Concrete support for railway track: sleepers

D. B. SCOTT

Mr J. Simpson, Sir William Halcrow & Partners

In extolling the merits of the concrete sleeper, the Author, throughout the Paper, associates the concrete sleeper with continuously welded rail (§§ 1, 9, 15 and 22). This tends to obscure what the benefits of the concrete sleeper might be, *per se*, when compared with the timber sleeper. The main advantages of the prestressed concrete sleeper, compared with the timber sleeper, would appear to be enhanced durability and greater weight to resist displacement.

24. It would be of interest to see stated, rather than the data in Table 3 which does not compare like with like, the purchase price of concrete sleepers with clips versus that of timber sleepers with baseplates and clips.

25. There has undoubtedly been an impressive tide, possibly created by the scarcity of timber, towards the use of prestressed concrete sleepers on main lines in the UK. Nevertheless, timbers still have to be used at points and crossings and, given a situation with readily available timber, timber sleepers could be selected for high speed continuously welded track.

26. One property of prestressed concrete sleepers which leaves some feeling of uneasiness is their behaviour in derailments. My own observation of the derailment at Ealing Broadway in December 1973 was that the sleepers disintegrated, leaving the prestressing wires free of the concrete and allowing the rails to be deflected considerable distances from their true alignment.

27. Since it is likely that the severity of the consequences of derailment can be mitigated by restraining the derailed train in its original alignment line (i.e., by avoiding jack-knifing), the continued presence of the rails in these circumstances is a considerable advantage.

28. Where prestressed concrete sleepers have been adopted, there seems to be a case for some provision—possible by the introduction of some normal reinforcement—so that the sleeper retains a degree of integrity after impact from derailed wheels.

Mr Scott

Assuming two lengths of railway track maintained to the same standard, one section having jointed track and the other continuously welded rail (CWR), the section with CWR will require considerably less maintenance than the length

DISCUSSION

with jointed track. This benefit is irrespective of any appropriate sleeper support system.

30. In addition to the virtues mentioned by Mr Simpson, the merits of concrete sleepers depend to some extent on the type. The monoblock pre-tensioned concrete sleeper including rail fastenings, as preferred in the UK, is cheaper in the UK than a timber sleeper of the required quality with fastenings on a first-cost basis. The trend from timber to concrete on a world-wide basis will rapidly increase for economic reasons. In many cases the economic factors will extend beyond a first-cost comparison.

31. In addition to the potential of reduced initial capital cost and the virtues mentioned by Mr Simpson, monoblock concrete sleepers with a good fastening system give more uniform and accurate track than timber-supported track, and also the former retains the improved properties much better than the latter. The accuracy is particularly advantageous for passenger comfort and safety in high speed trains, and the gauge retention has also proved beneficial for heavy axle traffic in curved territory such as that of the Canadian National Railway in the Rocky Mountains. For comparison purposes, maintenance costs and the life cycle cost of all components for each location require to be considered with initial financing costs over the lifetime of the specified track structure.

32. Concrete bearers at points and crossings have been in service and performed satisfactorily for many years, and an extension of use in the UK is under way. The principal drawback has been the difficulty in handling concrete bearers but this problem appears to have been overcome in Sweden where they have been used on a much larger scale, and other countries are currently planning to incorporate the benefit of concrete bearers in their track.

33. UK records indicate a considerably reduced incidence of derailments on concrete-sleepered track. Where the current practice of keeping the cribs full of ballast is maintained, damage such as described by Mr Simpson is generally avoided and gauge retained to allow the passage of traffic at reduced speed.

34. On the basis of a broad review there is insufficient evidence to justify the considerable extra cost of secondary reinforcement in pre-tensioned concrete sleepers. Such steel would not reduce the number of derailments or mitigate the consequences apart from possibly giving a minor handling advantage in replacement of sleepers suffering exceptional damage in a few cases.