



Bella Hotel

- **Betonelementer udnyttet til grænsen**

Kaare K.B. Dahl

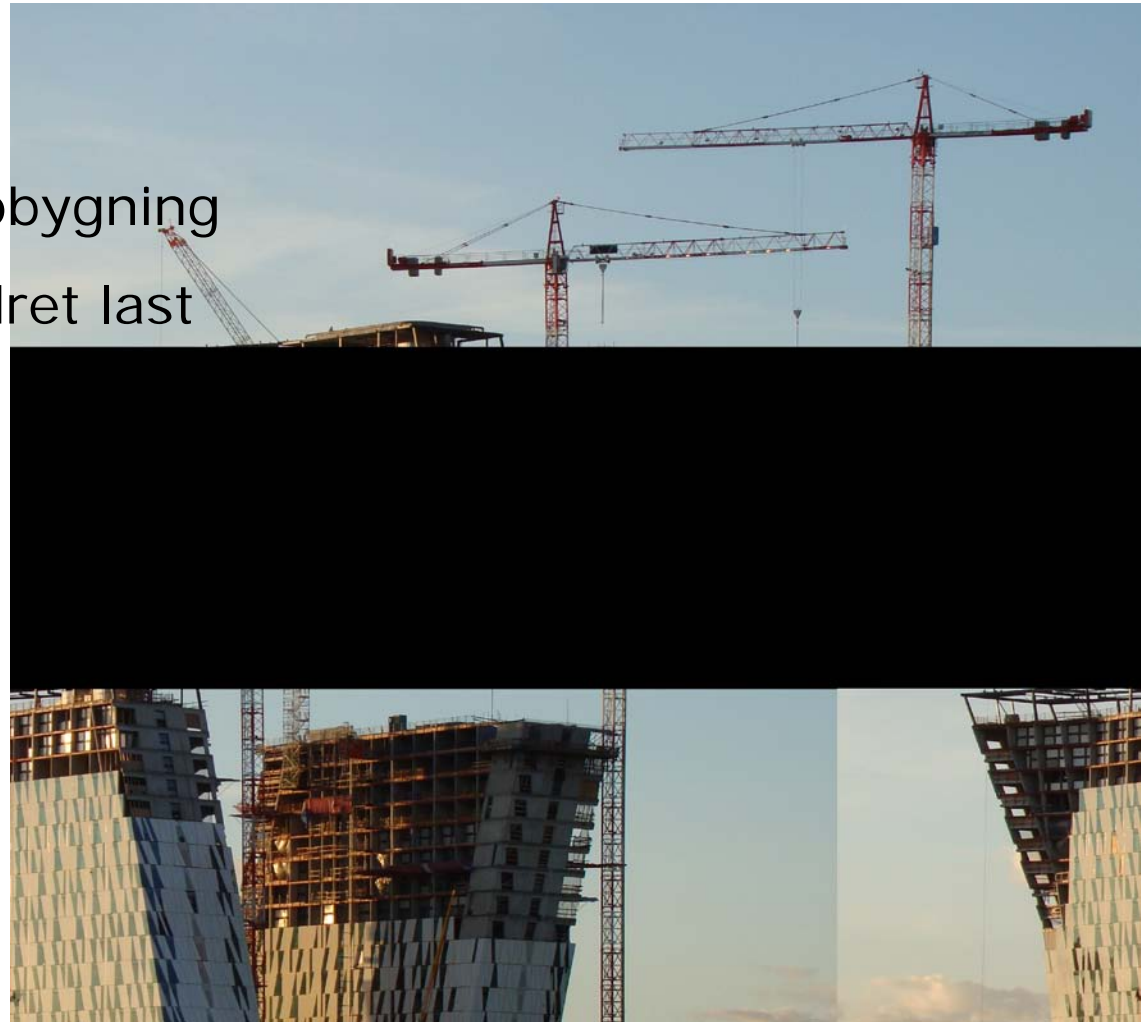
RAMBOLL

2010-12-10
Bella Hotel



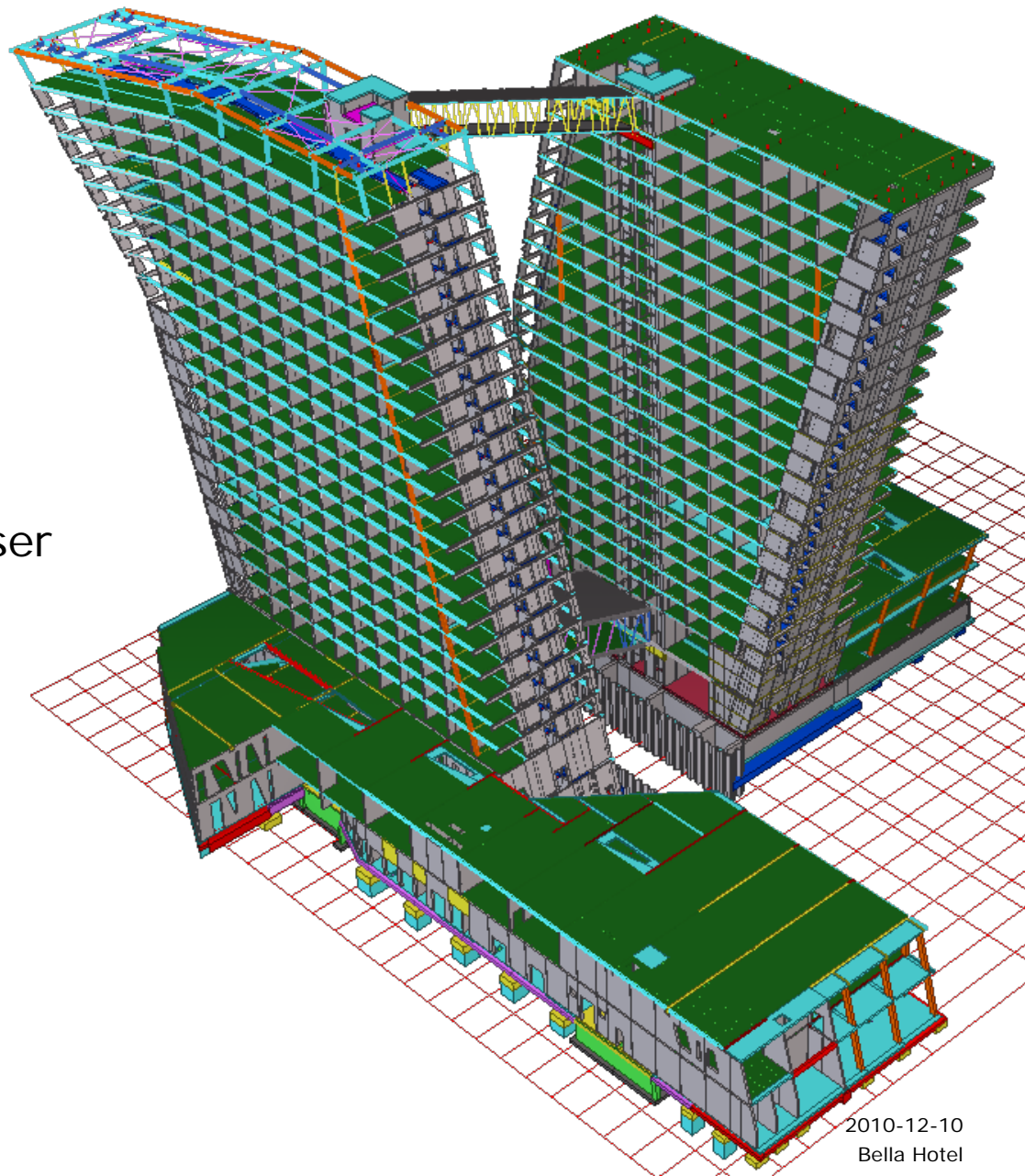
Agenda

- Nøgletal og generel opbygning
- Hovedstatikken for lodret last
- Stabilitet
- Gangbro på etage 23



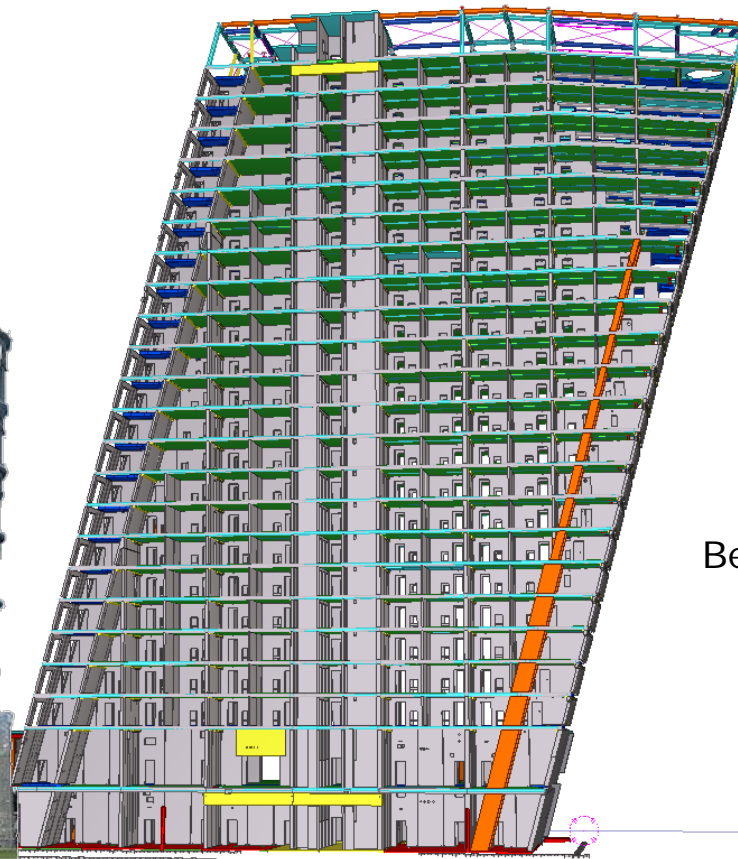
Nøgletal

- to 76.5m tårne
- 24 etager
- 2 gangbroer
- 814 4-stjernede værelser
- 44.000 m²
- 3 restauranter
- 32 møderum



En hældende bygning

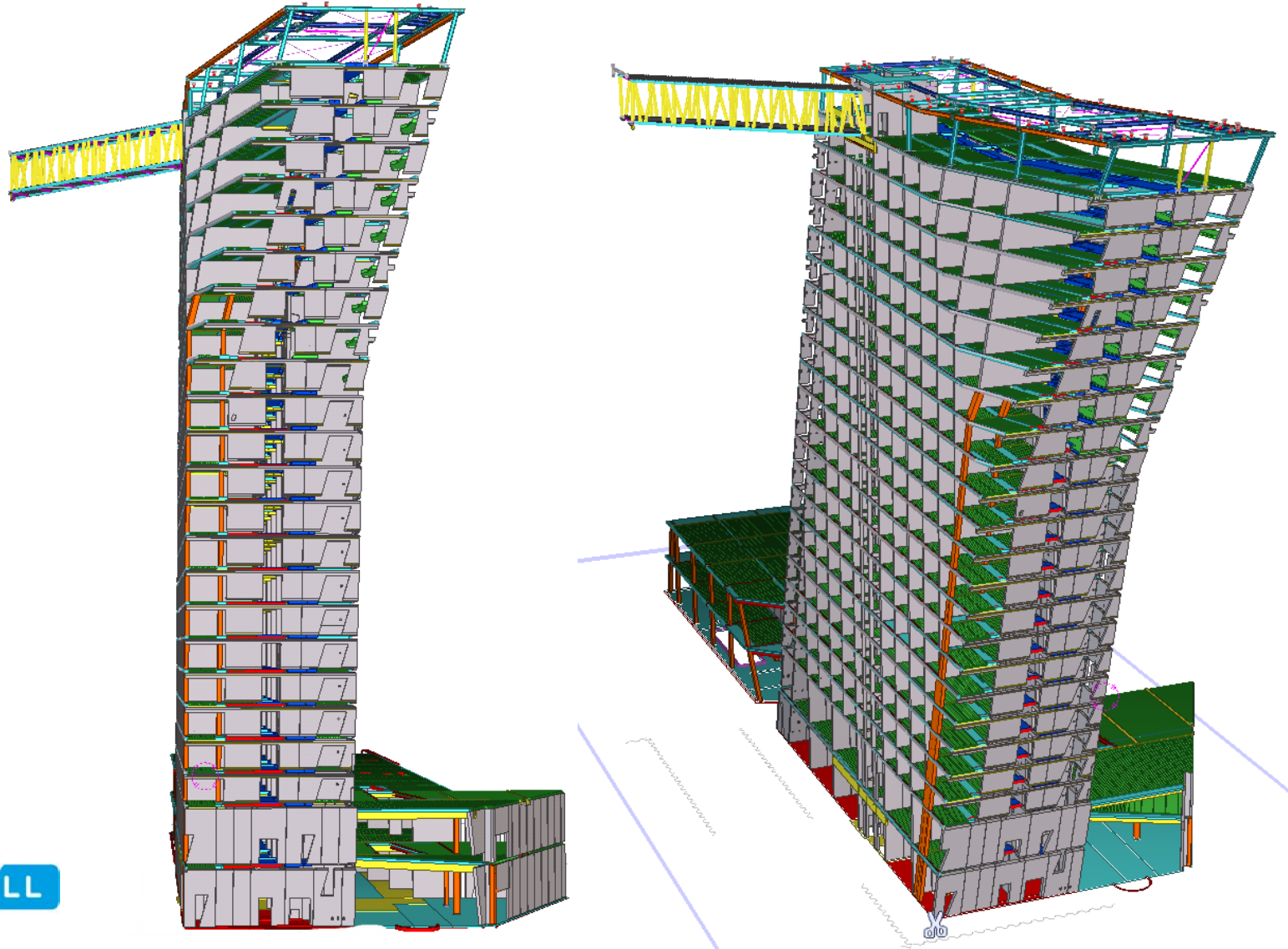
Pisa: 4 grader



Bella Hotel: 15 grader

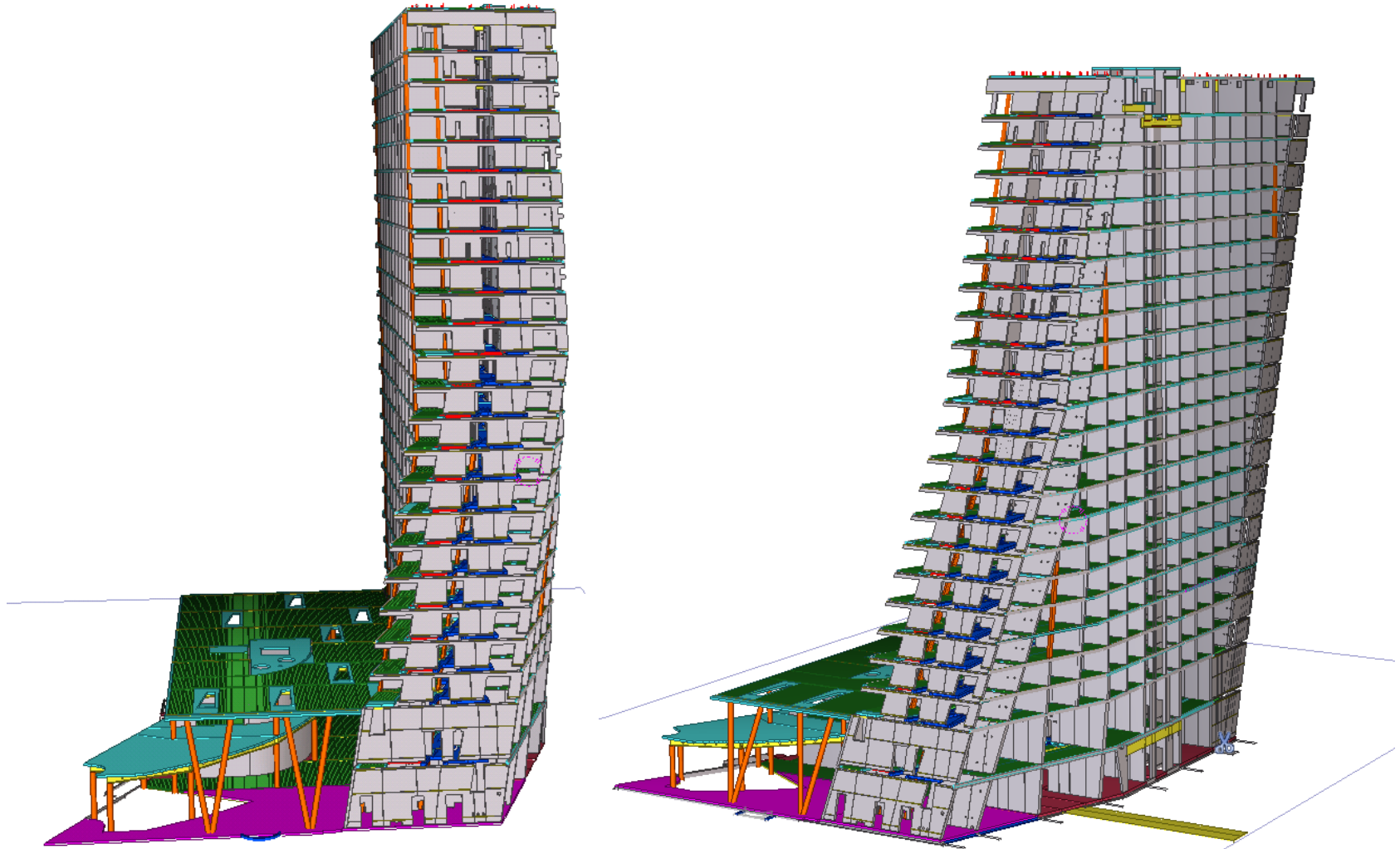
Tårn 1

Horizontal forskydning af de øverste 10 etager

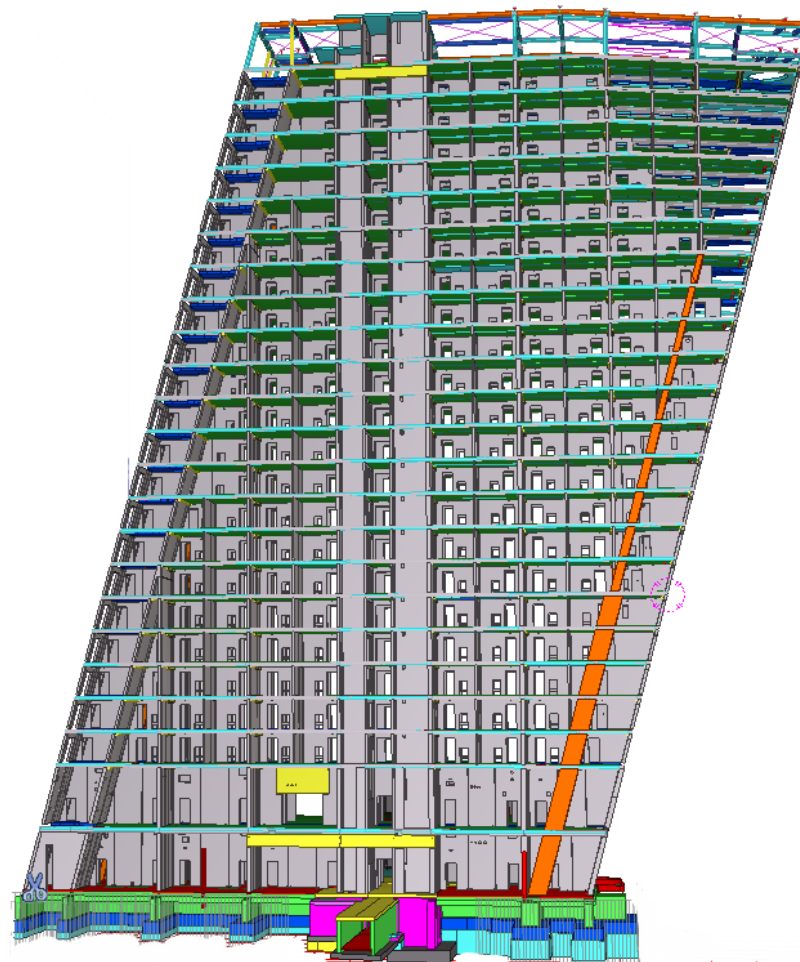


Tårn 2

Horizontal forskydning af de nederste 14 etager



Hovedkræfter

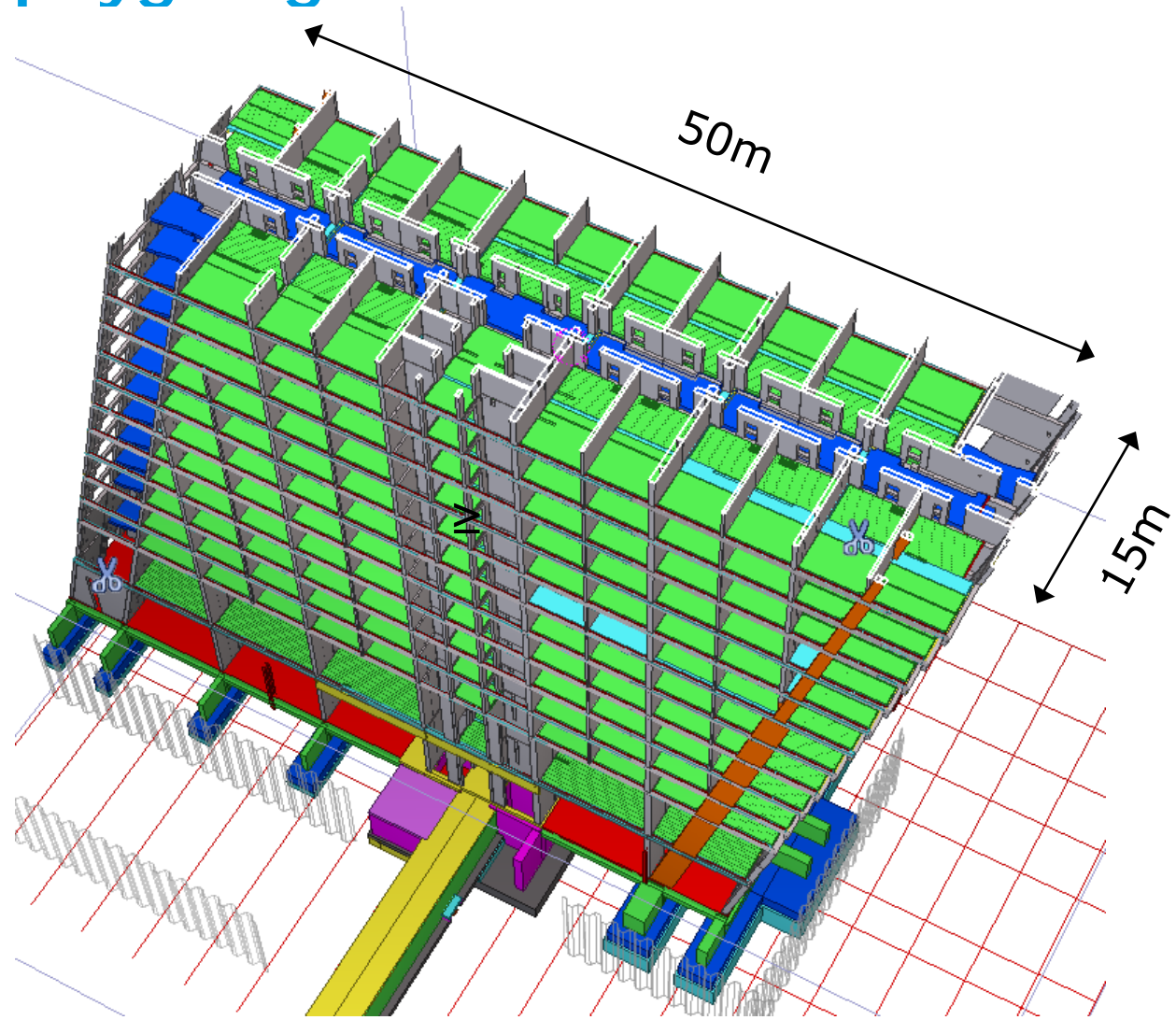


Væltende moment
1.200.000 kNm



Max. fundamentslast
300.000 kN på
15*20m fundament

Generel opbygning

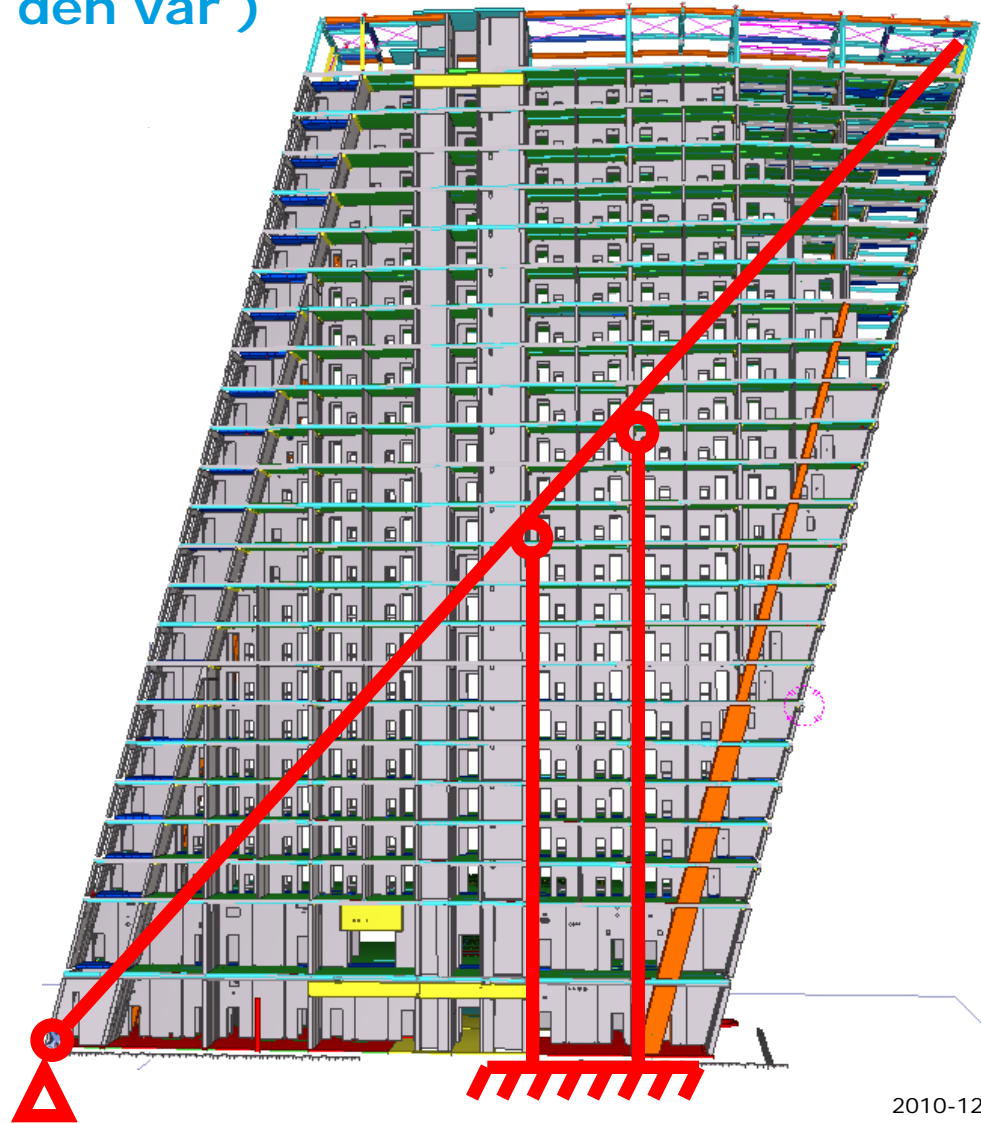


Hovedstatikken

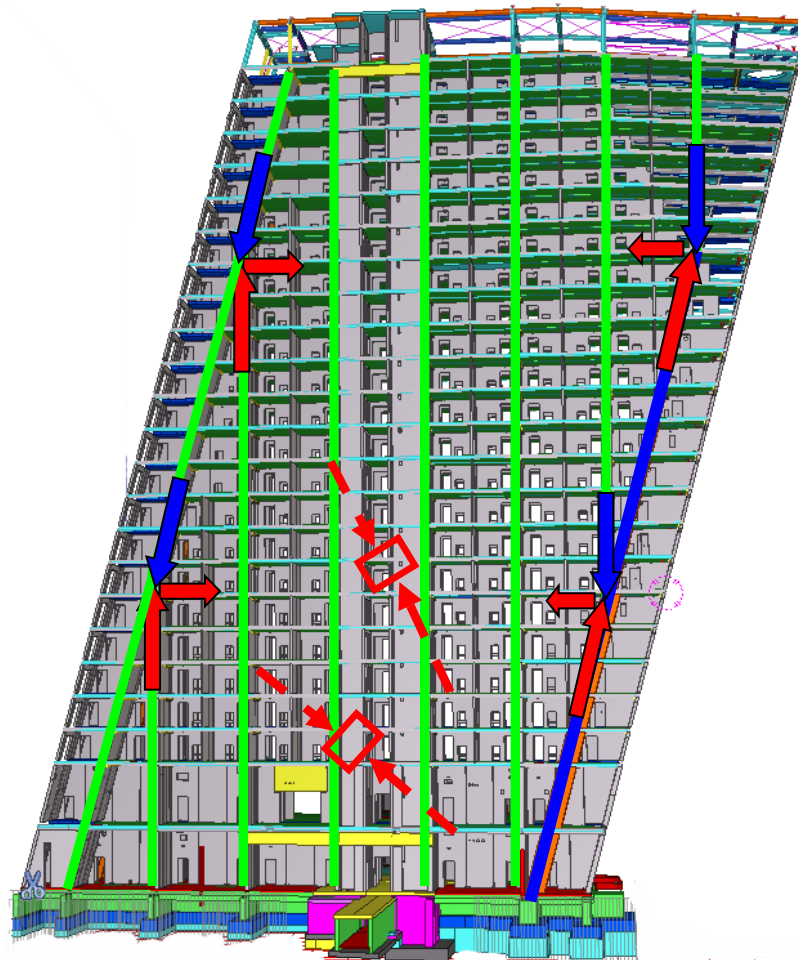
(som vi i starten troede den var)

6.500 betonelementer

- Vægge $550 \geq t \geq 150$
- Søjler $11 \geq L \geq 1,5$
- Bjælker (RB, KB, HSOQ)
- Forspændte huldæk



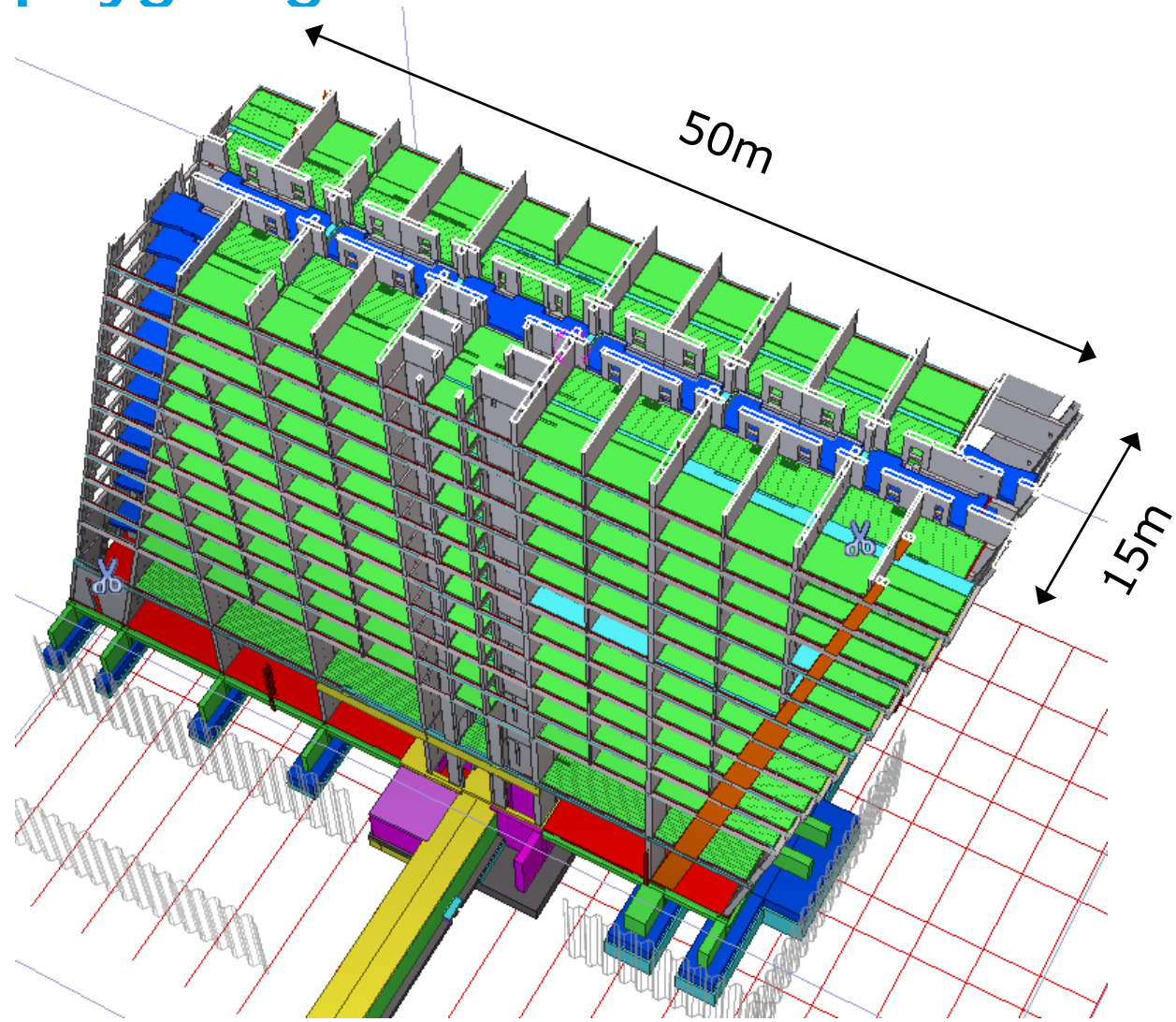
Hovedstatikken som den blev





Vandret last - stabilitet

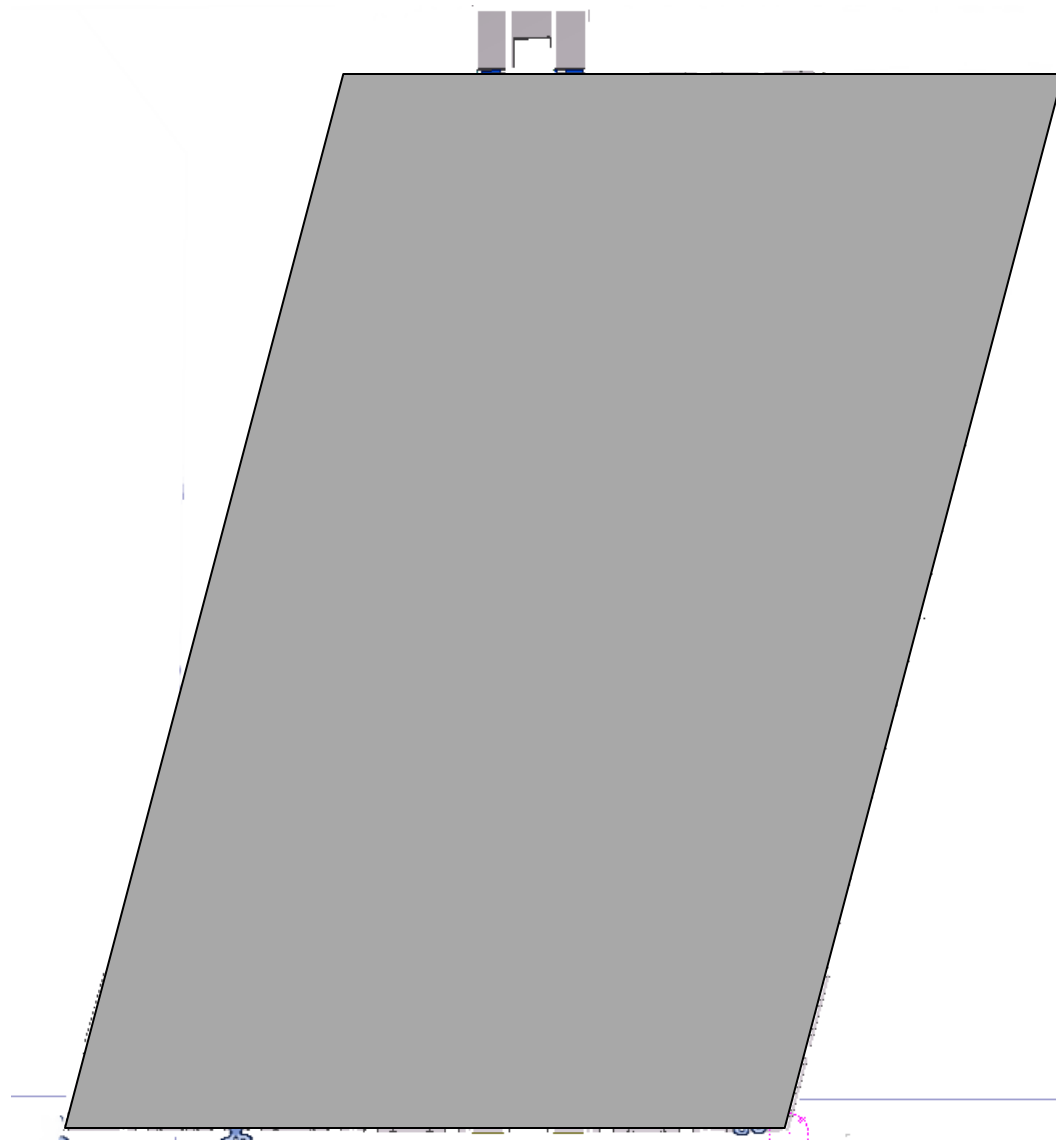
Generel opbygning





Langsgående stabilitet

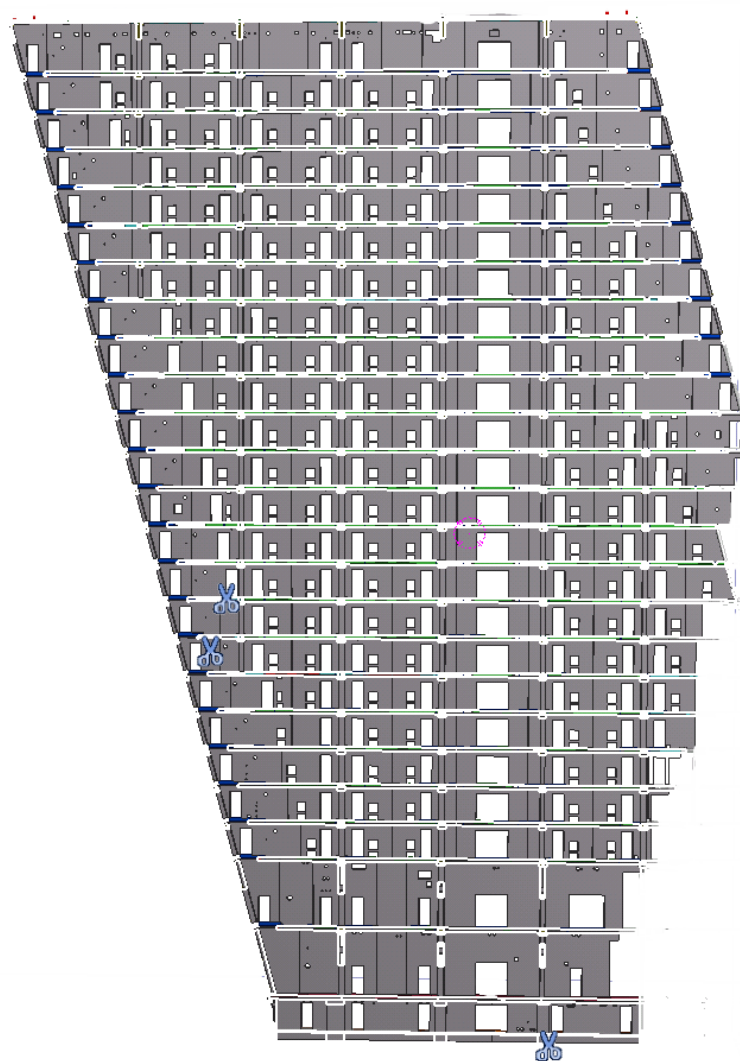
Tårn 1





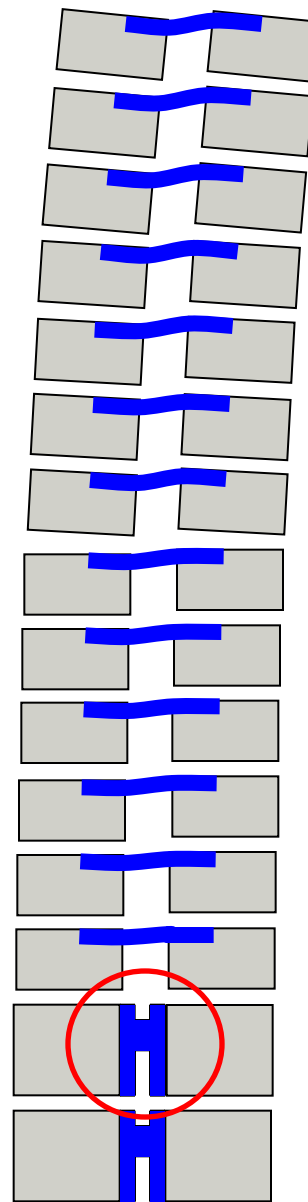
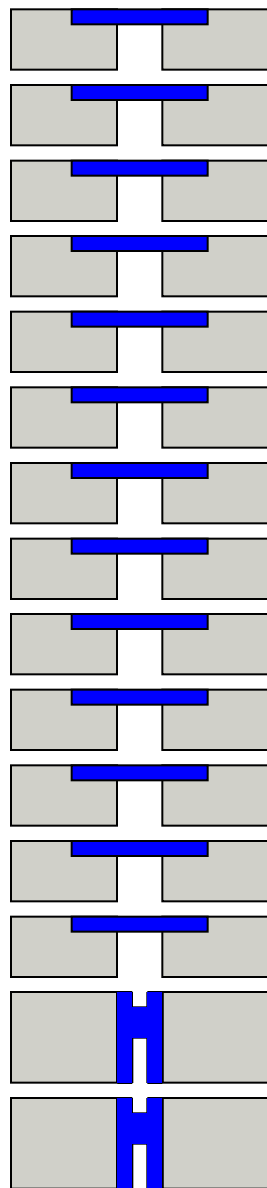
Langsgående stabilitet

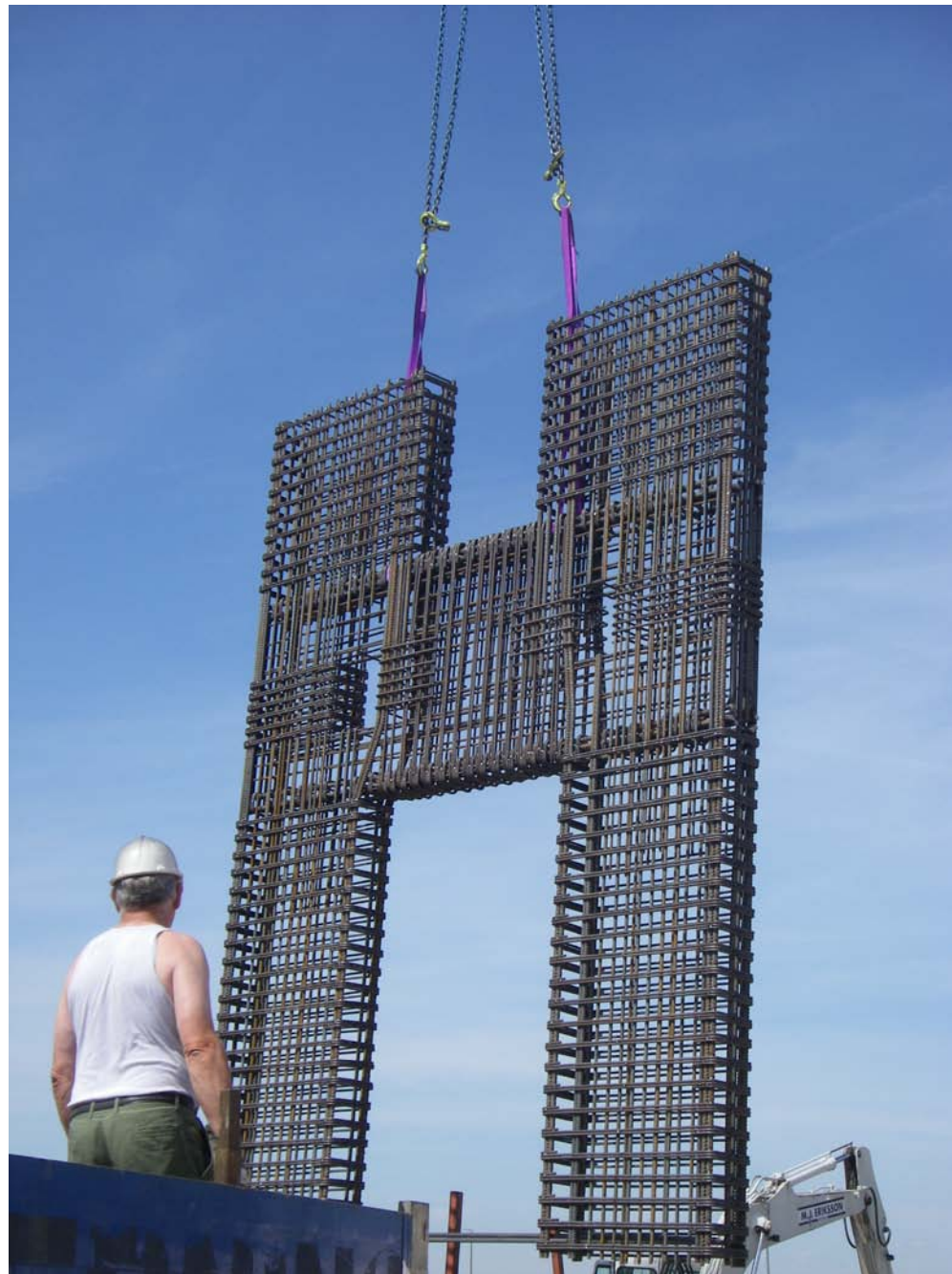
Tårn 2





Tværstabilitet





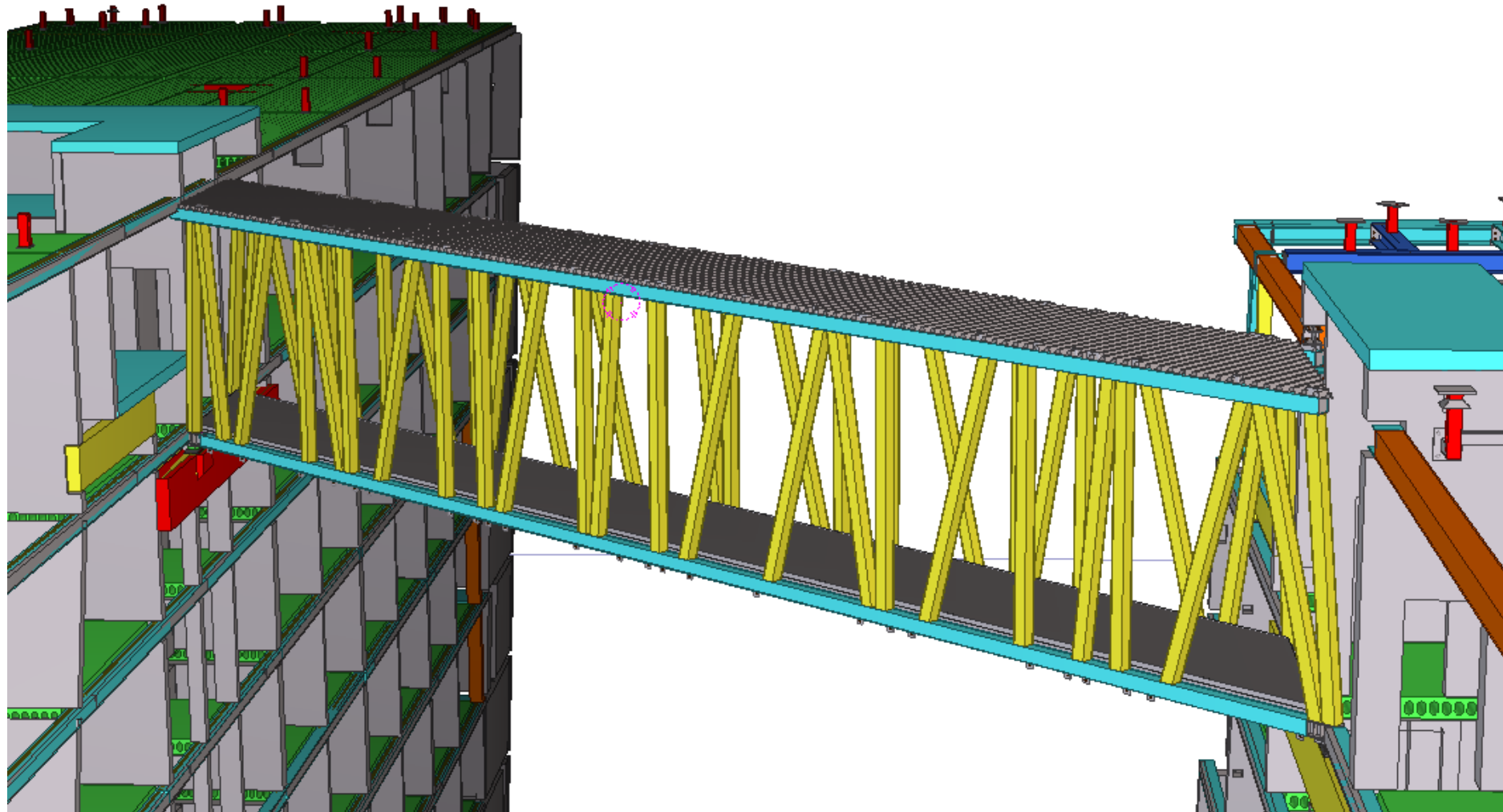




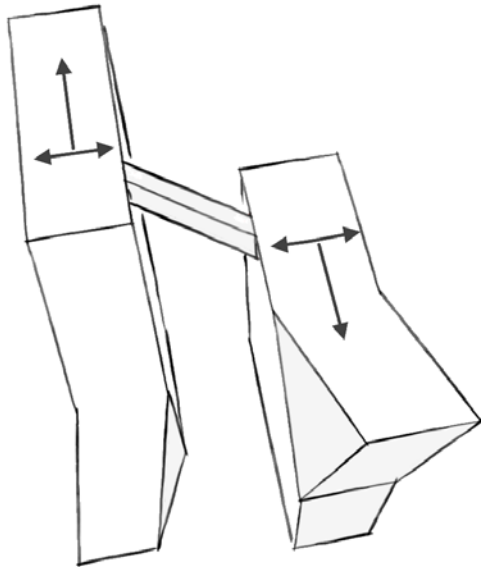
Gangbro på øverste etage



Gangbro på øverste etage



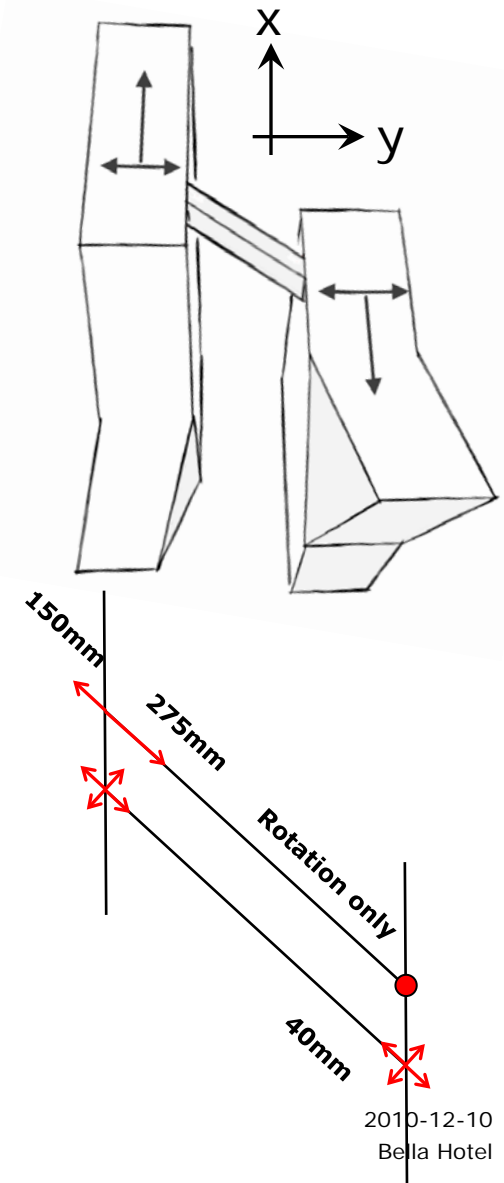
Bestemmelse af tårnenes bevægelser



- Vindlast
 - Sug på facader
 - Torsion af tårne
 - Svingninger
- Excentrisk nyttelast på langs
- Excentrisk nyttelast på tværs
- Krybning af beton
- Krybning af jorden
- "Skæv" opvarmning

Resulterende bevægelse

	U _x	U _y	Partial	U _{x_{regn}}	U _{y_{regn}}
	(mm)	(mm)		(mm)	(mm)
Krybning	140	18	1,00	140	18
Vind	7	71	1,00	7	71
Excentrisk	16	60	1,00	16	60
Termisk	12	98	0,5/1,3	5	38
Total væk				168	186
Total mod				28	169



Spørgsmål?

