

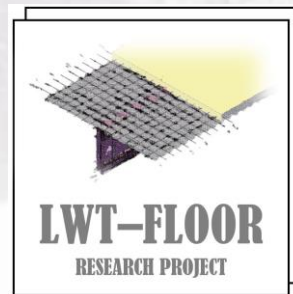
Project title: **Innovative lightweight cold-formed steel-concrete composite floor system**

Acronym: **LWT-FLOOR** Project ID: **UIP-2020-02-2964**

2<sup>nd</sup> LWT-FLOOR Project Workshop

# Implementation and analysis of the push-out test on shear connectors in composite beams cold-formed steel profiles-concrete

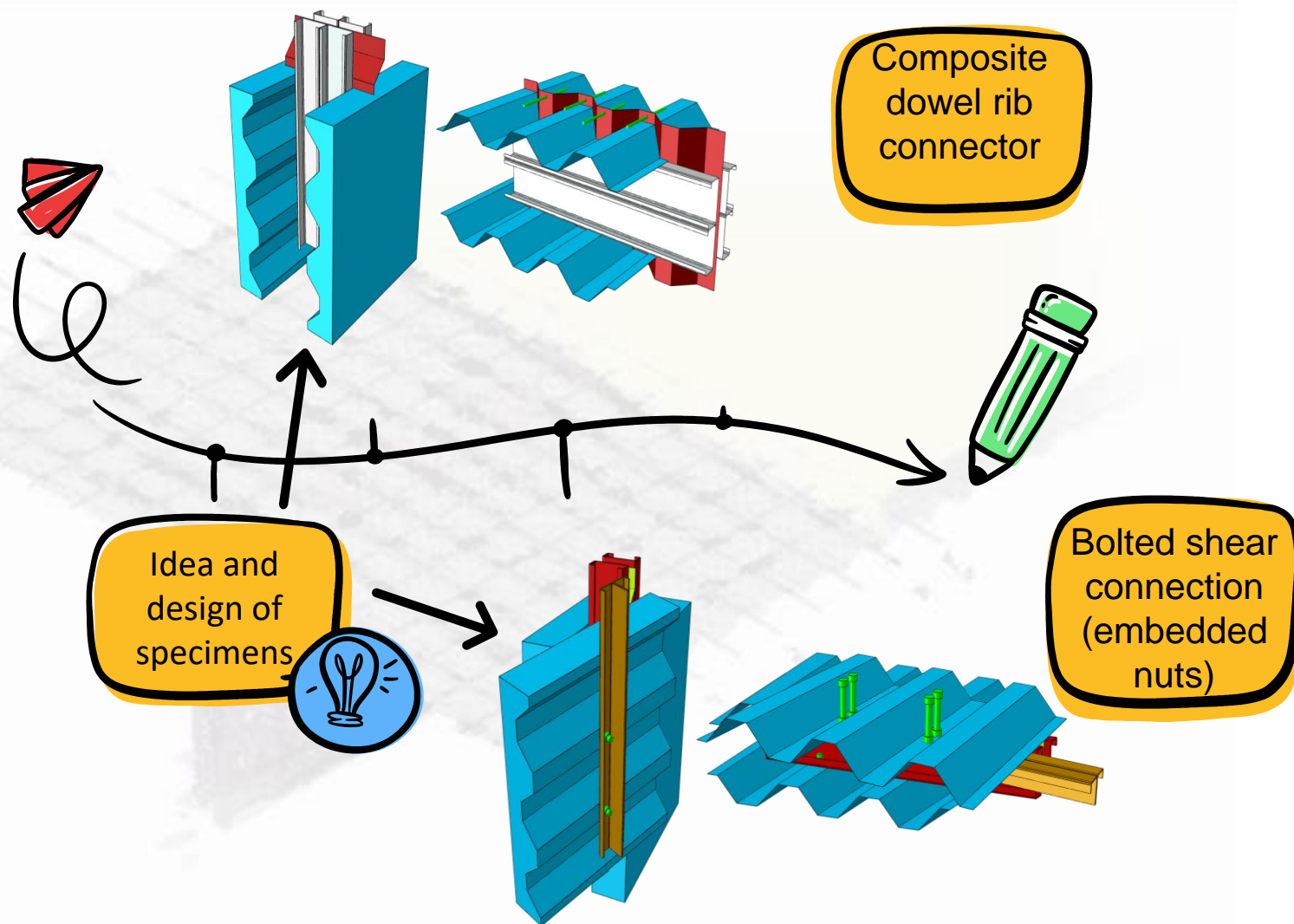
Vlaho Žuvelek, Ivan Ćurković, Ivan Lukačević, Andrea Rajić



University of Zagreb/Faculty of Civil Engineering

<http://www.grad.unizg.hr/lwtfloor>

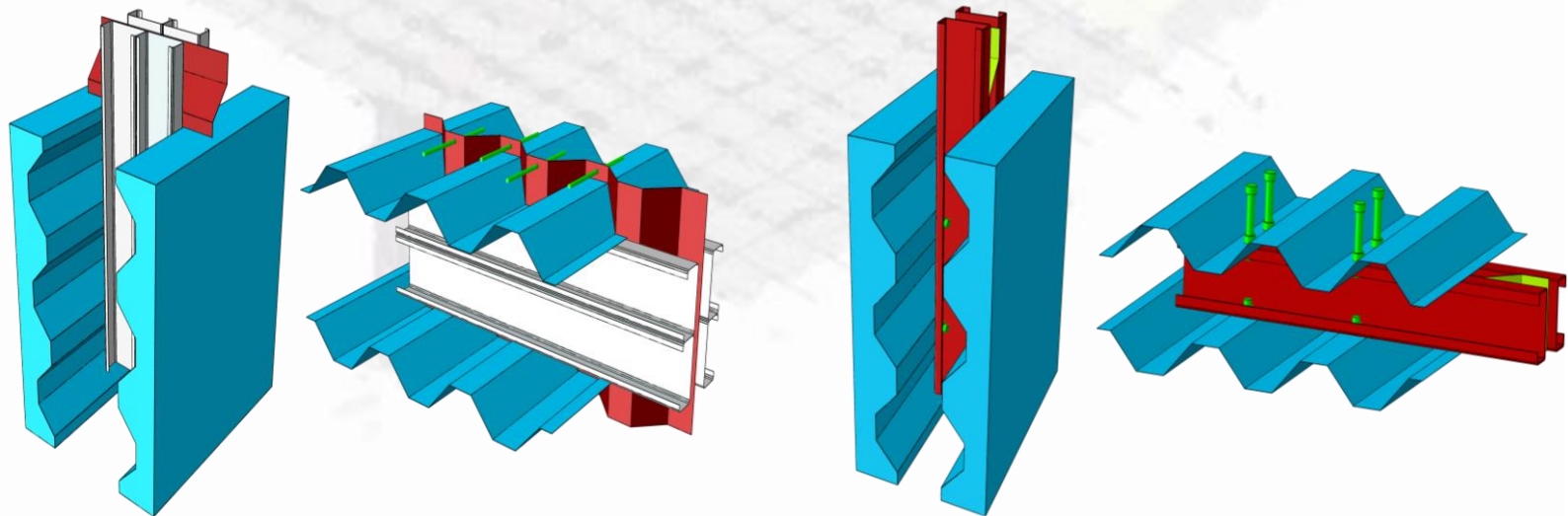
# Experimental program



# Experimental program

- Idea and design of specimens

- CFS 120x47xX mm
- Concrete slab 720x600x120 mm
- Profiled steel sheeting 720x600x1.0 mm
- Corrugated web 780x420xX mm & 780x120x1.25 mm
- Bolts M12 & M16, steel grade 8.8

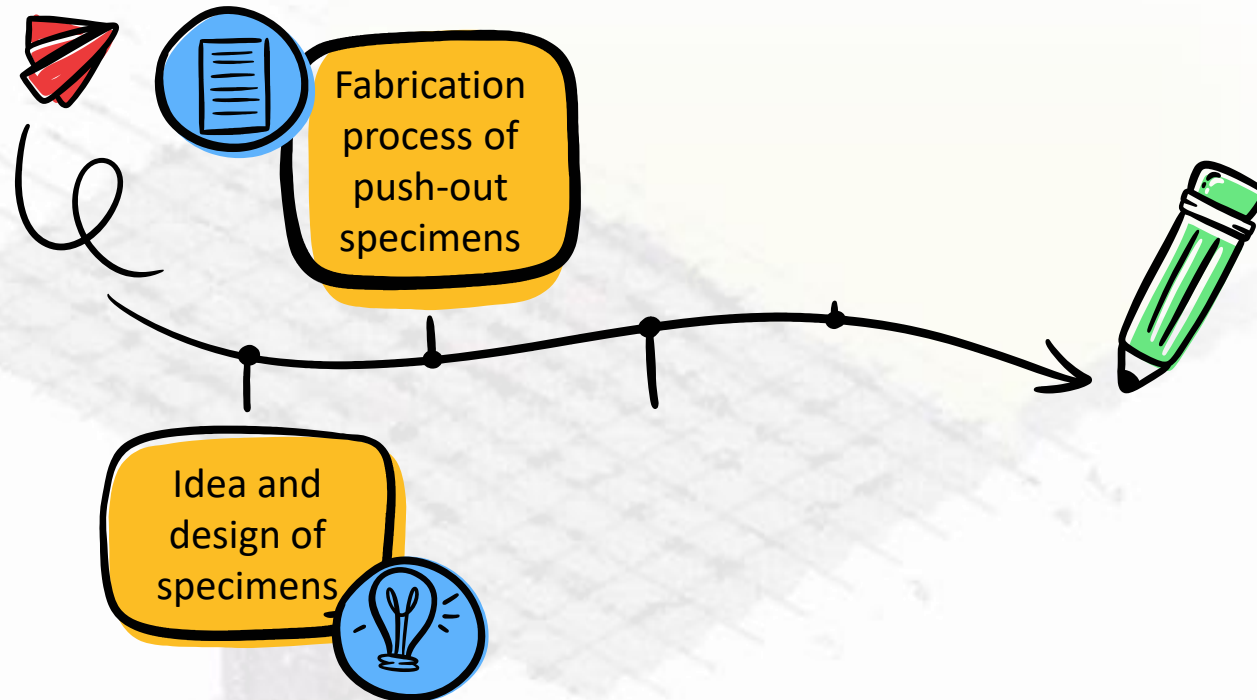


# Experimental program

- Idea and design of specimens

Specimen	CFS thickness [mm]	CW thickness [mm]	Steel grade	Bolt	Concrete class	
BB_01-03	3	1.25	DX51D	M12	NC20/25	
BB_04-06				M16		
BCWB_01-03				M16		
BCWB_04-06				M12		
BCWB_25_01-03	2.5			M12		
BCWB_S350GD_01-03	3		S350GD	M16		
CW_NC_08	2	0.8	DX51D	-	NC20/25	
CW_LC_08				-	LC20/22	
CW_NC_15		1.5		-	NC20/25	
CW_LC_15				-	LC20/22	

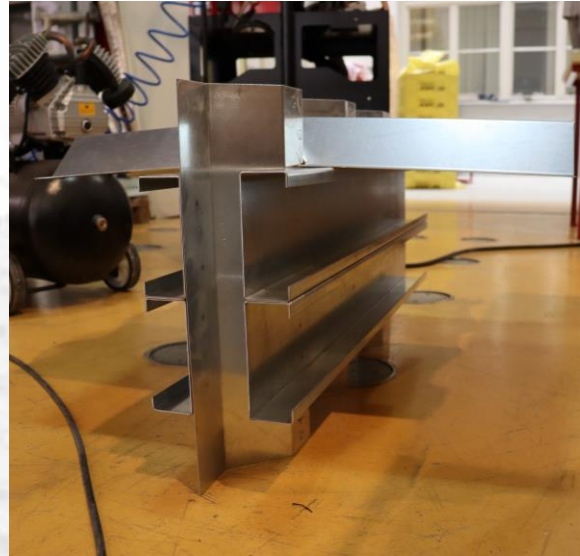
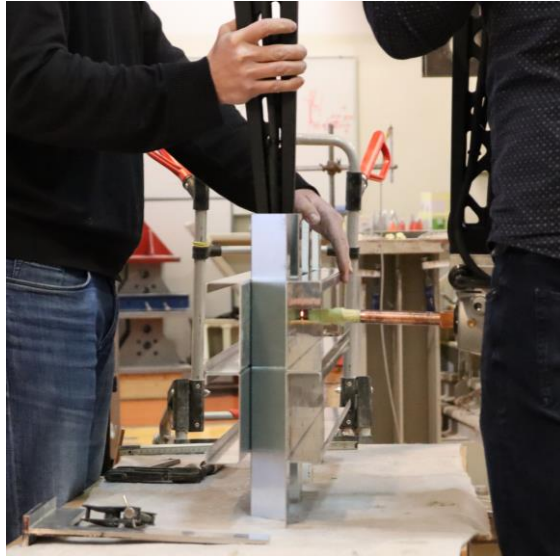
# Experimental program





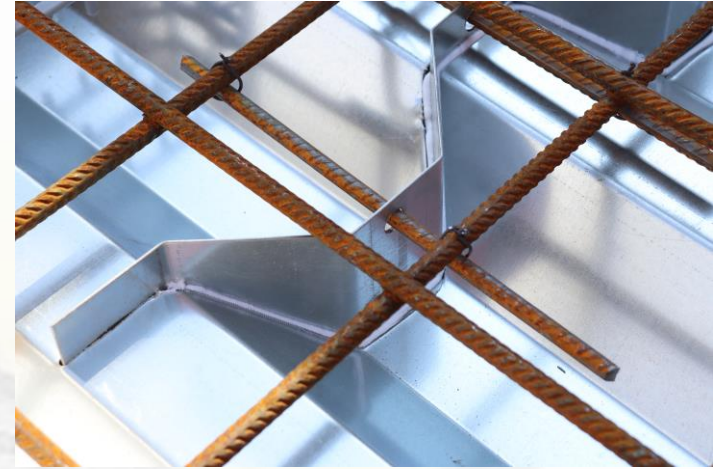
# Experimental program

- Fabrication process of composite dowel rib connector specimens



# Experimental program

- Fabrication process of composite dowel rib connector specimens





# Experimental program

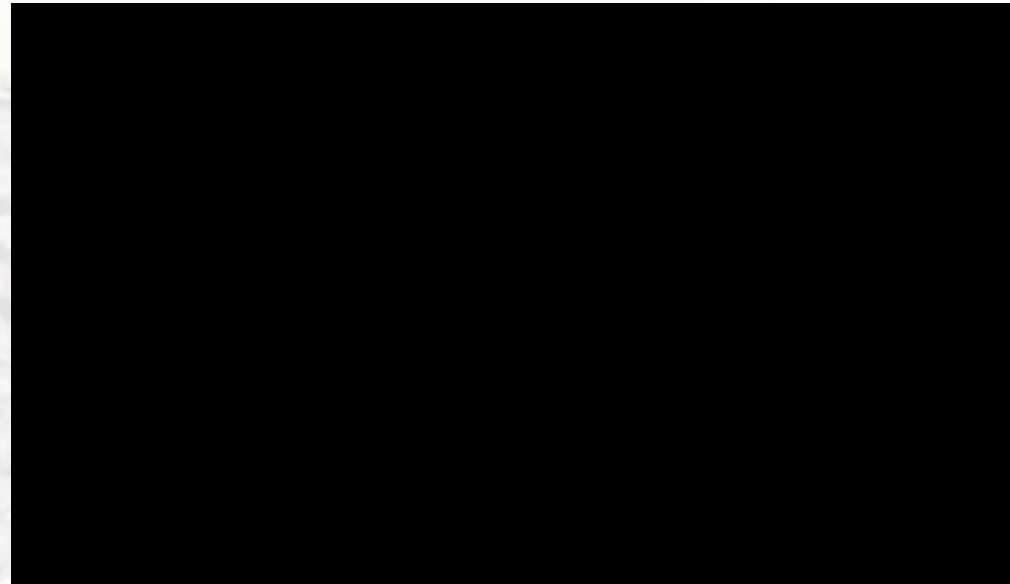
- Fabrication process of bolted shear connection specimens**



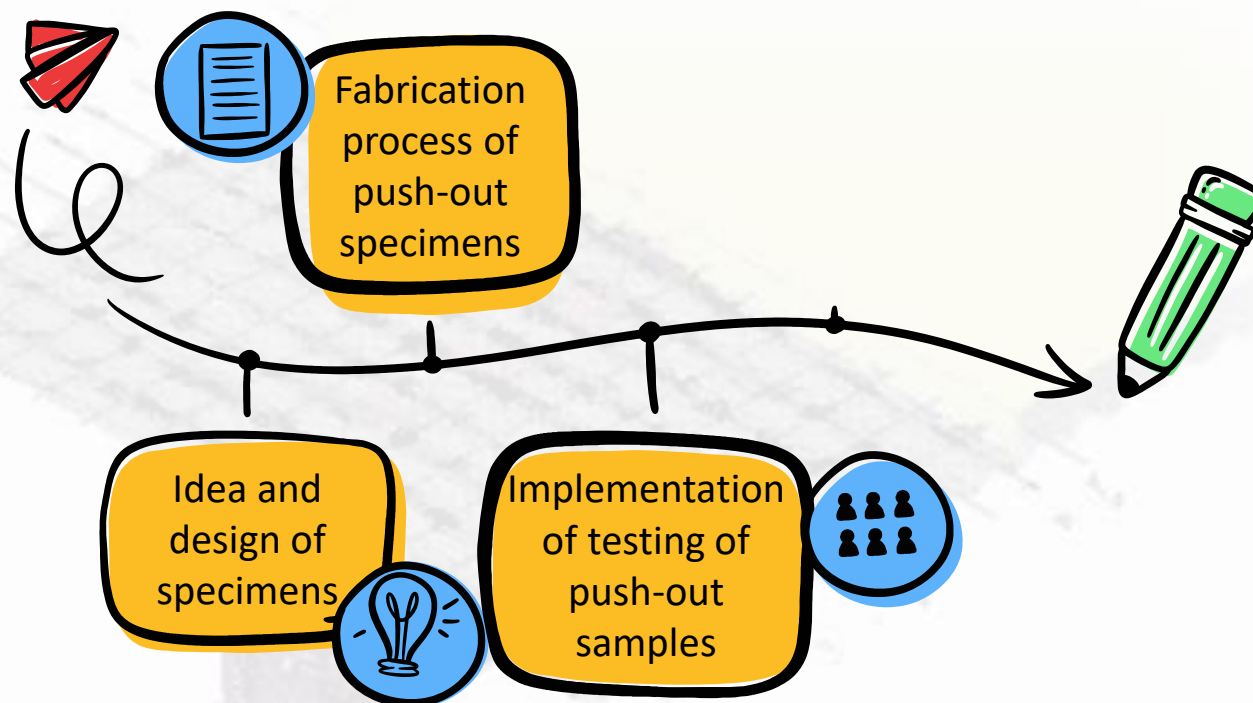


# Experimental program

- **Fabrication process of bolted shear connection specimens**

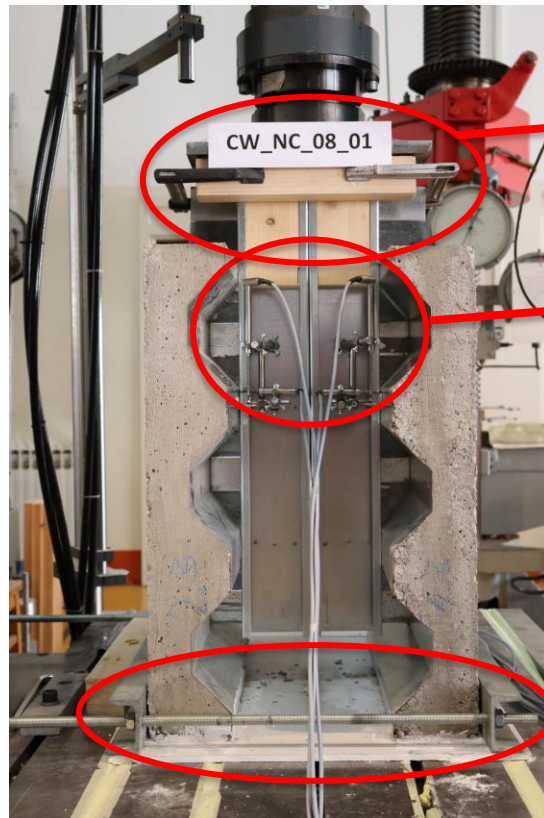


# Experimental program



# Experimental program

- Implementation of testing of push-out samples
  - Push-out tests are performed on the Zwick/Roell Z600 static testing machine.

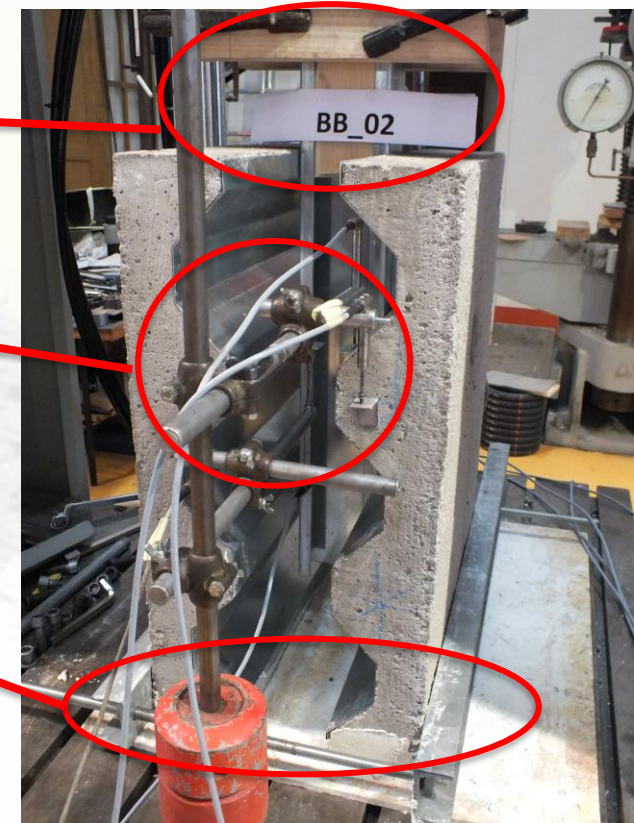


Composite dowel rib connector

Stiffeners

LVDT sensors  
(8 pieces)

Gypsum base

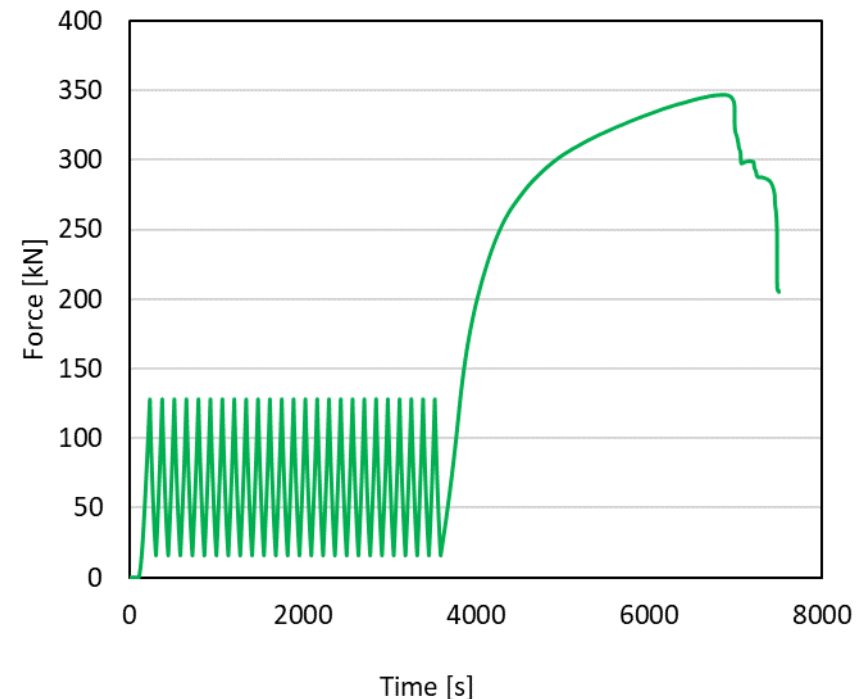
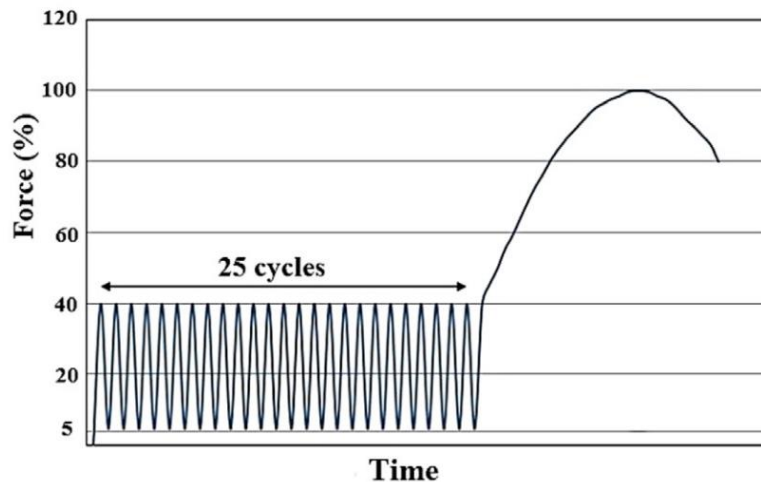


Bolted shear connection



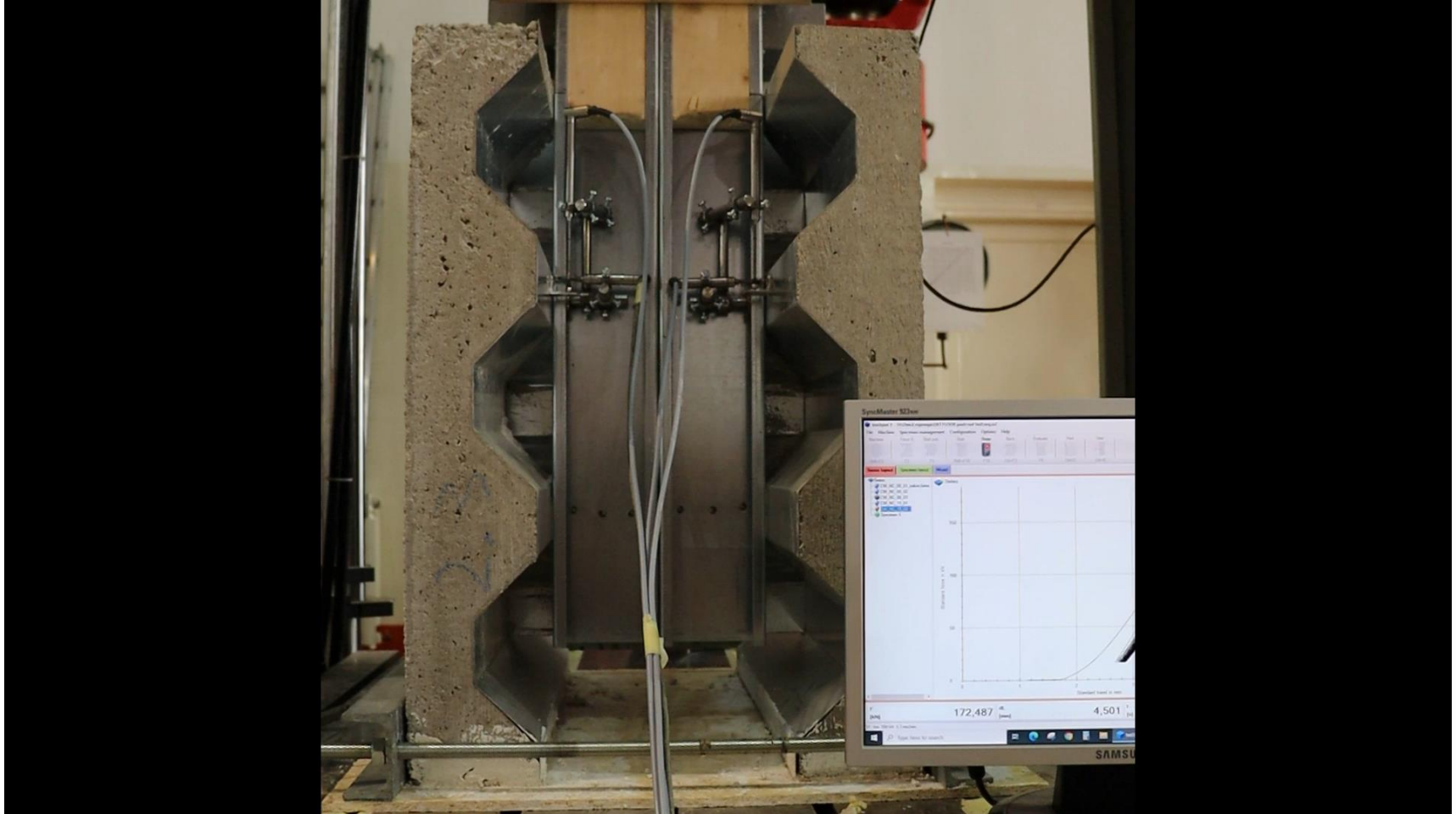
# Experimental program

- Implementation of testing of push-out samples
  - Loading program was considered based on Eurocode 4-Annex B



# Experimental program

- Implementation of testing of push-out samples

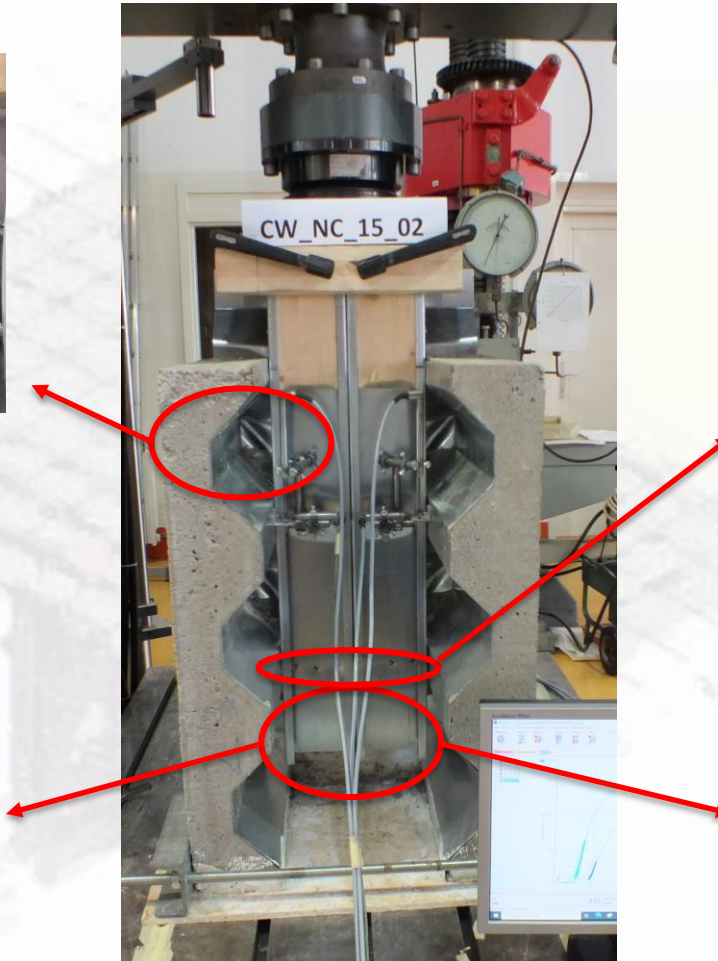


# Experimental program

- Implementation of testing of push-out samples



Front view



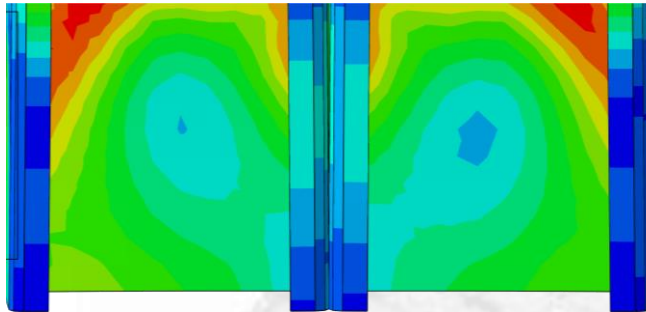
Back view



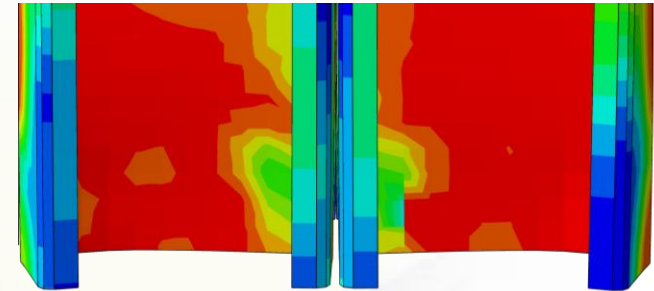
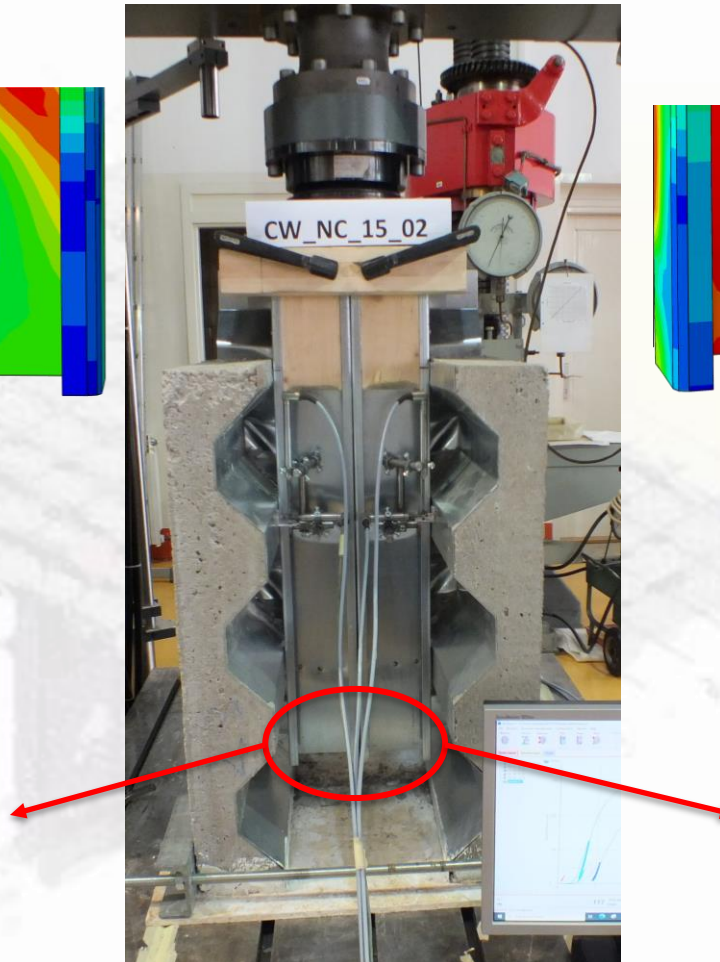


# Experimental program

- Implementation of testing of push-out samples



Front view

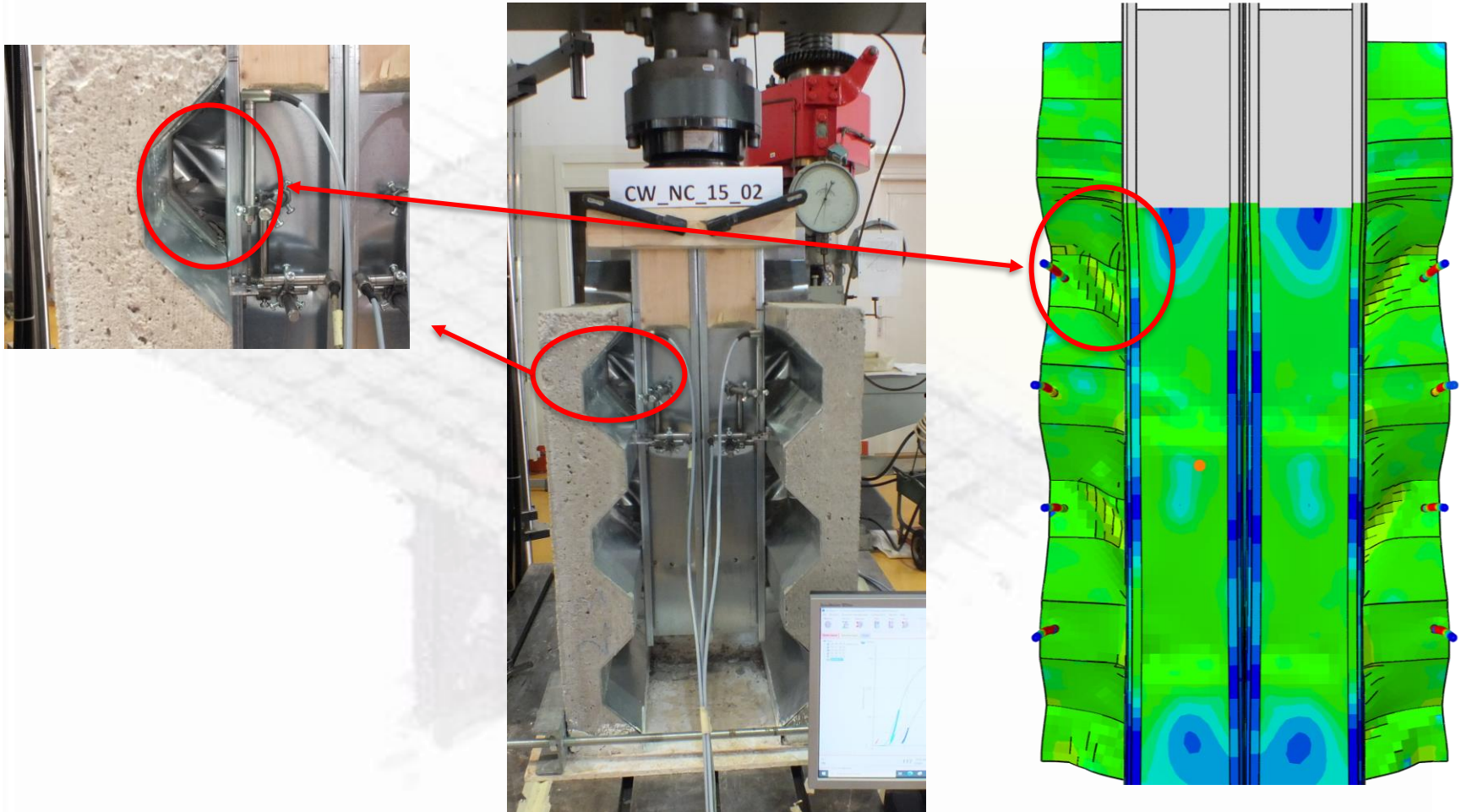


Back view



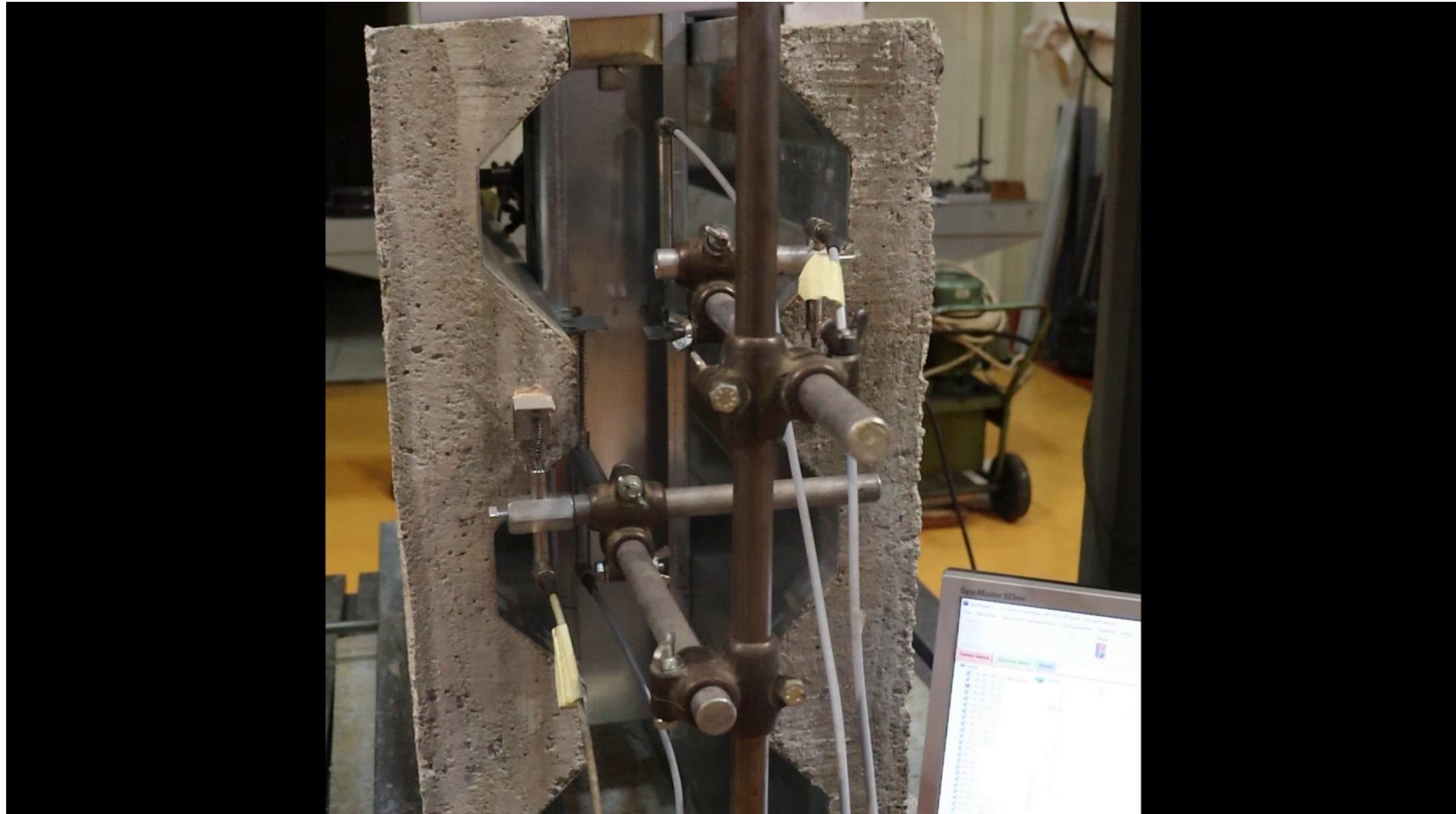
# Experimental program

- Implementation of testing of push-out samples



# Experimental program

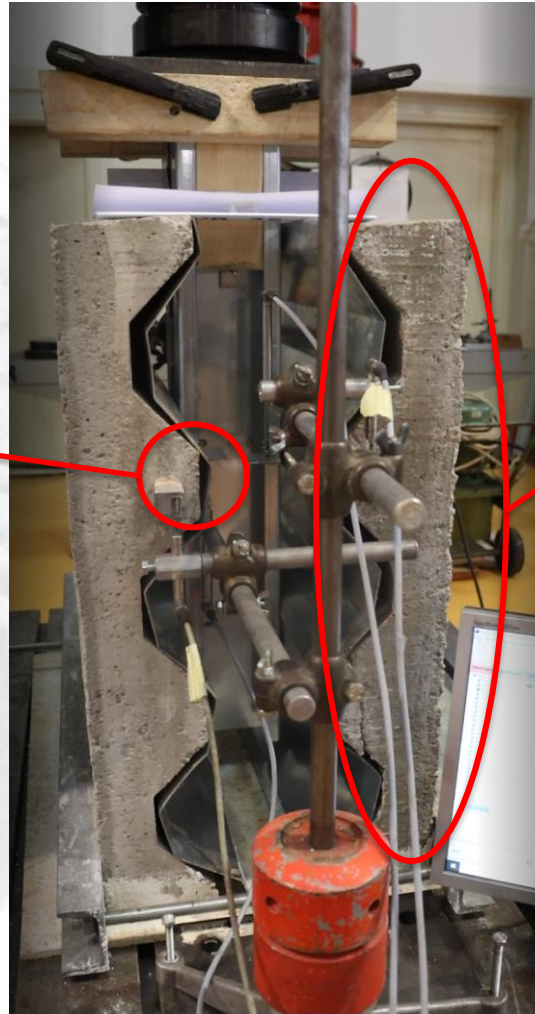
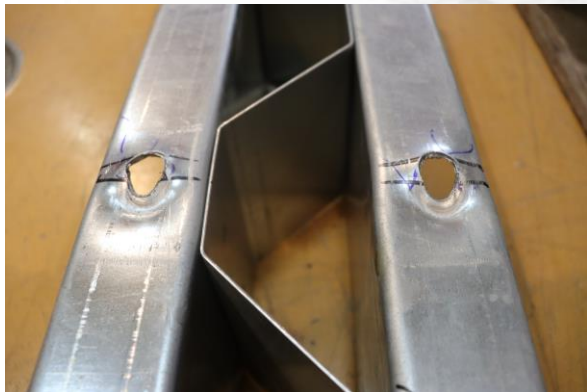
- Implementation of testing of push-out samples





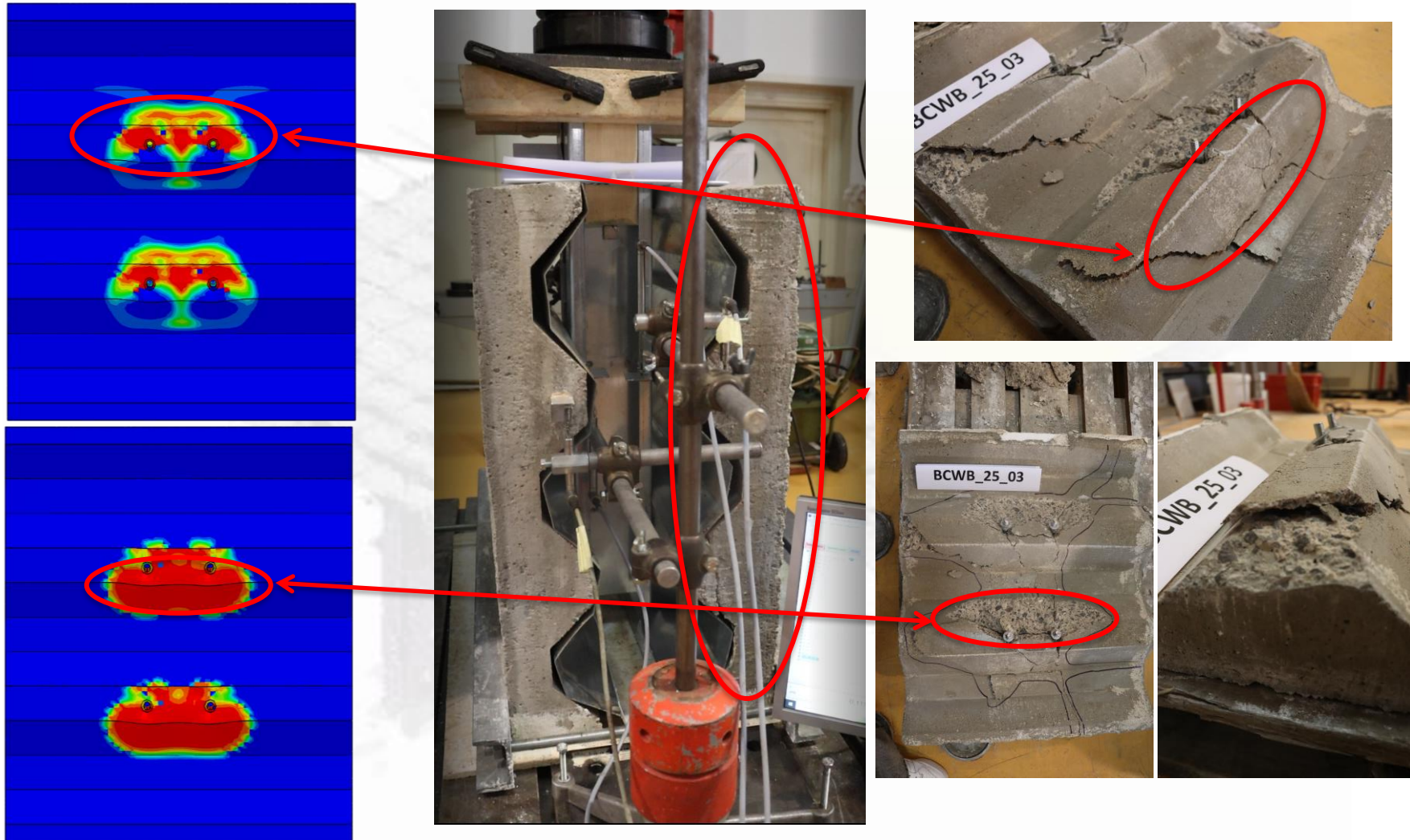
# Experimental program

- Implementation of testing of push-out samples



# Experimental program

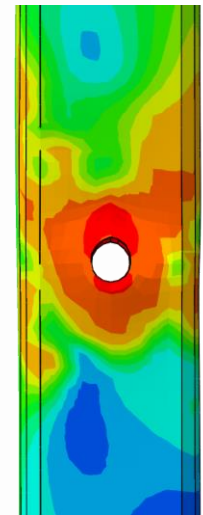
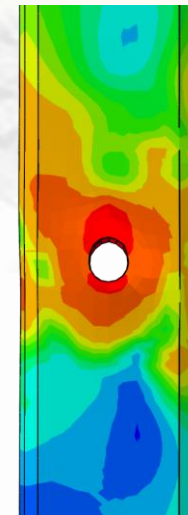
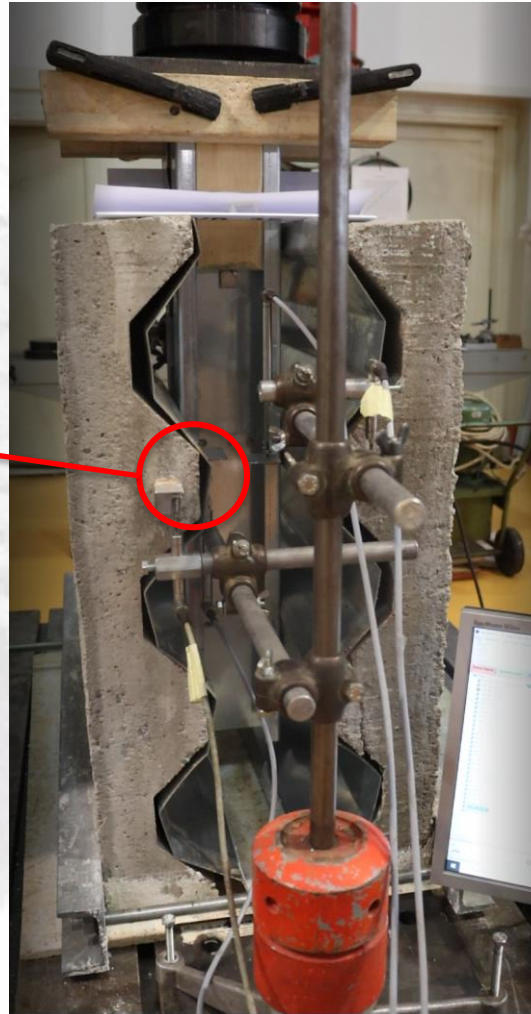
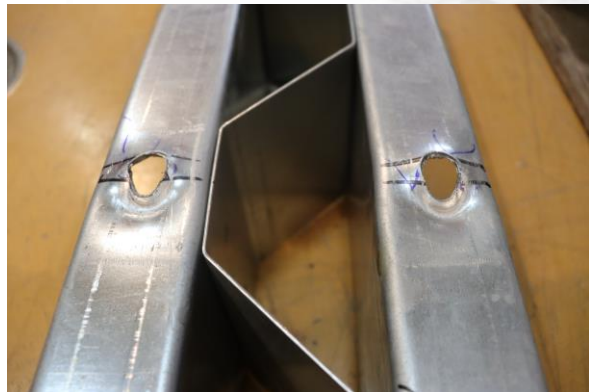
- Implementation of testing of push-out samples





# Experimental program

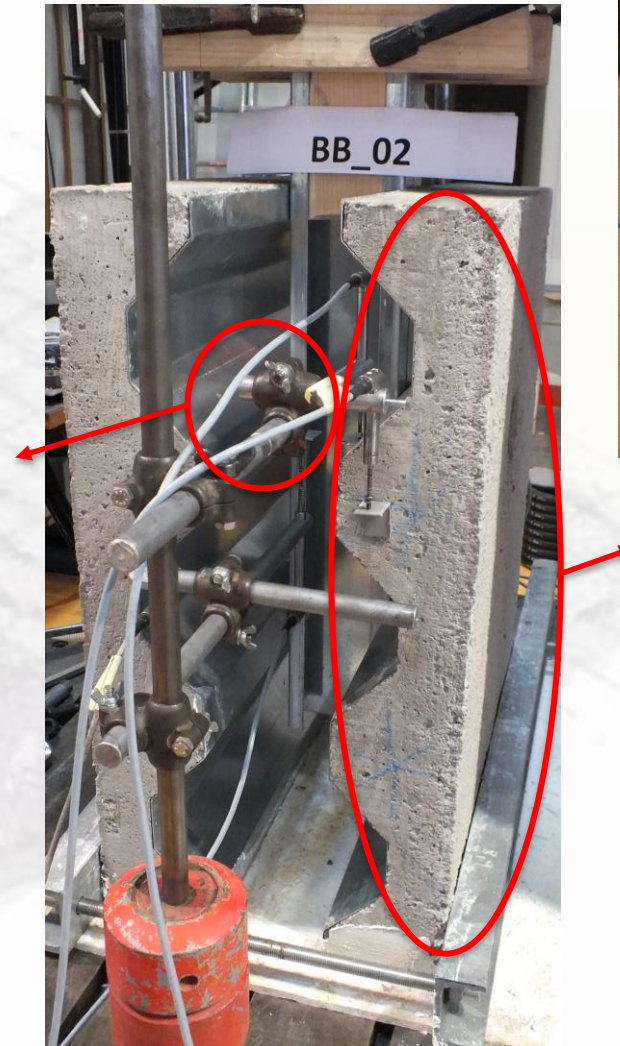
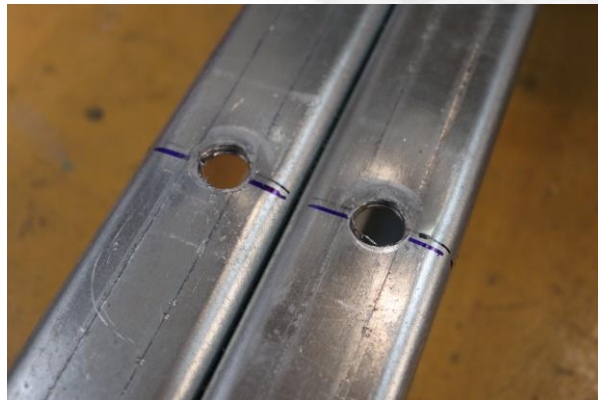
- Implementation of testing of push-out samples



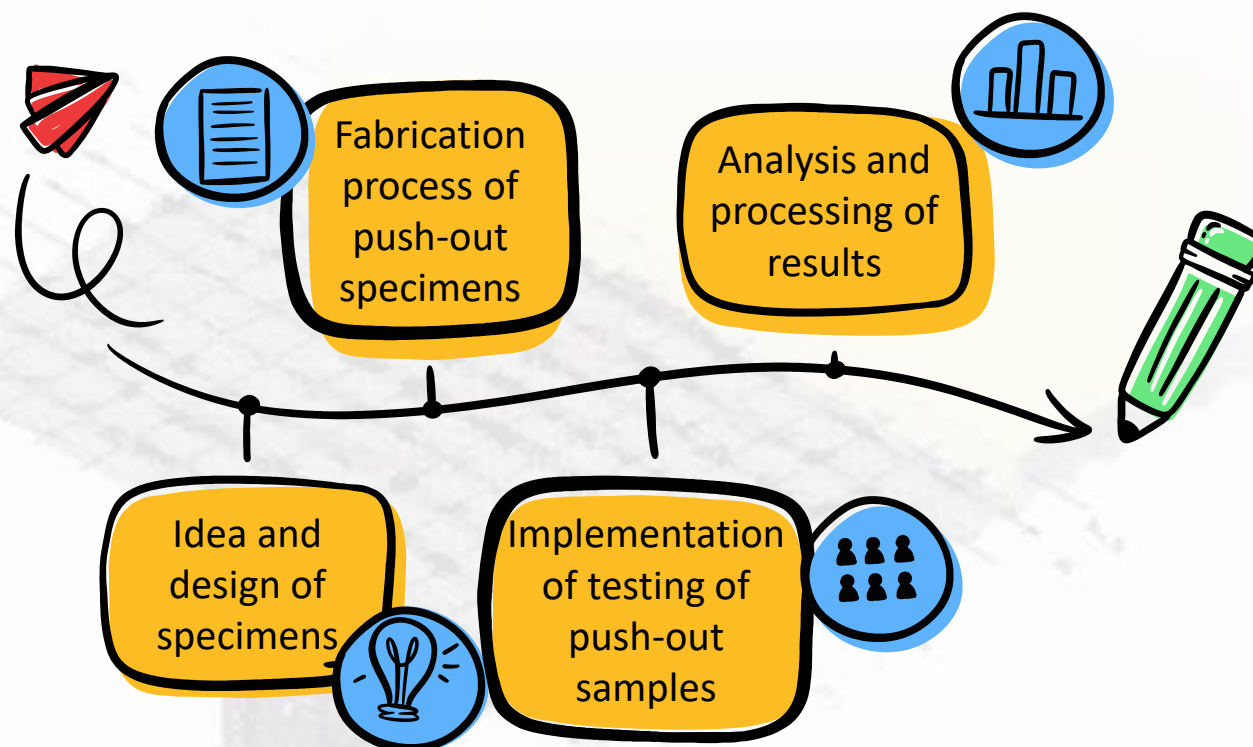


# Experimental program

- Implementation of testing of push-out samples

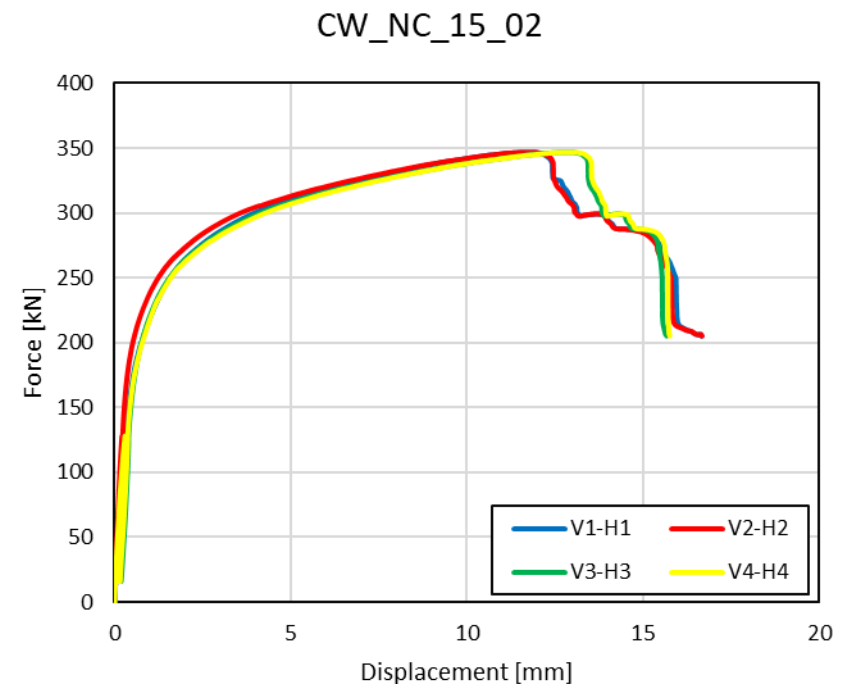
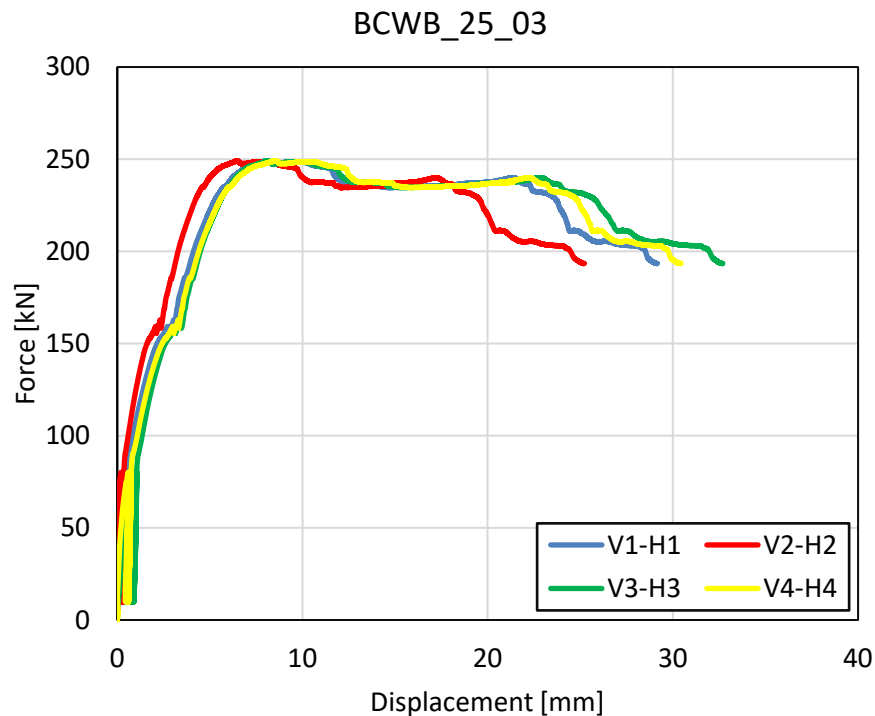


# Experimental program



# Experimental program

- Analysis and processing of results
  - Necessary to harmonize the results from the static machine and the MGC device

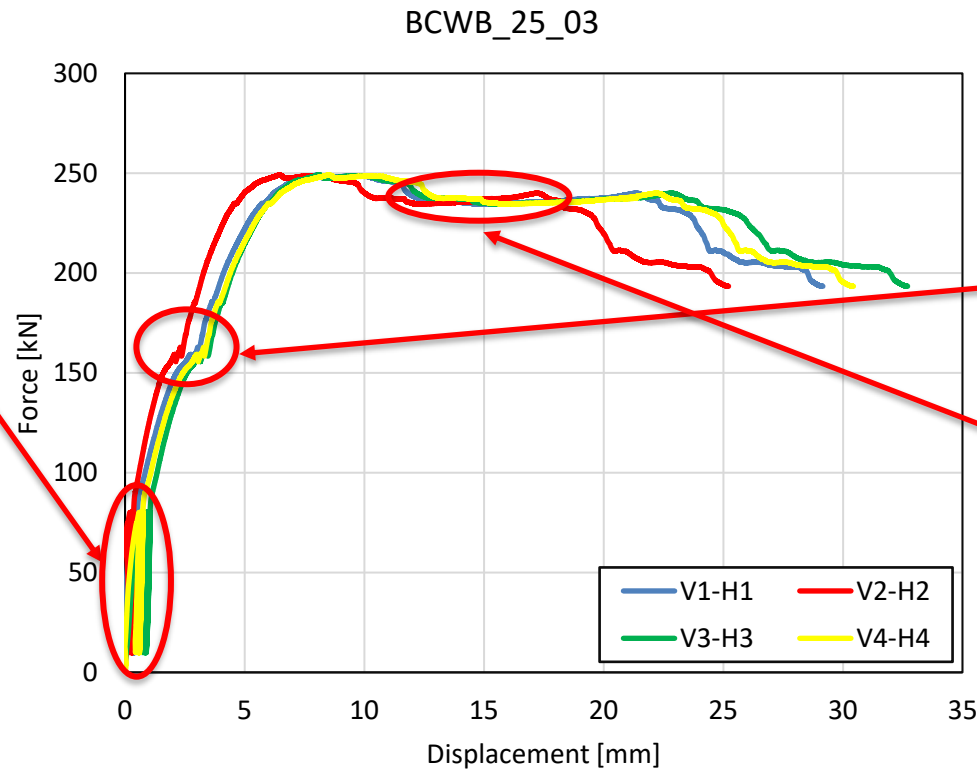




# Experimental program

- Analysis and processing of results

Cyclic loading



Seating of the  
bolt on the  
hole walls

Local failure

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