

# Hybrid structures: pros, cons, doubts?

## On Our Journeyt to Carbon Neutrality 2050

Together with suppliers and customers

**We build for a better society.**  
Transbay Transit Center, San Francisco, USA

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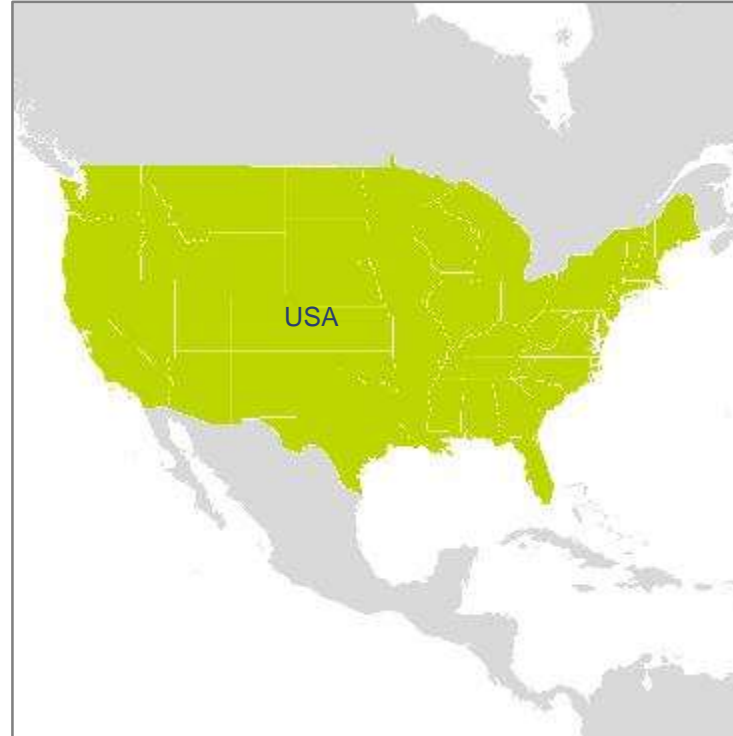


## Skanska in brief

- Founded 1887 in Sweden
- International business since 1897
- Quoted on the Nasdaq Stockholm
- 2016 revenues SEK 151 billion
- 41,000 employees



We are active in selected home markets



**Revenue by geographic areas**

Nordic countries **42%**   Europe **22%**   North America **36%**



# Global business streams

## Construction

Slussen, Stockholm, Sweden



## Project Development

Residential  
Development

Kruunuvuorenranta  
Helsinki  
Finland



Commercial  
Property  
Development

121 Seaport  
Boston  
USA



Infrastructure  
Development

LaGuardia  
New York  
USA



# Some Skanska insights

- PESTLE
  - Overall trends
- Skanska Sweden's 2050 goal
  - Carbon neutrality
- History and current situation
  - What have we learnt
- Risk mitigation
  - How we work to avoid risks?
- Summary

# PEST - Political, Economical, Societal, Technological

# We build for a better society

A graphic with a blue background and a green triangle in the top right corner. On the left, there are two stylized trees: a small green triangle and a larger green circle, both on thin brown stems. A large white quotation mark icon is positioned to the left of the text. The text is in white and reads: "Climate change concerns everyone. In fact business is both part of the problem and the solution. We want to contribute to build a better society, both by striving towards low carbon solutions within our operations, in addition to supporting our customers in their need of resilient solutions and lowering their carbon footprint." On the right side of the graphic is a photograph of Johan Karlström, CEO of Skanska, wearing glasses and a dark suit over a light-colored shirt, gesturing with his hand.

CLIMATE CHANGE IS EVERYONE'S BUSINESS

#COP23

@iccwbo

[iccwbo.org/bingo](https://iccwbo.org/bingo)

JOHAN KARLSTRÖM  
CEO, Skanska

# Carbon neutrality



# Carbon Neutrality 2050

- Journey to carbon neutrality
  - Good for customers and business
  - Lower costs and risks
  - Building a better society
- Includes the entire value chain



## History and current situation

Linköping  
Orgelbänken

1995

Växjö  
Wälludden

1997

Stockholm  
Hammarby Sjöstad

2001

Jyväskylä  
Finland

2003

BoKlok



# 1995 Orgelbänken

- 2/3 of the construction time compared a concrete frame
- Roughly the same price level
- Unprotected during construction, mould as a result
- Acoustic issues



## 1997 – Wälludden

- Wood and concrete frame built in parallell
- Acoustic issues
- Difficult to stabilize, doable
- Concrete frame found more robust, better suited for Skanska's production process
- Evaluation 10 year after completion confirms:
  - Acoustic issues
  - Movements between apartments and stairways
  - Rot in load carrying parts and in balconies





# 2001 – Hammarby Sjöstad



Hammarby Sjöstad  
in Stockholm was an  
expensive experience.  
Mold...

Fig 2 Tidningen Dagens Nyheter rapporterade om skadorna i Hammarby Sjöstad i en stort uppslagen serie i februari 2001.

Source: [https://www.sp.se/sv/units/risebuilt/energy/eti/Documents/SPrapp\\_2002-15.pdf](https://www.sp.se/sv/units/risebuilt/energy/eti/Documents/SPrapp_2002-15.pdf)



## 2003 - Jyväskylä congress hall

2500 m<sup>2</sup> of the roof fell  
down a Sunday morning.

10 persons within

The day before

1500-2000 persons

Not allowed to use the photo,  
owned by TT



## Current situation

- Large problems during construction with moisture related issues
- Large efforts for remediation of mold during construction



## Current situation

- Concrete frame with curtain walls
- Our site manager do understand the potential implications for tenants, this creates a bad work environment causing stress



# Supplier expectations

- Code compliance in all phases of the chain, from design, production to use
- Take our concerns seriously and address the issues we and our customers have
  - Robustness with respect to moisture
  - Moisture safe construction methods
  - Durable detailing
  - Joint responsibility

Unacceptable solution

# Risk mitigation

# Our requirements on a building system

## Codes (BBR)

- Material and products shall have known properties
  - Economically reasonable working life
  - Design models
  - Accessibility, dwelling design, room height, utility rooms
  - Safety in case of fire
- Hygiene, health and environment
    - Air, Light, Thermal climate, Moisture, vermin
  - Protection against noise
  - Safety in use
  - Energy conservation



# Skanska requirements on a building system

- Applicable on a national level
  - We need internal resources with knowledge about the system
    - Design, site-management, tendering etc.
    - Blue collars
    - Logistics
    - Market demands
  - Suppliers
    - Are the system available all over Sweden
- Cost effectiveness
  - Tendering
  - Guarantee costs
  - Revenue, wall thickness affects sellable area

# Skanska requirements on a building system

- Time effectiveness
  - Production time
  - Design time
  - Delivery times
- Robustness with respect to
  - Moisture, Energy (air tightness)
  - During production

# Our requirements on a building system

- Flexibility
  - Appearances, adjustment to situation plans, facades
  - Spans, affection room sizes
  - Electricity (channeling, placing of switches etc.)
  - Ventilation (channeling, shafts)
  - Water (fresh and grey)
  - Heating (optimization of piping)



# Analysis of flexibility

Evaluation of system with respect to flexibility

System	Appearance	Spans	Electricity	Ventilation	Water	Heating
1.	Orange	Green	Orange	Yellow	Orange	Orange
2.	Green	Yellow	Yellow	Green	Green	Green
3A.	Green	Yellow	Yellow	Yellow	Yellow	Green
3B.	Yellow	Yellow	Yellow	Yellow	Yellow	Green
4.	Green	Yellow	Yellow	Yellow	Yellow	Green
5.	Yellow	Orange	Yellow	Orange	Yellow	Yellow
6A.	Green	Yellow	Yellow	Green	Green	Green
6B.	Green	Yellow	Yellow	Yellow	Yellow	Green

# How could a hybrid system score?

Agregated evaluation						
System	National applicability	Supplier – Market	Cost efficiency	Time efficencye	Robustnes	Flexibility
1.r	Green	Green	Orange	Green	Green	Orange
2.	Red	Green	Green	Orange	Yellow	Green
3A.	Green	Yellow	Yellow	Yellow	Green	Green
3B.	Green	Yellow	Yellow	Green	Green	Green
4.	Yellow	Orange	Yellow	Yellow	Green	Green
5.	Yellow	Red	Orange	Green	Green	Yellow
6A.	Green	Yellow	Green	Yellow	Yellow	Green
6B.	Green	Yellow	Green	Yellow	Yellow	Green

# Summary and conclusions



# Summary

- Sustainability and our goal towards carbon neutrality by 2050 are drivers for change
- We have had significant issues with our wood projects and take precautions not to end up in the same situation
- Learning through pilot projects to be able to build with wood or wood-hybrid structures
- Skanska will be building more with wood, we are currently investing 250 MSEK in the BoKlok factory