



## The Preparation of Concrete for Structural Use

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**C**ONCRETE as a construction material is easily made and, having a high degree of workability, can be used in such a variety of ways that its use on the farm provides a means of construction that is invaluable to the farmer. Its properties make it an ideal material for every phase of farm construction. This article, the first of a series which aims at giving the farmer a better understanding of concrete so that he will be able to use it to best advantage, deals with the properties of concrete and methods of working it. Later articles will discuss reinforcement and forms, concrete bricks, pipes, and posts, concrete for foundations, yards, paths, retaining walls, and dams, and general uses of cement and concrete.

**T**O obtain the most effective use from any material a thorough understanding of the properties of that material is necessary. Construction in wood, metal, concrete, or any other material differs greatly and depends entirely on the properties of the material used.

Wood, being relatively soft, can be worked entirely by hand tools, and structures can be built in timber without any mechanical aids. Metal, however, cannot be easily worked without mechanical aids, and structures in metal require the use of machine tools to cut, drill, and shape the sections for fabrication.

The design of structures also depends on the properties of the material used. Timber, having a much lower tensile strength than steel, must be used in larger sections to carry an equivalent load in structural work.

The difference between tensile and compressive strength of steel makes it equally suitable for use for either type of stressing, provided suitable sections are used in each case, but the same difference with concrete makes it more suitable for compressive than tensile stressing. Concrete, as a structural material, is worked and formed in a plastic state and can therefore be moulded to any shape required. When the chemical action that produces hardening is complete the moulds or forms are stripped off, leaving a solid material with the qualities of stone and possessing properties which will be described later in this article.

### Composition of Concrete

Concrete is made by mixing cement and an aggregate composed of hard inert particles of varying size, such as a combination of sand or broken stone screenings, with gravel, broken stone, cinders, broken brick, or other material and reducing the mixture to a plastic condition by mixing it with water.

Compressive strength is generally accepted as the principal measure of the quality of concrete, and with a mixture of substances depending on chemical action to form the final product it will be readily understood that several factors will influence the quality and characteristics of that product.

The most important of these factors are:—

1. The proportions of mix of cement and aggregates,
2. The nature of aggregates and grading,
3. The water-cement ratio, and
4. The type of cement.