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1 PURPOSE

The purpose of this document is to summarise and highlight the requirements for various pavement reinstatements commonly undertaken in Queenstown as a result of excavations for utility services and infrastructure in pavements.

This guide should be read in conjunction with;

- > National Code of Practice for Utility Operators’ Access to Transport Corridors – 15th July 2020
- > QLDC Foam Bitumen Stabilised Pavement – Trench Reinstatement December 2010
- > Definitions shall be as per the National Code of Practice for Utility Operators’ Access to Transport Corridors – 15th July 2020

2 SCOPE

The scope of this guide is limited to the reinstatement of areas disturbed through the installation or repair of utility services and infrastructure. The guide specifically does not apply to new pavement construction.

3 TRENCH EXCAVATIONS

3.1 PRIOR TO TRENCH EXCAVATION

Prior to the the excavation of the trench:

- I. any concrete, asphalt or chip seal surfaces must be cut with a power saw in a clean, straight line through the full thickness of the surface layer;
- II. the separation distance (see image below) from the original saw cut must be a minimum of 150mm, except for concrete Carriageways where a minimum of 300mm applies, but more may be required to maintain the integrity of the final trench reinstatement;
- III. if necessary, a second saw-cut must be made to ensure that all edges are straight, smooth, parallel to the line of the trench and that minimum trench trimming allowance is achieved; and
- IV. all joints must be cut to a depth sufficient to avoid disturbance of adjoining pavement. The depth of cutting must be not less than 30mm, or for concrete carriageways, footpaths, and vehicle crossings the depth must be not less than 80% through the concrete pavement layer. When planning the location of the trenching, ensure that all the requirements of Section 3.5-3.7 (Surface Layer Reinstatement) can be met.

If any break over occurs:

- a further cut must be made to maintain trimming allowances and a clean edge for reinstatement;
- any change in direction of the saw cut must not exceed an angle of 45 degrees to the trenchline;
- the total length of over-break must not exceed 10% of the length of the trench; and
- the length of trim at any one section of over-break must not be less than 1m

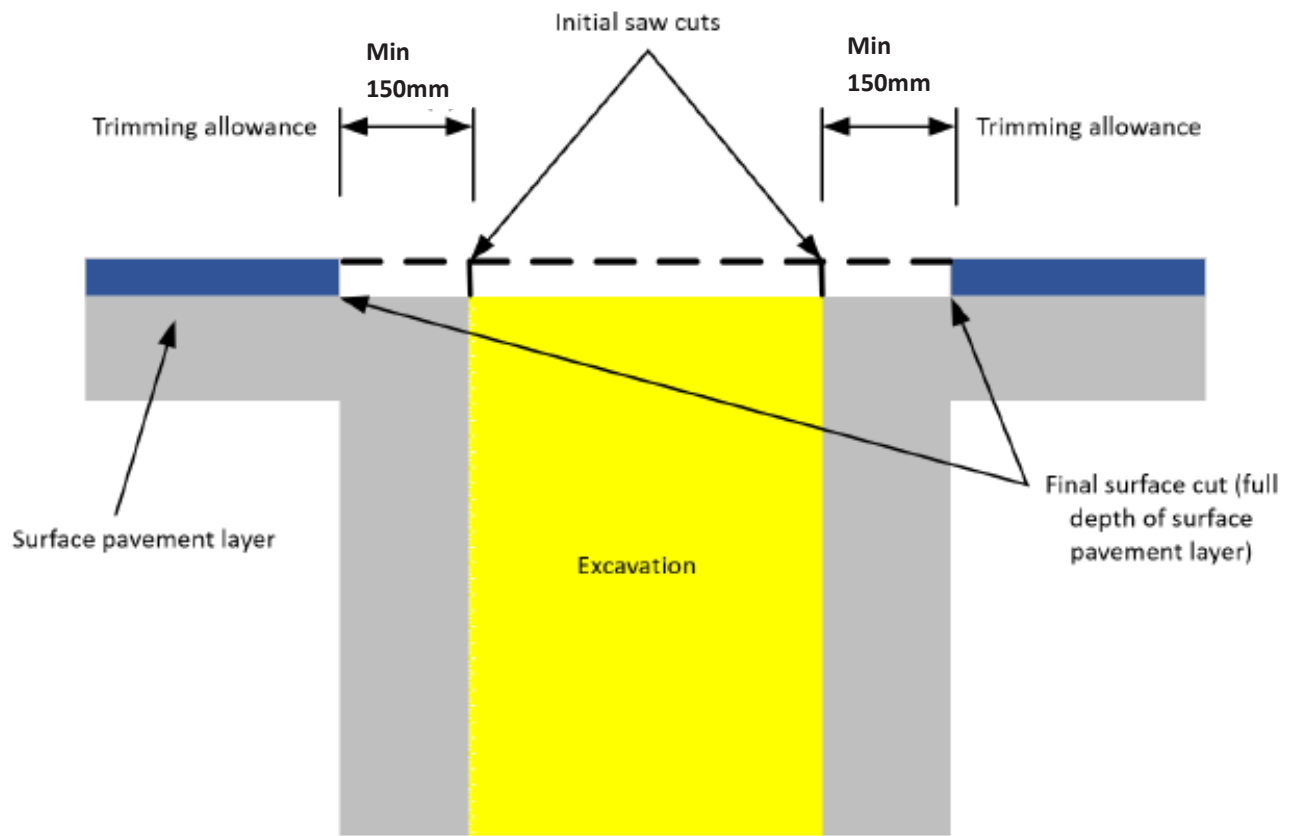


Figure 1 Trench Preparation (Section)

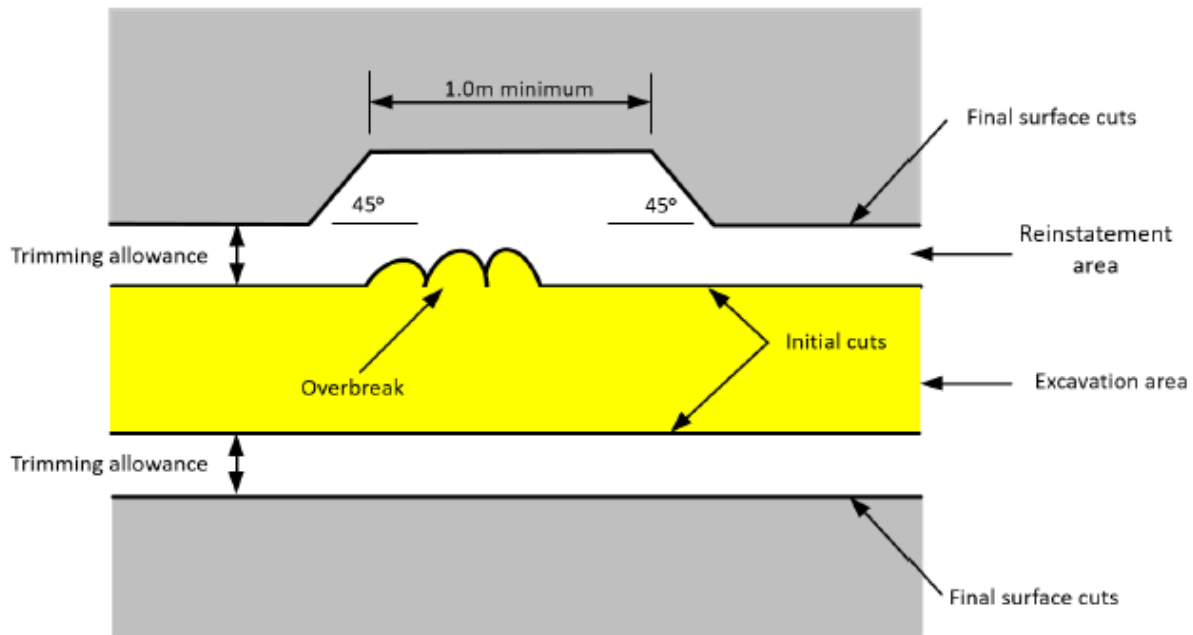


Figure 2 Overbreak Saw Cutting (Plan)

3.2 DURING EXCAVATION

During excavation works:

- I. there must be no undercutting of areas adjacent to the excavation;
- II. if slumping at the sides of the excavation causes depressed areas adjacent to the excavation, or if the edges of the pavement are lifted during excavation, additional trench cutting outside the original line of the excavation and outside the area of damage must be carried out;
- III. excavation to profile/depth must be in accordance with the construction drawings;
- IV. the length of open trench must be kept to a minimum and backfilled as soon as practicable;
- V. excavated material that is not being used for backfill must be removed from the site;
- VI. where groundwater is likely to accumulate as a result of Utility Works, excavations must be permanently drained; and
- VII. the Utility Operator must provide temporary support/shoring to all trenches if required to provide lateral support to the excavation and to comply with health and safety Act and codes, including the WorkSafe Good Practice guidelines of July 2016. The Utility Operator must certify this Work in accordance with the requirements of the Building Act 2004. Alternative trench support can include battering, ground stabilisation and sheet piling.

Depending on the depth of reinstatement and width of trench it is best practice to either step the pavement layers into the existing pavement or cut the batter wall at 45 degrees to avoid cracking of the trench on vertical edges.

Effective drainage of the trench is particularly important in rural situations where trenches run through cut areas, fill

embankments, or slip prone areas.

3.3 BACKFILL MATERIALS

All Backfill Materials

- must be in accordance with recognised standards and approved by the Corridor Manager;
- must be adequate to ensure that the backfilled area can at least match the pre-trench subsurface integrity;
- must be of sufficient quality and strength to support the imposed loading, including traffic and road construction loading;
- where concrete or other stabilised layers, including geotextile material, exist in the road pavement, the Utility Operator must reinstate the trench with similar material and
- must be neutral or beneficial in effect on any other Utility Structures with which there will be interaction.

The bedding/embedment material must be specified by the Utility Operator and placed as follows:

- in a loose state (sand must be dampened) and tamped to achieve compaction and surround of Utility; or
- in a fluidised state where specifically approved by the Corridor Manager; and
- to a depth of not more than 300 mm above the top of the Utility Structure unless a variance is agreed between the Utility Operator and Corridor Manager.

General Fill

- in Road Carriageway, shoulder and footpath, general fill must be well graded granular material free of deleterious material with maximum stone size 75mm;
- where the Utility Operator uses suitable excavated material in berms, the required compaction standards (Section 3.4 Backfill, Placement and Compaction) must be achieved as per below

3.4 BACKFILL PLACEMENT AND COMPACTION

Placement and compaction of all layers must:

- be in layers not exceeding 200 mm (compacted) thickness;
- allow for appropriate compaction methods around the Utility Structures;
- have mechanical compaction completed for each subsequent layer in turn; and
- ensure lapping of any geotextile material in accordance with the manufacturer's specification.

During backfilling and compaction:

Appendix L - Pavement Reinstatement Guide

- care must be taken to ensure no damage occurs to Utility Structures during compaction; and
- if over break or other disturbance of the pavement layers occurs, the surface of such areas must be re-cut, excavated and backfilled in compliance with this Section.

Where the strata exposed as side walls of a trench is considered relatively soft, such that there may be risk of settlement arising from ongoing post-construction penetration of the granular fill material into the trench sides, the Utility Operator should discuss backfill options with the Corridor Manager. These may include, for example, the application of a geo-textile liner in the trench, or the use of modified (lime or cement-treated) granular materials in the vicinity of the soft layer/s.

Compaction must:

- I. be carried out using suitable plant and equipment to achieve the specifications below. Please refer to the QLDC LDSC2020 COP with examples of trench backfill and compaction dwgs B1-3 and B1-4 from Appendix B Std dwgs and
- II. be confirmed by a Clegg hammer, or an agreed alternative, for sub-base and deeper fill; and
- III. be recorded on a the contractors own standard form for each job and results of each test shall be made available to the QLDC Corridor Manager on request

The use of a nuclear densometer or similar compaction testing device is required for larger excavations in carriageways (anything exceeding 20m², one entire lane, or with a linear length exceeding 10m).

Table 1 Clegg Impact Value (CIV) Value for Reinstatement

Layer	Carriageway	Footpath
Basecourse	98% MDD (IV40 [*])	IV 25
Sub-base	IV 35	IV 25
Deeper Fill	IV 25	IV 15

* Only applicable to reinstatements undertaken as part of a QLDC maintenance contract

Where a contractor is undertaking regular reinstatements on behalf of QLDC i.e. water leak repairs, or trench reinstatements, NDM testing is required once per month to demonstrate that the methodology is working as intended and the Clegg testing carried out is demonstrating the desired density results.



Figure 3 Aggregate wetted down during compaction to achieve 98% of MDD – note no compaction depression lines

3.5 SURFACING REINSTATEMENT (GENERAL REQUIREMENTS)

The Utility Operator must, unless otherwise agreed with the Corridor Manager:

- I. not open Trenched sites to Traffic until temporary or permanent resurfacing is in place;
- II. not use temporary resurfacing unless permanent resurfacing is not practicable; and
- III. have permanent resurfacing in place within seven ten working days of completion of backfill or temporary surfacing.

The Utility Operator must ensure the reinstated surfacing:

- I. is installed in clean, long, straight lines parallel to the kerb or Footpath, or for transverse Trenches, perpendicular to the kerb and channel;
- II. uses materials that match the surrounding surface in type, quality, texture, skid resistance and strength (note the use of asphalt for trench reinstatements in non-asphalt roadways is acceptable);
- III. matches at least the pre-existing surface in smoothness or ride quality for vehicles (vertical movements);
- IV. has a finished surface level and adjoining surface shaped to avoid ponding of surface water, such that the deviation of the surface from a 3m straight edge does not exceed 5mm;
- V. does not create a lip greater than 5mm where it joins existing seal on Carriageways;
- VI. is continuously graded towards stormwater drainage channels or gully entries;
- VII. has no lips greater than 3mm high in pedestrian surfaces; and
- VIII. be constructed to have a durable and functional life at least equivalent to the residual life of the existing pavement, as determined in consultation with the asset owner.

3.6 SURFACING REINSTATEMENT (ASPHALT)

Asphaltic concrete surfaces shall be designed and constructed in accordance with NZTA specification M10 2020 and M10 Notes (or latest version) and the following requirements;

- Once compaction is undertaken, the finished Basecourse height to finished surface depth must be checked to ensure the minimum depth of Asphalt is placed. This depth **MUST** be recorded.
- Patches must have a heavy tack coat prior to placing AC, minimum 0.5l/m² – see example photo below;



Figure 4 Tack Coat Application Examples

- The temperature of the AC must be recorded prior to placing and during placement to ensure compliance with the minimum temperature requirements.
- The mix design and relevant temperatures are to be recorded on site, preferably on the contractors own trace sheet or similar that is available on request to the Corridor Manager
- With the exclusion of pothole repairs undertaken under the QLDC Roading Maintenance Contract, all reinstatements are required to be bandage sealed.
- Areas greater than 20m², one entire lane, or with a linear length exceeding 10m² require a membrane seal underneath the asphalt. The requirements for a membrane seal are per 3.4.4.2 of the COP.

The following temperatures are provided as guidance; however, it is the contractor’s responsibility to ensure that they have the appropriate mix temperatures from their suppliers prior to placing the AC;

Table 2 Asphalt Temperature Guidance

Common Reinstatement Mix Types	Mix Temperature	Compaction Temperature	Minimum Layer Thickness
DG7	140-180	165-175	25
DG10	135-160	135-155	35
Mix 10	135-160	135-155	40

Additionally, depending on the ground temperatures at the time of placing, the minimum mix temperature should never be below 95 degrees Celsius or 110 degrees Celsius for polymer modified bitumen asphalts.

3.7 SURFACING REINSTATEMENT (CHIPSEAL)

Joint sealing/joint bandaging (required as minimum) and tack coats as necessary, should be part of the proposed methodology for approval, and guidance is included in the Chipsealing in New Zealand Handbook;

- I. Chip seal shall be reinstated using a two-coat chip seal; the first coat must be a coarse grade chip (e.g. Grade 3) and the second coat a finer grade (e.g. Grade 4 or 5) to visually blend with the existing adjacent surfacing. The second coat must overlap the existing surface by not less than 100mm;
- II. be laid in accordance with the NZTA specification TNZ P/3: First Coat Sealing and the Chipsealing in New Zealand Handbook or;
- III. be laid in accordance with the NZTA specifications TNZ P/4: Resealing or TNZ P/17: Performance Based Specification for Bituminous Reseals; and

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3.8 OTHER RESINSTAEMENTS

Concrete pavement surfaces

- be no less than 1m in any horizontal dimension in order to provide sufficient mass;
- match adjacent concrete paving depth but be no less than 100mm in depth (vehicle crossing depths may vary between RCAs. Check with your Corridor Manager);
- have reinforcing steel/mesh replaced to the same standard as the existing reinforcing;
- have a strength no less than 20MPa at 28 days. Admixtures may be used to attain the required strength earlier;
- match the surface finish of adjacent areas and if not being overlaid should be broom finished; and
- have construction joints formed to match those existing or be installed at minimum 4m centres.
- To re-establish a tight interlocking pattern with specified joint widths for pavers, it may be necessary to remove adjoining blocks and relay them up to a bordering physical feature such as the Road kerb.

Grass berms

- be reinstated level with clean and weed free topsoil to a minimum depth of 50mm (lightly compacted); and
- use approved seed and rake lightly to mix seed into top 20mm.

4 FOAM BITUMEN PAVEMENTS

In recent years Queenstown has seen an increase in the use of Foamed Bitumen Stabilisation throughout its roading projects.

In areas such as Queenstown, Foamed Bitumen Stabilisation provides many benefits to a roading rehabilitation project, for example;

- A strong pavement
- A pavement less susceptible to temperature effects i.e., frost/thaw
- insitu reuse of existing pavement materials

However, the increased use has created a situation whereby service providers are not accustomed to working with this material.

The following section presents a guide/specification for the reinstatement by providers of service trenches that needs to be carried out in pavements that have been Foamed Bitumen Stabilised. It is not usually practical or possible to have "fresh" foamed bitumen stabilised aggregate available for these maintenance works, so a practical alternative is specified in this document.

4.1 BEST PRACTICE

Prior to the physical construction it is best practice for service providers to be notified well in advance of the proposed carriageway rehabilitation. This can allow the operators to identify projects within the area and undertake any works that may be required prior to the stabilisation of the pavement. The best method of ensuring that a pavement remains watertight and uniformly robust after rehabilitation or maintenance works are completed is not undertaking trenching at all.

If a service must be installed via trenching in the pavement after its rehabilitation, an opportune time to carry this out would be prior to the second coat sealing of the site or prior to any planned sealing of the site. This would aid in the appearance of the final surface and maintaining a continuous water proofing layer.

4.2 FBS REINSTATEMENT SPECIFICATION

The ultimate goal of the trench reinstatement is to replace the excavated material with a material that will have a similar strength, stiffness, compaction and surface as the original material, thus avoiding rutting, cracking, differential settlement and moisture ingress.

Prior to starting the excavation

Saw cut a minimum of 100mm into the existing pavement (this is to provide a good surface to match into the stabilised material and protect the remaining stabilised pavement) and to a width 100mm wider on each side than the required trench width. The surfacing should also be cut further to give the profile depicted in figure 1 (chipseal) and figure 2 (thin AC).

Figs 1 & 2 do not refer to surfacing material. Suggest just refer to Fig 1 and Fig 2.

Excavation

The top 200mm of the excavated material i.e., the stabilised material, is to be stockpiled separately to the remaining material excavated. This material when cement is added (detailed below) will form the basecourse layers of the pavement.

Reinstatement

If the original saw cuts have been destroyed during excavation these are to be re cut to form a smooth surface.

Material to be placed in the bottom of the trench above the service bedding shall be the same excavated material or as per the backfill requirement of the service being installed / repaired.

Material to be placed 400mm from the surface shall be the same excavated stabilized and unstabilised material, with the addition of cement. The amount of cement added should be enough to produce a lean mix, in the order of 60kg of cement per m³ of soil. Water must be uniformly mixed through the material. Alternatively, if foamed basecourse material is available from another local stabilisation project this can be substituted, provided it is carted and placed without delay.

Material is to be placed in 200mm layers and compacted to achieve the required compaction as per the previous sections of this document.

QA documentation

QA records shall be compiled for each job and shall be made available to the Corridor Manager on request.

These shall include the following, which are not exclusive:

- Aggregate testing relevant to the aggregate specification eg TNZ M/4
- Aggregate compaction requirements and all test results which shall demonstrate compliance with QLDC requirements. Evidence of layer depths shall be provided
- Modified aggregate design and testing. All test results shall demonstrate compliance with QLDC requirements
- Surfacing design and production/placement QA showing compliance with requirements such as temperatures, compaction
- Photos of construction suitably labelled to provide time and location information