

Demonstration projects "Industrial, Flexible and Demountable Building" in the Netherlands

Ir. H.Westra, ir. H.Vos,

*Steering Committee for Experiments in Housing (SEV)
Postbus 1878, 3000 BW, Rotterdam Netherlands
T: 010-28285050
E: sev@sev.nl*

ABSTRACT: The programme "Demonstration projects Industrial, Flexible and Demountable Building" (known by its Dutch abbreviation IFD) is a joint initiative of the SEV with the Ministries of Economic Affairs (EZ), and of Housing, Spatial Planning and the Environment (VROM). The ministries are eager to promote the application of IFD building principles by industry and the market, so that the method can become embedded in conventional building practice. The motives of the ministries for participating in this programme are different. VROM has goals in the field of sustainability and durability, EZ hopes to improve the innovative force of the building industry. The SEV is the independent organisation that organises the selection of the projects, follows the progress in practice and disperses the lessons learned from the projects.

In this paper the following items will be discussed:

1. The IFD programme
2. IFD Building in the Netherlands
3. Background of the programme
4. The selection of new IFD demonstration projects
5. Lessons learned
6. What knowledge is missing?

1. THE IFD PROGRAMME

The IFD programme is being implemented by the SEV, in co-operation with the Foundation for Building Research, SBR. The programme will continue until the spring of 2005, during which time the SEV seeks to adopt demonstration projects through four tenders. The first acquisition of projects took place in the spring of 1999. From each tender, the best and most innovative projects were selected as demonstration project. The three project-tenders together yielded 71 demonstration projects. They serve to demonstrate innovative applications of IFD technologies, for both new constructions and renovation, public housing and utility building projects. The intention of the demonstration projects is to stimulate other parties to make use of IFD techniques. The use of IFD techniques might lead to a different way of organising a building project (Just-in Time delivery, after JIT-production of elements that are made under industrial conditions), new logistical solutions for flexible demands, reduction of

(building) waste, better work conditions, and more profitable buildings. The most of these goals are not new, but already part of broader policy schemes of the Dutch government. Also, in the field of architecture, since the "Maison Domino" of Le Corbusier, there are discussions going on that are very much related to the topics of IFD building. MIT Professor John Habraken wrote a book in 1961 predicting the end of mass production in housing (habitants wanting more individual flexibility) that led to the founding of the SAR (Foundation for Architects Research) and later to the Open Bouwen group (Open Construction Methods). These initiatives yielded the terms "support" (structural elements, also called "casco") and "infill" (non bearing elements). The building industry did very little with these ideas, the emphasis lay on the building of as many dwellings as possible. And the Dutch building industry was very good at producing uniform dwellings with a good quality at a low price. But, the market is changing, new answers are necessary.

2. IFD BUILDING IN THE NETHERLANDS

The principles of Industrial, Flexible and Demountable building are not new. For some time

now, innovative designers and suppliers have been active in developing new industrial concepts and products for the building industry, which could justifiably be included in the IFD category. The use of industrial building methods for offices, schools and factories has become more or less common practice. In circumstances leading to pressing demands for temporary accommodation, as the result of natural catastrophes or war, IFD construction methods have proved to be a natural choice because of the speed with which buildings can be erected and the fact that a uniform solution can be offered in response to tremendous volume requirements. The companies that are very strong in this market realise that the uniformity is not only an advantage, but in an open market also a disadvantage.

In the conventional building market, uniformity is a less valued factor; "modules" and "industrial products" are anathema to the companies and organisations commissioning building work. They want the building to reflect their own identity, not just to be one of many. A solution to this dilemma can be found in flexible product automation whereby standard basic modular products can be adapted to the customer's specific requirements and desires from project to project. That means that a standard building concept can be different in any location if some parts of the construction are flexible and demountable. That is possible with, for instance, industrial façade modules.

To date, however, developments seem to come to a halt after the one-off application of an IFD concept or product in a single project, and it has not proved possible to take the next step to products which are totally unrelated to a specific project. The construction world is not used to abstract innovations and new forms of co-operation. Compared to other industries, the building industry spends less than 2% of its annual turnover on R&D, and even then most of that investment can be attributed to the suppliers. The fragmented nature of the building sector, with many small businesses, and the way in which tendering is mainly concentrated on cost-based competition, provide little incentive for innovation.

In short, while there is plenty of interest in IFD building products and ideas from the supply side, there is not enough interest in the market, and IFD building principles are still far from being daily practice in the construction industry. In recent years, however, the users of buildings have become more outspoken, and the requirements and

wishes they are now expressing display far more dynamism and variation than ever before. And especially in house building the emphasis is going more and more to private principals, who contract an architect who draws an unique dwelling for that principal. The Dutch government wants this way of house building for 30 % of a years building production of dwellings.

At the same time, the real estate market is changing from one, which is supply driven to one, which is driven by demand, and the principals are compelling their contractors to seek alternative solutions and seemingly unique buildings. And this is where Industrial, Flexible and Demountable building techniques can come into their own, in that they offer many advantages.

3. BACK-GROUND OF THE PROGRAMME

With this information in the back of their minds, Damen Consultants carried out an investigation in 1997 into the current market potential of IFD Building, and the possibilities for stimulating construction on the basis of this technology, on behalf of the Ministry of Economic Affairs (EZ) in 1997. The main conclusion to come from this investigation was that IFD building principles embody an integrated concept which can unite environmental and economic interests by offering creative solutions to the use of raw materials, fuels, labour, expertise and technology. Especially the environmental possibilities of industrial production methods versus old fashioned building methods, reductions of building waste, a more flexible use of existing buildings and dwellings, were for the Ministry of Housing a big incentive to participate in this programme.

4. THE SELECTION OF NEW IFD DEMONSTRATION PROJECTS

The SEV is seeking to highlight interesting projects, which demonstrate the innovative ways in which IFD construction methods can be put into practice. Construction principals such as project developers, corporations and municipal councils are invited to put forward projects for demonstration status. In addition, parties who only occasionally commission construction work are also invited to submit projects. The plans must be definite and apply to a specific location. One condition for applications is that the actual construction work may not have been started and no commitments may have been made with regard

to the components of the project, which are related to IFD construction principles.

When assessing the projects the SEV will primarily consider criteria such as the degree of industrial production and co-operation which the project encompasses, the sustainability, innovative nature, and scope of application. The plans which best fulfil these criteria will be put forward by the SEV for the status of IFD construction demonstration project, together with the associated subsidy grants.

The SEV has set up an extensive expertise exchange network and information campaign around the projects which have been put forward for demonstration status. This campaign focuses not only on the demonstration projects themselves but also on the principles of IFD construction in general.

5. LESSONS LEARNED UNTIL NOW

Of those 71 selected projects until now, only 4 projects had to be stopped, for various reasons. June 2003, 27 projects are completed. When we analyse the demonstration projects, we see that half of the projects focus on Flexibility, about a third on Industrialisation and a fifth on Demountability. A fifth of the projects focus on all three aspects and as such contribute best to the integral concept of IFD.

Flexibility is in its nature the most important goal. Customers or building principals are interested in what to *do* with a building, rather than how to make it or how to get rid of it. This last item however deserves more attention and should become a point of concern. For cars or coffee machines we also pay some money in advance to make sure that at the end of the day, they can be properly taken apart and be recycled. For buildings this is not, or not yet, the case. 100% demountability is therefore only a strong item in temporary situations. We learn that in those circumstances “design for disassembly” usually means that parts of buildings must be disconnected. It helps when these parts are designed as products, instead of being put together on site out of (raw) materials. Some producers or builders call their building flexible in the sense of easy to remove; today a building, tomorrow an empty playfield. This is not the sort of flexibility we mean, this is pure demountable building.

Back to flexibility then, as main item for principals and those who help to establish the program of demands for a building. We speak of flexibility whenever a building is adaptable *over time and over and over again* in its volume and its lay-out. When only the first user or inhabitant can choose the lay-out and then the building is ‘frozen’, we call it freedom of choice. This should be otherwise a normal feature considering the amount of money involved in building your home or office building. A project with extensive possibilities of choice is complex in its logistics, but can be made with most traditional building techniques.

The real flexible projects learned us that a clear distinction in fixed and variable, or support and infill as you like, is most important. This distinction may vary in different situations. The expected type of use, the expected time span of use, the ownership, the physical context of the building (think about expanding) and also the context of building codes and regulations; all these aspects determine the level of flexibility one wants to reach in a program of demands. This asks of course for a rating of flexibility or a “flexindex”. We’re working on this item.

In the meantime the awareness of the specific need for flexibility is important. In some of our projects the intended level of flexibility was much higher than anyone would ever ask for in that situation. Even so the investments were higher and frustration is at hand. It’s a constant balance between predicting the future and today’s budget. Stewart Brand said “*All buildings are predictions and all predictions are wrong*”.

Technically we learned from all projects that a flexible building in the first place offers room for change, i.e. some over sizing of the casco. A great obstacle for change is of course the piping, ducting and sewage. In most IFD projects special products such as hollow floors and plug –and-play connectors were fitted in to make change possible. But especially for installation techniques, not all systems are already plug-and-play.

Industrialisation shows little progress, that is, on the scale of complete buildings. In most projects the steps that are taken are very small steps, and do not break with the standard techniques. Also the structure of the building industry is not affected, notwithstanding the problems with the logistics of how to get what a client wants from the drawing board into a real building or dwelling. Some other projects however are based on industrial concepts and have made a clear choice

to do so. Typical for their approach is not necessarily the use of new and experimental techniques, but cooperation and coordination. The know-how of manufacturers and suppliers is brought into the design process in an early stage. This opens the door for simply good prepared work where improvisation and redesign are diminished. Mostly however, parties don't want to come together this soon. A contractor wants to be free in choosing his materials and respective suppliers, because of economies. Where competition on price is the usual and only selling point, this approach asks for competition on quality and trust in cooperation. It also opens the door for innovations. Those partners who experienced a good team can work together on a library of building elements with which they can make several and different projects.

6. WHAT KNOWLEDGE IS STILL MISSING??

It might not be the knowledge that is missing, but the acceptance and implementation of it all that is the most important at this moment. Most principles described above, such as the distinction between fixed and variable elements, have been studied and proven to be profitable in theory. The building industry however has a conservative character and is divided in too many sub-subcontractors and advisors to profit from integral concepts. Introducing a new product usually means introducing a new step in the building process, also when this new steps replaces two or three former steps. The purchaser at a contractor's office compares stand-alone materials and products instead of their contribution to the building (process) as a whole. There is not yet thinking in prefabricated elements. Bottlenecks in the building process, problems that occur every time and ask for re-work every time, are behind the planners desk sometimes simply denied. Costs of failure, or avoidable costs as they are better called, are somewhat like 10% of the total building costs. Some people then conclude that, knowing this is a vast figure, they can better use this "budget" on innovation, in every single project! That is a chance!

What knowledge for the ideal use of IFD concepts is still missing, and which proposals would we like to see in the last tender of IFD projects? Of course we look for real integral design and real integral flexible buildings.

There's a lot of work to be done on installation techniques, to make installations adaptable and

replaceable. On the side of logistic is a lot to learn, to avoid improvisation on the building site and to control the data-explosion generated by the many choices people can make while choosing their new home.

Important work is also to be done in different ways of calculating the exploitation of an IFD building, especially on the item of life expectancy of building materials and elements. Good insight in the cost of exploitation can convince a principal to invest a little more at the front. As said before, the principal is at the same time also in need of instruments like a 'flex index' to express and his demands.

Building regulations and planning procedures should facilitate flexible building and town planning.

We hope to learn more on these items, and in the meantime try to learn from foreign developments as well. The SEV will continue to support innovative and experimental ideas and publish about it, so others can use the lessons of IFD Building.