Comfortable aging at home

A sustainable and life-cycle proof housing extension
Comfortable aging at home
A sustainable and life-cycle housing extension
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Existing row houses
Problem statement

Suitability of houses for seniors
Problem statement

Suitability of houses for seniors

Leeftijdsopbouw Nederlandse bevolking in 2005 en 2025

Problem statement

Suitability of houses for seniors

Government changed policy, separating housing and care, making older people live in their own houses for a longer time.

Most seniors want to live in their own home -70% of the people older than 75 want to stay in their own home until the end of their life. (Van Iersel & Leidelmeijer, 2010).
Problem statement

Suitability of houses for seniors

27% has troubles walking stairs

15% has trouble going in bath or under the shower

33% of people over 75 experience restrictions at home:
Problem statement

Suitability of houses for seniors

In 2013 woonden 190.000 75-plussers in een woning die niet geschikt is voor hen.

In 2040 wonen (zonder verdere ingrepen) 400.000 75-plussers in een woning die niet geschikt is voor ouderen.
Suitability of houses for seniors
Bad energy performance of current houses
Wooden construction
Problem statement

Bad energy performance of current houses

Amount of houses in an energy label divided by years

Around 1.4 million dwellings are post-war row house typology
Most of them have an energy label C or lower
Problem statement

Bad energy performance of current houses
Suitability of houses for seniors

Bad energy performance of current houses

Wooden construction
Technical fascination

Wooden construction
Suitability of houses for seniors

Bad energy performance of current houses

Wooden construction
How to design a transformation of an existing row house dwelling in the Netherlands with the use of wooden structures, in order to make it more sustainable and adaptable for all ages, especially older people, sustainable?
How to design a transformation of an existing row house dwelling in the Netherlands with the use of wooden structures, in order to make it more sustainable and adaptable for all ages, especially older people, sustainable?
Design suited for all people
Design suited for a lot of houses
Sustainable improvement

Programmatic improvement
Sustainable improvement

Greenhouse
Improved Insulation
Power generation
Extra space on the ground floor
Also usable as downstairs bedroom, bath and kitchen for older people
Usable as extra living space
Sustainable improvement

Programmatic improvement

construction

Suitability of houses for seniors

Wooden construction

Bad energy performance of current houses
Programmatic improvement

Suitability of houses for seniors

Demands seniors

Fitting program

Fitting to different houses

Floor plan
Demands seniors bedroom

Minimum distance between bed and wall of 1.1 meter

Enough window space

Direct access preferable to living room and bathroom

Enough blind wall space

Enough space for possible lifting device
Demands seniors bathroom

- 1.5 diameter free space so a wheelchair can rotate
- Direct access preferable to living room and bedroom with easy to handle doors
- Sink good accessible with a wheelchair
- Wheelchair friendly toilet
- Enough handles to help get up
- Mixer tap on side of shower
- Shower seat
- Shower without shower basin makes stepping in and out easier
Fitting program

- **Amount of facade**
  - Partly against the house
  - But for the biggest part not, more facade area needed
  - Big part against the facade, but the corners give extra facade area
  - Minimal facade, because the maximum area is put against the house

- **Walking distances**
  - Minimal walking distance, because all the functions are close to the existing house
  - Small walking distances, because most of the extension is close to the existing house
  - Small walking distance for the bedroom, but the bathroom is further away
  - Bigger walking distances, because the corridor is between the two building parts
  - Big walking distance (dependent on the place of the extension) seniors also need to go outside

- **Daylight accessibility**
  - Dependable on the exact sizes of the house
  - Extension can block a lot of the daylight, dependent on the depth and amount of glass used
  - Extension can block a part of the daylight, dependent on the depth and amount of glass used
  - Dependable on the distance between the house and extension, almost all light that used to reach the house still can
  - Dependable on the distance between the house and extension, most of the light that used to reach the house still can

- **Dependable on the length of the extension and garden**

- **All programatic demands can be fitted in the house**, dependable on the length of the extension and garden

- **Notes**
  - Less usable for a family, when the house is sold again

- **An access to the garden should be made**
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<tr>
<th>Amount of facade</th>
<th>Walking distances</th>
<th>Can fit the complete program</th>
<th>Daylight accessibility</th>
<th>Notes</th>
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<td>All programatic demands can be fitted in the house, dependant on the length of the extension and garden</td>
<td>Extension can block a lot of the daylight, dependant on the depth and amount of glass used</td>
<td>An access to the garden should be made</td>
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<td>Small walking distances, because most of the extension is close to the existing house</td>
<td>All programatic demands can be fitted in the house if the with of the house is big enough</td>
<td>Extension can block a lot of the daylight, dependant on the depth and amount of glass used</td>
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Extension can block a lot of the daylight, dependant on the depth and amount of glass used

An access to the garden should be made

Less usable for a family, when the house is sold again

Less usable for a family, when the house is sold again

Notes

Big part against the facade

Small walking distances, because most of the extension is close to the existing house

All programatic demands can be fitted in the house

Extension can block a lot of the daylight, dependant on the depth and amount of glass used

An access to the garden should be made

Less usable for a family, when the house is sold again

Less usable for a family, when the house is sold again
- Enough space for possible lifting device
- Enough blind wall space for closets
- Direct access preferable to living room and bathroom
- Enough window space
- Minimum distance between bed and wall of 1.1 meter
- Shower without shower basin makes stepping in and out easier
- Mixer tap on side of shower
- Shower seat
- Enough handles to help get up
- Wheelchair friendly toilet
- Sink good accessible with a wheelchair
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Enough space for possible lifting device.

Enough blind wall space for closets.

Direct access preferable to living room and bathroom.

Enough window space.

Minimum distance between bed and wall of 1.1 meter.

Shower without shower basin makes stepping in and out easier.

Sink good accessible with a wheelchair.

Wheelchair friendly toilet.

Mixer tap on side of shower.

Shower seat.

Enough handles to help get up.
Enough space for possible lifting device

Enough blind wall space for closets

Direct acces preferable to living room and bathroom

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Minimum distance between bed and wall of 1.1 meter

Enough Handles to help get up

Shower without shower basin makes stepping in and out easier

Sink good accesable with a wheelchair

Wheelchair friendly toilet

Mixer tap on side of shower

Shower seat

Shower seat

Enough space to help get up
Programmatic possibilities

Different widths
Programmatic possibilities
Programmatic possibilities

Different widths
Different widths

- More than 7.40 meter
- Average house, around 6 meter
- Minimal width for optimal use 5.20 meter
- Minimal size possible

Diagrams showing various widths of houses.
more than 7.40 meter
average house, around 6 meter
Minimal width for optimal use
5.20 meter
Minimal size possible
Fitting to different houses
Fitting to different houses
Sustainable improvement

Programmatic improvement

construction

Suitability of houses for seniors

Wooden construction

Bad energy performance of current houses
measuring specific sizes of existing house

Digital manufacture elements

Build it
Wooden construction

- Light construction
- Environment friendly
- Easy to work
- Digital fabrication
- Natural and friendly appearance
## Wooden construction

### Demands

<table>
<thead>
<tr>
<th>Specific demands for the different building components</th>
<th>New exterior layer</th>
<th>Construction extension part</th>
<th>connection extension to house</th>
<th>Adaptable connections</th>
<th>Foundation</th>
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<td><strong>Specifics</strong></td>
<td>Older row houses often don’t have insulation values that make a house energy efficient, so to make a house more energy sufficient, the insulation value of the facades should be improved. An extra layer of insulation on the outside can improve that.</td>
<td>To house the extra functions that are needed for the transformation of houses into houses also suitable for older people, an extra construction needs to be added.</td>
<td>At a couple of points the extension of the house will be connected to the current house, the place and type of connection that can be applied is dependable on the sizes and type of construction of the current houses.</td>
<td>To make a house which is suitable for all ages, included older people, a part of the house should be adaptable to changing needs of a certain group of people. So some of the connections in the construction should be made flexible of demountable to be able to change the configuration of the building.</td>
<td>The type of foundation needed depends on the weight of the construction used, a light construction is preferred, because then the foundation doesn’t need to be completely made out of concrete, which costs more time and money.</td>
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<td><strong>Weight</strong></td>
<td>The construction of the exterior layer should be light, because that way the current construction can support it, if the exterior layer is to heavy, it will need a stronger construction, which means that an extra construction should be added.</td>
<td>The construction of the extension needs to be able to stand on it’s own and it needs to be able to support the floors. Therefore it needs a substantial construction. It also needs to be light so the foundation can be kept to a minimum.</td>
<td>D.N.A.</td>
<td>A lighter foundation is cheaper then a heavier foundation.</td>
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<td><strong>Strength</strong></td>
<td>The new facade, with an extra insulation layer can be put on the construction of the existing house, so the construction doesn’t need to be very strong. It should however be strong enough to support it’s own weight.</td>
<td>Because the building need to be able to support two floors, the construction and the connections need to be strong.</td>
<td>The connection between the house and the extension needs to be quite strong to absorb a part of the forces. The biggest part of the forces however will be absorbed by the construction of the extension itself.</td>
<td>This is dependable on where in the extension adaptable connections will be applied, floor elements should be quite strong, facade or wall elements can be less strong.</td>
<td>The foundation should support the whole extension, so should be very strong.</td>
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<td><strong>Fit well to house</strong></td>
<td>Because the new exterior layer comes over the current facade, the layer should be manufactured to fit right onto the current facade. This means that the form of this layer will be different for every house type.</td>
<td>If the extension is placed completely against the wall of the existing house, those connections should be able to fit to the house, but most of the construction is not precisely depended on the current house.</td>
<td>On this point the extension and the existing house come together, so it is really important that the two parts fit toggether well.</td>
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Wooden construction

Connections
Sustainable improvement

Programmatic improvement

construction

Suitability of houses for seniors

Wooden construction

Bad energy performance of current houses