Sara Cultural Center, Skellefteå, Sweden – Steel Box Trusses and Tension Rods Allow Long Spans and a Timber Core

**Robert Schmitz** Architect, Partner, White Arkitekter



CTBUH 2022 Steel-Timber Conference

CTBUH STEEL& TIMBER HYBRID BUILDINGS CHICAGO.IL 2022 05 24 < 2

ROBERT SCHMITZ Lead Architect, Partner robert.schmitz@white.se

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# White Artiekter

# By 2030, all our architecture is carbon neutral through design excellence.

HAMNTORGET - SÖDRA SKANSTULL, STOCKHOLM

WHITE RESEARCH LAB

### WHITE RESEARCH LAB

## PROJECT BASED RESEARCH FOCUS AREAS AND KNOWLEDGE SHARING TRANSITION INTO CARBON NEUTRAL CONSTRUCTION

#### SKELLEFTEÅ CULTURE CENTRE

International competition 2015 30 000 m2 Locally coursed timber 75m tall, 20 floors



W

#### SKELLEFTEÅ, SWEDEN

#### **Gulf stream**

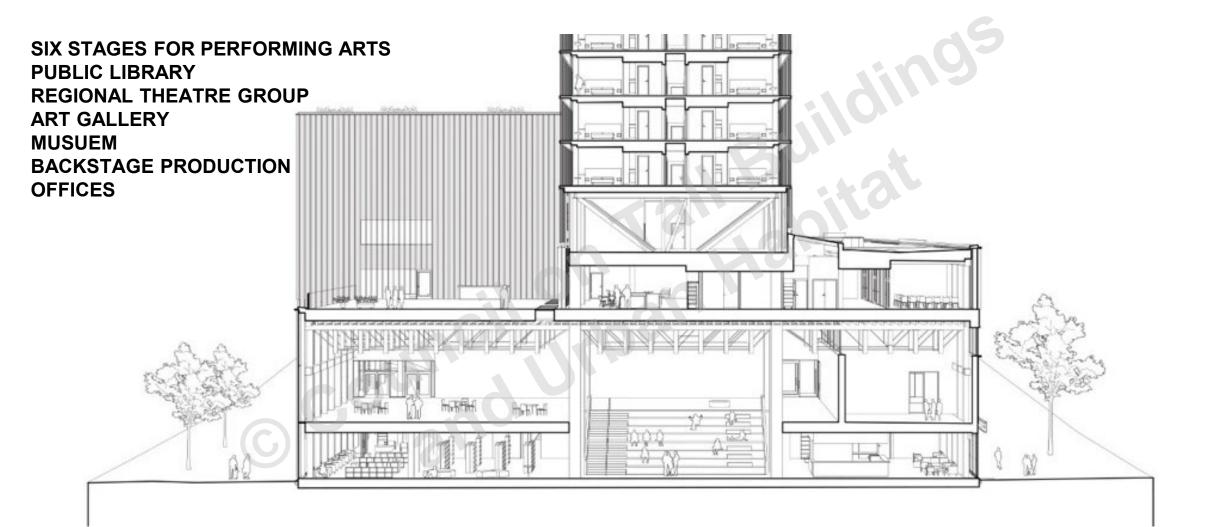
65 degrees north Dawson City - Yukon SKELLEFTEÅ

STOCKHOLM



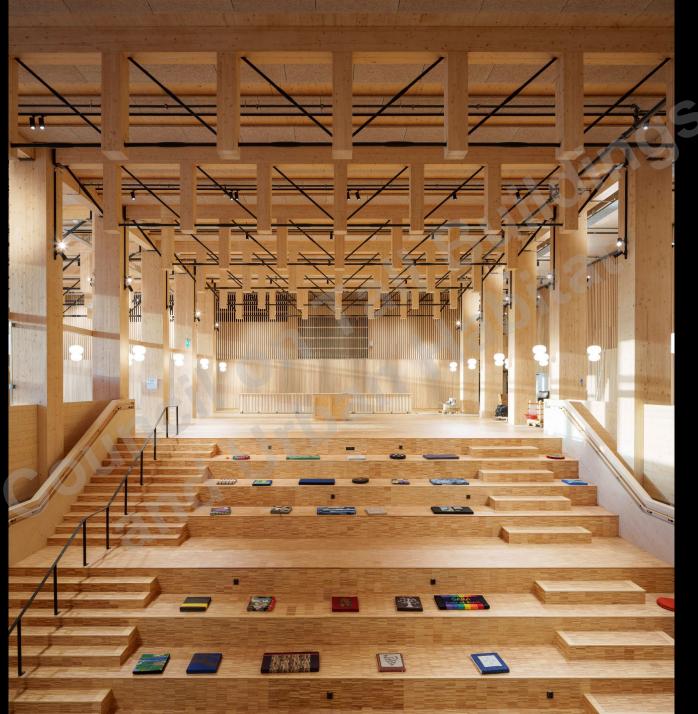


#### CULTURE CENTER



#### HYBRID TRUSSES

ENABLE FLEXIBLE SPACES



พกโร

HOTEL TOWER

205 HOTEL ROOMS CONFERENCE CENTER GYM ROOFTOP SPA 3 THEME RESTAURANTS

C





ROOF TOP SPA

PANORAMA RESTAURANT

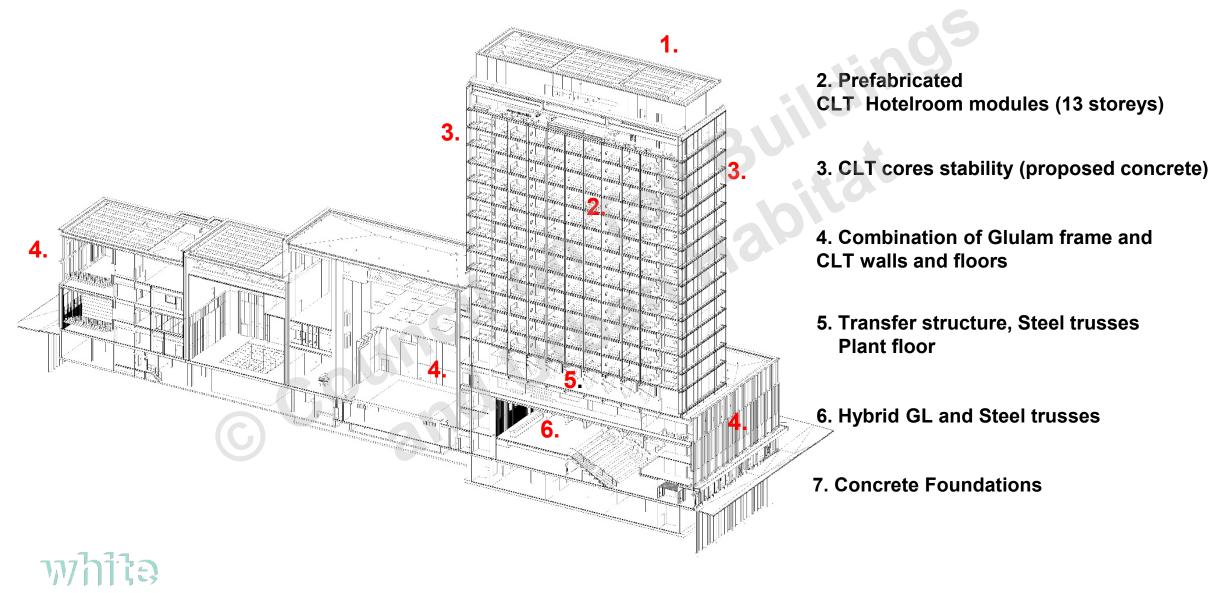
SAUNAS/ WELLNES

**TURKISH BATHS** 

INFINITY POOL, STAINLESS STEEL

Council and un

#### CONSTRUCTION

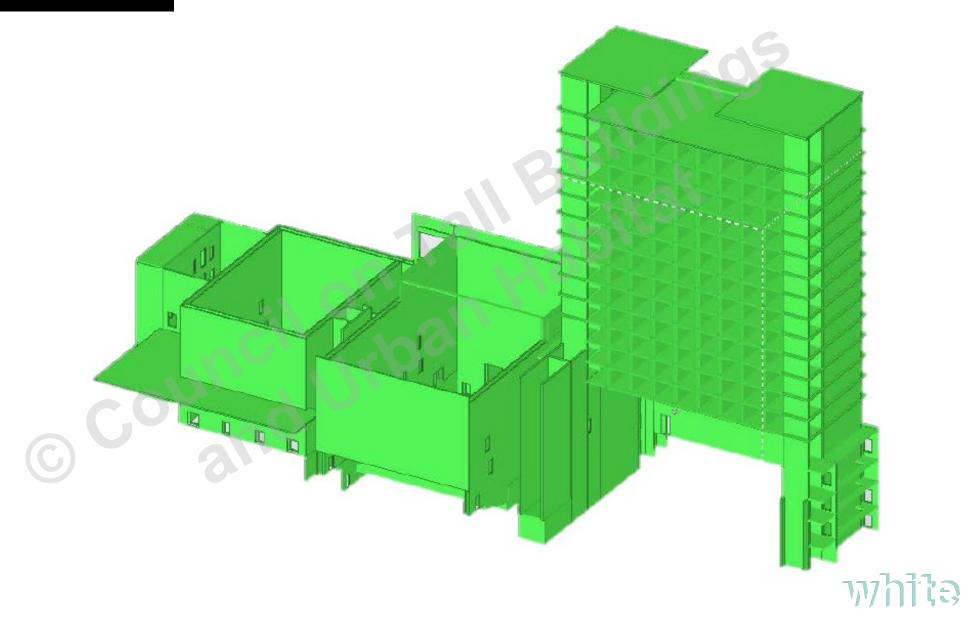


#### 1. Dead weight concrete slabs

#### ELEMENTS CLT

9000m3

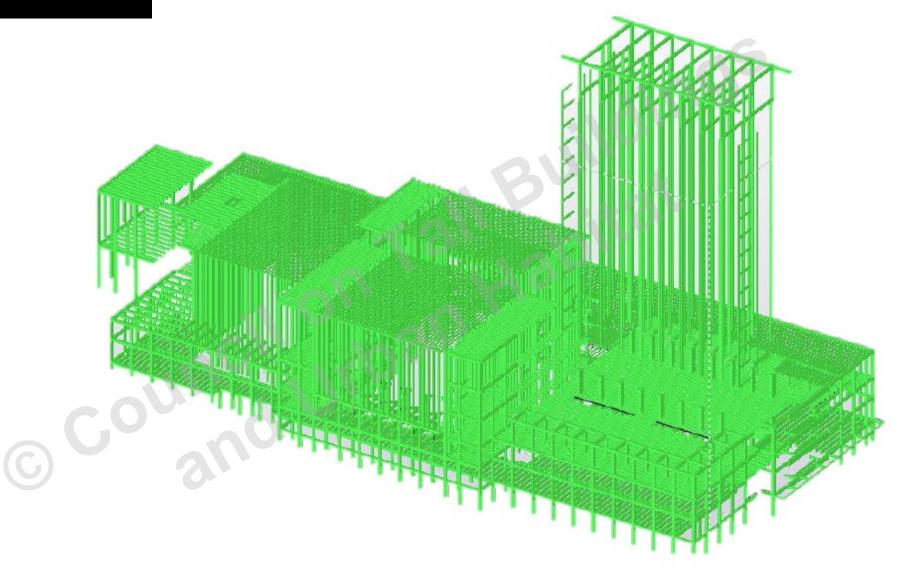
ELEVATOR CORES 3D VOLUMETRICS SHEAR WALLS FLOOR SLABS



#### ELEMENTS GLT

3000m3

BEAMS COLUMNS THRUSSES

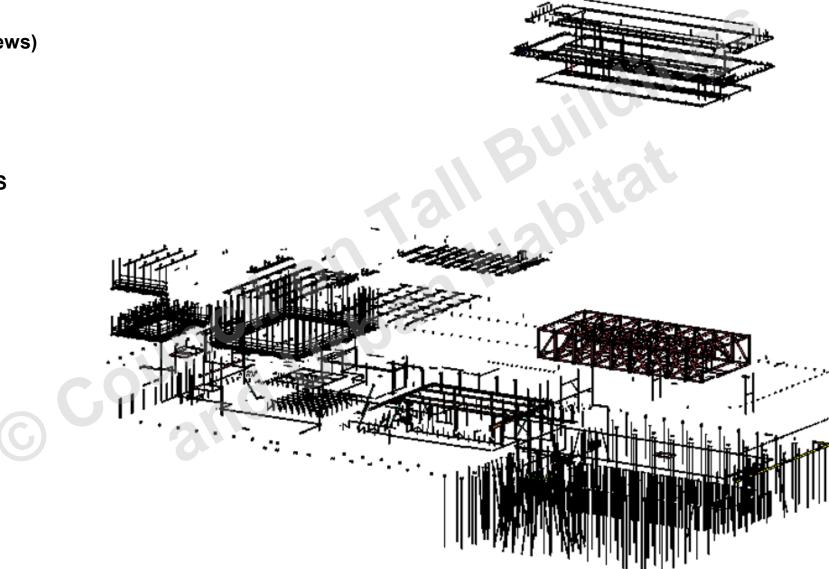




#### STEEL

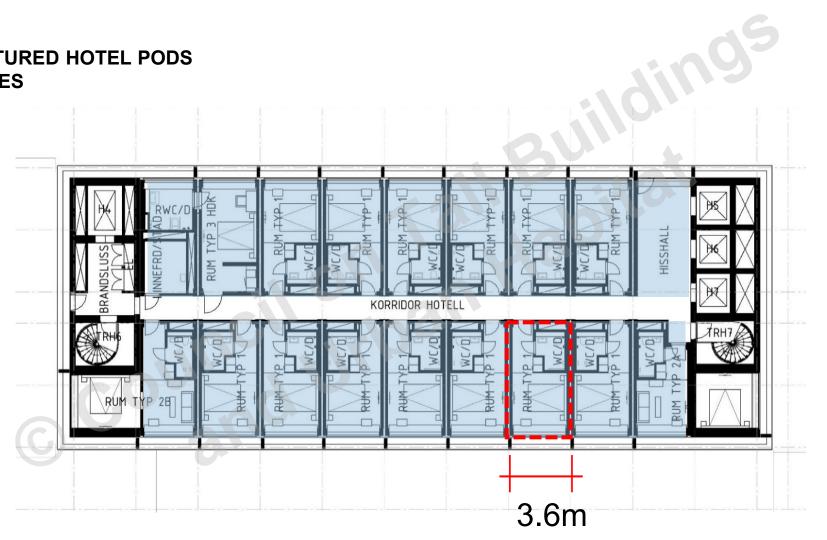
234 ton (excluding screws)

PILES TO BED ROCK TRUSSES CONNECTORS BRACKETS HYBRID FLOOR SLABS

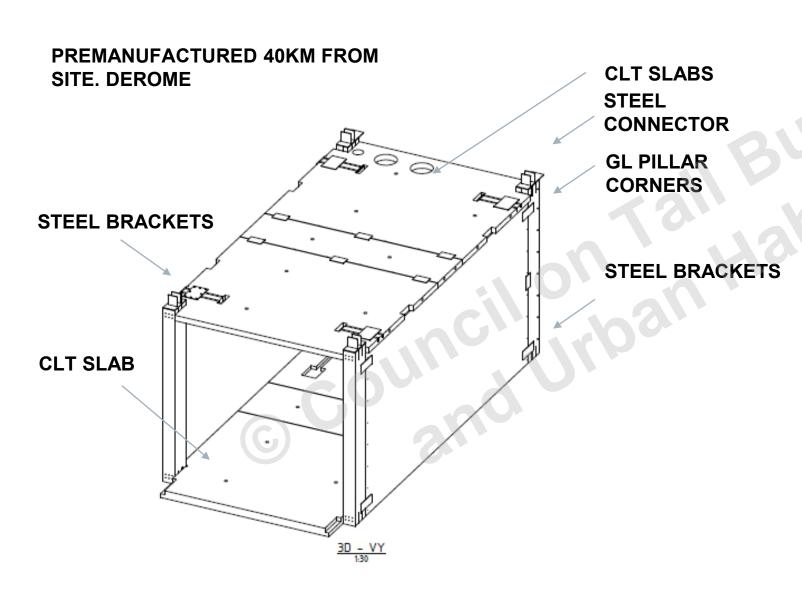


WOOD HOTEL

#### **18 PREMANUFACTURED HOTEL PODS 2 ELEVATOR CORES**



#### HOTEL ROOM MODULES







#### STEEL TRUSSES



#### PRE-FABRICATION, STORAGE.

#### Martinsons (Holmen)

CLT Factory 50 km from Skellefteå Bygdsiljum

Knowledge of properties of wood, made to measure FSC certification, Safe working environment.

or or or or or

Large elements, Fewer connectors Largest element 27x3M 12 ton

#### ON SITE CONSTRUCITON

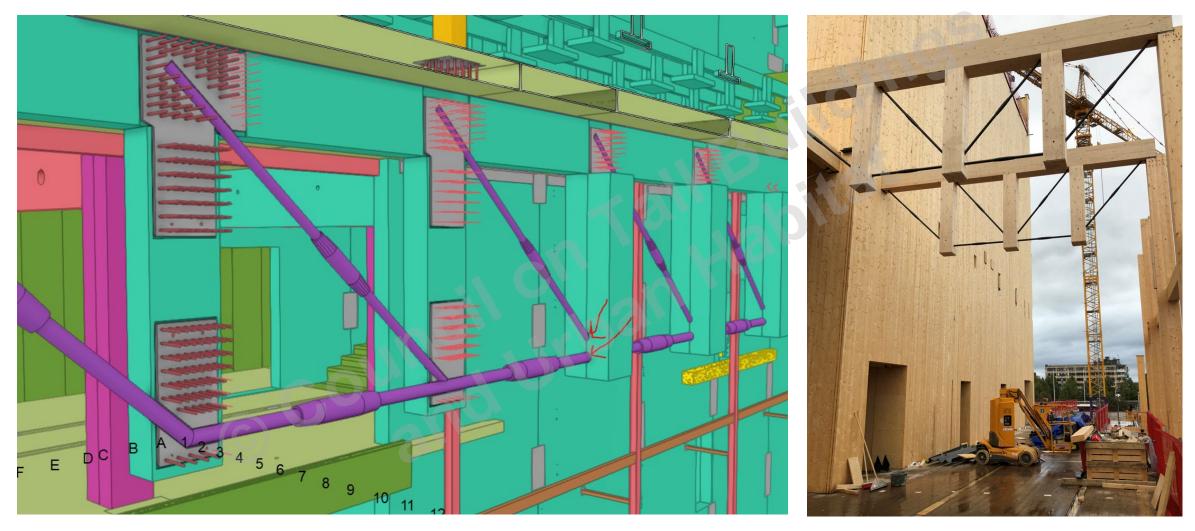
73 weeks of montage Build up vertically, 13 segments

Time saving 1 year of construction.

No weather protection

Reducing transportation with 80%

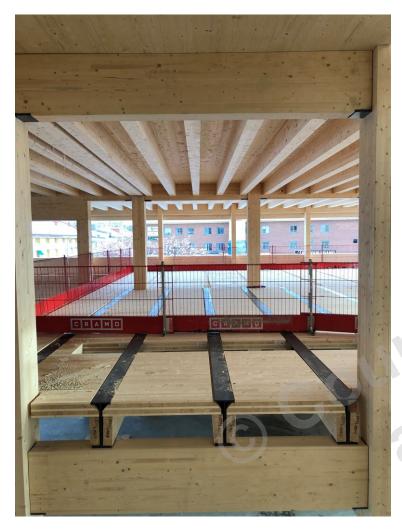
HYBRID TRUSSES



No weather protection

Section

#### OTHER USE OF STEEL



Hybrid steel timber floors



Steel brackets. 550 000p screwes.



2000p WR 13x 600-800

#### FIRE SAFETY

**RATED "BR0" SWEDISH SYSTEM** 

**FULLY SPRINKLERED** 

HOTEL TOWER WITH TR1+TR2 EVACUATION STAIRS + EVACUATION LIFT.

HOTEL R90/R60 CULTURE CENTRE: R60/R30

OVERDIMENSIONED WOOD BASED ON STANDARD CHARRING RATE

INTERNAL WOOD SURFACES FIRE COATED TO B-s1,d0 FACADE PANEL FIRE TREATED 2M ABOVE GROUND.



#### ENERGY PERFORMANCE

- EFFICIENT FACADE ENVELOPE
- ELIMINATION OF THERMAL BRIDGES
- FIXED AND MOBILE SUN PROTECTION
- HYBRID VENTILATION OF LARGE VOLUMES
- PHOTOVOLTAIC PANELS ON ROOFS AND FACADES
- 100% RENEWABLE HEATING AND COOLING GRID
- CONNECTED TO SMART GRID,
- **OPTIMIZATION BY ARTIFICIAL INTELLIGENCE**

CERTIFICATION "GOLD" SWEDEN GREEN BUILDING COUNCIL MILJÖBYGGNAD.

#### BIM INTEGRATED DESIGN



AR & VR



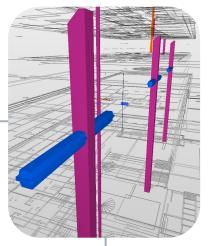
#### QUANTITY TAKE-OF

Anah	ze Massing & Site	Collaborate	View Manage	Add-Ins Mode	
en Lines	Render			Plan Views •	
		MY			
den Lines	S Render in Cloud	3D Sect	ion Callout	Elevation • 👸	• • <del>1</del>
	Render Gallery	View*	•	100	
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2			A	B	C C
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P			Type	Reference Level	Coun
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c		Eq.	B2(40x60)	1_B1	1
			B1(40x80)	1_B1	1
		0	B2(40x60)	1_B1	1
			B1(40x80)	1_81	1
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	-	• a	B1(40x80)	1 81	1
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DATABASE

Navigation pane		4	Items (0	01-FF&(E)				
		- 0 XI	Match			lame		
		Advanced search	0	0101.001	Work table			
		63	0101.002	Work chair, "balance"				
	012-05-16]	8 0101.003		Office chair with armrests, e				
Equipment numbering		Item classification	0	0101.004	Sofa 3 seats			
Procureme	ent	IFC	0	0101.005	Armchair			
Item groups	OmniC	lass 23 [2010-06-24]	63	0101.006	Lounge chair, ac	justable for		
A Demo Databas		0101.007 Puff						
01-FF&E			0	0101.008	Sofa, waiting room			
02-Building Elements			0	0101.009	Lounge chair, leather, adjust			
03-HVAC & Plumbing			0	0101.010	Chair, stackable			
04-Electrical			60	0101.011	Chair with armrests			
05-Communications			63	0101.013	Stool, high, behind counter			
<ul> <li>06-Finishes</li> <li>100-Stone</li> <li>110-Work Equipment</li> </ul>				0101.014 Chair, cafeteria				
			63	0101.015				
			č⊃ 0101.016 Chair, waiting room			mo		
viewer .			63	0101.017	Chair, "Trip Trap			
			60	0101.018	Sacco bag			
			63	0101.019 Chair without armrests				
			🖉 0101.020 Chair, comfort, easy			tasy		
				č⊃ 0101.021 Chair, comfort, easy (Red)				
			1			100.1		
				Showing 100 of 1153 Show all				
			Occurre	nces (0101.010: C	hair, stackable) 🗙			
		No 1-	Pro I	Room Function #:	Room Number	Room N		
		2 CAL		01.003	1A03	Office		
		2017		01.004	1A04	Office		
				01.005	1A05	Office		
		North Carl		01.006	1A06	Office		
		15011		01.007	1A07	Office		
		1.11		04.018	2C03	Consult.		
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		4		05.002	2816	Ph Tech		
		Kall .		05.004	2818	Ph Tes		
				05.008	2823			

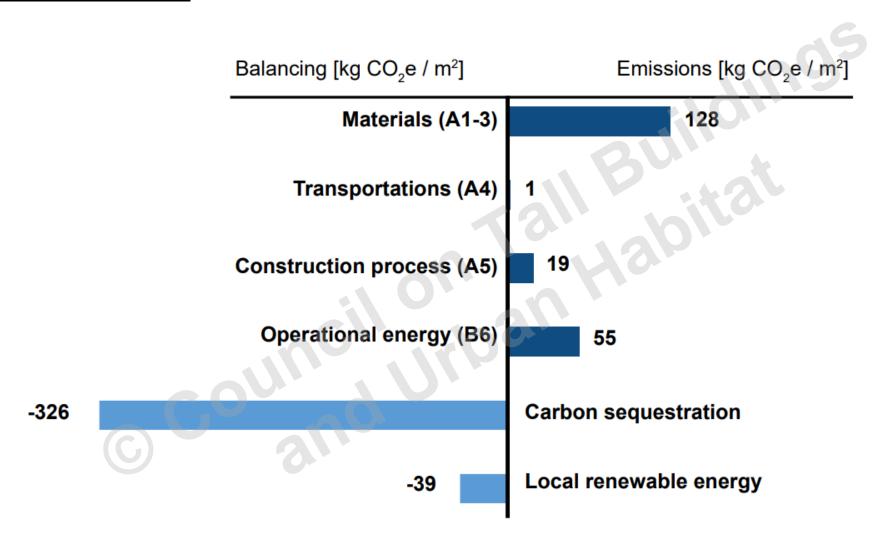
**REVIEW COLLISIONS** 



ON-SITE



#### LIFE CYCLE ANALYSIS



white

#### CLIMATE POSITIVE BUILDING

Carbon Sequesteration = 9000 tons of CO2-e\*

\*CO2 LCA over 50 years

ROBERT SCHMITZ, LEAD ARCHITECT robert.schmitz@white.se +46703742652

