



TECHNICKÝ A SKÚŠOBNÝ ÚSTAV STAVEBNÝ  
BUILDING TESTING AND RESEARCH INSTITUTE

# Prolongation of life-cycle-maintenance & thermal improvements

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# Thermal protection of walls using ETICS

- » When speaking about **thermal protection of external walls** we think on one layer masonry, structures with some layers of different materials, or about **additional insulation of existing structures using ETICS**.
- » The assumed intended **working life at least 25 years**, provided that the conditions for the packaging, transport, storage and installation as well as appropriate use, maintenance and repair are met.



# Working life

## » Working life (of products)

The period of time during which the performances of the product are maintained, under the corresponding service conditions, at a level compatible with the intended use conditions.

## » Working life (of works or parts of the works)

The period of time during which the performance will be maintained at a level compatible with the fulfilment of the Essential Requirements.

(source: ETAG 004/2013)



# Maintenance

## » Maintenance (of works)

**A set of preventive and other measures which are applied to the works in order to enable the works to fulfil all their functions during their working life. These measures include cleaning, servicing, repainting, repairing, replacing parts of the works where needed, etc.**

## » Normal maintenance (of works)

**Maintenance, normally including inspections, which occurs at time when the cost of the intervention which has to be made is not disproportionate to the value of the part of the work concerned, consequential costs (e.g. exploitation) being taken into account.**

(source: ETAG 004/2013)



# Durability

- » **Durability** (of products)

Ability of the product to contribute to the working life of the works by maintaining its performances, under the corresponding service conditions, at a level compatible with the fulfilment of the Essential Requirements by the works.

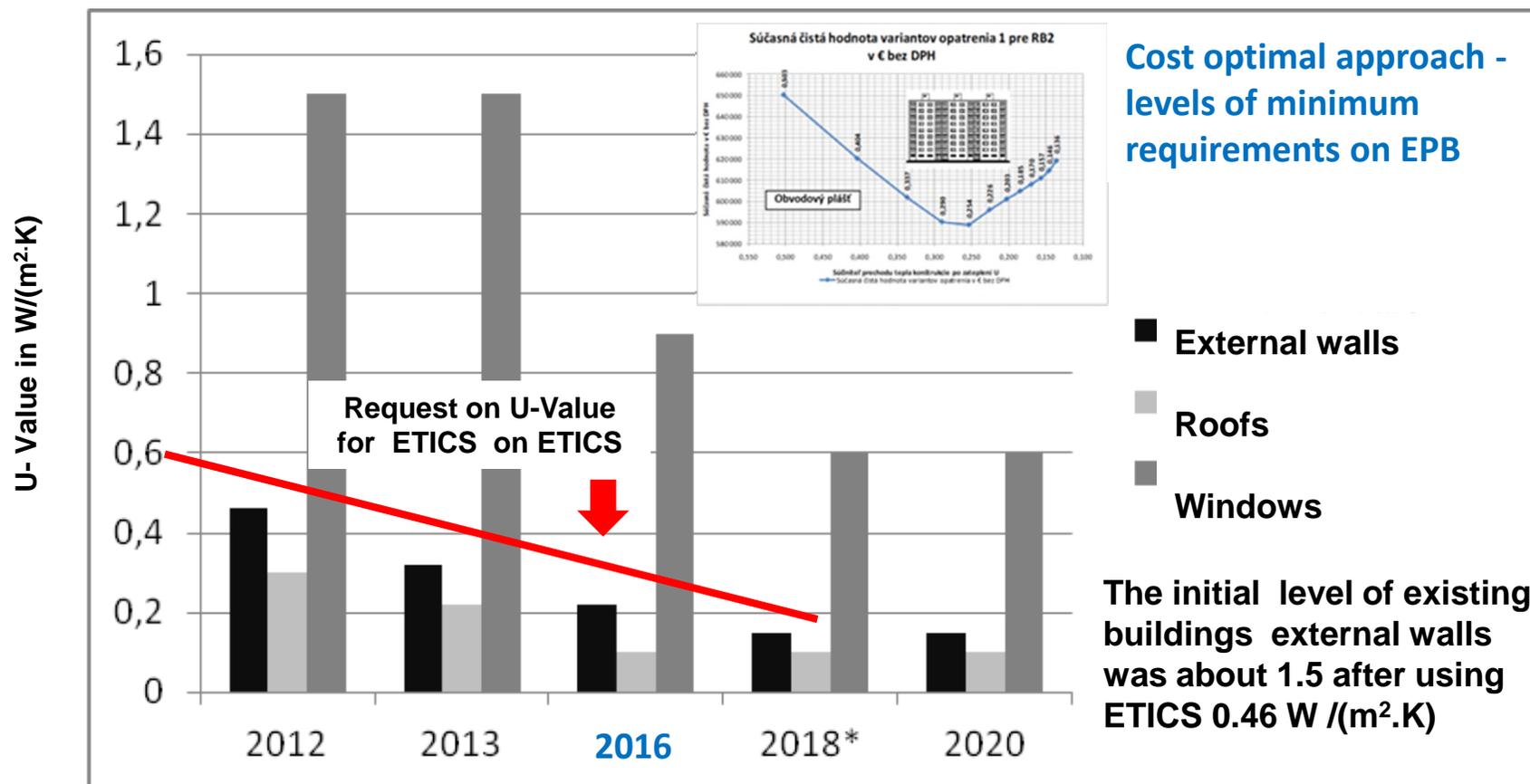
(source: ETAG 004/2013)

- » Working life of a structure is influenced not only by the real condition, but also by **tighten up the requirements**.
- » The external wall should fulfil the 6<sup>th</sup> essential requirement „**Energy economy and heat retention**“, what is invoking the necessity of insulation already insulated walls, to define the conditions of using **ETICS on ETICS**.



# Tighten of Requirements on thermal protection

Tightening requirements on thermal protection requires rest thickness of the thermal insulation layer ETICS – an example from SR



# Apartment building renovated in 1992



**Number and types of defects are affected by the level of design and implementation in time of carried out renewal, influenced by used components, and performed details of ETICS.**



# Apartment building renovated in 2002



**Long-acting level of requirements on thermal protection – application thickness of 60 mm thermal insulation**

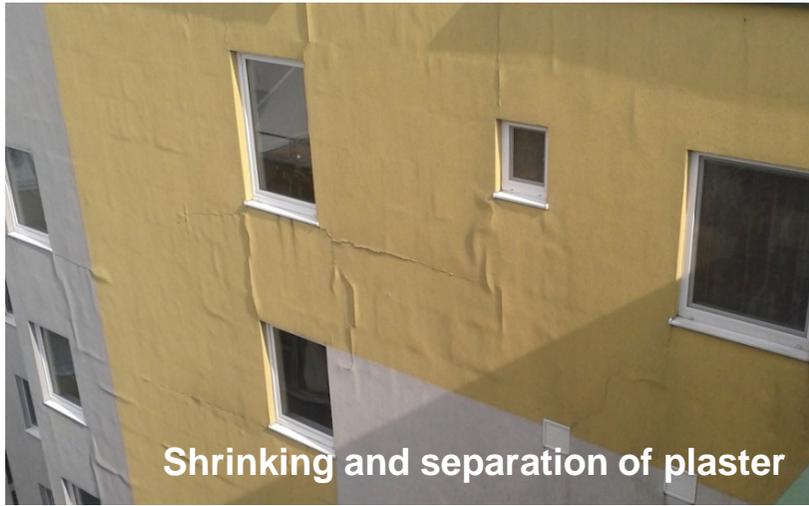


# Possibilities and conditions

- » **Increase the thickness** of the thermal insulation of external walls using **ETICS can be performed in the following ways:**
  - new construction of **ETICS** to the existing **ETICS** (double **ETICS**);
  - new construction of **ETICS** to the existing **ETICS** after prior removing of external layers (the base layer including the mesh and the surface layer);
  - construction of a new **ETICS** on the original wall structure after removing the whole existing **ETICS**.
  
- » To decide the way of performance an **inspection of existing ETICS** (visible defects, anchoring, mechanical properties, type and quality of thermal insulation, quality of **ETICS** surface, etc.)



# Visible defects



Shrinking and separation of plaster



Shrinking of the plaster



Algae

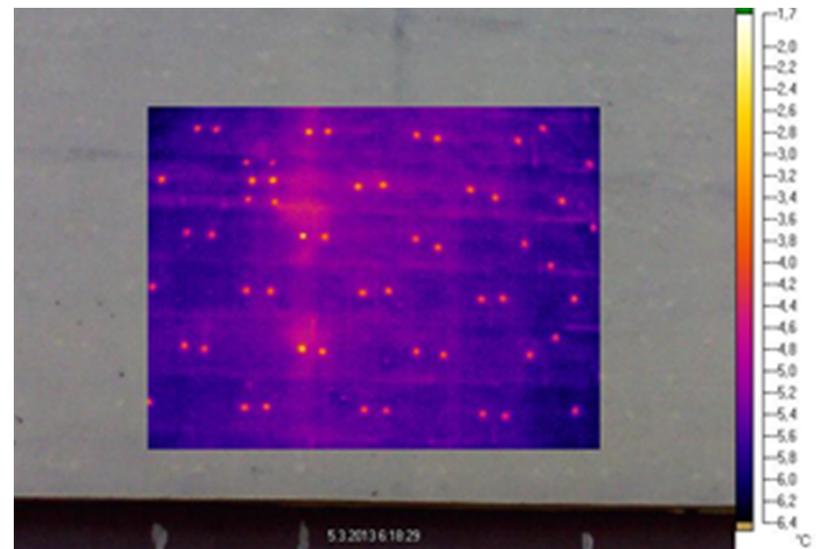


Risks



# Checking the anchoring through TICs

The basic condition for detecting the temperature field on the surface of the facade is the existence of heat flow claddings (EN 13187) are for measurement of residential buildings with heavy external cladding required temperature difference between the outside and inside envelope less than  $3/U$ , where  $U$  is the theoretical value of the building envelope heat transfer coefficient, but never less than  $5\text{ °C}$ .



# Checking the existing ETICS properties



**Thickness of all ETICS layers**



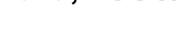
**Fixing of anchors and checking of adhesive**



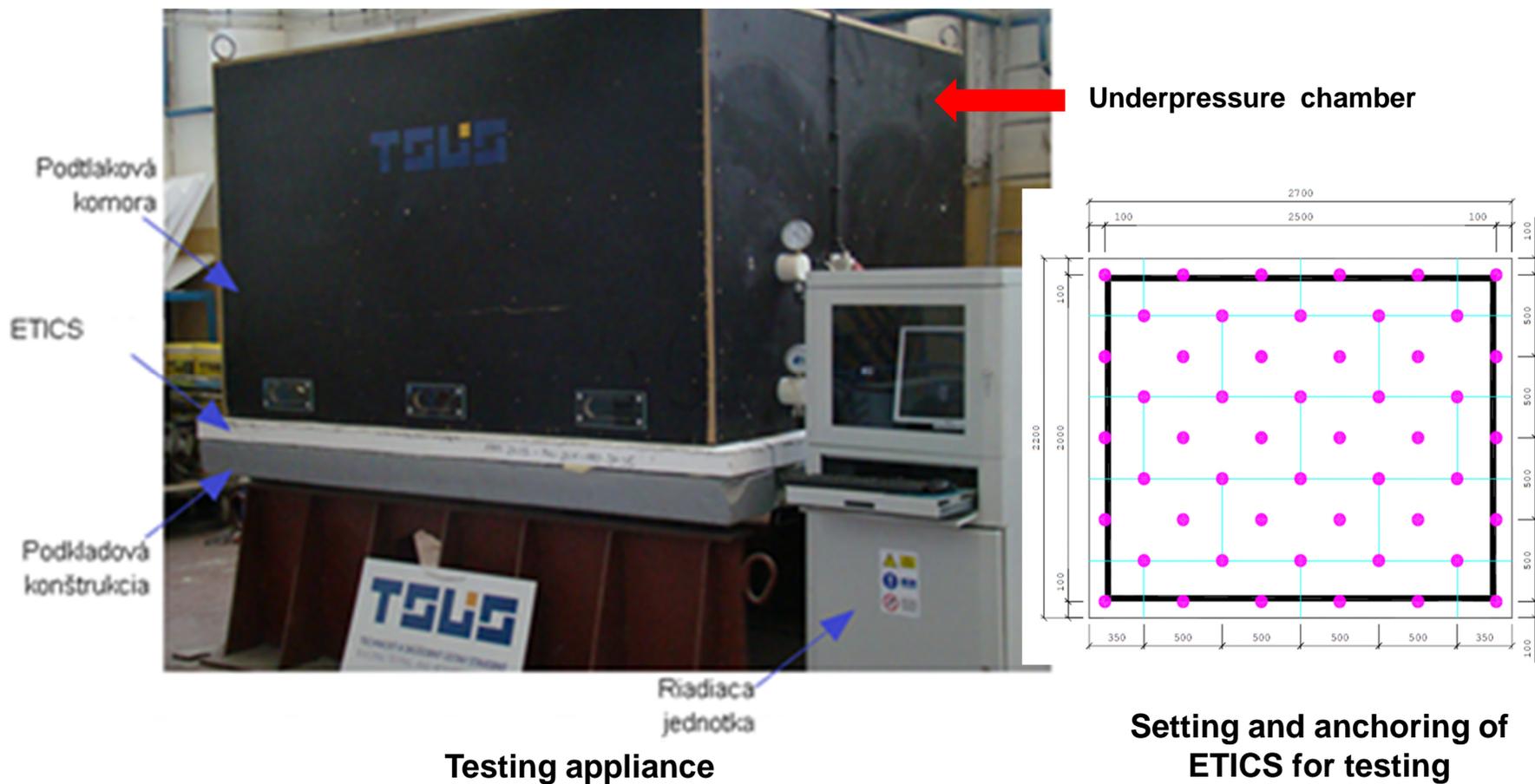
# Pull-out test of anchors from the base



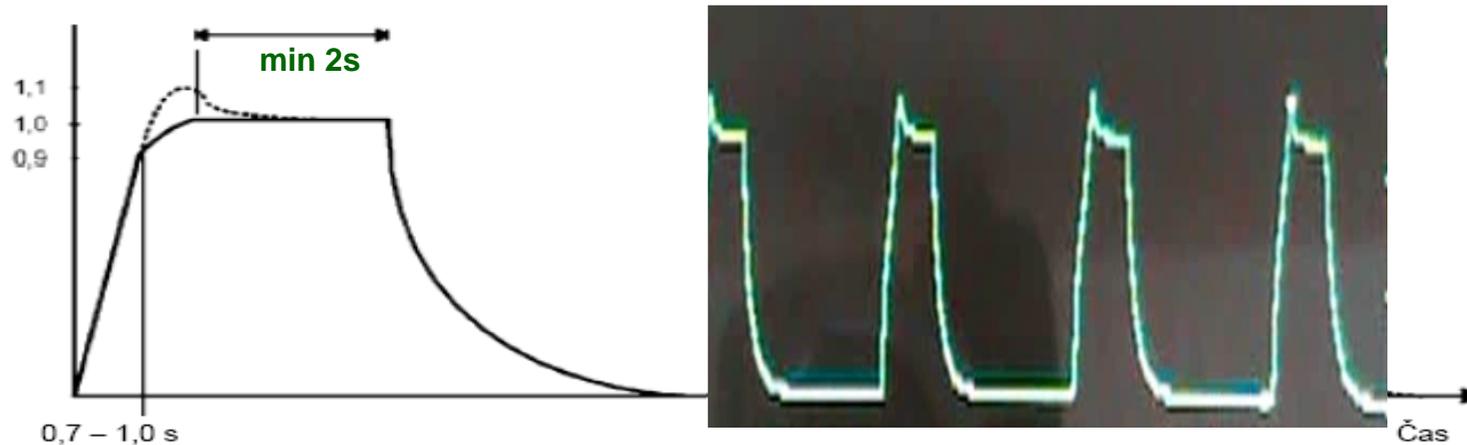
Testing „in situ“  
determine of  $R_{d2}$  of  
existing and proposed  
anchors

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Identifikácia materiálu nosnej vrstvy podkladu:	Pórobetón P3,3 - 580																																		
Identifikácia skúšaného typu rozpernej kotvy:	Alfaplast A 27																																		
Popis miesta skúšky:	Severná štítová stena																																		
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Záznam je vypracovaný pomocou kalkulačného programu pre navrhovanie mechanických spojov (verzia 01/05/2013). Oprávnený používateľ:  TECHNICKÝ A SKÚŠOBÝ ÚSTAV STAVEBNÝ, n. o., Bratislava Registračné číslo AO: 																																			

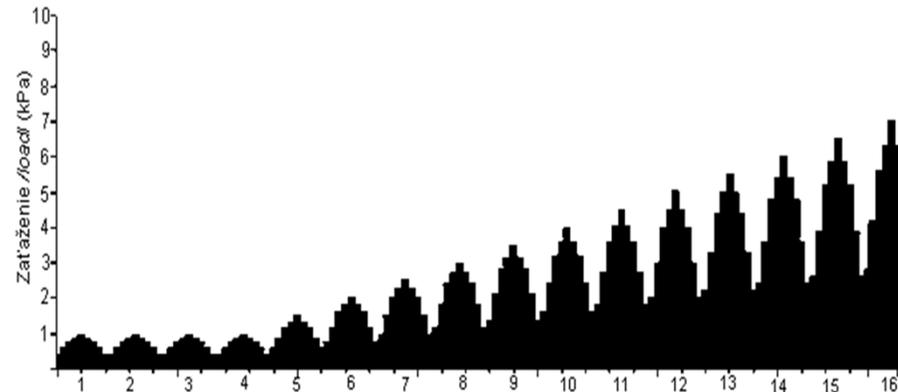
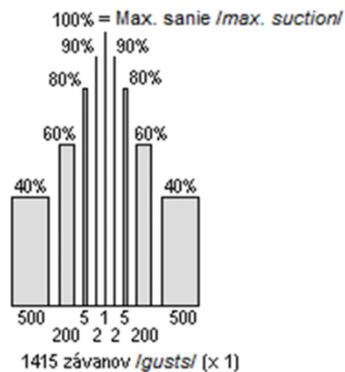
# Lift-up test of wind influence on ETICS



# Wind load during testing



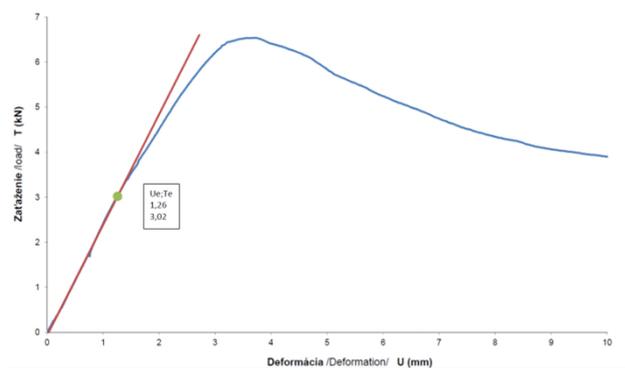
Basic load till the maxim should be achieved during 1,0 s



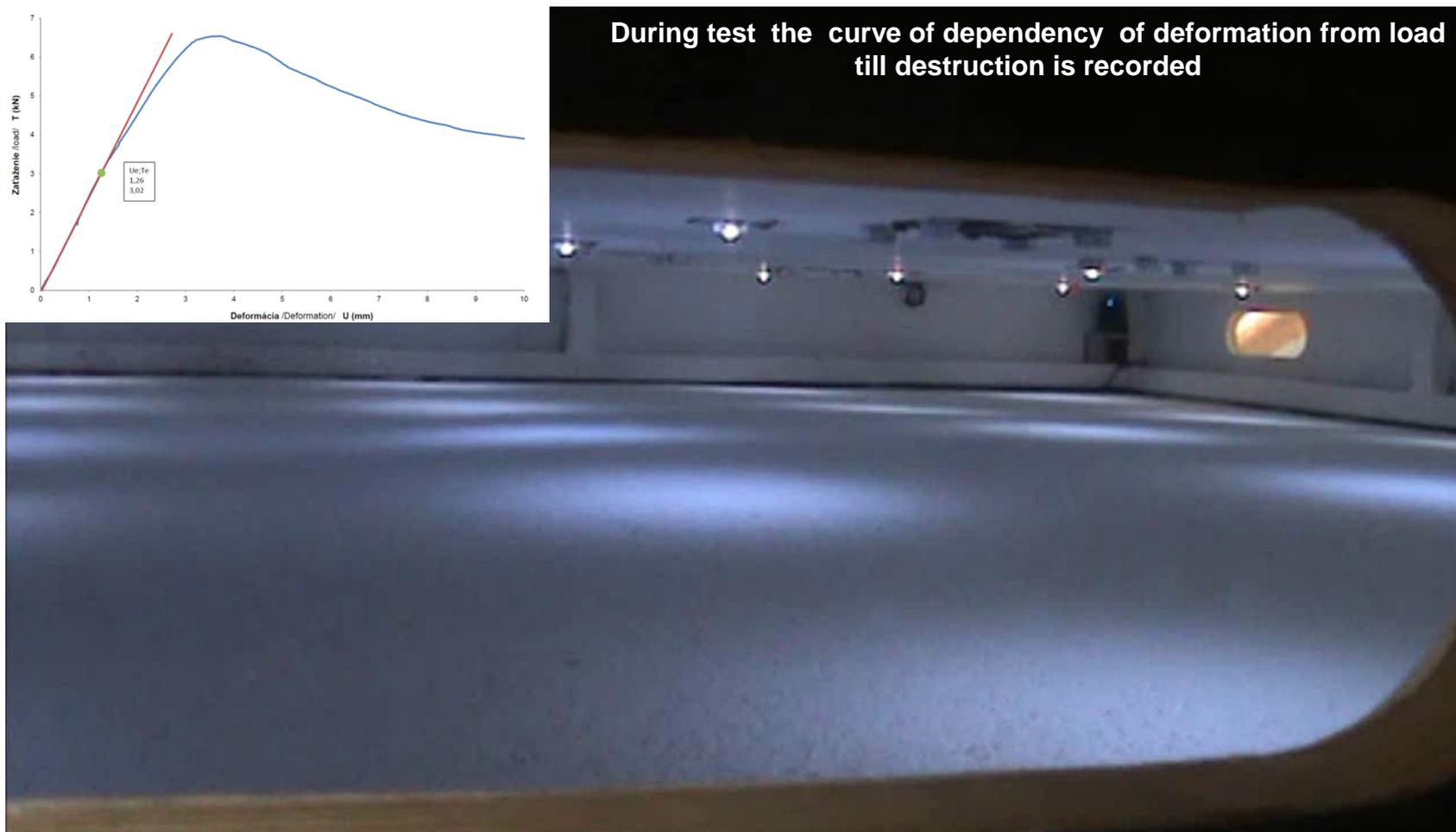
Load cycle consists of basic blast of 1415, and the value changes from 40 to 100%. The maximum load of each cycle after the first four cycles evenly increased until failure of the sample.



# Process of testing – Lift-up test



During test the curve of dependency of deformation from load till destruction is recorded



# Behaving of ETICS under the influence of wind

Accelerated projection of lift-up test



# Failure of ETICS after the test



# Checking the base after removal of ETICS



# Checking after removal of ETICS - case 2



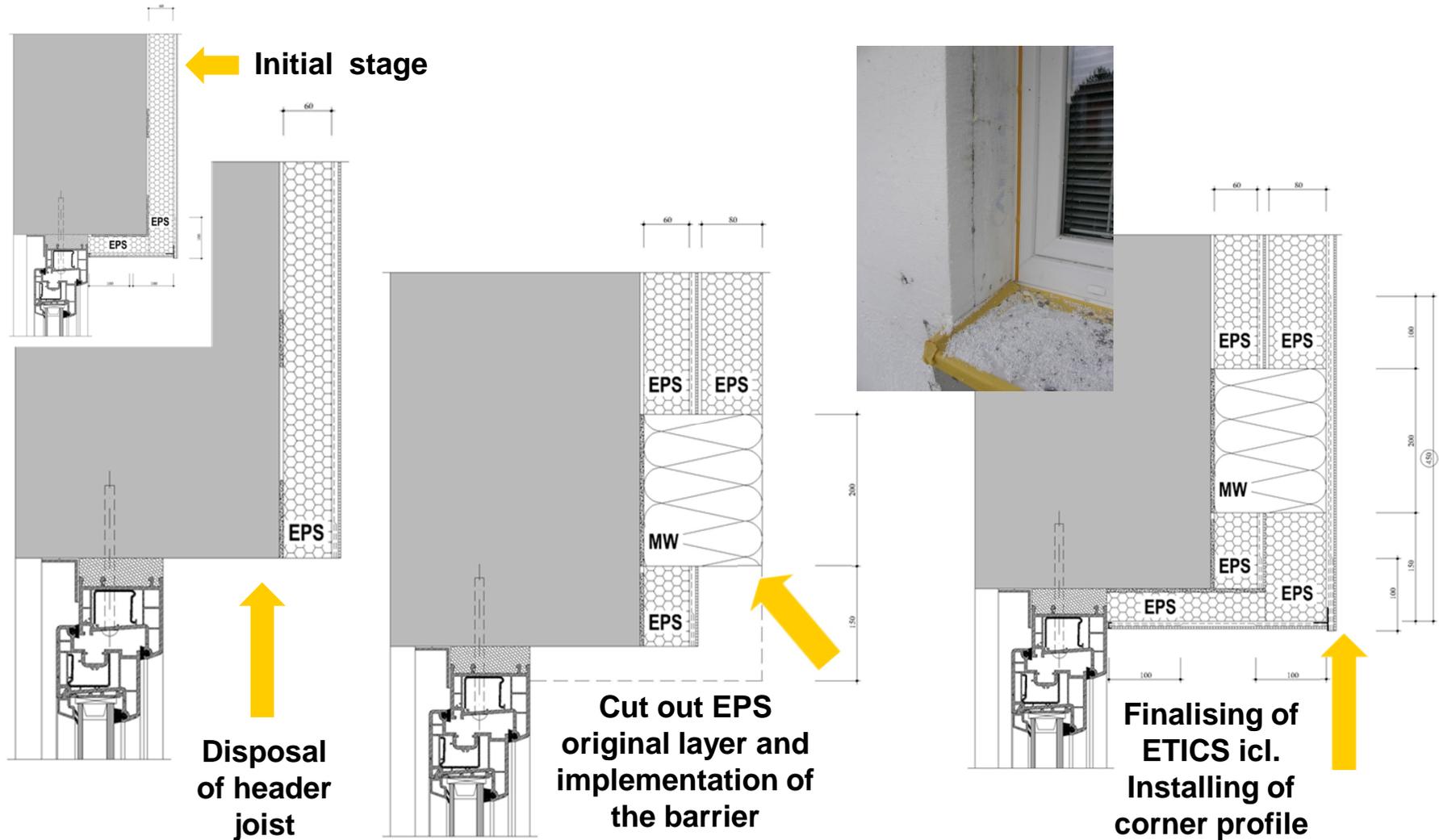
# Adhesiveness to the original ETICS



Adhesion without penetration



# Schema of ETICS doubling design



# Conclusion

- » **Starting design of external wall thermal protection improvement a very responsible checking of the original ETICS is needed.**
- » **To recognize the visible defects is only the start of preparation works.**
- » **The test of adhesion to the existing ETICS and pull-out test of anchors to the base (initial structure) is an obligation.**





Seat of TSÚS, npo  
and OZ ZPZ

## Thank you for Attention

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