Mt Victoria & Terrace Tunnels Upgrades

Smarter Tunnels for the 22nd Century

Presented by Steven Knowles, Stakeholder and Communications Manager
The New Zealand Transport Agency aims to:

- refurbish the tunnels to modern international practice
- improve air quality within the tunnels
- improve the amenity for pedestrians and cyclists
- complete the refurbishments by the end of 2011
- conduct the refurbishments with the least possible disruption
- inform, engage and consult tunnel users and the local community
Our Alliance

-Who are we?

Virtual organisation

Design team
Construction team
Commissioning team
Admin team
Etc.
Our Project

Terrace Tunnel Refurbishment

Opened in 1978
Bi-directional (2 lanes north – 1 lane south) 40,000 VPD
Tunnel Management Systems outdated and mechanical plant at end of life
Significant Fire Risks
Our Project

Mt Victoria Tunnel Refurbishment

Opened in 1931
Bi-directional (2 lanes north – 40,000 VPD)
Plenum slab in very poor condition
Tunnel fire suppression system ineffective
Our Project

- **Mt Victoria Tunnel Duplication**
  - Design a duplicate tunnel
  - 4 lane Ruahine Street
  - Consult with public on design
Our Challenges – Control Smoke

Emergency ventilation requires air velocity higher than the critical value
• to prevent smoke backlayering
• dense smoke and toxic fumes may make the environment untenable;
  (smoke kills)

Longitudinal Smoke Control

Direction of longitudinal ventilation, Direction of traffic
Exit Smoke clear path
Occupant evacuation Vehicle on fire Smoke exhaust
Downstream

New Zealand Government
Wellington Tunnels Alliance
Our Challenges – Tunnel Operations

- **Operator Observation**
  - Video Stopped Vehicle Detection
  - Video Smoke Detection
  - Linear Heat Detection Pre-Alarm
  - Linear Heat Detection Alarm

- **TOC Alarm**
  - CCTV monitor automatically shows incident image
  - CCTV monitor automatically shows incident image
  - TOC verifies fire
  - TIMP opens automatically
  - TOC pushes "Fire" button on TIMP
  - TOC manually calls NZFS

- **Fire Mode Activated (PLC selects actions from Mode Table) (note 3)**
  - Ventilation follows Mode Table fans are either turned off or directed to the portal closest to the fire at 1.5 m/s
  - FAIP automatically calls NZFS
  - TOC monitors tunnel air direction and velocity on TIMP
  - From TIMP TOC can change tunnel air speed setpoint
  - NZFS incident controller (IC) arrives to site and takes control
  - From TIMP TOC can activate NZFS Access Mode (Blow North or Blow South at 3 m/s) when requested by NZFS IC
  - IC requests TOC actions via TOC Hot Phone or Mobile

- **TOC can**: Start Immediately | Cancel Timer
  - Dynac activates fire alarm at FAIP
  - PLC starts 30s evacuation timer
  - PLC starts 90s deluge timer

- **TOC can**: Start Immediately | Cancel Timer
  - Activate evac signs (as per Mode Table), RRB, PA

- Lanes upstream of fire site are closed via LCS (downstream stay open)
  - From TIMP TOC can turn deluge zones on and off (note 2)

Note 1. LMD, AVFS, VMS all provide a default location to the TOC operator via the TIMP.
Note 2. TIMP Help to advise method of water application if more than 2 deluge zones are activated.
Note 3. Fire mode is latched and cannot be changed by any other input until fire mode has been reset.
Our Challenges – Minimise Traffic Disruption

SH1 Closed Every Night
8pm to 6am
7.30pm Set out TTM
Mobilise by 8.15pm
Demobilise by 5.00am
Clean the tunnel and remove TTM
Our Challenges – Minimise Traffic Disruption

**Typical night closure**
- 8pm- 6am
- Traffic flows on alternate routes, including diverted traffic are
  - 20% of am peak at 6am
  - 40- 80% of pm peak at 8pm
- Close liaison with WCC around events or incidents on road network

---

**Graphs:**
1. Ratio of throughput at Intersection with extended tunnel closures (AM)
2. Ratio of Throughput at Intersection with extended tunnel closures (PM)
Option 3 – demolish the deck using a crusher

Option 2 – deconstruct an entire bay by hand

Option 1 – break the bay into smaller elements

• Bay 1 – ceiling demolition by crane sheets
- Objects falling from height – eliminate the risk
- Build a deck, run it on rails, away from the traffic
Safety Innovations – Crash Deck
Safety Innovations - Heavy Lifter
Heavy lifter
Safety Innovations - Heavy lifter
The essentials on our job

- Permit to Work
- Working at heights
- Temporary works
- Heavy lifting
- Mobile plant
- Electrical work
- Live services
- Live traffic
Safety Essentials
Conclusion

Comments?
Questions?

Thank you