En modell av den planerade byggnaden
The heat transfer from inside building to outside during winter time, and its transfer from outside building to inside during summer time occur by two ways through the external structural envelope of the building:

1- Heat transfer through walls and roofs from air in one side to that in the other side
2- By air leakage or permeation whether it is cold or hot

Therefore if we want to constrict heat transmission we must improve the characteristic of heat insulation of walls, windows and roofs as well as decrease external air leakage to inside building through clefts in doors, windows and there rims or when it was opened, and that achieved by using windows and doors perfectly plugged.

Heat transmission occurs between two matters with different heat by conduction, convection, and radiation or by more than one method at the same time. Conduction method of heat transmission is the lonely method by which heat transfer in solid materials.

So:

\[ q = k \frac{A}{x} (t_0 - t_i)^1 \]

Where:

q: Amount of heat transferred, W (watt)

k: Heat conduction factor, W/m \(0^\circ\)C

A: Work area, m\(^2\)

x: The distance between the ends, m

\(t_0\): External temperature, \(0^\circ\)C

\(t_i\): Internal temperature, \(0^\circ\)C

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1 Symbols have been taken from ASHRAE.
3 Fig. has been taken from Wikipedia, http://sv.wikipedia.org.
Note: Design temperature\(^4\) is (see table 1):

- at summer \( t_0 = 45 \, ^\circ\text{C}, \, t_i = 22 \, ^\circ\text{C} \)
- at winter \( t_0 = 06 \, ^\circ\text{C}, \, t_i = 24 \, ^\circ\text{C} \)

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Table 1: *temperatures distribution during the year (2006) in Iraq*.\(^5\)

\[ R = \sum \frac{x}{k} \]

Where:

R: Heat resisting, m\(^2 \cdot ^\circ\text{C}/\text{W}\)

So

\[ q = \frac{A}{R} (t_0 - t_i) \]

When heat transfer between solid and liquid materials always there is a fine coat of liquid that try to adhere with the surface of solid material (substance) and this semi static fine coat act to prevent heat transmission causing additional resistance.

The caliper of this coat depends mainly on the circumstances of heat transmission by convection, on surface conformation, its divergence angle and on roughness of the surface.

\(^4\) Experimental degree refers to humans relaxation's temperature  
\(^5\) www.weather.com
With the passage of strong wind on external surface of walls or roofs, the fine coat layer differ in this case from that when the wind calm or that found in contact with the internal surface of the wall or roof.

This resistant can be define in the equation below:

\[ R = \frac{1}{f} \]

Where:

F: Film coefficient (surface resistance), W/m\(^2\) C

Note: Design film coefficient is:

- At summer \( F_i = 22.7 \) W/m\(^2\) C, wind speed \( 3.33 \) m/s (outside).
- At winter \( F_i = 34.1 \) W/m\(^2\) C, wind speed \( 6.67 \) m/s (outside).
- \( F_i = 9.37 \) W/m\(^2\) C, internal air speed \( 0.15 \) m/s.

The coefficient C “Heat conduction factor for inhomogeneous material” used for non homogenous material that difficult to obtain its thickness like air layers and perforated stones and heat resisting will be:

\[ R = \sum \frac{1}{c} \]

Now we can write a general equation of heat resistance for any wall or roof component that contains heat resistance for air layers, homogenous and non homogenous materials:

\[ R = \frac{1}{f_o} \sum \frac{x}{k} + \sum \frac{1}{c} + \frac{1}{fi} \]

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8. see page 13
For walls without insulation:

Total wall area\(^9\) \(213.677 \text{ m}^2\)

1. Wall formed from 5 layers\(^{10}\). It is as follow from inside to outside:

1/ Stucco (Gypsum), thickness 3mm, \(k=0.81 \text{ W/m } ^0\text{C}\)

2/ Plaster, thickness 10mm, \(k=0.721 \text{ W/m } ^0\text{C}\)

3/Brick, thickness 240mm, \(k=0.72 \text{ W/m } ^0\text{C}\)

4/Sand Cement Mortar, thickness 10mm, \(k=0.721 \text{ W/m } ^0\text{C}\)

5/Marble, thickness 15mm, \(k=2.9 \text{ W/m } ^0\text{C}\)

Fig.2: wall cross section.

At summer

\[
R = \frac{1}{9.37} + \frac{3 \times 10^{-3}}{0.81} + \frac{10 \times 10^{-3}}{0.721} + \frac{240 \times 10^{-3}}{0.72} + \frac{10 \times 10^{-3}}{0.721} + \frac{15 \times 10^{-3}}{2.9} + \frac{1}{22.7} = 0.518 \text{ m}^2 \text{ } ^0\text{C/W}
\]

\[
q = \frac{213.677}{0.518} (45 - 22) = 9437 \text{ W}
\]

\(^9\) See ground floor plan.

\(^{10}\) Add to that 2 layers outside and inside surface resistance.
At winter

\[
R = \frac{1}{9.37} + \frac{3 \times 10^{-3}}{0.81} + \frac{10 \times 10^{-3}}{0.721} + \frac{240 \times 10^{-3}}{0.721} + \frac{10 \times 10^{-3}}{2.9} + \frac{1}{34.1} = 0.506 \text{ m}^2 \text{ °C/W}
\]

\[
q = \frac{213.677}{0.506} (24 - 06) = 7602 \text{ W}
\]

2. Wall formed from 5 layers. It is as follow from inside to outside:

1/ Stucco (gypsum) thickness 3mm, \(k=0.81 \text{ W/m °C}\)

2/ Plaster thickness 10mm, \(k=0.721 \text{ W/m °C}\)

3/ Hollow block thickness 200mm \(C=5.11 \text{ W/m}^2 \text{ °C}\)

4/ Sand Cement Mortar thickness 10mm, \(k=0.721 \text{ W/m °C}\)

5/ Marble thickness 15mm, \(k=2.9 \text{ W/m °C}\)

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**Fig.3:** wall cross section.

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\(^{11}\) Add to that 2 layers outside and inside surface resistance.
At summer

\[ R = \frac{1}{9.37} + \frac{3 \times 10^{-3}}{0.81} + \frac{10 \times 10^{-3}}{0.721} + \frac{1}{5.11} + \frac{10 \times 10^{-3}}{0.721} + \frac{15 \times 10^{-3}}{2.9} + \frac{1}{22.7} = 0.383 \, \text{m}^2 \cdot \text{C/W} \]

\[ q = \frac{213.677}{0.383} (45 - 22) = 12828 \, \text{W} \]

At winter

\[ R = \frac{1}{9.37} + \frac{3 \times 10^{-3}}{0.81} + \frac{10 \times 10^{-3}}{0.721} + \frac{1}{5.11} + \frac{10 \times 10^{-3}}{0.721} + \frac{15 \times 10^{-3}}{2.9} + \frac{1}{34.1} = 0.369 \, \text{m}^2 \cdot \text{C/W} \]

\[ q = \frac{213.677}{0.369} (24 - 06) = 10444 \, \text{W} \]
For walls with insulation:

Wall formed from 5 layers\textsuperscript{12}. It is as follow from inside to outside:

1/ Stucco (Gypsum), thickness 3mm, $k=0.81 \text{ W/m } ^0\text{C}$

2/ Plaster, thickness 10mm, $k=0.721 \text{ W/m } ^0\text{C}$

3/ Concrete hollow block, thickness 200mm $C=5.11 \text{ W/m}^2\text{ } ^0\text{C}$

4/ Thermal insulation, thickness 100mm, $K=0.037 \text{ W/m} K$

5/ Brick, thickness 120mm, $k=0.72 \text{ W/m } ^0\text{C}$

\textbf{Fig.4: wall 3D section.}

\textsuperscript{12} Add to that 2 layers outside and inside surface resistance.
At summer

\[
R = \frac{1}{9.37} + 3 \times 10^{-3} + 10 \times 10^{-3} + \frac{1}{5.11} + 100 \times 10^{-3} + 120 \times 10^{-3} + \frac{1}{22.7} = 3.234 \text{ m}^2 \text{ °C/W}
\]

\[
q = \frac{213.677}{3.234} (45 - 22) = 1520 \text{ W}
\]

At winter

\[
R = \frac{1}{9.37} + 3 \times 10^{-3} + 10 \times 10^{-3} + \frac{1}{5.11} + 100 \times 10^{-3} + 120 \times 10^{-3} + \frac{1}{34.1} = 3.219 \text{ m}^2 \text{ °C/W}
\]

\[
q = \frac{213.677}{3.219} (24 - 06) = 1195 \text{ W}
\]

**Table 2: Energy calculation for walls.**
For roofs without insulation:

Total roof area\(^{13}\) 223 m\(^2\)

Ceiling formed from 5 layers\(^{14}\). It is as follow from inside to outside:

1/ Stucco, Thickness 3mm, k=0.058 W/m °C
2/ Plaster, Thickness 10mm, k=0.721 W/m °C
3/ R.C. Concrete, thickness 150mm, k=1.73 W/m °C
4/ Slope sand cement mortar, thickness 150mm, k=1.83 W/m °C
5/ 90cmX90cm Concrete tiles, thickness 25mm, k=1.73 W/m °C

Fig.5: Roof cross section.

At summer

\[
R = \frac{1}{9.37} + \frac{25 \times 10^{-3}}{1.73} + \frac{150 \times 10^{-3}}{1.83} + \frac{150 \times 10^{-3}}{1.73} + \frac{10 \times 10^{-3}}{0.721} + \frac{3 \times 10^{-3}}{0.81} + \frac{1}{22.7} = 0.352 \text{ m}^2 \text{ °C/W}
\]

\[
q = \frac{223}{0.352} (45 - 22) = 14577 \text{ W}
\]

\(^{13}\) See ground floor plan.
\(^{14}\) Add to that 2 layers outside and inside surface resistance.
At winter

\[ R = \frac{1}{9.37} + \frac{25 \times 10^{-3}}{1.73} + \frac{150 \times 10^{-3}}{1.83} + \frac{150 \times 10^{-3}}{1.73} + \frac{10 \times 10^{-3}}{0.721} + \frac{3 \times 10^{-3}}{0.81} + \frac{1}{34.1} = 0.201 \text{ m}^2 \text{C/W} \]

\[ q = \frac{223}{0.201} (24 - 06) = 19967 \text{ W} \]
For roofs with insulation:

Ceiling formed from 6 layers. It is as follow from inside to outside:

1/ Stucco thickness 3mm, $k=0.058$ W/m $^\circ$C

2/ Plaster thickness 10mm, $k=0.73$ W/m $^\circ$C

3/ R.C. Concrete thickness 150mm, $k=1.73$ W/m $^\circ$C

4/ Thermal insulation (Polystyrene), thickness 50mm, $k=0.045$

5/ Slope sand cement mortar, thickness 150mm, $k=1.83$ W/m $^\circ$C

6/ (900X900) mm Concrete tiles thickness 25mm, $k=1.73$ W/m $^\circ$C

At summer

$$R = \frac{1}{9.37} + \frac{25 \times 10^{-3}}{1.73} + \frac{150 \times 10^{-3}}{1.83} + \frac{150 \times 10^{-3}}{1.73} + \frac{10 \times 10^{-3}}{0.721} + \frac{50 \times 10^{-3}}{0.045} + \frac{3 \times 10^{-3}}{0.81} + \frac{1}{22.7} = 1.463 m^2 \text{ C/W}$$

$$q = \frac{223}{1.463} (45 - 22) = 3506 \text{ W}$$

Add to that 2 layers outside, and inside surface resistance.
At winter

\[ R = \frac{1}{9.37} + \frac{25 \times 10^{-3}}{1.73} + \frac{150 \times 10^{-3}}{1.83} + \frac{150 \times 10^{-3}}{1.73} + \frac{10 \times 10^{-3}}{0.721} + \frac{50 \times 10^{-3}}{0.045} + \frac{3 \times 10^{-3}}{0.81} + \frac{1}{34.1} = 1.448 \text{ m}^2 \cdot \text{C/W} \]

\[ q = \frac{223}{1.448} (24 - 06) = 2772 \text{ W} \]

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Table 3: Energy calculation for the ceiling.
**TOTAL GLASS OPENING AREA**

AREA = 3.359 M²  
QTY = 7Nos  
TOTAL AREA = 23.513 M²

AREA = 4.608 M²  
QTY = 1No.  
TOTAL AREA = 4.608 M²
AREA = 2.159 M²
QTY = 2 Nos.
TOTAL AREA = 4.318 M²

AREA = 2.589 M²
QTY = 1 No.
TOTAL AREA = 2.589 M²

AREA = 0.24 M²
QTY = 3 No.
TOTAL AREA = 0.72 M²

TOTAL GLASS AREA = 35.8 m²
Heat transfer by:

1. Conduction and convection

For one layer glass:

Window formed from 1 layer\(^{16}\). As follow:

1/ Glass, Thickness 6 mm, \(k = 0.9 \text{ W/m } ^{\circ}\text{C}\)

At summer

\[ R = \frac{1}{9.37} + \frac{0.006}{9} + \frac{1}{22.7} = 0.156 \text{ m}^2 \text{ } ^{\circ}\text{C/W} \]

\[ q = \frac{35.8}{0.156} (45 - 22) = 5278 \text{ W} \]

At winter

\[ R = \frac{1}{9.37} + \frac{0.006}{9} + \frac{1}{34.1} = 0.142 \text{ m}^2 \text{ } ^{\circ}\text{C/W} \]

\[ q = \frac{35.8}{0.142} (24 - 06) = 4538 \text{ W} \]

---

\(^{16}\) Add to that 2 layers outside and inside surface resistance.
For two layer glass:

Window formed from 3 layers. As follow:

1/ Glass, Thickness 6mm, k=0.9 W/m°C

2/ Air, Thickness 12mm, k=0.076 W/m°C

3/ Glass, Thickness 6mm, k=0.9 W/m°C

At summer

\[
R = \frac{1}{9.37} + \frac{0.006}{9} + \frac{12 \times 10^{-3}}{0.076} + \frac{0.006}{0.9} + \frac{1}{22.7} = 0.322 \, m^2 \, °C/W
\]

\[
q = \frac{35.8}{0.322} \times (45 - 22) = 2557 \, W
\]

At winter

\[
R = \frac{1}{9.37} + \frac{0.006}{9} + \frac{12 \times 10^{-3}}{0.076} + \frac{0.006}{0.9} + \frac{1}{34.1} = 0.310 \, m^2 \, °C/W
\]

\[
q = \frac{35.8}{0.310} \times (24 - 06) = 2078 \, W
\]

---

17 Add to that 2 layers outside, and inside surface resistance
18 K air= K conduction+K radiation, kc=0.025

\[
\frac{1}{\varepsilon_{12}} = \frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1
\]

Where: \(\varepsilon_1 = 0.92, \varepsilon_2 = 0.85, K_r = 5 \times \varepsilon_{12} \times \text{airthickness} = 0.051, K_{air} = 0.025 + 0.051 = 0.076\)
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SUM Yärmeeffekt: 26848 W
Värmeeenergi (MW/månth): 19,632864

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SUM Yärmeeffekt: 12831 W
Värmeeenergi (MW/månth): 9,3858

Table 4: Energy calculation for glass by conduction and convection.
2. Radiation

When the sun light applies on the glass, it’s solar separate in to:

Reflected solar, storage solar (which is small and can be neglected), and transmitted solar, as shown in the figure below.

![Diagram showing solar radiation components](image)

Fig.7: *Equilibrium heat for glass in the sun solar*\(^3\).

The transmitted solar cause heating to the thinks (furniture) inside the interim space. The heating equilibrium equation can be written as:

\[
I_t + U(t_o - t_i) = q_R + q_s + q_T + q_{rci} + q_{rco}
\]  
(1)

Where:

- \(I_t\) : Solar tensile heat
- \(q_R\) : Reflected solar
- \(q_s\) : Stored solar =0
- \(q_T\) : Transmitted solar
- \(q_{rci}\) : Radiation heat transfer to the inside space
- \(q_{rco}\) : Radiation heat transfer to the out space

\(^3\) ASHRAE Handbook, 1998 systems, ASHRAE.
Heat transfer due to difference in temperature

$q_R$ and $q_{eco}$ are heat transfers to the out space, so equation (1) can be written as:

$$\frac{q}{A} = F I_{i} + U (t_o - t_i) \quad (2)$$

Where:

$F$ is dimensionless factor represent the heat gain from radiation

Now we can assume that $SHG_{MAX} = F * I_{i} \quad (3)$

Where:

$SHG$ is solar heat gain from radiation which can be taken from ASHRAE table

Now equation (2) can be written as:

$$q = A \cdot SHG \quad (4)$$

Equation (4) can not represent the solar heat gain from radiation because there is wide range of glass, angle of solar, and solar tensile, therefore ASHRAE made a simple method where they used special kind of glass and made an experimental work for this kind for all days hour and for 17th latitude direction in the earth for all the months.

Due to the different between the glasses they assume shading coefficient:

$$SC = \frac{SolarHeatGain}{SolarHeatGainForASHRAE}$$

Cooling load factor (CLF) assume in order to correct the result because transmitted solar make heating to the thinks in side the space like furniture, so ASHRAE distribute the thinks inside the space into 3 kinds (Light, Medium, and Heavy), CLF can be obtain from ASHRAE table for different kinds of materials and time, in our research, we have been used the time 14:00 because the mean temperature was active at this time.

Equation (4) can be written as:

$$q = A \cdot SHG_{max} \cdot SC \cdot CLF \quad (5)$$

---

20 See Table 1, Appendix 2
Sample of calculation:

**North Glass**

A=5.989 m²

Time: 14:00

Latitude: 28N

Type of material in the internal space: Medium

SC: 0.94 for one layer of glass and 0.81 for two layer of glass

\[ q = A \times SHG_{\text{max}} \times SC \times CLF \]

\[ q_{\text{Jan, oneglass}} = 5.989 \times 79 \times 0.94 \times 0.75 = 333W \]

\[ q_{\text{Jan, twoglass}} = 5.989 \times 79 \times 0.81 \times 0.75 = 287W \]

**South Glass**

A=7.42 m²

Time: 14:00

Latitude: 28N

Type of material in the internal space: Medium

SC: 0.94 for one layer of glass and 0.81 for two layer of glass

\[ q = A \times SHG_{\text{max}} \times SC \times CLF \]

\[ q_{\text{Jan, oneglass}} = 7.42 \times 751 \times 0.94 \times 0.58 = 3038W \]

\[ q_{\text{Jan, twoglass}} = 7.42 \times 751 \times 0.81 \times 0.58 = 2617W \]

**West Glass**

A=9.579 m²

Time: 14:00

---

21 See bilaga 1.
Latitude: 28N
Type of material in the internal space: Medium
SC: 0.94 for one layer of glass and 0.81 for two layer of glass

\[ q = A \times SHG_{\text{max}} \times SC \times CLF \]

\[ q_{\text{Jun, one glass}} = 9.579 \times 577 \times 0.94 \times 0.29 = 1505W \]

\[ q_{\text{Jun, two glass}} = 9.579 \times 577 \times 0.81 \times 0.29 = 1298W \]

**East Glass**

A=14.377 m\(^2\)

Time: 14:00
Latitude: 28N
Type of material in the internal space: Medium
SC: 0.94 for one layer of glass and 0.81 for two layer of glass

\[ q = A \times SHG_{\text{max}} \times SC \times CLF \]

\[ q_{\text{Jun, one glass}} = 14.377 \times 577 \times 0.94 \times 0.31 = 2417W \]

\[ q_{\text{Jun, two glass}} = 14.377 \times 577 \times 0.81 \times 0.31 = 2083W \]
Table 5a: Energy calculation for glass by radiation.

<table>
<thead>
<tr>
<th>South Windows</th>
<th>East Windows</th>
<th>North Windows</th>
<th>West Windows</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.38°</td>
<td>17.38°</td>
<td>17.38°</td>
<td>17.38°</td>
</tr>
<tr>
<td>0.97</td>
<td>0.97</td>
<td>0.97</td>
<td>0.97</td>
</tr>
<tr>
<td>0.81</td>
<td>0.81</td>
<td>0.81</td>
<td>0.81</td>
</tr>
<tr>
<td>0.51</td>
<td>0.51</td>
<td>0.51</td>
<td>0.51</td>
</tr>
<tr>
<td>0.34</td>
<td>0.34</td>
<td>0.34</td>
<td>0.34</td>
</tr>
<tr>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>

For Test Glass Panes

<table>
<thead>
<tr>
<th>South Windows</th>
<th>East Windows</th>
<th>North Windows</th>
<th>West Windows</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.38°</td>
<td>17.38°</td>
<td>17.38°</td>
<td>17.38°</td>
</tr>
<tr>
<td>0.97</td>
<td>0.97</td>
<td>0.97</td>
<td>0.97</td>
</tr>
<tr>
<td>0.81</td>
<td>0.81</td>
<td>0.81</td>
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<tr>
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<td>0.51</td>
<td>0.51</td>
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<td>0.34</td>
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<tr>
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<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
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<tr>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Table 5b: *Energy calculation for glass by radiation.*

<table>
<thead>
<tr>
<th>q, kJ/m² · h · °C</th>
<th>Energi MW/m²</th>
<th>month</th>
</tr>
</thead>
<tbody>
<tr>
<td>7294</td>
<td>2,713.66</td>
<td></td>
</tr>
<tr>
<td>7595</td>
<td>2,551.92</td>
<td></td>
</tr>
<tr>
<td>7375</td>
<td>2,743.87</td>
<td></td>
</tr>
<tr>
<td>6559</td>
<td>2,360.88</td>
<td></td>
</tr>
<tr>
<td>5362</td>
<td>2,217.64</td>
<td></td>
</tr>
<tr>
<td>5869</td>
<td>2,112.91</td>
<td></td>
</tr>
<tr>
<td>5374</td>
<td>2,185.12</td>
<td></td>
</tr>
<tr>
<td>0300</td>
<td>2,375.93</td>
<td></td>
</tr>
<tr>
<td>7095</td>
<td>2,554.32</td>
<td></td>
</tr>
<tr>
<td>7323</td>
<td>2,480.76</td>
<td></td>
</tr>
<tr>
<td>7113</td>
<td>2,640.38</td>
<td></td>
</tr>
<tr>
<td><strong>q, Total</strong></td>
<td>**Energi MW/m²</td>
<td><strong>month</strong></td>
</tr>
<tr>
<td>81642</td>
<td>29,776.36</td>
<td></td>
</tr>
</tbody>
</table>

Referring to table 6, we can see that in winter the heat transfer by Conduction from inside space to outside which can be considered a loss of energy. Moreover, the heat transfer by Radiation from outside to inside spaces due to solar rays effects, which can be considered as a positive gain. Furthermore, the Glass plays a significant role when being isolated properly (two layers) as shown in the table.
Table 6: Total energy calculation.

<table>
<thead>
<tr>
<th>Month</th>
<th>Energy MWh/month</th>
<th>With Insulation</th>
<th>Without Insulation</th>
<th>Glass</th>
<th>Two Glass Layer</th>
<th>Roof</th>
<th>Wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>0.96</td>
<td>2.56</td>
<td>0.68</td>
<td>4.13</td>
<td>0.93</td>
<td>1.26</td>
<td>0.68</td>
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<td>Feb</td>
<td>1.16</td>
<td>2.8</td>
<td>0.78</td>
<td>4.37</td>
<td>1.07</td>
<td>1.31</td>
<td>0.78</td>
</tr>
<tr>
<td>Mar</td>
<td>1.31</td>
<td>3.06</td>
<td>0.88</td>
<td>4.62</td>
<td>1.20</td>
<td>1.36</td>
<td>0.88</td>
</tr>
<tr>
<td>Apr</td>
<td>1.40</td>
<td>3.33</td>
<td>0.98</td>
<td>4.83</td>
<td>1.33</td>
<td>1.41</td>
<td>0.98</td>
</tr>
<tr>
<td>May</td>
<td>1.49</td>
<td>3.57</td>
<td>1.08</td>
<td>5.05</td>
<td>1.45</td>
<td>1.46</td>
<td>1.08</td>
</tr>
<tr>
<td>Jun</td>
<td>1.59</td>
<td>3.86</td>
<td>1.18</td>
<td>5.27</td>
<td>1.58</td>
<td>1.51</td>
<td>1.18</td>
</tr>
<tr>
<td>Jul</td>
<td>1.69</td>
<td>4.16</td>
<td>1.28</td>
<td>5.50</td>
<td>1.71</td>
<td>1.56</td>
<td>1.28</td>
</tr>
<tr>
<td>Aug</td>
<td>1.79</td>
<td>4.46</td>
<td>1.38</td>
<td>5.73</td>
<td>1.84</td>
<td>1.61</td>
<td>1.38</td>
</tr>
<tr>
<td>Sep</td>
<td>1.89</td>
<td>4.76</td>
<td>1.48</td>
<td>5.96</td>
<td>1.97</td>
<td>1.66</td>
<td>1.48</td>
</tr>
<tr>
<td>Oct</td>
<td>1.99</td>
<td>5.06</td>
<td>1.58</td>
<td>6.19</td>
<td>2.10</td>
<td>1.71</td>
<td>1.58</td>
</tr>
<tr>
<td>Nov</td>
<td>2.09</td>
<td>5.36</td>
<td>1.68</td>
<td>6.42</td>
<td>2.23</td>
<td>1.76</td>
<td>1.68</td>
</tr>
<tr>
<td>Dec</td>
<td>2.19</td>
<td>5.67</td>
<td>1.78</td>
<td>6.66</td>
<td>2.36</td>
<td>1.81</td>
<td>1.78</td>
</tr>
</tbody>
</table>