

# ANALYSIS OF A VENTILATED FACADE WITH WOODEN CLADDING

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# Diferrence between of double-skin and conceptual contact facade?

Conceptual contact insulation system

Double-skin facade

Overheating  
heat trans

conventional

degradation

Wetting by v

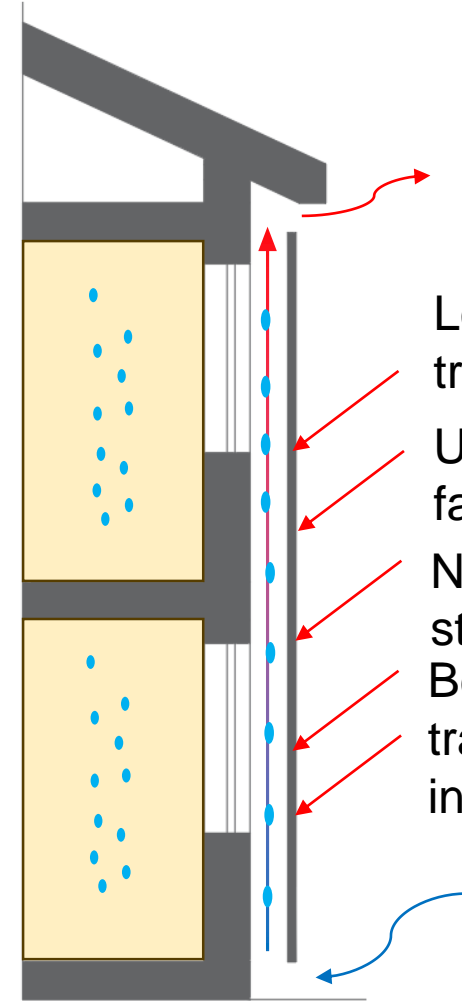
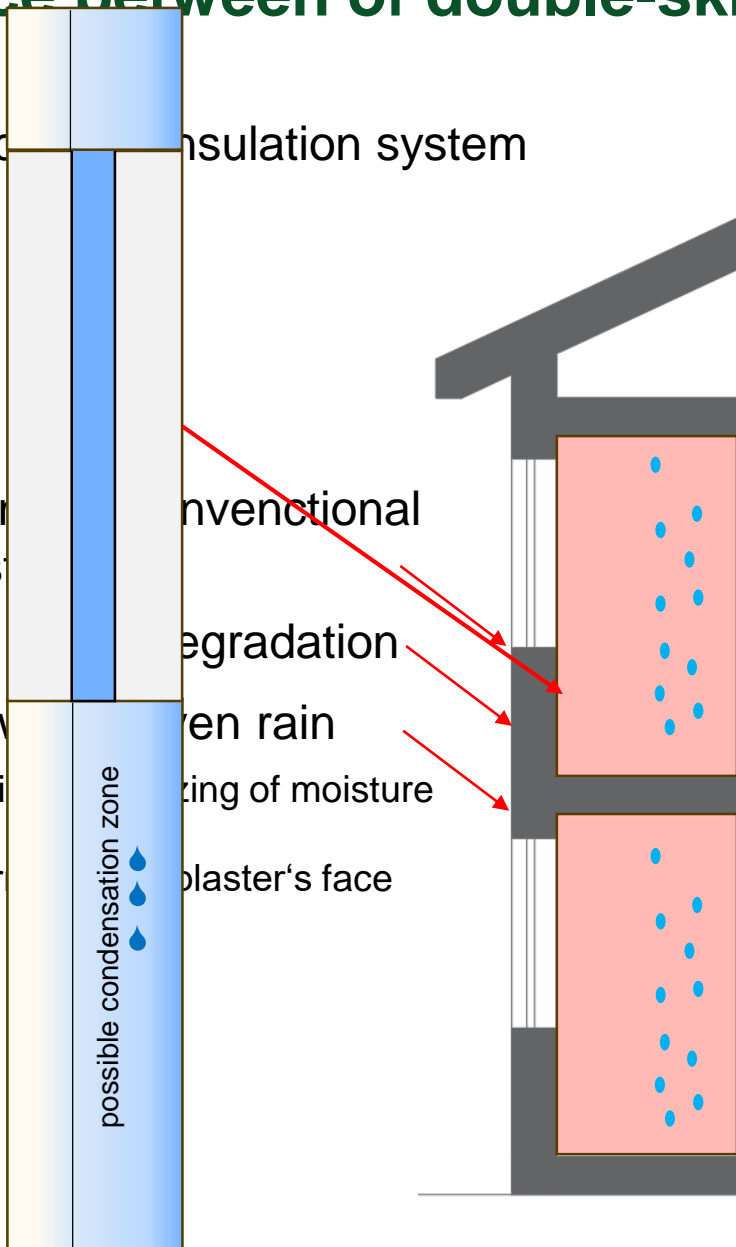
rain

wetting of moisture

plaster's face

- degradation in cycle
- lower per

possible condensation zone

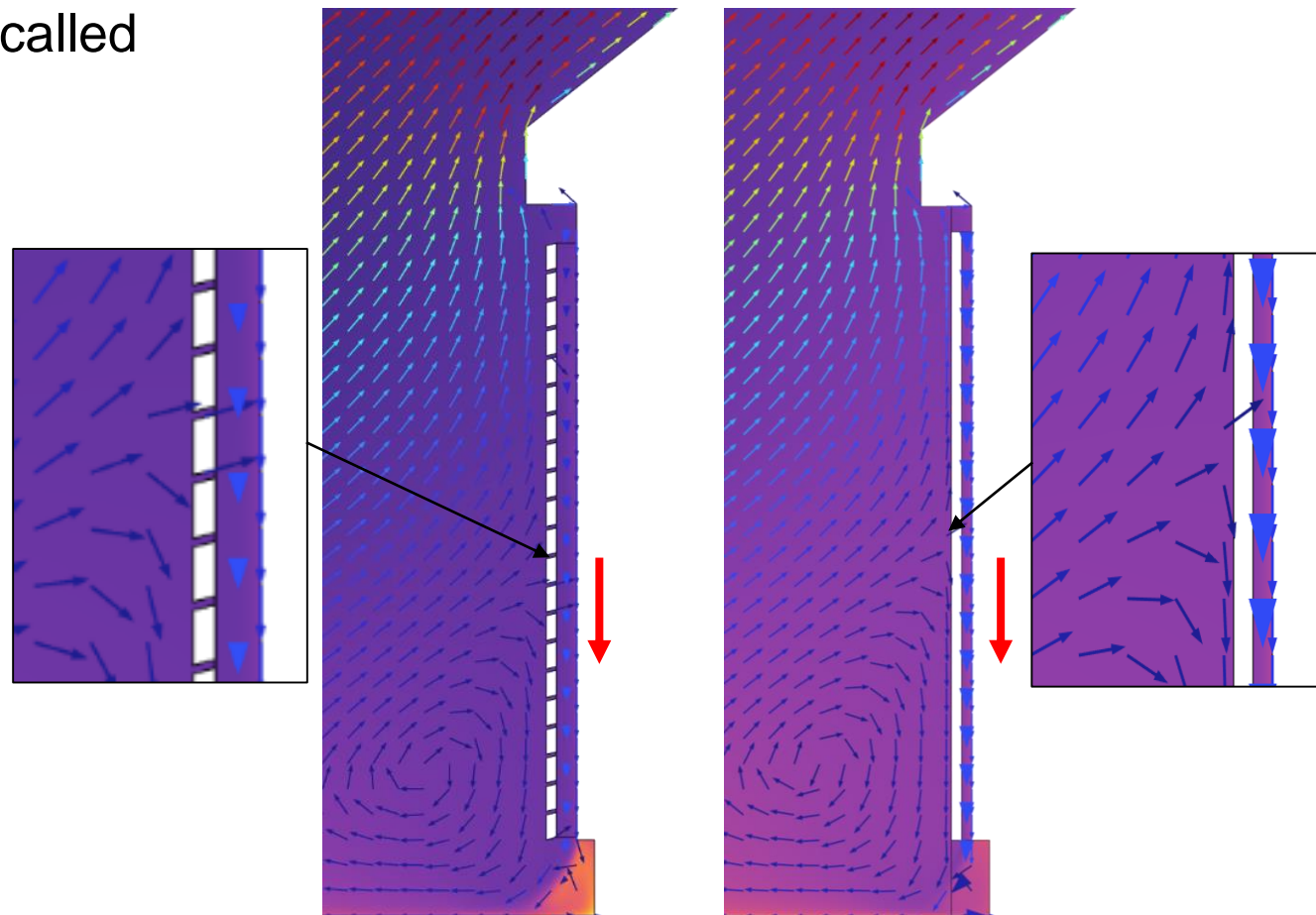


- Lower conventional heat transfer
- UV degradation only skin of facade
- No wetting of load bearing structure
- Better air vapour transmission due to the flow in the cavity

# Introduction – What is double-skin facade?

In the author's diploma thesis he chose a flat wooden cladding of his own design called imitation timbering.

Comparison of own design with commonly used slatted cladding



Picture (3.): Experimental model created by the author

# Fluid properties and mechanics

## Methodics

- **Traditional approaches in Czech Republic**

ČSN 731901. 2021. Roof design - Part 2. Roofs with folded roofing. Prague.

ČSN 73 0540-2 Thermal protection of buildings. Part 2: Functional requirements

ČSN ISO 6946 (730558) *Building elements and building structures - Thermal resistance and heat transfer coefficient - Calculation methods*

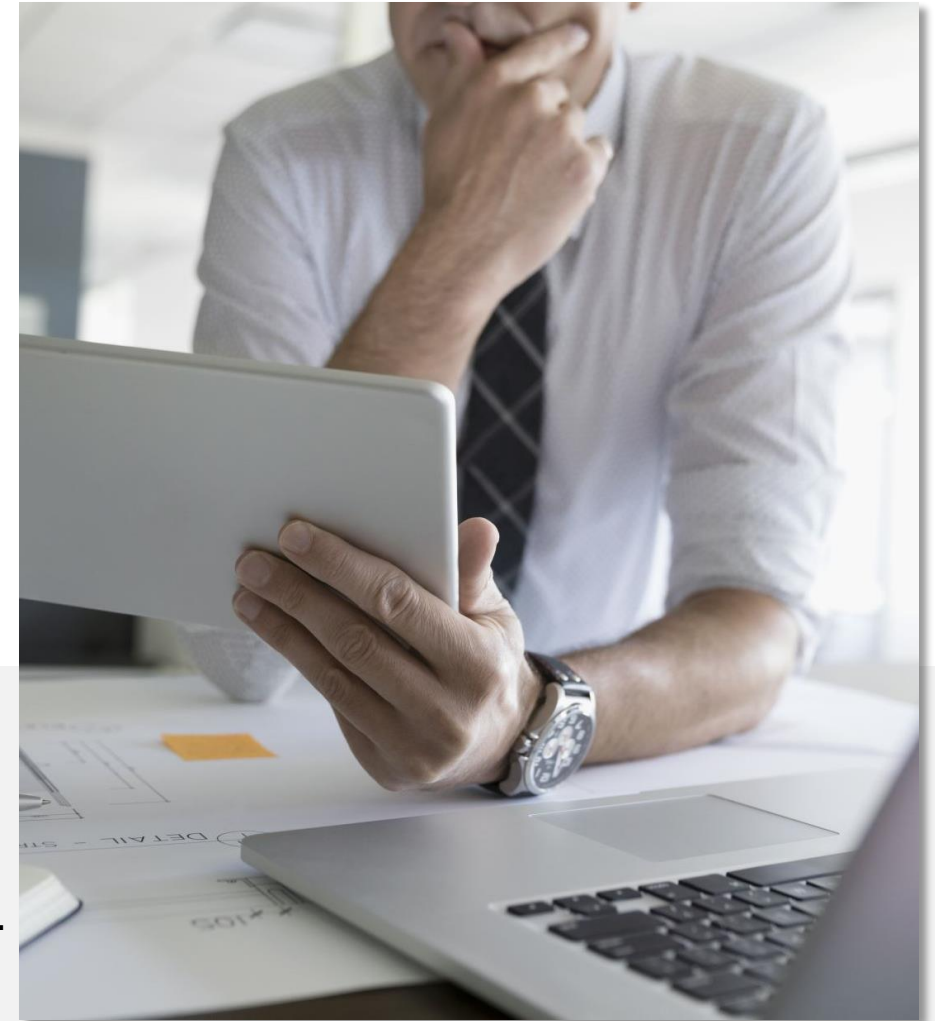
The standard came into force in 4/1977 and in slight modifications is still valid today.

- Experimental

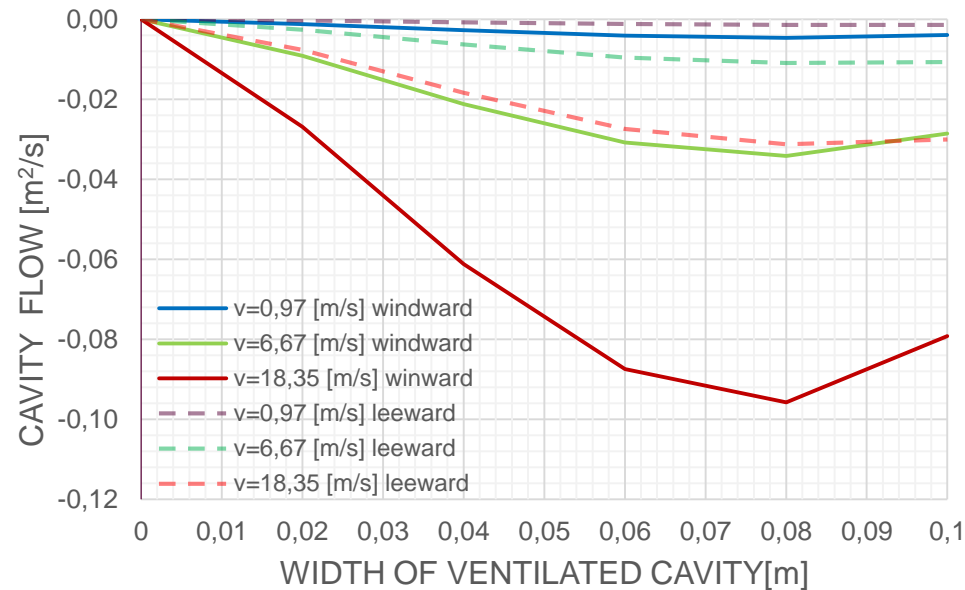
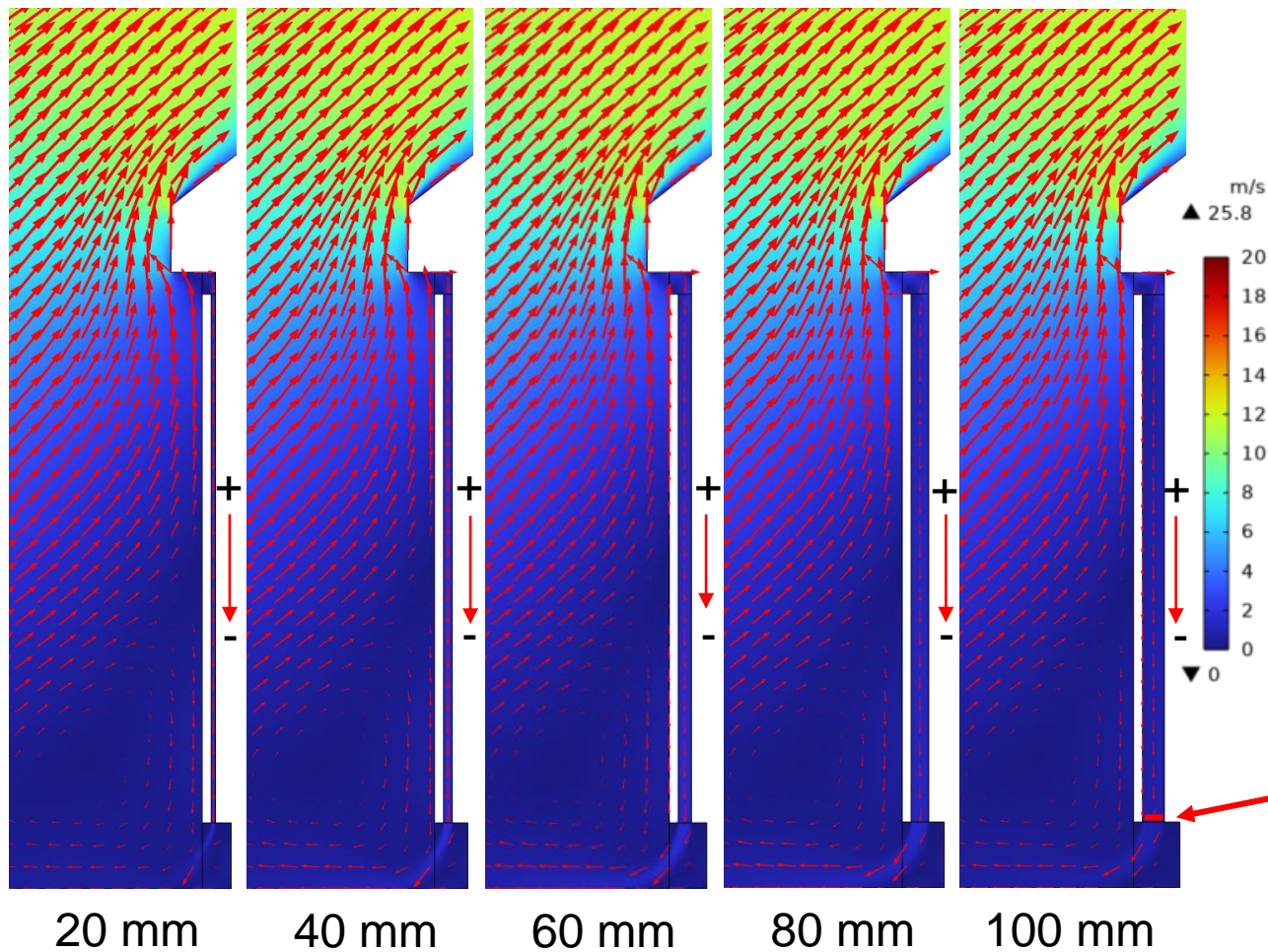
On real model, or scale model

- Numerical

Due to the complexity of the problem of ventilated facades and their thorough study it was necessary to use numerical methods.

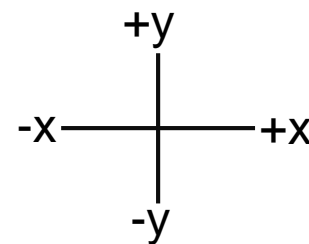


# Cavity flow rate as function of width



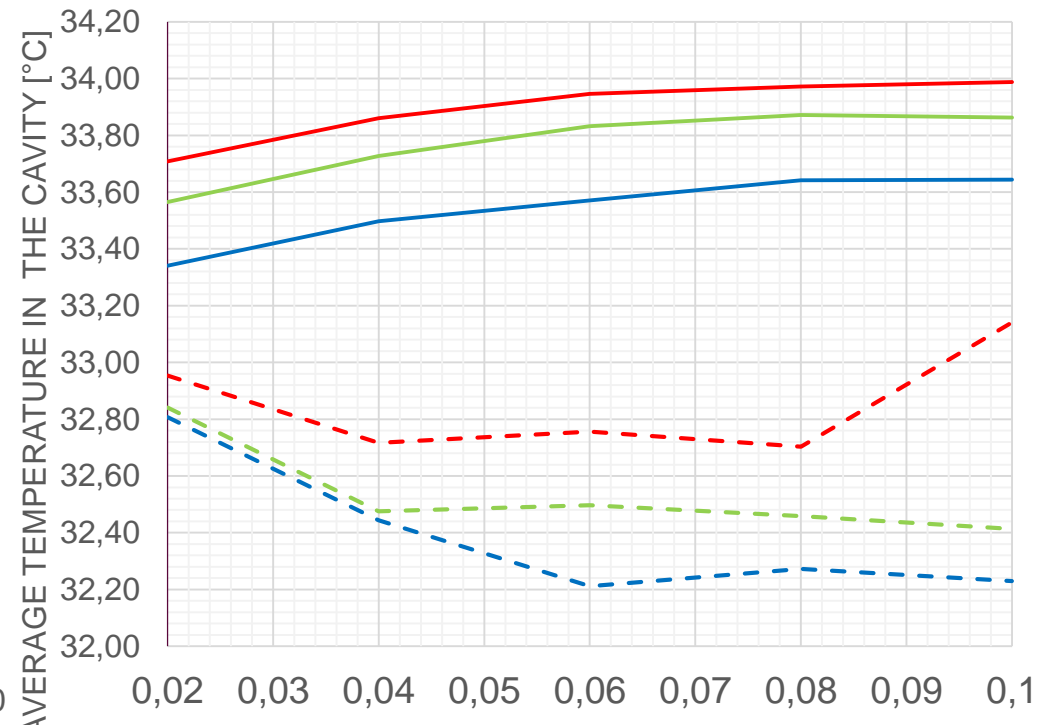
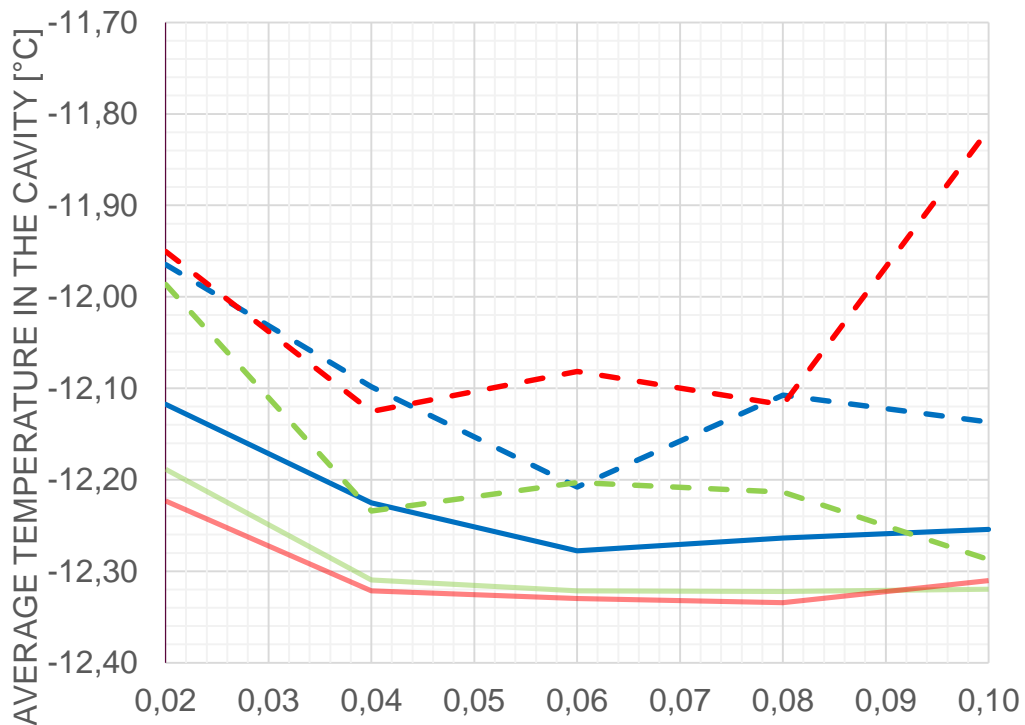
- Cavity flow [m<sup>2</sup>/s]

$$\int (\rho \cdot v) \cdot dl dt =$$



*T<sub>amb</sub>...* ambient temperature  
*Windward....* Návětrná strana  
*Leeward.....* Závětrná strana

# Average temperature in the cavity



- WIDTH OF VENTILATED CAVITY [m]
- Ts.01.v=0,97 [m/s] windward
  - - Ts.01.v=0,97 [m/s] leeward
  - Ts.01.v=6,67 [m/s] windward
  - - Ts.01.v=6,67 [m/s] leeward
  - Ts.01.v=18,35 [m/s] windward
  - - Ts.01.v=18,35 [m/s] leeward

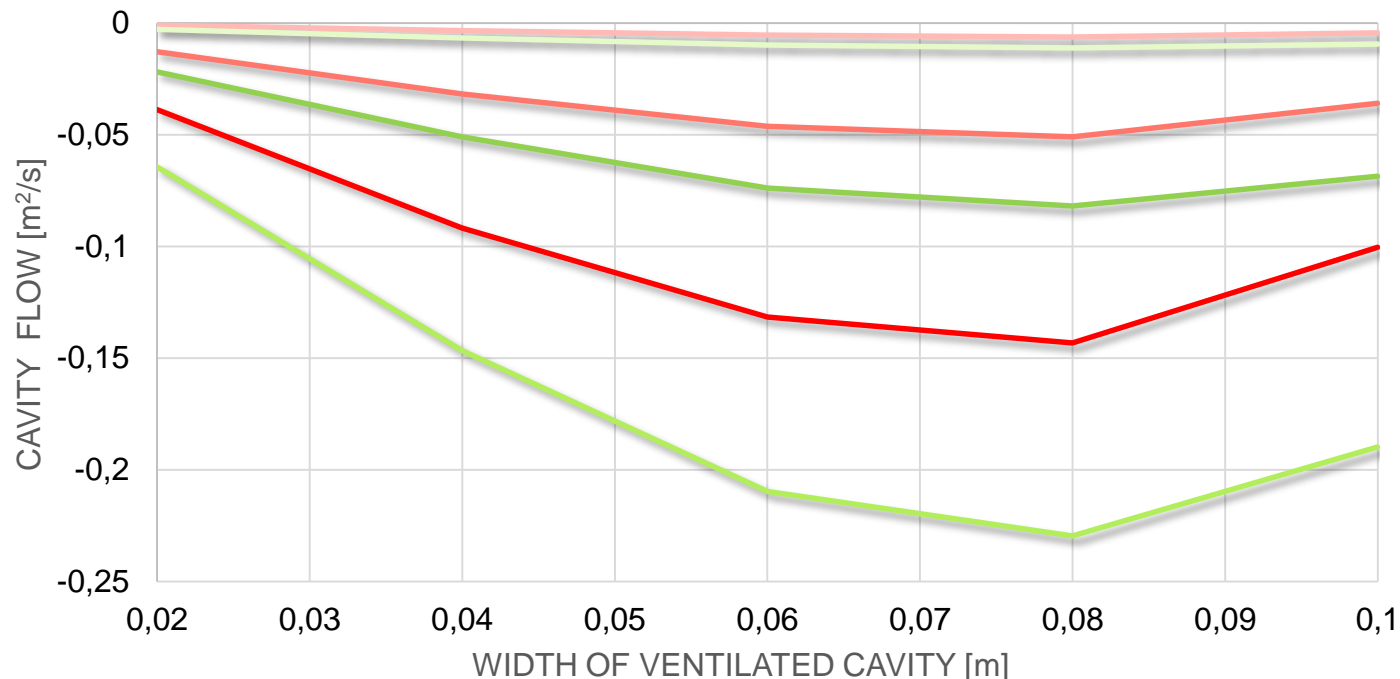
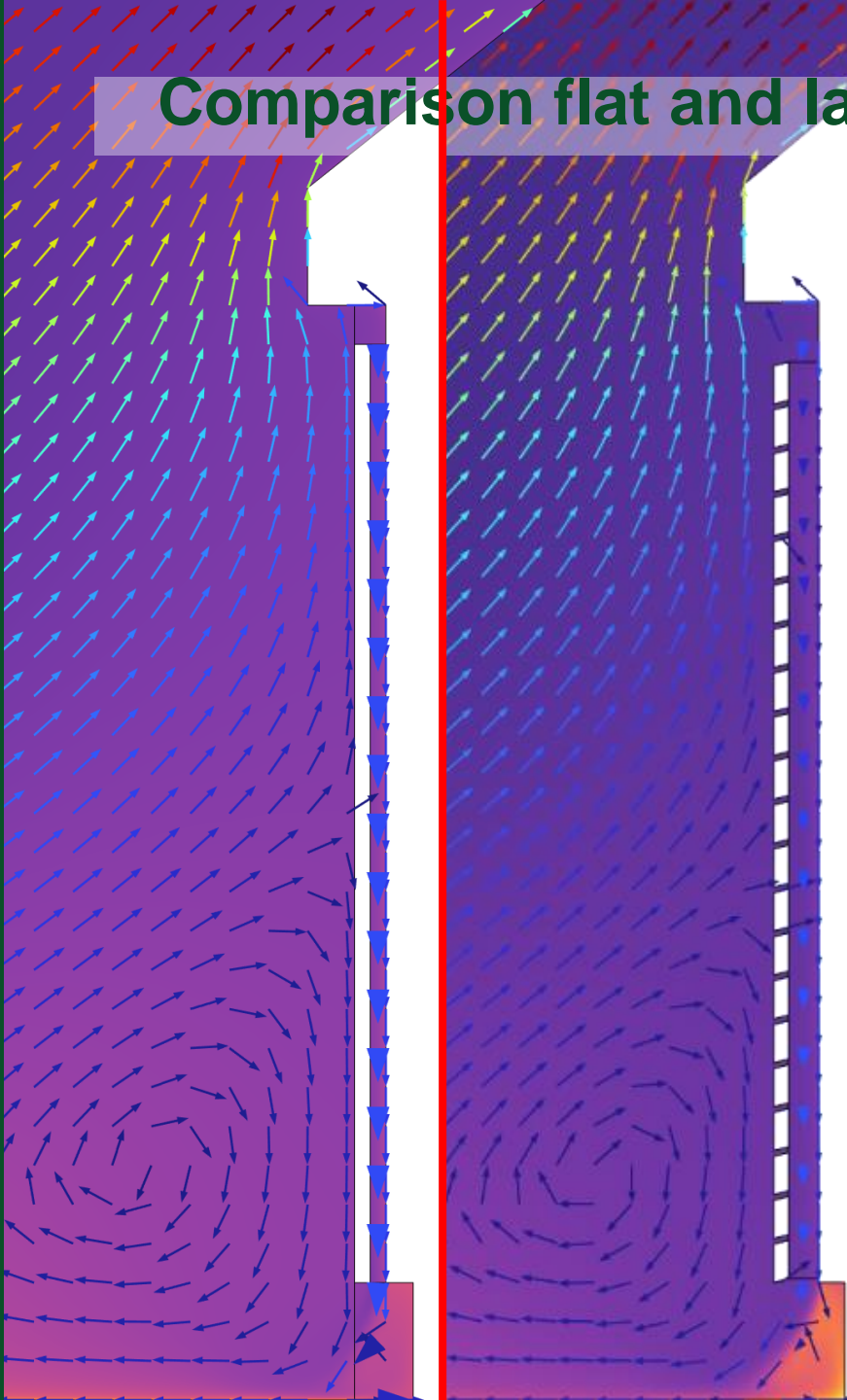
- WIDTH OF VENTILATED CAVITY [m]
- - Ts.04.v=0,97 [m/s] windward
  - Ts.04.v=0,97 [m/s] leeward
  - - Ts.04.v=6,67 [m/s] windward
  - Ts.04.v=6,67 [m/s] leeward
  - - Ts.04.v=18,35 [m/s] windward
  - Ts.04.v=18,35 [m/s] leeward

$T_{amb}...$  ambient temperature  
 Windward.... Návětrná strana  
 Leeward.....Závětrná strana

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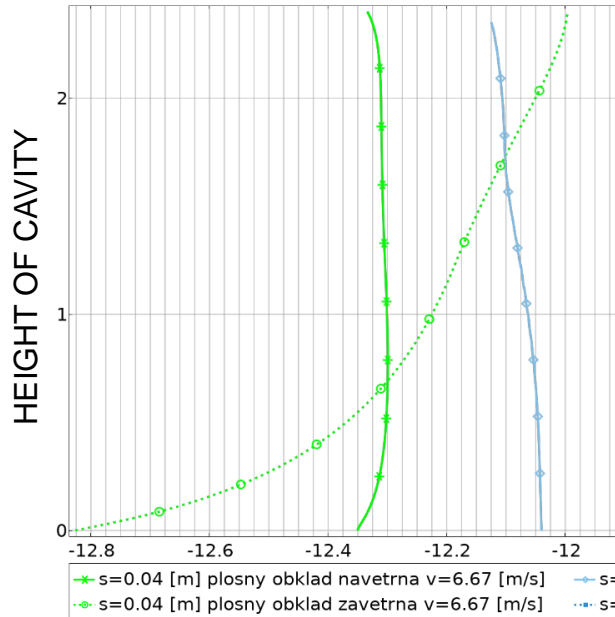
T=?

# Comparison flat and lamellar cladding flow rate as function of width



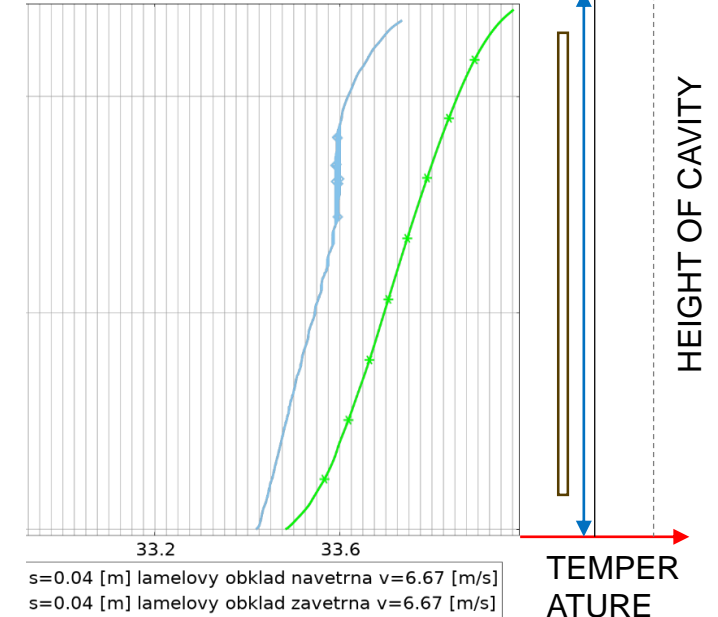
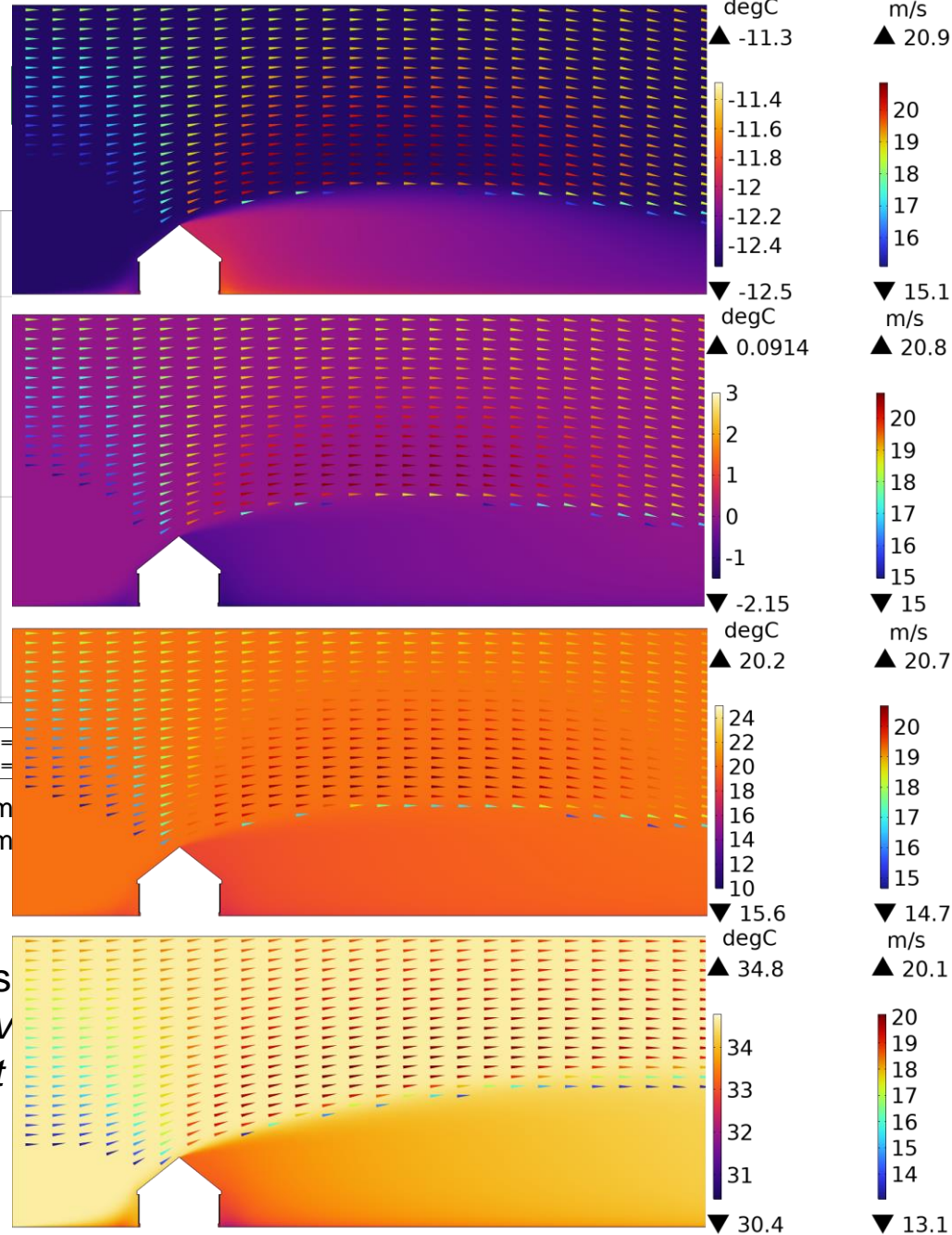
- lamellar cladding v=0.97 [m/s]
- lamellar cladding v=6.67 [m/s]
- lamellar cladding v=18.35 [m/s]
- flat cladding v=0.97 [m/s]
- flat cladding v=6.67 [m/s]
- flat cladding v=18.35 [m/s]

# Temperature



flat cladding winward  $v = 6,67$  m/s    lam  
 flat cladding leeward  $v = 6,67$  m/s    lam

**Refferent:**  
 cavity widht  
 amb. Velocity  
 amb. temperature



nelle cladding winward  $v = 6,67$  m/s  
 nelle cladding leeward  $v = 6,67$  m/s

1 mm  
 $67$  m/s  
 $6^{\circ}\text{C}$



# Discussion

- Effect of temperature on air parameters
- Creating a wind screen
- Direction of air flow in the cavity
- Temperature in the cavity
- Effect of the width of the ventilated gap on the quality of ventilation
- Comparison of slatted and flat tiles

# Closure

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# Acknowledgements and questions

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# Sources

## Zdroje obrázků:

Picture (1.): Author: Dubaj, vectorized by Guillaume Paumier (user:guillom) – Toky.png, Vol'né dielo,

Picture (2.) <https://www.fassade-color.com/fc-cz/rozmanitost>

Picture (3.) Souza, Eduardo. "How Do Double-Skin Façades Work? " [Como funcionam as fachadas duplas ventiladas?] 15 Feb 2024. ArchDaily. Accessed 4 May 2024. <<https://www.archdaily.com/922897/how-do-double-skin-facades-work>> ISSN 0719-8884

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## Literature and thesis:

VÁCLAVŮ, Pavel. 2024. Analýza provětrávané fasády s dřevěným obkladem. Diplomová práce. Brno: Mendelova univerzita v Brně Lesnická a dřevařská fakulta.

VÁCLAVŮ, Pavel. 2022. Dřevostavba rodinného domu. Bakalářská práce. Brno: Mendelova univerzita v Brně Lesnická a dřevařská fakulta.