 2.5 inches (8d box nail).

(2) Wall studs must have a minimum specific gravity of 0.42.

(3) Three-second-gust; based on wind pressures acting toward and away from building surfaces, at 30-ft height in Zone 5 with smallest effective area per Chapter 6 of ASCE 7-05, Section R301.2 of the 2009 and 2012 IRC, and Section 1609.1.1 of the 2009 IBC.

### Table 2b. Lap Siding – **Maximum ultimate design wind speed, $V_{ult}(1)$**

<table>
<thead>
<tr>
<th>Performance Category</th>
<th>Maximum Wall Stud Spacing (in.)</th>
<th>Siding Width (in.)</th>
<th>Maximum Ultimate Wind Pressure (psf)</th>
<th>Maximum Ultimate Design Wind Speed, $V_{ult}(3)$ (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>133</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>131</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>83</td>
<td>180</td>
</tr>
<tr>
<td>3/8</td>
<td>16</td>
<td>6</td>
<td>133</td>
<td>200</td>
</tr>
<tr>
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<td></td>
<td>8</td>
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<td>200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>81</td>
<td>180</td>
</tr>
<tr>
<td>7/16</td>
<td>16</td>
<td>6</td>
<td>119</td>
<td>200</td>
</tr>
<tr>
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<td></td>
<td>8</td>
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<td>180</td>
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<tr>
<td></td>
<td></td>
<td>12</td>
<td>54</td>
<td>140</td>
</tr>
</tbody>
</table>

*For SI: 1 inch = 25.4 mm, 1 psf = 47.88 Pa, 1 mph = 0.447 m/s.*

(1) One fastener per stud located 3/4 inch from the top edge of the siding. Each successive course of lap siding must overlap a minimum of 1 inch. Fastener must have a minimum head diameter of 0.297 inch, a minimum shaft diameter of 0.113 inch and a minimum length of 2.5 inches (8d box nail).

(2) Wall studs must have a minimum specific gravity of 0.42.

(3) Three-second-gust; based on wind pressures acting toward and away from building surfaces, at 30-ft height in Zone 5 with smallest effective area per Chapter 26 of ASCE 7-10 and Section 1609.1.1 of the 2012 IBC.
### Table 3a. Panel Siding – **Maximum nominal (allowable) design wind speed, $V_{\text{asd}}$**

<table>
<thead>
<tr>
<th>Performance Category</th>
<th>Maximum Wall Stud Spacing$^{(2)}$ (in.)</th>
<th>Fastener Spacing$^{(1)}$ (in. o.c.)</th>
<th>Maximum Allowable Wind Pressure</th>
<th>Maximum Nominal (Allowable) Wind Speed, $V_{\text{asd}}$$^{(3)}$ (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Edges</td>
<td>Field</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/8</td>
<td>16</td>
<td>6</td>
<td>12</td>
<td>46</td>
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<td></td>
<td>24</td>
<td>6</td>
<td>12</td>
<td>31</td>
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<tr>
<td>7/16</td>
<td>16</td>
<td>6</td>
<td>12</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>6</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>19/32</td>
<td>16</td>
<td>6</td>
<td>12</td>
<td>41</td>
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<tr>
<td></td>
<td>24</td>
<td>6</td>
<td>12</td>
<td>27</td>
</tr>
</tbody>
</table>

For SI: $1$ inch = $25.4$ mm, $1$ psf = $47.88$ Pa, $1$ mph = $0.447$ m/s.

$^{(1)}$ Fastener must have a minimum head diameter of $0.297$ inch, a minimum shaft diameter of $0.113$ inch and a minimum length of $2.5$ inches (8d box nail).

$^{(2)}$ Wall studs must have a minimum specific gravity of 0.42.

$^{(3)}$ Three-second-gust; based on wind pressures acting toward and away from building surfaces, at 30-ft height in Zone 5 with smallest effective area per Chapter 6 of ASCE 7-05, Section R301.2 of the 2009 and 2012 IRC, and Section 1609.1.1 of the 2009 IBC.

### Table 3b. Panel Siding – **Maximum ultimate design wind speed, $V_{\text{ult}}$**

<table>
<thead>
<tr>
<th>Performance Category</th>
<th>Maximum Wall Stud Spacing$^{(2)}$ (in.)</th>
<th>Fastener Spacing$^{(1)}$ (in. o.c.)</th>
<th>Maximum Ultimate Wind Pressure (psf)</th>
<th>Maximum Ultimate Design Wind Speed, $V_{\text{ult}}$$^{(3)}$ (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Edges</td>
<td>Field</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/8</td>
<td>16</td>
<td>6</td>
<td>12</td>
<td>77</td>
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<tr>
<td></td>
<td>24</td>
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<td>12</td>
<td>51</td>
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<td>7/16</td>
<td>16</td>
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<td>74</td>
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<tr>
<td>19/32</td>
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<td>69</td>
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<tr>
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<td>24</td>
<td>6</td>
<td>12</td>
<td>46</td>
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</tbody>
</table>

For SI: $1$ inch = $25.4$ mm, $1$ psf = $47.88$ Pa, $1$ mph = $0.447$ m/s.

$^{(1)}$ Fastener must have a minimum head diameter of $0.297$ inch, a minimum shaft diameter of $0.113$ inch and a minimum length of $2.5$ inches (8d box nail).

$^{(2)}$ Wall studs must have a minimum specific gravity of 0.42.

$^{(3)}$ Three-second-gust; based on wind pressures acting toward and away from building surfaces, at 30-ft height in Zone 5 with smallest effective area per Chapter 26 of ASCE 7-10 and Section 1609.1.1 of the 2012 IBC.
### Table 4a. Lap Siding Installed Over the Facer of SIPs<sup>(1)</sup> – Maximum nominal (allowable) design wind speed, \( V_{\text{asd}} \)<sup>(2)</sup>

<table>
<thead>
<tr>
<th>Performance Category</th>
<th>Maximum Ring Shank Nail Spacing&lt;sup&gt;(3)&lt;/sup&gt; (in.)</th>
<th>Maximum Wood Screw Spacing&lt;sup&gt;(4)&lt;/sup&gt; (in.)</th>
<th>Siding Width (in.)</th>
<th>Maximum Allowable Wind Pressure (psf)</th>
<th>Maximum Nominal (Allowable) Wind Speed, ( V_{\text{asd}} )&lt;sup&gt;(5)&lt;/sup&gt; (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8</td>
<td>8</td>
<td>12</td>
<td>6</td>
<td>80</td>
<td>170</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>12</td>
<td>40</td>
<td>125</td>
</tr>
<tr>
<td>7/16</td>
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<td>16</td>
<td>6</td>
<td>58</td>
<td>150</td>
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<td></td>
<td></td>
<td></td>
<td>12</td>
<td>27</td>
<td>105</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 psf = 47.88 Pa, 1 mph = 0.447 m/s.

<sup>(1)</sup> The facer of the structural insulated panels (SIPs) shall be 7/16 Performance Category or thicker OSB sheathing meeting DOC PS2 requirements.

<sup>(2)</sup> The tabulated values represent the capacity of the LP Lap Siding installed in accordance with the requirements of this table. The tabulated wind speed shall not exceed the SIP capacity for wind load resistance.

<sup>(3)</sup> One 6d ring shank nail (0.120 inch in diameter) located 1/2 inch from the top edge of the siding. The ring shank nails must have a minimum head diameter of 0.297 inch, a minimum shank diameter of 0.120 inch and a minimum length of 2 inches.

<sup>(4)</sup> One #8 wood screw (0.164 inch in diameter) located 1/2 inch from the top edge of the siding may be used. The wood screws must have a minimum head diameter of 0.297 inch, a minimum shank diameter of 0.164 inch and a minimum length of 2 inches.

<sup>(5)</sup> Three-second-gust; based on wind pressures acting toward and away from building surfaces, at 30-ft height in Zone 5 with smallest effective area per Chapter 6 of ASCE 7-05, Section R301.2 of the 2009 and 2012 IRC, and Section 1609.1.1 of the 2009 IBC.

### Table 4b. Lap Siding Installed Over the Facer of SIPs<sup>(1)</sup> – Maximum ultimate design wind speed, \( V_{\text{ult}} \)<sup>(2)</sup>

<table>
<thead>
<tr>
<th>Performance Category</th>
<th>Maximum Ring Shank Nail Spacing&lt;sup&gt;(3)&lt;/sup&gt; (in.)</th>
<th>Maximum Wood Screw Spacing&lt;sup&gt;(4)&lt;/sup&gt; (in.)</th>
<th>Siding Width (in.)</th>
<th>Maximum Ultimate Wind Pressure (psf)</th>
<th>Maximum Ultimate Design Wind Speed, ( V_{\text{ult}} )&lt;sup&gt;(5)&lt;/sup&gt; (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8</td>
<td>8</td>
<td>12</td>
<td>6</td>
<td>133</td>
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<td></td>
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<td>12</td>
<td>67</td>
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</tr>
<tr>
<td>7/16</td>
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<td>12</td>
<td>45</td>
<td>130</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 psf = 47.88 Pa, 1 mph = 0.447 m/s.

<sup>(1)</sup> The facer of the structural insulated panels (SIPs) shall be 7/16 Performance Category or thicker OSB sheathing meeting DOC PS2 requirements.

<sup>(2)</sup> The tabulated values represent the capacity of the LP Lap Siding installed in accordance with the requirements of this table. The tabulated wind speed shall not exceed the SIP capacity for wind load resistance.

<sup>(3)</sup> One 6d ring shank nail (0.120 inch in diameter) located 1/2 inch from the top edge of the siding. The ring shank nails must have a minimum head diameter of 0.297 inch, a minimum shank diameter of 0.120 inch and a minimum length of 2 inches.

<sup>(4)</sup> One #8 wood screw (0.164 inch in diameter) located 1/2 inch from the top edge of the siding may be used. The wood screws must have a minimum head diameter of 0.297 inch, a minimum shank diameter of 0.164 inch and a minimum length of 2 inches.

<sup>(5)</sup> Three-second-gust; based on wind pressures acting toward and away from building surfaces, at 30-ft height in Zone 5 with smallest effective area per Chapter 26 of ASCE 7-10 and Section 1609.1.1 of the 2012 IBC.
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R-Control SIPs have been long recognized as a structural component for use in wall, roof, or floor panels that resist structural loads. The structural capacity of R-Control SIPs has been determined through extensive testing with leading independent third party accredited test laboratories. The results of these tests have long been published in R-Control SIP Load Design Charts and recognized in ICC ES ESR-2233.

The complete package of structural information that supports R-Control Load Design Chart #1 has been analyzed and reviewed in order to provide basic SIP Engineering Properties for R-Control SIPs.

These R-Control SIP Engineering Properties are suitable for use with NTA IM 14 TIP 01, “Engineered Design of SIP Panels using NTA Listing Report Data”. A copy of NTA IM 14 TIP 01 is attached to this bulletin for references.

### R-Control SIP Engineering Properties

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<th>Property</th>
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<th>619</th>
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</tbody>
</table>

1. All properties are based on a minimum panel width of 24-inches.
2. Refer to NTA IM14 TIP 01 SIP Design Guide for details on engineered design using basic properties.

### R-Control SIP Section Properties

<table>
<thead>
<tr>
<th>h (in.)</th>
<th>c (in.)</th>
<th>A_{c} (in.^2/ft)</th>
<th>A_{f} (in.^2/ft)</th>
<th>I (in.^4/ft)</th>
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</thead>
<tbody>
<tr>
<td>4.5</td>
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<td>12.25</td>
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<td>141.8</td>
<td>5.25</td>
<td>366.3</td>
</tr>
</tbody>
</table>

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ENGINEERED DESIGN OF SIP PANELS
USING NTA LISTING REPORT DATA

1. SCOPE
1.1. GENERAL
This document applies to structural insulated panels (SIPs), which shall be defined as a structural facing material with a foam core. This document does not apply to the design of reinforcement materials which may be incorporated into SIPs, such as dimensional lumber or cold-formed steel. All other materials shall be designed in accordance with the appropriate code adopted design standards.

It is intended that this document be used in conjunction with competent engineering design, accurate fabrication, and adequate supervision of construction. NTA, Inc. does not assume any responsibility for error or omissions in this document, nor for engineering design, plans or construction prepared from it. It shall be the final responsibility of the designer to relate design assumptions and reference design value, and to make design adjustments appropriate to the end use.

1.2. DESIGN PROCEDURES
This document provides requirements for the design of SIP panels by the Allowable Stress Design (ASD) method. The technical basis for this document is the APA Plywood Design Specification Supplement 4—Design & Fabrication of Plywood Sandwich Panels\(^1\)\textsuperscript{,} which is adopted by reference in the International Building Code (IBC). Some provisions of the design guide have been modified to more closely model the actual behavior of the SIP system described in this report.

The design procedures provided herein generally assume uniform loads applied to a simply supported member. General loading and support conditions may be evaluated using rational analysis methods consistent with the methodology provided herein. If finite element analysis software is used, the designer must verify that the software considers shear deformations between model nodes as most commercially available finite element software packages only consider shear deformations at the nodes.

1.3. DESIGN LOADS
Minimum design loads shall be in accordance with the building code under which the structure is designed, or where applicable, other recognized minimum design load standards.

1.4. SERVICABILITY
Structural systems and members thereof shall be designed to have adequate stiffness to limit deflection and lateral drift. The deflections of structural members shall not exceed the limitations of the building code under which the structure is designed, or where applicable, other recognized minimum design load standards.

1.5. LOAD COMBINATIONS
Combinations of design load and forces, and load combinations factors, shall be in accordance with the building code under which the structure is designed, or where applicable, other recognized minimum design standards.

1.6. STRESS INCREASE
Duration of load increases in allowable stresses specified in the National Design Standard for Wood Construction (NDS) shall not be applied to SIP facings or core materials regardless of composition.

1.7. LIMITS OF USE
This document applies to NTA, Inc. listed SIP panels only and shall not be used with unlisted SIPs or SIPs listed/evaluated by other agencies. The design shall be limited to the specific panel thicknesses described in the listing report. This document shall not be applied to spans, heights, or aspect ratios not bounded by the limits of the listing report—extrapolation is not permitted.

\textsuperscript{1}This listing report is intended to indicate that NTA Inc. has evaluated product described and has found it to be eligible for labeling. Product not labeled as specified herein is not covered by this report. NTA Inc. makes no warranty, either expressed or implied, regarding the product covered by this report.
2. NOTATION

Except where otherwise noted, the symbols used in this document have the following meanings:

- $\Delta$ = Total deflection due to transverse load (in.)
- $\Delta_{LT}$ = Total immediate deflection due to the long-term component of the design load (in.)
- $\Delta_b$ = Deflection due to bending (in.)
- $\Delta_c$ = Deflection of core under concentrated load applied to facing (in.)
- $\Delta_i$ = Total immediate deflection due to application of a single design load acting alone (in.)
- $\Delta_s$ = Deflection due to shear (in.)
- $\Delta_{2nd}$ = Total immediate deflection considering secondary (P-delta) effects (in.)
- $\alpha$ = Total cross sectional area of facings (in.$^2$/ft)
- $A_v$ = Shear area of panel. For symmetric panels $A_v = 6(\alpha + c)$ (in.$^2$/ft)
- $c$ = Core thickness (in.)
- $C_r$ = Eccentric load factor, Section
- $C_{fr}$ = Size factor for shear, Section 4.4.3
- $C_s$ = Shear support correction factor
- $e$ = Load eccentricity, measured as the distance from the centroid of the section to the line of action of the applied load (in.)
- $E_b$ = SIP modulus of elasticity under transverse bending (psi)
- $E_f$ = Elastic modulus of facing under compressive load (psi)
- $F_c$ = Allowable facing compressive stress (psi)
- $F_t$ = Allowable facing tensile stress (psi)
- $F_s$ = Allowable shear stress (through thickness) (psi)
- $F_{ip}$ = Allowable shear load (in-plane) (plf)
- $G$ = SIP shear modulus (psi)
- $h$ = Overall SIP thickness (in.)
- $h_o$ = Reference SIP thickness for size correction factors (in.)
- $I$ = SIP moment of inertia (in.$^4$/ft)
- $I_f$ = Facing moment of inertia (in.$^4$/ft)
- $K_r$ = Time dependent deformation (creep) factor for a specific load type, Section A3.5.3
- $L$ = Span length (ft)
- $L_v$ = Shear span length (ft)
- $m$ = Shear size factor exponent
- $M$ = Applied moment (in.-lbf/ft)
- $P$ = Applied axial or concentrated load (lbf/ft.)
- $P_{ip}$ = Allowable axial load (lbf/ft.)
- $r$ = Radius of gyration (in.)
- $S$ = SIP section modulus for flexure under transverse loads (in.$^3$/ft)
- $V$ = Applied shear force (through thickness) (lbf)
- $V_{ip}$ = Applied shear force (in-plane) (plf)
- $w$ = Uniform transverse load (psf)
- $y_c$ = Distance from the centroid to the extreme compression fiber (in.)
- $\beta$ = Parameter of relative stiffness

3. USE CONSIDERATIONS

3.1. LOAD DURATION

Duration of load increases in allowable stress shall not be applied to SIP facings or cores. Duration of load increases may be applied to the design of connections and wood reinforcement as permitted in applicable material design specifications.
3.2. MOISTURE
This document applies to SIP panels used under dry service conditions. For SIP facings of wood or wood composites the in-use moisture content shall not exceed 19%.

3.3. TEMPERATURE
This Document applies to SIP panels used as structural members were sustained temperatures do not exceed 100°F.

4. BENDING MEMBERS
4.1. GENERAL
Each SIP panel subjected to transverse loads shall be of sufficient size and capacity to carry the applied loads without exceeding the allowable design values specified herein.

4.2. SPAN OF BENDING MEMBERS
For simple, continuous and cantilevered bending members, the design span shall be taken as the distance from face to face of support. When no bearing is provided, such as when a panel is supported by a spline only (C_v < 1.0), the design span shall extend the full height/length of the panel.

4.3. BENDING MEMBERS—FLEXURE
4.3.1. GENERAL
Panel flexural strength under transverse loading shall satisfy both equations below:

\[ M \leq F_s S \]  \hspace{1cm} \text{(Eqn. 4.3.1a)}

\[ M \leq F_s S \]  \hspace{1cm} \text{(Eqn. 4.3.1b)}

4.4. BENDING MEMBERS—SHEAR
4.4.1. GENERAL
The actual shear stress parallel to the facing at the core to facing interface shall not exceed the adjusted shear design value.

4.4.2. SHEAR DESIGN EQUATIONS
The panel shear strength under transverse loading shall satisfy the following equation:

\[ V \leq F_v C_{fv} C_{av} \]  \hspace{1cm} \text{(Eqn. 4.4.2)}

4.4.3. SHEAR SIZE ADJUSTMENT FACTOR, \( C_{fv} \)
The allowable shear strength shall be multiplied by a adjustment factor for the depth of the panel. The shear size adjustment factor shall be calculated using Equation 4.4.3.

\[ C_{fv} = \left( \frac{h_m}{h} \right)^m \]  \hspace{1cm} \text{(Eqn. 4.4.3)}

4.4.4. SUPPORT ADJUSTMENT FACTOR, \( C_v \)
4.4.4.1. For panel ends supported by full bearing on one facing and uniform loads applied to the opposite facing, the shear adjustment factor, \( C_v = 1.0 \) (see Figure A4.4.4).

4.4.4.2. For panel ends without bearing, supported by a top/bottom spline only, with uniform loads applied to either facing, the shear adjustment factor, \( C_v \) shall be based on testing specific to the following parameters (see Figure A4.4.4):
1. Panel manufacturer;
2. Spline type, as it relates to the withdrawal/pullout strength of the fasteners (e.g. specific gravity for wood plates);
3. Fastener type and penetration.

4.4.4.3. Where $C_v$ is less than 1.0, the allowable shear strength may be increased if the spline/fastener combination has a design withdrawal/pullout strength greater than the design withdrawal/pullout strength of the $C_v$ assembly. The increase in strength shall not exceed the difference in the design withdrawal/pullout strength between the stronger assembly and the $C_v$ assembly.

![Figure 4.4.4: $C_v$ Support Conditions](image)

4.4.5. SHEAR DESIGN FORCE
When calculating the shear force, $V$, in bending members:

a) For panels supported by full bearing on one facing and uniform loads applied to the opposite facing ($C_v = 1.0$), uniformly distributed loads within a distance from the supports equal to the depth of the panel, $h$, shall be permitted to be ignored.

b) For all other support and loading conditions ($C_v < 1.0$), no load applied to the panel may be ignored and $V$ shall be taken as the full reaction at the support under consideration.

![Figure 4.4.5: Design Shear Force](image)
4.5. BENDING MEMBERS—DEFLECTION

4.5.1. GENERAL
Deflection shall be calculated by standard methods of engineering mechanics considering both bending
defections and shear deflections.

4.5.2. DEFLECTION EQUATION
Deflection of a simply supported panel under uniform transverse load only shall be calculated as
follows:

\[
\Delta = \Delta_b + \Delta_s = \frac{5wL^4 \times 1728}{384E_I I} + \frac{3wL^2}{2 A_G}
\]  
(Eqn. 4.5.2a)

Deflections for panels subjected to combined loads shall consider the effects of axial load (P-delta effects).
The total deflection of panels under combined loads may be approximated as follows.

\[
\Delta_{2nd} = \frac{\Delta}{1 - P/P_{cr}}
\]  
(Eqn. 4.5.2b)

4.5.3. LONG-TERM LOADING
Where deflection under long-term loading must be limited, the total deflection, including creep
effects shall be calculated as follows:

\[
\Delta_T = \sum K_{cr} \Delta_i
\]  
(Eqn. 4.5.3)

<table>
<thead>
<tr>
<th>Load Type</th>
<th>EPS/XPS</th>
<th>Urethane</th>
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<tr>
<td>D, F, H, T</td>
<td>4.0</td>
<td>7.0</td>
</tr>
<tr>
<td>S, L</td>
<td>3.0</td>
<td>5.0</td>
</tr>
<tr>
<td>E, W, R, Lr, Fa</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

1 Table values are for OSB facings used under dry service conditions.
2 Load types are as defined in ASCE 7-05.

4.5.4. DEFLECTION LIMITS
The total deflection of structural or non-structural bending members, including consideration for long-term loading,
shall not exceed the more restrictive of the following:

a) the span divided by 120 (L/120);

b) the limitations of the building code under which the structure is designed;

c) or, other recognized minimum design load standards.
4.6. BEARING AND CONCENTRATED LOADS ON FACINGS

4.6.1. MINIMUM SUPPORT WIDTH
A minimum support width of 1.5-inches shall be provided at all supports where the SIP is designed for bearing \((Cv = 1.0)\). The bearing support shall be continuous along the end of the panel.

4.6.2. BEARING STRENGTH

4.6.2.1. Where a full-depth structural spline is provided at a point of bearing, the bearing strength shall not exceed the design bearing strength of the facings or spline, whichever is less.

4.6.2.2. Where a full-depth structural spline is not provided at a point of bearing and the bearing face of the panel is supported by the core only. The allowable bearing strength shall be limited to the load producing a long-term total compression of the core equal to 1/8-inch. Long term deflections shall be calculated in accordance with Section 4.5.3. The core compression deflection shall be calculated using the component material properties of the facing and the core considering the facing as a beam on an elastic foundation. Formulas for common cases (Figure 4.6.2.2) are provided in Equations 6.2.2.2a and 6.2.2.2b. Equations are for loads uniformly applied along the end of the panel.

![Figure 4.6.2.2: Bearing on Facings](image-url)

\[ \Delta_c = \frac{P}{4E_fI_fB^3} \]  
(Eqn. 4.6.2.2a)

\[ \Delta_c = \frac{P}{8E_fI_fB^3} \]  
(Eqn. 4.6.2.2b)

\[ \beta = \sqrt{\frac{3E_c}{E_fI_f}} \]  
(Eqn. 4.6.2.2c)
5. COMPRESSION MEMBERS

5.1. GENERAL
Each SIP panel subjected to compressive loads shall be of sufficient size and capacity to carry the applied loads without exceeding the allowable design values in this section.

5.1.1. COMPRESSION MEMBERS—LOAD ECCENTRICITY
The panel compression strength under axial loading shall satisfy the following equation:

\[ P \leq P_c \text{ where } P_c = C_e F_c A_f \]  
(Eqn. 5.1.1a)

The eccentric load factor shall be calculated using Equation 5.1.1b considering a minimum eccentricity equal to not less than one-sixth the overall panel thickness \( e \geq h/6 \).

\[ C_e = \frac{1}{1 + \frac{e y_c}{r^2 \sec \left( \frac{12L}{2r} \sqrt{\frac{3P}{A_f E_b}} + \frac{3P y_e}{2A_c G L} \right)}} \]  
(Eqn. 5.1.1b)

5.1.2. COMPRESSION MEMBERS—GLOBAL BUCKLING
The critical buckling load for a pinned-pinned column under axial loading shall satisfy the following equation:

\[ P \leq P_{cr} \text{ where } P_{cr} = \frac{\pi^2 E_b I}{3 \times (12L)^2 \left[ 1 + \frac{\pi^2 E_b I}{(12L)^2 \times A_c G} \right]^2} \]  
(Eqn. 5.1.2)

5.1.3. COMPRESSION MEMBERS—BEARING
The axial compressive load shall not exceed the bearing strength of the supporting materials. The bearing strength of the supporting materials shall be verified in accordance with the appropriate design specification. Where one or more of the SIP facings are not in bearing, the connection between the facings and the spline shall be designed to transfer the full load from the facings to the plate.

6. TENSION MEMBERS

6.1. GENERAL
A continuous load path shall be provided to transfer tension forces through the structure in a way that does not impart tensile loads to the SIP panel facings or core.
7. COMBINED LOADS

7.1. GENERAL
Panels subjected to combined loads shall of sufficient size and capacity to carry the applied loads without exceeding the allowable design values in this section.

7.1.1. COMBINED COMPRESSION, TRANSVERSE BENDING AND IN-PLANE SHEAR
Panel strength under combined axial compression, transverse bending and in-plane shear shall satisfy the following interaction equations:

\[
\frac{P}{P_e} + \frac{M_{\text{max}}}{F_e S} + \frac{V_{\text{ip}}}{F_{\text{vip}}} \leq 1.0
\]  
(Eqn. 7.1.1a)

\[
\frac{P}{P_{\text{cr}}} + \frac{M_{\text{max}}}{F_e S} + \frac{V_{\text{ip}}}{F_{\text{vip}}} \leq 1.0
\]  
(Eqn. 7.1.1b)

For simply supported beam columns \(M_{\text{max}}\) shall equal:

\[
M_{\text{max}} = 1.5wL^2 + P\Delta_{2\text{nd}}
\]  
(Eqn. 7.1.1c)

8. CONNECTIONS

8.1. GENERAL
Connections between SIP panels, splines, plates, and non-SIP assemblies shall be designed in accordance with the appropriate material design standard referenced in the applicable building code.

9. SHEAR WALLS AND DIAPHRAGMS

9.1. GENERAL
SIP panel shear walls and diaphragms acting as elements of the lateral force-resisting system shall be designed in accordance with this section.

9.2. DEFINITIONS
Reserved for future use.

9.3. SHEAR WALLS
Reserved for future use.

9.3.1. DEFINITIONS
Reserved for future use.

9.3.2. SHEAR WALL ANCHORAGE
Reserved for future use.

9.3.3. SHEAR WALL STRENGTH
Reserved for future use.

9.3.4. SHEAR WALL DEFLECTION
Reserved for future use.

9.4. DIAPHRAGMS
Reserved for future use.
10. REFERENCES

APPENDIX AND COMMENTARY

A1. DERIVATION OF ENGINEERING PROPERTIES FROM TEST DATA

The manner in which laboratory test data is used is the primary difference between the methodology presented in this guide and the historical approaches for justification of SIP panels. Historical approaches are largely based on direct use of E72 test data. Unlike historical approaches, this guide uses engineering mechanics to establish models for the test data. These models are applied to the test data to yield general engineering properties that are used as the basis for performance.

The advantages of the engineering mechanics approach over the historical approach are many. Some advantages include: basis for use as a structural material is consistent with other code recognized structural materials; improved statistical significance behind overall panel behavior; improved understanding of panel behavior by separate consideration various limit states; generalization of properties to permit engineered design of support and loading conditions that cannot be simulated in the laboratory.

A1.1. TRANSVERSE BENDING STIFFNESS

Panel stiffness under transverse load is determined using the load-deflection data from tests performed in accordance with ASTM E72. This process begins by reducing the data from each transverse load test into two values, the apparent bending modulus, \( E_a \), and a shear constant, \( K_s \). By obtaining these two values from multiple test configurations the elastic modulus, \( E_b \), and the shear modulus, \( G \), are derived using a procedure similar to that described in the appendix of ASTM D198.

A1.1.1. TEST PROGRAM

The test program shall consist of transverse load tests conducted in accordance with ASTM E72. Specimen configurations should be selected with regard to the range of spans and panel thicknesses used by a given manufacturer. At a minimum, it is recommended that not less than the minimum and maximum panel thicknesses are tested at their minimum and maximum spans, in each orthogonal direction (4 series of tests, 12 specimens, in each direction). It is recommended that additional specimens are tested so not less than 28 total specimens are tested, in each orthogonal direction (assuming facing is orthotropic), during the initial qualification. The configuration of the specimens between the upper and lower limits of thickness and span should be selected based on the calculated value of \( K_s \) (see section A1.1.3) with the goal of obtaining data points that are approximately equally spaced between the values for \( K_s \).

With regard to test procedure, efforts should be taken to isolate bending deflections from other sources of deformation during the test. Accordingly, it is recommended that panels are tested with a single solid top and bottom plate, deflection measurements are taken from the loaded surface of the panel and deformations at the supports are measured and subtracted from the measured midspan deflections.

A1.1.2. APPARENT BENDING MODULUS

The apparent bending modulus, \( E_a \), is an elastic bending modulus specific to a particular panel support and loading configuration. Unlike the true elastic modulus, \( E_b \), the apparent bending modulus accounts for both bending and shear distortions.

Using the test load-deflection data, the apparent bending stiffness, \( E_a l \), is calculated for each test specimen (see Table A1). In this equation, the term \( w/A \) is taken as the slope of a line best-fit through the load-deflection data corresponding to the anticipated range of in-service loads. This range is recommended to be taken as 25% to 100% of the allowable load with the allowable load calculated as the ultimate strength divided by 3.

The apparent bending modulus, \( E_a \), is calculated by dividing the bending stiffness by the moment of inertia. Considerations regarding data selection when determining the apparent bending modulus include:

1. The load-deflection plot for the test data should be reviewed to verify that the data points used for the regression are within the region of linear response.
2. The span used in the calculation of \( E_a \) shall be taken as the center-to-center spacing of the pin and roller supports and not the clear span between bearing plates.
3. The method of deflection measurement used in the test must be assessed. The data should correspond to the midspan deflection minus the average of the deflections occurring at the supports. The deflection apparatus required in E72 accomplishes this automatically, but additional gauges located over the supports may be used to achieve the same result.
4. The method of loading used in the test must be assessed. ASTM E72 permits loading using a ‘vacuum’ method or ‘bag’ method. The choice of loading method affects the manner in which the deflection readings are taken. Using the ‘vacuum’ method it is possible to measure deflections from the loaded surface, whereas the bag method requires deflections to be measured from the supported surface. Where deflections are measured from the supported surface it is not possible to measure and subtract out support deflections, as a result the apparent stiffness will be reduced. Additionally, if solid lumber splines are not provided at each end of the specimen, local

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deflections at the supports (see Section 4.6.2) further reduce the apparent stiffness and will result in a non-linear ‘hook’ in the \(1/E_a\) verses \(1/K_s\) plot. When using load-deflection data subjected to this effect, it is recommended that the data corresponding to a \(K_s\) (see Section A1.1.3) less than 250 are excluded from the analysis as the support deflections comprise a significant percentage of the midspan deflections for specimens below this limit.

### A1.1.3 SHEAR CONSTANT

A shear constant is also determined from each test. This constant assigns a value to the test configuration and accounts for the depth of the panel, span length, and arrangement of the applied load. This value is derived for a given test configuration by equating the deflection equation using the apparent bending modulus to the deflection equation considering bending and shear deformations separately. An example of this formulation is provided below for a simply supported panel subjected to a uniformly applied load. Table A1 provides equations for other loading and support configurations.

\[
\frac{5wL^4 \times 1728}{384E_aI} = \frac{5wL^4 \times 1728}{384E_aI} + \frac{3wL^2}{2A_G}
\]

(Eqn. A1.1.3a)

Reducing this equation to a linear equation yields:

\[
\frac{1}{E_a} = \frac{1}{E_b} + \frac{1}{G} \times \frac{384I}{40A_GL^2} \times \frac{1}{144}
\]

(Eqn. A1.1.3b)

The portion after the \(1/G\) term is taken as the constant \(K_s\).

\[
K_s = \frac{40A_GL^2}{384I} \times 144
\]

(Eqn. A1.1.3c)

It should be noted that the general formulation for shear deformation includes a dimensionless constant, \(\kappa\), which describes the shear stress distribution across the shear area, \(A_s\). For isotropic rectangular sections this constant typically ranges from 0.84 to 0.86; however, for the purposes of this analysis this constant is combined with the shear modulus, \(G\) (i.e. \(G = \kappa G_{\text{actual}}\)).

### Table A1: Transverse Stiffness Equations

<table>
<thead>
<tr>
<th>Test Configuration</th>
<th>Deflection Formula(^1)</th>
<th>Apparent Bending Stiffness, (E_aI) (psi-in.)</th>
<th>Shear Constant, (K_s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simply Supported Uniform Load</td>
<td>(\Delta = \frac{5wL^4 \times 1728}{384E_aI} + \frac{3wL^2}{2A_G})</td>
<td>(E_aI = \frac{5L^4}{384 \Delta} \times 1728)</td>
<td>(K_s = \frac{40A_GL^2}{384I} \times 144)</td>
</tr>
<tr>
<td>Simply Supported Point Load at Midspan</td>
<td>(\Delta = \frac{PL^4 \times 1728}{48E_aI} + \frac{PL \times 12}{4A_G})</td>
<td>(E_aI = \frac{L^2P}{48 \Delta} \times 1728)</td>
<td>(K_s = \frac{A_GL^2}{12I} \times 144)</td>
</tr>
</tbody>
</table>

Deflection at midspan.

### A1.1.4 BENDING AND SHEAR MODULI

The purpose of the equations in Table A1 is to linearize the test data across specimens of various depths, spans, and loading conditions (Equation A1.1.4). Each test yields one point on this line, with \(x = 1/K_s\) and \(y = 1/E_a\). The elastic modulus, \(E_a\), and shear modulus, \(G\), are determined from a line best-fit through all data points with \(E_a = 1/Y\)-Intercept and \(G = 1/Slope\).

\[
y = mx + b \Rightarrow \frac{1}{E_a} = \frac{1}{G} \times \frac{1}{K_s} + \frac{1}{E_b}
\]

(Eqn. A1.1.4)

As with all experimental correlations, some scatter is expected; however, if the data exhibits non-linear behavior at either end of the plot the test method should be more closely examined to determine whether bending deformations are sufficiently isolated from other deformations during the test (see Section A1.1.2).
A1.1.5. LIMITS OF USE
In accordance with standard engineering practice, extrapolation beyond the limits of the test program should be avoided. For properties determined using the method described herein, the limits of use are established by the shear constant, $K_c$.
Additionally, it is recommended that use of the parameters is limited to panel thicknesses bounded by the maximum and minimum tested thicknesses.

COMMENTS, QUESTIONS AND ERROR REPORTING
All efforts have been made to ensure the accuracy of this document; however, if errors are found please contact Eric Tompos, P.E., S.E. via email at etompos@ntainc.com.
R-Control SIPs are most commonly connected with surface, block, I-Beam, or dimensional lumber splines. I-Beam and dimensional lumber splines are used to provide additional strength and span capacity to R-Control SIPs assemblies. Laminated veneer lumber (LVL) is an alternative engineered wood spline option.

R-Control LVL’s are an alternative spline connection available for 8-1/4” R-Control SIPs. The following Load Design Chart provides the capacity of R-Control SIPs when connected with R-Control LVL’s spaced 4’ o.c.

### Roof/Floor - Transverse Loading

**LOAD DESIGN CHART**

*(SEE LVL SPLINE DETAIL SIP-102a)*

<table>
<thead>
<tr>
<th>R-CONTROL® SIPs</th>
<th>R-CONTROL LVL WIDTH</th>
<th>SIP THICKNESS</th>
<th>L/360</th>
<th>L/240</th>
<th>L/180</th>
</tr>
</thead>
<tbody>
<tr>
<td>PANEL SPAN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEFLECTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10'- 0”</td>
<td>81¹ 81¹ 81¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12'- 0”</td>
<td>63 68¹ 68¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14'- 0”</td>
<td>49 58¹ 58¹</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>16'- 0”</td>
<td>38 51¹ 51¹</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>18'- 0”</td>
<td>30 45¹ 45¹</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>20'- 0”</td>
<td>24 37 40¹</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

[1] LIMITED TO ULTIMATE FAILURE LOAD DIVIDED BY A FACTOR OF SAFETY OF THREE.
[2] LVL SPLINE MUST BE CONTINUOUS AND SPACED 4' O.C.
A major benefit of R-Control SIPs used for roof applications is their ability to span long distances. These distances are commonly from 8-12 feet for R-Control SIPs connected with surface or block splines and from 12-24 feet when connected with double 2X or engineered wood splines. When installed in a single span condition, the attachment of the R-Control SIP to the supports is accomplished with R-Control SIP fasteners at the end of the SIP. The spacing is commonly 6, 8, or 12 in. on center. Please refer to Load Design Chart #8 for screw spacing requirements for single span conditions.

R-Control SIPs are manufactured in sizes up to 8 ft. x 24 ft. The large size of R-Control SIPs provides the ability to install a single SIP very quickly and reduce the time and labor for installation. In many buildings the installation will be over multiple supports. When installed over multiple supports, the attachment of the R-Control SIP can be accomplished with an alternate fastening pattern. Multiple span connection patterns are based on the connection frequency required for the equivalent SIP single span length in accordance with Load Design Chart #8. Please refer to fastening patterns in this bulletin for conditions requiring R-Control screws at 6, 8, or 12 inches on center.
The figures illustrate the attachment pattern for a two to five span condition, but the general patterns can be extended to conditions with 6 or greater spans.
Connection Patterns for Condition with R-Control Screws 8 in. on Center

Connection patterns for single span condition

Connection patterns for two span condition

Connection patterns for three span condition

Connection patterns for four span condition

Connection patterns for five span condition

The figures illustrate the attachment pattern for a two to five span condition, but the general patterns can be extended to conditions with 6 or greater spans.
Connection Patterns for Condition with R-Control Screws 6 in. on Center

The figures illustrate the attachment pattern for a two to five span condition, but the general patterns can be extended to conditions with 6 or greater spans.
R-Control SIP roofs can be finished with a wide range of roof covering systems. Metal roofing is one type of roof covering that has been used successfully over R-Control SIPs for many years. Metal roofing provides a water tight roof system and has a long life expectancy when compared to many other roofing systems. One major advantage of metal roofing is that minimal maintenance is required over the life of the roof.

As with all roof covering systems, the installation must be in compliance with the metal roofing manufacturer’s recommended installation details. The primary consideration when installing metal roofing over R-Control SIPs is to ensure the roofing manufacturer provides installation recommendations for proper attachment into the 7/16” OSB facing of the R-Control SIP.

Berridge Manufacturing Company, a leader in the metal roofing industry, provides installation recommendations for the attachment of their metal roof system directly into the 7/16” OSB facing of R-Control SIPs. Following their installation recommendations provides assurance that the metal roof system will provide the long term durability that is expected.

R-Control confirmed the strength of the Berridge attachment recommendations by testing the uplift resistance of the 24 gauge Zee-Lock panel in accordance with UL 580, “Tests for Uplift Resistance of Roof Assemblies”. The tested assembly consisted of the Zee-Lock panel installed with a double lock, continuous Zee Rib, and #14 x 1-1/2 in. hex washer head Type A w/sealing washer from SFS Intec directly into the 7/16 in. OSB facing of an R-Control SIP. Two different fastening frequencies were evaluated.

<table>
<thead>
<tr>
<th>Ultimate Pressure</th>
<th>Fastener Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>160 psf</td>
<td>14 in. o.c.</td>
</tr>
<tr>
<td>265 psf</td>
<td>8 in. o.c.</td>
</tr>
</tbody>
</table>

The test results clearly demonstrate that metal roofing can meet high wind uplift pressures when fastened directly into the 7/16 in. OSB of an R-Control SIP.

For further information regarding Berridge Manufacturing Company products, please visit www.berridge.com
R-Control SIP roofs are connected with R-Control Screws to underlying support. The spacing of R-Control Screws to resist wind uplift loads is typically determined in accordance with Load Design Chart #8. However, some regions of the U.S. require higher wind resistance. This is most commonly in coastal regions.

The attached Load Design Chart #8a provides R-Control Screw spacing requirements for wind speeds up to 180 mph as required by the 2012 IBC.
## Roof - Uplift Loads

**LOAD DESIGN CHART #8a**

Maximum Spacing of R-Control Wood Screws At Supports - INCHES

<table>
<thead>
<tr>
<th>ROOF PITCH</th>
<th>SIP SPAN² (FT)</th>
<th>2009 IBC³ WIND SPEED, Vₐ₆₃₀</th>
<th>2009 IRC/2012 IRC WIND SPEED, Vₐ₆₃₀</th>
<th>2012 IBC⁴ WIND SPEED, Vₐ₆₃₀</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5:12</td>
<td></td>
<td>100 MPH</td>
<td>110 MPH</td>
<td>120 MPH</td>
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<tr>
<td>8</td>
<td>12</td>
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</tbody>
</table>

1. FASTENER SPACING IS BASED ON FASTENER HEAD PULL-THROUGH AND WITHDRAWAL STRENGTH OF R-CONTROL WOOD SCREWS TESTED IN ACCORDANCE WITH ASTM D1037. THE ALLOWABLE WITHDRAWAL STRENGTH AND PULL-THROUGH STRENGTH WERE TAKEN AS THE AVERAGE ULTIMATE LOAD DIVIDED BY A FACTOR OF SAFETY OF 5.0 AND A LOAD DURATION FACTOR OF 1.6 (ALLOWABLE PULL-THROUGH STRENGTH = 179 LBF, ALLOWABLE WITHDRAWAL STRENGTH = 200 LBF). FASTENERS INSTALLED AT 3-INCHES ON-CENTER OR LESS SHALL BE STAGGERED.

2. TABLE VALUES APPLY TO SIMPLY SUPPORTED SIP ROOF MEMBERS HAVING AN OVERHANG NOT TO EXCEED 24-INCHES. WOOD SUPPORT TO HAVE A MINIMUM SPECIFIC GRAVITY, G=0.42 (SPRUCE-PINE-FUR). SCREW SHALL HAVE SUFFICIENT LENGTH AND BE INSTALLED SO THAT IT PENETRATES THE WOOD SUPPORT A MINIMUM OF 1.5-INCHES.

3. THREE-SECOND-GUST WIND SPEED BASED ON A BUILDING HEIGHT OF 40-FEET, ZONE 2E, IMPORTANCE FACTOR, Lₜ₈₀=1.0 AND TOPOGRAPHIC FACTOR, Kₜ₈₀=1.0, INTERNAL PRESSURE COEFFICIENT, GCₜ₈₀=0.18 IN ACCORDANCE WITH ASCE 7, 2005 EDITION, SECTION 6.5.12.2.2 (MAIN WIND FORCE RESISTING SYSTEM, LOW-RISE BUILDING). A MINIMUM ROOF ASSEMBLY DEAD LOAD OF 10 PSF IS CONSIDERED IN THE TABULATED VALUES (UPLIFT PRESSURE REDUCE BY 0.6 TIMES 10 PSF).

4. THREE-SECOND-GUST WIND SPEED; BASED ON A BUILDING HEIGHT OF 40- FEET, ZONE 2E, IMPORTANCE FACTOR, Lₜ₈₀=1.0 AND TOPOGRAPHIC FACTOR, Kₜ₈₀=1.0, INTERNAL PRESSURE COEFFICIENT, GCₜ₈₀=0.18 IN ACCORDANCE WITH ASCE 7, 2010 EDITION, CHAPTER 28 (WIND LOADS ON BUILDING - MWFRS (ENVELOPE PROCEDURE). A MINIMUM ROOF ASSEMBLY DEAD LOAD OF 10 PSF IS CONSIDERED IN THE TABULATED VALUES (UPLIFT PRESSURE REDUCE BY 0.6 TIMES 10 PSF).
Subject: IECC Insulation U-Factor Requirements

Date: September 2013

R-Control SIPs are a versatile construction material used as walls and ceilings/roofs of buildings. R-Control SIPs provide both structural capacity and insulation for building envelopes. R-Control SIPs are available in a wide range of thicknesses to ensure that building owners are able to meet the most advanced energy code requirements, such as those published by the International Code Council (ICC). This bulletin provides a summary of the prescriptive U-factor requirements of the 2012 edition of International Energy Conservation Code (IECC) published by ICC. Please refer to the 2012 IECC for detailed information.

The IECC is a leading energy code that is applicable to both commercial and residential buildings and is often adopted as a code requirement at the State level. State adoption of IECC may also be to the prior versions of the IECC issued in 2006 and 2009.

The tables within this bulletin provide the U-factor requirements of 2012 IECC Table R402.1.3 (residential) and Table C402.1.2 (commercial) and demonstrates which R-Control SIP thickness meets or exceeds the requirements. The U-factor is the rate of heat transfer per unit area and per unit temperature difference and the units are BTU/hr•ft²•°F. The lower the U-factor, the greater the resistance to heat flow. U-factors equal to or less than that specified in the tables are permitted as an alternative to the R-value requirements of the 2012 IECC Table R402.1.1 or Table C402.1.2.

Alternative paths for conformance through comparison to 2012 IECC “R-value Tables” and detailed analysis are also available within the standard. R-Control recommends that the U-factor path be followed since this accounts most appropriately for the insulation performance of SIPs in comparison to lumber framing with traditional insulations.

Climate Zones

All of Alaska in Zone 7 except for the following Boroughs in Zone 8: Bethel, Dillingham, Fairbanks, N. Star, Nome North Slope, Northwest Arctic, South-Central Fairbanks, Wade Hampton, and Yukon-Koyukuk

Zone 1 includes: Hawaii, Guam, Puerto Rico, and the Virgin Islands
### 2012 IECC Table R402.1.3 Equivalent U-Factors
#### Residential Walls

<table>
<thead>
<tr>
<th>Zone</th>
<th>Wood-Framed Wall Requirement</th>
<th>R-Control SIP&lt;sup&gt;1&lt;/sup&gt;</th>
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</table>

<sup>1</sup> R-Control SIP U-Factors include inside air film, 1/2" gypsum wallboard, R-Control SIP, wood siding, and outside air film.

### 2012 IECC Table R402.1.3 Equivalent U-Factors
#### Residential Roof/Ceilings

<table>
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<tr>
<th>Zone</th>
<th>Roof/Ceiling Requirement</th>
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</tbody>
</table>

<sup>1</sup> R-Control SIP U-Factors include inside air film, 1/2" gypsum wallboard, R-Control SIP, asphalt shingles, and outside air film.
### 2012 IECC Table C402.1.2 Equivalent U-Factors

#### Commercial Walls

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<th>Zone</th>
<th>Wood-Framed Wall Requirement</th>
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1. R-Control SIP U-Factors include inside air film, 1/2" gypsum wallboard, R-Control SIP, wood siding, and outside air film.

#### Commercial Roof/Ceilings

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</tbody>
</table>

1. R-Control SIP U-Factors include inside air film, 1/2" gypsum wallboard, R-Control SIP, asphalt shingles, and outside air film.
The 2012 International Energy Conservation Code (IECC) includes specific requirements concerning air barriers to control the air leakage of buildings. Air barriers normally consist of materials assembled and joined together to provide a barrier to air leakage through the building envelope. An air barrier may be a single material or a combination of materials.

The IECC (Section C402.4.1.2.1) requires materials acting as air barriers to have an air permeability no greater than 0.004 cfm/ft² (0.02 L/s • m²) under a pressure differential of 0.3 inches water (75 Pa) when tested in accordance with ASTM E 2178.

A number of materials are deemed to comply with the IECC requirement provided joints are sealed. Two of the products complying with the requirement are oriented strand board (OSB) having a thickness of not less than 3/8 inch (10 mm) and gypsum board having a thickness of not less than 1/2 inch (12 mm).

An R-Control SIP which has 7/16 inch OSB facings meets the IECC requirement. In addition, the interior of an R-Control SIP is normally covered with 1/2 inch gypsum board for fire protection reasons. This interior gypsum board also meets the IECC requirement.

The IECC (Section C402.4.1.2.2) provides a requirement for assemblies acting as air barriers. Assemblies of materials are required to have an air leakage not to exceed 0.04 cfm/ft² (0.2 L/s • m²) under a pressure differential of 0.3 inches of water (75Pa).

R-Control SIPs were tested to demonstrate compliance with the IECC requirement for air barriers and to evaluate the air leakage of a SIP spline joint. A test assembly consisting of two R-Control SIPs, R-Control Low VOC Do-All-Ply, and R-Control SIP Tape was tested by a third party accredited laboratory. The two R-Control SIPs were joined in accordance with R-Control SIP detail SIP-102g.

The air leakage of the R-Control SIP assembly was less than 0.001 cfm/ft² (0.005 L/s • m²).

The R-Control assembly demonstrated performance which meets both the IECC requirements for an air barrier material and an air barrier assembly.
CONTROL YOUR:
• MATERIALS
• R-VALUES
• PROCESS
• COSTS
• TIMELINE
• LIABILITY

DON'T COMPROMISE YOUR:
• DESIGN
• ENERGY EFFICIENCY
• STRUCTURAL INTEGRITY
• PROFITABILITY
• QUALITY
• REPUTATION

R-Control SIPs are made exclusively with Foam-Control EPS. R-Control SIPs and Foam-Control EPS are manufactured by AFM Corporation licensees.

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www.r-control.com
SECTION 06 12 00

STRUCTURAL INSULATED PANELS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Structural Insulated Panels (SIPs).
B. Related Sections: Section(s) related to this section include:
   1. Section 06 10 00 Rough Carpentry
   2. Section 06 09 00 Wood and Plastics Fastenings

1.02 SYSTEM DESCRIPTION

Structural Insulated Panels (SIPs) consist of oriented strand board (OSB) laminated with structural adhesives to a termite resistant EPS insulation core, a EPA registered treatment for mold, mildew, and termites, and SIP Manufacturer supplied connecting splines, sealants, and SIP screws.

1.03 REFERENCES

C. DOC PS2 – Performance Standard for Wood-based Structural-Use Panels.
D. ICC ES AC04 – Acceptance Criteria for Sandwich Panels.
E. ICC ES AC05 – Acceptance Criteria for Sandwich Panel Adhesives.
F. ICC ES AC12 – Acceptance Criteria for Foam Plastic Insulation.
I. AWPA E12- Standard Method of Determining Corrosion of Metal in Contact with Treated Wood.
K. EPA - Registered products listing.

1.04 DESIGN REQUIREMENTS

A. Provide SIPs which have been manufactured, fabricated and installed to withstand loads [Specify code/standard reference.] and to maintain [Specify performance criteria.] performance criteria stated by SIP manufacturer without defects, damage or failure.

1.05 SUBMITTALS

A. Product Data: Submit product data for specified products.


3. Manufacturer’s Instructions: SIP Manufacturer’s Construction Manual and load design charts.

B. Calculations: Provide structural calculations by a registered architect or professional engineer [in the state of] qualified to perform such work.

C. Shop Drawings: Submit structural calculations by a registered architect or professional engineer [in the state of] qualified to perform such work.

D. Quality Assurance Submittals: Submit the following:
   1. Certificate: Product certificate showing compliance to Third Party Quality Control program of PFS Corp.

E. Fire Resistant Assemblies: PFS construction number for each fire-rated assembly

F. Warranty: Warranty documents specified herein.
1.06 QUALITY ASSURANCE
   A. Installer Qualifications: Installer should be experienced in performing work of this section and should have specialized in installation of work similar to that required for this project.
   B. Source Limitations: Obtain all SIPs through one source. All accessories to be as furnished or recommended by the SIP manufacturer.

1.07 Regulatory Requirements:
   A. SIPs shall be recognized for compliance with [International Building Code, International Residential Code, or specify] in a current ICC ES evaluation report
   B. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, foundation/structural system/substrate conditions, SIP manufacturer installation instructions and SIP manufacturer warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

1.08 DELIVERY, STORAGE & HANDLING
   A. Ordering: Comply with SIP manufacturer ordering instructions and lead time requirements to avoid construction delays.
   B. Delivery: Deliver materials from SIP manufacturer with identification labels or markings intact.
   C. Off-load SIPs from truck and handle using fork lift or other means to prevent damage to SIPs.
   D. SIPs shall be fully supported in storage and prevented from contact with the ground. Stack SIPs on pallets or a minimum of three stickers for every 8 feet of SIP length.
   E. SIPs shall be fully protected from weather. Protect against exposure to rain, water, dirt, mud, and other residue that may affect SIP performance. Cover stored SIPs with breathable protective wraps. SIPs shall be stored in a protected area.

1.09 WARRANTY
   A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
   B. Manufacturer’s Warranty: Submit SIP manufacturer’s standard warranty document. SIP Manufacturer warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
      1. Warranty Period: [Specify term.] years commencing on Date of Substantial Completion.

PART 2 PRODUCTS

***Note to Specifier*** Select the name and address of the local Licensed R-Control SIP Manufacturers/Suppliers.

2.01 Manufacturers/Suppliers:
   A. ACH Foam Technologies, LLC, 5250 North Sherman St., Denver, CO 80216
   B. ACH Foam Technologies, LLC, 111 W. Fireclay Ave., Murray, UT 84107
   C. ACH Foam Technologies, LLC, 775 Waltham Way, Suite 105, McCarran, NV 89434
   D. ACH Foam Technologies, LLC, 90 Trowbridge Drive, Fond du Lac, WI 54936-0660
   E. ACH Foam Technologies, LLC, 4001 Kaw Drive, Kansas City, KS 66102
   F. ACH Foam Technologies, LLC, 1418 Cow Palace Road, Newton, KS 67114
   G. ACH Foam Technologies, LLC, 809 East 15th Street, Washington, IA 52353
   H. ACH Foam Technologies, LLC, 2731 White Sulphur Road, Gainesville, GA 30501
   I. Big Sky Insulations, Inc., 15 Arden Drive, Belgrade, MT 59714
   J. Branch River Plastics, Inc., 15 Thurber Boulevard, Smithfield, RI 02917
   K. Energy Systems, Inc. 990 Epco Dr., Dandridge, TN 37725
   L. Mid-Atlantic Foam, 326 McGhee Road, Winchester, VA 22603
   M. NoArk Enterprises, Inc., 10101 Highway 70 East, North Little Rock, AR 72117
   N. Thermal Foams, Inc., 2101 Kenmore Avenue, Buffalo, NY 14207
   O. AFM Corporation, 17645 Juniper Path, Suite 260, Lakeville, MN 55044

2.02 Materials
   A. SIPs consisting of the following:
      1. UL certified EPS core with Perform Guard treatment, minimum of 0.95 pcf (15.2 kg/m³) complying with ASTM C578 Type I and having ICC ES recognition of termite resistance. Insulation manufacturer shall provide Third Party UL certificate. ICC ES report shall be provided for recognition of termite resistance in compliance with ICC AC239.
      2. OSB identified with APA or TECO performance mark with Exposure I durability rating and performance in accordance with DOC PS-2 span rating 24/16 or greater.
      3. Adhesives shall be in conformance with ICC ES AC05 – Acceptance Criteria for Sandwich Panel Adhesives
      4. FrameGuard treatment for mold, mildew, and termite resistance meeting the following requirements:
a. Registered with EPA.
b. Mold growth: 0 rating, tested to ASTM D3273 for 8 weeks at 77 degrees F and 100 percent relative humidity.
c. Termite resistance: Minimum rating of 7.0, tested to AWPA E-1.
d. Corrosion potential for metals in contact with treated wood: Maximum 2 mils per year, tested to AWPA E12 for minimum of 60 days on aluminum 2024, carbon steel, hot-dip galvanized steel, and G90 galvanized steel.
e. Equivalent lateral resistance and tooth holding capacity as untreated wood.

2.03 Accessories
A. Splines: OSB, block splines, or I-beam for use in joining SIPs shall be supplied by SIPs manufacturer.
B. Fasteners: corrosion resistant SIP screws compatible with SIP system shall be provided by the SIPs manufacturer.
   1. Wood Screws for attachment to wood members
   2. Heavy Duty Metal Screws for attachment to metal members (16 gauge to 3/16”)
   3. Light Duty Metal Screws for attachment to metal decks (18 gauge or thinner)
C. SIP Sealant: Shall be specifically designed for use with SIPs. Sealant must be compatible with all components of the SIP. Sealant shall be provided by the SIP manufacturer. VOC content of SIP sealant shall be less than 10 g/L.
D. Dimensional Lumber: SPF, #2 or better, or engineered equivalent unless otherwise required by structural drawings.
E. Vapor Barrier SIP Tape: woven and coated polyolefin membrane with synthetic adhesive suitable for indoor use, min. 4 inch wide for use on SIP joints as specified by designer. SIP Tape shall be supplied by the SIP manufacturer.

2.04 Fabrication
A. Sizes: SIPs shall be fabricated in accordance with approved Shop Drawings
B. Thermal Resistance, R-value
   ***Note to Specifier*** Select the R-value as required for each area of construction.
   1. 4 1/2” (114 mm) thick SIP with R-value of 15 at 75°F (16 at 40°F)
   2. 6 1/2” (165 mm) thick SIP with R-value of 23 at 75°F (24 at 40°F)
   3. 8 1/4” (210 mm) thick SIP with R-value of 29 at 75°F (32 at 40°F)
   4. 10 1/4” (260 mm) thick SIP with R-value of 37 at 75°F (40 at 40°F)
   5. 12 1/4” (311 mm) thick SIP with R-value of 45 at 75°F (48 at 40°F)

   ***Note to Specifier*** SIPs can be designed for use as 1 hour fire resistant assemblies. See technical information publications from SIP manufacturer.
C. Fire Performance Rating: [Specify fire performance rating].

   ***Note to Specifier*** Edit article below to suit project requirements. If substitutions are permitted, edit text below. Add text to refer to Division 1 Project Requirements (Product Substitutions Procedures) Section.

2.05 PRODUCT SUBSTITUTIONS
A. Substitutions: No substitutions permitted without fourteen day (14) prior approval.

2.06 RELATED MATERIALS
A. Related Materials: Refer to other sections for related materials as follows:
   1. Dimensional Lumber: SPF #2 or better or pre-engineered equivalent: Refer to Division 6 Carpentry Sections.

2.07 SOURCE QUALITY
A. Source Quality Assurance: Each SIP component required shall be supplied by SIP manufacturer and shall be obtained from selected SIP manufacturer or its approved supplier.
   1. Each SIP shall be labeled indicating PFS Third Party certification.
   2. Provide evidence of UL Third Party inspection and labeling of all insulation used in manufacture of SIPs.
   3. SIP manufacturer shall provide Lamination, R-Value and mold/mildew/termite resistance warranty documents for building owner acceptance. Manufacturer standard forms will be submitted.
   4. Provide SIPs with Foam-Control EPS with Perform Guard for termite resistance. Treatment shall be EPA registered with treatment efficacy substantiated by ICC ES report.
   5. Provide SIPs with FrameGuard treatment for mold, mildew, and termite resistance. Treatment shall be EPA registered with treatment efficacy substantiated by independent research.
   6. Dimensional Tolerance - shall comply with values listed in the manufacturer’s Quality Control Manual.
B. Source Quality: Obtain SIPs from a single manufacturer.
PART 3 EXECUTION

3.01 MANUFACTURER’S INSTRUCTIONS

A. Compliance: Comply with manufacturer’s ICC ES report, Load Design Charts, Construction Manual, Shop Drawings, and product data, including product technical bulletins, for installation.

B. Plans shall be reviewed by a qualified architect/engineer and shall be signed and/or sealed. Deviations from standard detail and load design values shall be calculated and signed and/or sealed by a qualified architect/engineer.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer’s instructions.

1. Verify conditions of foundation/structural system/substrate and other conditions which affect installation of SIPs. Any adverse conditions shall be reported in writing. Do not proceed with installation until adverse conditions are corrected.

3.03 INSTALLATION

A. SIP Installation:

***Note to Specifier*** Complete installation recommendations are available from the manufacturer. SIP weight and contractor preference will dictate the erection method used. The use of a crane or lift truck may be required for SIP placement. Consult with SIP manufacturer for recommended handling methods. Supplementary lifting clamps and attachments to be provided by the contractor.

1. SIP Supports: Provide level and square foundation/structural system/substrate that support wall and/or roof SIPs. For wall SIPs, hold sill plate back from edge of rim board 7/16" (11 mm) to allow full bearing of OSB skins. Provide 1 1/2" (38 mm) diameter access holes in plating to align with electrical wire chases in SIPs. Provide adequate bracing of SIPs during erection. Remove debris from plate area prior to SIP placement.

2. SIP Fastening: Connect SIPs by nails as shown on drawings. SIP sealant must be used together with each fastening techniques. Where SIP Screw Fasteners are used, provide a minimum of 1" (25.4 mm) penetration into support. Join SIPs using plates and splines. Secure attachment with nails, staples, or screws, and SIP sealant. Apply SIP sealant following SIP manufacturer recommendations.

3. SIP Tape: Provide SIP Tape at joints between SIP panels and at intersection of SIP roof and wall.

4. Vapor Retarders: Provide vapor retarders mandated by building code or climate conditions.

5. Thermal Barriers: Interior surfaces of SIPs shall be finished with a minimum 15-minute thermal barrier, such as 1/2" (13 mm) gypsum wallboard, nominal 1" (25 mm) wood paneling, or other approved materials. Apply code approved thermal barriers according to SIP manufacturer’s recommendations.

6. Restrictions: Do not install SIPs directly on concrete. Do not put plumbing in SIPs without consulting SIP manufacturer. Do not overcut skins for field-cut openings and do not cut skins for electrical chases. SIPs shall be protected from exposure to solvents and their vapors that damage the EPS foam core.

7. Remove and replace insulated wall or roof SIPs which have become excessively wet or damaged before proceeding with installation of additional SIPs or other work.

3.04 FIELD QUALITY REQUIREMENTS

A. Manufacturer’s Field Services: Upon Owner’s request, provide manufacturer’s field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer’s instructions.

1. Site Visits: [Specify number and duration of periodic site visits.]

3.05 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

1. Roof SIPs: Protect roof SIPs from weather. Provide temporary protection at the end of the day or when rain or snow is imminent.

2. After installation, cover SIPs to prevent contact with water on each exposed SIP edges and faces.

END OF SECTION
FOAM-CONTROL EPS

EXPANDED POLYSTYRENE
FROM FROST LINE TO ROOF LINE, YOU’RE IN CONTROL WITH FOAM-CONTROL EPS.

Foam-Control® EPS means control, not compromise.

Foam-Control EPS building products are engineered to give you the greatest possible control for your project application: from design and timelines, to materials and costs, and—ultimately—control over your results. The advantages to using Foam-Control EPS products include:

- State-of-the-art insulation and energy efficiency
- Variety of density, thickness, size
- UL QA monitored, tested, certified, listed
- Unlimited fabrication possibilities
- Building code recognized
- Warranted R-value
- Perform Guard® termite protection available
- Cost effective
- Long-lasting, strong, and stable
- Contains no CFC, HCFC, HFC, or formaldehyde
- Recyclable

Foam-Control EPS is a lightweight yet strong material that gives architects, designers and builders the freedom and confidence to turn their visions into reality.

This looks like a job for expanded polystyrene.

In the construction industry, Foam-Control EPS is among the most versatile, energy efficient, and cost effective insulators available, delivering extremely high, stable R-values. Depend on Foam-Control EPS to do the job—practically any job—from the ground up: perimeter foundation and underslab insulation, wall sheathing, EIFS insula-
tion, roof insulation, concrete insulation/void filler, ICF insulation, Geofoam and just about any construction application you can imagine.

With Foam-Control EPS, you’re the master of your materials.

Stands up to the elements, yet it’s good for the environment.

Cost effective thermal design is among the highest priorities in construction. Foam-Control EPS insulation products are available in a range of densities necessary to provide energy efficiency, structural integrity, and cost effectiveness. They’re proven to lower energy costs, saving both money and precious resources.

Foam-Control EPS, when used as a component in an engineered building system, helps to resist some of the toughest conditions nature can deliver, like rain, snow, wind, dust, heat and cold.

Foam-Control EPS with Perform Guard.

One of the most destructive forces anywhere is termites. Foam-Control EPS products can be manufactured with Perform Guard, a proven and safe additive that effectively resists termites.*

Proven to meet, or exceed, building codes.

Foam-Control EPS is manufactured to Quality Control Program standards monitored by Underwriters Laboratories, Inc. and recognized by national building codes. Foam-Control EPS manufacturers offer product warranties that ensure termite resistance, physical properties, and thermal
performance. Foam-Control EPS can stand up to all industry tests—and has. No other EPS can say that.

**It’s more than a foam. It’s a family.**

When you choose Foam-Control EPS, you’re not sending your order off to some mysterious factory. You’re collaborating with a team of experts who work with you every step of the way. We’re here to answer your questions, solve your problems, and do everything we can to make sure your project proceeds smoothly—and ends successfully.

Foam-Control EPS products are manufactured by AFM Corporation’s network of licensed manufacturers throughout North America and the world. AFM licensed facilities adhere to strict, consistent standards to ensure uniformly high-quality EPS products.

This network allows us to offer architects, designers and builders the best of both worlds: the resources of the country’s largest provider of EPS insulation products and systems, and the superior attention and customer service of a local supplier.

**Ready to take control? Start here.**

If you’re starting to wonder how Foam-Control EPS can contribute to your next project, here’s how to find out: Just contact your nearest Foam-Control EPS manufacturer. They’ll be happy to give you a design consultation, information about Foam-Control EPS products, pricing, and the answers to all your questions. Contact a sales rep, and download Foam-Control EPS documentation, through our web site at www.foam-control.com.

*Perform Guard is not a barrier, but should be used in conjunction with a total Pest Management Program available from a reputable Pest Control Operator.*
CONTROL, NOT COMPROMISE.

**CONTROL YOUR:**
- MATERIALS
- R-VALUES
- PROCESS
- COSTS
- TIMELINE
- LIABILITY

**DON'T COMPROMISE YOUR:**
- DESIGN
- ENERGY EFFICIENCY
- STRUCTURAL INTEGRITY
- PROFITABILITY
- QUALITY
- REPUTATION
Foam-Control® Nailbase

An easy to use one step insulation and nailable surface.

Foam-Control Nailbase consists of 7/16” Exposure I rated Oriented Strand Board (OSB) and UL Classified Foam-Control EPS rigid insulation. It is an ideal insulation and nailable surface for structural roof decks and walls. Stability and traffic resistance make Foam-Control Nailbase perfect for both residential/commercial roof decks and walls.

Advantages.
• Saves labor with one step installation
• Large size panels available
• Saves energy - no thermal breaks
• Outside installation - construction can occur without disruption of inside living areas

Benefits.
Foam-Control Nailbase provides both insulation and a nailable substrate for roofing or wall cladding materials. Foam-Control Nailbase installs quickly over structural roof decking and walls with screw connections. Standard roofing materials such as shingles, shakes, standing seam metal, tile, slate, etc., may be applied to Foam-Control Nailbase. Wood, vinyl, metal, stucco, etc., are all installable wall claddings over Foam-Control Nailbase.

Thickness/R-value.

<table>
<thead>
<tr>
<th>Thickness</th>
<th>R-value¹</th>
<th>75°F²</th>
<th>40°F³</th>
</tr>
</thead>
<tbody>
<tr>
<td>2”</td>
<td>6.6</td>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td>4”</td>
<td>14.2</td>
<td>15.4</td>
<td></td>
</tr>
<tr>
<td>6”</td>
<td>22.0</td>
<td>23.7</td>
<td></td>
</tr>
<tr>
<td>7 1/4”</td>
<td>28.8</td>
<td>31.0</td>
<td></td>
</tr>
<tr>
<td>9 1/4”</td>
<td>36.5</td>
<td>39.3</td>
<td></td>
</tr>
<tr>
<td>11 1/4”</td>
<td>44.2</td>
<td>47.7</td>
<td></td>
</tr>
</tbody>
</table>

¹ R-value units are °F·ft²·h/Btu.
² Recommended for design in WARM climates.
³ Recommended for design in COLD climates.

Proven to meet, or exceed, building codes.

Foam-Control Nailbase is manufactured under an industry leading quality control program monitored by UL and further recognized UL Evaluation Report UL ER11812-03.


CONTROL, NOT COMPROMISE.®

Foam face-off: Choosing Foam-Control Nailbase over other Nailbase products.
• EPS can easily vary density, thickness, and size to meet project R-values
• EPS is less-expensive than XPS and ISO products
• No CFC, HCFC, HFC, or formaldehyde in Foam-Control EPS
• No long-term R-value loss or thermal drift
• Foam-Control EPS with available to provide resistance to termites

Foam-Control Nailbase is also available with FrameGuard:

FrameGuard treatment for wood helps to resist mold, mildew and termite damage to its wood components.
Energy Code CI Requirements.

The use of continuous insulation is mandated by the 2012 International Energy Conservation Code (IECC). The IECC provides a prescriptive path for roof/ceiling insulation that includes the use of continuous insulation.

### IECC-2012 Prescriptive CI R-value

<table>
<thead>
<tr>
<th>Zone</th>
<th>Residential</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ceiling</td>
<td>Roof Above Deck</td>
</tr>
<tr>
<td>1</td>
<td>R-30</td>
<td>R-20ci</td>
</tr>
<tr>
<td>2</td>
<td>R-38</td>
<td>R-20ci</td>
</tr>
<tr>
<td>3</td>
<td>R-49</td>
<td>R-20ci</td>
</tr>
<tr>
<td>4 except Marine</td>
<td>R-49</td>
<td>R-25ci</td>
</tr>
<tr>
<td>5 and 4 Marine</td>
<td>R-49</td>
<td>R-25ci</td>
</tr>
<tr>
<td>6</td>
<td>R-49</td>
<td>R-30ci</td>
</tr>
<tr>
<td>7</td>
<td>R-49</td>
<td>R-35ci</td>
</tr>
<tr>
<td>8</td>
<td>R-49</td>
<td>R-35ci</td>
</tr>
</tbody>
</table>

Installation.

Installation shall be in strict accordance with published instructions, details, and drawings that are part of the contract documents for the project.

1. Foam-Control Nailbase must be installed over a structurally sound roof deck.

2. Apply vapor retarder as specified by a qualified design professional prior to the installation of the Foam-Control Nailbase.

Note: Climate conditions, code requirements, and building science dictate the use and position of vapor retarders within roof assemblies. Consult with local code officials and building science professional concerning the use of vapor retarders.

3. Install Foam-Control Nailbase and mechanically fasten with Foam-Control Screws as specified.

4. Install continuous wood blocking at perimeters, ridges, hips, and openings as specified.

5. Install roof cladding materials per manufacturer’s specifications and recommendations.

**Foam-Control Nailbase means control, not compromise.**

Foam-Control Nailbase is engineered to give you the greatest possible control for your insulation application: from design and timelines, to materials and costs, and—ultimately—control over your results. In the insulation industry, Foam-Control Nailbase is among the most versatile, energy efficient, and cost effective insulators available, delivering extremely high, stable R-values. Depend on Foam-Control Nailbase to do the job.

**Ready to take control? Start here.**

If you’re starting to wonder how Foam-Control Nailbase can contribute to your next project, here’s how to find out: Just contact your nearest Foam-Control Nailbase supplier. They’ll be happy to give you a design consultation, information about Foam-Control EPS products, pricing, and the answers to all your questions. Contact a sales rep and download Foam-Control Nailbase documentation at www.foam-control.com.
Foam-Control® Nailbase Vent-1

An easy to use one step insulation, roof deck venting, and nailable surface.

Foam-Control Nailbase Vent-1 consists of ⅝" Exposure I rated Oriented Strand Board (OSB) and UL Classified Foam-Control EPS rigid insulation with integral venting channels. It is an ideal insulation and vented nailable surface for structural roof decks. Stability, integral ventilation, and traffic resistance make Foam-Control Nailbase Vent-1 perfect for roof decks requiring ventilation.

Advantages.

• Saves labor with one step installation
• Integral venting channels
• Saves energy - no thermal breaks

Benefits.

Foam-Control Nailbase Vent-1 provides insulation, roof deck venting, and a nailable substrate for all roofing cladding materials. Foam-Control Nailbase Vent-1 installs quickly over structural roof decking with Foam-Control screws. Standard roofing materials such as shingles, shakes, standing seam metal, tile, slate, etc., may be applied to the OSB surface of Foam-Control Nailbase Vent-1.

Thickness/R-value.

<table>
<thead>
<tr>
<th>Thickness</th>
<th>R-value¹²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>75°F³</td>
</tr>
<tr>
<td>2&quot;</td>
<td>3.1</td>
</tr>
<tr>
<td>4&quot;</td>
<td>11.1</td>
</tr>
<tr>
<td>6&quot;</td>
<td>18.9</td>
</tr>
<tr>
<td>7 ⅛&quot;</td>
<td>25.7</td>
</tr>
<tr>
<td>9 ½&quot;</td>
<td>33.4</td>
</tr>
<tr>
<td>11 ½&quot;</td>
<td>41.1</td>
</tr>
</tbody>
</table>

¹ R-value units are °F·ft²·h/Btu.
² Based on 1" depth of vented air space.
³ Recommended for design in WARM climates.
⁴ Recommended for design in COLD climates.

Proven to meet, or exceed, building codes.

Foam-Control Nailbase Vent-1 is manufactured under an industry leading quality control program monitored by UL and further recognized UL Evaluation Report UL ERI1812-03.


Foam-Control Nailbase Vent-1 is also available with FrameGuard:

FrameGuard treatment for wood helps to resist mold, mildew and termite damage to its wood components.
Energy Code Ci Requirements.

The use of continuous insulation is mandated by the 2012 International Energy Conservation Code (IECC). The IECC provides a prescriptive path for roof/ceiling insulation that includes the use of continuous insulation.

<table>
<thead>
<tr>
<th>Zone</th>
<th>Residential</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ceiling</td>
<td>All other</td>
</tr>
<tr>
<td>1</td>
<td>R-30</td>
<td>R-20ci</td>
</tr>
<tr>
<td>2</td>
<td>R-38</td>
<td>R-20ci</td>
</tr>
<tr>
<td>3</td>
<td>R-49</td>
<td>R-20ci</td>
</tr>
<tr>
<td>4 except</td>
<td>R-49</td>
<td>R-25ci</td>
</tr>
<tr>
<td>Marine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 and 4 Marine</td>
<td>R-49</td>
<td>R-25ci</td>
</tr>
<tr>
<td></td>
<td>R-49</td>
<td>R-30ci</td>
</tr>
<tr>
<td>7</td>
<td>R-49</td>
<td>R-35ci</td>
</tr>
<tr>
<td>8</td>
<td>R-49</td>
<td>R-35ci</td>
</tr>
</tbody>
</table>

Installation.

Installation shall be in strict accordance with published instructions, details, and drawings that are part of the contract documents for the project.

1. Foam-Control Nailbase Vent-1 must be installed over a structurally sound roof deck.

2. Apply vapor retarder as specified by a qualified design professional prior to the installation of the Foam-Control Nailbase Vent-1 panel.

Note: Climate conditions, code requirements, and building science dictate the use and position of vapor retarders within roof assemblies. Consult with local code officials and building science professional concerning the use of vapor retarders.

3. Install Foam-Control Nailbase Vent-1 with venting channels parallel to the roof slope and mechanically fasten with Foam-Control Screws as specified.

4. Install continuous ventilated termination fixtures at all perimeters, ridges, hips, and openings that run perpendicular to the Foam-Control Nailbase Vent-1 venting channels.

5. Install continuous wood blocking at all perimeters and openings parallel to the Foam-Control Nailbase Vent-1 venting channels.

6. Install roof cladding materials per manufacturer’s specifications and recommendations.

Foam-Control Nailbase Vent-1 means control, not compromise.

Foam-Control Nailbase Vent-1 is engineered to give you the greatest possible control for your insulation and roof ventilation application: from design and timelines, to materials and costs, and—ultimately—control over your results. In the insulation industry, Foam-Control Nailbase Vent-1 is among the most versatile, energy efficient, and cost effective insulators available, delivering extremely high, stable R-values and integral roof ventilation. Depend on Foam-Control Nailbase Vent-1 to do the job.

Ready to take control? Start here.

If you’re starting to wonder how Foam-Control Nailbase Vent-1 can contribute to your next project, here’s how to find out: Just contact your nearest Foam-Control Nailbase Vent-1 supplier. They’ll be happy to give you a design consultation, information about Foam-Control EPS products, pricing, and the answers to all your questions. Contact a sales rep and download Foam-Control Nailbase Vent-1 documentation at www.foam-control.com.
Foam-Control® Nailbase Vent-2

An easy to use one step insulation, two-way roof deck venting, and nailable surface.

Foam-Control Nailbase Vent-2 consists of 7/16” Exposure I rated Oriented Strand Board (OSB) and UL Classified Foam-Control EPS rigid insulation with integral venting channels. It is an ideal insulation and vented nailable surface for structural roof decks. Stability, integral ventilation, and traffic resistance make Foam-Control Nailbase Vent-2 perfect for roof decks requiring two-way ventilation.

Advantages.
• Saves labor with one step installation
• Two-way integral venting channels
• Saves energy - no thermal breaks

Benefits.
Foam-Control Nailbase Vent-2 provides insulation, roof deck venting, and a nailable substrate for all roofing cladding materials. Foam-Control Nailbase Vent-2 installs quickly over structural roof decking with Foam-Control screws. Standard roofing materials such as shingles, shakes, standing seam metal, tile, slate, etc., may be applied to the OSB surface of Foam-Control Nailbase Vent-2.

Thickness/R-value.

<table>
<thead>
<tr>
<th>Thickness</th>
<th>R-value^1,2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>75°F^3</td>
</tr>
<tr>
<td>2”</td>
<td>2.9</td>
</tr>
<tr>
<td>4”</td>
<td>10.7</td>
</tr>
<tr>
<td>6”</td>
<td>18.5</td>
</tr>
<tr>
<td>7 1/4”</td>
<td>25.2</td>
</tr>
<tr>
<td>9 1/4”</td>
<td>32.9</td>
</tr>
<tr>
<td>11 1/4”</td>
<td>40.7</td>
</tr>
</tbody>
</table>

1 R-value units are °F·ft²·h/Btu.
2 Based on 1” depth of vented air space.
3 Recommended for design in WARM climates.
4 Recommended for design in COLD climates.

Proven to meet, or exceed, building codes.
Foam-Control Nailbase Vent-2 is manufactured under an industry leading quality control program monitored by UL and further recognized UL Evaluation Report UL ERI1812-03.

Choosing Foam-Control Nailbase Vent-2 over other Nailbase products.
• EPS can easily vary thickness to meet project R-values
• EPS is less-expensive than XPS and ISO products
• No CFC, HCFC, HFC, or formaldehyde in Foam-Control EPS
• No long-term R-value loss or thermal drift
• Foam-Control EPS with available to provide resistance to termites

Foam-Control Nailbase Vent-2 is also available with FrameGuard:
FrameGuard treatment for wood helps to resist mold, mildew and termite damage to its wood components.
Energy Code Ci Requirements.

The use of continuous insulation is mandated by the 2012 International Energy Conservation Code (IECC). The IECC provides a prescriptive path for roof/ceiling insulation that includes the use of continuous insulation.

<table>
<thead>
<tr>
<th>Zone</th>
<th>Residential Ceiling R-value</th>
<th>Residential Roof Above Deck R-value</th>
<th>Commercial All other R-value</th>
<th>Commercial Group R-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R-30</td>
<td>R-20ci</td>
<td>R-20ci</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>R-38</td>
<td>R-20ci</td>
<td>R-20ci</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>R-49</td>
<td>R-20ci</td>
<td>R-20ci</td>
<td></td>
</tr>
<tr>
<td>4 except Marine</td>
<td>R-49</td>
<td>R-25ci</td>
<td>R-25ci</td>
<td></td>
</tr>
<tr>
<td>5 and 4 Marine</td>
<td>R-49</td>
<td>R-25ci</td>
<td>R-25ci</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>R-49</td>
<td>R-30ci</td>
<td>R-30ci</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>R-49</td>
<td>R-35ci</td>
<td>R-35ci</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>R-49</td>
<td>R-35ci</td>
<td>R-35ci</td>
<td></td>
</tr>
</tbody>
</table>

Installation.

Installation shall be in strict accordance with published instructions, details, and drawings that are part of the contract documents for the project.

1. Foam-Control Nailbase Vent-2 must be installed over a structurally sound roof deck.

2. Apply vapor retarder as specified by a qualified design professional prior to the installation of the Foam-Control Nailbase Vent-2 panel.

Note: Climate conditions, code requirements, and building science dictate the use and position of vapor retarders within roof assemblies. Consult with local code officials and building science professional concerning the use of vapor retarders.

3. Install Foam-Control Nailbase Vent-2 and mechanically fasten with Foam-Control Screws as specified.

4. Install continuous ventilated termination fixtures at perimeters, ridges, hips, and openings as specified.

5. Install roof cladding materials per manufacturer’s specifications and recommendations.

Foam-Control Nailbase Vent-2 means control, not compromise.

Foam-Control Nailbase Vent-2 is engineered to give you the greatest possible control for your insulation and roof ventilation application: from design and timelines, to materials and costs, and—ultimately—control over your results. In the insulation industry, Foam-Control Nailbase Vent-2 is among the most versatile, energy efficient, and cost effective insulators available, delivering extremely high, stable R-values and integral roof ventilation. Depend on Foam-Control Nailbase Vent-2 to do the job.

Ready to take control? Start here.

If you’re starting to wonder how Foam-Control Nailbase Vent-2 can contribute to your next project, here’s how to find out: Just contact your nearest Foam-Control Nailbase Vent-2 supplier. They’ll be happy to give you a design consultation, information about Foam-Control EPS products, pricing, and the answers to all your questions. Contact a sales rep and download Foam-Control Nailbase Vent-2 documentation at www.foam-control.com.
Foam-Control® EPS
Perimeter / Underslab

Superior moisture resistance, stable R-value, and termite resistance to protect your insulation integrity.

Foam-Control EPS with Perform Guard® is a cost-effective, durable, and energy efficient solution for below grade insulation applications. It is an ideal material to stop energy loss at the foundation or slab. Foam-Control EPS with Perform Guard is a proven material with built in protection against the destructive force of termites. Foam-Control EPS is available in thicknesses to meet your local R-5, R-7.5, and R-10 insulation requirements.

Advantages.
- Saves energy
- Meets code requirements for below-grade use
- No long-term R-value loss or thermal drift
- No CFC, HCFC, HFC, or formaldehyde
- Superior moisture resistance
- Retains R-value even with moisture exposure
- Retains R-value after freeze-thaw cycling

Strength/R-value.

<table>
<thead>
<tr>
<th>Compressive Strength1, psi</th>
<th>R-value/inch2</th>
<th>75°F3</th>
<th>40°F4</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>15</td>
<td>4.2</td>
<td>4.6</td>
</tr>
<tr>
<td>250</td>
<td>25</td>
<td>4.4</td>
<td>4.8</td>
</tr>
<tr>
<td>400</td>
<td>40</td>
<td>4.4</td>
<td>4.8</td>
</tr>
<tr>
<td>600</td>
<td>60</td>
<td>4.5</td>
<td>4.9</td>
</tr>
</tbody>
</table>

1 Compressive strength @ 10% deformation.
2 R-value units are °F·ft²·h/Btu.
3 Recommended for design in WARM climates.
4 Recommended for design in COLD climates.

Proven to meet, or exceed, building codes.

Foam-Control EPS is manufactured under an industry leading quality control program monitored by UL and further recognized in ICC-ES Evaluation Report ER-1006 and UL Evaluation Report UL ER11812-01.


Foam-Control with Perform Guard meets ICC ES AC239, “Acceptance Criteria for Termite-Resistant Foam Plastics”.

Foam Control, NOT COMPROMISE.®

Foam face-off:
Choosing Foam-Control EPS with Perform Guard over XPS, Polyiso, and untreated EPS.

- EPS can easily vary density, thickness, and size
- EPS is less expensive than XPS and ISO
- Foam-Control EPS with Perform Guard is recognized in an ICC ES report as termite resistant and others are not
- Meets ICC ES EG239 requirements for termite resistance foam plastic
- Suitable for use in all areas of termite risk

* Perform Guard is not a barrier, but should be used in conjunction with a total Pest Management Program available from a reputable Pest Control Operator.
Stands up to the weather.
When tested in accordance with ASTM C1512, “Standard Test Method for Characterizing the Effect of Exposure to Environmental Cycling on Thermal Performance of Insulation Products” EPS maintains its R-value and strength after severe exposure to freeze-thaw cycles.

Problem.
Termites love to live, work, and eat in comfortable and protected surroundings. All untreated insulations can potentially provide this environment. Most of the U.S. is susceptible to termite activity. It is important that insulation products and systems account for the potential of termite infestation.

- Termites reduce insulation & system performance
- Termites cause problems for structural systems
- Costs to control termites can continue indefinitely

Termite Damaged Untreated Foams

Termite Infestation Risk.
Ready to take control? Start here.
If you’re starting to wonder how Foam-Control EPS with Perform Guard can contribute to your next project, here’s how to find out: Just contact your nearest Foam-Control EPS manufacturer. They’ll be happy to give you a design consultation, information about Foam-Control EPS products, pricing, and the answers to all your questions. Contact a sales rep and download Foam-Control EPS documentation at www.foam-control.com.

Testing.
Extensive research has been conducted to: find an effective additive that would deter termites, develop processes for the incorporation of the additive into EPS, and “test prove” and “field prove” the efficacy of the Foam-Control EPS with Perform Guard.
**Below Grade/Underslab Tech Data**

Foam-Control EPS (expanded polystyrene) is an architectural grade closed cell, moisture resistant rigid foam used for below grade/underslab construction applications. Foam-Control EPS conforms to ASTM C578, “Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation”.

Foam-Control EPS is manufactured under an industry leading quality control program monitored by UL and further recognized in ICC-ES Evaluation Report ER-10016 and UL Evaluation Report UL ER11812-01.

<table>
<thead>
<tr>
<th>Product</th>
<th>FOAM CONTROL 150</th>
<th>FOAM CONTROL 250</th>
<th>FOAM CONTROL 400</th>
<th>FOAM CONTROL 600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Strength(^1,2) @ 10% deformation, min. ASTM D1621</td>
<td>psi (kPa)</td>
<td>15 (104)</td>
<td>25 (173)</td>
<td>40 (276)</td>
</tr>
<tr>
<td>R-value(^1), Thermal Resistance, per inch, ASTM C518</td>
<td>°F·ft(^2)·h/Btu (°K·m(^2)/W)</td>
<td>25°F</td>
<td>4.8 (0.84)</td>
<td>5.0 (0.88)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40°F</td>
<td>4.6 (0.80)</td>
<td>4.8 (0.84)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75°F</td>
<td>4.2 (0.73)</td>
<td>4.4 (0.77)</td>
</tr>
<tr>
<td>Density, Nominal ASTM C303</td>
<td>lb/ft(^3) (kg/m(^3))</td>
<td>1.5 (24)</td>
<td>2.0 (32)</td>
<td>2.5 (40)</td>
</tr>
<tr>
<td>Flexural Strength(^1), min. ASTM C203</td>
<td>psi (kPa)</td>
<td>35 (242)</td>
<td>50 (345)</td>
<td>60 (414)</td>
</tr>
<tr>
<td>Water Vapor Permeance(^1) of 1.0 in. thickness, max., perm ASTM E96</td>
<td></td>
<td>3.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Water Absorption(^1) by total immersion, max., volume % ASTM C272</td>
<td></td>
<td>3.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Flame Spread ASTM E84</td>
<td></td>
<td>&lt;25</td>
<td>&lt;25</td>
<td>&lt;25</td>
</tr>
<tr>
<td>Smoke Developed ASTM E84</td>
<td></td>
<td>&lt;450</td>
<td>&lt;450</td>
<td>&lt;450</td>
</tr>
<tr>
<td>ASTM C578 Compliance, Type</td>
<td></td>
<td>II</td>
<td>IX</td>
<td>XIV</td>
</tr>
</tbody>
</table>

\(^1\) Please refer to ASTM C578 specification for complete information.

\(^2\) Compressive strength is measured at 10 percent in accordance with ASTM C578. A safety factor is required to prevent long-term creep for sustained loads. For static loads, a safety factor of 3:1 is recommended.
**Thermal Performance.**
The R-value of Foam-Control EPS remains constant and does not suffer from R-value loss. The closed cell structure of Foam-Control EPS contains air and not blowing agents which deplete over time.

**Exposure to Water and Water Vapor.**
The mechanical properties of EPS are unaffected by moisture. Exposure to water or water vapor does not cause swelling.

**Temperature Exposure/Flame Retardants.**
EPS is able to withstand the rigors of temperature cycling, assuring long-term performance.

Although flame retardants used in the manufacture of EPS provide an important margin of safety, all EPS products must be considered combustible.

The maximum recommended long-term exposure temperature for Foam-Control EPS is 165°F (74°C).

**Weathering.**
Long-term exposure to sunlight causes yellowing and a slight embrittlement of the surface due to ultraviolet light. This has little effect on mechanical properties. If stored outdoors, cover EPS with opaque polyethylene film, tarps, or similar material.

**Resistance to Termites, Mold, and Mildew.**
Foam plastic insulations have been shown to become termite infested under certain exposure conditions. Foam-Control EPS with Perform Guard® provides resistance to termite infestation. Please review literature on Foam-Control EPS with Perform Guard for complete information.

EPS will not decompose and will not support mold or mildew growth. EPS provides no nutrient value to plants or animals.

**Adhesives, Coatings, and Chemicals.**
Solvents which attack EPS include esters, ketones, ethers, aromatic, and aliphatic hydrocarbons and their emulsions, among others. If EPS is to be placed in contact with materials (or their vapors) of unknown composition, pretest for compatibility at maximum exposure temperature.

Do not install or use EPS with coal tar pitch, highly solvent-extended mastics, or solvent-based adhesives without adequate separation.

**Warranty.**
Foam-Control EPS Licensees offer a product warranty ensuring thermal performance, physical properties, and termite resistance.
FOAM-CONTROL EPS

ROOF INSULATIONS

CONTROL,
NOT COMPROMISE.
AT THE ROOF LINE, YOU’RE IN CONTROL WITH FOAM-CONTROL EPS ROOF INSULATIONS.


Foam-Control EPS Roof Insulations are engineered to give you the greatest possible control for your roofing system application: from design and timelines, to materials and costs, and—ultimately—control over your results. The advantages to using Foam-Control EPS Roof Insulations:

- State-of-the-art insulation and energy efficiency
- 20 year warranted stable R-value: no thermal drift like XPS or ISO
- Unlimited fabrication available:
  Tapered and Coverboards
- Variety of density, thickness, and size
- Meets ASTM C578
- Building code recognized
- UL QA monitored, tested, certified, listed
- FM Approved
- Single-Ply, MOD-BIT, and BUR compatible
- Perform Guard® termite protection available
- Contains no CFC, HCFC, or HFC blowing agents
- Cost effective
- Recyclable

This looks like a job for expanded polystyrene.

In the roofing industry, Foam-Control EPS Roof Insulations are among the most versatile, energy efficient, and cost effective insulators available, delivering extremely high, stable R-values. Depend on Foam-Control EPS to do the job as flat stock or tapered with labor-saving factory or field applied face laminates. Foam-Control EPS Roof Insulations are compatible with single-ply, modified bitumen, or built-up roofing.

<table>
<thead>
<tr>
<th>Foam-Control EPS R-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness, Inches</td>
</tr>
<tr>
<td>Type II</td>
</tr>
<tr>
<td>Type VIII</td>
</tr>
<tr>
<td>Type I</td>
</tr>
</tbody>
</table>

Note: Typical thicknesses and R-value at 40º F shown. Other thicknesses and Types can be supplied to meet any R-value requirement.

Stands up to the elements, yet it’s good for the environment.

Foam-Control EPS, when used as a component in an engineered roofing system, helps to resist some of the toughest conditions nature can deliver, like rain, snow, wind, heat, and cold.

Proven to meet, or exceed, building codes.

Foam-Control EPS is manufactured to Quality Control Program standards monitored by Underwriters Laboratories, Inc. and recognized by national building codes. Foam-Control EPS manufacturers offer product warranties that ensure thermal performance, physical properties, and termite resistance. Foam-Control EPS can stand up to all industry tests— and has. No other EPS can say that.

Direct to metal deck.

Foam-Control EPS Roof Insulations are building code recognized for direct to metal deck roofing assemblies.
Why Drain a Roof?
The roofing industry accepts that membrane performance and roof drainage go hand in hand. Membrane manufacturers will not guarantee the performance of their system without positive drainage and building codes mandate positive roof drainage.

With Foam-Control EPS, you’re in control of roof drainage.

Foam-Control EPS Tapered provides the drainage and insulation necessary under all commercial roofing systems and has been used successfully in millions of square feet of single-ply, modified bitumen, and built-up roofing.

Foam-Control EPS Tapered is offered in a one-layer, integral compound system or modular format, both offering optimum design flexibility for the architect and saves the roofer/applicator time and labor.

Also, pre-engineered factory cut cricket and saddle systems provide effective and economical drainage on structurally sloped roof decks.

Get Control of:
- Roof drainage
- Leakage problems
- Ice damage to membrane
- Stresses from ponding water
- Damaging vegetation growth

CONTROL, NOT COMPROMISE.

Foam face-off: Choosing Foam-Control EPS over XPS and ISO.

- EPS can easily vary density, thickness, and size
- EPS is less-expensive than XPS and ISO
- EPS is more easily fabricated for tapering
- EPS allows for more design possibilities
- EPS has a better R-value warranty
- EPS with Perform Guard™ protects against termites

* Perform Guard is not a barrier, but should be used in conjunction with a total Pest Management Program available from a reputable Pest Control Operator.
It’s more than a foam. It’s a family.
When you choose Foam-Control EPS, you’re not sending your order off to some mysterious factory. You’re collaborating with a team of experts who work with you every step of the way. We’re here to answer your questions, solve your problems, and do everything we can to make sure your project proceeds smoothly—and ends successfully.

Foam-Control EPS products are manufactured by AFM Corporation’s network of licensed manufacturers throughout North America and the world. AFM licensed facilities adhere to strict, consistent standards to ensure uniformly high-quality EPS products.

This network allows us to offer architects, designers, distributors, and roofer/applicators the best of both worlds: the resources of the country’s largest provider of EPS insulation products and systems, and the superior attention and customer service of a local supplier.

Ready to take control? Start here.
If you’re starting to wonder how Foam-Control EPS roof insulation can contribute to your next project, here’s how to find out: Just contact your nearest Foam-Control EPS manufacturer. They’ll be happy to give you a design consultation, information about Foam-Control EPS roof insulation products, pricing, calculating insulation requirements and slope design, and the answers to all your questions.

Specifications and Installation Guidelines.
Contact a sales rep and download Foam-Control EPS documentation at www.foam-control.com. Please consult Foam-Control EPS Roof Insulations TechData for complete Specifications and Installation guidelines.
SECTION 07 21 13.13
FOAM BOARD INSULATION

PART 1 GENERAL

1.01 SUMMARY
   A. Section includes rigid expanded polystyrene (EPS) insulation.
      1. Types of rigid expanded polystyrene include:
         a. Foam-Control EPS

1.02 REFERENCES
   C. ICC ES AC12 – Acceptance Criteria for Foam Plastic Insulation.

1.03 SUBMITTALS
   A. Submit insulation manufacturer’s product literature and installation instructions, including:
      1. Physical properties in compliance with ASTM C578 Type specified.
      3. Third Party certification of flame spread and smoke developed indexes
   B. 20-year in-service, non-prorated thermal performance warranty.

1.04 DELIVERY, STORAGE & HANDLING
   A. Deliver insulation in packages labeled with material Type and R-value.
   B. Store in original unopened packaging above ground, and protected from moisture and sunlight prior to installation.
   C. Product should not be exposed to open flame or other ignition sources.

1.05 WARRANTY
   A. Provide Foam-Control EPS 20-year in-service, non-prorated R-value warranty covering the long-term thermal performance of expanded polystyrene insulation.

PART 2 PRODUCTS

2.01 MATERIAL COMPATIBILITY
   A. The insulation must be compatible with all components of the intended application.

2.02 MANUFACTURERS/SUPPLIERS:
   ***Note to Specifier*** Select the name and address of the local Licensed Foam-Control EPS Manufacturers/Suppliers.
   A. ACH Foam Technologies, LLC, 5250 North Sherman St., Denver, CO 80216
   B. ACH Foam Technologies, LLC, 111 W. Fireclay Ave., Murray, UT 84107
   C. ACH Foam Technologies, LLC, 775 Waltham Way, Suite 105, McCarran, NV 89434
   D. ACH Foam Technologies, LLC, 90 Trowbridge Drive, Fond du Lac, WI 54936-0660
   E. ACH Foam Technologies, LLC, 4001 Kaw Drive, Kansas City, KS 66102
   F. ACH Foam Technologies, LLC, 1418 Cow Palace Road, Newton, KS 67114
   G. ACH Foam Technologies, LLC, 809 East 15th Street, Washington, IA 52353
   H. ACH Foam Technologies, LLC, 2731 White Sulphur Road, Gainesville, GA 30501
   I. Big Sky Insulations, Inc., 15 Arden Drive, Belgrade, MT 59714
   J. Branch River Plastics, Inc., 15 Thurber Boulevard, Smithfield, RI 02917
2.03 INSULATION
   A. Foam-Control EPS in compliance with ASTM C578.
   B. Foam-Control EPS with flame spread of less than 25 and a smoke developed index of less than 450
   C. Select one or more of the Insulation Types from the listings as follows, as required by the project:
      1. Foam-Control EPS Insulation: ASTM C578 [Type I, 0.90 pcf min.], [Type VIII, 1.15 pcf min.], [Type II, 1.35 pcf min.], [Type IX, 1.80 pcf min.].
         a. Thickness _____.
         b. R-value _____.

2.04 THERMAL BARRIER
   A. A thermal barrier must be installed as required by code.

***Note to Specifier*** Some applications may not require a thermal barrier. For these applications, please refer to ICC ES report.

PART 3 EXECUTION

3.01 INSTALLATION
   A. Installation: [ Specify instructions to suit project requirements. ]

END OF SECTION
DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
SECTION: 06 12 00—STRUCTURAL PANELS

REPORT HOLDER:

AFM CORPORATION
17645 JUNIPER PATH, SUITE 260
LAKEVILLE, MINNESOTA 55044

EVALUATION SUBJECT:

R-CONTROL® STRUCTURAL INSULATED PANELS (SIPS)
DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 12 00—Structural Panels

REPORT HOLDER:
AFM CORPORATION
17648 JUNIPER PATH, SUITE 260
LAKEVILLE, MINNESOTA 55044
www.r-control.com

EVALUATION SUBJECT:
R-CONTROL® STRUCTURAL INSULATED PANELS (SIPs)

ADDITIONAL LISTEES:
ACH FOAM TECHNOLOGIES, LLC
5250 NORTH SHERMAN STREET
DENVER, COLORADO 80216

BIG SKY INSULATIONS, INC.
15 ARDEN DRIVE
BELGRADE, MONTANA 59714

BRANCH RIVER PLASTICS, INC.
15 THURBER BOULEVARD
SMITHTOWN, RHODE ISLAND 02891

GEOFAZE, LLC
8276 HIGHWAY 27
KERRVILLE, TEXAS 78028

NOARK ENTERPRISES, INC.
10101 HIGHWAY 70 EAST
NORTH LITTLE ROCK, ARKANSAS 72117

THERMAL FOAMS, INC.
2101 KENMORE AVENUE
BUFFALO, NEW YORK 14207

1.0 EVALUATION SCOPE
Compliance with the following codes:
- 2012, 2009 and 2006 International Residential Code® (IRC)
- 2013 Abu Dhabi International Building Code (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Properties evaluated:
- Structural
- Thermal barrier
- Fire resistance

2.0 USES
R-Control Structural Insulated Panels (SIPs) are used as load-bearing wall, floor, and roof panels in fire-resistive and non-fire-resistive construction. The SIPs are alternatives to walls, floors, and roofs designed and constructed in accordance with IBC Section 2306; and walls, floors, and roofs installed in accordance with IRC Section 2308 or IRC Sections R502, R602, and R802. When R-Control SIPs are installed under the IRC, an engineered design is required in accordance with IRC Section R301.1.3 and Section 4.1.1 of this report. Use of the panels under 2012 and 2009 IRC Section R613 is outside scope of this evaluation report.

3.0 DESCRIPTION
3.1 General:
R-Control SIPs are factory-laminated sandwich panels consisting of oriented strand board (OSB) facings with an expanded polystyrene (EPS) foam plastic core. R-Control SIPs vary in width from 4 to 8 feet (1.2 m to 2.4 m) and in length from 8 to 24 feet (2.4 m to 7.2 m).

3.2 Materials:
3.2.1 Expanded Polystyrene: The EPS foam plastic core is foam-Control EPS with Perform Guard, which is recognized in ESR-1006 and complies with ASTM C578, Type I. EPS core nominal thickness is 3/16, 5/16, 7/16, 9/16, or 11/16 inches.
3.2.2 Facing: The facing material is nominally 7/16-inch-thick, Exposure 1 OSB rated sheathing with a 25/6 span rating, which complies with U.S. DOC PS2 and additional requirements as specified in the approved quality control manual. The OSB facings are continuous for each SIP. The OSB may be Blazeguard FR Deck Panel A, recognized in ESR-1365. The OSB facings are supplied by manufacturers listed in the approved quality documentation.
3.2.3 Adhesive: Adhesives comply with Type II, Class 2, performance requirements set forth in the ICC-ES Acceptance Criteria for Sandwich Panel Adhesives (AC05). The adhesives are supplied by manufacturers listed in the approved quality documentation.
3.2.4 Splines: Splines are identified as surface, block, lumber block, lumber, or I-beam type splines. Spline thickness equals the EPS core thickness of the SIPs to be joined, except for surface splines, which have a thickness of 7/16 inch (11.1 mm).

Surface splines are 4-inch-wide-by-7/16-inch-thick
(102 mm by 11.1 mm) OSB as described in Section 3.2.2.

Block splines consist of two 3-inch-wide-by-1/4-inch-thick (78 mm by 11.1 mm) OSB facings as described in Section 3.2.2, laminated to an EPS core. Block splines are manufactured in depths of 3 1/2, 5 1/2, 7 3/4, 9 3/4, 11 1/2 inches (98, 133, 184, 235, and 286 mm) as specified in the approved quality control manual.

Lumber block splines consist of two nominally 1-by-4 spruce-pine-fir No. 2 grade or better wood members laminated to an EPS core. Lumber block splines are manufactured in depths of 3 1/2, 5 1/2, 7 3/4, 9 3/4, and 11 1/2 inches (98, 133, 184, 235, and 286 mm) as specified in the approved quality control manual.

Lumber splines consist of solid sawn lumber, nominally 2-by-4 or 4-by-4 spruce-pine-fir No. 2 or better wood members, or, when justified by the structural design professional, equivalent engineered wood material.

I-beam splines are single-web I-joints manufactured in depths of 9 3/4 and 11 1/2 inches (235 and 286 mm) with minimum 1/2-inch-by-2 1/2-inch (38 mm by 63.5 mm) laminated veneer lumber flanges, as specified in the approved quality control manual.

3.2.5 R-Control SIP Screws: R-Control SIP screws are used to fasten R-Control SIPS to underlying supports for horizontal diaphragms. R-Control SIP screws are corrosion-resistant steel screws having a minimum Shank diameter of 0.188 inch (4.7 mm) and a minimum head diameter of 0.620 inch (15.5 mm). Screws are available in lengths from 3 inches to 18 inches (76.2 mm to 457.2 mm). The thread length for all screws is 2 1/4 inches (70 mm) measured from the tip. R-Control SIP Screws are manufactured as specified in the approved quality control manual.

3.2.6 R-Control Low VOC Do-All-Ply: R-Control Low VOC Do-All-Ply is specified as a sealant during installation of R-Control SIPS. R-Control Do-All-Ply is applied to the splines as indicated in the figures of this report. R-Control Low VOC Do-All-Ply is manufactured as specified in the approved quality control manual. Packaged in 20-ounce (628 ml) sausages, the sealant has a nine-month shelf life.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 R-Control SIP Walls, Floors, and Roofs: R-Control SIPS are limited to the allowable loads and loading conditions indicated in Tables 3 through 9 of this report. The allowable loads shown in these tables are the allowable loads of the R-Control SIPS only and do not include consideration of the elements supporting the SIPS, which must be designed, detailed and constructed to comply with the requirements of the IBC or IRC, as applicable.

The seismic-force-resisting system of structures consisting of the panels as shear walls, in whole or in part, must be designed and detailed in accordance with IBC Sections 2305 and 2306.

Where loading conditions result in the panels resisting combined stresses, the sum of the ratios of actual load over allowable load must be less than 1.0.

4.1.2 R-Control SIP Headers: Openings in R-Control SIP walls are limited to sizes, spans and the allowable loads specified in Table 10. Openings not covered by Table 10 must be framed to comply with requirements in the IBC or IRC, as applicable.

4.2 Installation:

4.2.1 General: R-Control SIPS must be installed in accordance with the manufacturer's published installation instructions, this evaluation report and the plans and specifications approved by the code official. The manufacturer's published installation instructions and this report must be strictly adhered to, and a copy of the instructions must be available at all times on the jobsite during installation.

Panels must be connected to each other along their edges with splines described in Section 3.2.4. Splines must be connected to the SIPs by fastening through the SIP OSB facing as specified by the applicable tables in this report.

4.2.2 Walls: The SIP core is typically recessed either 1/2 inches (38 mm) or 3/4 inches (99 mm) from the bottom and top panel edges. The recesses receive either nominally 2-by or 4-by spruce-pine-fir No. 2 or better bottom and top plates in a width matching the core thickness. R-Control Low VOC Do-All-Ply is applied to the plates as indicated in the figures of this report. Bottom and top plates must be fastened to the facings with 8d box nails at 6 inches (152 mm) on center as indicated in the tables, or in an equivalent, approved fashion.

The SIP core is recessed on the vertical sides to receive splines or vertical boundary members. R-Control Low VOC Do-All-Ply is applied to the splines as indicated in the figures of this report.

The SIP may have factory-cut, 1 1/2-inch-diameter (38 mm) wiring chases centered within the core: a horizontal chase at receptacles height, a horizontal chase at switch height, and vertical chases spaced a minimum of 48 inches (1219 mm) from one another.

4.2.3 Floors and Roofs: R-Control SIPS used for floors or roofs are a maximum of 8 feet (2.4 m) wide when joined with surface splines, block splines, or lumber block splines, and are a maximum of 4 feet (1.2 m) wide when joined with other splines described in Section 3.2.4 of this report. The SIP core is recessed to receive splines. R-Control Low VOC Do-All-Ply is applied to the splines as indicated in the figures of this report.

4.2.4 Headers: R-Control SIP headers must be constructed as described in Table 10 and the figures of this report.

4.2.5 SIP Protection:

4.2.5.1 Thermal Barrier at Wall, Roof and Floor: One-half-inch-thick (12.7 mm), regular gypsum wallboard, complying with ASTM C36 or ASTM C1395, must be installed on the interior surface of wall and roof panels, and the bottom side of floor panels having occupied space below the floor panel. The wallboard must be fastened to the face of the panels with minimum 1/4-inch-long (31.7 mm), No. 6, Type W drywall screws installed in accordance with ASTM C840 for use under the IBC, or Table R702.3.5 of the IRC, using 16-inch-on-center (406.4 mm) framing spacing guidelines. Alternatively, the interior of the R-Control SIP must be Blazeguard FR Deck Panel A in accordance with Section 3.2.2 of this report.

4.2.5.2 Thermal Barrier at Floor Surface: An approved thermal barrier must be installed over the top surface of the floor panels, such as minimum 1/4-inch-thick (76 mm) wood-based structural use sheathing installed in accordance with the applicable code.

4.2.5.3 Roof Exterior: R-Control SIPS must be protected by a roof covering, underlayment, and flashing installed in accordance with the IBC or IRC, as applicable, as indicated for 1/4-inch-thick (11 mm) solidly sheathed decks.
4.2.5.4 Wall Exterior: R-Control SIPs must be protected on the exterior by weather protection consisting of a water-resistant barrier and wall covering as required by the IBC or IRC, as applicable.

4.2.6 Fire-resistance-rated Assemblies:

4.2.6.1 One-hour Limited Load-bearing Wall Assembly: R-Control SIPs with thicknesses of 4\(\frac{1}{2}\)", 6\(\frac{1}{2}\)" or 8\(\frac{1}{4}\)" inches (114, 165, or 210 mm) are used to construct a one-hour fire-resistance-rated wall assembly. The SIP core is recessed 1\(\frac{1}{2}\) inches (38 mm) from the bottom SIP edge and 1\(\frac{1}{2}\) inches (38 mm) from the top SIP edge. The recesses receive nominally 2-by-6 spruce-pine-fir No. 2 or better lumber bottom and top plates with a depth to match the core thickness. The plates must be connected to the SIPs by fastening through the SIP OSB facing with 8d box nails spaced 6 inches (152 mm) on center, on each side of the SIP.

The SIP core is recessed on the vertical sides to receive surface or block splines in accordance with Section 3.2 of this report. R-Control Low VOC Do-All-Ply is applied to the splines as indicated in the figures of this report. The splines must be connected to the SIPs by fastening through the SIP OSB facing with 1\(\frac{1}{2}\)"-inch-long (41.3 mm), Type W, self-piercing tapping screws (ASTM C1002) spaced 6 inches (152 mm) on center.

The SIPs must be covered with two layers of 5\(\frac{1}{4}\)-inch-thick (15.0 mm) Type X gypsum wallboard, complying with ASTM C1396, on each side. Where the panels are exposed to the exterior, the exterior layers of gypsum boards must be 5\(\frac{1}{4}\)-inch-thick (15.9 mm), Type X gypsum sheathing complying with ASTM C1396. The vertical joints of the first layer of gypsum board must be offset a minimum of 16 inches (406 mm) from the spline joint. The first layer of gypsum board must be fastened to the panel facing with 1\(\frac{1}{2}\)"-inch-long (41.28 mm), Type W, self-piercing tapping screws complying with ASTM C1002, spaced 24 inches (610 mm) on center vertically and 16 inches (406 mm) on center horizontally. The second layer of gypsum board must be installed with 2-inch-long (50.8 mm), Type W, self-piercing tapping screws complying with ASTM C1002, spaced 12 inches (305 mm) on center vertically, in rows offset 12 inches (305 mm) from screws securing the first layer of gypsum board, and 16 inches (406 mm) on center horizontally, in rows offset 8 inches (203 mm) from screws securing the first layer of gypsum board. The vertical joints in the second layer of gypsum board must be offset a minimum of 16 inches (406 mm) from vertical joints of the first layer of gypsum board.

Exposed gypsum board joints must be covered with joint tape and joint compound and the exposed screw heads covered with joint compound in accordance with ASTM C840.

This fire-resistance-rated wall assembly is limited to 9 feet (2.7 m) in height and a maximum superimposed allowable axial compression load of 1,800 psf (26 kN/m).

4.2.6.2 One-hour Limited Load-bearing Wall Assembly: R-Control SIPs with a 6\(\frac{1}{2}\)- or 8\(\frac{1}{4}\)-inch thickness (165 or 210 mm) may be used to construct a one-hour fire-resistance-rated wall assembly. The SIPs have a maximum width of 4 feet (2.4 m). The SIP core is recessed 1\(\frac{1}{2}\) inches (38 mm) from the bottom panel edge and 3 inches (76 mm) from the top panel edge. The recesses receive nominally 2-by-6 or 2-by-8 wood plates with a minimum 0.43 specific gravity, such as hem-fir, Grade No. 2. The SIP core is recessed 1\(\frac{1}{2}\) inches (38 mm) on the vertical sides to receive nominally 2-by-6 or 2-by-8 wood splines.

The bottom plate must be connected to the SIPs by fastening through the SIP OSB facing with 8d box nails spaced 6 inches (152 mm) on center, on each side of the SIP. Two nominally 2-by-6 or 2-by-8 wood splines must be fastened together with 16d coated sinker nails spaced 24 inches (609.6 mm) on center and staggered. R-Control Low VOC Do-All-Ply is applied to the splines as indicated in the figures of this report. The 2-by-6 or 2-by-8 wood splines must be connected to the SIPs by fastening through the SIP OSB facing with 8d box nails, spaced 6 inches (152 mm) on center.

The top plate must be two nominally 2-by-6 or 2-by-8 wood plates fastened together with 16d coated sinker nails, spaced 16 inches (406.4 mm) on center and staggered. R-Control Low VOC Do-All-Ply is applied to the splines as indicated in the figures of this report. The top plate must be connected to the SIPs by fastening through the SIP OSB facing with 8d box nails spaced 6 inches (152 mm) on center placed through the SIP facing.

Electrical chases, 1\(\frac{1}{2}\) inches (38.1 mm) in diameter, are permitted to be located horizontally in the core of the SIP, 16 inches (406.4 mm) and 45 inches (1142 mm) above the bottom of the wall.

The SIP must be covered with one layer of 5\(\frac{1}{4}\)-inch-thick (15.88 mm) Temple-Inland Type TG-C gypsum board applied vertically on each side and fastened with phosphate-coated, cupped-head drywall nails, 1\(\frac{3}{4}\) inches (41.28 mm) long, spaced 8 inches (203 mm) on center along the perimeter of the wallboard and 12 inches (305 mm) on center vertically and 16 inches (406.4 mm) on center horizontally in the field of the board. The exposed joints of the gypsum board must be covered with joint tape and compound, and the exposed nails must be covered with joint compound in accordance with ASTM C840.

The fire-resistance-rated wall assembly is limited to 10 feet (3 m) in height and a superimposed allowable axial compression load of 2,200 psf (32 kN/m).

4.2.6.3 One-hour Roof-ceiling Assembly: The one-hour fire-resistance-rated roof-ceiling assembly must comply with the following requirements:

1. Structural wood beams must be a minimum of 4\(\frac{1}{2}\) inches wide by 9\(\frac{1}{2}\) inches deep (114 mm by 241 mm) and must be spaced in accordance with the IBC or IRC, as applicable.

2. The roof covering material must comply with the IBC. The roof construction must comply as a Class A, B or C roof assembly.

3. R-Control SIPs must be 4\(\frac{1}{2}\) inches to 12\(\frac{1}{4}\) inches (114 mm to 286 mm) thick.

4. R-Control SIPs must be connected with nominally 2-inch lumber splines installed in the recessed core. The lumber depth must be sized to match the core and must be connected to the SIP by fastening through the OSB facing with 8d common nails spaced 6 inches (152 mm) on center.

5. Each exposed SIP edge must be covered with nominally 2-inch wood blocking installed in the recessed core and connected to the SIP by fastening through the OSB facing with 8d common nails spaced 6 inches (152 mm) on center.

6. Minimum 5\(\frac{1}{4}\)-inch-thick (15.9 mm) gypsum board complying with ASTM C1396 must be installed in two layers on the underside of the SIPs and wood beams. The gypsum board's long dimension must be installed perpendicular to the wood beams. The first layer must
be connected using $1\frac{1}{4}$-inch-long (31.7 mm), Type S, bugle-head steel screws complying with ASTM C1002, spaced 8 inches (203 mm) on center along the joints and in rows spaced 16 inches (406 mm) on center in the field. The joints of the first layer of gypsum board must be staggered from the joints of the SIPs. The second layer of gypsum board must be fastened using 2-inch-long (51 mm), bugle-head, Type W, self-piercing steel screws complying with ASTM C1002, spaced 8 inches (203 mm) on center along the board edges and in rows 12 inches (305 mm) on center in the field. The joints of the gypsum board second layer must be staggered from the joints of the gypsum board first layer.

7. Exposed gypsum board joints must be covered with paper tape and joint compound. Screw heads must be covered with joint compound in accordance with ASTM C840.

4.2.6.4 One-hour Roof-ceiling Assembly: The one-hour fire-resistance-rated roof-ceiling assembly must comply with the following requirements.

1. Open web steel joist must be Type 10K1, minimum size, and must be designed, constructed and installed in accordance with the Steel Joist Institute (SJI) specifications for open web joist and joist girders, as referenced in Section 2206 of the IBC.

2. The roof covering material must comply with the IBC. The roof construction must comply as a Class A, B or C roof assembly.

3. R-Control SIPs must be 4$\frac{1}{2}$ inches to 12$\frac{1}{2}$ inches (114 mm to 286 mm) thick.

4. Splines must be OSB surface splines complying with Section 3.2.2 of this report, and must be connected to the SIPs by fastening through the OSB facing with 8d common nails spaced 6 inches (152 mm) on center.

5. Each exposed SIP edge must be covered with nominally 2-inch-wide wood blocking installed in the recessed SIP core and connected to the SIP by fastening through the OSB facing with 8d common nails spaced 6 inches (152 mm) on center.

6. Diamond mesh expanded galvanized steel lath weighing 3.4 pounds per square yard (1.3 kg/m²) with $\frac{3}{8}$-inch (9.5 mm) ribs must comply with ASTM C847. Lath must be secured to one side of the joist using No. 20 SWG steel tie wire located at the mid-height of every other web member. Additional lath must be installed on the underside of the SIPs and must be secured by means of 1-inch-wide-by-1$\frac{1}{2}$-inch-long (25.4 mm by 38 mm). No. 14 gage staples spaced 7 inches (178 mm) on center laterally and longitudinally to the SIP facings.

7. CAFCO BLAZE-SHIELD Type DC-F spray-applied fire-resistant material, recognized in ESR-1648, must be applied to both the open-web steel joists and the underside of the SIP. Steel joists, SIPs, and metal lath must be free of dirt, oil and loose scale. The surfaces to receive the fireproofing material must be wetted first by spraying with water. The minimum average thickness of the Type DC/F material must be $2\frac{1}{4}$ inches (57 mm). The minimum average thickness of the Type DC/F material applied to the open-web steel joists is $2\frac{1}{4}$ inches (57 mm), but the size of the steel joint members may require a different thickness that must be determined in accordance with ESR-1648. The measured individual and average minimum in-place, dry densities must be 11 pcf and 12 pcf (176 and 192 kg/m³), respectively.

4.3 Special Inspections:

4.3.1 Spray-applied Fire-resistant Material: Special inspection and tests must be provided in accordance with Section 1705.13 of the 2012 IBC, Section 1704.12 of the 2013 IBC, or Section 1704.11 of the 2006 IBC for the spray-applied fire-resistant material described in Section 4.2.6.4, item 7.

4.3.2 Where R-Control SIP shear walls are installed in buildings in IBC Seismic Design Categories C, D, E and F; Seismic Design Categories D, D, D, D and E for townhouses under the IRC; or Seismic Design Categories D, D, D, and E for detached one- and two-family dwellings under the IRC, periodic inspections of the fastening and anchoring of the shear wall assembly within the seismic-force-resisting system must be provided. Inspection must include connections of the assemblies to drag struts and hold-downs, in accordance with 2012 IBC Section 1705.10.1 or 1705.11.2, 2009 IBC Section 1706.2 or 1707.3, or 2006 IBC Section 1707.3, as applicable, unless these are exempted by IBC Section 1704.1.

5.0 CONDITIONS OF USE

The R-Control SIPs as described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The SIPs are fabricated, identified, and erected in accordance with this report and the manufacturer's published installation instructions. If there is a conflict between this report and the manufacturer's instructions, the more restrictive governs.

5.2 Design loads to be resisted by the SIPs must be determined in accordance with the IBC or IRC, as applicable, and must not exceed the allowable loads noted in this report.

5.3 All construction documents specifying the SIPs must comply with the design limitations of this report. Design calculations and details for the specific applications must be furnished to the code official, verifying compliance with this report and applicable codes. Connections and attachments of the SIPs are outside the scope of this report and must be addressed in the design calculations and details. The transfer of vertical and lateral loads from the roof or floor diaphragm into the shear wall and from the shear wall to the foundation must be addressed in the calculations. When R-Control SIP shear walls are used in buildings that are more than one story tall, calculations and details must be submitted to the code official showing the load path for the transfer of lateral and overturning forces from the upper-story shear walls to the foundation. The documents must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.4 R-Control SIPs and other wood elements must be installed as set forth in IBC Section 2304.11.2, 2012 or 2009 IRC Section R317.1, or 2006 IRC Section R319.1.

5.5 R-Control SIPs with thicknesses of 10% and 12% inches (260 and 311 mm) must be used only as roof or floor panels.

5.6 R-Control SIPs may be used as one-hour fire resistance-rated assemblies when constructed in accordance with Section 4.2.6.
5.7 The SIPs must be limited to use in buildings of Type V construction.
5.8 Wood-based materials, including SIP facings, must be protected from decay and termite damage in accordance with IBC Sections 2304.11.2.2 and 2304.11.2.6, or IRC Sections R319 and R320, as applicable.
5.9 When used as shear walls, the SIPs are recognized for use in Seismic Design Categories as provided for in Table 4 of this report. Use of the panels as shear walls for buildings in Seismic Design Categories D through F, in combination with other types of lateral-force-resisting systems, is outside the scope of this report.
5.10 The SIPs and their attachments are subject to inspection by the code official prior to covering with an approved water-resistive barrier or approved roof covering.
5.11 Special inspection for the spray-applied fire-resistant material must be provided in accordance with Section 4.3.1.
5.12 Shear walls constructed of SIPs, used in buildings in Seismic Design Categories C through F, must be subject to special inspection in accordance with Section 4.3.2.
5.13 Justification must be submitted to the code official demonstrating that the R-Control SIPs with the roof covering comply as a Class A, B or C roof assembly as required by IBC Sections 1505 and 2603.6 or IRC Section R602.
5.14 The SIPs are manufactured by the listees noted in this report, at the locations specified in Table 1, under a quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED
6.1 Data in accordance with the ICC-ES Acceptance Criteria for Sandwich Panels (AC04), dated February 2012 (editorially revised August 2013).
6.2 Reports of fire-resistance tests of wall and roof-ceiling assemblies in accordance with ASTM E119.
6.3 Report of room corner tests in accordance with UL 1715.
6.4 Reports of diaphragm load tests in accordance with ASTM E455.
6.5 Reports of cyclic racking shear load testing in accordance with Appendix A of AC04.

7.0 IDENTIFICATION
7.1 Each R-Control SIP is marked with the report holder's name (AFM); plant identification number (see Table 1); the product name (R-Control® SIPs); and the evaluation report number (ESR-2233).
7.2 R-Control SIPs with a Blazeguard FR Deckpanel A facer are also identified according to evaluation report ESR-1365.
7.3 I-beam splines are labeled with the words “for use with R-Control SIPs (ESR-2233).”
7.4 R-Control SIP Screws are labeled with the words “for use with R-Control SIPs (ESR-2233).”

<table>
<thead>
<tr>
<th>LISTEE</th>
<th>LOCATION</th>
<th>PLANT ID NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACH Foam Technologies, LLC</td>
<td>5250 North Sherman Street, Denver, Colorado 80216</td>
<td>U-01</td>
</tr>
<tr>
<td>Big Sky Insulations, Inc.</td>
<td>15 Arden Drive, Belgrade, Montana 59714</td>
<td>U-30</td>
</tr>
<tr>
<td>Branch River Plastics, Inc.</td>
<td>15 Thurber Boulevard, Smithfield, Rhode Island 02917</td>
<td>U-06</td>
</tr>
<tr>
<td>GeoFaze, LLC</td>
<td>5275 Highway 27, Kerrville, TX 76028</td>
<td>U-66</td>
</tr>
<tr>
<td>Noark Enterprises, Inc.</td>
<td>10101 Highway 70 East, North Little Rock, Arkansas 72117</td>
<td>U-24</td>
</tr>
<tr>
<td>Thermal Foams, Inc.</td>
<td>2101 Kenmore Ave, Buffalo, New York 14207</td>
<td>U-26</td>
</tr>
</tbody>
</table>

TABLE 2—R-CONTROL SIP Weight (psf)

<table>
<thead>
<tr>
<th>SIP Thickness (in.)</th>
<th>4¹/₂</th>
<th>6¹/₂</th>
<th>8¹/₄</th>
<th>10¹/₄</th>
<th>12¹/₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (psf)</td>
<td>3.2</td>
<td>3.4</td>
<td>3.6</td>
<td>3.8</td>
<td>4.0</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm; 1 psf = 4.8 kg/m².
### TABLE 3—ALLOWABLE AXIAL LOAD FOR R-CONTROL SIP WALLS\(^{1,2,3,4,5,6}\) (pf)
(See Detail SIP-101c)

<table>
<thead>
<tr>
<th>SIP HEIGHT (ft.)</th>
<th>4(\frac{1}{2}) INCH THICK</th>
<th>6(\frac{1}{2}) INCH THICK</th>
<th>8(\frac{1}{2}) INCH THICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 WAB(^7)</td>
<td>2,300</td>
<td>2,400</td>
<td>2,400</td>
</tr>
<tr>
<td>8</td>
<td>2,750</td>
<td>4,000</td>
<td>4,000</td>
</tr>
<tr>
<td>10</td>
<td>2,500</td>
<td>3,500</td>
<td>3,500</td>
</tr>
<tr>
<td>12</td>
<td>2,000</td>
<td>3,000</td>
<td>3,000</td>
</tr>
<tr>
<td>14</td>
<td>-</td>
<td>2,750</td>
<td>2,750</td>
</tr>
<tr>
<td>16</td>
<td>-</td>
<td>2,500</td>
<td>2,500</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 ft. = 304.8 mm, 1 pf = 1.49 kg/m.\(^2\)

\(^1\)See detail SIP-101c, as shown in Figure 1.

\(^2\)Tabulated allowable axial load is the maximum uniform load (pounds per linear foot) applied concentrically to the full thickness of the SIPs, including facings, to the top. Eccentric axial loading to one face of the SIP is outside the scope of this report. The base of the SIPs must be fully bearing, including facings, on structural supports.

\(^3\)Tabulated allowable axial load is based on a SIP with a maximum height to width ratio of 4:1.

\(^4\)For fire-resistance-rated wall assemblies, axial load limitations in Section 4.2.8 must be observed.

\(^5\)For combined loading, the requirements in Section 4.1 must be applied.

\(^6\)The maximum allowable axial load is limited to 71 percent of the reported allowable axial load when used as shear walls.

\(^7\)Tabulated values for 8 foot high weak axis bearing (WAB) are applicable to SIPs installed with the strong axis of the OSB facings perpendicular to the SIP height.

### TABLE 4—ALLOWABLE LATERAL IN-PLANE RACKING SHEAR LOAD FOR SHEAR WALL ASSEMBLIES CONSISTING OF R-CONTROL SIPs JOINED WITH SPLINES\(^1,2,3,4\)

<table>
<thead>
<tr>
<th>SPLINE TYPE(^6)</th>
<th>Bottom Plate</th>
<th>Top Plate</th>
<th>End Posts</th>
<th>NAIL TYPE(^8) (Length x Shank Dia. x Head Dia., in.)</th>
<th>NAIL SPACING</th>
<th>ALLOWABLE LOADS(^6) (pf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURFACE or BLOCK(^9)</td>
<td>Single 2-by</td>
<td>Single 2-by</td>
<td>Double 2-by or Single 4-by</td>
<td>8d box ((2\frac{1}{2})&quot; x 0.113&quot; x 0.281&quot; (\phi))</td>
<td>Single row at 6&quot; o.c.</td>
<td>335 pf</td>
</tr>
<tr>
<td>4X LUMBER(^7)</td>
<td>Single 4-by</td>
<td>Single 4-by</td>
<td>Double 2-by or Single 4-by</td>
<td>8d cooler ((2\frac{1}{2})&quot; x 0.113&quot; x 0.281&quot; (\phi))</td>
<td>Two staggered rows, 6&quot; o.c. (12&quot; o.c. each row)</td>
<td>360 pf</td>
</tr>
<tr>
<td>LUMBER BLOCK(^7)</td>
<td>Single 4-by</td>
<td>Single 4-by</td>
<td>Double 2-by or Single 4-by</td>
<td>8d cooler ((2\frac{1}{2})&quot; x 0.113&quot; x 0.281&quot; (\phi))</td>
<td>Two staggered rows, 4&quot; o.c. (8&quot; o.c. each row)</td>
<td>540 pf</td>
</tr>
<tr>
<td>4X LUMBER(^7)</td>
<td>Single 4-by</td>
<td>Single 4-by</td>
<td>Double 2-by or Single 4-by</td>
<td>8d cooler ((2\frac{1}{2})&quot; x 0.113&quot; x 0.281&quot; (\phi))</td>
<td>Two staggered rows, 4&quot; o.c. (8&quot; o.c. each row)</td>
<td>540 pf</td>
</tr>
<tr>
<td>4X LUMBER(^7)</td>
<td>Single 4-by</td>
<td>Single 4-by</td>
<td>Double 2-by or Single 4-by</td>
<td>8d cooler ((2\frac{1}{2})&quot; x 0.113&quot; x 0.281&quot; (\phi))</td>
<td>Two staggered rows, 2&quot; o.c. (4&quot; o.c. each row)</td>
<td>720 pf</td>
</tr>
<tr>
<td>4X LUMBER(^7)</td>
<td>Single 4-by</td>
<td>Single 4-by</td>
<td>Double 2-by or Single 4-by</td>
<td>8d cooler ((2\frac{1}{2})&quot; x 0.113&quot; x 0.281&quot; (\phi))</td>
<td>Two staggered rows, 2&quot; o.c. (4&quot; o.c. each row)</td>
<td>920 pf</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 pf = 14.59 N/m.

\(^1\)See details SIP-101c, SIP-101f, SIP-102, SIP-102k, and SIP-102m, as shown in Figures 1, 2, 3, 7 and 8, respectively. Framing lumber must be minimum Spruce-pine-fir No. 2 or better.

\(^2\)End posts and spines must be framed to provide full end bearing in accordance with IBC Section 2304.8.7. OSB facings must be fully bearing on structural supports. A hold-down device must be attached to the vertical studs at each end of the shear wall assembly. Installation of the hold-down devices must be in accordance with the hold-down device manufacturer's instructions and as designed by the registered design professional.

\(^3\)Top-of-wall horizontal in-plane drift (deflection) of R-Control SIP shear wall assemblies is 1/4 inch at the tabulated allowable lateral load.

\(^4\)The tabulated allowable racking shear loads are for panels installed with the strong axis of the OSB panel facings parallel to the wall height.

\(^5\)The minimum fastener edge distance is 3/4"-inch. Nails shall be installed on both sides of spine joint, bottom plate, top plate, and vertical boundary members (end posts) of the SIP shearwall. Nails must comply with ASTM F1867 and have a minimum bending yield strength of 100 ksi (690 MPa).

\(^6\)For nails installed into the shearrwall perimeter (top plate, bottom plate and end posts), the first row of nails must be 1"-inch from the parallel panel edges and second row must be 1 1/2" inches from the first row. For nails installed into the vertical spines, the rows of nails must be installed as shown in Figure 7 of this report.

\(^7\)This installation configuration is also recognized for use as both load-bearing and nonload-bearing shearwalls in Seismic Design Categories D, E and F with the seismic design coefficients of R = 6.5, C\(_h\) = 3.0, and C\(_l\) = 4.0 under the following provisions:

a. The maximum shear wall height-to-width ratio is 1:1.

b. The shear walls are supported by a rigid support, such as a concrete foundation.

c. The wall panels must be installed in a manner such that both facings of the wall panels are equally and uniformly restrained at the top and bottom of the panels. The member, element or structure supporting the shear wall and the vertical restraint provided to the facers of the SIPs at the top and bottom of the wall panel must be designed and detailed by a registered design professional.

d. When used as load-bearing panels, the allowable axial load must be determined in accordance with Table 3 of this report.
### TABLE 5—ALLOWABLE TRANSVERSE LOAD FOR R-CONTROL SIP WALLS WITH SURFACE, BLOCK, OR LUMBER BLOCK SPLINES<sup>1,2,3,8</sup> (psf)

<table>
<thead>
<tr>
<th>SIP THICKNESS (in.)</th>
<th>DEFLECTION LIMITS&lt;sup&gt;5&lt;/sup&gt;</th>
<th>SIP HEIGHT (ft.)</th>
<th>8</th>
<th>8 WAB&lt;sup&gt;5&lt;/sup&gt;</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&lt;sup&gt;1/2&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/360</td>
<td>30</td>
<td>30</td>
<td>22</td>
<td>17</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1/240</td>
<td>46</td>
<td>40</td>
<td>33</td>
<td>25</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1/180</td>
<td>56</td>
<td>40</td>
<td>45</td>
<td>34</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>56</td>
<td>40</td>
<td>45</td>
<td>38</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<td>6&lt;sup&gt;1/2&lt;/sup&gt;</td>
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<tr>
<td></td>
<td>1/360</td>
<td>46</td>
<td>40</td>
<td>36</td>
<td>28</td>
<td>22</td>
<td>18</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1/240</td>
<td>56</td>
<td>40</td>
<td>45</td>
<td>38</td>
<td>32</td>
<td>27</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1/180</td>
<td>56</td>
<td>40</td>
<td>45</td>
<td>38</td>
<td>32</td>
<td>20</td>
<td>—</td>
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<td></td>
<td>Strength</td>
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<td>45</td>
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<td>56</td>
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<td>45</td>
<td>38</td>
<td>32</td>
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<td>40</td>
<td>45</td>
<td>39</td>
<td>32</td>
<td>28</td>
<td>—</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psf = 4.88 kg/m<sup>2</sup>.

<sup>1</sup>See details SIP-101C, SIP-102, SIP-102G, and SIP-102M, as shown in Figures 1, 3, 6, and 8, respectively.

<sup>2</sup>At panel ends, each OSB facing must be fastened to solid lumber sills and plates (minimum specific gravity of 0.42) end with 0.112 inch diameter by 2.5-inch long (8d box) nails spaced at 6 inches on center on both faces of the panels. The sills and plates must be connected to structural supports.

<sup>3</sup>Connection specifications, design and installation must be in accordance with the IBC and applicable ESRs.

<sup>4</sup>Tabulated values are uniformly applied loads and are based on the strong-axis of the facing material oriented parallel to the span direction, except as stated in footnote 5.

<sup>5</sup>Values apply to short duration seismic or wind loads only.

<sup>6</sup>Deflection limit must be selected by building designer based on the serviceability (deflection) requirements of the structure (IBC Section 1604.3).

<sup>7</sup>Tabulated values for 8 foot high weak axis bearing (WAB) are applicable to SIPs installed with the strong axis of the OSB facings perpendicular to the SIP height.

### TABLE 6—ALLOWABLE TRANSVERSE LOAD FOR R-CONTROL SIP FLOORS AND ROOFS WITH SURFACE, BLOCK, OR LUMBER BLOCK SPLINES<sup>1,2,3,8,9</sup> (psf)

<table>
<thead>
<tr>
<th>SIP THICKNESS (in.)</th>
<th>DEFLECTION LIMITS&lt;sup&gt;4&lt;/sup&gt;</th>
<th>SIP SPAN (ft.)</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&lt;sup&gt;1/2&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>1/360</td>
<td>69</td>
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<td>—</td>
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<td>—</td>
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<td>1/180</td>
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<td>85</td>
<td>61</td>
<td>45</td>
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<td>—</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>127</td>
<td>85</td>
<td>61</td>
<td>45</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>6&lt;sup&gt;1/2&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/360</td>
<td>105</td>
<td>67</td>
<td>48</td>
<td>36</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1/240</td>
<td>131</td>
<td>88</td>
<td>66</td>
<td>53</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1/180</td>
<td>131</td>
<td>88</td>
<td>66</td>
<td>53</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>131</td>
<td>88</td>
<td>66</td>
<td>53</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>8&lt;sup&gt;1/4&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/360</td>
<td>135</td>
<td>88</td>
<td>63</td>
<td>48</td>
<td>36</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1/240</td>
<td>135</td>
<td>90</td>
<td>68</td>
<td>54</td>
<td>45</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1/180</td>
<td>135</td>
<td>90</td>
<td>68</td>
<td>54</td>
<td>45</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>135</td>
<td>90</td>
<td>68</td>
<td>54</td>
<td>45</td>
<td>—</td>
</tr>
<tr>
<td>10&lt;sup&gt;1/4&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/360</td>
<td>140</td>
<td>92</td>
<td>69</td>
<td>55</td>
<td>46</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1/240</td>
<td>140</td>
<td>92</td>
<td>69</td>
<td>55</td>
<td>46</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1/180</td>
<td>140</td>
<td>92</td>
<td>69</td>
<td>55</td>
<td>46</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>140</td>
<td>92</td>
<td>69</td>
<td>55</td>
<td>46</td>
<td>—</td>
</tr>
<tr>
<td>12&lt;sup&gt;1/4&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/360</td>
<td>138</td>
<td>92</td>
<td>69</td>
<td>55</td>
<td>46</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1/240</td>
<td>138</td>
<td>92</td>
<td>69</td>
<td>55</td>
<td>46</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1/180</td>
<td>138</td>
<td>92</td>
<td>69</td>
<td>55</td>
<td>46</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>138</td>
<td>92</td>
<td>69</td>
<td>55</td>
<td>46</td>
<td>—</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psf = 4.88 kg/m<sup>2</sup>.

<sup>1</sup>See details SIP-102, SIP-102G, or SIP-102M, as shown in Figures 3, 6, and 8, respectively.

<sup>2</sup>SIPs must be single span, simply supported and have a minimum 1/2-inch wide continuous bearing support at each end.

<sup>3</sup>Tabulated allowable transverse load is the maximum load (pounds per square foot) applied uniformly.

<sup>4</sup>The tabulated allowable transverse load is the lesser of the allowable load based on the applicable serviceability (deflection) limit (IBC Section 1604.3) or the strength limit (IBC Section 1604.2) using a factor of safety of three.

<sup>5</sup>Roofs must be designed to support a 300 lb. concentrated load according to IBC Section 1604.3 when the roof has access to maintenance workers.

<sup>6</sup>Values do not include dead weight of panels. Permanent loads, such as dead load, must not exceed 0.5 of the tabulated load.

<sup>7</sup>Tabulated values for 8 foot spans are applicable to SIPs installed with the strong axis of the OSB facings parallel or perpendicular to the SIP span.
### TABLE 7—ALLOWABLE TRANSVERSE LOAD FOR R-CONTROL SIP, FLOORS AND ROOFS WITH DOUBLE 2x WOOD MEMBER SPLINES\(^{1,2,3,4,5}\) (psf)

<table>
<thead>
<tr>
<th>SIP THICKNESS (in.)</th>
<th>LIMITS</th>
<th>PANEL SPAN (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>6(\frac{1}{2})</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>53</td>
</tr>
<tr>
<td>Strength</td>
<td></td>
<td>105</td>
</tr>
<tr>
<td>8(\frac{1}{4})</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>109</td>
</tr>
<tr>
<td>Strength</td>
<td></td>
<td>109</td>
</tr>
<tr>
<td>10(\frac{1}{4})</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>150</td>
</tr>
<tr>
<td>Strength</td>
<td></td>
<td>174</td>
</tr>
<tr>
<td>12(\frac{1}{4})</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>177</td>
</tr>
<tr>
<td>Strength</td>
<td></td>
<td>177</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psf = 4.88 kg/m\(^2\).

1. See detail SIP-102d, as shown in Figure 5.
2. Double 2x lumber splines must be continuous full length minimum spruce-pine-fir, minimum No. 2 grade, except the lumber must be Douglas fir-larch, minimum No. 2 grade, for 12\(\frac{1}{4}\) inch thick SIPs for all spans and 10\(\frac{1}{4}\)-inch-thick SIP panels spanning greater than 22 ft.
3. SIPs must be single span, simply supported and have a minimum 1\(\frac{1}{2}\)-inch wide continuous bearing support at each end.
4. Tabulated allowable transverse load is the maximum load (pounds per square foot) applied uniformly.
5. The tabulated allowable transverse load is the lesser of the allowable load based on the applicable serviceability (deflection) limit (IBC Section 1604.3) or the strength limit (IBC Section 1604.2) using a factor of safety of 3.
6. Roofs must be designed to support a 300 lb. concentrated load according to IBC Section 1607.4 when the roof has access to maintenance workers.

### TABLE 8—ALLOWABLE TRANSVERSE LOAD FOR R-CONTROL SIP, FLOORS AND ROOFS WITH I-BEAM SPLINES\(^{1,2,3,4,5}\) (psf)

<table>
<thead>
<tr>
<th>SIP THICKNESS (in.)</th>
<th>LIMITS</th>
<th>SIP SPAN (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>10(\frac{1}{4})</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>118</td>
</tr>
<tr>
<td>Strength</td>
<td></td>
<td>118</td>
</tr>
<tr>
<td>12(\frac{1}{4})</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>131</td>
</tr>
<tr>
<td>Strength</td>
<td></td>
<td>131</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psf = 4.88 kg/m\(^2\).

1. See detail SIP-102b, as shown in Figure 4.
2. I-beam splines must be continuous full length.
3. SIPs must be single span, simply supported and have a minimum 1\(\frac{1}{2}\)-inch wide continuous bearing support at each end.
4. Tabulated allowable transverse load is the maximum load (pounds per square foot) applied uniformly.
5. The tabulated allowable transverse load is the lesser of the allowable load based on the applicable serviceability (deflection) limit (IBC Section 1604.3) or the strength limit (IBC Section 1604.2) using a factor of safety of three.
6. Roofs must be designed to support a 300 lb. concentrated load according to IBC Section 1607.4 when the roof has access to maintenance workers.
# Table 9—Allowable Shear Load for R-Control SIPs Roof and Floor Panel Diaphragm Assemblies with Support Framing of Douglas Fir—Larch or Southern Pine for Wind or Seismic Loading

<table>
<thead>
<tr>
<th>SIP Thickness (in.)</th>
<th>Fastener Spacing (in.)</th>
<th>Boundaries</th>
<th>Spline</th>
<th>Panels to Support Parallel to Shear</th>
<th>Maximum Assembly Length (ft.) and Aspect Ratio</th>
<th>Allowable Strength (lbf)</th>
<th>Apparent Shear Stiffness, Go (lbf/in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 1/2 to 12 1/8</td>
<td>R-Control Screws 6</td>
<td>3 @ top and bottom</td>
<td>3, in two rows each side</td>
<td>12</td>
<td>36, 3:1</td>
<td>500</td>
<td>12,900</td>
</tr>
<tr>
<td>6 1/2 to 12 1/8</td>
<td>8d Box Nails 3</td>
<td>3, in two rows each side</td>
<td>of joint and staggered</td>
<td>12</td>
<td>36, 3:1</td>
<td>750</td>
<td>9,500</td>
</tr>
<tr>
<td>6 1/2 to 12 1/8</td>
<td>R-Control Screws 3</td>
<td>3 @ top and bottom</td>
<td>3, in two rows each side</td>
<td>12</td>
<td>24, 3:1</td>
<td>850</td>
<td>35,100</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lbf = 14.6 N, 1 lbf/in = 0.175 N/mm, 1 psi = 6895 Pa.

1See details SIP-139, SIP-140, and SIP-141, as shown in Figures 13, 14 and 15, respectively.

2Deflections at mid-span of a simply supported diaphragm must be computed in accordance with the following equation:

\[
\delta = \frac{5vL^4}{384EI} + 0.25vL + \frac{2(\Delta_e)}{2W}
\]

where:

- \( E \) = Modulus of elasticity of diaphragm chords, psi (Pa)
- \( A \) = Area of chord cross-section, in. \(^2\) (mm\(^2\))
- \( G_o \) = Apparent diaphragm shear stiffness from nail slip and panel shear deformation, lbf/in. (N/mm)
- \( L \) = Diaphragm length, ft. (m)
- \( v \) = Induced unit shear in diaphragm, lbf/ft (N/m)
- \( W \) = Diaphragm width, ft. (m)
- \( x \) = Distance from chord splice to nearest support, in. (mm)
- \( \Delta_e \) = Diaphragm chord splice slip at the induced unit shear in diaphragm, in. (mm)
- \( \delta \) = Maximum mid-span diaphragm deflection determined by elastic analysis, in. (mm)

3Diaphragm boundary elements must consist of full-depth, solid-sawn lumber, 2-inch minimum nominal width, minimum specific gravity of 0.50, inserted in SIP core, continuous across panel joints. Additionally, the diaphragm boundary elements must be supported by a continuous lumber member having a minimum 4-inch nominal width and minimum 3-inch nominal depth, minimum specific gravity of 0.50, and must be secured to the support member with R-Control screws at the tabulated spacing and a minimum 1/8 inch penetration into the receiving member.

4Nails connect SIP facings at joints perpendicular to shear to \( \frac{1}{16}\) in. x 4-in. OSB surface splices located under top face at all panel edges, at the tabulated spacing.

5Panel edges parallel to applied shear shall be reinforced with solid-sawn lumber, 4-inch minimum nominal width, and minimum specific gravity of 0.50, secured with screws as tabulated above.

6SIP ends perpendicular to spans must be staggered from adjacent panels.

# Table 10—Allowable Vertical Load for R-Control SIP Headers

<table>
<thead>
<tr>
<th>SIP Header Depth (in.)</th>
<th>Limits</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>L(_{480})</td>
<td>524</td>
<td>319</td>
<td>218</td>
</tr>
<tr>
<td></td>
<td>L(_{480})</td>
<td>703</td>
<td>374</td>
<td>248</td>
</tr>
<tr>
<td></td>
<td>L(_{560})</td>
<td>708</td>
<td>374</td>
<td>248</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>708</td>
<td>374</td>
<td>248</td>
</tr>
<tr>
<td></td>
<td>L(_{480})</td>
<td>782</td>
<td>466</td>
<td>351</td>
</tr>
<tr>
<td></td>
<td>L(_{560})</td>
<td>773</td>
<td>466</td>
<td>351</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>773</td>
<td>466</td>
<td>351</td>
</tr>
<tr>
<td>18</td>
<td>L(_{480})</td>
<td>837</td>
<td>577</td>
<td>455</td>
</tr>
<tr>
<td></td>
<td>L(_{560})</td>
<td>837</td>
<td>577</td>
<td>455</td>
</tr>
<tr>
<td></td>
<td>L(_{540})</td>
<td>837</td>
<td>577</td>
<td>455</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>837</td>
<td>577</td>
<td>455</td>
</tr>
<tr>
<td>24</td>
<td>L(_{480})</td>
<td>837</td>
<td>577</td>
<td>455</td>
</tr>
<tr>
<td></td>
<td>L(_{560})</td>
<td>837</td>
<td>577</td>
<td>455</td>
</tr>
<tr>
<td></td>
<td>L(_{540})</td>
<td>837</td>
<td>577</td>
<td>455</td>
</tr>
<tr>
<td></td>
<td>Strength</td>
<td>837</td>
<td>577</td>
<td>455</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lbf = 14.59 N/m.

1See details SIP-112, SIP-113 and SIP-114, as shown in Figures 9, 10 and 11, respectively.

2Tabulated allowable load is the maximum load (pounds per square foot) applied uniformly.

3Headers are permitted to have splices at supported ends. Alternatively, the header may be continuous without splices.

4Top and bottom plates must have a minimum assigned specific gravity of 0.50, such as Douglas fir—larch, and minimum No. 2 grade. The 2-inch-thick wood top plate must have a width equal to the SIP core thickness and be recessed into the pre-cut channel in the top of the header.

5Concentrated loads superimposed on SIP wall headers must be supported by conventional construction methods or by other methods designed and constructed to support the governing load combination defined in IBC Section 1605.3 without exceeding the appropriate specified allowable stresses for the materials of construction.

6The tabulated allowable vertical load is the lesser of the allowable load based on the applicable serviceability (deflection) limit (IBC Section 1604.3) or the ultimate load (IBC Section 1604.2) using a factor of safety of three.

7Vertical members supporting each end of the SIP headers must be designed for the tributary vertical (gravity) and transverse (wind) loads carried by SIP headers.
8d box (0.113) nails @ 6" o.c. each side, or equivalent. Typical top & bottom.

NOTE: OSB facings must be fully supported by foundation system.

NOTE: Use minimum grade SPF #2 or engineered equivalent for 2X plating.

SECTION
Scale: NTS
Updated 1-16-12

R-Control® SIP
TITLE: Plate Connections
NO. SIP-101c

Factory electrical chase.
R-Control Do-All-Ply
1/2" diameter continuous bead top & bottom plate, see SIP-101a.

Varies

1 1/2"

NOTE: OSB facings must be fully supported by foundation system.

NOTE: Use minimum grade Douglas-fir larch #2 or equivalent.

SECTION
Scale: NTS
Updated 1-16-12

R-Control® SIP
TITLE: High Load Shear Wall
NO. SIP-101f

4X Plate Connections

FIGURE 1

FIGURE 2
8d box (0.113) nails in two staggered rows, 2" o.c. both sides of joint.

Plan
Scale: NTS
R-Control Do-All-Ply
1/2" diameter continuous bead.

Note: Use minimum grade
Douglas-fir larch #2
or equivalent.

Section
Scale: NTS
8d box (0.113) nails
in two staggered rows,
2" o.c. both sides of joint,
top and bottom.

SIP Tape or equivalent
vapor retarder located
interior or exterior
per climate conditions
or code requirement.

Section/Plan
Scale: NTS
R-Control SIP
1X SPF #2
Factory electrical chase.

8d box (0.113) nails
@ 6" o.c. both sides of
panel joint, or equivalent.
Typical each side of panel.

SIP Tape or equivalent
vapor retarder located
interior or exterior
per climate conditions
or code requirement.

R-Control® SIP
TITLE: Spline Connection
4X - 2" o.c.
NO.
SIP-102k

FIGURE 7

FIGURE 8
**ISOMETRIC**

Scale: NTS

**NOTE:** Diagram represents headers in a wall assembly. Refer to detail SIP-112a. Minimum dimensions are not required between openings, but the posts supporting the header must extend to the floor. The bottom plate of the header must extend to the outside of the post.

**FIGURE 9**

**SECTION**

Scale: NTS

See Load Design Chart #5 for allowable depths, spans & capacities of R-Control SIP used as a header.

**FIGURE 10**
Notes:
1. Factory provided electrical chases must be pre-arranged with the R-Control SIP Manufacturer prior to fabrication of the panels.
2. SIP installer shall provide field drilled holes in top plates, sill/base plates, vertical plates and through floors to access electrical chases.
3. Follow local code requirements for electrical installation.

NOTE: Diagram represents headers in a monolithic wall assembly. Splines may occur above & below openings. Minimum panel dimension of 12" must be maintained over openings.
**PLAN**
Scale: NTS

8d box (0.113) nails in two rows 3" o.c. both sides of joint.

**SECTION**
Scale: NTS

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

Note: Spline to be of material conforming to DOC PS2, min thickness 7/16".

**LEGEND**

- **R-Control® SIP**
- **R-Control Wood Screw**
- **R-Control Do-All-Ply 1/2" diameter continuous bead**
- **SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.**

Note: Roof covering & underlayment as req'd by code.

**FIGURE 13**

**FIGURE 14**
Note: Roof covering & underlayment as req'd by code.

Note: Spline to be of material conforming to DOC PS2, min. thickness 7/16".

8d box (0.113) nails @ 3" o.c. both sides of panel joint or equivalent. (See SIP-139)

R-Control SIP.

R-Control Wood Screw, min. 1-5/8" penetration, see Load Design Charts for spacing requirements.

SIP Tape or equivalent vapor retarder located interior or exterior per climate conditions or code requirement.

SECTION
Scale: NTS

R-Control SIP

TITLE: Diaphragm Connection
- Intermediate support
NO. SIP-141

FIGURE 15
DIVISION: 07 00 00— THERMAL AND MOISTURE
SECTION: 07 21 00— THERMAL INSULATION
SECTION: 07 22 00— ROOF AND DECK INSULATION

REPORT HOLDER:

AFM CORPORATION

17645 JUNIPER PATH, SUITE 260
LAKEVILLE, MINNESOTA 55044

EVALUATION SUBJECT:

FOAM-CONTROL® BOARDS, FOAM-CONTROL® WITH PERFORM GUARD® BOARDS
AND FOAM-CONTROL® WITH PERFORM GUARD² BOARDS AND FOAM-CONTROL
GEOFOAM BLOCKS

"2014 Recipient of Prestigious Western States Seismic Policy Council
(WSSPC) Award in Excellence"

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DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION
Section: 07 21 00—Thermal Insulation
Section: 07 22 00—Roof and Deck Insulation

REPORT HOLDER:
AFM CORPORATION
17645 JUNIPER PATH, SUITE 260
LAKEVILLE, MINNESOTA 55044
www.foam-control.com

EVALUATION SUBJECT:
FOAM-CONTROL® BOARDS, FOAM-CONTROL® WITH PERFORM GUARD® BOARDS AND FOAM-CONTROL® WITH PERFORM GUARD® BOARDS AND FOAM-CONTROL GEOFOAM BLOCKS

ADDITIONAL LISTEES:
ACH FOAM TECHNOLOGIES, LLC
BIG SKY INSULATIONS, INC.
BRANCH RIVER PLASTICS, INC.
CELLOFOAM NORTH AMERICA, INC.
HENRY PRODUCTS, INC.
NOARK ENTERPRISES, INC.
PACIFIC ALLIED PRODUCTS, LTD.
POLIESTIRENO ALFA-GAMMA S.A. de C.V.
POLY-FOAM INC.
THERMA FOAM, LLC
THERMAL FOAMS, INC.

1.0 EVALUATION SCOPE
Compliance with the following codes:
- 2012 International Building Code® (IBC)
- 2012 International Residential Code® (IRC)
- 2012 International Energy Conservation Code® (IECC)

Properties evaluated:
Foam-Control Boards:
- Surface-burning characteristics
- Physical properties/thermal resistance (R-values)
- Attic and crawl space installation
- Fire resistance (D2D Foam-Control®)
Foam-Control with Perform Guard Boards and Foam-Control with Perform Guard® Boards:
- Surface-burning characteristics
- Physical properties/thermal resistance (R-values)
- Termite resistance
Foam-Control Geofoam Blocks:
- Surface-burning characteristics
- Physical properties/compressive resistance

2.0 USES

2.1 Foam-Control Boards:
Foam-Control boards are used as nonstructural insulation in wall cavities, door cavities, ceiling and floor assemblies, and roof covering assemblies, or on the outside faces of exterior walls. The insulation boards may be used on walls in attics and crawl spaces without a covering when installation is in accordance with Section 4.2.2.

The insulation boards may be used as the core of sandwich panels when specifically recognized in a current evaluation report.

The insulation boards may be used as exterior perimeter insulation around concrete slab edges, on foundation walls, or under flat concrete slab on grade construction, except in areas where the probability of termite exposure is “very heavy” as defined in IBC Section 2603.8 and IRC Section R318.4.

The insulation boards may be used as components of Class A, B, and C roof covering systems installed on steel decks, when installation is in accordance with Section 4.4. The insulation boards may be used as a roof insulation when recognized in an ICC-ES evaluation report on the roof covering system.

2.2 Foam-Control WSG Boards:
Foam-Control WSG boards may be used as a component of a wall covering system when recognized in an ICC-ES report.
2.3 Foam-Control D2D Boards:
Foam-Control D2D boards may be used as components of a Class A, B, or C roof covering system installed directly onto steel decks, when installation is in accordance with Section 4.4 of this report.

2.4 Foam-Control with Perform Guard Boards:
Foam-Control with Perform Guard boards are used as nonstructural insulation. The boards are recognized for installation below grade in areas subject to termites in accordance with Section 4.5 of this report. When installation is in areas where the probability of termite infestation is "very heavy" as described in IBC Section 2603.8, or IRC Section R316.7, use is limited to areas exposed to the Reticulitermes species.

The insulation boards may be used in wall cavities or on the outside faces of exterior walls. The insulation boards may be used as exterior perimeter insulation around concrete slab edges, on foundation walls, or under concrete slab on grade construction.

2.5 Foam-Control with Perform Guard² Boards:
Foam-Control with Perform Guard² boards are used as nonstructural insulation. The boards are recognized for installation below grade in areas subject to termites in accordance with Section 4.6 of this report.

The insulation boards may be used in wall cavities or on the outside faces of exterior walls. The insulation boards may be used as exterior perimeter insulation around concrete slab edges, on foundation walls, or under concrete slab on grade construction.

2.6 Foam-Control Geofoam Blocks:
Foam-Control Geofoam blocks are used as lightweight structural fill in floor cavities when installation is in accordance with Section 4.7 of this report.

3.0 DESCRIPTION

3.1 General:
The Foam-Control EPS products described in Sections 3.2 through 3.7 are molded, closed-cell expanded polystyrene (EPS). The insulation boards described in Sections 3.2 through 3.6 comply with ASTM C578. The geofoam blocks described in Section 3.7 comply with ASTM D6817. All insulation boards and geofoam blocks have a flame-spread index not exceeding 25 and a smoke-developed index not exceeding 450 when tested at a thickness of 6 inches (152 mm) in accordance with ASTM E84, and have thermal resistance values noted in Table 1. The maximum thicknesses and requirements for installation of a thermal barrier for the specific insulation types are described in the applicable sections of Section 4.0.

3.2 Foam-Control Boards:
Foam-Control 100, 130, 150, 250, 400, and 600 boards are manufactured at minimum densities of 0.90, 1.15, 1.35, 1.60, 2.40 and 3.00pcf (14.4, 18.4, 21.6, 26.8, 38.4, and 48.0 kg/m³) and comply with ASTM C578 Type I, Type II, Type IX, Type XIV and Type XV, respectively.

3.3 Foam-Control WSG Boards:
Foam-Control WSG boards are manufactured at a minimum density of 0.90pcf (14.4 kg/m³) and comply with ASTM C578 Type I and ASTM E2430.

3.4 Foam-Control EPS D2D Boards (Types I, VIII, II, IX, XIV and XV):
Foam-Control 100, 130, 150, 250, 400, and 600 D2D boards are manufactured at minimum densities of 0.90, 1.15, 1.35, 1.60, 2.40 and 3.00pcf (14.4, 18.4, 21.6, 26.8, 38.4 and 48.0 kg/m³), and comply with ASTM C578 Type I, Type VIII, Type II, Type IX, Type XIV and Type XV, respectively.

3.5 Foam-Control with Perform Guard Boards:
Foam-Control 100, 130, 150, 250, 400, and 600 with Perform Guard boards are factory-treated for termite resistance. The boards are manufactured at minimum densities of 0.90, 1.15, 1.35, 1.60, 2.40 and 3.00pcf (14.4, 18.4, 21.6, 26.8, 38.4 and 48.0 kg/m³), and comply with ASTM C578 Type I, Type II, Type IX, Type XIV and Type XV, respectively.

3.6 Foam-Control with Perform Guard² Boards:
Foam-Control 100, 130, 150, 250, 400, and 600 with Perform Guard² boards are factory-treated for termite resistance. The boards are manufactured at minimum densities of 0.90, 1.15, 1.35, 1.60, 2.40 and 3.00pcf (14.4, 18.4, 21.6, 26.8, 38.4 and 48.0 kg/m³), and comply with ASTM C578 Type I, Type II, Type IX, Type XIV and Type XV, respectively.

3.7 Foam-Control Geofoam Blocks:
Foam-Control EPS15, EPS19, EPS22, EPS29, EPS39, and EPS46 Geofoam blocks are manufactured at minimum densities of 0.90, 1.15, 1.35, 1.60, 2.40 and 2.85pcf (14.4, 18.4, 21.6, 26.8, 38.4 and 45.7 kg/m³), and comply with ASTM D6817 Type EPS15, EPS19, EPS22, EPS29, EPS39 and EPS46, respectively.

4.0 INSTALLATION

4.1 General:
Foam-Control boards, Foam-Control with Perform Guard boards, Foam-Control with Perform Guard² boards and Foam-Control Geofoam blocks are installed in accordance with the manufacturer's published installation instructions and this evaluation report. The manufacturer's published installation instructions and this report must be strictly adhered to, and a copy of the instructions must be available at all times on the jobsite during installation.

4.2 Foam-Control Boards:
4.2.1 General: Foam-Control boards must be attached to supports in a manner that will hold the insulation securely in place. The insulation boards must not be used structurally to resist transverse, vertical or in-plane loads except when this is specifically recognized in a separate evaluation report. The boards must not be used as exterior stud wall bracing. Wall bracing must be provided in accordance with IBC Sections 2308.9.3 and 2308.12.4 or IRC Section R602.10.

The insulation boards must not be used as a nailing base for exterior finish materials. Fasteners used to attach exterior finish material over insulation boards must comply with a current ICC-ES evaluation report for proprietary wall covering materials, IBC Section 1404 or 1405, IRC Table 703.4, and the installation instructions from the finish manufacturer. For cementitious exterior wall coating applications, fasteners for insulation board thicker than 1/2 inches (38 mm) must be considered for lateral resistance to ensure support for the exterior wall coatings. Finish materials over the insulation boards must be structurally adequate to resist the required horizontal forces perpendicular to the wall.

The interior of the building must be separated from the insulation boards with a thermal barrier as required by IBC Section 2603.4 or IRC Section R316.4, except when installation is in accordance with Section 4.2.2 of this report.
In areas where the probability of termite infestation is defined as "very heavy" and when foam plastic insulation is used with wood construction, the foam plastic must be installed in accordance with IBC Section 2603.8 or IRC Section R318.4. Areas of very heavy termite infestation must be determined in accordance with IBC Figure 2603.8 and IRC Figure R301.2 (B), as applicable.

Insulation boards for use as roof insulation must be installed in accordance with Section 4.4 or as recognized in an ICC-ES evaluation report on a roof covering system. The insulation board may be used as the core material for doors that do not require a fire-resistance rating, when installed in accordance with IBC Sections 2603.4.1.6, 2603.4.1.8, and 2603.4.1.9 or IRC Sections R316.5.5 and R316.5.6.

4.2.2 Special Uses—Attics and Crawl Spaces: Foam-Control boards may be used on walls of attics and crawl spaces, without the coverings listed in Section 4.2.2 of the IBC or IRC Sections R316.5.3 and R316.5.4, under all of the following conditions:

1. Entry to the attic or crawl space is limited to service of utilities, and no storage is permitted. Utilities include, but are not limited to, mechanical equipment, electrical wiring, fans, plumbing, gas or electric hot water heaters, and gas or electric furnaces.
2. There are no interconnected attic or basement areas.
3. Air in the attic or crawl space is not circulated to other parts of the building.
4. Attic ventilation is provided in accordance with IBC Section 1203.2 or IRC Section R808, as applicable.
5. Under-floor ventilation is provided in accordance with IBC Section 1203.3 or IRC Section R408.1 as applicable.
6. Combustion air is provided in accordance with Section 701 of the International Mechanical Code® (IMC).
7. Insulation boards molded using BASF, Flint Hills, Nova or Styrochem EPS resins are limited to a maximum thickness as follows: up to 4.0 inches (102 mm) for Foam-Control 100, up to 3.2 inches (81 mm) for Foam-Control 130, up to 2.7 inches (69 mm) for Foam-Control 150, up to 2.0 inches (50 mm) for Foam-Control 250, up to 1.6 inches (41 mm) for Foam-Control 400 and up to 1.3 inches (33 mm) for Foam-Control 600.
8. Insulation boards molded using Neksema EPS resins are limited to a maximum thickness of 3 inches (76mm) for Foam-Control 100, 130, 150, and 250.

4.3 Foam-Control Boards (Type I-WSG):
Foam-Control WSG boards must be installed as part of an exterior cementitious wall covering, an EIFS system or any proprietary wall system, when installation is in accordance with an ICC-ES or an ICC-ES evaluation report on the wall covering system.

4.4 Foam-Control D2D Boards:

4.4.1 Application Directly to Steel Roof Decks without a Thermal Barrier: Foam-Control D2D roof insulation may be used as a component of a Class A, B, or C roof covering installed on steel decks without a thermal barrier, when installation is in accordance with Sections 4.4.2, 4.4.3 and 4.4.4.

4.4.2 Materials:

4.4.2.1 Steel Deck: Steel roof decking must be minimum No. 22 MSG [0.030 inch (0.78 mm)], 1 1/2-inch-deep (36 mm), unperforated, painted or galvanized steel decking, with flutes spaced a maximum of 6 inches (152 mm) on center. The deck must be welded or mechanically fastened to structural supports in accordance with the applicable code.

4.4.2.2 Foam Plastic Insulation: The Foam-Control D2D insulation boards may have a maximum thickness as follows: up to 9.0 inches (229 mm) for Foam-Control 100, 7.2 inches (183 mm) for Foam-Control 130, 6.0 inches (152 mm) for Foam-Control 150, and 4.5 inches (114 mm) for Foam-Control 250, 3.6 inches (91 mm) for Foam-Control 400 and 3.0 inches (76 mm) for Foam-Control 600.

4.4.2.3 Cover Board: When used, the cover board in the roof covering assembly is 1/2-inch-thick (6.4 mm) Dens-Deck® Roof Board, manufactured by Georgia-Pacific Corporation, or 1/2-inch-thick (12.7 mm) wood-fiber board complying with ASTM C206.

4.4.2.4 Roof Covering: The roof covering membrane must be a mechanically attached, fully adhered or ballasted EPDM or thermoplastic membrane listed in an ICC-ES evaluation report as part of a Class A, B, or C roof covering assembly. Thermoplastic membranes include polyvinyl chloride (PVC), modified PVC, chlorosulfonated polyethylene (CSPE), and thermoplastic polyolefin (TPO). The membrane is limited to a maximum nominal thickness of 0.045 inch (1.1 mm). The evaluation report on the roof covering assembly must specify one of the following assemblies as the only components of the classified roof covering assembly permitted under the conditions of this report:

a. A generic EPS insulation board having the same density and installed thickness as the Foam-Control roof insulation listed in Table 1 of this report, the cover board described in Section 4.4.2.3, and the roof covering membrane described in this section (Section 4.4.2.4), installed over a steel deck as described in Section 4.4.2.1.

b. A generic EPS insulation board having the same density and installed thickness as the Foam-Control roof insulation listed in this report, the roof covering membrane described in this section (Section 4.4.2.4), and stone ballast, installed over a steel deck as described in Section 4.4.3 of this report.

4.4.3 Installation: The Foam-Control roof insulation boards are loosely laid directly over the steel deck in single or multiple layers, to a maximum total thickness and density as noted in Section 4.4.2.2. The top layer of insulation must be placed so that the labeling required in Section 7.0 is facing up. Tapered EPS foam boards may be installed, provided the maximum allowable thickness is not exceeded. The cover board described in Section 4.4.2.3, when required, is laid over the insulation.

The method of attaching the roof covering, cover boards, and insulation boards to the steel roof deck must be in accordance with the ICC-ES evaluation report on the roof covering membrane, and as described in Section 4.4.2.4 of this report.

4.4.4 Reroofing: New roofing must not be applied over existing roof covering assemblies. Additional EPS foam insulation may be added over the existing EPS foam insulation, provided inspection in accordance with IBC Section 1510 or IRC Section R907 indicates the existing EPS is sound material, the density of the EPS being added is equal to the density of the existing EPS, the existing EPS meets the requirements of this report, and the total thickness of the existing EPS plus the new EPS being added conforms to Section 4.4.2.2. The existing roof
covering and, if necessary, the cover board must be removed before new roofing materials, having characteristics specifically described in this report, can be installed.

4.5 Foam-Control with Perform Guard Boards:
Foam-Control with Perform Guard boards is installed as specified in Section 4.2.1 of this report, except that use is not restricted in areas where the probability of termite infestation is defined as "very heavy" under Section 2603.8 of the IBC or IRC Section R318.4.

4.6 Foam-Control with Perform Guard2 Boards:
Foam-Control with Perform Guard2 is installed as specified in Section 4.2.1 of this report, except that use is not restricted in areas where the probability of termite infestation is defined as "very heavy" under IBC Section 2603.8 or IRC Section R318.4.

4.7 Foam-Control Geofoam Blocks:
Foam-Control Geofoam blocks must be in accordance with the manufacturer’s installation instructions and as noted in Section 5.8. The insulation blocks must not be used structurally to resist loads except as provided for in Section 5.8.2 and 5.8.3.

The interior of the building must be separated from the geofoam blocks with a thermal barrier as required by IBC Section 2603.4, except when installation is in accordance with Section 5.8.1.

5.0 CONDITIONS OF USE
The Foam-Control boards, Foam-Control with Perform Guard boards, Foam-Control with Perform Guard2 boards and Foam-Control Geofoam blocks described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The insulation boards must be produced, identified, and installed in accordance with the manufacturer’s published installation instructions. If there is a conflict between this report and the manufacturer’s instructions, this report governs.

5.2 The insulation boards must be separated from the building interior with a thermal barrier complying with the applicable code, such as 1/2-inch (12.7 mm) gypsum wallboard installed in accordance with the applicable code, except as described in Sections 4.2.2, 4.4, and 4.7 of this report.

5.3 Exterior walls must be protected by a water-resistant barrier complying with IBC Section 1404.2 or IRC Section R703.2, and by wall coverings that provide the necessary structural resistance to wind and seismic forces in spanning between wall framing members.

5.4 In areas where the probability of termite infestation is defined as “very heavy”, the foam plastic must be installed in accordance with IBC Section 2603.8 or IRC Section R318.4, except as permitted for Foam-Control Perform Guard EPS in Section 4.5 or for Foam-Control Perform Guard EPS2 in Section 4.6.

5.5 Walls on which the boards are applied must be braced in accordance with the applicable code.

5.6 When Foam-Control D2D insulation boards are installed directly to a steel roof deck without a thermal barrier for structures regulated under the IBC, the following conditions apply:

5.6.1 The insulation boards must be part of a Class A, B, or C roof covering system as described in Section 4.4 of this report. The insulation boards may be installed without a thermal barrier as addressed in IBC Section 2603.4.1.5.

5.6.2 Reroofing must be in accordance with Section 4.4.4.

5.6.3 Permanent placards bearing the following words are attached to roof hatches and where other roof access is located: “This roof covering includes foam plastic insulation applied directly to a steel deck. The existing roofing membrane, slip sheets, and cover boards must be removed before reroofing. Limits also exist for cover boards and membranes. See ICC-ES evaluation report ESR-1006 before reroofing.”

5.7 Maximum thickness is as noted in Section 3.1 of this report, except where noted otherwise in Section 4.0.

5.8 When geofoam blocks are installed, the following conditions of use apply:

5.8.1 The geofoam blocks must be separated from the building interior with a minimum 1-inch-thick (25.4 mm) layer of concrete or masonry on all faces as required by IBC Section 2603.4.1.1, except in buildings of Type V construction where separation may be by a minimum nominally 1/2-inch-thick wood structural panel when installation is in accordance with IBC Section 2603.4.1.14. Where the thermal barrier consists of a minimum 1-inch-thick (25.4 mm) layer of concrete or masonry, the thickness of the geofoam blocks in the floor assembly may exceed 4 inches (102 mm). The design of the concrete or masonry covering is outside the scope of this report and must comply with all applicable code requirements for the occupancy and type of construction for the specific project.

5.8.2 The design loads to be resisted by the geofoam blocks must be determined in accordance with the IBC. The compressive resistance of the geofoam blocks at 1 percent strain is listed in Table 2 as determined in accordance with ASTM D6817. The use of the geofoam blocks is limited to floor applications where the uniform and localized loading does not exceed the compressive resistance of the geofoam blocks at 1 percent strain.

5.8.3 Design calculations and details for the specific applications, verifying compliance with this report and applicable codes, must be furnished to the code official. The documents must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.8.4 Use of the geofoam blocks is limited to applications where the geofoam will not be subject to direct exposure to hydrocarbons.

5.8.5 Penetrations through the thermal barrier described in Section 5.8.1 shall be subject to approval by the code official. When the geofoam blocks are used in a fire-resistance-rated floor assembly, penetrations through the assembly must be protected in accordance with IBC Section 714.4. If used, through-penetration firestop systems must be tested.
5.9 The products are manufactured by the listees at the locations specified in Table 3 under a quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

6.1 Foam-Control Boards:

6.1.1 Data in accordance with the ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2012 (editorially revised August 2013), including reports of tests in accordance with Appendix B.

6.1.2 Data in accordance with UL1256.

6.2 Foam-Control with Perform Guard and Foam-Control with Perform Guard²:

6.2.1 Data in accordance with the ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2012 (editorially revised August 2013).

6.2.2 Data in accordance with the ICC-ES Acceptance Criteria for Termite-resistant Foam Plastics (AC239), dated October 2008 (editorially revised February 2014).

6.3 Foam-Control Geofoam Blocks:

Data in accordance with the ICC-ES Acceptance Criteria for Rigid Cellular Polystyrene (RCPS)

Geofoam for Use in Interior Floor Applications (AC452), dated October 2013.

7.0 IDENTIFICATION

Foam-Control Boards, Foam-Control with Perform Guard boards, Foam-Control with Perform Guard² boards and Foam-Control Geofoam blocks are marked on each board with the report holder’s name (AFM); the plant ID number; the ASTM type or product name; and the evaluation report number (ESR-1006). Additionally, an inspection agency certificate, including the flame-spread index, the smoke-developed index, and the thermal-resistance (R-value) for insulation complying with ASTM C578, and compressive resistance (for insulation complying with ASTM D6817), is provided with each shipment of insulation boards.

Bundles of Foam-Control insulation board include instructions regarding R-value required by ASTM C578.

In addition to the marking noted above, each Foam-Control D2D insulation board has the following wording: “When used in reroofing applications, limits exist for cover board and membrane. See ICC-ES evaluation report ESR-1006 before reroofing.”

In addition to the foam plastic board markings noted above, Foam-Control insulation boards for use under Section 4.2.2, in attics and crawl spaces, are labeled with one of the following: “BASF,” “Flint Hills,” “Nova,” “StyroChem,” or “Nexxemia.”

<table>
<thead>
<tr>
<th>Product</th>
<th>ASTM TYPE</th>
<th>MINIMUM DENSITY (pcf)</th>
<th>THERMAL RESISTANCE (per 1 inch thickness)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foam-Control 100</td>
<td>Type I</td>
<td>0.90</td>
<td>3.6</td>
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<tr>
<td>Foam-Control 130</td>
<td>Type VIII</td>
<td>1.15</td>
<td>3.8</td>
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<tr>
<td>Foam-Control 150</td>
<td>Type II</td>
<td>1.35</td>
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<td>Foam-Control 250</td>
<td>Type IX</td>
<td>1.80</td>
<td>4.2</td>
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<td>Foam-Control 400</td>
<td>Type XIV</td>
<td>2.40</td>
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<td>Foam-Control 600</td>
<td>Type XV</td>
<td>3.00</td>
<td>4.2</td>
</tr>
</tbody>
</table>

For ²: 1 pcf = 16.018 kg/m³. 1°F·ft²·h·Btu/ft² = 0.176 m²·K/W.

¹Thermal resistance (R) values are based on tested values between 1 and 4 inches and must be multiplied by the installed thickness for thicknesses greater than 1 inch (25 mm). Maximum foam plastic thickness recognized in this report is 5 inches.

²The values listed are the minimum required by ASTM C578.
### TABLE 2—FOAM-CONTROL GEOFOAM INSULATION BLOCK COMPREHENSIVE RESISTANCE VALUES

<table>
<thead>
<tr>
<th>Product</th>
<th>ASTM TYPE</th>
<th>MINIMUM DENSITY (pcf)</th>
<th>COMPREHENSIVE RESISTANCE (at 1% strain) (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foam-Control EPS15</td>
<td>Type EPS15</td>
<td>0.90</td>
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<td>Foam-Control EPS19</td>
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<td>Foam-Control EPS22</td>
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<td>Foam-Control EPS39</td>
<td>Type EPS39</td>
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<tr>
<td>Foam-Control EPS46</td>
<td>Type EPS46</td>
<td>2.85</td>
<td>18.6</td>
</tr>
</tbody>
</table>

For St: 1 pcf = 16.018 kg/m³, 1 psi = 6.894757 kPa.

*The values listed are the minimum required by ASTM D6917.

### TABLE 3—MANUFACTURING LOCATIONS

<table>
<thead>
<tr>
<th>LISTEE</th>
<th>LOCATION</th>
<th>PLANT ID NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACH Foam Technologies, LLC</td>
<td>5250 North Sherman Street</td>
<td>U-1</td>
</tr>
<tr>
<td></td>
<td>Denver, Colorado 80216</td>
<td></td>
</tr>
<tr>
<td>ACH Foam Technologies, LLC</td>
<td>111 West Fireclay Avenue</td>
<td>U-2</td>
</tr>
<tr>
<td></td>
<td>Murray, Utah 84107</td>
<td></td>
</tr>
<tr>
<td>ACH Foam Technologies, LLC</td>
<td>2731 White Sulfur Road</td>
<td>U-4</td>
</tr>
<tr>
<td></td>
<td>Gainesville, Georgia 30503</td>
<td></td>
</tr>
<tr>
<td>ACH Foam Technologies, LLC</td>
<td>775 Waltham Way, Suite 105</td>
<td>U-53</td>
</tr>
<tr>
<td></td>
<td>McCarran, Nevada 89434</td>
<td></td>
</tr>
<tr>
<td>ACH Foam Technologies, LLC</td>
<td>1400 North 3rd St.</td>
<td>U-8</td>
</tr>
<tr>
<td></td>
<td>Kansas City, Kansas 66101</td>
<td></td>
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<tr>
<td>ACH Foam Technologies, LLC</td>
<td>90 Trowbridge Drive</td>
<td>U-37</td>
</tr>
<tr>
<td></td>
<td>Fond Du Lac, Wisconsin 54936-0669</td>
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</tr>
<tr>
<td>ACH Foam Technologies, LLC</td>
<td>809 East 15th Street</td>
<td>U-55</td>
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<tr>
<td></td>
<td>Washington, Iowa 52353</td>
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<tr>
<td>Big Sky Insulations, Inc.</td>
<td>15 Arden Drive</td>
<td>U-30</td>
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<td></td>
<td>Belgrade, Montana 59714</td>
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<tr>
<td>Branch River Plastics, Inc.</td>
<td>15 Thurber Boulevard</td>
<td>U-6</td>
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<td>Smithfield, Rhode Island 02917</td>
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<tr>
<td>Cellofoam North America, Inc.</td>
<td>326 McChee Road</td>
<td>U-14</td>
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<tr>
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<td>Winchester, Virginia 22603</td>
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<tr>
<td>Henry Products, Inc.</td>
<td>302 South 23rd Avenue</td>
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<td>Phoenix, AZ 85009</td>
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<td>Noark Enterprises, Inc.</td>
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<tr>
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<td>North Little Rock, Arkansas 72117</td>
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<tr>
<td>Pacific Allied Products, Ltd.</td>
<td>91-110 Naami Loop</td>
<td>U-17</td>
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<td>Kapolei, Hawaii 96707</td>
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<tr>
<td>Poliestireno Alfa-Gamma S.A. de C.V.</td>
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<tr>
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<td>ejido Aguilles Serdan C.P.</td>
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<td></td>
<td>Gómez Palacio, Durango Mexico</td>
<td></td>
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<td>Poly-Foam, Inc.</td>
<td>116 Pine Street South</td>
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<td>Lester Prairie, Minnesota 55354</td>
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<tr>
<td>Therma Foam, LLC</td>
<td>1240 Hwy 77 N</td>
<td>U-25</td>
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<td>Hillsboro, Texas 76645</td>
<td></td>
</tr>
<tr>
<td>Thermal Foams, Inc.</td>
<td>2101 Kenmore Ave.</td>
<td>U-26</td>
</tr>
<tr>
<td></td>
<td>Buffalo, NY 14207</td>
<td></td>
</tr>
</tbody>
</table>
UL Evaluation Report

UL ER11812-01

Issued: August 1, 2013
Revised: March 1, 2015


UL Category Code: ULEX

CSI MasterFormat®

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION
Sub-level 2: 07 20 00 - Thermal Protection
Sub-level 3: 07 21 00 - Thermal Insulation
Sub-level 4: 07 21 13 - Board Insulation

Sub-level 3: 07 22 00 - Roof and Deck Insulation
Sub-level 4: 07 22 16 - Roof Board Insulation

Sub-level 3: 07 25 00 - Weather Barriers

Sub-level 3: 07 27 00 - Air Barriers

DIVISION: 31 00 00 - Earthworks
Sub-level 3: 31 23 00 - Excavation and Fill
Sub-level 4: 31 23 23 - Fill

COMPANY:

AFM CORPORATION
17645 JUNIPER PATH, SUITE 260
LAKEVILLE, MN 55044
www.foam-control.com
1. SUBJECT:

FOAM-CONTROL® INSULATION BOARDS
FOAM-CONTROL® WSG INSULATION BOARDS
FOAM-CONTROL® WITH PERFORM GUARD INSULATION BOARDS
FOAM-CONTROL® WITH PERFORM GUARD2 INSULATION BOARDS
FOAM-CONTROL® CLIMATE
FOAM-CONTROL® CLIMATE WITH PERFORM GUARD
FOAM-CONTROL® CLIMATE WITH PERFORM GUARD2
FOAM-CONTROL® GEOFOAM BLOCKS
FOAM-CONTROL® WITH PERFORM GUARD GEOFOAM BLOCKS
FOAM-CONTROL® WITH PERFORM GUARD2 GEOFOAM BLOCKS

Throughout this report, unless specifically indicated otherwise:

- The reference to Foam-Control Insulation Boards will also apply to Foam-Control WSG Insulation Boards and Foam-Control Insulation Boards with Perform Guard and Perform Guard2.
- The reference to Foam-Control Climate will also apply to Foam-Control Climate with Perform Guard and Perform Guard2.
- The reference to Foam-Control Geofoam Blocks will apply to Foam-Control Geofoam Blocks with Perform Guard and Perform Guard2.

2. SCOPE OF EVALUATION:

- 2012 International Building Code ® (IBC)
- 2012 International Residential Code ® (IRC)
- 2012 International Energy Code ® (IECC)
- ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2012 (editorially revised August 2013)
- ICC-ES Acceptance Criteria for Quality Documentation (AC10, dated December 2012)
The products were evaluated for the following properties (Also see Table 1)

**Foam-Control Insulation Boards:**

- Surface Burning Characteristics (ANSI/UL723, ASTM E84)
- Physical Properties (ASTM C578)
- Physical Properties – Foam-Control WSG only (ASTM E2430)
- Roof Deck Construction Material With Resistance to Internal Fire Exposure (ANSI/UL1256)
- Roofing Systems for Exterior Fire Exposure (ANSI/UL790, ASTM E108)
- Uplift Tests For Roof Covering Systems, (ANSI/UL1897)
- Flammability Testing for Use in Attics and Crawl Spaces (AC12, App. A and B)
- Termite Resistance – Foam-Control with Perform Guard Insulation Boards and Foam-Control with Perform Guard2 Insulation Boards, only, (ICC-ES AC239)
- For Use on Exterior Commercial Walls (NFPA 285)

**Foam-Control Climate:**

- Surface Burning Characteristics (ANSI/UL723, ASTM E84)
- Physical Properties (ASTM C578)
- Roofing Systems for Exterior Fire Exposure (ANSI/UL790, ASTM E108)
- Air Barrier (ASTM E2178)
- Flammability Testing for Use in Attics and Crawl Spaces (AC12, App. A and B)
- Water-resistive Barrier (AC71)
- Termite Resistance – Foam-Control Climate with Perform Guard and Foam-Control Climate with Perform Guard2 only, (ICC-ES AC239)
- For Use on Exterior Commercial Walls (NFPA 285)

**Foam-Control Geofoam Blocks:**

- Surface Burning Characteristics (ANSI/UL723, ASTM E84)
- Physical Properties (ASTM D6817)
- Foam Plastic - Special Approval (ANSI/UL1715)
- Termite Resistance - Foam-Control with Perform Guard Geofoam Blocks and Foam-Control EPS Perform Guard2 Geofoam Blocks, only, (ICC-ES AC239)
Table 1 – Properties Evaluated

<table>
<thead>
<tr>
<th>Properties Evaluated</th>
<th>Foam-Control Insulation Boards</th>
<th>Foam Control Climate</th>
<th>Foam-Control Geofoam Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Burning Characteristics</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Physical Properties (ASTM C578)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Physical Properties** (ASTM E2430)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Properties (ASTM D6817)</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Roofing Systems for Exterior Fire Exposure</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Uplift Tests For Roof Covering Systems</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flammability Testing for Use in Attics and Crawl Spaces</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Termite Resistance *</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Water-resistive Barrier</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Barrier</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foam Plastic - Special Approval</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Exterior Walls (NFPA 285)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

* Only the products with Perform Guard and Perform Guard2 have been evaluated for Termite Resistance
** Only Foam-Control WSG Insulation Boards
3. REFERENCED DOCUMENTS

- **ICC-ES:**
  - ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2012 (editorially revised August 2013)
  - ICC-ES Acceptance Criteria for Quality Documentation (AC10), dated December 2012
  - ICC-ES Acceptance Criteria for Foam Plastic Sheathing Panels Used as Water-Resistive Barriers (AC71), dated February 2003

- **ANSI/UL:**
  - ANSI/UL723 (ASTM E84), Test for Surface Burning Characteristics of Building Materials
  - ANSI/UL790 (ASTM E108), Standard Test Methods for Fire Tests of Roof Coverings
  - ANSI/UL1256, Standard for Fire Test of Roof Deck Constructions
  - ANSI/UL 1897, Uplift Tests for Roof Covering Systems
  - ANSI/UL 1715, Fire Test of Interior Finish Material

- **ASTM:**
  - ASTM D6817, Standard Specification for Rigid Cellular Polystyrene Geofoam
  - ASTM D7180, Standard Guide for Use of Expanded Polystyrene (EPS) Geofoam in Geotechnical Projects
  - ASTM D7557, Standard Practice for Sampling of Expanded Polystyrene Geofoam Specimens

- **NFPA:**

4. USES

4.1 Foam-Control Insulation Boards:

Foam-Control Insulation Boards are used as nonstructural insulation on the interior or exterior of above grade walls, on the interior or exterior of below grade walls, below concrete slabs, around concrete slab edges, or as roof insulation. Installation shall be in accordance with Section 6.2 of this report.

The insulation boards may be used on walls in attics and crawl spaces when installation is in accordance with Section 6.2.2.

4.2 Foam-Control WSG Insulation Boards:

Foam Control WSG Insulation Boards are used as a component in Exterior Insulation and Finish Systems (EIFS).

4.3 Foam-Control Climate:

Foam-Control Climate is used as nonstructural insulation on the interior or exterior of above grade walls, on the interior or exterior of below grade walls, below concrete slabs, and around concrete slab edges, or as roof insulation. Installation shall be in accordance with Section 6.2 of this report.
The insulation may be used on walls in attics and crawl spaces when installation is in accordance with Section 6.2.2.

The insulation may be used as an alternative to the water-resistant barrier specified in the IBC Section 1404.2 and IRC Section R703.2 when installation is in accordance with Section 6.2.3.

The insulation may be used as an air barrier to limit air infiltration in accordance with IECC Section C402.4.1.2.1 when installation is in accordance with Section 6.2.3.

4.4 Foam-Control Geofoam Blocks:

Foam-Control Geofoam Blocks are used as lightweight structural fill in floor cavities. Installation shall be in accordance with Section 6.3 of this report

5. PRODUCT DESCRIPTION

5.1 General:

Foam-Control Insulation Boards, Foam-Control Climate and Foam-Control Geofoam Blocks described in 5.2, 5.3, and 5.4 are molded, closed-cell expanded polystyrene having a flame spread index not exceeding 25 and a smoke developed index not exceeding 450 for thicknesses up to 5 inches for the Foam-Control Insulation Boards and Foam-Control Geofoam Blocks and for thicknesses up to 4 inches for Foam-Control Climate, when tested in accordance with UL723 (ASTM E84) as required by Section 2603.3 of the IBC or Section R316.3 of the IRC, as applicable.

The following products are treated for termite resistance in accordance with Section 2603.9, exception 2 of the IBC or Section R318.4, exception 2 of the IRC, as applicable:

- Foam-Control with Perform Guard Insulation Boards
- Foam-Control with Perform Guard2 Insulation Boards
- Foam-Control Climate with Perform Guard
- Foam-Control Climate with Perform Guard2
- Foam-Control with Perform Guard Geofoam Blocks
- Foam-Control with Perform Guard2 Geofoam Blocks

5.2 Foam-Control Insulation Boards:

Foam-Control-50, 100, 130, 150, 250, 400, and 600 Insulation Boards are manufactured at minimum densities of 0.70, 0.90, 1.15, 1.35, 1.80, 2.40, and 3.00 lbs/ft³ and comply with ASTM C578 designations of Type XI, Type I, Type VIII, Type II, Type IX, Type XIV, and Type XV respectively. See Table 2 below:
Table 2 – Thermal Resistance Values

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>ASTM TYPE</th>
<th>DENSITY, min., lb/ft³</th>
<th>THERMAL RESISTANCE ¹, min., ° F-ft²-h/Btu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foam-Control 50</td>
<td>Type XI</td>
<td>0.70</td>
<td>3.1</td>
</tr>
<tr>
<td>Foam-Control 100</td>
<td>Type I</td>
<td>0.90</td>
<td>3.6</td>
</tr>
<tr>
<td>Foam-Control 130</td>
<td>Type VIII</td>
<td>1.15</td>
<td>3.8</td>
</tr>
<tr>
<td>Foam-Control 150</td>
<td>Type II</td>
<td>1.35</td>
<td>4.0</td>
</tr>
<tr>
<td>Foam-Control 250</td>
<td>Type IX</td>
<td>1.80</td>
<td>4.2</td>
</tr>
<tr>
<td>Foam-Control 400</td>
<td>Type XIV</td>
<td>2.40</td>
<td>4.2</td>
</tr>
<tr>
<td>Foam-Control 600</td>
<td>Type XV</td>
<td>3.00</td>
<td>4.3</td>
</tr>
</tbody>
</table>

¹Thermal resistance (R) values are based on tested values at 1 inch thickness and 75°F mean temperature and must be multiplied by the installed thickness for thicknesses greater than 1 inch.

5.3 Foam-Control WSG Insulation Boards:

Foam-Control EPS Type I-WSG Insulation Boards have been found to comply with ASTM C578 and ASTM E2430. The boards are manufactured at a minimum density of 0.90 lbs/ft³ and have ASTM C578 designation of Type I.

5.3 Foam-Control Climate:

Foam-Control Climate 100, 130, 150, 250, 400, and 600 consists of Foam-Control Insulation Boards laminated with polypropylene or polyethylene film on both faces. The facers may also be a metalized polypropylene or polyethylene film. Foam-Control Climate 100, 130, 150, 250, 400, and 600 are manufactured at minimum core densities of 0.90, 1.15, 1.35, 1.80, 2.4, and 3.0 lbs/ft³ and comply with ASTM C578 designations Type I, Type VIII, Type II, Type IX, Type XIV, and Type XV respectively.

5.4 Foam-Control Geofoam Blocks:

Foam-Control Geofoam EPS12, EPS15, EPS19, EPS22, EPS29, EPS39, AND EPS46 blocks are manufactured at minimum densities of 0.70, 0.90, 1.15, 1.35, 1.80, 2.40, and 2.85 lbs/ft³ and comply with ASTM D6817 designations of EPS12, EPS15, EPS19, EPS22, EPS29, EPS39, and EPS46 respectively. See Table 3 below:
Table 3 – ASTM D6817 Physical Property Requirements for RCPS Geofoam

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>ASTM TYPE</th>
<th>DENSITY, min., lb/ft³</th>
<th>COMPRESSIVE RESISTANCE, min., psi at 1% Strain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foam-Control</td>
<td>Type EPS12</td>
<td>0.70</td>
<td>2.2</td>
</tr>
<tr>
<td>Foam-Control</td>
<td>Type EPS15</td>
<td>0.90</td>
<td>3.6</td>
</tr>
<tr>
<td>Foam-Control</td>
<td>Type EPS19</td>
<td>1.15</td>
<td>5.8</td>
</tr>
<tr>
<td>Foam-Control</td>
<td>Type EPS22</td>
<td>1.35</td>
<td>7.3</td>
</tr>
<tr>
<td>Foam-Control</td>
<td>Type EPS29</td>
<td>1.80</td>
<td>10.9</td>
</tr>
<tr>
<td>Foam-Control</td>
<td>Type EPS39</td>
<td>2.40</td>
<td>15.0</td>
</tr>
<tr>
<td>Foam-Control</td>
<td>Type EPS46</td>
<td>2.85</td>
<td>18.6</td>
</tr>
</tbody>
</table>

6. INSTALLATION

6.1 General:

Foam-Control Insulation Boards, Foam-Control Climate and Foam-Control Geofoam blocks are installed in accordance with the manufacturer’s published installation instructions and this evaluation report. The manufacturer’s published installation instructions and this report must be strictly adhered to, and a copy of the instructions shall be available on the jobsite during installation.

6.2 Foam-Control Insulation Boards and Foam-Control Climate:

Foam-Control Insulation Boards or Foam-Control Climate must be attached to the structure in a manner that will hold the insulation securely in place. The insulation boards must not be used structurally to resist transverse, axial or shear loads.

The interior of the building must be separated from the Foam-Control Insulation Boards or Foam-Control Climate with a thermal barrier as required by Section 2603.4 of the IBC or Section R316.4 of the IRC, as applicable.
Foam-Control Insulation Boards and Foam-Control Climate may be used as vapor retarders based on perm values described in Tables 4 and 5, respectively, when required in accordance with the applicable sections of the IBC, IRC and IECC. Vapor retarders are classified as follows:

Class I: 0.1 perm or less  
Class II: 0.1 < perm ≤ 1.0  
Class III: 1.0 < perm ≤ 10 perm

### Table 4 – Water Vapor Permeance of Foam-Control Insulation Boards

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>ASTM C578 TYPE</th>
<th>DENSITY, min., lb/ft³</th>
<th>MAXIMUM PERM ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foam-Control 50</td>
<td>Type XI</td>
<td>0.70</td>
<td>5.0</td>
</tr>
<tr>
<td>Foam-Control 100</td>
<td>Type I</td>
<td>0.90</td>
<td>5.0</td>
</tr>
<tr>
<td>Foam-Control 130</td>
<td>Type VIII</td>
<td>1.15</td>
<td>3.5</td>
</tr>
<tr>
<td>Foam-Control 150</td>
<td>Type II</td>
<td>1.35</td>
<td>3.5</td>
</tr>
<tr>
<td>Foam-Control 250</td>
<td>Type IX</td>
<td>1.80</td>
<td>2.5</td>
</tr>
<tr>
<td>Foam-Control 400</td>
<td>Type XIV</td>
<td>2.40</td>
<td>2.5</td>
</tr>
<tr>
<td>Foam-Control 600</td>
<td>Type XV</td>
<td>3.00</td>
<td>2.5</td>
</tr>
</tbody>
</table>

¹ Water vapor permeance values are based on 1 inch thickness when tested in accordance with ASTM C578 and ASTM E96. Actual water vapor permeance values may be calculated based on insulation thickness, by dividing the perm value shown by the installed thickness in inches.

### Table 5 – Water Vapor Permeance of Foam-Control Climate

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>ASTM TYPE</th>
<th>DENSITY, min., lb/ft³</th>
<th>MAXIMUM PERM ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foam-Control CLIMATE 100</td>
<td>Type I</td>
<td>0.90</td>
<td>0.3</td>
</tr>
<tr>
<td>Foam-Control CLIMATE 130</td>
<td>Type VIII</td>
<td>1.15</td>
<td>0.3</td>
</tr>
<tr>
<td>Foam-Control CLIMATE 150</td>
<td>Type II</td>
<td>1.35</td>
<td>0.3</td>
</tr>
<tr>
<td>Foam-Control CLIMATE 250</td>
<td>Type IX</td>
<td>1.80</td>
<td>0.3</td>
</tr>
<tr>
<td>Foam-Control CLIMATE 400</td>
<td>Type XIV</td>
<td>2.40</td>
<td>0.3</td>
</tr>
<tr>
<td>Foam-Control CLIMATE 600</td>
<td>Type XV</td>
<td>3.00</td>
<td>0.3</td>
</tr>
</tbody>
</table>

¹ Water vapor permeance values are based on 1 inch thickness when tested in accordance with ASTM C578 and ASTM E96. Actual water vapor permeance values vary based on insulation thickness.
6.2.1 Foam-Control Insulation Boards and Foam Control Climate Used in Roofing:

Foam-Control Insulation Boards are used as a roofing insulation as follows:

- As part of a UL Classified Class A, B or C roof-covering assembly in accordance with UL 790,
- As part of a UL Classified Roof Deck Construction in accordance with UL 1256, or
- As part of a UL Classified Roofing System, Uplift Resistance, in accordance with UL 1897.

Foam-Control Climate Boards are used as a roofing insulation as follows:

- As part of a UL Classified Class A, B or C roof-covering assembly in accordance with UL 790.

6.2.2 Foam-Control Insulation Boards and Foam-Control Climate Used in Attics and Crawl Spaces:

Foam-Control Insulation Boards and Foam-Control Climate may be used on walls of attics and crawl spaces, without the coverings listed in Section 2603.4.1.6 of the IBC or Sections R316.5.3 and R316.5.4 of the IRC, as follows:

1. Entry to the attic or crawl space is limited to service of utilities, and no storage is permitted. Utilities include, but are not limited to, mechanical equipment, electrical wiring, fans, plumbing, gas or electric hot water heaters, and gas or electric furnaces.
2. There are no interconnected crawl space areas.
3. Air in the attic or crawl space is not circulated to other parts of the building.
4. Under-floor (crawl space) ventilation is provided when required by Section 1203.3 of the IBC or Section R408.1 IRC, as applicable.
5. Combustion air is provided in accordance with IMC Sections 701 and 703 (2006 IMC) or Section 701 (2012 and 2009 IMC).
6. Foam-Control Insulation boards are limited to a maximum thickness of 4 inches (102 mm) for Foam-Control 100, or a maximum thickness of 3-1/4 inches (82.6 mm) for Foam-Control 130, or a maximum thickness of 2-2/3 inches (67.8 mm) for Foam-Control 150, or a maximum thickness of 2 inches (51 mm) for Foam-Control 250.

6.2.3 Foam-Control Climate Used as a Water-Resistive Barrier

Foam-Control Climate with a minimum of 1 inch (25.4 mm) thickness may be used as an alternative to the water-resistive barrier required by IBC Section 1404.2 and IRC Section R703.2 when installed in accordance with this Section.

Foam-Control Climate must be installed directly to framing members spaced a maximum of 24 inches (610 mm) on center. Foam-Control Climate must be installed horizontally with tongue edges facing upward or installed vertically with no horizontal joints. Vertical joints must be backed by framing members.
Foam-Control Climate is attached with 1 inch (25.4 mm) wide crown No. 16 gage corrosion-resistant staples spaced 6 inches (152mm) on center. Fastener crowns and joints between boards must be covered with Foam-Control Climate Tape. A minimum 0.019 inch (0.48 mm) corrosion-resistance weep screed with a vertical attachment flange measuring a minimum of 3-1/2 inches (89mm) must be provided at the bottom of the wall. The installation of the weep screed must be in accordance with IBC Section 2512.1.1 or Section R703.6.2.1 of the IRC, as applicable.

Flashing of flanged window penetrations must be installed in accordance with IBC Section 1405.4. The flashing tape must completely cover the framing sill and extend a minimum of 8 inches (203 mm) up the sides of the opening and 6 inches (152 mm) onto the face of the Foam-Control Climate at the front of the window opening.

Flashing of small penetrations (e.g. pipes) must be with a silicone sealant complying with ASTM C920.

6.2.4 Foam-Control Insulation Boards and Foam-Control Climate used on the exterior of above grade walls:

Foam-Control Insulation Boards and Foam-Control Climate are used on the exterior of above grade walls as follows:

- Exterior Walls of One- and Two-Family Dwellings in accordance with the 2012 IRC,
- Exterior walls of one story buildings of Types I, II, III, or IV construction in accordance with Section 2603.4.1.4 of the IBC,
- Exterior walls of Type V construction in accordance with Section 2603.2, 2603.3, and 2603.4 of the IBC, or
- Exterior walls of buildings more than one story of Types I, II, III, or IV construction in accordance with Section 2603.5 of the IBC, when part of
  - a UL Classified Exterior Wall System in accordance with NFPA 285. See Section 7.2.
  - an Exterior Wall System in accordance with NFPA 285. See Table 6.
<table>
<thead>
<tr>
<th>Table 6 – NFPA 285 Compliant Assembly Options – See Figure 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Wall Options</strong></td>
</tr>
<tr>
<td>1) Cast Concrete Walls</td>
</tr>
<tr>
<td>2) CMU Cast Concrete Walls</td>
</tr>
<tr>
<td>3) Steel Stud Framed Wall</td>
</tr>
<tr>
<td>a. 25 GA. (min.) 3 5/8” (min.) steel studs spaced 24” o.c. (max.)</td>
</tr>
<tr>
<td>b. Lateral Bracing Every 4 ft. vertically</td>
</tr>
<tr>
<td>c. 5/8” Type X Gypsum Wallboard Interior</td>
</tr>
<tr>
<td>d. Cavity Insulation</td>
</tr>
<tr>
<td>i. None</td>
</tr>
<tr>
<td>ii. Any Class A, B, or C Fiberglass batt insulation (faced or unfaced)</td>
</tr>
<tr>
<td>iii. Any noncombustible insulation</td>
</tr>
<tr>
<td>e. Any 1/2” (min.) Exterior Gypsum Sheathing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Water Resistive Barrier / Air Barrier Options Over Base Wall</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) None</td>
</tr>
<tr>
<td>2) BASF Enershield HP</td>
</tr>
<tr>
<td>3) BASF Enershield I</td>
</tr>
<tr>
<td>4) Carlisle Barritech NP</td>
</tr>
<tr>
<td>5) Carlisle Barritech VP</td>
</tr>
<tr>
<td>6) Dupont Fluid Applied WB</td>
</tr>
<tr>
<td>7) Dupont Tyvek Commercialwrap (1 or 2 layers)</td>
</tr>
<tr>
<td>8) Grace Perm-A-Barrier VPS</td>
</tr>
<tr>
<td>9) Tremco EXOAir 230</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Foam-Control EPS Exterior Insulation Options</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) 10 3/4” (max.) Foam-Control 100</td>
</tr>
<tr>
<td>2) 8 1/4” (max.) Foam-Control 130</td>
</tr>
<tr>
<td>3) 7” (max.) Foam-Control 150</td>
</tr>
<tr>
<td>4) 5 1/4” (max.) Foam-Control 250</td>
</tr>
<tr>
<td>5) 4” (max.) Foam-Control 400</td>
</tr>
<tr>
<td>6) 3 1/4” (max.) Foam-Control 600</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Exterior Cladding Options</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Brick - Nominal 4” clay brick or veneer with 2” (max.) air gap behind the cladding. Brick with ties/anchors 24” o.c. (max.)</td>
</tr>
<tr>
<td>2) Concrete - 2” (min.) with 2” (max.) air gap behind the cladding</td>
</tr>
<tr>
<td>3) Concrete Masonry Units - 4” (min.) with 2” (max.) air gap behind the cladding</td>
</tr>
<tr>
<td>4) Limestone - 2” (min.) with non-open joints installation technique such as shiplap</td>
</tr>
<tr>
<td>5) Natural Stone Veneer - 2” (min.) with non-open joints installation technique such as shiplap</td>
</tr>
<tr>
<td>6) Precast Artificial Stone - 1-1/2” (min.) complying with ICC-ES, AC 51 with non-open joint installation technique</td>
</tr>
<tr>
<td>7) Terra Cotta Cladding - 1-1/4” (min.) solid with non-open joint installation technique such as shiplap</td>
</tr>
<tr>
<td>8) Stucco - 3/4” (min.) exterior cement plaster and lath</td>
</tr>
</tbody>
</table>
Fire Stopping at Floor Line Options

1) Mineral wool fiber fire stop in each stud cavity at floor line. Thickness equal to stud cavity depth. Follow manufacturer instruction for installation.

Window Header Detail

1) 25 GA. (min.) sheet metal (steel) flashing with 1” thick, 4 pcf mineral wool over interior of sheet steel
2) Header design equal or better than item 1

Figure 1 – NFPA 285 Wall Assembly

6.3 Foam-Control Geofoam Blocks:

Foam-Control Geofoam blocks are placed loosely on a level surface or existing structural slab. The blocks may be installed in a single layer or in multiple layers.


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When Foam-Control EPS geofoam blocks are less than 4 in. in thickness, the interior of the building must be separated from the geofoam blocks with a thermal barrier as required by Section 2603.4 of the IBC or Section R316.4 of the IRC, as applicable.

When Foam-Control EPS geofoam blocks are greater than 4 in. in thickness, a minimum 1 in. concrete or masonry must cover the geofoam blocks on all faces.

7. CONDITIONS OF USE

7.1 General:

The Foam-Control Insulation Boards, Foam-Control Climate and the Foam-Control Geofoam blocks described in this report comply with, or are suitable alternatives to what is specified in those codes listed in Section 2 of this report, subject to the following conditions. The Foam-Control Insulation Boards, Foam-Control Climate and Foam-Control Geofoam Blocks must be produced, identified, and installed in accordance with the manufacturer’s published installation instructions. If there is a conflict between this report and the manufacturer’s instructions this report governs.

In areas where the probability of termite infestation is defined as “very heavy”, Foam-Control Insulation Boards, Foam-Control Climate and Foam-Control Geofoam Blocks without the Perform Guard or Perform Guard2 treatment must be installed in accordance with IBC Section 2603.9 of the IBC or Section R318.4 of the IRC, as applicable.

The use of Foam-Control Insulation Boards, Foam-Control Climate and Foam-Control Geofoam Blocks with the Perform Guard or Perform Guard2 treatment are not restricted in areas where the probability of termite infestation is defined as “very heavy” in accordance with Section 2603.9 of the IBC or Section R318.4 of the IRC, as applicable.

7.2 Foam-Control Insulation Boards and Foam-Control Climate:

The Foam-Control Insulation Boards and Foam-Control Climate must be separated from the building interior with a thermal barrier, such as ½ in. gypsum board, as required by Section 2603.4 of the IBC or Section R316.4 of the IRC, as applicable.

For a listing of applicable UL Certifications for Foam-Control Insulation Boards, see the Online Certifications Directory for the following categories. Foam-Control Climate is UL Certified for BRYX, QORW and FWFO, only.

- See UL Online Certifications Directory for Foamed Plastic, UL Classified for Surface Burning Characteristics in accordance with UL723 (BRYX).
- See UL Online Certifications Directory for Polystyrene Thermal Insulation, Rigid Cellular, UL Classified in accordance with ASTM C578 (QORW).
- See UL Online Certifications Directory for Class A, B or C roof-covering assemblies UL Classified in accordance with UL 790 (TGFU).
- See UL Online Certifications Directory for Roof Deck Constructions for assemblies UL Classified in accordance with UL 1256 (TJBX):
- See UL Online Certifications Directory for Roof Deck Constructions for assemblies UL Classified in accordance with UL 1897 (TG1K):
7.3 Foam-Control Geofoam Blocks:

Foam-Control Geofoam Blocks less than 4 in. in thickness must be separated from the building interior with a thermal barrier such as ½ in. gypsum board, as required by Section 2603.4 of the IBC or Section R316.4 of the IRC, as applicable. Foam-Control Geofoam Blocks greater than 4 in. in thickness must be separated from the building interior with a minimum 1 in. thick concrete or masonry on all faces as required by Section 2603.4.1.1 of the IBC.

Design loads to be resisted by the Foam-Control Geofoam Blocks must be determined in accordance with the IBC or IRC, as applicable, and must not exceed the allowable loads noted in this report.

All construction documents specifying the Foam-Control Geofoam Blocks must comply with the design limitations of this report. Design calculations and details for the specific applications must be furnished to the code official, verifying compliance with this report and applicable codes. The documents must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

For a listing of applicable UL Certifications for Foam-Control Geofoam Blocks, see the Online Certifications Directory for the following categories:

- See UL Online Certifications Directory for Foamed Plastic, UL Classified for Surface Burning Characteristics in accordance with UL723 (BRYX).
- See UL Online Certifications Directory for Foamed Plastic, UL Classified for Interior Building Construction in accordance with UL1715 (OERU).

7.4 Manufacturing Locations:
The products are manufactured at the following locations described in Table 6 under the UL LLC Listing or Classification and Follow-Up Service Program, which includes audits in accordance with ICC-ES Acceptance Criteria for Quality Documentation, AC 10.
<table>
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<tr>
<th>LISTEE</th>
<th>LOCATION</th>
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<tr>
<td>ACH Foam Technologies, LLC</td>
<td>5250 North Sherman Street</td>
<td>U-1</td>
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<tr>
<td></td>
<td>Denver, Colorado 80216</td>
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<tr>
<td>ACH Foam Technologies, LLC</td>
<td>111 West Fireclay Avenue</td>
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<td>Murray, Utah 84107</td>
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<tr>
<td>ACH Foam Technologies, LLC</td>
<td>2731 White Sulfur Road</td>
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<td></td>
<td>Gainesville, Georgia 30503</td>
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<tr>
<td>ACH Foam Technologies, LLC</td>
<td>775 Waltham Way, Suite 105</td>
<td>U-53</td>
</tr>
<tr>
<td></td>
<td>McCarran, Nevada 89434</td>
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<tr>
<td>ACH Foam Technologies, LLC</td>
<td>1400 North 3rd St.</td>
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<td></td>
<td>Kansas City, Kansas 66101</td>
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<tr>
<td>ACH Foam Technologies, LLC</td>
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<tr>
<td>ACH Foam Technologies, LLC</td>
<td>809 East 15th Street</td>
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<td></td>
<td>Washington, Iowa 52353</td>
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<tr>
<td>Big Sky Insulations, Inc.</td>
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<tr>
<td></td>
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<tr>
<td>Branch River Plastics, Inc.</td>
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<tr>
<td>Cellofoam North America, Inc.</td>
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<tr>
<td>Henry Products, Inc.</td>
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<tr>
<td>Jabsen and Jessen Packaging</td>
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<td>Noark Enterprises, Inc.</td>
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<td>Pacific Allied Products, Ltd.</td>
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<td>Poly-Foam, Inc.</td>
<td>116 Pine Street South</td>
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<td>Lester Prairie, Minnesota 55354</td>
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<tr>
<td>Therma Foam, LLC</td>
<td>1240 Hwy 77 N</td>
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<td>Hillsboro, Texas 76645</td>
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<td>Thermal Foams, Inc.</td>
<td>2101 Kenmore Ave</td>
<td>U-26</td>
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<td>Buffalo, NY 14207</td>
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<tr>
<td>Thermal Foams/Syracuse Inc.</td>
<td>6173 S Bay Rd</td>
<td>U-27</td>
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<td>Cicero, NY 13039</td>
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</table>
8. SUPPORTING EVIDENCE

8.1 Foam-Control Insulation Boards:

8.1.1 Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2012 (editorially revised August 2013).

8.1.2 Data in accordance with ICC-ES Acceptance Criteria for Termite Resistant Foam Plastics (AC239), dated October 2008 (editorially revised February 2014).

8.1.3 UL Classification reports in accordance with UL 723, ASTM C578, UL 790, UL 1256, 1897 and NFPA 285. See UL Product Certification Categories (BRYX), (QORW), (TGFU), (TJBX), (TGIK) and (FWFO) respectively.

See links to UL’s On-Line Certification Directory in Section 7.2.

8.1.4 Reports and analysis of wall fire tests in accordance with NFPA 285.

8.1.5 Documentation of quality system elements described in AC10.

8.2 Foam-Control Climate:

8.2.1 Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2012 (editorially revised August 2013).

8.2.2 Data in accordance with ICC-ES Acceptance Criteria for Termite Resistant Foam Plastics (AC239), dated October 2008 (editorially revised February 2014).

8.2.3 Data in accordance with ICC-ES Acceptance Criteria for Foam Plastic Sheathing Panels used as Water Resistive Barriers (AC71), dated February 2003.

8.2.4 Data in accordance with ASTM E2178 Standard Test Method for Air Permeance of Building Materials.

8.2.5 UL Classification reports in accordance with UL 723, ASTM C578, ASTM E2430 and NFPA 285.. See UL Product Certification Categories (BRYX), (QORW) and (FWFO).

See links to UL’s On-Line Certification Directory in Section 7.2.

8.2.6 Reports and analysis of wall fire tests in accordance with NFPA 285.

8.2.7 Documentation of quality system elements described in AC10.
8.3 Foam-Control Geofoam Blocks:

8.3.1 UL Classification reports in accordance with UL 723, ASTM D6817, and UL 1715. See UL Product Certification Categories (BRYX), (QORW) and (OERU), respectively.

See links to UL’s On-Line Certification Directory for BRYX and QORW in section 7.3.

8.3.2 Data in accordance with ICC-ES Acceptance Criteria for Termite Resistant Foam Plastics (AC239), dated October 2008.

8.3.3 Documentation of quality system elements described in AC10.

9. IDENTIFICATION

The Foam-Control Insulation Boards, Foam-Control Climate and Foam-Control Geofoam Blocks described in this evaluation report are identified by a marking bearing the report holder’s name (AFM), the plant identification, the product name, the ASTM type designation, the UL Classification Mark, and the evaluation report number UL ER11812-01. The validity of the evaluation report is contingent upon this identification appearing on the product or UL Classification Mark certificate.

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