AND RESLIENT REHIDC65



opment in Pernis. Based on a flood

resilient city that functions with ac-

cess and utilities through a flooding

incident, leaving residents safe to living their normal life, the new development is connected through a



The Healthy Homes competition defines the nis is protected from flooding by a surround-

Flooding

dustrial harbors, shipyards, petrochemical industry, and factories. The old town of Persite, an old football field situated on the very ing dike, and since there is no space left for north tip of the old town of Pernis in Rotter- expansion in the protected area, the town dam. Placed right by the Maas, the large river needs a solution for expanding to the floodflowing through Rotterdam, the site is placed prone area outside the dike

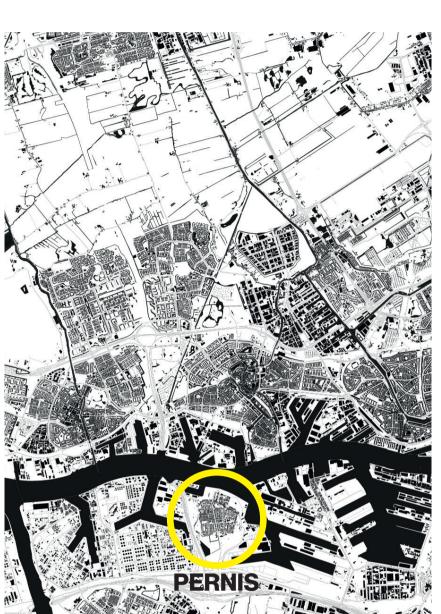
With so many people at risk, it's not sustain- A flood-resilient building goes beyond limitable to only create new expensive develing or preventing water ingress to a building. opments that can restrict water. The crea- It includes measures as making the interior tion and development of technologies and wet proof/recoverable, reconfiguring the solutions that can be retrofitted in existing ground floor or adding a story, design for buildings and implemented in situations drying out quickly, and suitability for moving where retention is not an option, is crucial to back in the house quickly after a flood. ensure all people the opportunity to adapt Simple solutions such as using products that to the future. Tomorrow's problems need to are resilient to getting wet, placing electrical be solved today. A new reality where flood- outlets higher, and using doors and windows ing is a part of society is approaching. Today with flood-resistant seals can minimize fuflood events are commonly categorized as ture damage. Also, the use of a 'sump pump' disasters, but in some parts of the world it's connected to drains in the floor gets water already part of their life without being cate- out of the house. Flood resilience is a rather gorized as such.

"An event or occurrence of On the ground floor measures have been a ruinous or very distressing nature; a calamity; esp. a sudden accident or natural catastrophe that causes be removed in the recovery period. great damage or loss of life." In the rooms placed on the ground floor, it is - Oed.com. 2021 If the implemented solution for flooding sible. The three isometric renderings illus-

facilitates life and activity, its effect would no flooding. longer be categorized as disastrous.

low-tech solution to flooding. (cam.ac.uk)

made in order to resist flooding. In the wall and floor, a cavity drainage barrier layer is installed to lead the flood water to the sump pump placed under the floor. This will also help to drain the water when water needs to necessary to make different actions in order for the room to take as little damage as posconciliates the impact, reinstate access and trate the before, under, and after scenarios of



Γhe town

Thermal & acoustic

trolling its own comfort and well-being.

the heat, and to examine, understand and utilize so-

lar radiation for passive heat gain in the relevant situ-

ations, either through permanent shading or utilizing

the principle of plants as solar shading to prevent

overheating. All passive strategies are dependent on

ered through the analysis and studies regarding the mate.

through material choice and solar radiation, to utilize throughout the night

comfort

than cars. The old and unbothered town with its village-like atmosphere (in the middle of industry and city) and cute, old, ornamented, and historic houses, with each its own front yard and front door, showing the individualistic nature The old town of Pernis has a long varied history, starting of the people of Pernis, and in the Netherlands as a whole, as a farming and fishing village, affected by the First World inhabit a less diverse population group than the rest of War, overshadowed and physically enclosed by the thriv-Rotterdam and the Netherlands. The plans for the future ing economy and expanding industry of Rotterdam. Per- of the town states to change this with new urban developnis became a part of the municipality of Rotterdam and a ments with diverse housing opportunities. Furthermore, metro station was added, combined with a bicycle tunnel the new developments are to push the historic town to a to Rotterdam and good bus routes, the town has excellent more contemporary urban area, strengthening the relation



Freestanding table rather than fittet island Worktops uses material with low water

Elevated cabinets on legs for drying Air gap bewtween cabinet and wall to aid drying Cabinet doors fitted with quick release Locate appliances in ancillary, lower P6 Drawers designed to easily be removed

 Appliances positioned at higher level Oookers can be removed prior to flooding Radiator placed on higher level 2 Acceptance of some goods requiring replacement post-flood Electricity from above

template for apartments in varying sizes. The bare



pathway lifted from the ground, ending at our building. Orientation of building blocks wind in courtyard. Utilizes wind direction for natural ventilation. Blocks noise from East/west apartments allow sun when residents are home. Opening of buildings allows sun in courtyard

Configuring permanent struc- Elevating utilities like power and Access routes elevated from Green roofs and walls use living tures within the urban develop- communications above flood risk flood risk level ensure safe retreat vegetation as surface cover to buffment in an attenuating pattern, level enables the urban develop- during flood conditions. The range er and slow the movement of raincan reduce the velocity and size to distinguish which areas will be ment integrates the scheme ver- diversity, reduce overheating, and of waves when they move further prone to flooding.

tically but also allows the urban attenuate noise. development to function during

Section of construction

tension.

wooden cladding 15 mm

Wind barrier 10 mm

vapor barrier

insulation 100 mm

Wooden floor 15 mm

wooden slab 200 mm

wooden beam 200 mm

Exterior concrete 100 mm Closed cell insulation 200 mm

gypsum finish 10 mm

ground floor

solar Energy consumption and heat contri-

slats 25x25 mm

Ventilated airspace 25 mm

gypsum interior finish 10mm

Diagrams showing the structural The ground floor has a mix of comgrowth of Pernis through the last munal and public use in an every-100 years, showing that Pernis as day scenario. In case of flooding the a village has outlived the industri- 1st floor will inhabit the public zone alisation of Rotterdam, creating a and work in a new context to supvillage island amongst harbour. port the circumstances.

All apartments have their own front door and front garden/area, while The building is divided by two to the ground floor and 1st floor inhabit create a sunny courtyard, while apartments, café, bike parking, a the buildings step back to give gymand retail. light and connection to ground floor. The grid allows for circulation and plants as solar shading. Apartments oriented west-

with public functions as retail, library, café, and gym through the building complex invites the public to interact with it. Maintaining this flow on the ground floor creates a vertical transition zone from public to private. The residents use the 1st-floor circulation, while this upper surface also can function as a public pathway when flooded.

"Each apartment has its own door and stairs (if its possible). It is a very impractical solution - it can be read as a value. Dutch

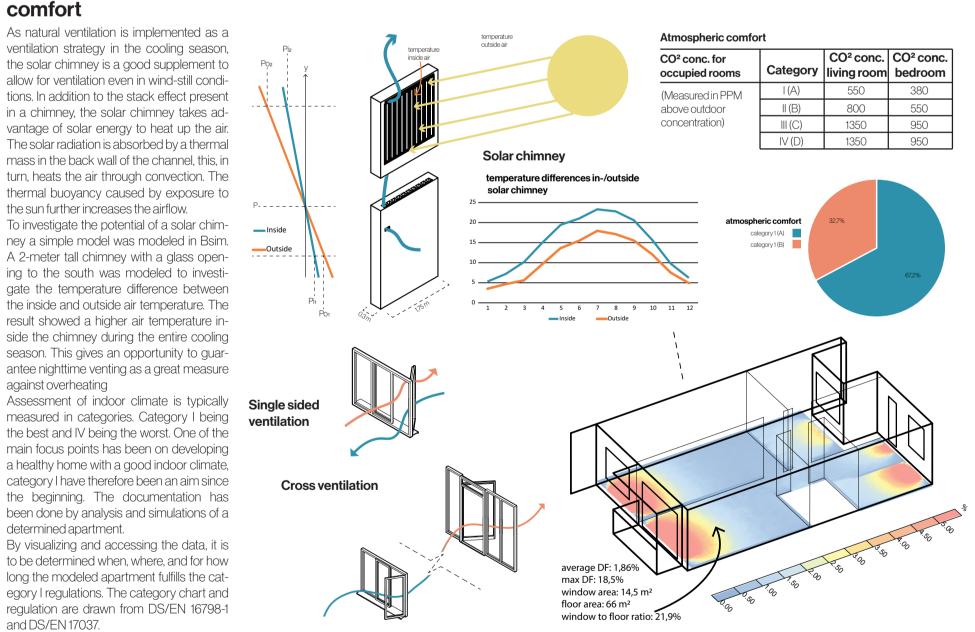
- Birgitte Louise Hansen, 2020 architect, researcher, educator, resident of Rotterdam (translated)

Visual & atmospheric comfort

As natural ventilation is implemented as a ventilation strategy in the cooling season, the solar chimney is a good supplement to allow for ventilation even in wind-still conditions. In addition to the stack effect present in a chimney, the solar chimney takes advantage of solar energy to heat up the air. The solar radiation is absorbed by a thermal mass in the back wall of the channel, this, in turn, heats the air through convection. The thermal buoyancy caused by exposure to the sun further increases the airflow. To investigate the potential of a solar chimney a simple model was modeled in Bsim. A 2-meter tall chimney with a glass opening to the south was modeled to investi-

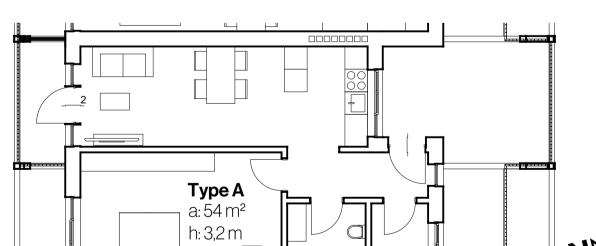
season. This gives an opportunity to guarantee nighttime venting as a great measure against overheating Assessment of indoor climate is typically Single sided measured in categories. Category I being ventilation the best and IV being the worst. One of the main focus points has been on developing a healthy home with a good indoor climate, category I have therefore been an aim since the beginning. The documentation has been done by analysis and simulations of a

determined apartment. By visualizing and accessing the data, it is to be determined when, where, and for how long the modeled apartment fulfills the category I regulations. The category chart and regulation are drawn from DS/EN 16798-1 and DS/EN 17037.









Assembling the knowledge and information gath- the understanding and utilization of the local microcli-

indoor en-vironment, it is clear that many measures By basing a good and qualitative indoor environment

can be taken into consideration in terms of ventila- on achieving thermal-, atmospheric-, visual-, and

tion, shading, and user integration. Specifically, the acoustic comfort, the design of the building is de-

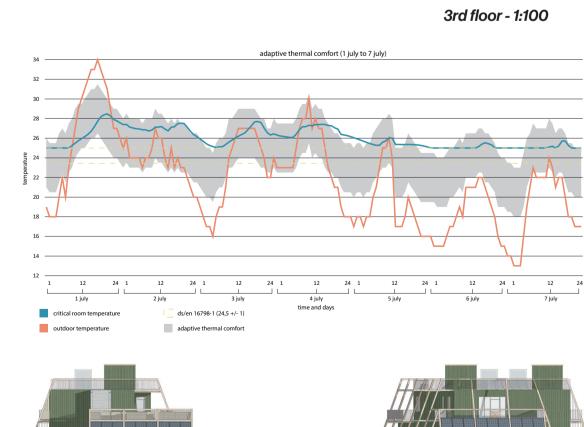
integration of passive strategies regarding natural pendent on working with integrated design solutions.

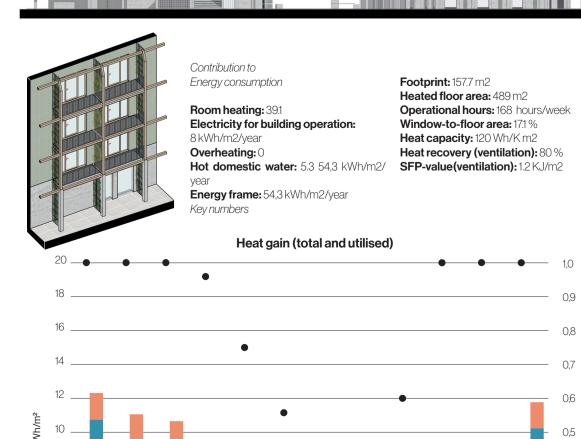
ventilation, window openings and solar chimney, in Structurally, concrete load bearing walls go east-

the design is necessary to include the user in con- west, dividing the building into segments creating a

Other passive strategies to implement are creating concrete wall utilizes solar radiation to absorb heat

the possibility to utilize the principle of thermal mass through its thermal mass, and then releases the heat





Domestic hot water

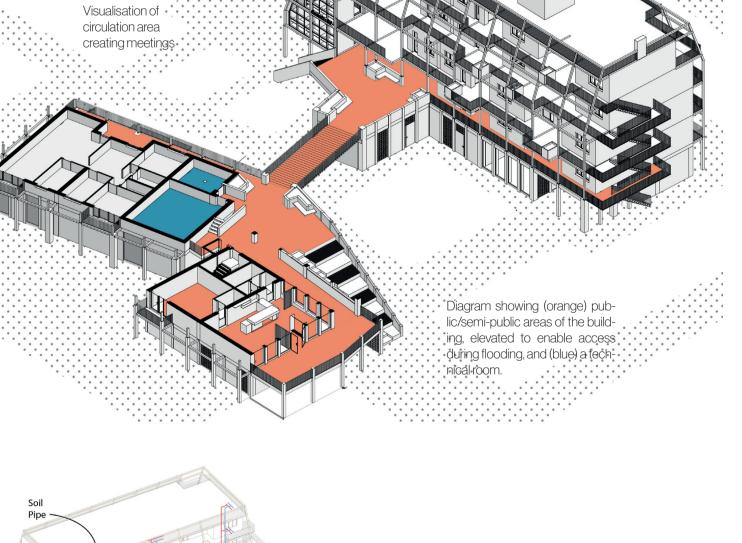
Utilisable heat gain

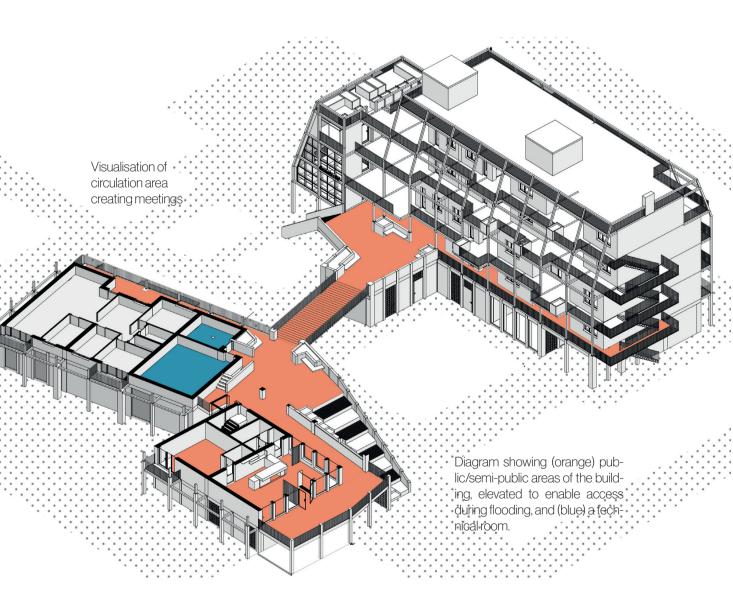
Utility factor

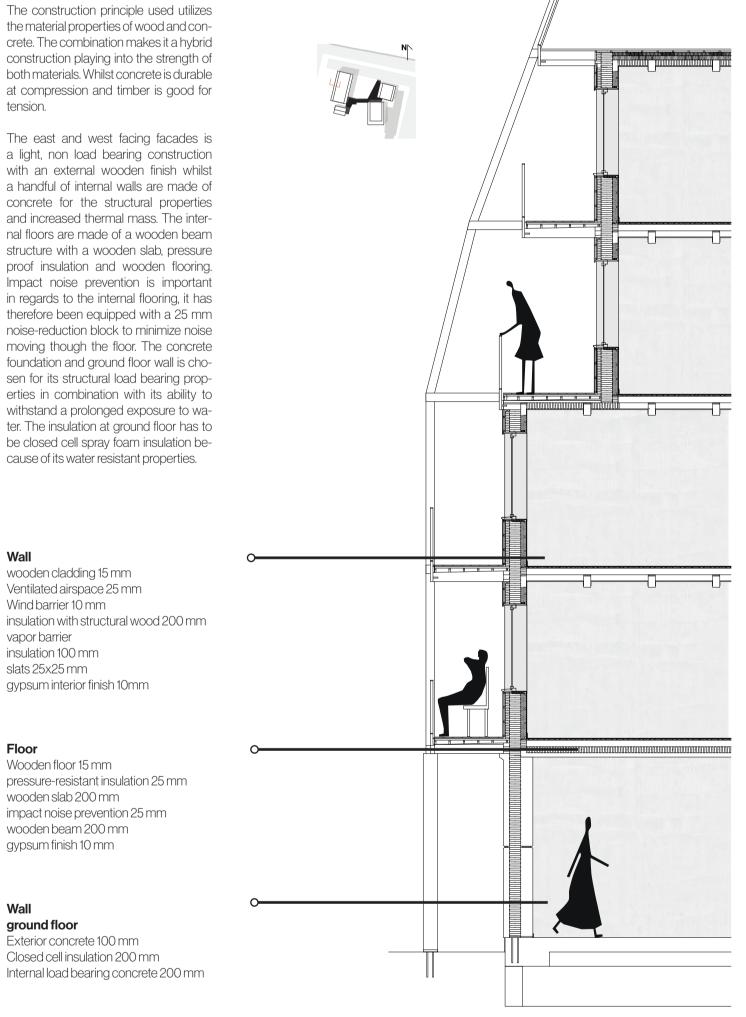
Transmission loss

Ventilation loss

Visualisation of circulation area creating meetings Diagram showing (orange) public/semi-public areas of the building, elevated to enable access during flooding, and (blue) a tech-

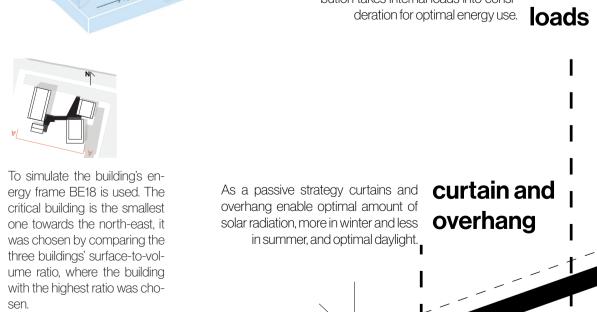






Cross The apartments are open, or can be

opened, inside through west to east,



quired 60 kWh/m2/year. This is a result of emphasis on the indoor climate, where the shape of the building and its airchangerate greatly contribute to heat loss. 40 m2 photovoltaic is incorporated in the design, if this is taken into account in the simulation, the results are lowered to 54,3 kWh/m2/year. Overall the energy frame simulated an estimate further work

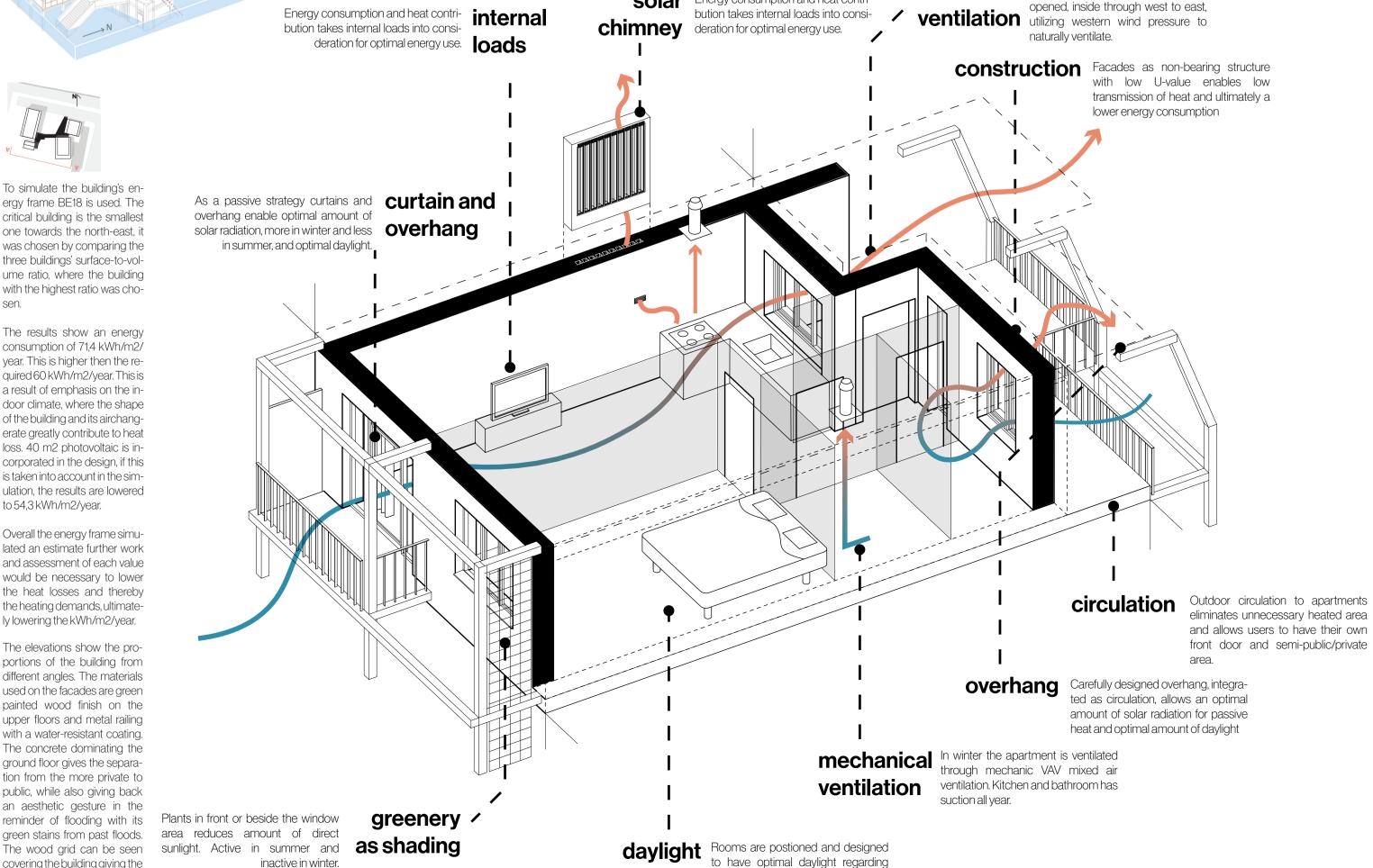
The results show an energy consumption of 71,4 kWh/m2/ year. This is higher then the re-

and assessment of each value would be necessary to lower the heat losses and thereby the heating demands, ultimately lowering the kWh/m2/year. The elevations show the proportions of the building from different angles. The materials used on the facades are green

painted wood finish on the upper floors and metal railing with a water-resistant coating. The concrete dominating the ground floor gives the separation from the more private to public, while also giving back an aesthetic gesture in the

covering the building giving the

facade an extra dimension.



their function. Morning sun in kitchen

and evening sun in living room.