sustainer design guidelines

Dear reader,

These are Sustainer's design guidelines. As the possibilities of the system are growing continously and improvements are always on the way, so are our design guidelines.

For questions, you can always reach out to one of our employees.

Enjoy!

Missing anything that you think should be part of the Design Guidelines? Let us know!

Table of contents

1	Introducing the module	2
2	Towards an economic design	6
3	Configure the optimal apartment plan	8
4	Stacking modules	11
5	Most common wall types	15
6	Facades and windows	20
7	Balconies	27
8	Roof options	29
9	Techincal installations and wet spaces	30

v03
12-05-2026

introducing the module

a first perspective on Sustainer's .home apartment module

The Sustainer .Home module is built out of:

- 4 LVL (or Baubuche) columns on the corners
- LVL beam structure for floor and ceiling, with Spano plating and gypsum fireproofing
- LVL floor top plate with optional floor heating
- Different options of insulation: cellulose, mineral wool, glass wool and many others
- Facades of LVL studs and gypsum plating
- A wide variety of possible window frame types (inculding tripple glass)
- A wide variety of possible facade finishings
- Interior and separation walls of timber studs and gypsum, and optional stability function
- Integrated ducts and wiring in floors, ceiling and walls
- 4 foundation points with bespoke steel anchors
- Standard steel connections to connect modules, cores, corridors, galleries and balconies

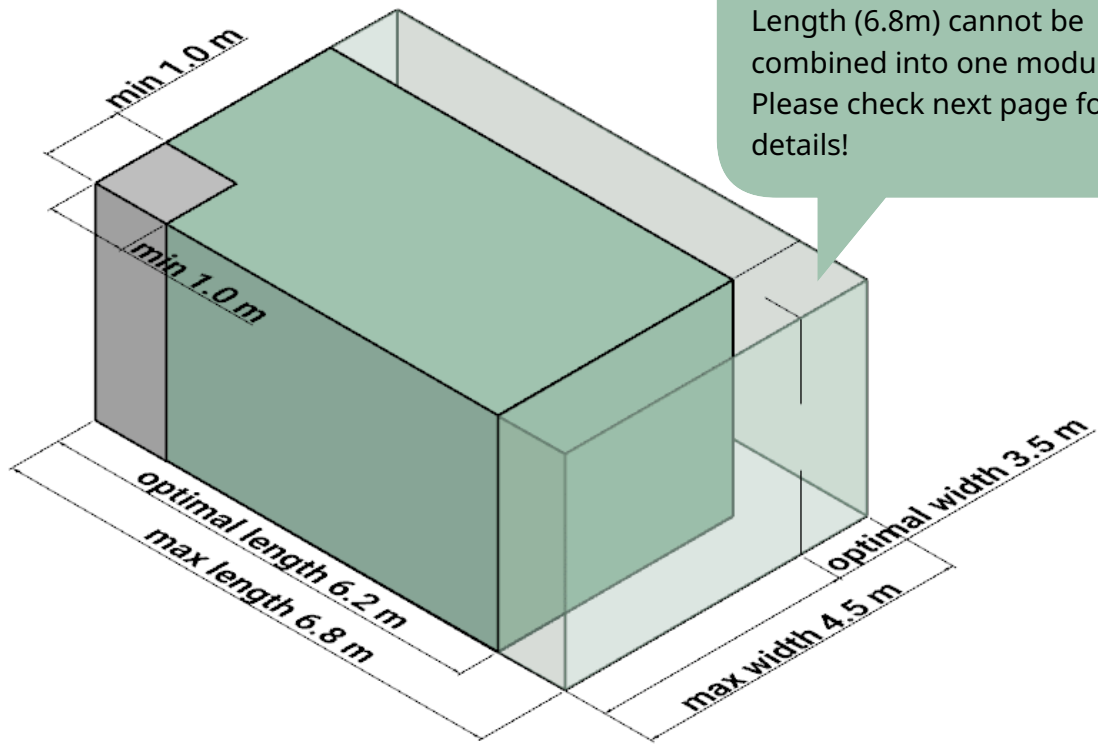
And much more...



introducing the module

What are the maximum module sizes?

Watch out! Maximum Width (4.5m) x Maximum Length (6.8m) cannot be combined into one module. Please check next page for details!

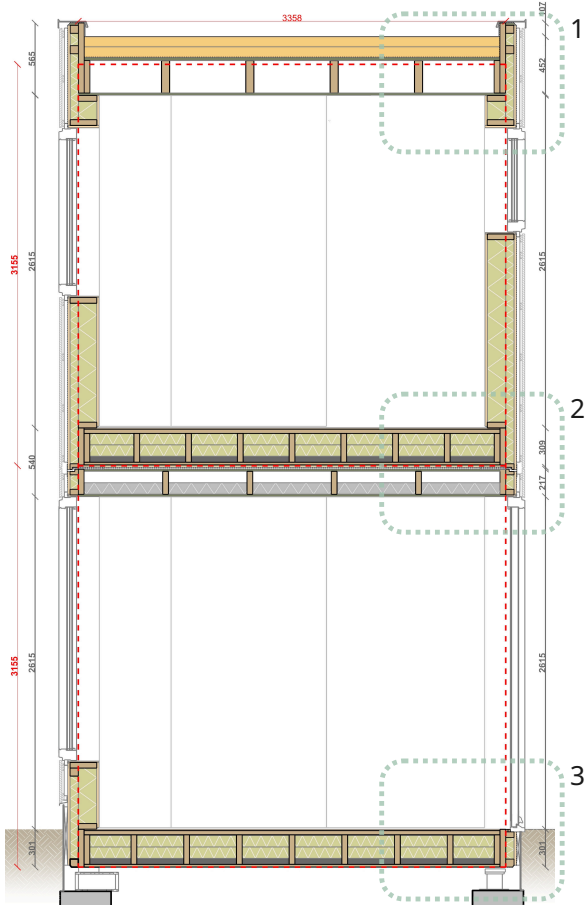


Ask Us!

We are currently looking into making longer modules feasible & economic (~7.5m x ~2.6m)

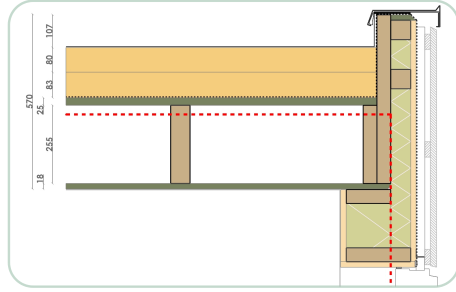
introducing the module

A first view on the details of roof, floor and ceiling

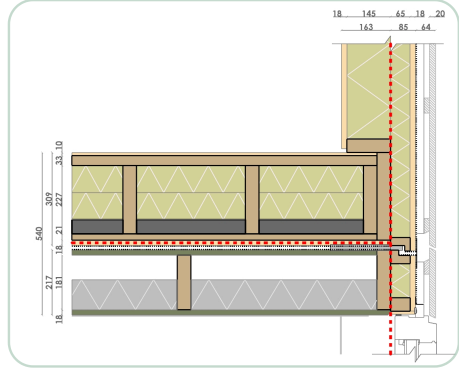


- Fermacell
- LVL
- Rock wool
- Glass wool
- Spano
- Olivijn
- Pirinsulation
- Facade cladding
- Fassade folie
- Module grid line

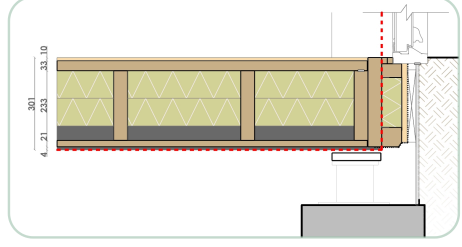
1



2



3



towards an economic design

Not all possible designs are economic

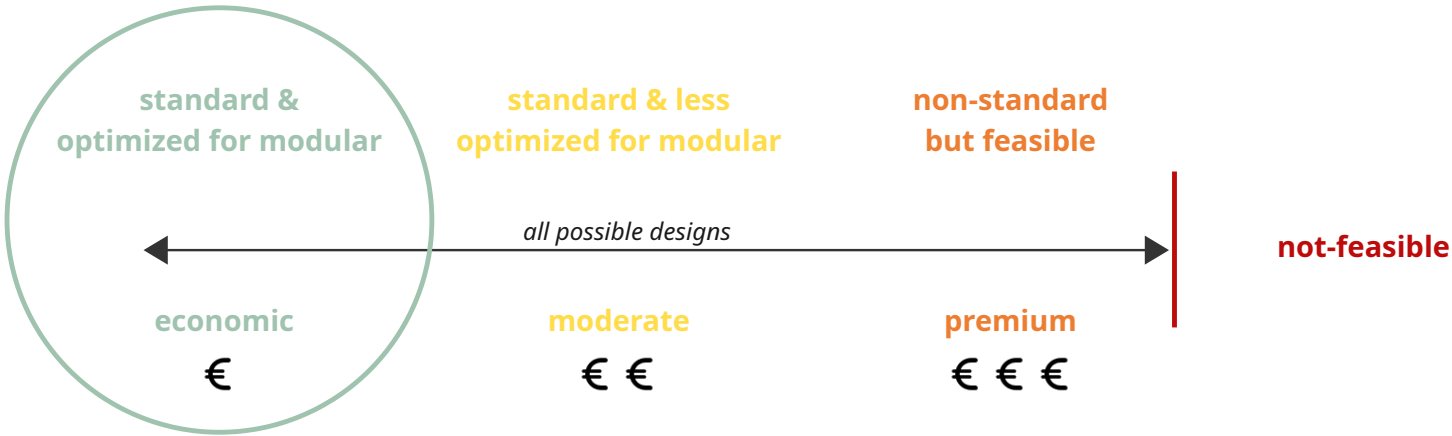
Many designs are possible
For a modular system, the Sustainer system has a relative wide range of applicability.

As modules can have many different sizes and can be configured in many different ways, many different designs are possible.

Also outside of the standard, there are options that are feasible, but demand project specific engineering.

Not all designs are economic
Even though many designs are possible, some designs are more economic then other designs.

These design guidelines help you to optimize your design.



towards an economic design

It's not only about optimizing modules

Generic economic principles

A design that is optimized for modules is not necessarily an economic design. Economic building design is about so much more than just modules. Optimizing these elements will also help smoothen the module layout.

- Keep it simple
- Avoid redundant square meters (unnecessary routing or square meters above the client's wishes)
- Optimize facade/floor area
- Galleries are ofte more economic than cores and corridors
- A good connection to other building parts, such as a plinth, parking garage and a (non-system) core. An optimally chosen module grid *can sometimes* hurt your plinth column grid

Some basic guidelines more related to modules:

- Limit setbacks and shifts (in columns or modules)
- Balconies are often more economic than loggias
- Copy and connect apartment plans vertically
- Repetition is a joy for every engineer and supply chain
- Less modules and less module sizes are often better
- Aim to have all installations in 1 module

A smooth design process

A design process during a tender phase can for example follow these steps:

1. Grid design and module layout based on program of requirements, site conditions, client wishes and design guidelines by Architect
2. **Feedback by Sustainer**
3. Apartment interior layout by Architect
4. **Feedback by Sustainer**
5. HVAC and installations concept by Installation Party
6. **Stability and column concept and feedback by Sustainer**
7. Final tender design and output of building design metrics
8. **From metrics to cost calculation by Sustainer**

towards an economic design

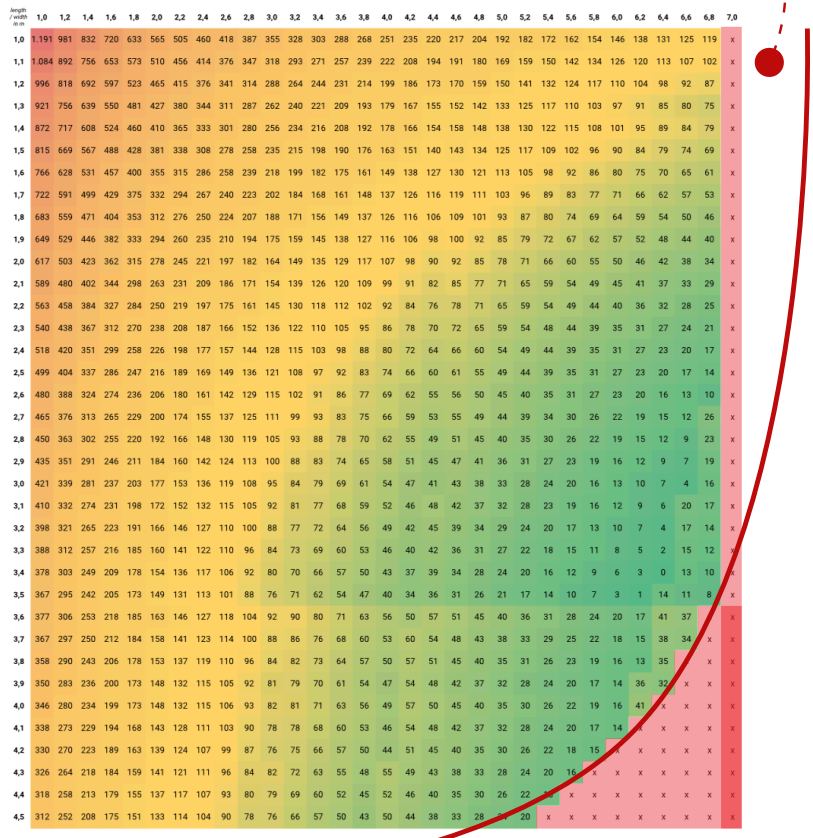
What is the impact of the module size on building costs?

Table shows the **extra** costs in €/M2 BVO in comparison to the most economic module size of 6,4 x 3,4.

Price differences are based on an average module in a typical apartment block.

Including: modules, transportation, assembly of modules on site, façade, wallpaper-ready interior walls and all margins of parties that are part of the supply chain.

Excluding: HVAC and bathroom, kitchen, interior painting, building access structures, foundation, green roofs, placement costs, balconies and galleries, unforeseen expenses margin



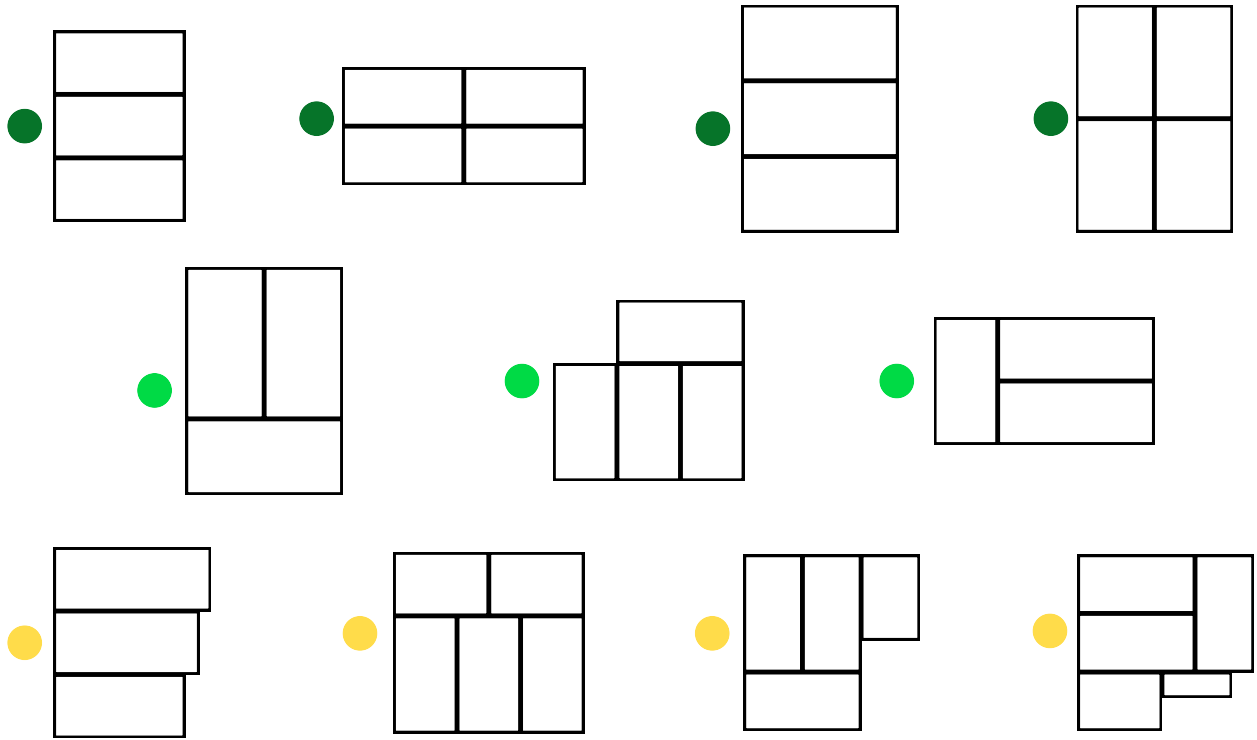
length / width in m	1,0	1,2	1,4	1,6	1,8	2,0	2,2	2,4	2,6	2,8	3,0	3,2	3,4	3,6	3,8	4,0	4,2	4,4	4,6	4,8	5,0	5,2	5,4	5,6	5,8	6,0	6,2	6,4	6,6	6,8	7,0
1,0	1.191	981	832	720	633	565	505	460	418	387	355	328	303	288	268	251	235	220	217	204	192	182	172	162	154	146	138	131	125	119	x
1,1	1.084	892	756	653	573	510	456	414	376	347	318	293	271	257	239	222	208	194	191	180	169	159	150	142	134	126	120	113	107	102	x
1,2	996	818	692	597	523	465	415	376	341	314	288	264	244	231	214	199	186	173	170	159	150	141	132	124	117	110	104	98	92	87	x
1,3	921	756	639	550	481	427	380	344	311	287	262	240	221	209	193	179	167	155	152	142	133	125	117	110	103	97	91	85	80	75	x
1,4	872	717	608	524	460	410	365	333	301	280	256	234	216	208	192	178	166	154	158	148	138	130	122	115	108	101	95	89	84	79	x
1,5	815	669	567	488	428	381	338	308	278	258	235	215	198	190	176	163	151	140	143	134	125	117	109	102	96	90	84	79	74	69	x
1,6	766	628	531	457	400	355	315	286	258	239	218	199	182	175	161	149	138	127	130	121	113	105	98	92	86	80	75	70	65	61	x
1,7	722	591	499	429	375	332	294	267	240	223	202	184	168	161	148	137	126	116	119	111	103	96	89	83	77	71	66	62	57	53	x
1,8	683	559	471	404	353	312	276	250	224	207	188	171	156	149	137	126	116	106	109	101	93	87	80	74	69	64	59	54	50	46	x
1,9	649	529	446	382	333	294	260	235	210	194	175	159	145	138	127	116	106	98	100	92	85	79	72	67	62	57	52	48	44	40	x
2,0	617	503	423	362	315	278	245	221	197	182	164	149	135	129	117	107	98	90	92	85	78	71	66	60	55	50	46	42	38	34	x
2,1	589	480	402	344	298	263	231	209	186	171	154	139	126	120	109	99	91	82	85	77	71	65	59	54	49	45	41	37	33	29	x
2,2	563	458	384	327	284	250	219	197	175	161	145	130	118	112	102	92	84	76	78	71	65	59	54	49	44	40	36	32	28	25	x
2,3	540	438	367	312	270	238	208	187	166	152	136	122	110	105	95	86	78	70	72	65	59	54	48	44	39	35	31	27	24	21	x
2,4	518	420	351	299	258	226	198	177	157	144	128	115	103	98	88	80	72	64	66	60	54	49	44	39	35	31	27	23	20	17	x
2,5	499	404	337	286	247	216	189	169	149	136	121	108	97	92	83	74	66	60	61	55	49	44	39	35	31	27	23	20	17	14	x
2,6	480	388	324	274	236	206	180	161	142	129	115	102	91	86	77	69	62	55	56	50	45	40	35	31	27	23	20	16	13	10	x
2,7	465	376	313	265	229	200	174	155	137	125	111	99	93	83	75	66	59	53	55	49	44	39	34	30	26	22	19	15	12	26	x
2,8	450	363	302	255	220	192	166	148	130	119	105	93	88	78	70	62	55	49	51	45	40	35	30	26	22	19	15	12	9	23	x
2,9	435	351	291	246	211	184	160	142	124	113	100	88	83	74	65	58	51	45	47	41	36	31	27	23	19	16	12	9	7	19	x
3,0	421	339	281	237	203	177	153	136	119	108	95	84	79	69	61	54	47	41	43	38	33	28	24	20	16	13	10	7	4	16	x
3,1	410	332	274	231	198	172	152	132	115	105	92	81	77	68	59	52	46	48	42	37	32	28	23	19	16	12	9	6	20	17	x
3,2	398	321	265	223	191	166	146	127	110	100	88	77	72	64	56	49	42	45	39	34	29	24	20	17	13	10	7	4	17	14	x
3,3	388	312	257	216	185	160	141	122	110	96	84	73	69	60	53	46	40	42	36	31	27	22	18	15	11	8	5	2	15	12	x
3,4	378	303	249	209	178	154	136	117	106	92	80	70	66	57	50	43	37	39	34	28	24	20	16	12	9	6	3	0	13	10	x
3,5	367	295	242	205	173	149	131	113	101	88	76	71	62	54	47	40	34	36	31	26	21	17	14	10	7	3	1	14	11	8	x
3,6	377	306	253	218	185	163	146	127	118	104	92	90	80	71	63	56	50	57	51	45	40	36	31	28	24	20	17	41	37	x	x
3,7	367	297	250	212	184	158	141	123	114	100	88	86	76	68	60	53	60	54	48	43	38	33	29	25	22	18	15	38	34	x	x
3,8	358	290	243	206	178	153	137	119	110	96	84	82	73	64	57	50	57	51	45	40	35	31	26	23	19	16	13	35	x	x	x
3,9	350	283	236	200	173	148	132	115	105	92	81	79	70	61	54	47	54	48	42	37	32	28	24	20	17	14	36	32	x	x	x
4,0	346	280	234	199	173	148	132	115	106	93	82	81	71	63	56	49	57	50	45	40	35	30	26	22	19	16	41	x	x	x	x
4,1	338	273	229	194	168	143	128	111	103	90	78	78	68	60	53	46	54	48	42	37	32	28	24	20	17	14	x	x	x	x	x
4,2	330	270	223	189	163	139	124	107	99	87	76	75	66	57	50	44	51	45	40	35	30	26	22	18	15	x	x	x	x	x	x
4,3	326	264	218	184	159	141	121	111	96	84	82	72	63	55	48	55	49	43	38	33	28	24	20	16	x	x	x	x	x	x	x
4,4	318	258	213	179	155	137	117	107	93	80	79	69	60	52	45	52	46	40	35	30	26	22	x	x	x	x	x	x	x	x	x
4,5	312	252	208	175	151	133	114	104	90	78	76	66	57	50	43	50	44	38	33	28	24	20	x	x	x	x	x	x	x	x	x

Ask Us!

We are currently looking into making longer modules feasible & economic (~7.5m x ~2.6m)

configure the optimal apartment plan

Straightforward configurations are more optimal than others



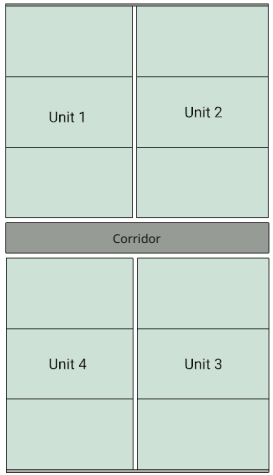
The shade indicates the economic favorability of a design. Even though all designs are technically possible, some are more cost efficient than others. As the shade fades the project becomes more complex and column alignment, stability, installation infrastructure e.g. become a bigger challenges and will cost more to solve.

Design Guidelines:

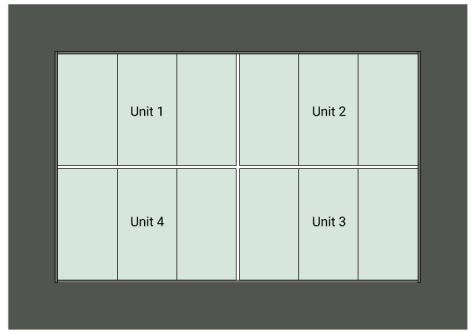
- Repetition of module sizes
- Align columns in clear grids
- Repetition of apartment plans vertically and horizontally

configure the optimal apartment plan

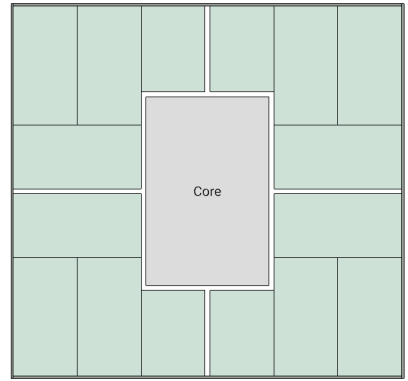
Circulation types, different apartments and the general layout



corridor



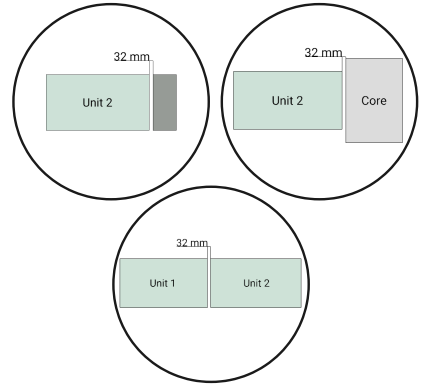
gallery



core

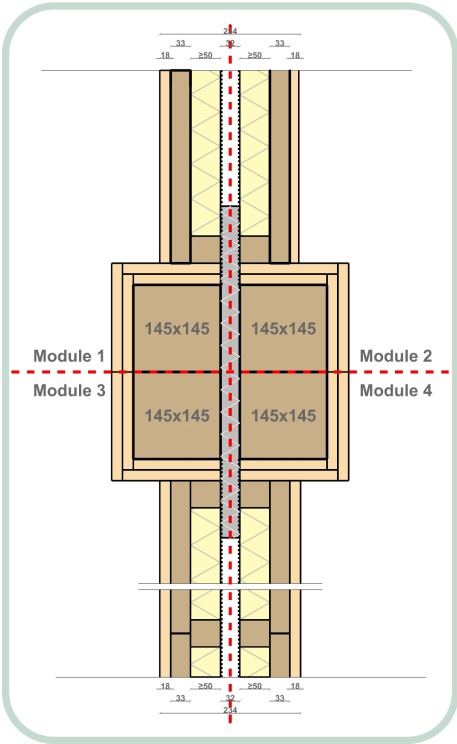
Design Guidelines:

- Corridor and core can be either (prefab) concrete, CLT or in the Sustainer system
- A corridor or core in the Sustainer system should be discussed with Sustainer
- Between apartments and between apartments and corridor/core is a cavity of 32mm
- The 32mm cavity needs to be included in the building design
- Mentioned module sizes are indicated *without* the 32mm cavity
- The 32mm cavity is part of the separation wall between two apartments
- A separation wall has 2 parts on either side of the cavity
- A separation wall can only be placed at the edge between two modules
- More on the separation wall on [page]

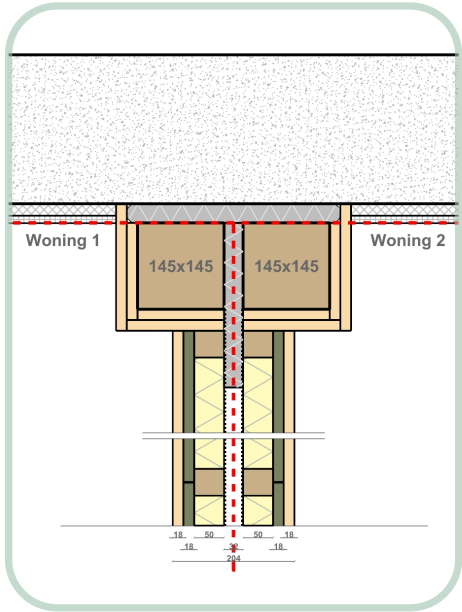


configure the optimal apartment plan

Examples of related building details



A separation wall at the crossing of 4 modules



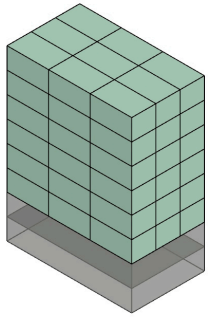
A separation wall at the connection to a core



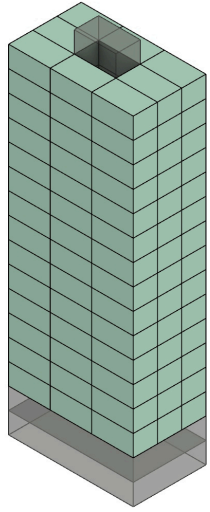
stacking modules

How high can you stack and choosing between Baubuche and LVL

How high can we go?



up to six layers (excl. plinth) possible without core



up to twelve layers (excl. plinth) possible with added stability of core

Baubuche or LVL columns?

The higher a building, the bigger the loads on the columns. To take on the increasing loads a column can be changed in size (see next page) and in material (see below).

Columns come in LVL-C and in Baubuche. The primary difference between LVL-C (Metsa's LVLQ, made of spruce (softwood) and BauBuche, made of beech (hardwood) is their density and load-bearing capacity. LVL-C is the standard choice for low-to-medium-rise buildings with moderate structural loads. BauBuche is engineered for high-rise or heavy-load structures, where the extreme strength of hardwood allows for significantly higher weight capacities.



European Beech



Spruce

stacking modules

Picking the right column size and column strategy

Column Size Table
This table below shows the estimated column size (square size in mm) in either LVLC (KertoQ) or Baubuche.

The actual size of the column is defined by the load. The load is influenced by the position of the column (in the plan and in the section), the size of the module and the stability concept.

The spatial reservation in the building design should also consider 2 additional protective layers of gypsum (2 x 18mm). See next page for more info.

Layers	LVL-C (KertoQ)*	Baubuche*
3	145	145
4	150-180	145
5	160-190	145
7	180-220	145-170
12**	210-250	160-190

* Sizes excluding fireproof cladding (~36mm)
** Above 10 layers, additional stability is necessary and needs to be researched before deciding on feasibility

Column Shape Strategy
Columns can have different dimensions and shapes, influenced by costs, loads and function. It is important to choose a column strategy, e.g.:

>>> Repetition - Choose 1 column type and use it all for the purpose of repetition and simplicity. *E.g.: for a building of 7 layers, all columns will be the same size as the biggest column, 220mm.*

>>> Parametric - Every column is shaped based on its unique position in the building. Sustainer's parametric approach can facilitate this. This can save 25 e./column.

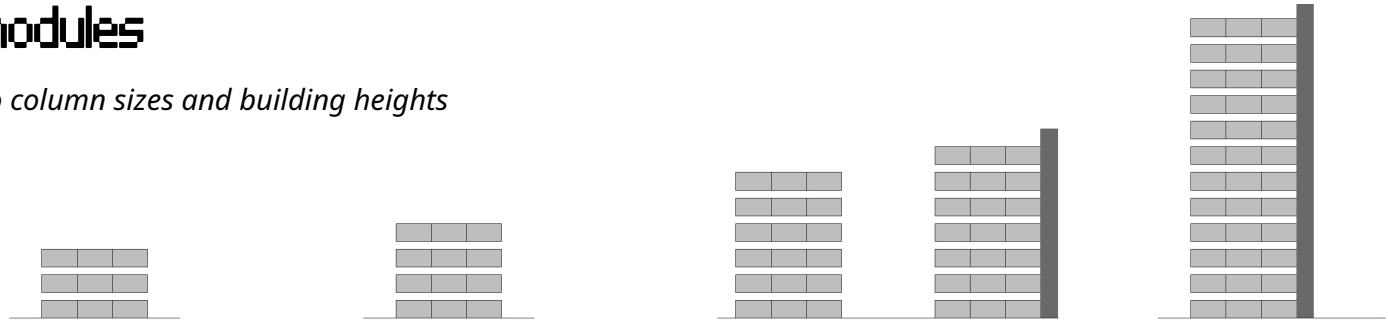
>>> Hybrid - Pick 3 types of columns, e.g. 1 type per floor. *E.g.: for a building of 7 layers, the top 3 layers can be 145mm, the next 3 layers can be ~200mm and the bottom layer 220mm.*

Design Guidelines:

- Column sizes increase when building more layers
- Pick a column strategy: Repetition, Parametric or Hybrid. For a tender/sketch phase: usually repetition.
- The Sustainer system can build up to 6 layers without a structural non-Sustainer core, up to 12 layers with a structural core
- Columns are usually protected by 2 layers of gypsum board

stacking modules

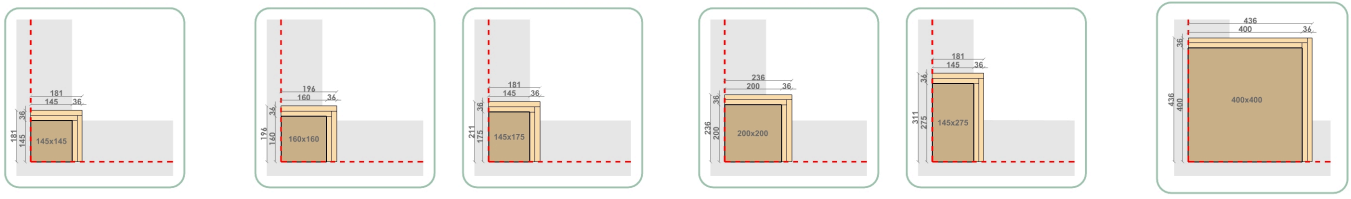
Diving deeper into column sizes and building heights



Building Layers

3 4 6 7 12

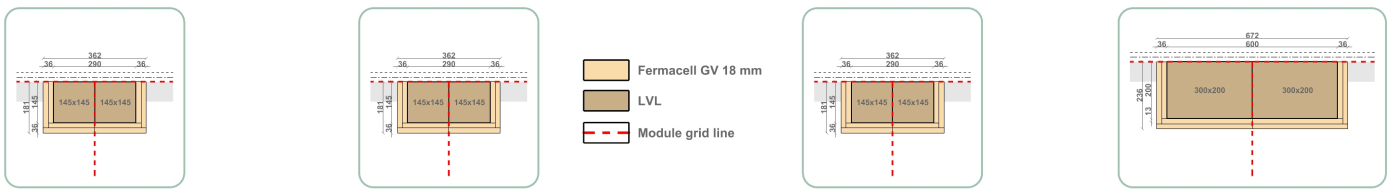
Column in Facade



4 Modules connecting column freestanding



2 Modules connecting column in separation wall

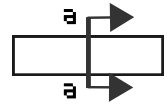


Fermacell GV 18 mm

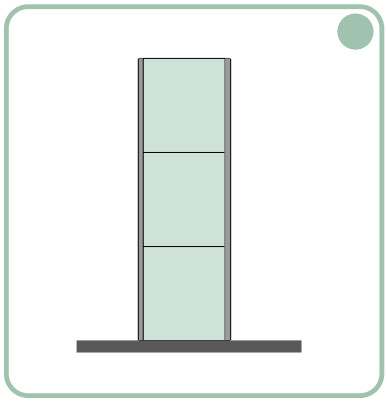
LVL

Module grid line

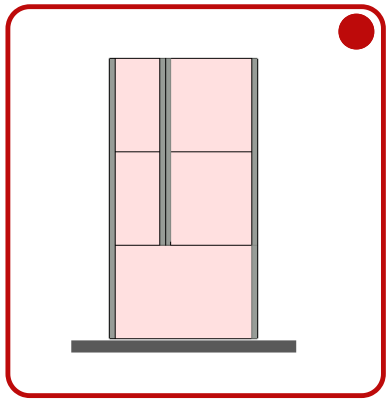
stacking modules – sections a–a



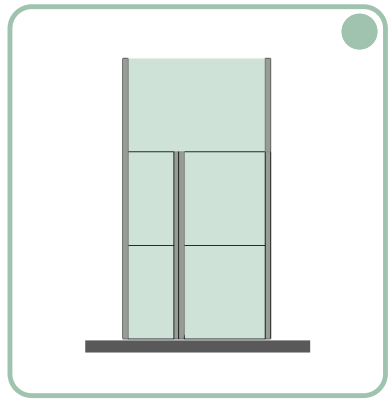
Most important rule: columns always align!



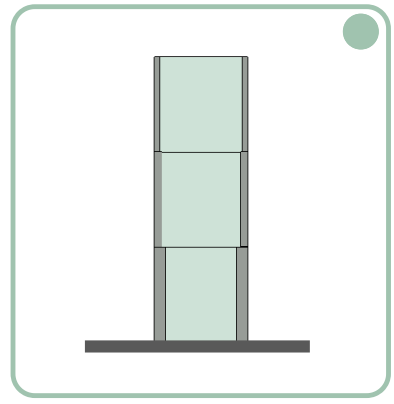
Columns need to be aligned for stacking



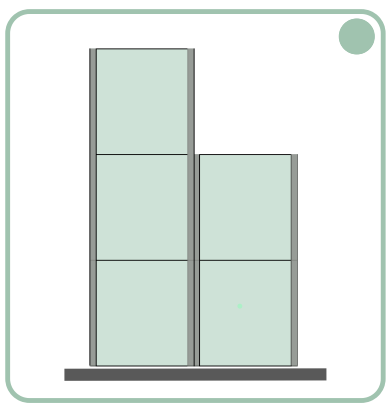
Columns are not aligned and continuous on all floors



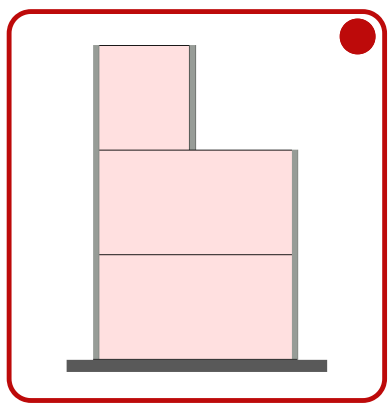
Columns only need to be aligned towards the bottom



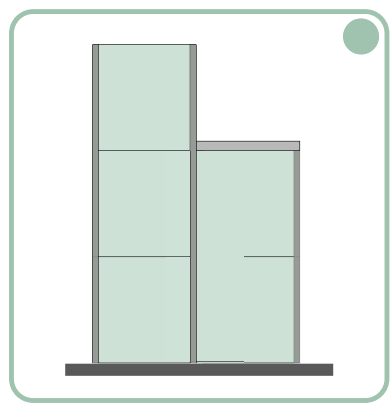
Columns are aligned, but can be thicker at the bottom at 5+ floors



Setback with aligned columns. A setback is a full module.

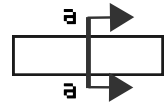


Setback without aligned columns

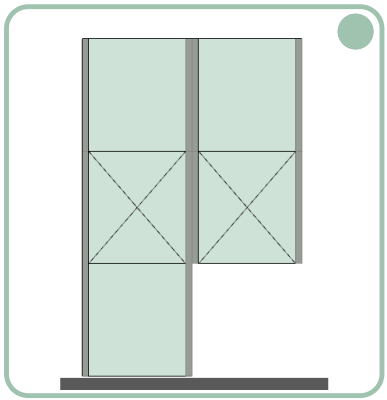


Setback with extra support column and roof terrace

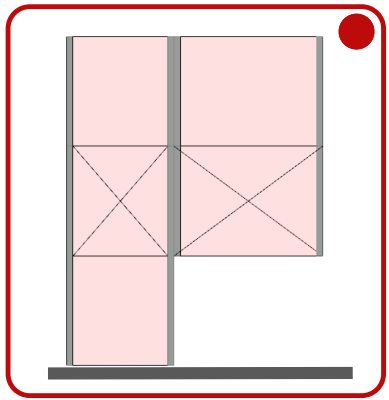
stacking modules – sections a-a



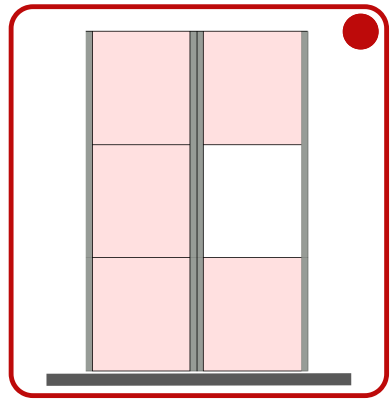
Most important rule: columns always align!



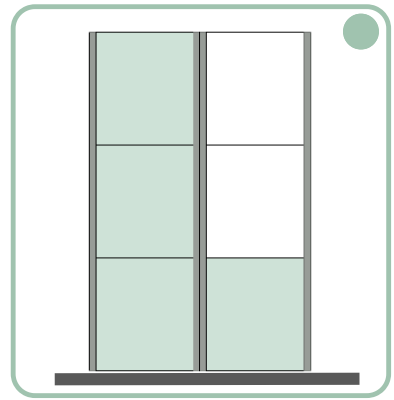
Cantilever over module short side; extra bracing is needed



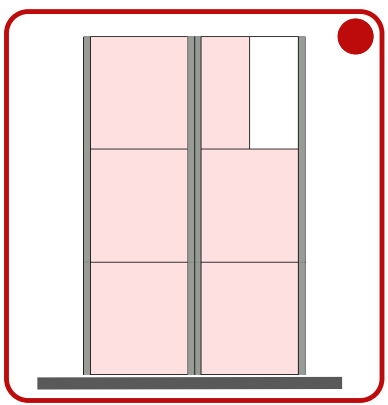
Cantilever over module long side; not possible



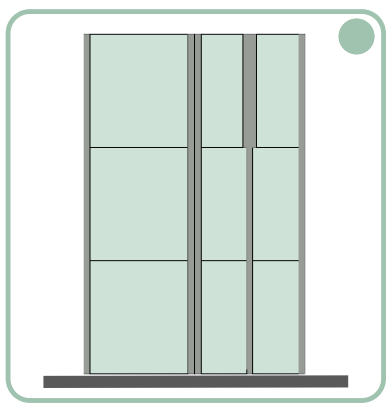
A regular module above a loggia module is possible (not yet explored)



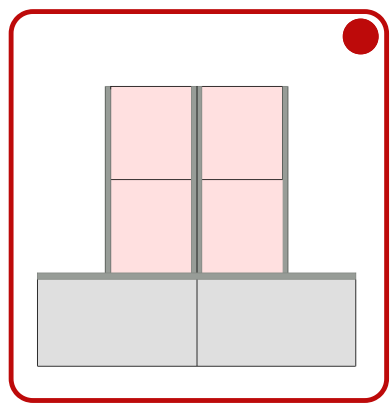
A full module as a loggia



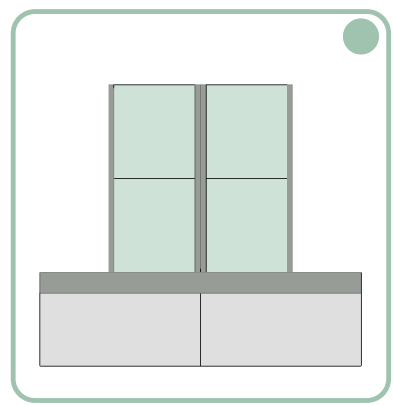
Half a module as a loggia



A module is split in 2 modules, extra columns are added



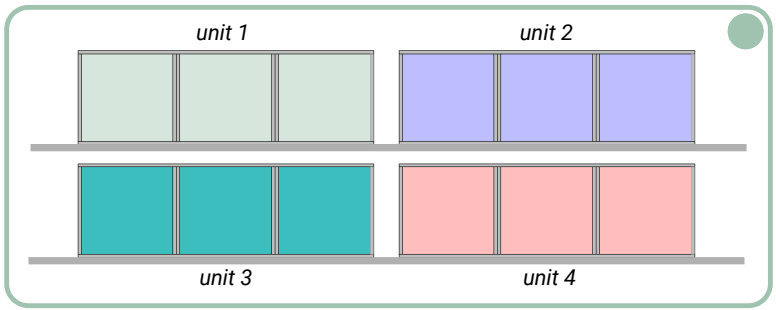
Unaligned parking/plinth grid



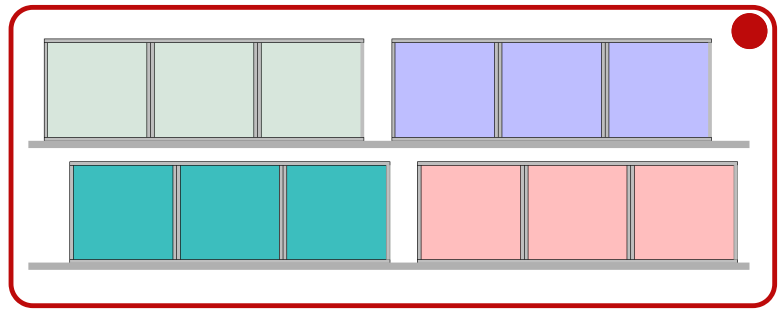
Unaligned parking/plinth grid with table/beam construction

stacking modules

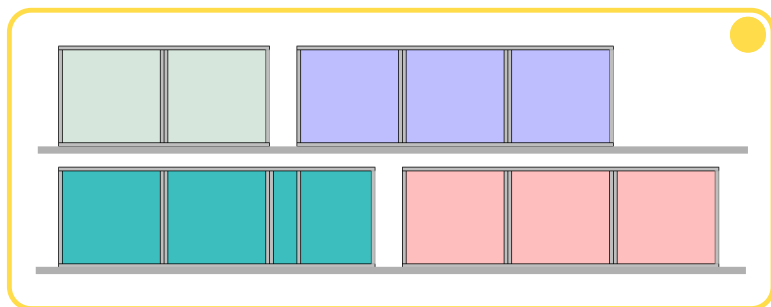
Apartment alignment and dividing walls (front view)



4 apartment of 3 modules stacked vertically and horizontally; dividing wall cavities (32mm) are aligned



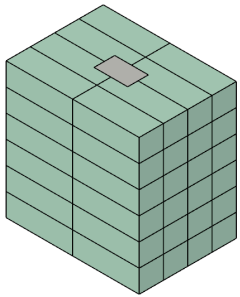
SHIFT TOP APARTMENTS, CAVITY (32mm) DOES NOT ALIGN
4 apartment of 3 modules stacked vertically and horizontally; dividing wall cavities not aligned. Not due to cantilevering.

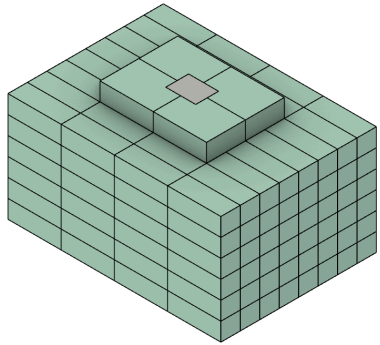


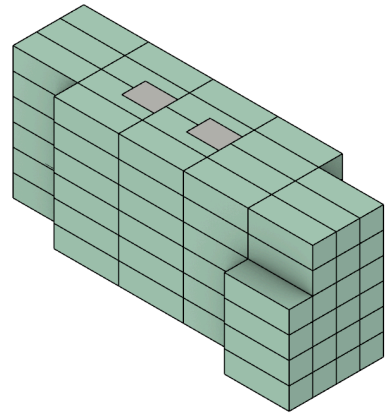
SOLUTION: ADD CAVITY (32mm)
4 apartment of 3 modules stacked vertically and horizontally; dividing wall cavities are aligned and filled up with fitting piece

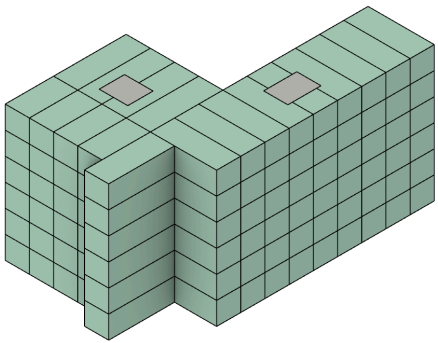
stacking modules

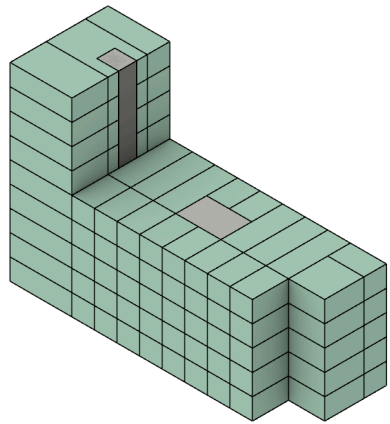
Building volumes examples







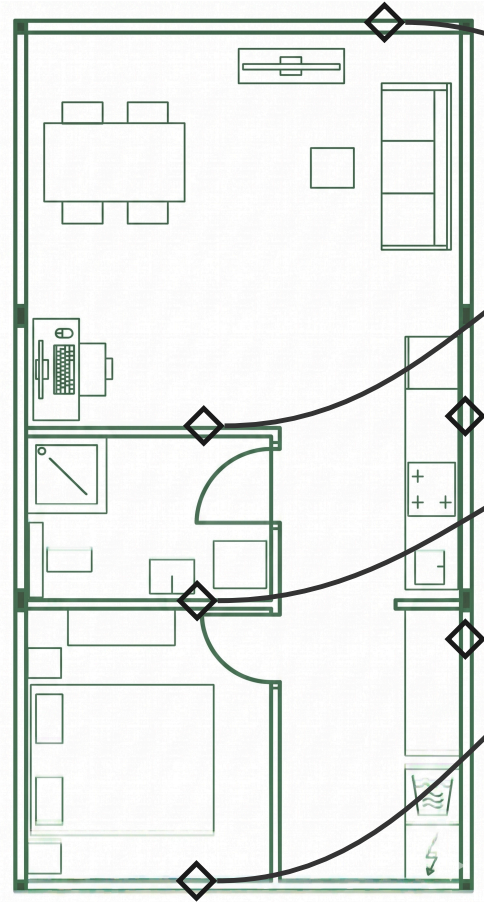




Adding layers of complexity to a modular setup has almost endless possibilities when still aligning structurally columns grids as well as having cores for stability purposes. Supporting optimization of modular placement as well as providing an initial structural advice is part of Sustainer's work.

most common wall types

Overview for the most used type walls within a Sustainer Project



Facade walls

Interior walls

2nd wall behind kitchen for installations; on top of separation wall

Interior walls - optional stability (at module border)

Separation walls

Division wall- corridor side

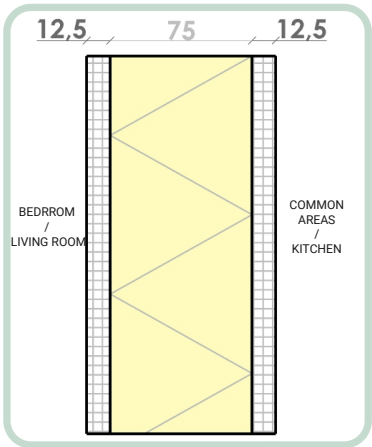
Principles:

- For designing in tenders: all interior walls could be for example 100 mm, optimization can be done in later phases.
- On the following pages you can see the different interior walls applied in practice.

most common wall types

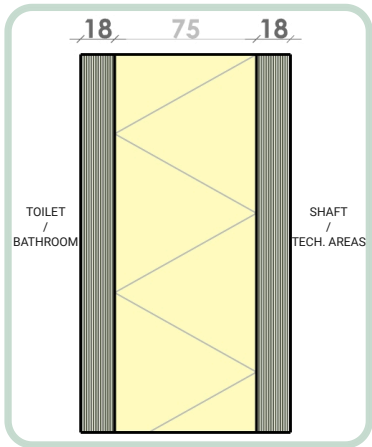
Interior walls

Acoustic Insulation
Spano 18 mm
Gypsum board



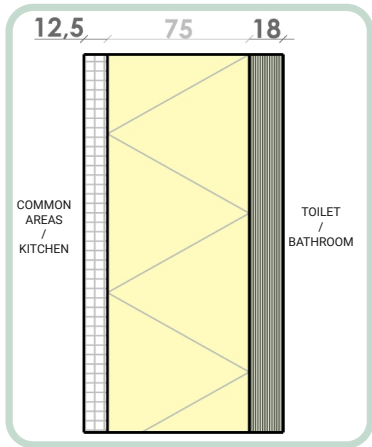
Interior Wall
12,5 mm Gypsum board
75 mm LVL studs / insulation
12,5 mm Gypsum board

For certain projects it can be 63 mm LVL / insulation



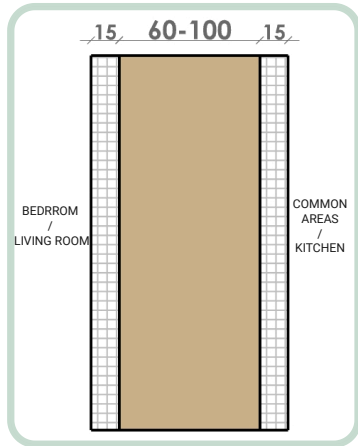
Interior Wall with 2 side reinforcement
18 mm SPANO
75 mm LVL studs / insulation
18 mm SPANO (or FERM i.e. in case needed for shafts)

For certain projects it can be 63 mm LVL / insulation



Interior Wall with 1 side reinforcement
12,5 mm Gypsum board
75 mm LVL studs / insulation
18 mm SPANO

For certain projects it can be 63 mm LVL / insulation



Interior Stability Wall
15 mm Gypsum fireboard
can be between 60-100mm
15 mm Gypsum fireboard

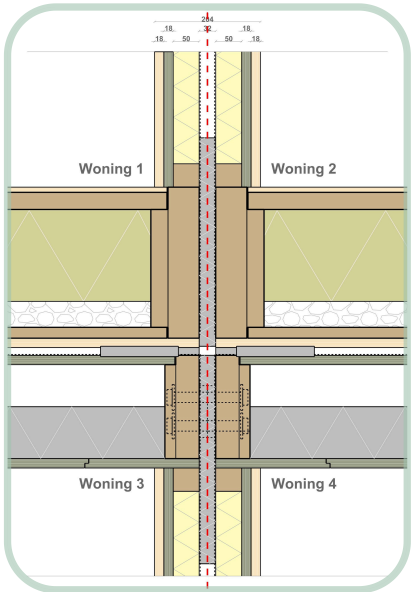
For certain projects, a 60–100 mm LVL block is used as a stability wall.

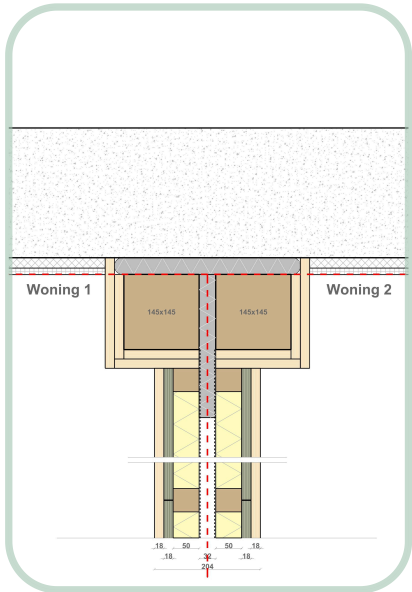
Principles:

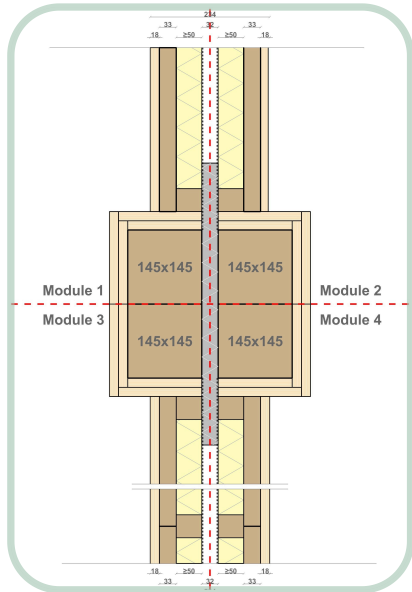
- Interior walls divide spaces inside the apartment: rooms, hallways, bathrooms, closets, utility closets, technical spaces, utility shafts
- Interior walls that run parallel to a module border are best placed at a 20mm distance from the border, so interior doors can be placed prefab
- Interior walls can never be placed on a module border, except when they cross perpendicular

most common wall types

Separation wall examples









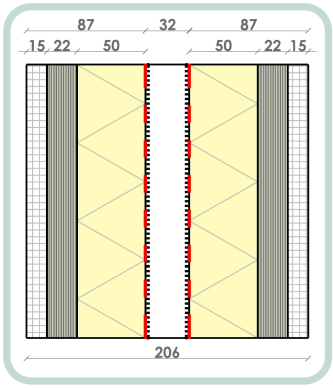
Design Principles:

- A division wall is an acoustic and fire safe wall barrier between 2 apartments
- A division wall is always placed on the border of 2 modules (or a module and corridor/core), never in 1 module
- A division wall is drawn as 2 wall segments and a 32mm cavity. Both wall segments are situated in opposite modules, as pictured A and B in the first image.
- Depending on performance, division walls vary in build-up and thickness (see some options on the next page)

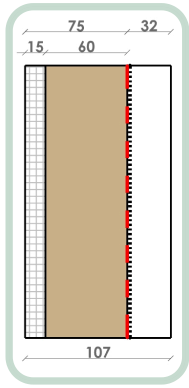
most common wall types

Separation walls

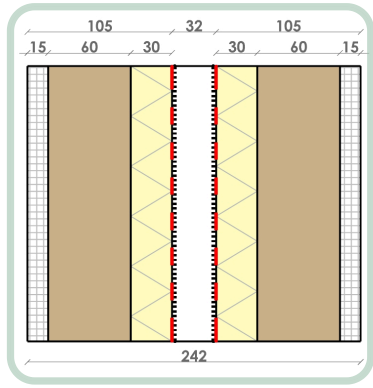
There are many types of separation walls. Most often the Basic wall is used. When extra stability is necessary one of the other options is chosen.



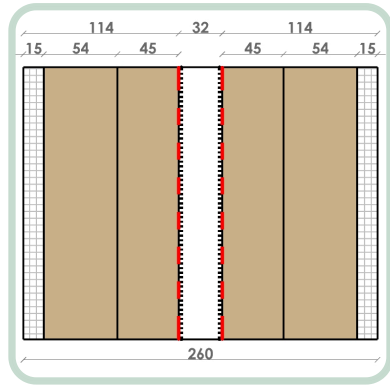
Basic wall



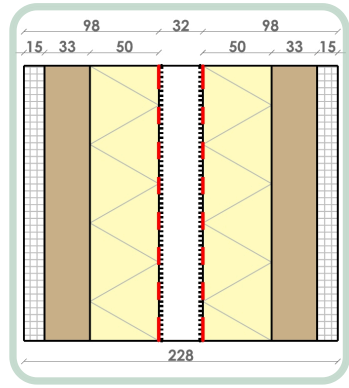
Wall 63



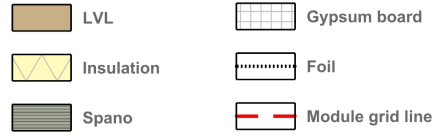
Wall 63 with acoustic insulation 27



Wall 100

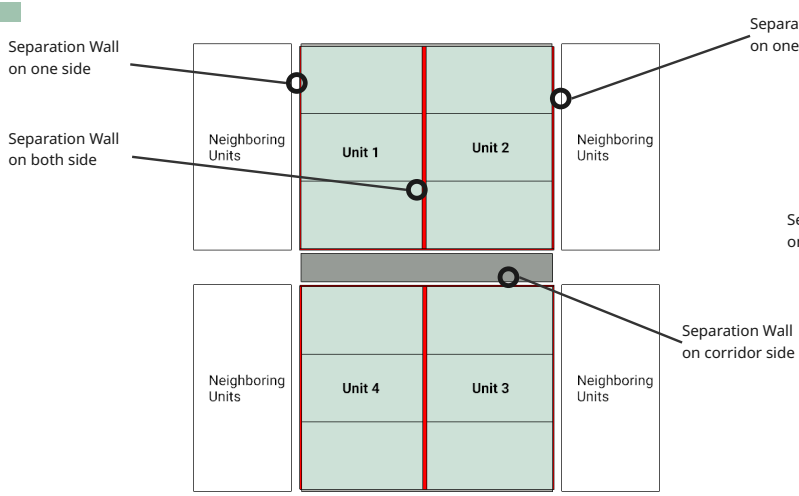


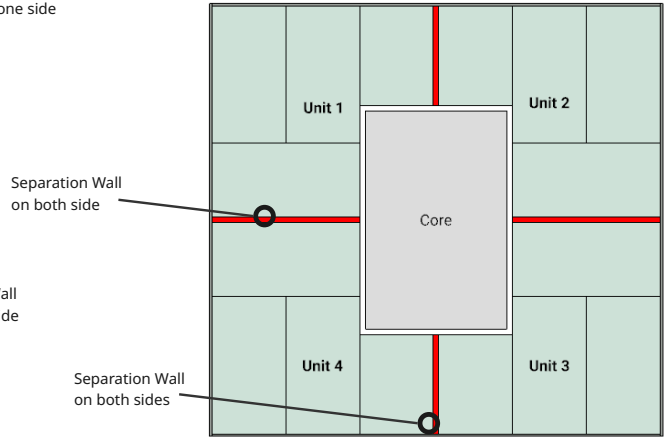
Wall 33

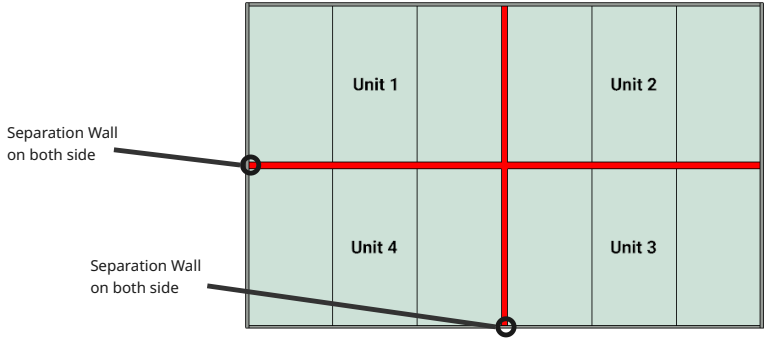


most common wall types

Separation walls - placement in apartment plan



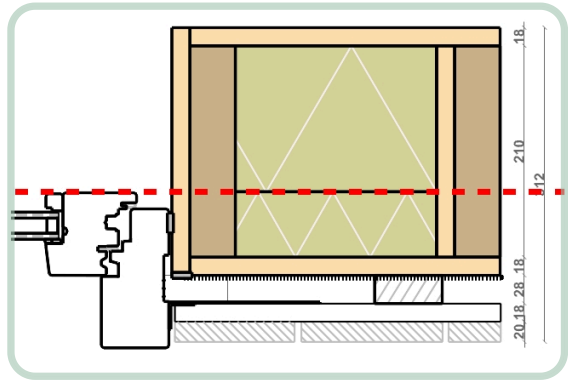




*neighboring units are to be seen with the same layout and distribution as Unit 1,2,3,4 (copies)

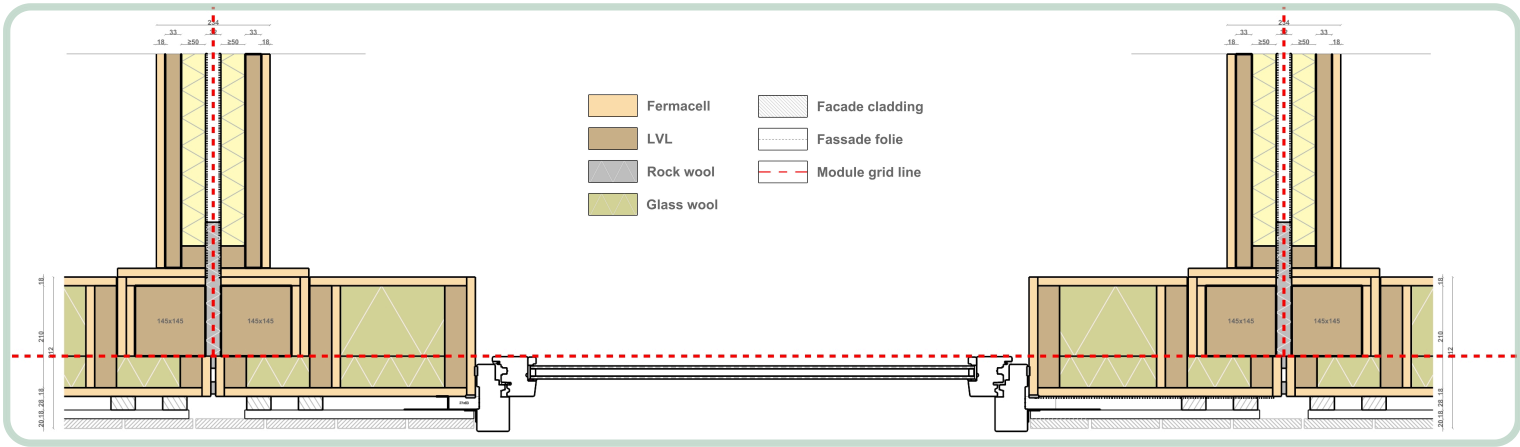
facades and windows

The facade



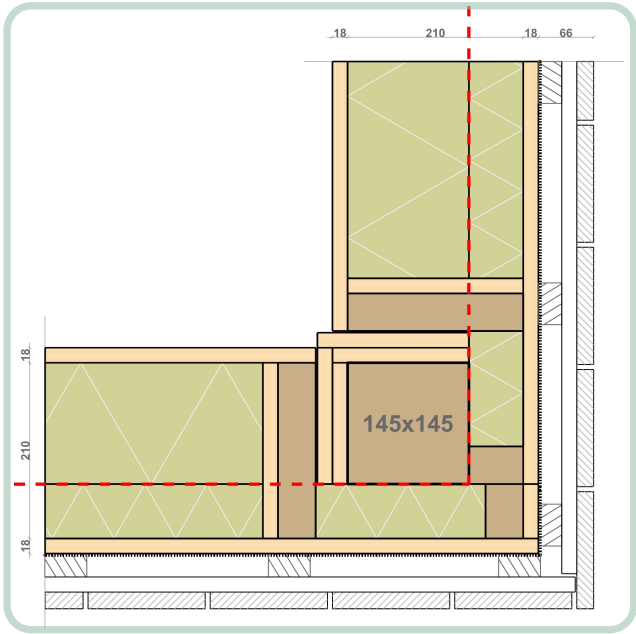
Design Guidelines:

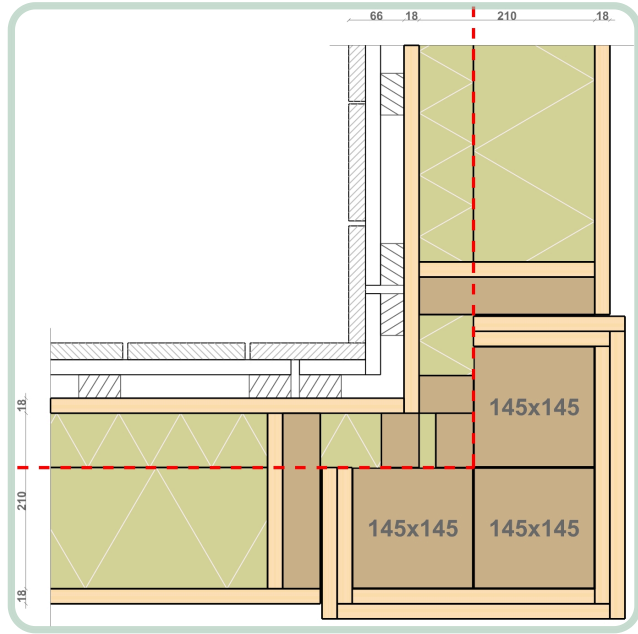
- The facade has a total thickness **312mm**, including a timber cladding. The interior part of the facade (inside the module) is **158mm.** The exterior part of the facade (ouside the module) is **88mm** untill the water barrier and **154mm** including the cladding
- The facade is made out of LVL studs and fermacell boards
- 0.181 W/m²K without including thermal bridges, 0.35 W/m²K including thermal bridges
- Damp-open
- Different facade finishings
- Diverse facade thickness (upon request), to optimize Rc-value



facades and windows

Facade detail - examples





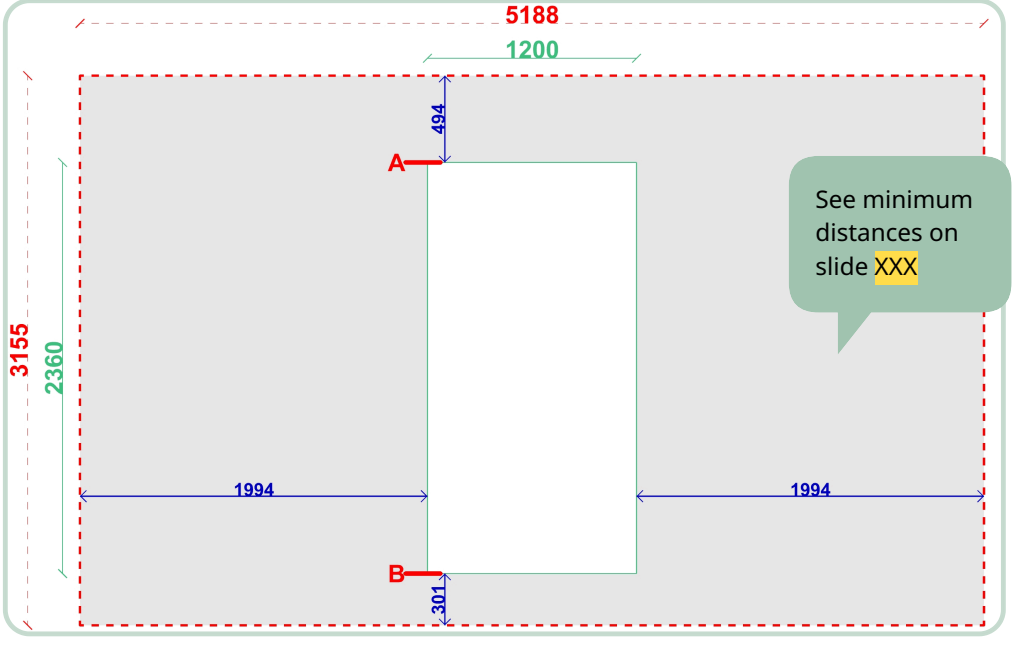
Fermacell
LVL
Glass wool
Facade cladding
Fassade folie
Module grid line

facades and windows

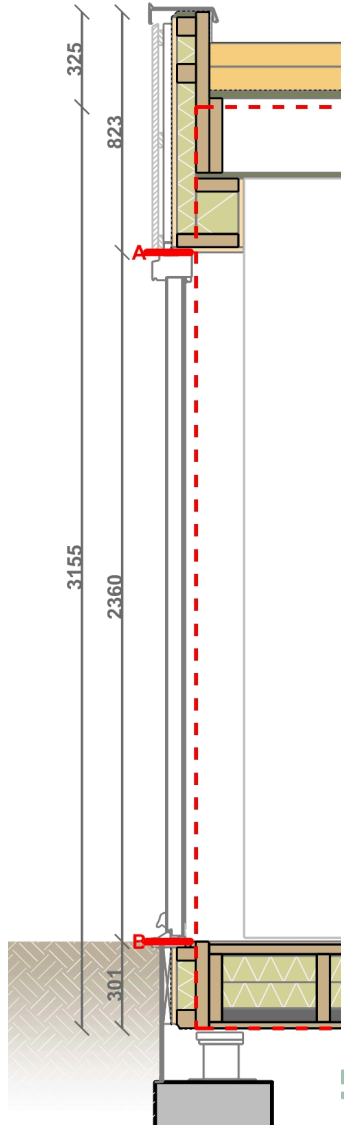
Window placement

Design Guidelines:

- windows and doors are considered openings
- openings influence a lot the RC value of the facade.
- openings and their influence on the RC value are considered project by project and calculated separately.
- windows can freely be placed, as long as the conditions on this and the following pages are taken into account.

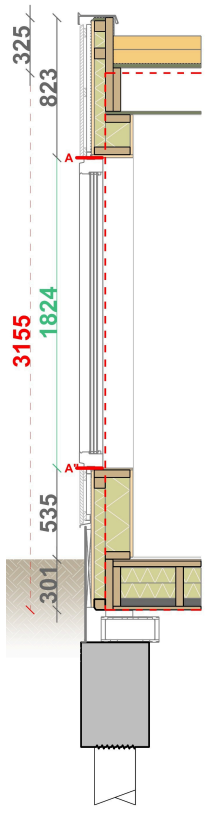


Maximum window height

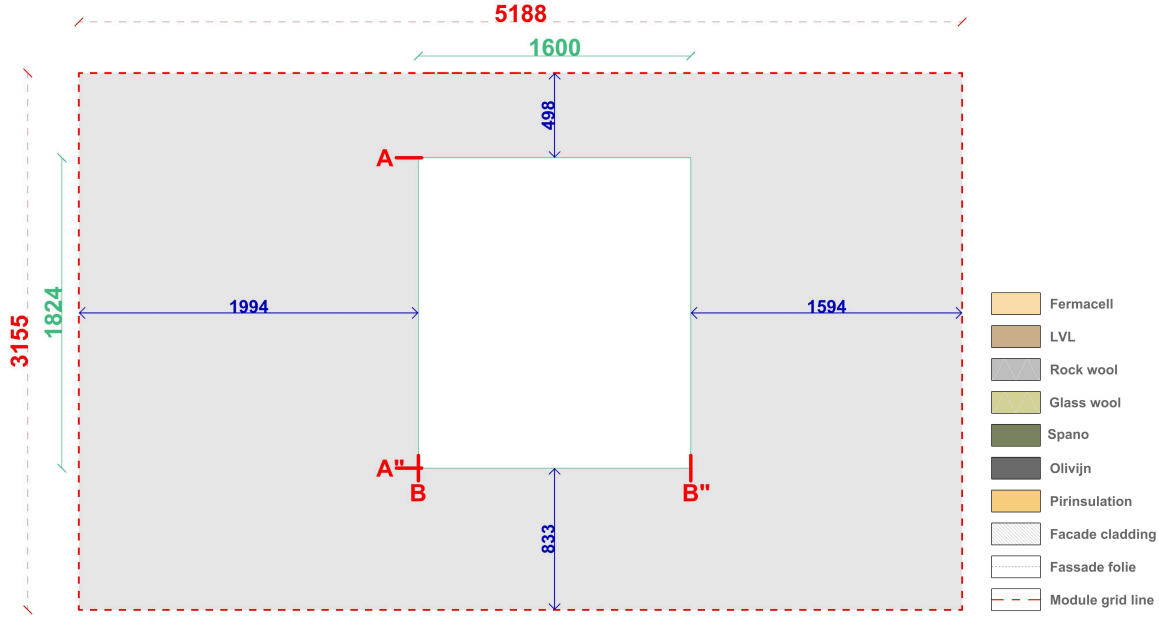


facades and windows

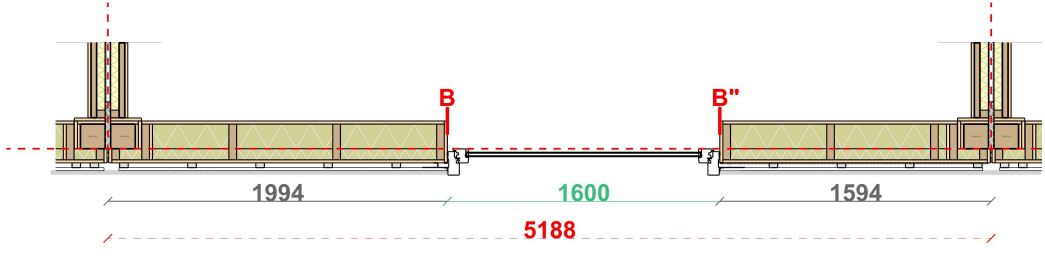
Window placement: how to define window dimensions



Sectional elevation



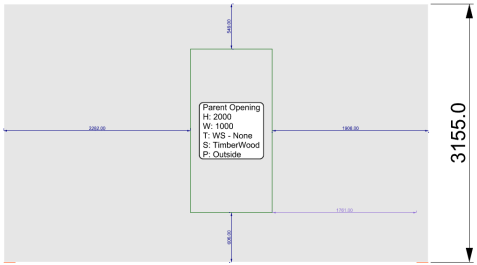
Module elevation with window placement



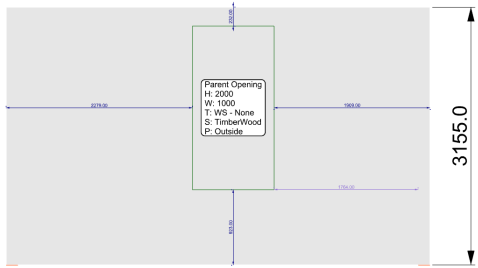
Sectional plan

facades and windows

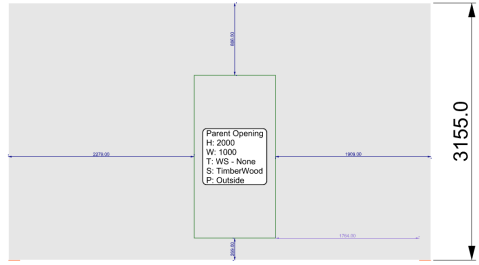
Window placement



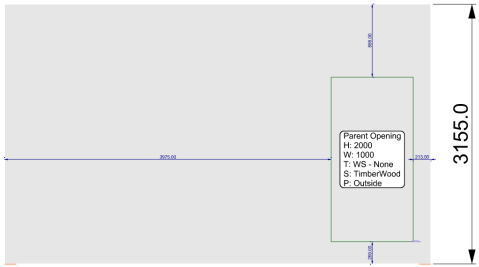
example of window placement without disruption of tolerances (to ceiling, floor, columns...)



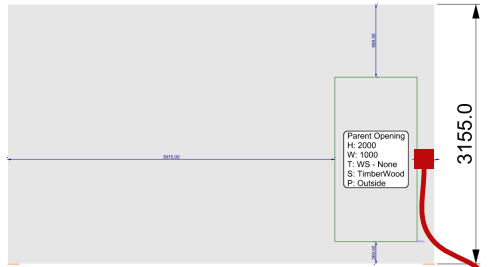
example of window placement placed at minimum distance from ceiling



example of window placement placed at minimum distance from floor



example of window placement placed at minimum distance from colums



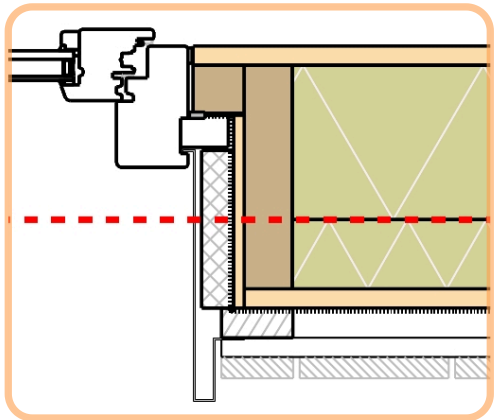
example of window placement placed at less than minimum distance from colums

less than 213 mm

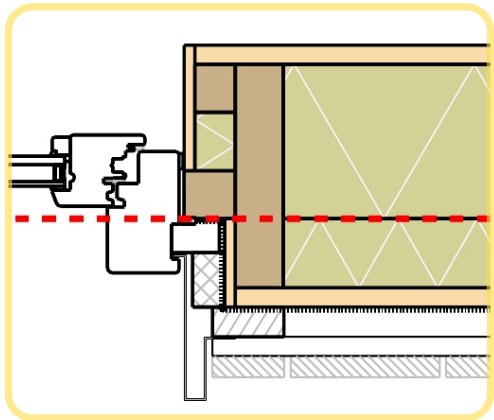
Openings need to be added following specific minimum tolerances from the different building elements, such as ceiling, floor, columns.

facades and windows

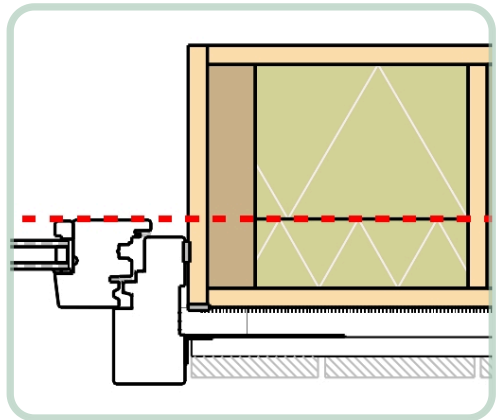
Window placement



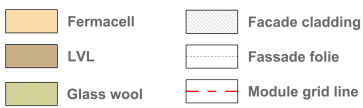
Slightly more expensive,
but thermally inferior



Slightly more expensive,
but thermally superior



Preferred option



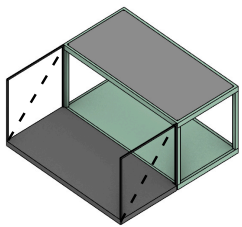
Design guidelines:

- openings can be placed with various systems, tolerances and rules depending on project needs or manufacturer usage.
- all openings need to respect the minimum distances from the boundaries to columns, floors and ceilings
- openings cannot be placed at smaller distance of 91 mm between each other

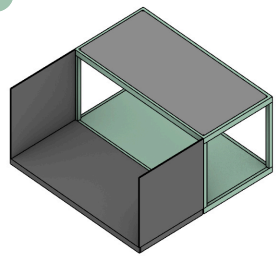
balconies

Balcony options and non-options

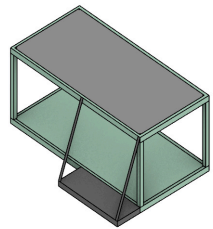
Note! Balconies are not included into the Sustainer system and should be engineered elsewhere. Balcony connections are Sustainer standard.



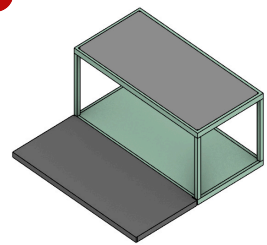
Balcony spans column-column and is supported by floorhigh braces



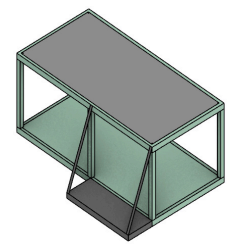
Braces can also be hidden in panels



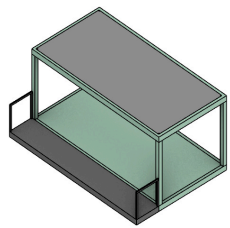
Balcony does not span column-column; not possible



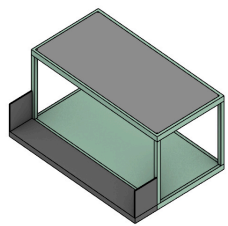
Balcony does not have any bracing support



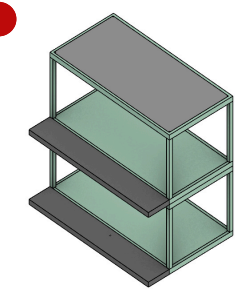
Balcony does not span column-column, but extra column has been added



Balcony has semi-high braces; balcony-depth is limited, columns have extra depth



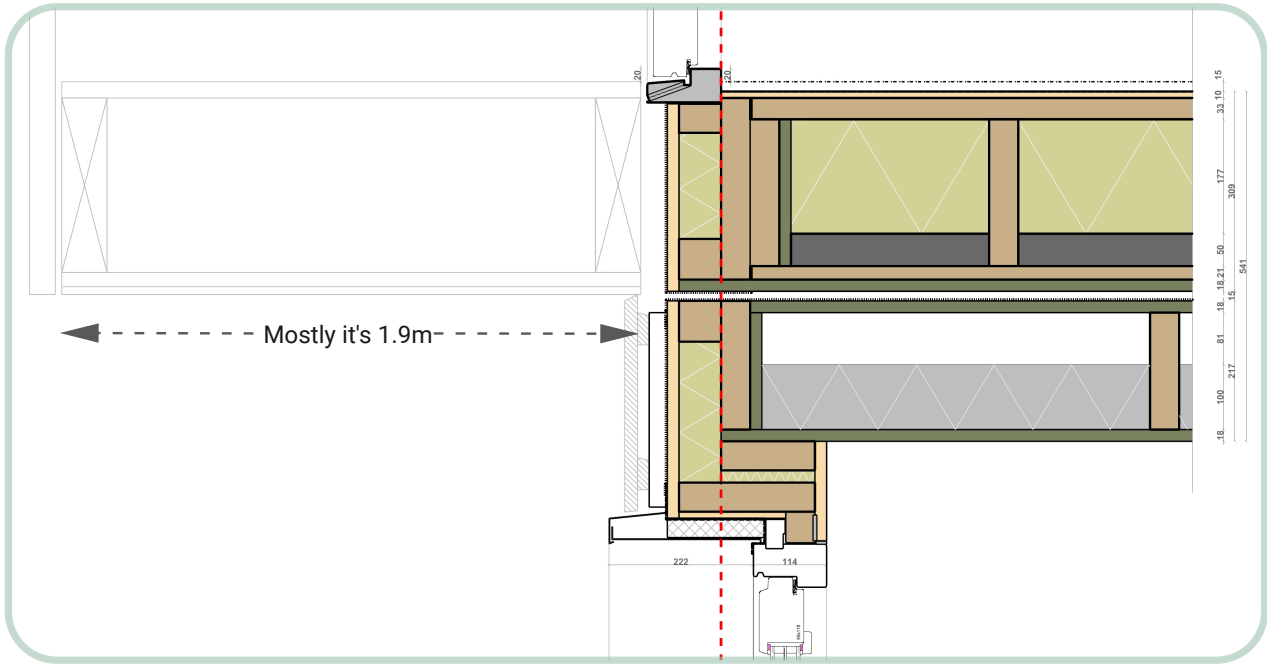
Semi-high braces can be hidden in panels

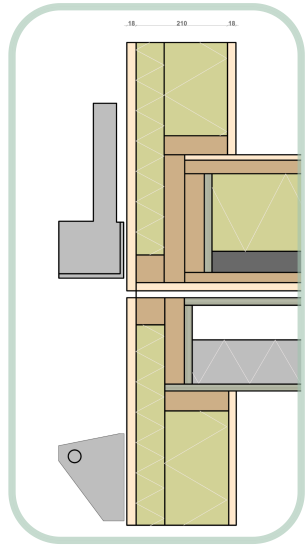


Balcony spans column to column, no braces are added; not possible

balconies

Balcony detail





Connection detail

- Fermacell
- LVL
- Rock wool
- Glass wool
- Spano
- Olivijn
- Facade cladding
- Fassade folie
- Module grid line

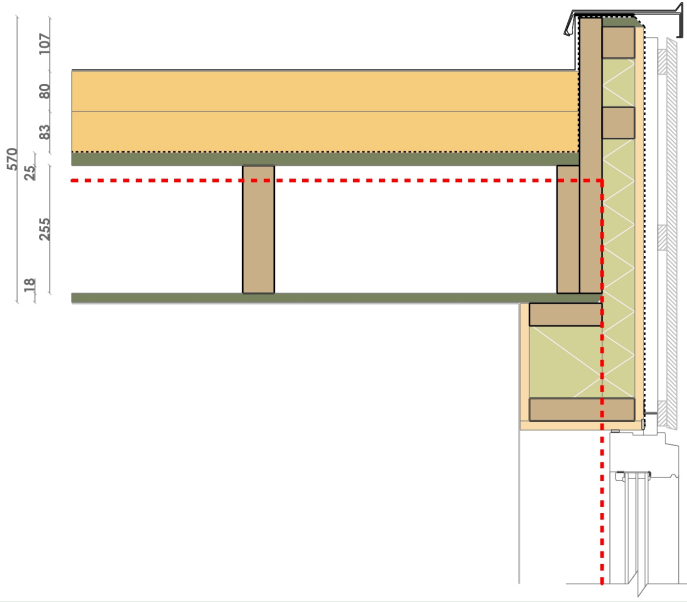
Design guidelines:

- Typical balconies are up to 7 m², with a depth of 1.9 m from the building façade.
- The balcony length can vary as needed, provided that:
- It is supported at every column location; and
- An intermediate column is placed when a balcony ends midway a module.

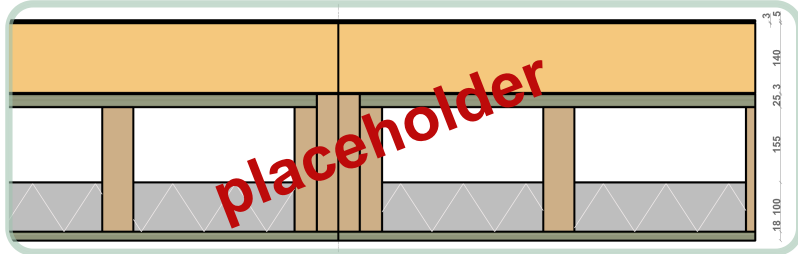
roof

Different roof options

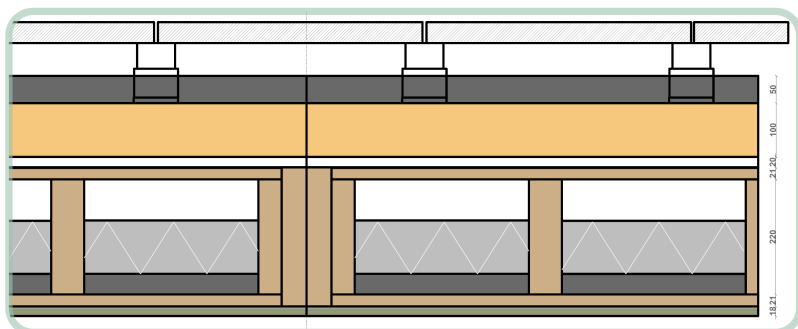
Steel
Flexible mass
Spano
LVL
Pirinsulation
Rock wool
Module grid line



Basic Roof



Water Retention Layer



Roof Terrace **without** Water Retention Layer

This sheet is still in development

technical installations and wet spaces

HVAC, bathroom, fuseboard, etc.

Positioning of bathroom, kitchen and tech space and the spatial reservations for them are extremely important for the overall pricing of the project and the ease of the design.

Design Guidelines

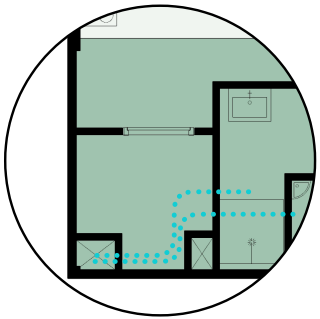
- **Prefab Optimization**: Everything that can be prepared in the factory is cheaper; avoid connections between ducts/conduits on the construction site where possible, i.e. between modules
- **Spatial Reservations**: Account for the fixed heights of floor and ceiling packages for piping/wiring and installation infrastructure.
- **Clustering**: Wet cells (bathroom/toilet), technical rooms, kitchens, and shafts should preferably be clustered into a single "tech module."
- **Equipment Placement**: Mount appliances/equipment preferably on interior walls rather than on the façade or separation walls
- **Shaft and Meter Cupboard Position**: These must take into account the position of beams, columns, and the foundation to avoid conflicts in the structure.

Everything needs to be confirmed by the installation advisor.

This sheet is still in development

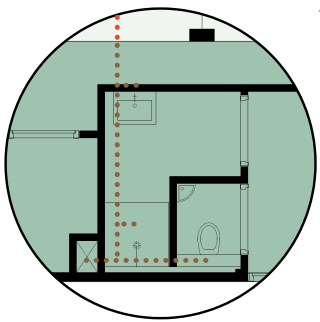
technical installations and wet spaces

Positioning of bathroom, kitchen and tech space



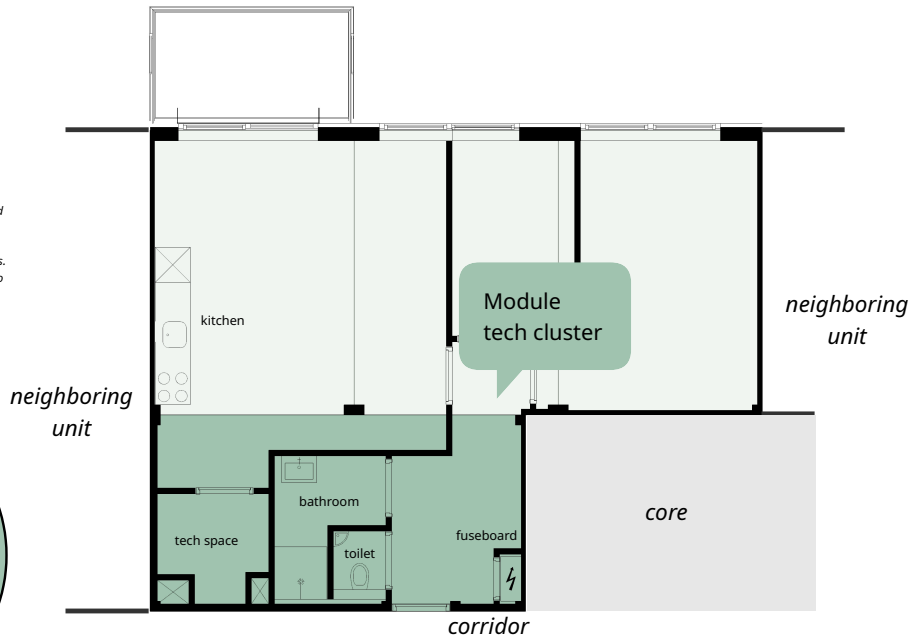
The tech space, wet spaces and shafts have all been placed within one module. Most of the ventilation pipes do not cross a module boundary, avoiding a connection that has to be made on the building site after placement of modules. In addition to this, by designing the shaft locations close to the tech space and wet spaces, extra meters of piping can also be avoided.

Preferable distance between kitchen and tech space <4m.

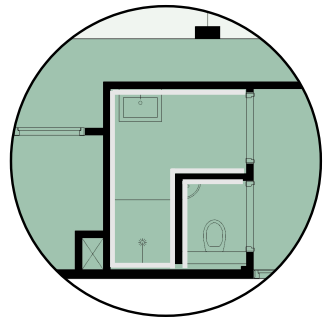


The tech space, wet spaces and shafts have all been placed within one module. This means most of the sewage pipes do not cross a module boundary. In addition to that, by designing the shaft locations close to the tech space and wet spaces, extra meters of piping can also be avoided.

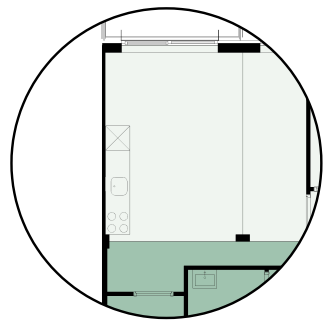
This sheet is still in development



This setup for the module tech cluster is preferred due to the shaft connections not being too distant from each other. This makes the cost for the unit lower than if the shafts positions would be opposite sides of the unit.



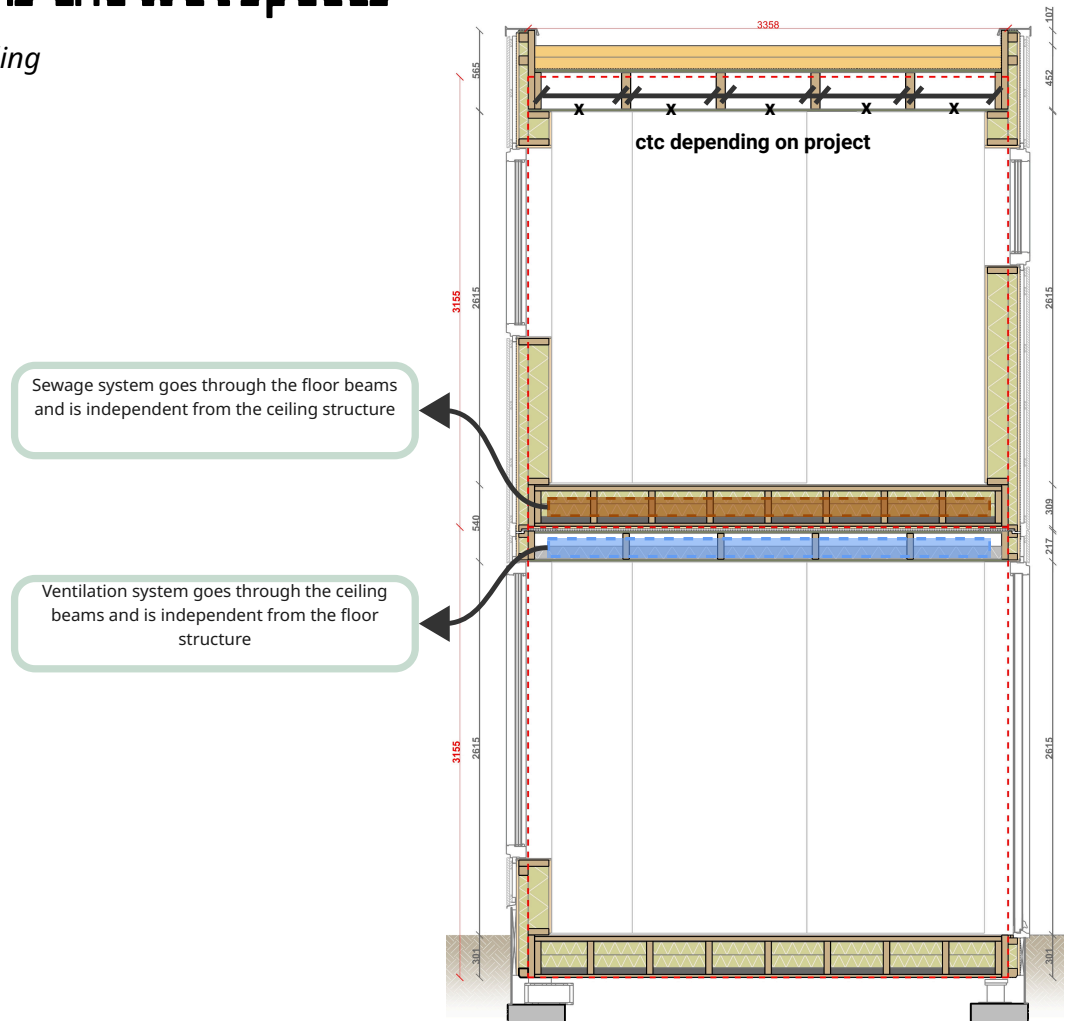
All wet spaces within the boundaries of 1 module: installations, watertight finishing can be placed within the factory.



The kitchen has been placed within one module: the kitchen can be part of the modular assembly process within a factory. However, the kitchen is not placed in the same module as the tech space, resulting in HVAC crossing a module boundary, which has disadvantages.

technical installations and wet spaces

Ducts and piping in floor and ceiling



This sheet is still in development