HOPTILLE, FROM STIGMA TO CHARISMA

TECHNICAL ANALYSIS - COLLECTIVE

Image enhancing transformation of post-modern architecture while retaining its identity

M.C. LOUWERENS

Colofon

Cornee Louwerens,
Jonathan Verhoef,
Marije de Ruijter,
Nurhadi Nugraha,
Stefan Lichtenveldt,
Rewar Obeid

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S2C.3: Technical Analysis - collective
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Graduation studio Adapting to 20th Century Heritage
Master Architecture, Urbanism and Building Sciences

**Dyslexia*

TU Delft
Delft University of Technology
Faculty of Architecture
and the Built Environment

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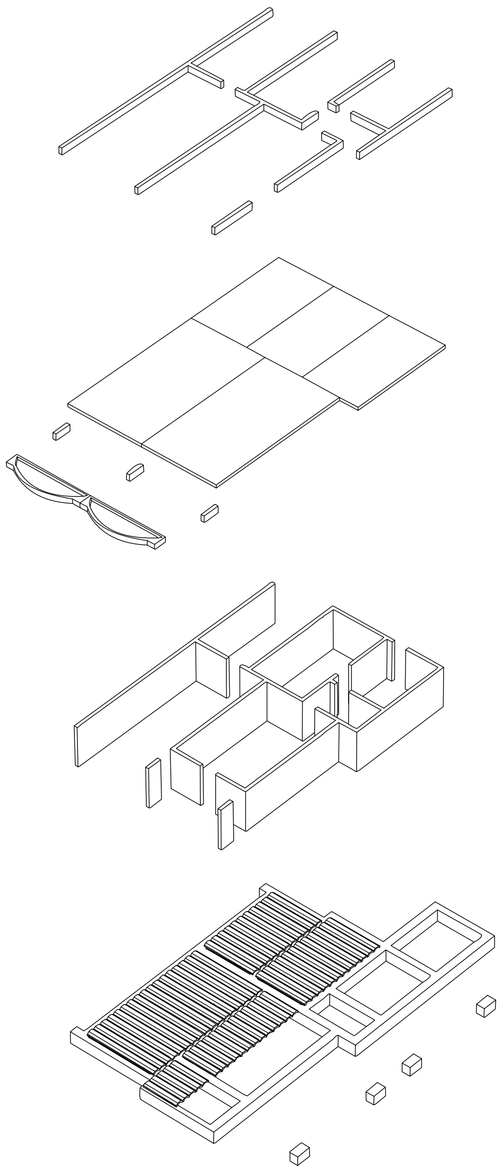
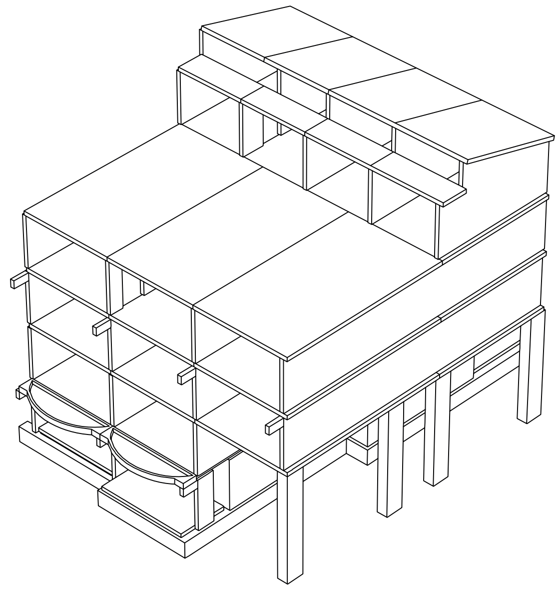
STRUCTURE



Building order

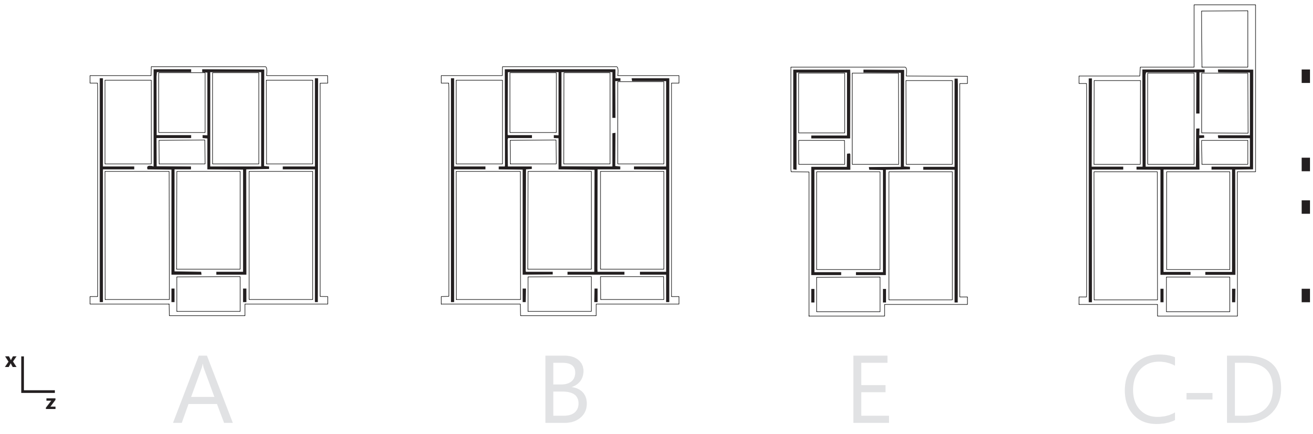
The building is constructed in concrete with several prefab concrete elements to support the cast of concrete. Prefab concrete elements also make up the facade structure of the building, with a brick cladding in front.



The piles are drilled first, after which concrete beams are placed/cast that support the wall structre of the building.

On these foundation beams concrete shell shaped panels (dutch: broodjesvloer) are placed alongside eachother(see next page, fig 2) which are then poured over with concrete. When the ground floor bearing walls are then cast on the beams, a temporary construction is placed inbetween to support the casting of the floors of the upper storey.

Prefab concrete slab floor elements are then positioned at height of the top of the walls(see next page, fig 3). Spanning from wall to wall. To be cast together and make a solid construction. And this is repeated for all the other storeys.
Balconies are prefabricated and rest on the consoles attached to the bearing walls.



Variations

Because of the variation in segments of the building organisation(see page 3) the concrete foundation also changes for each of these variations. The width of these beams is 500mm both in x and z direction. Except for the outermost z-beams that carry the groundfloor facades. These are only 300 mm.

The distance from core to core of the bearing walls is either 4800mm or 3600 mm depending on the side of the building.
And the core of the walls in the z direction are 8950 and 6650mm from both facade-lines.

The width(z axis) of one variant(ABCD) is therefore 14400 mm

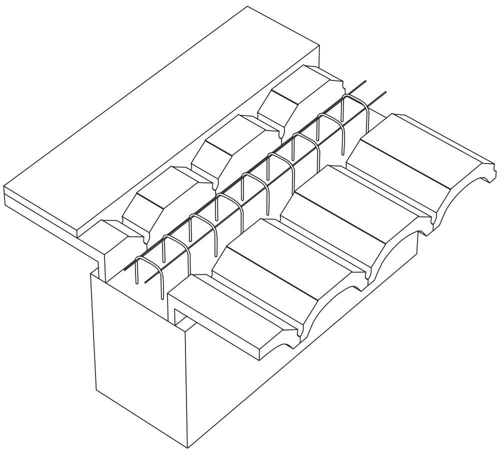
Floor to floor height of the building is 2800 mm. And the bearing walls themselves are 200 mm thick.

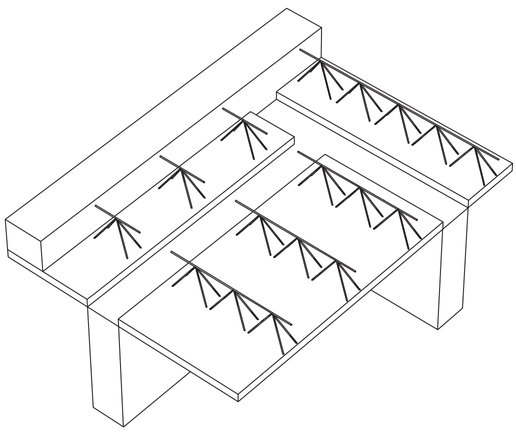
Construction details

Both figures below are construction knots. The left being the ground level floor, and the right being the upper floors.

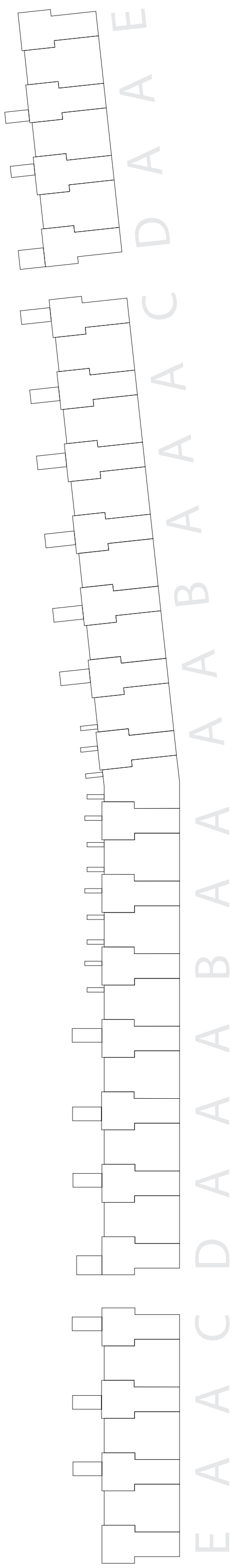
The left one is called a "broodjesvloer" construction in dutch and it consists of these half round shell shaped slabs with internal steel reinforcement. This is covered and connected with the adjoining concrete with a screed. The elements themselves have a with of 500 mm and a height of 180 to 200 mm. The screed can then range from 40-50 mm. Depending on the span.
Because of this all the elements are placed in the z direction.

The right one shows a breedplaatvloerconstruction. With a prefab floor slabs reinforced with steel lattice girders. To be cast over later and joining the walls and floors into one solid construction.





BUILDING ORGANISATION



Concept explanation - This Hoptille mid-rise building consists of a string of different building segments. A being the most prevalent. And B, C, D and E being altered versions to allow for vertical routing and also the underpasses.

Over time renovations have been made to the building. That made the accessibility less reliant on the inner street of the building. And dwellings have even been joint together and some also incorporated some segments of the(former) inner street.

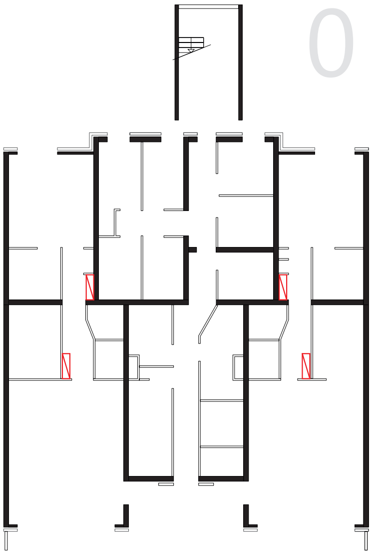
The building has many maisonettes. Meaning that a dwelling extends over multiple floors. In the table below, in the right column it shows how many dwellings per building segment extend over multiple floors, example: 3(1-2) means 3 dwellings that are part of the first and second floor(bg meaning groundfloor).

Numbers - the building has 16.085 m2 total living area and garage space divided by 4.977 m2 ground space. Resulting in a 3.23 fsi. With a count of 244 dwellings. Averaging 60,5m2 living area per dwelling.

		Opp	aantallen
14	Segment (A)	60,3x2(bg) 60,7x2 - 85,5x1(1) 31x3 - 52x1 - 44,35x1(2) 63,45x1 - 31x1 - 40x1 - 22x2(3) 45 x2(4) total: **785.3 m2**	2(bg) 3(1-2) 2(2) 3(3-4) 2(3) 12 dwellings
2	Segment(B)	60,3x1 - 74x1(bg) 60,7x2 - 85,5x1(1) 85,6x1 - 62,5x1 - 31x1(2) 65,5x1 - 68,2x1 - 62,6x1(3) 44x1 - 22x2(4) total: **804.6 m2**	2(bg) 3(1-2) 3(3-4) 8 dwellings
2	Segment(C)	60.3x1(bg) 60,7x1 - 85,5x1(1) 31x3 - 21.5x1 - 52x1(2) 63.4x1 - 31x1 - 39.9x1 - 22x2(3) 44x1 - 22x2(4) total: **639.3 m2**	1(bg) 2(1-2) 3(2) 2(3) 3(3-4) 11 dwellings
2	Segment(D)	60.3x1(bg) 60,7x1 - 69x1(1) 31x3 - 21.5x1 - 44,5x1(2) 63.4x1 - 31x1 - 39.9x1 - 22x2(3) 44x1 - 22x2(4) total: **615.3m2**	1(bg) 2(1-2) 3(2) 2(3) 3(3-4) 11 dwellings
2	Segment(E)	60.3x1(bg) 60,7x1 - 69,6x1(1) 31x2 - 44,45x1(2) 31x2 - 22x2(3) 22x2(4) total: **447 m2**	1(bg) 2(1-2) 1(2) 2(3) 2(3-4) 8 dwellings
	Garageboxes	62.1(ABC) of 47.8(D+E) m2	

14776+1309

0



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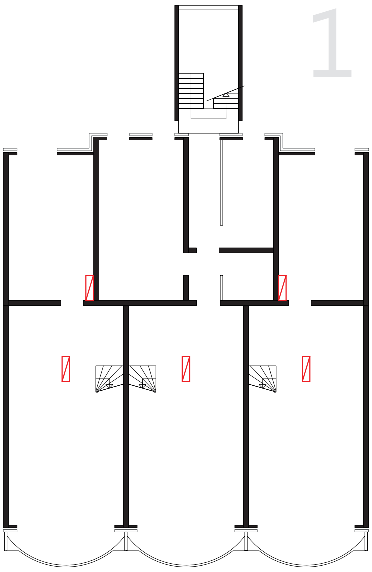

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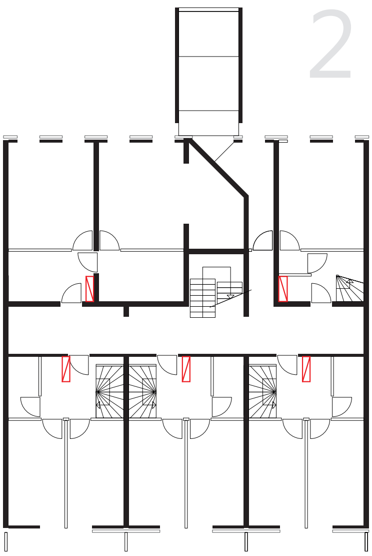

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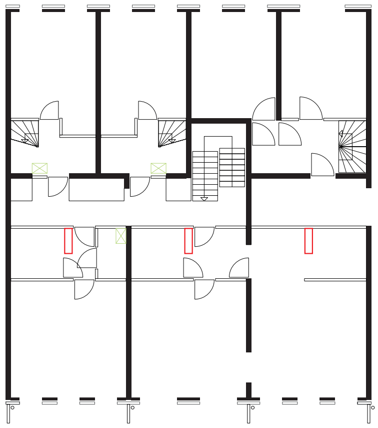

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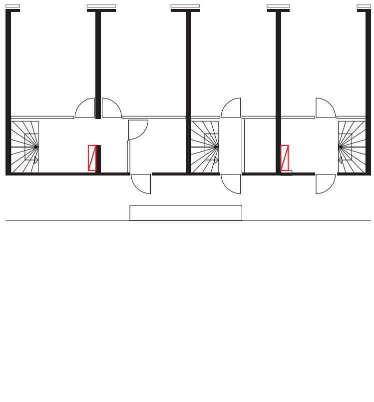


These floorplans show the levels of segment A. With on the groundfloor garage space in the center. And a dwelling on each side.

On the first floor there are three dwellings, where the middle dwelling possibly can be accessed through the outdoor staircase. The other two are accessed from the second floor. Like they were supposed to be originally.

On the second floor, which is accessible through the staircase, the hallway connects with 5 dwellings. of which only 3 extend to the level below.

On the third floor, which is accessible by taking the staircae from the second floor, the hallway connects to 5 dwellings. Of which only 3 extend to the fourth floor.

RENOVATIONS *1984*

Since completion in 1980 the building has been renovated twice. The focus of the first renovation was on dividing the interior corridor into smaller sections. The second renovation focused on the middle section of the building (grid 48-72) as the apartments in this section were still accessed through an internal corridor.

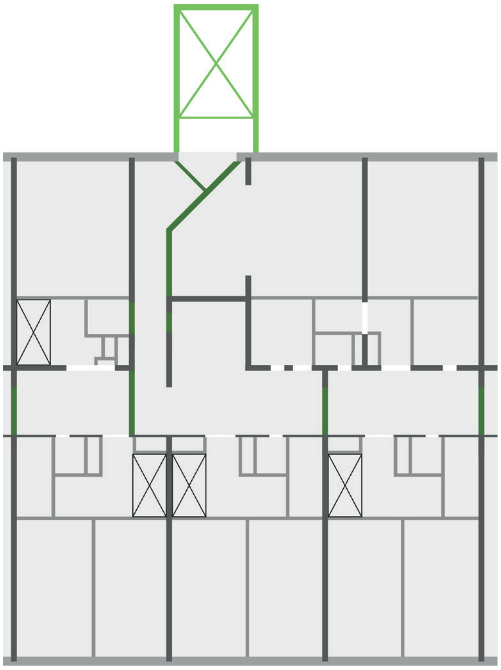
During the first renovation in 1984 13 staircases, with prefabricated concrete walls, were added to the north-east side of the building, therefor creating more access points to the internal corridor on the second floor. Subsequently the corridor that used to be 300 m long was split into eighteen sections of 14,4 m and one bigger section in the middle of 57,6 m.

To divide the corridor into smaller sections multiple partitions were added, being either doors with a small window beside it, or walls of glass bricks. Furthermore, a connection between the added staircases and the corridor was created on the second level. To do so partitioning walls were built using sand-lime bricks, with a plaster finish.

Sand-lime bricks were also used to close of some of the existing openings in the structure. Openings in the floor on the third level were closed of using glass bricks, as a result light can still enter the corridor on the level below. Meanwhile, new openings were also created in the loadbearing walls. For the small openings, used for doors, no new structure was added. However, for bigger openings steel beams were added.

Lastly, insulation was added to some walls on the third floor. These walls separate dwellings but are thinner than other house separating walls, it is therefore plausible the insulation was added in order to reduce noise.

In short, the interventions during the first renovation are:
- Add prefabricated concrete staircases
- Add sand-lime brick walls, with plaster finish
- Divide internal corridor using glass bricks or doors and windows
- Close openings in floor using glass bricks
- Create openings in structure, add steel beams for larger openings
- Add insulation to thin partitioning walls



Add prefabricated concrete staircases

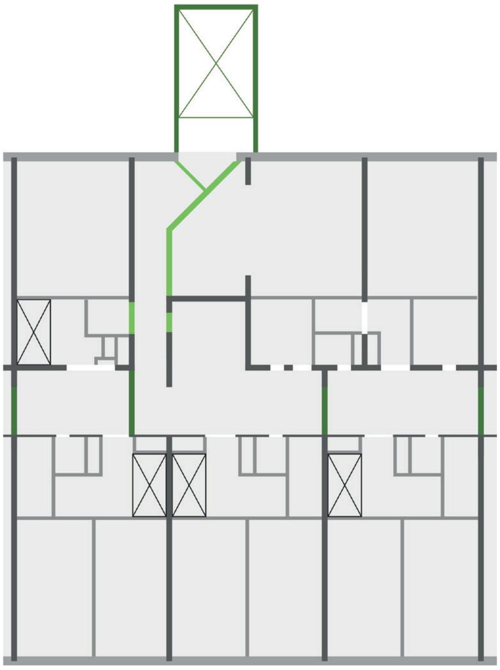
http://fotos.serc.nl/noord-holland/amsterdam/amsterdam-65586/

Predominantly closed stairwells

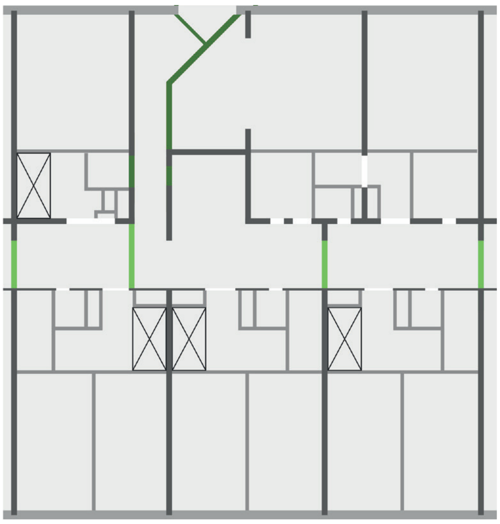
Stadsarchief Amsterdam https://archief.amsterdam/beeldbank/

Transparent stairwells

http://www.amsterdamstreetside.nl/

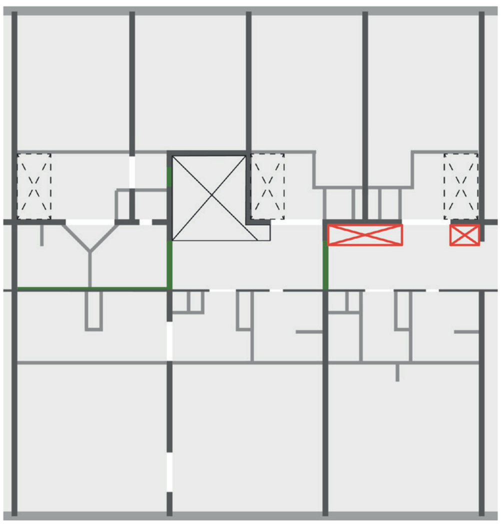


Add sand-lime brick walls, with plaster finish

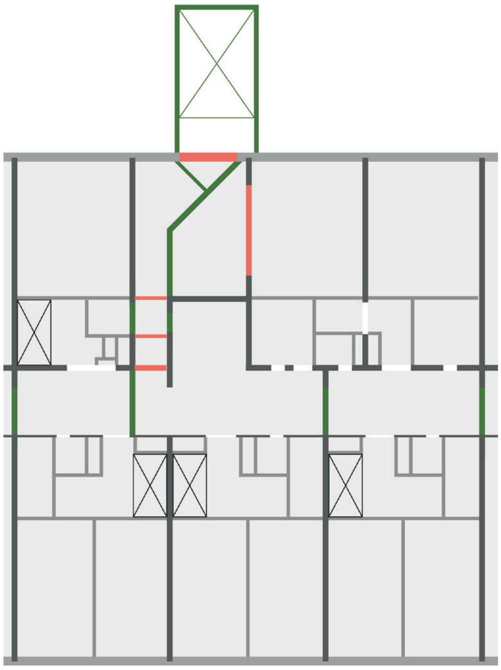


Divide internal corridor using glass bricks or doors and windows

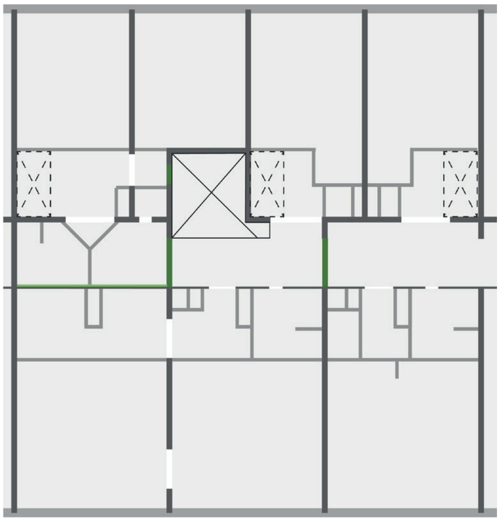
https://www.woningnetregioamsterdam.nl/Eenheiddetails



Close openings in floor using glass bricks



Create openings in structure, add steel beams for larger openings



Add insulation to thin partitioning walls

RENOVATIONS *1993*

As mentioned, the second renovation focused on the middle section of the building. Again, the access system was altered. In this section the internal corridor was completely removed, as well as the only staircase on the south-west side of the building.

Half of the dwellings that had their access on the second floor now have their entrance on the first floor; twelve demountable metal stairs were added to the north-east façade, allowing direct access to the dwellings. The other dwellings in the middle section can be accessed by a gallery on the third floor, as well on the north-east side of the building.

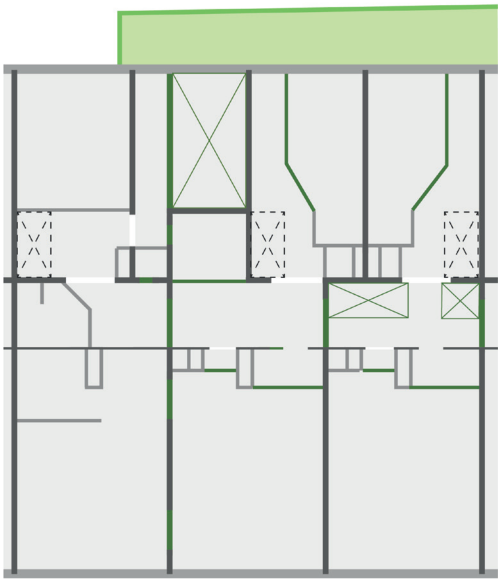
The gallery can be accessed by two staircases. One of these was already present up to the second floor. However, a connection to the third floor and the entirety of the other staircase had to be created. The floor was removed between two load-bearing walls, with the exception of the third floor. On the third floor a HEB 180 steel beam was added to bear the remaining part of the floor.

The space from the removed internal corridor was integrated into the dwellings. The partitions built during the previous renovation were removed and replaced by sand-lime walls. Some other openings, for doors and windows, were also closed using sand-lime brick. On the third floor internal walls were removed and new gibo walls were added to redesign the floorplan.

Similarly, the openings in the floor that were closed of using glass bricks were opened again in this section of the building. These openings were used for stairs connecting spaces on the second floor to the third floor. By adding these stairs and keeping the stairs that used to give access to the internal corridor, no extra openings needed to be created. Only one of the staircases that was used to access the internal corridor was demolished, the opening in the floor filled with in-situ concrete.

In short, the interventions during the second renovation are:
- Remove internal corridor and demolish the staircase on south-west side
- Add gallery on the third floor
- Add external stairs to the first floor
- Add internal staircases to the third floor gallery
- Re-open the openings that were closed during the previous renovation
- Use sand-lime bricks to close openings
- Remove internal walls and add gibo walls
- Add staircases using re-opened openings
- Remove unnecessary staircase

As the sand-lime partitions were not present in the building at first, it can be assumed that these walls can be removed, without damaging the integrity of the structure. Similarly, the gallery and external staircases can be removed, and as the external staircases are demountable these can be reused.



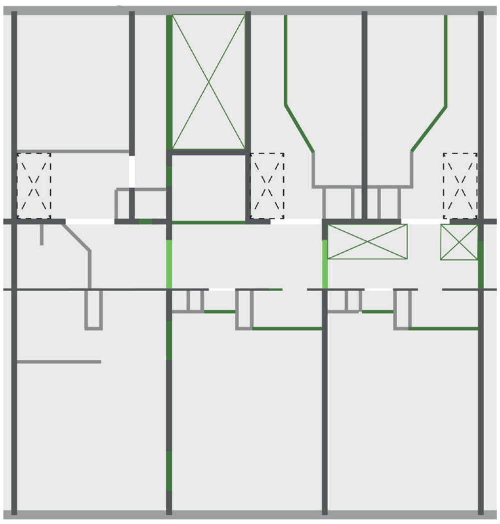
Add gallery on the third floor

M. de Ruijter

Remove internal corridor and demolish the staircase on south-west side

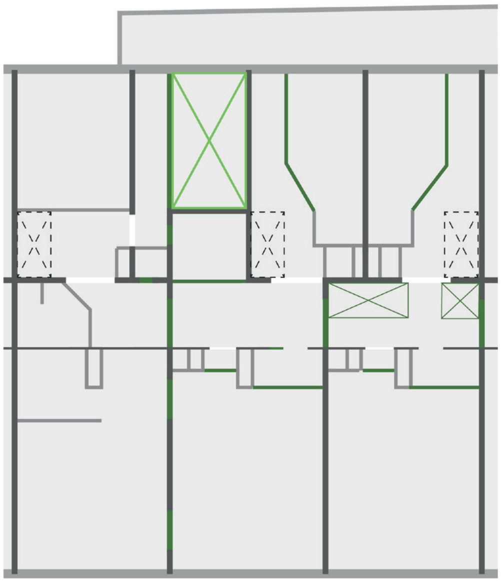
Add external stairs to the first floor

M. de Ruijter

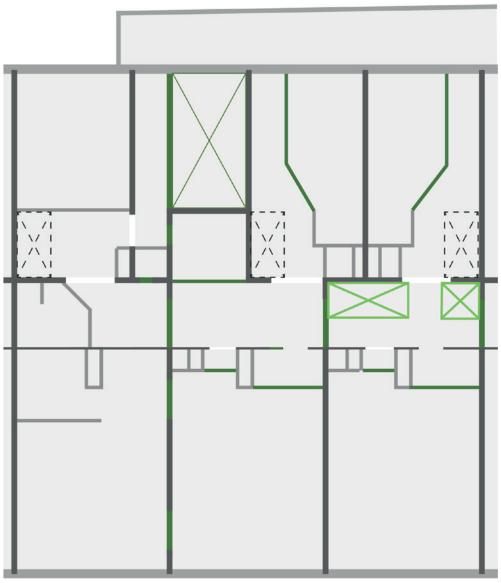


Remove internal corridor and demolish the staircase on south-west side

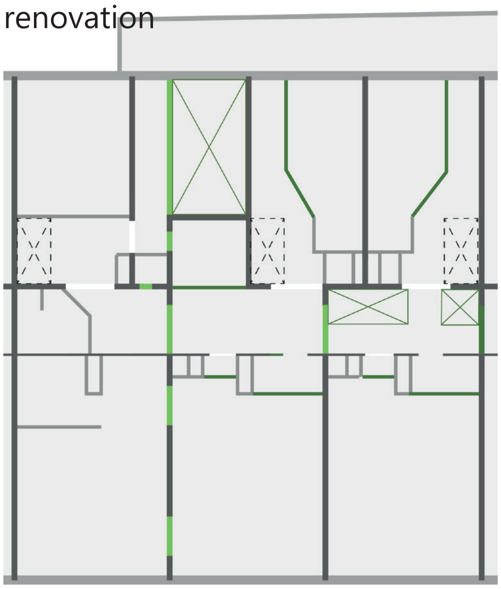
Stadsarchief Amsterdam, D. Kransberg
https://archief.amsterdam/beeldbank/



Add internal staircases to the third floor gallery

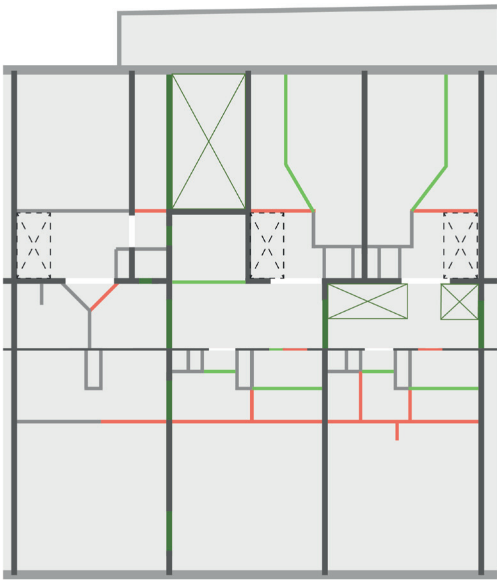


Re-open the openings that were closed during the previous renovation



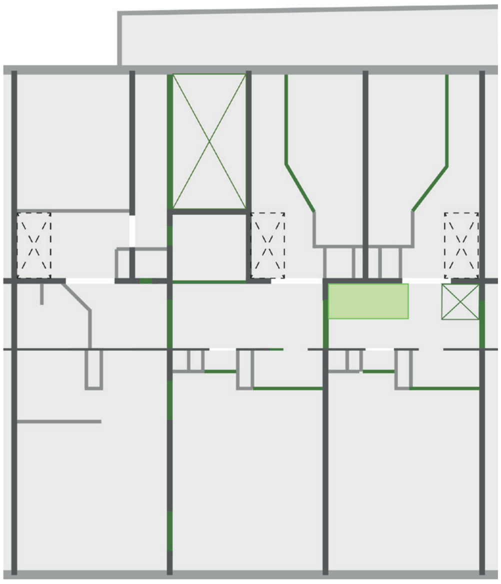
Use sand-lime bricks to close openings

https://www.woningnetregioamsterdam.nl/Eenheiddetails



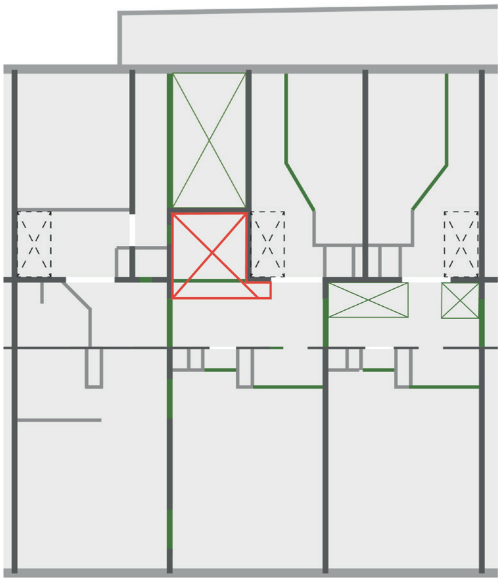
Remove internal walls and add gibo walls

https://www.woningnetregioamsterdam.nl/Eenheiddetails



Add staircases using re-opened openings

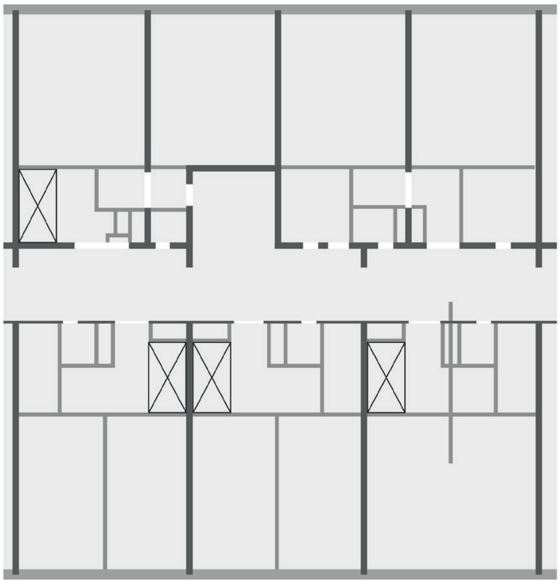
https://www.woningnetregioamsterdam.nl/Eenheiddetails



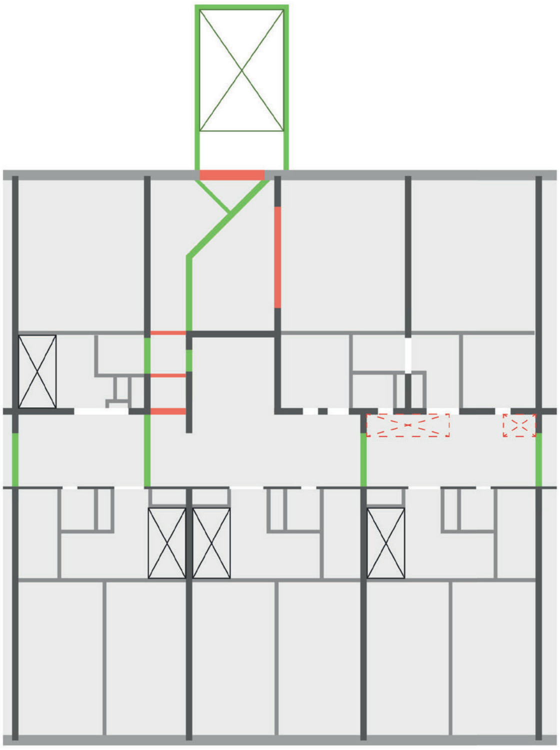
Remove unnecessary staircase

bron

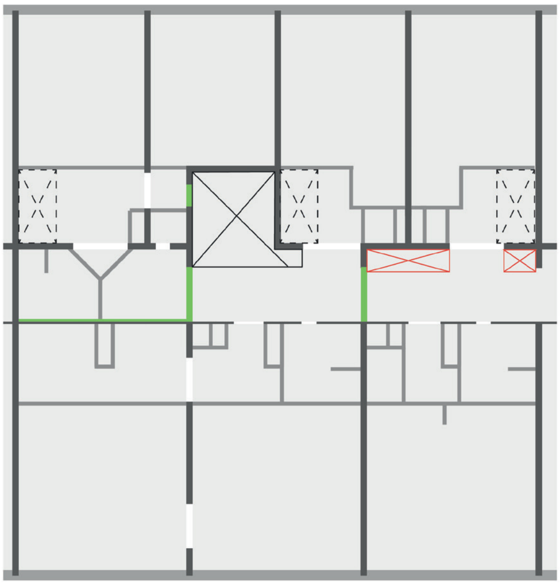
Overview of changes during renovations



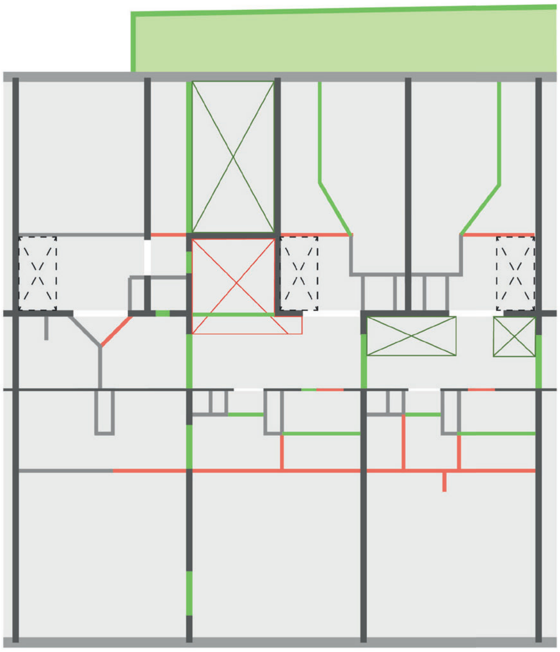
second floor - 1980



second floor - 1984

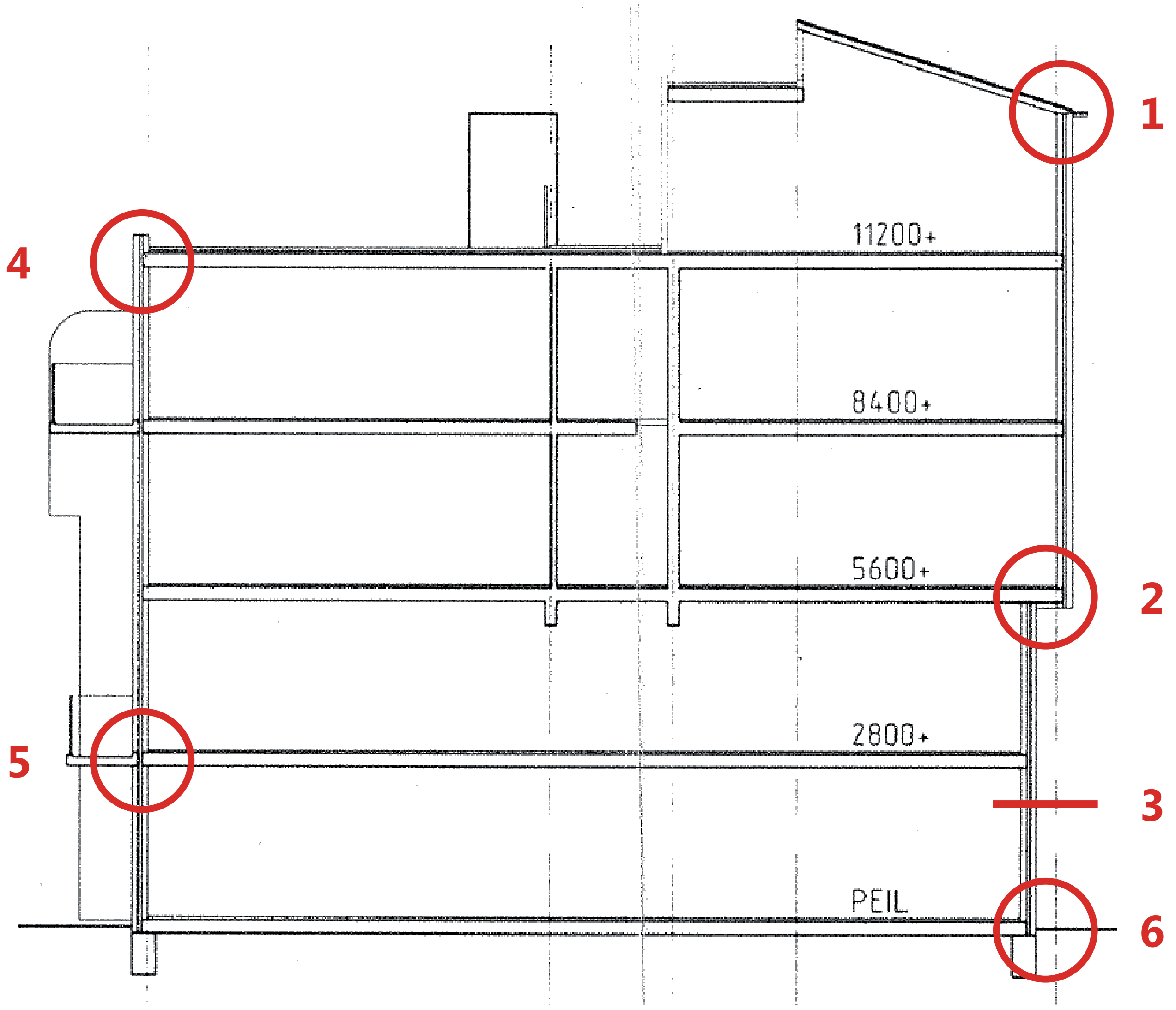


Third floor - 1984



Third floor - 1993

DETAILS



It is important to understand the current building well to the smallest scale; detail level. During the on site research phase, the poor technical performance of the mid-rise building was frequently mentioned. This analysis helps to identify these technical problems that can play a role in the renovation process. It can also provide insight into the cultural and historical value of the building.

In total, 6 details have been worked out on the most important nodes that together provide an overview of how the building is constructed.

The 6 details provide a varied range of details; 3 of which are on the northeast facade, 3 on the southwest facade, from foundation to roof.
It concerns 5 vertical details and 1 horizontal detail. The details are both original and from the renovation.

Every detail is provided with original drawings, a photo and textual explanation. It turns out that the original details do not always correspond to the current situation. For this reason, the details have been reinterpreted according to the most truthful scenario.

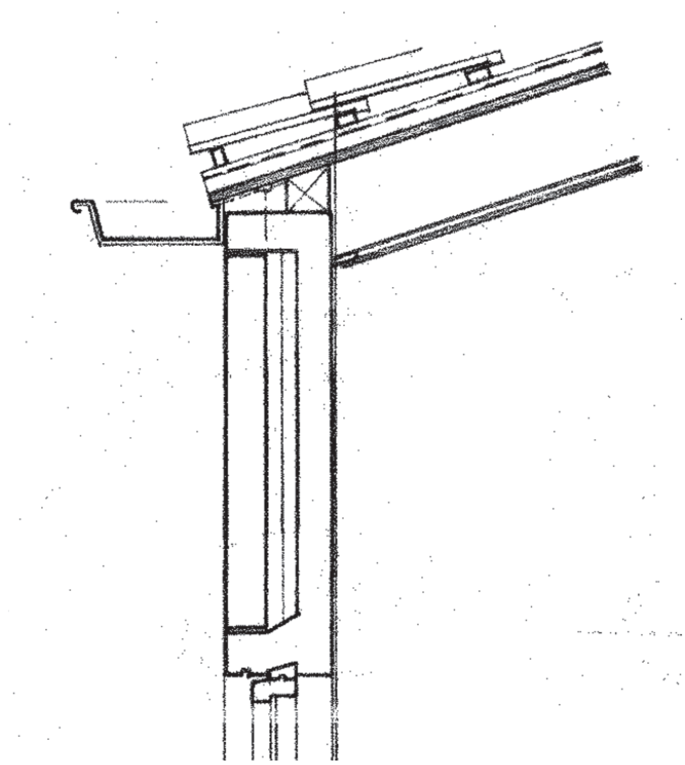
North-east facade

South-west facade

DETAIL 1

Pitched roof

Steel structure, no insulation cold bridge

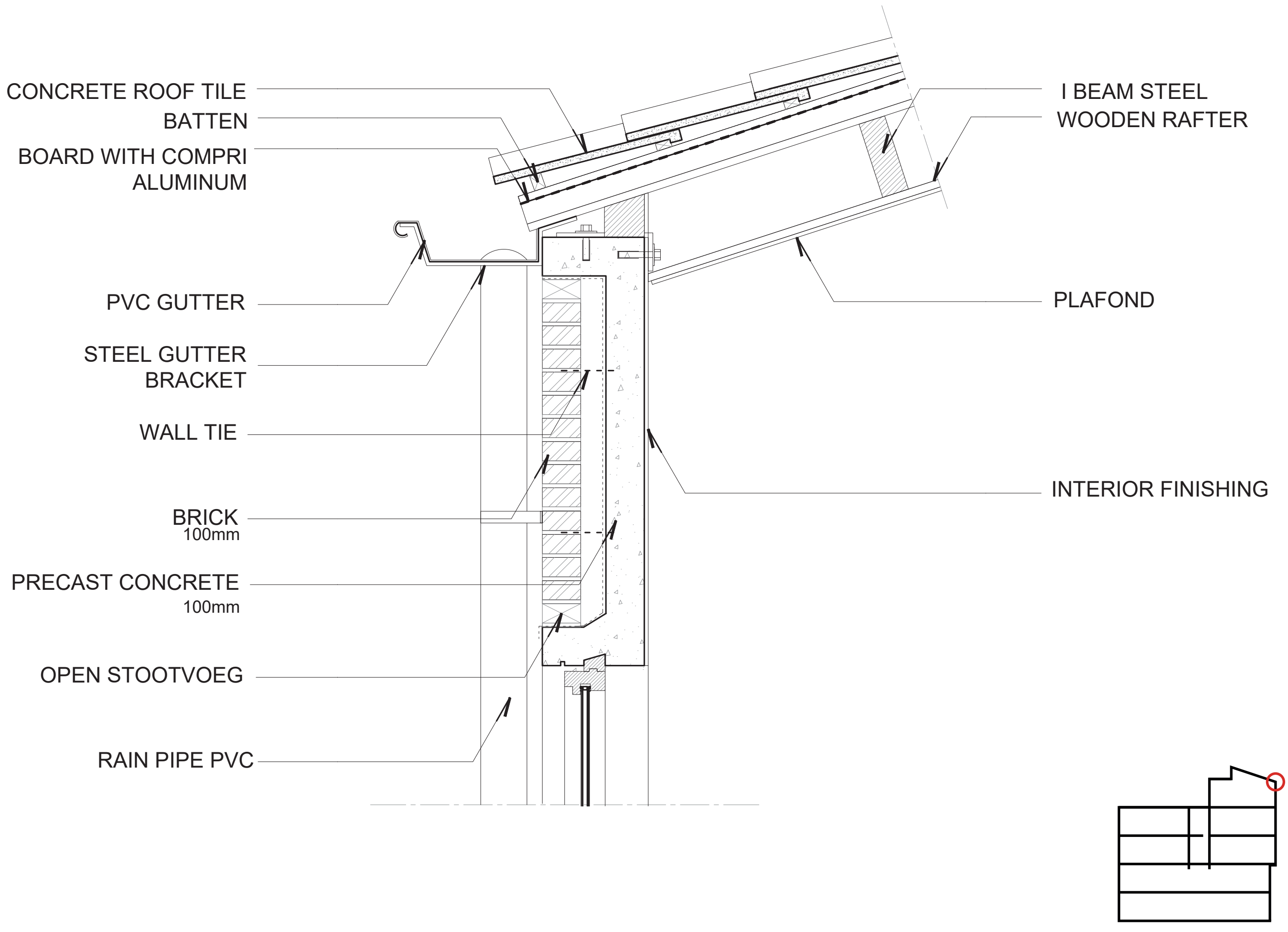


The detail shows the slanted roof components of the north-east facade of Hoptille. It has five storeys high on this side, thus the roof itself is barely seen from the ground level.

In general, the roof is steel structure with concrete roof tile. The steel structures seat in the prefabricated concrete wall in the main structure and prefab concrete in the facade. The 240mm I-beam profile has a span of 4,350mm. The rafters are made out of wood meanwhile the battens are steel hollows to support the concrete roof tile. From the original drawing of this detail, it did not indicate the presence of any roof insulation. So this raised concerns of heat loss and a cold bridge from the roof.

The facade in the fifth floor shares the same principle with other parts of the Hoptille's facades. It has brick work as outer layer and cavity of 65mm followed by prefabricated concrete panel 100mm in which also becomes a cold bridge because of exposure to the outside just above the windows.

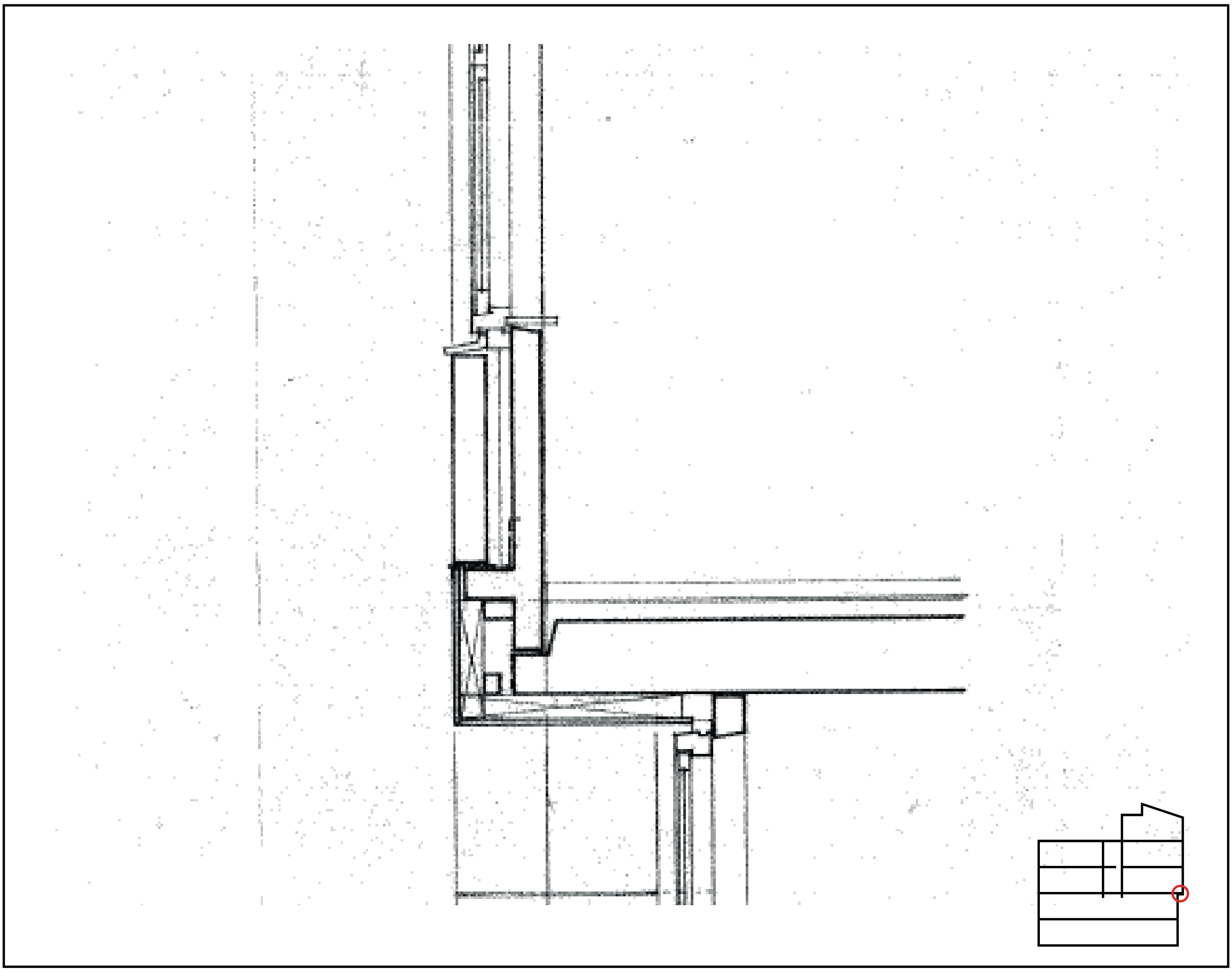
This detail is important to understand how these components are something to consider not only for the top-up intervention but also the energy performance of the renovation.



DETAIL 2

Recessed facade

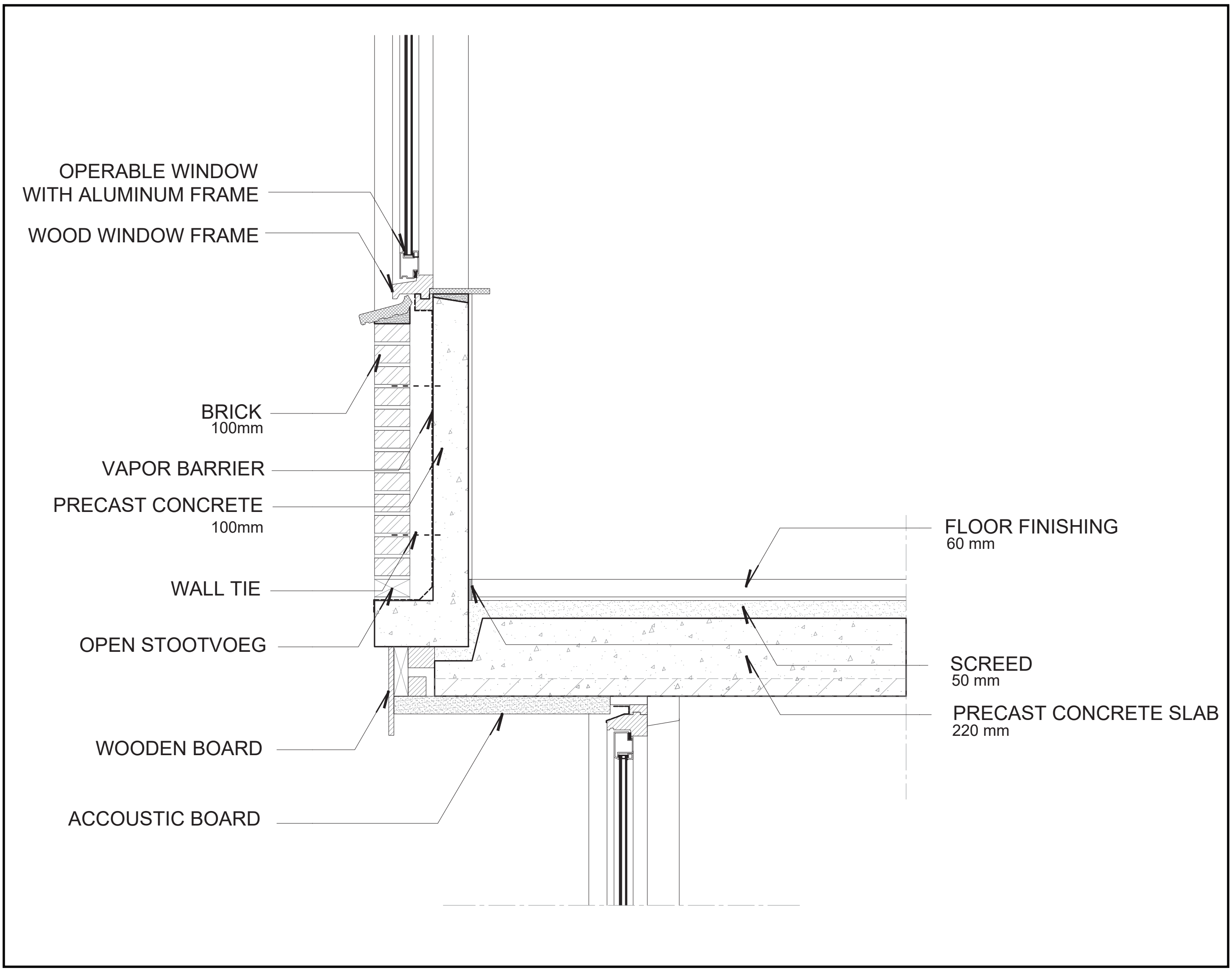
Self supporting facade, cold bridge



This detail concerns the recessed façade that repeats itself repeatedly on the north-east façade of Hoptille, which is the former rear of the building, but currently concerns the front. This place was chosen because it is an iconic and original element in this facade.

Like the rest of the building, the floor is a precast concrete slab with the corresponding finishes. The facade structure is also the same as the rest of the building; 100 mm brick exterior wall supported by a self-supporting concrete facade construction of 90 mm thick, with a cavity of 30 mm and 40 mm insulation in between. The original framework from 1980 is a wooden outer frame and an aluminum inner frame.

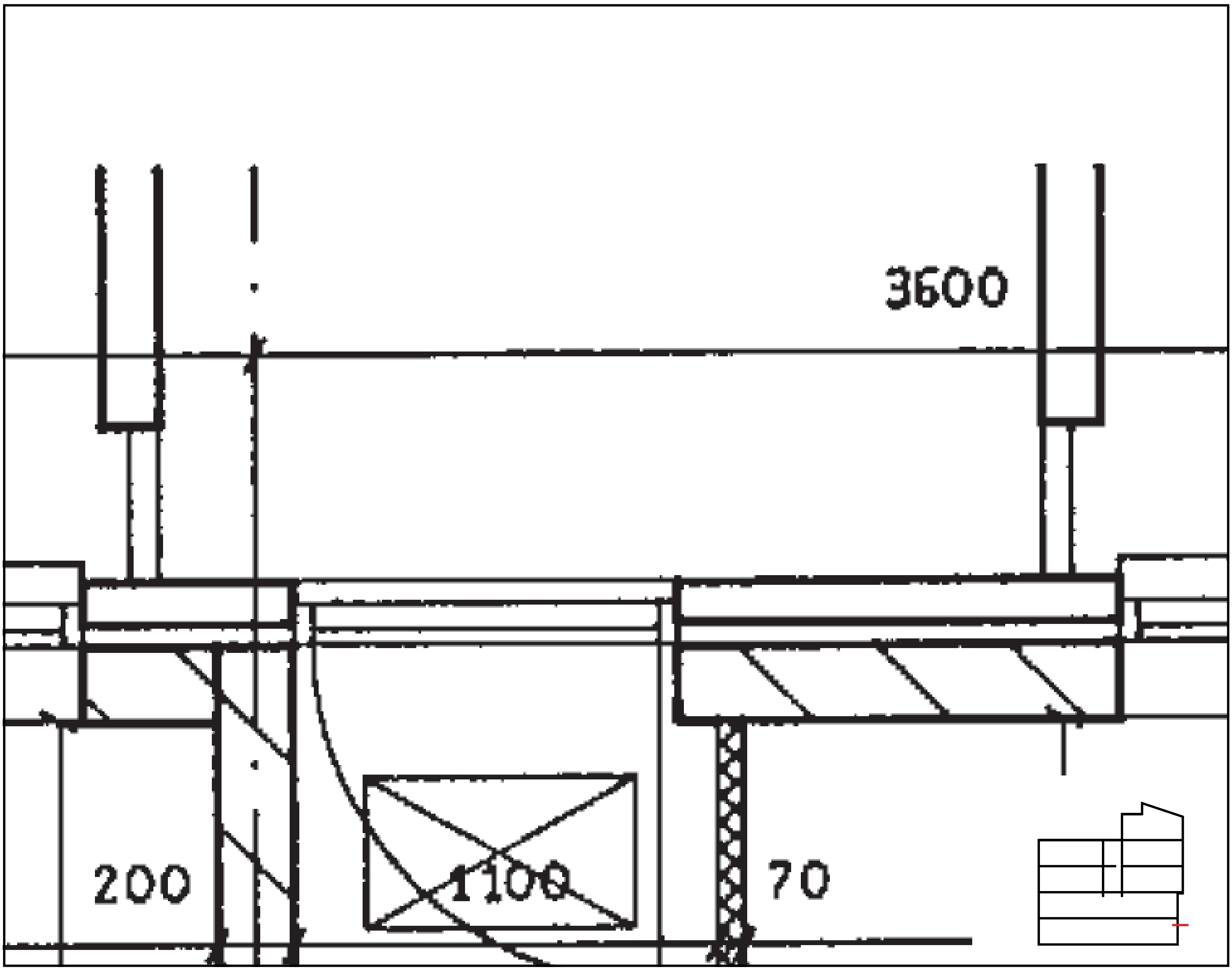
Considering the recessed facade, the detail differs from the original. The self-supporting facade was conceived in the original design by a wooden plate of approximately 500 mm high, but the plate is according to recent photos half as high. Secondly, this wooden plate would also be used on the bottom of the recessed facade. Ultimately, a fire-resistant and insulating wood wool cement board was chosen. Finally, the visible concrete facade construction takes on a different shape than originally conceived. The load-bearing facade element is located completely at the bottom instead of the 150 mm higher, aligned with the higher wooden plate. This has no consequences for the technical performance; both variants are a cold bridge.



DETAIL 3

Horizontal connection

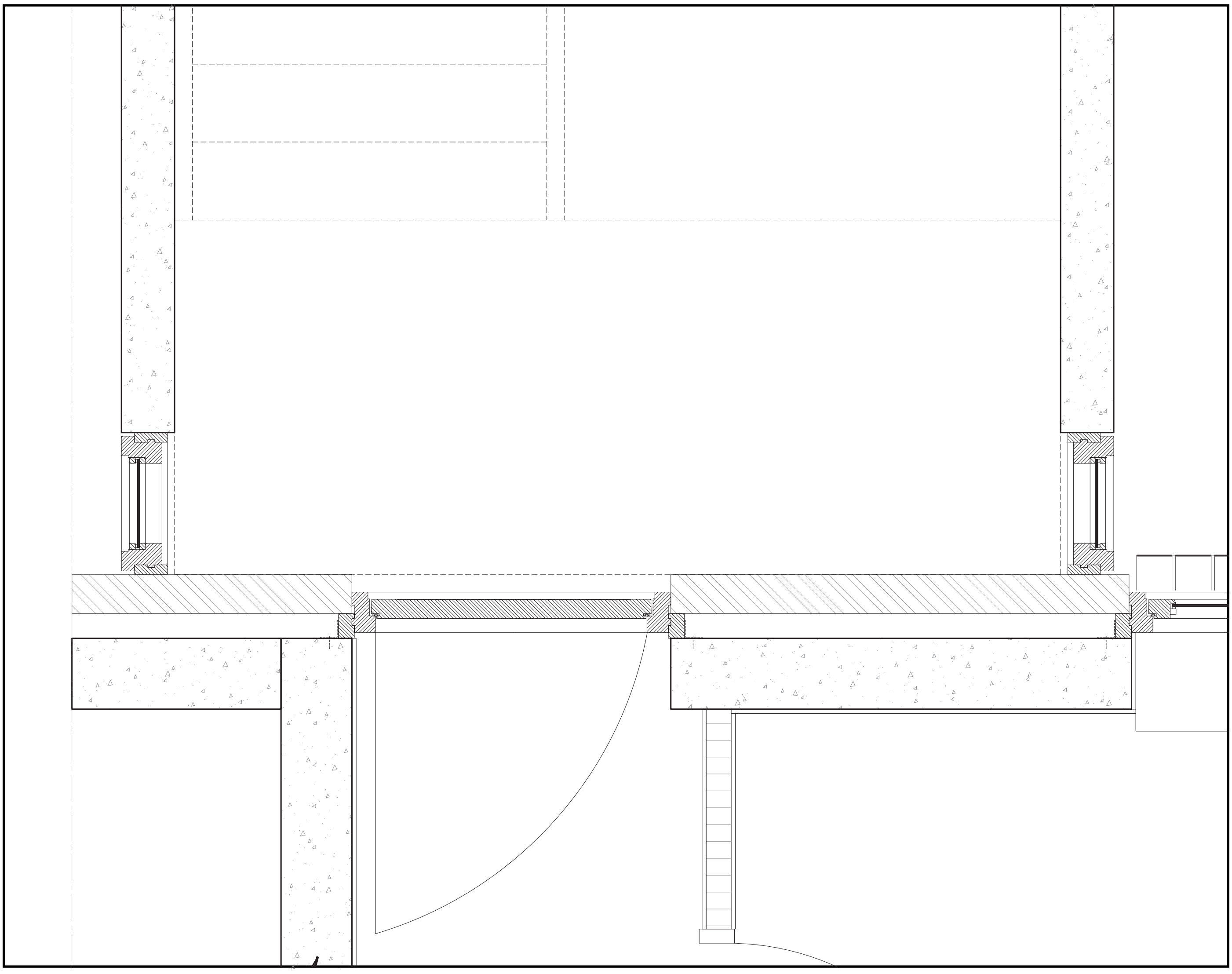
Connection between the facade and staircase, renovation



This detail concerns the recessed façade that repeats itself repeatedly on the north-east façade of Hoptille, which is the former rear of the building, but currently concerns the front. This place was chosen because it is an iconic and original element in this facade.

The facade structure is also the same as the rest of the building; 100 mm brick outer wall supported by a self-supporting concrete facade construction, or 90 mm thick, with a cavity of 30 mm and 40 mm insulation in between.

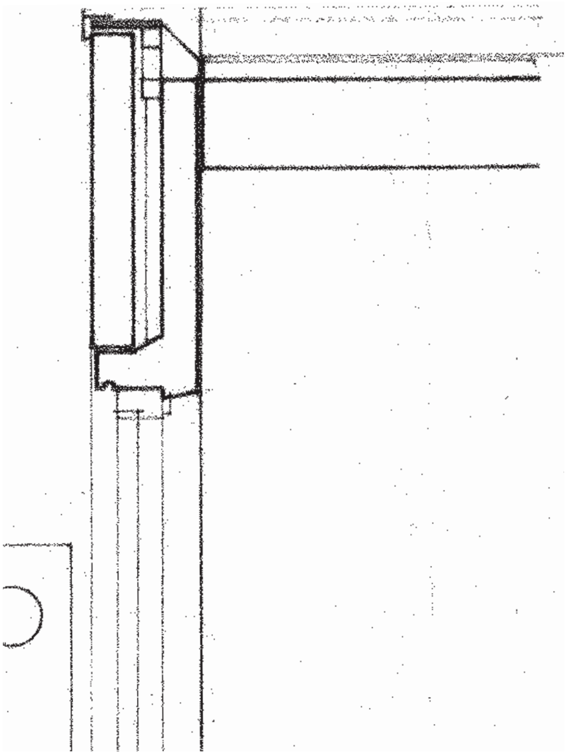
Given the floor plan drawing, not much has changed the original. The details show that not much has been done to insulate the house properly. The load-bearing wall is not insulated, which creates thermal bridges

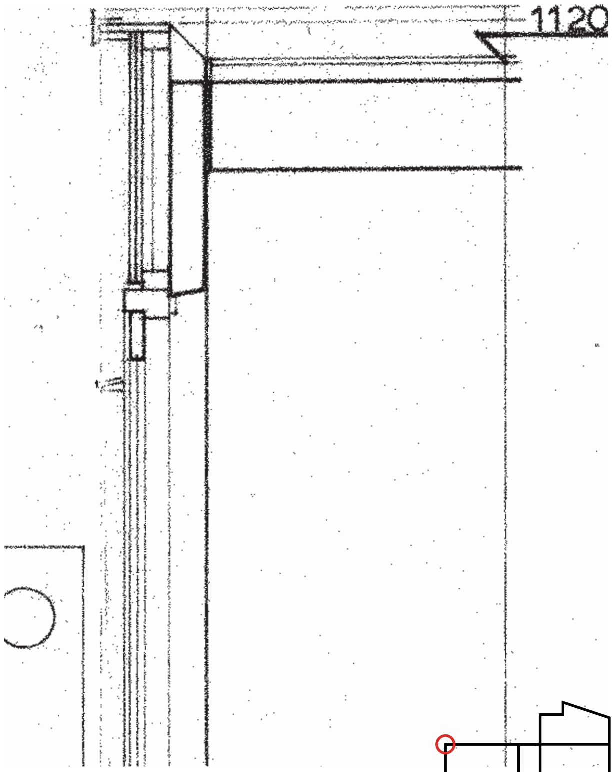


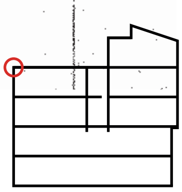
DETAIL 4

Flat roof

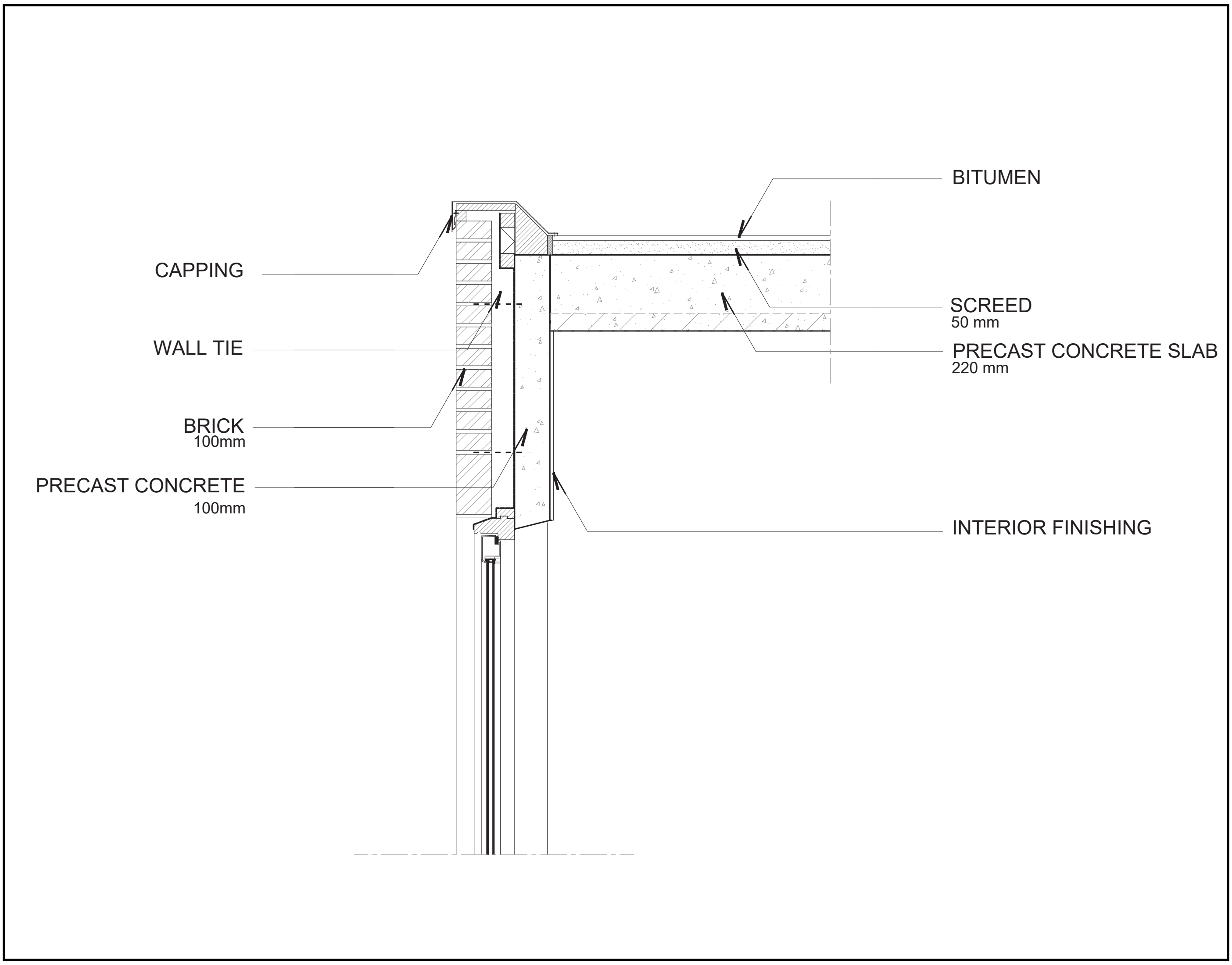
Significant change drawing and construction







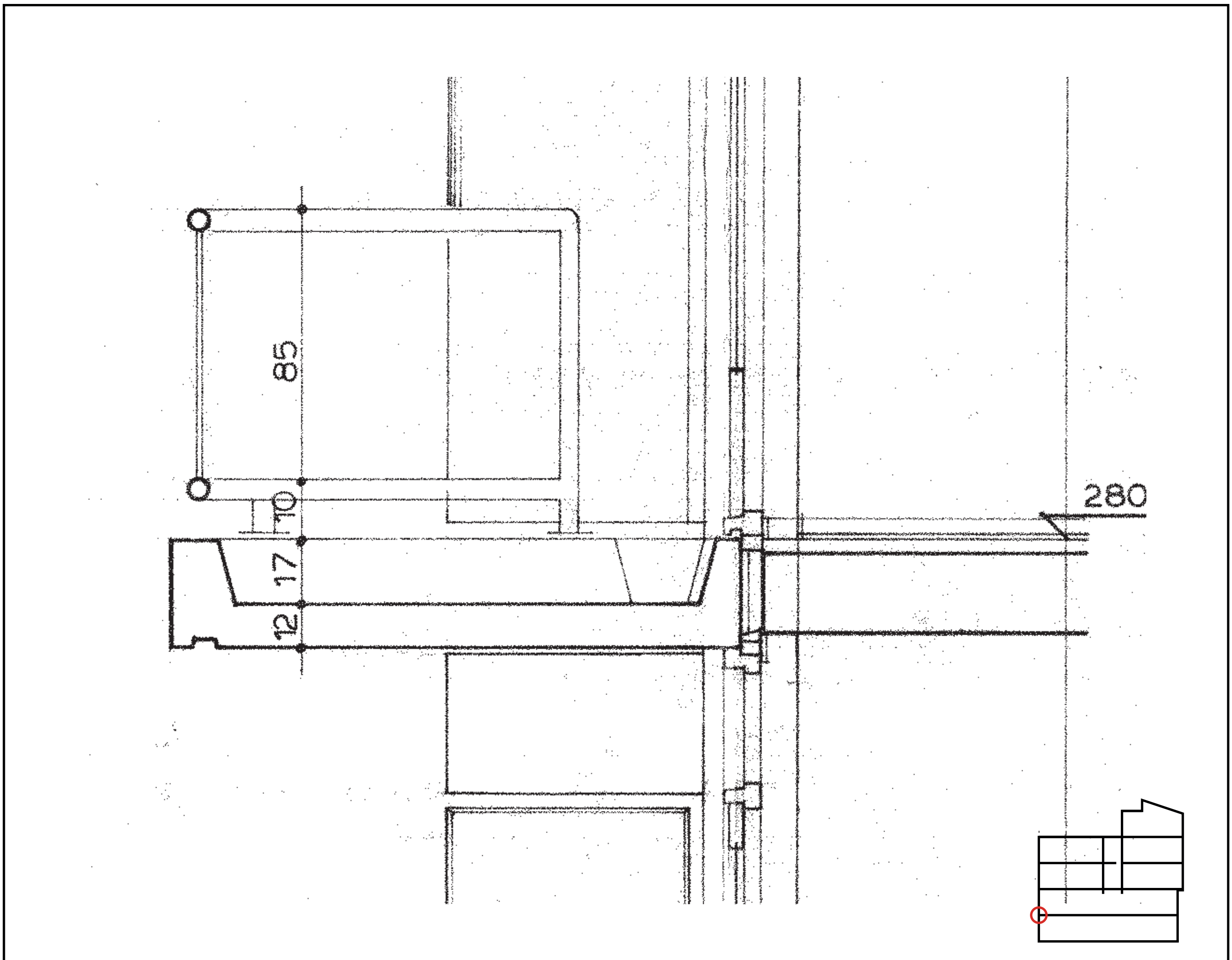
This detail shows the connection of the roof to the facade on the south-west side of the building. Originally this detail had 2 variations, one with brickwork and one with panels as the facade exterior finnish. This last variant however, is not present in the mid-rise building of Hoptille. While comparing the brickwork detail with the pictures of the facade it turned out that there was one major difference in the two. The detail shows that the final facade should show a concrete strip right above the windows on this floor, when looking at the picture it becomes clear that this has been changed in the process. The updated detail shows how we suspect that the current facade is built.



DETAIL 5

Balcony/floor, 1st floor

Prefab balcony on consoles, meeting the concrete floor and facade window frame.

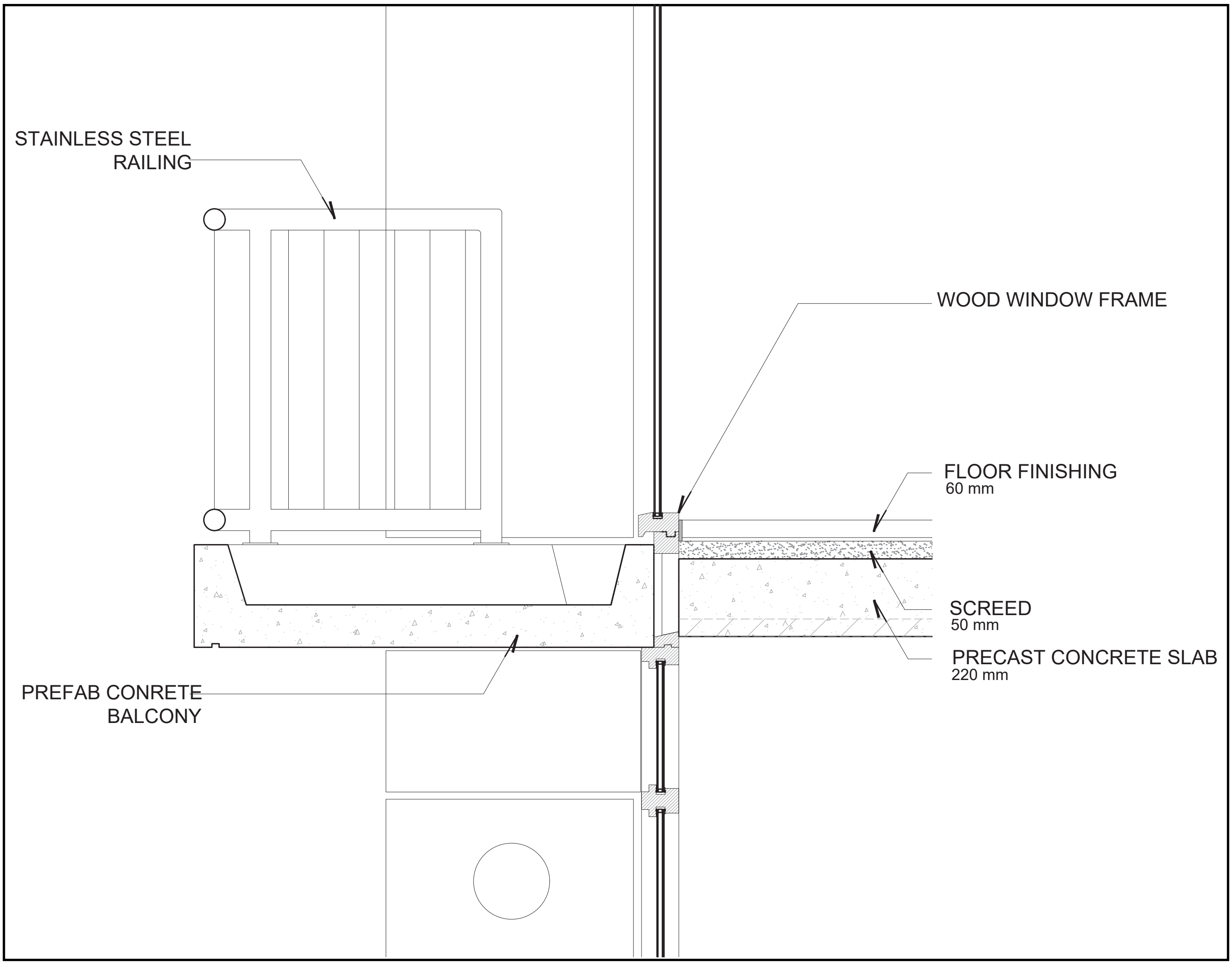


The floor of the building is made with prefab floor slabs reinforced with steel lattice girders. Which is then poured over with concrete to create a firm structure with the load bearing walls. And finished with a concrete screed.

The facade is made of wood window frames spanning from floor to floor.
And the balcony is made of prefab elements, resting on the consoles sticking outside the facade. These consoles are connected to the bearing walls and thus puncture the thermal line of the facade.

The balconies themselves must have some way of draining rainwater near the facade side, since there is no visible path to drain that surface on the front side.
The drain pipes in some cases even go through the interior of the building.

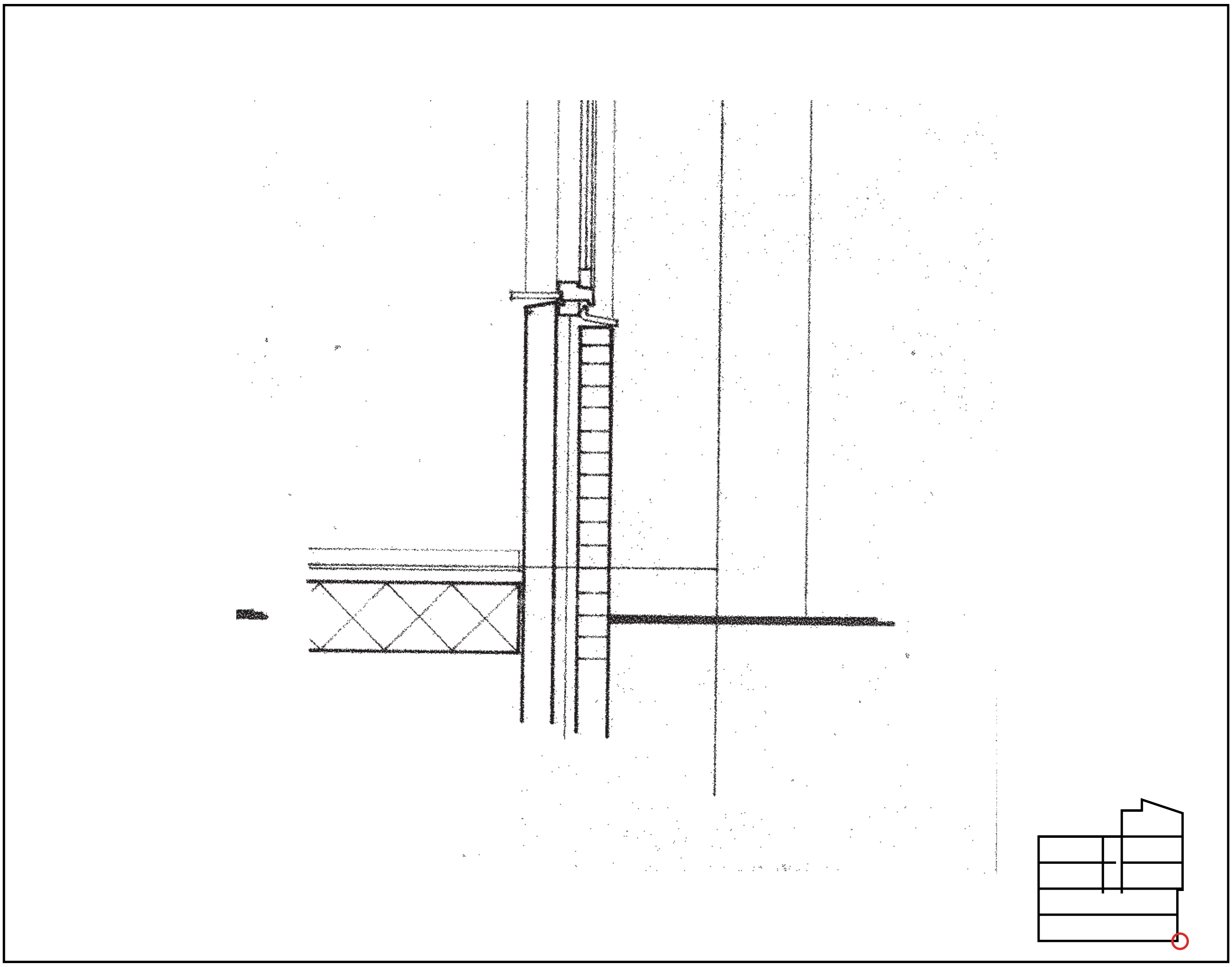
The balcony is finished with a hollow pipe, cast iron balustrade. Painted white.
And between the balconies hang vertical concrete elements. Connected to the balconies with steel anchors on the top and bottom of these elements. They are meant as visual barriers between neighbours, and as aesthetic elements.



DETAIL 6

Ground floor

Connection between foundation, beam and block floor and precast concrete facade

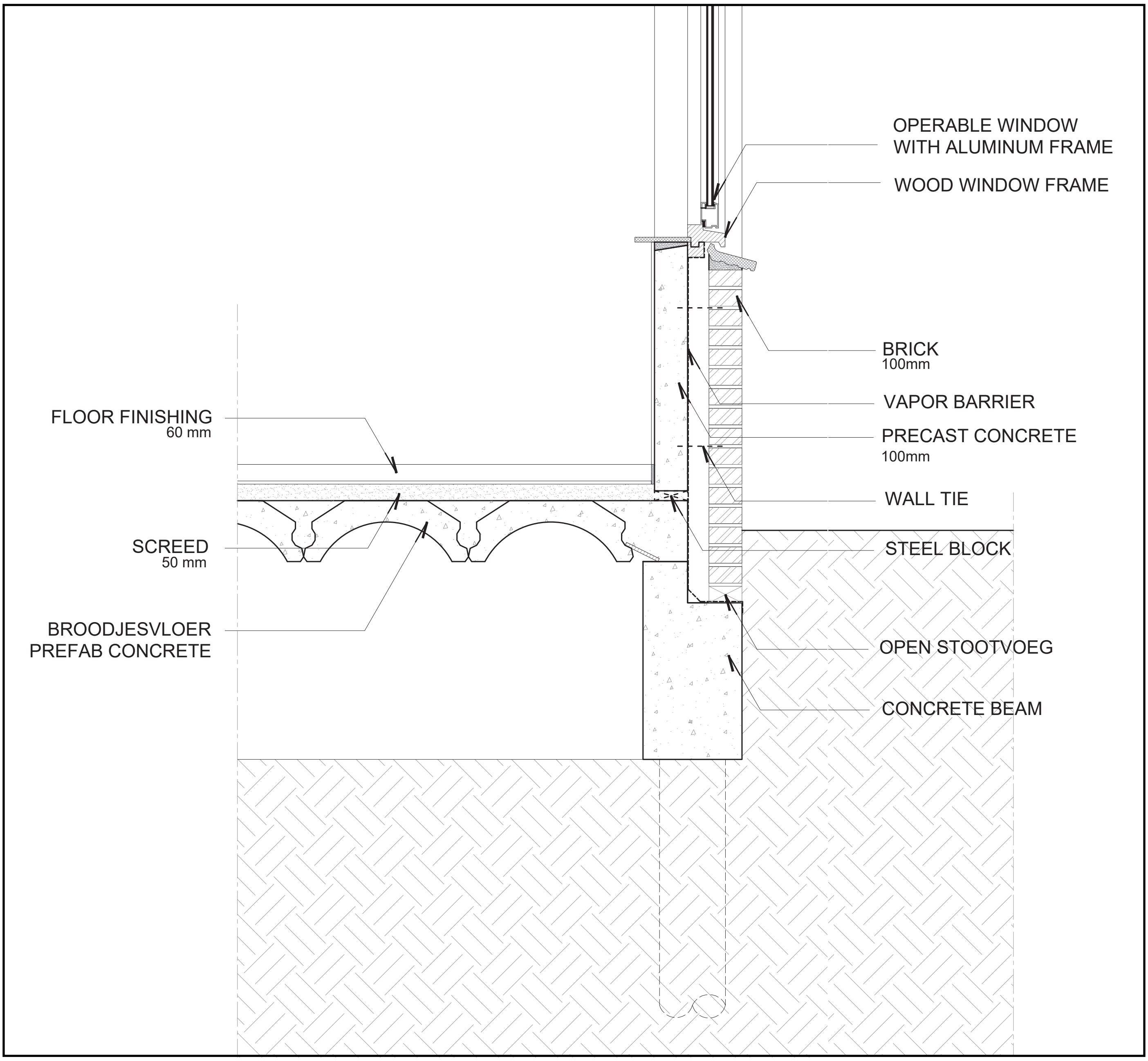


This detail shows the connection between the ground floor and the facade on the north-east side of the building. This detail of the foundation is similar for the entire ground floor, with the exception of the width of the precast concrete slab and the height of the opening in the wall.

The original drawing does not show the detail as it has been constructed. Some features are not shown on the drawing, such as the ventilation shaft, as shown in the photograph, which is used to ventilate the crawl space beneath the building.

Furthermore, the original drawing does not show the actual connection between the facade and the ground floor, as the drawing is quite abstract. A standard drawing supplied by the contractor creates a better understanding of the connection, even though the facade in this drawing does not match the facade of the building.

The beam and block floor is placed parallel to the facade, the gaps between the slabs filled with in-situ concrete. The floor rests directly on the foundation, as does the brick facade. The brick facade is kept in place by wall ties connected to the precast concrete wall slabs, with a cavity in between the brick and concrete.



APPENDIX

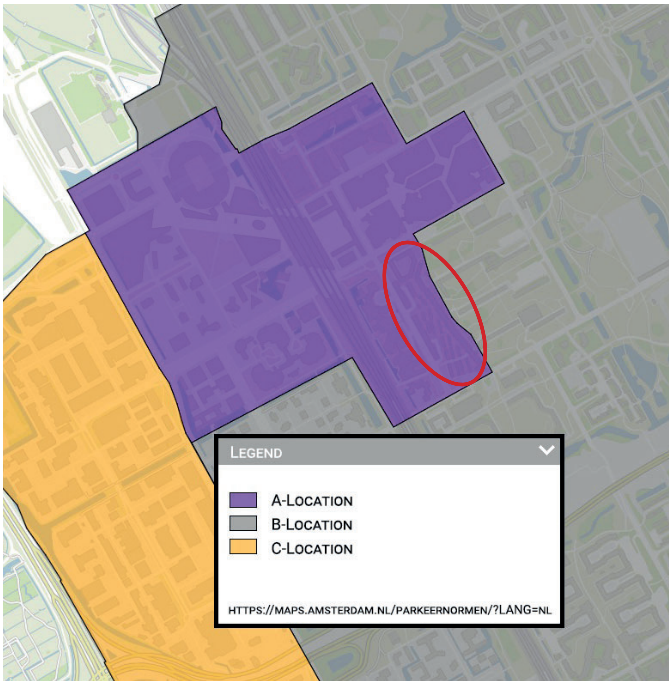
PARKING RATIO

Parking norms Amsterdam

Amsterdam knows three kinds of parking zones, these zones are known as A, B and C zones. The better an area is accessible through public transport the higher the rating of the area is. The Hoptille street is in a A-Location as the Amsterdam Bijlmer Arena train and metro station is very closeby.

The set rules for A zones is that there is no minimum parking norm for all dwelling types. Therefor the minimum parking requirement in Hoptille is equal to 0 parking spots per dwelling. The maximum parking norm for all dwelling types is 1 parking spots per dwelling.

Residents also do not get a parking parking permit regardless of the dwelling type they live in.



Gemeente Amsterdam (2017),
Nota Parkeernormen Auto

Maps.amsterdam.nl (2021)
Parking locations Zuidoost

Aantal geëiste en maximaal toegestane parkeerplaatsen per woning	A-locaties		B-locaties		C-locaties	
	Minimum parkeernorm	Maximum parkeernorm	Minimum parkeernorm	Maximum parkeernorm	Minimum parkeernorm	Maximum parkeernorm
Vrije sector						
-Woningen tot 30 m² bvo	geen	1	0,1[8]	1		
-Woningen tussen 30 m² en 60 m² bvo	geen	1	0,3	1	maatwerk	maatwerk
-Woningen boven de 60 m² bvo	geen	1	0,6	1		
Sociale- en middeldure huur	geen	1	geen	1	maatwerk	maatwerk

§ 5.4 Parkeernorm bij nieuwbouwwoningen op A-locaties

- Een maximumparkeernorm van één parkeerplek per woning voor alle woningtypen, vrije sectorwoningen (koop en huur), middeldure- en sociale huurwoningen.
- Geen minimumparkeernorm voor alle woningtypen, vrije sectorwoningen (koop en huur), middeldure- en sociale huurwoningen. De minimumparkeereis is daarmee gelijk aan nul.
- Geen parkeervergunning voor bewoners bij nieuwbouw van alle woningtypen, vrije sectorwoningen (koop en huur), middeldure- en sociale huurwoningen.

Stadsdeel	Op straat (incl. bijzondere plaatsen)	In garages (openbaar en niet-openbaar)
Nieuw-West	59.000	37.000
Zuid	53.000	23.000
Zuidoost	26.000	38.000
Oost	33.000	28.000
Noord	44.000	12.000
West	31.000	10.000
Centrum	15.000	13.000
Westpoort	4.000	5.000
Totaal (433.000)	**266.000**	**167.000**

Autobezit per stadsdeel			
Stadsdeel	**Gem. aantal auto's per huishouden 1 persoon**	**Gem. aantal auto's per huishouden ≥ 2 personen**	**Aantal geregistreerde auto's, excl. leaseauto's**
Nieuw-West	0,43	0,82	40.800
Zuid	0,48	0,65	41.600
Zuidoost	0,30	0,59	29.400
Oost	0,39	0,71	33.400
Noord	0,33	0,81	28.500
West	0,18	0,55	32.800
Centrum	0,21	0,55	24.300
Westpoort	zie (Nieuw-) West	zie (Nieuw-) West	zie (Nieuw-) West
Gemiddelde	0,32	0,68	
Totaal		**excl. leaseauto's:** **incl. leaseauto's:**	**230.700** **248.000**

Stadsdeel	Bestaande voorraad eind 2015	Toevoeging 2016 tot en met 2020	2021 e.v.
Centrum	54.000	± 500	
West	77.000	± 3.200	
Nieuw-West	64.000	± 6.400	
Zuid	78.000	± 2.100	
Oost	64.000	± 9.000	
Noord	41.000	± 6.000	
Zuidoost	39.000	± 2.700	
Amsterdam	**417.000**	**± 30.000**	**Ruim 5.000 per jaar**

Oude normen	Centrum	Noord	West	Nieuw-West	Zuid	Zuidoost
Vrije-sectorwoningen	Geen minimum-norm Maximaal 0,5 pp/pw	Minimaal 1 pp/pw Geen maxi-mum	Minimaal 0,6 pp/pw Maximaal 0,9 pp/pw	Minimaal 1 pp/pw Geen maxi-mum	Minimaal 1 pp/pw Geen maxi-mum	Minimaal 1 pp/pw Geen maxi-mum
Sociale huurwoningen	Geen minimum-norm Maximaal 0,5 pp/pw	Minimaal 0,5 pp/pw Geen maxi-mum	Minimaal 0,4 pp p/w Maximaal 0,6 pp/pw	Minimaal 0,7 pp/pw Geen maxi-mum	Minimaal 0,7 pp/pw Geen maxi-mum	Minimaal 0,5 pp/pw Geen maxi-mum
Studentenwoningen	Geen minimum-norm Maximaal 0,5 pp/pw	Minimaal 0,1 pp p/w Geen maxi-mum				

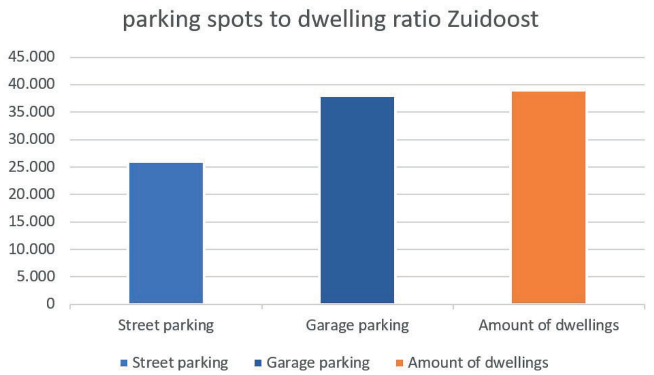
Data

There are no statistics about car ownership and existing parking spots in the street of Hoptille, however there is data about this information of the larger scale, Amsterdam Zuidoost. This data from 2015 is the most current data provided by municipality of amsterdam.

In Zuidoost the average amount of cars owned by 1 person households is 0,3. The average amount of cars owned by 2 or more person households is 0,59. The total amount of registered cars (excl. lease cars) is 29.400 in Zuidoost.

The amount of available parking spots on the street in Zuidoost is 26.000, the amount of available parking spots in parking garages is 38.000.

The amount of dwellings at the end of 2015 in Zuidoost is 39.000 with the expectation to see a growth of around 2.700 dwellings in the coming years up until 2020.



Gemeente Amsterdam (2017),
Nota Parkeernormen Auto

Parking vision of Amsterdam

The municipality of Amsterdam has multiple visions for the future. Some of the parking visions are describes as follows:

Parking: Less parking in the streets for a better public space with a higher traffic flow.

Bicycle: Extra bike parking and active enforcement of bike parking at busy locations.

Gemeente Amsterdam (2013),
MobiliteitsAanpak Amsterdam 2030

R VALUE

Definition

The R-value indicates the thermal insulating ability of a layer of material, often used as insulating double-glazed windows, walls, floors, roofs. The R-value is the thermal resistance of a layer of material and is expressed in m 2 K / W. The higher the R is, the greater isolates the resistance to heat transfer and the better the material.

The calculation of the R-value is dependent on the materials from which the test structure is composed. The thickness of the material, in meters, is divided by the λ-value (thermal conductivity). The higher the value, the better the insulation; a layer twice as thick has proportionally twice the thermal resistance.

The formula is $R = d / \lambda$ where:
R = thermal resistance in m 2 K / W
d = thickness of the material in m.
λ = thermal conductivity in W / m K

Current requirements of R-value

From 2015, the following RC values apply to new construction in the Netherlands:

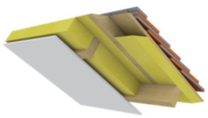
Position	Rc-waarde (NEN 1068, tot 1-1-2021) [m2K/W]	Rc-waarde (NTA 8800, vanaf 1-1-2021) [m2K/W]
Roof	>= 6,0	>= 6,3
Facade	>= 4,5	>= 4,7
Floor	>= 3,5	>= 3,7

Calculation

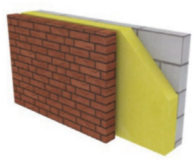
For the calculation of the value Rc, we can all of the individual R-values summing to each other.
We call the heat resistance of a structure Rc. The Rc is the sum of the R values of the different materials + the transition resistance of air on the material. A separate transition resistance applies to the inside (interior) and the outside (exterior) of a construction

Ri = 0.13m2K / W
Re = 0.04m2K / W
For a cavity wall we also calculate with a resistance of
Cavity = 0.17 m2K / W

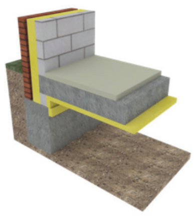
The calculations will be made on 3 positions:



Roof



Facade



Floor

Roof R-value: 2,0 m2·k/W

Layer	Source	Materials	Thickness	λ_{calc} (W/m·K)	R_m (m^2·K/W)
Interior finish	SBR-Referentiede	Plasterboard	12.5	0.250	0.0500
Foil inside		Vapor barrier foil	5	0.000	0.0000
Wooden beams	SBR-Referentiede	Hardwood	0	0.173	
Insulation	Rockwool		50	0.035	
Roof boarding	SBR-Referentiede	Wood	50	0.170	0.2941
Foil outside		Steaming foil	5	0.000	0.0000
Cavity	Eternit		90	0.000	1.7900
		Totale dikte constructie:	162.50		

R_{si}	=	0.10	m^2·K/W
R_{se}	=	0.04	m^2·K/W
R_T	=	2.27	m^2·K/W
ΔU_{fa}	=		W/m^2·K
ΔU_w = 0,05 *U_T	=	0.02	W/m^2·K

R_C Bouwbesluit = 2.0 m^2·K/W

U_T	=	0.44	W/m^2·K
ΔU	=	0.02	W/m^2·K
U_C = $U_T + \Delta U$	=	0.46	W/m^2·K
R_C = $1/U_C - R_{si} - R_{se}$	=	2.03	m^2·K/W
R_C Bouwbesluit	=	**2.0**	m^2·K/W

Wall R-value: 1,2 m2·k/W

Layer	Source	Materials	Thickness (mm)	λ_{calc} W/m·K)	R_m (m^2·K/W)
Inner cavity leaf	SBR-Referentiedetails	Beton (gewapend)	90	2.500	0.0360
Insulation	SBR-Referentiedetails	Isolatie (overig)	35	0.033	1.0606
Wall ties	SBR-Referentiedetails			17.000	
Cavity			30		0.1600
Outer cavity leaf	SBR-Referentiedetails	Brick wall	100	1.200	0.0833

R_{si}	=	0.13	m^2·K/W
R_{se}	=	0.04	m^2·K/W
R_T	=	1.51	m^2·K/W
ΔU_{fa}	=	0.01	W/m^2·K
ΔU_w = 0.05 * U_T	=	0.03	W/m^2·K

R_C Bouwbesluit = 1.2 m^2·K/W

U_T	=	0.66	W/m^2·K
ΔU	=	0.04	W/m^2·K
U_C = $U_T + \Delta U$	=	0.70	W/m^2·K
R_C = $1/U_C - R_{si} - R_{se}$	=	1.25	m^2·K/W
R_C Bouwbesluit	=	1.2	m^2·K/W

Floor R-value: 1,4 m2·k/W

Layer (binnen→ buiten)	Source	Materials	Thickness (mm)	λ_{calc} (W/m·K)	R_m (m^2·K/W)
Screed	SBR-Referentiede	Cement screed	50	1.000	0.0500
Concrete floor	SBR-Referentiede	Concrete floor	200	2.500	0.0800
Insulation	Rockwool	RockSono Solid	50	0.035	1.4286
		Totale dikte constructie:	300.00		

R_{si}	=	0.17	m^2·K/W
R_{se} Crawl space	=	0.17	m^2·K/W
R_T	=	1.90	m^2·K/W
ΔU_{fa}	=		W/m^2·K
ΔU_w = 0,05 *U_T	=	0.03	W/m^2·K

R_C Bouwbesluit = 1.4 m^2·K/W

U_T	=	0.53	W/m^2·K
ΔU	=	0.03	W/m^2·K
U_C = $U_T + \Delta U$	=	0.55	W/m^2·K
R_C = $1/U_C - R_{si} - R_{se}$	=	1.47	m^2·K/W
R_C Bouwbesluit	=	**1.4**	m^2·K/W

Conclusion R-value

Renovation is partially renew, alter or enhance a building. According to the Building Act, Article 5.6, paragraph 1, for thermal insulation applies the legal level obtained, with the lower limit Rc = 1.3 m2K / W. The legally obtained level applies to the air volume flow.

Replacement of insulation layers
When the renewal or replacement of insulation layers is applicable, in accordance with article 5.6 member 2 of the Building Act for thermal insulation, it is legally obtained level, with the lower limits:

Rc = 2.5 m2.K / W for a floor;
1.3 m2.K / W for a facade and
2.0m2. K / W for a roof.

Houses built before 1975 are often poorly insulated. This is because insulation in homes before the time was not yet required. Most pre-1975 houses were built without cavity walls or other forms of insulation. thereby homes of this age lose much heat. Moreover, it is more expensive in these houses to live in, because energy costs are significantly higher than isolated that do well in a home. This article explains how older homes are insulated and what improvements are possible.

The houses that were built in the past are hardly insulated. Back then it was not taken into account insulation during construction. It is difficult to sketch a picture of how the older homes have been isolated at the time, because of course this varies by property. An insulation company can provide more precise information about this. However, the year of manufacture of a property may or may give an indication of the degree of insulation.

You can still have your home well insulated in many ways. You can make for example allow applying insulation in the walls, attic, in the wall, the floor, the doors and cracks in the crawl space, or double or secondary glazing.

Roof insulation is also possible afterwards, with both a sloping and a flat roof. View which options apply specifically to your home. Afterwards isolation is often more expensive, so consider carefully all options before making a decision here. This is because insulation is often also possible in places that you would not have thought of at first.

3 | NEW HERITAGE

Delft University of Technology
Faculty of Architecture
and the Built Environment