DEFINITIONS OF INSULATION TERMS

Thermal insulation in construction is rated by the amount of heat that will flow through one square foot, per hour, per degree F temperature difference. This measurement is made in Btu and expressed as either “k”, “C”, or “U” values.

“k” (conductivity):
The measurement of heat flow through one-inch thickness of any single material per hour x °F'' is technically written: 
\[ k = \frac{\text{Btu}}{\text{hr}} \frac{1}{(\text{sq.ft.})(\text{°F/inch})} \]. “k” values are determined by laboratory tests and may be found in product manufacturers’ literature.

Example:
- *k* of Rigid Urethane Foam: 0.14 Btu/(hr)(sq.ft.) (°F/inch)
- *k* of Glass Fiber: 0.25 Btu/(hr)(sq.ft.) (°F/inch)
- *k* of Expanded Polystyrene Bead Board: 0.28 Btu/(hr)(sq.ft.) (°F/inch)
- *k* of Fiberboard Roof Insulation: 0.34 Btu/(hr)(sq.ft.) (°F/inch)
- *k* of Concrete (not dried): 12.00 Btu/(hr)(sq.ft.) (°F/inch)

“C” (conductance):
The measurement of heat flow through any single material that is more or less than one-inch thick is expressed as 
\[ C = \frac{\text{Btu}}{\text{hr}} \frac{1}{(\text{sq.ft.})(\text{°F})} \]. To find “C”, divide thickness (T) of the material into its “k” factor. Formula: \( C \) (For one inch of material, “k” and “C” are the same).

“U” Factor:
The measurement, in Btu of heat flow, per hour square foot (°F) ... through a combination of materials or structure, such as, hung ceiling and air space (if used), roof-deck vapor barrier, roof insulations, built-up roofing and the air films below and above these combinations. Formula: \( U = \frac{\text{Btu}}{\text{hr}} \frac{1}{(\text{sq.ft.})(\text{°F})} \).

“R” Factor:
Since “k” and “C” values decrease as insulation value increases, it is impossible to add “C” and “k” values. Therefore, it is necessary to use an additional factor to find the “U”. This is called the “R” factor. “R” is the reciprocal of the material’s “C” and is found by dividing “C” into 1. Therefore, the formula is: \( R = \frac{1}{C} \)

“R” factors of each material in construction are added together to obtain total resistance (R1). To calculate the thickness of insulation required to meet a specified “U”, first determine the total resistance of the structure. \( \frac{1}{R} \) is the reciprocal of “U” and is found by dividing “U” into 1. Therefore the formula is \( R = \frac{1}{U} \)

“Degree Days”
The number of degrees the average temperature deviates from 65°F each day during the heating season.

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For more information contact:

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1-519-622-1131
1-800-265-3510
Thermal Values

**Therma Bloc**

- Improve sound resistance
- Improve dewpoint
- Easy installation of pipes, conduit
- Benefits residential or commercial
- Minimize insulative problems

Therma Bloc is available in 20cm, 25cm and 30cm units, in lightweight or concrete, standard or decorative, plain or coloured. The architect, engineer, design builder now has an opportunity to design with energy conservation in mind, and enhance the overall project, by using masonry insulated single wythe or cavity wall construction.

On the job, you receive pre-insulated block, and the insulated wall within a wall requires no special handling or installation procedures.

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Our sales representatives will assist you in obtaining samples, literature, and methods of further cost savings in using Therma Bloc.

**Features**
- Reduce overall construction costs
- Minimize insulative problems
- More consistent insulative values
- Metric units only
- No waste or clean-up costs
- Benefits residential or commercial
- Easy installation of pipes, conduit
- Eliminate cold spots in exterior walls
- Improve dewpoint
- Speed completion of job
- Improve sound resistance
- Warmer walls in winter, cooler walls in summer
- Use above or below grade
- Greater fuel efficiency
- Eliminate vandalism to interior insulated walls, with drywall

**Benefits**

% Reduction in Heat Loss

<table>
<thead>
<tr>
<th>Reduction in Heat Loss (Btu/hr)</th>
<th>202/1000</th>
<th>2250</th>
<th>3000</th>
<th>3750</th>
<th>4500</th>
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</thead>
<tbody>
<tr>
<td>Based on A 1000 SQ. FT. WALL</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
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**NCMA Concrete Masonry R-Value Evaluation**

**20 x 20 x 40 cm Concrete Masonry Unit With Expanded Polystyrene Inserts**

**Concrete Density**

<table>
<thead>
<tr>
<th>Rips/cm³</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>5.6</td>
<td>0.18</td>
<td>0.98</td>
<td>1.02</td>
</tr>
<tr>
<td>95</td>
<td>5.1</td>
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<td>105</td>
<td>4.7</td>
<td>0.21</td>
<td>0.83</td>
<td>1.20</td>
</tr>
<tr>
<td>115</td>
<td>4.3</td>
<td>0.23</td>
<td>0.76</td>
<td>1.32</td>
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<td>125</td>
<td>3.9</td>
<td>0.25</td>
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<td>135</td>
<td>3.6</td>
<td>0.28</td>
<td>0.63</td>
<td>1.60</td>
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**25 x 20 x 40 cm Concrete Masonry Unit With Expanded Polystyrene Inserts**

**Concrete Density**

<table>
<thead>
<tr>
<th>Rips/cm³</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>5.5</td>
<td>0.18</td>
<td>0.98</td>
<td>1.03</td>
</tr>
<tr>
<td>95</td>
<td>5.1</td>
<td>0.19</td>
<td>0.90</td>
<td>1.11</td>
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<tr>
<td>105</td>
<td>4.7</td>
<td>0.21</td>
<td>0.83</td>
<td>1.20</td>
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<tr>
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</table>

**30 x 20 x 40 cm Concrete Masonry Unit With Expanded Polystyrene Inserts**

**Concrete Density**

<table>
<thead>
<tr>
<th>Rips/cm³</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
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</thead>
<tbody>
<tr>
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<td>0.66</td>
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<td>135</td>
<td>3.5</td>
<td>0.29</td>
<td>0.61</td>
<td>1.64</td>
</tr>
</tbody>
</table>

**Notes:**
- Unit properties based on mold drawing above. Picture is of 20 cm units provided to the Laboratory
- Values between those shown in the table above can be determined by interpolation
- Concrete masonry provides thermal mass to structures that minimizes interior temperature fluctuation and reduces heating and cooling costs. The R-Values shown above do not take into account the benefits provided by thermal mass, which should be considered separately.

**Manager, Research and Development Laboratory**

Nicholas R. Lang
Phone: 703/713-1900  Fax: 703/713-1910
Website: www.ncma.org

Thermal Values

**Product Description:**

**Company Name:**

**Report Date:** 3/27/2013

**Notes:**

Basis for calculation and terms of this certification are described on the back of this page.

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