Building adaptable housing allows the costs of later adaptations to stay within limits. This becomes an important factor when a person becomes handicapped, or a handicapped person seeking a house wants to move in. After six years of experimenting with adaptable building in the Netherlands, the results became available in the summer of 1991. In this article, the concept of adaptable building is described in relation to other approaches, and a summary of the results is given.

1. Housing of the handicapped - a historical perspective

In the course of time, the ideas about people with a physical handicap and their housing have undergone radical metamorphoses. The ancient Greeks, for example, totally rejected handicapped persons and were in the habit of killing any visibly deformed infants. In medieval times, religious institutions started to take care of people with disabilities. At that time, handicapped persons were still at the bottom rung of the social ladder, and they were largely left to fend for themselves. It was not until the middle of the nineteenth century that a beginning was made with proper medical care. During the twentieth century, these services to the handicapped were further developed, along with charity. After 1945, the pace of development was accelerated by the pressure from large numbers of war victims, which also strongly boosted medical rehabilitation. To a certain extent, however, the specialized care still placed handicapped people outside "normal" society in the fifties and sixties. But from the seventies onward, Dutch organizations for the handicapped and the state have vigorously stimulated the integration and recognition of disabled people as full members of society.

The changes summarized above also bore consequences for the housing of the handicapped. While in medieval times disabled people often led a roving life or found shelter in hospices and poorhouses, the situation has improved to such an extent - particularly since 1945 - that at present handicapped people are offered a variety of housing possibilities. In the Netherlands initiatives in this field have led, amongst other things, to the establishment of so-called "protected homes" (these are small homes for around 30 residents, or independent housing units within a larger compound). Apart from this, a great deal of attention has been paid to the adaptation of "normal" housing.

In 1960, the report Housing the Disabled listed the requirements for houses for handicapped persons, although the authors limited this category to people who use walking sticks or wheelchairs. Based on the recommendations in this report, a rehabilitation specialist succeeded in restructuring the ongoing construction of three council houses, which were then made into two adapted homes for families of which the housewives used a wheelchair. In 1967, the families moved into these houses, thereby introducing a new element into Dutch council housing. Later, many Dutch municipalities decided to allocate a certain proportion of new developments (usually around 1%) for houses suitable to wheelchair users. Also in the beginning of the sixties, it became statutory for the government to subsidize individual housing adaptations, thus establishing the base for the present Regulation on Financial Support for Housing the Disabled. Another milestone in the history of Dutch council housing is formed by the year 1978, when the first pile for 15 Fokus-houses was driven into the ground. These were houses already adapted to wheelchair users and offering 24-hour care by a so-called ADL-unit (assistance in daily routine tasks). In essence, a Fokus-project offers seriously handicapped people the opportunity of living on their own like everyone else. An ordinary rental agreement is ente-
red into and the houses are located amongst normal houses. Currently, the objective is to establish about 35 such projects.

2. Building for a wider average

The developments mentioned above have meant a great improvement in the housing situation of the disabled, yet it is too early to sit back and applaud a job well done. The average construction en masse is still too much dominated by the image of the ‘average’ adult whose reach, strength and stamina have been made the prevailing standards. Houses with raised thresholds, narrow doorways and insufficient room for manoeuvring for, amongst others, users of walking sticks and wheelchairs do not exactly testify to a sustained effort to build for everyone. Whoever has the misfortune to be disabled by a disease or an accident will often have to resort to costly alterations to adapt his or her home to the new needs. Often, these costs will rise beyond the subsidy limit, forcing people to move. In the Netherlands, these forced moves are estimated to amount to 7,000 annually. In such cases, houses specifically constructed for wheelchair users may offer a solution, but it appears difficult to balance supply and demand in an adequate way. In practice, this means that in some places houses stand vacant while elsewhere there are long waiting lists. Apart from that, such a ‘categorical’ approach severely restricts the choice of disabled people in the housing market, and makes it hard or even impossible for them to visit others.

The problems mentioned above might be overcome, if designers should take the (future) use by a physically handicapped person into account straight from the start. This does not mean that every possible adaptation must be incorporated right away; but it is vital that later adaptations can be realized simply and relatively cheaply, and that from the start the house will be suitable for visiting by a disabled person. In 1985, the Dutch National Housing Council (Nationale Woningraad, or NWR) with several other organizations started an Experiment in Building Adaptable Housing, to assess the extent to which both objectives - suitability for visiting and adaptability - might be actually realized within the framework of council housing.

In the theoretical stage of this experiment, the concept of adaptable building was explained in detail. In the brochure Requirements for Building Adaptable Housing (NWR, 1987). For common activities such as entering, moving through the house, sitting, cooking, sleeping, using the bathroom, etcetera, this brochure set out clear guidelines concerning the construction requirements for adaptable housing. It also indicated to which categories of disabled these requirements applied. 19 categories of handicapped people (amongst others, the visually, aurally, and motor disabled) were distinguished, plus the category ‘all users’, which was mainly included to show that many of the requirements concerning adaptability contribute to more comfortable living conditions for the non-handicapped as well.

In the implementation stage, 33 housing corporations across the country realized 40 projects based on the Requirements for Building Adaptable Housing.

3. Building Adaptable Housing in practice

The conclusions drawn by the NWR from the Experiment in Building Adaptable Housing are highly positive (‘Evaluation of the NWR-Experiment’, 1991). The construction of adaptable housing appears to be feasible within the limits of costs and cubic measures commonly used in council housing. All projects were realized within the framework of the current system of subsidies. Provided a house is large enough to meet the requirements of adaptability, overhead costs do not go beyond some tens or at most hundreds of guilders. In several cases, a more efficient design even decreased costs. It is not until houses have to be enlarged to accommodate the requirements of adaptability that costs are substantially increased. Once a house has been constructed in an adaptable way, any individual adaptations still needed in a later stage appear to be considerably cheaper than would have been the case with a non-adaptable design. If the starting point is adaptability on the highest level, i.e. adaptations for the use of a wheelchair, the costs saved can amount to as much as 50 to 60%. Therefore, says the NWR,
Figure 1: Example of an adaptably constructed project: 64 houses in a semi-sheltered accommodation complex for the elderly

At left: original, non-adaptable design. At right: adaptable design

Costs adaptability: NLG 236
Costs adaptation non-adaptable design: NLG 54,312
Costs adaptation adaptable design: NLG 20,636

the Requirements for Building Adaptable Housing should be routinely included in the list of requirements for the construction of new houses. They would like to see the following requirements for adaptability included in the official regulations:

- free door passages 850 mm
- maximum height of thresholds 20 mm
- width of stairs 900 mm
- minimum size of toilet 900x1200 mm
- a lift in residence buildings where the gross floor space amounts to 2500 m² or more
- room for turning in common traffic areas of a residence building: 1.5x1.5m
- minimum aisle width for traditional single-family housing (living room and kitchen downstairs, bedrooms on the first floor): 5.4m
- minimum aisle width for housing for the elderly (semi-groundlevel houses with living room, bedroom, bathroom and kitchen downstairs, and space for bedrooms on the first floor): 6m
- minimum aisle width for flats: 6.6m

The Experiment in Building Adaptable Housing was also supported by the Steering Committee for Experiments in Council Housing (Stuurgroep Experimenten Volkshuisvesting, SEV), as part of a project concerning housing for the elderly. To a large extent, the SEV agrees with the conclusions of the NWR. However, the SEV is of the opinion that the principle of cost neutrality has not been proven conclusively as far as single-family housing with bedrooms and bathroom on the first floor is concerned. The problem is mainly constituted by the costs of an adaptable staircase or a space reserved in the upper floor for the future installation of a staircase platform.
lift. A staircase need not raise costs if the requirements fit a so-called suspended lift (a new type of staircase lift). Unfortunately, such lifts are very expensive (as yet).

Apart from costs, the SEV also reviewed the quality of living. The analyses show that, to a certain extent, the freedom of choice concerning the lay-out is limited by the requirements for adaptability. The required sizes of the living room and master bedroom, for example, will often result in a minimal size of the remaining bedrooms. It would appear that adaptable building renders a more neutral lay-out of the house, with rooms of equal quality, not very feasible. Although all designs of the NWR-experiment incorporated toilets in the bathroom units, it is also possible to opt for separate toilets. However, this does require a flexible dividing wall between bathroom and toilet.

4. Consequences for the size of the house

Based on the positive results of the field experiment, one might be tempted to conclude that it is only a matter of time before adaptable building will be practised on a large scale. Just an extensive information campaign as well as some adjustments in the regulations, and presto! the objectives will have been reached. But whether future large-scale construction will indeed comply with the Requirements for Building Adaptable Housing largely depends on the consequences for the house sizes required. After all, the NWR-evaluation shows that enlarging houses to meet the requirements can result in considerably higher costs compared to non-adaptable designs. Therefore an important question is: will the space offered by the usual council house designs be adequate? The results of the NWR-experiment do not provide a conclusive answer. Only in 6 of the 40 projects were originally non-adaptable designs available, and 4 of these did meet the requirements as to size. One project was enlarged from 8.1m to 8.4m; but, provided a different lay-out was used, this proved not really necessary for meeting the requirements. Only in the first project, it appeared that the original design needed enlarging, from 9.2m to 10m. The other designs had adaptability incorporated from the start, and thus could not be compared to a non-adaptable design. The building corporations involved with such designs did not seem to encounter many problems in complying with the measures set out in the Requirements for Building Adaptable Housing without exceeding the available budget. An exception is the (master) bedroom, which in quite a few cases did not meet all aspects of the requirements.

In a study analogous to the NWR-experiment, the Technical University Delft followed a different route to establish the consequences of adaptable building for the required house size. With 9 common spatial relations schemes, the minimum floor space demanded by the Requirements for Building Adaptable Housing (NWR87) was compared to that demanded by some other sets of standards (Van der Most van Spijk et al., 1989; Boekhorst et al., 1990):

a. The Model Building Ordinance (MBV, formulated by the Association of Dutch Municipalities, 1987), as a yardstick for the minimum housing quality required by the government.

b. The guidelines laid down by the Public Housing Department of The Hague (VH/DH), as a yardstick for the minimum housing quality customarily required by (large) municipalities.

c. Regulations and Guidelines 1976 (V&W/76). These have been rescinded, but a quite substantial part of the present housing stock was constructed under these rules.

d. The guidelines set out in Call for Admittance (GT, published by the Dutch Council for the Disabled, 1990). These are generally accepted as a yardstick for the spatial needs of the physically handicapped. Also, according to the NWR Requirements for Building Adaptable Housing, an adaptable house should, in its adapted state, meet the requirements of Call for Admittance.
Figure 2: One of the spatial relations schemes studied by TU Delft: type D, a three-room flat for the elderly, giving out onto an interior corridor.

At left: the lay-out in accordance with the minimum measures laid down in the guidelines of the Public Housing Department of The Hague (interior net surface 60 m²).

At right: the same lay-out in accordance with the minimum measures laid out in the NWR Requirements for Building Adaptable Housing (interior net surface 66 m²).

The main conclusions from the Delft study are summarized in Table 1.

### Table 1. Minimum interior net surface in m² required by various sets of standards.

<table>
<thead>
<tr>
<th>Spatial relations schemes examined</th>
<th>2 rooms</th>
<th>3 rooms</th>
<th>4 rooms</th>
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<tr>
<td></td>
<td>A</td>
<td>B C</td>
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<tr>
<td>MBV</td>
<td>46</td>
<td>53 53</td>
<td>70 65</td>
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<td>VH/DH</td>
<td>54 58 58</td>
<td>60 65 67</td>
<td>83 84</td>
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<td>V&amp;W/76</td>
<td>55 56 56</td>
<td>54 69 75</td>
<td>81 75</td>
</tr>
<tr>
<td>NWR87</td>
<td>59 69 62</td>
<td>66 69 69</td>
<td>87 82</td>
</tr>
<tr>
<td>GT</td>
<td>68 73 75</td>
<td>88 93 91</td>
<td>107 105</td>
</tr>
</tbody>
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A: gallery-accessed, with bedroom on gallery side and kitchen + living room on opposite side
B: gallery-accessed, with kitchen on gallery side and living room + bedroom on opposite side
C: gallery-accessed, with bedroom on gallery side, living room on opposite side, and kitchen in between
D: entrance through inner corridor, with kitchen + bedroom on entrance side and living room + bedroom on opposite side
E: staircase accessed porch, with kitchen + bedroom on entrance side and living room + bedroom on opposite side
F: gallery-accessed, with kitchen + bedroom on gallery side and living room + bedroom on opposite side
G: gallery-accessed, with all bedrooms on gallery side and kitchen + living room on opposite side
H: gallery-accessed, with 2 (children’s) bedrooms on gallery side and 1 (master) bedroom on opposite side
I: single-family house, with living quarters on the entrance side and kitchen + bedroom on the opposite side ('senior citizens’ housing'), and upstairs bedroom(s)
Spatial relations scheme E in this table shows that designing according to the NWR Requirements for Building Adaptable Housing demands 65/65 = 1.06, or 6% more floor space than that according to the municipal guidelines of The Hague (NH/DH). When all items in the table are compared in this way, the following picture emerges:

a. Designing according to the NWR Requirements demands an average of 7% extra floor space compared to the guidelines of the Public Housing Department of The Hague, and the Regulations and Guidelines 1976.

b. Designing according to Call for Admittance demands the considerably higher average of 31% extra floor space compared to the guidelines of the Hague Public Housing Department, and the Regulations and Guidelines 1976.

c. The extra floor space varies widely per type of house. NWR87 differs most from other sets of standards in the 2-room houses studied, averaging 12% more than both The Hague and V&I76. For the 4-room houses, differences drop to 3 and 4%, whereas the 3-room houses take a centre position with 7 and 5% respectively. When comparing Call for Admittance to the Public Housing Department and the Regulations and Guidelines, the spatial relations type 1 (senior citizens’ housing) comes out most favourably, with +21% and +9% respectively. For type D (a 3-room flat for elderly people, giving out onto an inner corridor), this comparison is the most unfavourable: here, differences run as high as 47 and 63%.

From the above it may be concluded that designing houses with 3 and 4 rooms according to the Requirements for Building Adaptable Housing needs hardly any more floor space than is current practice in council housing. The demand that in adapted state such houses should comply with the standards set out in Call for Admittance, however, does require a considerable amount of extra floor space. As stacked building does not allow for extension at a later stage, this would mean that, from the start, adaptable houses should be of a more spacious design than usually imposed by current quality standards. With a later adaptation, an alternative may be to sacrifice one (bed)room, thus creating enough space to extend the other rooms. An objection to this, albeit a surmountable one, is that this interferes with the initial brief.

5. Points of attention

To keep adaptable building affordable, it will often be necessary to compromise, especially at the top levels of adaptability i.e. the guidelines in Call for Admittance regarding spatial use for wheelchair users. Two options are open:

a. It may be accepted that adaptability for all categories of disabled persons is not always feasible, and different levels of adaptability may have to be discerned. This may consist of adaptability for the handicapped who can move about, but not for those in a wheelchair; or suitability for visiting, but not adaptability for everyone up to the level of usability.

b. Or one may choose to build adaptibly for everyone, while abandoning strict adherence to the guidelines in Call for Admittance.

In this connection it is remarkable that, in its evaluation, the NWR did not examine the adaptable designs for compatibility with Call for Admittance, but with the requirements of the local Public Medical Department. In tests concerning the main aspects, most projects appeared to score quite well, which to some extent supports the second option. The experiences which handicapped people have with adaptable housing in accordance with the current requirements - in both adaptable and adapted state - will have to be studied to show the extent to which adjusting the Requirements for Building Adaptable Housing is desirable and feasible.

A second local point for further discussion is the suitability for visiting. The mere fact that measurements and lay-out of staircase-accessed dwellings and gallery-accessed dwellings without lifts do meet the requirements for building adaptable housing does not automatically render
these houses suitable for visiting by everybody. Reserving space for the future installation of a lift does not solve the problem for present visitors. The proposition that adaptable building is possible within the current limitations of costs and measures of council housing, threatens to push the objective of immediate suitability for visiting out of everyone's sight. Searching for affordable ways of entering, suitable to everyone including wheelchair users, must remain a vital point of attention!

A third area demanding special attention is adaptable renovation of the existing housing stock. After all, many disabled people depend for their housing choice on the existing stock. The NWR has already initiated a sequel to their experiment, which is called Adaptable Renovation. So far, the results from three test cases have not been very encouraging (EGM Architects, 1969). Adaptable renovation is only feasible, both technically and financially, in cases of high-level renovation. In this context it should be noted that the studied projects do not adequately represent the great variety in post-war housing. The Delft study of the floor space required by various sets of standards, for instance, showed that, for houses with three and four rooms, designs in accordance with the Regulations and Guidelines 1976 and those in accordance with the Requirements for Building Adaptable Housing need almost the same amount of floor space. It is not unlikely that adaptable renovation is far more feasible in the segment of housing stock constructed according to the 1976 standards.

6. Epilogue

The NWR-experiment Building Adaptable Housing has contributed enormously to the introduction of this concept in council housing practice. Several housing corporations have already declared that in future they will build nothing but adaptable housing. Thus, the concept has clearly outgrown the planning phase. Based on all positive experiences, the NWR intends to publish a handbook Building Adaptable Housing, which will include pilot projects as well as a new version of the Requirements for Building Adaptable Housing. Also, a new edition of Call for Admittance will be included in the international handbook Accessibility, serving as the Dutch elaboration of the general chapters, of which the functional and spatial principles will be the same for all of Europe. It is hoped that all people involved will exchange theoretical views and practical experiences. Only if both publications can count on broad support will building adaptable housing and offering a suitable environment to all categories become as common as a shower or central heating.

7. References

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