

THE FULL-SCALE LABORATORY IN LUND

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An often repeated statement of the nature of the result of our general construction activities in general says that any building and environmental arrangement could be seen as a pure experimental product. The building, in this sense, is nothing but one single full-scale experiment started afresh each time, unfortunately, we could add, without the consistent follow-up measures.

In view of this way of understanding the building process you might deduce the interest in a more anticipating attitude and behaviour, namely the mock-up method or the full-scale design process, based on the philosophy that in a situation of uncertainty you had better try before than after. An underlying presumption is, however, that generally there is a lack of knowledge about the consequences by transferring spatial and design ideas from drawings to one to one realization. A lack of knowledge not only among lay people but also among professionals.

The mock-up practice can also to the same extent be derived from a pure investigative interest with the aim to virtually analyze general or specific problems in the relationship man and the built environment, particularly buildings and spatial settings on the micro level. That means the use of the full-scale method for the search for basic design knowledge. In this sense the mock-up activities started in Sweden and I will return to that later on.

The mock-up as a mean for research and development work - systema-

tic investigations with recording equipment and test subjects - does not exclude the experimental dimension in the more genuine meaning. This I presume must be said to be a classical use of mock-up activities, with a special significance to the training of students in the architectural education. In the training situation you have both the wish to make all kinds of experiments - with form, space, material, light, and so on - but you have also a demand from the students to be able to visualize in one to one their tentative design ideas.

To summarize the possible aims of full-scale activities we can recognize the following five ways:

- (1) as a mean to facilitate or improve the professional design process, giving a concrete form to drawing symbols in scale one to one
- (2) as an investigation method for analyses and assessments of spatial organization and measures; basic knowledge of the relationship of man and the built environment as well as application studies
- (3) as a tool for users's participation in the design and building process
- (4) as a mean for experimental design and
- (5) by that also for the use in the training of architect students.

Each of these areas of use has its theoretical and practical implications, which might be of our common interest to discuss in this conference. I have not the ambition, however, to systematically go deep into these points, just to touch upon them when they are brought to the fore in the context of our experiences in Lund.

Very shortly before I am going to tell something about our ongoing activities in Lund I want to give you some historical data in the Swedish context of full-scale practice.

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My historical studies in the Swedish housing research area has brought me to a very early statement about full-scale activities; publishing the results of the first investigation of kitchen equipments in the 20's the author - an architect - says that he regrets that even if he had made a very thorough analytic investigation it should have been supplemented with tests and experiments of housework in one to one scale. His idea was realized more than ten years after when a group of architects and home economic professionals (women) started the housework studies, activities that lasted for a long period and came to be the basis for the kitchen equipment standards (within the Swedish Industrial Standards) approved around 1950. Of course, all these simulation studies and tests on realistic basis could be executed without any more sophisticated physical arrangements. But here the principal idea of full-scale studies was introduced in Sweden. The Swedish housework studies were, however, and that must be emphasized, to a great extent influenced by the German and American 'scientific management' movement, the Taylorism and the idea of a rationalistic approach to the design of domestic space and dwellings, that started in the 20's.

The interest in full-scale investigations increased in the beginning of the 60's, in harmony with the rationalistic planning to make ready for the big housing boom. The claim for reliable basic knowledge for general recommendations about design qualifications elicited public resources in different ways. The setting up of the National Swedish Institute for Building Research was one of these

endeavours and here studies started (or were overtaken from the Consumers' Institute) including mock-up activities even if executed in some very provisional arrangements (a basement hall with low ceiling height). At the time when the new school of architecture was going to be set up in Lund a full-scale laboratory was put into the building programme and was in 1964 built as the first realization in Sweden of such a facility, especially designed for this purpose. In the geographical context of this conference it is funny to note that the prototype of the Lund laboratory was a laboratory here in Copenhagen at a state council for economic domestic issues ('Statens hushållningsråd').

I will give a brief presentation of the laboratory and its facilities in Lund. After that I want to give some ideas of what we have done, emphasizing the last years.

Important is the size, both the floor area and the volume; 15 by 18 metres and with the height of 6 metres. The three facades are glass-covered, a grid of windows which allow day-light studies to a certain degree but also can be covered if wanted. A very useful equipment is the platform, moveable both horizontally and vertically and with an area of about half the area of the hall.

Water supply and outlet can be arranged by holes in the concrete slab, enabling tubes and pipes to be drawn. The mock-up equipment consists of a collection of light-weight panels, 2.40 high, with various breadths from 10 to 60 cm. There are also elements of various design to use as doors and windows.

Supplementary equipment, as we have worked very much with dwelling

design, consists of the interior equipment components in accordance with the Swedish Standard System.

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In each specific case a carpenter's workshop can be used for producing complementary construction details and dummies.

The recording equipment includes a video-camera, super 8 film camera with possibilities for interval operating.

Full-scale investigations of three types have been carried out in our lab in Lund. By using the word investigation I mean some kind of serious research activities (not pure demonstration projects). These three types can be labelled: (1) studies for basic design knowledge, (2) application studies, usually commissioned studies and (3) participation application studies, also commissioned by clients. The differences between these categories will be clear by exemplifying in the following.

I have to admit that the first type - the pure research approach - has not been the prevailing activity. Here I will take the opportunity to refer to the imposing work that has been done in Stockholm at our parallel institute at the School of Architecture and started at SIB in the early 60's. Basic research about functional measures and what they call 'mobility behaviour' has been conducted by Thiberg, Hallberg and Nyberg. And these studies have not required the supply of a large and full equipped laboratory, not existing there.

We have, however, some studies of the basic research character. An early example is one in charge of another department in Lund, what

we call the 'stair case studies', which had an extremely good use of the lab facilities. Here huge arrangements were mocked up and fairly dangerous situations were simulated with test persons running up and down the stairs. The results of these tests were gradually influencing the building regulations in Sweden.

A study carried out in the midst of the 70's was the laundry study where full-scale experiments were just a part of a more extensive investigation. The lab experiment aimed to develop the arrangement of the equipment and the set of apparatus in a closely located laundry in a multi-family house.

Another study dealt with problems for people with visual defects, aiming to a supporting design to help the ability orientation. The physical measures were mainly colour conditioning.

A newly conducted study had the purpose to analyze the space of the entrance hall of the dwelling. The choice of testing situations was derived from the identification of critical events in the use of the entrance: when many people enter and when a person in wheel-chair has to enter and undress in this little space. To assess the dimensions of such a restricted space with the pressure to minimize, the investigation methods must be very thoroughly considered.

I could also mention the experiment studies with a unit for cooking and preparing meals for smaller collective houses. It was conducted with a high degree of realism. The possibility to use water supply and outlet in the equipmental situation was here favourable.

Continuing with the application studies there are more examples at hand. In the past there are some spectacular ones: for instance when the lab was filled up with small children simulating a day care center or when the interior of a caravan for building workers was mocked up and tested as changing-room and lunch room by a real group of workers.

In the economic growth period not only housing was built but also hospitals in a large scale and some of our studies dealt with dimensioning ward rooms, where even the minor measures according to the multiplying effect are important. These were studies where the lab facilities with the supply of space and the very easy managed mock-up elements combined with the recording equipment were especially usable.

Finally, talking about application studies, I want to exemplify with the type of studies we have carried out in the last years and which have a kind of a new approach. This new approach is characterized by the fact that the users are involved in the investigation process, not only as test persons but as collaborators.

Elisabeth Dalholm, who has been in charge of these studies, has developed the testing methods and the communication - the practical dialogue - with the users. The participative approach has been logic due to the investigation object; in one case, a large-scale hospital catering with a staff of 34 persons, which should be renovated and added to; in the other case a meteorologist station also going to be renovated and physically reorganized. Of course, it is a special precondition when you have the persons at hand in a renewal process but on the other hand it is not an unusual situation

nowadays.

In the case of the hospital catering the tests were worked out with groups of the staff engaged in each working moment in the kitchen. The starting point was the design sketches from the architect with kitchen fittings and apparatus arranged according to his ideas. Working sequences were simulated in the tests in the mock-up (where the equipment was partly real, partly dummies) and the staff took intensely part in the assessments and discussions, more and more as the tests went on. The result of the full-scale experiment was that many modifications were made and new ideas came up, not only concerning the space organization, but also the construction and design of the non-fixed equipment. A comment from one of the external participants concerned the advantages of the process in starting the individuals in the staff actually to think creatively. And many of the staff persons expressed their satisfaction with the process; they actually felt that they had influenced the final design.

The improvement of the working environment in the weather station at Sturup was a communicative study with a smaller staff. But the task was much more complicated as the working situation in such a place is extremely mixed up with information to be handled, telephone calls and disturbances of noise and people running out and in, etc. The full-scale studies included a high degree of simulation of the in- and outgoing information, the computer work, the map drawing by working out the prognosis and the interfering between the staff members. The study ended up in new layout and a design of the operator desk which also was actually produced in the lab workshop by our two technicians, Sven Jönsson and Per Tibbelin. Also in this

case there was a very close collaboration between the lab team and the users, the staff in the station.

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I want to end up this review of examples from the Lund laboratory with some pictures showing how we have used the facilities in the field of education.

First a glimpse from a collaboration Elisabeth has practised with teachers in the secondary school. Pupils have built up flats and furnished them. They started with the model in 1:10. They once also tried an historical approach, learning about the good old times of living. The result was an artistic dwelling of 19th century style where they performed a role play in adequate dresses.

Our courses in the first year of the curriculum at the School of Architecture include exercises with spatial experiments; we stress the 'small measures', door passages, wheel-chair moving space and abilities and so on.

If I finally should give an assessment of our experiences with the facilities we have to our disposal in Lund, one first remark is that our panel equipment has its obvious advantages, but has also to be supplemented with hand-made constructions.

One advantage is above all the convenience in changing the mock-up, they are light and easy to combine, it takes a short time to build up a whole room. The time-saving is very important when you work together with users in a participation experiment. But it is also important when you get a commission for a mock-up with short respite, and this, I must say, happens quite often. In this way they are

also personnel saving.

A disadvantage with our panels are the stiffness of the system, the fixed height and the square nature of the panels, inviting to a rectangular design and limiting the possibilities of more unconventional solutions. In a pedagogical situation it can be argued that this is particularly limiting.

We had a discussion yesterday in our lab with two guests, who are here, about the various properties and equipment facilities. From our point of view in Lund, the size according to floor area and height is well fitting. So is also the case with the function of the moveable platform, which gives the possibilities to build up in two stories - a two-storey flat for instance - and to practise recording from above, as you have seen in many of the pictures. We also find it favourable with the large areas of day-light giving the possibilities by building close to the windows to make experiments with the day-light. The problem with closing the day-light is, however, not finally solved.

We have the water and outlet supply facilities which we have used in many of the research experiments.

The activity in the lab is nowadays rather intensive. We are commissioned for application studies to a degree which is just what we can manage. And the financing of these commissions seems to be unproblematic. We want to extend the participation design studies to the field of housing rehabilitation.

For pure research work and developing activities the situation is

less favourable. Even if you to a certain degree can profit from experiences in applied studies it is not always enough. To get funds for this kind of work is more difficult. To develop the methods of full-scale experiments, and also to improve the equipment, maybe the mock-up facilities or the recording apparatus with computer support requires a lot of resources in personnel and time. I do think this co-operation on an international level can be a starting point for our own development and for our ability to persuade those who are keeping the power of the money needed for it.

I would like to make a final statement of the use of mock-ups and the demand for this tool.

Nowadays we have lost - and primarily ordinary people have lost - the old relationship to the one to one reality in the built environment which was common in old days when people built their own houses and buildings. The design process has been mystified and has alienated people to what happens in the process. The full-scale method could change this. The full-scale activities directed to the users are of important interest for the future. The mock-up methods can be used as a mean for making the process more democratic and enabling people to be involved and conscious about their closest environment, and by that help to re-establish the old relationship.