THE PERMANENT WAY

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At the Adelaide conference Mr C.J.M. Steele delivered a paper on track construction, some points of which may well have been specifically directed to the museum here at Ferny Grove.

Among the points raised were:

(1) The layout of the depot area (buildings as well as trackwork)

(2) Operation with a purpose (going somewhere)

(3) All construction methods to be applicable to semi skilled or unskilled labour

(4) Utilization where possible of available stock items.

On the layout of the depot area at Ferny Grove we have three buildings used to house our cars. Two of these are depot buildings each of three roads with a capacity of three of the larger cars. The No 3 road of the No 1 depot building has been equipped with an inspection pit.

With regard to operating with a purpose the museum is most fortunate in that the area in which we are sited is filled land (garbage tip) and normally would only be used as parkland or sporting fields. The city administration has however virtually designed the layout of the sporting ovals to fit in with an optimum track layout for the museum which will result in an eventual run of 1.9 km of which 350 m will eventually be double track.

The construction programme has been dictated by a number of factors, some of which were:

(1) To provide adequate storage for all equipment.
(2) To provide facilities to enable this equipment to be maintained and restored.
(3) To carry out such works as were required to enable operation of the equipment.

In the provision of suitable buildings for the storage of the equipment we were most fortunate as two buildings already existed on site and the full length of one bay of Ipswich Road Depot was made available to the Museum. This was reconstructed as two buildings each of three roads having between them the capacity to house the majority of the existing museum fleet.

The first of the previously existing buildings has been extended to the rear to provide sufficient length for the longest cars in the collection and is being progressively equipped to carry out its function as a workshop and will eventually be equipped with a pit. The building has a capacity of three cars and one road vehicle. A lean-to on one side provides storage for a further two road vehicles.

The second of these buildings is used as a stores building in which a further three motor vehicles are also held.

To enable ready servicing of the rolling stock it was felt that a pit was essential, accordingly provision was made for a full length inspection pit which was constructed at the front of No 3 road of the No 1 depot which is presently the running depot.

As some trackwork was essential to move trams from various temporary storages to permanent storage as it became available, this early work has to varying degrees dictated the present track arrangement, and has made a number of points most obvious, some of which are:

On grades such as exist at Ferny Grove, expansion and contraction stresses alone without operational stresses imposed by tractive or braking forces will induce downhill movement unless anchored either by heavy ballasting or by laying in mass concrete.

In areas of white ant infestation untreated timber sleepers have a useful life of three years or less.

Temporary or below standard trackwork is an exercise of doubtful benefit and there are few more demoralising tasks to volunteer workers than dismantling trackwork to enable it to be relaid to an acceptable operating standard.

The standards set for all trackwork must be as high as practical, with the finished work being as near as possible to maintenance free.

Consideration should be also given to methods of construction that will minimise damage to cars should the worst occur.

In the museum situation there generally exists very limited physical and financial resources. For these reasons investigation was made into the various alternative methods of tracklaying available with consideration being given to the following points:

(a) Availability of components
(b) Suitability to site situation
(c) Initial cost
(d) Maintenance factor

The various alternative methods of construction or options were as listed:

(1) Railway T rail on timber sleepers in open ballast
(2) Railway T rail on timber sleepers ballasted to rail head and sealed
(3) Railway T rail in mass concrete to railhead level
(4) Tramway type grooved rail on timber sleepers in open ballast
(5) Tramway type grooved rail on timber sleepers ballasted to rail head and sealed
(6) Tramway type rail in mass concrete to railhead level

The availability of components, specifically rail, led to the exclusion of options 4 and 5 with option 6 being effectively restricted to use in conjunction with pointwork.

The next point to be considered was that of suitability of the construction method to the soil conditions. It is quite obvious that conventional open ballasted track is more practical than mass concrete over areas where continuing settling of the ground level can be expected over an extended period such as the proposed run across the face of the present dump. On the other hand on natural ground particualrly where a white ant problem exists mass concrete offers considerable advantages.

The next point, that of initial cost, was considered with the labour content also being included. To lay a 12.2 metre length of track to the method given in option 1 would require 14 sleepers and 9.8 m^3 of ballast costing $168.00 and $176.40 respectively for a total cost of $344.40.

To lay the same 12.2 metre length of track to option 2 would require an additional $35.50 for ballast and $21.00 for surface sealing in addition to the material used in option 1 making the cost $400.90.

Construction of option 3 would require 10 m^3 of pre-mix concrete costing $418.60 and 6 tie bars costing $27.00 making a total of $445.60 per 12.2 metres.

The construction labour factor in option 1 was considered to be the lowest followed by option 3 with option 2 having the highest labour content by nature of the method of construction.

The next consideration was maintenance with obviously the material and labour components being the major factors. Two periods were used for this exercise, firstly 5 years then 15 years. The labour content was calculated in man-hours which for this purpose were converted to financial terms at a rate of $4.00 per hour.

Option 1. Over the 5 year period a 12.2 metre length would require on average the replacement of one sleeper and some repacking. The costs involved being for material, one sleeper $14.00, labour 8 man hours or $32.00. A total of $46.00.

Over the 15 year period on average there could be a requirement for the replacement of 9 sleepers and repacking. The costs involved being for material, 9 sleepers $126.00, labour 43 man-hours valued at $172.00 for a total of $298.00.

Option 2. Because of the method of construction, sleeper replacements could be less than for option 1, however the labour requirements would be greater for each replacement operation and additional cost would be incurred in resealing the surface.

Over the five year period one sleeper could be required as well as some repacking, in this case the costs would be for material, one sleeper and resealing material $16.00 with a labour content of 12 man-hours worth $48.00 for a total of $64.00. Over the 15 year period the requirement could be seven sleepers with spot repacking and resealing. The costs involved would be material $112.00 and labour content of 73 man-hours worth $292.00 for a total of $404.00.

Option 3. Was considered to be maintenance free over both the 5 and 15 year periods based on the life of the mass concrete track in Queen Street Brisbane which saw better than 30 years of service under conditions of extremely heavy traffic both tram and motor vehicle with no appreciable maintenance over

that period. For purposes of evaluation, the costs became as follows:

Option 1. Construction $344.40 with maintenance over 5 years without labour $358.40. With maintenance over 15 years without labour $470.40 with labour over the 15 years this becomes $642.40.

Option 2. Construction $400.90 with maintenance over 5 years, without labour $416.90. With maintenance over 15 years without labour $512.90. With labour content over the 15 year period with becomes $804.90.

Option 3. Over all periods the costs remained the same until such time as rerailing was required, these costs were $445.60.

In comparison with Option 1 there is an initial saving over Option 3 of $101.20 after a period of 5 years including the labour component the gap has narrowed to $55.20 over the span of 15 years even without labour the balance has swung to the advantage of mass concrete construction by $24.80 and with the labour component the advantage widens to $196.80.

Other advantages of Option 3 over Option 1 were no weed control problem and as in the case of this museum it is intended to operate trolly buses this style of track will provide portion of the roadway for these vehicles, also in the unfortunate case that the worst occurs and a car becomes derailed the risks of serious damage to the equipment is lessened and rerailing is simplified.

In the light of the circumstances existing at Ferny Grove the following decisions were taken.

(1) All pointwork would be laid in mass concrete on construction and existing pointwork would be modified to this form of construction as soon as practical.

(2) All running trackage will be laid in mass concrete except over unstable ground.

(3) All trackage over unstable ground will initially be laid as open ballasted track.

An alternative appearance can be obtained by utilising mass concrete construction to within 25 mm of the surface and a hot-mix surface above that to rail head.

In conclusion, provided initial finance is available mass concrete track construction is perhaps the ideal answer in a low traffic density museum situation where both financial and labour resources must be covered.