

Lubrizol Advanced Materials, Inc.

FBC™ Building Solutions

This report includes information related to plumbing materials and water distribution taken from the *National Green Building Standard™*.

The FBC Discussion following each section details the applicability of FBC products.

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INDOOR ENVIRONMENTAL QUALITY POLLUTANT SOURCE CONTROL MOISTURE MANAGEMENT: VAPOR, RAINWATER, PLUMBING, HVAC

July 30, 2010

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Sections related to plumbing materials and water distribution in the *National Green Building Standard*™ [1] are identified herein. The Commentary sections contain relevant information from the *National Green Building Standard*™ Commentary [2]. The FBC Discussion following each section details the applicability of FBC products.

CHAPTER 3 COMPLIANCE METHOD

303 - GREEN BUILDINGS

303.1 Green Buildings. The threshold points required for the environmental performance levels for a green building shall be in accordance with Table 303. To qualify for one of these performance levels, all of the following shall be satisfied:

- (1) The threshold number of points, in accordance with Table 303, shall be achieved as prescribed in Categories 1 through 6. The lowest level achieved in any category shall determine the overall performance level achieved for the building.
- (2) In addition to the threshold number of points in each category, all mandatory provisions of each category shall be implemented.
- (3) In addition to Section 701, either Section 702 (Performance Path) or Section 703 (Prescriptive Path) shall be used to establish the threshold performance level under Category 3 (Energy Efficiency).
- (4) In addition to the threshold number of points prescribed in Categories 1 through 6, the additional points prescribed in Category 7 shall be achieved from any of the categories. Where deemed appropriate by the Adopting Entity, additional points from Category 7 may be assigned to another category (or categories) to increase the threshold points required for that category (or categories). Points shall not be reduced by the Adopting Entity in any of the six other categories.

Table 303 Threshold Point Ratings for Green Buildings

Green Building Categories			Performance Level Points ^{(1) (2)}			
			BRONZE	SILVER	GOLD	EMERALD
1.	Chapter 5	Lot Design, Preparation, and Development	39	66	93	119
2.	Chapter 6	Resource Efficiency	45	79	113	146
3.	Chapter 7	Energy Efficiency	30	60	100	120
4.	Chapter 8	Water Efficiency	14	26	41	60
5.	Chapter 9	Indoor Environmental Quality	36	65	100	140
6.	Chapter 10	Operation, Maintenance, and Building Owner Education	8	10	11	12
7.		Additional Points from any category	50	100	100	100
Total Points:			222	406	558	697

⁽¹⁾ In addition to the threshold number of points in each category, all mandatory provisions of each category shall be implemented.

⁽²⁾ For dwelling units greater than 4,000 square feet (372 m²), the number of points in Category 7 (Additional Points from any category) shall be increased in accordance with Section 601.1. The "Total Points" shall be increased by the same number of points.

303.1 Commentary: Minimum points can be increased for individual chapters so long as the total required does not increase. Minimum points from chapters cannot be decreased even if there is a corresponding increase in another chapter.

303.1 FBC Discussion: FBC products contribute to points in Chapters 8 and 9.

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CHAPTER 6 RESOURCE EFFICIENCY

604		Points per Table 604.1												
RECYCLED-CONTENT BUILDING MATERIALS														
<p>604.1 Recycled content. Building materials with recycled content are used for two minor and/or two major components of the building.</p> <p style="text-align: center;">Table 604.1 Recycled Content</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Material Percentage Recycled Content</th> <th style="text-align: center;">Points Per 2 Minor</th> <th style="text-align: center;">Points Per 2 Major</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">25% to less than 50%</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">50% to less than 75%</td> <td style="text-align: center;">2</td> <td style="text-align: center;">4</td> </tr> <tr> <td style="text-align: center;">more than 75%</td> <td style="text-align: center;">3</td> <td style="text-align: center;">6</td> </tr> </tbody> </table>			Material Percentage Recycled Content	Points Per 2 Minor	Points Per 2 Major	25% to less than 50%	1	2	50% to less than 75%	2	4	more than 75%	3	6
Material Percentage Recycled Content	Points Per 2 Minor		Points Per 2 Major											
25% to less than 50%	1	2												
50% to less than 75%	2	4												
more than 75%	3	6												
<p>604.1 Commentary: All plumbing pipe and plumbing fixtures are considered minor components.</p> <p>604.1 FBC Discussion: Copper is a minor component. Even if copper is 100% recycled, using copper will not award a builder incremental points since the list of items in this category is large. Other items will quickly cause the builder to earn the maximum allowable points.</p>														

605		6 Points Max
RECYCLED CONSTRUCTION WASTE		
<p>605.3 Recycled construction materials. Construction materials (e.g., wood, cardboard, metals, drywall, plastic, asphalt roof shingles, or concrete) are recycled offsite.</p> <p>(1) a minimum of two types of materials are recycled</p> <p>(2) for each additional recycled material</p>		
<p>3</p> <p>1</p>		
<p>605.3 Commentary: Recycling done off-site can be done by a third party, and the quantity of each material that must be recycled is determined by the Adopting Entity.</p> <p>605.3 FBC Discussion: This does not apply to FBC products or any other piping material.</p>		

607		9 Points Max
RESOURCE-EFFICIENT MATERIALS		
<p>607.1 Resource-efficient materials. Products containing fewer materials are used to achieve the same end-use requirements as conventional products, including but not limited to: (3 points awarded for each material.)</p> <p>(1) lighter, thinner brick with bed depth less than 3 inches and/or brick with coring of more than 25 percent</p> <p>(2) engineered wood or engineered steel products</p> <p>(3) roof or floor trusses</p>		
<p>607.1 Commentary: Applies to all products which use less of the same materials in a system without compromising performance.</p> <p>607.1 FBC Discussion: This does not currently apply to FBC products or any other piping material.</p>		

609		15 Points Max
LIFE CYCLE ANALYSIS		
<p>609.1 Life cycle analysis. A more environmentally preferable product or assembly is selected for an application based upon the use of a Life Cycle Assessment (LCA) tool compliant with ISO 14044 or other recognized standards that compare the environmental impact of building materials, assemblies, or the whole building.</p> <p>(1) per product/system comparison</p> <p>(2) whole building LCA analysis</p>		
<p>3</p> <p>15</p>		
<p>609.1 Commentary: Points are awarded to products which have a favorable LCA comparison to other products which serve the same function and could reasonably be used on the project in question.</p> <p>609.1 FBC Discussion: This does not currently apply to FBC products or any other piping material.</p>		

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CHAPTER 7 ENERGY EFFICIENCY

703

PRESCRIPTIVE PATH

703.5 Water heating design, equipment, and installation

703.5.1. Water heater Energy Factor (EF) is equal to or greater than the following:

(1) Gas water heating

Table 703.5.1(1)(a)
Gas Water Heating

(Storage with input rate of 75,000 Btu/h or less or
instantaneous input rate of 200,000 Btu/h or less)

Size (gallons)	Energy Factor	POINTS
30 to < 40	0.64	1
40 to < 50	0.62	1
50 to < 65	0.60	1
65 to < 75	0.58	1
≥ 75	0.56	1
Any	0.80	10

For SI: 1 gallon = 3.785 L

Table 703.5.1(1)(b)
Gas Water Heating

(Storage with input rate of greater than 75,000 Btu/h or
instantaneous input rate greater than 200,000 Btu/h)

Size (gallons)	Thermal Efficiency	POINTS
Any	82-86%	1
Any	> 86%	10

**Points per
Table
703.5.1(1)(a)
or
Table
703.5.1(1)(b)**

(2) Electric water heating

Table 703.5.1(2)
Electric Water Heating

Size (gallons)	Energy Factor	POINTS
30 to < 40	0.95	1
40 to < 50	0.94	1
50 to < 65	0.92	1
65 to < 80	0.90	1
80 to < 100	0.88	1
≥ 100	0.86	1

For SI: 1 gallon = 3.785 L

**Points per
Table
703.5.1(2)**

(3) Oil water heating

Table 703.5.1(3)
Oil Water Heating

Size (gallons)	Energy Factor	POINTS
30 to < 50	0.59	1
≥ 50	0.55	1

For SI: 1 gallon = 3.785 L

**Points per
Table
703.5.1(3)**

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<p>(4) Heat pump water heating</p> <p style="text-align: center;">Table 703.5.1(4) Heat Pump Water Heating</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 30%;">Energy Factor</th> <th style="width: 40%; text-align: center;">POINTS</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Heat Pump</td> <td style="text-align: center;">1.5</td> <td style="text-align: center;">7</td> </tr> <tr> <td style="text-align: center;">Heat Pump</td> <td style="text-align: center;">2.0</td> <td style="text-align: center;">10</td> </tr> </tbody> </table>		Energy Factor	POINTS	Heat Pump	1.5	7	Heat Pump	2.0	10	Points per Table 703.5.1(4)
	Energy Factor	POINTS								
Heat Pump	1.5	7								
Heat Pump	2.0	10								

703.5.1 Commentary: Water heater efficiency can be determined by the products permanent label, "EnergyGuide" label, or information in the product specifications.

703.5.1 FBC Discussion: This does not apply to FBC products or any other piping material.

<p>703.5.4.1 Hot water lines are insulated to a minimum of R-4.</p>	<p>1</p>
<p>703.5.4.1 Commentary: The presence and R-value of pipe insulation can be verified visually.</p> <p>703.5.4.1 FBC Discussion: R-4 is a measure of thermal resistance, which indicates the thermal insulation of a material. No points for FBC products or any other piping material; however, a CPVC water distribution system is more energy-efficient than a metal plumbing system. As an insulator, CPVC does not lose heat the way metal pipes can. Superior heat retention saves money on hot water heating costs; there is less waste since occupants do not have to wait for the running water to "get hot".</p>	

<p>703.5.4.2 Boiler supply piping is insulated in unconditioned spaces.</p>	<p>1</p>
<p>703.5.4.2 Commentary: The presence and R-value of pipe insulation can be verified visually.</p> <p>703.5.4.2 FBC Discussion: No points for FBC products or any other piping material. Reference 703.5.4.1 FBC Discussion for insulating capabilities of CPVC.</p>	

<p>703.5.5 Indirect-fired water heater storage tanks heated from boiler systems are installed.</p>	<p>1</p>
<p>703.5.5 Commentary: The presence of this system is verified visually.</p> <p>703.5.5 FBC Discussion: This does not apply to FBC products or any other piping material.</p>	

704
ADDITIONAL PRACTICES

<p>704.3 Renewable energy and solar heating and cooling</p> <p>704.3.2 Solar water heating</p> <p>704.3.2.1 Solar water heater. SRCC (Solar Rating & Certification Corporation) OG 300 rated, or equivalent, solar domestic water heating system is installed. Solar Energy Factor (SEF as defined by SRCC) is in accordance with Table 704.3.2.1.</p> <p style="text-align: center;">Table 704.3.2.1 Solar Hot Water Systems</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">SEF - Electric Tank</th> <th style="width: 30%;">SEF - Gas Tank</th> <th style="width: 40%; text-align: center;">POINTS</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.30 - 1.50</td> <td style="text-align: center;">0.85 - 1.00</td> <td style="text-align: center;">8</td> </tr> <tr> <td style="text-align: center;">1.51 - 1.80</td> <td style="text-align: center;">1.01 - 1.20</td> <td style="text-align: center;">11</td> </tr> <tr> <td style="text-align: center;">1.81 - 2.30</td> <td style="text-align: center;">1.21 - 1.50</td> <td style="text-align: center;">14</td> </tr> <tr> <td style="text-align: center;">2.31 - 3.00</td> <td style="text-align: center;">1.51 - 2.00</td> <td style="text-align: center;">17</td> </tr> <tr> <td style="text-align: center;">≥ 3.01</td> <td style="text-align: center;">≥ 2.01</td> <td style="text-align: center;">20</td> </tr> </tbody> </table>	SEF - Electric Tank	SEF - Gas Tank	POINTS	1.30 - 1.50	0.85 - 1.00	8	1.51 - 1.80	1.01 - 1.20	11	1.81 - 2.30	1.21 - 1.50	14	2.31 - 3.00	1.51 - 2.00	17	≥ 3.01	≥ 2.01	20	Points per Table 704.3.2.1
SEF - Electric Tank	SEF - Gas Tank	POINTS																	
1.30 - 1.50	0.85 - 1.00	8																	
1.51 - 1.80	1.01 - 1.20	11																	
1.81 - 2.30	1.21 - 1.50	14																	
2.31 - 3.00	1.51 - 2.00	17																	
≥ 3.01	≥ 2.01	20																	

704.3.2.1 Commentary: The decision to incorporate a solar water heating system should be made as early as possible to minimize cost and maximize component placement.

704.3.2.1 FBC Discussion: No points for FBC products or any other piping material; however, FBC products are ideal to facilitate installation of this type of system.

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CHAPTER 8 WATER EFFICIENCY

801	
INDOOR AND OUTDOOR WATER USE	
801.1 Indoor hot water usage	
801.1.1 Indoor hot water usage is reduced by one of the following practices:	
(1) All hot water piping that runs to the plumbing fixtures in both the kitchen and bathrooms is 40 feet (12,192 mm) or less in length from the water heater and is sized in accordance with the code for the specified application.	2
(2) All hot water piping that runs to the plumbing fixtures in both the kitchen and bathrooms is 30 feet (9144 mm) or less from the water heater and is sized in accordance with the code for the specified application.	3
(3) One of the following piping system designs is implemented:	
(a) use of structured-type plumbing with demand-controlled hot water loops, in which the volume of water contained in the pipe and fixture fittings downstream of the recirculating trunk line is a maximum of 4 cups (0.95 liters) (57.75 cubic inches) (0.25 gallons), or	6
(b) engineered parallel piping system (i.e., manifold system) in which the hot water line distance from the water heater to the parallel piping system is less than 15 feet (4570 mm) and the parallel piping to the fixture fittings contains a maximum of 8 cups (1.89 liters) (115.50 cubic inches) (0.50 gallons), or	6
(c) central core plumbing system with all plumbing fixture fittings (e.g., faucets, showerheads) located such that the volume of water contained in each pipe run between the water heater and fixture fitting is a maximum of 6 cups (1.42 liters) (86.63 cubic inches) (0.38 gallons).	8
(4) Pipe runs exceeding 40 feet (12,192 mm) from the water heater to fixture locations are aided by one of the following:	1
(a) tankless water heater is installed at point of use and is served only by cold water or a solar-assisted system.	
(b) on-demand hot water recirculation system is installed.	
801.1.1 Commentary: CPVC has a considerably lower volume of water in Cups per Foot. CPVC use can facilitate longer pipe runs while staying under the 4 or 6 cup limitations in 3(a) and 3(c).	
801.1.1 FBC Discussion: All FBC products are ideal to help a builder facilitate installation of these systems. (1), (2), (3)(a), (3)(c), and (4): Apply to FlowGuard Gold®.	
(3)(a) Note: FlowGuard Gold® is ideal for hot water recirculation systems. It is 67% by weight chlorine and unaffected by chlorine in the water supply.	
(3)(b): Applies to the FlowGuard® MultiPort CPVC Manifold System. The FlowGuard® MultiPort CPVC Manifold System was awarded the NAHB-RC "Green Approved" product seal.	

802	
INNOVATIVE PRACTICES	
802.1 Gray water. Gray water, as specified in ICC IRC, Appendix O, is separated and reused, as permitted by local building code.	
[Points awarded for either Section 802.1(1) or 802.1(2), not both.]	
(1) each water closet flushed by reclaimed or recycled water (Points awarded per fixture.)	4
(2) irrigation from reclaimed or recycled water on-site	10
802.1 Commentary: Gray water may not be used for drinking or cooking purposes, gray water cannot be reclaimed from kitchen sinks or dishwashers, and gray water may not be used to supply exterior hose outlets. Gray water may only be used to supply toilets, urinals, and outdoor irrigation and may only come from lavatory sink and shower water.	
802.1 FBC Discussion: No points for FBC products or any other piping system; however, gray water applications result in more aggressive black water (waste water) that is best handled by CPVC piping.	

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CHAPTER 9 INDOOR ENVIRONMENTAL QUALITY

901	
POLLUTANT SOURCE CONTROL	
901.9 Adhesives and sealants. A minimum of 85 percent of site-applied adhesives and sealants are in accordance with Section 901.9.1 and/or Section 901.9.2.	
901.9.1 Exterior low-VOC adhesives and sealants: A minimum of 85 percent of site-applied products used for the installation of subfloors and on the exterior of the project are in accordance with one of the following. (1) The California Air Resources Board consumer products regulation (2) GS-36	5
901.9.1 Commentary: Exterior adhesives and sealants need improved weathering resistance and exposure to extreme temperatures and are separated from interior adhesives and sealants, whose emphasis is on improved indoor air quality.	
901.9.1 FBC Discussion: Exterior low-VOC adhesives and sealants do not apply to FBC products.	
901.9.2 Interior low-VOC adhesives and sealants. A minimum of 85 percent of site-applied products used within the interior of the building are in accordance with one of the following, as applicable. (1) CDPH 01350, as certified by a third-party program, such as the GREENGUARD Environmental Institute's <i>Children and Schools Certification Program</i> or the Scientific Certifications Systems <i>Indoor Advantage Gold Program</i> . (2) GS-36	5
901.9.2 Commentary: Product compliance must be verified with product manufacturers' information, including but not limited to material safety data sheets, technical data sheets, or compliance letters.	
901.9.2 FBC Discussion: (1) FBC products are not certified to GREENGUARD or any other third-party program. (2) Green Seal standard for Commercial Adhesives (GS-36) as it applies to CPVC [3]: 1. Scope a. Adhesives, adhesives applied onto substrates, and aerosol adhesives. Adhesives covered by the standard shall be intended and labeled for use as a commercial adhesive. The subcategories of adhesives included in this Standard are: v. Chlorinated Polyvinyl Chloride (CPVC) Welding Adhesive is any adhesive intended by the manufacturer for the welding of CPVC plastic pipe. 2. Definitions c. Commercial Adhesive: An adhesive product that is designed for use in the maintenance or operation of an establishment that manufactures, transports, or sells goods or commodities, or provides services for profit; or is engaged in the nonprofit promotion of a particular public, educational, or charitable cause. Establishments include, but are not limited to, government Agencies, military organizations, factories, schools, hospitals, sanitariums, prisons, libraries, office complexes, restaurants, hotels, stores, automobile service and parts centers, health clubs, theaters, or transportation companies. Commercial Adhesives do not include products that are incorporated into or used exclusively in the manufacture or construction of the goods or commodities that are produced by the establishment. 3. Product Specific Health and Environmental Requirements e. Volatile Organic Compounds (VOC weight in grams/liter minus water) CPVC Welding: 490 grams/liter minus water	
As of 07/2010, the following low-VOC solvent cements used for joining FlowGuard Gold® and Corzan® comply with GS-36: • IPS 2714 and 724 • Oatey 31820, 31821, 31822, 31823, and 31824	

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903	
MOISTURE MANAGEMENT: VAPOR, RAINWATER, PLUMBING, HVAC	
903.5 Plumbing	2
903.5.1 Plumbing distribution lines are not installed in exterior wall cavities.	2
903.5.1 and 903.5.2 Commentary: Installation of plumbing pipe in exterior walls, even when insulated, presents a risk of freezing and bursting. All plumbing must be installed in conditioned spaces to receive the maximum number of points.	
903.5.1 FBC Discussion: No points for FBC products or any other piping material; however, FBC products facilitate this type of installation.	
903.5.2 Commentary: Cold water pipes in unconditioned spaces are insulated to a minimum of R-4 with pipe insulation or other covering that adequately prevents condensation.	2
903.5.2 FBC Discussion: No points for FBC products or any other piping material. Reference 703.5.4.1 FBC Discussion for insulating capabilities of CPVC.	

Sources

- [1] National Association of Home Builders. (2009). *National Green Building Standard™*. Builder Books.
- [2] National Association of Home Builders. (2010). *National Green Building Standard™ Commentary*. Builder Books.
- [3] Green Seal Standards and Certification. (2000). *Commercial Adhesives (GS-36)*. Green Seal, Inc.

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