

# Pathway to meet latest seismic standards

The elevated pathway through Mt Victoria Tunnel has withstood many earthquakes since the tunnel opened on 12 October 1931.

Its resilience includes surviving the 7.2 quake on 24 June 1942, the strongest experienced by Wellington since 1855 when Basin Lake was heaved upward to become Basin Reserve.

Now the pathway is being given additional strengthening to meet the more rigorous seismic standards of New Zealand in the 21st Century, post the February 2011 Canterbury Earthquake. The strengthening is one of the safety objectives of the Stage 2 upgrade for the tunnel and is expected to be complete in November this year.

The pathway used by cyclists and pedestrians is raised above the traffic lanes to receive fresh air from the tunnel's ventilation system. In the space beneath the pathway are power cables that feed the eastern suburbs, including Wellington Airport, and the tunnel's ventilation ducts.

## ➔ Bracing with anchors and straps

The pathway is basically a concrete shelf extending from the tunnel lining to the parapet wall beside the traffic lanes. The bottom layer of the path is reinforced with steel but the top layer is not.

Diagonal bracing using steel straps is being bolted to the path and fixed to anchors bored into the walls. This bracing system both reinforces the pathway and ties it firmly into the tunnel lining.

### STATISTICS:

- 100 anchors – one every six metres bored into the tunnel wall
- Steel straps fixed in a V-shape across the path to the anchors – a total of 200 straps

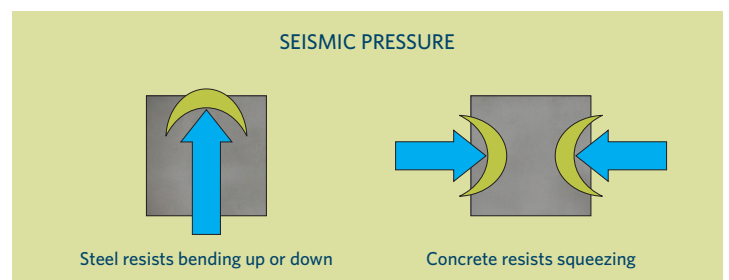
In the event of a major earthquake in Wellington, the seismic strengthening is designed to prevent the pathway detaching from the tunnel lining. The path would remain safe for pedestrians and cyclists as well as for the service ducts below, and safe for traffic to pass by.



*The path will be resurfaced with asphalt for a smooth finish on top of the straps*

## ➔ How reinforced concrete stays strong

Reinforced concrete has the strength to withstand the pressures an earthquake brings to bear. Steel and concrete have different properties: steel resists bending and pulling, while concrete resists squeezing. An earthquake bends, pulls and squeezes a structure but steel and concrete are able to work together to resist these seismic forces.



## ➔ Many steps to a transformation

Step by step, 84-year-old Mt Victoria Tunnel is being transformed into a 21st Century entity capable of communicating swiftly with tunnel users in emergencies.

Travellers through the tunnel may notice fittings that look like ladders stretching along the ceiling. They are, in fact, sturdy trays to hold, among other things, power cables for the new communications system.

Outside, unseen by travellers, a small building is being erected in upper Paterson St that will be the plant room where cables link to control panels.

Further afield, at Memorial Park Alliance in Taranaki Street and Wellington Traffic Operations Centre in Johnsonville, technical whizzes are innovating and testing the computer software and hardware that will provide the tunnel with up-to-the-minute communications capability.

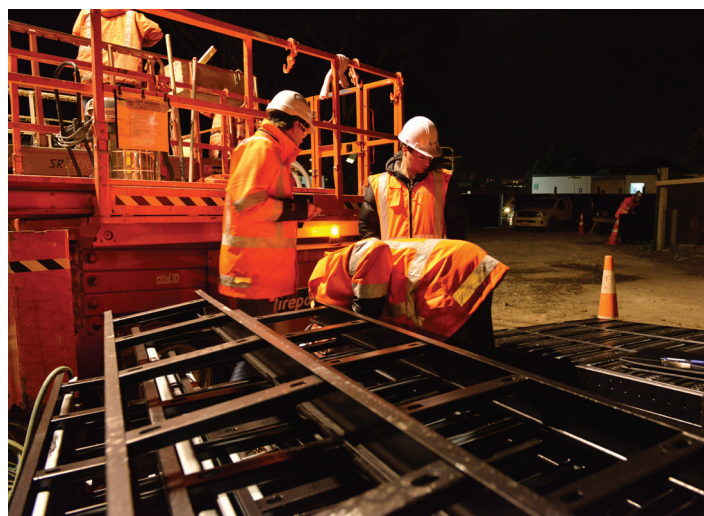
When complete, in case of an emergency such as a car fire, the communications system will use:

- Thermal imaging cameras that can “see” through smoke and sunstrike – a first for New Zealand state highway tunnels and to be trialled for wider use
- A radio rebroadcast system that allows traffic controllers to interrupt car radio programmes with emergency messages
- A loudspeaker system to inform pedestrians and cyclists on the tunnel pathway of emergencies
- Exit signs that brighten to illuminate the way out
- Links to the traffic signals to ensure the tunnel can quickly empty at both ends; and to barrier arms that lower to prevent cyclists and pedestrians entering the tunnel.

The technological communications system wouldn’t have made it this far were it not for people digging up the footpaths and roads – a familiar sight to us all. Since April, a team have installed ducts to carry communications cables underground from a major connection point in Cambridge Terrace to the lights at the Basin Reserve end of the tunnel and to the new plant room in upper Paterson Street.

Current work involves inserting the ducts from the Paterson Street plant room through the top of the tunnel to carry the cables to the cable trays. This has included drilling through the roof of the tunnel directly above the portals.

It all takes time but by mid-2016 when the Stage 2 upgrade is finished, Mt Victoria Tunnel will be heading towards its 85th birthday on 12 October and looking and acting better than new.



Engineers inspect cable trays prior to installation



Site workers installing cable trays in the tunnel ceiling



Testing the software system

Temporary tunnel technology trial room

## ➔ Listen to your radio in the tunnel

By mid-2016, travellers will be able to listen to their radios in Mt Victoria Tunnel which is being wired for what is called a rebroadcasting system – similar to the Terrace Tunnel’s.

Radio signals are blocked by the hillside and tunnel structure but the new system will capture the frequencies of the most-used stations and rebroadcast them into the tunnel.

The tunnel will broadcast 28 radio station frequencies: 10 AM and 18 FM. They range from widely popular stations such as Radio NZ, Radio Sport, The Breeze, Classic Hits 90FM, MoreFM and NewstalkZB to more specialised stations such as Radio Rhema, Atiawa Toa FM – Hutt Valley, Flava and N ui FM.

As happens with other tunnels, listeners may notice a brief pause while the outside signal switches to the tunnel’s system.



## → Looking back in time

Mt Victoria Tunnel was built over a distance of 623 metres (nearly two-thirds of a kilometre or more than a third of a mile) by the Hansford and Mills Construction Company. Tunnelling began in December 1929.

A standard tunnel excavation technique was used in which two teams of diggers began on either side of the hill, eventually meeting in the centre. The initial breakthrough when the two separate teams of diggers met occurred at 2.30pm on 31 May 1930. Arnold Downer was chief engineer and, when Hansford and Mills went into liquidation, stayed on to complete the work. He later formed Downer NZ, a long-standing company which is one of the Memorial Park Alliance partners now working on Upgrade Stage 2.

The tunnel provided a quicker connection between the eastern suburbs and central city than travelling around the harbour's bays and is now an important link on State Highway 1 through the North Island.

The tunnel was opened officially by Wellington Mayor Thomas Hislop on 12 October 1931.



*Earthmoving for the access road beside Paterson St in 1929*



*Hataitai end in the early stages of excavation with parallel side tunnels*



*Basin Reserve end of the tunnel with central block serving as a working platform*



*Hataitai end – side tunnels have been enlarged around the central block of rock*



*Photos: Wellington City Council Archives*



## → Why green for Mt Victoria Tunnel?

The freshness of the open spaces around Mt Victoria Tunnel influenced the decision to make green the tunnel's theme colour. Each SH1 tunnel in Wellington city has a different colour theme, from orange in the Terrace Tunnel to cream in Arras Tunnel.

Mt Victoria Tunnel is the first tunnel on State Highway 1 through Wellington and passes through one of the most significant green landscapes in the city, often called "the lungs of the city". Matairangi, the Maori name for Mt Victoria, means "a place to watch the sky".

The tunnel's green will wrap across the ceiling at either end as a visual marker of the entry and exit. A green strip will also stretch through the entire length of the tunnel beside the pedestrian walkway. A soft white strip below the green will reinforce the visual line created by the top of the white balustrade and reflective panels beside the vehicle lanes.

Pedestrians and cyclists will also get an appreciation of the distance travelled and length of the tunnel with distance markings on the new asphalt underfoot in both directions.

## → Fresher air for the tunnel

Mt Victoria Tunnel was the first road tunnel in New Zealand to be mechanically ventilated and upgrading of the ventilation will be done in stages.

During the tunnel upgrade currently underway, parts of the existing fans will be replaced, retaining the existing system but making it work more effectively. A major overhaul of the ventilation system is planned for the Stage 3 upgrade at a date yet to be determined.

## → Bus service helps hundreds from one side to the other

The free Mt Victoria Bus operated by Memorial Park Alliance during tunnel closures is becoming a flagship for the upgrade project. With permission from Greater Wellington Regional Council, the bus can use the Hataitai Bus Tunnel to transport pedestrians and cyclists from one side of Mt Victoria to the other.

Driver Mark Osborne is the friendly face fronting the service and transports around 100 pedestrians and cyclists each night with our van and trailer. Pick-up and exit stops for the bus are our two bus shelters, one in Taurima St, Hataitai, and the other beside our depot in Dufferin St, near the Basin Reserve.

Hours are the same as the tunnel closures: 9.00pm – 6.00am Sundays to Thursdays.



Driver Mark Osborne makes sure his passengers are safe inside the free bus



### CONTACT DETAILS

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Tunnel closed 9.00pm – 6.00am Sundays to Thursdays to mid-2016

We provide regular email updates on work progress that impacts on neighbours. Please email us to join our contact list.

