KiwiRail

Local Network Instructions:

L6.1 Otira Tunnel

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1. Incident / Emergency Response

Emergency situations are managed using the Emergency Response Management Plan which includes Trigger Action Response Plans (Otira TARPS) and Duty Cards and the Otira Tunnel Appendix.

1.1 Hi-Rail Vehicles

Hi-Rail vehicles are located with Track Maintenance Representatives at Springfield, Otira and Greymouth.

When they are on duty, access to Hi-Rail vehicles can be via the Train Controller, phone 43367 or 04 498 3367, who is in radio contact with these vehicles.

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2. Working in the Tunnel

2.1 Gas Level Mitigation – Ventilation

If you receive an A1 gas alarm activation:

- request the Train Controller to close the door and start one set of fans.

If the A1 gas alarm continues:

1. leave the tunnel or go to your predetermined fresh air point in the tunnel, and
2. request the Train Controller to flush the tunnel of fumes before re-entry.

2.2 General Precautions

All Rail Personnel entering the tunnel must:

1. be certified in Tunnel Operations as per the requirements of Competency Management Manual as well as any specific certifications relevant to Otira Tunnel operations (CABA, Saver PP and Emergency Changeover Stations), and
2. have a supply of drinking water available to prevent dehydration.

2.2.1 RPE Requirements

The following table outlines RPE requirements applicable to personnel entering Otira Tunnel.

Personnel	Self-Contained Self Rescue Device	Approved certified full-face type mask and P3 NO_2/CO canister
Locomotive Engineers	✓	✓
Infrastructure Personnel	✓	X
On-Board Passenger Personnel	✓	X

Compressed Air Breathing Apparatus (CABA) is available on the banker Locomotives and in the six Emergency Stations for personnel that are certified in the use of CABA.

A Saver PP device is located in the AKC of the TranzAlpine for personnel certified in its use. The purpose of this device is to protect personnel when going to ground to transfer to CABA.

CAUTION

In the case of any RPE being used from the Emergency Stations, no rail movements will be allowed in the tunnel except for the purpose of recommissioning the Emergency stations.

On-board Passenger and Track Maintenance Representatives are equipped with an SCSR device to be used in the event of an on-ground evacuation from the tunnel.

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NOTE
For tunnels other than Otira:

- On-board Passenger Personnel have access to a full-face type mask and P3 NO2/CO canister and are purposed for tunnels where a Train Manager goes to ground in order to assist with the splitting or re-coupling of TranzAlpine.
- These requirements of a Train Manager do not apply to Otira Tunnel where all tasks on ground will be completed by a member of the Locomotive Crewing staff.

2.2.2 Operational Personnel

Only banker Locomotive Engineers and Rail Operators certified in CABA are permitted to undertake operational work on the ground within the tunnel.

Only banker certified Locomotive Engineers are permitted to operate trains through the tunnel.

NOTE
This includes Locomotive Engineers training to be a banker Locomotive Engineer of relief banker Locomotive Engineer

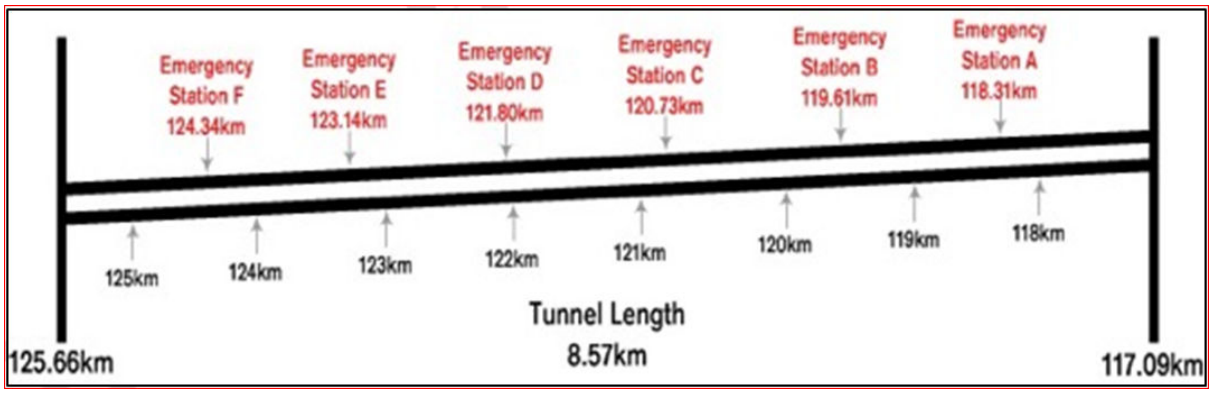
Only personnel certified in Freight or Infrastructure Tunnel Operations are permitted to travel through the tunnel in locomotives.

- Personnel based outside of Otira who need to travel through the tunnel, must apply for a cab pass through the Christchurch Linehaul Operations Manager (LOM) and supply reason why.

2.2.3 Emergency Changeover stations

Six emergency stations approximately 1200 metres apart within the Otira Tunnel are equipped with:

1. two additional complete CABA sets
2. eight additional SCSR devices, and
3. a fresh air exchange system.



These emergency stations are checked and replenished by NZ Mines Rescue.

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2.2.4 Infrastructure Escape Devices

The equipped emergency stations that allow SCSR devices to be changed negates the requirement for having a secondary escape device.

Every person or infrastructure group entering the tunnel must have access to a gas monitor capable of monitoring NO_2/CO/O_2 with audible and visual alarms set at the Action Levels outlined in **KiwiRail SHE Standard 14-STD-005-SHE Working in Tunnels** Appendix 3 – Trigger Action Response Plan (TARP) Gas Alarm Response.

2.2.5 Locomotive Crews Additional Precautions

Before any train enters the tunnel:

1. all locomotive crew must be in the lead locomotive
2. each person must carry their own gas monitor and either place it or wear it in such a location that it monitors the air as close to their head as is practicable
3. each person must have access to their own gas mask and filter, and SCSR
4. both uphill and downhill banker locomotives must carry:
   a. two full CABA sets each
   b. two spare CABA air cylinders in each and
   c. two helmets equipped with lighting.
5. when the banker locomotives are attached to a train, the Train Locomotive Engineer must take the current Train Work Order, backup radio and their gas monitor to the leading cab of the banker locomotives before departing Arthur's Pass or Otira.

IMPORTANT
The gas monitor must never be covered or placed inside a bag.

2.2.6 Before Leaving the Locomotive Cab in the Tunnel

The banker Locomotive Engineer on services is responsible for attending to any problems on the train.

Before leaving the locomotive cab in the tunnel:

1. advise the Train Controller of the situation
2. carry out gas monitor checks to establish which type of RPE is to be used. You may also ask the Train Controller for a gas reading of the real-time monitors
3. the banker Locomotive Engineer must have gas mask and filter, and/or CABA before leaving the cab with a portable radio and spare gas filter
4. the banker Locomotive Engineer must select and use the best possible RPE for their situation when outside the locomotive cab
5. the Locomotive Engineer must fit their own RPE first and then assist any other personnel having difficulty fitting RPE
6. the banker Locomotive Engineer outside of the cab must:
   a. monitor the gas levels to ensure they are using the correct RPE for the situation
7. if the Locomotive Engineer in the cab is required to leave to assist the banker Locomotive Engineer in the tunnel, the Locomotive Engineer must communicate and update the Train Controller on their movement towards the banker Locomotive Engineer as agreed.

Responsibility for organising the sanitising, checking and resealing the gas mask(s) and checking CABA equipment at the completion of the shift lies with:

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- Linehaul Operations Manager Christchurch, or
- KiwiRail Manager Greymouth, or
- banker Locomotive Engineer Otira.

Used filters must be replaced, and event recorded in the Access Provider's Incident Reporting system.

2.3 Tunnel Hazards

2.3.1 Walking Hazards

Underfoot Conditions

Exposure to the drain side of the Otira Tunnel (right side uphill) is to be avoided wherever possible due to the degraded condition of the drain grating.

There have been several areas identified where the drain grating has rusted out, resulting in holes appearing and the risk of people falling into the drain below.

WARNING
Falling through the grating could result in lower leg injuries or lacerations.

If required to be on the drain side, be aware that it may not be obvious that the grating is in a weakened state.

On occasions where it is unavoidable to be on the drain side of the tunnel to carry out their duties, Rail Personnel boarding or alighting rail vehicles must exercise extreme care and ensure they have the correct PPE and sufficient lighting to avoid standing on the drain grating.

Rail Personnel must report to their Line Manager each occasion where they are required to access the drain side of the tunnel while performing their duties.

WARNING
The walkway (left side uphill) is wet, ground is uneven and there are obstacles protruding from the walls which could cause harm.

2.3.2 Temperature Extremes

Correct PPE must always be worn and a supply of drinking water available to prevent dehydration.

2.3.3 Noise

Correct PPE must always be used.

2.4 Track Maintenance Representatives

2.4.1 Infrastructure Activities – Precautions

Track Maintenance Representatives required to enter or work in the tunnel must not enter the tunnel until it has been completely purged of fumes and in the case of the Otira portal, until the door has been opened for at least five minutes.

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WARNING

Hazard - **Trains proceeding through the tunnel**

Rail personnel must only commence work / travel on the line after it has been confirmed that the train, or all parts of the train have arrived complete at Arthur's Pass / Otira as trains may set back at any time, in either direction.

WARNING

Hazard - Risk of Ventilation System failure

When infrastructure activities are being carried out in the Otira Tunnel, no other infrastructure activities may be carried out between the Otira Portal and 8R Otira, unless the tunnel ventilation system is being locally controlled (at the Otira Portal).

Reason: Any interference with the track circuits between the Otira Portal and 8R Otira when the Train Controller is operating on automatic or manual will result in the tunnel door opening.

WARNING

Hazard – Bridge No.50 Train stationary in Otira Tunnel

Rail Personnel trained in manual operation of the tunnel ventilation system in an emergency situation may only cross Bridge No.50 on foot in the following conditions:

- the Train Controller has confirmed that the train is stationary
- permission must be obtained from the Train Controller before crossing on foot
- the Train Controller must be advised when you are clear of the bridge

2.4.2 Planned Work

When the use of the tunnel ventilation system is required, for welding or work train operations, this will be manually operated by qualified personnel at the Otira portal under the direction of the RPO.

The qualified person must immediately contact the RPO if the fan(s) stop working or door opens, without being requested to do so.

2.4.3 Tunnel Flush

When possible, a manual tunnel flush should be undertaken when Infrastructure personnel exit the tunnel for breaks, or at the end of the shift.

If the tunnel ventilation system is under the control of the Train Controller, they should be requested to flush the tunnel.

This is to ensure personnel / trains enter a clean air environment.

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2.4.4 Planned Work using Train Control Radio Channel

When planned work requires localised use of the Otira Tunnel, Train Control VHF Radio Channel, to manage planned work the following instructions apply.

The Tunnel Work Plan must have a Safety Communications Officer, as shown in **KiwiRail SHE Standard 14-STD-005-SHE Working in Tunnels, Instruction 14.0 Communication with Train Control**.

Application for planned work must include the additional details to be shown on the bulletin.

The bulletin for the planned work must show:

- Localisation of the Train Control VHF Radio Channel Radio (date and times).
- Details of Safety Communications Officer location and contact details.

Safety Communications Officer will arrange with the Train Controller to have agreed communication check calls and confirm details before the planned work commences.

Train Control Action	Selcall Codes
Localise to tunnel	10104
Restore the Train Control Link	10103

The Train Controller will advise the first rail movement (before it enters the Arthur's Pass – Otira block section) that the radio link has been restored to Train Control and arrange for a base call via the Otira Tunnel Radio Channel to be carried out, to confirm the link is operating.

2.4.5 Unplanned Work

When the use of the tunnel ventilation system is required, this will be operated by the Train Controller under the direction of the RPO.

The Train Controller must immediately contact the RPO if the fan(s) stop working or door opens without being requested to do so.

IMPORTANT

Petrol powered plant are prohibited from being operated inside the tunnel, for all types of work.

2.4.6 Work Trains

Banker locomotives should be used with the minimum number of locomotives operating to reduce fume emissions

Track Maintenance Representatives must be inside the EP enclosed area or locomotive cabs when travelling to and from the worksite

Work trains may travel through the Otira tunnel for the purpose of commencing work from the Arthur's Pass portal.

The Train Controller must:

- only allow a work train to enter the tunnel when it is known that both fan lines are operational
- run the fans and keep the door closed as long as possible before work train exits the tunnel.

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NOTE
Locomotive Engineers when exiting the tunnel at the Otira portal must be near the tunnel door before requesting it to be opened.

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3. Operating Instructions for All Trains

3.1 Locomotive Preparation

Only locomotives with fully operational dynamic brake are to be dispatched from Middleton for Midland Line trains if they are required to enter the Otira Tunnel.

3.2 Head End Monitors

To enable the location of trains in the Otira Tunnel to be calculated if disabled etc., the Locomotive Engineer must activate the head end monitor distance counter when the lead locomotive enters the tunnel.

3.3 Train Delays

Locomotive Engineers travelling in the Otira Tunnel must notify the Train Controller if they are going to exceed the basic (normal) running time for the tunnel.

3.4 Disabled Trains

If a westbound train is disabled, then a request must be made to the Train Controller for the door to be closed and the cooling fan started unless relief is coming from the Otira end of the tunnel.

CAUTION
Detonators are not used in tunnels

3.5 Derailments

Should a train derail in the tunnel, request the Train Controller to leave the door closed and keep the cooling fan running while awaiting assistance.

If necessary, after conferring with the Train Controller and securing the train then exit tunnel either by:

- using locomotive(s) or
- walking out.

3.6 Fire Suppressed Locomotives

Only fire suppressed locomotives may be dispatched from Middleton for Midland Line trains if they are required to enter the Otira Tunnel.

3.7 Locomotive Parting Within Tunnel

The following procedure applies when there is a parting in the locomotive consist in the Otira Tunnel, with a train attached.

1. Once movement stops, proceed to the trailing locomotive on the lead portion. Close the EP, MR, and BP pipe cocks. This will restore full braking on these locomotives.
2. Proceed to the lead locomotive on the trailing portion. Close the EP and MR cocks on this locomotive. Do not close the BP cock.
3. Enter the lead loco cab on the trailing portion and move the Enter the lead loco cab on the trailing portion and move the MU2A valve to Lead or Dead.
4. Proceed down the train and apply all the wagon park brakes.

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5. Bring the lead portion down onto the lead locomotive of the trailing portion to couple up
6. Pull Out Short once the drawbars are connected to check the security of the coupling.
7. In the lead banker locomotive, place the automatic brake valve in Handle Off.
8. Once the BP pressure has settled at approx. 50kPa, open a brake pipe cock on the front of the lead locomotive.
9. Couple the MR, EP and BP pipes between the parted locomotives and open all the cocks.
10. Enter the cab of the lead locomotive of the trailing portion. Switch the MU2A valve into the Trail 6 or 26 position. This restores control of the brakes on these locomotives to the lead banker.
11. Return to the lead locomotive and close the brake pipe cock on the headstock.
12. On the lead locomotive move the Automatic Brake Valve into Release to recharge the train.
13. Once the train is recharged make a full-service automatic brake application.
14. Walk the train releasing all park brakes.

3.8 Locomotive Brake Set-Up

This modified procedure is to mitigate the risks identified following a parting between locomotives on an eastbound service in the Otira Tunnel.

Banker Locomotives Running Light:

Whenever the banker locomotives are running around light between services the brakes must be set up as per the following table:

Item	Lead loco	2nd loco	3rd Loco	4th Loco
Automatic Brake Valve	Cut in (FRT or Pass) as required	Cut out	Cut Out	Cut out
MU2A Valve	Lead or Dead	Trail 6 or 26	Trail 6 or 26	Trail 24

Locomotive Brake Set Up on Freight Trains:

Item	Lead Loco	2nd Loco	3rd Loco	4th Loco	1st Train Loco	2nd Train Loco
Automatic Brake Valve	Cut in (FRT or Pass) as required	Cut out	Cut Out	Cut out	Cut out	Cut Out
MU2A Valve	Lead or Dead	Trail 6 or 26	Trail 6 or 26	Trail 24	Trail 24	Trail 6 or 26

Locomotive Brake Set Up on TranzAlpine:

Item	Lead Loco	2nd Loco	1st Train Loco	2nd Train Loco	3rd Banker Loco	6th Loco
Automatic Brake Valve	Cut in (FRT or Pass) as required	Cut out	Cut Out	Cut out	Cut out	Cut Out
MU2A Valve	Lead or Dead	Trail 6 or 26	Trail 24	Trail 6 or 26	Trail 6 or 26	Lead or Dead

Change Over Procedure from Lead to Trail 24

1. Make a full-service reduction with the Automatic Brake Valve.
2. Once BP pressure has settled at 390 kPa cut out the Automatic Brake Valve.
3. Move the Automatic Brake Valve handle to Handle Off position.
4. Move the MU2A valve to the Trail 24 position.
5. Proceed to the new lead cab and cut in the brakes.

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NOTE: The brakes on the locomotive set to Trail 24 will remain applied after EP pipe air leaks off.

Train Locomotive Brake Set Up Procedure When Banker Locomotives are Attached

These instructions are used when the banker locomotive is being attached to the train locomotive and the locomotive brake release is checked prior to departure.

1. Attach the banker locomotive to the front of the train.
2. Test the physical coupling.
3. The banker Locomotive Engineer must fully apply the train brake.
4. The train Locomotive Engineer couples hoses and .
5. The Train Locomotive Engineer:
    a. cuts out the Automatic Brake
    b. moves to the Handle Off position
    c. moves the MU2A Valve to Trail 26
    d. centres and removes the reverser.
6. The banker Locomotive Engineer moves the throttle to Notch 1, forward, release Independent Brake and bleed off.
7. The train Locomotive Engineer must visually check the locomotive brake release. Downhill banker will have brakes
8. Train Locomotive Engineer re-enters the cab and moves the MU2A valve to the Trail 24 position. The train locomotive brakes will apply at this point to a level that is consistent to the train brake application.
9. The banker Locomotive Engineer applies Independent brake to full-service.
10. The banker Locomotive Engineer releases the Independent brake.
11. The train Locomotive Engineer confirms that the Downhill banker brakes and lead train brakes remain applied (this confirms the correct Trail 24 set-up on these locomotives).
12. The banker Locomotive Engineer applies Independent brake and centres the reverser handle.
13. The train Locomotive Engineer plugs the jumper cable in.
14. The banker Locomotive Engineer conducts a power test.

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4. Coal and Express Freight Trains

4.1 Uphill Train Failures – Operating Plans

Uphill	Loco Failure - Still Moving	Loco Failure - Stationary Otira Portal – 119.5km	Multiple Loco Failure / Stalling Otira Portal – 119.5km	Loco Failure - Stationary 119.5km – Arthur's Pass Portal
Option	**A**	**A**	**C**	**B**

A Train moving – continue with max throttle setting of No. 7

B Train stopped between 119.50km and Arthur's Pass Portal. - If a locomotive has failed between the 119.50km and the Arthur's Pass Portal then the Locomotive Engineer is to attempt to exit the tunnel on the remaining locomotive power.

C If unable to rectify fault, first consider setting back the train, or if the Locomotive Engineer considers it unsafe to set back (derailment), then apply the Emergency Cut and Run procedures in Instruction 4.1.2 Emergency Cut/Run Procedures [17].

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4.1.1 Setting Back Instructions

The train can set back provided the locomotive compressors are operational to maintain air to the train braking system.

WARNING

The locomotive brakes may not hold a fully loaded coal train.

The train may start to move backwards as the train brakes release.

Before the setting back movement commences, the Train Controller must be told but if the Train Controller cannot be contacted, then the movement may commence with the Locomotive Engineer attempting to establish contact with the Train Controller.

Trains setting back out of the tunnel may continue to 8L Otira, with or without the Train Controllers permission if necessary, and a SWA is not required for the movement.

TO09 Setting Back and Propelling and **SO02 Automatic Signalling Rules, 5. Setting Back in Block Section Authority** are modified accordingly.

1. Enter Otira Station limits in accordance with **SO01 Responding to Signals, 4.3 Authorising Passing of Signals at Stop**.
2. Trains setting back to Otira must be piloted from 8L Down Home signal.
3. The Pilot must ensure the correct route is set in the Otira yard.
4. Up trains may set back between Otira and the Western Portal for training and certification purposes after receiving authority from the Train Controller. A SWA-01 authority is not required.

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NOTE
If the Train Controller cannot be contacted by either radio or track telephone, the Locomotive Engineer must be aware that the tunnel door will not be open. The train can be stopped short of the door and the Locomotive Engineer can operate the emergency reset switch located in the old Emergency Telephone Box at No.6 Refuge (50 metres west of RDTD and RRDTD indicators) to open the tunnel door and turn the fan off.

With Dynamic Brake Operational

1. Advise the Train Controller of the circumstances.
2. Stop the train with a minimum brake pipe reduction (50 kPa).
3. At the point of stopping, apply Independent brake fully on the locomotives.
4. Set the isolation switch on any defective locomotive to Isolate.
5. Place the reverser to Reverse and select Dynamic Brake.
6. Move the Dynamic Brake handle around to the Full Amps position. Wait 50 seconds.
7. Slowly release the Independent brake – the train should begin to set back.
8. Regulate the Dynamic Brake to hold the train speed at a maximum of 15 km/h. The Dynamic Brake handle position of 5 to 6 is all that should be required to balance the speed with the brake pipe reduction, once the train has settled.
9. If train speed exceeds 15 km/h with full Dynamic Brake effort, then increase the brake pipe reduction to regulate the speed, as circumstances require.
10. The train brakes may only be released with the train stopped. Should this be necessary, then once the train has stopped, place the reverser to forward, release the train brakes and advance the throttle to notch 4. This will hold the train until the brake pipe is fully recharged when another reduction of the train brakes can be made again to continue with the setting back of the train.

Without Dynamic Brake Operational

1. Advise the Train Controller of the circumstances.
2. Stop the train with a minimum brake pipe reduction (50 kPa).
3. At the point of stopping, fully apply the Independent brake on the locomotives.
4. Place the reverser handle to Reverse.
5. Slowly release the Independent brake on the locomotive until the train starts to set back.
6. Once the train starts setting back, use the Independent brake on the locomotive to control the train speed to a maximum of 10 km/h by maintaining brake cylinder pressure at 80 to 100 kPa.
7. If the train speed exceeds 10 km/h with a maximum of 100 kPa brake cylinder pressure on the locomotive, increase the brake pipe reduction on the train brake to regulate the speed, as circumstances require.

4.1.2 Emergency Cut / Run Procedures

Uphill Train 1 in 33 Gradient

1. Advise the Train Controller of the circumstances.
2. Stop the train with a minimum brake pipe reduction.
3. Apply the Independent brake on the locomotives fully.
4. Advise the Train Controller of the circumstances. You may also ask the Train Controller for a gas reading of the real-time monitors.
5. Proceed on foot to establish locomotive(s) or train failure.

At the Remaining Front Locomotive

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6. Directly in front of the remaining front locomotive, close all air cocks and remove the jumper cable.
7. Enter the cab and fully apply the Independent brake.
8. Place the MU2A valve to the Lead/Dead position.
9. Place the Automatic Brake handle to full-service position then Automatic Brake Valve to Cut In position. The ER pressure must rise to full-service pressure (370 – 390 kPa) and the BP pressure must fall to the full-service pressure.
10. Apply park brakes and chock the remaining locomotives and first ten wagons.
11. Uncouple the front locomotive(s) required and proceed to Arthur's Pass.

On Arrival Back at the Stabled Train with the Relief Locomotives

12. Make the mechanical coupling only to the remaining front locomotive.

Uphill Relief Locomotive

13. Place the MU2A valve to the Lead/Dead position.
14. Fully apply the Independent brake.
15. Place the Automatic Brake handle to the Full Release position and place the Automatic Brake valve to the Cut In position.
16. Observe that the Equalising Reservoir recharges on the gauge.
17. Place the Automatic Brake valve to the Cut Out position.
18. Place the Automatic Brake to the Handle Off position.

Downhill Relief Locomotive

19. Set the locomotive up for trail position.

Remaining Front Locomotive

20. Set the locomotive up for trail position.
21. Now couple air hoses between the remaining front locomotive and the downhill relief locomotive.
22. Connect the jumper cable.

Return to cab of Uphill relief locomotive

23. Place the Automatic Brake Valve to the Cut In position.
24. Remove all wheel chocks and release the park brakes.
25. Return to the uphill locomotive and conduct a brake test on the locomotives only.
26. Place the Automatic Brake valve handle to the Release position. The train brakes will now begin to recharge.
27. Place the reverser handle to forward, observe the PCS light on the panel until it goes out, then move the throttle to notch 2.
28. Slowly release the Independent brake to allow the locomotives to stretch out.
29. When ready to lift train, advance the throttle accordingly.

CAUTION
Do not move the throttle to the next power notch until the train has stopped accelerating.

4.2 Double Banking

When a Locomotive Engineer is required to double bank their train in the Otira Tunnel:

Before separating the first half, the Locomotive Engineer must:

1. Reset the head end monitor on the locomotive closest to the wagons to zero.
2. Place a reflectorised Marker / LED light on the facing end of the first wagon of the second half of the train.

When returning for the second part of the train:

3. The returning locomotives must travel at a speed that the Locomotive Engineer is able to stop in half the clear visible distance ahead.
4. Dynamic Brake is not to be used, due to the back wash effect of fumes when slowing down.

The head end monitor is to be used as a guide only to assist the Locomotive Engineer to the train.

4.3 Knuckle Replacement

1. Put the knuckle on the cowcatcher and tie it to the hook there.
2. Move the locomotive as close to the wagon as practical and the lift is easy.
3. Put the broken one on the cowcatcher and take out.

4.4 Burst Hose Repair Process (Two in the cab)

1. Advise the Train Controller
2. Apply power and sand until the train pulls to a stop. This conditions the rail for maximum adhesion.
3. Apply the locomotive Independent brakes fully. Proceed back along the train applying park brakes on the first 5 wagons.
4. Note the wagon number with the burst hose, and at which end of the wagon.
5. Return to the front of the locomotive, hold the brake pipe hose firmly and fully open the brake pipe cock.
6. Leave the brake pipe cock open.
7. In the cab of the lead locomotive, place the Automatic Brake Valve to Cut Out position.
8. Proceed back to the burst hose and replace it.
9. Recouple the brake pipe hoses on the wagon and open the air cocks.
10. Continue to the rear of the train checking for any derailment. If the rear of the train is inaccessible, advise the Train Controller
11. Return to the front of the locomotive and close the brake pipe cock fully.
12. In the cab of the lead locomotive place the Brake Valve Cut Out to the Cut In position.
13. The train brakes will now recharge and once fully recharged, make a brake pipe reduction of 100kPa.
14. Proceed back along the train releasing park brakes on the wagons.
15. Return to the locomotive cab, release the train brakes and continue journey.

4.5 Vigilance System Reset Process

1. Move the Automatic Brake Valve handle to the Handle Off position.
2. Wait 50 seconds and operate the Vigilance Penalty Brake Reset switch.
3. Once reset, move the Automatic Brake Valve handle to Release and recharge the air brake system.
4. If required on an up gradient, begin throttling up to notch 4 to hold the train while a full recharge is obtained. Ensure that the PCS light goes out before advancing the throttle.
5. If required on a down gradient, set up for full Dynamic brake after pressing or resetting the Vigilance Penalty Brake Reset switch. Ensure the PCS light goes out before selecting Dynamic brake.

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4.6 Uphill Broken Buffer Process

When an uphill train in the Otira Tunnel has a broken buffer, the following process is to be followed:

WARNING
Apply all park brakes to secure train.

Locomotive Engineer of Relief Locomotives

1. Proceeds to the rear of the disabled train and stops short.

Assisting Person

2. Removes TEM and couples the locomotives to the train.

The Locomotive Engineer of Relief Locomotives

3. Changes driving positions from uphill cab to downhill cab.
4. Tests the locomotive brakes and power after changing ends, pushes uphill into the rake and holds the buffers compressed with the brake. This will minimise the run out when train brakes are released.

The following table shows how many wagons can be removed by number and class of locomotive.

Locomotives	Maximum number coal wagons
1 DXC	6
2 DXC	12
3 DXC	18

When all wagons can be removed in one movement:

After the Locomotive Engineer changes ends, the assisting person:

1. Couples the BP hose and opens the taps.
2. Lift the chocks/park brakes from wagons only after the train air brakes are fully recharged.

When more than one movement is required to remove an uphill train:

The Assisting Person

1. Closes the taps and uncouples the BP hoses at the required number of wagons.
2. Places the reflectorised end of train marker (with LED light) on the downhill end of the remaining uphill portion.
3. Returns to the locomotives, couples the BP hose, and opens the taps.
4. Only after the train air brakes are fully recharged, lifts the chocks / park brakes from wagons for this movement.

The Locomotive Engineer of Relief Locomotives

1. Eases up rake, to allow wagons to be reduced.
   a. If unable to push, reduce number of wagons being reduced.

The Assisting Person

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1. Uncouples the wagons for this movement from the balance of the train.

4.7 Train / Banker Locomotive Combinations

Four fire suppressed banker DXC locomotives will be available at Otira for operation over the Otira – Arthur's Pass section.

The objective is to operate fire suppressed locomotives operating in notch 6, with proven redundancy.

Non fire suppressed locomotives on any train must be shut down while in the Otira tunnel.

Uphill Freight Trains

The load / throttle combinations for uphill freight trains are shown in Table 1.

Table 1

No. Banker Locomotives	Train Locomotives		Maximum Throttle Notch Setting for Otira Tunnel	Max. Trailing Load excluding Dead Locomotives
	Fire Suppressed (running)	Unsuppressed (dead)		
4	2	0	6	2160 tonne
4	1	1	6	1883 tonne
4	0	2	6	1506 tonne
4	0	0	6	1506 tonne

Operational Method:

1. Current notching procedure applies departing Otira.
2. Once at the cutting approaching Bridge 50, reduce the throttle to notch 6 and monitor the train speed.
3. If the settled speed in the cutting approaching Bridge 50 is lower than 30 km/h, do not attempt to enter the tunnel. A speed lower than 30 km/h in notch 6 indicates that there is a problem with the locomotives or dragging brakes on the train.
4. Rectify the problem before attempting to run the train through the tunnel.
5. Once in the tunnel remain in notch 6 for the duration of the trip through.

NOTE
A lower notch setting can be used for lighter loads.

6. If wheel slip does occur use a light Independent brake application to 50 kPa BC pressure, until the amps settle and wheel slip correction stops.
7. If one locomotive drops offline for any reason, increase the throttle setting to notch 7. Use light Independent brake to assist the Brightstar system if wheel slip occurs.

WARNING
If too high a throttle setting is used, the rear locomotives will overheat and derate which loses the advantages of the horsepower redundancy.

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When operating in the Otira Tunnel, maximum throttle settings to be used are as follows:

- 5 locomotives - notch 7
- 6 locomotives - notch 6

4.7.1 AAR Draw Gear Requirements – CC & CE Class Vehicles

The ratio of vehicles fitted with AAR draw gear being marshalled on the head of loaded coal trains is as follows:

Total Wagons on the train	CC or CE Wagons on the head
0–20	**Nil**
21	**1**
22	**2**
23	**3**
24	**4**
25	**6**
26	**7**
27	**8**
28	**10**
29	**11**
30	**12**

4.7.2 Draw Gear Requirements from Otira to Arthur's Pass

Banker Loco No.1	Banker Loco No.2	Banker Loco No.3	Banker Loco No.4
DXC	**DXC**	**DXC**	**DXC**
Load Limit	**Draw Gear Restriction**		
2160	**Maximum speed is 35 km/h inside the tunnel Wagon marshalling** due to drawgear strength. CC and CE wagons must be leading		
1340	Wagons with automatic couplers must make up the leading part of the train weight of 480 tonnes, e.g. IA wagons.		
960	Wagons with hook and pin couplers have a maximum trailing weight of 960 tonnes		

4.7.3 Attaching Banker Locomotives to Trains

Before banker locomotives are moved onto a train, the train must be stopped. The train is not to be moved onto the stopped banker locomotives.

4.7.4 Banker Air Brake Tests

1. Bankers couple to the train locomotives, then ease out to check the drawbar connection.
2. Banker throttle to idle, then couple the hoses and open the brake cocks. Do not insert the jumper cable. Bankers can be put into notch 1 if required to hold the train.
3. Cut out the brakes on the lead train locomotive.
4. Carry out the Intermediate brake test on the consist.
5. On completion of the brake test, insert the jumper cable between the downhill banker and lead train locomotive.
6. Carry out the power test on the locomotives.

4.7.5 Locomotive Jumper Cable Test - Otira and Arthur's Pass

This must be completed after the required connections have been completed as per the relevant instructions.

Acceleration of starting trains from Otira must be strictly in accordance with the table provided in Instruction 4.7 Train / Banker Locomotive Combinations [21].

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4.7.6 Starting Trains at Otira

To avoid overstressing the drawgear when starting at Otira, the following guidelines are to be used:

- Up to notch 4 to start the train and build speed.
- Notch 5 at 15 km/h
- Notch 6 at 20 km/h
- Notch 7 at 25 km/h
- Notch 8 at 30 km/h

4.8 Downhill Trains – Tonnage Limits & Operating Instructions

Dynamic brake operation on the train locomotives must be confirmed on the Otarama Bank between Bridge No.15 (55.06 km) and Bridge No.16 (57.03 km) prior to entering the Otira tunnel.

Maintaining brake is the preferred braking option for the train combinations descending the Otira Tunnel.

If dynamic brake fails descending the Otira Tunnel, serial braking can be used, based on the following rules:

- Maximum speed 25 km/h
- Releasing speed is stopped
- Train to be held on Independent brake until a full recharge has been obtained

4.8.1 Downhill Train Load / Speed Combinations

Train & Banker Locomotive Combinations (Fire Suppressed)	Maintaining Braking (Air + Dynamic				Serial Braking (Air brake only)			
	Max Load	Max Length	Max Speed	Release Speed	Max Load	Max Length	Max Speed	Release Speed
2 DFB	760	650	35	10	760	650	25	Stop & Hold for Full Recharge
2 DXC	860	650	35	10	860	650	25	Stop & Hold for Full Recharge
3 DXC	1290	800	35	10	1290	800	25	Stop & Hold for Full Recharge
4 DXC	1500	800	35	10	1500	800	25	Stop & Hold for Full Recharge
5 DXC	1500	850	35	10	1500	850	25	Stop & Hold for Full Recharge
6 DXC	1500	850	35	10	1500	850	25	Stop & Hold for Full Recharge
60 wagons empty coal service	1350	950	35	10	1350	950	25	Stop & Hold for Full Recharge

Dead locomotives are included in the maximum loads shown in the table above.

The above speed restrictions only apply through the Otira Tunnel and over Bridge 50.

Ordinary freight train assisted by banker locomotives:

- maximum trailing weight of 1500 tonnes
- maximum length of 800 metres (assisting locomotives not counted)
- a minimum of two DXC locomotives plus the four banker locomotives to be used

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- all locomotives set up for multiple unit operation
- maintaining braking must be used combining dynamic brake with a minimum reduction air brake application on the train. Releasing speed for maintaining braking 20 km/h and maximum speed 40 km/h
- if serial braking is used, releasing speed is stopped
- the train must be held on Independent brake until a full recharge has been obtained.

Double Coal Rakes (up to 60 empty coal wagons)

- three of the four train locos will be running on arrival at Arthur's Pass
- should the four banker locomotives be required, the lead train loco can be taken offline.
- all air hoses are to be coupled to ensure that all locomotive air brakes will operate in multiple unit running modes
- maintaining braking to be used combining dynamic brake with a minimum reduction air brake application on the train. Releasing speed for maintaining braking is 20 km/h
- maximum speed 40 km/h
- if serial braking is required to be used, releasing speed is stopped and maximum speed is 25 km/h

Train braking additional requirements: (ordinary freight)

Where one DXC locomotive on the consist has a dynamic brake failure en route:

- a maximum length of 800 metres, excluding assisting locomotives is allowed to be conveyed
- the train loco(s) with the working dynamic brake and all four banker locos are to be online
- maintaining braking must be used combining dynamic brake with a minimum reduction air brake application on the train. Releasing speed for maintaining braking is 20 km/h and a maximum speed of 40 km/h.
- if serial braking is used releasing speed is stopped.
- the train must be held on Independent brake until a full recharge has been obtained.

4.9 Light Locomotive Movements

Where possible light locomotive movements should consist of back-to-back locomotives.

Spare chocks are available in tunnel Emergency Change-out Stations.

When required to leave the locomotive cab in the Otira Tunnel, the Locomotive Engineer must:

1. contact the Train Controller
2. secure the train (apply the park brake(s) and chock the park brake side of the locomotive)
3. request that the Train Controller use the tunnel ventilation system to reduce gas levels
4. shut down the locomotive(s) if ventilation is not operating
5. arrange assistance with the Train Controller
    1. If back-to-back locomotives – arrange to set back where possible

4.10 Single Light Locomotive

Downhill:

- A single light locomotive travelling downhill must not exceed 35 km/h.
- Sanders must be working when travelling in the Otira Tunnel.

Uphill:

- A single light locomotive may run uphill without banking.

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4.11 Locomotive Load Schedule

All other load schedule particulars not included in this section are held by the KiwiRail Linehaul Service Manager and included in the Master Locomotive Load Schedules.

4.12 Train Parting within Tunnel

The rear portion of the train is to be secured to allow the recoupling to be safely carried out.

Locomotive Engineers that hold full banker certification may recouple all train partings.

Locomotive Engineers who do not hold the full banker certification may only recouple up to, and including 20 wagons:

- using the Non-Banker Locomotive Engineer's check sheet
- following the directions of the banker Locomotive Engineer at all times

Non-Banker Locomotive Engineer's Check Sheet **Recoupling 1 to 20 Wagons process:**
1. Independent Brake - fully applied. 2. Train Brake - after full recharge (Minimum reduction). 3. Reverser - move to direction of travel. 4. Dynamic Brake - engage and advance handle to position full B8. 5. Wait 50 seconds. 6. Independent Brake - Slowly release. 7. Speed – Dead Slow. 8. Dynamic, Independent and train brakes used to control speed. 9. Follow the directions of the banker Locomotive Engineer at all times.

If the front portion of the parting is greater than 20 wagons, the rear portion is to be secured and the front portion taken to Arthur's Pass.

If the fans are unable to operate and the Locomotive Engineer can safely secure the rear portion, then the rear is to be secured by applying chocks and all park brakes to the second portion.

Returning to the train for the second portion requires the use of **Instruction 4.2 – Double Banking [18]**.

5. Passenger Train Instructions

5.1 Total Number of Passengers and Crew

The Locomotive Engineer must advise the Train Controller of the total number of passengers and crew on the train departing Arthur's Pass (westbound) and Otira (eastbound).

The Train Controller must record these numbers on the Train Control diagram.

5.2 Locomotive and Banker Requirements

All locomotives must have operating fire suppression systems.

Locomotives without an operating fire suppression system may travel through the Otira Tunnel provided they are shut down.

Banker locomotive(s) must be attached to the train as follows:

803 – Two banker locomotives are to be attached to the rear of the train

804 – One banker locomotive is to be attached to the rear of the train

5.3 Passenger Train Vehicle Requirements

Passengers and on-board crew may only travel through the Otira tunnel in AK class carriages. Travelling through the Otira tunnel in any non-AK passenger vehicle is prohibited.

AK type Carriage Consist Specifications for Otira Tunnel

Maximum Consist: 12 Vehicles. Typical maximum consist will be 9 AK +3 AKL/AKV/AKS or 8 AK + 4 AKL/AKV/AKS

Train	Consist	Train Locos	Lead Banker	Rear Banker	Loco Setup
803	Up to a maximum 12 total	1 DFB, DXC or DXB5120	2 DXC	2 DXC	Rear Bankers idling offline Lead Bankers and Train Loco working online in MU
804	Up to a maximum 12 total	1 DFB, DXC or DXB5120	1 DXC	1 DXC	Rear Banker idling offline Lead Banker and Train Loco working online in MU

5.4 TranzAlpine Operations – Banker Process

For uphill passenger trains the maximum speed is 40 km/h, this applies for all banker locomotive configurations.

For downhill passenger trains the maximum speed is 30 km/h, this applies for all banker locomotive configurations.

803 Process – Arthur's Pass / Otira

Refer to the TranzAlpine Split Banker Process Job Aid for detailed procedures and role responsibilities.

Unless significant mitigating circumstances exist which may affect passenger welfare (e.g. berthing delays, passenger illness, on-board emergency), the banker locomotives must be at Arthur's Pass and set up as follows before the arrival of 803:

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- Two uphill banker locomotives standing in the East Backshunt.

The minimum requirement for 803 is two banker locomotives on the rear and two locomotives online on the head.

804 Process – Otira / Arthur's Pass

Refer to the TranzAlpine Split Banker Process Job Aid for detailed procedures and role responsibilities.

Unless significant mitigating circumstances exist which may affect passenger welfare (e.g. berthing delays, passenger illness, on-board emergency), the banker locomotives must be at Otira and set up as follows before the arrival of 804:

- One downhill banker locomotive standing in the West Backshunt.

Single locomotive uphill trains must have two banker locomotives attached.

5.5 Locomotive Engineer Responsibilities

The Locomotive Engineer of passenger trains at Arthur's Pass and at Otira must not depart until:

- they have visually checked all locomotives and found no signs of overheating
- all engine bay doors are secured closed
- no signs of fuel or oil leaks on the running board
- the Train Manager has confirmed that the Emergency Brake Override function has been activated

5.6 Intermediate Brake Test – 803

When the downhill bankers are attached to the 803 consist at the East End of the Arthur's Pass platform, the Intermediate test may be performed from the leading passenger car.

Rail Operating Code Section 5.3, **Instruction 6.6 Intermediate Test / Test Position** is modified accordingly.

5.7 Train Manager Instructions

5.7.1 Right of Way

Before giving Right of Way from Arthur's Pass or Otira:

- all viewing decks are to be locked
- confirm the Train Safe light is illuminated.

5.7.2 Approaching the Tunnel

When approaching the tunnel, Train Managers must:

- confirm all air conditioning systems are switched to Tunnel Mode
- confirm Emergency brake override function has activated.

5.8 Setting Back Out of the Tunnel

If necessary, trains may:

- set back out of the tunnel/drive out in opposite direction
- divide, with part setting back and/or part proceeding forward

TO09 Setting Back and Propelling and **SO02 Automatic Signalling Rules 5. Setting Back in Block Section Authority** are modified accordingly.

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Train Controller permission is required to continue to Otira Station and enter station limits at Arthur's Pass / Otira in accordance with **SO01 Responding to Signals 4.3 Authorising Passing of Signals at Stop**.

5.9 Brake Cut Over Procedures for a Divided Passenger Service in Tunnel

Lead Locomotive

1. Declare an emergency to the Train Controller, then use VHF channel 4 for Locomotive Engineer to Locomotive Engineer and Locomotive Engineer to Train Manager communication.
2. Apply Independent brake once movement has stopped. Make an 80 kPa reduction if the BP is intact. Move the Automatic Brake Valve to Handle Off if the BP has been ruptured.
3. Once confirmed the banker Locomotive Engineer is on board the banker locomotive, switch the Automatic Brake Valve cut off valve from Pass to Cut Out, then move handle to Handle Off.
4. Radio confirmation to the banker Locomotive Engineer that the lead locomotive Automatic Brake Valve is cut out.

Banker Locomotive

1. Move to the banker locomotive once an emergency has been declared.
2. Once on board the banker locomotive, confirm the MU2A valve is in Lead or Dead position, then apply the Independent brake to full service.
3. Advise the lead locomotive Locomotive Engineer that you are on board the banker locomotive and ready for brake cut over.
4. Once the lead locomotive Locomotive Engineer has confirmed the Automatic Brake Valve is cut out, move the cut off valve from Cut Out to Passenger position, and move the Automatic Brake Valve handle back to Full-Service position.
5. Radio confirmation of the Automatic Brake Valve cut over to the lead locomotive Locomotive Engineer. Banker Locomotive Engineer / Rail Operator on the ground
6. Only move the Automatic Brake Valve to release when the banker Locomotive Engineer / Rail Operator calls for the ease up to uncouple the lead vehicles.
7. Use the train brake to stop and hold the train when the banker Locomotive Engineer / Rail Operator calls for "Out Short." Also apply the Independent brake to full service.
8. Once the banker Locomotive Engineer / Rail Operator confirms the brakes are applied on the last vehicle, move the Automatic Brake Valve to Release.
9. When the banker Locomotive Engineer / Rail Operator is confirmed back on board and the train is closed up, call the Train Controller for the tunnel door to be opened and fans stopped if exiting to Otira.
10. Exit the tunnel.

Banker Locomotive Engineer/Rail Operator and Lead Loco Locomotive Engineer

1. The banker Locomotive Engineer / Rail Operator applies the derailed vehicle park brakes.
2. The banker Locomotive Engineer / Rail Operator chocks the derailed vehicle wheels.
3. Once confirmation of brake cut over to the banker locomotive has been given, the banker Locomotive Engineer / Rail Operator lifts the BP and MR taps between the derailed and non-derailed vehicles.
4. Once the vehicles to be left in the tunnel have been secured, banker Locomotive Engineer / Rail Operator calls for an ease up from the banker locomotive.
5. The banker Locomotive Engineer / Rail Operator uncouples the train from the derailed vehicles, then calls the train out short.
6. Lead Locomotive Engineer shuts down the derailed Locomotive(s)
7. The banker Locomotive Engineer / Rail Operator checks and confirms the brakes are applied on the last vehicle.

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8. After the banker Locomotive Engineer has moved the Automatic Brake Valve to release, banker Locomotive Engineer / Rail Operator confirms brakes on the last vehicle have released.
9. The banker Locomotive Engineer, Rail Operator and lead Locomotive Engineer get on board the train and Train Manger closes up.
10. The Train Manager confirms Train Closed to the banker Locomotive Engineer in control of the train.

5.10 Emergency Evacuation of Passengers

Evacuation should not take place unless necessary – the tunnel is extremely cold and underfoot conditions are not suitable for most people.

If the Locomotive Engineer requires evacuation of passengers due to fire or imminent danger, the Train Manager will be advised of the method to be undertaken, referring to the flow chart guide.

The Locomotive Engineer will advise the Train Controller of the situation and if evacuation is required, after consideration of air (fume) conditions or fire hazard in the tunnel, come to an agreement with the Train Manager, as to which end passengers are to be directed to.

The evacuation will be carried out in accordance with the Train Locomotive Engineer's Emergency Evacuation Procedures, with a member of the Train Crew, at the front of the evacuation group, using a gas monitor (measuring NO_2 and CO) checking gas levels in the tunnel.

See Emergency Procedures Manual, 5. Rail Operating Company Emergency Response Requirements.

5.11 Steam Locomotives

Steam locomotives are prohibited from travelling through the Otira Tunnel until a risk assessment is completed by the Upper South Island Tunnel Focus Group due to changing respiratory protection requirements.

5.12 Defective Park Brakes

Carriages with known park brake faults must not be taken through the tunnel.

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6. Otira Tunnel Ventilation System

6.1 Overview

A tunnel door is installed at the Otira end of the tunnel. It works in conjunction with two extractor fan lines to clear the tunnel of fumes and provide cooling for diesel locomotives hauling trains up the tunnel from Otira to Arthur's Pass.

6.2 Operation

Up Tunnel Door Indicator UTD indicates the position of the door for Up trains, Down Tunnel Door Indicator DTD indicates the position of the door for Down trains and advanced warning is given by Door Indicator RDTD and RRDTD which is located at the regulation braking distance in advance of DTD.

DTD indications are:

- Red if the door is closed
- Purple if the door is open

RDTD and RRDTD indications are:

- Yellow if the door is closed
- Purple if the door is open

The ventilation system has four modes of operation:

6.2.1 Automatic Mode

Once an Up train is completely inside the tunnel, the door will close, and the first fan line (locomotive cooling) will start after a time delay. When the train is clear of the axle counter heads at Arthur's Pass:

- the second fan line will start and run for 22 minutes
- the fans will turn off, and
- the door will open.

When a Down train is clear of UTD indicator the door will close and both fans will start. After 15 minutes, the fans will turn off and the door will open.

- Before a Proceed aspect can be obtained on No.8RF Departure signal at Otira the door must be open.
- Before a proceed aspect can be obtained on No.4LE Departure signal at Arthur's Pass, the door must be open.

NOTE

Automatic operation of the tunnel door will not be possible for a train setting back movement or for insulated vehicles, i.e., some KiwiRail Track Maintenance Machines or Hi-Rail vehicles.

For these movements, the doors must be operated remotely from either Train Control or at the tunnel door control box.

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The duration the fans can run for can be varied by the KiwiRail Signal / Electrical Maintenance personnel who must first advise the reason to the Network Control Manager and Terminal Manager Greymouth before the adjustment is made.

6.2.2 Remote Mode from Train Control

In this mode the Train Controller has control of the operation of the ventilation fans and the doors, when required.

Before clearing the Departure signal concerned or issuing a Safe Working Authority, the Train Controller must always advise Locomotive Engineers on trains entering the Otira–Arthur's Pass block section that the tunnel door / ventilation system is on remote control, and they are to call at the following locations:

Uphill Trains Tunnel Calls

Locomotive Engineers must call the Train Controller when the train is in the tunnel clear of the Down Tunnel Door Indicator DTD (using the head end counter) and when outside the Arthur's Pass portal.

Downhill Trains Tunnel Calls

Locomotive Engineers must call the Train Controller when the train has cleared the Otira portal travelling to Otira.

NOTE

Those calls will indicate to the Train Controller that the relevant ventilation system fans must be started immediately.

6.2.3 Local Remote Mode

The operation of the system will be under the direction of the Train Controller. The door is controlled on site from local door and fan remote control boxes mounted on the side of the traction substation The controls must be operated by a Competent Worker.

Before local control can be taken, the ventilation system must be in local remote mode. This is achieved by either:

- selection by the Train Controller or
- failure of the signalling system.

In this situation the Train Controller must not allow a train to leave Otira until there is a Competent Worker present at the tunnel to operate the door ventilation system.

The person operating the door ventilation system must remain on site until a Signals Maintenance Representative advises the Train Controller that the fault has been rectified and the signalling is again operating reliably.

The control of the door / ventilation system can then be handed back to the Train Controller for normal operation.

The instructions for operating the system in this mode are included in the Train Control Realflex Signalling Instructions; copies are held by the Train Controller and Signals Maintenance Representatives at Otira.

6.2.4 Manual Mode

Manual operation of the system will be under the direction of the Train Controller. The door and fans are controlled from the control room at the Otira Portal by a Signal Maintenance Representative by passing the Tunnel system PLC.

6.3 Failure and Emergency Situations

6.3.1 Door Failure

No trains may enter the tunnel in either direction.

6.3.2 Door Operating and No Fans Operating

No trains may enter the tunnel in either direction.

6.3.3 Ascertaining the Tunnel is Clear of Fumes

Ascertaining the Tunnel is clear of Fumes is either by:

- The Train Controller on the Train Control panel, or
- A Signals Maintenance Representative at Arthur's Pass or Otira establishing that all gas sensors are green.

6.3.4 Tunnel Door Fails to Close

When an Uphill train is travelling in the tunnel under normal operating conditions and the door fails to close, this will result in locomotives overheating. The Train Controller must immediately advise the Locomotive Engineer to stop the train and set back out of the tunnel.

NOTE

Operators of Uphill trains must check the indication on the RRDTD indicator to establish if the door has closed. If the indicator has failed, the Locomotive Engineer is to ask the Train Controller if the door has closed.

6.3.5 Other Failures

Should any of the following failures occur:

- door operation
- failure of either fan line to start cooling
- fan fails to start on entry, or
- cooling fan starts, and then fails (before train has reached 6000m into tunnel – 119.50 km)

The Train Controller must:

- immediately advise the Locomotive Engineer, who must immediately bring their train to a stop
- put tunnel system on Manual
- reset the tunnel system when the train has been confirmed as stopped and arrange for the Locomotive Engineer to set back clear of the UTD indicator.
  - resetting the tunnel system will open the tunnel door
- close the door and carry out a remote tunnel flush when the Locomotive Engineer confirms the train is clear of the UTD indicator.
- open the door
- place the tunnel system on automatic

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- advise the Locomotive Engineer to proceed.

If the cooling fan fails to start for a second time, the Train Controller must:

- immediately instruct the Locomotive Engineer to stop their train
- open the tunnel door
- advise the Locomotive Engineer to set the train back out of the tunnel to Otira until personnel are on site to locally / manually operate the system, or repairs are able to be carried out.

NOTE
If Rail Personnel are exposed to gas levels above the TWA, there is a requirement for a 60-minute stand down period.

If the Cooling fan starts then fails with a train beyond 6000m into tunnel 119.50km

The Train Controller must immediately advise the Locomotive Engineer.

NOTE
After 120 seconds the second fan line may start. If this occurs, the Train Controller must advise the Locomotive Engineer that the cooling fan has restarted.

The Locomotive Engineer must assess the performance and position of the train – when making a decision to either:

- continue to Arthur's Pass, or
- stop and set back.

WARNING
Do not reset the tunnel system while a train is moving in the tunnel as this will result in overheating and locomotive failure

When train is within 600m of either side of 6000m into the tunnel, the Locomotive Engineer can use discretion on which process to apply.

NOTE
Passenger Trains The Train Controller must immediately advise the Locomotive Engineer of the situation. The TARP for passenger trains allows them to continue.

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6.4 Purging Tunnel of Fumes

The tunnel ventilation systems should be used to flush the tunnel of fumes before the next rail vehicle or personnel enters the tunnel.

	Previous Train was Eastbound	Previous Train was Westbound
Two fan lines working	Close door and run fans for 22 minutes	Close door and run fans for 15 minutes
One fan line working	Close door and run fan for 45 minutes	Close door and run fan for 25 minutes

These times may be extended by the Track or Signals Maintenance Representatives or on advice from the Banker Locomotive Engineer with experience in local conditions.

When the one or both fans fail and the fumes flush has not been completed, then the tunnel must be remotely purged using the fans as shown in the table above.

After the door fails in any position (i.e., power failure and standby failure), it may be operated local remotely / manually by a qualified person, under the direction of the Train Controller.

6.4.1 Gas Detection System

Six multi gas monitors in the Otira Tunnel convey readings of levels of Carbon Monoxide (CO), Carbon Dioxide (CO_2) and Oxygen (O^2).

The signalling screen for the tunnel shows the following reading readings for each sensor:

- main screen as Green (safe) or Red (danger / sensor failure)
- local screen red or green numbers for each gas level

Normal operation of tunnel, the Train Controller will only authorise a movement to depart Arthur's Pass / Otira (into the tunnel) when all 6 sensors on the main screen are green.

NOTE
As a train travels through the tunnel, the sensors will change to red and remain red until a satisfactory purge is completed.

When infrastructure activities are being carried out in the tunnel, the Train Controller, if able to communicate with the Track Maintenance Representative must advise them when a sensor changes from Green to Red.

The NCM must be advised of all Infrastructure activations and sensor failures (includes failure to reset off the initial flush) with all events required to be recorded in the Access Provider's Incident Reporting system.

Failure of sensor(s) on the main screen to return to Green after initial flush.

If two or more sensors and / or sensor No.6 fails to clear when the initial flush cycle has completed, the Train Controller must carry out a full manual flush of the tunnel.

The flush to be carried out as follows:

- 2 Fan Lines set time for 45 minutes, and
- 1 Fan line set time for 60 minutes, and
- monitor the main screen sensors.

After 22 – 30 minutes and up to 45 – 60 minutes, if they all restore to Green, reset the system, and authorise movements to proceed.

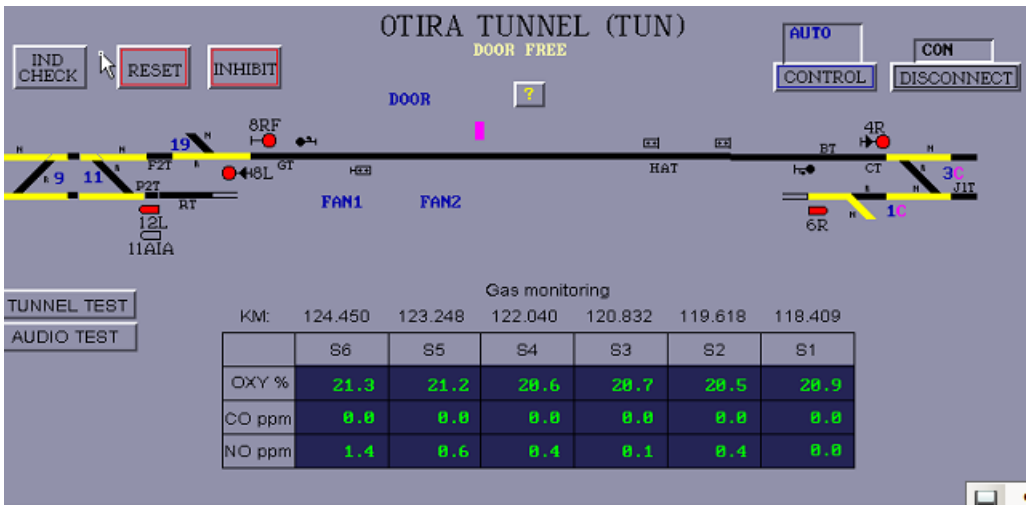
At 45 - 60 minutes, any sensors still red will be deemed to have failed.

If two or more sensors and / or sensor No.6 have failed, the Train Controller must:

- Advise the Locomotive Engineer of the movement that a sensor has failed, and an additional manual flush has been carried out
- Enter the sensor number into the Conditions section of the Access Provider's Speed Restriction System.
- Arrange for Operations Support to action repairs to the damaged sensor.

NOTE
Sensor No.6 failure will require the Train Controller to continue with purge times as shown above.

Local Screen shown is for Train Control information to see movement in levels and monitor activity.



6.4.2 Total Failure of Sensors on the Main Screen

If unable to ascertain that the tunnel is clear of fumes (see 6.3.3), the Train Controller will be required to extend purge times as shown in 6.4.1

6.4.3 Light Locomotive Purge Times

After light locomotives have exited the tunnel and all gas sensors are displaying green, the automatic purge cycle may be manually terminated by the Train Controller.

The Train Controller must reset the system to automatic for the next movement.

6.5 Track Evaluation Car (EM80)

Before departing Otira for an uphill movement, the Operator of the Track Evaluation Car, must advise the Train Controller that:

- the tunnel system is required to be placed on manual control

NOTE
The Train Controller must confirm with the Operator that the tunnel ventilation system is on manual before departure from Otira

- after passing the 120 km peg, the tunnel door is to be closed and one cooling fan is to be started
- manual tunnel flush is to occur upon exit of the Track Evaluation Car from the tunnel.

NOTE
If the system is on automatic, coal dust will be dragged on to the head of the rail creating a wheel slip and possible stall problem around 1 km into the tunnel.

6.5.1 Failure of Door Indicators

When the door indicators fail to clear, regardless of which mode of operation the ventilation system is operating, the Train Controller can authorise the passing of door indicators at Stop.

When the door indicators fail to clear and the tunnel door is under local remote control, the Train Controller can authorise the passing of door indicators at Stop after consulting with the person in charge of the remote control panel at the Otira portal,

The Train Controller must ensure the tunnel doors are open before authorising the door indicators to be passed at Stop.

In addition, when a train is stopped by accident, failure or obstruction in this area, the Train Controller can authorise a relief locomotive to pass the door indicators at Stop once the SWA-02 requirements have been completed.

NOTE
If the tunnel doors are open at the time, the door indicators will display a purple indication as they only indicate the position of the doors, not if the line is occupied.

6.5.2 Door Emergency Operation

The tunnel door when closed can be opened inside the tunnel using the following:

- The emergency reset switch located in the old Emergency Telephone Box at No.6 Refuge, or
- The emergency reset button adjacent to the airlock room door.

When the emergency reset switch / button is operated, this will also turn the fan off.

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6.5.3 Manning

EM80 must only be driven by a certified banker Locomotive Engineer between Arthur's Pass and Otira.

6.6 Block Section Signal Failure

Refer to **SO02 Automatic Signalling Rules, 4. Block Section Entry Authority.**

6.7 Signalling Failure or Train Control Unable to Control the Ventilation System

The normal operation of the tunnel doors / ventilation system should be on automatic unless there has been a complete signalling failure or a ventilation system failure requiring local operation.

Eastbound trains:

Before issuing the Safe Working Authority, the Train Controller, in addition to carrying out the necessary safeguard checks, must inform the Locomotive Engineer to be prepared to stop their train at the Door Indicator as the status of the door cannot be established.

When there is no detection of the ventilation system, the Train Controller should arrange for Local Remote / Manual Operation to be used at the Otira portal to ensure the door closes and the cooling fan line starts.

Westbound trains:

Before issuing the Safe Working Authority, the Train Controller, in addition to carrying out the necessary safeguard checks must ensure that the Door Open light is illuminated. If the Door Closed light is illuminated or it cannot be established whether the door is open or closed, then the door must be visually checked and remotely / manually opened prior to the Safe Working Authority being issued.

Ventilation system:

When there is a fault with the track circuits that control the Otira tunnel ventilation system the Train Controller must take the following action:

Situation - No Block Open Indications but all track circuits are clear and HAT track is also clear.

Actions:

1. Ensure the flush cycle worked correctly for the previous train.
2. If this cannot be confirmed, complete a Remote Flush (20 minutes for 2 fan lines or 45 minutes for 1 fan line).
3. Push the Tunnel Reset.
4. If this does not fix the fault the Train Controller may need to issue a Safe Working Authority for the train to proceed.
5. Notify a Signals Maintenance Representative of the fault and action taken.

This action will ensure a flush has been completed since the last train.

6.8 Emergency Access at Otira Portal

An airlock room is situated next to the tunnel door to allow access to and from the tunnel while the door is closed, and the fans are operating.

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Picture 1: Airlock room outside entrance

Picture 2: Airlock room inside tunnel entrance

To enter or leave the airlock room in these circumstances:

1. The door vent must first be opened, and air pressure be allowed to equalise.
2. The door into the room may then be opened.
3. On entering the room, close the door and the vent.
4. Repeat the process at the next door to gain access to the tunnel or outside.

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7. Radio / Telephone – Otira Tunnel

7.1 Radio Communications

The VHF radio coverage is continuous in the tunnel on Train Control channel 4 and channel 7.

Channel 4 provides communication between:

- Train Controller and locomotive
- Train Controller and VHF portable
- a person using a portable and Locomotive Engineer (on either locomotive or portable radio).

Channel 7 works as a standalone repeater system in the tunnel.

This can be used for communication anywhere in the rail corridor between Otira Station and Arthurs Pass including in the tunnel.

Under normal operation this channel can be used for any communication between KiwiRail VHF Radios. Such as Track Maintenance Representatives working in the tunnel and communication between on-board staff with Locomotive Engineer without disturbing the Train Controller.

The actual coverage on channel 1 between two VHF radios is about 20 metres line of sight. This will be reduced when line of sight is reduced. i.e., when a train is in the part of the tunnel the two parties are trying to communicate in.

7.2 Radio Failure

In the event of a radio failure, trains are prohibited from entering the tunnel.

When there is a failure of the tunnel radio system, the radio link or radio computer system, personnel may not enter the tunnel, unless they are carrying out repairs to the radio system.

Safe Working procedures must be applied when carrying out repairs to the radio system.

In the event of a radio failure while a train is in the tunnel, telephones are available.

See 7.4 Train Control Telephone Locations.

7.3 Tunnel Radio Testing System

Otira Tunnel has separate VHF Repeaters / test radios which automatically check the Tunnel Radio system.

Test Radio located at Telephone Portal		Repeater located at	Repeater coverage
1	118.4 km	Arthur's Pass Portal	Arthur's Pass 118.6 km
2	119.6 km	120 km	118.5 km – 121.5 km
3	123.2 km	123 km	121.5 km – 124.3 km
4	124.4 km	Otira Portal	124.3 km–Otira

The radio system is automatically tested every four hours.

The test system runs direct off the power supply. As well as checking the repeaters, a failed Auto Poll can indicate the power supply is off.

Back up batteries have a life of approximately 36 hours before a complete system failure.

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In the event of an Automatic test failure then the Neon testing system will send an email and text message to advise Operations Support of a poll failure, who will advise STTE Personnel and the Train Controller of the faulty radio test.

7.4 Train Control Telephone Locations

Train Control telephones in the tunnel are at the following meterages:

- 118.409 km
- 119.617 km
- 120.832 km
- 122.039 km
- 123.247 km
- 124.450 km

Lift receiver, check for dial tone then press the hash (#) key followed by the required speed dial number:

- # 1 - Train Control emergency
- # 2 – Midland Control (East)
- # 3 - West Control

For any other number, dial “1” for outside line then the number you require, e.g., 04 498 3367 for Midland Control

Inside the telephone box, it will show the telephone number for the Train Controller to ring back on.

Telephones are enclosed in a special reflective protective cover and on any occasion the telephones are used the covers must be replaced following use of telephone.

Missing covers must be reported to Operations Support.

7.5 Telephone Outages

Failure of telephones in the Otira Tunnel will be advised by Bulletin.

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8. Otira

8.1 Trains Standing on the Main Line

Before a locomotive is detached from any train or rake of vehicles standing on the main line, all park brakes must be applied to hold the train or rake of vehicles safely as the air brake must not be relied upon for this purpose.

A Rail Operator must be in close attendance of the train or vehicles during the time the locomotive is detached.

8.2 Triangle

The speed of all movements on the triangle must not exceed 10 km/h.

8.3 Otira River Flood Warning Device

A flood warning device is located at the road bridge on SH73 just below the junction of the Rolleston and Otira Rivers (between Arthur's Pass and Otira).

The flood warning device is connected to the computer signalling screen in Train Control. A flashing indication in red of the word "FLOOD" is displayed when the river level has risen above a certain height.

IMPORTANT
In the event of the flood warning activating, all trains are to be held until clearance from Infrastructure personnel is given.

The flood warning device is tested daily at 10:00 hours by the Train Controller via the Train Control Realflex screen.

8.4 Berthing Instructions

To avoid blocking Otira Settlement Road level crossing, eastbound trains which cannot be berthed in clear of 2L signal must be held at 2RABC Up Home signal until the service is ready for dispatch, at which time the bankers should be attached.

8.4.1 North Main Platform Out of Code

Due to the height between the rail and north main platform being out of code, passenger trains required to stop for passenger work must use the south main platform only.

8.5 Yard Restrictions

No. 2 Road (Fuel Road), Otira yard is restricted to locomotives only.

8.6 Banker Detach Procedure Otira / Arthur's Pass

The following procedure combines common practice and learning from large train tests, to provide a step-by-step best practice for cutting off the banker locomotives at both Arthur's Pass and Otira.

The aim of this method is to ensure that no unintended movement can occur when the banker locomotives are cut off from the train.

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8.6.1 Ventilation of Lead Train Locomotive Cab

On arrival at Arthur's Pass or Otira, the Rail Operator must walk back and open the A side cab door of the train lead locomotive.

Should the changeover Locomotive Engineer be present, the following will occur:

- The Rail Operator opens the A side door.
- The Changeover Locomotive Engineer opens the B side door.

NOTE
Both the Rail Operator and Locomotive Engineer must have a gas monitor with them.

Process:

1. Climb up onto running board with gas monitor and open door(s) of train lead locomotive.
2. Ensure you are ready to move away from this area immediately after step 1.
3. If while on the running board the gas monitor alarms, ensure you immediately get down onto the ground.

IMPORTANT
Neither the Rail Operator nor Locomotive Engineer are to enter the cab until five minutes after the door(s) have been opened.

Gas monitors must be worn when entering the cab. Should the monitor alarm, you must exit the cab and wait a further five minutes for the gas to dissipate.

8.6.2 Banker Locomotive Engineer

1. Apply Automatic or Dynamic brake as required to reduce the train speed for the intended stop.
2. As train speed drops below 20 km/h approaching the desired stopping point, increase Independent brake pressure up to 300 kPa. This ensures the train stops fully bunched to avoid a run-in at brake release.
3. Once the train has stopped, apply full Independent brake.
4. Once the Train Locomotive Engineer has advised they are in lead locomotive cab, move the Automatic brake to release. If a run-in does occur, the banker locomotives will provide extra braking to prevent any movement.
5. Once a full recharge has been obtained, cut out the Automatic Brake Valve on the lead banker.
6. Advise the Train Locomotive Engineer by radio that the Automatic brake has been cut out.

8.6.3 Train Locomotive Engineer

1. Move from the lead banker locomotive to the lead train locomotive cab once the movement has stopped.
2. Advise the banker Locomotive Engineer once in the lead cab.
3. Once the banker Locomotive Engineer has advised by radio that the lead banker automatic brake is cut out, cut in the Automatic Brake on the lead train locomotive and make an 80 kPa reduction to reapply the train brake.

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4. Ensure that the Independent brake is in the Full Application position, then move the MU2A valve from the Trail 6 or 26 position to the Lead or Dead position.
5. The banker locomotives can now be safely cut off from the train locomotives.

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9. Tunnel Sheeting

The Train Controller must be immediately advised of any sheets that have dropped / fallen on to the tunnel floor.

The Train Controller must not allow any trains to proceed into the tunnel until the Track Maintenance Representative is on site or Area Manager / Regional Manager confirms it is safe for trains to travel through the tunnel after fallen sheeting has been removed or secured.

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