

# TEST REPORT

SQM\_404\_2025

CUSTOMER

**Kebe S.A.**

PRODUCT NAME

**ORTHOBLOCK MK150**

TYPE OF PRODUCT

**Masonry unit**

TYPE OF TEST

**DETERMINATION OF THE DRY THERMAL CONDUCTIVITY VALUES OF THE UNIT (EN ISO 6946)  
AND OF THE MASONRY MADE WITH IT**

**Ordering** Kebe S.A.

**Product placed on the market from** Kebe S.A. - 61100 Nea Santa - Kilkis - GREECE

**Data related to the sample examined** Masonry unit

**Sample origin** sampled and provided from the Customer

**Manufacturing plant** Kebe S.A. - 61100 Nea Santa - Kilkis - GREECE

**Estimate** prot. 25349/lab of 06/04/2025

**Order confirmation** email of 06/04/2025

**Receipt of the samples** June 2025

**Test execution** June 2025

**Laboratory and location of test execution** Certimac - via Ravegnana, 186 - Faenza (RA)

**Report issued** 16/06/2025

**Revision** n° 00

**Test executed by:** Eng. Sebastiano Marianini

**Report drafted by:** Eng. Sebastiano Marianini

**Approval:** Technical director Eng. L. Laghi

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*This test report is part of a file in PDF format  
digitally signed by Luca Laghi*

Chief Technical Officer  
(Eng. Luca Laghi)



## 1. Object of the test

The following test report describes the determination of the equivalent thermal values of a masonry brick. The calculations were performed by means of a Finite Element Model implemented in Ansys 18.2 (Ref. 2-b), applied to a planar cross section (unit length), perpendicular to the holes axis and parallel to the thermal flux.

## 2. Reference standards and documents

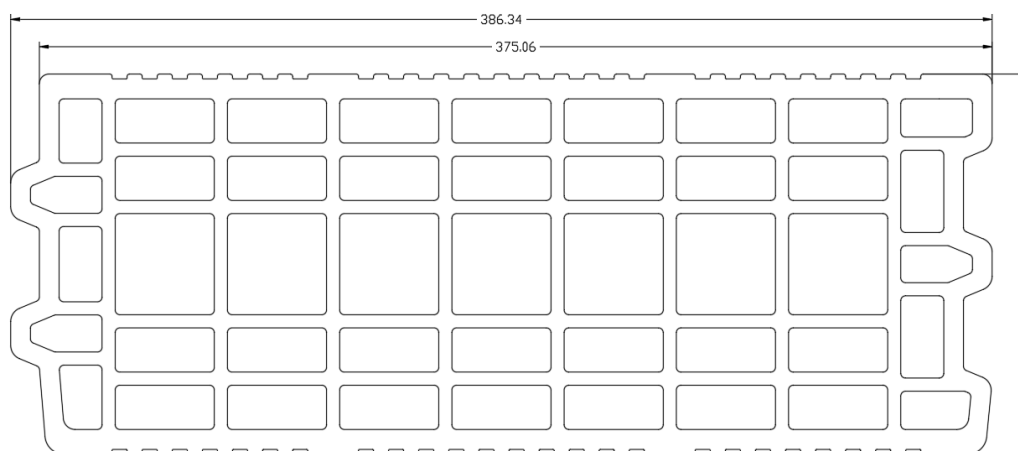
The tests have been executed according to the methods defined in the following documentations and reference standards:

- EN 1745:2012. Masonry and masonry products – Methods for determining thermal properties.
- CertiMaC calibration report 040219-C-17/Rev01. Calibration of a two-dimensional model for the calculation of the equivalent thermal conductivity of a masonry unit.
- EN 6946:2008. Building components and building elements – Thermal resistance and thermal transmittance – Calculation method.

## 3. Input data

The technical drawing of the block and the thermal conductivity of fired clay were supplied by the client (Figure 1). All input data used for the calculation are shown in Table 1.

**Figure 1.** Geometry of the block

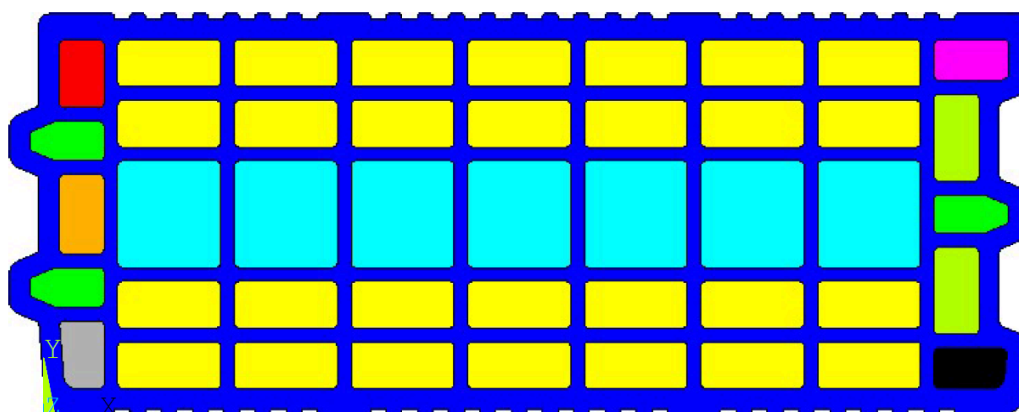


**Table 1.** Input data

| Physical quantity                                    | Nominal value           | Ref.                     |
|------------------------------------------------------|-------------------------|--------------------------|
| Internal temperature $T_i$                           | 20 °C = 293.15 K        | Ref. 2-a and 2-c         |
| External temperature $T_e$                           | 0 °C = 273.15 K         | Ref. 2-a and 2-c         |
| Internal superficial resistance $R_{si}$             | 0.13 m <sup>2</sup> K/W | Ref. 2-a and 2-c         |
| External superficial resistance $R_{se}$             | 0.04 m <sup>2</sup> K/W | Ref. 2-a and 2-c         |
| Material thermal conductivity $\lambda_{10,dry,mat}$ | 0.401 W/mK              | Provided by the Customer |
| Brick dimensions                                     | 380 x 150 x 240 mm      | Provided by the Customer |

Equivalent thermal conductivity values of air voids were determined according to the methodology outlined in Ref. 2-a and 2-c., approximating convective and radiative heat transfer inside the void (Figure 2).

**Figure 2.** Cross section of the block and air voids



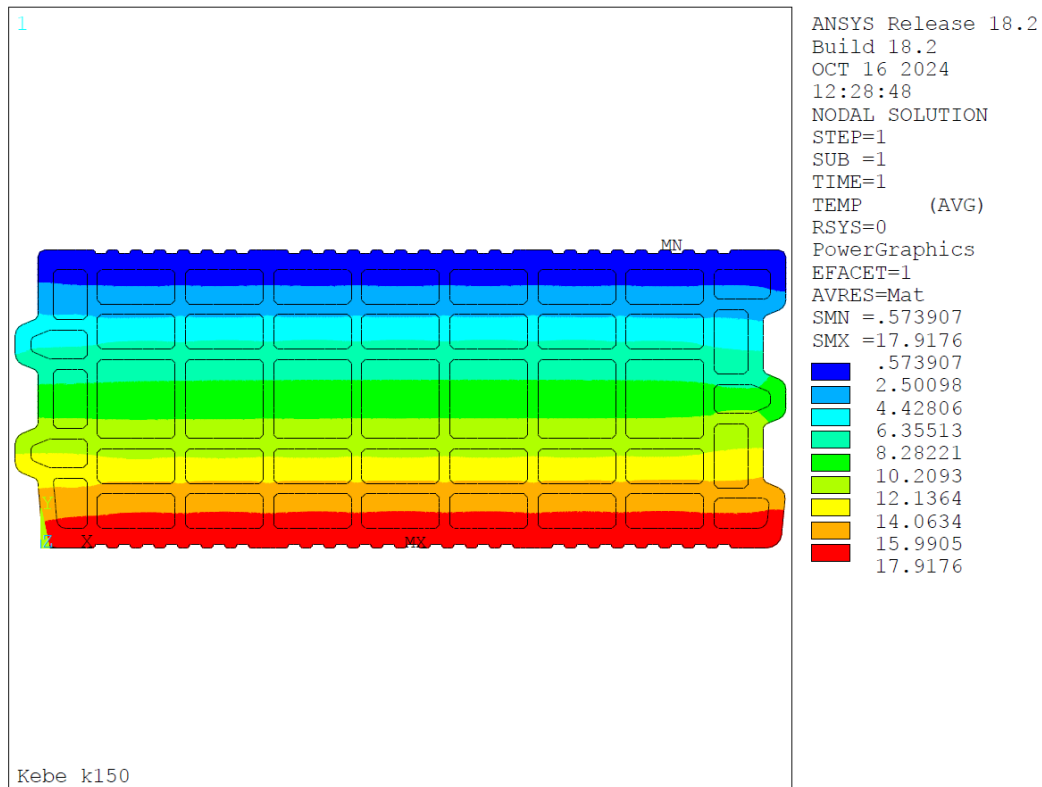
## 4. Results

Table 2 shows the results of the Finite Elements Analysis; Figures 3 and 4 graphically show the distribution of the isotherms and the vector state of the heat flow.

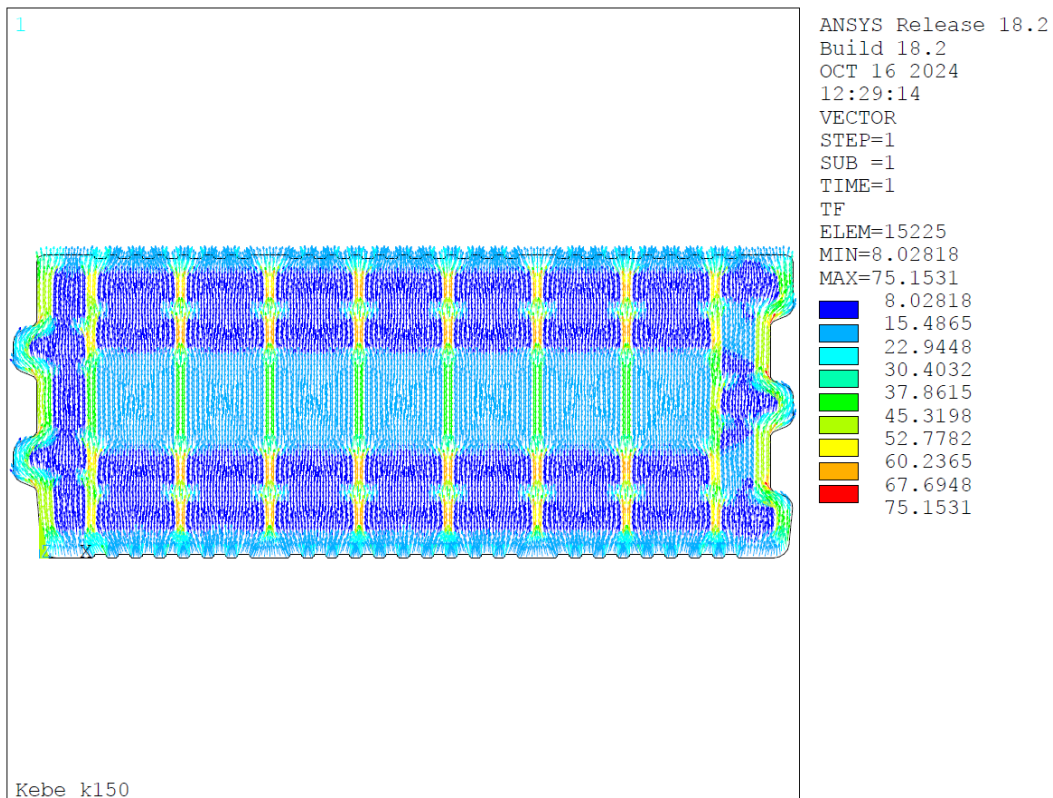
**Table 2.** FEM results

| Heat flow<br>[W/m] | Thermal coupling coefficient<br>$L^{2D}$ [W/mK] | Thermal transmittance<br>$U$ [W/m <sup>2</sup> K] | Total thermal resistance<br>$R_T$ [m <sup>2</sup> K/W] | True thermal resistance of the masonry unit<br>$R_t$ [m <sup>2</sup> K/W] | Equivalent thermal conductivity<br>$\lambda_{10,dry,unit}$ [W/mK] |
|--------------------|-------------------------------------------------|---------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------|
| 7,5498             | 0,3775                                          | 1,0065                                            | 0,9936                                                 | 0,8236                                                                    | 0,1815                                                            |

**Figure 3.** Distribution of isotherms in the block [°C]



**Figure 4.** Average heat flow vectors [W/m<sup>2</sup>]



#### 4. Determination of thermal values of the masonry

To conduct a comprehensive assessment of the thermal performance of the masonry, only the horizontal mortar joints were taken into account, without plaster layers. Given the interlocking geometry of the blocks, the vertical joints were not considered in the analysis, as they do not contribute significantly to the overall thermal behavior. In order to ensure a thorough evaluation, the thermal properties of the masonry were analyzed by studying the configuration as detailed in Table 3. Table 3. The adopted mortar properties refer to the product “**ORTHOBLOCK BOND**”, drawing on thermophysical data made available by the Client.

**Table 3.** Masonry configurations

| Masonry  | Description              |                                                                   |                          |
|----------|--------------------------|-------------------------------------------------------------------|--------------------------|
| <b>1</b> | Horizontal mortar joints | Thickness = 3 mm<br>$\lambda_{\text{mortar}} = 0.61 \text{ W/mK}$ | Provided by the Costumer |
|          | Internal plaster         | Not present                                                       | Provided by the Costumer |
|          | External plaster         | Not present                                                       | Provided by the Costumer |

Table 4 shows the thermal values of the masonry, in the configuration described above.

**Table 4.** Results of the calculation for the masonry no. 1

| Physical quantity                                                                | Result |
|----------------------------------------------------------------------------------|--------|
| True thermal resistance of the masonry<br>$R_t \text{ [m}^2\text{K/W]}$          | 0.8001 |
| Equivalent thermal conductivity<br>$\lambda_{\text{dry,masonry}} \text{ [W/mK]}$ | 0.1868 |
| Total thermal resistance<br>$R_T \text{ [m}^2\text{K/W]}$                        | 0.9701 |
| Thermal transmittance<br>$U \text{ [W/m}^2\text{K]}$                             | 1.0308 |

## SUMMARY TABLE OF RESULTS

The tests previously described gave the following results:

| Product          | Equivalent thermal conductivity<br>$\lambda_{\text{dry,masonry}}$ [W/mK] | Thermal transmittance<br>$U$ [W/m <sup>2</sup> K] |
|------------------|--------------------------------------------------------------------------|---------------------------------------------------|
| Orthoblock MK150 | <b>0.1815</b>                                                            | <b>1.0065</b>                                     |
| Masonry no. 1    | <b>0.1868</b>                                                            | <b>1.0308</b>                                     |

### 5. List of distribution

|                  |          |         |
|------------------|----------|---------|
| <b>ENEA</b>      | Archivio | 1 copia |
| <b>Certimac</b>  | Archivio | 1 copia |
| <b>Kebe S.A.</b> | Archivio | 1 copia |

| In charged of technical test execution                                              | In charged of technical report drafting                                             | Technical director Approval                                                           |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Eng. Sebastiano Marianini                                                           | Eng. Sebastiano Marianini                                                           | Ing. Luca Laghi                                                                       |
|  |  |  |

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