# R-Value and Densities Chart

<table>
<thead>
<tr>
<th>Material</th>
<th>R-Value Per Inch</th>
<th>R-Value Per Unit</th>
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</thead>
<tbody>
<tr>
<td>Inside Air Film</td>
<td>0.68</td>
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<tr>
<td>Air Space between Studs</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Building Paper</td>
<td>0.06</td>
<td></td>
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<tr>
<td>1½ in. Fiberboard Sheathing</td>
<td>1.52</td>
<td></td>
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<tr>
<td>Gypsum Wallboard or Drywall</td>
<td>0.90</td>
<td>--</td>
</tr>
<tr>
<td>OSB/Particle Board - Low Density</td>
<td>1.41</td>
<td>--</td>
</tr>
<tr>
<td>OSB/Particle Board - Medium Density</td>
<td>1.06</td>
<td>--</td>
</tr>
<tr>
<td>Plywood or Wood Panels</td>
<td>1.24</td>
<td>--</td>
</tr>
<tr>
<td>Hardwood</td>
<td>0.90</td>
<td>--</td>
</tr>
<tr>
<td>Cement Mortar</td>
<td>0.20</td>
<td>--</td>
</tr>
<tr>
<td>Sand &amp; Gravel</td>
<td>0.60</td>
<td>--</td>
</tr>
<tr>
<td>Stucco</td>
<td>0.20</td>
<td>--</td>
</tr>
<tr>
<td>Glass Block</td>
<td>0.51</td>
<td>--</td>
</tr>
<tr>
<td><strong>Masonry Systems</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brick 90 lb/cu ft</td>
<td>0.20</td>
<td>--</td>
</tr>
<tr>
<td>Brick 120 lb/cu ft</td>
<td>0.11</td>
<td>--</td>
</tr>
<tr>
<td>Concrete pour</td>
<td>0.08</td>
<td>--</td>
</tr>
<tr>
<td>Concrete Block Normal wt. 8in. empty core</td>
<td>--</td>
<td>1.11 - 0.97</td>
</tr>
<tr>
<td>Concrete Block Normal wt. 12in. empty core</td>
<td>--</td>
<td>1.23</td>
</tr>
<tr>
<td>Concrete Block Medium wt. 8in. empty core</td>
<td>--</td>
<td>1.71 - 1.28</td>
</tr>
<tr>
<td>Concrete Block Light wt. 8in. empty core</td>
<td>--</td>
<td>3.20 - 1.90</td>
</tr>
<tr>
<td>Concrete Block Light wt. 12in. empty core</td>
<td>--</td>
<td>2.60 - 2.30</td>
</tr>
<tr>
<td><strong>Roofing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roofing Felt</td>
<td>0.06</td>
<td>--</td>
</tr>
<tr>
<td>Asphalt Roll - 90 lb</td>
<td>0.15</td>
<td>--</td>
</tr>
<tr>
<td>Asphalt Shingle</td>
<td>0.44</td>
<td>--</td>
</tr>
<tr>
<td>Slate ½ in.</td>
<td>0.05</td>
<td>--</td>
</tr>
<tr>
<td>Wood</td>
<td>0.94</td>
<td>--</td>
</tr>
<tr>
<td>Metal – any</td>
<td>0.00</td>
<td>--</td>
</tr>
<tr>
<td>Ceramic Tile – ¼ in.</td>
<td>0.20</td>
<td>--</td>
</tr>
<tr>
<td><strong>Siding</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood Shingles 16in. – 7in. exp.</td>
<td>0.87</td>
<td>--</td>
</tr>
<tr>
<td>Wood Drop 1in. x 8in.</td>
<td>0.79</td>
<td>--</td>
</tr>
<tr>
<td>Wood Bevel ¾in. x 10in.</td>
<td>1.05</td>
<td>--</td>
</tr>
<tr>
<td>Aluminum/Steel – Hollow</td>
<td>0.61</td>
<td>--</td>
</tr>
<tr>
<td>Aluminum/Steel with 3/8in. backer</td>
<td>1.82</td>
<td>--</td>
</tr>
<tr>
<td>Vinyl Siding</td>
<td>&lt;1.0 – 4.0</td>
<td>--</td>
</tr>
<tr>
<td>Composite – Hardboard siding 0.4375in.</td>
<td>0.67</td>
<td>--</td>
</tr>
<tr>
<td><strong>Insulation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blankets/Batts - Fiberglass</td>
<td>3.0 - 3.8</td>
<td>--</td>
</tr>
<tr>
<td>Type of Building Section</td>
<td>R-Value</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Wood frame walls</td>
<td>3 plus R-value of the insulation used</td>
<td></td>
</tr>
<tr>
<td>Floors above unheated spaces</td>
<td>2 plus R-value of the insulation used</td>
<td></td>
</tr>
<tr>
<td>Ceilings</td>
<td>1-1/2 plus R-value of the insulation</td>
<td></td>
</tr>
<tr>
<td>Single-glazed windows</td>
<td>0.88</td>
<td></td>
</tr>
<tr>
<td>Double-glazed windows</td>
<td>1.67</td>
<td></td>
</tr>
<tr>
<td>Doors with glass</td>
<td>Use R-value of the glass for the entire door</td>
<td></td>
</tr>
<tr>
<td>Doors without glass</td>
<td>1.67</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Typical Masonry Systems</th>
<th>R-Value Per Inch</th>
<th>R-Value Per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brick - 90 lb/cu ft</td>
<td>0.20</td>
<td>--</td>
</tr>
<tr>
<td>Brick - 120 lb/cu ft</td>
<td>0.11</td>
<td>--</td>
</tr>
<tr>
<td>Concrete Block - Normal wt. 8in. empty core</td>
<td>--</td>
<td>1.11 - 0.97</td>
</tr>
<tr>
<td>Concrete Block - Normal wt. 12in. empty core</td>
<td>--</td>
<td>1.23</td>
</tr>
<tr>
<td>Concrete Block - Medium wt. 8in. empty core</td>
<td>--</td>
<td>1.71 - 1.28</td>
</tr>
<tr>
<td>Concrete Block - Light weight 8in. empty core</td>
<td>--</td>
<td>3.20 - 1.90</td>
</tr>
<tr>
<td>Concrete Block - Light weight 12in. empty core</td>
<td>--</td>
<td>2.60 - 2.30</td>
</tr>
</tbody>
</table>
The following table was taken from the Home Energy Website:

<table>
<thead>
<tr>
<th>No.</th>
<th>System Description</th>
<th>Clear Wall R-Value (Rcw)</th>
<th>Whole Wall R-Value (Rww)</th>
<th>(Rww/Rcw) x 100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12&quot; two-core insulating units concrete 120lb./ft³, EPS inserts 1 7/8&quot; thick, grout fillings 24&quot;o.c.</td>
<td>3.7</td>
<td>3.6</td>
<td>97%</td>
</tr>
<tr>
<td>2</td>
<td>12&quot; two-core insulating units wood concrete 40lb./ft³, EPS inserts 1 7/8&quot; thick, grout fillings 24&quot;o.c.</td>
<td>9.4</td>
<td>8.6</td>
<td>92%</td>
</tr>
<tr>
<td>3</td>
<td>12&quot; cut-web insulating units concrete 120lb./ft³, EPS inserts 2 1/2&quot; thick, grout fillings 16&quot;o.c.</td>
<td>4.7</td>
<td>4.1</td>
<td>88%</td>
</tr>
<tr>
<td>4</td>
<td>12&quot; cut-web insulating units wood concrete 40lb./ft³, EPS inserts 2 1/2&quot; thick, grout fillings 16&quot;o.c.</td>
<td>10.7</td>
<td>9.2</td>
<td>86%</td>
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<tr>
<td>5</td>
<td>12&quot; multicore insulating units polystyrene beads concrete 30lb./ft³, EPS inserts in all cores</td>
<td>19.2</td>
<td>14.7</td>
<td>77%</td>
</tr>
<tr>
<td>6</td>
<td>EPS block forms poured in place with concrete, block walls 1 7/8&quot; thick</td>
<td>15.2</td>
<td>15.7</td>
<td>103%</td>
</tr>
<tr>
<td>7</td>
<td>2 x 4 wood stud wall 16&quot;o.c., R-11 batts, 1/2&quot; plywood exterior, 1/2&quot; gypsum board interior</td>
<td>10.6</td>
<td>9.6</td>
<td>91%</td>
</tr>
<tr>
<td>8</td>
<td>2 x 4 wood stud wall 24&quot; o.c., R-11 batts, 1/2&quot; plywood exterior, 1/2&quot; gypsum board interior</td>
<td>10.8</td>
<td>9.9</td>
<td>91%</td>
</tr>
<tr>
<td>9</td>
<td>2 x 6 wood stud wall 24&quot; o.c., R-19 batts, 1/2&quot; plywood exterior, 1/2&quot; gypsum board interior</td>
<td>16.4</td>
<td>13.7</td>
<td>84%</td>
</tr>
<tr>
<td>10</td>
<td>Larsen truss walls 2 x 4 wood stud wall 16&quot;o.c., R-11 batts + 8-in-thick Larsen trusses insulated by 8&quot;-thick batts, 1/2&quot; plywood exterior, 1/2&quot; gypsum board interior</td>
<td>40.4</td>
<td>38.5</td>
<td>95%</td>
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<tr>
<td>11</td>
<td>Stressed-skin panel wall, 6&quot;-thick foam core + 1/2&quot; oriented strand board (OSB) boards, 1/2&quot; plywood exterior, 1/2&quot; gypsum board interior</td>
<td>24.7</td>
<td>21.6</td>
<td>88%</td>
</tr>
<tr>
<td>12</td>
<td>4&quot; metal stud wall 24&quot; o.c., R-11 batts, 1/2&quot; plywood exterior + 1-in EPS sheathing + 1/2&quot; wood siding, 1/2&quot; gypsum board interior. NAHB Energy Conservation House Details.</td>
<td>14.8</td>
<td>10.9</td>
<td>74%</td>
</tr>
<tr>
<td>13</td>
<td>3 1/2&quot; metal stud wall 16&quot; o.c., R-11 batts, 1/2&quot; plywood exterior + 1/2&quot; wood siding, 1/2&quot; gypsum board interior</td>
<td>7.4</td>
<td>6.1</td>
<td>83%</td>
</tr>
<tr>
<td>14</td>
<td>3 1/2&quot; metal stud wall 16&quot; o.c., R-11 batts, 1/2&quot; plywood exterior + 1/2&quot; wood siding, 1/2&quot; gypsum board interior</td>
<td>9.9</td>
<td>8.0</td>
<td>81%</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>R-Value</td>
<td>U-Value</td>
<td>%E</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------</td>
<td>---------</td>
<td>---------</td>
<td>----</td>
</tr>
<tr>
<td>15.</td>
<td>plywood exterior + 1/2&quot; EPS sheathing + 1/2&quot; wood siding, 1/2&quot; gypsum board interior. AISI Manual details</td>
<td>11.8</td>
<td>9.5</td>
<td>81%</td>
</tr>
<tr>
<td>16.</td>
<td>3 1/2&quot; metal stud wall 16&quot; o.c., R-11 batts, 1/2&quot; plywood exterior + 1&quot; EPS sheathing + 1/2&quot; wood siding, 1/2&quot; gypsum board interior. AISI Manual details</td>
<td>9.4</td>
<td>7.1</td>
<td>75%</td>
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<tr>
<td>17.</td>
<td>3 1/2&quot; metal stud wall 24&quot; o.c., R-11 batts, 1/2&quot; plywood exterior + 1/2&quot; wood siding, 1/2&quot; gypsum board interior. AISI Manual details</td>
<td>11.8</td>
<td>8.9</td>
<td>76%</td>
</tr>
<tr>
<td>18.</td>
<td>3 1/2&quot; metal stud wall 24&quot; o.c., R-11 batts, 1/2&quot; plywood exterior + 1&quot; EPS sheathing + 1/2&quot; wood siding, 1/2&quot; gypsum board interior. AISI Manual details</td>
<td>13.3</td>
<td>10.2</td>
<td>77%</td>
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<tr>
<td>Temperature (degrees F)</td>
<td>Density of Fresh Water (pounds per cubic foot)</td>
<td>Temperature (degrees F)</td>
<td>Density of Sea Water (pounds per cubic foot)</td>
<td>Temperature (degrees F)</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------</td>
<td>-----------------------------------------------</td>
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<tr>
<td>32</td>
<td>62.410</td>
<td>30</td>
<td>64.250</td>
<td>-50</td>
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<td>40</td>
<td>62.418</td>
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<td>64.200</td>
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<td>50</td>
<td>62.401</td>
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<td>64.170</td>
<td>-30</td>
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<td>60</td>
<td>62.358</td>
<td>60</td>
<td>64.100</td>
<td>-20</td>
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<td>70</td>
<td>62.293</td>
<td>70</td>
<td>64.020</td>
<td>-10</td>
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<td>80</td>
<td>62.208</td>
<td>80</td>
<td>63.950</td>
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<td>90</td>
<td>62.105</td>
<td>90</td>
<td>63.800</td>
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<td>100</td>
<td>61.986</td>
<td>100</td>
<td>63.700</td>
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<td>110</td>
<td>61.852</td>
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<td>30</td>
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<tr>
<td>120</td>
<td>61.704</td>
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</table>

Approximate values in J / kg °K of Specific Heat Capacity

<table>
<thead>
<tr>
<th>Material</th>
<th>Specific Heat Capacity (J / kg °K)</th>
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<tbody>
<tr>
<td>Air</td>
<td>1000</td>
</tr>
<tr>
<td>Aluminum</td>
<td>900</td>
</tr>
<tr>
<td>Asbestos</td>
<td>840</td>
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<tr>
<td>Brass</td>
<td>400</td>
</tr>
<tr>
<td>Brick</td>
<td>750</td>
</tr>
<tr>
<td>Concrete</td>
<td>3300</td>
</tr>
<tr>
<td>Cork</td>
<td>2000</td>
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<td>Glass</td>
<td>600</td>
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<tr>
<td>Gold</td>
<td>130</td>
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<tr>
<td>Ice</td>
<td>2100</td>
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<tr>
<td>Iron, cast</td>
<td>500</td>
</tr>
<tr>
<td>Lead</td>
<td>125</td>
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<td>Mercury</td>
<td>140</td>
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<td>Nylon</td>
<td>1700</td>
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<tr>
<td>Paraffin</td>
<td>2100</td>
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<tr>
<td>Platinum</td>
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<tr>
<td>Polythene</td>
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<td>Silver</td>
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<tr>
<td>Steel</td>
<td>450</td>
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<tr>
<td>Water</td>
<td>4200</td>
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Civil Engineering and Architecture R-Value and Densities Chart – Page 5