Some Notes on the Strength of Concrete Building Blocks.

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The concrete building block industry is rapidly assuming an important position and is now established on a firm basis among the other industries supplying building materials.

Reinforced concrete is now very largely used and seems to be the best form of concrete used for floors, beams and columns, but the concrete block seems to be the form of concrete most adaptable for use in the walls of residences and other buildings.

The industry has grown so rapidly in the past few years that standard specifications for their manufacture and use have been adopted by the National Association of Cement Users and by many cities of the United States. The need for proper specifications was brought about mainly on account of the large number of inferior blocks placed on the market by irresponsible manufacturers. The causes for this are various, such as: a desire for higher profits brought about by using inferior ingredients; ignorance as to the best methods of using the materials at hand, careless workmanship and improper treatment as to storage, etc.

The specification for crushing strength as called for by most specifications is so high that it can be filled only by the best methods and the best material, and although it is many times more than a block will ever be called upon to stand in actual use in a wall, yet it insures a block which is strong, dense and thereby water-proof, with clean-cut, smooth edges, and a block which will endure for ages.

The following are some items which enter into the making of good concrete blocks:

In the selection of a cement, a maker has two alternatives. He must either use a first-class, standard brand of known excellence, or he may use the competitive brands on the market, thereby getting lower prices. In the latter case, he should have each shipment sampled and tested by a reliable testing laboratory.

An unsound cement may not show up till the block is in the wall or for years after, but it is practically inevitable that the block will finally

crack and disintegrate. Some cement companies take proper precautions in the treatment of raw materials and storage of the finished product, such that very rarely does an unsound cement leave their mill. Other companies, in the rush of business, do not properly mix and grind their raw material and finished cement, and do not store the cement long enough for the hydration of the free lime present. These are conditions that tend to place more or less unsound cement on the market. The future of the concrete block manifestly depends to a great extent upon the use of a sound cement.

For maximum strength in concrete, the cement must be finely ground, but fine grinding is expensive and consequently this part of the manufacture is often slighted. The cement should also be slow setting, as a cement that reaches its initial set in two or three hours will be stronger at the end of seven days or a month than a quicker setting cement that reaches its initial set in forty or fifty minutes.

The cement to be used in concrete blocks should in all cases pass the specifications of the American Society for Testing Materials.

Too frequently the reason for poor concrete is ascribed to poor cement, and no thought is given the other materials entering in, namely: sand, gravel or broken stone. The selection and proportioning of the aggregate for the best concrete is very important in the building block industry. It is well known that the proportions of cement, sand and stone which will give the densest mixture of concrete will also give the highest strength. It is also recognized that a rich, dense mixture of concrete is the most nearly waterproof that concrete alone can be made. So that for a strong, water-proof block, it is important that the cement and aggregate be properly proportioned. This may be done by actual trial mixtures to determine the densest concrete. An aggregate containing coarse stones and sand has greater density than sand alone and consequently is better for use in concrete blocks.

According to Wm. B. Fuller, an eminent authority on concrete, the most nearly perfect gradation of sizes of particles in an aggregate may best be known by the process of mechanical analysis and subsequent re-proportioning. In case the business warrants it, samples of the gravel should be submitted to a reliable testing laboratory for mechanical analysis to determine the proper proportions,

A dirty gravel or one that contains impurities should be washed. This will not only improve the strength of the concrete, but will make a more uniform and desirable color for the finished block.

It is now agreed that cement hardens by a process of crystallization of the active elements. Water must be present for the crystallizing to go on. Therefore it is necessary that the proper amount of water be used in mixing the concrete. This, by some authorities, is from 8 to 18 per cent. Also it is necessary that after moulding, the block must not be allowed to dry out, as no subsequent addition of water will give perfect crystallization. Some makers cure their blocks in a steam bath, thereby insuring constant moisture. The economical value of steaming concrete blocks is a subject for experiment as yet. Most specifications limit the time after making at which blocks may be used in the wall, so that the increased speed of hardening by the steam process is not so important.

The specification for crushing strength of concrete blocks, in most cases, is 1,000 pounds per square inch of gross area, no allowance being made for the hollow spaces. The block must reach this strength in 28 or 30 days after making.

The city of Indianapolis has recently adopted specifications for concrete building blocks, and the results of the first series of tests for the block makers of that city by the Laboratory for Testing Materials of Purdue University, indicate a chance for improvement.

Of 75 tests of blocks, supposed to have been made under the specifications, only 28 per cent. passed the specification for crushing strength, and the average age of these was 41 days instead of 30. Similar results have no doubt been found in all cities which have adopted a building block ordinance. However, under the influence of these somewhat rigorous specifications, it is to be expected that the quality of the product on the market will greatly improve. This in itself will strengthen the industry for those makers who are content to manufacture good blocks at a reasonable profit.

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