

## **Software title**

U value calculator – My App

## **Background and motivation of this software**

Due to the large number of similar software, great competitiveness, the market environment is not good, so we need to innovate or gain advantages in other aspects.

Because the scientific method used is relatively simple and clear, the software development environment is relatively good, in the process of writing code did not encounter great difficulties.

The software environment is windows 10, the development process mainly uses PyQt6.

This software was created to enable the architecture environment engineer to get a U value faster when choosing the right materials and structures, thus making the job faster.

## **Key functions of the software**

The main function of the software is to calculate U value. By inputting resistance, thickness conductivity, and other data, the U value is calculated using the formula.

## **Algorithm/scientific methods behind your software**

The scientific method of software is to calculate the u value by selecting the structure and material after input thickness. U-value means thermal conductivity coefficient, represents the ability of a material to allow heat to pass through per unit area, the unit is  $W/m^2 \cdot K$ .

Here's the formula:

$$R = \frac{D}{\lambda} \quad \text{Eqn.1}$$

R is thermal resistance, the unit is  $m^2 \cdot K/W$ ;

D is thickness of material, the unit is  $m$ ;

$\lambda$  is thermal conductivity of a material, the unit is  $W/K \cdot m$ .

$$U = \frac{1}{R} \quad \text{Eqn.2}$$

U is thermal conductivity coefficient, the unit is  $W/m^2 \cdot K$ ;

R is thermal resistance, the unit is  $m^2 \cdot K/W$ .

## **Similar products in the market**

According to the results of the search and survey, there are mainly two types of products of the same type on the market:

1. Web: [https://www.changeplan.co.uk/u\\_value\\_calculator.php](https://www.changeplan.co.uk/u_value_calculator.php)

- a) Choose the type of material as needed:

  **U-Value Calculator**  
Thermal transmittance (U-value) according to BS EN ISO 6946:2017

username / email password

**Project Address**

**Element Type:**

**Material**  
Select from the Materials Menu above & edit as required or enter your own custom values.

**Internal Surface ( Rsi )**

**External Surface ( Rse )** 0.0400

**Total thickness:** 0.0 **mm (actual)**  
**Total resistance:** 0.000 **m<sup>2</sup>K/W**  
**U-Value (uncorrected):** 0.000 **W/m<sup>2</sup>K**  
 Total  $\Delta U$ : 0.010  
**U-Value (corrected):**  $U = \frac{1}{RT} + \Delta U =$  0.000 **W/m<sup>2</sup>K**

**Walls Material Menu**

Blocks	Project Reference
Boards	<input type="text"/>
Bricks	<input type="text"/>
Cavity	<input type="text"/>
Coatings	Building Use Domestic
Concrete	Building Type Build
Insulation	Membrane
Metal	Conductivity W/mK
Stone	Percent
Tiles	Thickness mm
Timber	Resistance m <sup>2</sup> K/W

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b) Choose the use of the building:



# U-Value Calculator

Thermal transmittance (U-value) according to BS EN ISO 6946:2017



username / email

password

Login

Register Account

Password Reset

Walls Material Menu



## Project Address

## Project Reference

### Building Use

Domestic

Select the use of building.

Domestic

Commercial

Max U-Value  $U = \frac{1}{RT} = 0.00 \text{ W/m}^2\text{K}$

### Element Type:

### Material

Select from the Materials Menu above & edit as required or enter your own custom values.

Conductivity  
W/mK

Percent  
%

Thickness  
mm

Resistance  
m<sup>2</sup>K/W

100

ADD  DEL

EDIT

### Internal Surface ( Rsi )

0.1300

EDIT

### External Surface ( Rse )

0.0400

EDIT

\* denotes a custom material and/or values entered by the user and cannot be verified as to its accuracy.

Total thickness:

$RT = Rsi + Rse =$   0.0

mm (actual)

Total resistance:

$RT = Rsi + Rse =$   0.000

m<sup>2</sup>K/W

U-Value (uncorrected):

$U = \frac{1}{RT} =$   0.000

W/m<sup>2</sup>K

Total  $\Delta U$ :

0.010

U-Value (corrected):

$U = \frac{1}{RT} + \Delta U =$   0.000

W/m<sup>2</sup>K



Recalculate

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- c) Choose the type of build:



# U-Value Calculator

Thermal transmittance (U-value) according to BS EN ISO 6946:2017



username / email

password

Login

Register Account

Password Reset

Walls Material Menu



## Project Address

## Project Reference

### Building Use

Domestic

### Build Type

New Build

Select the type of build. 0.00 W/m<sup>2</sup>K

New Build

Extension

Refurbishment

Resistance  
m<sup>2</sup>K/W

### Element Type:

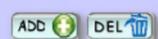
### Material

Select from the Materials Menu above & edit as required or enter your own custom values.

Conductivity  
W/mK

100

0.1300



### Internal Surface ( Rsi )

0.0400



### External Surface ( Rse )

\* denotes a custom material and/or values entered by the user and cannot be verified as to its accuracy.

0.0400



### Total thickness:

0.0

mm (actual)

### Total resistance:

0.000

m<sup>2</sup>K/W

### U-Value (uncorrected):

0.000

W/m<sup>2</sup>K

### Total ΔU:

0.010

### U-Value (corrected):

$U = \frac{1}{RT} + \Delta U =$

0.000

W/m<sup>2</sup>K



Recalculate

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- d) Choose the type of the element:

Register for FREE to make use of the full features below  
 Ability to Save, Load and copy your calculations  
 A wider and more comprehensive selection of materials  
 Group saved calculations by project reference  
 Share individual calculations with friends and colleagues


**ulator**  
 IS EN ISO 6946:2017
 

username / email

password

Login

Register Account

Password Reset

Walls Material Menu



## Project Address

## Project Reference

## Building Use

Domestic

## Build Type

New Build

Max U-Value  $U = \frac{1}{R_{T}} = 0.00 \text{ W/m}^2\text{K}$ 

## Element Type:

## Material

Select from the Materials Menu & enter your own custom values.

## Internal Surface ( Rsi )

## External Surface ( Rse )

\*\* denotes a custom material and/or va
Total thickness:  
Total resistance:  
U-Value (uncorrected):  
Total  $\Delta U$ :

## U-Value (corrected):

- Select the type of element.
- External Wall
  - Internal Wall
  - Pitched Roof (cold)
  - Pitched Roof (warm)
  - Flat Roof (cold)
  - Flat Roof (warm)
  - Intermediate Floor
  - Ground Floor (floating)
  - Ground Floor (suspended)

Activity

Percent

%

Thickness

mm

Resistance

 $\text{m}^2\text{K/W}$ 

ADD

DEL

EDIT

0.1300

0.0400

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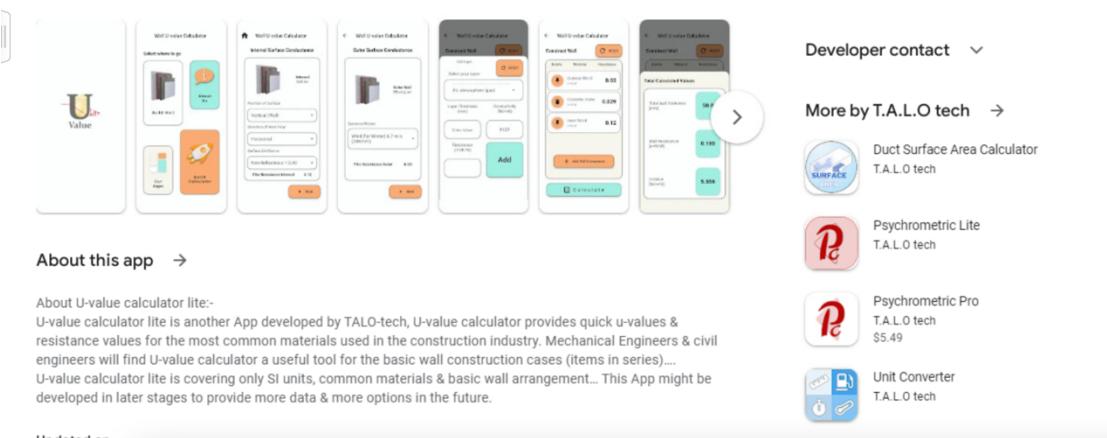
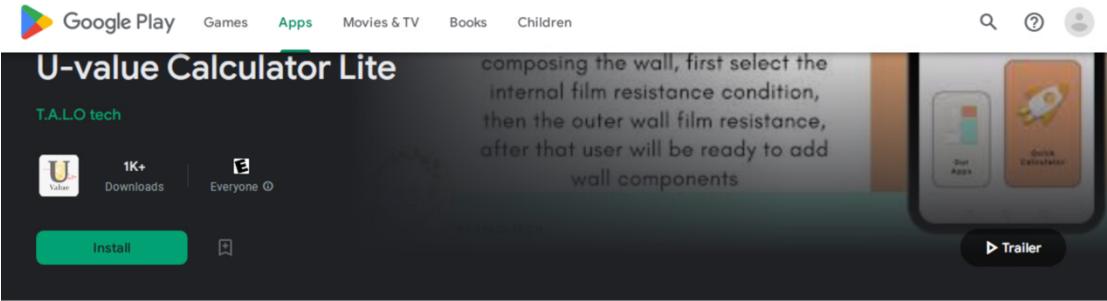
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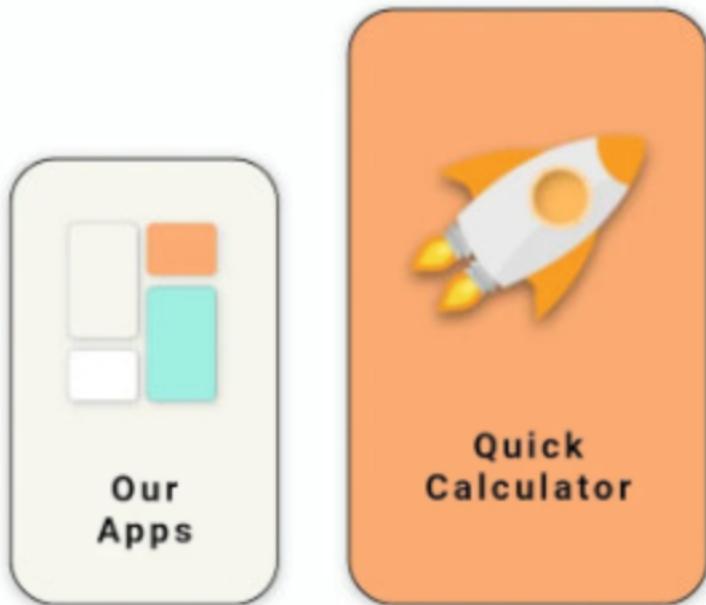
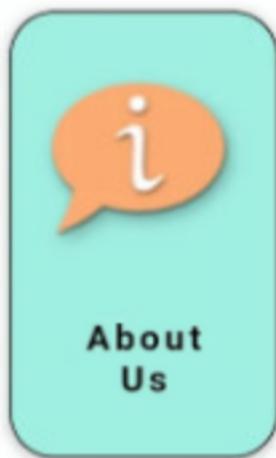
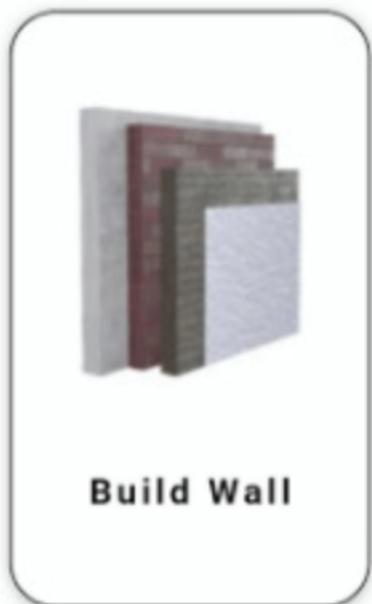
0.0400



- a) A menu where can make choices:

## Wall U-value Calculator

Select where to go



- 
- b) According to the type of material, choose the position of surface, direction of heat flow,

and surface emittance:



## Wall U-value Calculator

### Internal Surface Conductance



Internal  
Still Air

Position of Surface

Vertical (Wall)

Direction of Heat Flow

Horizontal

Surface Emittance

Non-Reflective  $\varepsilon = 0.90$

Film Resistance Internal      0.12

▶ Next

- c) Choose outer surface conductance:

← Wall U-value Calculator

Outer Surface Conductance



Outer Wall  
Moving air

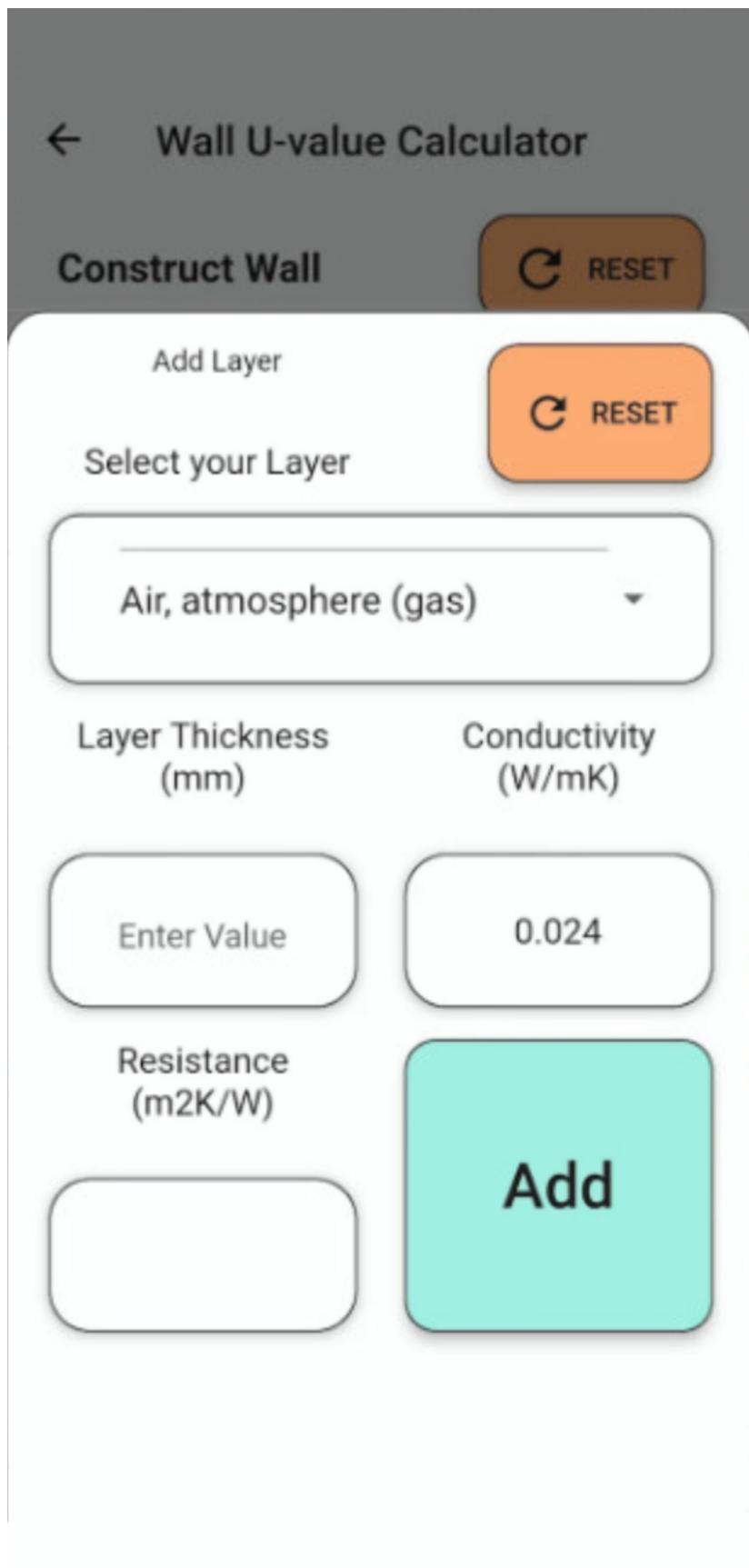
Summer/Winter

Wind (for Winter) 6.7 m/s  
(24Km/h)

Film Resistance Outer      0.03

▶ Next

- d) If you have more layers, you can add them and enter the layer thickness, conductivity, and resistance:



- e) The resistance of each component is obtained respectively:

← Wall U-value Calculator

Construct Wall

RESET

Delete

Material

Resistance



Outdoor film R

$\text{m}^2\text{K/W}$

0.03



Concrete, stone

$\text{m}^2\text{K/W}$

0.029



Inner film R

$\text{m}^2\text{K/W}$

0.12

+ Add Wall Component



Calculate

- f) Click on each component to see its information, such as total thickness, resistance, and

u-value.

