AN EXERCISE IN LARGE SCALE JOINERY: RESTORATION OF THREE HISTORIC WELLINGTON & MANAWATU RAILWAY CARRIAGES

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Abstract
Three railway carriages built by the Wellington & Manawatu Railway Company at Thorndon, Wellington, 1904-08 survive, the last complete vehicles of the Company's rolling stock. They are in process of being restored in the Hutt Valley, Wellington, to as near "as-built" condition as possible. These carriages were built using plans based on a batch of earlier carriages built for the Company in Philadelphia, Pa., United States of America. Much of the timber used for their construction was recycled from material salvaged from a large viaduct built of native timbers in 1886.

These carriages are notable in New Zealand because their structural design uses composite wood and steel trusses built into the sidewalls below the window line, and their construction made extensive use of re-cycled kauri timber salvaged from a large viaduct. They are also the last complete rolling stock built by the Wellington & Manawatu Railway Company which was New Zealand's most successful privately built and owned railway. In a number of ways, the Company was in advance of New Zealand's Railways Department practice, this being reflected in the design, construction and fittings of these three carriages.

Volunteer work continues on the project, having begun in earnest in 2004. An adequate workshop had to be built before restoration work began. One carriage is nearing the end of restoration and was first displayed publicly during an open day on 18 October, 2014. A second has been stripped to its framing. Replacement frame timbers are being prefabricated for those members that will have to be replaced because of advanced decay. The third complete surviving carriage has been received on site but is unlikely to be worked on by the present team before the other two are more significantly advanced.

1. Introduction

Figure 1: WMR 48 in the project workshop before restoration began, 2004.

Our project began when the New Zealand Railway & Locomotive Society Board of Management (NZRLS, the Society) received a request from its Hawkes Bay Branch that it assume responsibility for railway carriage No. 48 built by the Wellington & Manawatu Railway Company (WMR, the Company), later New Zealand Railways (NZR) carriage A 1126 (Figure 1). This carriage had been used as clubrooms at Clive, near Napier, from 1960 until it was transferred to Gracefield, Lower Hutt, in November 1994, in an unsuccessful bid to find a sponsor for it to be restored.

The Branch was able to supply a significant sum of grant monies which the Board put towards the cost of a suitable workshop building to house the carriage for its restoration.

When our building was sufficiently complete to protect WMR No. 48 from the weather, it was brought to the site at Silverstream, Hutt Valley, and formally rolled in on 6 March, 1999. Work did not commence immediately, until a permanent floor could be built. When funds permitted, a concrete floor with two railway roads built in was completed and the collection of necessary woodworking machinery began. Three phase electrical supply was connected and the building wired with plenty of fluorescent lights and sockets. Other services, water, sewer, telephone, had to wait until much later, again for funding reasons.

Our first significant grants were received from Stout Trust and from Weta Workshop, for which we were very grateful. They unlocked many subsequent sources.

The project has grown from that point. The other two surviving complete WMR carriages have come to the project through the generosity of various Society members, so that we now have all three complete remaining WMR vehicles.

2. The Wellington & Manawatu Railway Company

This Company was floated in February 1881 with the objective of building a railway to link Wellington with the Manawatu district via Wellington's west coast. The Company's history is recorded in the book *Uncommon Carrier*, by K R Cassells. [1] At that time, the government was unable to fund any significant new railway because of lack of capital. The WMR's formal opening was on 3 November, 1886, when the Governor drove the last spike at Otaihanga, Paraparaumu.

As the Government was still very short of funds, it could not buy the completed line, as envisaged by the Company. Instead, its Directors had a railway they had to run and to make profitable. They did so, paying dividends from 1891 onwards. In financial terms, at least, no other privately owned railway in New Zealand has ever been as successful.

The Directors and Engineers quickly realised that their best operating model was the rapidly expanding railroads of the United States of America (USA). The Company adopted North American practices widely, bringing its practices ahead of NZR's, often by decades. Examples of this include the use of telephones for communications and to control traffic, and the use of electric lighting in carriages and in its Thorndon yard, Wellington. Increasingly, rolling stock was obtained from or modelled on that of North America.

With the expectation that the North Island Main Trunk railway (NIMT) between Wellington and Auckland would be completed in 1908, the Government served notice that it would exercise its right to buy the Company, so that the whole NIMT would be controlled and operated by the NZR. Control of the WMR passed to NZR on 7 December, 1908.

3. WMR Passenger Carriages

The WMR built and operated a total of 53 passenger carriages (one other was converted to a dining car on arrival in New Zealand), plus three dining cars. Forty carriages were built in North America 1885-1902; two at NZR's Addington workshops, Christchurch, in 1886; and another 12 carriages were built in the Company's Thorndon workshops 1904–08.

Three of these last are the carriages included in the project discussed here. All three were built as second class saloon cars, with bench seats arranged in two rows, one along each side wall. Seats were wooden, with leather upholstery padded with horse hair.

4. Carriages included in the Project

4.1. General Description

Figure 2: WMR 36 being built by Jackson & Sharp, Philadelphia, Pa., USA, 1902.

Figure 3: Interior view of 36 as built.

Structural and fittings design in these three followed North American practice, as a batch of similar carriages built in 1902 by Jackson & Sharp of Philadelphia, Pa,, USA (Figures 2, 3). The main load bearing structure is a composite truss built in to each side wall, comprising wooden floor beams and a steel tie anchored at each end of the body. The tie rises diagonally to a cast post over the bogie centres, then runs horizontally under the window sill to above the other bogie centre. The two end arrangements are mirror images of each other.

To ensure the steel tie is kept in tension under load, a steel truss rod under each side wall between the bogies has a left and a right-hand threaded turnbuckle to tighten it. Tightening the truss rods has the effect of lifting the whole body to a hogging camber, making sure the trusses in the walls will work as intended.

This was a more efficient use of materials than was NZR practice of the time. Wood was readily available as a construction material in both North

America and New Zealand, whereas steel was relatively expensive. Consequent on this, and on supply problems, there was an incentive to use steel only where absolutely essential. NZR practice followed British design principles of building a steel underframe that provided all load-bearing structural functions. Wooden framed and sheathed bodies were then built by NZR on top of the steel underframes.

As far as possible the programme under which these WMR carriages were built used native timbers salvaged from the original wooden trestle viaduct across the Belmont Valley, just north of Johnsonville, Wellington. This viaduct was replaced with a steel structure in 1904. Kauri was the main timber used for body-building. The largest members are six floor sills the length of the carriages' bodies, 8" x 5", 44'-4' long (200 mm x 125 mm, 13.5 metres long). The two central sills that take buffing forces are hardwood. The other four sills are kauri.

Internal match-lining of the saloons was kauri up to the window sills, American oak where visible above the seats from the window sills up and across the ceilings. Internal partitions and draught screens were all American oak, panelled. All interior woodwork was varnished.

The floors are double-skinned with longitudinal planking and the spaces in between skins are packed with wood shavings for better insulation.

There are 14 main lifting windows and another 14 clerestory windows along each side of the carriages included in our project. Each end wall has lifting windows flanking the entry doors.

Second class cars like these were painted a red-based colour which appears to have weathered to a light brown in time. We were fortunate to obtain a flake of the original paint for colour matching from under a fitting installed by NZR. Roofs were painted slate grey. Underfloor areas, bogies and brake gear, etc., were black.

A water closet and hand basin were provided in a separate compartment in each car. Four electric chandeliers, fed by batteries carried in some guard's vans, were fitted and there were two kerosene burning lights for use when electricity supply was not available. Available construction plans make no provision for a light in the toilet compartment. No form of heating was provided.

One apparent anachronism was the fitting of dead buffers. These were short sprung buffers located each side of the main, Norwegian pattern buffer-couplings, used in common with NZR. If the main coupling broke, the dead buffers prevented adjacent vehicles from closing up fully on each other. They had been developed for this reason in North America in the days of link and pin couplings before the Master Car Builders' knuckle-pattern coupling was adopted as standard in 1890. With link and pin couplings there was no other means of protecting shunters (switchmen) when making a coupling between moving vehicles. Broken couplings are still a significant hazard when they occur.

Westinghouse automatic air brakes were fitted from new. Their operating principle is that the air pressure holds the brakes off. Reduce the pressure in the train pipe and the brakes are applied proportionate to the train pipe pressure reduction.

4.2. The Project Carriages

The first carriage to come to the project was No. 48, built in 1906. As with all the Company's rolling stock, it was bought by the Government in 1908 and added to NZR's stock.

WMR standard fittings were replaced by NZR standard items over time. For example, the electric and kerosene lights were replaced with Pintsch compressed gas lights. The dead buffers were removed. End platforms railings and gates together with monogrammed glazing in the doors were replaced with standard NZR fittings. Other lesser modifications were made over the years.

No. 48 was bought by the NZRLS Hawkes Bay Branch in 1961 for £25. Removal from NZR tracks to a close by site at Clive railway yard was greatly facilitated by a case of beer given to the local track gang!

From there No. 48 came to Wellington in 1994 and to the NZRLS site at Silverstream in 1999, as discussed above. It was in the best condition of the three carriages as received by our restoration team, as it had been subjected to regular maintenance after it passed out of NZR use. It was protected from the weather when stored at Gracefield through the good offices of the Rail Heritage Trust and New Zealand Rail Ltd.

Second to be received was carriage No. 52 which had been built in 1907. This was bought in 1959 by the NZRLS Wanganui Branch. No. 52 was then sold to the traction engine society in Marton. They removed the bogies and the truss rods when these were damaged during unloading. In 1974 ownership of this carriage was transferred to the NZRLS Wellington Branch which later became the Silver Stream Railway. The carriage was stored at Seaview, Lower Hutt, until it was transported to Silverstream in 1988. The body has sagged over time after the truss rods were removed. As a result of prolonged exposure to the weather, this carriage has deteriorated worst of the three, with much rot in structural members (Figure 4).

Figure 4: WMR No. 52 being transported to the project workshop. The body sags after removal of truss rods and much rot is apparent.

No. 42 (built 1904) was bought by the late Bob Mann and stored for many years sheathed in corrugated iron at the base of the Bush Tramway Club in Pukemiro, Waikato. Bob bequeathed it to NZRLS and it was received on our site 23 April, 2014. This carriage has also deteriorated over the years, being in intermediate condition between that of the other two as received. Its internal layout differed from that of Nos. 48 and 52 by having the toilet at the northern end, above the bogie. The latter two had the toilet in the centre, dividing their interior accommodation into two saloons.

The engineering heritage values of these carriages include that they:

- were built to the best North American practice of their day;
- are distinctive in New Zealand to the WMR, a company that had advanced technical standards and practices for its time;
- exemplify active materials conservation policies of the period before 1908.

Their heritage importance was recognised by the people who saved them in the period around 1960 when they became surplus to NZR operations.

5. Restoration of WMR 48

5.1. Conservation Plan

A formal restoration plan was commissioned from architect and conservator Ian Bowman by the Rail Heritage Trust. [2] We received this in 2002.

Conservation policies in accordance with the International Council on Monuments and Sites (ICOMOS) New Zealand Charter for the Conservation of Places of Cultural Heritage Value were prepared for the guidance of the project team. These covered:

- Long term conservation of No. 48;
- Interpretation of the value of the carriage;
- Its then physical condition;
- Recommendations for repair; and
- Future maintenance.

As far as possible, the principles and polices of his plan are being followed.

The project team decided at the beginning that No. 48 would be restored to its original as-built condition or as near to that as possible. This policy has been extended to the other two carriages.

5.2. Research in Preparation for Restoration

Considerable research was carried out in New Zealand and in the USA to establish as much authentic information on the original condition of the carriage as possible. Relevant plans and photographs were obtained from sources in both countries. Many of the WMR records had been lost or destroyed through the years, but engineering drawings were available from archival sources and from New Zealand Rail Ltd. mechanical engineering records.

Engineering drawings for the Woods safety gates, standard on WMR carriages, were located in and copies obtained from the Illinois Railway Museum Pullman Library, Union, Ill., USA.

Despite a great deal of effort, some details could not be established with certainty. For example, only one photograph has been found showing a WMR carriage kerosene light and no view has been found of the interior of a toilet compartment. Available plans are insufficiently detailed in this area and some details such as doors heights and choices of specific joinery mouldings have involved much discussion with knowledgeable people.

The design of the electric light chandeliers was able to be deduced from a reproduction manufacturers' catalogue of 1905 and from repairs to the ceiling after NZR removed these fittings.

5.3. Restoration 2004–14

Restoration commenced in June 2004. Annual progress was recorded in the Society's annual reports [3], from which this summary has been prepared.

No. 48 was in the Society's workshop, protected from the weather. The building had been completed with two parallel rail sidings set into a reinforced concrete floor. Three-phase electric power supply had been connected and a comprehensive collection of woodworking machinery was being obtained from a number of donors.

Sufficient toughened glass for the windows for carriages Nos. 48 and 52 had been donated in 2003. Our general policy has been to obtain materials and to make parts for both carriages at the one time. Items for No. 52 are being held ready for when they are needed.

When work began in 2004 benches, kitchen facilities, and beds installed by past owners were removed from No. 48. One exterior wall was stripped of its tongue and groove (t & g) timber cladding so the condition of the framing could be assessed. All remaining non-original fittings were removed.

Fund-raising also commenced. We found the most successful approach was to seek multiple modest sums, each for a specific purpose

Through 2004–05 the carriage was lifted off its bogies, which were taken apart, sand blasted and painted. All exterior cladding was stripped off the framing and 14 wall studs that had rot in them were replaced. Replacement t & g kauri cladding was obtained, cut to size, and primer painted ready for use later.

The following year patterns were made for missing parts of the bogies and replacement castings obtained. New springs for the suspension and drawgear were obtained for both carriages. The old roof cladding on No. 48 was removed to allow broken and rotten roof timbers to be replaced. Some large holes cut in the roof by NZR for gas lights ventilation were patched over. Work began on applying new t & g wall cladding. The tedious and difficult work of stripping paint applied by NZR to the interior match-lining began. We had established from observation that this woodwork was varnished originally.

Donated jarrah floor beams from a building reconstruction site were machined by a joiner, who cut four new headstocks for use on Nos. 48 and 52. Enough glass for use in both Nos. 48 and 52's new clerestory toplights was sand-blasted with a pattern matching the original.

In 2008 all exterior cladding was replaced. Much painstaking sanding was carried out to strip paint from the interior match-lining. The making of new window sashes from mahogany for both carriages began.

Other work carried out in 2007-08 included rebuilding the end entry platforms, including the new jarrah headstocks and the fitting of drawgear, steps and handrails. Very weathered timbers at the ends of the roof were replaced. Work began on machining new main window sashes in mahogany.

During the next year wheels, tyres and axles were checked by a mechanical engineer accepted by New Zealand Rail Ltd and remedial work agreed. One set of axle and wheels was rejected as the tyres were considered too thin, so an acceptable replacement wheelset was obtained. As necessary, axle bearing areas were skimmed to remove pitting caused by corrosion when No. 48 was out in the open. The bogies were then reassembled and run under the body again. Air brake equipment was overhauled, refitted, and everything underfloor was painted black.

The decision was made that the match-lining of the ceiling would be taken down to permit the stripping of all traces of NZR paint. This was when we confirmed that the original treatment was varnish. At this time the original WMR electrical wiring was found. It was replaced with modern insulated wires. We were able to re-use the kauri match-lining and 75% of the oak. The new oak was sourced to match the old and the lining was completed. The floor was lifted and re-laid using new kauri planking.

Blinds were also made and will be fitted to the main windows later in the project.

Pattern-making commenced for the many small metal parts needed to replace lost fittings and ones replaced by NZR. Larger castings include those for the Woods safety gates on the end entry platforms, dead buffers, window openers and luggage rack brackets. The last of these patterns are being worked on at present.

A milestone was reached in April 2011, when No. 48 was taken out of the shed for a test run. It was found to ride very comfortably at low speed on somewhat rough track. Leaks in the air brake piping were marked for later attention.

Through 2011–12 toilet compartment partitions and draught screens adjacent to the internal doors were made and fitted. Varnishing of all exposed interior woodwork was begun. Windows are complete except for their metal fittings and final painting.

In 2014 interior woodwork is complete except for all doors, which are yet to be made. Top coat painting of the exterior was completed this spring. Work is beginning on making replacement electric and kerosene light fittings.

5.4. Remaining Work to Complete No. 48

Castings are needed for a multitude of small fittings, for the Woods gates, and for the dead buffers. Doors have to be made. The main windows sashes are ready for final painting and fitting. Once the Woods gates and dead buffers are made and fitted the end platforms can be painted.

Replacement electric and kerosene lights have yet to be made.

A final step will be contracting a sign-writer to apply linings, company name, carriage number, and class designation on each side of the carriage.

6. Restoration of WMR 52

No. 52 was donated to the Society in 2003. It had been left exposed to the weather for a long time and was in very poor condition, exacerbated by the removal of the truss rods earlier. The carriage was jacked off its bogies and placed on levelled trestles in the workshop to stabilise and dry out.

In 2012 a separate restoration team stripped the cladding, match-lining and floors. None of this timber was salvageable. The four kauri floor sills had advanced rot in their mid-sections and also need to be replaced.

Timber was bought in 2014 which allowed a start to be made on prefabricating replacement wall studs and diagonal braces that need renewal. Laminated finger-jointed macrocarpa beams have been obtained to replace the rotten kauri floor sills.

7. The Future of the Project

While there is no specific target date to complete restoration of No. 48, this should be achieved within the next two years.

Work has begun on the structural repairs needed for the restoration of No. 52. We expect this project to continue in a manner similar to No. 48.

At this stage there is no firm proposal to commence work on No. 42.

Once the project is complete, we will have three second class WMR carriages restored to as near original condition as possible. Our intention is that they be held under cover and on display, available for use on special occasions. KiwiRail has indicated that permission could be given to place them on its tracks for special events. However, this will be subject to stringent safety conditions and precautions, such as yard movements only, or under block of line conditions to keep them clear of modern trains.

A beguiling thought is that some members of our kindred society, Steam Incorporated, of Paekakariki, have the salvaged frames from the engine and tender of WMR locomotive No.9. They have begun a long term project for the restoration of this with the objective of producing a working locomotive again. Perhaps one day, No. 9 and our carriages could come together to recreate a genuine WMR train?

8. Conclusion

The Society's management committee was aware it was taking responsibility for a significant project when it agreed to accept WMR No. 48 from our Hawkes Bay Branch. The project has grown with the addition of the other two carriages but is proving to be within the resources of the Society and its restoration team as long as time is not a constraint.

The carriages are distinctive and technically notable within New Zealand. Through their original owners they provide a link with Wellington's founding retailers and commercial entrepreneurship of 134 years ago.

9. Acknowledgements

I am grateful for the help given by Messrs C E P Davis (project manager) and W W Prebble as I prepared this paper. They are leading this ambitious project and have done most of the research that has made our project possible.

Many people within NZRLS have contributed in a wide range of ways to this project. Without their work these three historic WMR carriages would have been destroyed long ago.

We are very grateful to a wide range of funders whose grants have made possible progress at a rate well in advance of what NZRLS could achieve from its own resources.

Photographs were taken by or obtained from W W Prebble (Figures 1 and 4) and the Delaware State Archives (Figures 2 and 3).

10. References

[1] Cassells, K R, *Uncommon Carrier, the History of the Wellington and Manawatu Railway Company, 1882-1908,* Wellington, NZ, NZRLS, 1994.

[2] Bowman, I, *Conservation Plan, Carriage A 1126,* Wellington, NZ, Ian Bowman, 2002.

[3] Annual Reports of the New Zealand Railway & Locomotive Society, Inc., supplements to *The New Zealand Railway Observer*, volumes 56-71, 1999-2014.