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## Building System Based on Demountable Sheet Steel Elements

Système de bâtiments utilisant des tôles d'acier démontables

Demontables Wohnungsbau system aus Stahlblechelementen

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Research was started some years ago, in Eindhoven on the considered possibility of using sheet-steel elements in housing and before long the idea of industrialization was being considered. It has resulted in the development of a steel bearing system as the main part of what Prof. N.J. Habraken calls as a "support" in house building. This system has three essential points:

- Industrialization by design-independent mass production of relatively small elements for loadbearing and infill systems,
- Occupant's wishes as to layout and finish can be met,
- Optimal use is possible of CAD-CAM in design, production and logistic management.

The essence of the bearing system is the element shown in figure 1a<sub>2</sub>. These elements are used both horizontally and vertically in two widths: 600 mm and 1200 mm (fig. 1a<sub>1</sub>).

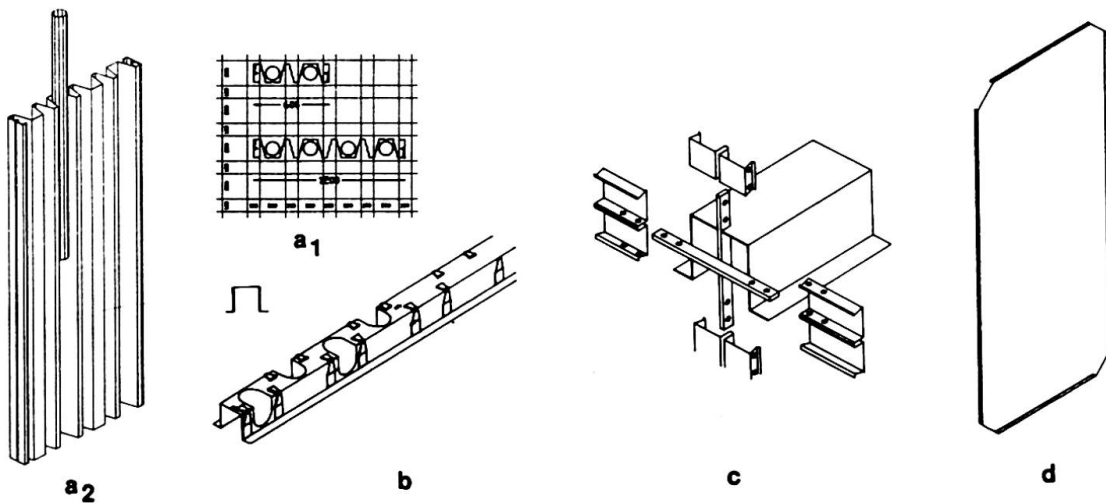


Fig. 1

Steel bearing elements of this kind, together with a so-called "hat profile" (fig. 1b) form the "bearing structure" of the support. The "hat profile" allows the positioning and connection of the horizontal and vertical elements of the bearing structure. Therefore, small parts are spotwelded on the outer and upper sides of the "hat". For securing horizontal and vertical coherence, coupling strips are needed, as given in fig. 1c. The "house of cards" still requires stability provisions in the form of steel-sheet shear walls in the transversal direction. These walls are suitably placed, parallel to the front and back façades of the building (fig. 1d). So that the steel bearing system can form a support, it has to be clad with subsystems for the floating floor, prepositioned wall panel and the ceiling (fig. 2), all developed as design independent subsystems.

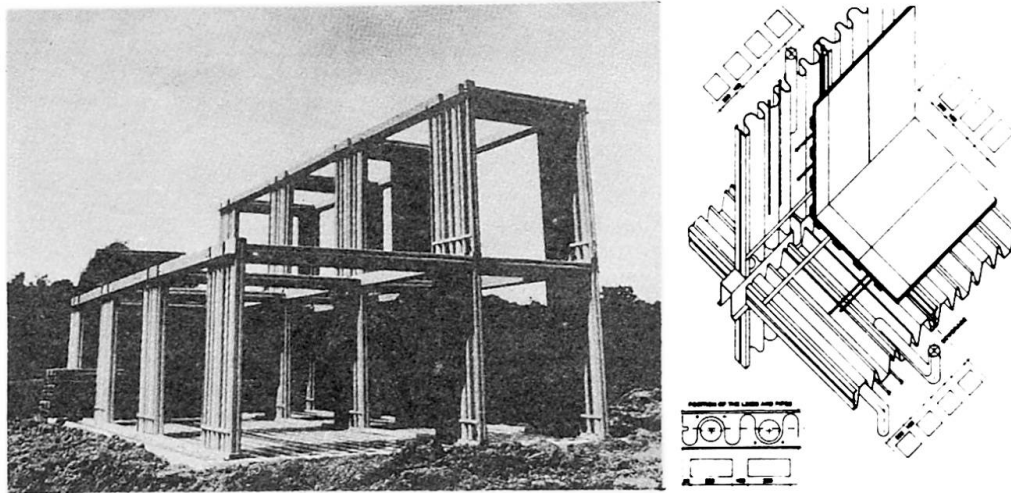


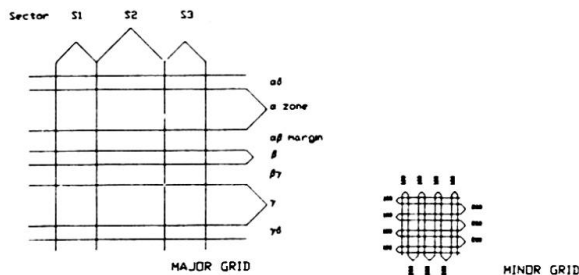
Fig. 2

A house design has not been used for the development of this system but a stylization of that developed by Prof. Habraken in his design method.

This includes the use of 2 tartan grids, namely:

- a major grid, determining zones, margins and sectors for occupancy functions,
- a minor grid of 100 and 200-mm bands, based on 300 mm.

The lines of the major grid coincide with the centre lines of the 100-mm bands of the minor grid.



Together, these two grids enable the development of design-independent components, within a very exactly defined system of agreements on placing and dimensions. These components can be applied in all designs that can be made in the major grid, where there is freedom of choice in the  $\alpha$ ,  $\beta$  and  $\gamma$  zones, as well as in the sectors  $S_1$ ,  $S_2$  etc. In all, the bearing structure consists of 14 different elements, demonstrating the effect of this method of handling the problem. With this very small number of different elements a wide range of bearing structures can be built.

For all subsystems, except those known as mechanical, seven in all, on the same principle, efforts are made in this project to cover a maximum of layouts with few different elements. (See the paper of J.F.G. Janssen: Design Strategy for an Industrialized Building System).

Some subsystems need less than 14 elements, others require a few more; so that calculating an average of 15 for each, we have  $\pm 100$  different components, with which a great diversity of dwellings can be built.

Even if we had miscalculated by 500% we would then need about 500, which is still only 10% of the 5000 different elements necessary in the Japanese Steel Housing System [4].

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