OPEN BUILDING FOR HOUSING REHABILITATION

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ABSTRACT

An innovative strategy for rehabilitating public housing is being adopted in the Netherlands. The strategy, known as Open Building, distinguishes three levels of physical systems and control: the neighborhood, the base building and the individual dwelling. By organizing responsibilities this way, physical adjustments can take place on each level with reduced conflict compared to traditional approaches. Upgrading one-unit-at-a-time, for instance, is less difficult, and allows investment decisions to be targeted and timed with more precision and in smaller increments than in traditional renovation. Each dwelling can now match occupant requirements and ability-to-pay, at costs no greater than making all units the same. Lastly, an Open Building project's common elements can be upgraded without vacating the building, yielding social, economic and technical benefits for all parties.

INTRODUCTION

Open Building is an approach to the gradual improvement of urban residential environments, both public and private. The principle is that each dwelling should be able, over time, to match the needs of the household occupying it. Each dwelling should be understood as an individual unit of control, capable of being manipulated independently, in the context of a community level. The community level consists of that part of the physical environment - the common infrastructure of spaces and physical systems - shared by all individual units.

The concept of treating each dwelling in a multi-family building as a separate decision presents difficulties in the traditional approach used by large management organizations such as large public housing authorities. Building managers have become accustomed to treating a large residential project as a unity, believing it to be efficient, in part because buildings are not constructed to enable efficient one-unit-at-time adaptation. Without Open Building, public authorities have basically two options for building renovation, neither of which is desirable.

TRADITIONAL APPROACHES

The first option is to vacate an entire building and proceed with either selective or gut-rehabilitation. Tenants may move back in or new tenants must be found, approved and settled. This is hard on the social fabric, takes extensive planning to relocate households and their possessions, and large expenses are incurred in the social engineering processes involved. A sizable loss of income is also assured during the period of renovation.

The second option for a housing authority is to do the renovation work while tenants stay in place. In this case, occupants are treated to long periods of disruption and noise while workers move in and out redoing units, replacing equipment and mechanical systems, painting, and putting in new cabinets and finishes. Because of the difficulties of working in an occupied building, a high level of cooperation is required between all parties, especially the owner and the contractor, but also the occupants, a level of cooperation which is often hard to achieve.

In both of these approaches, original layouts are usually retained while new bathrooms and kitchens are installed. It is not always the case, however, that the old floor plans are suitable. Work in one unit is often tied to neighboring units because the physical systems belonging to the entire building are not clearly separated from those serving individual units, nor those of one unit from others. Differences in life style, life stages and income cannot be respected, because it is considered efficient to standardize all the units as much as possible. This leaves no one satisfied. Some households feel that the new rents are too high, and some feel that they do not get what they want and can afford.

A NEW APPROACH

Open Building offers a new paradigm which is attractive to public housing authorities and to occupants of building being renovated, whether in a scheme emphasizing unit ownership, or in a rental project. In an Open Building project, each dwelling unit is considered as a separate project. Thus, a variety of floor plans and levels of investment per-unit is the natural outcome. It is now no more expensive for each dwelling to be different than to be the same.

When this approach is used to support occupants in determining their own floor plans, the rewards are significant for both occupant and building owner. In rental housing, tenants get what they want within the limits of what they can afford in rent, and because they decide their dwelling's characteristics, they are more likely to take better care of it and will normally stay longer, further reducing owner costs which can be as much as $800 or more per move. In a building being renovated for sale of units, the same benefits are available, except that households make investments based on their ability to obtain loans on the interior they have decided. In both situations, there is likely to be less deterioration of the units and the building, and lower maintenance expenses for the owner.

Most important, one-unit-at-a-time renovation offers a continuous, low impact process of gradual adaptation. Each time a household moves out, renewal and adaptation is possible, although not required. Because the logistics have been solved, the time between occupancies is less than a month, making adaptation a form of continuous maintenance. Violent swings in the condition of the housing stock, resulting from massive and disruptive renewal after years of overall stagnation, can now be avoided.

OVERCOMING THE OVER-HOUSED / UNDER-HOUSED PREDICAMENT

The best guarantee to insure good marketability of a project on a long term basis is to undertake a market-oriented and flexible rent (or sales) policy. In this process, the occupant's individual preferences have a central position. Thinking this way, it is impossible to have a standard dwelling, or to know before hand what unit to build. Offering standard quality wastes energy and money. One household will have more quality than desired, and others may be able to pay for more than they would get in the "standard" unit, thus not using potential purchasing power.

In a traditional project, standardization produces poor results as indicated in the following diagram:

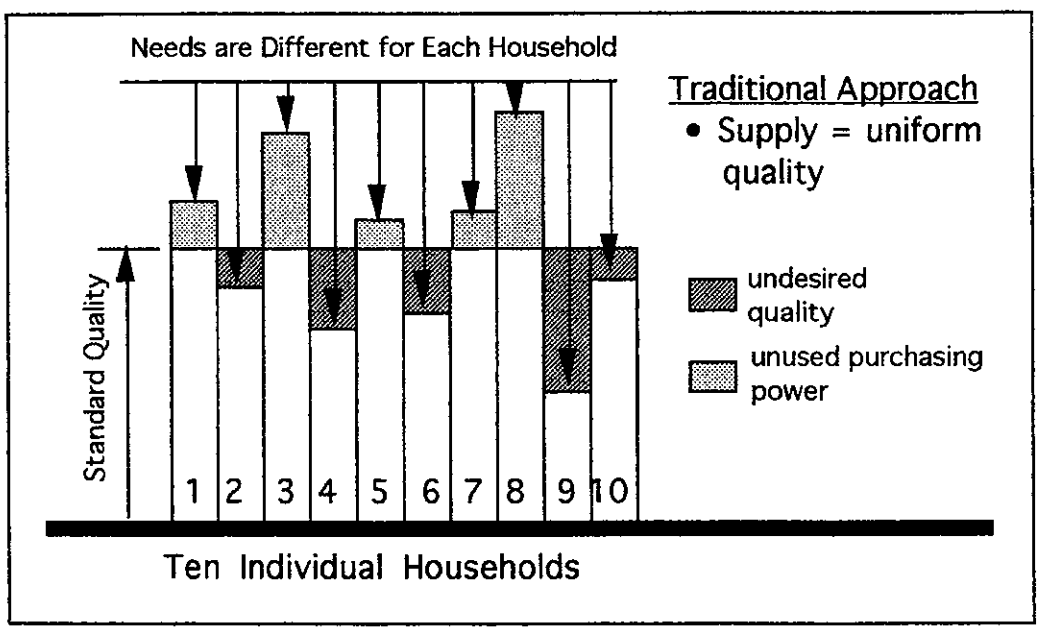


Figure 1: The traditional problem of a standardized project

In an Open Building Project, each household can be supplied with a unit which meets their preferences and ability to pay exactly. A base building will have the capacity to respond to varying demands in two ways: in the size of the dwelling unit, in the floor plan layout and cost of finishes and equipment inside the unit.

This is an important advantage in projects which seek to diversify incomes among the occupants and also allow households to remain in the building when their incomes grow.

This is indicated in the following diagram:

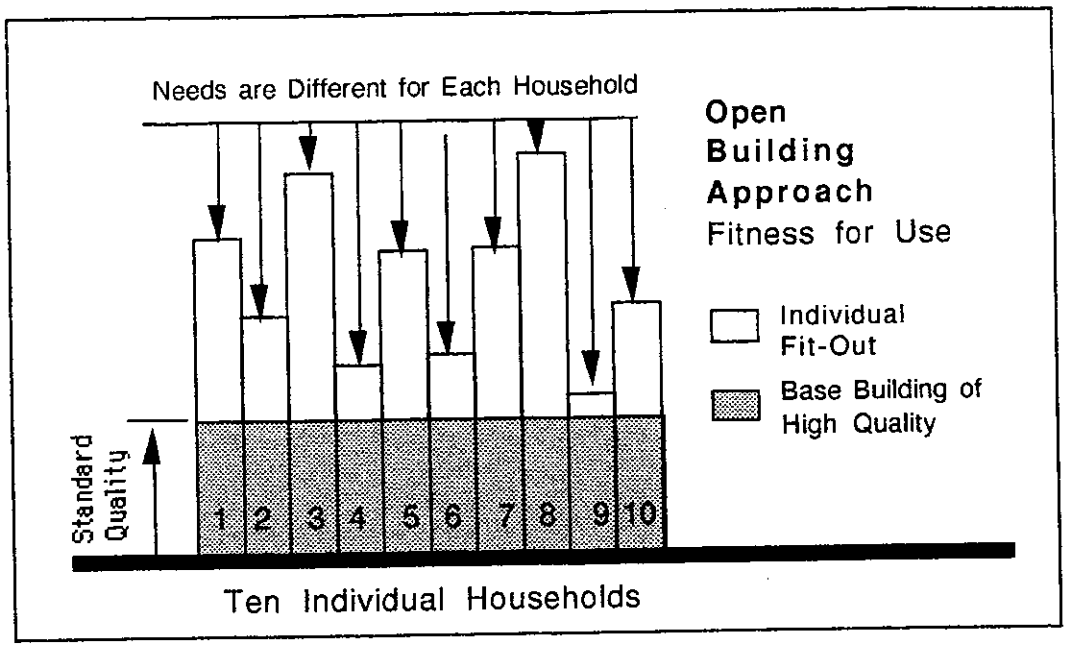


Figure 2: An Open Building Project; Units Attuned to Each Household

UPGRADING THE BASE BUILDING AND THE SITE

While it is important to upgrade each dwelling in response to individual preferences and ability-to-pay on a unit-by-unit basis, the building's common facilities, such as stairs, elevators, central mechanical systems, facades, entries, parking facilities and landscaping, also need to be improved in most cases. For these common elements, the building owner has to take initiative, while consulting with the building's occupants. This work is done at its own pace, and can be handled with bids independent from the work on the individual units. As such it is easier for contractors to know what is expected and to determine prices.

REPORT ON A CURRENT OPEN BUILDING RENOVATION PROJECT

Recently, the first phase of an Open Building renovation project was completed for the housing corporation Patrimoniums Woningen in Voorburg, The Netherlands. It involved a block of three buildings constructed in 1962. The complex has 110 flats accessed by 13 stairwells, two units to a landing. The first phase included the following tasks in one of the blocks containing 50 units.

••• a face lift of the site, (Site or Tissue Level) including: (see page 9)

> adding 10 new small dwellings with gardens at ground level, replacing storage units, to improve street "life";
> adding 4 new, 2-story for-sale dwelling on the edges of the existing multi-story buildings.
> upgrading the landscaping, parking area, and other site features, and adding freestanding, brick storage units.

••• renovation of the block (Base Building Level): (see pages 9 and 10)

> adding elevators and new stairs
> enlarging balconies
> improving the thermal insulation of roof and facades
> replacement of original glass with insulated units and repairing window frames

••• inside the dwelling units (Fit-out or Infill Level): (see pages 9 and 10)

> renovation of individual units if individual tenants wish to invest money to do so(a number already have done so).
> when vacancies occur, new tenants can choose a completely new interior, matching their needs and expectations.

ISSUES EFFECTING THE DECISION TO RENOVATE

Investments needed to renovate a project of this size involve complex decisions, and involve a number of criteria:

> how is the housing project situated in relation to shopping, schools, public service and recreation facilities;
> how is the image of the project, related to:
  - the age of the area
  - the maintenance of the public space
  - the kinds of households living in the area, according to age, public assistance, education, etc.

- the level of vandalism, small criminality, etc.
- the price-quality ratio of the housing stock in the area.

POLICY ALTERNATIVES AND STRATEGIES

The two basic choices for the housing authority were to maintain the project, or to demolish it and redevelop the site. In considering the options, the authority decided that the quality of the building stock and the potential for good rentability indicated that renovation had merit over redevelopment. Further, the demand for units was strong, requiring no new measures on the demand side. The policy alternatives are diagrammed as follows:

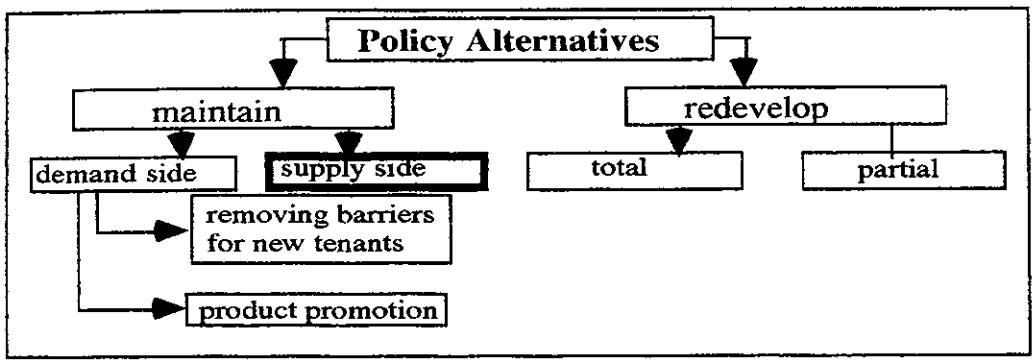


Figure 3: Policy Alternatives in Outline

ADAPTATION OF THE SUPPLY SIDE

The principle issue in improving the supply side in a maintenance strategy is the balance between price and quality. Quality is the degree to which the project fulfills users requirements currently and over the next 10 year period. As shown in the chart below, the housing authority considered three aspects to quality:

> technical quality
> housing quality
> the quality of the tenants

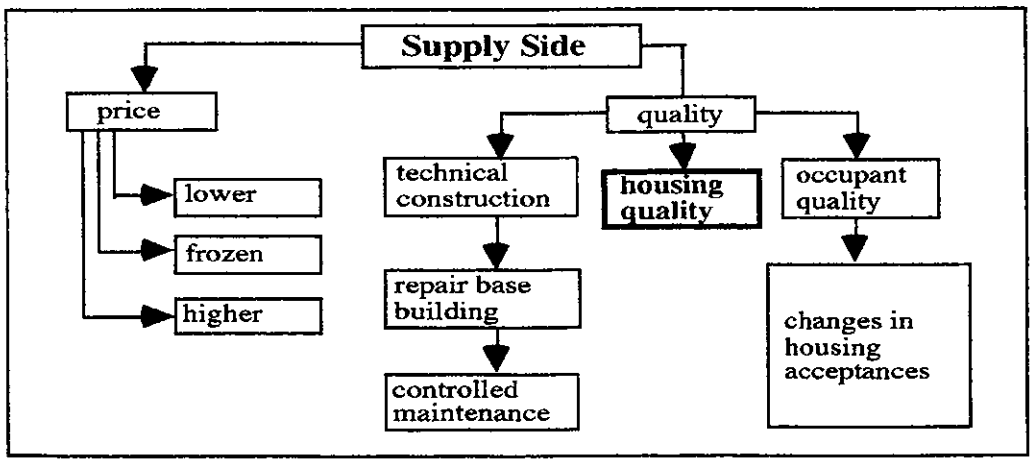


Figure 4: Strategies for the Supply Side

At Voorburg, construction quality has been improved by technical measures including improvements in the roof, windows, the concrete balconies, and the exterior masonry walls, meaning an investment equivalent to $8000 /du. The most important decision in this regard was to improve the quality of the entire project by increasing the housing quality at all levels, not only the individual fit-out or the base building level, but the neighborhood level as well.

IMPROVING THE HOUSING QUALITY

The improvements of housing quality can be achieved on all of the three levels:

> the neighborhood environment (tissue level)
> the building block (base building level)
> the dwelling unit (fit-out level)

At every level, two kinds of measures are possible:
> changing the distribution of control, which usually means reducing the scope of control by the central authority and delegating responsibility to occupants and/or to an on-site manager.
> changing the physical systems, adding features, removing certain elements, or adjusting systems already in place.

Examples of changing the control distribution include the following:
> at the neighborhood level, there is the possibility to decentralize the responsibility for the landscape areas, parking places, play areas, etc.
> at the base building level, responsibility for managing the building can be decentralized and given to an on-site manager with a separate budget.
> at the dwelling level, responsibility for the fit-out by individual tenants is possible as well as complete ownership of the fit-out by occupants.

These measures are summarized in the following diagram:

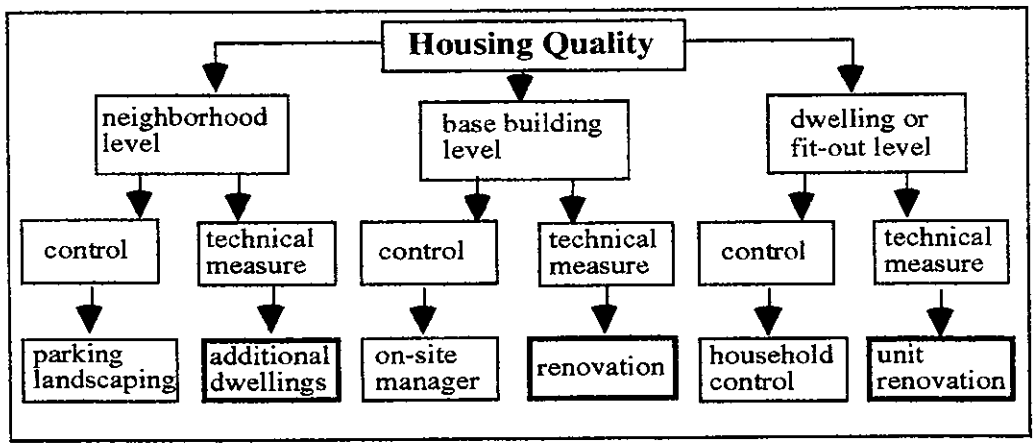


Figure 5: Strategies to improve the housing quality

MEASURES AT THE NEIGHBORHOOD LEVEL

The overall residential environment is normally considered to be the responsibility of the local government. In the case of Dutch public housing, the Local Housing Authority normally has responsibility, although it may be shared with the municipality.

In the Voorburg project, the housing authority decided to improve the quality of the neighborhood environment as part of the architect's commission for the renovation of the project. First, new dwellings were installed at the street level on the front of the buildings. New dwelling units were also built on the ends of the existing blocks, replacing old garages and thereby enclosing the private side or backyards. These improvements have been made by the housing corporation, with the support and participation of the city of Voorburg.

RENOVATION OF THE BASE BUILDING OR SUPPORT

At the level of the base building, a number of changes have been made (see pages 9 and 10)

> an hydraulic elevator has been added at each stairwell in the same slab opening that had contained the old stairway. A new stair was then built outside the volume of the building, with a glassblock enclosure allowing each to be naturally lit. New ground level entry halls were built at each elevator/stair.
> the exterior facade of the block was upgraded with improved thermal insulation and insulated glass in renewed wood window frames.
> the existing balconies on the street facades of have been enlarged and their concrete work improved. Facing the interior common space, smaller balcony extensions have been added in certain locations.
> additional dwelling units were added at ground level, suited particularly (but not exclusively) for elderly people and individuals with physical diasbilities. They are small units facing the public street, reestablishing the buildings in the traditional Dutch manner of directly and closely fronting the sidewalk with large picture windows. These units replace the storage units which had occupied the ground level in the front.
> the building level mechanical systems, vertical utility stacks for gas, water and drainage, electricity and ventilation equipment have been improved. A new vertical stack has been added adjacent to the new elevators providing exhaust ducts and space for new supply lines for water, gas and electricity.

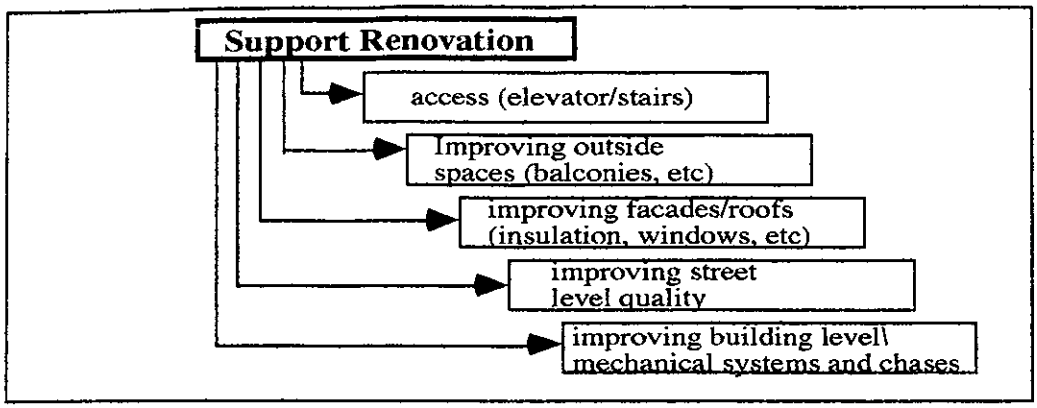


Figure 6: Strategies to renovate the base building

The building costs for this level of renovation are $25,000 per dwelling, (excluding maintenance and repair).

IMPROVEMENTS OF THE DWELLING LEVEL

During the renovation of the base building, the inside of the dwellings has not been changed. Prior to the base building renovation, several demonstration units had been completely fitted out with the Matura Infill System, a commercial product now on the market. The fitting out of these two units has proved the feasibility of renovating individual units at the time the tenant wishes to act, or when occupants vacate and a new tenant decides to move in, without disturbing adjacent units and without implementing a comprehensive base building renovation.

This process of one-unit-at-a-time renovation has the following advantages:
> it is possible to fulfill individual requirements of new tenants
> increased flexibility in timing individual unit renovation is possible
> existing tenants are free to accept, defer or reject renovation of their own dwelling unit
> recent technical advances can be incorporated on a per-unit basis
> the Matura Infill system provides increased sound isolation of units both on the floors and party walls
> the rentability of the whole project is improved
> rents are increased 7% to assure cost effective project management over a long term given the costs of renovation
> if a household is not interested in a complete renovation, it is possible to selectively renovate the unit (e.g. only a new kitchen or bathroom with a smaller increase in rent.

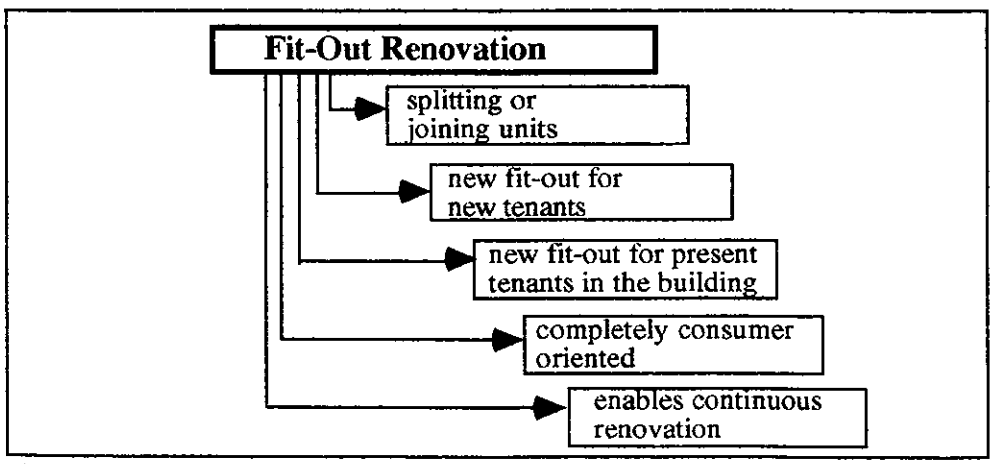


Figure 7: Decisions related to the Fit-Out Level

FINANCIAL CONSEQUENCES

To predict long term consequences, calculations are made with a life-time cost model, developed by KD Consultants. Future operating/maintenance costs and profits can be simulated regarding several parameters::
> interest rate
> inflation
> increase of building and maintenance costs over the long term
> yearly increase in rents, and frequency of moves of tenants

INVESTMENTS IN THE RENOVATION

The investments in the renovation are depicted in the graph below. Values are given in dollars per dwelling.

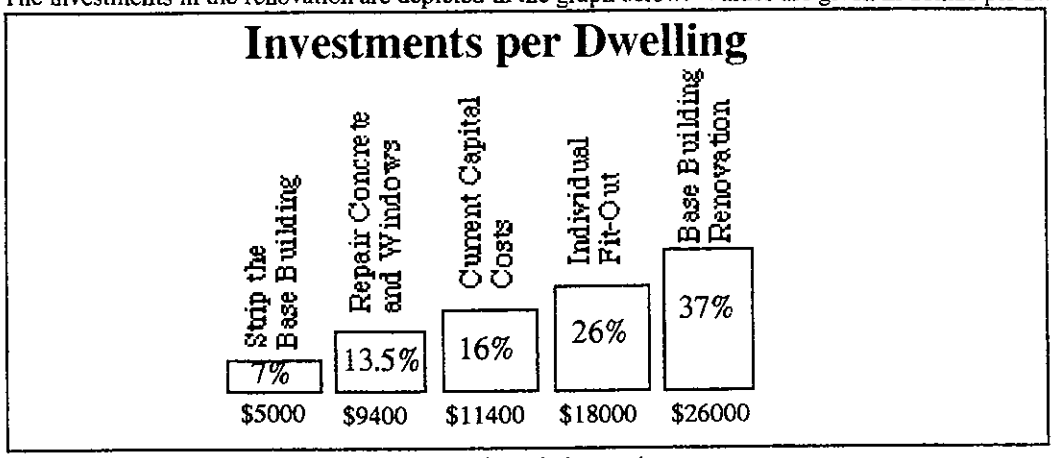


Figure 8: Investments per dwelling for the existing project

INVESTMENTS IN THE NEW DWELLINGS

The investments in the new dwellings are depicted in the overall cost table below (Figure 9). The overhead costs of the main contractor were 22%: 11% for site organization and site services, and 11% for general overhead and profit. Changing the process and splitting the responsibilities into two separate contracts, one for the base building and the other for the fit-out could save at least 50% of the overhead of the main contractor for the fit-out part.
This means that after delivery of the base building, the site organization and site services and equipment are fully the responsibility of the supplier of the fit-out. According to the calculations of the main contractor, the Matura Infill System will be $600-$1000 more expensive per dwelling compared to a traditional fit out process. However, the overhead costs of the main contractor alone, related to the interior finishing work, are +/- $3000 per dwelling.

This means that at least 50% of this could be saved if the Matura Infill System were used. Another advantage in its use is the decrease of interest costs during construction, because of the shorter building time, made possible by the more efficient fit-out installation using the Matura System. The savings is about 10 weeks on a project of this size.

PROJECT	Base Building	Fit-Out	Total	Overh'd	Tax	Total	Other	Invest-ment
10 dwellings	$28000	$11000	$39000	$8600	$8300	$55900	$6100	$62000
4 new du's.	$46000	$16000	$62000	$13600	$13200	$88800	$16200	$105000
4 garages	$8000		$8000	$1800	$1700	$11500	$1500	$13000

Figure 9: Cost Distribution of the Project

CONCLUSIONS ABOUT BUILDING COSTS

The general conclusion is that in the case of a renovation project, an "infill" or fit-out system like the Matura Infill System is the lower cost solution. Further, because of the advancements incorporated in this system's off-site and on-site logistics and installation procedures, it can not be compared with a traditional one-unit-at-a-time renovation. The price associated with this new approach is now a question of market supply and demand, between the tenant and the supplier of the fit-out system.

LONG TERM OPERATION AND MAINTENANCE COSTS AFTER RENOVATION

The long term costs and income from the rents has to be in balance over time. In the chart below, the results of calculations in regard to this necessary balance are shown. The first 3 years show a profit. The next 13 years show a deficit. After 16 years, the results are again positive. The net present value over 30 years includes a positive salvage value for the base building, a very important factor for the housing corporation.

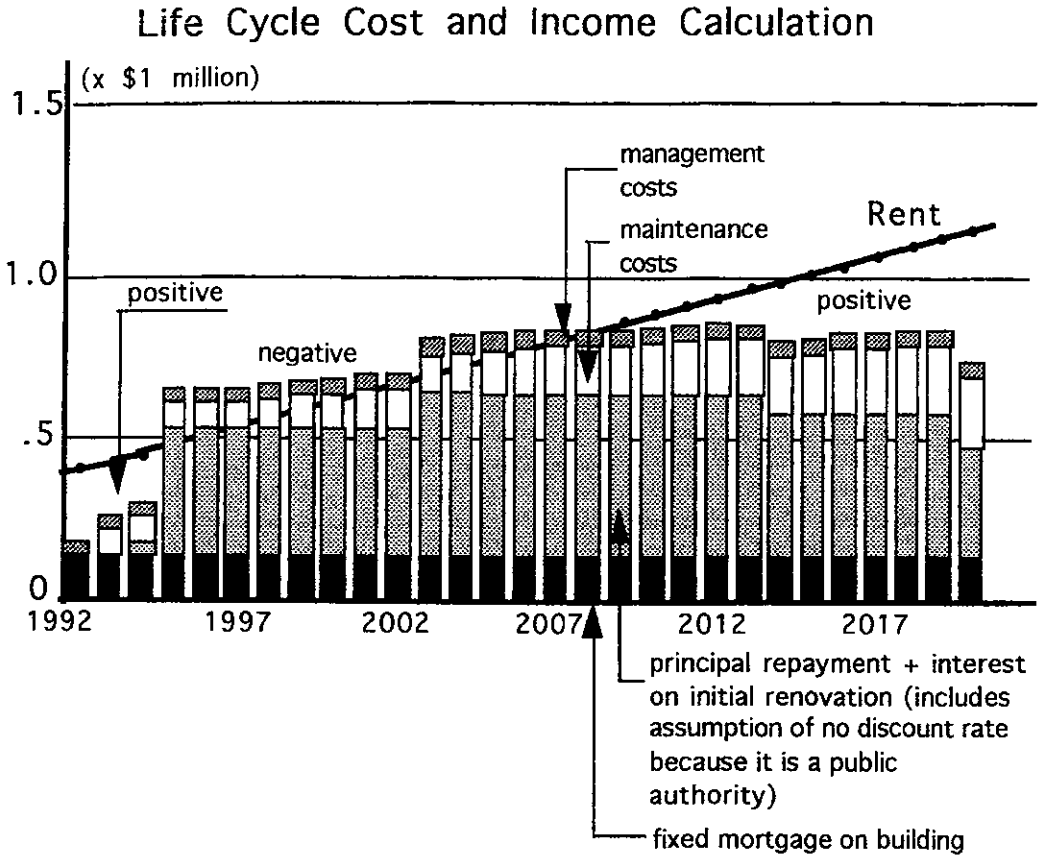


Figure 10: Life Cycle Calculations after renovation, including 5% new Fit-out Units per year.

SUMMARY

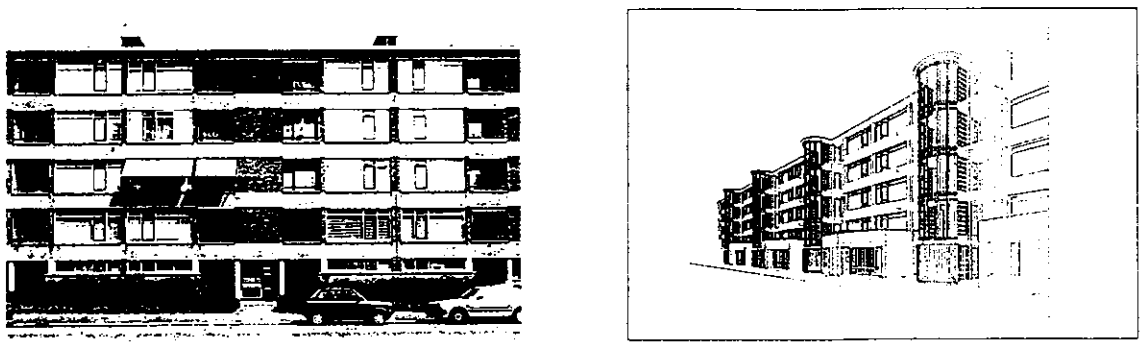
Open Building represents a new approach to residential construction and renovation of multi-family housing, including the public housing stock that is structurally sound, in healthy or potentially healthy neighborhoods, and thus remains economically viable. Work to date in the Netherlands has progressed so that it is now clear that renovation accomplished in this way is no more costly than conventional practice, and gives a number of important advantages unavailable to those employing conventional renovation.

For several decades in the US, both retail and commercial construction have been evolving in such a way that distinguishing a base building and a fit-out level is now conventional. Design, construction, financing, interior fit-out systems development and other aspects are now moving into second generation approaches. It is now unthinkable to invest in these kinds of buildings without assessing their capacity to be adapted to new and changing occupancies and technologies. The question now is whether residential development, in both the public housing stock and the private market, will adopt the paradigm governing the other two of the three primary income producing property types in the US building stock.

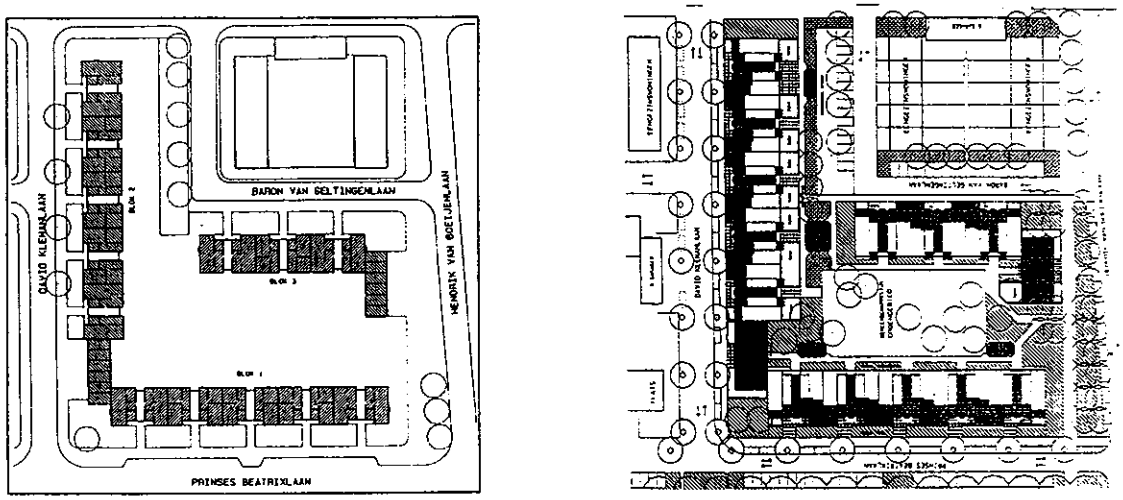
Experience points strongly to the importance of building now for the future, in all building types, when fine-grained adaptation will certainly be a dominant activity. Building with change in mind makes sense as we seek more sustainable and humane built environments, and also makes sense for both local and national economies.

The movement toward Open Building in the retail and commerical sectors did not ocur quickly. Early projects cost more than the inherent costs of the approach. It may have first occurred in these building use types because they have larger profits associated with them than residential uses. Business and commercial tenants in the aggregate represent more powerful organized interests than households. Further, commercial and retail buildings are technically less complex than residential buildings, with a less dense distribution of mechanical systems on a uniform square foot basis, and fewer separate tenants than a residential building of the same size. So it is not surprising that residential construction has not led the way.

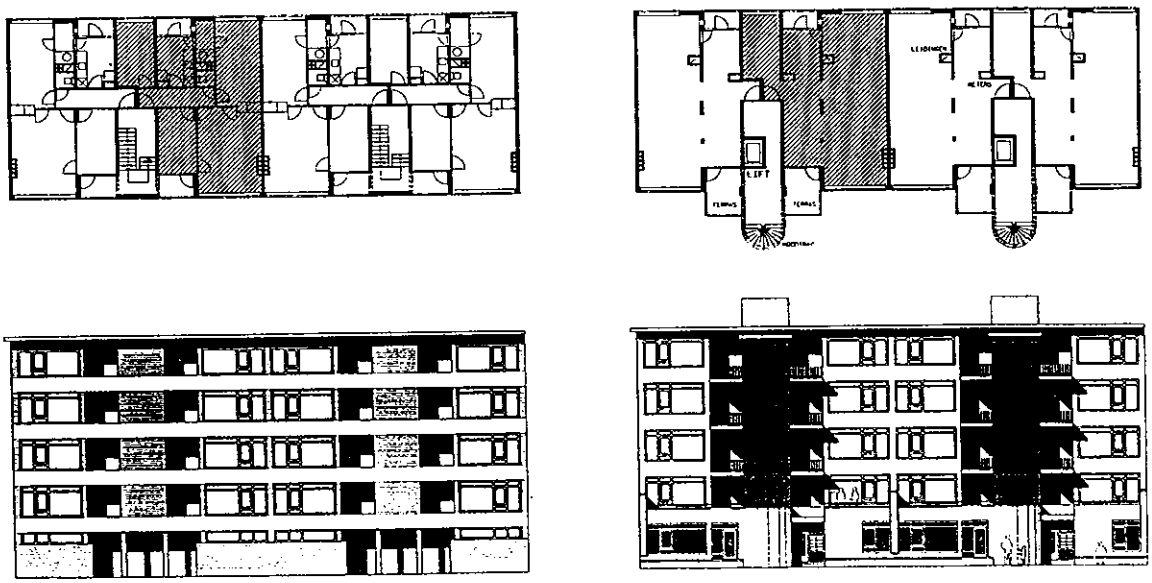
Having observed this paradigm at work in other areas and use types, we are in a good position to adopt the process in the construction and renovation of at least some of the US residential building stock. The problem now is to identify and catalyze the necessary diverse interests to construct demonstration projects in the United States.



• A view of the existing block (left) and a view of the renewed block showing new stairs, balconies and ground floor units (right).

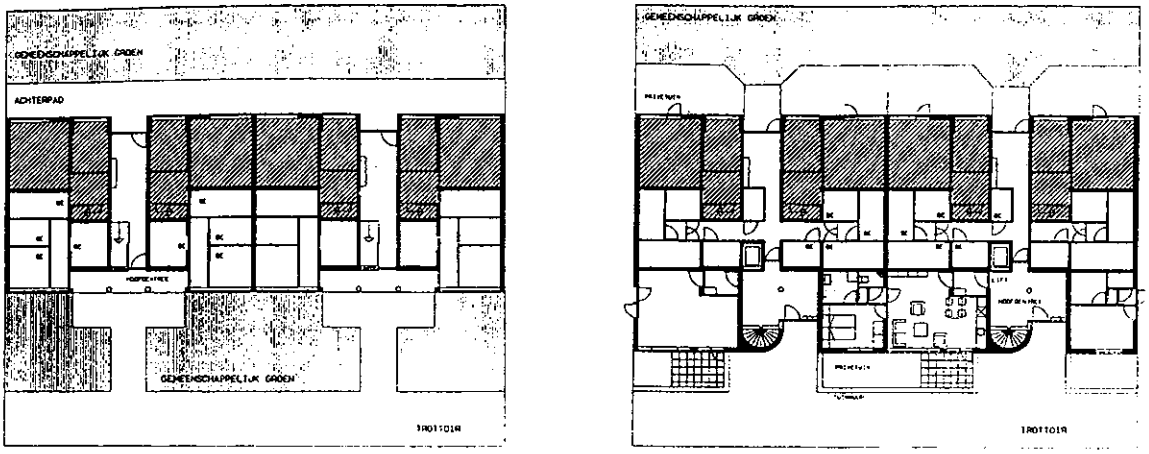


• The site plan before upgrading (left) and the present site plan showing new pedestrian walkways, entrances to the building from both sides, new for-sale units replacing the rows of garages, and new freestanding storage units.

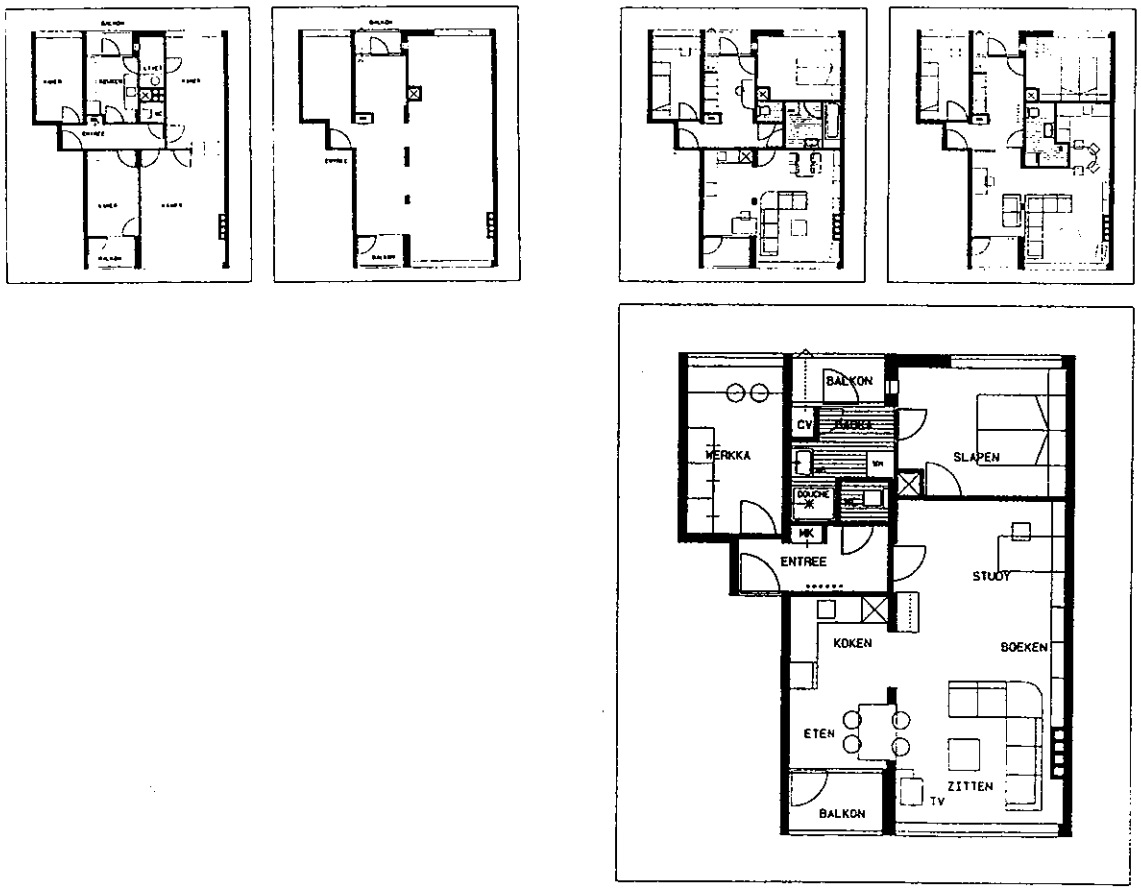


• The original base building plan and facade (built in 1962) as it appeared prior to renovation, showing a typical 5 room dwelling (left). On the right, the renewed base building facade, showing how the internal load-bearing structure was modified to increase each dwelling unit's capacity to hold a variety of layouts in the same space(right)

THE BASE BUILDING: BASIC PLAN VARIANTS AT THE FIT-OUT LEVEL



• The ground level of the building before renovation, showing storage space (in white) on the street side, with two story dwellings on the side of the block facing the inner courtyard (left). On the right, a ground floor plan of the building showing new street sideunits with their private gardens, also showing the new elevators and stairs(right).



• Typical floor plan of a standard 5 room dwelling before renovation, and after "cleaning out" the unit and making openings in one cross bearing wall (left). On the right are three interior layout variants provided by the architect for the young couple moving into one of the renovated units. They chose the plan showed enlarged. Later, an elderly couple immediately upstairs decided to renovate, and selected a plan similar to the one on the upper right.

VIEW OF THE RENEWED BUILDING'S STREET FRONT

A CAD generated drawing of the renovated base building or support in the Voorburg project.

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About the Authors

Karel Dekker is a building economist and principle of the consulting firm KD Consultants in Voorburg, the Netherlands. His work involves economic and strategy planning for private companies and governments in the EC, including infrastructure planning and building construction. He has done some of the seminal economic analysis showing that Open Building can cost less.

Dr. Stephen Kendall has a PhD in Architecture from MIT a professional degree from the University of Cincinnati, and a Masters of Architecture and Urban Design from Washington University in St. Louis. He is an architect, educator and building researcher. His advocacy of Open Building has led to two workshops of major US organizations to explore the opportunities in adopting Open Building. He has studied Open Building practices and projects in Japan and Europe, and has published the major assessments of this approach in the US market.