Aquatherm Piping Systems
LEED Reference Guide

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aquatherm

Contents

Introduction

The following document is a practical guide for applying Aquatherm piping systems to the LEED credits program. This document was produced by Aquatherm to illustrate the various ways in which upgrading to fusible polypropylene piping systems can earn and contribute to LEED credits.

There are many ways to help protect environmental and human health while promoting sustainable development. Switching to Aquatherm piping systems from the current industry standards offers a wide variety of health and safety benefits, not all of which are addressed by the LEED program at this time. This document is intended to address Aquatherm's relevance to LEED credits based on Version 2.2 of the LEED for New Construction and Major Renovations Reference Guide.

The strategies outlined in the document act as a starting point for earning the appropriate LEED credits. Depending on the situation, upgrading to Aquatherm could offer an even larger contribution to the LEED credits than listed here.

Aquatherm is proud to be a member of the USGBC and a pioneering contributor to the development of sustainable, environmentally-friendly building materials.

Complete LEED Credits[1]

Sustainable Sites		14 possible points
Prereq 1	Construction Activity Pollution Prevention	1
Credit 1	Site Selection	1
Credit 2	Development Density & Community Connectivity	1
Credit 3	Brownfield Redevelopment	1
Credit 4.1	Alternative Transportation, Public Transportation Access	1
Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
Credit 4.3	Alternative Transportation, Low Emitting & Fuel Efficient Vehicles	1
Credit 4.4	Alternative Transportation, Parking Capacity	1
Credit 5.1	Site Development, Protect or Restore Habitat	1
Credit 5.2	Site Development, Maximize Open Space	1
Credit 6.1	Stormwater Design, Quantity Control	1
Credit 6.2	Stormwater Design, Quality Control	1
Credit 7.1	Heat Island Effect, Non-Roof	1
Credit 7.2	Heat Island Effect, Roof	1
Credit 8	Light Pollution Reduction	1
Water Efficiency		**5 possible points**
Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
Credit 2	Innovative Wastewater Technologies	1
Credit 3.1	Water Use Reduction, 20% Reduction	1
Credit 3.2	Water Use Reduction, 30% Reduction	1
Energy & Atmosphere		**17 possible points**
Prereq 1	Fundamental Commissioning of the Building Energy Systems	Required
Prereq 2	Minimum Energy Performance	Required
Prereq 3	Fundamental Refrigerant Management	Required
Credit 1	*Optimize Energy Performance*	*1 - 10*
Credit 2	On-Site Renewable Energy	1 - 3
Credit 3	Enhanced Commissioning	1
Credit 4	Enhanced Refrigerant Management	1
Credit 5	Measurement & Verification	1
Credit 6	Green Power	1
Materials & Resources		**13 possible points**
Prereq 1	Storage & Collection of Recyclables	1
Credit 1.1	Building Reuse, Maintain 75% of Existing Walls, Floors & Roof	1
Credit 1.2	Building Reuse, Maintain 95% of Existing Walls, Floors & Roof	1
Credit 1.3	Building Reuse, Maintain 50% of Interior Non-Structural Elements	1
Credit 2.1	*Construction Waste Management, Divert 50% from Disposal*	*1*
Credit 2.2	*Construction Waste Management, Divert 75% from Disposal*	*1*

Credit 3.1	Materials Reuse, 5%	1
Credit 3.2	Materials Reuse, 10%	1
Credit 4.1	Recycled Content, 10% (post-consumer + 1/2 pre-consumer)	1
Credit 4.2	Recycled Content, 20% (post-consumer + 1/2 pre-consumer)	1
Credit 5.1	Regional Materials, 10% Extracted, Processed & Manufactured Regionally	1
Credit 5.2	Regional Materials, 20% Extracted, Processed & Manufactured Regionally	1
Credit 6	Rapidly Renewable Materials	1
Credit 7	Certified Wood	1
Indoor Environmental Quality		**15 possible points**
Prereq 1	Minimum IAQ Performance	1
Prereq 2	Environmental Tobacco Smoke (ETS) Control	1
Credit 1	Outdoor Air Delivery Monitoring	1
Credit 2	Increased Ventilation	1
Credit 3.1	*Construction IAQ Management Plan, During Construction*	*1*
Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
Credit 4.1	*Low-Emitting Materials, Adhesives & Sealants*	*1*
Credit 4.2	Low-Emitting Materials, Paints & Coatings	1
Credit 4.3	Low-Emitting Materials, Carpet System	1
Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
Credit 5	Indoor Chemical & Pollutant Source Control	1
Credit 6.1	Controllability of Systems, Lighting	1
Credit 6.2	Controllability of Systems, Thermal Comfort	1
Credit 7.1	Thermal Comfort, Design	1
Credit 7.2	Thermal Comfort, Verification	1
Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
Credit 8.2	Daylight & Views, Views for 90% of Spaces	1
Innovation & Design Process		**5 possible points**
Credit 1.1	*Innovation in Design*	*1*
Credit 1.2	*Innovation in Design*	*1*
Credit 1.3	*Innovation in Design*	*1*
Credit 1.4	*Innovation in Design*	*1*
Credit 2	LEED Accredited Professional	1
Project Totals		69 Points
Certified 26–32 points • Silver 33–38 points • Gold 39–51 points • Platinum 52–69 points		

Energy & Atmosphere[2]
EA Credit 1: Optimize Energy Performance
1-10 Points

Intent

Achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

Requirements

Select one of the four compliance path options described below. Project teams documenting achievement using any of these options are assumed to be in compliance with EA Prerequisite 2.

NOTE: LEED for New Construction projects registered after June 26th, 2007 are required to achieve at least two (2) points under EAc1.

OPTION 1 — WHOLE BUILDING ENERGY SIMULATION (1–10 Points)
Demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004 by a whole building project simulation using the Building Performance Rating Method in Appendix G of the Standard. The minimum energy cost savings percentage for each point threshold is as follows:

New Buildings	Existing Building	Renovations Points
10.5%	3.5%	1
14%	7%	2
17.5%	10.5%	3
21%	14%	4
24.5%	17.5%	5
28%	21%	6
31.5%	24.5%	7
35%	28%	8
38.5%	31.5%	9
42%	35%	10

** Note: Only projects registered prior to June 26, 2007 may pursue 1 point under EAc1.*

Appendix G of Standard 90.1-2004 requires that the energy analysis done for the Building Performance Rating Method include ALL of the energy costs within and associated with the building project. To achieve points using this credit, the proposed design—

- must comply with the mandatory provisions (Sections 5.4, 6.4, 7.4, 8.4, 9.4 and 10.4) in Standard 90.1- 2004;
- must include all the energy costs within and associated with the building project;
- must be compared against a baseline building that complies with Appendix G to Standard 90.1-2004. The default process energy cost is 25% of the total energy cost for the baseline building. For buildings where the process energy cost is less than 25% of the baseline building energy cost, the LEED submittal must include supporting documentation substantiating that process energy inputs are appropriate.

For the purpose of this analysis, process energy is considered to include, but is not limited to, office and general miscellaneous equipment, computers, elevators and escalators, kitchen cooking and refrigeration, laundry washing and drying, lighting exempt from the lighting power allowance (e.g., lighting integral to medical equipment) and other (e.g., waterfall pumps). Regulated (non-process) energy includes lighting (such as for the interior, parking garage, surface parking, façade, or building grounds, except as noted above), HVAC (such as for space heating, space cooling, fans, pumps, toilet exhaust, parking garage ventilation, kitchen hood exhaust, etc.), and service water heating for domestic or space heating purposes.

For EA Credit 1, process loads shall be identical for both the baseline building performance rating and for the proposed building performance rating. However, project teams may follow the Exceptional Calculation Method (ASHRAE 90.1-2004 G2.5) to document measures that reduce process loads. Documentation of process load energy savings shall include a list of the assumptions made for both the base and proposed design, and theoretical or empirical information supporting these assumptions.

OR

OPTION 2 — PRESCRIPTIVE COMPLIANCE PATH: ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004 (4 Points)

Comply with the prescriptive measures of the ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004. The following restrictions apply:

- Buildings must be under 20,000 square feet.
- Buildings must be office occupancy.
- Project teams must fully comply with all applicable criteria as established in the Advanced Energy Design Guide for the climate zone in which the building is located.

OR

OPTION 3 — PRESCRIPTIVE COMPLIANCE PATH: Advanced Buildings™ Core Performance™ Guide (2-5 Points)

Comply with the prescriptive measures identified in the Advanced Buildings™ Core Performance™ Guide developed by the New Buildings Institute. The following restrictions apply:

- Buildings must be under 100,000 square feet.
- Buildings may NOT be health care, warehouse or laboratory projects.
- Project teams must fully comply with Sections One, Design Process Strategies, and Two, Core Performance Requirements.

Minimum points achieved under Option 3 (2-3 points):

- Three (3) points are available for all office, school, public assembly, and retail projects under 100,000 square feet that comply with Sections One and Two of the Core Performance Guide.
- Two (2) points are available for all other project types under 100,000 square feet (except health care, warehouse, or laboratory projects) that implement the basic requirements of the Core Performance Guide

Additional points available under Option 3 (up to 2 additional points):

- Up to two (2) additional points are available to projects that implement performance strategies listed in Section Three, Enhanced Performance. For every three strategies implemented from this section, one point is available.
- Any strategies applicable to the project may be implemented except:
  - 3.1-Cool Roofs
  - 3.8-Night Venting
  - 3.13-Additional Commissioning

These strategies are addressed by different aspects of the LEED program and are not eligible for additional points under EA Credit 1.

OR

OPTION 4 — PRESCRIPTIVE COMPLIANCE PATH: Advanced Buildings Benchmark™ Basic Criteria and Prescriptive Measures (1 Point)

Note: projects registered after June 26, 2007 may not use this option

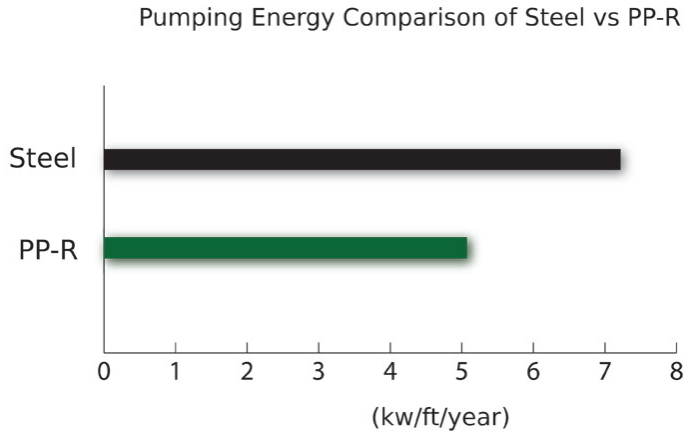
Comply with the Basic Criteria and Prescriptive Measures of the Advanced Buildings Benchmark™ Version 1.1 with the exception of the following sections: 1.7 Monitoring and Trendlogging, 1.11 Indoor Air Quality, and 1.14 Networked Computer Monitor Control. The following restrictions apply:

- Project teams must fully comply with all applicable criteria as established in Advanced Buildings Benchmark for the climate zone in which the building is located.

Relevance of Aquatherm to the LEED Credit

The pumps used to transport water and other fluids around the site play a significant role in the total electricity consumption of the building. There are a number of ASHRAE guidelines regarding the efficiency of pumps and motors, but there is little consideration for the friction factor within the piping system. Friction in the piping system results in lost pumping energy, as well as reduced performance and a shortened life-cycle for the pumps and motors.

Aquatherm's polypropylene piping systems have a lower friction factor than copper or steel piping systems. Replacing a standard metal piping system with an equivalent polypropylene piping system can reduce the amount of pumping energy lost in the system, improving overall efficiency.



By reducing the amount of energy lost to friction in a piping system, the amount of electricity used by the pumps and motors can be significantly reduced. In the case of a steel hydronic system, 50% difference in the pipe friction factor can yield a 30% savings in annual energy use of the pumping system. The total percentage of the building's energy use is dependent on the size and application of the system, as well as the other energy-consuming systems on the site.

Furthermore, the friction factor of metal systems, particularly steel, tends to increase over time, as corrosion and scaling begin to restrict water-flow. Aquatherm piping systems are not subject to corrosion or scaling and will continue to perform at the same level throughout the life of the system.

Aquatherm-recommended Strategy

Calculate the estimated annual energy use of the pumps and motors, based on an industry standard system. Implement a polypropylene piping system with a lower pipe friction factor and calculate the difference in energy consumption. Add this total to the building's proposed performance rating.

Materials & Resources[3]
MR Credit 2.1-2.2: Construction Waste Management
1-2 Points

MR Credit 2.1: Construction Waste Management: Divert 50% From Disposal
1 Point

Intent

Divert construction, demolition and land-clearing debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

Requirements

Recycle and/or salvage at least 50% of non-hazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or co-mingled. Excavated soil and land-clearing debris do not contribute to this credit. Calculations can be done by weight or volume, but must be consistent throughout.

MR Credit 2.2: Construction Waste Management: Divert 75% From Disposal
1 Point in addition to MR Credit 2.1

Intent

Divert construction and demolition debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

Requirements

Recycle and/or salvage an additional 25% beyond MR Credit 2.1 (75% total) of non-hazardous construction and demolition debris. Excavated soil and land-clearing debris do not contribute to this credit. Calculations can be done by weight or volume, but must be consistent throughout.

Relevance of Aquatherm to the LEED Credit

Polypropylene is a completely recyclable material. Waste pieces of the material are neither sharp nor hazardous, and can easily be collected and stored for recycling. Simplify the process of gathering and storing waste materials by replace metal piping systems with a safer polypropylene system, such as Climatherm or Fusiotherm.

Aquatherm-recommended Strategy

Gather up all waste pieces of the Aquatherm piping system into suitable containers and send them to facilities that accept polypropylene for recycling. Track the amount of recycled material by weight or volume for the final calculations for this credit.

Indoor Environmental Quality[4]
EQ Credit 3.1: Construction IAQ Management Plan: During Construction
1 Point

Intent

Reduce indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.

Requirements

Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:

- During construction meet or exceed the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 1995, Chapter 3.
- Protect stored on-site or installed absorptive materials from moisture damage.
- If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999. Replace all filtration media immediately prior to occupancy.

Relevance of Aquatherm to the LEED Credit

During construction, the flumes generated by welding, soldering, and gluing a piping system together can contaminate the air inside the site, as well as permeate absorbent materials such as paints, carpets, insulation, etc.

The use of heat-fusion connections eliminate the fumes produced by soldering, welding, and gluing the piping systems together. This helps minimize the number of pollutant sources in the building, as well as reducing the risk of contamination for absorptive materials. This can be included into the IAQ Management Plan, improving the overall air quality while reducing the amount of resources and planning needed to do so.

Aquatherm-recommended Strategy

Implement a polypropylene piping system with heat-fusion connections in place of a standard piping system, removing soldering, welding, and gluing as a source of indoor pollutants and contaminants. Take this into consideration while generating the IAQ Management Plan.

Indoor Environmental Quality[5]
EQ Credit 4.1: Low-Emitting Materials: Adhesives & Sealants
1 Point

Intent

Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirements

All adhesives and sealants used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the requirements of the following reference standards:

- Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management District (SCAQMD) Rule #1168. VOC limits are listed in the table below and correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005.

Architectural Applications	VOC Limit [g/L less water]
Indoor Carpet Adhesives	50
Carpet Pad Adhesives	50
Wood Flooring Adhesives	100
Rubber Floor Adhesives	60
Subfloor Adhesives	50
Ceramic Tile Adhesives	65
VCT & Asphalt Adhesives	50
Drywall & Panel Adhesives	50
Cove Base Adhesives	50
Multipurpose Construction Adhesives	70
Structural Glazing Adhesives	100
Specialty Applications	**VOC Limit [g/L less water]**
PVC Welding	510
CPVC Welding	490
ABS Welding	325
Plastic Cement Welding	250
Adhesive Primer for Plastic	550
Contact Adhesive	80
Special Purpose Contact Adhesive	250
Structural Wood Member Adhesive	140
Sheet Applied Rubber Lining Operations	850
Top & Trim Adhesive	250

Substrate Specific Applications	VOC Limit [g/L less water]
Metal to Metal	30
Plastic Foams	50
Porous Material (except wood)	50
Wood	30
Fiberglass	80
Sealants	**VOC Limit [g/L less water]**
Architectural	250
Nonmembrane Roof	300
Roadway	250
Single-Ply Roof Membrane	450
Other	420
Sealant Primers	**VOC Limit [g/L less water]**
Architectural Non Porous	250
Architectural Porous	775
Other	750

- Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36 requirements in effect on October 19, 2000.

Aerosol Adhesives:	VOC Weight [g/L minus water]
General purpose mist spray	65% VOCs by weight
General purpose web spray	55% VOCs by weight
Special purpose aerosol adhesives (all types)	70% VOCs by weight

Relevance of Aquatherm to the LEED Credit

Many plastic piping systems are joined using glues or chemical welding. These processes often generate a large volume of dangerous VOC's on a jobsite. VOC's are dangerous to human health as well as the environment and atmosphere.

PVC welding, CPVC welding, plastic cement and adhesive primers can account for up to 1800 g/L of VOC's on the site, 22% of the total allowable VOC's on a job site. The majority of these processes are used in piping applications. The function of these

applications can often be handled by a different piping material, making it easy to completely remove these sources of indoor emissions from the site.

Aquatherm piping systems are VOC free, and are joined using a safe and clean heat-fusion process. This makes them an ideal candidate to replace glued and chemically welded systems in most cases.

Aquatherm-recommended Strategy

Drastically reduce or eliminate VOC's caused by PVC welding, CPVC welding, plastic cement welding, and adhesive primers for plastic by implementing a piping system with heat-fusion connections. Replace these systems with equivalent fusible polypropylene systems, such as Fusiotherm and Climatherm, removing these VOC's from the site entirely, as well as the need to track and document them.

Innovation & Design Process[6]
ID Credit 1.1, 1.2, 1.3, and 1.4: Innovation in Design
1–4 Points

Intent

To provide design teams and projects the opportunity to be awarded points for exceptional performance above the requirements set by the LEED for New Construction Green Building Rating System and/or innovative performance in Green Building categories not specifically addressed by the LEED for New Construction Green Building Rating System.

Requirements

Credit 1.1 (1 point) In writing, identify the intent of the proposed innovation credit, the proposed requirement for compliance, the proposed submittals to demonstrate compliance, and the design approach (strategies) that might be used to meet the requirements.

Credit 1.2 (1 point) Same as Credit 1.1

Credit 1.3 (1 point) Same as Credit 1.1

Credit 1.4 (1 point) Same as Credit 1.1

Aquatherm-recommended Strategy

In 2007, the LEED Technical and Scientific Advisory Committee PVC Task Group published its conclusions on an extensive material analysis regarding the risks and benefits of PVC as a building material. Their conclusions included a recommendation to establish credits "incentivizing the substitution of problematic materials with others that are demonstrably better with regard to environmental and human health impacts over their life cycles."[7]

Following this assessment, it is recommended to seek credits for using materials that generate significantly lower emissions to manufacture and install, thus reducing the impact on environmental and human health.

It is also recommended to seek credits for using a material that avoids use of problematic chemicals without introducing other problematic chemicals, thus protecting the environment and the humans in and around the site.

Follow the subsequent guidelines to replace problematic piping systems with systems that fulfill the TSVC's recommendation. Apply for LEED ID Credits based on those guidelines.

LEED Credit ID 1.1 Reduced Environmental Impact of Potable Water System

Intent

Significantly reduce emissions by utilizing a lower-impact potable piping system than the current industry-standard

Requirements

Comparing to the industry-standard material for the potable piping application on the site, implement a piping system that produces at least 50% less total emissions to produce and install, based off a combination of Air, Soil, and Water emissions.

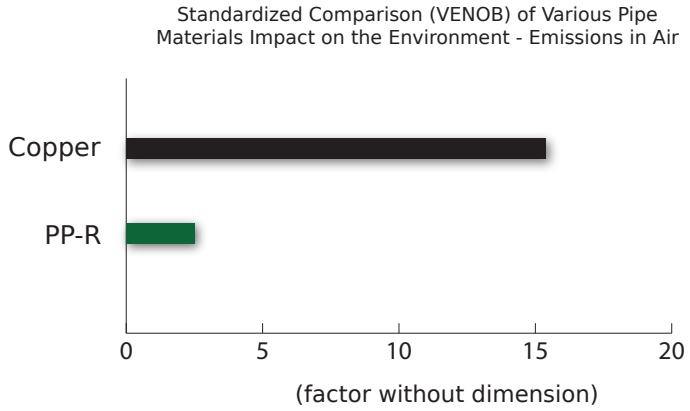
Or

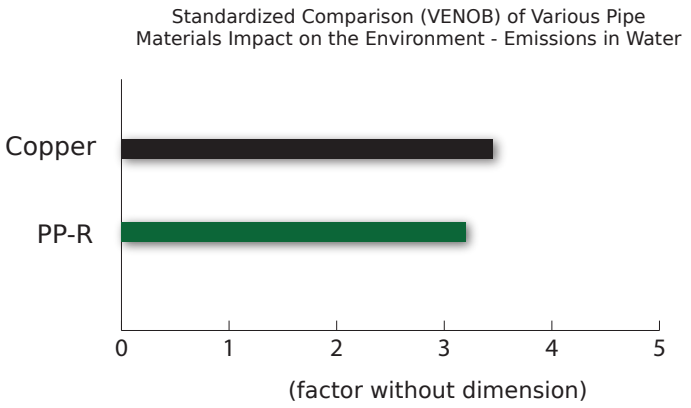
Comparing to the industry-standard material for the potable piping application on the site, implement a piping system that uses at least 50% less energy to produce and install, based off total energy consumption of production and installation.

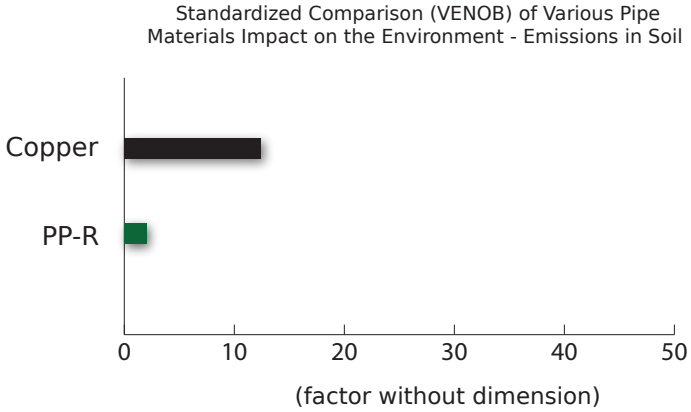
Aquatherm-recommended Strategy

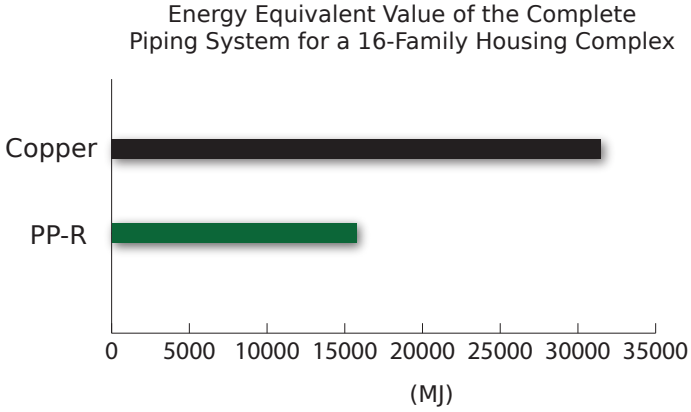
The current industry-standard material for potable piping systems is copper. By using an equivalent polypropylene system, both the requirements for half emissions and half energy can be met.

A objective analysis conducted at the Technical University in Berlin concluded the following[8]:









The study shows that a polypropylene piping system produces an average of less than 50% of the total emissions of a comparable copper piping system, as well as requiring less than 50% the energy to manufacture.

LEED Credit ID 1.2 Eliminate hazardous chemicals from the potable piping system

Intent

Limit water, soil, and air pollution on the site by reducing the amount of heavy metals used in the potable piping system without introducing PVCs, VOCs, or similarly hazardous materials.

Requirements

Comparing to the industry-standard material for the potable piping application on the site, implement a piping system that utilizes at least 80% less heavy metals (CU, FE, PB, NI, etc.) in its pipes, valves, and fittings (as a combined total). This requirement is only met if the system contains no PVC's or other plastics know to adversely affect human health.

Aquatherm-recommended Strategy

The current industry-standard material for potable piping systems is copper. By using an equivalent polypropylene system with heat-fusion connections in place of a copper piping system, over 80% of the heavy metals in the system can be eliminated without introducing PVC's, VOC's, or other hazardous chemicals.

LEED Credit ID 1.3 Reduced Environmental Impact of Heating and Cooling Distribution System

Intent

Significantly reduce emissions by utilizing a lower-impact hydronic piping system than the current industry-standard.

Requirements

Comparing to the industry-standard material for the hydronic piping application on the site, implement a piping system that produces at least 50% less total emissions to produce and install, based off a combination of Air, Soil, and Water emissions.

Or

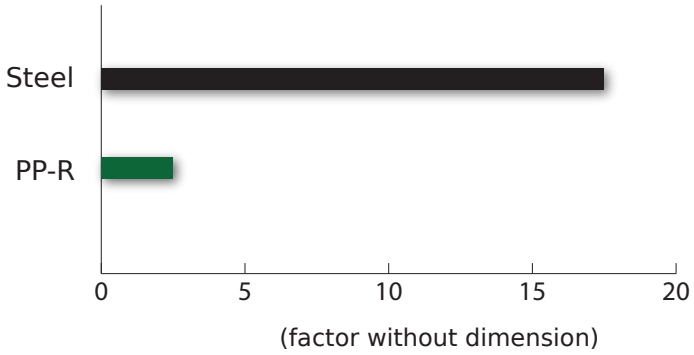
Comparing to the industry-standard material for the hydronic piping application on the site, implement a piping system that uses at least 50% less energy to produce and install, based off total energy consumption of production and installation.

Aquatherm-recommended Strategy

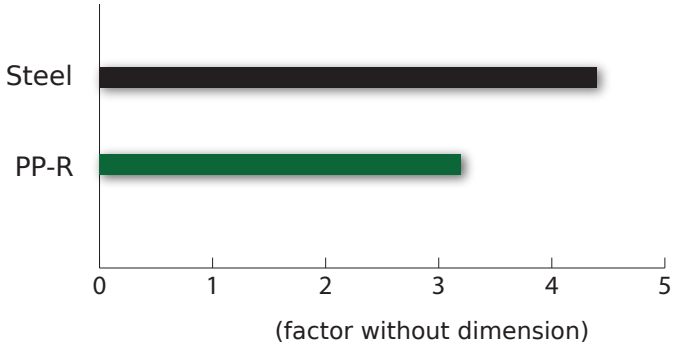
The current industry-standard material for hydronic piping systems is steel. By using an equivalent polypropylene system, both the requirements for 50% less emissions and 50% less energy used can be met.

A objective analysis conducted at the Technical University in Berlin concluded the following:

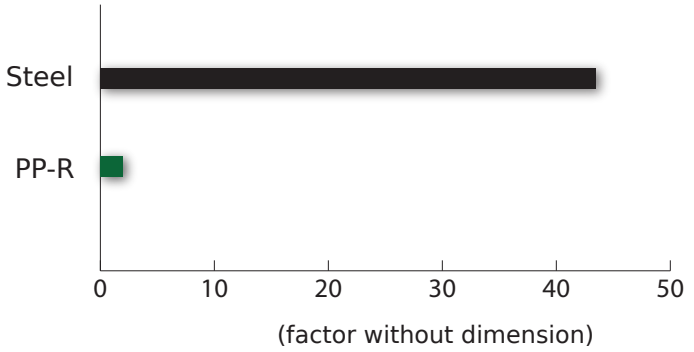
Standardized Comparison (VENOB) of Various Pipe Materials Impact on the Environment - Emissions in Air



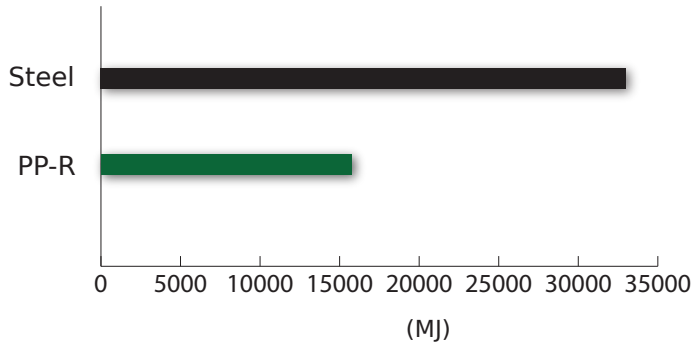
Standardized Comparison (VENOB) of Various Pipe Materials Impact on the Environment - Emissions in Water



Standardized Comparison (VENOB) of Various Pipe Materials Impact on the Environment - Emissions in Soil



Energy Equivalent Value of the Complete Piping System for a 16-Family Housing Complex



The study shows that a polypropylene piping system produces an average of less than 50% of the total emissions of a comparable steel piping system, as well as requiring less than 50% the energy to manufacture.

LEED Credit ID 1.4 Eliminate hazardous chemicals from the hydronic piping system

Intent

Limit water, soil, and air pollution on the site by reducing the amount of heavy metals used in the hydronic piping system without introducing PVCs, VOCs, or similarly hazardous materials.

Requirements

Comparing to the industry-standard material for the hydronic piping application on the site, implement a piping system that utilizes at least 80% less heavy metals (CU, FE, PB, NI, etc.) in its pipes, valves, and fittings (as a combined total). This requirement is only met if the alternative system contains no PVC's or other plastics know to adversely affect human health.

Aquatherm-recommended Strategy

The current industry-standard material for hydronic piping systems is steel. By using an equivalent polypropylene system with heat-fusion connections in place of a copper piping system, over 80% of the heavy metals in the system can be eliminated without introducing PVC's, VOC's, or other hazardous chemicals.

Sources

[1]LEED for New Construction & Major Renovations Rating System, Ver. 2.2. 6-7. USGBC. 2008 <http://www.usgbc.org/ShowFile.aspx?DocumentID=1095>

[2]LEED for New Construction & Major Renovations Rating System, Ver. 2.2. Oct. 2005. 33-35. USGBC. 2008 <http://www.usgbc.org/ShowFile.aspx?DocumentID=1095>

[3]LEED for New Construction & Major Renovations Rating System, Ver. 2.2. Oct. 2005. 47-48. USGBC. 2008 <http://www.usgbc.org/ShowFile.aspx?DocumentID=1095>

[4]LEED for New Construction & Major Renovations Rating System, Ver. 2.2. Oct. 2005. 62. USGBC. 2008 <http://www.usgbc.org/ShowFile.aspx?DocumentID=1095>

[5]LEED for New Construction & Major Renovations Rating System, Ver. 2.2. Oct. 2005. 65-66. USGBC. 2008 <http://www.usgbc.org/ShowFile.aspx?DocumentID=1095>

[6]LEED for New Construction & Major Renovations Rating System, Ver. 2.2. Oct. 2005. 77. USGBC. 2008 <http://www.usgbc.org/ShowFile.aspx?DocumentID=1095>

[7]Altshuler, Kara, Scott Horst, Nadav Malin, Greg Norris, and Yurika Nishioka. Assessment of the Technical Basis for a PVC-Related Materials Credit for LEED. Feb, 2007. 89-90. LEED Technical and Scientific Advisory Committee PVC Task Group. <https://www.usgbc.org/ShowFile.aspx?DocumentID=2372>

[8]Käuter H., Weïnfein R., Jökel C.: Final Report: Comparitive analysis of drinking water systems, Technical University Berlin, Berlin, 12. 1994