Soil Block Presses

by Kiran Mukerji

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Kiran Mukerji

Soil Block Presses
SOIL BLOCK PRESSES
Report on a Global Survey

Prepared on behalf of

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During the past 5 - 10 years, there has been a rapid increase of interest in soil construction technologies in most parts of the world - particularly in developing countries. Consequently, the various appropriate technology (AT) information centres, including GATE, have been receiving a growing number of requests for information on this subject. Within this field, an area of special interest has been the production of compressed soil blocks, directly on the building site.

Most AT organizations and research institutions dealing with soil technologies have a collection of information on soil block presses, but it appears that no comprehensive study on these machines exists so far. Thus, it is largely a matter of chance, whether or not the required information on soil block presses can be provided by the institution asked.

In order to achieve more clarity on this issue, GATE decided to conduct a global survey of easily transportable or mobile soil block presses. The aim is to prepare a document, which will be distributed to AT and research institutions around the world, or sent upon request to interested parties in developing countries and all those involved in development activities.

This report represents a first stage of the survey. It was prepared by evaluating all the literature in the GATE library and those of a few other institutions in Europe. Additional material was accumulated through extensive correspondence with institutions and manufacturers of block presses, in various countries. The result of this work, documented in this report, constitutes the basis for the final publication, which, hopefully, will be more complete and up-to-date. This document is, therefore, being circulated to all the addresses listed in Annex B (and to a limited number of institutions on request), with a view to receiving comments and further information, which could be of use in preparing the final publication. In connection with this, GATE kindly requests all correspondence to be conducted directly with the author, whose address is given on the title page.

It is hoped that the information given in this study, will help to activate further interest in soil construction technology and provide potential builders with the means of finding the most appropriate blockmaking machine. As far as possible, all sources of information and addresses have been given, and cross-references have been made in the text and charts, wherever appropriate, so that anyone can carry out further investigations, if necessary.

Several recipients of this report have either directly or indirectly contributed literature, illustrative material, comments and the like, for which the author wishes to express his sincere thanks. Without this interchange of information and ideas, no reasonable work can be done on a project of this kind. The preparation of this document must, therefore, be viewed as a joint international effort, from which, hopefully, a great many people will benefit - most of all, the local house-builder, who is thus able to find the most appropriate soil block press.
Town hall on the Isle of Mayotte, built with stabilized soil blocks, by CRATerre, Grenoble. Photo: Jürgen Schneider (Bibl. 54)
Preparinig This Report

The main object of this study was to collect information. This was implemented by three means:

- bibliographical research,
- extensive correspondence,
- personal visits to institutions, block press manufacturers and experts in Germany, England and Switzerland.

The work was carried out in the course of four months, which is a relatively short period for a global survey. Nevertheless, with the encouraging response, that was received from all sides, it was possible to collect a great deal more material, than was originally expected.

2.1 Bibliographical Research

A fairly intensive study of all available literature on soil construction and related appropriate technologies was necessary, in order to find out, where requests for information would be most effective. This required visits to the libraries of universities, information centres, research and development organizations, as well as to AT institutions.

As was expected, this last group had the most useful literature to offer. Visits to bookshops and the author's own collection of literature provided further sources of information.

Studying the better-known standard literature on soil construction, one tends to get the impression that there are only about 15 - 20 types of soil block presses. However, conferences, AT journals, bulletins from research institutions, and similar publications, which are not usually easy to get, brought to light quite a few more types of machines. But, in most cases, the information on them was insufficient, so that contacts with the developer or manufacturer were necessary, in order to obtain more details.

2.2 Correspondence

Well over 100 letters, requesting information, were sent out to AT institutions, research and development organizations and manufacturers of soil block presses throughout the world. The addresses were mainly selected on the basis of references found in the literature studied. Further addresses ensued from several replies, so that writing letters became a major feature of the project and is still continuing, while this report is being written.

Two requirements needed to be fulfilled: firstly, to achieve a high rate of response, and secondly, to receive the replies in time to incorporate them into the report.

In order to generate a greater interest in the survey, and consequently more readiness to reply, the letters were written on the following basis:

- As far as possible, each letter was written individually, taking into account the special activities, experiences, publications, products of the addressee. Many years of experience have shown that circular letters or general questionnaires usually tend to remain unanswered - for understandable reasons.

- Each request for information was accompanied by a short explanatory note from GATE, in order to underline the official nature of the survey.

- Since no help should be expected without an adequate request, the author offered to be of assistance, in any way desired, in return for information and comments received. The refund of any costs incurred, was also offered. And, in various cases, these offers were accepted.

The problem of receiving replies in time to evaluate the information and use it for the report, was not solved, although the requests indicated the urgency. The overall response was about 50%, while replies from European countries exceeded 60%, those from North and South America were in the region of 40%, and those from Africa, Asia and Oceania remained below 30%. Nevertheless, most of the replies contained valuable information and have thus helped to complete this fairly comprehensive study.

Correspondence will hopefully continue on account of the interest that this document is expected to generate. Readers are requested to send any appropriate information, comments or criticisms to the author's address, as these will help to compile a more complete and useful study in the final stage.

2.3 Personal Contacts

As far as the financial resources and limited time permitted, every opportunity was taken to speak to experts, either by telephone calls or personal visits. No other means of communication can be more effective, as it not only helps to break the barriers of anonymity, which allows a freer exchange of views, but also saves a great deal of time, since it avoids lengthy correspondence, by receiving answers to questions immediately. In the case of personal visits, processes and equipment can be demonstrated, photographs can be taken and useful literature or samples of material can be handed over.

2.4 General

Since the collection of material largely depended on what happened to be available in libraries, or what was sent in response to the author's requests, as also on manufacturer's pamphlets and personal views of experts, a value judgement of the soil block presses, mentioned in this study, was not permissible. Thus, the summary of soil block presses (Section 3.2) contains all the types of machines, that were identified so far, even if great similarities may be noted amongst some of them. However, in most cases, it is just the technical principle that is the same, while the technical details can
differ substantially, according to certain specific local requirements and individual ideas of the respective designers.

It is, therefore, extremely useful to include machines that resemble each other, and to point out, in which way they actually differ. This gives those, who propose to buy or construct a press of their own, a means to find the most appropriate design for their particular needs. It also helps them to find the supplier located closest to them, so that the costs of transportation can be kept as low as possible.

In the proposed final GATE document on soil block presses, which will incorporate all the responses generated by this report, the aim will be to provide the information and technical data, according to a uniform system, such that comparisons will be possible, to a certain extent, and a reasonable value judgement can be made, according to the reader's own criteria.

Prior to this final study, however, GATE is considering preparing information leaflets (called "Product Information: Soil Block Presses", an example of which is shown on pages 42-43) on a few selected machines that have been tested in the field and found worthy of further recommendation. Therefore, personal opinions, positive or negative experiences in the use of soil block presses will be greatly valued. The reply form at the end of this report can be used for this purpose, or any other appropriate form of communication.
RESULTS OF THE STUDY

3.1 Roles on Some Institutions

As mentioned in the previous section, several institutions throughout the world were identified and contacted, although not all of them responded, or were able to contribute towards the preparation of this report. Some of them, however, are of special interest in the context of this study, which is why a few comments and general information on them are given below.

3.1.1 GATE, Eschborn

The activities of GATE in the field of soil technology mainly include housing and research projects in some developing countries, as well as the publication of relevant literature and dissemination of experiences of the GATE staff and information, which has been collected in the GATE documentation department. Housing projects, that involve soil technologies have been implemented in some Latin American countries, of which one example, namely in El Salvador, is described in a GATE publication (Bibl. 21). Research projects, in which soil techniques were investigated, were undertaken, for example, in Guatemala, in connection with low-cost, earthquake resistant roofing (Bibl. 41), and in Kenya, with a view to applying the local lateritic soils for low cost housing. A detailed manual on the construction of a

3.1.2 IRB, Stuttgart

The "Informationszentrum RAUM und BAU", which is one of 25 institutions of the Fraunhofer-Gesellschaft, a semi-governmental organization, is perhaps the biggest German documentation centre on all regional planning and architectural issues. Apart from a large...
The author wanted to know from Raimund Wegener, who is mainly responsible for the Latin American projects, whether soil block presses were being used in their housing schemes, and what their experiences were. Surprisingly, the answer was no, since soil constructions have an extremely poor reputation amongst the house-builders, as well as the authorities. Also, on account of regular maintenance requirements and repairs, the buildings tend to become as expensive as conventional structures, made of burnt bricks or concrete blocks. Furthermore, Mr. Wegener mentioned that the soil block houses, which were built in El Salvador (1978 - 79) as part of a GATE project, have caused considerable dissatisfaction amongst the dwellers. (Author's note: This attitude can be observed quite frequently, but need not apply to all situations. There are sufficient examples of successful soil construction projects in all parts of the world. In some parts of the USA and Europe, earth buildings are valued for their living comfort and environmental appropriateness. As this awareness spreads to other regions, and construction techniques are improved, the poorer population of the Third World will be more inclined to accept soil buildings.)

3.1.4 Gesamthochschule Kassel

The Research Laboratory for Experimental Building, of Kassel University, which is headed by Dr. Ing. Gerhard Minke, has been conducting intensive research on soil technologies since the mid-1970s. A number of prototype structures, employing a variety of old as well as newly developed techniques, have been built in Germany and overseas. All of which are well documented, though unfortunately (with very few exceptions) only in German. Professor Minke also publishes a kind of journal (which appears irregularly, roughly twice a year), called "Bauen mit Lehmm" (Building with Soil), which features new developments and project reports on soil constructions, mainly in Germany.

On account of the long experience in soil technologies, intensive practical courses (usually of 6 days duration) are held regularly, which are always well attended by architects, masons, students, even from other faculties. But apart from research and training, building with soil has found its way into a large housing scheme in Kassel (150 houses), for which Professor Minke is mainly responsible.

3.1.5 Institut Lohmbau, Well-Beuerbach

The non-profit Soil Building Institute was founded in 1967 by Roger Krätz, a sculptor, soil building specialist and lecturer at Hanover University, after about 5 years of active research and development work on the variety of uses of soil. The institute moved to an old farm house in Well-Beuerbach in 1983. The members are a group of independent experts, mainly architects, and their aims include the promotion of soil technologies in Germany, provision of advisory services and project implementation. These activities will shortly be extended to overseas development aid projects. A great deal of experimental work is being undertaken in soil, for some specialties, using soil veneers and furniture, as well as interior decorations and renovations with soil.

Soil technology courses on various themes, eg, walls, domes, ovens, are held very frequently and constitute the main activity of the institute. There are sometimes held outside Germany, so that inspirations can be derived from other environments and cultural influences. The regular exchange of information, experiences and views with other experts in Europe and overseas is another major function of the institute, which organizes annual meetings of soil experts, in a different place each time.

3.1.6 AVM, Rüsselsheim

The Metalwork Training Centre (Ausbildungsverbund Metal!), in Rüsselsheim, has little to do with developing countries, but was recently asked by GATE to produce four CINVA-Ram type soil block presses, according to the GATE manual of the CENITHEMA Press from Cameroon (Bibli. 43). Two of them are now being used on some overseas projects. These are probably the first CINVA-Ram presses to be used in Germany, and some modifications were made to satisfy official German and overseas standards. It is pleasing to note, that this expertise for training had a very direct practical use for a development project in the Third World — a model that could be incorporated in many other training programs.

3.1.7 ITDG, London and Rugby

The Intermediate Technology Development Group, which had its headquarters in London, is now based in Rugby (since 1 January 1985). Only IT Publications and the Bookshop, together with three smaller units, have remained in the London office.

Soil technologies are presently not a special area of activity of ITDG, but information is being collected, as far as possible. The author was able to meet Michael Parkes, who is in charge of the building materials section, and Tony Bullard, for a discussion. With a few reorganizations within ITDG, new ideas and strategies may come to ITDG soon. A lot of useful information was found in the ITDG documentation files. Further information was purchased for the London workshop in London, but the choice of books dealing with soil construction is rather limited.
7 Aufbringen eines Lehmputzes

8.9 Errichtung einer Lehmstoppelwand
Die Errichtung einer massigen Lehmstoppelwand dient als Kletterschalung aus Lehm, in der der Lehm als selbstregierender schwach wasserhältiger Lehm eingebracht wird. Die Lehmziegel wurden in ca. 7 cm Dicke eingefügt und in der Schalung bis hin auf eine höhere Verdichtung des Lehm auf 55-60 % des Ausgangsvolumens. Durch den minimalen Wassergehalt, die starke mechanische Verdichtung und durch vertikale Flussrichtungen wurden Schadensfreiheit und Wärmeübertragung verbessert.

Anmerkungen
(1) Leitung der Kurse und theoretische Ein- führung: Prof. Dr.-Ing. Gerold O. Winkler
Praktische Betreuung: Dipl.-Ing. Günter zur Wieden
Organisation: Dipl.-Ing. Ullrich Neeber
 Sekretariat: Helmut Lüders

(2) Anmeldung und Anfragen: Helmut Lüders
Menzelstr. 12, 9500 Regensburg
Tel.: 05671/5463310

Excerpt from the first issue of Gerold Winkler's Journal on "Building with Soil" (Bibl. 38).
The experimental building which was constructed in 1950. The photograph was taken in October 1955.

Current exposure tests with stabilized soil blocks which were made with the BREPAK machine. Each block sample has a different combination of soil and binder. (In the picture: John Noonan, who is in charge of these tests).

David Webb demonstrating the BREPAK Block Clamp, with which heavy blocks can be easily carried with ease and placed accurately in masonry construction, producing perfectly uniform joints. (See page xiv)
3.1.8 Building Research Station, Garston

This research institute, which was founded in 1921, probably has the longest experience in tropical building research. It is interesting to note that, as early as 1950, an experimental building constructed of soil-cement bricks was erected on the BRS premises. It is still in use as a store, and has satisfactorily withstood the cold-humid English climate, without special care. However, the first layers of bricks up to damp-proof course level consisted of fired clay bricks, giving the walls good moisture protection. The walls were divided into sections: partly solid and partly cavity brickwork, with a variety of surface finishes and renderings, for testing—encouraging results.

Stabilized soil constructions are being investigated and developed more intensively over the past decade, mainly under the responsibility of David Webb, internationally one of the leading experts in the field. He also designed the BREPAK soil block press and other useful devices. Together with his colleague, Ray Smith, he has just completed a monograph on the production of stabilized soil blocks, which will be published by the International Labour Office, Geneva, as one of three technical memoranda on building materials for low-cost housing within their Technology Series. The assistance, that these two experts gave the author, was invaluable.

It is also worth mentioning that Mr. Webb is a member of the working party on Laterite Based Materials (LBM), which was initiated by Rilem (International Union of Testing and Research Laboratories for Materials and Structures), Paris, in January 1983, to prepare international guidelines on laterite technology. Furthermore, he is involved in the updating of the British Standard (BS 1924) on "Methods of Testing Stabilized Soils".

3.1.9 GRET, Paris

The Technological Research and Exchange Group, which was established in 1976, aims to collect available documentation on different technologies and to promote the diffusion of information through its Question/Answer Service. GRET's publications include several hundred technical development leaflets; books, studies, and technical files covering a variety of disciplines; and a bimonthly bulletin "RESEAUX - la lettre du GRET".

In August 1985, GRET published a "Dossier Presses à Briques", which contained information on 16 soil block presses. This was probably the most comprehensive and up-to-date compilation done by an appropriate technology institution. It had to rely mainly on photocopied material from other sources, such that some illustrations are not easily distinguishable. Nevertheless, it contained information on 6 block presses—and happily also the manufacturer's addresses—which the author had not come across before. This was a good example of how valuable the work of an AT institution can be for a study of this kind.

3.1.10 CRATerre, Eybens (Grenoble)

The members of the Centre for Research and Application of Earth Construction Technology are among the most experienced soil experts. Apart from research and training courses, which are conducted at the Grenoble School of Architecture (UPAG), the group has implemented numerous soil building projects and studies, not only in France, but also in many French-speaking African countries, as well as Mexico and Peru. They are presently the technical advisors of the largest single soil building project in Europe, comprising 64 houses, located at Île d'Abeau (between Lyon and Grenoble).
The members of CRA-Terre have designed and constructed two soil block presses ("La Palatite" and "CRA-Terre Forum Block Press") and published several monographs, handbooks, and articles on soil technologies. One of these, "Construire en Terre" (Building with Earth), is certainly one of the most attractive and complete publications on the subject, but unfortunately only available in French. The lack of funds has been the main obstacle in getting the book translated into English.

Judging from this book, CRA-Terre seems to possess the most comprehensive documentation on soil technologies. The book also contains the largest number of references to soil block presses, but without details and addresses. It was, however, disappointing that a direct request for these was not compiled with by CRA-Terre.

3.1.11 Centre de Terre, Lavalette (Toulouse)

This centre for research, demonstration and documentation of soil building techniques was founded in 1978 as a private initiative, by Joseph Collane, an architect and soil building enthusiast. One of his specialties is to introduce artistic forms in soil-cement masonry structures, and to carve out ornamental shapes in finished walls. The architectural firm, called ARCHECO, is responsible for the design and construction of over 100 soil buildings in Southern France.

The Centre de Terre also incorporates a firm, called SOUE, which develops soil block presses (TOR-System, GEO 30, GEO 300) to produce the soil-cement blocks for ARCHECO’s projects.

Photos from ARCHECO, Centre de Terre

Top: View of the centre in Lavalette, with some unconventional details of the facade and courtyard.

Left: Soil brick production unit ("Presse Tournante"), with which the centre makes its own building material.

Below: Examples of ARCHECO's projects: two "bioclimatic" houses built in and around Toulouse, Southern France.
3.1.12 SKAT, St. Gall

As a section of the Institute for Latin American Research and Development Cooperation at the University of St. Gall, the Swiss Centre for Appropriate Technology was established in 1978. However, it does not deal only with Latin America, but with the entire Third World. The activities of SKAT are many-fold: consultancy, project implementation, feasibility studies, question/answer service, documentation, publication of monographs, working papers etc., book-sales, conferences, seminars and cooperation with other AT organizations.

Of all the information centres visited by the author, the SKAT documentation was found to be the most complete, and consequently, most useful. It is also of great advantage that many of the books in the library can be purchased directly from SKAT.

Various issues of mutual interest were also discussed with Dr. Urs Heierli, Managing Director of SKAT. Since a few soil block presses are also being manufactured in Switzerland, SKAT has been involved in their assessment, on behalf of the Swiss government. They also prepared a working paper on "Soil block Making Equipment" (Bibl. 57). Dr. Heierli agreed that a comprehensive study of these machines would be very valuable, in view of the growing demand in all parts of the world, and the increasing choice of equipment. He also feels that it would be especially beneficial for all those involved in low cost housing, if a number of AT development and research institutions, would coordinate their activities, in testing as many machines and systems as possible, under field conditions, and exchanging test results and experiences. There is no doubt that this suggestion deserves further consideration, especially amongst development aid organizations.

3.1.13 ETH-Hönggerberg, Zürich

At the Institute for Building Technology of the Swiss Technical University, intensive research is being undertaken on soil based materials. In charge of these investigations is Hans D. Sulzer, assistant professor and technical consultant, who designed and built the manually-operated soil-block press (SATURNIA), which greatly simplifies handling and produces uniform, good quality bricks at a faster rate than other manual presses.

It is interesting to note that Mr. Sulzer originally planned to construct three more types of presses, to satisfy a variety of differing requirements, but has now given up this idea, on account of an accident with his machine and the "bricks it produces. The reason is not that the press is less efficient than other known types, but that he has come to the conclusion that the physical properties of his soil-cement blocks are superior to those of compressed soil-cement blocks. Although this is difficult to believe, as it contradicts generally accepted views, this has been proved by laboratory test results, for which Mr. Sulzer even has a scientific explanation. Details of his investigations will be published shortly, and there can be no doubt that they will generate a great deal of discussion, and possibly lead to a new approach to soil building technologies.

Mr. Sulzer has also developed a chemical product, called "Protectearth", for the impermeation of compacted dry earth. The "diluted solution", which can be applied by a brush or spraying device, penetrates the surface 2 - 6 mm deep, creating a molecular film between the soil particles, which prevents water absorption, but allows vapour movements. This product can be a viable alternative to soil stabilization and is of special interest for the conservation of historical monuments.

3.1.14 IFECE, Washington, D.C.

The International Foundation for Earth Construction was established in 1983, in close collaboration with the Cooperative Housing Foundation in Washington D.C., which over thirty years of international experience in planning and developing low income housing programs.

IFEC is a non-profit organization dedicated to helping people create better shelter by using earth construction techniques. This is achieved by providing advice and technical assistance; consulting; conducting research, testing and training projects in the Third World; preparation and dissemination of literature on stabilized earth and related technologies, as well as promotion of unstabilized adobe and on rainwater collection and storage; cooperation with academic and industrial organizations and coordination of research activities; and finally, organization of international symposia and ad hoc group meetings. In November 1985, IFEC served as co-sponsor of the International Symposium on Earth Architecture held in Beijing, People's Republic of China, in cooperation with the Architectural Society of China.

IFEC's Board of Trustees and Advisory Council comprises the most well-known and experienced soil construction and housing experts.

3.1.15 AT International, Washington, D.C.

Appropriate Technology International is a private, non-profit corporation, created in 1977 in response to a mandate from the U.S. Congress to "promote the development and dissemination of technologies appropriate for developing countries". Although funded by the U.S. Agency for International Development, ATI is ensured flexibility and independence, in order that it may operate primarily in the private sector. Its governing body is a board of Trustees, whose members are drawn from private companies, the banking sector, research sector and American and international NGOs.

Within ATI, the Technology and Enterprise Development Group seeks to identify and appraise technology and enterprise opportunities for ATI's development programs. A member of this group, Carlos R. Lela (Minerals Development Specialist), has conducted studies on soil cement constructions, especially with regard to seismic resistance and low-cost housing programs in Nicaragua, and on AUAHA's soil building techniques (Mall symposium). ATI is currently considering a brick project in Tanzania, where the working performance of several soil block presses will be assessed. If this materializes, it would already be a big step towards the realization of Dr. Heierli's proposal (ref. section 3.1.12: SKAT).
3.1.16 CTA, Asunción

In 1981, the Centre for Appropriate Technology was established at the Catholic University, under the direction of Ing. Thomas Giehl, an integrated expert of CIM (Migrations Centre for Intergovernmental Development), Frankfurt, Germany. CTA's activities are oriented towards the development of low-cost housing technology and utilization of non-conventional energy sources in Paraguay. Within these objectives, soil building techniques represent a major area of research.

Of special interest is the development of a soil block press, which is similar to the CINVA-Ram, but produces three blocks at a time, thus achieving an extremely high rate of production. A demonstration building ("Prototype A") was built with the soil blocks, at only 30 - 40% of the cost of conventional constructions with burnt bricks (Bibl. 19, 20). A current 2-year project deals with the improvement of housing in rural areas of Paraguay, with a view to eliminating infestation by a vector, the triatomine, which transmits the dangerous Chagas disease. The results of this work will be of great interest to all the tropical and sub-tropical countries of Latin America.

Several technical bulletins and audio-visual material (slides and cassettes) are available from CTA.

3.1.17 ADAUA, Ouagadougou

With its headquarters in the capital of Burkina Faso (formerly Upper Volta), ADAUA is probably the most active group of soil building specialists in Africa. The non-profit Association for the Development of Traditional African Urbanism and Architecture was founded in 1974 in Geneva, Switzerland, but is now entirely run by Africans, and operates mainly in West Africa. The staff includes architects, engineers, and social workers, as well as brick-makers and masons. Their main functions are to revive traditional soil building techniques, develop improved systems, train and support local artisans and implement building projects, often encouraging and guiding low-income families to build their houses themselves.

The principal material used are soil-cement bricks, which are produced on a press that was invented as far back as 1904, and is still being manufactured in Belgium. ADAUA has perfected the techniques of building vaults and domes, which were rediscovered by Hassan Fathy in Egypt.

3.1.18 UST, Kumasi

The Building and Road Research Institute, at the University of Science and Technology in Kumasi, Ghana, is well-known for its extensive research work and many technical publications on various aspects of soil construction and particularly with lateritic soils. Especially famous is the TEK-Block Press, which was developed in 1970 by the Department of Housing and Planning Research, Faculty of Architecture (Bibl. 13, 45). This development resulted from experiments undertaken to determine the suitability of the CINVA-Ram for use in Ghana. Since the CINVA-Ram was found to have a few deficiencies, a new block press was designed to overcome them. Until then, not many soil block presses were known, but it seems that the development of the TEK
Settlement in Bamako, Mali

Some impressions of ADAU’s work. Photos: Jürgen Schneider (Bl. 34)

The Panafrikan Institute in Ouagadougou, Burkina Faso (Upper Volta)
3.1.20 CBRI, Roorkee

The Central Building Research Institute grew out of a small research unit, established in 1947, by the Indian Council of Scientific and Industrial Research. CBRI is now the largest building research institute on the sub-continent and has a high international reputation. It deals with practically all aspects of housing, building and planning in the context of tropical developing countries, and most of the work is documented in the institute's reports, articles and conference papers.

Soil engineering is one of the institute's main areas of research. Several innovative materials, building components and techniques have resulted from this, eg the "sarvatogriha" (house for all), with a vaulted roof, based on the Egyptian technique used by Hassan Fathy. Also hand-operated as well as automatic brick presses have been developed, primarily to produce clay and sand-lime bricks for firing, but which probably are also suitable for making soil-cement bricks.

3.1.21 ASTRA, Bangalore

As a centre for the Application of Science and Technology to Rural Areas, at the Indian Institute of Science, Bangalore, ASTRA has conducted extensive studies on rural building techniques in Southern India, of which soil constructions are, for obvious reasons, the most widespread. Studies of locally available soil block presses revealed deficiencies, which could be eliminated by a modified machine. Such a machine, named ASTRAM, was developed by K.S. Jagadish and B.V. Venkatarama Reddy in 1980 (Bib. 215). After more than four years of field testing, commercial production began in 1985, by the end of which year, 60 machines have been operating in India.

"Sarvatogriha" : An experimental low-cost vaulted house built without cement or steel and using no formwork.

Developments of the Central Building Research Institute
3.2 Summary of Soil Block Presses

This section contains all the soil block presses that were identified in the course of the study. They are divided into four groups:

3.2.1 Currently available presses, with details in Annex A

3.2.2 Currently available presses, without further details

3.2.3 Industrial - factory based - plants

3.2.4 Soil block presses, which are not being produced anymore

As this is the most important part of the study and probably the section that will be consulted most often, pains were taken to make it as accurate, up-to-date and comprehensive as possible. However, no claims are made to completeness, and the correctness of the information depended on the material available when completing the report, some of which being too vague, or possibly outdated.

A few words need to be said about the column on "Average rate of production": The figures do not always correspond to the values given by the manufacturers, who either mention minimum or maximum production rates. Furthermore, each machine has its own range of block size(s), which usually differs from others. On account of the large number of machines listed here, similar devices could be compared with one another, showing that some producers tended to give rather optimistic figures (probably achieved under ideal workshop conditions) over short periods, while others estimate the output more modestly. The figures given in the following summary, therefore, represent an attempt to even out these differences, although admittedly, these have been worked out on a purely theoretical estimation. The users of this inventory are, therefore, requested to view the column on production rates merely as a guideline.

Truly comparable output rates can only be established by extensive field tests of all the machines under the same conditions. As regards the number of workers mentioned in the list, they generally include one person to prepare the soil mix, in addition to those needed to charge, unload and operate the press. Some manufacturers, however, prefer to include more people for these operations, which is indeed more realistic and appropriate for developing countries.

It is hoped that the expected response to this study will bring forward more accurate and comparable data, and that the section 3.2.2 (on presses without further details) can be eliminated in the final document.
3.2.1 Currently available presses, with details in Appendix A

<table>
<thead>
<tr>
<th>SOIL BLOCK PRESSES</th>
<th>ADDRESSES:</th>
<th>SOURCE OF INFORMATION</th>
<th>BRIEF DESCRIPTION</th>
<th>AVERAGE RATE OF PRODUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>C=Correspondence</td>
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<tr>
<td></td>
<td></td>
<td>L=Leaflet</td>
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<tr>
<td></td>
<td></td>
<td>D=Directory</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>E=Encyclopedia</td>
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<td></td>
</tr>
<tr>
<td>CINVA - Ram 1952</td>
<td>a Inter-American Housing and Planning Centre COLOMBIA</td>
<td>B 51, 58, 60, 62</td>
<td>Steel mould box with a piston at the bottom and a lid which is opened for filling. A long metal handle is manually operated, moves the compression piston via a toggle linkage. All connections welded. Production of one block per cycle.</td>
<td>40 - 60</td>
</tr>
<tr>
<td></td>
<td>b Metalube Ltd COLOMBIA</td>
<td>64, 65</td>
<td></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>1 Industria e Comercio de Maquinas BRAZIL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 Schrader-Bellows USA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 Fraser Eng. Co. NEW ZEALAND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEX Block Press 1970</td>
<td>a/b Department of Housing and Planning Research UST, Kumasi GHANA</td>
<td>B 13, 45, 60</td>
<td>Sturdier version of CINVA-Ram, with simplified handling, wooden lever and larger block size</td>
<td>30 - 40</td>
</tr>
<tr>
<td>La Palafitte 1975 (P)</td>
<td>a ADETEN 1'Unité Pédagogique d'Architecture de Grenoble: CRATerre Lacs Rivaux, Haut-Brié, 38320 Eybens FRANCE</td>
<td>B 01, 06</td>
<td>Modified TEX Block Press</td>
<td>40 - 60</td>
</tr>
<tr>
<td>CINVA-Ram 1977</td>
<td>a/b CETA 15 Ave. 14-61, Zona 10 Guatemala City GUATEMALA</td>
<td>B 31</td>
<td>Modified CINVA-Ram to produce hollow blocks (for placement of reinforcing rods in seismic wall construction)</td>
<td>40 - 60</td>
</tr>
<tr>
<td>CENEEMA Earth and Loam Block Press 1979</td>
<td>a/b CENEEMA B.P. 1040 Yaoundé CAMEROON</td>
<td>B 23</td>
<td>Modified CINVA-Ram</td>
<td>40 - 60</td>
</tr>
<tr>
<td>AVM Block Press 1984</td>
<td>a/b Ausbildungswerb. Metall (AVM) Bernhard-Atelung-Str. 42 6090 Rüsselheim FED. REP. OF GERMANY</td>
<td>C</td>
<td>CENEEMA Press modified such that only German DIN standard parts are used.</td>
<td>40 - 60</td>
</tr>
<tr>
<td>SISD Dirt-Cement Brick Press</td>
<td>a/b Southern Institute for Skill Development Thai-German Project PO Box 5, Koe Sang Songkla 80011 THAILAND</td>
<td>R 26</td>
<td>Modified CINVA-Ram</td>
<td>40 - 60</td>
</tr>
<tr>
<td>Meili - 60 Manual Brick Press</td>
<td>a/b Meili Engineering Gewerbe-Center Rothaus 8635 Dürnten SWITZERLAND</td>
<td>C</td>
<td>Modified CINVA-Ram</td>
<td>40 - 60</td>
</tr>
<tr>
<td>MARO Block Press</td>
<td>a/b MARO Enterprise 95 bis route de Suisse 1290 Versoix SWITZERLAND</td>
<td>C</td>
<td>Modified CINVA-Ram, assembled only with screws and bolts.</td>
<td>40 - 60</td>
</tr>
<tr>
<td>SOIL BLOCK PRESS</td>
<td>ADDRESSES:</td>
<td>SOURCE OF INFORMATION</td>
<td>BRIEF DESCRIPTION</td>
<td>AVERAGE RATE OF PRODUCTION</td>
</tr>
<tr>
<td>------------------</td>
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<td>---------------------------</td>
</tr>
<tr>
<td>Year of development (if known)</td>
<td>a Developer</td>
<td>C=Correspondence</td>
<td>Similar to MARO Block Press</td>
<td>Blocks/hour (number of workers)</td>
</tr>
<tr>
<td>(P) = Prototype</td>
<td>b Manufacturer</td>
<td>L=Leaflet</td>
<td>Copy of CINVA-Ram</td>
<td>40 - 60</td>
</tr>
<tr>
<td>CTBI Block Press</td>
<td>a/b C.T.B.I. Zone Industrielle 51140 Muizon FRANCE</td>
<td>B 33</td>
<td>Copy of CINVA-Ram</td>
<td>(3)</td>
</tr>
<tr>
<td>UNATA</td>
<td>b GVD Heuvelstraat 131 3140 Rumst-Herstal BELGIUM</td>
<td>C</td>
<td>Copy of CINVA-Ram</td>
<td>40 - 60</td>
</tr>
<tr>
<td>JESSON Brick Press</td>
<td>a/b Jesson Industries PO Box 664 Port Elizabeth 6000 SOUTH AFRICA</td>
<td>C</td>
<td>Modified CINVA-Ram with attached filler hopper</td>
<td>40 - 60</td>
</tr>
<tr>
<td>A.B.I. Block Press</td>
<td>a/b Abidjan-Industrie B.P. 343 45 Rue P.et M. Curie Zone 4 C Abidjan IVORY COAST</td>
<td>L</td>
<td>Same principle as CINVA-Ram, with interchangeable moulds for hollow blocks</td>
<td>40 - 60</td>
</tr>
<tr>
<td>CTA Block Press</td>
<td>a/b CTA Facultad de Ciencias y Tecnologia Universidad Catolica Asuncion PARAGUAY</td>
<td>C</td>
<td>Modified CINVA-Ram, producing 3 blocks per cycle</td>
<td>150 - 180</td>
</tr>
<tr>
<td>GEO 50</td>
<td>a/b SOUEN Centre de Terre Lavalle 31590 Verfeil FRANCE</td>
<td>C</td>
<td>Same principle as CINVA-Ram, but easier to handle, with lever action only on one side</td>
<td>20 - 50</td>
</tr>
<tr>
<td>SATURNIA 1983</td>
<td>a ETH-Horgenberg Inst.für Hochbautechnik B093 Zürich SWITZERLAND</td>
<td>C</td>
<td>Same principle as CINVA-Ram, but easier to handle, with one-sided lever action and mechanism for accurate filling of mould</td>
<td>100 - 150</td>
</tr>
<tr>
<td>RIFFON Block Press</td>
<td>a/b J. Riffon Rue J. Wilgot 6 5220 Andenne BELGIUM</td>
<td>C</td>
<td>Pedal and lever operated press, with piston suspended over 1 m high moulding table, designed such that operator stands upright</td>
<td>100 - 120</td>
</tr>
<tr>
<td>ELLSON Blockmaster (S, D, SB 1, SB 2) 1950</td>
<td>a Ellson Equipments (Pty)Ltd. PO Box 261 532 Excon 2023 SOUTH AFRICA</td>
<td>C</td>
<td>Similar to CINVA-Ram, in principle, but larger, heavier, with interchangeable moulds. Compression effected by &quot;jumping-pull&quot;, thus better compaction than CINVA-Ram</td>
<td>60 - 80</td>
</tr>
<tr>
<td>ASTRA 1980</td>
<td>a ASTRA Indian Institute of Science Bangalore 560012 INDIA</td>
<td>C</td>
<td>Lighter and improved version of ELLSON Blockmaster</td>
<td>60 - 80</td>
</tr>
<tr>
<td>SOIL BLOCK PRESS</td>
<td>ADDRESSES:</td>
<td>SOURCE OF INFORMATION</td>
<td>BRIEF DESCRIPTION</td>
<td>AVERAGE RATE OF PRODUCTION Blocks/hour (number of workers)</td>
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<tr>
<td>CRAterre Perou Block Press</td>
<td>a/b CRAterre Perou Apagado Postal 399 Huancayo PERU</td>
<td>B 06, 35</td>
<td>In principle, similar to ELLSON Blockmaster, but with wheels and larger block size. Side tables for soil mix and finished blocks facilitate handling.</td>
<td>100 - 120</td>
</tr>
<tr>
<td>Multibloc BREPAK Block Press</td>
<td>a Building Research Station Overseas Division Garston, Watford WD2 7JR ENGLAND</td>
<td>C</td>
<td>Sturdier version of CINVARAM, with manually operated hydraulic pump, achieving five times higher compaction than CINVARAM.</td>
<td>35 - 40</td>
</tr>
<tr>
<td>ZORA Brickmaking Machine</td>
<td>a/b Zora Company Ltd. 112 Power Road London W4 5PY ENGLAND</td>
<td>C</td>
<td>Motor-driven hydraulic block press with extremely high compaction</td>
<td>120 - 150</td>
</tr>
<tr>
<td>TERSTARAM Block Press</td>
<td>a Les Ateliers de Villers-Perwin 1-3 rue E. Gossiaux 6311 Villers-Perwin BELGIUM</td>
<td>C</td>
<td>Manually operated press for making blocks and tiles, producing 24 blocks per cycle (Original names: SUPER MADELOW, later STABILOC, also well known as LANDCRETE).</td>
<td>150 - 200</td>
</tr>
<tr>
<td>CERAMAN Manual Press</td>
<td>a same as TERSTARAM CERATEC 228 rue du Touquet 7792 Fleogsteerg BELGIUM</td>
<td>C</td>
<td>Same as TERSTARAM, but with automatic ejection of blocks</td>
<td>200 - 300</td>
</tr>
<tr>
<td>SEMI-TERTSTEMATIC Automatic Brick Press</td>
<td>a and b: same as for TERSTARAM</td>
<td>C</td>
<td>Motor-driven version of TERSTARAM (Original name LA MAJO)</td>
<td>400 - 600</td>
</tr>
<tr>
<td>CERAMATIC Automatic Brick Press</td>
<td>a and b: same as for CERAMAN</td>
<td>C</td>
<td>Motor-driven mechanical block press with rotating 3 station table, for filling, moulding and ejection of 2 bricks a time (original name: LA MAJO-MATIQUE)</td>
<td>1000 - 1300</td>
</tr>
<tr>
<td>LESCHA SBM</td>
<td>a Lescha/Augsburg and Consolid/SWITZERLAND</td>
<td>C</td>
<td>Complete production unit on wheels, incorporating mixer, hopper and 4 station rotating table with hydraulic press for 2 bricks a time (improved version of CLU 2000).</td>
<td>500 - 700</td>
</tr>
<tr>
<td>CLU 3000</td>
<td>a/b CONSOLID AG Aechelistr. 18 9435 Heerbrugg SWITZERLAND</td>
<td>C</td>
<td>Further development of CLU 2000 with higher compaction of bricks, but 1 brick each time.</td>
<td>300 - 500</td>
</tr>
<tr>
<td>SOIL BLOCK PRESS</td>
<td>ADDRESSES:</td>
<td>SOURCE OF INFORMATION</td>
<td>BRIEF DESCRIPTION</td>
<td>AVERAGE RATE OF PRODUCTION Blocks/hour (number of workers)</td>
</tr>
<tr>
<td>------------------</td>
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<td>------------------------------------------------------</td>
</tr>
<tr>
<td>Year of development (if known)</td>
<td>Developer</td>
<td>C=Correspondence</td>
<td>Simplified version of</td>
<td>100 - 120</td>
</tr>
<tr>
<td>(P) = Prototype</td>
<td>Manufacturer</td>
<td>L=Leafllet</td>
<td>CLU 3000, semiautomatic operation, 1 brick per cycle</td>
<td></td>
</tr>
<tr>
<td>ECOBRICK 1000</td>
<td>a/b Distler Schmidheini</td>
<td>B=Bibliography</td>
<td>(rotating table omitted)</td>
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<tr>
<td>1990</td>
<td>Weinbergstr. 29</td>
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<tr>
<td>Balgach</td>
<td>9436 Balgach</td>
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<tr>
<td>SWITZERLAND</td>
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<tr>
<td>MEILLI Mechanpress</td>
<td>a/b Meilli Engineering</td>
<td>C</td>
<td>Same operating principle</td>
<td>700 - 900</td>
</tr>
<tr>
<td></td>
<td>Coverbe-Center Rothena</td>
<td></td>
<td>as CLU 3000</td>
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<td></td>
<td>8635 Durnten</td>
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<td></td>
<td>SWITZERLAND</td>
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<tr>
<td>TERRE 2000</td>
<td>a/b RCF TERRE 2000</td>
<td>C</td>
<td>New type of hydraulic press</td>
<td>200 - 300</td>
</tr>
<tr>
<td>Presse IMK 6750-40</td>
<td>Systeme Constructif</td>
<td>L</td>
<td>with separate mixer and conveyor pipe for soil mix, 1 block per cycle</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>B.P. 98</td>
<td>B 33</td>
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<td></td>
<td>13160 Chatellurehard</td>
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<td>FRANCE</td>
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<tr>
<td>PACT 500 Block Press</td>
<td>a/b ALTECH</td>
<td>C</td>
<td>Compact motor-driven mechanical press; with 4 station rotating table compacting 1 block at a time, interchangeable moulds</td>
<td>300 - 350</td>
</tr>
<tr>
<td>(previous model</td>
<td>Rue du Bauldiers,</td>
<td>L</td>
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<td>PACT 315)</td>
<td>01720 Fabron</td>
<td>B 33</td>
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<td></td>
<td>FRANCE</td>
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<tr>
<td>CTBI Hydraulic Press</td>
<td>a/b C.T.B.I.</td>
<td>C</td>
<td>Semi-automatic, electrically driven hydraulic press, complete with hopper for uniform, accurate filling of mould</td>
<td>80 - 110</td>
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<tr>
<td></td>
<td>Zone Industrielle</td>
<td>L</td>
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<tr>
<td></td>
<td>51140 Muizon</td>
<td>B 33</td>
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<td></td>
<td>FRANCE</td>
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<tr>
<td>GEO 500 Semi-Bloc. Unité Atelier</td>
<td>a/b SOUEN</td>
<td>C</td>
<td>Semi-automatic, diesel powered press, operated in conjunction with a separate mixer, all equipment being charged and unloaded manually</td>
<td>100 - 200</td>
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<tr>
<td></td>
<td>Centre de Terre</td>
<td>L</td>
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<td></td>
<td>Lavalette</td>
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<tr>
<td></td>
<td>31590 Verfeil</td>
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<td></td>
<td>FRANCE</td>
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<tr>
<td>GROUPE UNITPRESS</td>
<td>a/b HALLUMEGA</td>
<td>L</td>
<td>Complete production unit on 3000-vehicle, wheels, with mixer, hopper and rotating table for mechanical compaction</td>
<td>1500 - 2000</td>
</tr>
<tr>
<td></td>
<td>37 rue des Ecoles</td>
<td>B 06, 33</td>
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<tr>
<td></td>
<td>59780 Baisieux</td>
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<td></td>
<td>FRANCE</td>
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<tr>
<td>ULTRABLOC IMPACT 1/2</td>
<td>a/b ULTRABLOC</td>
<td>C</td>
<td>Mobile hydraulic press, with manual (Impact 1) or automatic (Impact 2) operation; extremely high compaction</td>
<td>200 - 300</td>
</tr>
<tr>
<td></td>
<td>109 Yarra Street</td>
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<td></td>
<td>32806 Orlando, FL</td>
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<tr>
<td></td>
<td>USA</td>
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<tr>
<td>TERRABLOCK Duplex</td>
<td>a/b Earth Technology Corp.</td>
<td>C</td>
<td>Fully automatic, computer controlled, self-contained mobile production unit, extremely large blocks with highest known compaction</td>
<td>360 - 600</td>
</tr>
<tr>
<td></td>
<td>175 Brennen Road</td>
<td>L</td>
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<td></td>
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<tr>
<td></td>
<td>Orlando, FL 32806</td>
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<tr>
<td></td>
<td>USA</td>
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</tr>
<tr>
<td>HANS SUMPF Brick Machine</td>
<td>a/b Hans Sumpf Adobe Co.</td>
<td>B 16, 34</td>
<td>Mobile production unit, which lays 35 blocks per cycle on clean, flat ground, no pressure moulding, hence strictly not a block press</td>
<td>many 1000</td>
</tr>
<tr>
<td>1946</td>
<td>Fresno, California</td>
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<td></td>
<td>via: IPEC</td>
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<tr>
<td></td>
<td>3282 Theresa Lane</td>
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<tr>
<td></td>
<td>Lafayette, CA 94549</td>
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<tr>
<td></td>
<td>USA</td>
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<td></td>
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<tr>
<td>EARTH BRICK MACHINE</td>
<td>a/b Australian Adobe</td>
<td>C</td>
<td>Fully automatic, self-contained production unit on 3000-vehicle, wheels, producing blocks of all sizes, with extremely high compaction</td>
<td>1000 - 1500</td>
</tr>
<tr>
<td></td>
<td>Industries</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Suite 4, &quot;Ormond House&quot;</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>109 Yarra Street</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Geelong, Vic. 3220</td>
<td></td>
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<tr>
<td></td>
<td>AUSTRALIA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLOCK PRESS</td>
<td>SOURCE OF INFORMATION / COMMENTS</td>
<td></td>
<td></td>
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<td>-------------</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adobemaster hand-powered adobe maker</td>
<td>Bibl. 06 Address of producer: Design Services, Box 2334, Ruidoso, NM 88345/USA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apex manual and hydraulic operated brick moulding machines</td>
<td>Information received from UNIDO, Vienna. Manufacturer: Apex Engineering &amp; Construction Co., PO Box 57067, Nairobi/Kenya</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bernat - Saulidre, output 300 - 400 bricks/hour</td>
<td>Bibl. 06, but without further details. Manufacturer: M. Tesyre, 74 rue de Fey, 81100 Castres/France</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG.25, output 300 - 400 bricks/hour</td>
<td>Bibl. 06, but without further details</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBRI manual (100 bricks/hour) and mechanically operated brick presses (250-bricks/hour), with compaction pressures of 10 and 20 N/mm² respectively</td>
<td>Bibl. 06: Paper on &quot;Appropriate Technologies and Materials for Housing and Building in India&quot; by staff members of Central Building Research Institute (CBRI), Nennten/India. These presses were developed for the production of clay bricks and sand-lime bricks for firing; probably also suitable for soil-cement bricks.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth Ram</td>
<td>Bibl. 06, but without further details. Manufactured in Mesa, Arizona/USA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HALLUNECA 3 75, B 100, B 150, B 200, mechanical presses</td>
<td>Bibl. 06, but without further details. Machine produced by Hallumeca, 37 rue des Ecoles, 39700 Maisieux/France</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Han Suk Sang brick plant for non-fired clay bricks, compacted at 20 N/mm²</td>
<td>Article in Asia-Pacific Tech Monitor (May/June 1985), Bangalore/India. Address of producer: Han Suk Sang Co.Ltd, 1157-7, Chorang-Dong, Dong-kw. Pusan/Korea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lattonblock manual (60 blocks/hour) and automatic (600 blocks/hour) block making machines</td>
<td>Bibl. 04: Paper on &quot;A New Low Energy Intensive Building Material based on Lateritic Soil for Low Cost Housing in Developing Nations&quot;. Machines developed by Structural Engineering Research Centre (SERC), Madras, and Mechanical Engineering Research and Development Organization, New Delhi/India</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lorev</td>
<td>Personal communication from David Webb, Building Research Station, Garston/England. The machine is produced in Italy.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanized, mobile brick press, driven by animal or hydro-power or simple one-cylinder combustion engine, with an output of at least 125 bricks/hour on a 4 step rotating table</td>
<td>Bibl. 33 and article in Asia-Pacific Tech Monitor (May/June 1985), Bangalore/India: The machine was developed by Dirk Janssen of Delft University of Technology, Centre for Appropriate Technology (CAT), PO Box 5048, 2600 GA Delft/Netherlands</td>
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<td></td>
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<tr>
<td>Raffin</td>
<td>Bibl. 06, but without further details</td>
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<td></td>
<td></td>
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<tr>
<td>Ram Tech, automated, hydraulicallypowered rotating turret machine</td>
<td>Same newsletter as above. Manufactured in Santa Fe, New Mexico/USA</td>
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<td></td>
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<tr>
<td>Soil Crete, automated CINVA-Ram producing about 100 blocks/hour</td>
<td>Earth System Reporter (newsletter of Earth Systems Dev. Inst., PO Box 1217, Corrales, NM 87048). Manufactured in Southern Colorado</td>
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<td></td>
<td></td>
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<tr>
<td>Valram</td>
<td>Communication from Aromar Ravi of Development Alternatives, Shelter Group, 22 Palam Marg, Vasant Vihar, New Delhi 110057. No details known, except that field testing of prototype is nearing completion and commercial production will commence in February 1986. Family of machines planned.</td>
<td></td>
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</table>

**3.2.2** Currently available presses, without further details.
### 3.2.3 Industrial - factory based - plants

<table>
<thead>
<tr>
<th>PRODUCTION UNIT</th>
<th>SOURCE OF INFORMATION / COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krupp Atlas brick plant, conceived to produce laterite-based bricks</td>
<td>Bibl. 40. Manufacturer: Krupp-Polysius AG, Graf-Galen-Str. 17, 4720 Beckum/FR Germany. The plant was supposed to be built in West Africa, but never passed the planning stage.</td>
</tr>
<tr>
<td>Supertor hydraulically powered brick plant, with output of 2500 bricks/hour</td>
<td>Bibl. 32. Manufacturer: Torsa Maquinas et Equipamentos Ltda, Sao Paulo/Brazil.</td>
</tr>
<tr>
<td>Tecmor HCR3, HCR5</td>
<td>Bibl. 06. Manufacturer: Tecmor, Equipamentos &amp; Mecanicos Ltda, Rua da Imprensa, 331, Sao Carlos/Brazil.</td>
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<tr>
<td>T.E.G. Equipment block press, evidently the same plant as Tecmor</td>
<td>Information from manufacturer: E. Goffaux, 1-3 rue Emile Gossiaux, 6311 Villers-Petten/Belgium.</td>
</tr>
<tr>
<td>Aebi ASP 350 automatic hydraulic press, output 1440 bricks/hour</td>
<td>Bibl. 01. Manufacturer: Robert Aebi SA, 8023 Zürich/Switzerland.</td>
</tr>
<tr>
<td>ACCEFA Presses &quot;DYNATERRE&quot;</td>
<td>Bibl. 06. Manufacturer: André Accetta, 1'Ecole d'Architecture de St. Etienne, 1 rue Buisson, 42000 St. Etienne/France.</td>
</tr>
<tr>
<td>Terroc T 14 (1 block/cycle) and T 4 (4 blocks/cycle)</td>
<td>Bibl. 33. Manufacturer: Saret, B.P. 102, Route de Carpentras, 84130 Le Pontet/France.</td>
</tr>
<tr>
<td>CTBI Automatique (L.P.F. 500) output 350 - 400 bricks/hour</td>
<td>Bibl. 33. Manufacturer: CTBI; Zone Industrielle, 51140 Muizon/France.</td>
</tr>
<tr>
<td>GEO 500 Auto-Bloc electrically powered automatic press, output 300 bricks/hour</td>
<td>Information from manufacturer: SOUEN, Centre de Terre, Lavalette, 31590 Verfeil/France. The press (also called &quot;Touneil&quot;) was constructed to produce bricks for the centre's own use.</td>
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</tbody>
</table>

### 3.2.4 Soil block presses, which are not being produced anymore

<table>
<thead>
<tr>
<th>BLOCK PRESS</th>
<th>SOURCE OF INFORMATION / COMMENTS</th>
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<tr>
<td>MACHINE A BRAS No. 1</td>
<td>Bibl. 06, see Illustration &quot;Le Musée des Presses&quot;</td>
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<tr>
<td>PRESSE PM A BRAS</td>
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</tr>
<tr>
<td>PRESSE RAPIDE No. 5</td>
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</tr>
<tr>
<td>MACHINE Houdra TYPE C</td>
<td>ditto</td>
</tr>
<tr>
<td>DAMETTE No. 1</td>
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<tr>
<td>BLOCK PRESS</td>
<td>SOURCE OF INFORMATION / COMMENTS</td>
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<tr>
<td>------------</td>
<td>----------------------------------</td>
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<tr>
<td>MACHINE PNEUMATIQUE TYPE 810</td>
<td>Bibl. 06, see Illustration &quot;Le Musée des Presse&quot;</td>
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<tr>
<td>PILONNEUSE A BRAS TYPE PBB</td>
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<tr>
<td>PILON GUIDE SYSTEME D</td>
<td>ditto</td>
</tr>
<tr>
<td>PILON GUIDE CANADA</td>
<td>ditto</td>
</tr>
<tr>
<td>PRESSE EN BOIS</td>
<td>ditto</td>
</tr>
<tr>
<td>HERCULEENNE</td>
<td>ditto</td>
</tr>
<tr>
<td>PRESSE CURER</td>
<td>ditto</td>
</tr>
<tr>
<td>LA MADELON</td>
<td>Information from manufacturer: E. Goffaux, Les Ateliers de Villers-Perwin, 1-3 rue E. Gossiaux, 6311 Villers-Perwin/Belgium. patented in the year 1904, designed for use in the Belgian Congo (Zaire).</td>
</tr>
<tr>
<td>SUPER MADELON/STABIBLOC</td>
<td>Improved version of LA MADELON</td>
</tr>
<tr>
<td>LANDCRETE</td>
<td>Same as SUPER MADELON, but produced by Landsborough Findlay Ltd., Johannesburg/South Africa</td>
</tr>
<tr>
<td>FIB-SM</td>
<td>Same as SUPER MADELON, but produced by Le Four Industrial Belge, 14 rue des 3 Arbres, 1180 Brussels/Belgium</td>
</tr>
<tr>
<td>LA MAJO</td>
<td>Developed by Les Ateliers de Villers-Perwin in 1933, as a motor-driven version of SUPER MADELON, now built with minor modifications under the name SEMI-TESTAMATIC</td>
</tr>
<tr>
<td>LA MAJO MATIC</td>
<td>Developed by above firm in 1953, now produced with slight changes under the same name CERAMATIC</td>
</tr>
<tr>
<td>FIB-MM</td>
<td>Same as LA MAJO-MATIC, produced by Le Four Industrial Belge</td>
</tr>
<tr>
<td>WINGET Rotary Hydraulic Block Press</td>
<td>Details obtained from D. Webb, Building Research Station, Garston. Machine developed and produced by Winget Ltd., Rochester, Kent/England</td>
</tr>
<tr>
<td>10 P / 11 P</td>
<td>Bibl. 01. 06. Modification of WINGET Block Press, manufactured as prototypes by Guilhon Barthelemy, 18 rue de Mont Fast, 84 Avignon/France</td>
</tr>
<tr>
<td>MMH 2000 (rotary hydraulic press with single block moulds) / MMH 4000 (same machine with double block moulds)</td>
<td>Bibl. 01. 06, also information from M. Platbrood. The machine is basically the PRESSE MAJO-MATIC HYDRAULIQUE developed in 1976 by Les Ateliers de Villers-Perwin. Also produced by Fernand Platbrood, 20 rue de la Rieze, 6404 Cul-des-Sarts, Couvin/Belgium</td>
</tr>
<tr>
<td>POWER-TEK BLOCK hydraulic press with 4 rotating mould boxes, producing 300 blocks/hour with compaction pressure of 7 N/mm²</td>
<td>Bibl. 01. 06. Prototype developed at Dept. of Housing and Planning Research, UST Kumasi/Ghana, to achieve higher output, cheaper and stronger bricks than the manually operated TEK BLOCK press</td>
</tr>
<tr>
<td>CLU 2000, self-contained, hydraulic block press on wheels, with 4 step rotating table, output 350 - 500 blocks/hour</td>
<td>Bibl. 01. 06. 33. Jointly designed by Consolid AG, Aechelistr. 18, 9434 Heerbrugg/Switzerland, and Lescha KG, Ulmer Str. 269/251, 8900 Augsburg/FR Germany</td>
</tr>
<tr>
<td>TOB-System/Geotrem</td>
<td>Bibl. 33 and information from SOUDIN/ARCHIECO, Centre de Terre, Lavalette, 31590 Verfeil/France. Although the press functioned well, mounting it on a wheeled chassis was found to make it unnecessarily cramped, complicated and expensive. Thus it was succeeded by the GEO 300 Semi-Bloc.</td>
</tr>
</tbody>
</table>
LE MUSEE DES PRESSES

MACHINE A BRAS N° 1

Le moule est basé par un marteau à bras qui écrase ainsi une partie du moule avant qu'il ne se mette à mouler. Le moule est ensuite relevé à la presse. Matériel Bonnet.

PRESSE FM A BRAS


PRESSE RAPIDE N° 5

Papier masqué à bras avec ressorts de rappel. Passe d'ouvrage 5 ou 1 ouvrage. Poids de la presse d'environ 1 ou deux monnaies et un prion, ou celui d'un kg. Matériel de la société France-Assicrienne.

MACHINE Haurda TYPE C


MACHINE PNEUMATIQUE TYPE 810

Pouvoir de service, utilisé pour la fabrication de meules de manœuvre, du moule de coton, de la combinaison de la terre, de la suspension des corps avec un principe de 3 cm de diamètre, allumée à 5 ou comprime à 1 cm. À l'état de la dynamo, une machine autrement plus puissante peut confondre l'action de ce dernier en frappant le contour de la table à une cadence atteignant 150 coups par minute. Ensuite, le fondaté est fixe dans le sens vertical et déplacé latéralement. Puissance absorbée et comprimé de 3 cv. Matériel Stein.
**FIGURE 236**

**PILONNEUSE A BRAS TYPE PBB**

Pilonneuse à bras avec ressorts de rappel
Mains d'oeuvre : 2 ou 2 ouvrants
Fabrication: Bonneuil Materiall Brandes

**PILON GUIDE SYSTÈME D**

Le flotteur est monté sur le principe du montage pilon guidé entre deux cannelures. 
Moulage: 15 ou 18 sec
Extrait des Sélections du Système D n° 12

**PILON GUIDE CANADA**

L'opérateur guide le pilon pour parvenir toute la surface du moulé rempli de terre. Le pilon frappe et coupe par mouvement. Il faut environ 4 minutes pour réaliser un bloc.

**UNIVERSITY OF SASKATCHEWAN**

**HerCULEENNE**

Presse à pâte en acier soude qui était livrée avec des moules permettant, de fabriquer des briques de 10 x 10 x 20 cm. D'autres formats étaient disponibles et il existait également des moules permettant de fabriquer des cordes, des tubes, des demi-tubes. L'étendue de 4 x 4 x 20, 6 x 6 x 20 cm. Production par jour: 300. Nombre d'ouvriers: 2

**PRESSE EN BOIS**

Conçue par le SIR de Dakar et employée en Afrique occidentale.

**PRESSE CURER**

Presse Curer conçue à l'Université de Cambridge. Dégage:
Puissance: 150 W (80 A) 
Temps de compression: 1.5 sec. 
Moules: 10 x 10 x 20 cm. 
Épaisseur: 20 mm. 
Dimensions des briques: 23 x 11 x 9,5 cm. Production par jour: 200. 
Nombre d'ouvriers: 2.

**CRATex**
FIGURE 217

Pressé mécanique à moteur effectuant l'opération pressage et démoulage en 15 secondes. La production est donc en rapport avec le temps mis pour le remplissage des moules et l'enlevement des pièces. Dimensions : L x L x H = 1300 x 2000 x 1060 mm. Poids net 120 kg. Moteur à essence au alcool. Tutte de compression 1 x 1. Brique 125 x 25 x 5 cm. Production par jour 1500. Profondeur max du moulage 140 mm. Courante max du plateau 5 x 5 mm. Usines d'usinez : Materiel Villers France. Similaire à la presse Majomatic.


La Meilleure Presse à Briques

RENDEZ-MAXIMUM

La meilleure presse à briques fut inventée par moi en 1904 et brevetée sous les n°178 015 et 178 189.

"LA MADELON" est le dernier modèle de presse à menotte. C'est le fruit de 20 ans d'expérience dans la construction et confection de presse. Elle est à la fois de minuscules marques de satisfaction de la part de nos clients.

PRESSE: LA MADELON - cette préférée presse à briques, il y a longtemps que les gens qui voudraient avoir des idées courtes les ont connues. Ce qui est arrivé, même à nos machines, n'est pas une machine incombustible qui triomphe de tout, qui permet de produire des fourmis ou des fourmis. A finement dans le cœur du monde. Il est intéressant que ce soit la presse qui nous ramène à ce primitif.

ENTREZ: LA MADELON - cette presse à briques est fabriquée en Belgique. Nous pouvons placer sur 'LA MADELON' des moulins pour briques creuses, briques close, briques pleines, briques de toutes sortes et autres produits pouvant se monter par pression.

PRESSE: "LA MADELON" est efficace, puissante, simple et à la mesure que la terre se comprime et que la terre s'agglomère. De plus, le moindre effort, c'est ainsi malaxé les produits avec le maximum d'efficacité, la consommation de terre est réduite, et il y a plus de rejet de poussière et de déchets.

FONCTIONNEMENT: - L'opérateur doit se déplacer, et ce, se déplacer, le travail est alors approprié et la génération fatale, qui agit sur les personnes, peut être évitée. Pas de poussière, pas de déchets!

PRODUCTION: - Nous avons des machines d'équipement qui sont couverts de 10 000 briques par jour, et nous avons certaines d'équipement d'entraînement à la fabrication de briques par jour.

CONSTRUCTION: - Notre construction est entièrement métallique, nos pièces sont entièrement interchangeables, les axes sont moulés dans un corps moule de briques de manière précise, et ils peuvent être remis en place sans difficulté.

MOYENS: - Nous utilisons les moyens les plus avancés dans nos ateliers, et nous pouvons offrir de la qualité et des services de qualité.

Pour se servir avantageusement de la Presse à Briques LA MADELON

"LA MADELON" est construite pour la presse à briques. Elle est moulée par une machine, et c'est ainsi que nous pouvons offrir des produits avec le maximum d'efficacité, la consommation de terre est réduite, et il y a plus de rejet de poussière et de déchets.

Pour obtenir de plus amples informations, n'hésitez pas à nous contacter.
LA SUPER MADELON COLONIALE

La Super Madeleon Coloniale sans chaine fonctionne comme la Madeleon ordinaire, mais avec plus de facilité étant munie sur roulements fixes. Une seconde minute permet à celui qui envoie les briques d'ailer le presseur. L'ajustage des ouvertures est dérivé de la presse. La même façon de presse, même temps de pression, est beaucoup plus économique.

Sur la Super Madeleon pour briques, on peut placer des moules pour la fabrication des tuiles, carreaux, tuyaux, briques trompes, nécromaces, etc. Il n'est donc pas nécessaire de demander une machine spéciale à la livraison ou faire des machines spéciales. Les moules et accessoires nécessaires peuvent toujours être obtenus et placés sur la presse sans modification.

La Super Madeleon est employée par de nombreux coloniaux qui ont constaté après essai que la production était généralement 20 fois plus forte qu'avec les presses à bras.

La Super Madeleon Coloniale-emballée en une caisse en plan-chêne de 25 mm. ne coule que 7,0 kg et ne pèse que 47 kg.

C'est une Madeleon renforcée, et perfectionnée, soit poids et son volume sont restés sensiblement de même parce que les renforcements consistent en l'emploi de fer au lieu de fonte et d'acier de forte résistance.

Les quelques caractéristiques qui précèdent justifient bien son nom de Coloniale.

Outre les nombreux avantages de la Madeleon, facilité de fonctionnement, d'entretien et de déplacement, nous avons par les perfectionnements suivants fait de la Super Madeleon une machine idéale à tous points de vue.

La cuvette de pression, auparavant en fonte, est en acier forgé. La chambre de pression est remplacée par une tôle articulée. Les organes essentiels, peuvent faire un million de briques sans grèseage et sont pratiquement inextensibles et inélastiques.

Le levier de demandeur placé au centre de la machine, est approprié à façon de pouvoir fabriquer des briques ayant jusqu'à 1 cm d'épaisseur.

Les organes de pression, cuvet, béche, etc., sont protégés par un carter en tôle qui les met à l'abri des projections de terre et de sable, ce qui leur assure une longue durée.

La cuvette est équilibrée de façon qu'elle s'ouvre et se ferme avec une aisance parfaite.

Le nouveau système de fermeture, dont les pièces sont facilement remplacables et à peu de frais, y est appliqué.

Les moules se remplacent avec une facilité que l'on ne trouve dans aucune autre machine.

Le manœuvreur de pression est monté de telle sorte que la terre ne reste jamais sur ses articulations et, de ce fait, l'usure est pratiquement nulle.

Montée sur roues, et munie de freins pour la conduite, elle se déplace très aisément sur le chantier.

Les principales pièces de la Super Madeleon, telles que cuvet, manœuvreur de pression, fermeture, etc., sont celles que celles employées dans la Madeleon au motor et qui ont été étudiées pour un travail beaucoup plus dur que dans les presses à main.

Les pièces étant parfaitement interchangeables, son entretien est facile et les réparations peu coûteuses.

Rien n'a été négligé pour faire de la Super Madeleon une machine nettement supérieure, son prix un peu plus élevé que celui des machines concurrentes, est amplement justifié par les nombreux avantages qu'elle réunit.

La Super Madeleon Coloniale est une machine dont on dit : je l'ai payée un peu plus cher, mais au moins j'ai une bonne machine qui finalement est plus économique qu'une autre à bon marché et surtout aux colonies pour les frais d'emballage et de transport sont très élevés, qu'il s'agisse d'une machine médiocre ou d'une Madeleon.
<table>
<thead>
<tr>
<th>Réf</th>
<th>Nombre pièces</th>
<th>Désignation</th>
<th>N° Pièces</th>
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<td>guide du piston</td>
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"LA MAJO"
MOTOR BRICK PRESS

- LA MAJO - having proved itself in Belgium, we have no hesitation in recommending it for other countries.

- LA MAJO - for sizes, housed bricks, molded bricks, etc., can all be placed on the "LA MAJO" press. There is therefore no need to order a special machine if at some future date it is desired to manufacture these articles. The necessary moulds and accessories can also be obtained and placed on the press without any additional cost.

Manufacturing with "LA MAJO" - the work is exactly the same as with hand presses, but the bricks are pressed and taken out of the mould automatically in 2-3 seconds, without any effort on the part of the workman; he need only pull down the clutch lever.

This is an advantageous advantage when the labour available is of limited ability and the machine possesses the necessary effort to press sharply.

PRESSURE: The "LA MAJO" is designed to give a pressure comparable to that of a press weighing 22 tons, and never furthermore, unlike with a hand press, one may therefore count on obtaining properly pressed bricks.

The "LA MAJO" may be entrusted without apprehension to even the least skilled workmen; we are unaware of any mistake, imprudence or faulty handling which could cause any sort of damage whatever. Provided that the operator works more or less reasonably, the "LA MAJO" will never give any trouble.

The machine is built to press as would a press weighing 22 tons. If for any reason it is called upon to make a greater effort, it stops. Pebbles or bits of iron may find their way into the moulds (or even be placed there purposely) without causing the slightest accident. The clutch box simply has to be lifted for work to be continued.

UPKEEP: - Since the machine stops if an abnormal demand is made upon it, any breakage or forcing is avoided, as is, of course, premature wear. As the "LA MAJO" works smoothly and effortlessly, upkeep is often less than for a hand press.

Improved, simplified and the result of long experience, the "LA MAJO" is perfect down to the smallest detail. All parts are interchangeable and can be replaced on the spot without calling in an experienced workman. The parts are machined, milled and ground out. Two grommets are located on the casting and no case is known of one of these breaking or going out of line during use.

For a list of the parts, see the catalog. The "LA MAJO" is manufactured by E. GOSSIAUX & CIE, Villers-Perwin (Hainaut) Belgium. Offices: VILLERS-PERWIN (Hainaut-Belgium) tel. Mellet 29 and 55, rue de Suede, BRUSSELS (Belgium) tel. 38.29.81

<table>
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<tr>
<th>Per hour</th>
<th>Time per pair</th>
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The figures are based on 2 to 2½ per hour pressing and turning out. In practice this is the time for a motor press.

Naturally, with a motor the pressing and turning out can be done more quickly but not only would there be no great profit in that, since the workman is picking up the earth and conveying it to the press during this time, but also it is injurious to the quality of the bricks.

Automatic presses seldom make good bricks, not only because one often has to work with earth in too dry, but also because the pressing is nearly always done too hurriedly.

The pressure being quite sufficient and always taking 2½ to 3 seconds, irrespective of the workman's ability to organize properly the preparation of the earth and the evaporation of the manufactured articles, "LA MAJO" outperforms all other makes of good quality and production.

Our Belgian workmen generally fill the moulds and take out 100 bricks in 8 seconds, so that however hurried may be the ability of an unskilled worker he can easily do the same work in double the time and turn out 500 well-pressed bricks per hour.

The extra trouble taken to prepare and the earth properly compacted, time to be saved in moulding, and careful preparation of the moulds, all contribute to this interest.

We stress this point, for some people consider that time spent in preparing the earth is partly time wasted, whereas lack of preparation is often the source of all the troubles.

There are also those who imagine that a stronger pressure can make for a lack of perfection. By heavy pressing badly prepared earth, bricks can be made which are of good appearance when removed from the moulds, but in the earth itself has not been mixed sufficiently the drying and firing is not so regular and the bricks are less homogeneous. The result is an expenditure in motive force and upkeep of material, far greater than the economy made in preparing the earth, while at the same time the article produced is of poorer quality.

We have prepared a booklet giving advice regarding the choice of earth, its preparation, and the organization of work for the manufacture of bricks with a press. This booklet is supplied with all our presses and is freely at your disposal.

MOTIVE FORCE NECESSARY. — The "LA MAJO" is fitted with a 1.35 HP electric motor or a 1.5 HP petrol motor. Both types of motors are supplied complete with appropriate support and pulley. Throttle-wheel of the press must run at a speed of 300 to 320 revolutions per minute; an arrow indicates the direction of rotation. The kinetic energy of the fly-wheel makes the pressure obtained comparable to that of a press without fly-wheel driven by a 5 HP motor.

PACKING. — The "LA MAJO" is packed completely assembled, in a 4/4 wooden case, reinforced, braced and hooped and measuring 2 metres in length, 0.655 metres wide and 1.08 metres in height; gross weight 725 kilos, net weight 590 kilos.

The necessary electric motor can be placed in the same case without any increase in size.
Presses à Brique, à Tuiles, etc., à Main et au Moteur
MACHINES POUR BLOCS EN TERRE, EN BÉTON, ETC. - MALAISEURS - PRESSES À HUILE À MAIN

Ateliers de Constructions de Villers-Perwin
E. GOSSIAUX

Téléphone MELLET (07) 74.10.29
Compte Chèques Postaux Bruxelles 843.80
(à Madame M. L. GOSSIAUX)
Télégrammes:
GOSSIAUX-PRESSES VILLERS-PERWIN
Code A.B.C. 5th Edition
R. C. Charleroi 22864

PRESSE À BRIQUES À MOTEUR
"LA MAJO-MATIC"

Messieurs,

Veuillez trouver ci-jointes, les références que quelques clients ont eu l'amabilité de nous envoyer. Ces témoignages sont la plus sûre garantie de la qualité de notre matériel et de l'intérêt qu'offre notre "MAJO-MATIC". Nous vous prions d'agréer, Messieurs, l'expression de nos sentiments distingués.

Ateliers GOSSIAUX

Mijne Heren,

Gelieve hierbij de referenties te vinden die enige klan-
ten de vriendschap hadden ons te zenden.
Deze getuigenissen zijn de zekerste waarborg der kwaliteit van ons materieel en het belang welke de "MAJO-MATIC" aanbiedt. Wij bidden U, Mijne Heren, de verzekering onzer oprechte groeten te aanvaarden.

Met hoogachtung,
Werkhuizen GOSSIAUX.
Better, cheaper and faster construction with stabilised soilblocks.

**Winget Rotary Hydraulic Block Press**

A Highly Efficient Machine Producing Blocks of Exceptional Strength

**THE WINGET ROTARY HYDRAULIC BLOCK PRESS**

**BRIEF SPECIFICATION**

Both pressing and ejection rams are double acting and are protected against line dives. The pressing rams work to a definite stop, ensuring that all blocks are of equal thickness.

The load applied by the pressing ram is 15 tons, 1,900 lb. p.s.i. on a 12 in. x 6 in. block, and when this pressure is attained a tell-tale gives the operator a visible signal.

The whole machine is robustly constructed and is mounted on metal wheels.

Volume measuring boxes are supplied; these permit the accurate measurement of material and rapid charging of the mould boxes.

The standard machine will make plain blocks 12 in. x 6 in. x 4 in. but the following variations are available:

(a) Block with central longitudinal groove on each 12 in. face.

(b) Block with deep top groove giving a reduction in weight of about fifteen per cent.

*With four operators, one on the mixer and three on the block machine a maximum production rate of 180 blocks per hour can be maintained steadily, and this can be increased to 300 blocks per hour with an experienced team of operators.*

**APPROXIMATE SHIPPING SPECIFICATION**

No 1 Crate—Rotary Hydraulic Block Press

72 x 78 x 28 in. high (196 x 192 x 71 cm.)

Gross weight 1 ton 6 cwts 5 qrs.

Net weight 1 ton 4 cwt 2 qrs.

(1,377 kilograms)

No 2 Crate—Type D4 Trough Mixer

78 x 78 x 28 in. high (198 x 198 x 71 cm.)

Gross Weight 1 ton 14 cwts 2 qrs.

Net weight 1 ton 14 cwts 2 qrs.

(1,795 kilograms)

The Winget Research and Development Staff are constantly making advances in design and incorporating improved materials. It is in the interest of users that improvements are applied without delay, consequently the details given in this catalogue may be altered without notice.

**Winget**

WINGET LTD., ROCHESTER, KENT, ENGLAND

Tel: Strood, Kent 1 (2 lines) Telephone: Winget, Rochester

LONDON OFFICE: 1-3 New Bond Street, W.1

Tel: W.1 The Park 0721-2-3

Telex: Winget, Moos, London

Dudley Turner & Partners, W. & J. Mackay & Co., Cheltenham
THE WINGET STABILISED SOIL BLOCK PROCESS

what it is and what it does

Stabilised Soil Blocks - Why? There has always been a great need throughout the world for good, cheap buildings. For centuries mud has been used to produce them, usually in one of three ways:

- Primitive rounded earth
- Handmade, sun-dried bricks
- Mud-daubed walls

but since these methods certain drawbacks were always present. With poor construction, snow and considerable thickness of wall was necessary to provide sufficient strength. Handmade mud-bricks or mud-daubed walls were proof against weather and termites.

Here are no such drawbacks with stabilised soil blocks produced on the Winget Block Press. Light & swift and the blocks are of exact dimensions with high load-bearing quality, resistant to weather and termites.

After a long and careful investigation into both the field and the laboratory, Winget have evolved the unique design of their stabilised soil press in the form of the Winget Rotary Brick Press. This brick press, which incorporates a properly engineered lift, will produce one brick up to 200 bricks of correct size and centre with considerable strength.

The organisation of the site and layout of plant is covered in another publication.

The Winget Equipment. The Winget Rotary Brick Press is a fully self-contained unit, which produces 800 blocks per hour (8250 per 8-hour day). The blocks are of exact dimensions with high load-bearing quality, resistant to weather and termites.

Winget Soil Block Houses. The houses are constructed in modern style, with a wall thickness of 6 inches, being built in traditional materials for better insulation. The blocks are made with a combination of soil and cement, ensuring a strong and durable structure.

Winget Block Machine. The blocks are made with a combination of soil and cement, ensuring a strong and durable structure.

The Standard of Winget Equipment. All Winget products are designed and manufactured to the highest standards, ensuring a trouble-free life of many years. To ensure that they continue to work at their highest efficiency it is obvious that regular cleaning and lubrication must be provided, and the block machine and other equipment must be easy to maintain in both these respects. Spare parts are always available from stock.

Youself and Winget. Although thisleaflet we have tried to answer the questions which we think will first come to your mind, there may be some points about which you would like more information. In this case, please do not hesitate to ask us; we are happy to assist you.

THE FOLLOWING ARE THREE TYPICAL ANALYSIS OF SOIL SAMPLES WHICH WE HAVE RECEIVED AT VARIOUS TIMES:

- Soil from Central S America: suitable for brick making
- Soil from West Africa: suitable for brick making
- Soil from England: suitable for brick making

In extreme climatic conditions it may be advisable to render the soil blocks completely waterproof. This can be done merely by applying a water-spray to the surface of the blocks. This can be done merely by applying a water-spray to the surface of the blocks, or by introducing commercial waterproofing agents into the soil mix before the blocks are made. Due to the high degree of compression, frost has little effect on the block.

Soil blocks, with various stabilisers, have been exposed to sub-zero temperatures for considerable periods with no marked effect. Coated or otherwise protected blocks are capable of even greater resistance to extreme of climate and temperature.

The advice of our technical and research departments on the various problems connected with the production of stabilised soil blocks is always available.
New low-cost soil brick plant "CLU 2000" produces water-resistant soil bricks.

Technical specification:
- Mixer: 140 ltr paddle mixer + reverse 24 ltr mechanically operated
- Press: Hydraulically operated, valve-controlled press and extruder. Total pressure 12,000 kg
- Power: 11 hp, 7 kW electric motor, model: 1280 air-cooled, hand starter. Fuel consumption 2 ltr per hour, equipped with Bosch hydraulic pump, mechanical clutch and gear
- Transport: 2 wheel axle with 7.00 x 14 B.P. tires allow to be driven or carried by medium-size truck at up to 25 km per hour
- Site installation: Firm positioning on 4 transportable legs after removal of wheel axle with lifting jack
- Accessories: Starter crank, lubricating tools and some spare parts
- Total weight: Approx. 1550 kg, with package approx. 1750 kg
- Dimensions: 322 x 192 x 120 cm
- Production: 200 to 300 soil bricks per hour
- Brick size: 25 x 12 x 7.5 cm. Other dimensions available upon request.

Pictures and specifications may be subject to changes. Rights applied for.

The soil brick plant "CLU 2000" allows the simple manufacture of high-quality soil bricks, which can be an excellent construction material for low-cost housing, erosion protection walls, linings for irrigation and drainage channels, dams, embankments, etc.

For soil bricks, any type of soil, having a semi-cohesive or cohesive character, can be used because the natural cohesion is necessary to get the required compressive strength. The treatment with CONSOLID 444 and CONSERVEX is protecting the brick against softening by water and loss of strength.

The compressive strength of such treated bricks will be between 25 to 60 kg/cm², in this range sufficient for single-storey houses. If higher compressive strength is required, already the addition of 1 to 3 % cement to the treated soil will increase the compressive strength to values of about 100 kg/cm².

The commonly used landcrete and sandcrete blocks may as well be produced with the soil brick plant "CLU 2000". It is recommended to use a combination of cement and CONSOLID 444 or lime hydrate and CONSOLID 444 to get best stability results.

Most soils qualified for high-quality bricks are in the range of the optimum moisture content between 10 and 20 %. Highly cohesive soils (heavy clays) can be cut down to this OMC by adding sandy material. Non-cohesive soils (sand) will require the addition of up to 20 % of clayey material to get enough natural cohesion for stable soil bricks.

For water-resistant soil bricks, the required average quantity of CONSOLID 444 and CONSERVEX, per one cubic metre of soil, is one litre of CONSOLID 444 and 10 litres of CONSERVEX, to be properly mixed with the soil in the paddle mixer of the soil brick plant.

A crew of 4 to 5 workers can produce per working day 2000 to 3000 bricks with one plant. The bricks are stored for air-drying in the shadow and achieve their full strength after drying out. However, they may be used already one to two days after production. During the drying period, the bricks must be protected against heavy rains.
2 Brick-pressing by hydraulics

The second quarter of the turn-table transports and load the compacted bricks above the hydraulic cylinder plate. They are then subsequently activated when the next brick is being compressed. Both hydraulic and pneumatic operations are performed by hand or using jacks or rams. This involves breaking and forming the bricks to achieve the desired shape. High-quality brick-making requires CONSOLID 444 and CONSERVEX treated soil bricks, simultaneously hydraulically and pneumatically advanced production facilities providing optimal shaping of the soil.-k N The mixing of CONSOLID 444 and CONSERVEX, both used at 15% pressure force for the soil brick production, guarantees constantly precise dimensional tolerances.

The joint efforts of Consil AG, Switzerland, and the well-known firm "Schutte Loening" in Hamburg, Germany, have led to the development of this unique low-cost and easy plant. This mobile plant integrates the two mechanized production units: paddle mixer and brick press. The entire plant is lightweight, simple to operate at low running costs.

3 Extruding of the bricks

The last quarter runs to turn the turn-table transports and loads the compacted bricks above the hydraulic cylinder plate, being simultaneously activated when the next brick is being compressed. Both hydraulic and pneumatic operations are performed using jacks or rams. This process involves breaking and forming the bricks to achieve the desired shape. High-quality brick-making requires CONSOLID 444 and CONSERVEX treated soil bricks, simultaneously hydraulically and pneumatically advanced production facilities providing optimal shaping of the soil.

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The quality of the finished bricks can be improved by repairing voids or uneven corners of the bricks as long as they are moist. If the bricks are manufactured properly, such "minor" work will not be necessary or, at worst, only in a very small proportion.

When dry, the bricks may be used for masonry work with the same technique as burnt bricks or concrete blocks. The mortar, which glues the bricks together, can be a mixture of sand and cement as well as sand and cement and lime. And in a mixture of the same cohesive soil with CONSOLID 444 and CONSERVEX, which is mixed with the plant to a slurry by adding enough water, will be a suitable soil mortar with the advantage that the entire wall is built of uniform material.

If the bricks are used for purposes with extreme heavy water exposure or on the weathered surfaces of houses and walls, it is recommended to apply a top-coat with CONSIL soil brick enamel, a silicate-polymer resin solution, which is claimed highly effective in water-proofing of the exposed surface. This coating is always applied after the last step of the manufacture process. Depending upon the local conditions, one or two coatings with CONSIL are applied by brush or roller. The coats will be made under water (i.e., with CONSIL) and then are ready for construction or additional finishing.
TOB SYSTEM

Groupe Mobile de Production de Briques en Terre Crue Compressée
Transportable unit for the manufacture of bricks from compressed unbaked clay.

Le broyeur et la pelle tracteur ne figurent pas sur la photographie.
The grinder and mechanical shovel are not shown in the photograph.

1. Mâlette
Mixer
2. Tromie de remplissage
Filling hopper
3. Carroussel à trois postes
Rotative mould block with three positions
4. Moteur Diesel
Diesel Engine
5. Réervoir de circuit hydraulique
Hydraulic system reservoir
6. Châssis tracteur
Trailer
7. Tampon de vidage de l'acier
Sliding door for use as cement mixer

TOB-System

SOUVEN
La Pouzin
31130 Valence
France

PRICE
11765-14380 U.S.$

TIME OF DELIVERY
2 Months

DIMENSIONS OF MACHINE
470x180x220cm

WEIGHT
1970kg

TYPE OF ENGINE
Lombardini L40 Diesel

TYPE OF FUEL
Diesel

ENERGY CONSUMPTION
6.71/h

STATIONARY, PORTABLE OR MOBILE
Mobile

TYPE OF MIXER
TOB mixer 5000

MANUFACTURING PRESSURE
57kp/cm²

COMPRESSION VOLUME
2

SIZE OF BLOCS
29x14x8.5cm (Interchangeable moulds)

DIMENSION OF MOULD IN OPEN STATE
29x14x17cm (Standard mould)

NUMBER OF BLOCKS PRODUCED PER DAY (8 HOURS)
3000

NUMBER OF EMPLOYEES WORKING THE MACHINE
3

PRODUCTION VOLUME PER DAY
10m³

COMMENTS:
It is possible to use the machine as a cement mixer on site.
3.3 Soil Block Presses - Past and Present

3.3.1 Building with Earth

Soil is today, as it was thousands of years ago, the building material that is surely always around. Yet, despite this, building with earth is looked upon, in many regions of the world, with distrust - as being the construction system of the poor. And yet, soil is one of the most appropriate materials, in terms of environmental and health aspects.

The reasons for the widespread negative attitude towards such constructions are manifold. Some principal ones are:

- Soil is available almost everywhere and usually at no-cost. (What does not cost anything, is not valued!)
- Earth constructions require regular maintenance and repairs, even under moderate climatic conditions. Negligence could otherwise lead to rapid dilapidation. (But repairs mean a great deal of extra work and, quite often, extra expenses.)
- Keeping earth buildings clean can be difficult; rough or cracked floors, walls or ceilings can harbour vermin, and parasites, which carry dangerous diseases, such as the "Chagas" disease, which affects at least 20 million people in Latin America.

However, as long as the use of soil as a building material is rejected for purely technical reasons, there are several remedies, such as proper building design (with sufficient weather-proofing and precautionary measures), careful and correct preparation of the soil mix (grain size distribution, addition of stabilizing agents, mixing, water content), and, equally important, good compaction, irrespective of the type of construction.

3.3.2 Development of Soil Block Presses

Experience in soil construction has shown that manual compaction of the damp earth (by throwing or ramming) generally cannot achieve the high strength, durability of burnt clay bricks or concrete (blocks), with which soil structures are invariably compared. In order to achieve higher compaction, mechanical devices were developed, both in the form of tampers, as well as in the form of block presses (first made out of wood, later out of iron or steel). The first documented block press was invented by Francois Gossiaux in 1789, which the Frenchman named "La Cressie". A variety of presses have been developed since then, and many are not being produced or used since long. However, the oldest soil block press, which is still being manufactured today, was invented in 1904 (see page 26).

The machine was designed by a Belgian engineer, E. Gossiaux, of Villers-Perwin, together with Belgian missionaries, who were beginning to explore and develop the Congo (today Zaire). The popular French marching song of those days gave the press the name: LA MADELON. The improved version of the machine was called SUPER MADELON. Many years later the machine was manufactured in South Africa, called "LANDECETE", and became well-known throughout the world. In 1973, the inventor of the SUPER MADELON developed a semi-automatic, motor-driven version of it, and called it LA MAJO. About 20 years later, Gossiaux designed and built an automatic, mechanical block press, with a motor and built-in hydraulic press, named LA MAJO-MATIC. The machine, based on the same principle, but with a hydraulic press, was manufactured in England and called WINGET Rotary Hydraulic Block Press.

In the 1970s, the Ateliers de Villers-Perwin ceased production of the SUPER MADELON, which was also called STABIBLOC. This machine was, however, still being manufactured, although by other Belgian firms, and carried the names FIB-SM, TERSTARAM and CERAMAN. The last two are still being produced. Also LA MAJO is still available, with slight modifications, and called SEMI-TERSTAMATIQUE, just as LA MAJO-MATIC was available for some time as FIB-MM, and is now being produced, with a few changes, as CERAMATIC.

A number of other block presses, both manual and motor-driven, have vanished from the market. Some illustrations of these are shown on pages 23 - 25, entitled "Le Musée des Presses" (taken from "Construction en Terre" by Crafierre, Bibl. U6).

All these machines were relatively large, heavy and expensive, so that their use was limited. What was needed was a small, light, easy-to-operate and cheap block press, which could be used on the remotest building sites in the Third World.

According to these requirements, the Chilean engineer, Roél Ramirez, developed such a machine in 1992. He was then working with CINVA, the Inter-American Housing Center in Bogota, Colombia. The press was, therefore, called CINVA-Ram, whereby "Ram" was derived either from Ramirez, or from the English word for a compacting device.

The CINVA-Ram is now by far the best-known and most widely used block press. Numerous variations of it have been manufactured in many countries, but, in its original form, it still is the lightest and least expensive block press available - every improvement, in terms of handling, output and sturdiness, invariably means an increase in price. Another well-known, manually operated block press is the ELLISON BLOCKMASTER, which was mostly manufactured in South Africa, but is now being manufactured in India (since 1959). However, despite its versatility and efficiency, it is not as widely used as the CINVA-Ram, probably due to its greater size, weight and cost.

In the 1950s and 60s, interest in soil construction was generally low. In the 1970s, research work and implementation of technologies in development projects steadily increased, largely on account of the worldwide energy crisis. Apart from several other publications, Hassan Fathy's "Architecture for the Poor" (Bibl. 15), which was published in 1973, did a great deal in reviving interest in soil construction systems. Of importance was also the TEK-Block Press (Ghong, 1970), and the CETA-Ram (Guatemala, 1977). Since the beginning of the 1980s, this tendency has gained additional momentum.

In the course of these developments, a new generation of soil block presses came into existence in the 1970s, namely complete production units on wheels. The equipment generally required for block making, apart from the press itself, a mixer and a measuring
3.3.3 General Aspects of Producing Compressed Soil Blocks

The list of soil block presses in section 3.2 gives a vivid impression of the diversity of the machines available today. There are machines for almost any given situation and desired performance, accordingly also at all prices, between 200 and 75000 US Dollars.

It is self-evident that the cheaper and more expensive machines cannot be compared with each other in any way, even though they principally serve the same purpose. The following (extremely generalized) compilation of the respective advantages and disadvantages clearly shows, that each system caters for a certain range of needs and thus has a valid place to fill. Grossly simplified, the cheaper devices are taken to be manually operated, while the expensive machines are referred to as motor-driven and automated.

Advantages of manually operated presses
- Low capital and operational costs.
- Quick delivery.
- Low weight (devices like the CINVA-Ram can, if necessary, be taken along as unaccompanied flight luggage; easy to transport on wheel-barrows or bullock-carts).
- Small in size, thus little storage space required.
- Simple to handle, even for unskilled workers.
- Apart from cleaning the mould and lubrication of moving parts, low maintenance requirements.
- Possibility of repairs in local workshops, no special spare parts required.
- Usable at any location, since only muscle power is required.
- No additional costs of energy.
- No time loss due to failure of energy supply.

Disadvantages of manually operated presses
- Low rate of production per machine (on average between 40 and 150 blocks per hour), thus requiring a number of machines to achieve a reasonable output.
- Low compaction pressure (averaging 0.5 to 2.5 N/mm²), hence poor quality of soil blocks (lower compressive strength, higher moisture absorption, susceptibility to disintegration).
- Tendency to produce irregular block sizes or compaction, depending on compressing system, if filling the mould is done manually.
- Extremely tiring operation; thus, in the course of a series production, tendency of gradual drop in quality and uniformity of blocks produced, if the pressure is continuously exerted by the same person.
- On account of the lower compaction pressure, necessity of adding larger proportions of binder (consequently increasing the costs), in order to achieve sufficient ultimate strength and water resistance.

Advantages of automatic, motor-driven presses
- High rate of production (on average between 200 and 1500 blocks per hour).
- High compaction pressure (between 4 and 24 N/mm²), hence good quality of soil blocks (optimum dimensional uniformity, stability of edges and high compressive strength, low moisture absorption, longevity, saving of costly and tedious surface treatment, appropriateness for multi-stored buildings).
- Continuously uniform quality of blocks, since no muscle power is applied.
- Requirement of only small proportions of binder (thus saving costs), on account of the high compaction pressure.
- Reduction of manual work, thus saving costs, while wages are high.

Disadvantages of automatic, motor-driven presses
- High capital and operational costs.
- Relatively long delivery time.
- Usually very heavy, requiring powerful lifting gear and vehicles for transportation, the transports are troublesome and expensive.
- Large size, requiring large working area, making safe storage under lock and key difficult.
- Requirement of high insurance cover.
- Necessity of skilled labour for operation of machines.
- Maintenance requirements comparable with those of motor vehicles.
- Requirement of specialists for repairs; spare parts possibly expensive and difficult to get, or only after long delivery time.
- Dependency on local energy supply.

Summary
The above list of advantages and disadvantages of the different categories of soil block presses lead to the following conclusions:

Small, manually operated machines are best suited:
- in case of limited capital resources;
- for projects in remote areas, or those that lack the necessary infrastructure;
- on small building sites, with limited working space;
- in areas of low precipitation, thus excluding the danger of excessive water absorption;
- for small building projects with single-storied structures, for which the quality of soil blocks is of less importance;
- in places, where the potential for self-help inputs is high;
- or where entrepreneurs, with a small capital base and a team of unskilled workers, produce soil blocks for the local market.

Powered, high capacity machines are advantageous:

- where sufficient financial resources are available;
- in cases where high production rates are needed and there is a high demand over a long period;
- for projects, that specify better qualities of soil blocks;
- in working environments with sufficient energy supply, as well as maintenance and repair facilities;
- in cases, where labour is expensive or not easily available;
- or in case of disaster aid operations, which necessitate efficient and quick help and good, cheap material in large quantities. (Quite often, tents and other temporary accommodations are provided at high costs, requiring more permanent substitutes later on. It is wise to help the disaster victims to build stable, permanent houses straight away. Thus it could be a far better bargain, to invest the money, which usually is spent on provisional measures, in the procurement of a high capacity soil block press.)

In view of the vast choice of machines available, it seems difficult to decide which one should be bought. If there is not enough money to buy expensive equipment, the choice is smaller and the decision much easier. But generally, the following points need to be considered, especially when the available resources allow for the purchase of higher priced equipment.

Auxiliary devices: Does the soil block press incorporate all the functions required for block production, or does additional equipment (crushing machine, sieve, mixer, measuring scoop, etc.) have to be procured? Consideration should not only be given to the costs, but also to the required storage and working space, as well as transports.

Material quality: Even though the compressive strength of blocks, in most cases, need not be high – the quality of CTNVA-Ram blocks is structurally quite adequate – it is important to note, that weakly compacted blocks are porous and easily absorb moisture, the course surface is difficult to keep clean and can be abraded easily, while cracks and cavities are likely to harbour vermin. Such surfaces usually need some protective coating, which naturally incurs additional costs. Denser blocks, which have been compacted with pressures upwards of 7 or 8 N/mm², can remain untreated, offer no refuge to insects, and can do with only small quantities of binder (ie cement, or lime). Alternatively, in case of low compaction pressures, a chemical additive (eg asphalt-based) can provide the necessary moisture resistance. However, such additives do not increase the compressive strength of the block, and it should also be remembered, that these substances invariably have to be imported, thus making the production of blocks more expensive and dependent on supplies.

Block format: Small sizes require a greater number of blocks per cubic metre than larger ones, so the overall effort needed to produce small blocks is greater than that of making large ones. Furthermore, masonry constructions with small bricks require more mortar, since the proportion of joints is higher. Therefore, the best block format is determined by the maximum weight and size that can be easily handled by a single person.

Manual work: It is generally accepted that 8 hours represent a working day. Considering that a manually operated press requires the person, who pulls or pushes down the lever, to exert a great force, up to about twice every minute, it becomes clear that gradual exhaustion causes diminishing performance and lower quality blocks. In development projects, this work is frequently done by unskilled workers, who commonly are not blessed with regular or nourishing meals, and thus possess less strength and stamina. In view of this, every means of facilitating manual operations should be given priority, if the financial resources permit. If a motor-driven machine is chosen, it would be advantageous to also be able to operate it manually, in case of short supply of energy, or failure of the motor.
The soil block presses, of which detailed information and illustrations (from manufacturers' pamphlets, publications and other sources) are given in this annex, correspond to those listed in section 3.2.1. The selection of material presented here was determined by the choice of available documents and their suitability for reproduction. Some machines are well documented, while the information on others is, in some cases, totally inadequate. Thus, the number of pages of information on the respective machines only indicates the availability of suitable material, but has nothing to do with the quality or appropriateness of the machines.

The aim of this compilation is to enhance the usefulness of the document, by helping the user to understand the rather abstract list in section 3.2 better. Also, as a kind of catalogue, potential soil block builders may obtain sufficient information from a single source, rather than having to conduct costly and time-consuming correspondence with various manufacturers. Although a final document is planned later, it is hoped that this study can be put to immediate use, in spreading the information on soil block presses, especially through the question and answer services of the respective appropriate technology centres. The binding of this document was thus chosen to facilitate photocopying.

The machines included here are:

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<td>EARTH BRICK MACHINE</td>
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The CINVA-Ram Block Press is a simple, low-cost portable machine for making building blocks and tiles from common soil. The press, made entirely of steel, has a mould box in which a hand-operated piston compresses a slightly moistened mixture of soil and cement or lime.

The press was developed as a tool for small individual or mutual self-help programs. It was designed by Neri Ramirez, an engineer, at the Inter-American Housing Center (CINVA) of the Organization of American States in Bogota, Colombia, in 1952. It is still the cheapest and lightest machine available and has been copied and modified several thousand times in all parts of the world.

TECHNICAL DETAILS

- Weight: 63 kg (140 lbs.)
- Height and base width: 742 x 744 mm (10" x 16" x 26")
- Application force of lever: 36 kg (80 lbs.)
- Bearing Strength: 1.4-3.5 N/mm² (Fully cured blocks) (200-500 psi)
- Size of block: 9 x 14 x 29 cm (3.5 x 5.5 x 11.5")
- Size of tile: 5 x 14 x 29 cm (1.5 x 5.5 x 11.5")
- Average number of blocks or tiles that can be made by two people per day: 300-500
- Average number of blocks needed for a two-room house: 2500
- Average number of blocks per 50 kg of cement: 150

REFERENCES

OPERATING THE PRESS

In order to make good compressed earth blocks and tiles, enough earth mix must be loaded into the mold box to require a hard pull on the handle. Make a few test blocks and tiles to determine the quantity of your earth mix which must be loaded into the press to give you this adequate hard pull.

There are three basic operations in making the compressed earth blocks or tiles:
1. Loading the mold box.
2. Compressing the mix.
3. Filling the finished product.

DETAILED MOVEMENTS

1. Place the handle in the rest position and open the mold box by swinging the cover horizontally until its stop is reached; then fill the mold box with the prepared earth.

2. Close the mold box, skimming off excess earth, and bring the handle to the vertical position, then release the latch.

3. Pull down the handle until it is parallel with the ground. This applies the necessary pressure to form the block. If the mold box is properly filled, this should result in a "hard pull".

4. Return the handle to the original rest position, swing cover back and open the mold box.

5. Pull down on the handle in the opposite direction until it is parallel with the ground. This ejects the block.

6a. Removing blocks from the press: Place hands flat at the ends of the block, being careful not to damage the corners or edges and then gently lift the block from the mold box. Place on edge at the curing site.

6b. Removing tiles from the press: Place one flat hand on top of the tile. Keeping the tile and wooden insert together, slide both off the mold box until the other hand can be placed beneath the insert. Place both on edge at the curing site and then gently separate the insert from the tile.

ADJUSTING THE PISTON

In full ejection position the piston head should be level with top of mold box. Continued use of the press or accidental jarring may loosen the two guide angles and force them out of vertical alignment, producing blocks having unequal end dimensions. To correct this, move guide angles by regulating adjustment bolts.

MAINTENANCE AND REPAIR

The machine must not be overloaded. This happens when too much soil is placed in the mold, and another man is asked to "give a hand" with compacting. Never allow two men on the handle, either for compacting or ejecting the block.

All moving parts and wearing parts (trolleys, pins, pressure plate, guide plates, piston cylinder, bearings and supports of axles) should be well lubricated every 4 to 8 hours with heavy oil or grease to insure smooth operation and cut down on wear.

The pins which secure the pivot shafts, compression yoke and rollers should be replaced when broken by the largest nails available, because the pins will last longer than the average cotter pin. If C-ring replacements are not available, broken C-rings can be replaced by wrapping a piece of wire in the groove.

The inside of the box and the under surface of the cover must be kept clean. Breaks and cracks are caused by loose or incorrectly adjusted guide plates.

Tapering is caused by incorrectly adjusted guide plates.

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Compiled by:
Kiran Mukerji, Consultant Architect
Starnberg/FRG
January 1986
People in both industrialized and developing countries have long been waiting for an improved version of the "Chiva Ram" brick press to come onto the market. That product has arrived with the introduction of the "Meili-60" manual soil brick/block press.

The 20 tons manual press for the economic production of earth building bricks and blocks of any size offers:
- Rugged design
- Troublefree operation
- Unsurpassed economy
- High performance
- Minimum investment
- Maintenance free

The "Meili-60" press operates according to the principle of the off-center press utilizing the maximum leverage effect possible in the final phase of the pressing process. The machine easily achieves a pressing power of 20 tons, corresponding to a pressure of more than 50 kg/cm² – sufficient to achieve the desired brick density.

Technical information:
- Soil brick dimension: 250 x 125 x 80 mm
- Pressing power on lever: ca. 20 tons
- Pressing power on brick: ca. 50 kg/cm²
- Density degree: 118
- Output per hour: 60 to 120 bricks plus

Other sizes bricks can be manufactured according to your specifications. Manufacturer reserves right to change technical specifications.

Offers for manufacturing the "Meili-60" manual soil brick/block press under license in various countries will be considered. Manufacturer reserves the right to change technical specifications.
mark klein
planning design and supply
of light steel framed modular buildings and components
Block Production Sequence with the MARO Block Press
1. MOULE EN ACIER SPÉCIAL POLI
2. BIELLES EN ACIER MONTÉES SUR BAGUES "GLYCODUR" SANS GRAISSAGE
3. MÉCANISME DE PASSAGE ET D'ÉVACUATION + COUVERCLE EN ACIER 1/2 DUR
4. SUPPORT DE COUVERCLE EN FER PLAT
5. STABILISATEUR EN FER CORNITRE DE 50 MM DEMONTABLE PAR 4 VIS
6. LEVIER EN TUBE RENFORCE Ø 40 MM
7. GUIDAGE PLATEAU INFÉRIEUR EN TUBE CARRE DE 80 MM DE CÔTE
8. POIGNÉES DE MANUTENTION COUVERCLE EN ACIER ROND Ø 18 MM
PRESSE MANUELLE A TERRE

double Système

MANUAL EARTH PRESS
DOUBLE SYSTEM

CONCEPTION BASED ON RESEARCH INTO THE PAST
EXPERIMENTATION IN THE PRESENT

- Simple and resistant mechanism,
- Minimal of physical effort,
- Compact design, Case size $0.95 \times 0.52 \times 0.33 = 0.170$ m$^3$.
  Weight (ready for use): 85 Kg.
- Double (surplus) compression
  Earth + 2% cement = 25 Kg./cm$^2$.
- Output (loading and unloading excluded): 15 seconds for
  a block of $29 \times 14.5 \times 11$ cm.
- Full range of technical services: assistance, analyse,
  climatic protection, etc.

C.T.B.I. "CONSTRUCTION TERRE BOIS INTERNATIONAL"
Z.I. rue du Grand Pré 51140 HUIZON (FRANCE)
S.A. au capital de 250 000 Francs N° SIRET 330.472.101.00014
TEL. 26.02.90.02 TELEX: DATA350 850 560 F
Double manual system (DSM)

a) DESCRIPTION:
Simple & resistant equipment made of current metallurgical raw materials.

Simple: in its original conception
- 1 stand
- 1 magazine press
- movable floor for ejection
- one lever for pressing and ejection

Simple: to assemble
- strain borne by soldered parts
- bolting, and mechanical soldering, for removable parts

Resistant: by the quality of materials used, in its basic working principle.

b) OPERATING:
Stage 1 - Filling of Frame:
The frame is filled by hand using a shovel or bucket. The quantity of earth required is indicated by the rest position of the adjustable cover plate.

Stage 2 - Closing of Frame:
To close frame, simply slide the cover plate forward over the opening.

Stage 3 - Pressing by Lower Plate:
Pressure is applied in two stages. First the lower part is raised by bringing the lever from a vertical into a horizontal position. This requires very little effort.

Stage 4 - Pressing by Upper Plate:
As soon as the lower plate stops rising, the upper plate is automatically lowered a short way, thus multiplying satisfactorily the final pressure exerted.

Stage 5 - Opening of Frame:
The frame is opened by sliding the cover plate back across the opening.

Stage 6 - Ejection:
The earth block is ejected by lowering the lever from a vertical to a horizontal position. This is a simple operation that requires no change in the position of the worker in relation to the machine.

Then back to Stage 1 by bringing the lever back into the vertical position.

c) PHYSICAL CHARACTERISTICS:
- Weight: 85 Kg.
- Height: 1,02 m without lever/2,25 m with removable lever.
- Length: 0,45 m without cover rest or stabilizer.
- 1,15 m with cover rest and stabilizer.
- Breadth: 0,28 m
- Average strain perpendicular to lever during pressing operation: 30 daN
- Force exerted on block at end of pressing operation: 15 t.

d) TECHNICAL CHARACTERISTICS:
Simple and resistant mechanism.

e) OUTPUT:
- Blocks of 29 X 14,5 X 10,5
- Weight: 10 Kg.
- Output varying with:
  - the product required
  - the number of workers involved
  - the preparation for different types of earth
- Average output 50 - 90 earth blocks/hour, with 3 workers.
  (preparation 1, press 1, ejection 1).

f) PACKAGING - TRANSPORT - WEIGHT:
Stand, lever and sliding cover plate are removable for easy transport.
All items are packed in a wooden box suitable for different types of transport as required.
Size of packing: 0,95 X 0,53 X 0,33, i.e. 0,170 m³; weight of 105 Kgs.
All types of transport are possible: plane, ship, truck (even small van, or boot of private vehicle); animal transport for African countries.

g) COSTS:
Depend on destination. An estimate will be given based on distance and importance of order.
This equipment is mainly designed for developing countries.
Packing, transport and prices:

The dimensions of a brick-press are as followed:
- seaworth packed: 940 x 510 x 290 mm
- unpacked: 700 x 450 x 260 mm

For daily prices you can better consult the price-list, which is freely available at UNATA secretariat.

For general transport modalities: look at the last page of this catalogue.
Which are the advantages of the UNATA brick-press?

With the UNATA brick-press, it is possible to make building-bricks with the local earth. Such stones were already made in former times. They were called "adobes". The fundamental difference between the adobes and our building-stones, is that the adobes had to be pressed down by hand in wooden forms, while in our brick-press, a metal form is used, so that our stones are pressed under high pressure.

Using pressed stones of earth has following advantages:

You can press the stones at the same place wherever you want to build.
The structure of the local earth is often suitable to make building-stones.
The volume of water is minimal, so it is possible to build during the season. These circumstances give you the possibility to reduce production-costs and time considerably.

Working with the brick-press does not require special qualifications. When it is carefully used, it can be passed on to other people and communities (for instance by a sort of renting system). So individuals as well as communities can use the brick-press without high expenses. Houses can be constructed more easily because of the regular form of the stones.

These stones also better resist the tropical circumstances than the traditional adobes.

Advantages of the more perfectionated presses:

The UNATA brick-press has a low weight: 80 kg. It is easily transportable from one place to another, even when no carriages are available. Provided with the fastening beam, which makes the press more stable, it can be moved over long distance by four people without a problem.

The low price makes it purchasable for persons, communities, cooperations and little undertakings, who don't have much financial means. The UNATA brick-press is suitable for building dwellings, buildings for agriculture and buildings for public use.
How to use the brick-press?

It is a simple machine, operated by hand. Maybe it's good to make a team, that's responsible for digging, pulverizing and pressing the stones. If necessary one can add a stabilizer (cement or mortar or a decoction of banana-leaves).

The brick-press has to be placed on a fastening-beam and a flat underground. One opens the cover and fills the form with earth, which is pulverized and sifted. One can add a stabilizer (5% mortar, cement or a decoction of banana leaves), but this is not indispensable.

Close the cover and the stone is pressed by one person.

Production capacity.

Depending on the number of workers, for instance 2 to 6, it is possible to press 20 to 60 bricks an hour.

The dimensions of the brick are: 29 x 14 x 9 cm.

Heckoning with these dimensions, one needs about 33 bricks a square meter to build for instance a dividing-wall.

The building of a little house in Rwanda.

A water-level, a rectangle and a string were sufficient.
DIRT-CHEAP BUILDING BRICKS

by NIC SNYMAN

With this machine, soil excavated on a building site can be used to make the bricks you're going to need to erect the building.

A NEW concept in hand-operated brick presses has been developed by Mr Harold Jesson, of Port Elizabeth. The beauty of this press is that it uses mainly soil that is available anywhere at virtually no cost, and most subsoils, beneath the layer containing organic material, are suitable for providing the box aggregate.

The press is designed to bring what is believed to be a greater degree of pressure on to the mixture by manual means than has been possible before.

A production rate of about 1 200 bricks a day could be expected from three inexperienced operators from each machine. Much more could be expected by paying a production bonus.

- Is very mobile and completely self-stabilized on almost any surface without need for elevated rigging.
- Incorporates a tilting hopper hinged to the machine which flips on and off the pressure box in two seconds. This is an important feature because it prevents waste by overfilling.
- The lid opens and closes automatically at precisely the right moment.
- Converts about 70 kg of musgue power on the two 6 kg handles to about 800 kg or more on the brick mixture.
- A "rear" on the machine ensures that all bricks are 73 mm thick — brick size 220 x 110 x 78 mm.
- One man operating the handles can compress and extract the brick in about six seconds, a second man removes the brick and refills in not much longer, the third dresses the mix in constant supply.

Mr Jesson demonstrating his soil-cement brick-making machine with a capacity of 1 200 bricks a day.

The stability is built up by a lattice work of cross-granulation and density.

These important factors — cement content, moisture content and degree of density — vary with the type of soil and can be determined only by experiment. Enough cement must be added to produce satisfactory hardening. Start with say 10 parts soil to one part cement with enough moisture to pack the grains well and leave enough air as possible, the mix must be given the maximum density — Portland Cement Institute.

The strength needed is seldom less than 5 to 6 Mpa — in many cases much more than this.

This press could also be a boon in the homestead areas — like the Okavango, which is short of good building sand and has an over-abundance of labour and serious housing problems.

The Jesson brick press is quick and easy to operate. To do this simply make a satisfactory trail brick, extract it up into a smooth empty paint tin or similar container depress down and level off, then cut off the top of the paint tin level with the top of the mixture. You now have a gauge box suitable for that particular mixture.

Extract the brick in about six seconds, a second man removes the brick and refills in not much longer, the third dresses the mix in constant supply.

Extract the brick in about six seconds, a second man replaces the brick and refills in not much longer, the third dresses the mix in constant supply.

To reap maximum benefit from this ingenious press, a filter-gauge box should be made to enclose the same amount of mix is tipped into the box every time. This will increase production speed.

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PRESSE A PARPAINGS DE TERRE
BREVETÉE - S.G.D.G.

Notre presse à parpaing permet d'obtenir des parpaings de terre extrêmement compactés de 5 cm, 10 cm ou 15 cm d'épaisseur. Cette petite machine, étudiée et réalisée dans nos ateliers présente l'avantage d'être très maniable; sa robustesse lui garantit un long usage sans aucun entretien.

RENDEMENT DE LA PRESSE : deux employés peuvent moler facilement 500 blocs de terre dans une journée normale de travail,

MOULES À MAIN : nous fabriquons des moules à mains pour parpaings de ciment.

Moules de 20 cm pleins
15 cm creux
10 cm creux
ainsi que des moules «clastrats» dit «boite aux lettres».

MÉCANIQUE - FONDERIE - FROID
Production Ivoirienne
TAPA
COMPONENTES DE LA MAQUINA BLOQUERA C.T.A

PLATAFORMA DE SOPORTE DE MATRICES Y COMPRESION

PLANTA DE LA PLATAFORMA INVERTIDA

GUIAS REGULABLES

CUCHILLA

VISTA LATERAL

VISTA FRONTAL
CTA Block Press

Placing the dividers before filling the moulds.

Position of lever just before compaction phase.

On-site brick production with the CTA Press, for a church project in Paraguay.

Pulling out the dividers after compaction.

Removal of the ejected bricks.

Laying out the fresh bricks for drying.
FABRIQUEZ VOUS-MÊME VOS BRIQUES EN TERRE COMPRESSÉE

(Produce yourself compressed soil blocks)

- Investissement minimum. (Low cost).
- Manipulation simple et rapide. (Easy and quick to handle).
- Bonne qualité des briques. (Prime quality blocks).

Une équipe pluridisciplinaire, une expérience de plusieurs années, plus de cinquante réalisations de terre : le CENTRE DE TERRE vous aide à construire.

CARACTERISTIQUES

- Compression à double effet (Dual compaction action)
- Force maximale : 8 tonnes (Maximal strength)
- Pression moyenne : 15 à 20 bars (Mean pressure)
- Production : 20 à 50 briques/heure (Output)
- Poids de la presse : 100 kgs (Press weight)
- Dimensions minimales : (Minimal dimensions meters)
  L 0,40 x l 0,35 x h 1,00 (m)
- Caractéristiques des briques : (Blocks characteristics)
  - longueur (length) : 29 cm
  - largeur (width) : 14 cm
  - épaisseur (Thickness) : 9 cm
  - Poids (Weight) = 7 kgs.

UTILISATION

(USE)

- Utiliser une terre argilo-sableuse légèrement humidifiée et additionnée éventuellement de ciment ou de chaux (4 à 5 %) bien malaxée. (Use clayed sand soil lightly moistened and eventually add lime or cement 4-5 % well mixed).
- Fixer la presse horizontalement sur une longue pièce de bois. (Fix tightly the press on a long beam).
- Le levier est manipulé par une seule personne. (The lever is handled by one person of the same time).
- Les briques sont stockées à l'abri pendant 15 jours avant leur utilisation. (Shelter the blocks during 15 days before use).
- Nettoyer et graisser la presse après chaque utilisation. (Clean and oil the press after every use).

FONCTIONNEMENT

(WORKING PROCESS)

1. Remplir le moule (Fill up the mould)
2. Rabattre le couvercle (Shut down the cover)
3. Compression (Compaction)
4. Ejecter le bloc (Block ejection)
5. Retour en position de remplissage (Return to the fillin position)
6. Fixer la presse horizontalement sur une longue pièce de bois. (Fix tightly the press on a long beam).
Le rouleau GEO 50 est entièrement démontable.
L'entretien et la maintenance peuvent être ainsi facilement assurés avec un outillage simple.

1. Houlte en plaques d'acier épais soudées.
2. Plateau inférieur : plaque d'acier épais rectangulaire fixe sur support tube potelet 50 mm et guidé par roulements étanches sur profils dorinères internes.
4. Arceau en for plat cintré.
5. Sabot de transmission des efforts : plaque d'acier épais.
6. Chemin de roulement acier par plat articulé par ancre à 0° d'alignement.
7. Levier tube potelet 60 mm.
8. Crochet de charge articulé fixé par boulon-terreau, plat plat.
9. Support stabilisateur amovible compris 50/30 mm fixé par 4 boulons dorinères.
10. Rallonges levier amovibles, tubes duvret semblables.
11. Roulements d'appui, étanches double face SUR support acier comprimé Ø 30 mm.
12. Articulation sabot - plateau intérieur acier comprimé Ø 30 mm sur palier graissé.
13. Système de suspension de l'ensemble couvercle - chemin de roulement à articulation et ressorts de rappel.
**AIM**

Improvement of:

- Productivity of hand press compared with that of the CINVA-Ram.
- Quality of end product:
  a. Better consistency of compressive strength values through more accurate filling of mould (1% difference in filling can lead to 2% variation in strength)
  b. Pressing on both sides in order to achieve better, homogenous compaction on both faces of the block.

**CONCEPT**

- Hand press.
- Mobility on wheels.
- Compaction through toggle lever (like the CINVA-Ram)
- Mechanism under the mould (unlike CINVA-Ram)
- Lid attached to cam (unlike the CINVA-Ram), such that it is pulled down during compaction, making the top surface compacter.
- Filling and measurement of the soil mix in a separate unit, which is adjustable to get optimum quantities, depending on the type of soil used.
- Possibility of making perforated blocks by means of inserts. (Sulzer: This proved to be a fallacy!)
- Compression and extraction following each other in the same movement of lever.

**DISADVANTAGES** (according to H D Sulzer)

- Price approx. 2000.- sFr, if manufactured in Switzerland (approx. 1200.- sFr, if made in a low-wage country).
- Weight approx. 200 kg (3 x CINVA-Ram).
- Hand press: difficult to motorize.
- Higher productivity (4 blocks/min) is illusory, since a team of 2-3 men cannot stand the effort for an 8-hour day.
- Pressing is the best way to produce blocks: adobe is superior.

However, right solution for soil-cement, or other pulverulent stabilizer. Especially suitable when the area for drying is small (pressed blocks can be stacked immediately on removal from the press).
Le matériel consiste en un rotamètre (module) qui contrôle le débit de chaîne ou de fluide.

UTILISATION

Le matériel est utilisé en fonctionnement du modèle de 1000 kg/m².

DESCRIPTION

Le matériel est constitué d'un module de contrôle de débit, d'un module de mesure et d'un module de calcul.

CARACTÉRISTIQUES

- Module de contrôle : ajustement, réglage, compensation des pertes de charge
- Module de mesure : enregistrement des données, analyse des courbes
- Module de calcul : traitement des données, génération des rapports
No foundation required.

The machine can be transported by bullock cart to the remotest village.

Hand operated. No engine, no motor.

Simple to operate. Employs unskilled labour.

With “Soil on Site” there will be no transport delays, no breakage, no waste and with stabilised-sol no burning.

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The Elson Lesson

- Use of local material: One of the cheapest and most readily available building materials is common earth. It has been used for thousands of years for floors and walls in all parts of the world. In India earth is widely used as a building material even to-day, especially in areas having dry climates. Adobe building blocks, stones set in mud, sundried bricks and the pisé-de-terre methods persist to this day.

- The problem: Traditionally used, earth construction suffers from serious defects, viz., poor durability when exposed to weathering, movement of walls due to moisture and temperature changes, impermeance of protective coatings such as country plaster and oil, unhygienic dusty floors.

- Stabilisation: Many of the above drawbacks can be overcome by adding a small quantity of cement (or other stabilisers such as lime, bitumen, curd, etc.), selecting soil and applying mechanicalpressure to produce well-graded, true-shape building blocks. Cement is a binder of the highest efficiency and bettered by far the straw and animal wastes used in conventional rural mud houses.

- Type of soil: Nearly 80% of the earth's soil is clayey. Use of local material: One of the cheapest ways bodily by picking off the clay content to import packing or lump forming in the sand portion of such a soil can be differentiated and the mix thoroughly turned over as before. A handful of the mix is taken to see that freshly made blocks are now tightly pressed in the hand to check if they have been damaged on the corners and surface. If necessary, the mould shall not be left unutilised for more than one hour. On no account should mud be formed. Once such a mould has hardened sufficiently to permit handling, the quantity of cement to be used in the mould should be calculated to obtain blocks of uniform quality and resistance, special care must be taken to fill the machine mould each time, with the same amount of mix. A pair of triangular scoops are provided for each corresponding mould size. The scoop is overfilled with the ready-to-use mix and the material above the inclined plane of the scoop is spread out with a stroke of the palm. The quantity, now remaining in the scoop is deposited into the mould. (Alternatively weigh batching of the ready-mix using a simple springBalance scale with a suspended metal scoop is most accurate. The lid is slammed and the clamp applied. The operator on the lever now swings back to complete the "pull-down". The box must be filled with a quantity of mix sufficient to require an evident effort by the operators when they pull down. If the lever is improperly filled if the lever offers no resistance and overfilled it the operators cannot bring the lever down even with some extra effort. In the latter case the mould must be refill ed, as any undue jarring effort on the lever to accomplish the pull-down will damage the machine's mechanism and the wing the operators. Once the pull-down is completed, the clamp is released and on further pressing down of the lever the block is ejected clear off the top of the mould. The block is picked off and carried to the stacking and curing place.

- Lubrication of the mould walls will have an occasional treatment of an oil-water emulsion.

- Curing: The curing process is of great importance and if not done correctly it may ruin the results of the previous work. The dampness of the blocks must be eliminated slowly and regularly during manufacture. This process must be carried out under cover protected from the direct incidence of sun and rain. Special care must be taken to see that freshly made blocks are not exposed to hot blasts of wind. Curing can be done with a shed or in sunshine. The rows of blocks can be covered with large leaves, wet gunny bags, etc., or placed in a cool damp place for about eight days. It is essential to dry the blocks fully and allow their initial shrinkage to be completed prior to placing in the wall.

- Charged Blocks: The amount of cement to be used as abatement will depend upon the type of soil and the end use of the block. Generally with a good sandy soil blocks containing as little as 5% cement (i.e. 20 : 1 mix) are adequate for constructing single story buildings. The proportion can be increased to 8%.

- Rain bearing and external walls can be of a richer proportion of cement compared to internal partition walls. Walls upon the general working heights in a house may have a higher admixture of cement there to change to a lower proportion. Pressure tests: must be thin and not too rich in cement. Sand-lime cement plasters applied thinly will work much better. Generally the blocks need no other finish than two coats of white wash. Mortar for mortars to join the same soil used in the manufacture of the blocks is recommended, but mixed with cement and lime. A good proportion is one cement : two lime : nine earth.

- Use of Lime: Good results can also be obtained with lime and working with soils of high clay content. Lime used in conjunction with cement (in the same manner also reduces the total quantity of cement required) affords better impermeability to the resulting blocks. The advice of a soil testing laboratory in such cases is worth all the effort. Curing time is longer.

- Floor tiles of size 12" x 6" x 1" can also be produced. Blocking is the formation of a soil cement mix of richer proportion. The objective of this is to make the tiles more resistant to the wear to which they are subjected. Still better results can be obtained, if a fine layer of sand and cement (2 : 1) is spread on the bottom of the mould box before filling it with the soil-cement mix. This layer can also be mixed with mineral colours.
Une presse à briques au travail : la "Blockmaster"

Tout d'abord, une bonne dose.

Le remplissage terminé, le couvercle est fermé et verrouillé.

Le bras dans le moule et comprimant la terre.

Montez le piston. Hors le couvercle est déverrouillé et ouvert.

Et le bras abaissé au maximum de sa course fait remonter la brique.

Et voilà une magnifique brique de terre compressée qui, une fois séchée, servira peut-être à la construction de l'un de ces splendides bonbalions...
Plate 1. The Astram

Plate 2. Filling the Astram mould with soil

Plate 3. Soil Block Compaction

Plate 4. Ejection of soil block

Developed at ASTRA
Centre for the Application of Science
and Technology to Rural Areas
Indian Institute of Science
Bangalore 560 012 / INDIA

FIG. 1. ASTRAM

Manufacturer:
M/S AeroWeld Industries
B9, HAL Industrial Estate
Bangalore / INDIA
often on the type of clay mineral in the soil. A direct attempt at block compaction in a machine will reveal the feasibility or otherwise of the block manufacture. A soil with high clay content will lead to a block with lots of cracks on drying. On the other hand, block making with highly sandy soil becomes virtually impossible due to the very large forces needed by sandy soils during compaction.

The presence of clay in a soil can be easily recognised by its tendency to form lumps in the dry condition. A good amount of clay is indicated when a dry soil lump cannot be easily crushed in the hand. The presence of coarse sand particles can be ascertained by squeezing the wet soil in the hand. If the soil is too clayey it can be improved by mixing sand or sandy soil. However, highly clayey soils can pose problems while mixing. The two loams and lateritic soils of South India are generally suitable for compacted soil blocks.

It would be ideal if the soil at the site of the building can be used for the making of the blocks. This would completely eliminate the need to transport the blocks. In the event of the local soil not being satisfactory for block making, one could continue mixing it with a better soil transported from a different spot. As a rough guide to the quantities of soil needed, it may be assumed that a 25 square metre (plinth area) house will need about 19 cubic metres of loose soil. This much of soil can be obtained by digging to a depth of 15 cms over a 10 m x 13 m site.

3. THE ASTRAM (Plate-1)

Figure 1 shows the end elevation of the ASTRAM. The machine consists essentially of (1) a mould to receive the soil, (2) a toggle lever mechanism to compact the soil and (3) a frame to support the mould and the toggle lever. The mould is provided with a stifferened plate lid which can be locked down after closing with a eccentric locking mechanism. The mould is interchangeable and currently moulds of two sizes are being used with the ASTRAM. The two moulds can produce blocks of sizes 30 cms x 14.5 cms x 10 cms, and 30 cms x 23 cms x 10 cms, respectively. The frame of the ram can also easily accept moulds of other sizes, if needed. Figure 1b shows the scoop which is to be used in measuring out the right amount of soil. Moulds of different sizes must be used with corresponding scoops. The ram with the smaller mould weighs 107 kg.

A. SOIL BLOCK COMPACTING IN THE ASTRAM

The following steps are to be followed in compacting soil blocks in the ASTRAM.

(i) Preparation of the soil:

It is desirable to remove roots and large pieces of stones (> 1 cm in size) from the soil before producing the block. The compaction of the soil in the machine must be carried out at a moisture content which is as close to the optimum moisture content as possible. It is not essential to carry out an 'optimum moisture content measurement' for every block making operation. A simple field test can be used to determine whether the moisture content is right or not. When the moisture content is optimum, the soil can be easily pressed into a ball in the hand and it hardly sticks to the palm in the process. For a majority of the soils, this moisture content varies between 12% to 16%. The requisite amount of water is to be added to the soil with a fine sprinkler and the soil is to be thoroughly mixed by hand.

(ii) Soil block making in the ram:

(a) The lid of the mould is first opened completely and the compaction lever is raised to a vertical position (Plate-2). The lever must be held as close to the mould as possible. The interior of the mould may be initially smeared with used lubricating oil or any other choice oil (This may be repeated once after 5 or 6 blocks are made). The thin base plate of the ram is now placed at the bottom of the mould. The properly sized soil is now measured out in the ancoop and pushed into the mould. The sharp end of the scoop must be thrust deep into the mould and the soil emptied by an up and down motion.
(b) The lid of the mould is now closed with a slight impact and is held down by the eccentric looking arrangement.

(c) The compaction is now carried out by pressing the lever down till it reaches the stopper (Plate-3). During this operation, the base of the mould moves up by 6 cm.

(d) The lid is now opened by lifting the block lever. The compaction lever is pushed further down through an angle of about 20°, forcing the compacted mud block out of the mould (Plate-4). The block may now be removed by sliding it horizontally along with the base plate. The lever must be held down while the block is removed from the machine.

(iii) The stacking of blocks:

The blocks are to be stacked for drying/curing in a shaded area on level ground. The area used for stacking must also be as close to the machine as possible. The blocks may be stacked one above the other up to five layers.

(iv) Hints for troubleshooting in compaction:

(a) In a satisfactory compaction, some resistance will be felt towards the completion of the stroke. In case, the compaction is too easy, it is possible that too little soil was used and the resulting density and strength will be on the low side. A little extra soil may be fed into the mould so that increased density and strength will be achieved.

(b) Sometimes the compaction stroke cannot be completed due to high resistance. It is possible that one of the following is happening:

(i) The soil is too dry.

(ii) The soil is too wet.

(iii) The amount of moisture in the soil is inadequate.

The situation in cases 1 and 2 can be remedied by using lesser soil and more moisture respectively. Situation 3 needs a mixing of more clayey soil to reduce compactive effort.

(c) The weight or the density of the block is generally a good index of its quality. The 30 x 14.5 x 10 cm block will generally weigh 8.5 kg or more when it is just out of the machine. Similarly the 30 x 23 x 10 cm block will weigh 13 kg or more. A block which is very much lighter must be rejected. The block with low density can often be usually recognised by its rough and porous surface texture.

(d) If the moisture is too much the soil will tend to stick to the sides of the mould. The corners will appear to be out of shape.

(a) The locking lever of the lid can sometimes get jammed. This can happen especially if excess soil has been fed into the mould. The lid should not be forced upon in such cases. The locking bolt of the lid must be loosened with a spanner to release the locking pressure. The bolt must be brought back to the original position before the next block is made.

5. STABILISED SOIL BLOCKS

It is generally preferable to make compacted blocks out of stabilised soils for exterior use. This is not to discredit the fine performance of mud walls which is often observed in many rural areas. The soil properties which contribute to the durability of mud walls have not yet been clearly understood. It is hence desirable to be more circumspect about the performance of unstabilised soil blocks until more detailed information about soil behaviour under varying climatic situations is available.
El bloque de tierra prensado es una técnica intermedia entre el adobe y el tapial. Una de sus ventajas es que se pueden hacer bloques en blanco y negro, porque los podemos almacenar inmediatamente dentro de un local, colocándolos hasta en dos hiladas. Los bloques secan en una semana, al sol y al aire libre, y en un mes, dentro de una casa. Tienen que estar completamente secos antes de usarlos.

Actualmente, CRATERRE está construyendo varias versiones de prensas CRATERRE ha diseñado y construido en 1980 en los talleres del observatorio de Huayacan (Instituto Geofísico del Perú) un primer prototipo de prensa fabricado con materiales comprados en el mercado local.

### Como producir los bloques con la prensa CRATERRE

- **Preparación de la tierra**: Es tan fácil como en el tapial. Pero, hay que desmineralizar la tierra y hacer los probadores. Mejor todavía sería cerrar la tierra con una malla de media pulgada.

- **Verificación de la humedad de la tierra**: la cantidad de agua en la tierra debe ser muy exacta. Debe ser un poco húmeda. El control preciso de la humedad está descrito en la página del tapial.

- **Moldeo**: se lleva la tierra a la prensa por montones, para que el hombre que moldea tenga siempre tierra a la mano. En el fondo del molde se coloca una planchita de triplay.

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Con este sistema se puede producir 120 bloques de 28 x 28 x 9 cm. cada hora. El bloque de tierra prensada es tarduro al salir de la prensa, que se puede agarrar sin problemas. Se pone de canto y se recupera la planchita de triplay para el siguiente bloque.

### Fabricación de 5,500 bloques durante la época de lluvias por los comuneros de Copal, 1981

Los bloques pueden tener formas diferentes según el uso a que se los destine.

Por ejemplo, hay una forma especial de bloque para reforzar el muro con madera. (ver albañilería armada)

Esta técnica permite estabilizar la tierra con cal, momento, sobre todo de los bloques que deben resistir más a la humedad (ver mejoramiento de la tierra)

### (Excerpt from Bibl. 35)
FICHE DESCRIPTIVE DE LA PRESSE « CRATERRE »

- Presse manuelle à pression statique.
- Moulage, ouverture automatique du couvercle et démoulage obtenu par abaissement du levier d'un mouvement continu et uniforme.
- Dimensions : presse seule : \( L = 230, I = 189; h = 124 \); Presse toute équipée : \( L = 230, I = 280, h = 124 \).
- Poids : presse seule : 230 kg, presse toute équipée : 280 kg.
- Pression de compactage : 15 à 20 \( \text{kg/cm}^2 \).
- Taux de compression : 1,67.
- Profondeur max. du moule : 160 mm.
- Course max. du plat : 70 mm.
- Dimensions des blocs : variabes - système de moules interchangeables : 1 bloc de \( 28 \times 28 \times 8 \) cm ; 1 bloc de \( 28 \times 28 \times 8 \) cm à encoches latérales ; 2 blocs de \( 28 \times 12,8 \times 8 \) cm ; 2 blocs de \( 28 \times 12,8 \times 8 \) cm à encoches latérales.
- Nombre de blocs/heure : 120 blocs de \( 28 \times 28 \times 8 \) cm.
- Volume possible compacté par jour : 3,23 m³.
- Nombre de personnes : minimum 2 à 3.
- Entretien : par graissage à coupelle.
- Accessoires : 1 table destinée au stockage de 60 kg de terre, 1 table destinée au dégagement des blocs, 10 plaquettes de contreplaque pour le transport des blocs frais par type de moule.
- Cette presse a reçu un brevet d'invention en 1982.

(Excerpt from Bibl. 06)
Soil Selection

Not all soil types are suitable for block production however "Laticite" soils with a clay content as found in the tropical and semi tropical regions of the world will generally be acceptable. It is the clay content of a soil that is most susceptible to the action of weathering and will shrink and swell with the addition of water.

This type of soil may be stabilised by the addition of a suitable agent and where the clay content is less than 30% cement would be satisfactory, for higher clay contents stabilisation with hydrated lime would be more appropriate. The addition of the stabilising agent will aid the compressive strength of the block and improve durability under weathering actions.

Compaction of a stabilised material in the Brepak with a pressure approximating 10 MN m\(^{-2}\) allows the full advantage of the stabilising agent to be realised.

Mixing

Mixing of the soil should be carried out after the excavated soil has been dried (under the sun). Crushed and sieved (20mm) at about 1:5 to 1:3 by weight may be added approx 5%, 10%. The necessary water is required to bind the mix and aid production and also to work with the stabilising agent, the amount of water is approximately 12% by weight.

In general 0.3 cu.m of mixed material will be required per hour to keep the pressing working equivalent to approximately 8 110 Kgs per block.

Final mix proportions and amount required per block is ultimately found by on site trials in actual working conditions.

Technical Statistics

1. Overall length (excluding lever arm) 790 mm
2. Overall width (excluding ejector ram lever) 510 mm
3. Overall height 760 mm
4. Lever arm extension 1500 mm
5. Press weight 190 Kgs
6. Lever arm weight 11 Kgs
7. Ejector ram lever weight 2 Kgs
8. Effective thrust on mould base plate 44 Tonnnes
9. Effective thrust on faces for ram 6.5 Tonnnes
10. Effective compaction pressure 10 MN m\(^{-2}\)
11. Average production ratio 3600 blocks/hour
12. Labour force required 5 fitters
13. Standard block size 29 x 14 x 10 cms

Shipping Specifications

- Length: 840 mm
- Width: 620 mm
- Height: 920 mm
- Approx weight: 150 Kgs
THE MULTIBLOC BREPAK BLOCK PRESS

The Multibloc Brepak machine comprises a moulding area of fixed size which, together with the supporting structural frame, forms an integral unit of all-steel construction. The complete unit should be mounted to a permanent foundation or may be used on a rigid timber baseboard.

Access to the mould area is via a top cover plate pivoting about a corner mounted locating pin. The cover plate may be moved to one side away from the mould opening. The compact design of the unit allows for ease of installation at site and may be used from site to site when mounted to the timber base.

The machine design and manufacture is specifically in keeping with the requirements for long service life with a minimum of spare parts usage and maintenance, making the unit particularly suitable for use in areas where rural development is of primary importance.

The press is fitted with a lever arm extension and mechanical linkage which provides a means of locking the top cover plate onto the mould and also allows for initial compaction of the block material within the mould area.

The Brepak block press was developed by the Overseas Division of the UK Building Research Establishment and is being produced under licence granted by this Establishment.

Once the lever arm and cover plate are secured the second stage of block compaction, up to a pressure of 10 MN/m², is applied by use of the hand operated hydraulic pump acting through a piston beneath the base plate of the mould.

Production Sequence

1. The top cover plate is moved to one side on the locating pivot to gain access to the moulding cavity. It should be ensured that the ejector ram is clear from beneath the base plate of the mould.

2. With the base plate in its lowest position within the mould the screw valve of the hydraulic pump is unscrewed by one turn. The internal surfaces of the mould area should be lightly oiled to aid the release of new blocks.

3. The mould is then manually filled with a measured quantity of the soil mixture and hand pressure is used to ensure complete filling of the mould corners. Once completely filled the top cover plate is moved across the top to its closed position.

4. The lever arm is fitted with a locking toggle which now placed in the locking position, the lever arm assembly may now be raised by approximately 90 degrees until the centre rollers enter the guide locations on the top of the mould cover. At this point the lock toggle is returned to its original position and the lever arm is pulled downward through a further 90 degrees to a horizontal position.

5. The screw valve is tightened by hand pressure so that the pump may be manually operated and the base plate is kept in place. The lever arm is pulled downward through a further 90 degrees to a horizontal position.

6. The hydraulic pressure on the piston is released and the lever arm may be returned through a full arc back to its original position.

7. The newly pressed block is exposed by sliding the top cover plate and downward pressure on the lever arm will eject the block for removal. If significant resistance is felt the stand-by ejector ram is used to free the mould base plate and operated until the block is free.

THE MULTIBLOC BREPAK BLOCK CLAMP

When securely gripped between rubber pads this simple, hand-held clamp permits the easy movement and accurate placing of cured blocks.

Block handling around the site and during laying is reduced to a single-handed operation and results in fewer breakage losses with improved productivity.
Field Trial

Overseas Development Administration (ODA) supported the first overseas field trial in Kenya of the BREPAK block making machine, the object being to evaluate this new machine under actual site working conditions. A joint research project was started in 1981 between BRE and The Housing Research and Development Unit (HRDU) of the University of Nairobi, Kenya.

The joint BRE/HRDU soil stabilisation research project consisted of three main aspects:

(i) Scientific laboratory tests to establish the proportions of materials to be used.

(ii) The on-site field trial preparation of soil mixes and production of stabilised soil blocks using the BREPAK machine.

(iii) The erection of a 50 m² demonstration structure (eventually to be used as a medical clinic) using the blocks made on-site by village labour.

The site selected for this field trial was located at Kabiro village within the Kawangware District of Nairobi and is some 10 km from Nairobi city centre. It is situated near the headquarters of HRDU and it made it possible for HRDU staff to regularly visit the site and monitor the progress.

The first aspect dealt with laboratory tests to identify suitable local soils for stabilisation and to determine the optimum moisture contents for these soils. The most economic proportion of different stabilisers for the various soils was then selected. Sample blocks were tested to obtain wet compressive strengths, resistance to moisture absorption and durability.

The local soil at Kawangware is called Murram and contains about 15% clay. Because hydrated lime is more expensive than cement in Nairobi it was decided to stabilise the Murram soil with 4% cement and good quality blocks were produced.

The field trial made use of the results of the laboratory tests. These results had to be put in a simplified form for the use of people in the field. The people were able to prepare the soil, measure the required quantities by volume, prepare the mixes by hand and produce blocks on a large scale using the BREPAK block making machine.

The cost of stabilised soil-cement blocks produced by the BREPAK machine compared favourably with conventional concrete blocks of 140 mm thickness. For example, a square metre of walling built with cement stabilised soil blocks resulted in a cost saving of about 46% of the cost of a concrete block wall.

About 3000 stabilised soil-cement blocks produced by the people were used to erect the demonstration structure of over 46 square metre floor area.
ZORA BRICK MAKING MACHINE

The advanced patented design of the "Zora" brick making machine enables the operator to transform common soil into building bricks in a few seconds.

This ready-made unit incorporates a unique double hydraulic ram, which provides the high pressures to form perfect bricks every time.

The simple "Zora" hydraulic brick making machine offered by our company produces durable building bricks and floor tiles from common soil for the construction of a wide variety of low cost housing units and farm buildings.

Using the machine eliminates the need for much more conventional building materials such as fire bricks or concrete bricks and avoids the additional cost of transporting them on site. But if the bricks produced on the machine are laid in situ, they would far superior to ordinary fire bricks, because of their density and could be used for building foundations and pillars, thus eliminating the need for concrete.

The machine can be used by unskilled personnel and is sturdy built to withstand rigorous outdoor operating conditions with little maintenance. It is supplied in three versions—with its hydraulic system powered by an electric motor, a petrol or diesel engine or with a manually operated hydraulic pump. Apart from the source of power all three models are fitted with the same basic components and moulded on identical chassis trolleys for easy movement on site.

One outstanding feature of this machine is the high pressure of 190 bar (2,800 psi) at which bricks are compressed, giving them strength of 3.5 MdaN/m² which exceeds the minimum strength requirement of 2.4 MdaN/m² for peace and stability blocks specified in B.S. 2028, resulting in a highly compact durable product with hardly any wastage during manufacture due to breakages or malformation. After the spray test, there was no erosion, and the durability of bricks formed at such pressures appears high.

High pressures form the mould box with sharp surfaces ready for plastering or painting if required and unlike concrete blocks can be immediately removed immediately after being formed and then stacked for curing without the use of a pallet. They are ready for use after curing period of about eight days and continue to cure and gain full strength for a further three weeks.

The standard mould box provided is ideal for applications of blocks measuring 250mm x 140mm x 110mm deep or tiles of the same length and width but with a varying depth. For example, three tiles each 30mm deep can be made at one time, using two 5mm thick separating boards in the mould box. Semi-hollow bricks are formed by a detachable wooden shaped block (shown below) located in the top plate of the mould box.

With a powered machine, normal operating speeds of up to 180 bricks or 450 tiles (each 30mm thick) per hour are achievable with two operators, one to fill the mould box with soil, the other to handle the hydraulic control. These rates are approximately 700-1000 bricks per hour using the manually operated machine.

Both soils are suitable for brick production, however, common "LATERIC" soils with a clay content of 30-50% are best in most parts of the world where it will generally be acceptable. However, the clay content in the soil must be accurate to the action of weathering and which will shrink and swell with the addition of water. This type of soil may be stabilised by the addition of a suitable agent, and where the clay content is less than 30%, 50% of cement would be satisfactory. For higher clay contents up to 70% of hydrated lime would be more appropriate. These stabilisations of soil will aid the compressive strength of the brick and improve durability under weathering actions.

Within the earth is one of the most important considerations and should be 12.5-15% by weight.

A simple test to determine the correct amount of moisture is to insert a ball of the soil into a wooden block and either break it in two or break it in two and leave it without any moisture, and then allow it to sit for a week or two. The soil should either be sticky, tell an amount of water is needed or hard as an indication of soil in need of water.
Block Production Sequence with the ZORA Brickmaking Machine

The ZORA Machine

Winding the starter rope

Starting the engine

Levering the piston

Filling the mould

Compressing the block

Ejecting the block

Impact test by throwing

Some finished interlocking blocks
PRESSE TERSTARAM

Machine manuelle pour le moulage de terre par pression.
Idéale pour la fabrication de briques en terre stabilisée et pour le moulage de briques de terre cuite.
Elle accepte des moules aux dimensions du client avec un maximum de 295 x 295 mm.
Le changement de moule se fait en 15 minutes.
Sa conception et sa robustesse a été étudiée spécialement pour les pays tropicaux.

Fernand PLATBROOD

ÉTUDE ET CONSTRUCTION DE MACHINES POUR LA FABRICATION DES PRODUITS EN TERRE STABILISÉE

CARACTERISTIQUES TECHNIQUES :
Course fixe du piston inférieur : 38 mm.
Rabattement du couvercle dans le moule : 15 mm.
Règlement de l'épaisseur du produit par les cales de différentes dimensions livrées avec la machine.
Poussée théorique maximum : 20 tonnes
Production journalière :
800 blocs de 295 x 140 mm.
1600 briques de 220 x 110 mm.
(12 briques à chaque opération)

PLATBROOD
20 RUE DE LA RIEZE
B 6404 CUL-DES-SARTS—COUVIN BELGIQUE
Other brickmaking machines and equipment:

**CERAMASTER** integrated and autonomous production unit for the production of (stabilised) hollow blocks consisting of a gridmill, a double shaft mixer and a hydraulic press with rotating table.

**CERAMATIC** high production mechanical or hydraulic press consisting of a 5-station rotary table powered by electrical or internal motor.

**CERAMEX** cost effective vertical extrusion unit (without vacuum) for quantity production of bricks (water lubricated wooden die)

**CERADES** impact disintegrator consisting of two counterrotating hollow drums driven by two electrical motors specially developed for use with CERAMAN and CERAMATIC presses.

**CERAMAX** double or single shaft mixers, horizontal or vertical

**CERAMILL** grid-mill for the grinding of dry clay

**CERACUT** multi-wire manual or electrical cutter.

**RGS 200** firing equipment for solid fuels in Hoffman o' tunnel kilns.

and more in general all machines for the production of bricks from the simple to the most automated installations.

**CERATEC** presents not only machinery but also a complete range of services to its customers.

We take care of the complete engineering and layout of your brickmaking plant.

The year long know how of our staff in operating brick plants and in developing brickmaking machines can be used to your advantage in developing and implementing your complete brick plant.

On demand our services perform qualified expertise and engineering for existing or planned brickmaking projects.

CERATEC also frequently organizes complete training courses in brickmaking for future production and maintenance personnel.

CERAMAN

Manual press
the CERAMAN exists in two versions:

Type S and Type H:
Type S can produce bricks with a height up to 70 mm.

Type H permits, through only a minor adjustment, to produce either products with a maximal height of 70 mm or a maximal height of 90 mm. (See table.)

**Technical data sheet:**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke length of the piston</th>
<th>kg/cm²</th>
<th>kg</th>
<th>cm²</th>
<th>S</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
<td>37</td>
<td>50</td>
<td>20</td>
<td>140×50×100</td>
<td>140×50×100</td>
</tr>
<tr>
<td>S</td>
<td>mm</td>
<td>37</td>
<td>20</td>
<td>20</td>
<td>140×50×100</td>
<td>140×50×100</td>
</tr>
<tr>
<td>H</td>
<td>mm</td>
<td>37 or 45</td>
<td>20</td>
<td>20</td>
<td>140×50×100</td>
<td>140×50×100</td>
</tr>
</tbody>
</table>

The CERAMAN is a reliable low-cost brickmaking machine you need.

The CERAMAN is a reliable low-cost brickmaking machine operated by two persons. Its main characteristics are its robustness and reliability, its extreme simplicity in use, its efficient performance and its polyvalence - just changing molds (a few minutes work), you can produce either plane or perforated bricks (of practically all sizes), paving tiles of every wanted design and even roofing tiles.

The CERAMAN press is one of the most widely-used hard-operated mechanical presses. Brick producing with the CERAMAN requires no special skills: the day, which is put in the mould by a sheared, is precompacted by closing the cover. Bricks are pressed and automatically ejected by using the two levers.

The production method used is "dry" or "cold" pressing.

The CERAMAN can produce either red bricks or the fired or compressed earth blocks stabilized with cement or another binder (information on request).

The CERAMAN can be delivered with a large variety of molds:

- brick molds: can either be a double brick or a single brick mold can be ordered for plain, lightened or perforated bricks.
- These molds can be covered with an elastic layer to permit an easy un-moulding.

A large choice of moulds:

- roofing tiles: 3 types are available: roman, marseille and flamin tiles.
- paving tiles: rectangular, square or any other design on request.
- Most of these molds are held in stock.
- Each mold can also be delivered with the mark of your firm on it!
Lé construction et la conception permet une utilisation de main-d'œuvre peu qualifiée et d'entretien aisé par des artisans locaux peu outillés.

Ce matériel répond à un usage intensif, à une utilisation maladroite, aux contraintes climatiques (chaleur, humidité et vents de sable).

Le volant d'inertie permet d'obtenir une poussée de 20 tonnes avec seulement 1 moteur électrique de 1,5 Ch.

La régulation et la commande de la presse sont obtenues par un embrayage de voiture Renault sur-dimensionné.

Un ressort puissant dans le système de poussée évite les accidents suivants : trop de terre corps durs dans la terre.

Cette presse accepte les moules dont les dimensions ne dépassent pas 40 x 30 cm (moules identiques à la Terstaram manuelle).

La production journalière est de 5.000 briques de 22 x 10,5 x 6 cm (2 briques à la fois) ou 2,000 blocs de 29,5 x 14 x 9 cm.

Version moteur essence ou diesel sur demande.

Calorpeinture de 2,22 m x 0,70 m x 1,14 m de hauteur.

Poids de la presse : 765 kg
Poids B : 925 kg.
Other brickmaking machines and equipment:

CERAMASTER integrated and autonomous production unit for the production of (stabilized) hollow blocks consisting of a grid-mill, a double-shaft mixer and a hydraulic press with rotating table.

CERAMAN versatile, low-cost manual brick press for the production of plain or perforated bricks, paving tiles and roofing tiles.

CERAMEX cost-effective, vertical extrusion unit (without vacuum) for quantity production of bricks (water-lubricated wooden die).

CERADES impact disintegrator consisting of two counterrotating hollow drums driven by two electrical motors, specially developed for use with CERAMAN and CERAMATIC presses.

CERAMAX double or single-shaft mixers, horizontal or vertical.

CERAMILL grid-mill for the grinding of dry clay.

CERACUT multi-wire manual or electrical cutter.

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and more in general all machines for the production of bricks from the simple to the most automated installations.

CERATEC presents not only machinery but also a complete range of services to its customers.

We take care of the complete engineering and on demand our services perform qualified expertise and engineering for existing or planned brickmaking projects. CERATEC also frequently organises complete training courses in brickmaking for future production and maintenance personnel.

On demand our services perform qualified expertise and engineering for existing or planned brickmaking projects. CERATEC also frequently organises complete training courses in brickmaking for future production and maintenance personnel.
the CERAMATIC

The renowned automatic brick press with the rotating 3-station table

The CERAMATIC is an all-mechanical automatic brick press with a favourable production to total cost ratio. Its main characteristics are its robustness and reliability, simplicity in use, its efficient and autonomous performance and its mobility. The CERAMATIC has an automatic rotating 3-station table: a filling station, a moulding station and a de-moulding or ejection station.

Motor power is used for the automatic pressing and ejection of the bricks and for the rotation of the table.

Bricks are produced on a continuous basis. Through "dry pressing" of the raw material: a simple and appropriate technology for the production of quality bricks.

The CERAMATIC can produce either clay bricks to be fired in a kiln or compressed earth blocks stabilised with cement or another binder.

the CERAMATIC

A movable and autonomous production unit

The CERAMATIC is originally fitted with four wheels so that it can easily be moved on the clay site or the production yard.

The CERAMATIC requires no installation costs and is immediately ready for production. It can be made autonomous through the use of the small petrol or diesel engine. The engines are easily removable.

the CERAMATIC

exists in three versions:

Type ME: powered by an electrical motor of 4 h.p. (1500 rev/min. voltage on choice).
Type MD: powered by a diesel engine of 5 h.p. (1500 rev/min. - average consumption of 6.5 liter/hour).
Type MP: powered by a petrol engine of 5 h.p. (1500 rev/min. - average consumption of 5.4 liter/hour).

With the CERAMATIC type M, bricks are pressed at high compaction pressures through a mechanical lever system. The production level is imposed mechanically, but can be determined in advance through the choice of a larger or smaller flywheel.

There exists also a hydraulic version of the standard CERAMATIC press, model Type H, especially developed for the production of bricks of greater height at even higher compaction pressures.

Technical data sheet

<table>
<thead>
<tr>
<th>Type</th>
<th>kg</th>
<th>kg/cm²</th>
<th>mm</th>
<th>mm</th>
<th>kg/hr</th>
<th>cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal compression force</td>
<td>up to 30000</td>
<td>up to 65</td>
<td>adjustable</td>
<td>60</td>
<td>140</td>
<td>156</td>
</tr>
</tbody>
</table>
| Nominal compaction pressure | Nominal stroke length of piston | Maximum stroke length of piston | Maximum filling height of mould | Maximum height of bricks | Compressi

the CERAMATIC

Simplicity in use and robustness for a guaranteed production of quality bricks.

Brick-producing with the CERAMATIC is easy and requires only two unskilled operators: one to fill the moulds and one to take the pressed bricks from the table and put them on a wheelbarrow.

The clay, which is put in the moulds with a shovel (filling station), is first automatically precompressed by a cone-shaped roll, then bricks are mechanically pressed (moulding station) and automatically ejected (de-moulding station).

In order to make the CERAMATIC a reliable production machine, all mechanical parts have been largely dimensioned; a number of securities have been provided for and all transmission gear has been concentrated in a closed casing.

Each CERAMATIC press is supplied with a set of first necessity tools and small spare parts.
Die neue Erdziegelmaschine LESCHA SBM bietet moderne Problemlösungen zur Herstellung von hochwertigen Mauersteinen aus Erden (Lehm / Laterit) ohne oder mit stabilisierenden Zusatzmitteln.

Die spezielle Vorteile bestimmen die hohe Qualität der Lehmsteine:

Dadurch ist die LESCHA SBM universell und wirtschaftlich einsetzbar. Ein breites Spektrum von Erden - tonreich bis sandreich- kann mit allen zur Stabilisierung geeigneten Zusatzmitteln verarbeitet werden und ergibt in jedem Fall Steine von bestmöglicher Qualität. Die Druckfestigkeit kann durch Zementsatz gesteigert werden. Dadurch sind auch hohe Werte für den mehrgeschossigen Hochbau erreicht. So wurde beim Beispiel mit nur 3% Zement auf das Lehmgewicht eine Druckfestigkeit nach 28 Tagen von 8 N/mm² nach DIN, entsprechend 8 Mpa oder 1160 psi nach ASTM erreicht. Durch den Zusatz von nur 1% des Additivs LESCHA FL 1 nach dreitägiger voller Wasserlagerung, was in der Baupraxis kaum vorkommt, an diesen Steinen noch eine Festigkeit von 3 N/mm² gemessen.

Die Wirtschaftlichkeit der Maschine ergibt sich aus der möglichen Einsparung von Zusatzstoffen, durch deren hochgradig homogene Ermischung und die hohe Verdichtung. Qualität und Preise der Lehmsteine werden in erster Linie durch die Qualität der Maschine beeinflusst.

Besonders wirtschaftlich ist auch, daß die Maschine sowohl stationär in einem Fabrikationsbetrieb als auch mobil an ständig wechselnden Baustellen eingesetzt werden kann. Die mögliche Leistung von bis zu 700 Steinen pro Stunde mit 4 Arbeitern ist ebenfalls ausserordentlich kostengünstig.

Der Preis der LESCHA SBM wird bei ca. DM 60.000,- liegen.

LESCHA MASCHINENFABRIK GMBH
Postfach 10 25 40, D 8900 Augsburg 1, Tel. (0921) 40 82 00, telex 53 660 lescha

Um sehr gute Wassergentlichkeit der Lehme steine - selbst bei niederem Zement ein setz - zu erreichen, wird ein Zusatz von LESCHA FL 1 empfohlen. Eine günstige Dosierung für Lehmige mit mittlerem Tongehalt ist zum Beispiel 3% Zement und 2% FL 1, jeweils vom Lehmgewicht. FL 1 ist stark wasserabweisend, mindert jedoch weder Festigkeit noch Austrocknung oder Atmungsfähigkeit der Wand und ist beständig gegen UV-Licht und mikrobielle Zersetzung. FL 1 sollte in Verbindung mit Zement oder BA verwendet werden.

Die Kosten für einen Erdziegel Größe 25 x 13 x 7,5 cm können wie folgt kalkuliert werden:

<table>
<thead>
<tr>
<th>Material</th>
<th>Preissatz pro Stein</th>
<th>DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zement DM 120,-/to</td>
<td>pro Stein DM 0,02</td>
<td></td>
</tr>
<tr>
<td>LESCHA FL 1 DM 350,-/to</td>
<td>pro Stein DM 0,02</td>
<td></td>
</tr>
<tr>
<td>Kraftstoffverbrauch 9 l/h</td>
<td>pro Stein DM 0,02</td>
<td></td>
</tr>
<tr>
<td>Lohnkosten bei 700 Steinen pro Stunde</td>
<td>pro Lohnkosten DM 0,12</td>
<td></td>
</tr>
<tr>
<td>4 Arbeitern und DM 22,-/h</td>
<td>Arbeitstage/Jahr DM 0,01</td>
<td></td>
</tr>
</tbody>
</table>

Gesamtkosten pro Stein DM 0,19

Dagegen kostet:
1 gebrannter Ziegelstein DM 0,50
1 Zementstein (Beton) DM 0,70

Technische Daten

Die Maschine besteht aus
(1) Kipptrogzwecksicherer
(2) Materialaufzug für Lehme
(3) Materialvorratsbehälter
(4) Steinpresse mit Drachtfach
(5) Motorgehäuse

Steinformat: 25 x 13 x 7,5 cm, zwei Steine pro Pressung
Leistung: Bis 700 Steine pro Stunde bei 4 Arbeitern
Mischer: Hydraulischer Preßstempel mit 110 to
Motor: 3 Zylinder-Viertakt-Dieselmotor "Deutz", mit 40 kW (54 PS) Leistung
Fahrwerk: ungefähr bis zu 40 km/h, auf Wunsch mit Federradachse und 80 km/h
Lescha - Steinpresse Typ SBM

Gewicht: ~2000 - 2500 kg

Maßstab 1:25
SOIL BRICK PLANT CLU 3000

with

produces
durable
weather-resistant
soil bricks

adobe
briques en terre
ladrillos de barro

A Product of

CONSOLID AG

Technical specification:

1. Power: 12 HP diesel engine, HATZ Type E 306. Belt-driven, hydraulic starter, fuel consumption approx. 2.5 litres/hour.
2. Directly coupled hydraulic pump, generating the power for all hydraulic components.
3. Mixer and feeder unit: A double mixer unit with horizontal mixing at approx. 50 RPM. The upper mixer is used for mixing the chemical cement and the lower mixer continues mixing and feeds the rotating moulds simultaneously with the ready-mixed soil. Each mixer has a mixing and storage volume of 100 litres.
4. Rotary moulds: The press table with 4 moulds is hydraulically turned once after each press (extrusion step).
5. Press / Extruder: The pressing of the brick is manually initiated by the operator. Simultaneously the forming pressed brick is extruded. The compression force is 15,000 kg, corresponding with 50 kg/cm².
6. Transportation: The whole plant is mounted on a special single-axle trailer with double-belt 7.00 x 14 tyres, an adjustable shaft bar, a height adjustable front wheel and hand brake. Maximum speed according to local regulations, not exceeding 50 km/h.
7. Dimensions: Length 302 cm; width 140 cm; height 152 cm. Net weight approx. 1800 kg.

1. Diesel engine
2. Mixer and feeder unit
3. Press table (rotary mould)
4. Mixer and press/extrusion lever
5. Handbrake
6. Telescopic legs
7. Moulds for single brick (Extrusion position)
8. Hydraulic press cylinder
9. Tank for hydraulic oil
10. Hydraulic pump
Half of our world population lives in housing mainly erected by the use of soil as building material. Therefore any quality improvement of soil for building purposes is of vital interest for millions of people. For building purposes soil is excellent, as long as its dry stability is maintained. Loss of such stability, primarily by water influence, is causing problems and may lead to total destruction of such houses. Weathering erosion by rains and softening of the soil material by soaking water damage heavily soil buildings. The treatment of in-place, cohesive soil with CONSOLID 444 and CONSERVEX allows to stop the destructive influence of water to a high degree by waterproofing soil effectively. Such water-resistant soil offers excellent opportunities for the manufacture of water-resistant soil bricks for better housing. Should the natural dry strength of soil not already satisfy, additional improvement is possible in combination with small quantities of binders. High-quality soil buildings require CONSOLID 444/CONSERVEX treated soil bricks, simultaneously an adequately advanced production facility, providing optimal sieving of the soil, thorough mixing with CONSOLID 444 and CONSERVEX and eventually other additives as well as high pressure for the soil brick production, granting constantly precise dimensional tolerances. These suppositions are fulfilled with the soil brick plant "CLU 3000" and the CATAPUL- TER sieve machine.

1 Filling the moulds

The "CLU 3000" is equipped with a double mixer unit. The upper mixer is mixing the soil with the chemicals CONSOLID and CONSERVEX. After mixing the batch is discharged into the lower mixer, where mixing is reinitiated, and simultaneously the moulds of the press table are automatically filled through a hole in the bottom. In this way, the moulds are always filled with the same quantity of soil which gives a constant thickness of the bricks.

2 Brick-pressing by hydraulics

When the mould filled under the feeder mixer turns one quarter, the filled mould is freely visible for inspection. A further turning of a quarter brings the filled mould under the hydraulic press, which compacts the loose soil with a pressure of 18'000 kg or 50 kg/cm².

3 Extruding of the bricks

The next quarter turn of the press table is the extrusion station, where at the same time when the brick is pressed the formerly pressed brick will be extruded to be removed for stock-piling. With the next quarter turn the new empty mould returns again under the feeder mixer to be filled again.

The compressive strength of the green bricks is already high enough to allow stock-piling in high staples. Drying time for the bricks is approx. 2 to 3 days in the shadow.

JOB DESCRIPTION OF WORKERS

Worker No.1 - the operator - is responsible for the engine and operates the rotary mould and press / extrusion step with the respective lever.

Worker No.2 and 3 are filling the mixer with 100 litres of loose soil for each batch and add during mixing to each batch the proper quantities of CONSOLID 444 and CONSERVEX diluted in enough water to get the optimum moisture content in the soil for best compaction.

Worker No.4 removes the extruded bricks for storage and drying, placing them on the ground, pallets or racks in the shadow for several days.

The quality of the finished bricks can be improved by repairing voids or uneven corners of the bricks as long as they are moist. If the bricks are manufactured properly, such "cosmetic" work will not be necessary or is reached in a very small proportion.

When dry, the bricks may be used for masonry work with the same technique as burnt bricks or concrete blocks. The mortar, which glues the bricks together, can be a mixture of sand and cement as well as sand with cement and lime. But also a mixture of the cohesive soil with CONSOLID 444 and CONSERVEX, which is mixed with the plant to a mortar by adding enough water, will be a suitable mortar with the advantage that the entire wall is built of uniform material.

If the bricks are used for purposes with extreme heavy water exposure or on the weathered surfaces of houses and walls, it is recommended to apply a top-coat with CONSIL soil brick coating, a silicone-copolymer resin solution, which is creating highly effective waterproofing of the exposed surface. This coating is always applied at last step. Therefore, if a building is plastered and painted, the CONSIL top-coating will be the last process applied. Depending upon the local conditions, one or two coatings with CONSIL are applied by brush or roller. Bricks which will be used under water have to be coated with CONSIL on all sides by dipping the dry brick fully into the CONSIL solution. The protective coating will become fully effective after evaporation of the solvents.
NEW LOW-COST SOIL BRICK MACHINE "ECOBRICK 1000"

The highly economical "ECOBRICK 1000" is a complete and universal soil brick manufacturing plant for producing quality but low-cost building bricks with almost any natural soil material.

The "ECOBRICK 1000" represents the result of more than 10 years of research, design and practical experience in soil brick manufacturing.

Its modern appropriate technology, its costs and efficiency are well qualified to satisfy the demand for good low-cost housing at an extremely attractive self-reliance/import ratio due to optimum use of local resources (materials and unskilled labour) and substantial elimination of transport problems.

The unique little giant "ECOBRICK 1000" is the key to create or boost decentralised family or small industry brick-making and therefore bound to counter effectively the huge and growing need of a large part of the world's population for low-cost, but decent housing.

TECHNOLOGY: Modern, appropriate, economic, efficient and unique. Various patents.

MATERIALS: All natural in-place mineral soils (except salt-contaminated and black cotton soils). Any binding materials, such as clay, cement, lime, bitumen emulsions, chemicals, etc. at surprisingly low quantities.

LABOUR: After one day training, two unskilled male or female workers produce already 100 bricks per hour, corresponding to a 12 cm wall of 2 sq.metre.

BRICKS: Size 25 x 12 x 7.5 cm
Weight 4 to 4.7 kg
Compressive strength 30 to 100 kg/cm². Density 1.8 to 2.1.
(Indicated ranges depend upon chosen process).

No firing process; 2 to 4 days air-curing. Flat and/or dented faces, uniform. Original colour of soil.

Excellent room climate properties due to very low heat and noise transmission.

Walls may be plastered or painted.

Immediate placing of "green bricks" for air-curing; easy and quick handling by masons, causing no back troubles.

FLEXIBILITY: Mobile or stationary models as "ready to produce" or "do it yourself assembly kit" available.

Module design allows quick and simple disassembling and reassembling.

Simple but accurate field compressive strength testing device available.
Meili mechanical soil brick press

Technical specifications of this low-cost high performance machine

- **Engine**
  - Kind of engine: 2-cyl. diesel engine
  - Cooling system: air
  - Performance: 18.5 HP DIN at 2700 r.p.m.
  - Range of revolutions: 1800-2700 r.p.m.
  - Max. torque: 6.25 mkg
  - Consumption: 195 gr/hp

- **Starting mechanism**
  - Hand-accelerator

- **Drive**
  - Engine
  - 1 stage: dry friction clutch-type engine
  - 2 stage: flat-belt drive ca. 3:1
  - Mixer: v-belt drive ca. 3:1
  - Total reduction: 30:1
  - Lever is separated from the mixer by a mechanical clutch

- **Soil material mixer**
  - Diameter: 800 mm
  - Height: 320 mm
  - Content: 150 liters
  - Revolutions: 60-70 r.p.m.
  - Number of shovels: 3

- **Moulds and press table**
  - Diameter of the table: 1050 mm
  - Height of the table: 130 mm
  - Moulds: standard: 250x125 mm
  - Max.: 300x150 mm
  - Turning rhythm: every 4 sec. from 90 to 90 degrees

- **Steering device**
  - Revolutions of steering disc: 15-20 r.p.m.
  - Type of steering: mechanical
  - Enforced movements: pressing, turning, pushing out, lifting

- **Chassis**
  - Number of axles: 1
  - Axle weight limit: 150 kg
  - Suspension: 155 SR 12
  - Coupling device: pole with a support

- **Dimensions and weights**
  - Total length without pole: 2300 mm
  - Total width: 1250 mm
  - Total height: 1650 mm
  - Packing volume: 4.75 m³
  - Total weight: ca. 1700 kg

As a result of the tremendous success achieved by the "Meili 60" manual brick/block press in countries like Guinea, Nigeria and India, etc., and in recognition of the overwhelming need for large quantities of cheap, durable building materials in all of the developing countries, the Meili technology development group now offers its new and versatile: Meili "Mechanpress" - The automatic soil brick and block making machine. Using the same basic idea and operating principles of the famous "Meili 60" manual brick/block pressing machine, Meili has now developed a motor-driven mechanical 20 tons soil brick and block making machine capable of producing upwards of 1000 top-quality soil bricks and blocks per hour.

The Meili mechanpress offers:
- Simple design
- Sturdiness
- High performance
- Easy maintenance
- Reliability
- Economy

Meili Engineering
Practical and affordable technologies for developing countries
Gewerbe-Center Rothaus
6653 Emmaus/Österreich
Telex 875 750
Gewerbe-Center Rothaus
6653 Emmaus/Österreich
Telex 875 750
Telefon 0557/31 59 21
Telex 875 750
Telefon 0557/31 59 21
le bloc en terre: TERRE 2000
TERRE 2000

FRANCHE COMTÉ

DESCRIPTION DES PRODUITS

Blocs pleins de dimensions :
L = 30 cm  l = 15 cm  h = 15 cm

Tolérance : inférieurs à 1 mm
Poids : 12 à 14 kg
Densité moyenne : 1,3 kg/dm³
Résistance à la compression : 80 à 120 bars

APPLICATION DES PRODUITS

Les blocs sont utilisables dans les murs porteurs de 15 cm d'épaisseur pour des constructions en rez-de-chaussée ou avec un étage.

MATIÈRES PREMIÈRES

Tous les types de terre sont en principe utilisables avec plus ou moins d'intervention, excepté les couches de terre argileuse.

Les caractéristiques optimales seraient les suivantes :
- Exemple de matériau végétal :
  - granulométrie : max. 15 mm
  - teneur en argile : 20 %
  - teneur en limon : 30 %
  - teneur en sable : 50 %

Le kitargile est parfaitement utilisable.

Les stabilisants les plus coûteux sont la chaux, la ciment, la chaux, teneur en arsélie : 20 %.

RESISTANCE à la compression : 80 à 130 bars.

LES ESSAIS DE BASE

Apres l'arrachage et le préparatort le terre est passée dans un mélangeur, puis dans la presse par un transporteur à vis.

Les blocs sont comprimés à 90 bars, évacués manuellement et mis à sécher pendant 7 à 10 jours.

Pour chaque projet d'implantation, il est indispensable de faire les analyses des sols du chantier et de recenser les ressources locales pour le traitement (biocoût et encours).

Les analyses peuvent être réalisées par des laboratoires locaux (LABORATOIRES DES TRAVAUX PUBLICS par exemple).

Les essais en FRANCE sont obligatoires et nécessitent au minimum 15 kg pour des essais sur éprouvettes et jusqu'à 300 kg pour des essais réels.

EQUIPEMENT DE BASE

Il s'agit d'une unité autoportante comprenant un mélangeur de 250 l, un transporteur à vis, une pression hydraulique de 125 bars et un moteur diesel de 130 Cv à démarrage hydraulique ou manuel.

L'ensemble pese environ 7 tonnes et ses dimensions le rendent aisément transportable d'un chantier à l'autre à l' aide d'une remorque tractable.

CAPACITÉ DE PRODUCTION

100 blocs/3, entrer en 1 équipe : 3.000 blocs/jour.

Cette quantité correspond à 110 m² de mur de 15 cm (22 blocs/m²).

DOCUMENTS

7.1 Terrain et bâtiments
La machine nécessite aucun construit spécial, est éventuellement pour abriter la machine et pour le stockage des blocs.

7.2 Équipements de base
L'unité coûte 270.000,- FF PAR MAURICE
100.000,- FF CAT. DANASIN.

7.3 Equipements et installations annexes
Il s'agit de matériel classique d'extraction de terre pour environ 15 jours.

PRESSE THR 6750-40 - TERRE 2000 - BREVETE

Application : compression du matériau granuleux pour réaliser des blocs de dimensions 15 cm X 30 cm avec hauteur variable jusqu'à 15 cm max.

Principe : hydraulique à double pression

Mouvement : par tirage et tension de compression et de décompression.

Autonomie : complète, en mémoire de base par moteur thermique : 12,5 kW - Consommation : max 1,5 l. de Gazoil à l'heure - Moteur hydraulique : 12 V - 90 A.

Mobilité : machine tractable, faible encombrement, embarquée adaptée en option.

Capacité : largeur = 1,4 m - longueur = 2,5 m - hauteur = 1,5 m - Poids = 450 Kgs environ.

Force de compression : en base 40 tonnes (90 Kgs par cm² en pression sur le matériau).

Capacité : 300 blocs à l'heure en fonction du matériau.

 Fonctionnement : en base semi-automatique après remplissage de la hotte, action du levier de commande qui permet de comprimer, de mouler et d'excéder le bloc que l'on peut manipuler aussitôt.

VISE DE TRANSPORT TERRE 2000
element mobile, fonctionnement par moteur électrique ou système hydraulique option à définir. Puissance = 3 kw.

Dimensions : hauteur = 1,50 m - longueur = 3,30 m - largeur = 1,20 m - Poids = 600 Kgs environ.

Système d'arrêt automatique quand la remplissage de la hotte est achevé.

MÉLANÈRE

Dimensions : largeur = 0,80 m - longueur = 2,20 m - hauteur = 1,50 m - Poids = 600 Kgs environ.


Capacité : 300 tonnes.

Trappe de distribution.

LA CHAÎNE

L'ensemble de ces trois éléments constituent la chaîne de fabrication TERRE 2000. Entièrement compatibles, des options peuvent être étudiées pour des demandes spécifiques.

THE PLANT - FACT 500

FACT 500 is a press based on a specific patented gearing system and a four mould rotating plate.

Its weight of 150 tons guarantees it in the light mobile plants.

The machine essentially consists of a mechanical compaction envelope and a rotating plate equipped with four moulds permitting the following operations:
- Feeding,
- Control,
- Compression,
- Extrusion.

Each mould is bottomless parallelepiped. The soil rests on a fixed plate placed under the rotating plate and slides when the plate moves. It is manually initiated.

Feeding is carried out through a hopper placed close on the plate, whose rotation raises the earth in the mould permitting a precise volumetric dosage.

Compression is mechanically achieved by an eccentric whose phase permits to a counter-couple to exert an increasing force up to 50 tons, with an energy source of 1 Hp.

The duration of the entire compaction cycle is of the order of 6 seconds. It is operated through a command and automatically stopped after each compaction - extrusion.

Extrusion is done from below, through an opening of the mould in the fixed table. The manufactured bricks are received on a tilting fixed table and are recovered by hand.

If a change of brick size is requested, remove the four moulds, the two plates (compressing and compaction), the reception table and the lower plate height. This work doesn't take more than 20 minutes.

OPTIONS
- Electrical engine 3800 volts or 1200 volt.
- Road frame with movable wheels and pole.
- Pneumatic brickyard wheels instead of two feet.

MAINTENANCE
- Weekly-greasing of bearings and sliding pieces.

PREPARATION OF THE SOIL

In order to eliminate undesirable elements from the soil for compaction (gravel and stones) and to get a uniform mix (lumps)

The selected material must be studied and can vary from 5 to 15 cm according to the soil.

The soil must be placed either through a fixed screen (gravel and stones), a vibrating screen, or a percussion which consists of crushing and mixing.

The soil must be dry or slightly wet.

GRINDING

Fortunately, it is seldom necessary.

This operation brings to a correct grain size and transforms a lumpy material, or homogenizes other soils.
Les blocs de terre croûte compactées

Les qualités du matériau terre sont unanimement reconnues :
- absence de cuisson impliquant un faible coût énergétique ;
- faible consommation de stabilisant permettant une indépendance de produits importés (ciment, sable...) ;
- une bonne inertie thermique offrant un meilleur confort d'habitation ;
- faible consommation de stabilisant permettant une indépendance des produits importés (ciment, sable...) ;
- une grande facilité et une bonne souplesse de mise en œuvre ;
- des possibilités de fabrication en région humide (contrairement à l'adobe) ;
- blocs manipulables soit comprimés ;
- stockage immédiat en tas sous simple bâche ;
- la possibilité d'embaucher une main d'œuvre locale peu qualifiée à l'issue d'une formation de courte durée.

CARACTÉRISTIQUES DES BLOCS

Elles dépendent essentiellement de la terre utilisée :
- la résistance à l'écraçement peut varier de 40 à 150 kg/cm² ;
- la stabilité à l'eau est également fonction du choix et de la quantité de stabilisant introduit dans la terre.

A titre d'exemple, certaines terres permettent de réaliser des blocs qui résistent à une semaine d'immersion totale avec moins de 3% de ciment.
PRESSE HYDRAULIQUE CTI1

a) DESCRIPTION :
Matiériel réalisé avec des matières premières courantes et des composants courants.
Matiériel fonctionnant à l'aide d'un vérin hydraulique et alimenté par un moteur électrique.
Matiériel plus volumineux que la presse manuelle mais de dimensions raisonnables.
Matériel monté sur longerons afin de pouvoir le fixer au sol en poste fixe. II peut être monté sur un essieu et tractable derrière un véhicule léger.

b) FONCTIONNEMENT :

1er temps - Remplissage du moule :
Le remplissage peut se faire manuellement (à la pelle ou au seau) ou mécaniquement avec tapis d'aménée et une tronée de stockage située au-dessus du moule, la quantité de terre nécessaire est donnée par la position réglable du couvercle de pressage sur son appui.

2ème temps - Fermeture du moule
Manuellement on tire sur le couvercle qui en coulissant vient obturer le moule.

3ème temps - Compression
Dès que le couvercle est en position fermée et sans qu'aucune autre information ne soit donnée à l'armoire d'automatisme le vérin de pressage s'actionne comprimant le carreau de terre en s'avançant entre ses 2 plateaux inférieur et supérieur.

4ème temps - Ouverture du moule
Automatiquement, sans intervention de l'opérateur dès que la côte finale du carreau est atteinte le couvercle s'ouvre verticalement.

5ème temps - Ejection :
L'opérateur, en poussant le couvercle vers l'arrière donne le signal d'éjection par micro-contact.
Dès que le carreau est sorti du moule, l'opérateur s'en saisit, le cycle est ainsi terminé.

6ème temps - Relance cycle suivant :
Une double commande (bouton poussoir + pédale) autorise le départ d'un nouveau cycle en phase de remplissage.

c) CARACTERISTIQUES PHYSIQUES :
- Poids : 350 kg
- Hauteur : 1,15 m
- Longueur : 1,6 m
- Largeur : 0,9 m

d) CARACTERISTIQUES TECHNIQUES :
Tous les composants sont français.

(1) ELECTRICITE :
- a) automatisme "Télémechanique" et protections
- b) puissance : Moteur "LEROY SOMMER" 1500 tr/min puissance 5,5 Kw intensité 12,6 A tension 380 V

En option matériel tropicalisé.

(2) HYDRAULIQUE :
- a- génération : "Pompe HP1"
  Débit 10 l/min à 1500 tr/min
  Pression de service : 160 bar
- b- vérin : "CPGAC"
  alissage = 100 mm
  tige = 60 mm
  course = 125 mm
  force = 17,5 t.
c) distribution : distributeurs "CPDAC"
limiteur de pression "CPDAC"
filtration "WYDAC"

bac contenance 50 l liquide hydraulique.

(3) MECANIQUE :

Le moule ainsi que toutes les pièces soumises a des efforts importants sont en aciers spéciaux mécano-soudés.

Les guidages sont réalisés par bagues "GLYCODUR" très résistantes.

CTBI Hydraulic Press


e) CADENCE DE FABRICATION :

Carreaux de 32x16x10,5
Poids d'un carreau : 12 Kg
Cadence variable suivant :
- la fabrication à réaliser
- les matériaux de service autour (alimentation et évacuation).

Les matériaux peuvent être mécanisés ou automatisés.

En moyenne de 50 à 110 carreaux/horaire mais avec une seule personne au commandes et sans effort physique

donnees extraites d'un chantier.

f) CONDITIONNEMENT - TRANSPORT - POIS :

Dans la conception même de ce matériel ces détails n'ont pas été oubliés.

Son chassis sur longeron permet une manipulation rapide et une mise en place précision.

Son conditionnement peut être soit :

- 1 caisse bois de 1,20 x 0,85 x 0,95 pour un volume de : 2,100 M3 et un poids de 1000 Kgs
- 1 housse plastique retractive

Tous les moyens de transport peuvent être utilisés : l'avion, le bateau, le camion, la camionnette. Ce matériel peut également être tracté derrière un véhicule léger lorsqu'il est monté sur remorque.

g) COUT :

Matériel exécuté en un seul exemplaire. Prix actuellement estimé entre 65,000 et 70,000, Frahers d'1, Départ MİFÍON. Toutefois, toute étude est nécessaire à chaque consultation afin de répondre précisément à la demande du client.

h) DESTINATION :

Marché local en construction neuve pour des petites opérations.
Marché à l'exportation. Toutefois, pour les pays d'Afrique il y a lieu que le matériel soit tropicalisé.
GEO 500 Semi-Bloc, Unité Atelier

A - ORGANISATION - MATÉRIEL - MAIN D'ŒUVRE

Hypothèse
- Gisement sur lieu de construction - extraction manuelle ou à l'aide de matériels agricoles disponibles sur place.
- Pas de réseau électrique: un moteur diesel (12CV) actionne la centrale hydraulique qui alimente la presse et le malaxeur équipé d'un moteur hydraulique.

Schéma de production

<table>
<thead>
<tr>
<th>MAIN D'ŒUVRE/OPÉRATIONS</th>
<th>MATÉRIELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Extraction - Préparation du sol brut: 2 pers</td>
<td>1- Matériels de base (à amortir)</td>
</tr>
<tr>
<td>2- Chargement du malaxeur dosage riche/eau commande: 2 pers</td>
<td>Malaxeur/tamisieur (moteur hydraulique)</td>
</tr>
<tr>
<td>3- Alimentation de la presse: 1 pers</td>
<td>MX 200T</td>
</tr>
<tr>
<td>4- Commande de la presse : Réglages, contrôle des blocs: 1 pers</td>
<td>Presse semi-automatique (moteur diesel)</td>
</tr>
<tr>
<td>5- Manutention - stockage des blocs (compillement): 2 pers</td>
<td>GEO 500 Semi-Bloc</td>
</tr>
<tr>
<td>TOTAL MAIN D'ŒUVRE: 8 personnes</td>
<td></td>
</tr>
</tbody>
</table>

B - ANALYSE ÉCONOMIQUE

B-1 PRODUCTION MOYENNE JOURNALIÈRE

- Débit malaxeur: 1,5 tonnes/heure Temps effectif de travail: 6,5 heures Durée de gâchée: 13 à 15 minutes.
- Débit de la presse: 1,8 tonnes/heure Temps effectif de travail: 5,5 heures Temps de cyclage: 15 secondes.

PRODUCTION MOYENNE JOURNALIÈRE: 10 tonnes NOMBRE DE BLOCS 29,5/14/9 1350 blocs Poids moyen: 7,5 kg.

B-2 CONSOMMATIONS JOURNALIÈRES

a) Matières

- Pour 10 tonnes de blocs produits:
  - Eau d'apport (64): 600 litres
  - Sol brut humide avec 30% de refus au tamisage: 11,6 tonnes
  - Ciment 4,5% du poids. Total humide: 150 kg.

b) Énergie

- P.R.N. 1 moteur diesel 12CV. Consommation 3 litres/h. Durée de fonctionnement: 7 heures
  Consommation journalière gas-oil: 21 litres
44 - DESTINATION -

Fabrication de briques pleines dont la production maximum est de:

- 2 000 briques par heure, soit environ :
- 3 000 000 de briques par an.

42 - TYPE DE PRODUCTION -

La production de briques est réalisée à partir d'argile moyenne dont l'humidité est de 15 à 18 %, sans broyage particulier.

Les mélanges argile-sables sont également utilisés.

43 - AVANTAGES -

Les groupes UNIPRESS sont mobiles et peuvent se déplacer dans les usines près des fours et des carrières.

Ils sont autonomes et peuvent être alimentés par diesel ou électricité.

Les puissances absorbées sont faibles.
Ultra bloc's new Impact series of pressed-earth block machines represents over 20 years of experience in the field. Ultra bloc's pressed-earth block units are similar to adobe, but are 3-4 times stronger, only need 4-6% moisture, and can be laid in the wall immediately after manufacture. Designed and built for trouble-free operation and easy maintenance, the low-profile Impact models need no special dirt-loading equipment and can be hauled by compact car or truck. Hydraulic power-take-offs run a dirt screen, available separately.

Instructions on machine operation and maintenance, soil analysis and preparation and suggested building systems are included with each machine.

Prices and specifications subject to change without notice.
The Terrablock System

When you're building from the ground up

"The Terrablock System of earth-wall construction is a process which I think will revolutionize the housing industry worldwide. It is the ideal technique when you're building from the ground up."

—Arnold Palmer

Once Terrablock walls have been built, a fast-drying chemical sealant is readily applied by brush, roller or sprayer. The walls are then ready for a finishing coat of plaster or other mortar, which can be finished in any texture or pattern desired. Protected in this way, the block wall remains stable.

The Terrablock is probably the most cost-effective wall building block in the world. The raw material is universally abundant and not likely to escalate in price. The production of Terrablocks is also efficient. Running on between 12 and 16 liters of fuel, the Terrablock Duplex can produce enough material to build the walls of a 12-foot square dwelling.

12-inch Terrablock walls are:

- Non-Toxic
- Sound Proof
- Chemically Stable
- Fireproof
- High Thermal Insulation Value
- Extremely Durable
The Terrablock System of earth-wall construction, commonly known as adobe, is probably the simplest and most cost-effective home-building technique in the world. The Terrablock System virtually eliminates the labour intensive, time consuming drawbacks of adobe construction, whilst maintaining all of adobe's extraordinary properties and characteristics as a building material.

The Terrablock Duplex Machine

The key to the Terrablock System is the Terrablock Duplex Machine. This single piece of equipment transforms common soil into a building material of superb quality. The machine itself is compact, portable, uncomplicated, reliable, automatic and energy efficient.

The Terrablock Duplex uses hydraulic pressure, up to 4,885 PSI, to produce stable and dimensionally uniform blocks that can often go directly into a wall without any curing or drying time. Terrablocks can be grout-bonded, laid with a traditional mortar, dry-slacked or grouted.

The Terrablock Duplex is self-contained, is easily towed, loaded with soil, and quickly put into operation on the construction site. The Terrablock Duplex is simple to operate and maintain. Apart from its diesel power plant, it has only three main moving components.

Dirt with a natural moisture content of 4 to 14% is ideal for the Terrablock System and can be hydraulically compressed into stable building units by the Terrablock Duplex Machine, usually without additives. It is estimated that 94% of all readily available soils fall within the acceptable range.

Terrablocks: The End Product

Terrablocks are easily lifted by gripping tongs to go directly into a wall, or they can be stacked for future use. Since Terrablocks are dimensionally uniform and have a perfectly flat bedding surface, they can be dry-stacked, a technique that does not require a skilled mason or mortar, provided the blocks are properly levelled and set on a suitable footing.
Features

- Fully automatic operation, controlled by Automatg 16 computer.
- Hydraulic system has a capacity of 150 U.S. gallons (566 l) of oil, continuously filtered to 10 microns by a permanent filter.
- Integrated hydraulic oil cooling system.
- All hydraulic components are industrial grade.
- Powered by 43 H.P. Isuzu diesel engine with a heavy-duty capacity radiator, specially fitted with integrated heat exchanger.
- All valves housed in heavy duty bronze with an internal chrome ball for long life.
- Permanent heavy duty grizzly screen on hopper filters out rocks and foreign debris.
- Two automatic vibrating devices keep soil moving at a constant rate through throat of hopper.
- Frame made of heavy wall tubing for extreme strength to weight ratio and rigidity.
- All welds are full penetration by metal inert gas process for superior strength and vibration resistance.
- Block moulds heat treated to Rockwell hardness for wear resistance.
- Tandem levelling axles with electric brakes.
- Four standard automotive wheels with heavy duty six-ply rated tires.
- Two ten foot single wheel-type conveyors made of galvanized steel.
- Large volume built-in accessory compartment.
- Equipped with metric, fractional, and Allen wrenches.
- Finished in industrial white enamel for maximum solar reflection.
- Fully warranted test of defects in materials and workmanship when maintained per specifications for 1,000 hours of operation or 6 months.

Dimensions and Specifications

- Machine size: 17-feet (5.1m) long by 7-feet 6-inches (2.29m) high by 7-feet 10-inches (2.39m) wide. Fits into standard size shipping container.
- Weight: Approximately 8,000 lbs. (3,629kg.), excluding oil.
- Hopper capacity: 84 cubic feet (2.35m).
- Hydraulic oil capacity: 156 U.S. gallons (591 l).5
- Hydraulic pressure: Variable (0-1,100 PSI (535Kg/cm² to 750Kg/cm²).
- Electrical system: 24 volt D.C. with two 12 volt storage batteries.
- Fuel consumption: Approximately 3 liters of diesel fuel per hour.
- Block size: Width, 12-inches; height, 14-inches. Both dimensions accurate to .005 inches. Entire block flat and square, length approximately 10-inches (250mm).
- Rate of production: Finished Terrablocks produced at the rate of six to ten blocks per minute.

Robert Gross
President and Builder

EARTH TECHNOLOGY CORP.
910200 E. 6th Street
1750 E. 6th Street
Orlando, FL 32805
fill the cavities completely with mud mix and spread off the top to give a smooth surface. The mold is then lifted to leave a "nest" of bricks, and the machine is rolled ahead to a new spot and the process repeated. The mold is sprayed occasionally with water to eliminate any mud hanging up on the mold walls and to ensure the production of uniform bricks.

Many thousands of bricks can be produced each working day with this machine. It is important to note that the Hans Sumpf system for brick production is highly efficient and is designed so that soil, mud and bricks are moved the least possible amount. The bricks are turned on edge after a few days to speed drying, but are left in the field where they are cast until completely cured. The following pictures, Figure 4, show the Hans Sumpf plant in operation.

C. Bricks by Pressure Molding

We wish to consider this process separately from the conventional wet molding method because special techniques are required to use asphalt products as stabilizers in making pressed bricks. This is because pressure molding must use a soil mix that is relatively "dry," while conventional molding uses a much wetter mud mix. Generally portland cement is the best choice for compressed bricks as
Figure 3. Brick Molding Machine
Our machines are automatic, hydraulically controlled, and powered by a diesel or electric motor. They produce earth bricks stabilized with cement or lime or fly ash. The materials required are typically 95% soil, with a 15%-30% clay content, and 5% cement, which are readily available in any country. The stabilizing gives great strength (8.2 MPa average compressive strength) and durability, but bricks can be made from 100% soil unstabilized if stabilizers are unavailable or considered too expensive. Walls can then be sealed against weather with a variety of readily available sealants.

The machine can be mobile and is light enough to be towed anywhere by a four wheel drive. The main ram exerts 120 tons of pressure on each brick. Machines can be made to produce any size brick or one machine to produce a variety of sizes e.g. 12” x 10” x 5” (350/hour), 3” x 9” x 4” (1400 per hour), 2” x 10” x 5” (2800 per hour). The whole process is automatic and can be organized with as few as two people for the whole operation. Soil is fed in one end by a front end loader (or the machine can be designed for loading by a large team of labourers) and bricks emerge ready for use at the other end. Soil with a low moisture content (2-8%) is quite suitable and no firing is required.

The bricks are selling well in Australia. We are just commencing a project for the Fiji Housing Authority to build an initial 50 plus houses, but expect this to extend into many more with our special anti-hurricane anti-earthquake design for which our very dense bricks are particularly suitable. In the first six months of this year we expect to have machines also in India, China and Zimbabwe as we already have orders from those countries.

We are interested in cooperating with developing countries not only to supply the machines, but also to assist with any help required in the production of bricks and construction of shelter appropriate to whatever locality. The present cost of the machine is $45,000 (Australian) ex factory.

Our main aim is to mass produce low cost housing in developing countries.
The following list of addresses is also the mailing list of this study. It includes a wide variety of institutions, in all parts of the world, comprising appropriate technology information centres, with question and answer services; education, training and research institutes that specialize in soil constructions, or generally in building in developing countries; development aid organizations; and publishers of journals and bulletins on appropriate technologies or Third World development issues in general.

Most of these institutions have been extremely cooperative and generously provided the author with information and advice, for which he is most grateful. Some of the other recipients did not respond to previous requests for information, but it is hoped that they will now be able to do so, or at least comment on this study. It is also hoped that this document, or parts of its contents, are passed on to other interested institutions and individuals, so that as many people as possible can benefit from it and possibly contribute further material for the final publication.

### Addresses

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(DESWOS)
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007 Informationszentrum RAUM und BAU der Fraunhofer-Gesellschaft
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020 Building Research Station
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021 Intermediate Technology Publications Ltd.
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022 Intermediate Technology Development Group
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Oxford OX2 7DZ

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Lavallette
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75700 Paris

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AGCD
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Blijde Inkomstraat 9
3000 Leuven

Commission Européenne
Commission Générale pour le Développement
200 rue de La Loi
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CAT
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Delft University of Technology
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P.O. Box 20704
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International Information Services
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Technology and Employment Branch
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Pittsburgh PA 15213

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Office of International Affairs
Washington, D.C. 20410

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601, 17th Street, N.W.
Washington, D.C. 20577

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Ann Arbor, Michigan 48109

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Washington, D.C. 20037

059 Interrect
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Dallas, TX 75222

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77 Massachusetts Avenue
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061 National Academy of Sciences
2101 Constitution Avenue
Washington, D.C. 20418

062 TRANET
Transnational Network for Appropriate Technology
Box 567
Kangeles
Maine 04970

063 Volunteers in Asia
Appropriate Technology Project
P.O. Box 4543
Stanford, CA 94305

064 UN Interim Fund on Science
and Technology for Development
United Nations
New York, NY 10017

065 VITA
Volunteers in Technical Assistance
1815 N Lynn Street, Suite 200
Arlington VA 22209 - 8438

066 The World Bank
Science and Technology Unit
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Washington, D.C. 20433

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067 CEMAT
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sobre Tecnología Apropiada
Apartado Postal 1160
Guatemala Ciudad

068 CETA
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Tecnología Apropiada
15 ave. 14 - 01, Zona 10
Guatemala Ciudad

069 ICAITI
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Investigación y Tecnología Industrial
Apartado Postal 1302
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Condominio Cuscatlán
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San Salvador

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Santo Domingo

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Bridgetown

Colombia
074 SENA
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Programa de Desarrollo Tecnológico
Apartado Aéreo 9801
Bogotá
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Bibliography

(E)=English;(G)=German;(F)=French;(S)=Spanish

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06 CRAterre (Centre de recherche et d'application terre: P. Doat, A. Hays, H. Rouben, S. Matuk, F. Vitoux): Construire en terre, éditions alternatives, Paris, 1983 (F)

07 Danseu, P.A.: La Terre Stabilisée, Planification Habitat Information (No.76) S.M.U.H. (Secrétariat des Misssions d'Urbanisme et d'Habitation), Paris, 1984 (F)


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11 Department of Housing and Urban Development: Mud Brick Roofs, HUD, Washington, D.C., 1959 (E)

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19 Gieth, Thomas: Construction of Low-Cost Dwellings with Composted Soil Blocks (Prototype 'A'), C.T.A., Catholic University, Asunción, 1984 (E)


22 Hammond, A.A.: Prolonging the Life of Earth Buildings in the Tropics, Building Research and Practice (May/June 1973), Building and Road Research Institute, UST Kumasi, 1973 (E)

23 Hecht, Hans: Instructions for Building and Using an Earth and Loam Brick Press (built by CENREMA, Yaoundé/Cameroon), CATE-Modul D 6/12, Eschborn, 1979 (E.G,F)


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29 Lola, Carlos R.: Research Efforts on Soil Cement Stabilization for Low-Cost Housing in Nicaragua, University of Tennessee, Knoxville, December 1981 (E)


31 Lou Má, Roberto E.: La Ceta-Ram, Una máquina para producir bloques huecos de suelo cementado, inspirada en el diseno de la Cerva-Ram, CETA (Centro de Experimentación en Tecnología Apropiada), Guatemala, February 1977 (S,E)

32 Lunt, M.G.: Stabilized Soil Blocks for Building, Overseas Building Note No. 104, Building Research Establishment, Garston, February 1960 (E)
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Federal Republic of Germany

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