

MUNICIPAL DEPARTMENT

CEMENT-CONCRETE CULVERTS*

(Continued from last issue.)

It is a natural inference to suppose that a rough, irregular surface will secure greater adhesion than one that is smooth. However that may be, there is little reason to doubt that gravel will make a good concrete. But there is a right and a wrong way of using gravel. It is not uncommon to find cement and gravel just as it is taken from the pit, mixed to form a concrete. Remembering the proper composition of a concrete, and placing beside this the fact that gravel usually contains sand, but not in any definite proportions, that some pockets of "gravel" may be almost completely sand, while in the layers adjoining there may be little if any sand, it will be readily understood why it is that, in some cases, concrete mixed in this way may be successful, yet it will always be uncertain and hazardous. The only safe method is to separate the stone and sand composing the gravel by screening, then to mix cement, sand and stone uniformly and in their right proportions.

A cause of poor concrete is the excessive amount of water used when mixing. The tendency very often is to bring concrete to the same consistency as common mortar, a very great mistake. Concrete when ready to be placed in the work should have the appearance of freshly dug earth. Where an excessive amount of water is used, the hardened concrete will have an open, spongy texture. The concrete should be mixed close to the work in a box which is sometimes specified as watertight, but the concrete will quickly make it so. It should be mixed in just such quantity as is required, and a constant stream kept passing to the work. It should be laid in layers, and each layer thoroughly rammed until moisture appears on the surface.

It is very necessary to see that the sand and stone used in making the concrete are clean, that is, free from clay, loam, vegetable or other matter which will act as an adulterant, and result in a weak and friable concrete. If such matter is intermixed with the stone it is well to flush it away with a good stream of water. Large stone used in rubble concrete should also be treated in this way. Indeed, it is well, particularly in hot weather, to dampen the stone before mixing it with the mortar. The stone in hot weather causes the moisture to evaporate, with the result that it sets too quickly; and at times there is

*From a paper read by A. W. Campbell, C. E., Ontario Good Roads Commissioner, before the Association of Ontario Land Surveyors.

more or less absorption from the mortar in immediate contact with the stone, unless the stone, as intimated, has been previously dampened.

When the work ceases for the day, or is for other reasons interrupted, the surface should be damp until work is resumed. When work is in progress in hot weather, any exposed surfaces should be kept damp and protected from the rays of the sun; otherwise the surface will, in setting too rapidly, be interlaced with hair-like cracks, which, filling with water in winter, and freezing, will cause the surface to scale off. The same scaling results from laying concrete in frosty weather.

Arch culverts of masonry or concrete fail frequently from settlement, caused by an insecure foundation.

The one element in the construction of concrete work which presents a real difficulty is the uncertainty with regard to the quality of cement. The means of perform-

ing complete tests are not within the reach of small municipalities and they are dependent upon the good reputation of the brand employed. Different batches of cement of the same brand differ, as we know, in quality, and sometimes very much to the disadvantage of the user. A brand may be, in general, good, and yet there are lapses now and then, a little carelessness in chemistry perhaps, which cause an occasional lot to be unfit for use. This is a disadvantage which small municipalities have at present to meet; yet it is one, I feel confident, is growing less, and will continue to grow less, as experience in the manufacture of cement reaches a more definite stage.

Mr. J. B. Rankin, of Chatham, Ont., has been appointed drainage referee for Ontario. Mr. B. M. Britton, M.P., resigned this position some time ago.

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