SKANSKA

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

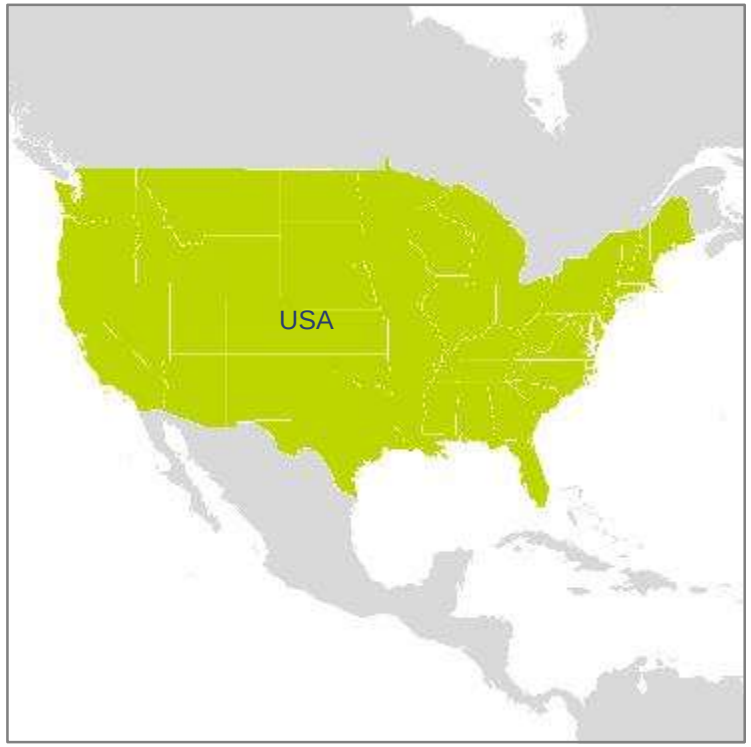
Joakim Jeppsson

Research and Development Skanska Sverige AB

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

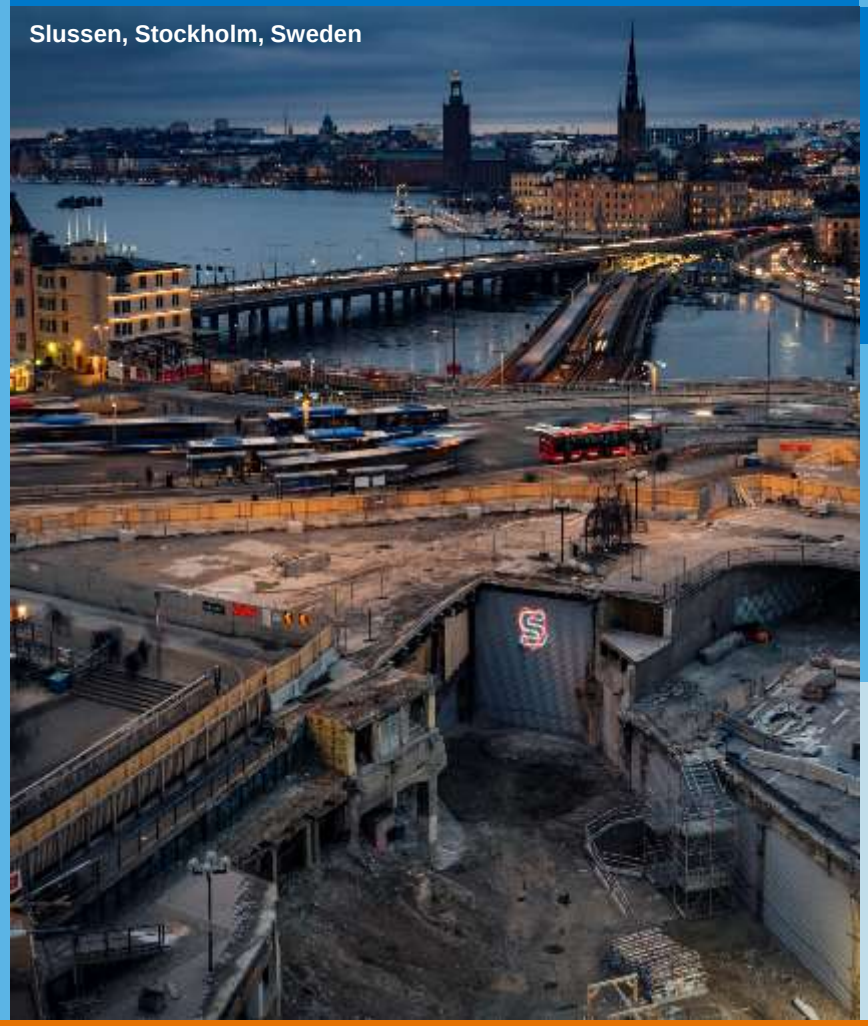


Revenue by geographic areas

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

Carbon neutrality

SKANSKA

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

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 Skanka’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

2003 - Jyväskylä congress hall

2500 m^2 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 adress 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 know 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	Appearence	Spanns	Electricity	Ventilation	Water	Heating
1.						
2.						
3A.						
3B.						
4.						
5.						
6A.						
6B.						

How could a hybrid system score?

Agregated evaluation

System	National applicability	Supplier – Market	Cost effiency	Time efficencye	Robustnes	Flexibility
1.r						
2.						
3A.						
3B.						
4.						
5.						
6A.						
6B.						

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 i 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