

MONOLITHIC CONCRETE HOUSES*

NEARLY fifty years ago the first monolithic concrete house was constructed. This house is in use to-day and shows every evidence that the end of the next fifty years will find it in the same condition as it is to-day. A permanent asset to the wealth of the nation was contributed when this house was built. We do not know what this house cost at the time it was built, but whatever the cost may have been, it is insignificant when spread over the half-century of useful service it has already rendered and will doubtless continue to render for years to come. No doubt this house cost more to build than a frame house would have cost, but *ultimate* economy, which includes the cost of maintenance, repairs and depreciation, tells a story quite different from a comparison of first cost. The cheapest thing to buy is usually not the cheapest in the end.

A very pertinent question, then, is why have we not built more concrete houses? The answer lies largely in the fact that general knowledge in regard to the real worth of concrete houses is slight, and that knowledge in regard to the technique of constructing them is confined to a few. The objects of this report will be, therefore, not only to state the case of the real worth of concrete houses, but to point out the lines along which future practical development of the monolithic concrete house must take.

A house must be habitable and therefore comfortable. It must protect its inhabitants against the heat and cold, and be sanitary. Its appearance, while secondary from a purely utilitarian standpoint, must not violate the principles of architecture and harmony with surroundings and proportion. But, "A thing of beauty is a joy forever" is true only if the thing lasts forever. This means that the structure must be permanent.

Utility is obtained by proper planning for the use of enclosed space. The concrete house allows this without interfering with architectural treatment. By employing a "dead" air space in the walls, insulation against heat and cold is obtained. The concrete house is easily cleansed and furnishes no harbor for vermin or disease-breeding germs. Concrete is strong and permanent. It does not rust, rot or decay. Admitting then, that concrete as a house-building material meets the fundamental requirements, the question remains as to how it may be utilized in a practical way in the construction of homes. The report of this committee will attempt to answer this question only in so far as the monolithic house employing forms in its construction is concerned.

There are but two fundamental problems to be solved in practical monolithic concrete house construction. These are (1) forms and design, and (2) field practice.

Forms and Design

A monolithic house of any architectural design, form or size can be built, but in order that the cost of construction be held within reasonable limits, the forms must be used over and over again. This requires either that the same set of forms should allow wide variation as to length, height and relation of surfaces, or that the design itself be limited to the flexibility allowed by the particular system of forms employed.

There is no system of concrete house molds available but that require a certain degree of standardization in design to make their use economical. Gables, bay-windows, curved surfaces or other than right-angle corners add to the cost of form-work. For a large group of houses, which is essentially the industrial housing problem to-day, much emphasis has been placed on appearance. Rows of houses of identical design are often condemned, and rightly so if each individual house is ugly, whether built of wood, brick or concrete. There is little choice, however, between a group of houses all different, but each of which is ugly, and a group of ugly houses all alike, excepting that the ensemble of all different ugly houses is more offensive than the group of all alike ugly houses.

*Report of committee presented at the recent Chicago conference on concrete house construction.

The real objection seems to lie in the design of the house itself. It does not appear that a group of houses each of which is pleasing will present an unpleasing ensemble even though they all have the same general dimensions. Thus the problem is at once solved by producing a correct architectural design as to general style and proportion, which can readily be altered in minor details, such as the entrance, porch and roof, without at all affecting the pleasing architectural proportion. This is the work of the architect and offers a challenge to his talent and genius.

Design for a large project must above all other things be practical and must, therefore, meet all the real needs of the occupants. Large groups of industrial houses will, in large measure, be occupied by a fairly uniform class of families. Different grades of workmen or different nationalities usually require separate groups, with corresponding differences in size or design of house. Within each of these sub-groups there is little reason for much variation in the main dimensions or floor plans of the houses, and the objection of sameness is at once removed by a skilful arrangement of houses, with variations in roofs and porches, surface treatment, location of entrances and the facing directions of their fronts. This has been amply demonstrated in a number of recent industrial housing developments, and the fact that the monolithic house has practical limitations as to variety, because of the use of forms, should not hinder the adoption of this type.

Too often the monolithic house is discarded as soon as the half truth is suggested that they must all be alike, when, as a matter of fact, a little skill will completely dispel all appearance of monotony, and if the general design is good, the group will be attractive.

The molds that have been developed and used may be classified as to material: Wood and steel. The most widely known concrete house molds are those invented by C. H. Ingersoll and used to construct the concrete houses at Phillipsburg and Union, N.J. These molds do not permit of much variation in design, and a complete separate set is required for each type of house. The houses at Phillipsburg are all of the same general design, but the visitor will be struck more by the apparent variety than the actual similarity. The molds produce a solid wall, which is furred, lathed and plastered to furnish the insulation required to prevent condensation of moisture on the interior surface.

Another system of wooden forms utilizing grooved 2 by 4's which support and hold in place sectional wooden forms, is known as the Felligren system, and is said to have been successfully used in and around Chicago.

The best known systems of steel molds are the Hydraulic Steelcraft, Morrill, Lambie, Metaform, Blaw-Knox, Schub and the Van Guilder. The Steelcraft, Morrill, Metaform, Blaw-Knox and Schub molds are made up of relatively small plates from 2 to 3 ft. square. The Lambie forms are composed of steel channels set vertically, clipped together at the flanges and lined with horizontal liners composed of steel angles. The Van Guilder molds represent a different type, consisting of a combination of plates about 9 to 18 ins. high, held together by yokes and released from the wall by levers. When the chambers of the machine are tamped full of concrete, the plates are released and the machine moved ahead, travelling around the wall and forming a course from 9 to 18 ins. high. This method produces a double wall and obviates the need of furring, and does not impose restrictions on design.

Field Practice

The total amount of concrete required for a concrete house is relatively small and does not justify heavy and elaborate equipment. Large capacity mixers and spouting from a high tower have not proven successful. A small one-bag batch mixer will mix the concrete in sufficient quantity and with sufficient rapidity, and where construction is on a large scale, with many houses going up at once, several small mixers are needed rather than one or a few large ones. For the construction of two-story houses, some separate means of elevating the concrete is necessary unless elevating ma-