Letters to the Editor

Placing Concrete in Frosty Weather.

Sir,—In your issue of February 24th there appears an article entitled "Concrete Pipe Tunnel, N.T.R., Quebec," by Mr. C. V. Johnson, A.M.Can.Soc.C.E.

This article is exceedingly interesting in that it deals with the question of depositing concrete during frosty weather—a subject which, in this country with its long and intensely cold winters, is one of supreme importance. That concrete in large masses, such as heavy dock walls or bridge abutments, may be safely deposited during periods of considerable frost, provided that precautionary measures are taken, is fairly well established; but a special interest centres in Mr. Johnson's article because the work described was a pipe tunnel having side walls only 12 inches thick, and floor and covering of slabs only 6 inches thick; and the article is rendered really valuable because the author gives the lowest temperature during which concrete was deposited, describes fully the precautions taken to insure the safety of the work, and is able to give assurance that no bad results followed.

It is just this point—the completeness of the information given—which has led me to trespass upon your columns in order to direct attention to the necessity for this completeness on the part of engineers who describe, in your columns or elsewhere, works which they have carried out, if these descriptions are to be fully and lastingly valuable.

The question of depositing concrete during frosty weather is one which at present appears to be in a somewhat unsatisfactory condition. Different engineers have varying opinions as to the limit of temperature, and the precautions necessary, and in practice this frequently works out as little better than "rule of thumb," or the precarious judgment of the moment. As stated above, it is fairly well established that concrete in large masses may be safely deposited during frosty weather under certain precautionary conditions, but it would be highly desirable if this could be narrowed down so as to establish a lowest permissible temperature, and to define the precautions necessary during the mixing and after placing the concrete, so that some approach to uniformity in practice might be attained and the conditions, the result of sure and certain knowledge, laid down in the specifications when tenders for work are invited.

Similarly there could be established the lowest temperature at which it is safely permissible to build in brick or stone, in which, of course, the mortar is applied in thin layers.

At one time, the present writer was engaged for some 12 years in the construction of dock, harbor and pier works on the northwest coast of England. These works were almost entirely carried out in concrete and stonework. The setting of stone masonry was stopped as soon as the temperature reached the freezing point; and no concrete was allowed to be deposited, even in large masses, after the temperature had reached 4° below freezing point, or 28° Fahr., and only then when the newly deposited concrete would be immediately covered by the rising tide, and remain submerged for several hours. Of course, no precautionary measures, such as heating the materials, were taken, though occasionally the sea-water was used in mixing the concrete. It need scarcely be added that under such conditions none of the concrete ever showed any signs of deterioration from the effects of frost; but it is quite clear that such extreme caution is unnecessary, and would be well-nigh impossible or impracticable in this country. By heating the materials and protecting the new work concrete may safely be deposited at a much lower temperature than 28° Fahr., and it only remains to establish the lowest temperature and the protective measures necessary under the extreme conditions.

There must be many engineers in the country who have had large experience in this matter, and who, doubtless, have much valuable and detailed information in their possession. If such engineers would publish more freely the results of their experience in full detail, and if these details of various conditions and results were collected and made readily accessible, something approaching the lowest permissible temperature and the necessary protective measures might be reached.

The thought suggests itself that the preliminary step—that of collecting exact information—might very properly be taken by the various branches of the Canadian Society of Civil Engineers, each branch working amongst its own members. After this, the results might appear in the transactions of the parent Society, and the information would thus be placed in the hands of the great majority of engineers throughout the country.

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Ottawa, Ont., March 28th, 1916.

Stresses in Lattice Bars of Channel Columns.

Sir,—We may distinguish between the loads that lattice bars normally carry and the loads for which they should be designed, in order to make the design of a column consistent as a whole. It is the latter problem that Mr. Pearse has sought to solve.

It may be well to review briefly what we know regarding the actual stresses in the lattice bars of columns that have been tested and what bearing these results have upon design.

In Bulletin 44, Talbot and Moore give results of three tests of the lattice bars on each of two columns. Column No. 1 was of steel built for the tests and designed slender to show the phenomena expected. It had two plates 20″ x ⅜″, four angles 2″ x 2″ x ¼″, and two rows of single lacing. Column No. 2a was of wrought iron and had seen service in a railway bridge. It had two channels 10″ 30lbs., and two rows of double lacing. The strain gauges were attached to the lattice bars in such a way that they gave the average strain over the entire section of each bar in the gauge length used. For the five bars that showed the highest stress in each test the authors of this bulletin estimate the equivalent ratio of the transverse shear to central column load as follows: