

This clause is not only a great deal simpler than the cumbersome formulæ which it replaces, but the results are more logical and in accord with experience. The intention probably is that all stresses as figured for the concentrated live load be increased 30 per cent. and those for the uniform live load, 10 per cent. This, however, is not perfectly clear in the wording of the above clause. True, the concentrated live load usually produces the maximum stresses in the stringers, floor beams and hangers, but it may also, under special conditions, produce maximum stresses in diagonal members, counters, bearings on abutments, and sometimes in very short spans, in main chord members. On the other hand, sidewalk stringers carry only uniform live load, for which 10 per cent. impact would be sufficient, and there is room for argument as to whether a cantilever sidewalk bracket is a floor beam or not within the meaning of the above clause. If it is admitted that "impact" is a property or factor of the live

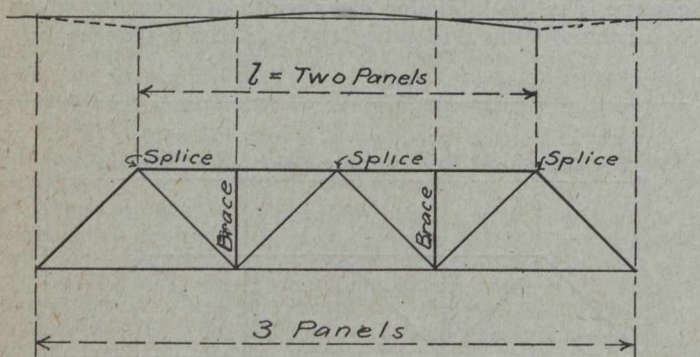


Fig. 3

load, then it must be considered independent of the member of a structure which it may affect. The above clause would be greatly improved if it were rewritten so as to clearly state that the percentage for impact must be added to the estimated stresses produced by the various loads, and then there would be no doubt that maximum stresses in whatever member or connection they occur would be provided for.

Under the clauses which deal with "Construction," "Details" and "Workmanship" there are to be noted many minor revisions, all tending toward those higher standards of practice which have long been in use in railway bridge work. Sub-punching and reaming of rivet holes, while left optional to the engineer in charge, is for the first time mentioned in these specifications. There is one little item that might be questioned on the grounds of economy and that is the requiring all pipe railing to be galvanized. Admitting all the considerations in favor of the galvanized pipe, yet there are many places where the painted pipe would be just as serviceable and as durable as the painted truss it is attached to or the painted lattice railing alongside of it. For this reason the galvanizing might well be left optional.

Important changes have been made in the paint specifications in which is now included a specification for red lead. The amount of this pigment in the shop coat of paint has been increased from 12 to 20 pounds per gallon, which makes a pretty heavy paint for a shop coat. It is suggested that steel hand-railings be painted white. This is, of course, to make them show up better in the distance and at night, just as canal bridges are sometimes painted white for the same reason. Might this not, however, be made the first step toward a more decorative treatment of steel bridges? Certainly white bridges stand out more prominently in the landscape and look less like a machine.

The pleasing effect of many concrete bridges depends a great deal on their whiteness. White paint would also show up the rust spots and the need of repainting would sooner become evident to even the most careless observer.

The specification for steel has been considerably revised and now closely follows the 1909 Standard Specifications for Structural Steel for Bridges of the American Society for Testing Materials. In fact it requires careful comparison to detect the differences and it would have been more satisfactory to have adopted these standard specifications without change.

Commendable additions and ones which will add to its usefulness are sections on timber floors, creosoted wood blocks and preservation of timber. This last-mentioned subject is every year becoming more important and deserves a place in the highway bridge specification.

The final section, "General Conditions," has been somewhat amplified and strengthened in the interests of municipality by stating more fully and clearly the powers of the engineer in charge.

The specification is provided with a very complete index. The care taken in the cross-indexing is indicated by the fact that while there are only two hundred and thirty clauses to be indexed there are probably over six hundred references in the index. Some key words, however, are not the ones which one would naturally look for. For example, these are some of them: "Carelessness of contractor," "Disorderly employees," "Interference with travel," "Reliable work to be done," "Workmen, painting to be done by skilled," etc.

This specification is the product of a growth or evolution. The practice adopted by the department of frequently revising their specifications, cutting out dead material, revising ambiguous clauses, adding new matter and yet retaining (and thus standardizing) what has been found by experience to be practicable and satisfactory, has resulted in an unusually consistent and workable specification, which is placing, if it has not already placed, steel highway bridge building in Ontario on a solid basis. But in saying all this it is not necessarily implied that the specification is perfect or that it will be universally approved. It is probably not such a one as a committee of engineers and contractors would draw up but, on the other hand, it has a definiteness and character which is usually lacking in a specification in which an attempt is made to please everybody. If it is interpreted with common sense and in a not too narrow spirit there should not be much cause for complaint from anyone who wishes to do first-class work.

In conjunction with the 1917 specifications the Department has prepared a set of "General Plans for Steel Highway Bridges" for spans ranging from 28 feet to 120 feet for both 16 and 18-foot concrete roadways, Class A (for main county roads), together with standard abutments and concrete culverts up to 20-foot spans. The value of such standards is quite apparent as they have long been needed.

Each plan gives a complete stress diagram for a bridge and a small scale "show plan," such as up-to-date bridge companies have been accustomed to prepare with their tenders. These show plans indicate details of construction with fair clearness, but it is probable that they are intended to be taken only as suggestions and not to be followed absolutely. Whether it is due to their small scale or not, they are inclined to be clumsy, poorly proportioned, and in some cases inconsistent and wasteful of material and rivets. Every bridge shop has its own particular methods of operation, and work which one shop