

WELLINGTON CITY ORIGINAL KELBURNE CABLE CAR INSTALLATION

HISTORY;

The City of Wellington New Zealand is located on the shores of a beautiful harbour surrounded by steeply rising terrain. Organised European settlement commenced in 1840. By the turn of the century the limited near flat areas of land had been built on. The inevitable development of the hills must begin and has subsequently become a characteristic of the city.

This led to the formation in 1898 of the Upland Estate Company. Transport to the hill top areas became critical. The directors then formed the Kelburne & Karori Tramway company with the object of building a cable car system to give access to the hill tops immediately behind the developed area. Note the original spelling of Kelburne The “e” has subsequently been omitted.

V



The top terminal of the cable car is located at the top of the hill below the arrow

Only local Councils were permitted to operate tramway systems. A special Parliamentary Bill had to be passed to allow the Council to delegate their authority to a private company to operate a cable car system which was considered to be a tramway system.

Mr James Fulton a Consulting Engineer practising in the Town was commissioned to design the system. Interestingly Mr Fulton was one of the first Professional Engineers to be trained in New Zealand, his experience having been obtained on the Wellington-Manawatu Railway construction, and to have his qualification recognized overseas by the Institution of Civil Engineers of London. Cable car technology was then only forty years old.

Construction commenced in 1899. Complaints were recorded of blasting through the night. Prison labour was used in the construction. On the 22nd February 1902 the system commenced operation. During the first year of operation 425000 passengers were carried. The demand was so great that in 1903 "Palace type" horse drawn trams of 1882 were converted as trailers and were coupled to the uphill side of the grip cars.

A steam driven electrical generator was purchased from the NZ. Defence Department in 1919 and the car, track and tunnel lighting was supplied from this plant. The cars had originally been lit by oil lamps, and the track and tunnels not lit at all.

On the 7th August 1933 an Order in Council was obtained to permit converting from steam haulage to electric powered haulage.

In 1946 the Wellington City Council bought out the original private company.

In 1973 the switchgear installed in 1933 was replaced.

In 1974 as a consequence of an accident, the inspecting authority, the Ministry of Works, ordered the removal of the trailer cars and in 1978 the system was taken out of service in preparation for the installation of a new system.

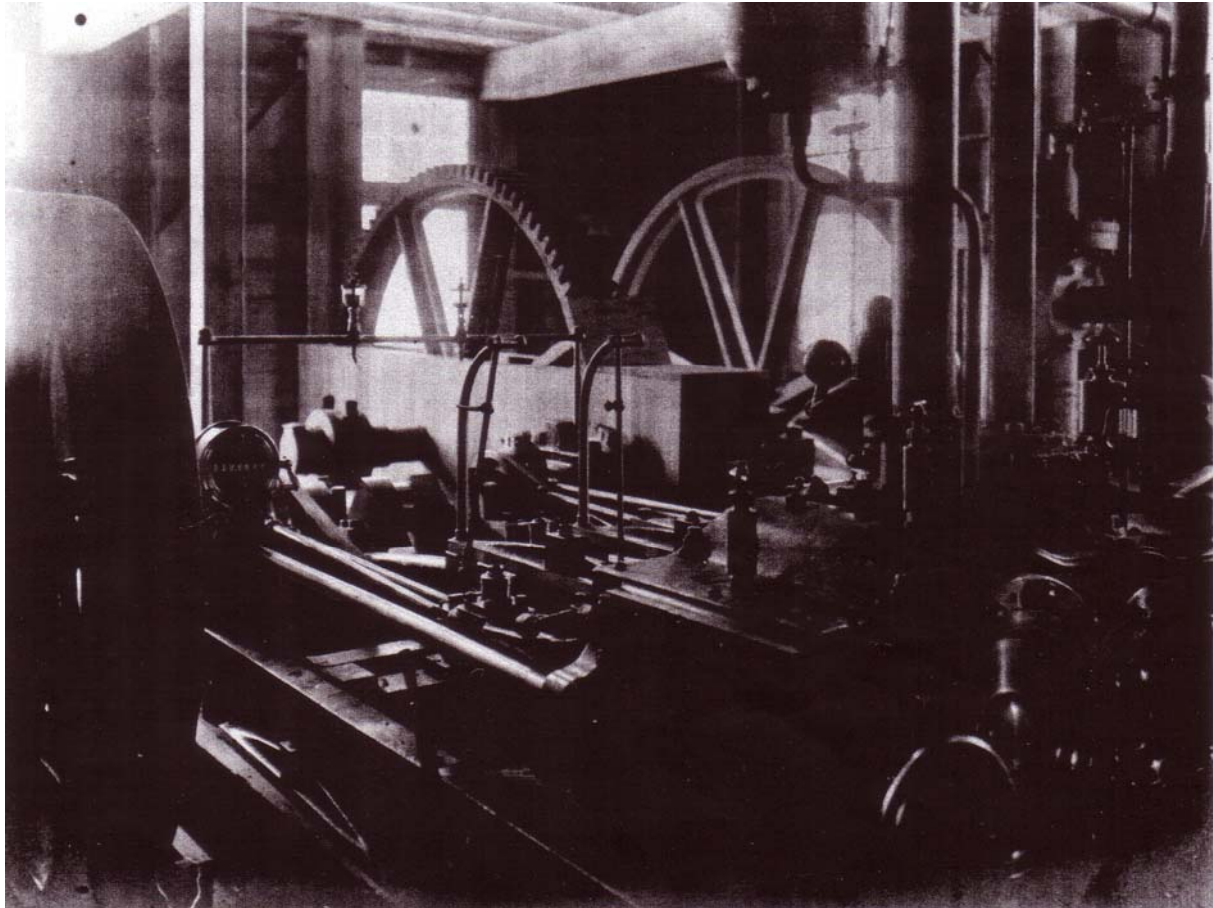
In 1993 after much pressure from residents the Council decided to preserve the original winding house and to convert it to a museum which decision the Council have not regretted.

DESCRIPTION;

The system was comprised of a double track of 1050mm gauge set at 2.7m centres on which ran two cars. The two cars were connected by a balance rope which passed around a horizontal bull wheel at the top of the tracks. A separate continuous rope was driven by a steam engine and coal fired boilers. The down car gripped this rope at the commencement of a journey and this in turn pulled the up car up by the balance rope thus preventing the rope becoming slack. Thus the system was not a pure cable car system but a combination cable car and funicular railway system. Three braking systems were provided, conventional wheel shoe brakes, wooden shoes pressing on the rails each operated by separate hand levers and a caliper system which gripped a centre rail and was operated by a hand wheel. The length was 608m and the rise 119m. The line was straight, on a consistent grade of 5.1 and with a level section at each end. It included three tunnels each 79m in length and three viaducts.

The operating speed was 4.38m per sec. and the acceleration 0.36m /sec./sec..

The winding machinery was located alongside the track at the top of the incline. This consisted of a traction wheel of 3m diameter driven by a compound steam engine through a cast pinion and spur gear. The gears were replaced at an early stage by a machined helical gear wheel and pinion. A second engine was provided as a stand by, and either was engaged by sliding the traction wheel shaft along the bed plate by 30mm. This was arranged that at mid point both pinions were meshing with the gear wheel and so the steam engine maintained control of the rope.. The gear ratios were 6.3 to 1 and 6.27 to 1 as one engine was more powerful than the other.



The original winding machinery as in 1904

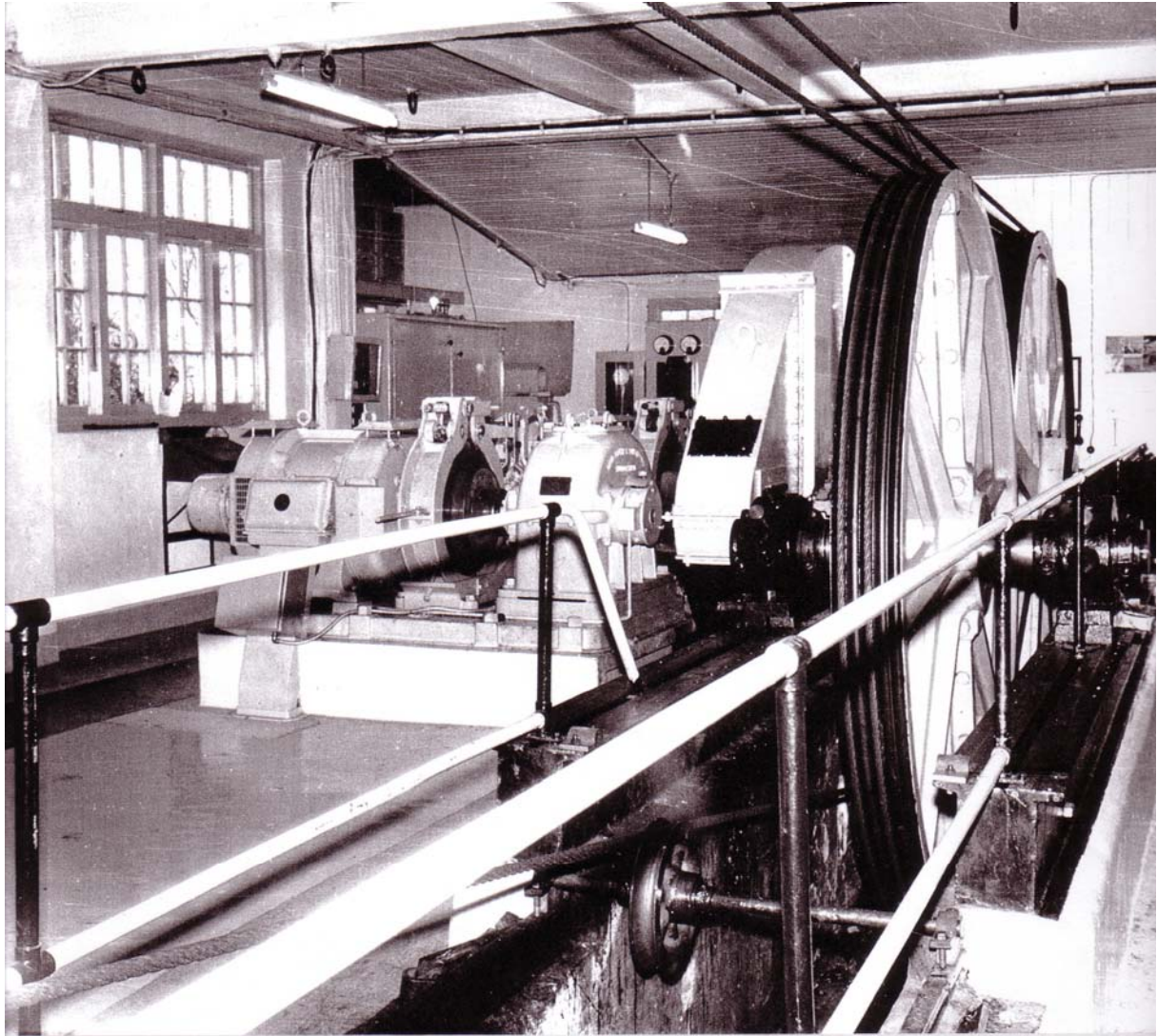
There was an idler wheel, and a tensioning wheel mounted on a carriage. The driving rope passed around the traction wheel in a vee groove, then around the idler wheel and again around the traction wheel in a second groove, around the tension wheel and back around the traction wheel in a third groove, round the idler wheel in a second groove and around the traction wheel in a fourth groove. Thus 720 degrees of wrap were obtained on the traction wheel. The idler wheel was tilted 1 degree so that the rope coming off one groove of the traction wheel returned onto an adjacent groove. Then the rope went out under the street, round pulleys through 180 degrees, down the centre of the first track, round a bull wheel at the bottom of the track and back up the centre of the second track, around 180 degrees and back into the winding room.

The rope was 75mm circumference, plough steel, lang lay 6/7 construction with a breaking load of 31.5 tonnes. Three cars were provided, two in service and a spare for replacing other cars for servicing. The grip cars weighed 4.06 tonnes and the trailers 2.29 tonnes.

The traction rope was reversed at the end of each journey and stopped at each intermediate stop in response to a signal from either driver initially, by means of cranking a telephone magneto, connected to the engine room via collector cables laid alongside the track.

Subsequently pantographs on the car roofs and overhead collector wires were used and latterly electric bells.

MODIFICATIONS;



The winding machinery in 1934 after the electrification. The traction wheel and idler wheel can be seen on the right and an electric motor and gear box to the left

The substantial modification of the system was the conversion to electric traction. The original traction wheel and gear wheel were retained as was the roping. New pinions were possibly made. The provision for changing from one driving motor to another was retained. Two 150hp 730rpm 400volt B.T.H. slip ring induction motors were provided in place of the steam engines and these were coupled to the pinions through two David Brown 200hp 730/206 reduction gear boxes with integral electrically operated shoe brakes. We have no record of the original control gear other than that it included 2, 6step adjustable definite time limit controllers, each with its own bank of cast iron grid resistors, and had provision through change over switches so that either motor could be coupled to either controller with interlocks so that all switches have to be in correct sequence before the OCB could be closed. The motors were controlled from the cars through a pantograph system and “up down and off switches” in each car. Both car switches had to be set in the same direction before the motor would respond. There were also track over ride limit switches and over speed switches on each motor.

RESTORATION;

One cable car and trailer set had been preserved in storage in their original condition as they were taken out of service in 1978. Some fittings as door latches, hand grips, head lights had been souvenired and replacement fittings had to be found, and in some cases cast, and fitted. The building was restored and refitted by the City Council and rails, including a centre rail, were installed in the upper storey which had originally been the car servicing workshop. The winding gear in the basement was substantially intact apart from the ropes. The idler wheel was out of its bearings and one pedestal was missing. The bearings were plain bronze but set in spherical housings and thus were self aligning. A new pedestal had to be cast and spherical seating machined. A bull wheel of maximum diameter that could be accommodated in the original tunnel under the road was fabricated and installed. The system was then roped. A set of slip rings were removed from one motor and replaced by a vee pulley. A 15hp motor was provided and drove the original motor through vee belts. A high torque electronic starter was used to start the motor and control the speed. The original control gear is preserved on site but not utilized.

COMPLETION;



The Museum Building.



The grip car and trailer behind. Note the sloping seats. The drivers position is behind These seats. Below is the winding gear. In the foreground is the tension wheel and at the far end the idler wheel and the traction wheel.





The winding gear viewed from the other side showing from the extreme left the vee belt drive enclosure, the original motor, the gearbox and the traction and idler wheels.

The Museum is now open daily from 9am to 5pm. Admission is free. The winding gear operates if there are visitors. There are many photographs on display and audio visual presentations. A shop provides memorabilia, books and other products.

At present it is proposed to add to the building a lecture room particularly for school visits and a second grip car is being restored to its original condition as in 1904 and this will be displayed also. The museum is located at the terminus of the new cable car system and so readily accessible from the central business district. The site affords a magnificent view of the City and the inner harbour. There are other attractions nearby.