

„Development of new concepts for house technology in prefabricated houses“

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Abstract

Prefabricated houses offer very good conditions for an efficient type of construction due to their high degree of prefabrication. The margin for decreasing costs, however, is not yet fully utilized. Considerable potentials are hidden especially in the field of installations. The project „Installationskern“ marks the first step in view to a prefabricated installation for residential homes (one-family houses). The building process with the installation on site which is time consuming and costly, is still the normal procedure at present. This procedure shall be simplified in future by employing prefabricated installation modules. The most important aim of an efficient installation method shall be the decreasing of costs and the avoiding of eventual origins of mistakes in the co-ordination of the trades.

The most important pre-condition for prefabricating the house technique is the concentration of all pipes and wires for supply and disposal in one central installation module which is all-storey high (Fig. 1 and Fig. 2). Already when delivered to the building site, the module shall contain all pipes, fittings and distributors etc. for the house technique (heating, ventilation, solar technique, water and hot water supply, electric current, vacuum cleaner etc.). The central module takes over two functions in the building. It is an all-storey high shaft for installations and, at the same time, a partition wall for rooms. The construction is shown in Fig. 3 and Fig. 4. These two functions represent a challenge for the designing engineer as the sound reduction properties of the building shall not be affected by using the all-storey high shaft for installations of a light type of construction, which is prefabricated to a high degree.

In close co-operation with the industry of prefabricated houses and with companies working on the field of sanitary facilities and heating, the prototype of a prefabricated, all-storey high installation module was developed. The development comprised construction, production and mounting as well as a test of the component in practice including physical and economic examinations. On the basis of results and experiences gathered, recommendations for construction, production and mounting of such module have been summarized.

As a conclusion it may be stated that the developed installation module may be already used today for one-family houses, especially for prefabricated houses in wood construction. An example is shown in Fig. 5. The problems occurred in the field of sound insulation have been solved in most points by the consistently two-layer type of construction of the module (Fig. 6) and by taking sound insulating measures in the area of installation. For individual questions, however, there is still a need for development as e.g. the influence of all-storey high mullions built into the module on the flanking sound transmission loss. There are considerations towards an installation module separated into one-storey high parts which would lead to a considerable improvement in view to the sound reduction. The additional connecting points of pipes which will then be necessary, would result, however, in a higher expenditure in mounting at the building site and thus in a lower degree of prefabrication.

Examinations of the efficiency show that already the present construction can lead to a decrease of materials used for the installation by about 25 % and a decrease of share in wages by about 20 %. Prefabrication of house installation will rise from 25 % now to about 50 %. The efficiency of the new installation technique is still capable of being improved e.g. by usage of mounting elements which are especially made for prefabricated houses or by using prefabricated bundles of pipes and modular building parts.

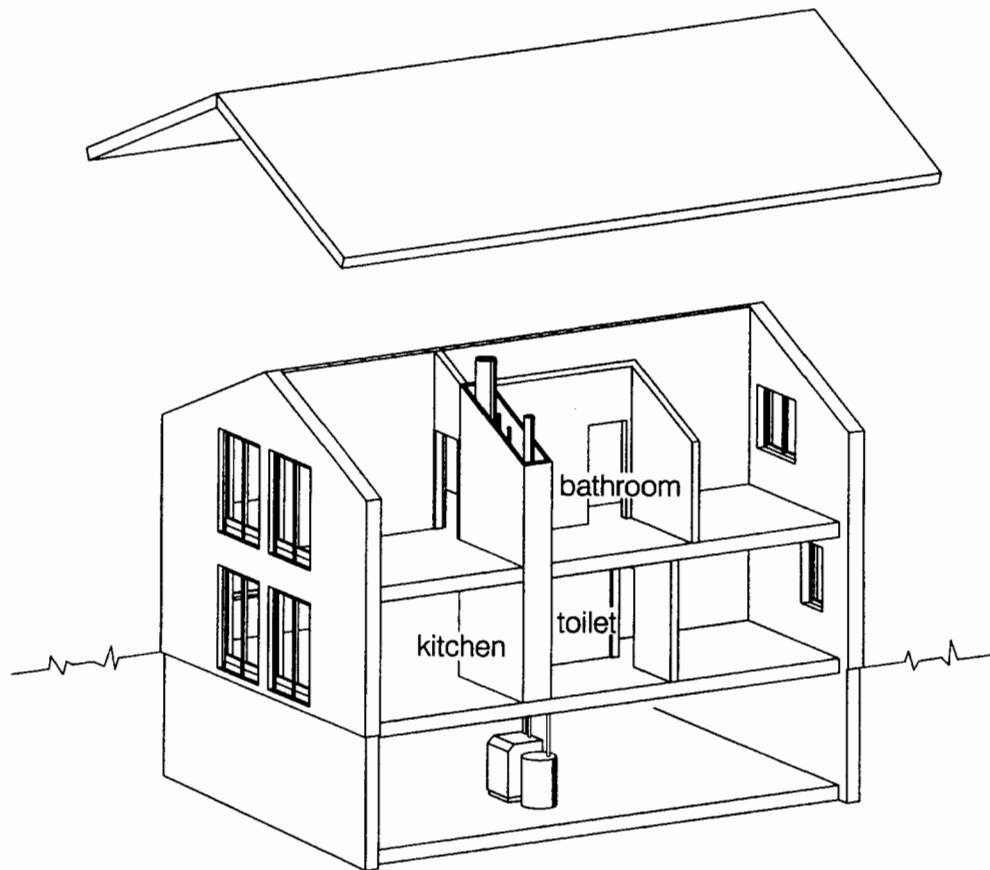


Fig.1: Principle of a prefabricated installation module.
The prefabricated, all story high shaft contains all pipes for supply and disposal of a building.

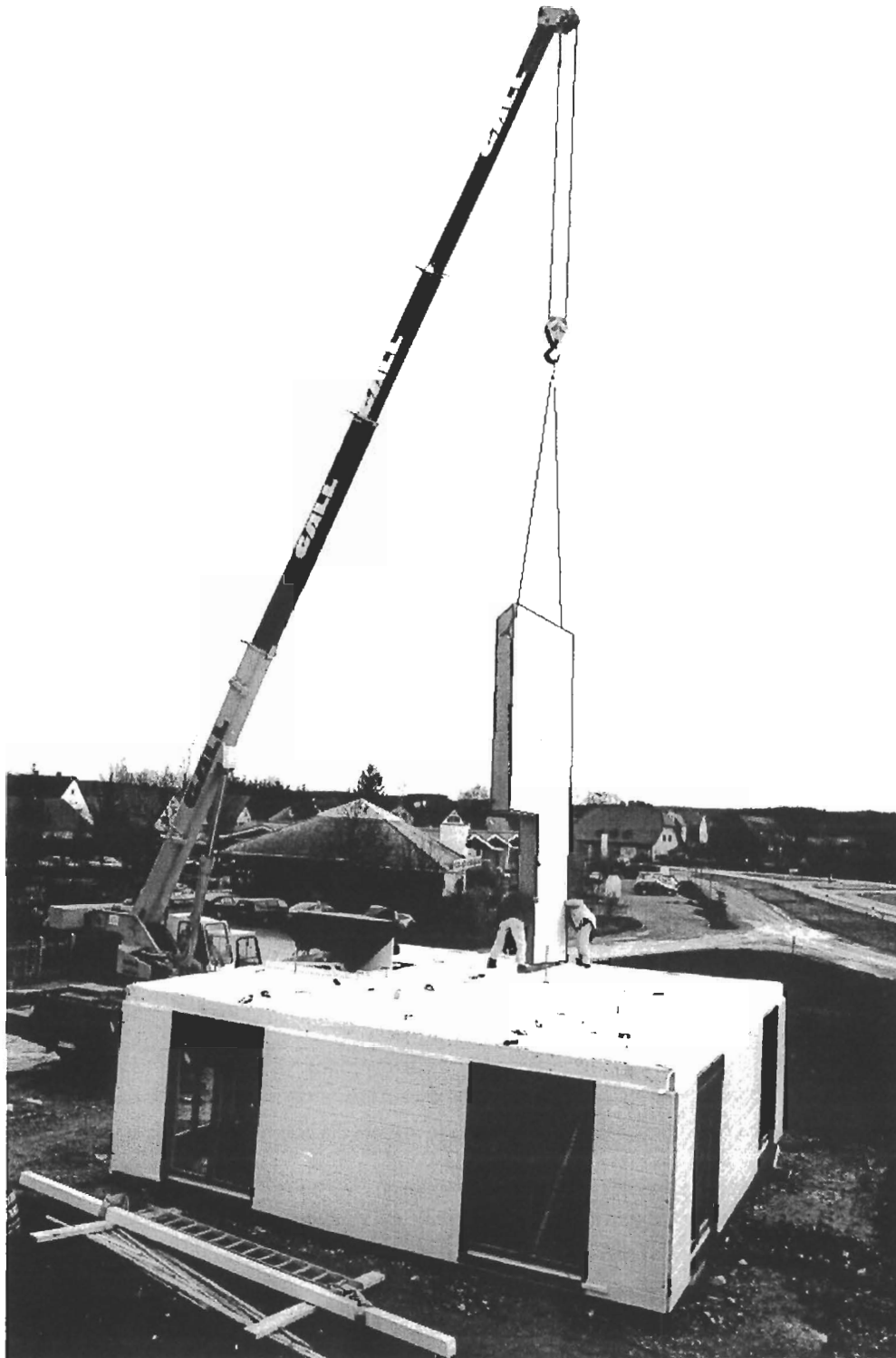


Fig. 2: Mounting of a prefabricated installation module in a prefabricated house. The module contains all pipes, fittings and distributors, mounting elements etc. for the house technique when delivered to the building site.

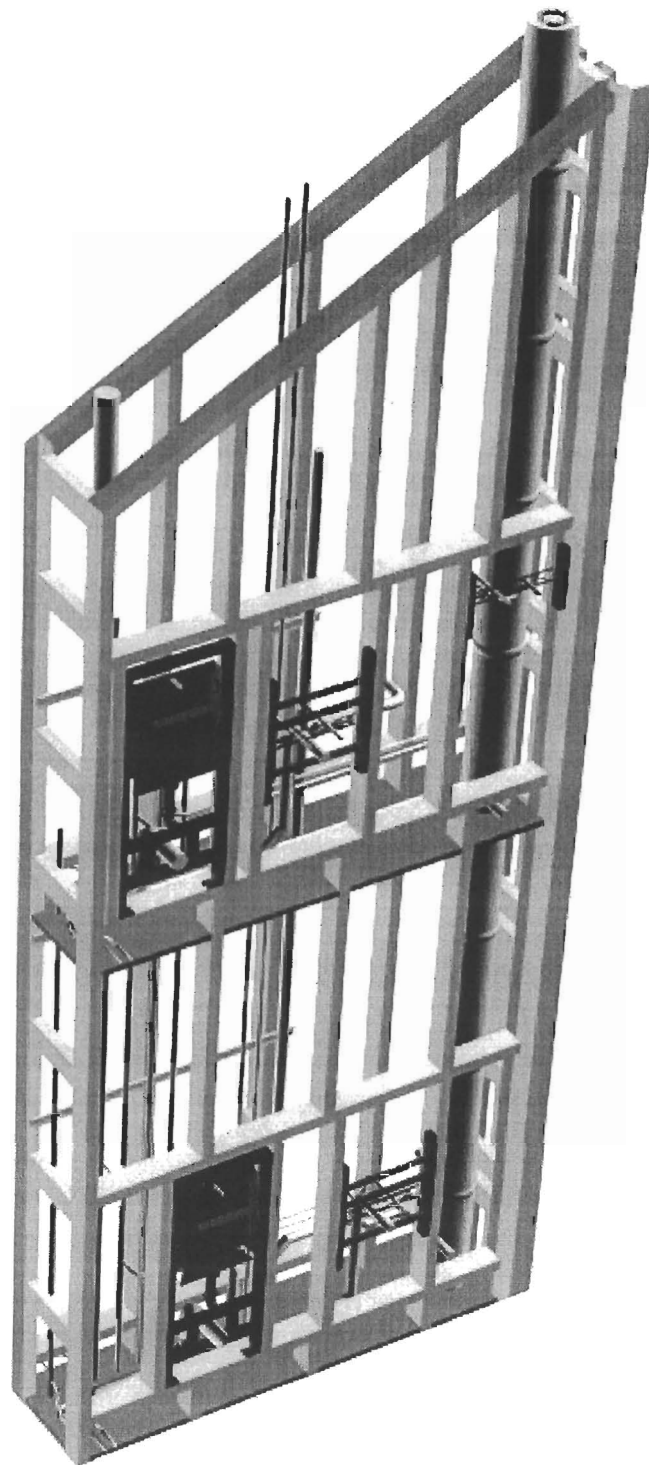


Fig. 3: View of an all storey high installation module without planking. The assembled pipe modules and the mounting elements for toilet, wash basin, shower etc. are shown. The prefabricated exhaust pipe of the heating system is integrated into the right side.

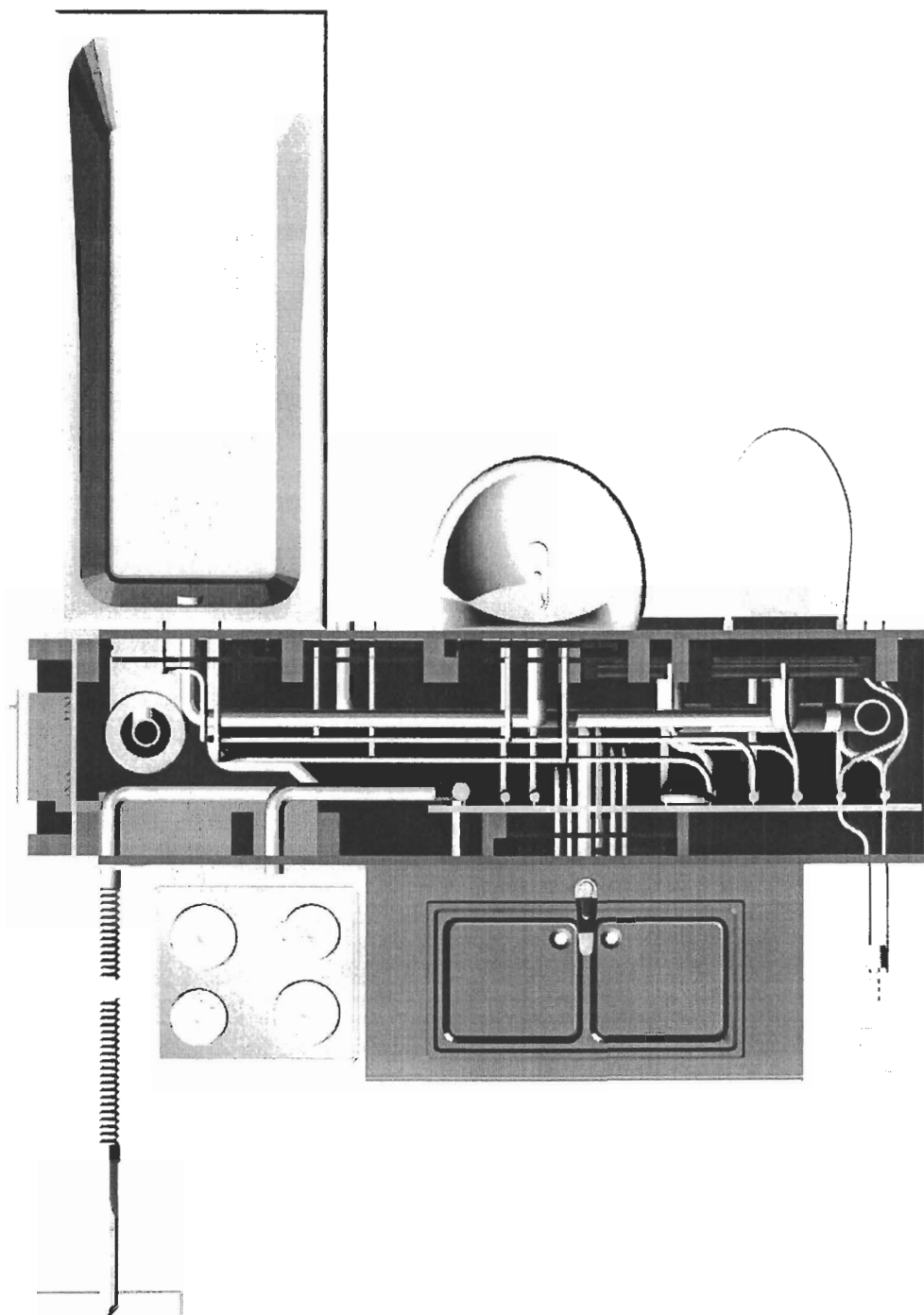


Fig. 4: Cross section of an installation module.
On the basis of a suitable ground plan, sanitary elements can be put directly to the installation module.

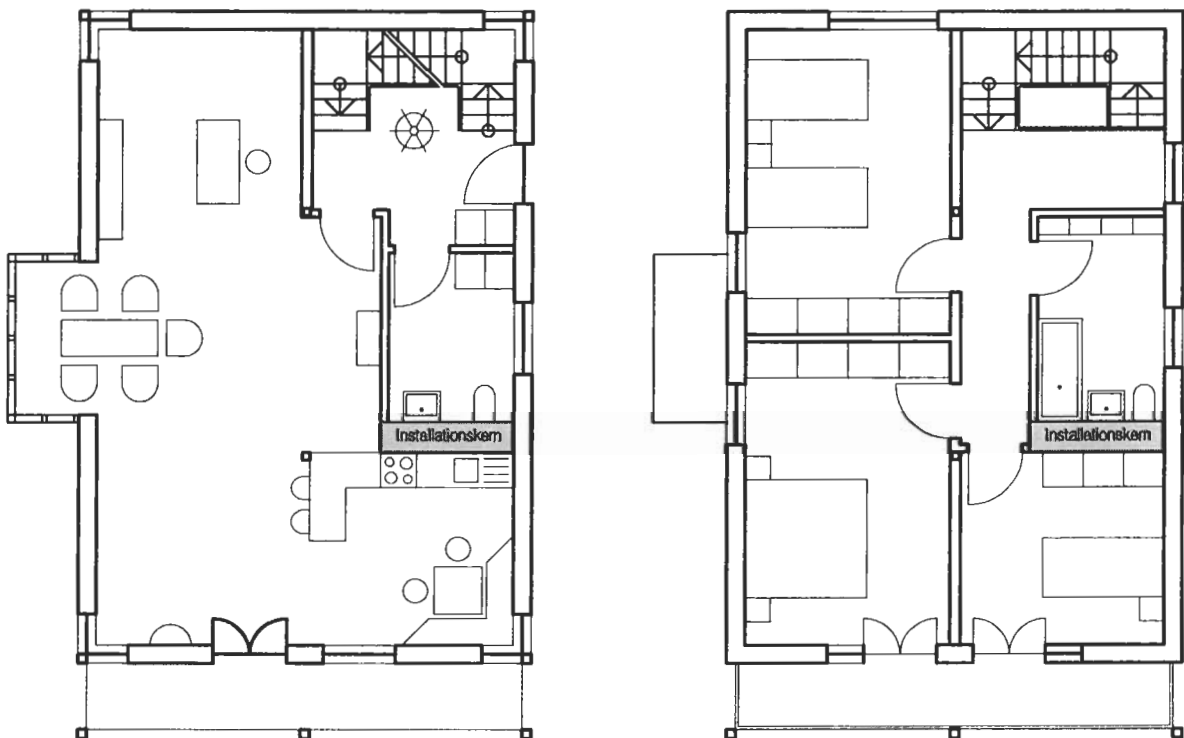


Fig. 5: Example for a one-family home (project „Rosenheimer Haus“).
Here all rooms with house technology are situated around the installation module.

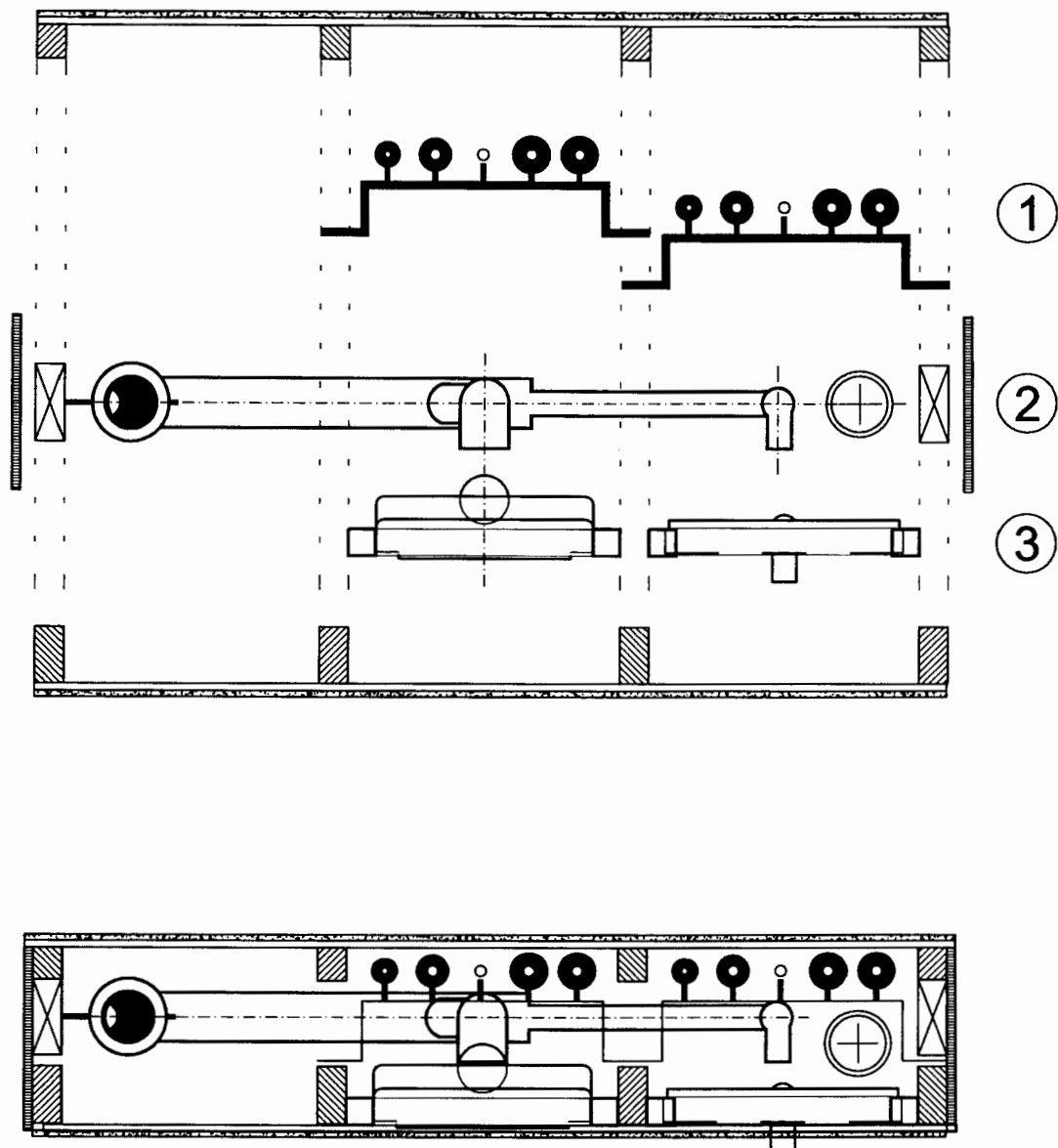


Fig. 6: Principle for the construction of an installation module.
The figure shows the different layers of the module. The following components are integrated:

- (1) pipes for house technique
- (2) pipes for waste water and ventilation
- (3) prefabricated mounting elements for toilet, wash basin etc.