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O4 – BEST PRACTICIES

Cracow, 2021 (updated 08.2023)

RIGA BUILDING COLLEGE
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INTRODUCTION

Best practices examples of buildings was selected by project experts for visualizing possibilities of modern timber buildings. They were asked for selecting 3 local and 2 international examples, who represents best possible way of supporting course curriculum. Lesson learnt from this approach is that markets, buyers demands and legislative approach is very different in each country. Research shows, that on some markets timber construction is very popular and demanded by developers and buyers – on other examples are singular and there is a significant technological delay compering to other.

Selected examples describes variety of technical approaches in time and shows exact used techniques and technologies used in a building that can be used as a reference or starting point according to function, form or height of a building.

Variety of accessible data is different and my change in time so there was selection of parameters done to allow presentation of examples with some common level.

Where it was possible there are some additional materials pointed in a form of a link driving attention to published materials.

We strongly advise tutors of this course to investigate selected examples and add od change 5 of them, to better suit your needs (focusing of types of buildings, heights etc.).

There are also mayor differences between countries in their regulations, so it is always good to check design location for setting a correct set of rules to work. Some examples can suffer from specific regulations (for example fire safety code) and have to include some solutions, that are typical for local markets, and are not needed on other locations.

1. Residential buildings

Residential buildings are specific in terms of how and when they are being used. They are mostly occupied from afternoons till mornings, so noise reduction elements are highly required. Other specific is fire safety and connotation with ownership, which makes this building safer on a start than other types - we want to secure our homes. In pure residential function we also know our neighbours, so no extra access controls are demanded.

Selected examples represents different height and densities but shows variety of façade finishes and form building possibilities.

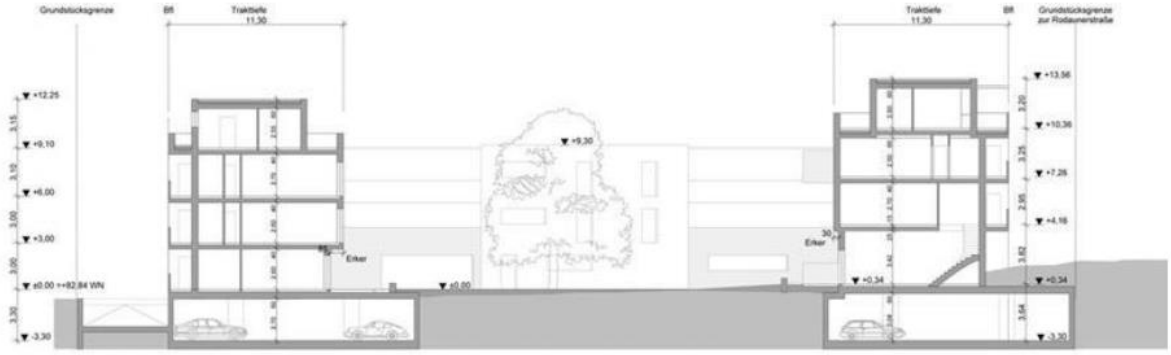
Typology of a buildings is varius, but it represents variety of design approaches and communication solutions in building coreas, staircases, lifts and walk paths. It also allows to show quality and technicality of shaping interiors of apartments and common parts of a building, materials durability and prospected way of using buildings. It is typical to shape residential buildings for non changeable plans, that requires following local building codes for residential function.

1.1. Breitenfurterstraße 450 – 454, Vienna, Austria

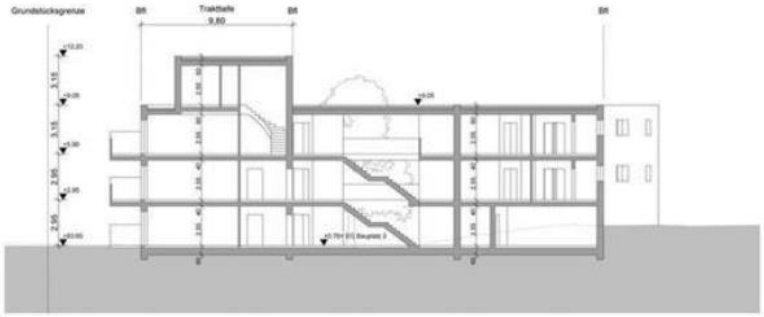
CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Vienna	Austria	2013	3	10.5m	7916m² (GFA)

This residential building was designed by P.Good, Praschl-Goodrazi (architects) and RWT Plus ZT (engineers). It was built in 2013. Building is 3 storeys, 10,5m high and has got 7916m2 of gross floor area. Structure is concrete core and CLT shear walls and ceilings are CLT slabs with max 5,2m span. External walls are made out of CLT panels and timber frame construction. Core and staircases are made out of concrete. Concrete foundation consist basement level. Building has klimaaktiv silver certificate and won Wienwood 15 award.

Source: https://www.pgood.at/breitenfurterstrasse450-454.html

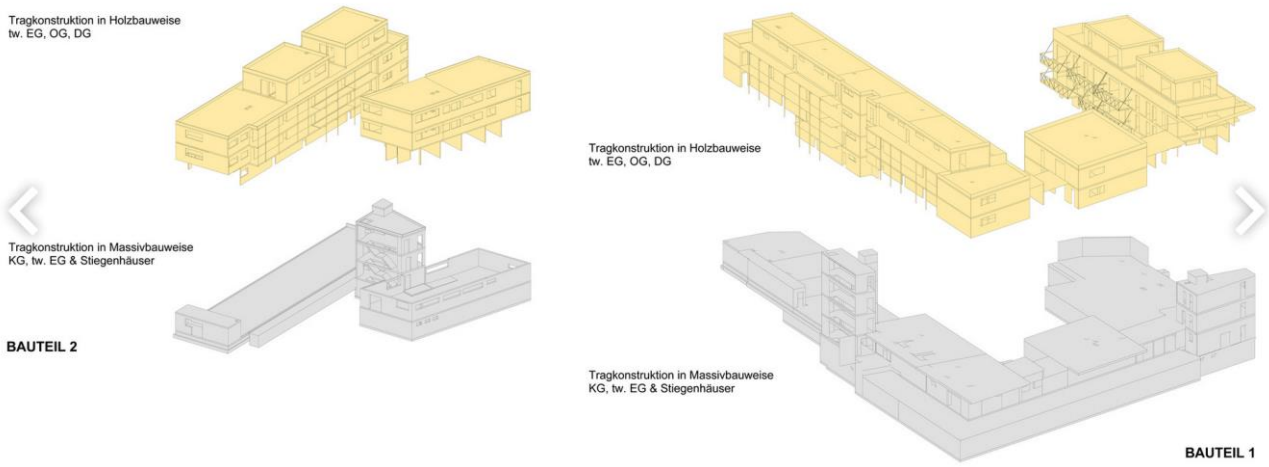


Schnitt Bauteil 1



Schnitt Bauteil 2

Source: https://www.baunetzwissen.de/nachhaltig-bauen/objekte/wohnen/generationen-wohnanlage-in-wien-4043671



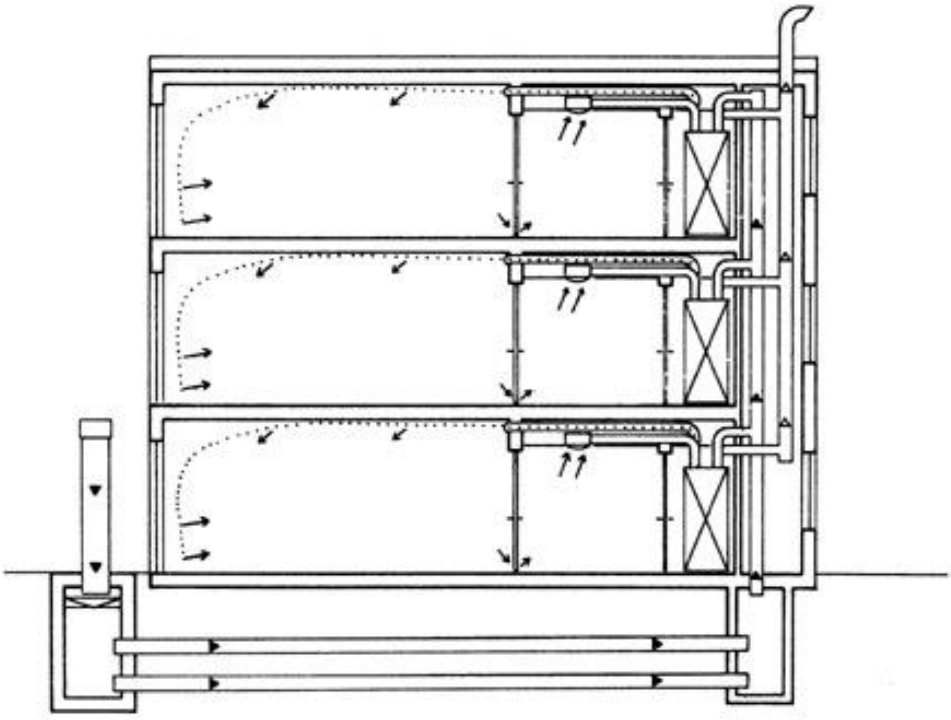
Source: https://www.baunetzwissen.de/nachhaltig-bauen/objekte/wohnen/generationen-wohnanlage-in-wien-4043671

1.2. Residential complex in Ölzbündt, Dornbirn, Austria

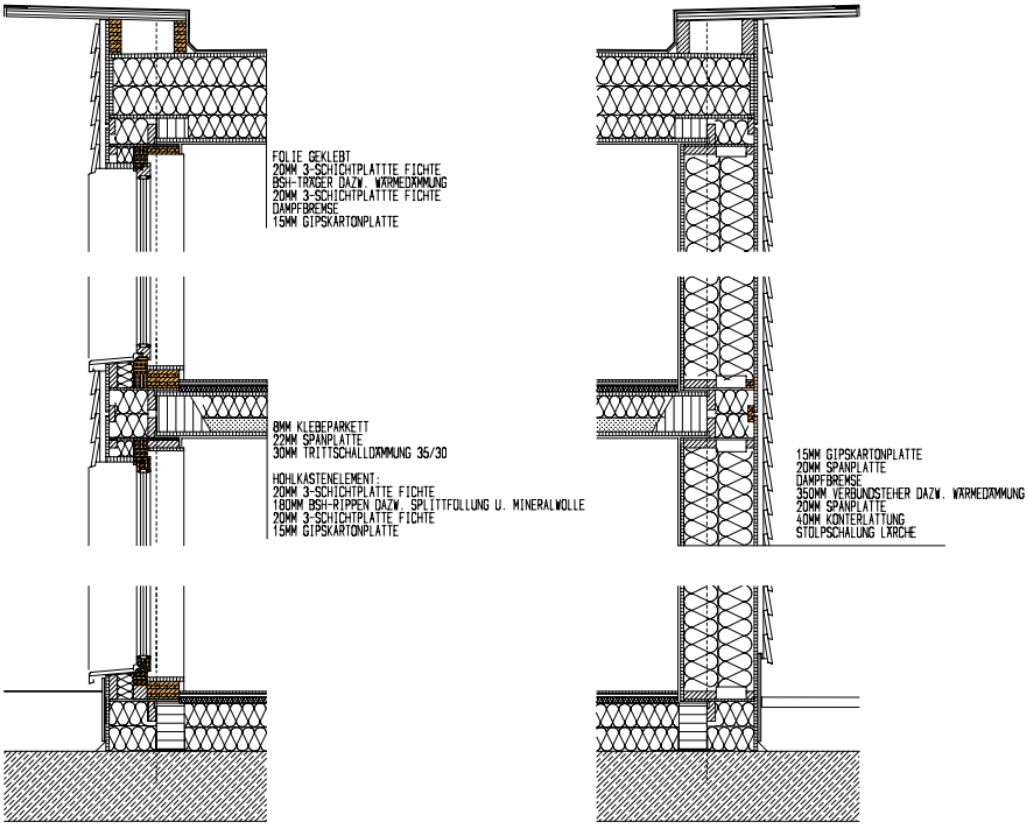
CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Dornbirn	Austria	1997	3	10m	2300m² (GFA)

This residential building was designed by Hermanmn Kaufmann (architects) and Merz Kaufmann Partner (engineers). It was built in 1997. Building is 3 storeys, 10m high and has got 2300m2 of gross floor area. Structure is grid of CLT and timber columns (2,4 x 4,5m grid) and CLT shear walls and ceilings are prefabricated timber frame boxes with max 6,2m span. External walls are made out as non-load-bearing curtain walls – light frame, ventilated and prefabricated. Stairs are made out of steel. Concrete foundation consist basement level. Building has passive house certificate.

Source: https://www.wooddays.eu/it/architecture/projekt/detail/wohnanlage-oelzbuendt/index.html



Source: https://www.wooddays.eu/it/architecture/projekt/detail/wohnanlage-oelzbuendt/index.html



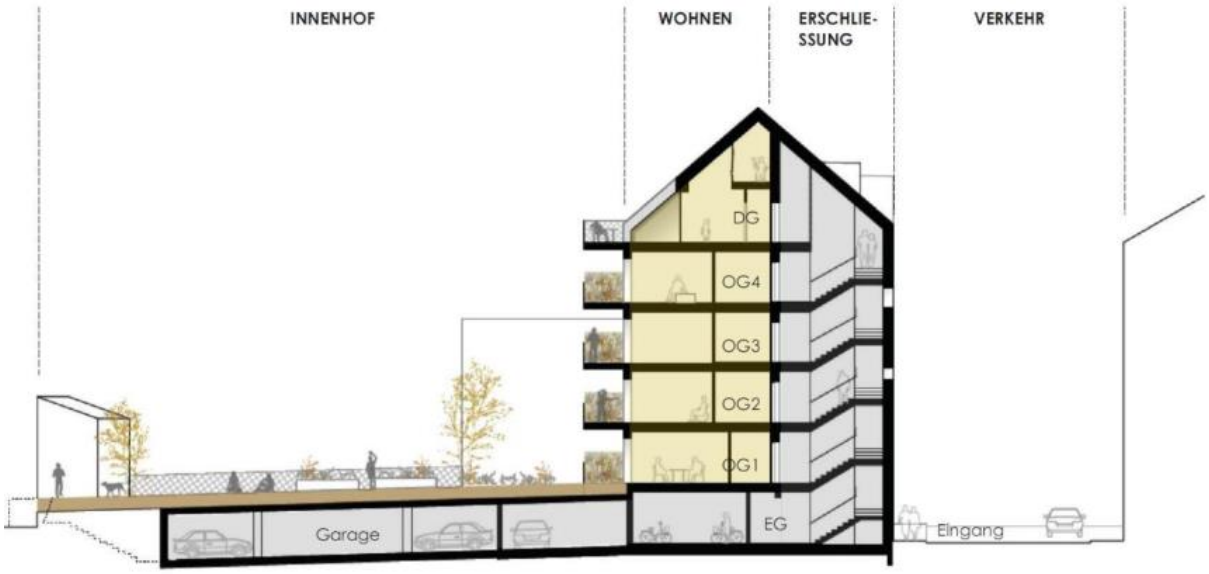
Source: https://www.hkarchitekten.at/en/project/oelzbuendt/

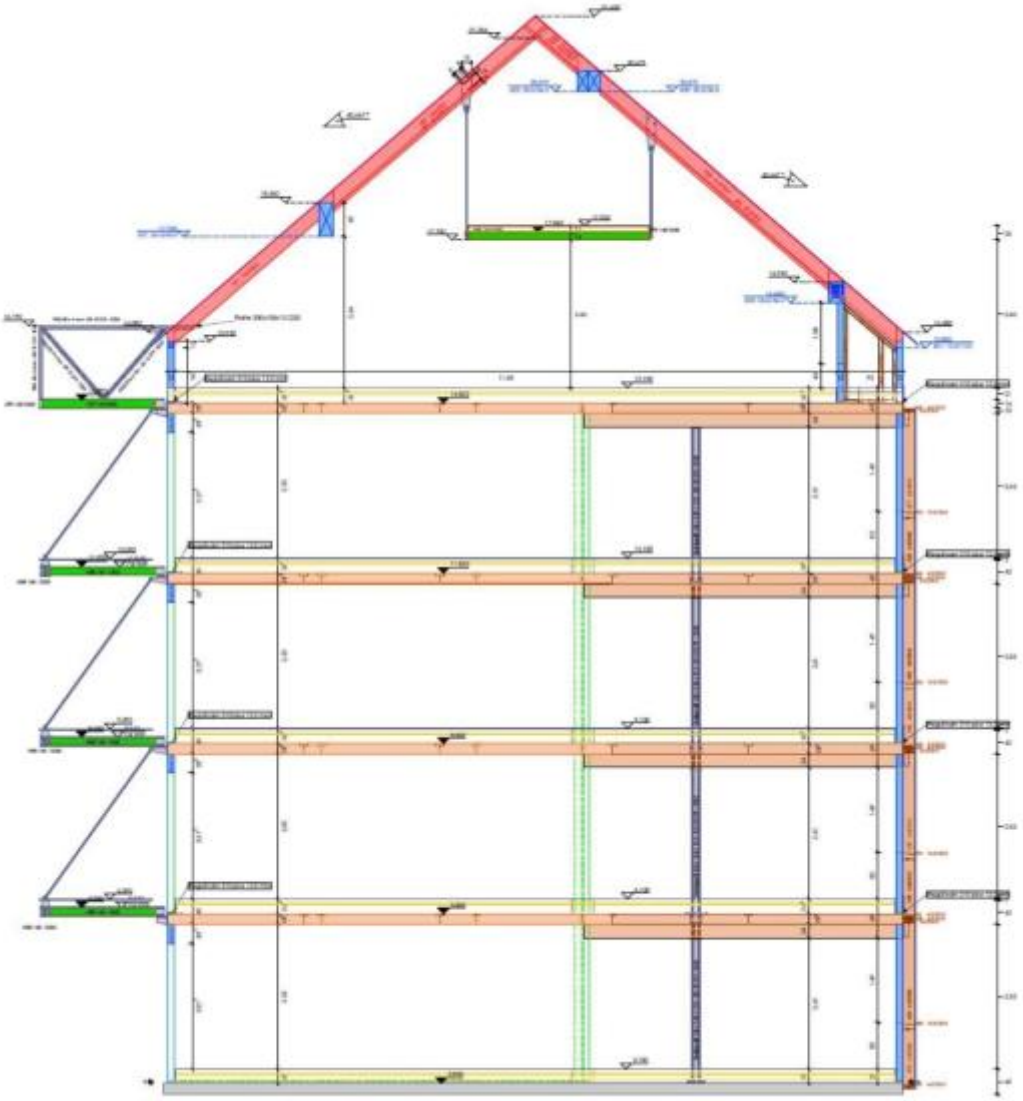
1.3. Rosenstraße Housing, Linz, Austria

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Linz	Austria	2017	5	13.5m	2850m² (GFA)

This residential building was designed by X Architekten (architects) and GG Ingenieure (engineers). It was built in 2017. Building is 5 storeys, 13,5m high and has got 2850m2 of gross floor area. Structure is concrete core, CLT wall system and CLT ceiling slabs. External walls are made out load-bearing walls – ventilated and covered with cement fibre boards.. Stairs are made out of concrete. Concrete foundation consist basement level with partially arranged parking-lot. Building has not been certified.

Source: https://www.xarchitekten.at/holzwohnbau-rosenstrasse/





Source:
https://www.proholz.at/fileadmin/proholz/media/bauholz/2019/bauholzlinz_1_2019_modul1_03_birgmann.pdf

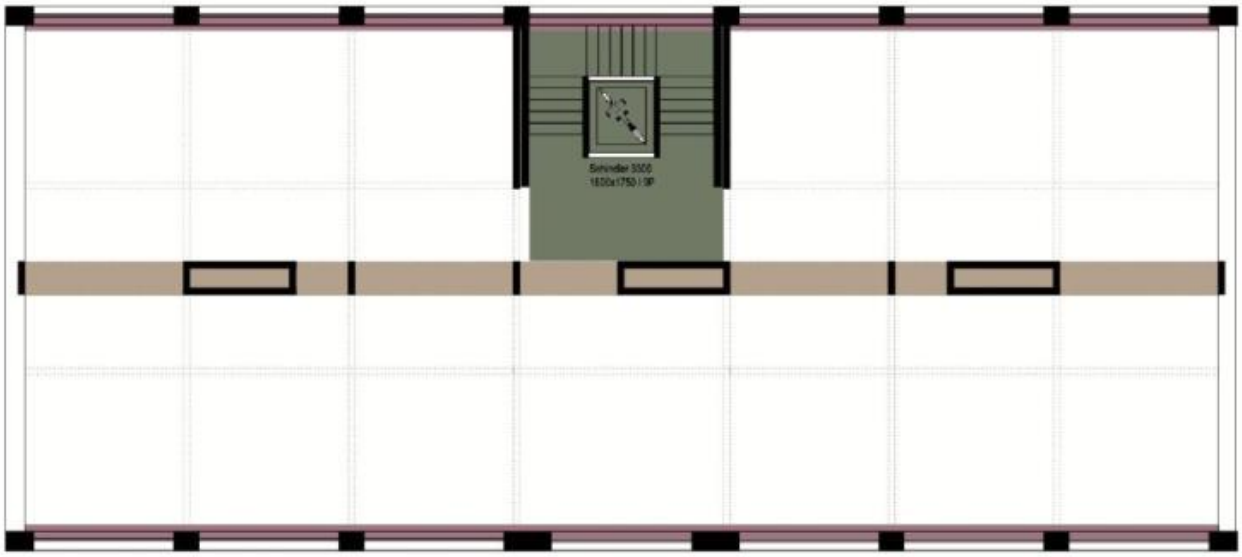
1.4. Swisswoodhouse, Nebikon, Switzerland

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Nebikon	Switzerland	2014	3,5	13m	2525m² (GFA)

This residential building was designed by Bauart Architekten (architects) and Renggli AG (engineers). It was built in 2014. Building is 3,5 storeys, 13m high and has got 2525m^2 of gross floor area. Structure is concrete core and grid of CLT walls and timber columns. Ceilings are prefabricated timber frame. External walls are wooden curtain walls, ventilated and prefabricated. Core and stairs are made out of concrete. Basement level in concrete hosts underground parking lot. Building has Minergie-P-Eco Standard certificate and also won Best Architects Award 16.

Source: https://bauart.ch/projekte/swisswoodhouse-nebikon

Unterzüge aus Holz
Unterzüge aus Beton
Eingeschobenes Treppenhaus



Source: https://bauart.ch/projekte/swisswoodhouse-nebikon

Source: https://bauart.ch/projekte/swisswoodhouse-nebikon

1.5. Hoas Tuuliniitty, Espoo, Finland

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Espoo	Finland	2021	13	42m	7584 m^2

This residential building was designed by Ark.tsto. Jukka Turtiainen (architects) and A-Insinöörit (engineers). It was built in 2021. Building is 13 storeys, 42m high and has got 7584m^2 of floor area. It was tallest timber modular tower in Finland in 2021. Structure is CLT core and grid of CLT shear walls and timber LVL columns. Ceilings are CLT slabs. External walls are CLT + external thermal and cover layers, ventilated and prefabricated. Core and stairs are made out of timber (CLT). Foundation is thick reinforced concrete slab.

Source: https://puuinfo.fi/arkkitehtuuri/block-of-flats/hoas-tuuliniitty-worlds-tallest-modular-wooden-building-completed-in-espoo/?lang=en

Source: https://puuinfo.fi/arkkitehtuuri/block-of-flats/hoas-tuuliniitty-worlds-tallest-modular-wooden-building-completed-in-espoo/?lang=en

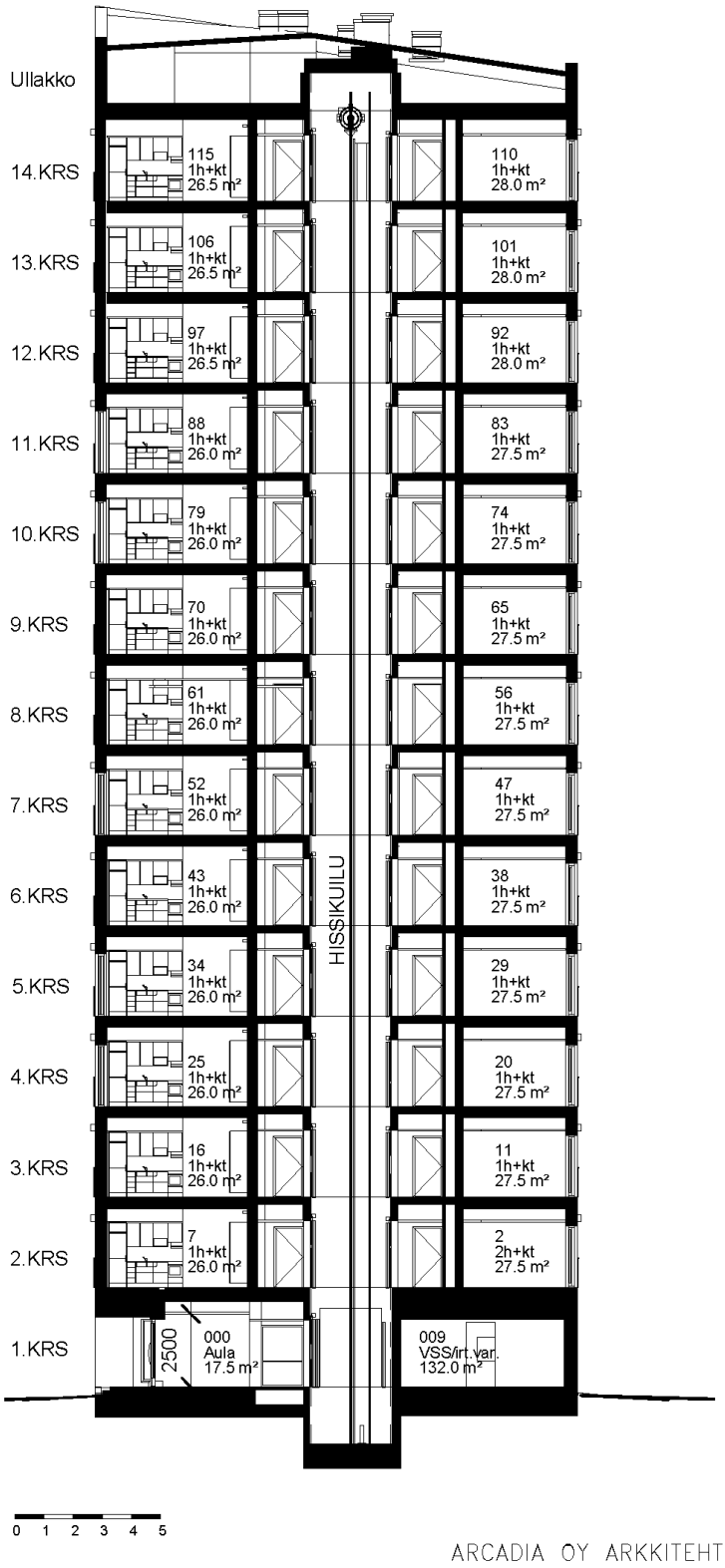
Source: https://puuinfo.fi/arkkitehtuuri/block-of-flats/hoas-tuuliniitty-worlds-tallest-modular-wooden-building-completed-in-espoo/?lang=en

1.6. Lighthouse Joensuu, Joensuu, Finland

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Joensuu	Finland	2019	14	48m	5934 m^2

This residential building was designed by Arkkitehtitoimisto Arcadia Oy (architects) and Joensuun Juva Oy (engineers). It was built in 2019. Building is 14 storeys, 48m high and has got 5934 m^2 of floor area. Structure is mixed - concrete and CLT core and grid of CLT shear walls and timber columns. Ceilings are prefabricated CLT slabs. External walls are CLT panels, ventilated and prefabricated. Massive concrete slab and ground floor reinforced concrete walls make a podium for the whole building.

Source: https://puuinfo.fi/arkkitehtuuri/block-of-flats/lighthouse-joensuu/?lang=en



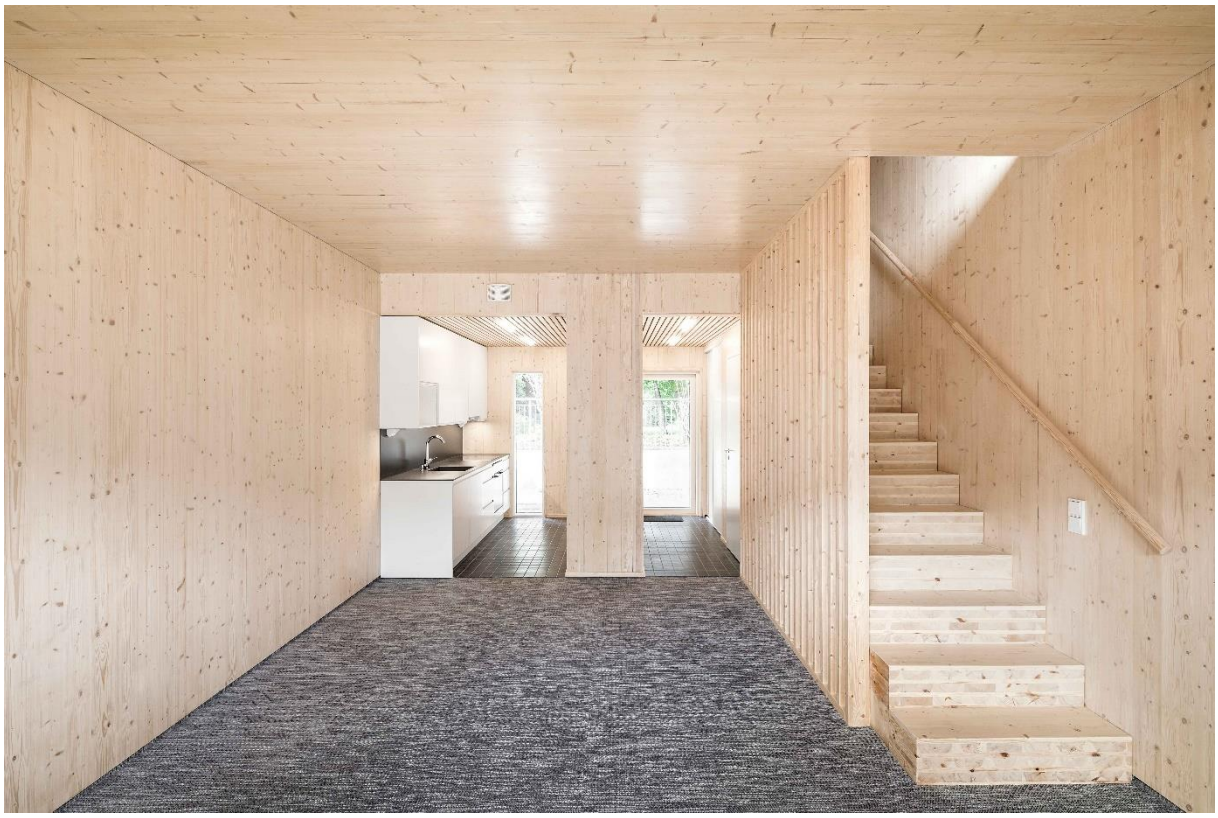
Source: https://puuinfo.fi/arkkitehtuuri/block-of-flats/lighthouse-joensuu/?lang=en

1.7. As Oy Laajasalon Greija, Helsinki, Finland

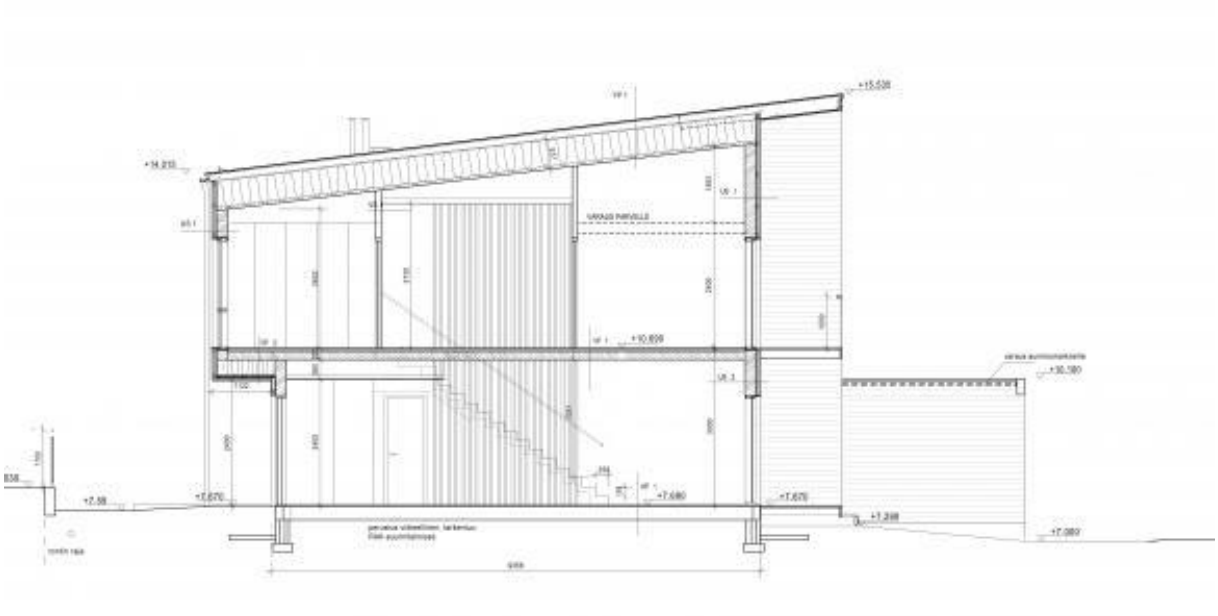
CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Helsinki	Finland	2019	2	6.5m	522 m^2

This residential building was designed by Woodberg Oy (architects) and Koski Consulting Oy (engineers). It was built in 2019. Building is 2 storeys, 6,5m high and has got 522m^2 of floor area. Structure is pure CLT - internal and external walls. Ceilings are prefabricated CLT slabs. Core and stairs are made out of CLT. There is no basement – building has got regular concrete footing.

source: https://puuinfo.fi/arkkitehtuuri/detached-houses/as-oy-laajasalon-greija/?lang=en



source: https://puuinfo.fi/arkkitehtuuri/detached-houses/as-oy-laajasalon-greija/?lang=en



source: https://puuinfo.fi/arkkitehtuuri/detached-houses/as-oy-laajasalon-greija/?lang=en

1.8. Eskolantie, Helsinki, Finland

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Helsinki	Finland	2015	7 (6 in wood)	~21m	7700m^2

This residential building was designed by Matti Iiramo Architects (architects) and Sweco Rakennetekniikka Oy (engineers). It was built in 2015. Building is 7 storeys, and has got 7700m^2 of floor area. Structure is CLT core and grid of CLT shear walls. Ceilings are CLT slabs. External walls are CLT + external thermal and cover layers, ventilated and prefabricated. Core and stairs are made out of timber (CLT). Foundation and ground floor are made in reinforced concrete.

source: https://puuinfo.fi/arkkitehtuuri/block-of-flats/haso-heka-eskolantie-apartment-blocks/?lang=en

source: https://puuinfo.fi/arkkitehtuuri/block-of-flats/haso-heka-eskolantie-apartment-blocks/?lang=en

1.9. CLT Residential Building in Girona, Spain

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Girona	Spain	2020	5	22m	

This residential building was designed by Bosch Capdeferro (architects) and Blazquez Guanter SLP (engineers). It was built in 2020. Building is 5 storeys, 22m heigh and has got 4375m^2 of floor area. Structure is CLT core and grid of CLT shear walls. Ceilings are CLT slabs. External walls are CLT + external thermal and cover layers, ventilated and prefabricated. Foundation are done as underground level – boxed reinforced concrete podium. EGOIN SA was awarded a timber design project

Source: https://www.dlubal.com/en-US/downloads-and-information/references/customer-projects/001173?industry=timber-structures

Source: https://arquitecturaviva.com/works/bloque-6x6-en-gerona

Source: https://arquitecturaviva.com/works/bloque-6x6-en-gerona

1.10. Cirerers, Barcelona, Spain

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Barcelona	Spain	2021	7	26.5m	

This residential building was designed by Celobert (Diego Carrilo Messa) (architects) and Jorge Blasco Miguel and Ferran Peralba Garrabou (engineers). It was built in 2021. Building is 7 storeys, 26,5m heigh. Structure is CLT with partial concrete core and grid of CLT shear wall and timber columns. Ceilings are CLT slabs. External walls are CLT + external thermal and cover layers, ventilated and prefabricated. Ground floor is concrete columns supporting first concrete slab – creating podium for timber structure.

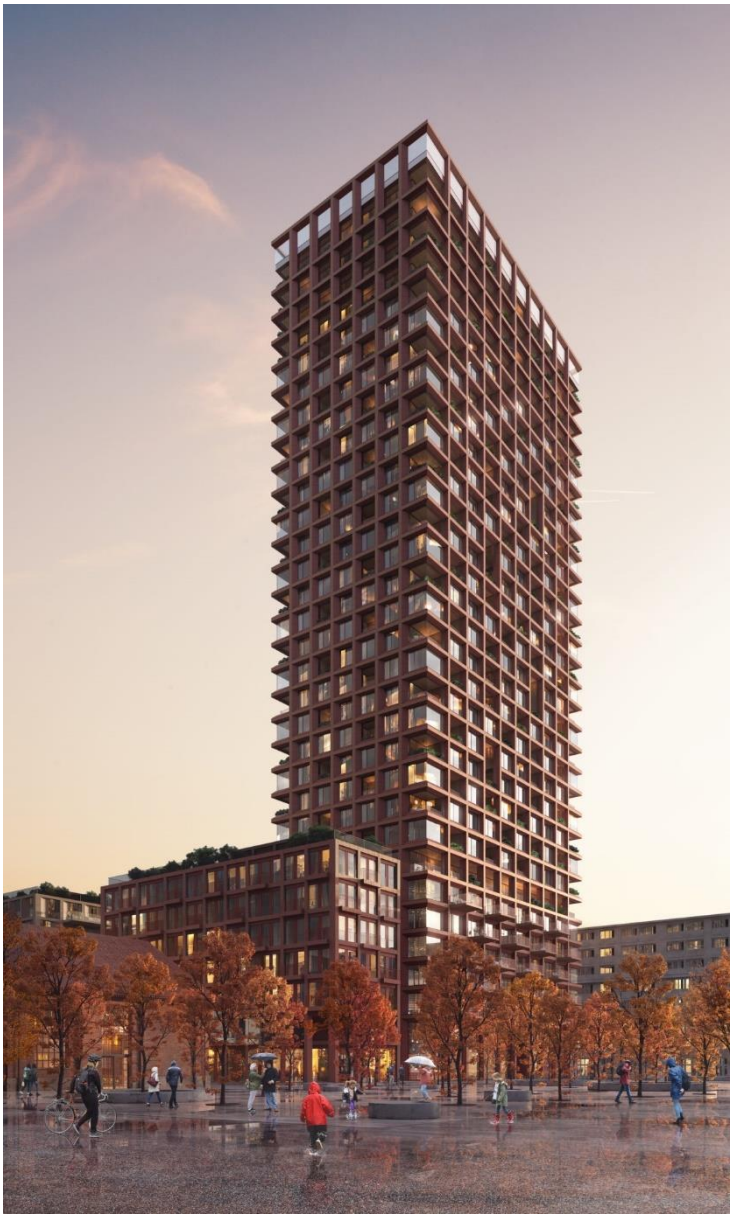
Source: https://www.dlubal.com/en/downloads-and-information/references/customer-projects/001218

Source: https://www.dlubal.com/en/downloads-and-information/references/customer-projects/001218

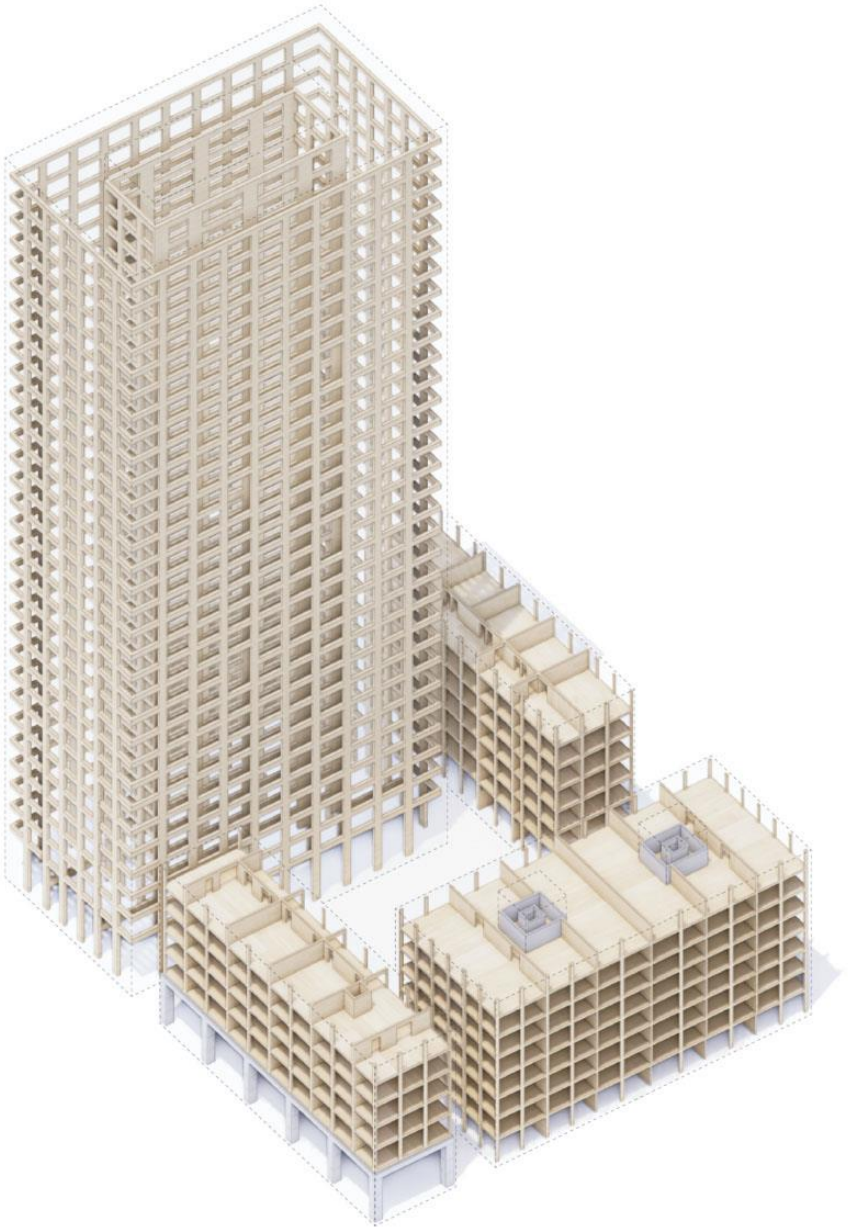
1.11. Rocket&Tigerli, Winterthur, Switzerland

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Winterthur	Switzerland	2022	30	100m	34500m^2

This residential building was designed by Schmidt Hammer Lassen (SHL) (architects) and Implenia (engineers). It was presented as project in 2022 and is planned to be raised ad 2027. Building is 30 storeys, 100m heigh and has got 34500m^2 of floor area. Structure is CLT core and CLT shear walls. Ceilings are CLT slabs. External walls are CLT + external thermal and cover layers, ventilated and prefabricated. Concrete foundation, possibly multi sub-floors will be equipped in this project.



Source: https://www.shl.dk/work/rocket-tigerli



Source: https://www.shl.dk/work/rocket-tigerli

1.12. Forte Living, Melbourne, Austaralia

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Melbourne	Australia	2014	10	32.2m	

This residential building was designed by Andrew Nieland / Lendlease Australia. It was built in 2014. Building is 10 storeys, 32,2m high. Structure is CLT core and walls and timber columns. Ceilings are prefabricated CLT slabs. Structure is stiffened by CLT crossings. External walls are wooden curtain walls, ventilated and prefabricated.

Source: https://www.woodworks.org/resources/survey-of-international-tall-wood-buildings/

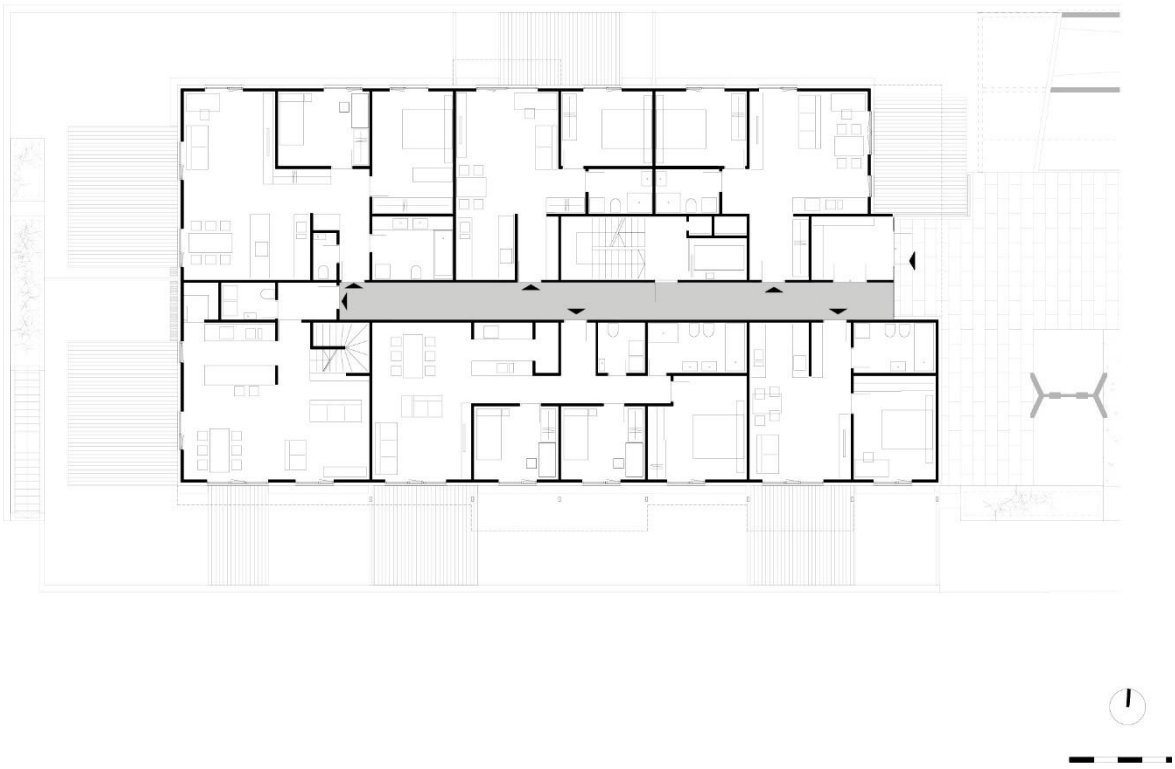
Source: https://www.researchgate.net/figure/Floor-plan-and-exterior-view-of-case-study-building-Source-Lend-Lease-2013_fig1_297712685

1.13. Karantanika Apartments, Domzale, Slovenia

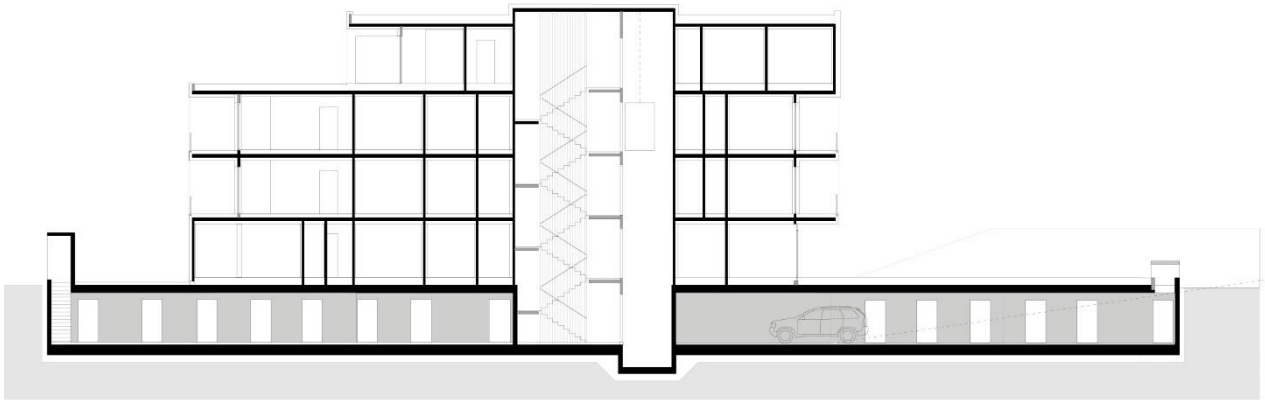
CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Domzale	Slovenia	2018	4	13m	3058m^2 GFA

This residential building was designed by Tria Studio (architects) and CBD (engineers). It was built in 2018. Building is 4 storeys, 13m high and has got 3058m^2 of floor area. Structure is CLT core and grid of CLT walls. Ceilings are prefabricated CLT slabs. External walls CLT panels, ventilated and prefabricated. Core and stairs are made out of CLT. Traditional Concrete foundations. All wood was processed in 1 km rang from building site.

Source: https://outsider.si/tria-studio-karantanika/



Source: https://outsider.si/tria-studio-karantanika/



Source: https://outsider.si/tria-studio-karantanika/

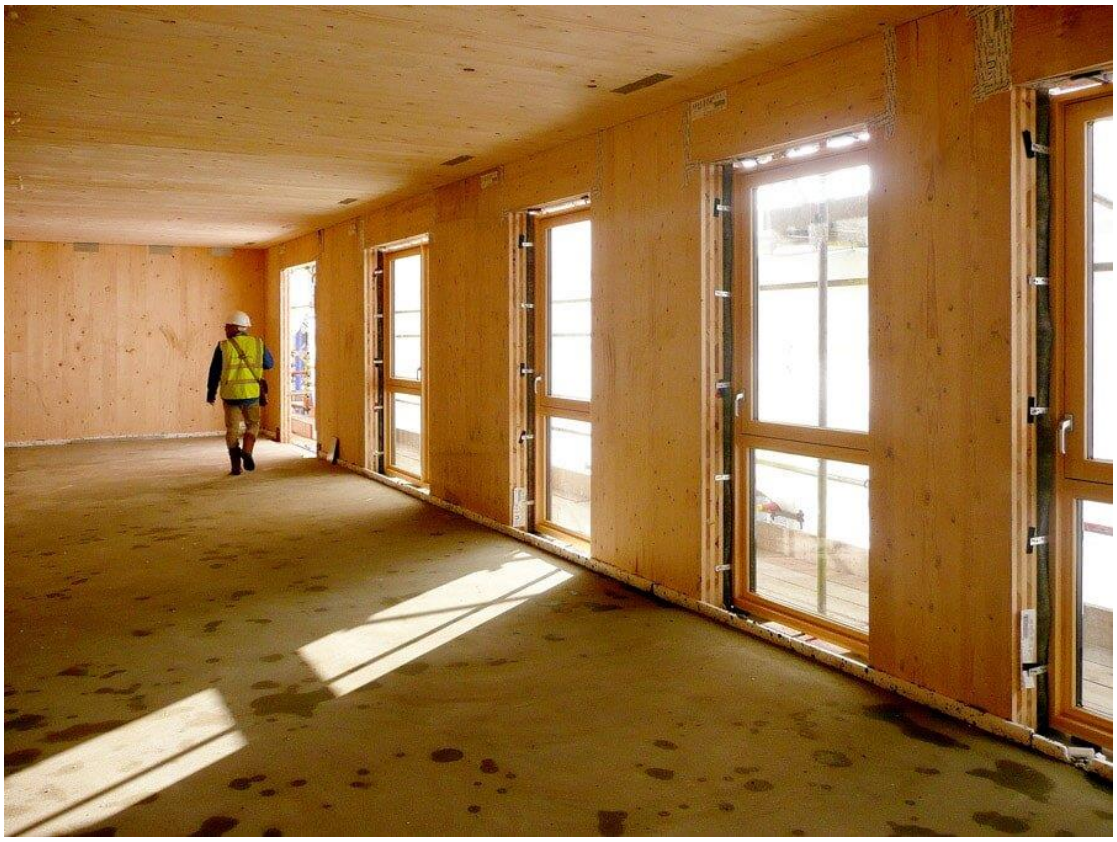
1.14. Bridport House, London, UK

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
London	UK	2011	5-8	25m	

This residential building was designed by X Architekten (architects) and GG Ingenieure (engineers). It was built in 2017. Building is 5 storeys, 13,5m high and has got 2850m2 of gross floor area. Structure is concrete core, CLT wall system and CLT ceiling slabs. External walls are made out load-bearing walls – ventilated and covered with cement fibre boards.. Stairs are made out of concrete. Concrete foundation consist basement level with partially arranged parking-lot. Building has not been certified. In this building timber structures goes up from a ground level. Total amoun1576m3 of wood

Source: http://www.eurban.co.uk/project/bridport-house/

Source: https://www.gandelligroup.com/approfondimento-edifici-in-xlam-multipiano-milano-67-novembre-2014-corso-promolegno/?lang=en

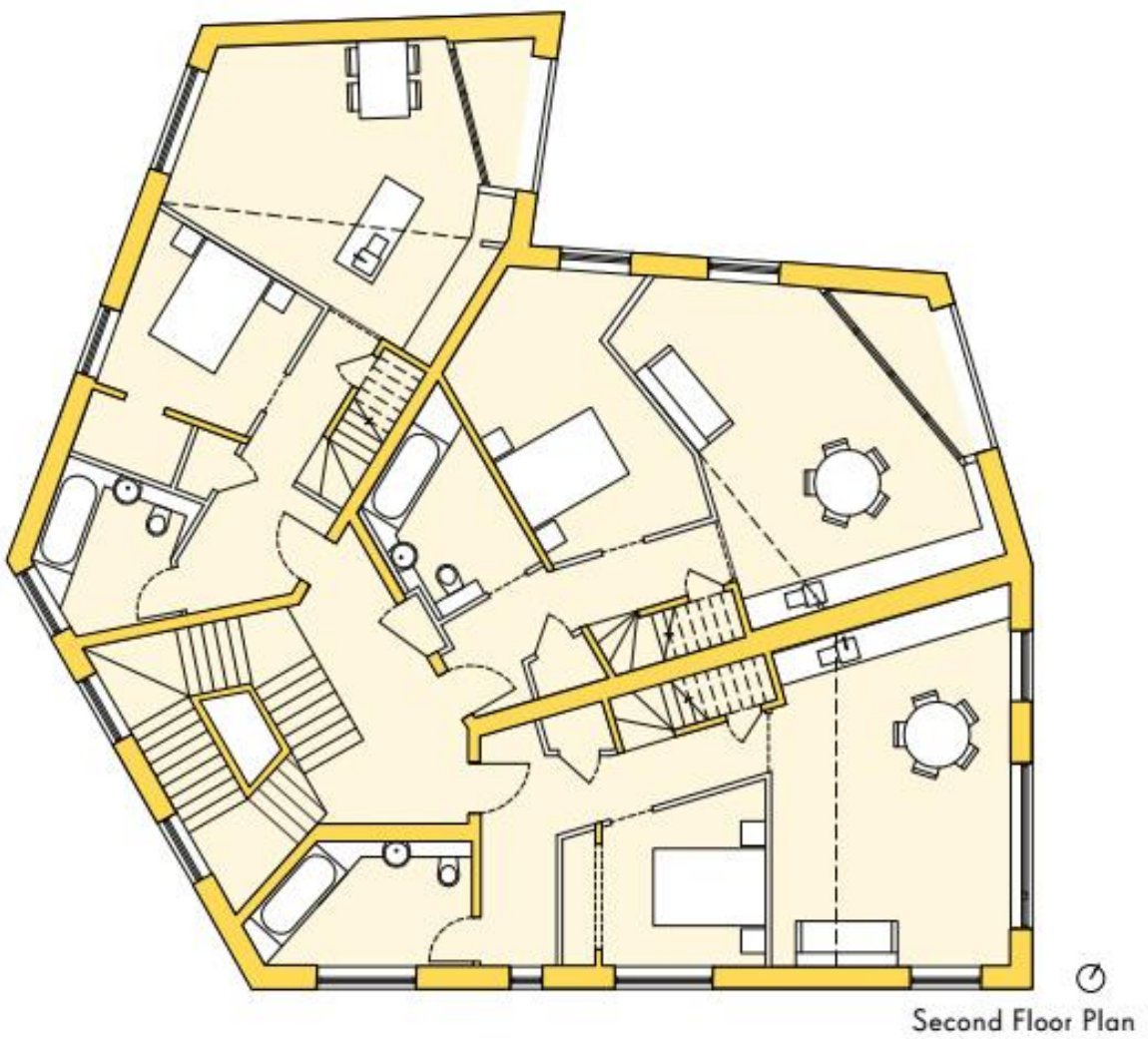


Source: http://www.eurban.co.uk/project/bridport-house/

1.15. Mazarin House, London, UK

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
London	UK	2014	4	11m	605 m2

This residential building was designed by Arboreal Architecture (architects) and KLH UK (engineers). It was built in 2014. Building is 4 storeys, 11m high and has got 605m2 of gross floor area. Structure is CLT core, CLT wall system and CLT ceiling slabs. External walls are made out of CLT walls – ventilated and covered with wood and plaster. Stairs and core are made out of CLT. Concrete foundation is a part of a structure picked in this case. Interesting thing is lack of flat oriented slabs under the roof – it creates a unique pattern of freely shaped spaces in non-orthogonal directions.



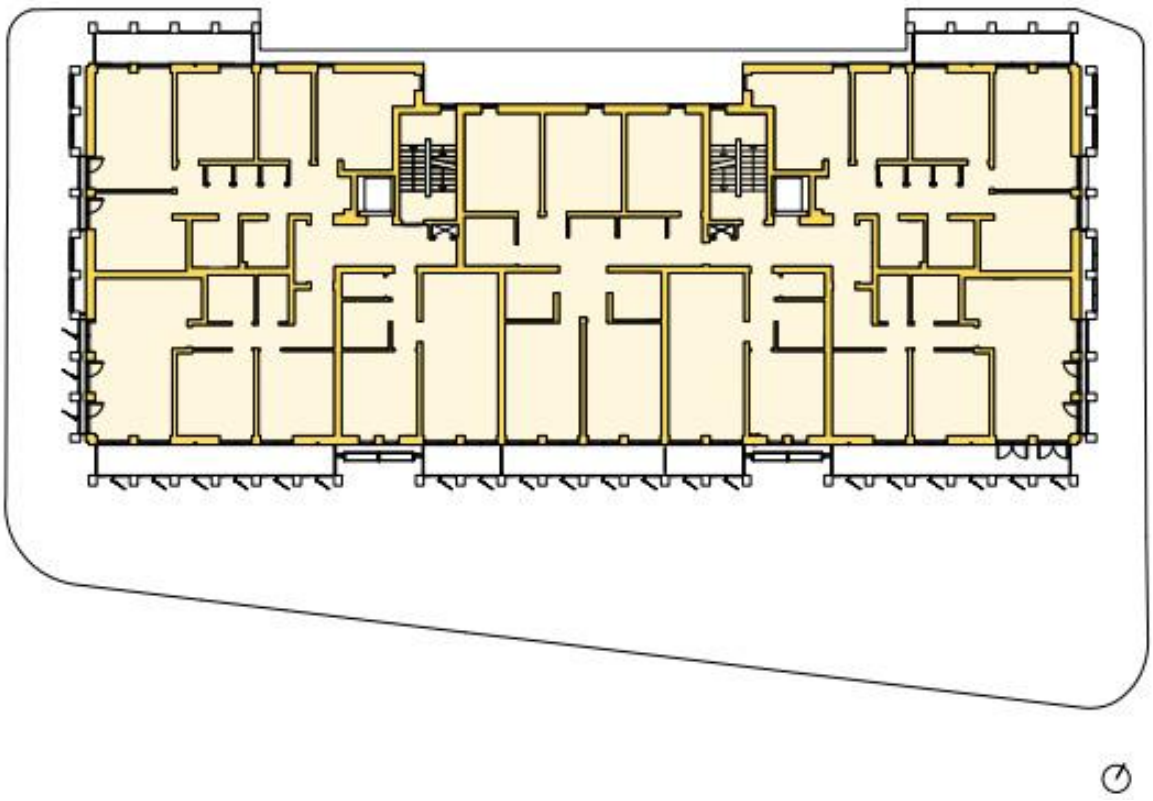
Source: https://www.thinkwood.com/wp-content/uploads/2019/08/Think-Wood-Publication-100-Projects-UK-CLT.pdf

source: https://www.archdaily.com/633279/marzarin-arboreal-architecture

1.16. Kingsgate House, London, UK

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
London	UK	2014	7	23m	

This residential building was designed by Horden Cherry Lee Architects (architects) and KLH UK (engineers). It was built in 2014. Building is 7 storeys, 13m high. Structure is entirely made out of CLT – walls, cores and slabs There is also a secondary row of external columns made as decorative pieces – made with other metal material.. External walls are made out of CLT walls – ventilated and covered with wood and plaster. Stairs and core are made out of CLT. Concrete foundation is a part of a structure picked in this case. It was 1092m3 of timber used for raising this building.



Source: https://www.thinkwood.com/wp-content/uploads/2019/08/Think-Wood-Publication-100-Projects-UK-CLT.pdf

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Source: https://www.thinkwood.com/wp-content/uploads/2019/08/Think-Wood-Publication-100-Projects-UK-CLT.pdf

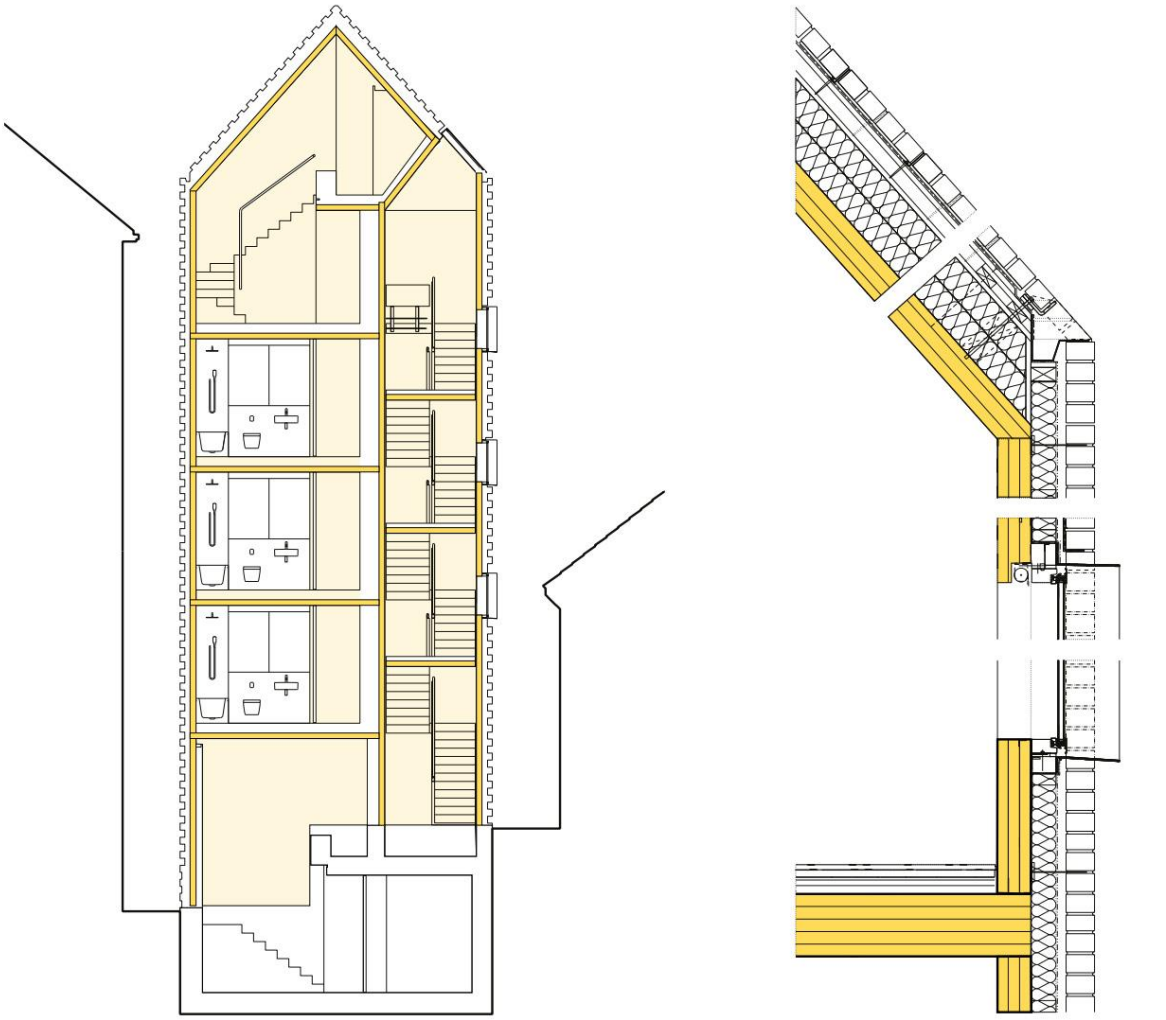
1.17. Barretts Grove, London, UK

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
London	UK	2016	5	18m	635m^2

This residential building was designed by Groupwork (architects) and Egoin (engineers). It was built in 2016. Building is 5 storeys, 18m high and has got 635m2 of floor area. Structure is entirely made out of CLT – walls, cores and slabs External walls are made out of CLT – ventilated and covered with wood and plaster. Stairs and core are made out of CLT. Concrete foundation is a part of a structure under ground level.

Source: https://www.thinkwood.com/wp-content/uploads/2019/08/Think-Wood-Publication-100-Projects-UK-CLT.pdf

Source: https://www.thinkwood.com/wp-content/uploads/2019/08/Think-Wood-Publication-100-Projects-UK-CLT.pdf



Section and Detail

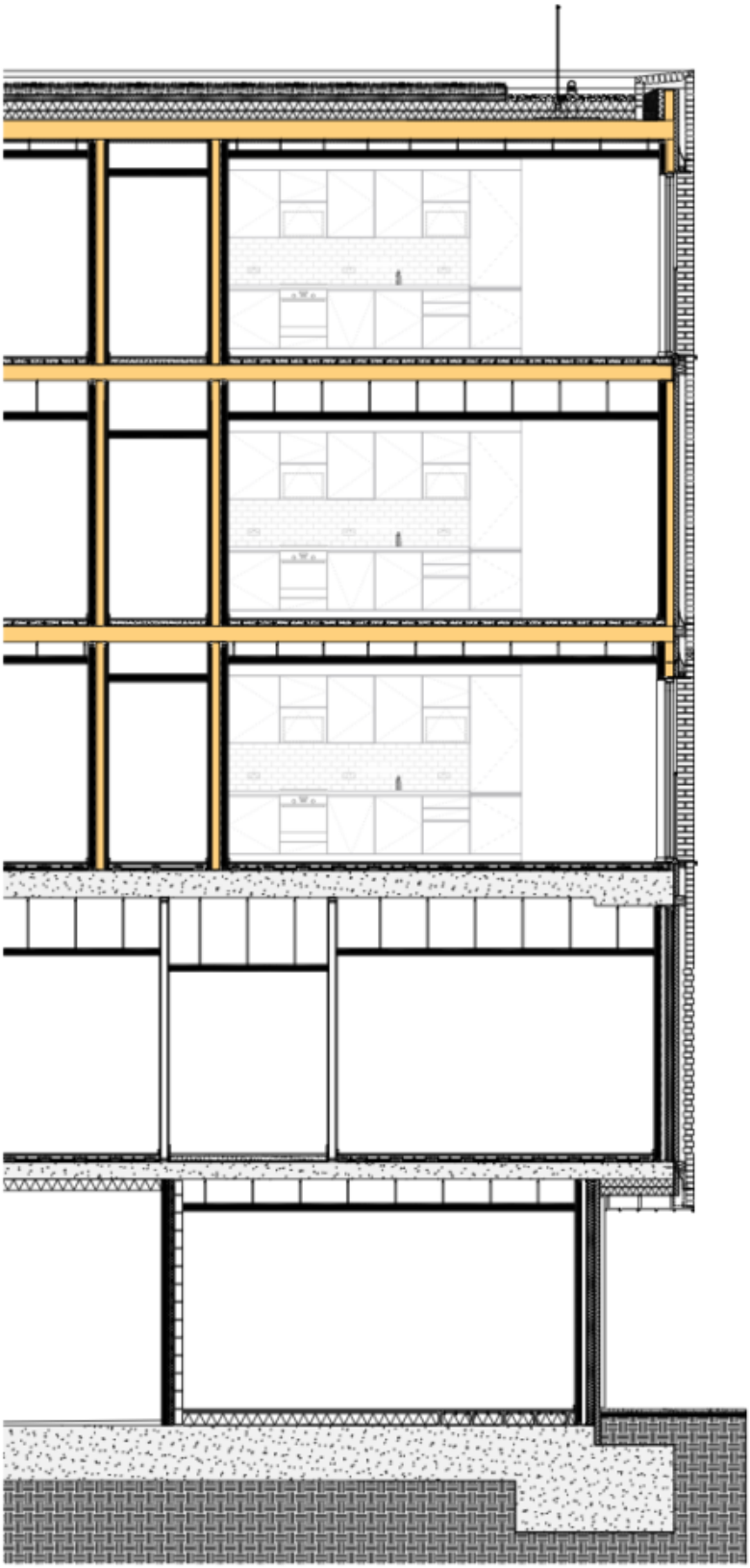
Source: https://www.thinkwood.com/wp-content/uploads/2019/08/Think-Wood-Publication-100-Projects-UK-CLT.pdf

1.18. Trafalgar Place, London, UK

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
London	UK	2015	4-10	36m	1800m2

This residential building was designed by dRMM (architects) and Eurban (engineers). It was built in 2015. Building is 4 to 10 storeys, 36m high and has got 1800m2 of floor area. Structure is entirely made out of CLT – walls, cores and slabs External walls are made out of CLT – ventilated and covered with wood and plaster. Brick is being used as an external façade material – Heavier then structural part. Stairs and core are made out of CLT. Concrete podium is shallow foundation slab and two bottom floors in reinforced concrete. Above that level structure is pure CLT.

Source: https://www.thinkwood.com/wp-content/uploads/2019/08/Think-Wood-Publication-100-Projects-UK-CLT.pdf



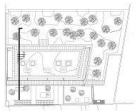
Source: https://drmmstudio.com/insight/hybrid-timber-structure/

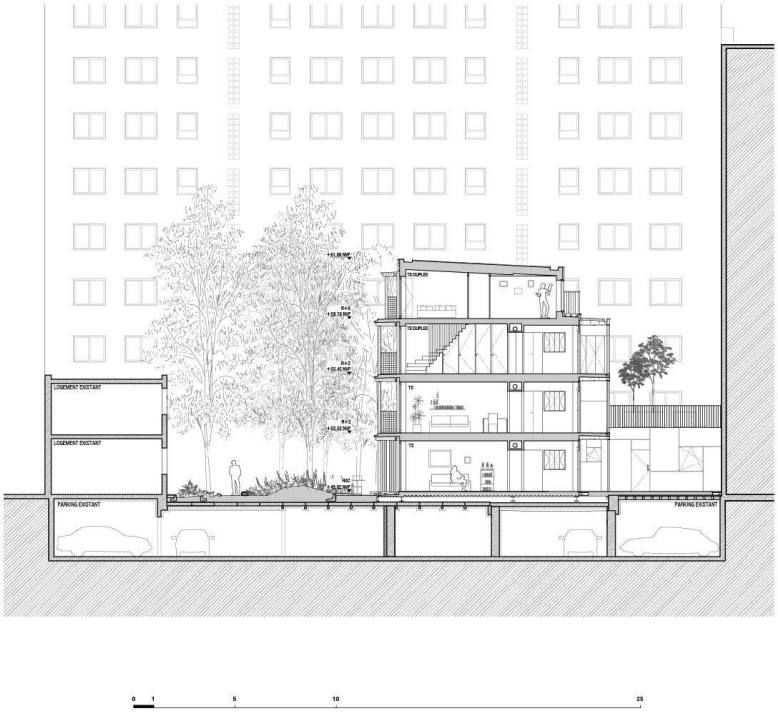
1.19. 73 Saint Mande Housing, Paris, France

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Paris	France	2020	4	12m	716m^2

This residential building was designed by Mars Architects (architects) and Scyna 4 (engineers). It was built in 2020. Building is 4 storeys, 12m high and has got 716m2 of floor area. Structural aspects were limited by building location, which is in a courtyard surrounded by existing buildings. Only access point was to move elements through underground parking lot. Because new building was to be placed over existing structural slab of parking lot beneath weight was also crucial matter. Structure is timber clt core with clt slabs. External walls and non-load bearing walls are in light frame. Façade is insulated and ventilated. Building was signed on a list in Mies van der Rohe building of a year award.

Source: https://afasiaarchzine.com/2021/02/mars-architectes/

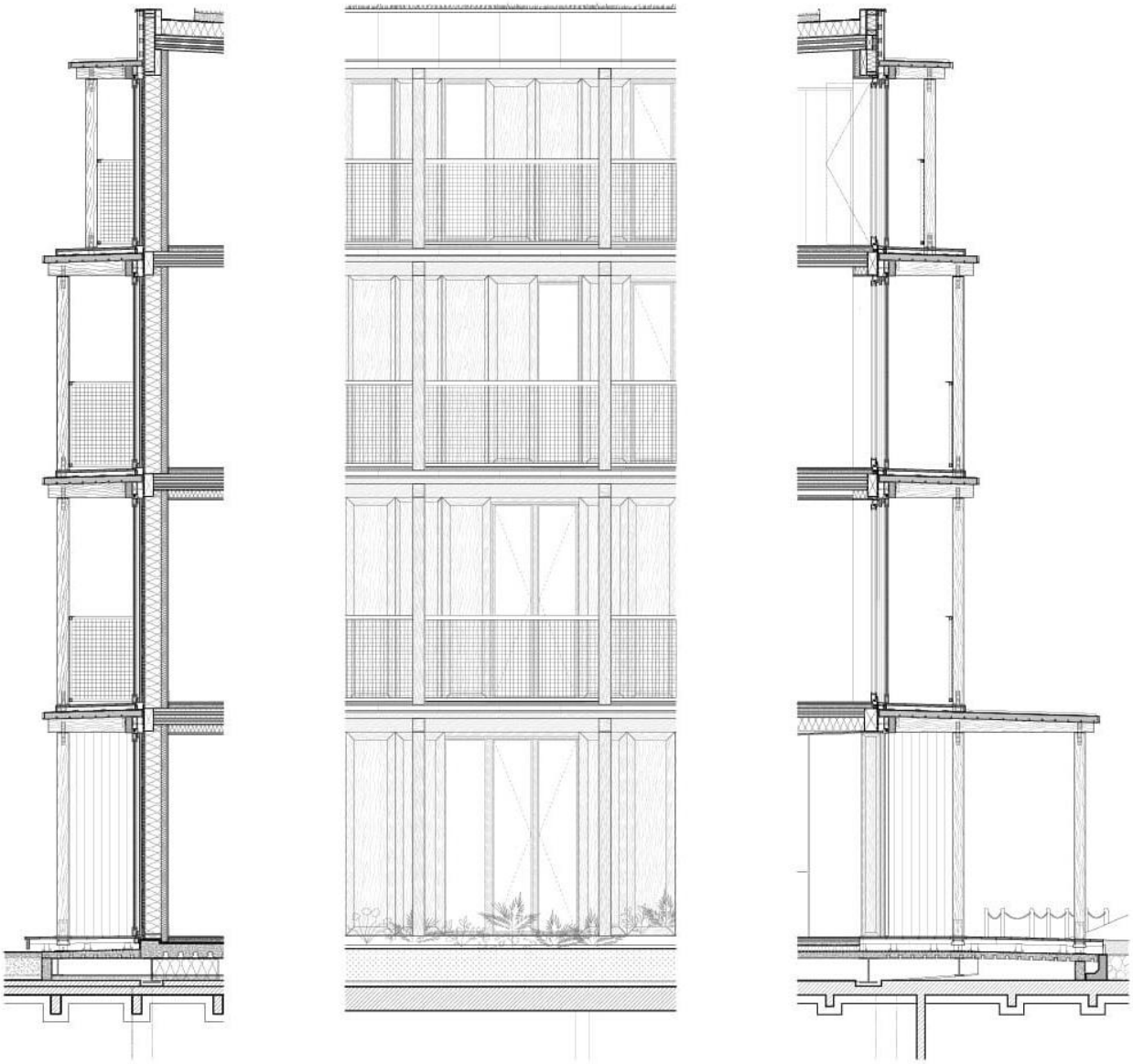




Source: https://afasiaarchzine.com/2021/02/mars-architectes/

R+2

Source: https://afasiaarchzine.com/2021/02/mars-architectes/



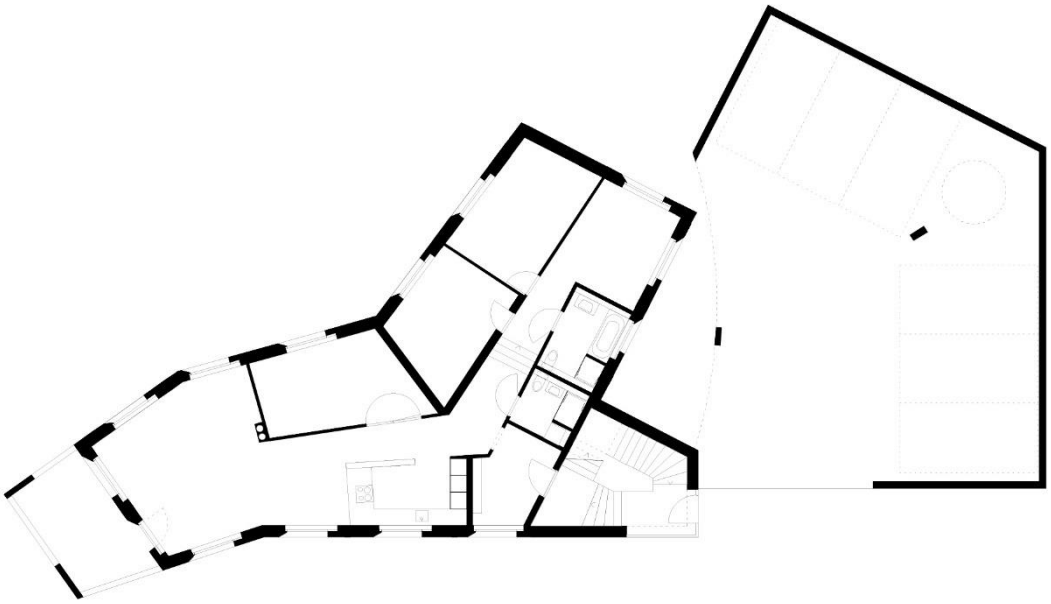
Source: https://afasiaarchzine.com/2021/02/mars-architectes/

1.20. Gapont, Triesen, Liechtenstein

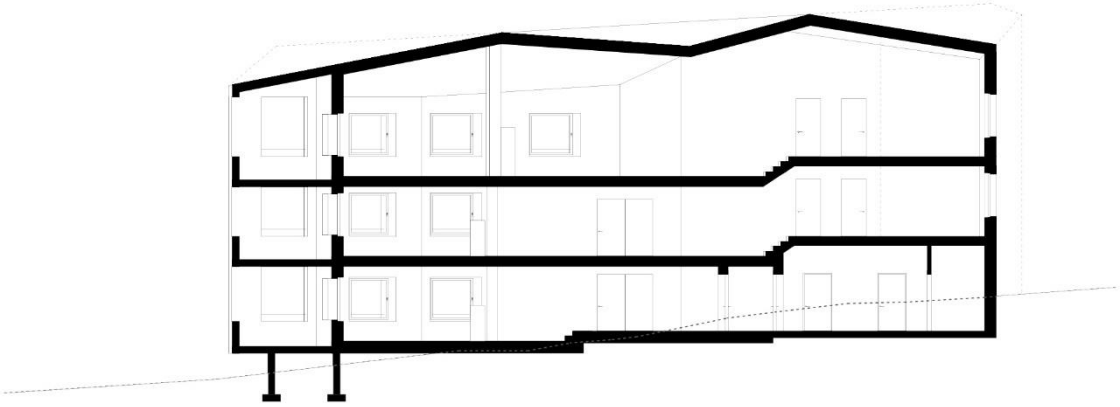
CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Triesen	Lichtenstein	2015	3	~12m	816m^2

This residential building was designed by Uli Mayer, Urs Hüssy Architekten ETH/SIA, Triesen (LI) (architects) Wenaweser und Partner Bauingenieure AG, Schaan (LI); Holz: XYLO AG, Schaan (LI) (engineers). It was built in 2015. Building is 3 storeys, 12m high and has got 816m2 of floor area. Structure of a building is mixed: basements (foundation) and stairs cores are made in concrete. Load bearing walls and ceilings are in CLT timber structures. Timber structure was erected in 3 working days. Building was awarded with German Design Award 2018, LIA Auszeichnung für Gutes Bauen in Liechtenstein.

Source: https://www.triplewood.eu/en/projects/multi-family-house-gapont



Source: https://www.triplewood.eu/en/projects/multi-family-house-gapont



Source: https://www.triplewood.eu/en/projects/multi-family-house-gapont

2. Mixed use buildings

Mixed use buildings are independent group of examples, as they represent different approach. Security and safety problems are very vivid in this group, as there is a mix of different user types (temporary, one time users and long term residents), different occupancy timing – work and commercial users during a day, and residents after work and during the night. There is also different fire safety classification for both, so building technology require to combine both. Usually commercial and living zones have got independent aesthetics, so also different finish types or different technologies are being required to apply on one building.

Technologically this type of buildings usually uses two or more different types of structures combined to work as one. Separate requirements of inner space shaping influences modularity and quality of materials and rooms in both functions. Usually it also enables to coexist two different kinds of fire safety zones side by side to be coded into building structure.

Those vivid examples shows variety and flexibility of approaches as durability, cost consumption and quality.

2.1. Dalston Works, London, UK

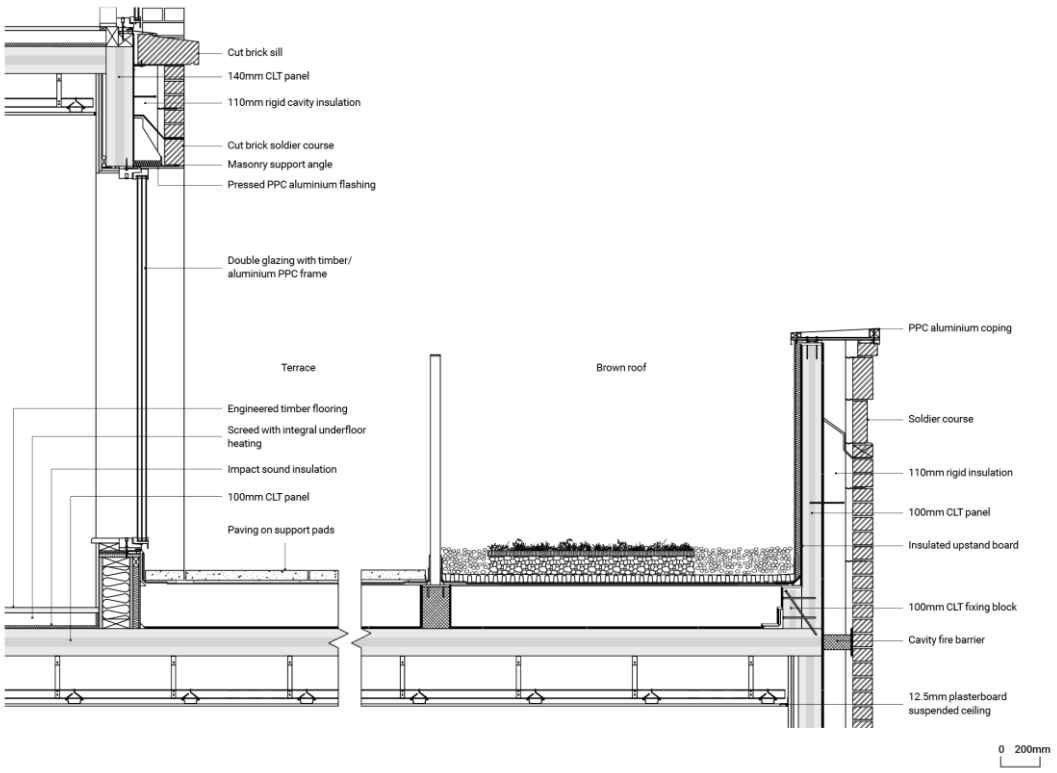
CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
London	UK	2017	10	34m	~16000m^2 (~11000m^2 flats)

This commercial + residential building was designed by Waugh Thistleton Architects (architects) and amboll (CLT & façade), PJCE (concrete and civils) (engineers). It was built in 2017. Building is 10 storeys, 34m high and has got 16000m2 of floor area (11000 for residential purposes). Structure is entirely made out of CLT – walls, cores and slabs Slabs are hybrid timber concrete mix for stability and load transfer. External walls are made out of CLT – ventilated and covered with wood and plaster. Brick is being used as an external façade material – Heavier than structural part. Stairs and core are made out of CLT. High concrete podium is standing on shallow foundation slab over partial parking lot underneath. Entire ground floor level is made out of massive reinforced concrete walls, columns and slabs.

Source: https://www.archdaily.com/903839/worlds-largest-clt-building-provides-a-model-for-high-density-urban-housing

Source: https://waughthistleton.com/dalston-works/

Roof terrace detail section



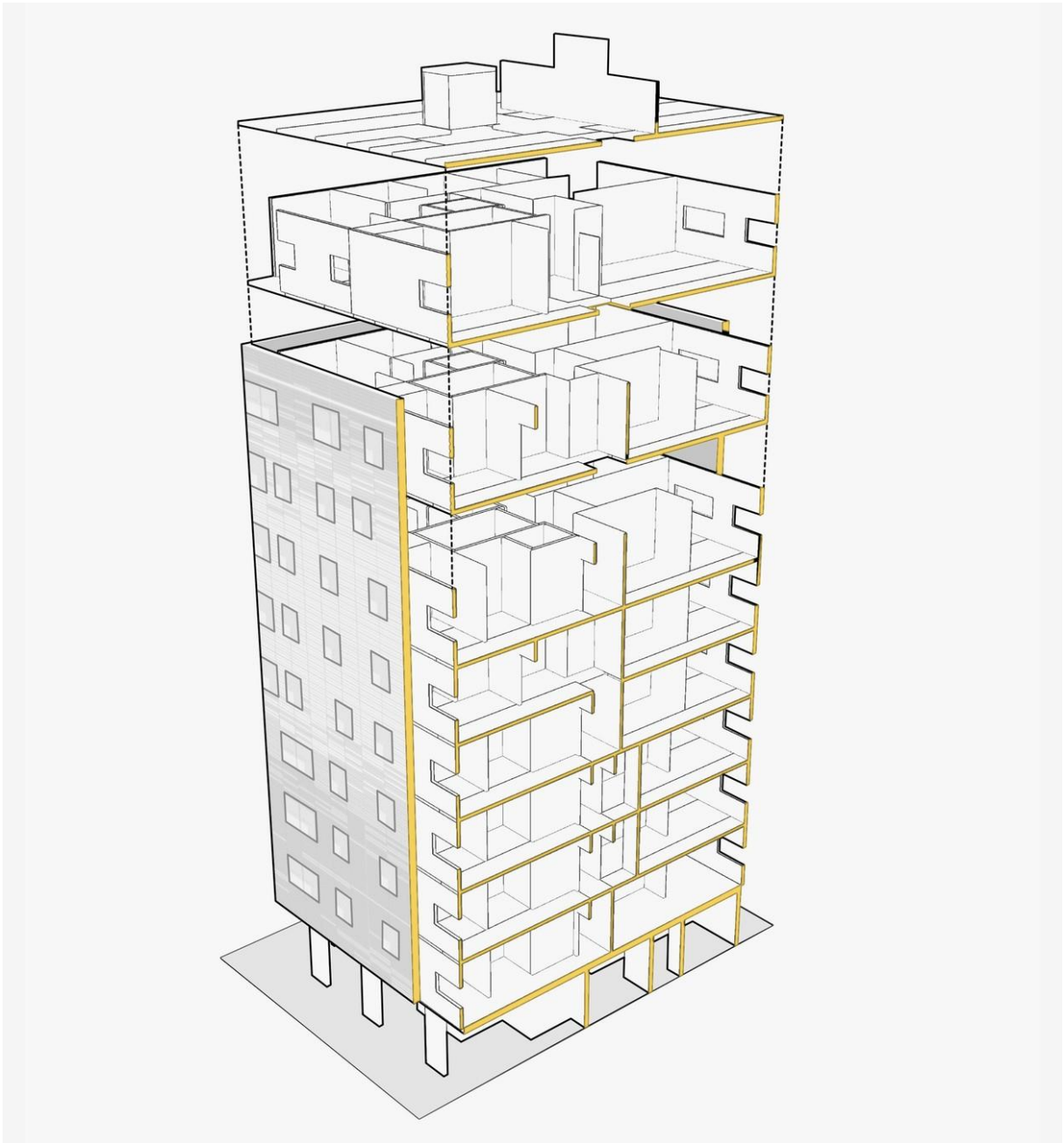
Source: https://www.architectsjournal.co.uk/buildings/high-density-low-carbon-dalston-works-by-waugh-thistleton

2.2. Stadthaus/Murray Grove, London, UK

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
London	UK	2009	9	29m	

This office and residential building was designed by Waugh Thistleton Architects (architects) and Techniker / Jenkins & Potter (engineers). It was built in 2009. Building is 9 storeys, 29m high. Structure is entirely made out of CLT – walls, cores and slabs External walls are made out of CLT – ventilated and covered with wood and plaster. Stairs and core are made out of CLT. There is no traditional concrete podium – foundation slab and timber elements starting from ground level. Building has won many awards – Wood Award 2008, Timber in construction award 2008, and Timber Journal Award 2008.

Source: https://waughthistleton.com/murray-grove/



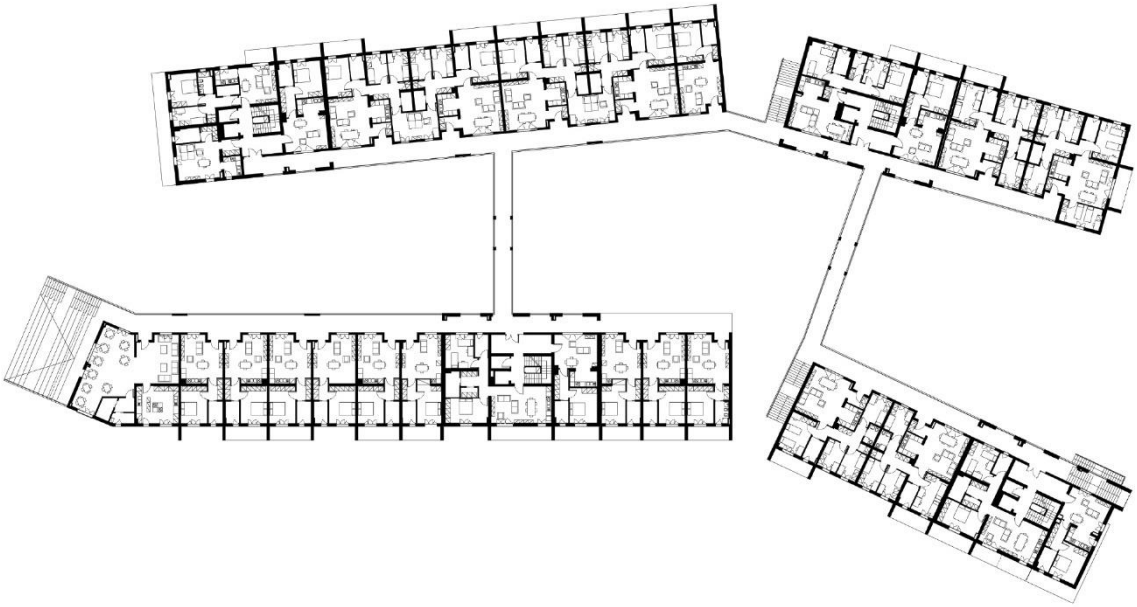
Source: https://waughthistleton.com/murray-grove/

2.3. Social Housing Via Cenni, Milan, Italy

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Milan	Italy	2013	9	27m	9300m^2

This office and residential building was designed by Rossiprodi Associati SrL (architects) and Borlini & Zanini SA (engineers). It was built in 2013. Building is 9 storeys, 27m high and has got 9300m2 of floor area (11000 for residential purposes). Structure is entirely made out of CLT – walls, cores and slabs Some internal walls are light frame. External walls are made out of CLT – ventilated and covered with wood and plaster. Stairs and core are made out of CLT. Ground level is partially buried and covered by walkways and decs but is pure reinforced concrete. What unique in the building is that it was permitted according to seismic regulations to be used with CLT construction as one of the first. It has got CENED certificate and main heating system for it is geothermal heat-pump.

Source: https://archello.com/project/social-housing-in-via-cenni



Source: https://archello.com/project/social-housing-in-via-cenni

Source: https://archello.com/project/social-housing-in-via-cenni

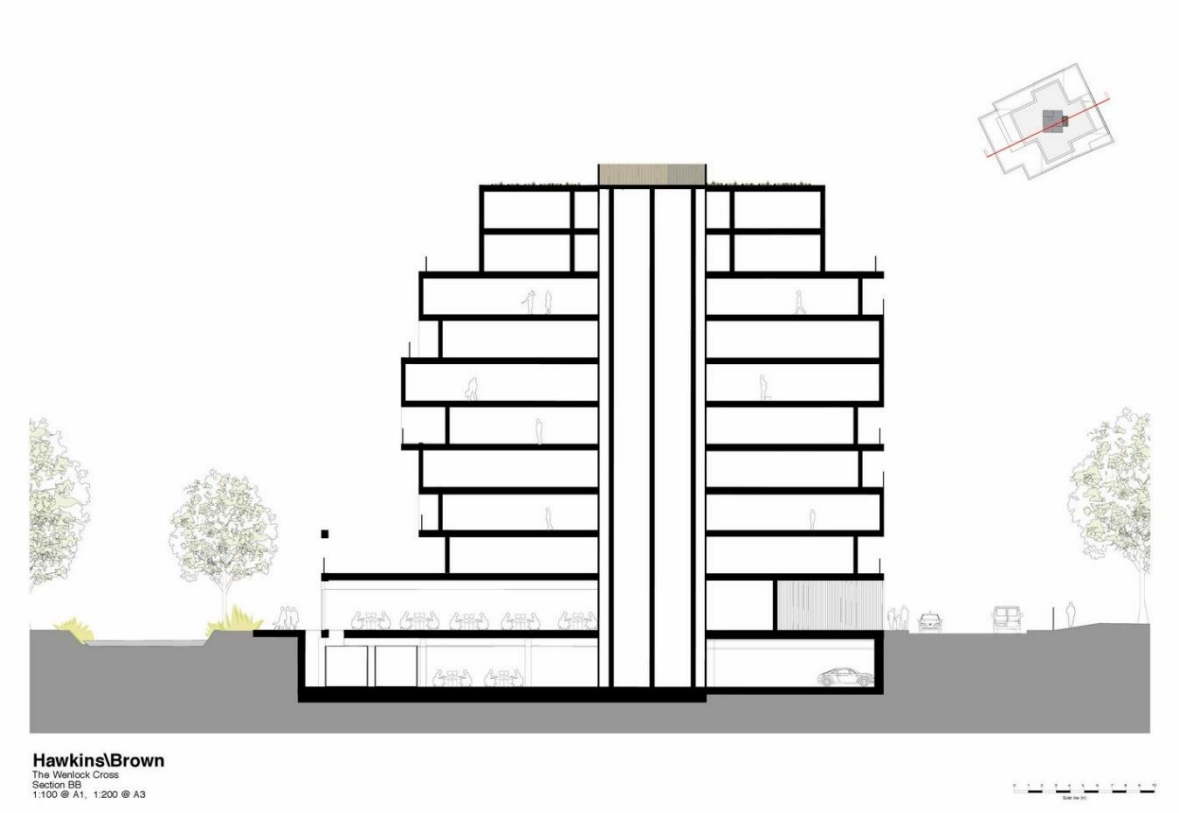
2.4. Wenlock Cross / the cube, Hockney, UK

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Hockney	UK	2015	10	33m	4650m^2 + 1190m^2 office

This commercial and residential building was designed by Hawkins/Brown (architects) and Engenuiti (engineers). It was built in 2015. Building is 10 storeys, 33m high and has got 4650m2 residential and 1190m2 of commercial floor area. Structure is made out of CLT walls, concrete core, CLT slabs and steel columns] External walls are made out of CLT – ventilated and covered with wood, brick, tiles and plaster. Basement level is arranged as parking lot and constructed as two slabs and walls with reinforced concrete. Amount of timber used for wood elements is 1313m3.

Source: https://archello.com/pt/story/19140/attachments/photos-videos

Source: https://archello.com/pt/story/19140/attachments/photos-videos



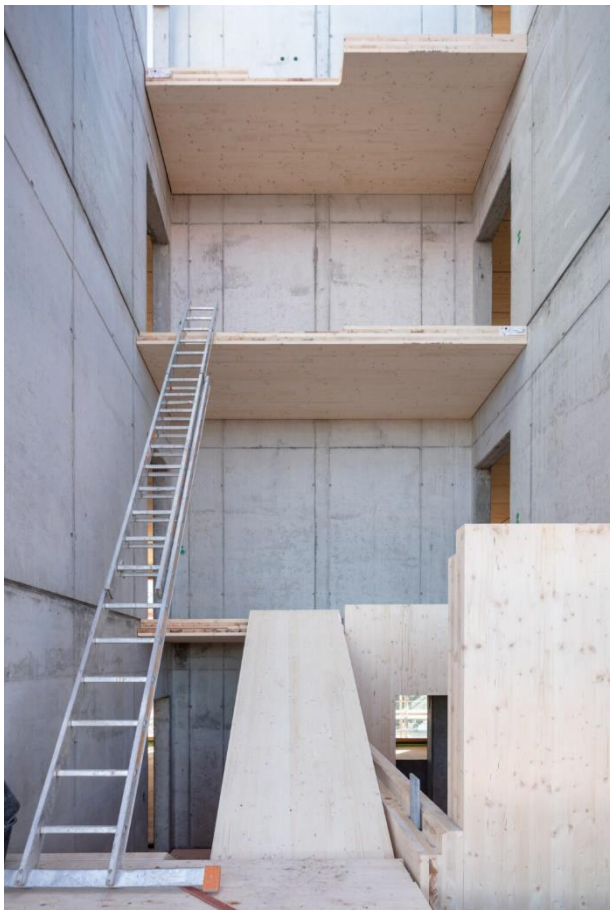
Source: https://archello.com/pt/story/19140/attachments/photos-videos

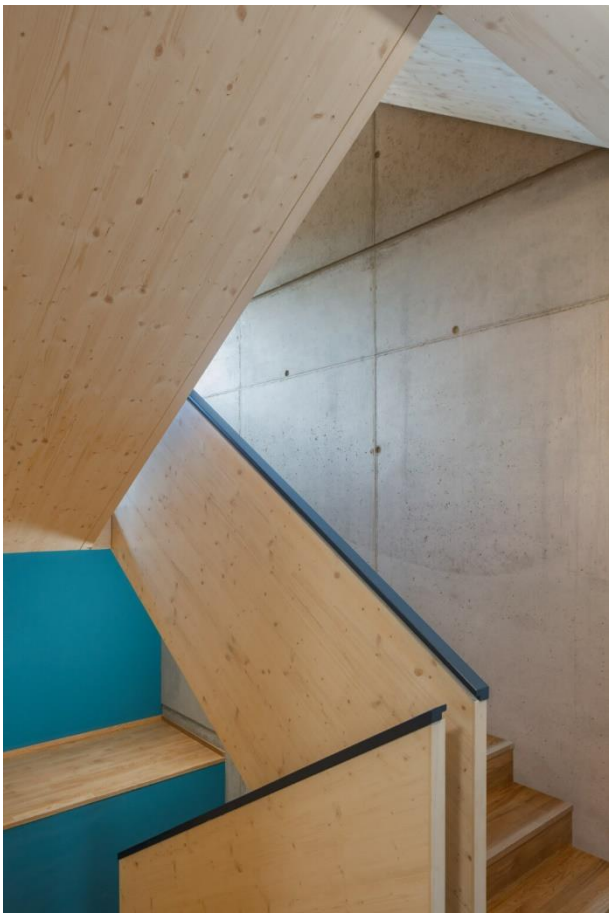
2.5. Walden48, Berlin, Germany

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Berlin	Germany	2022	7	~22m	~7000m^2

This residential with commercial ground floor building was designed by ARGE Scharabi | Raupach (architects). It was built in 2020. Building is 7 storeys, ~22m high and has got 7000m2 floor area. Structure is hybrid: staircase cores and fire dividing walls are in concrete, ceilings are CLT slabs + concrete and other load-bearing walls, stairs and lift shafts are CLT. Building was Finalist of Deutscher Nachhaltigkeitspreis Architektur 2021.

Source: https://holzbauatlas.berlin/walden48_scharabi-architekten/





Source: https://holzbauatlas.berlin/walden48_scharabi-architekten/

Source: https://holzbauatlas.berlin/walden48_scharabi-architekten/

3. Office buildings

Office buildings are one closed group as they represent interesting technological approach, that is hardly represented on other types. In this function you can find long spans and open spaces, that can be rearranged frequently. Structural possibilities are well represented on those examples. In residential buildings room partitions happened to be load-bearing partitions, which divides spans for smaller distances and for optimizing structure height of building elements can be lowered. On office buildings role of cores of buildings and services locations are hardly being find on other examples. In this building type it also important to use technologies and materials that will meet requirements of high durability as those spaces are being used stronger than residential functions (number of workers and customers is massive). It is also a function that is very close with high budgets for building costs – newer technologies, efficient materials and building elements, cutting edge approach that again is not suitable for residential functions.

3.1. Küng Office Building, Alpnach, Switzerland

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Alpnach	Switzerland	2020	4	12m	1144m² (GFA)

This office building was designed by Seiler Linhart Architects (architects). It was built in 2020. Building is 4 storeys, 12m high and has got 1144m2 of gross floor area. Structure is made out of CLT walls and slabs and concrete core. External walls are made out of CLT – in Holzpur technology. Basement level is constructed as bottom slab and walls with reinforced concrete.

Source: https://www.swiss-architects.com/de/architecture-news/bau-der-woche/holz-pur

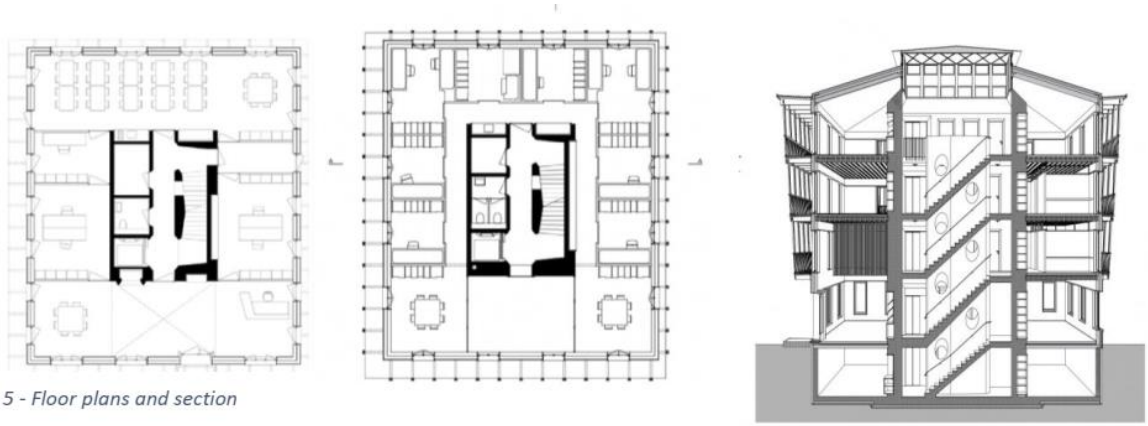
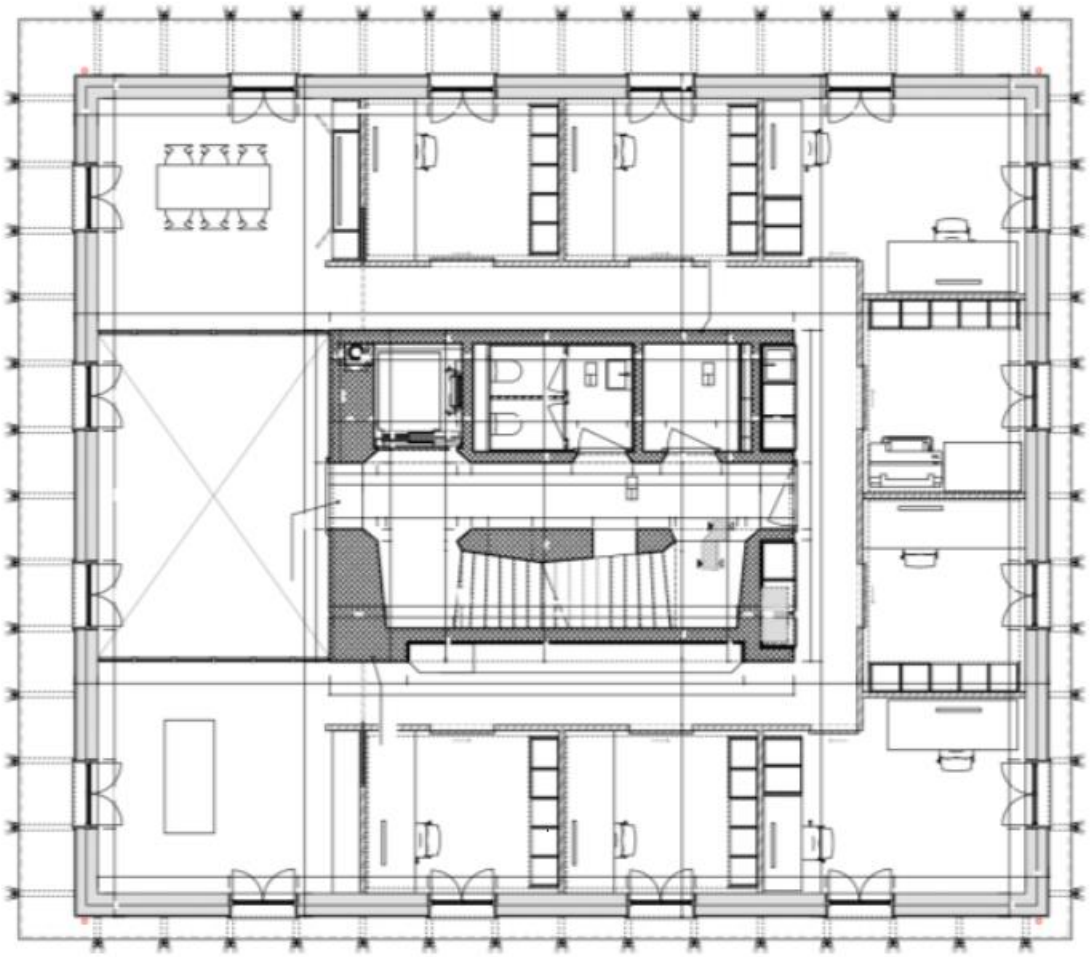


Fig. 5 - Floor plans and section

Source: https://www.swiss-architects.com/de/architecture-news/bau-der-woche/holz-pur



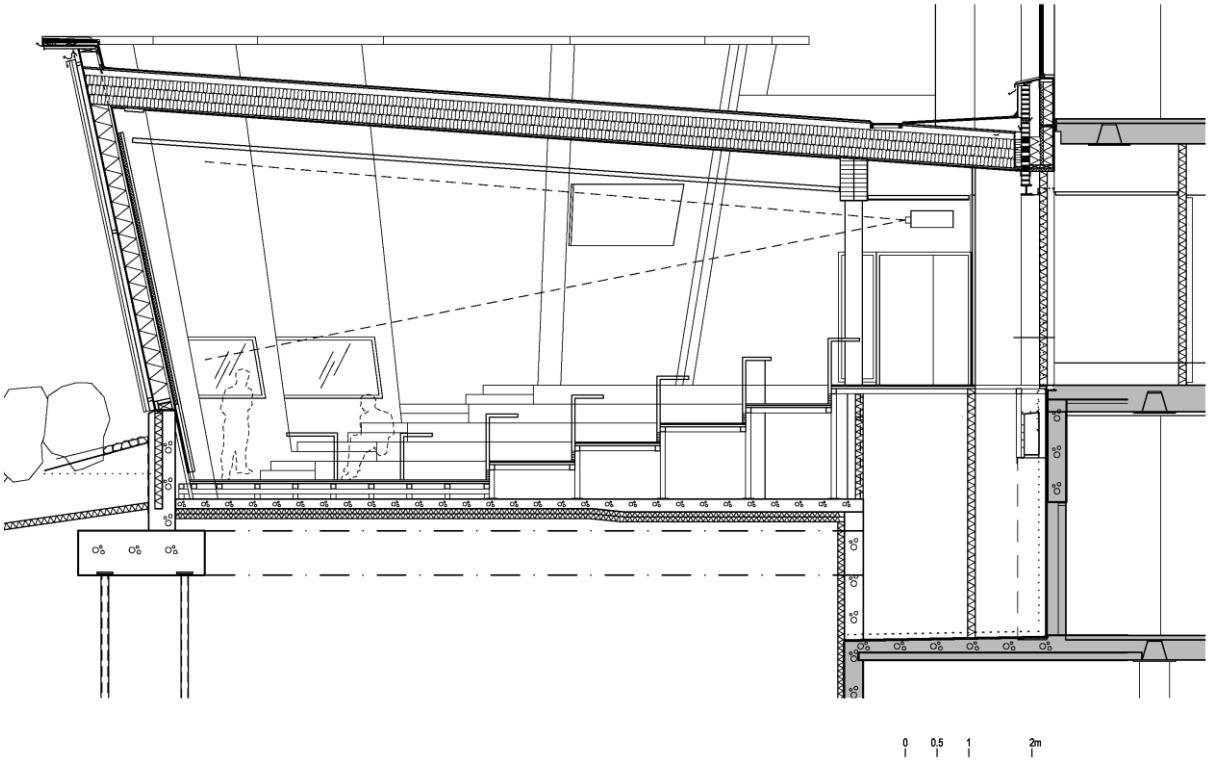
Source: https://www.swiss-architects.com/de/architecture-news/bau-der-woche/holz-pur

3.2. Auditorium – Metsä Group and MELA main office, Espoo, Finland

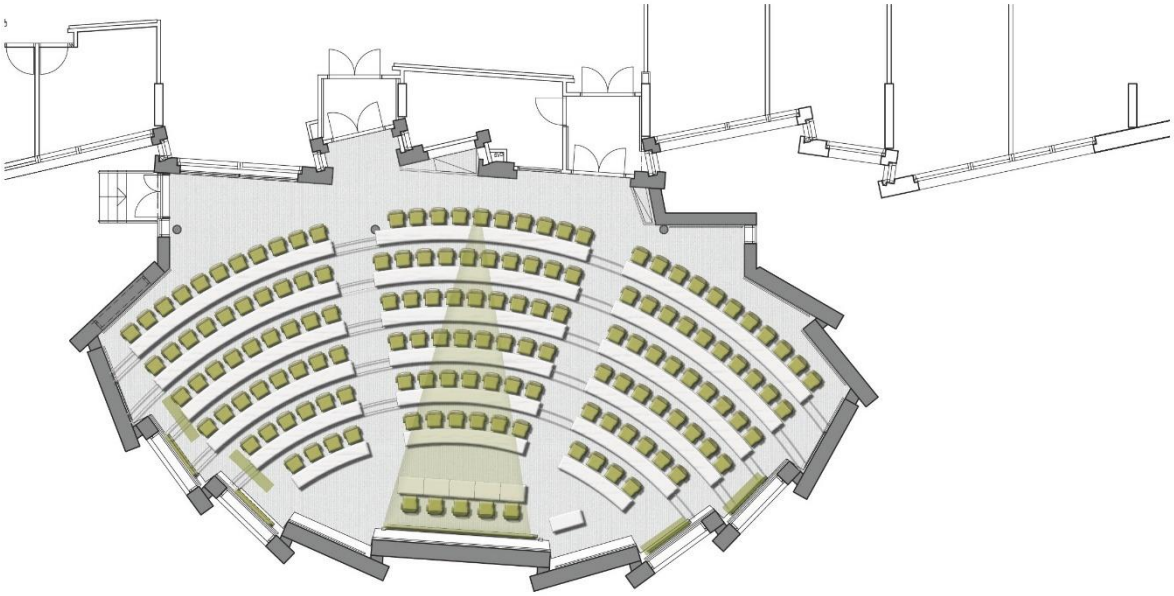
CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Espoo	Finland	2016	1	8m	300 m^2

This office building was designed by Helin & Co (architects) and Wise Group Finland (engineering). It was built in 2016. Building is 1 storeys, 8m high and has got 300m2 of floor area. Structure is made out of CLT walls and slabs. External walls are made out of CLT with additional covering lavers. Shallow foundation footing and slab is building solid support for a one floor but wide plan object.

Source: https://puuinfo.fi/arkkitehtuuri/toimistot/metsa-group-mela-auditorio/



Source: https://puuinfo.fi/arkkitehtuuri/toimistot/metsa-group-mela-auditorio/



Source: https://puuinfo.fi/arkkitehtuuri/toimistot/metsa-group-mela-auditorio/

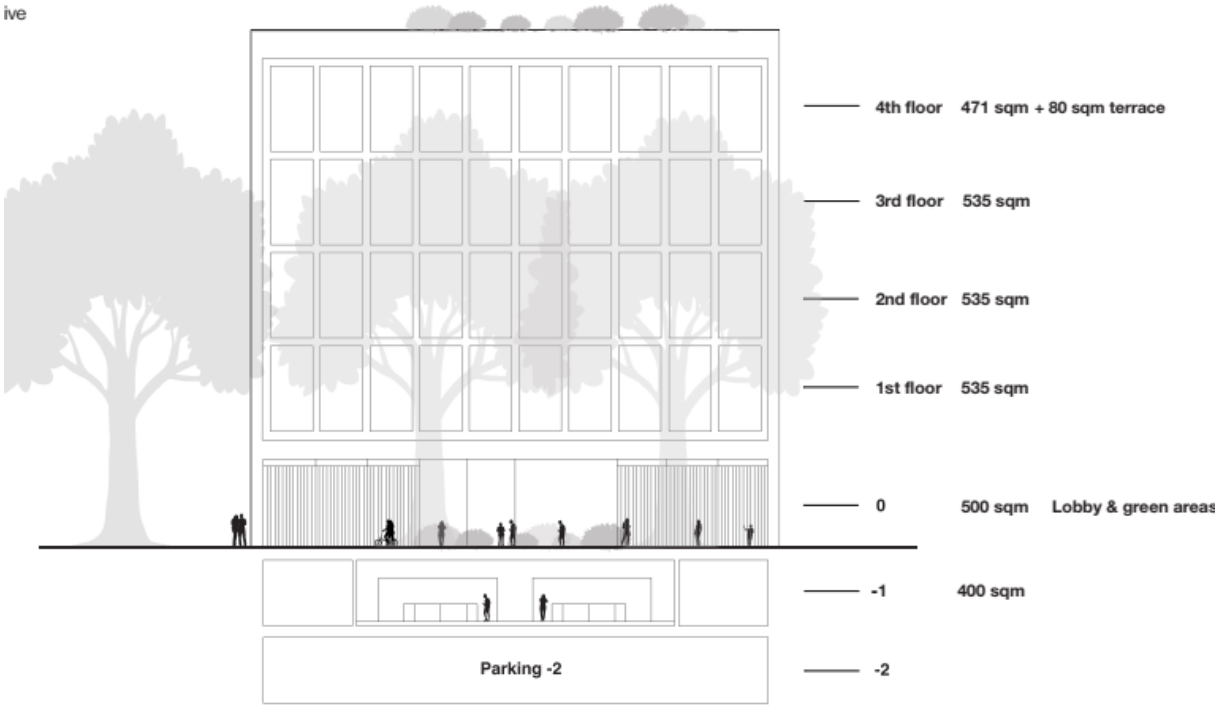
3.3. Wittywood, Barcelona, Spain

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Barcelona	Spain	2021	5	22m	3600m2

This office building was designed by F. Xavier Grinyó de la Peña and Xavier Ballarín (architects) and Rubio Elecnor (engineering). It was built in 2021. Building is 5 storeys, 22m high and has got 3600m2 of floor area. Structure is table construction (columns and slabs), walls in CLL. Ceilings are in hybrid construction with timber beams and concrete slab. External walls are made out of CLT and light frame. Concrete box foundation had two floors down – bottom is parking lot and upper one for commercial use.

Source: https://wittywood.es/en/

Source: https://wittywood.es/en/



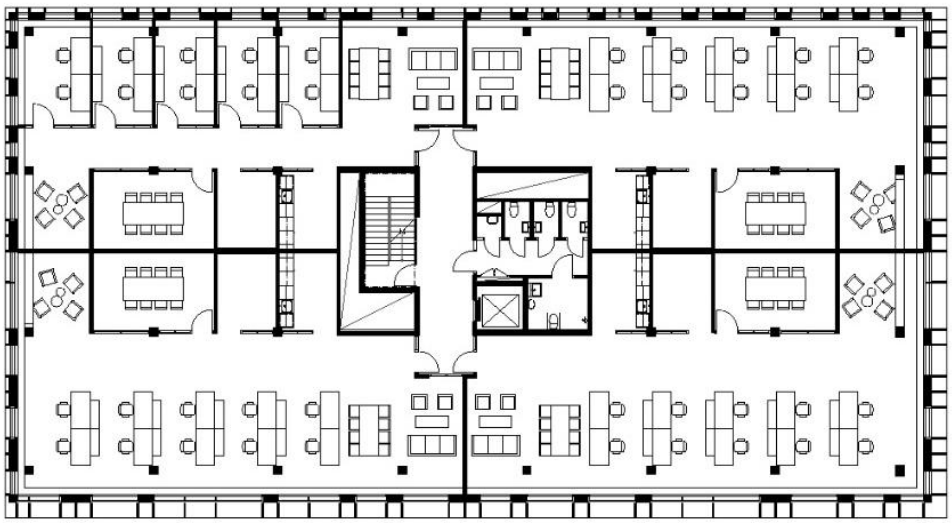
Source: https://wittywood.es/en/

3.4. Nodi, Gothenburg, Sweden

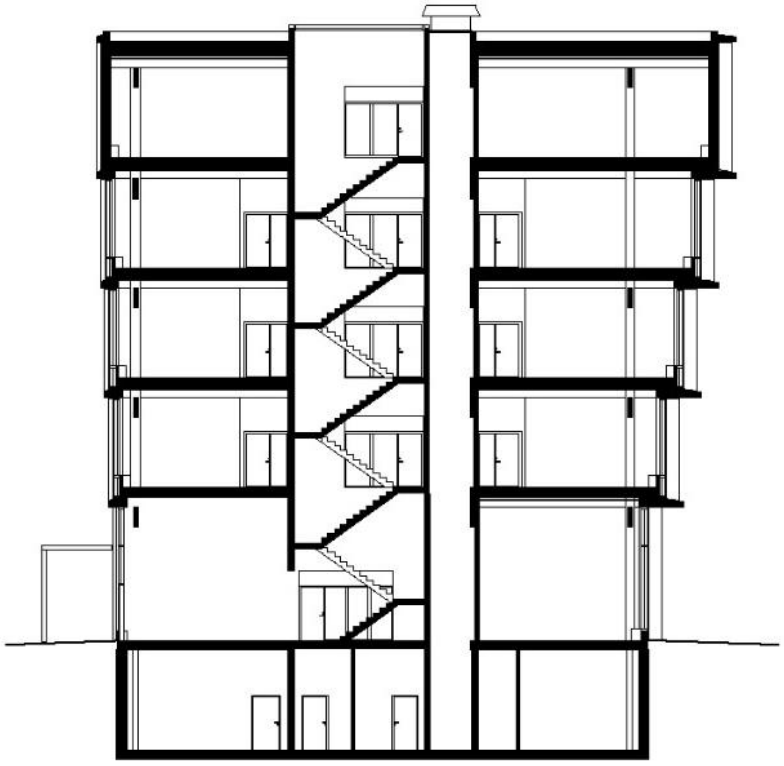
CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Gothenburg	Sweden	2021	5	17m	4660m^2

This office building was designed by White Arkiteker (architects) and (engineering). It was built in 2021. Building is 5 storeys, 17m high and has got 4660m2 of floor area. Structure is frame construction of GLT standing on underground basement floor podium made in concrete. Core containing stairs, lifts and toilets + kitchens is solid. Building was awarded with Best business building, Dezeen Awards, 2021.

Source: https://www.detail.de/de_en/burogebaude-nodi-von-white-arkitekter



Source: https://www.detail.de/de_en/burogebaude-nodi-von-white-arkitekter



Source: https://www.detail.de/de_en/burogebaude-nodi-von-white-arkitekter

4. Other types of buildings

This chapter represents unique buildings and approaches that can help to describe possibilities of mass timber technology that can be used for residential buildings. Technologies used for shaping those buildings are modern, elegant, and allows to gain specific goals, as open plans, visibility, quality of inner spaces or others. Examples represent cutting edge technology jet to be developed and popularized in more common, residential functions.

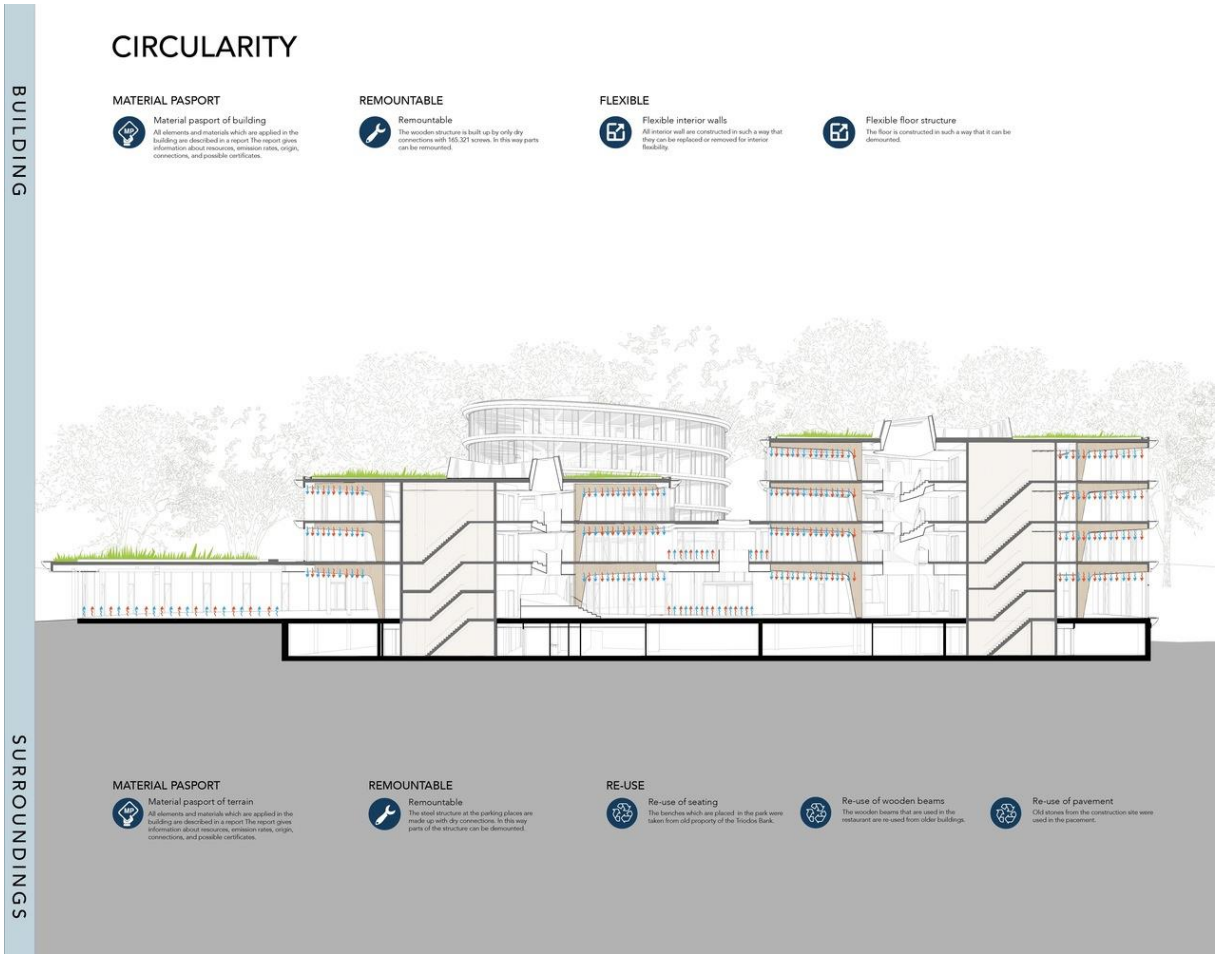
4.1. Triodos Bank, Driebergen-Rijsenburg, The Netherlands

CITY	COUNTRY	YEAR	# of STOREYS	TOTAL HEIGHT	TOTAL SURFACE
Driebergen-Rijsenburg	Netherlands	2019	3-6	~22m	12994 m^2

This Bank building was designed by RAU Architects (architects) and JP van Eesteeren (engineering). It was built in 2019. Building is 3 to 6 storeys, 22m high and has got 12994 m2 of floor area. Structure of a building is fully timber except underground part. Foundation and parking lot is in concrete. Upper part is made in timber – CLT cores and slabs, load bearing walls are cooperating with columns, glulam frames and light frame walls. Building is designed and erected with circular approach.

Source: https://www.archdaily.com/926357/triodos-bank-rau-architects

Source: https://www.archdaily.com/926357/triodos-bank-rau-architects



Source: https://www.archdaily.com/926357/triodos-bank-rau-architects

5. Conclusions

Timber technologies is suitable for developing mid sized residential buildings. Problems, that were met during design and erection processes across the globe can, and have to be included into global timber knowledge. Wood is a great, multifunctional natural material, that has got some unique performance and parameters which are answers for modern, grooving world problems. Knowledge base can be implemented onto local markets and countries legislatives and education processes to speed up a way for catching the most advanced countries. Most countries has got historical interference with wood as structural material, but the biggest problem right now is to prepare customers for this revolution. Mind changing from fire safety issues for fully green, renewable, modern and circular material have to be made for total building sector renovation.

As shown in this document mass timber buildings are constantly being developed and erected on many scales, volumes and sectors. New optimization purposes are being provided, new technologies and skills are being presented. That is why this book of examples can be quickly outdated, and that is why it should be always revised, when planned to use it. Adding newest, better examples pushing borders further should be a good practice in preparation educational materials.