Lighthouse, Joensuu, Finland: Thread Bars in a Discontinuous Post-Tension System

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Steel-Timber Conference

Karelia in figures

Students
4100

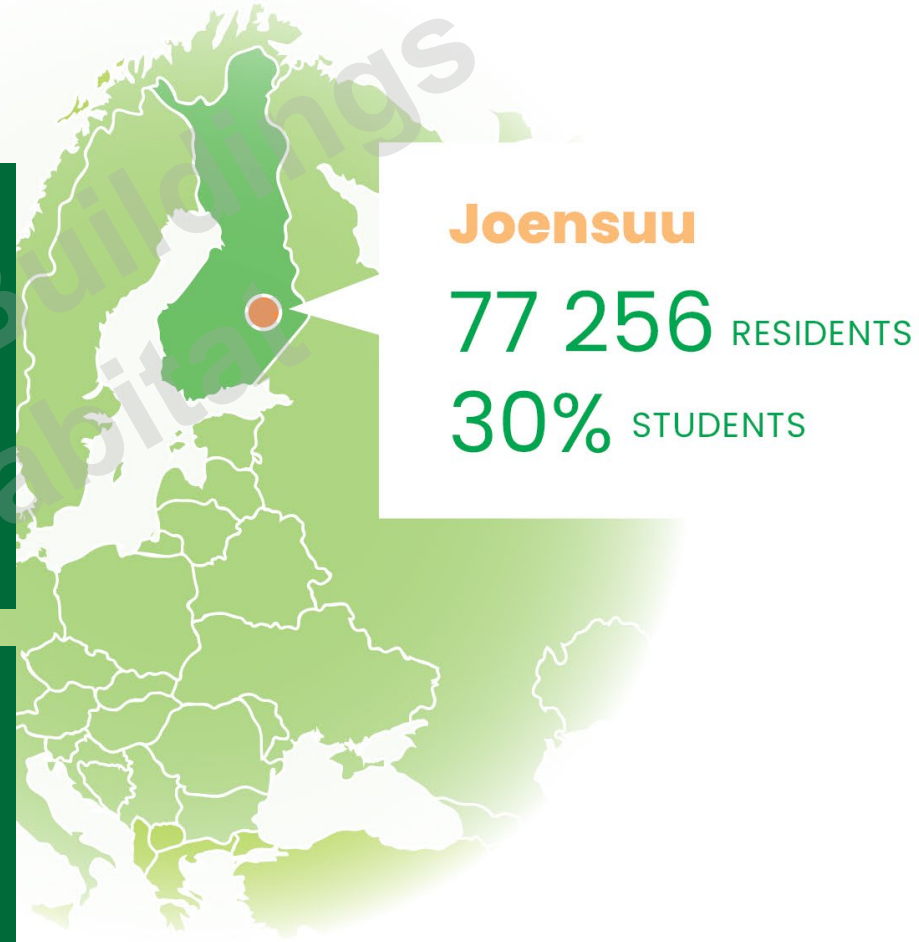
Completed degrees in 2021
875

International degree students
160

Staff
323

Degree programmes
22

Exchange students
135

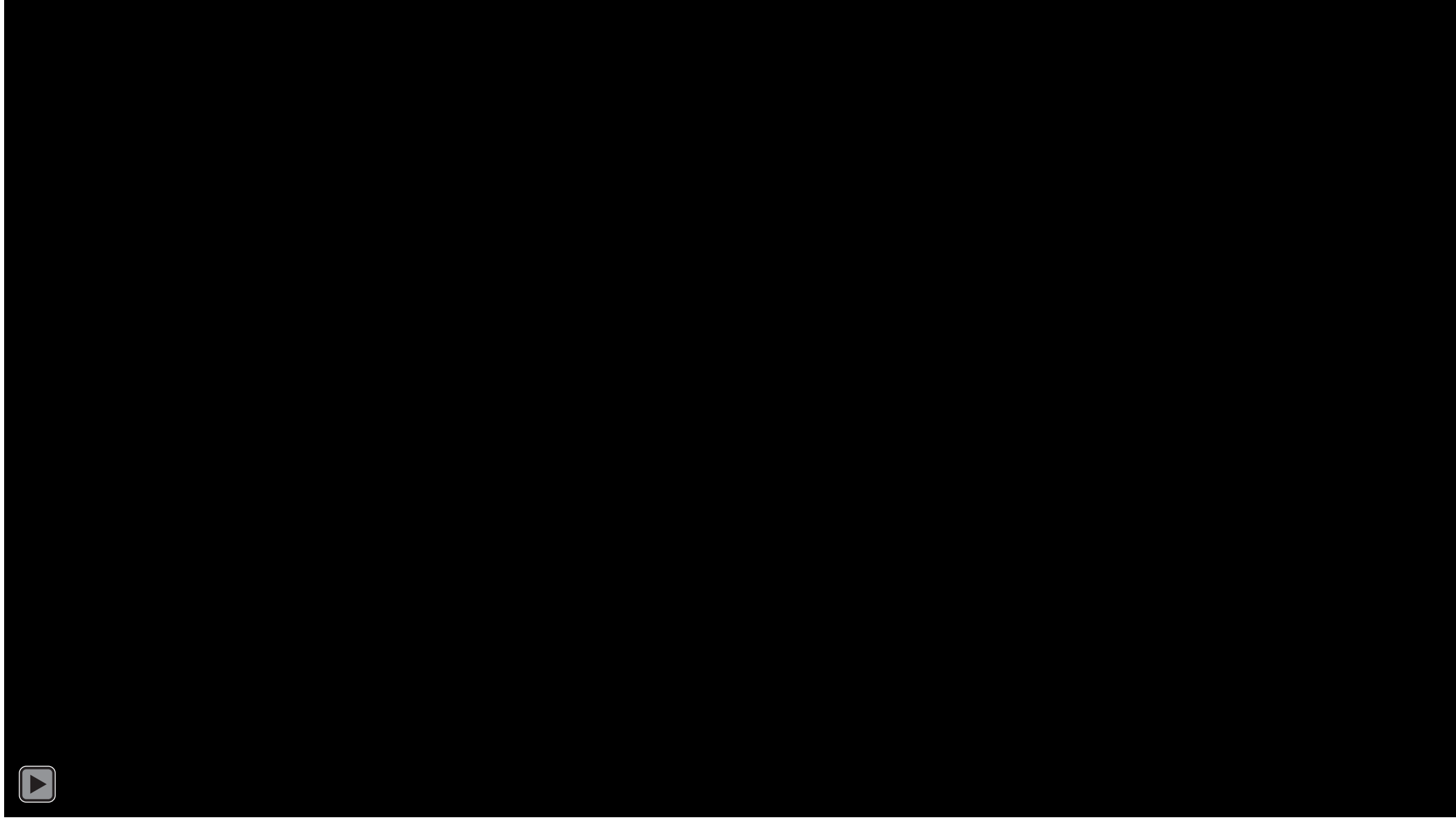


Lighthouse Joensuu

- Builder: Student Housing Company Joensuun Elli
- Architectural design: Arcadia Oy Arkkitehtitoimisto
- Structural design: AINS Group Joensuu
- General contractor: Rakennustoimisto Eero Reijonen Oy
- Funding for research: Ministry of the Environment

Lighthouse Joensuu

- Located in Joensuu, Finland
- Housing for students
- 117 residences
- 14-storeys
- Total height of 48 meters (157.5 ft)
- Completed 2019



Structural facts

- Mass-timber frame
- Shear wall system
- Pile foundations
- Podium slab
- High strength steel rods
- Rothoblaas connectors

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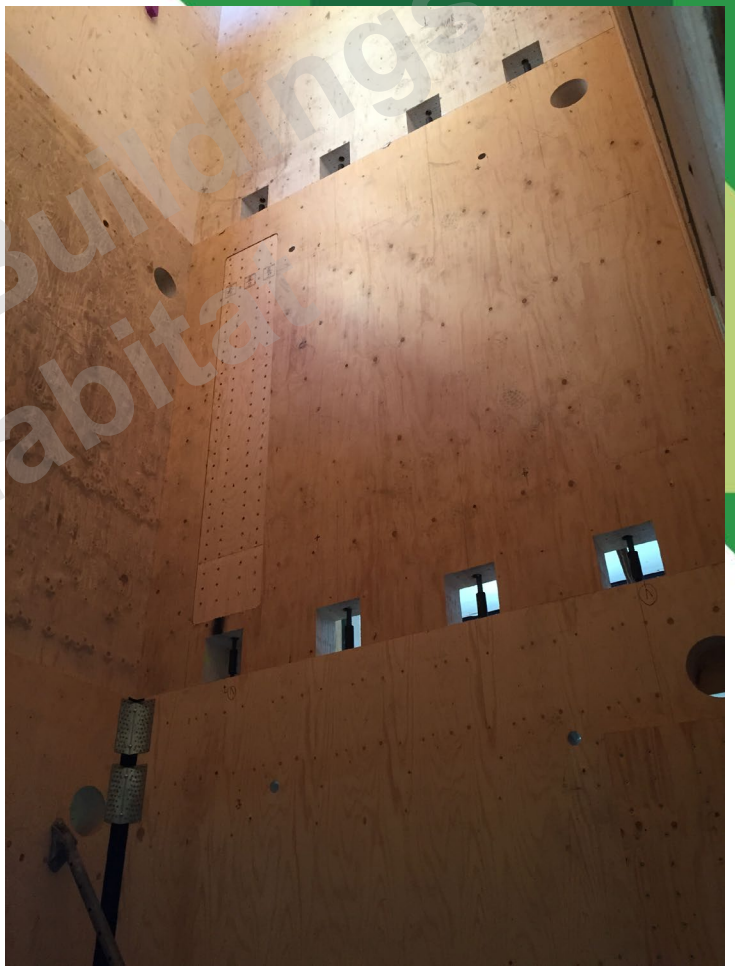
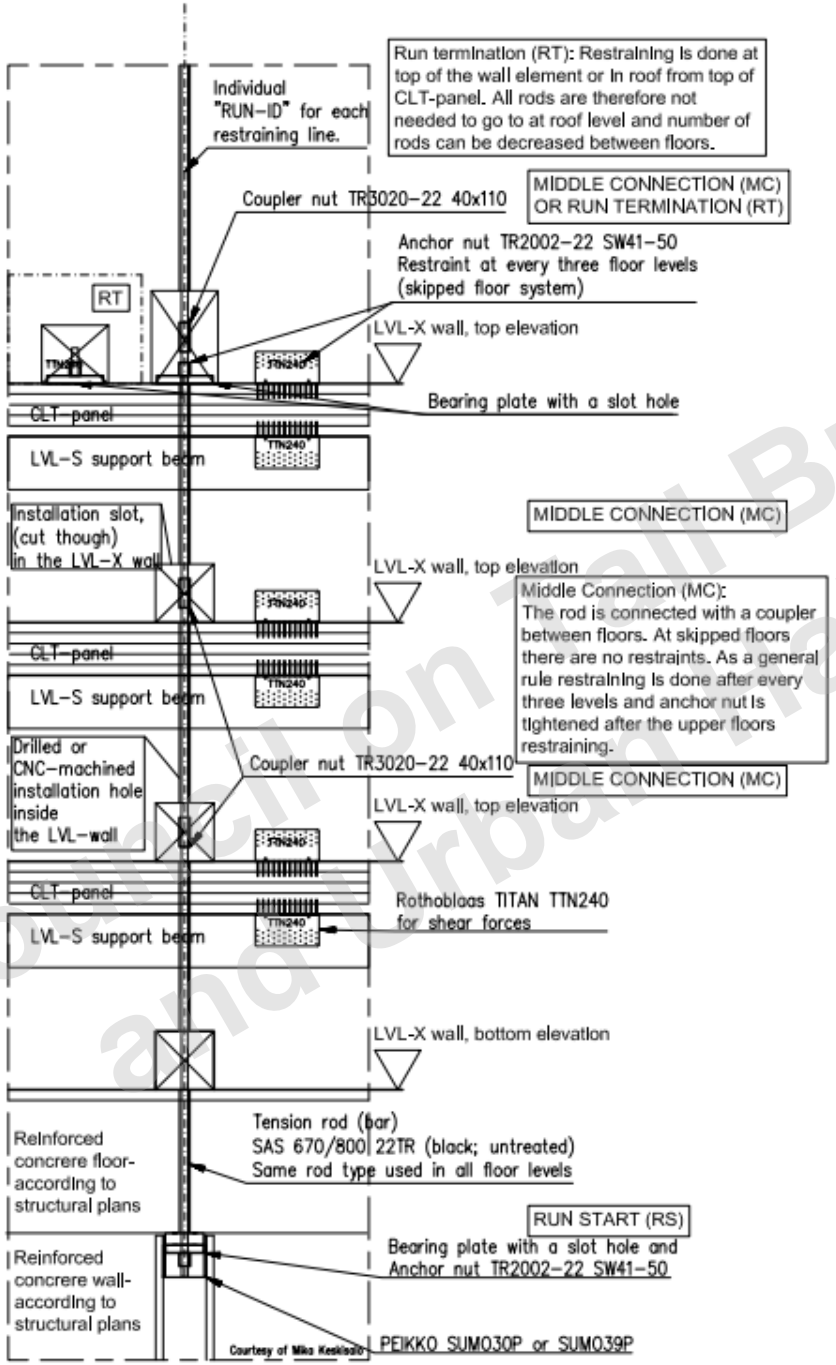
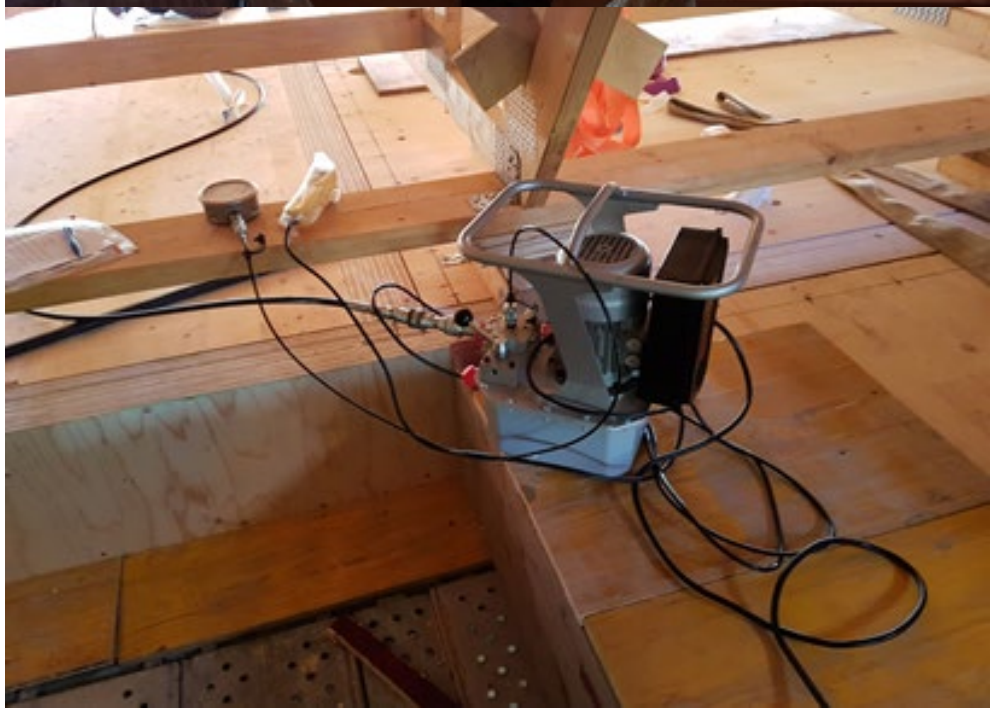
Use of tension rods



Tension rods

- Main stability against overturning forces by using post tensioned rods
- Internal and unponded
- SAS 670/800





Alternatives for used system?
Goal to have anchoring of 216 kN

Reinforced concrete	Post-tension rod	Steel plate
C20/25	22 TR+plate+ nut	650x550x10 (mm)
		+110 screws (d10)
		
~2600 CO^2e kg	~200 CO^2e kg	~120 CO^2e kg

Cost of labour and assembly?

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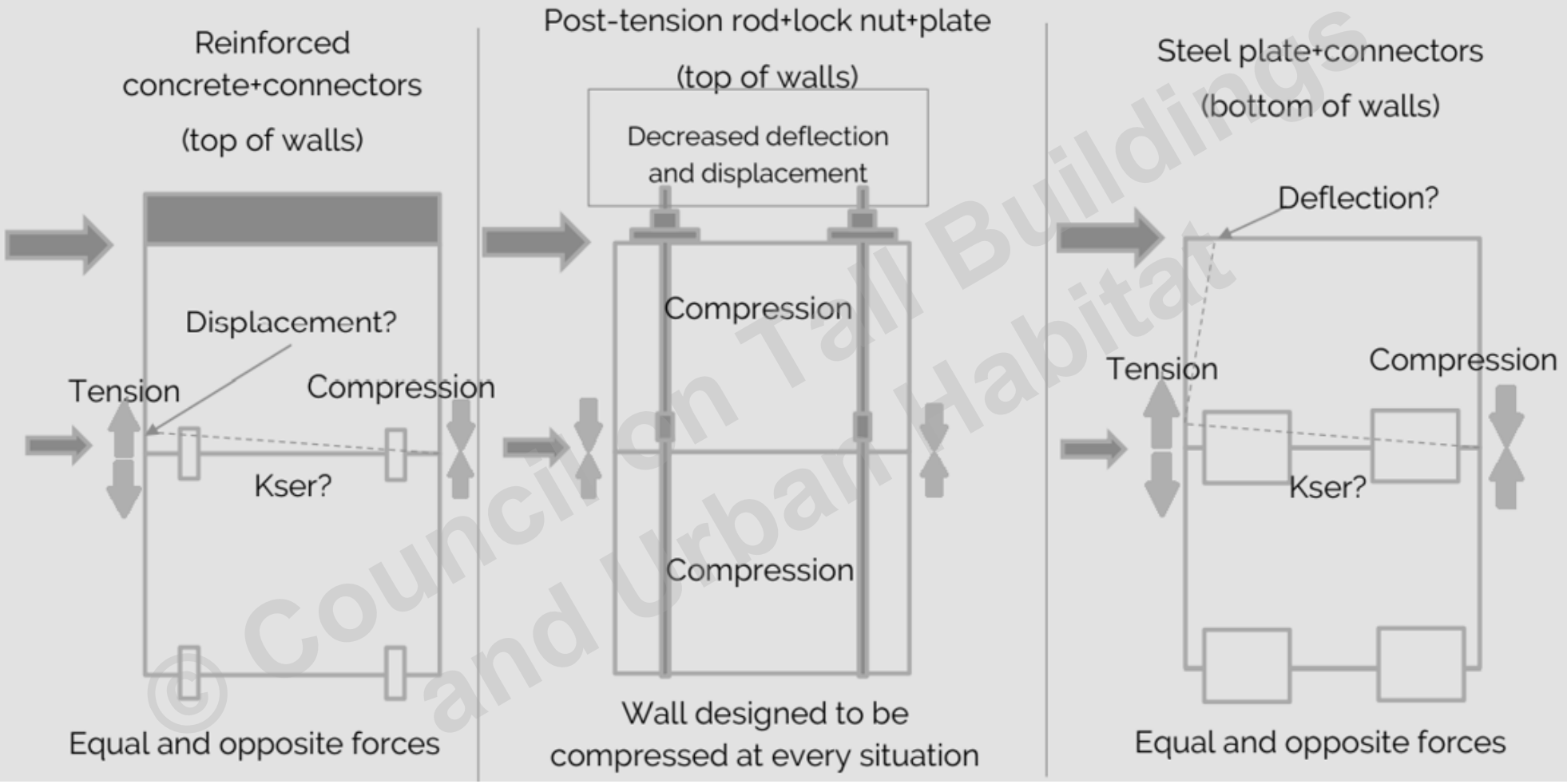
What is the difference? Stack of two walls...



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Solutions for Buildings
and Habitat

Case studies

- Acoustics
- Building physics
- Deformations
- Vibration
- Resident satisfaction survey

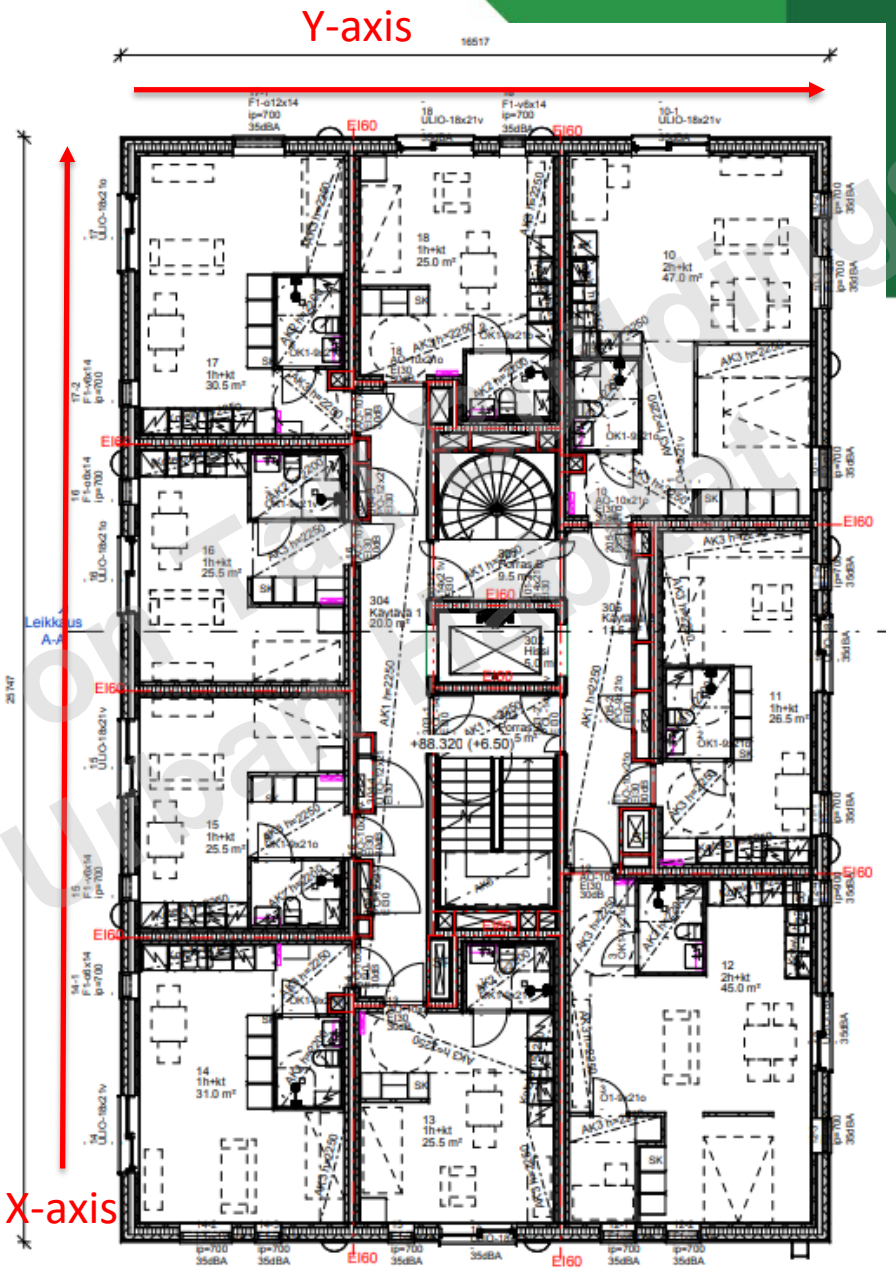
Vibration

- Continuous measurements using 3-axis MEMS accelerometer

- Frequency in the y-direction:
  - Measured 1.3 Hz
  - Calculated 1.129 Hz

- Frequency in the x-direction:
  - Measured 1.8 Hz
  - Calculated 1.583 Hz

- Vibration begings at a wind speed of 12 m/s (39.37 ft/s)



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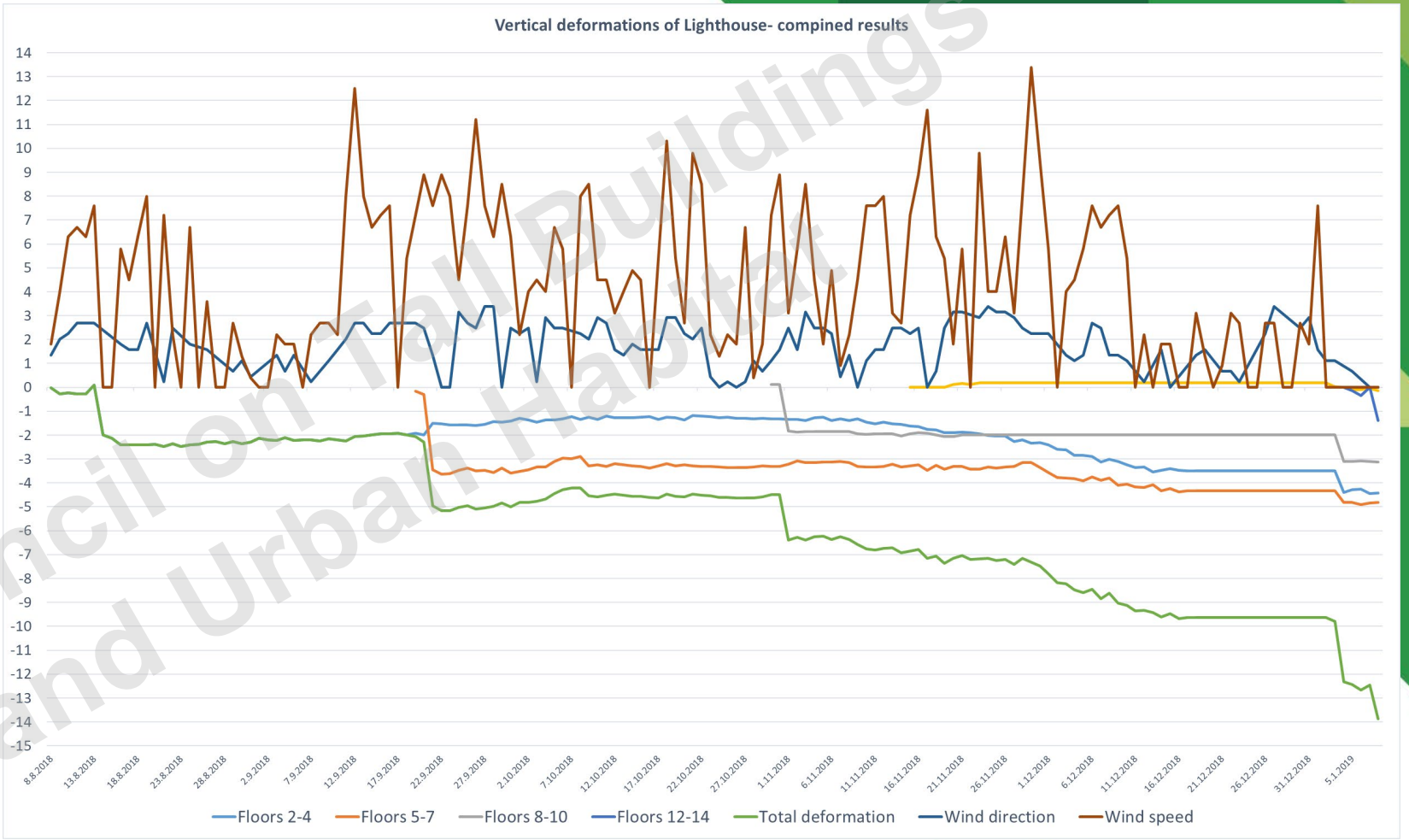
Deformations

- Custom made displacement sensors
- Measurements in two stages
- Deformation during the first four months: 15 mm (0.59 in)
- The largest deformations at the beginning



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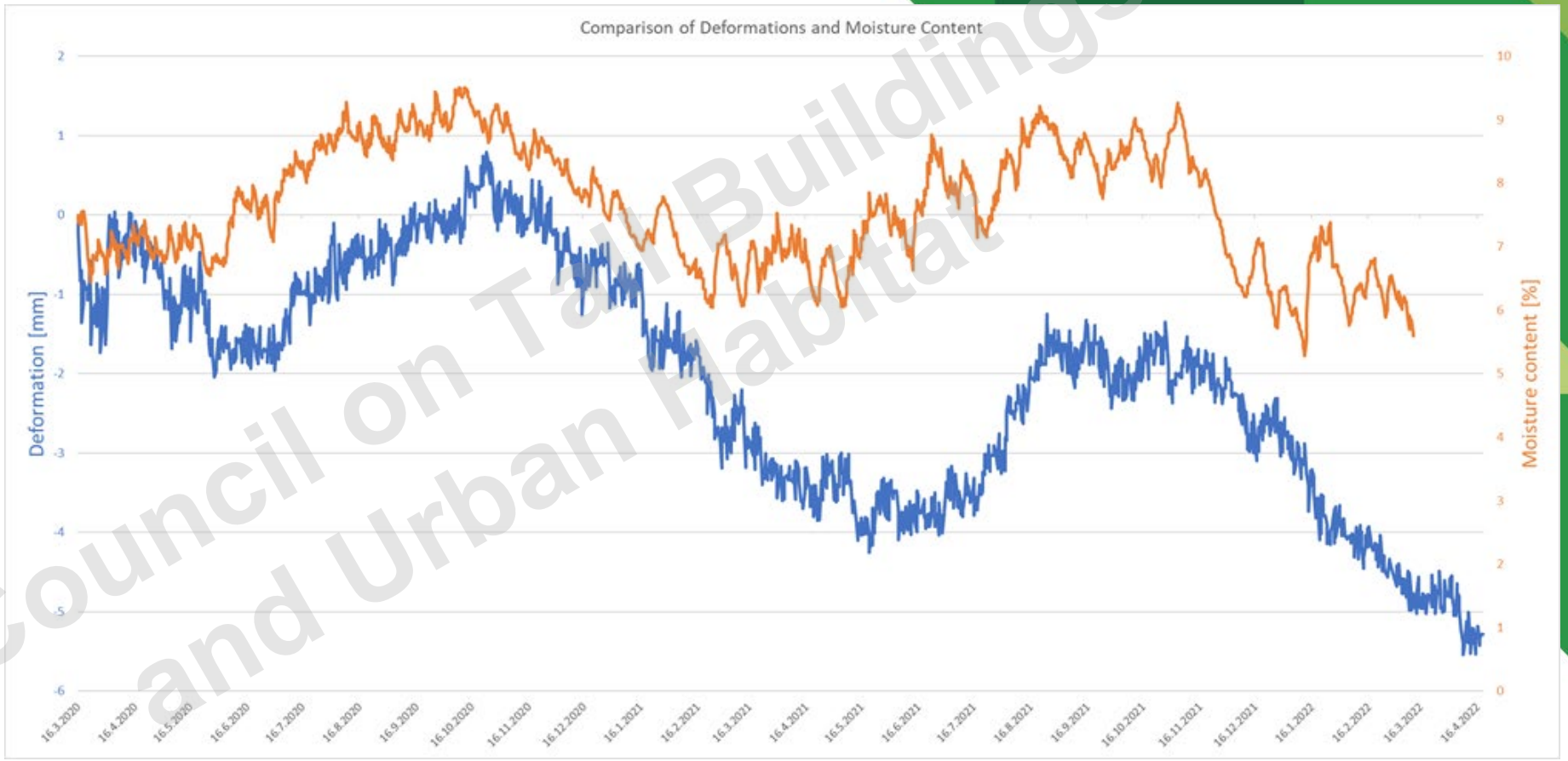
Deformations

- Deformation in 2020 – 2022, 24 months: 5.5 mm (0.22 in)
- Total deformation: 20.5 mm (0.807 in)
- Deformation per storey: 1.58 mm (0.062 in)



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