Geofoam No. 5001

Subject: **Understanding ASTM Standards for Geofoam**

Date: **January 2003 (Revised January 2019)**

ASTM D6817, "Standard Specification for Rigid Cellular Polystyrene Geofoam" was published by ASTM late in 2002. This standard was developed through the ASTM consensus process with input from researchers, third party agencies, users, general interest members, and manufacturers of geotechnical products.

ASTM D6817 addressed the need for a standard which is suitable for geofoam applications. Until this standard was issued, specifiers of molded polystyrene products for geotechnical applications had to rely on ASTM C578, "Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation." ASTM C578 provides information on thermal insulation and not geotechnical applications. Of particular note, the compressive resistance in ASTM C578 is listed at 10% deformation, a level that is not suitable for geotechnical load bearing applications.

ASTM D6817 provides the compressive resistance at 1% deformation for Geofoam. The compressive resistance at 1% deformation is often used in the design of geofoam projects. ASTM D6817 also includes the non mandatory 5% and 10% compressive resistance values as some specialty applications are designed to deform under loading.

ASTM D6817 provides a standard on which to specify the performance of geofoam.

The attached table outlines a few key physical properties of Hawaii Construction Foam Geofoam in accordance with ASTM D6817, "Standard Specification for Rigid Cellular Polystyrene Geofoam" compared to Hawaii Construction Foam insulation in accordance with ASTM C578, "Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation".

This table outlines a few key physical properties of Hawaii Construction Foam Geofoam in accordance with ASTM D6817, "Standard Specification for Rigid Cellular Polystyrene Geofoam" compared to Hawaii Construction Foam insulation in accordance with ASTM C578, "Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation".

Product		Geofoam 12	Geofoam 15	Geofoam 19	Geofoam 22	Geofoam 29	Geofoam 39	Geofoam 46	Insulation 50	Insulation 100	Insulation 130	Insulation 150	Insulation 250	Insulation 400	Insulation 600
ASTM D6817[1] Compliance, Type		EPS12	EPS15	EPS19	EPS22	EPS29	EPS39	EPS46							
ASTM C578[2] Compliance, Type									XI	I	VIII	II	IX	XIV	XV
Density[1,2], min., ASTM C303	lb/ft^3 (kg/m^3)	0.70 (11)	0.90 (15)	1.15 (18)	1.35 (22)	1.80 (29)	2.40 (38)	2.85 (46)	0.70 (12)	0.90 (15)	1.15 (18)	1.35 (22)	1.80 (29)	2.40 (38)	3.0 (48)
Compressive Resistance @1% deformation[1], min., ASTM D1621	psi (kPa)	2.2 (15)	3.6 (25)	5.8 (40)	7.3 (50)	10.9 (75)	15.0 (103)	18.6 (128)							
Compressive Strength @10%[2], min., ASTM D1621	psi (kPa)								5 (35)	10 (69)	13 (90)	15 (104)	25 (173)	40 (276)	60 (414)
R-value[2], Thermal Resistance, per inch, ASTM C518	°F·ft^2·h/ Btu (°K·m^2/W)								3.2 (0.56)	3.9 (0.68)	3.9 (0.69)	4.2 (0.73)	4.4 (0.77)	4.4 (0.77)	4.5 (0.78)
Flexural Strength[1,2], min. ASTM C203	psi (kPa)	10 (69)	25 (172)	30 (207)	35 (240)	50 (345)	60 (414)	75 (517)	10 (69)	25 (173)	30 (208)	35 (242)	50 (345)	60 (414)	75 (517)
Oxygen Index[1,2], min.	vol. %	24	24	24	24	24	24	24	24	24	24	24	24	24	24

[1] Please refer to ASTM D6817 specification for complete information.
[2] Please refer to ASTM C578 specification for complete information.

PAP 5001-08/20

Geofoam No. 5002

Subject: **Understanding Sample Size for Geofoam Testing**

Date: **January 2003 (Revised January 2019)**

Pacific Allied Products, Ltd has long published performance values for Hawaii Construction Foam Geofoam with respect to compressive resistance.

Pacific Allied Products, Ltd conducts tests on Geofoam for compressive resistance properties using ASTM D1621 "Test Method for Compressive Properties of Rigid Cellular Plastics." Prior to 2002, the tests were conducted on twelve inch cubes samples. This large size was selected to coincide with the large Geofoam blocks used for most geotechnical applications.

The development of ASTM D6817 (see Technical Bulletin Geofoam no. 5001) for Geofoam has led to standardization in the testing of samples. Prior to the development of ASTM D6817, an industry consensus on the testing of samples for compressive resistance properties was not available. **Two inch cube samples are specified by ASTM D6817.** The relatively small size of the two inch cube sample is to accommodate most geotechnical test facilities, many of which are not capable of testing larger samples.

Pacific Allied Products, Ltd has conducted testing in accordance with ASTM D1621 "Test Method for Compressive Properties of Rigid Cellular Plastics" using two inch cube samples. The results of these test for Hawaii Construction Foam Geofoam shows full compliance with the ASTM D6817 requirements.

A review of the values contained in the table below show that the Hawaii Construction Foam Geofoam appears stronger when tested in twelve inch cubes versus two inch cubes. The testing of two inch cubes creates a significantly greater proportion of cut edges which slightly reduce compressive resistance performance.

In addition to the sample size, results for the testing of geofoam are dependent upon the loading rate of the test. The ASTM D6817 testing specifies that the samples should be tested at a loading rate equal to 10 percent strain per minute. All Hawaii Construction Foam geofoam testing has been conducted at this loading rate.

Pacific Allied Products, Ltd supports the publishing of compressive resistance values related to geofoam on 2 inch cube samples loaded at a 0.2 inches per minute as specified in ASTM D6817.

Hawaii Construction Foam Geofoam Properties

PRODUCT		HAWAII CONSTRUCTION FOAM					
		12	15	19	22	29	39
Compressive Resistance[1] @ 1% deformation, min.	psi psf (kPa)	2.2 320 (15)	3.6 520 (25)	5.8 840 (40)	7.3 1050 (50)	10.9 1570 (75)	15.0 2160 (103)
Compressive Resistance[2] @ 1% deformation, min.	psi psf (kPa)	3.2 460 (22)	4.6 660 (32)	6.2 892 (43)	8.3 1200 (57)	11.9 1710 (82)	16.0 2300 (110)
ASTM D6817 Compliance, Type		EPS12	EPS15	EPS19	EPS22	EPS29	EPS39

[1] *ASTM D1621-00 using 2" (50mm) cubes.*

[2] *ASTM D1621-00 using 12" (305mm) cubes.*

PAP 5002-08/20

Geofoam No. 5003

Subject: **Understanding ASTM D7180 - Standard Guide for Use of Expanded Polystyrene (EPS) Geofoam in Geotechnical Projects**

Date: **September 2005 (Revised January 2019)**

Hawaii Construction Foam Geofoam is manufactured in conformance to ASTM D6817, "Standard Specification for Rigid Cellular Polystyrene Geofoam". This standard covers the material properties for Geofoam but does not provide any guidance on the use of Geofoam.

In order to provide this important design guidance, ASTM has created a baseline of information that is relevant to the use of Geofoam and has published a new ASTM standard guide. ASTM D7180, "Standard Guide for Use of Expanded Polystyrene (EPS) Geofoam in Geotechnical Projects" gives guidance to the engineering community for the use of Geofoam.

Excerpt from ASTM D7180

1. Scope

1.1 This guide covers some of the basic considerations for the use of expanded polystyrene (EPS) geofoam in geotechnical projects.

1.2 This guide offers a collection of information and does not recommend a course of action. This guide cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances.

1.3 This guide is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this guide be applied without consideration of a projects many unique aspects.

1.4 The word "standard" in the title of this guide means only that this guide has been approved through the ASTM International consensus process.

1.5 The values given in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.6 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

The standards referenced in this bulletin are copyrighted by ASTM. If you require any of the above reference standards, please visit ASTM at their website, www.astm.org to purchase a copy.

PAP 5003-08/20

Geofoam No. 5004

Subject: **R-values of Geofoam**

Date: **September 2007 (Revised January 2019)**

Hawaii Construction Foam Geofoam is manufactured in conformance to ASTM D6817, "Standard Specification for Rigid Cellular Polystyrene Geofoam." This standard covers the material properties most often required for Geofoam.

However, Hawaii Construction Foam Geofoam is often used in applications which require detailed information of the insulation performance, or R-value. The following Table provides R-value information for Hawaii Construction Foam Geofoam. The values in the table are based on testing in accordance with ASTM C177, "Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus," or ASTM C518, "Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus."

Hawaii Construction Foam Geofoam Properties

PRODUCT			HAWAII CONSTRUCTION FOAM						
			12	15	19	22	29	39	46
Density[1], min.		lb/ft^3 (kg/m^3)	0.70 (12)	0.90 (15)	1.15 (18)	1.35 (22)	1.80 (29)	2.40 (38)	2.85 (46)
R-value[1], Thermal Resistance, per inch, ASTM C518	25°F	°F.ft^2.h/Btu (°K.m^2/W)	3.6 (0.63)	4.4 (0.77)	4.5 (0.80)	4.8 (0.84)	5.0 (0.88)	5.0 (0.88)	5.1 (0.90)
	40°F	°F.ft^2.h/Btu (°K.m^2/W)	3.4 (0.60)	4.2 (0.73)	4.3 (0.75)	4.6 (0.80)	4.8 (0.84)	4.8 (0.84)	4.9 (0.86)
	75°F	°F.ft^2.h/Btu (°K.m^2/W)	3.2 (0.56)	3.9 (0.68)	3.9 (0.69)	4.2 (0.73)	4.4 (0.77)	4.4 (0.77)	4.5 (0.78)
ASTM D6817 Compliance, Type			EPS12	EPS15	EPS19	EPS22	EPS29	EPS39	EPS46

PAP 5004-08/20

Geofoam No. 5005

Subject: **Geofoam Testing Frequency: ASTM D7557**

Date: **August 2009 (Revised January 2019)**

Hawaii Construction Foam Geofoam has long supported the ongoing testing of Geofoam samples in accordance with ASTM D6817, "Standard Specification for Rigid Cellular Polystyrene Geofoam", to ensure specified performance. ASTM D6817 provides the minimum requirements for meeting specific properties, such as compressive resistance and density. However, ASTM D6817 provides no guidance on the frequency of testing of Geofoam samples to ensure ongoing compliance with the specified minimum properties.

A new standard, ASTM D7557, "Standard Practice for Sampling of Expanded Polystyrene Geofoam Specimens", has been published to provide guidance on the recommended testing frequency for Geofoam. The Standard Practice provides guidance on the location, frequency, and method of sampling representative specimens from large blocks of Geofoam. The key item included in ASTM D7557 is the frequency of the testing. The table below shows testing schedule when following ASTM D7557.

Hawaii Construction Foam Geofoam Sampling Frequency		
Initial Sample	**Ongoing Sample**	
1 block from first lot	1 block per each 500 m^3 (650 yd^3) for first 2,000 m^3 (2600 yd^3)	1 block per each 2,000 m^3 (2600 yd^3) thereafter

Hawaii Construction Foam supports the ongoing testing of Geofoam in accordance with the frequency specified in ASTM D7557 to ensure ongoing compliance with ASTM D6817.

PAP 5005-08/20

Geofoam No. 5006

Subject: **Proposed AASHTO Geofoam Specification**

Date: **April 2010 (Revised January 2019)**

Hawaii Construction Foam Geofoam is a cellular plastic material manufactured in block form to meet ASTM D6817, "Standard Specification for Rigid, Cellular Polystyrene Geofoam." The ASTM D6817 specification is the only consensus based standard available for Geofoam.

However, an alternative proposed Geofoam specification is referenced on some highway/transportation projects. This proposed specification is found in NCHRP publication 529, "Guideline and Recommended Standard for Geofoam Applications in Highway Embankments". NCHRP 529 includes a section called "Recommended EPS-Block Geofoam Standard for Lightweight Fill in Road Embankments and Bridge Approach Fills on Soft Ground".

The proposed specification is commonly referred to as the "AASHTO Geofoam Specification", although the specification has not been formally published by AASHTO.

The key performance property required in ASTM D6817 and the proposed AASHTO Geofoam Specification is equivalent despite being described with different language. Compressive resistance at 1% in ASTM D6817 is equal to Elastic Limit Stress in the proposed AASHTO specification. Please find below ASTM D6817 Types recommended to meet the proposed AASHTO Geofoam Specification.

The following ASTM D6817 Types are recommended to meet the Proposed AASHTO Geofoam Specification.

Proposed AASHTO Geofoam Specification

PRODUCT		EPS40	EPS50	EPS70	EPS100
Block Density, min.	lb/ft³ (kg/m³)	1.00 (16)	1.25 (20)	1.50 (24)	2.00 (32)
Elastic Limit Stress, min.	psi (kPa)	5.8 (40)	7.2 (50)	10.1 (70)	14.5 (100)
Initial Tanget, Young's Modulus	psi (MPa)	580 (4)	725 (5)	1015 (7)	1450 (10)
HAWAII CONSTRUCTION FOAM recommended		**19**	**22**	**29**	**39**

ASTM D6817 Geofoam Specification

PRODUCT		HAWAII CONSTRUCTION FOAM			
		19	**22**	**29**	**39**
Density, min.	lb/ft³ (kg/m³)	1.15 (18.4)	1.35 (21.6)	1.80 (28.8)	2.40 (38.4)
Compressive Resistance @ 1% deformation, min.	psi (kPa)	5.8 (40)	7.3 (50)	10.9 (75)	15.0 (103)
Elastic Modulus, min.	psi (mPa)	580 (4)	730 (5)	1090 (7.5)	1500 (10.3)

PAP 5006-08/20

Geofoam No. 5007

Subject: **Geofoam use on the interior of Buildings - Code Considerations**

Date: **August 2010 (Revised January 2019)**

Hawaii Construction Foam Geofoam is used extensively as a geotechnical material for a wide range of applications. Examples include road widening, road elevation changes, bridge embankments, and retaining walls. The lightweight and predictable engineering properties of geofoam makes it ideal to solve lightweight fill and lateral load challenges.

In addition to civil engineering applications, geofoam is used on the interior of buildings to solve engineering challenges. An example application of Geofoam used in a building's interior space is to raise the elevation of a concrete slab, while not adding significant additional load. Geofoam provides the solution to this and many other interior applications.

Materials used on and in buildings must conform to the structural and life safety requirements of the International Building Code (IBC). When Hawaii Construction Foam Geofoam is used in building construction, the requirements of Chapter 26-Plastics of the IBC must be met. Although Geofoam is not specifically mentioned in Chapter 26-Plastics, Geofoam is considered a foam plastic. Thus, the requirements for foam plastics insulations applies to Geofoam.

Two key requirements for foam plastic products identified in the 2009 IBC are:

> **2603.2 Labeling and identification.**
> Packages and containers of foam plastic insulation and foam plastic insulation components delivered to the job site shall bear the label of an approved agency showing the manufacturer's name, product listing, product identification and information sufficient to determine that the end use will comply with the code requirements.

> **2603.3 Surface-burning characteristics.**
> Unless otherwise indicated in this section, foam plastic insulation and foam plastic cores of manufactured assemblies shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested in the maximum thickness intended for use in accordance with ASTM E84 or UL 723. Loose fill-type foam plastic insulation shall be tested as board stock for the flame spread and smoke-developed indexes.

IBC Sections 2603.2 and 2603.3 states that geofoam must be covered by a third party agency listing and have been tested in accordance with ASTM E84 or UL 723. In order to meet these requirements, Hawaii Construction Foam Geofoam is covered by an Underwriters Laboratories (UL) third party inspection listing program which provides for UL labeling and testing in compliance with ASTM E84/UL 723.

The requirements for the use of thermal barriers over foam plastics is covered by IBC Section 2603.4:

> **2603.4 Thermal barrier.**
> Except as provided for in Sections 2603.4.1 and 2603.9, foam plastic shall be separated from the interior of a building by an approved thermal barrier of 1/2-inch (12.7 mm) gypsum wallboard or equivalent thermal barrier material that will limit the average temperature rise of the unexposed surface to not more than 250°F (120°C) after 15 minutes of fire exposure, complying with the standard time-temperature curve of ASTME 119 or UL 263. The thermal barrier shall be installed in such a manner that it will remain in place for 15 minutes based on FM 4880, UL 1040, NFPA 286 or UL 1715. Combustible concealed spaces shall comply with Section 717.

This section from the IBC makes it clear that Geofoam must be separated from the interior of the building by 1/2 in. gypsum board or a similar material.

A leading fire protection consulting firm was contracted to provide guidance on this IBC issue. The result is that the protection of the Geofoam from potential fire exposure is the primary concern.

Due to the applications of Geofoam potentially using greater thicknesses than foam plastics applied for general insulation uses, the thermal barrier protection recommendations for Hawaii Construction Foam Geofoam are as follows:

1. **A minimum of 1.0-inch thick concrete, concrete masonry or brick, or**
2. **A minimum of two layers of 5/8 inch thick, Type X gypsum wallboard, or**
3. **Equivalent type of protection.**

These minimum protection recommendations provide more than the 15-minute thermal barrier protection and will prevent ignition of the Geofoam for a time period greater than that required by the building Code.

In further support of Geofoam interior applications subject to building code compliance, Hawaii Construction Foam Geofoam has been recognized in UL Evaluation Report ER11812-01. ER11812-01 recognizes both the IBC surface burning characteristics and the structural performance of Hawaii Construction Foam Geofoam in accordance with ASTM D6817, “Standard Specification for Rigid Cellular Polystyrene Geofoam”.

PAP-5007-08/20

Geofoam No. 5008

Subject: **Chemical Exposure**

Date: **February 2011 (Revised January 2019)**

Hawaii Construction Foam Geofoam is used in a wide variety of applications. There may be instances in applications where the Hawaii Construction Foam Geofoam is subjected to chemical exposure. This can be by either direct exposure to the chemicals or to their chemical vapors. Exposure to chemicals most commonly occurs during the installation process or as the result of a contaminated site conditions after the Hawaii Construction Foam Geofoam is in place.

The attached table provides general guidance for the resistance of Hawaii Construction Foam Geofoam to a number of chemicals. The table is intended to provide a preliminary guide, but does not guarantee long term performance of Hawaii Construction Foam Geofoam when in contact with the listed or any other chemicals.

It is recommended that laboratory tests modeled to represent chemical exposure in end use conditions be conducted to assure efficacy of the Hawaii Construction Foam Geofoam.

When the exposure of Hawaii Construction Foam Geofoam to any harmful chemicals is a possibility or in doubt, the protection of Hawaii Construction Foam Geofoam by means of an appropriate barrier material is required.

Rating: Overall chemical exposure performance is noted by a rating symbol.

S = Satisfactory M = Marginal *U = Unsatisfactory

Chemical	Rating
Acetic Acid (5%)	S
Acetic Acid (10%)	M
Acetone	U
Ammonia	S
Benzene	U
Butly Alcohol	S
Citric Acid (10%)	S
Citric Acid (20%)	M
Detergents	M
Diesel Fuel	U
Ethyl Acetate (98%)	U
Ethyl Alcohol (95%)	M
Ethylene Glycol	S
Gasoline	U
Hexane	U
Hydrocloric Acid (10%)	S
Hydrocloric Acid (38%)	M
Hydrocloric Acid (100%)	U
Hydrogen Peroxide (30%)	S
Isopropyl Alcohol	M

Chemical	Rating
Kerosene	U
Methyl Alcohol	M
Methyl Ethyl Ketone	U
Mineral Oil	S
Motor Oil	M
Nitric Acid (20%)	U
Paint Thinner	U
Petroleum Jelly	S
Potassium Hydroxide (%30)	S
Propyl Alcohol	M
Propylene Glycol	S
Sodium Chloride (saturated)	M
Sodium Hypochlorite (15%)	S
Sodium Hydroxide (40%)	S
Sulphuric Acid (50%)	S
Sulphuric Acid (96%)	S
Toluene	U
Turpentine	U
Water (salt/sea)	S
Xylene	U

* Hawaii Construction Foam Geofoam must be protected by an appropriate barrier material if there is a potential of exposure to these chemicals.

This information contained herein is provided for general purposes only. By providing this information, Pacific Allied Products, Ltd makes no guaranty or warranty, and does not assume any liability with respect to the accuracy or completeness of such information, and hereby expressly disclaims any implied warranties of fitness of the use of Hawaii Construction Foam Geofoam for a particular purpose.

PAP 5008-08/20

Geofoam No. 5009

Subject: **Geofoam Friction**

Date: **March 2011 (Revised January 2019)**

Hawaii Construction Foam Geofoam is manufactured in conformance to ASTM D6817, "Standard Specification for Rigid Cellular Polystyrene Geofoam." This standard covers the material properties of Geofoam that are most often required for project design. However, Hawaii Construction Foam Geofoam is often used in applications which require additional information of the friction resistance between layers of Geofoam blocks.

Various researchers have conducted tests following the general procedures of ASTM D5321, "Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method" to determine the friction coefficient/friction angle for Geofoam.

The range of friction coefficient values generally reported for Geofoam to Geofoam range from 0.7 to 1.0[1].

The range of friction angle values generally reported for Geofoam to Geofoam for peak and residual shear resistance range from 32 to 48 degrees and from 27 to 35 degrees respectively.

There is a large variability in results since there is no industry standard testing conditions for sample size, surface roughness, displacement rate, and normal stress levels.

Based upon these results, researchers generally recommend an Geofoam/Geofoam friction coefficient of approximately 0.6 or an equivalent friction angle of 31 degrees for preliminary design.

References

1. http://geofoam.syr.edu/GRC_i15.asp

2. NCHRP Report 529, "Guideline and Recommended Standard for Geofoam Applications in Highway Embankments", Transportation Research Board, 2004

PAP 5009-08/20

Geofoam No. 5010

Subject: **Membrane Suppliers**

Date: **June 2012 (Revised January 2019)**

Hawaii Construction Foam Geofoam is often used in applications where a designer has specified the use of a geomembrane. Geomembranes are commonly used to provide waterproofing when geofoam is used in a building application or to provide resistance to hydrocarbons in transportation applications.

When a geomembrane is specified, the requirements for the geomembrane must be well understood to ensure the proper selection of membrane is made as a wide range of materials are available. Please contact the geomembrane manufacturers directly for product selection, suitability to meet project requirements, geofoam compatibility, and installation recommendations.

The following list of geomembrane suppliers is provided as a courtesy to Hawaii Construction Foam Geofoam users and is not necessarily exhaustive.

Agru America, Inc
www.agruamerica.com
843-546-0600

Carlisle SynTec Inc
www.carlislegeomembrane.com
800-479-6832

Cooley/Group
www.cooleygroup.com
401-724-9000

Firestone Specialty Products
www.firestonesp.com
800-428-4442

GSE Environmental
www.gseworld.com
800-435-2008

Intertape Polymer Group Inc
www.intertapepolymer.com
800-474-8273

MPC Containment
www.mpccontainment.com
800-585-0184

Poly-Flex, Inc
www.poly-flex.com
888-765-9359

Raven Industries
www.ravenind.com
605-336-2750

Seaman Corporation
www.xr-5.com
800-927-8578

Pacific Allied Products, Ltd does not make any warranty with respect to the suitability of any geomembrane. Please check with the geomembrane manufacturer directly to confirm the

PAP 5010-08/20

Geofoam No. 5011

Subject: LEED Credits for Hawaii Construction Foam® Geofoam and Hawaii Construction Foam GeoGripper® Plates

Date:

The United States Green Building Council (USGBC) publishes a credit based rating system to help encourage sustainable design. The Leadership in Energy and Environmental Design (LEED) Rating System developed by the USGBC establishes requirements for design components that impact sustainable design. Credits or points are earned for meeting specific milestones in various categories. These categories include Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, and Innovation and Design Process. A minimum number of available points are required to achieve a LEED Certified rating. Higher Silver, Gold, and Platinum levels are also available by meeting higher point thresholds.

LEED Point Potential for Hawaii Construction Foam Geofoam

Materials and Resources

Building Reuse: Credit 1 – Hawaii Construction Foam Geofoam is dimensionally stable and can be reused during building renovations.

Local/Regional Materials: Credit 5 – Hawaii Construction Foam Geofoam is manufactured at over 20 locations across North America. A Hawaii Construction Foam Geofoam facility will likely be less than 500 miles from the jobsite to help meet the local materials requirements.

Energy and Atmosphere

Minimum Energy Performance: Prerequisite Credit 2
Hawaii Construction Foam Geofoam helps ensure compliance with local energy codes and ASHRAE 90.1-1999

Optimized Energy Performance: Credit 1
Hawaii Construction Foam Geofoam provides a stable R-value without thermal drift, ensuring long term performance.

LEED Point Potential for Hawaii Construction Foam GeoGripper® Plates

Materials and Resources

Recycled Content: Credit 4 – with 51% recycled content, Hawaii Construction Foam GeoGripper Plates help meet your recycled materials credit

Postconsumer: 41%

Preconsumer: 19%

Total Recycled Content: 60%

LEED Eligible Recycled Content: 51%

PAP 5011-08/20

Geofoam No. 5012

Subject: **Specialty Compressible Application of Geofoam**

Date: **October 2015 (Revised January 2019)**

Hawaii Construction Foam Geofoam is manufactured in conformance to ASTM D6817, "Standard Specification for Rigid Cellular Polystyrene Geofoam." This standard covers the material properties most often required for geofoam applications. For most applications, long-term design loads should not exceed the linear elastic range of Hawaii Construction Foam Geofoam which is equal to the compressive resistance at 1% deformation.

However, in some specialty compressible applications the compressive resistance at 5% and 10% deformation may be applicable. The following Table provides the compressive resistance at 5% and 10% deformation for Hawaii Construction Foam Geofoam.

Hawaii Construction Foam Geofoam Properties for Compressible Applications

PRODUCT		HAWAII CONSTRUCTION FOAM						
		12	15	19	22	29	39	46
Compressive Resistance[1] @ 5% deformation, min.	psi psf (kPa)	5.1 730 (35)	8.0 1150 (55)	13.1 1890 (90)	16.7 2400 (115)	24.7 3560 (170)	35.0 5040 (241)	43.5 6260 (300)
Compressive Resistance[1] @ 10% deformation, min.	psi psf (kPa)	5.8 840 (40)	10.2 1470 (70)	16.0 2300 (110)	19.6 2820 (135)	29.0 4180 (200)	40.0 5760 (276)	50.0 7200 (345)
ASTM D6817 Compliance, Type		EPS12	EPS15	EPS19	EPS22	EPS29	EPS39	EPS46

[1] See ASTM D6817 Standard for test methods and complete information.

The compressive resistance at 5% and 10% deformation for Hawaii Construction Foam Geofoam should be used only

PAP 5012-08/20