

Automation of design and construction of single-family houses made of brickwork:

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0. Summary

The following report details the procedure for the erection of buildings in solid brickwork with prefabricated wall panels. The first part describes the partially automated plant as it already exists and of which several are in operation. The second part delineates the stages of development as they have been planned for further automation of the complete production process.

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1. Procedure used so far for the erection of a prefabricated building.

1.1 Design and planning

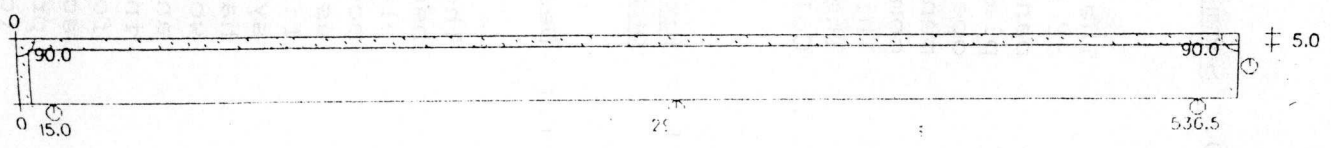
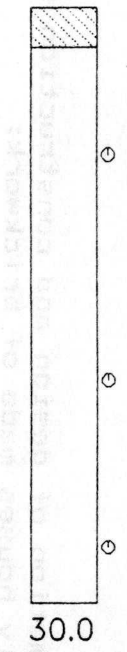
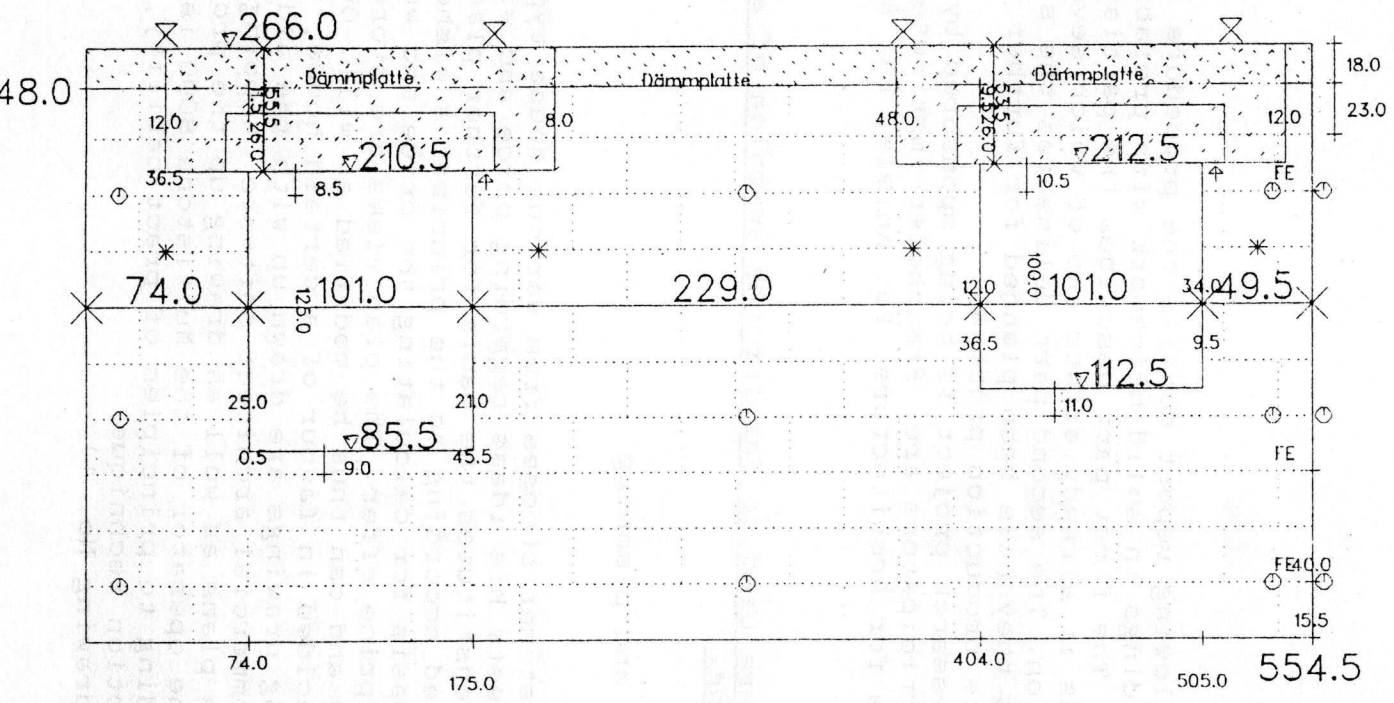
The customer chooses from various house types the one which best meets his ideas regarding price and size. This model plan constitutes the basis for further planning. It can be modified according to the principal's wishes. It also serves as a basis for calculating the price and working out a fixed-price offer. The plan views are stored in the CAD system and can thus be modified at will. Once the principal has decided in favour of a certain house, all license and working drawings are drawn up with the aid of the computer and commercial architect software. Mapping out the panels in the plans as well as drawing up the production drawings for the operator of the Multistone 8000 is done by hand according to principles of practicability, economy and production technique.
 (cf. drawing No. 1)

- setzanker
- geneisen
- el
- ⊙ Anschlüsseisen
- RA Ringanker
- ⊕ Gurttroller

WMZ/LM II A

Wandgewicht: 3244 KG

Wandfläche: 11.5qm



Skizze 1

1.2 Partially automatic production of wall components

The operator is given the production drawings in which the measurements of length, width, height, windows, doors, hooks, irons as well as the position of the centre of gravity are shown. Using these drawings, the operator produces 8-14 wall series (8 m x 2,20 m x 0,30 m) a day. He measures on the turntable, lays on the stones taking into consideration the sawn stones, and he moves the machine on to the next series of stones. Subsequently, another worker embeds the transport irons (cf. Fig. M 8000).

1.3 Loading, transport and fitting of the prefabricated components

After about 3 days of hardening and drying, the components are loaded onto a low-loader with the help of a travelling crane and then transported to the building site. At the building site they are assembled by a crew of 4-5 men with the aid of a truck-crane. (One floor per day including ceiling panels).

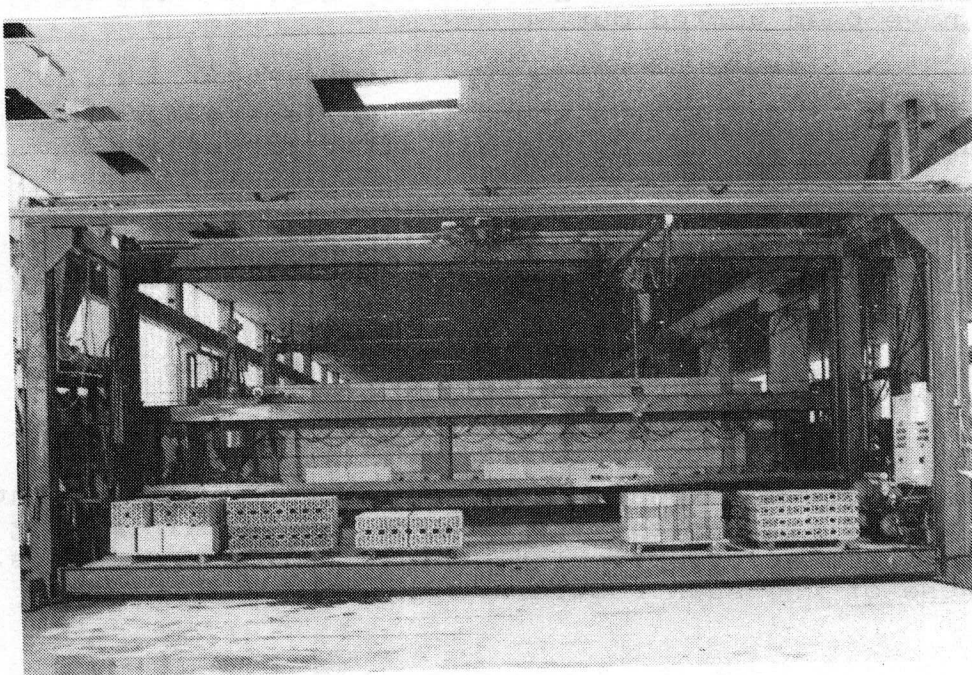


Fig. No. 1: Partially automatic wall machine M 8000

2. Plant conceived for further automation and linking of substations.

2.1 Design and planning

We have envisaged the development of a programme which can map out and arrange the components in the plans. Besides, it should be possible to print out measured production drawings. These drawings must also show user-specific data, material requirements and invoicing data. At the same time, the fully automatic wall machine is to receive production instructions to produce the wall elements without the assistance of the operator, i.e., the planning and production levels are to be linked by applying computer technology.

2.2 Fully automatic production of wall components

With the above plant, the operator's functions as described above and the sawing of the stones are to be performed according to the programme automatically but still flexibly. Flexibility not only means that wall panels with the same dimensions can be produced; it also means that all measurements preset by the plan can be realized without major programme modification or change-over. So far, two possible solutions have been worked out:

1. A stationary installation where the walls are moved on for further treatment immediately after production.
2. A mobile installation where the walls are not moved on for further treatment before they are dry.

Solution (2) is being investigated further under the research project.

As a result of the expected high performance of the plant a new problem will arise, i.e., brick rubble. Minimizing waste is aimed at by optimal planning (wall measurements) are re-use of the sawn rubble.

2.3 Supplementation of the plant by further trades

After hardening, the walls are moved on for further treatment to the individual trades: stations such as electrical installation, plasterer, fitting of windows and ledges. A high degree of prefabrication is aimed at in the hall so that the work at the building sites, which is weather-dependent and involves covering long distances, is reduced.

2.4 Linking of substations

Linking (with feedback) planning with the fully automatic plant as well as linking the individual trades with each other is necessary for the production process to be optimal and smooth. This way, the machine can receive production instructions directly from the planning department. Consequently, the operator has more time for supervisory tasks.