

REINFORCED CONCRETE BRIDGES.

THE following abstracts from the report of a committee on reinforced concrete bridges of the American Railway Bridge and Building Association will be found of interest and value. The report was presented at the thirty-fifth annual convention, held in Detroit, October 19th to 21st.

In the construction of railway bridges there are three common methods of procedure in placing slabs: (1) Constructing slabs at a central point, hauling them to the bridge site on flat cars, and setting them in place with a derrick or wrecker. (2) Building slabs at the bridge site at the side of their permanent location, and skidding them into place. (3) Where there is sufficient head room, the slabs built at the bridge site are, of course, constructed in place. There is a decided preference for casting slabs at a central point and lifting them into place. Fourteen roads with a mileage of 64,700 follow this method, while eleven roads, with a mileage of 31,000, report building slab at the bridge site.

The conditions governing the use of the first method are (1) the renewal of a bridge on the same alignment, while maintaining traffic on all tracks. Where the span is not too long, a temporary trestle to carry traffic is built to clear the finished structure. The slab is then built under traffic. Where long spans of a new structure prohibit the construction of a trestle, the tracks are shifted temporarily beyond the limits of the structure. (2) The renewal of a bridge on the same alignment with traffic closed on one track: The slab is built on sections 13 ft. wide, under the closed track. This method obtains only on large construction, where the forces can be moved to some other part of the work during the time allowed for the concrete to set. When the concrete under the closed track has set, a different track is closed and its traffic diverted to the track on the finished slab. (3) The renewal of a bridge or new construction on a change of alignment: Such work is generally constructed by contract. Company forces are usually employed where the construction interferes with traffic. The conditions governing the use of the second method are where unit construction is used where traffic must be maintained on all tracks without interruption for any length of time without change of alignment. The methods of handling work trains depend largely on whether the work is being done by company forces or by contract. A large system that does the work by company forces necessarily has its work train service well systematized. When called out, the train is kept busy during the full day. In this class of work the train has little to do beside moving the materials. Wherever possible, material is allowed to accumulate at the nearest station until enough is on hand to make a full day's work for a train. Where this is not practicable, it is handled by the local freight. The material is handled by the men on the job, whether on company work or contract. Where the work train service is for contract work, it is quite a general practice to make a fixed charge for this service. Under this arrangement the contractor can have all the train service he requests, but it will be to his interest to use it only when he actually needs it.

The differences in the work train service on the various roads appear to be due more to the difference in the amount of the service, and to the local conditions, than to any established practice in the handling of such trains.

The question of methods for concreting in cold weather and protection against frost is one on which the southern roads have little to say, but with the roads of the northern states and Canada the question is a live one. Wherever practicable, all concrete work is done during the warm months, but where the winter season is long, it becomes necessary to do considerable concreting in freezing weather. The necessity for heating the ingredients in freezing weather and keeping the concrete warm after it is placed, is generally acknowledged. The methods for accomplishing this vary considerably. The different methods of heating the sand and stone are steam pipes, steam jets and fires in pipes or under grilles laid under piles of material. The protection of the concrete in place is secured either by housing it in and warming with stoves, steam coils, etc., or by covering it with double forms with air spaces, sacks, tarpaulins, hay or anything that will prevent the circulation of air in contact with the forms. Salt is used under certain restrictions, in mass concrete, but, obviously, it cannot be permitted in reinforced concrete on account of the action of salt on the reinforcing steel. The preparation of test pieces during the progress of the work has been recommended frequently. In order to show the condition of the concrete the test pieces must be exposed to the same conditions as the concrete from which they are taken. This test is not recommended as a means for determining the quality of the cement, or other ingredients in the concrete; this must be determined before they are mixed. It has been suggested as a means for determining whether the concrete has hardened sufficiently for the removal of the forms, and has been done more frequently, perhaps, in connection with building work than on bridges.

It is evident from the reports of the roads that the making of test pieces is not by any means general. The replies of twenty-one roads, with a total mileage of 53,500 is "no." Eight roads, with a mileage of 46,500, advise that they make test pieces on certain work, or under special conditions of construction.

The question of the spouting of concrete called for a great variety of answers. Three roads reported that spouting is not permitted on their work under any conditions. Ten roads permit spouting without any specific restrictions as to slope or distance, but subject to the general requirement that the concrete shall be delivered in good condition at the forms. Sixteen roads permit spouting under specific restrictions as to slope, distance, amount of water, etc.

Evidently there is a great deal of dissatisfaction with, or distrust of, this practice. The rules and restrictions under which spouting is permitted on most of the roads reporting indicate that the method will give satisfactory results, provided the work is properly conducted and carefully supervised. On those roads where it is prohibited, the belief evidently prevails that concrete cannot be delivered in good condition by this method, or that the abuse of the method cannot be wholly prevented by their inspection service.

The facility with which concrete can be delivered over a considerable range by spouting makes it desirable to permit the method, provided the work can be supervised so effectively that there will be no abuse of the method. That this is the most general view is shown by the number of roads, and the mileage represented by the roads permitting spouting under specific restrictions.