



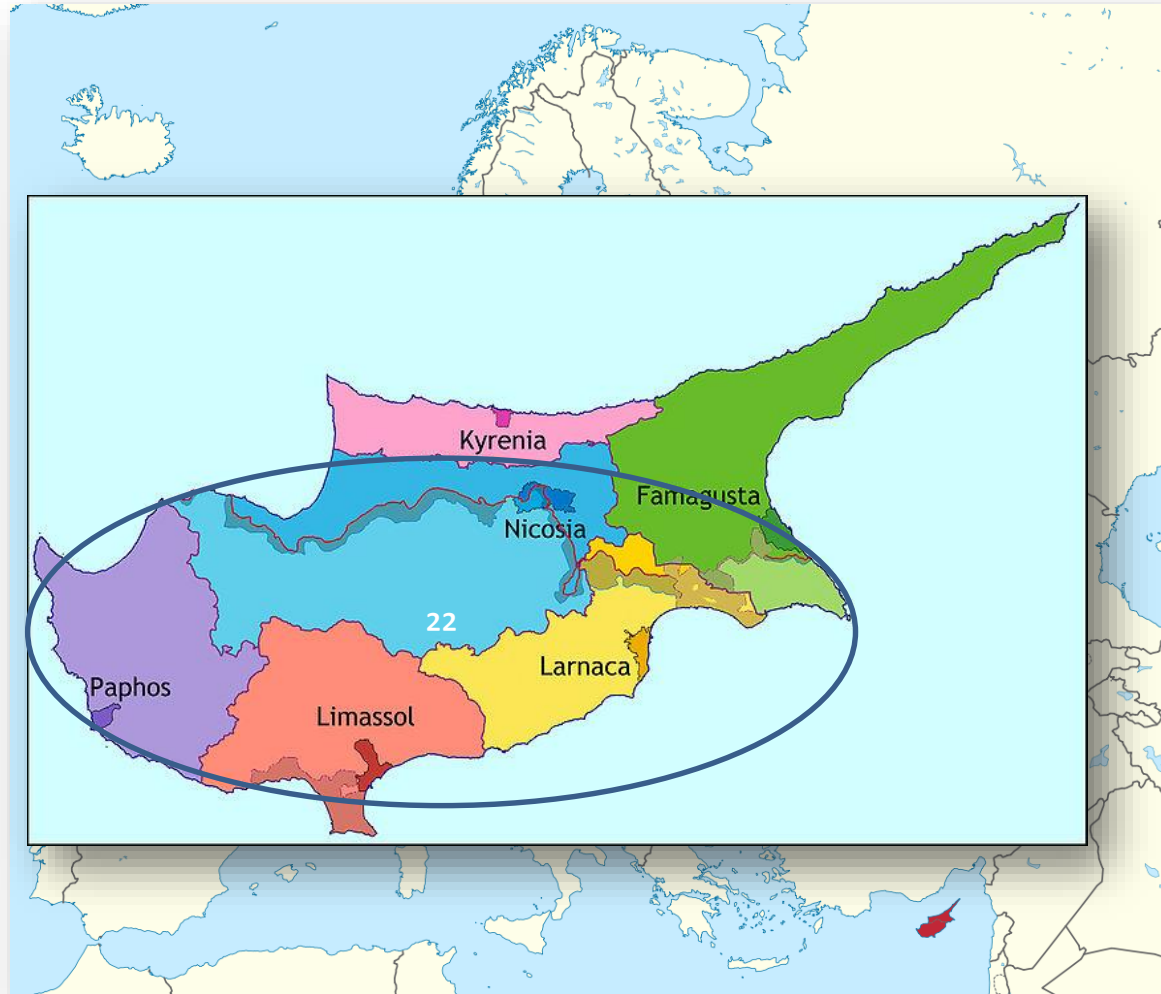
# Observations on heat transmission coefficients compliance in Cyprus

Matthaios Santamouris  
Marina Kyprianou Dracou  
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# Climate conditions in Cyprus

Summer comfort is extremely essential in Cyprus as the high temperatures experienced during the summer sometimes reach at around 40 - 43 C°.

Moreover, the diurnal temperature variations that occur from the highs and lows during the day make the need for thermal control of the building necessary.



# National requirements for U-values (KPD 432/2013 & KPD 433/2013)

**2007:** First maximum U-values requirements

**RESULT = Insulation of a building mandatory.**

**2010:** Important revision

**RESULT = Compliance with maximum average U-value,  
Min. accepted energy efficiency category B in the EPC**

**2013:** Maximum specified U-values amendment, (KPD 432/2013 & KPD 433/2013).

**RESULT: New specified maximum U-values:**

- $U_{\max}$  external walls/ columns/ beams = 0,72 W/m<sup>2</sup>K
- $U_{\max}$  external exposed floors/ roofs = 0,63 W/m<sup>2</sup>K
- $U_{\max}$  floors above spaces without air-conditioning = 2,00 W/m<sup>2</sup>K
- $U_{\max}$  external openings=3,23 W/m<sup>2</sup>K
- $U_{\max}$  average=1,30 W/m<sup>2</sup>K

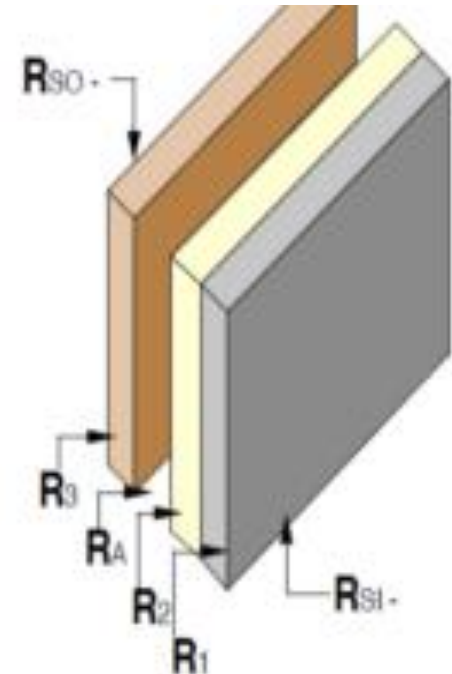
# Principles of calculation of U-values

The U-value is the inverse sum of the resistances of each building material and surface resistances to the outer and inner faces of the material build up of the element.

$$U = \frac{1}{R_{SI} + R_{SO} + R_A + R_1 + R_2 + R_4 + R_5}$$

$R_{SI}$  - thermal resistance of internal surface  
 $R_{SO}$  - thermal resistance of outside surface  
 $R_A$  - thermal resistance of unvented air cavities  
 $R_1$  etc - thermal resistances of building components

Units -  $W/m^2K$



**EPC calculation has to be done before building permit !**

# Objectives of Cyprus new data collection study

## Objectives

Study aims to provide answers to the questions:

How well new requirements regarding maximum U-values and maximum average U-Value have been followed both in design and construction?

What percentage of the residential properties from those examined actually comply with those regulations?

In case of non compliance of maximum U-values and maximum average U-value with the requirements in actual construction, are there specific elements that do not comply?

In case of non compliance of maximum U-values and maximum average U-value with the requirements in actual construction, is there a pattern of causes for this?

# Scope and Methodology

## Scope of the study

Cyprus new QUALICHeCK data collection study examined and analysed 27 newly built and well documented residential properties.

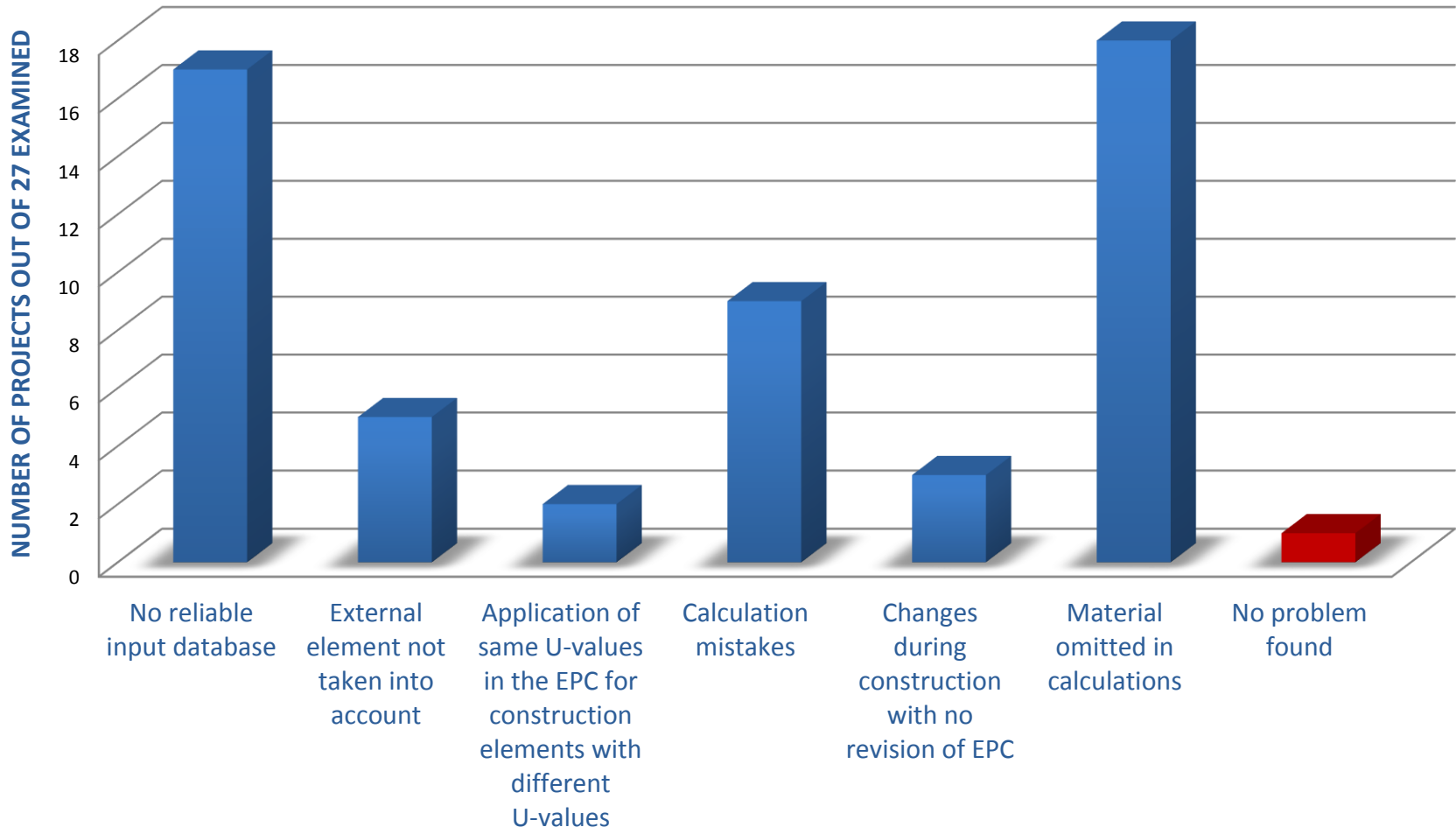
## Information collected and analyses conducted:

- Collection of design documentation
- Collection of as stated in EPC U-Values for the shell and frames and average U-value
- Collection of photographs of examined properties (construction phase) and communication with architect/tenants to check actual construction of various elements and calculate their U-values
- Site visits and inspections to check actual construction
- Collection of documents from suppliers regarding U-Values of specific elements

## **Statements made by qualified building energy assessors (QE) who declined to provide any information regarding either all or some of their EPCs**

1. “I know that some of the residential properties have not been constructed as specified, and one of the reasons is that there was not a supervising engineer on site during construction, as the properties were owned by a developer.”
2. “Alterations were made during construction but some of the EPCs were not revised due to time/budget reasons.”
3. “When information was asked by the engineers of the project regarding the building elements, they said to proceed with the same calculations regarding those elements as the ones usually made in other projects.”

# Deviations between calculated in EPC U-values and in actual U-values





# Objectives of Cyprus new data collection study

## Questions:

How well new requirements regarding maximum U-values and maximum average U-Value have been followed both in design and construction?

What percentage of the residential properties from those examined comply with those regulations?

In case of non compliance of maximum U-values and maximum average U-value with the requirements in actual construction, are there specific elements that do not comply?

In case of non compliance of maximum U-values and maximum average U-value with the requirements in actual construction, is there a pattern of causes for this?

## Answers

Only in specific construction elements, in 10 out of 27 examined residential properties they have not been followed

Only 63% of the examined residential properties fully comply => 37% do not comply

From the 37% of the residential properties that do not comply, 60% do not comply with U<sub>max</sub> exposed floor slabs, 60% do not comply with U<sub>max</sub> external openings, 40% do not comply with U<sub>max</sub> columns / beams / shear walls

Lack of knowledge with result construction elements not taken into account, changes during construction - no control framework on site / no revision of EPC, application of same U-values for constr. elements with different ones for simplification

# Conclusions

## **Requested information was not provided by some QE**

**Reason:** Reported in EPC U-values vary from actual U-values due to:

- Lack of a supervising engineer on site/property owned by developer
- Alterations made during construction without the relevant revision of the EPC due to time/budget reasons
- Engineer giving wrong and/or deficient information to QE due to lack of knowledge or appreciation of the value of EPC

**Even in the 27 examined residential properties where information was provided by QE,** which are the best cases, there are deviations between reported and actual U-values, which sometimes are not so important, e.g. during calculation a construction element like the coat cement being omitted, but which sometimes are very important, e.g. no reliable input data, construction elements like a whole exposed slab or single glazed windows being omitted, and changes during construction without the relevant EPC revision.



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