D., L. & W. R.R. Bridge, No. 9.99

That the flat-slab system has flexible possibilities not obtainable by established bridge construction, a plan, (Fig. 9) of a study in the renewal and extension of the D., L. & W. R.R. Bridge, No. 9.99, is submitted for consideration.

It is here proposed to remove the present two-track steel bridge for the reason that the abutments, 29 ft. apart, encroach upon the 41-ft. 6 in. new driveway, which has been substantially paved with granite block on a concrete base. The bridge is to be extended for future track development on the southerly end, including the installation of an industrial track by extension of the present separate sidings which terminate close to the proposed bridge on either side.

Lateral street intersections fixed the 5 per cent. grade of the street on the southerly side to begin at the face of the present steel bridge, thereby materially encroaching upon the vertical clearance for future expansion of tracks at their present elevation. To overcome this difficulty the flat slab is here tilted in the transverse direction to be approximately parallel with the grade of the present crown of street, and in the longitudinal direction parallel with the grade of the tracks. This flexibleness and the thin slab have resulted in a very shallow floor depth street, and in the longitudinal direction parallel with the grade of effecting the preservation of the established well-ballasted main line tracks, and the extension across the bridge of the industrial siding to the right at its present elevation without resorting to the usual alternative of lowering the street, which in this case would be a very expensive operation. When the future third and fourth tracks are laid, they can easily be established at the elevation 1 ft. 6 ins. above the present tracks necessary to provide the proper amount of ballast.

The most important consideration in the construction of the small type railway bridge on an established alignment is to maintain traffic without interruption during the operation. This is handled in a number of ways. Where the topography will permit, the alignment is shifted temporarily in order that the bridge might be built clear of traffic, in part or in its entirety. Where the right-of-way is of limited width and the tracks cannot be shifted, a timber pile bent trestle of 12-ft. spans is driven under traffic and between these bents, after the excavation has been made the abutment and piers only of the new bridge can be built. Long temporary through girders are often used to span out to out of the new abutment lines in order that the entire bridge may be built underneath. If no old girders are available and the only solution is the timber trestle there arises the exclusion of the flat-slab construction, for the reason that the floor system of the new bridge must be erected beyond the bridge site, either in units or in the whole, followed by a quick removal of the trestle stringers and the installation of the completed floor system on the new masonry during hours of least traffic.

This very important consideration of construction is satisfied in the last example by dividing the work into two parts along the construction joint as indicated. This joint is placed without weakening the strength of the slab and so that the southerly half can be built first without interference with traffic and alongside of present structure by removing only a small portion of the old masonry. The main line tracks will be shifted temporarily to the completed half which gives clear field for the removal of the old bridge and completion of the new structure. The bulkheads of the construction joint are arranged to be practically normal to the bands of reinforcement.

The measure of the advantage in cost of the flat-slab railway bridge, compared with other types, varies considerably and is dependent upon the conditions at hand. There seems to be no question concerning the architectural and structural advantages, the latter results in less maintenance and greater permanence. Of immeasurable value is the simplicity of design and the expediency with which the construction can be carried on. These features are emphasized in the last example which, with its 45° 44′ angle of crossing coupled with the grades of the street and tracks, would considerably complicate the details of design and construction of established bridge practice. The flat-slab design will not require any special consideration on account of these complications. Its flexibility offers much opportunity in overcoming and simplifying other inherent complications of the small type railway bridge.

PROTECTING IRON FROM CORROSION

IN a paper read before the Iron and Steel Institute, J. N. Friend summarized as follows the results of his researches on the usefulness of paint for protecting ironwork from atmospheric corrosion: (1) The practical value of acceleration tests is very small in the present state of our knowledge. Reliable results can only be obtained from tests carried out under conditions closely resembling those prevailing in practice. (2) Addition of pigment to oil increases the efficiency of the latter as a protective paint until a maximum is reached. After this, further addition of pigment causes deterioration. The best results are obtainable from paints possessing as high a percentage of good oil as is compatible with good body and any other working property that has to be considered. (3) Linseed oil on setting expands by some 3.3 per cent. This is the primary cause of crinkling. Further oxidation causes a decrease in volume, which in time leads to cracking. (4) Linoxyn is permeable to moisture. The permeability is reduced by heating in absence of air, the oil increasing in density, viscosity, and molecular weight. (5) Polymerized linseed oil affords a better protection than raw oil when used as a paint vehicle. (6) The functions of a pigment are to toughen the film and render it less permeable to water-vapor and oxygen. It also reduces the expansion of the oil on setting, and thus minimizes the tendency to crinkle. (7) A thick coat of paint protects the underlying metal more efficiently than a thin coat, provided the coat is not so thick that running or crinkling takes place. (8) The very best results are obtained by multiple coats. Two thin coats are better than one thick one of equal weight. (9) Thinners enable thin coats of paint to be applied. Turpentine leaves a very slight residue behind upon evaporation, but its effect on the efficiency of the paint is small. (10) Other things being equal, the most permanent paints are those containing black or red pigments, since these absorb the shorter rays of light, and prevent them from hastening the destructive oxidation of the linoxyn by the air. (11) Finer pigments afford more efficient protection than coarse pigments, since they are more thoroughly in contact with the oil. (12) Iron structures should be painted whilst their scale is still on, after loosely adherent flakes and rust have been scraped off. The paint will last rather longer than if applied to the pickled or sand-blasted surface, and the labor of removing the scale is saved. (13) Experiments with rusty plates are not conclusive, but suggest that the rust need not be so carefully removed, prior to painting, as is usually thought to be necessary.