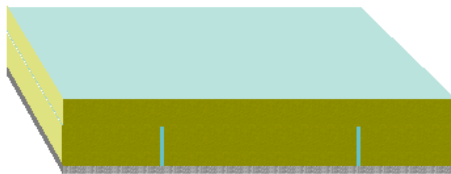


Documentation of the component  
 Thermal transmittance (U-value) according to Digest 465  
 Source: **own catalogue - Pitched roofs**  
 Component: **NCAF12541 227 Shepherds Bush Rd Roof 01 V2**

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This illustration of inhomogeneous layers is provided only to assist in visualising the arrangement.



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Assignment: Roof with a pitch  $\geq 70^\circ$

|                                                                                     | Manufacturer | Name                                       | Thickness<br>[m],<br>number            | Lambda<br>[W/(mK)] | Q                                                                                   | R<br>[m²K/W]                                                                        |        |
|-------------------------------------------------------------------------------------|--------------|--------------------------------------------|----------------------------------------|--------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------|
|                                                                                     | Rse          |                                            |                                        |                    |                                                                                     | 0.0400                                                                              |        |
|  | 1            | Own catalogue                              | VM ZINC Panel (Standing Seam) 600mm CC | 0.0007             | 160.000                                                                             |  | 0.0000 |
|  | 2            | Own catalogue                              | Breather membrane for VM Zinc          | 0.0002             | 0.100                                                                               |  | 0.0020 |
|  | 3            | Own catalogue                              | Hardrock Multi-Fix (DD)                | 0.1050             | 0.039                                                                               |  | 2.6923 |
|                                                                                     | Fixings      | Generic Thermally Broken Fasteners No./m²: | 0.8/m²                                 | 0.500              |  | -                                                                                   |        |
|                                                                                     | Fixings      | equivalent diameter: 0.01 m                |                                        |                    |                                                                                     |                                                                                     |        |
|                                                                                     | Air gaps     | Level 0: dU" = 0.00 W/(m²K)                |                                        |                    |                                                                                     |                                                                                     |        |
|  | 4            | BS EN 12524                                | Steel                                  | 0.0007             | 50.000                                                                              |  | 0.0000 |
|  | 5            | Light steel-frame                          | consisting of:                         | 0.1500             | ø 0.184                                                                             |                                                                                     | 0.8157 |
|                                                                                     | 5a           | Own catalogue                              | Steel Frame Slab                       | 99.70 %            | 0.034                                                                               |  | -      |
|                                                                                     | Air gaps     | Level 0: dU" = 0.00 W/(m²K)                |                                        |                    |                                                                                     |                                                                                     |        |
|                                                                                     | 5b           | BS EN 12524                                | Steel                                  | 00.30 %            | 50.000                                                                              |  | -      |
|  | 6            | BS EN 12524                                | Polyethylene 0.15 mm                   | 0.0002             | 0.170                                                                               |  | 0.0009 |
|  | 7            | BS EN 12524                                | Gypsum plasterboard                    | 0.0125             | 0.250                                                                               |  | 0.0500 |
|  | 8            | BS EN 12524                                | Gypsum plasterboard                    | 0.0125             | 0.250                                                                               |  | 0.0500 |
|                                                                                     | Rsi          |                                            |                                        |                    |                                                                                     | 0.1300                                                                              |        |
|                                                                                     |              |                                            | 0.2818                                 |                    |                                                                                     |                                                                                     |        |



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$$R_T = p \cdot R_{T'} + (1-p) \cdot R_{T''} = 5.46 \text{ m}^2\text{K/W}$$

| Correction to U-value for                                                                                           | according to           | delta U<br>[W/(m <sup>2</sup> K)] |
|---------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------------------|
| Mechanical fasteners                                                                                                | Digest 465             | <del>0.0001</del>                 |
| Air gaps                                                                                                            | BS EN ISO 6946 Annex F | <del>0.0000</del>                 |
| Air gaps and fixings corrections need not be applied, as their total effect is less than 3% (Annex D BS 6946:1996). |                        |                                   |
|                                                                                                                     |                        | 0.0000                            |

$$U = 1/R_T + \Sigma \Delta U = 0.18 \text{ W/(m}^2\text{K)}$$

- Q .. The physical values of the building materials has been graded by their level of quality. These 5 levels are the following
- A** .. A: Data is entered and validated by the manufacturer or supplier. Data is continuously tested by 3rd party.
  - B** .. B: Data is entered and validated by the manufacturer or supplier. Data is certified by 3rd party
  - C** .. C: Data is entered and validated by the manufacturer or supplier.
  - D** .. D: Information is entered by BuildDesk without special agreement with the manufacturer, supplier or others.
  - E** .. E: Information is entered by the user of the BuildDesk software without special agreement with the manufacturer, supplier or others.

$$U = \boxed{0.18 \text{ W/(m}^2\text{K)}} \quad R_T = \boxed{5.46 \text{ m}^2\text{K/W}}$$

Documentation of the component  
Thermal transmittance (U-value) according to Digest 465

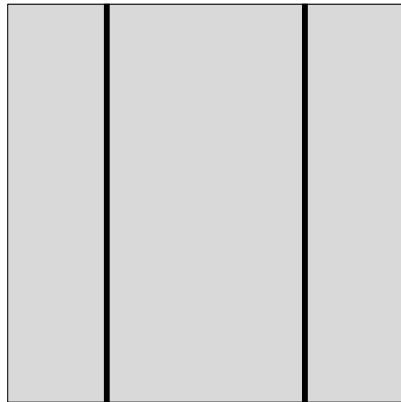
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Source: **own catalogue - Pitched roofs**

Component: **NCAF12541 227 Shepherds Bush Rd Roof 01 V2**

Steel percentage: 0.30 %

Light steel-frame sections  
The portion is given in %.



|   |                                                                                   |                                                        |          |
|---|-----------------------------------------------------------------------------------|--------------------------------------------------------|----------|
| A |  | consisting of material layers: 1, 2, 3, 4, 5a, 6, 7, 8 | = 99.70% |
| B |  | consisting of material layers: 1, 2, 3, 4, 5b, 6, 7, 8 | = 0.30%  |

#### Upper limit of the thermal transfer resistance R

$$U_A [W/(m^2K)] = \frac{1}{(\sum R_{i,A}) + R_{si} + R_{se}} = \frac{1}{7.21 + 0.13 + 0.04} = 0.14$$

$$U_B [W/(m^2K)] = \frac{1}{(\sum R_{i,B}) + R_{si} + R_{se}} = \frac{1}{2.80 + 0.13 + 0.04} = 0.34$$

$$R_T' = \frac{1}{A * U_A + B * U_B} = 7.34 \text{ m}^2\text{K/W}$$

#### Lower limit of the thermal transfer resistance R

|                                                                  |                                            |        |
|------------------------------------------------------------------|--------------------------------------------|--------|
| $R_{se} [m^2K/W]$                                                |                                            | = 0.04 |
| $R_1'' [m^2K/W] = d_1 / \lambda_1 =$                             | 0.0007 / 160.000                           | = 0.00 |
| $R_2'' [m^2K/W] = d_2 / \lambda_2 =$                             | 0.0002 / 0.100                             | = 0.00 |
| $R_3'' [m^2K/W] = d_3 / \lambda_3 =$                             | 0.1050 / 0.039                             | = 2.69 |
| $R_4'' [m^2K/W] = d_4 / \lambda_4 =$                             | 0.0007 / 50.000                            | = 0.00 |
| $R_5'' [m^2K/W] = d_5 / (\lambda_{5a} * A + \lambda_{5b} * B) =$ | 0.1500 / (0.034 * 99.70% + 50.000 * 0.30%) | = 0.82 |
| $R_6'' [m^2K/W] = d_6 / \lambda_6 =$                             | 0.0002 / 0.170                             | = 0.00 |
| $R_7'' [m^2K/W] = d_7 / \lambda_7 =$                             | 0.0125 / 0.250                             | = 0.05 |
| $R_8'' [m^2K/W] = d_8 / \lambda_8 =$                             | 0.0125 / 0.250                             | = 0.05 |
| $R_{si} [m^2K/W]$                                                |                                            | = 0.13 |

$$R_T'' = \sum R_i'' + R_{si} + R_{se} = 3.78 \text{ m}^2\text{K/W}$$

|                       |                           |
|-----------------------|---------------------------|
| Kind of frame:        | Hybrid frame              |
| Flange width:         | known not to exceed 50 mm |
| Stud spacing s [m]:   | 0.600                     |
| Stud depth d [m]:     | 0.150                     |
| Web thickness t [m]:  | 0.00180                   |
| Steel percentage [%]: | 0.30                      |

#### Weight factor p

Formula:  $p = 0,8 * (R_T''/R_T') + 0,32 - 0,2 * (0,6/s) - 0,04 * (d/0,1) = 0.472$

$$R_T = p * R_T' + (1-p) * R_T'' = 5.46 \text{ m}^2\text{K/W}$$

# Documentation of the component

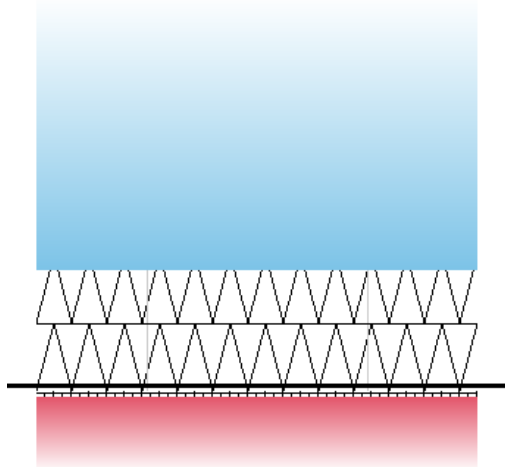
## Heat capacity

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Source: **own catalogue - Pitched roofs**

Component: **NCAF12541 227 Shepherds Bush Rd Roof 01 V2**

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The list of materials shown below may differ from those in the U-value calculation printout. Only material layers which are used in the heat capacity calculation are listed.

Single material layers shown in the U-value calculation printout may be separated to meet the exclusion criteria:

- A .. The total thickness of the layers exceed 0.1 m.
- B .. The mid point in the construction is reached.

For insulation layers the following criteria applies:

- C .. An insulating layer is reached (defined as  $\lambda \leq 0.08 \text{ W/(mK)}$ ).

| Name                                     | Thickness<br>[m] | lambda<br>[W/(mK)] | Q | Thermal<br>capacity<br>[kJ/(kgK)] | Q | Density<br>[kg/m³] | Q | Thermal<br>mass<br>kJ/(m²K) | Criteria<br>Exclusion |
|------------------------------------------|------------------|--------------------|---|-----------------------------------|---|--------------------|---|-----------------------------|-----------------------|
| <b>End of calculation - Cold</b>         |                  |                    |   |                                   |   |                    |   |                             |                       |
| 1 VM ZINC Panel (Standing Seam) 600mm CC | 0.0007           | 160.000            | E | 0.88                              | E | 2800.0             | E | 1.7                         | A, -, C               |
| 2 Breather membrane for VM Zinc          | 0.0002           | 0.100              | E | 1.70                              | E | 322.0              | E | 0.1                         | A, -, C               |
| 3 Hardrock Multi-Fix (DD)                | 0.1050           | 0.039              | E | 1.03                              | E | 160.0              | E | 0.0                         | A, -, C               |
| 4 Steel                                  | 0.0007           | 50.000             | D | 0.45                              | D | 7800.0             | D | 2.5                         | A, -, C               |
| 5 Light steel-frame consisting of:       | 0.0752           |                    |   |                                   |   |                    |   | 0.8                         | A, -, C               |
| 5a Steel Frame Slab                      | 99.70%           | 0.034              | E | 1.03                              | E | 35.0               | E | 2.7                         | A, -, C               |
| 5b Steel                                 | 00.30%           | 50.000             | D | 0.45                              | D | 7800.0             | D | 0.8                         | A, -, C               |
| 5 Light steel-frame consisting of:       | 0.0749           |                    |   |                                   |   |                    |   | 0.8                         | -, -, C               |
| 5a Steel Frame Slab                      | 99.70%           | 0.034              | E | 1.03                              | E | 35.0               | E | 2.7                         | -, -, C               |
| 5b Steel                                 | 00.30%           | 50.000             | D | 0.45                              | D | 7800.0             | D | 0.8                         | -, -, -               |
| 6 Polyethylene 0.15 mm                   | 0.0002           | 0.170              | D | 2.20                              | D | 920.0              | D | 0.3                         | -, -, -               |
| 7 Gypsum plasterboard                    | 0.0125           | 0.250              | D | 1.00                              | D | 900.0              | D | 11.3                        | -, -, -               |
| 8 Gypsum plasterboard                    | 0.0125           | 0.250              | D | 1.00                              | D | 900.0              | D | 11.3                        | -, -, -               |
| <b>Start of calculation - Warm</b>       |                  |                    |   |                                   |   |                    |   |                             |                       |
|                                          | <b>0.2818</b>    |                    |   |                                   |   |                    |   | <b>22.8</b>                 |                       |

**Heat capacity = 22.8 kJ/(m²K)**

The following exclusion criteria apply:

- A .. The total thickness of the layers exceed 0.1 m.
- C .. An insulating layer is reached (defined as  $\lambda \leq 0.08 \text{ W/(mK)}$ ).

Q .. The physical values of the building materials has been graded by their level of quality. These 5 levels are the following

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