35 RE-DESIGN AND RENOVATION

LEO VERHOEF

35.1 INTRODUCTION

Buildings ultimately reach the end of their life-span. Various notions may be implied by 'life-span', like:

- Economic life-span; after which it is not attractive any more to maintain a material, building component or building.
- Functional life-span; the degree in which the building is satisfactory for carrying out the function for which it was designed is an important part of the economic life-span.
- Technical life-span literally means the end. The material from which the building is constructed is giving up, or materials seeing to the coherence of the building. For important parts of the building, like the skeleton, this may take a much longer time than the economic life-span.[a]

Reaching the end of one of these stages of life-span may cause terminating the life of the building, by demolishing it. In what is following here that option, and others, are discussed. When buildings have arrived at the end of their functional-economic life-span, the technical life-span has not been reached by far, generally speaking. At this point a number of decisions are possible:

- Demolition and building anew. Increasingly, the environmental costs of processing the debris of the demolition can not be waved; to this the use of energy for manufacturing new products should be added, actually. On the social level there is increasing pressure against demolishing buildings with a sound potential for renovation. The quality of the overall structure is important;
- Continuation of usage. Given the fact that the building has ceased to function properly, the user will only be prepared to lengthen his use at significantly lower costs. From an economic viewpoint the building is valued lower.
- Re-design with renovation activities. Buildings are increasingly adapted to a (re)new(ed) use. The aim of this is to see to it that the building is functioning properly; in this, innovative energy concepts are taken explicitly into account: for instance active – and passive – solar energy, or the application of façade variants, like a second façade skin, or a climate façade.

35.2 DEALING WITH THE PRELIMINARY STAGE AND THE STAGE OF THE PROJECT STUDY

Dealing with re-design and renovation of buildings may distinguish a preliminary stage and the stage of the project study itself. The preliminary stage serves to reach a decision for recycling and renovation.[b] Topics like a market study are coming to the fore in order to tune locations, buildings and functions; global analysis of the building in which situation, possibilities of usage and general properties are addressed; and an investigation into special aspects with regard to the building and the location, like environmental and other requirements, rights and obligations associated with the building and possibilities for subsidy. Conclusions regarding possibilities for re-design and renovation as well as an estimate of costs, usually on the basis of characteristic numbers compared to building from scratch; or demolition and building from scratch finalise this stage and indicate the financial framework for the project study.

During the stage of the project study a number of steps may be discerned as well. It starts with the in-take, followed by a stage in which the location, the building and the function are analysed, after which the development of concepts for usage is conducted. This is leading to selection of one of the concepts (possibly with variants), followed by materialising the concept in its relationship to the budget.

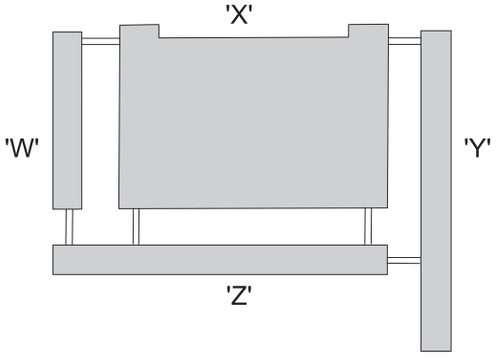
a Kristinsson, J. (2000) *Lecture-text*.
b Rongen, C.T.H. van (1988) *Hergebruik van gebouwen, een verkennend onderzoek*.

The stage of the project study starts with an accurate survey of current conditions. These may be itemised according to location, building and usage; with the purpose to find out what is valuable in the existing situation. It may be that the value of an ensemble, building or setting is already protected, for instance in the case of a monument, creating restrictions and other possibilities for re-design and renovation. Generally speaking, such a protection does not apply.

Collecting or producing material that should be recorded by drawings, photographs and maps is an element of this stage. In order to clarify matters by way of an example, a study of Delft University is described globally, in which the task was undertaken to study how usage of a specific built ensemble could be improved upon. Since the preliminary stage or project stage did not apply, the conceptual project study could start immediately.

35.3 EXAMPLE *'CONCEPTUAL STUDY OF RENEWED USE OF BUILDINGS'*[a]

The approach of such a project study is illustrated by an example taken from practice. It concerned four buildings functioning as offices with its associated functions as well as laboratory functions. Management wanted to find out how many people could be housed in the built ensemble, if the laboratory part could be allocated to a building created separately. The underlying thought was strong reduction in use of space by the laboratory caused by IC technology.



329 Ensemble

General points of departure for the study included:

- Interventions for adaptation of the existing buildings 'w', 'x', 'y' and 'z', for new functions are applying to office housing with associated functions, like conferencing rooms, meeting rooms, office restaurant.
- Separation of functions; and, if possible, per part of the building. Mixing functions, like those of offices with laboratory ones, is no longer desirable. Laboratory functions should be housed in a separate building;
- Concentrating the functions associated with housing offices as much as possible.
- Solving the problems related to fire security and the view from the low building 'x';
- Modernising the buildings in such a way that it gives a 'corporate identity' feeling.

In the general approach to this stage of the project study the following was mentioned already:

- In-take;
- Stage of analysis of building and function;
- Development of concepts of usage.

After this, the selection is following one of the concepts with possible variants, then materialising the concept as related to the budget.

330 Façade

The building in-take regarded architecture, usage, technical possibilities of adapting on the basis of construction/ detailing and quality of maintenance, particularly of the façades.

During the analysis stage of the building and functions a number of conclusions was drawn based on the in-take that should lead to improvement. The most important ones:

In an architectural sense:

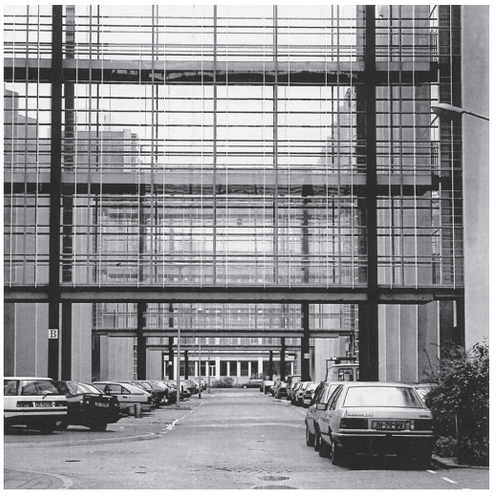
- The buildings are not displaying a lower and upper side;
- The columns, placed out of the façade by more than one metre, are not functioning as such, in order to interrupt the horizontal character of the 170 metres long buildings. The length is staying dominant and the building remains anonymous;
- The buildings have a strongly defensive character, since the walls reach 1,1 m. above the floors;

a Verhoef, L.G.W. and A.J. van Stigt (1994) *Conceptueel onderzoek naar het hergebruik van de gebouwen*.

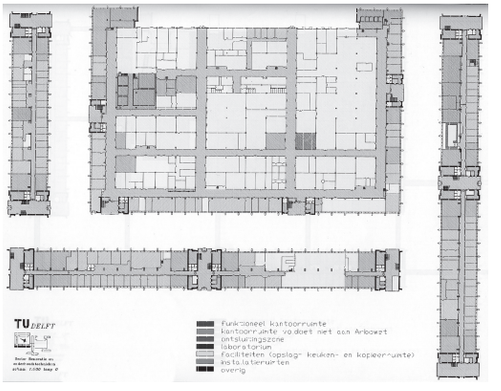
- The detailing of the stairs system in brick is not in harmony with the heavy columns in the façade;
- The nine aerial bridges are too many for giving clarity to the structure of access.

From a viewpoint of usage:
- The drawings show that many spaces are not used as an office. The buildings can be used more intensively than up to now;
- Building ‘x’ with its dimensions of 80 by 120 m. is not obeying legal requirements with regard to lighting and view. Separate study concerning adaptability of building ‘x’ is called for;
- The bottom glass line on 1,2 m. above floor level is clashing with the legal requirement of 0,9 m.;
- Parts of building ‘x’ must be removed in order to comply with legal requirements for daylight and view;
- Analysis shows that raising the floors housing the ducts for new usage is preferred to lowering the beams of the façade, and with it the glass line.

In a technical sense:
- The façade features a very special construction. The columns outside of the building have been linked to the monolith concrete façade beams by pre-fabricated concrete linkages. The link has been realised by hanging staves and short concrete elements. In this case the technical detailing is so important, that long-term and controlled protection is deemed necessary. The conclusion drawn from the analysis caused selection of skin sheltering from rain around the inner directed side of buildings ‘w’, ‘y’ and ‘z’ and to cover the streets between these buildings and ‘x’ with a hood from glass. This selection is also enabling the appropriate ‘corporate identity’ and the creation of an inner world;
- The foundations and the construction are demonstrating after repeated calculation so much reserve, that an additional floor can be constructed on the building;
- The beam on the ground floor breast-high has no significance for the construction. By removing it and adding a floor, the building is getting, by the changes proposed, in addition a lower and an upper side in an architectural sense.

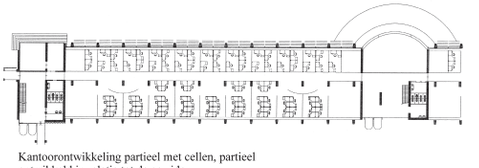


331 Bridges



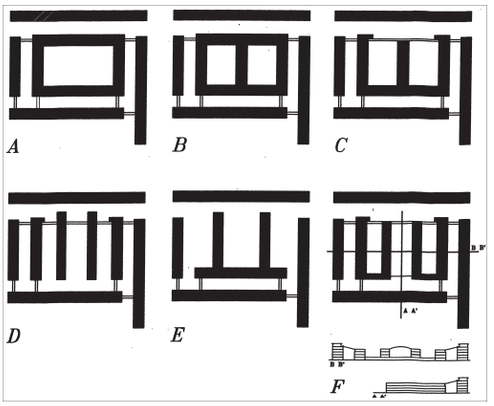
332 Floor plan

333 Façade

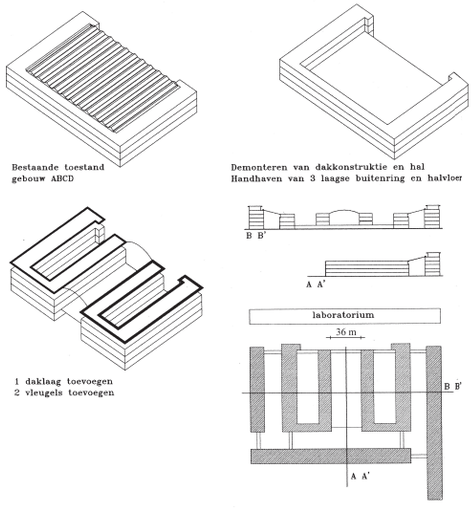


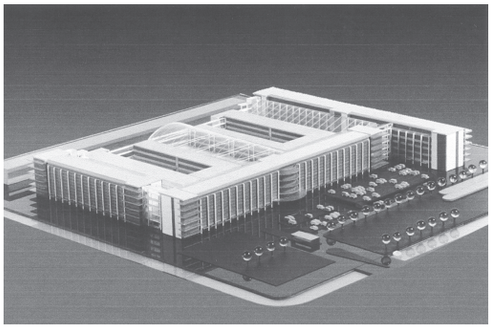
Kantoorontwikkeling partieel met cellen, partieel ontwikkeld in relatie tot de corridor

334 Floor plan



335 Six shape variants





336 Selection

35.4 DEVELOPING USAGE CONCEPTS FOR BUILDING 'X'

Building 'x' has a U-shaped skin with a rather office-like look, with in-between a space with the structure resembling a hall. The point of departure of the study concerns maximising the number of office working places. Legal requirements concerning light and view are making the present form unacceptable and are necessitating partial demolition. On this basis six variants were developed: three on the basis of large atrium shapes and three on more linear ones.

A one single atrium building;
B a double atrium building;
C an E-structure;
D a structure in lines (| | | |);
E a ⎍ structure;
F a mixed structure (U U).

After an analysis of all concepts variant F, with a (U U) structure proves to be the most satisfactory one. It has a central area immediately behind the central entrance in building 'z'.

This leads to a continuous language of forms in the covered inner streets parallel to the buildings 'w', 'z' en 'y'. By the intervention the areas at the roofed central hall and at the atria get a language of forms differing from the façades, but one that is consistent and continuous.

In this concept all buildings must be accessed by a double ring structure including the aerial bridges. Since the inner areas have been covered, the glass enclosures of the existing aerial bridges have become redundant: free elements in space, demonstrating their primary function. Each area and building with covered streets protecting the existing façades gets a character of its own. The inner world created this way stands in open connection with the spacious central area with a roof 36 metres wide.

When conceptual selections for usage and architecture have been made, materialising and detailing as related to the budget is called for. With regard to the objective of the present book, *'Ways to Study and Research'*, the process has been described in large strides in terms of what is needed when it comes to re-design and what the most important factors are.

For smaller components within the whole – for instance in the case of the new outer façades – the same procedure is followed. Then also the 'in-take' is the basis; and then, specifically:

- Data and dimensions of the existing façade;
- Stage of analysis of the façade and its function. This causes the new outer façades, second ones, while the solar energy generated is used during winter and disposed of in summer;
- Developing the usage concepts
- Selection of one of the concepts with possibly variants for the outer façade and then materialising the concept as it is related to the budget for the façade.

35.5 CONCLUSION

In the case that there are weighty arguments for extending the life-span of a building, redesign and renovation are called for. In the above the various stages of study have been discussed on the basis of an example taken from practice. The constructive part of the building was emphasised, and checked on quantifiable life-spans, like economical, functional and technical ones.

The type, size and state of the technical installations of a building are at least as important for judging the architectural state; since that is not only made on measurable properties, but predominantly on emotional results. A climate is up to a large degree a feeling and is therefor not to be measured objectively. One should use the work of behavioural sciences. The next Chapter will discuss this in more detail and provide examples.