On the building-site itself the contractors will have to become accustomed to reading the plans with the aid of grids.

Advantages of the Module

Norming will allow for great flexibility in the use of constructional materials. Normed products can be replaced easily. In particular, the following benefits can be cited:

For the architect:

- plans can be dimensioned much more rapidly (Ill. 8);
- a help in the choice of room size (Ill. 9);
- freedom in the choice of dimensions outside the grid without any inconvenience arising;
- precision and clarity in the execution of plans; ease in discovering mistakes;
- reduction in number of detail plans; subsidiary appendices eliminated (Ill. 10);
- thanks to the plans the basic idea can be simplified, for the architect, engineer and contractor will be working jointly;
- fewer errors, time taken over design reduced;
- the grid will be a coordinating system and will replace detail designs, which up to now have been the best way of making a point of detail comprehensible (Ill. 10);
- materials and products can be changed without any difficulties as to junction points or size;
- aid in the drawing up of estimates;
- estimates can be established more rapidly and accurately;
- more accurate tenders;
- lower tenders by virtue of the advantages accruing to the contractor;
- greater security in assessing expenses;
- a better way of comparing various products.

For the manufacturer:

- production unit;
- simplification of storage, ordering, despatch, supervision, etc.;
- reduction in transport costs;
- increased markets;
- competition will be based on technical and economic factors and not on advertising alone.

For the contractor:

- speed, ease and accuracy in the fixing of tenders;
- less scope for error in the reading of plans and estimate;
- rationalized work and enhanced profitability;
- no more waste on the building-site;
- reduced pilferage;
- better masonry at a lower cost (7 to 10 % reduction);
- fewer problems on the site;
- fewer foremen and superintendents;
- facilitation of survey and supervisory work;
- reduced building-time, higher annual turnover;
- limited stores and inventories, simplification of ordering;
- transport economy;
- simplification of site plans;
- easier supervision of material.

For the owner:

- reduction of building-time, less interest to pay;
- less mass-produced work;
- higher quality, better joints (Ill. 12);
- regular building despite weather conditions.

Application of the Module

20 % of the American firms use the module; more than 50 % use the same principle for scaling foundations. This is understandable in view of the fact that the cement flags are themselves normed.

Use of the Module in Forms of Construction

The following buildings have been erected and dimensioned on the basis of norms:

Hospitals	16 %
Schools	14 %
Housing	14 %
Churches	10 %
Industrial buildings	10 %
Administrative buildings	6 %
Other types	5 %

The high percentages for hospitals and schools built on the basis of norms are due to the laws and regulations governing such buildings.

Sales Openings for Normed Products

Normed building products are very much in demand. 66 % of all architects order such products when they can be had. It is interesting to note that nowadays the sales openings for normed products are twice as favourable as those for the same products which have not been normed.

Adoption of the Module by the Architect

A questionnaire drawn up in 1959 showed that of all the architects who had tried working with a modular screen 85 % had adopted the principle. Moreover, it is worth pointing out that where conditions have been normal this system of mensuration has received an enthusiastic welcome from architects.

Number of Products Normed at the Present Time

Official norms

At the time of writing there are 4 official standard scales recognized in the USA:

- the 4″ scale, which is used as a base for all constructional products (1945);
- normed cement flags;
- normed bricks;
- normed fireplace bricks.

Normed Products that have not yet been Officially Recognized

In addition to the norms mentioned above work is going ahead in every branch of the sector. Thus we find the American construction catalogue indicating that 90 % of all current products have been based on normed standards. This does not mean, however, that these products are cheaper than those constructed according to traditional methods. As a result the trade is undergoing a critical phase of development.

Products that have not been Normed

A survey carried out by a construction journal in the autumn of 1959 showed that out of 298 product advertisements 254 were based on norms; 5 out of 6 new products corresponded to the module. In general the non-normed products were as follows:

- synthetic flooring;
- tiles (ceramic);
- laundry and washing units;
- doors.

With regard to the flooring, it should be pointed out that the tiles can be had as standardized products. Should the architect, nevertheless, prefer special orders when it comes to this product, this arises from the fact that it is difficult to adapt these tiles to the dimensions of the building. Normed ceramic tiles are very rare. Production techniques and the tolerances demanded by the tiles themselves and the manner in which they are laid down make it difficult for norming to gain a footing.
At the present time adaptation costs as regards washing and laundry units are too high to make standardization feasible. This is a problem that has to be settled in the future.

Choice of an appropriate Module

It may seem surprising that only 4 standard modules are recognized in the United States, but the importance of this fact should not be under-estimated. Agreement to the "inch" model in construction represented a step forward. The unanimous adoption of a new module is the primary basis for any future activity and is the result of very thorough research.

Norming of Bricks

The adoption by brick factories of a standard scale has given rise to very concrete results. This industry has always been regarded as the key point in all constructional work.

Types of Norms

Technical and social development, architectural demands, practical experience, climatic variations and the individual features in every building are all factors that make it impossible to establish definitive norms with any guarantee of success.

The History of Standardization

1921 First research work on the 4″ module by the industrialist, Bemis;

1936 Publication of "The Evolving House" by Bemis, in which he urges the use of the 4″ module;

1938 American Standard Association (ASA); foundation of the A-62 Committee. The American Institute of Architects and the producers' Council become the Committee's "godparents";

1939–43 Standardization of military buildings;

1945 The 4″ module is introduced as an American standard;

1948 The Modular Service Association is disbanded;

1949 The AIA founds an office for modular coordination;

1950 The National Association of Home Builders becomes the third "godparent" of the A-62 Committee;

1956 AIA Office for Modular Coordination is disbanded;

1956 The Associated General Contractors of America becomes the fourth "godparent" of the A-62 Committee;

1957 Foundation of the Modular Building Standards Association under the auspices of the AIA, AGCA, NAHB and PC – good organization with sound financial backing, great progress.

It will be seen how greatly a badly run organization with limited finances is handicapped in its development.

The Infrastructure Today and Its Work of Standardization

The supreme body in this infrastructure is the American Standard Association (ASA). This national organization is financed by industry. Subordinate to it is the Committee for Dimensional Coordination of Building Products and Materials (A-62). The executive authority of the A-62 is the secretariat of the Modular Building Standard Association (MBSA). In addition to these organizations the US Army Corps of Engineers and the Veterans' Administration have played a meritorious part in this pioneer work.

Difficulties in the Establishment of Norms

Two important factors have hampered work over the past 35 years:

- the lack of finances
- the choice of a period in which architects and manufacturers were reluctant to switch to norms.

Supply and Demand

One of the most difficult problem to be solved in the application of a norm is the coordination of supply and demand as the latter cannot be great if normed products are not already available, which argument applies in reserve as regards supply.

Conclusions

Types of norms and standardized dimensions:

The construction norms in the USA can be divided into standardized dimensions and types of norms. Standardized dimensions cover questions of mensuration, i. e. from the simplest problem to the modular coordinating system.

The types of norms specify the shape, dimensions, advantages and quality of the construction elements.

A size norm always corresponds to a module of 4″. The type of norm covers all the other forms of standardization. If, for example, we speak of a normed brick, that means the product is also normed as regards its shape. Although the ordering of dimensions offers certain incontestable advantages, the desire to establish a type of norm at all costs is scarely justifiable, for in this case there is a tendency for standardization to appear something extraneous. It is to be regretted that the competent authorities are unable to distinguish better the different ends and prerequisites of these two forms of standard.

Although we regard the assimilation of a product in its dimensions and junction points within the modular framework as sensible, the official establishment of shapes and profiles strikens as an unjustified limitation of the market. The development of a norm type should be the function of the producer. The difficulty of creating a norm type and the fact that apart from bricks no other product has been declared standardized as to its shape and size is clear evidence of the confusion of norm size and norm type.

The Aim of Norming

The wish to introduce modular coordination into building appears to be an appropriate and promising one at the present time. All in all, a module merely defines the dimensions of the joints in the finished elements. Freedom of expression is thus retained. Discipline in the selection of external dimensions should, in no case, affect aesthetic considerations. With the introduction of a unit of mensuration into construction it must be possible to rationalize works and thus to reduce construction costs. The architect's work is becoming more difficult from year to year because of the appearance of new materials and products on the market. The welcome we extend to any hope of reducing construction costs must, of necessity, be tempered with reserve.
The establishment of a form of modular coordination is not, in the last analysis, the only way of reducing the cost of methods of building. The simplification of work is, however, an incontestable desideratum and would appear to be the main factor at the present time militating for standardization.

Titelbild

Das Bild zeigt einen Ausschnitt aus dem Magnetspeicher einer elektronischen Datenverarbeitungsanlage. Im Speicher werden Instruktionen, Zwischenresultate, Konstanten usw. aufbewahrt. Jedes der Ringlein (Durchmesser ca. 3 mm) kann positiv oder negativ magnetisiert werden und damit eine duale Zahl darstellen. Moderne Datenverarbeitungsanlagen verfügen über Speicher, in denen einige Tausende bis mehrere Zehntausende von Buchstaben und Zahlen Platz finden.

Reproduction de la couverture

La figure représente une partie d'un enregistreur magnétique du cerveau électronique. Cet enregistreur peut conserver des instructions, des résultats intermédiaires, des constantes et autres données. Chacune des rondelles (Ø 3 mm env.) peut être magnétisée positivement ou négativement et ainsi exprimer un chiffre en rapport avec le pôle. Les cerveaux électroniques modernes disposent d'enregistreurs capables d'emmagasiner plusieurs milliers de chiffres et de lettres.

Picture on the Cover

This picture shows part of a magnetic filer in an electronic brain. This filer can retain instructions, intermediate results, constants and other data. Each of the rings (Ø 3 mm. approx.) can be positively or negatively magnetized and thus express a two-place figure. Modern electronic brains contain filers capable of storing several thousand figures and letters.

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Eine Notiz war leider fehlerhaft wiedergegeben. Es muß heißen:

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Geboren 1932 in Stuttgart, Architekturstudium an der T. H. Stuttgart von 1952 bis 1956, danach Assistent von Prof. Volkart.