Engineering Construction Specification

C13 Road openings and restorations (Utilities)

Print version is uncontrolled. Current version is maintained on Wingecarribee Shire Council Website in searchable PDF format.

This document is a modified version of AUS-SPEC 1152
Road openings and restorations (Utilities) October 2018 version

Working with you

WSC.NSW.GOV.AU

Wingecarribee
SHIRE COUNCIL

Table of Contents

1 General

1.1 Responsibilities

1.1.1 General

Requirement: Provide road opening and restoration works for installation of underground services within public road reserves or reserves under Council control including clearing, excavation, backfilling and restoration of surfaces, as documented. This worksection does not include the installation activities of the relevant utility services.

1.2 Standards

1.2.1 General

Standards: To the relevant Road Authorities, Work Cover and utility authority's specifications.

1.3 Interpretation

1.3.1 Abbreviations

General: For the purposes of this worksection the following abbreviations apply:

- AADT: Annual average daily traffic.
- CRO: Council's restoration officer.
- CTPO: Council's tree preservation officer.
- EMP: Environment Management Plan.
- GPR: Ground penetrating radar.
- MMDD: Maximum Modified Dry Density (modified compactive effort).
- MSDD: Maximum Standard Dry Density (standard compactive effort).
- QA: Quality assurance.

1.3.2 Definitions

General: For the purposes of this worksection, the following definitions given in the following standards apply. The text in brackets is additional to that in the standards.

- Austroads AP-C087:

  Base/base course: One or more layers of material usually constituting the uppermost structural element of a pavement and on which the surfacing may be placed, which may be composed of fine crushed rock, natural gravel, broken stone, stabilised material, asphalt or Portland cement concrete.

  Carriageway: That portion of a road or bridge devoted particularly to the use of vehicles, that is between guide posts, kerbs, or barriers where these are provided, inclusive of shoulders and auxiliary lanes.

  Clearing: The removal of vegetation or other obstacles at or above ground prior to the commencement of earthwork, drainage, etc.

  Footpath/pathway: A public way reserved for the movement of pedestrians, motorised wheelchairs and personal mobility devices manually propelled vehicles.

  Overlay zone: The part of the trench backfill immediately over the utility service, for a maximum of 300 mm.

  Pavement: The portion of a road designed for the support of, and to form a running surface for, vehicular traffic (including the subbase and base course).

Shoulder: The portion of formed carriageway that is adjacent to the traffic lane and contiguous and flush with the surface of the pavement.

Subbase/subbase course: The material laid on the subgrade below the base either for the purpose of making up additional pavement thickness required over the subgrade, or to prevent intrusion of the subgrade into the base, or to provide a working platform.

Subgrade: The trimmed or prepared portion of the formation on which the pavement is constructed. Generally taken to relate to the upper line of the formation.

Wearing course/wearing surface: The part of the pavement upon which the traffic travels.

- AS 4000 or any other form of contract:

  Contractor: The person bound to carry out and complete work under the Contract. (A Contractor may be internal or external to the Utility Authority).

  Principal: The Principal stated in the Annexure to the General conditions of contract. (The utility authority or service provider for whom the service installation and restoration work is being conducted.)

  Superintendent: The person stated in the Annexure to the General conditions of contract as the Superintendent or other person from time to time appointed in writing by the Principal to be the Superintendent and notified as such in writing to the Contractor by the Principal and, so far as concerns the functions exercisable by a Superintendent's Representative, includes a Superintendent's Representative.

Other definitions: For the purposes of this worksection the following definitions apply:

- Carriageway concrete pavements: Reinforced concrete pavements. Does not include roller compacted concrete bases and subbases.
- Council: The Local Government Authority for the area where the work is carried out.
- Hold point (AUS-SPEC): A mandatory verification position in the contract beyond which work cannot proceed without the designated authorisation.
- Protected species: Plants identified by Council or other relevant authorities as protected species.
- Road authority: An authority with legislated responsibility for the management and maintenance of roads.
- Selected material zone: The top part of the upper zone of formation in which material of a specified higher quality is required.
- Utility authority: Refer to Principal.
- Verge (rural): Defined area of the formation in rural roads outside the shoulder at the top of the batter slope.
- Verge (urban): That portion of the road formation not covered by the carriageway or footpath.
- Witness point (AUS-SPEC): A nominated position, in the different stages of the Contract, where the option of attendance may be exercised by the Superintendent, after notification of the requirement.

1.4 Tolerances

1.4.1 Final carriageway restored surface tolerance

Maximum deviation from a 3 m straightedge: ± 5 mm, with no impact on traffic passing over the restored area, when checked 5 to 10 working days after completion.

1.4.2 Pathways and paved public areas

Lippage at patches: Match the surface level at any point along the patch's edge with the adjoining footpath surface within 5 mm.

1.5 Submissions

1.5.1 Authority approvals

Requirement: Submit details of all authority approval before commencing the works for which the approval is granted, including the following: insert "Council requires the use of trenchless technology for all subsurface construction work within a public roadway unless shown otherwise to be impractical or not possible" where appropriate.

- Trenching: Submit proof of approval for trenching by the public utility authorities and/or evidence of conformity with the authority requirements.
- Existing services: Provide written confirmation from the Authority that retired services are inactive.

1.5.2 Execution details

Environmental Management Plan: Submit an EMP conforming to the requirements of the relevant State authority.

Traffic management: Submit Traffic control plan for controlling vehicular and pedestrian traffic to **PROVISION FOR TRAFFIC**, **Traffic management**.

Tree roots: Submit proposals for an elevated platform, to protect tree dripline during compaction, to suit proposed earthworks machinery.

- Submission time: 3 working days before working near trees.

Water table: If excavation below the water table is required, submit proposals for protection of subgrade against weakening.

- Submission time: 10 working days before excavation.

1.5.3 Products and materials

Trench backfill: Submit details of backfill material, including source.

- Submission time: 5 working days before start of backfill.

Concrete footpath and driveways including textured and patterned: If a jointing material other than bituminous fibreboard is proposed, submit details of material.

1.5.4 Records

QA assurance: Submit evidence of QA accreditation required by the Contract and a Quality plan for the Works.

- Submission time: 10 working days before commencement.

Work-as-executed drawings: Submit fully marked-up drawings for the whole of the Work.

- Drawings: Submit marked up and certified work-as-executed drawings for the whole of the Contract before issue of the Final Certificate.

  Submission time: Within 10 working days after approving completed restoration works.

- Surface utilities: Record information on background or submerged utilities to the documented quality level, conforming to AS 5488.

1.5.5 Tests

Results: Submit results of testing to **ANNEXURE – MAXIMUM LOT SIZE AND MINIMUM TEST FREQUENCIES**.

1.6 Inspections

1.6.1 Notice

General: Give notice so that inspection may be made of the following:

- Set-out of works: Set-out lines and markings before commencement of excavation and any surface clearing work.
- Excavation: Completed excavation to the trench/foundation level.
- Trench backfill: Bedding, benching and overlay material installation after backfill compaction.
- Surface restoration preparation: Set-out of area for paved restoration before paving.
- Compaction and settlement of temporary pavement: Settlement identified and rectified.
- Temporary carriageways: Completed carriageway restoration.
- Surface restoration: Completed final surface installation of carriageway, footpath, driveway and planting, as appropriate.
- Verge, plants, shrubs and trees:

  Completed staking of trees and shrubs.

  Completed replanting of plants, shrubs and trees including replacement plants.
- Pavement markings and street furniture: Completion of reinstatement.
- Clean up: Completed restored work after cleaning.

2 Pre-construction planning

2.1 The works generally

2.1.1 Planning

Checklist: Conform to Flow diagram 1 in the Guide to codes and practices for streets opening or other State equivalent guide.
Existing utility services: Liaise and document the constraints, if any, on for excavation required by the Utility Authority.
Road opening permit: Obtain from the appropriate Roads Authority.

2.1.2 Authority approval

Approval by other public utility authorities: Where other public utilities exist in the vicinity of the Works, conform to one of the following before starting excavation:

- Obtain approval from the relevant authority for the proposed method of excavation.
- Incorporate the requirements of the relevant utility in the proposed work methods.

2.1.3 Environmental control measures

Requirement: Prepare and implement an EMP including erosion and sedimentation control measures, and noise and dust control measures, as required by the relevant environmental legislation, conforming to the requirements of the relevant Statutory Authorities.

2.2 Provision for traffic

2.2.1 Traffic control plan (TCP)

Requirement: Prepare a TCP showing the following, as appropriate:

- Types and locations of permanent regulatory and advisory signs.

- Types and locations of temporary signs, including advance warning signs and speed zone signs.
- Pavement marking details, including types of delineation required, turning arrows, stop/holding lines and other road markings, types and positions of raised pavement markers and other delineation devices.
- Locations of permanent and temporary traffic signals.
- Locations and lengths of tapers and buffer zones.
- Locations of traffic controllers.
- Locations of entry and exit gates to the working areas, individually numbered and signposted.
- Pedestrians and cyclists paths.
- Details of side roads and access for adjoining properties and parking.
- Locations of safety barriers, barrier systems and end terminals.
- Locations of temporary lighting.
- Special consideration to the safety of the workers, pedestrians, cyclists.

2.2.2 Access and notification

Prior to any works being undertaken, a Section 138 approval under the Roads Act is required.
Impact of the Works: Liaise with the affected property owners/occupants to minimise the impact of the Works on the property owners/occupants including impact on surrounding businesses and commercial areas. Include these requirements in the Traffic control plan.
Access to properties adjacent to the Works: Provide continuous safe, all weather vehicular and pedestrian access.
Notice to property owners/occupants affected by the Works: 48 hours before access restriction.

- Emergency works: Provide notice as soon as possible after commencing such works.

Signage: Provide signs conforming to the following:

- Dimensions: 450 mm wide and 300 mm high.
- Material and form: Steel signs that are visible on all approaches.
- Text and graphics: Quoting the name of the utility, its logo, the contractor's name and an emergency phone number.
- Lettering: 40 mm high letters and numbers in arial font.

2.2.3 Major roads

Works on state or regional roads: Obtain approval of the Traffic control plan from the State road authorities, council and police.

2.2.4 Local road closures

Full road closures on local roads: Obtain approval of the Traffic control plan from Council.
Emergency works: Obtain pre-approval and implement the Traffic control plan at commencement of Contract.

2.3 Quality assurance

2.3.1 Quality plan

Quality plan documents: Include all checklists, inspections, testing and documentation required in **ANNEXURE – MINIMUM TESTING FREQUENCIES** and as necessary for the Works to conform to the Contract documents.

2.3.2 Hold and witness points

Quality plan: Incorporate Hold and Witness Points into the checklists.
Hold Point sign-off: By the approved Contractor's representative and the Superintendent.
Notice for inspections: Conform to **INSPECTIONS**.
Notice for Council officers: Minimum 24 hours, conforming to **INSPECTIONS**.

2.3.3 Hold point approval by Contractor's inspector

Sign-off: If allowed by the Quality plan, the Contractor's nominated inspector may sign-off certain Hold Points. Approval will be determined by the Contractor's performance in relation to the requirements of the Quality plan and the Contract.

2.3.4 Testing

Frequencies: Conform to **ANNEXURE – MINIMUM TESTING FREQUENCIES**. Retest non-conforming work and rectify where necessary.

2.3.5 Auditing

QA documents: The Contractor's QA system may be audited as required. Provide information/documents where requested.

2.3.6 Costing provisions for QA

Additional costs: It is assumed all QA provisions are included in the costing for the Works and there will be no additional payment for conformance with the QA requirements.

2.4 ALL roads

2.4.1 Utility services

Approval: Do not install utility services by open trenching methods in any carriageway without prior approval. This is a HOLD POINT.
Alternative: Install utility services under these carriageway pavements in conformance with *C34 Trenchless conduit installation* or the relevant Utility Authority's Specification as directed.
Maintenance: If maintenance of the Utility Authority's services requires the use of open trenching methods in these carriageway pavements, proceed only with approval.
Restoration: To Final restoration of carriageway subbase and base (flexible) in accordance with Council's Standard drawing or the relevant road authority's requirements.

3 Execution

3.1 General

3.1.1 Provision for traffic

Requirement: Conform to the approved Traffic control plan.
Traffic obstruction: Construct the Works in a safe manner with the least possible obstruction to vehicular and pedestrian traffic.

3.2 Existing utility services

3.2.1 Marking

Locating and marking services: Before starting earthworks, locate and mark existing underground services in the areas which will be affected by the earthworks operations including clearing, excavating and trenching.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.
Excavation adjacent to utility services: Use only Utility Authority approved methods of excavation.
Telecommunication services: Contact the network service provider for information on underground services.

3.3 Set-out of the works

3.3.1 Set-out

Initial limits: Set out limits of the proposed excavation for trenches, pits and chambers required for the utility service installation.
Set-out markings: Legibly mark without permanently defacing any surface.
Adjusted limits: Adjust set-out to minimise or eliminate residual small portions of paving slabs in the existing paved surfaces and joint patterns in conformance with **Pathways and driveways and Carriageways**, as appropriate.

3.3.2 Utility services under any carriageway

Open trenching methods: Do not use to install utility services using open trenching method within the carriageway particularly the trafficable lanes without Roads Authority approval.
Coordination of the Works with utility services installation: Coordinate with trenchless conduit installation requirements or the relevant Utility Authority's specification.
Maintenance: If maintenance of the Utility Authority's services requires the use of open trenching methods in the carriageway pavements, obtain approval before proceeding.
Restoration work: Conform to **FINAL RESTORATION OF CARRIAGEWAY** to Council's standard drawing or the relevant road authority's requirements.

3.3.3 Pathways and driveways

- Bitumen and concrete paving:
- Bitumen and concrete paving: In conformance with the reinstatement provisions and sketches of the above guide
- Segmental paving units: Set-out line at least one whole unit clear of both sides of the minimal alignment of the trench.
- Textured or patterned concrete: Obtain directions for set-out line.
- Driveways: Where driveways are not to be disturbed and utility services are to be installed, coordinate with trenchless conduit installation requirements. If trenchless installation methods are not practicable, locate and obtain approval for the set-out line to allow an aesthetically acceptable restoration of the pavement. This is a WITNESS POINT.

3.3.4 Carriageways

Trenches in asphalt pavements: Do not plan for trench excavation without the approval of the Road Authority Set-out at the minimum width for the depth of service and, wherever possible, at right angles to the road reserve boundary.
Survey marks: For trench or surface work in the vicinity of Permanent or State Survey Marks, obtain protection or relocation requirements from the Land Information Centre of the State Authority responsible for survey records before commencement of Work.
Concrete pavements: Do not plan for trench excavation without the approval of the Road Authority. Seek the advice and approval of the appropriate road authority for the location of trench set out lines. Refer also to the Guides to codes and practices for street openings. This is a WITNESS POINT.

3.3.5 Survey marks

Authority requirements: Do not plan for trench excavation without the approval of the Road Authority. Before commencing trench or surface work within the vicinity of Permanent or State Survey Marks, refer to NSW Land Registry Services or other appropriate Authority responsible for survey records, for protection or relocation requirements.

3.4 Waste disposal and recycling

3.4.1 Waste management

Waste/spoil material: Legally dispose to an appropriate recycling facility, disposal site or a legal waste management centre. NOTE Coal Tar contamination may exist at some locations within Wingecarribee Shire.

3.5 Surface treatment removal

3.5.1 Concrete and asphalt pavements

Sawcutting: Sawcut trench set-out lines of concrete or asphalt footpaths and asphalt footpath/carriageway pavements for the full depth of the bound pavement layer, except where set-out line is located along expansion joints. For rigid pavements double cut the pavement 100 mm apart to protect the adjoining concrete pavements from damage during demolition activities.
Concrete and asphalt removal: Break out concrete or asphalt footpath and carriageway pavement material between the trench set-out lines, remove and legally dispose off-site conforming to the EMP.

3.5.2 Segmental paving units and dimension stones

Paving units removal: Take up full and cut paving units, between trench set-out lines, by hand and neatly stack on wooden pallets for re-use. Obtain agreement for storage locations.
Dimension kerb and gutter units removal: Take up units located between trench set-out lines and store as for paving units.
Concrete edging: Break out, remove and legally dispose off-site.
Concrete subbase: If present, sawcut along the trench set-out lines.

3.5.3 Decorative pavers laid on mortar bed

Decorative pavers laid on mortar bed and concrete base: If services installation is required, do not disturb except where trenchless conduit installation is impractical.
Pavement removal: If disturbing these surfaces is required, remove pavers for re-use, stack and secure against theft or damage. Remove mortar bedding mix.
Sawcutting: Do not sawcut pavers. If required, provide evidence that replacement pavers, of the same type, size, colour and decoration, are available.
Concrete subbase removal: Sawcut along the trench set-out lines and remove. If percussion equipment is required for removal, make sure adjacent areas of paving are not disturbed.

3.5.4 Grass

Removal method: Neatly cut turf between trench set-out lines into 300 mm squares and stockpile for re-use or dispose off-site if unsuitable for re-use.
Stockpiling for re-use: Obtain agreement for storage locations. Water grass as required for replanting during the storage period.
Grass unsuitable for re-use: Replace with grass turf of the same species.

3.5.5 Small plants, shrubs and trees

Plants required for replanting: Identify and confirm with the CTPO plants suitable for replanting between set-out lines. Take up heritage listed/protected plants and plants confirmed suitable for replanting for storage.
Storage: Wrap rootball in a hessian or plastic bag with drain holes and water as required during the storage period.
Plants unsuitable for replanting: Remove and dispose off-site.

3.5.6 House stormwater pipes

Pipes discharging into carriageway gutters: Maintain operational at all times.
Pipes damaged by the Works: Repair or replace pipes, including house supply pipes, to match existing. Provide watertight seals to all joints and connections.

3.5.7 Street furniture

Furniture likely to interfere with or be damaged by the Works: Remove and store furniture, including signage, seats and litter bins. Obtain direction for storage location.

3.6 Excavation

3.6.1 Topsoil

Topsoil suitable for re-use: Strip, remove and stockpile. Obtain direction for stockpile location. If on-site stockpiling is impracticable, stockpile the topsoil off-site or legally dispose off-site.
Removal timing: Before trench excavation.

3.6.2 Trenching

Dimensions: Excavate trenches to the standard widths and depths for the particular utility service installation or as documented in Council's Standard Drawing.
Stabilisation of sides: Provide shoring, sheet piling or other necessary measures in conformance with statutory requirements.
Approval by utility/service provider: If public utilities exist in the vicinity of the Works, obtain approval from the authority relevant to the method of excavation before starting excavation.
Excavation level: Excavate trench or foundation to the planned bedding or foundation bottom level.

3.6.3 Existing services

Existing underground services: Conform to **EXISTING UTILITY SERVICES** in the *C01 General requirements (Construction)* and *Workcover NSW Work near underground assets*. Locate using DBYD information and by exploratory excavation or by ground penetrating radar (GPR) before principal trench excavation.
Disused, retired or abandoned services: Before removal, provide written confirmation from the appropriate Authority that services are inactive.
Removal of retired services: Excavate, remove all components and legally dispose off-site. Backfill the excavation in conformance with **TRENCH BACKFILL**.

3.6.4 Excavated material stockpiles

Excavated material: Segregate earth and rock material and stockpile for re-use in backfilling operations when the material is suitable for backfilling. Obtain approval for stockpile locations.
Stockpile locations: Obtain direction for stockpile locations. Do not stockpile against tree trunks, buildings, fences or obstruct the free flow of water along gutters where stockpiling is permitted along the line of the trench excavation.

If stockpiling is not permitted: Dispose legally off-site.

3.6.5 Unsuitable material

Disposal: Remove any material from the bottom of the trench or at foundation level which is deemed unsuitable, legally dispose off-site and replace with backfill material in conformance with **TRENCH BACKFILL**.
Bottom of excavated trench/foundation level: Align with the slope of the utility service after unsuitable material has been removed and replaced.

3.6.6 Contaminated or hazardous material

Contaminated excavated material: If encountered, provide notification and dispose of the material to the requirements of the relevant Statutory Authority.

3.7 Existing trees

3.7.1 Protection during works

Existing trees: Existing trees are legally protected by Council's Tree Preservation Order. Protect from damage during the Works.
Bulk and harmful materials: Do not store, stockpile, dump or otherwise place under or near trees materials such as oil, waste concrete, clearings and boulders. Prevent wind blown materials from harming trees and plants.

3.7.2 Work near trees

Damage: Prevent damage to tree bark. Do not attach stays and guys to trees.
Topsoil: Do not remove topsoil within the dripline of the trees.
Excavating within driplines: If required, use hand or trenchless methods so that root systems remain intact and undamaged.
Duration of open excavations under tree canopies: Obtain direction from the CTPO.

3.7.3 Tree roots

Cutting roots: If cutting roots more than 50 mm diameter, obtain approval from the CTPO before proceeding. Cut using methods that do not unduly disturb the remaining root system. Immediately after cutting, water the tree and apply a liquid rooting hormone to stimulate the growth of new roots.
Compacted ground: Do not compact the ground or use skid-steel vehicles under the tree driplines.
Compaction protection: Protect areas adjacent to the tree dripline.
Watering trees: Water as necessary, including where roots are exposed at ambient temperatures higher than 35°C.
Mulching: Spread 100 mm thick organic mulch to the whole area covered by the driplines of protected trees.

3.8 Trench backfill

3.8.1 Bedding, haunch, side and overlay zones

Materials and installation: Conform to the Utility Authority's requirements.
Side zone and overlay material: Install as required for the utility service being installed. Make sure material performance conforms to **TRENCH BACKFILL** and **COMPACTION**.
Geotextile: Install a geotextile sheet on any coarse overlay material to prevent piping of fines.

3.8.2 Backfill

Refer to Council's standard drawing

3.8.3 Water table

Seepage zones: If sand/cement backfill is used, make sure natural seepage zones are not cut off by the impervious sand/cement material. Provide a pervious drainage layer or suitable subsoil drainage to maintain natural seepage.
Water in pervious material: If sand, crushed rock or similar pervious materials are used for trench backfill and bedding in a clay subgrade, make sure seepage water is not trapped in the pervious material, so that it saturates the adjacent clay subgrade and weakens it. If this occurs, install subsoil drainage for the bedding and backfill, or provide an impervious layer of material between any possible sources of seepage and the pervious backfill material.
Excavation below the natural water table: If required and the permanent exclusion of water from subgrade is not possible, submit proposals to protect the subgrade against weakening or obtain directions vary the excavation requirements.

3.8.4 Selected material zone below subbase level

Excavation through a selected material zone: If required, backfill within the selected material zone using materials conforming to the following:

- Free from stones larger than 100 mm maximum dimension.
- The fraction passing a 19 mm Australian Standard sieve with a 4 day soaked CBR value not less than that of the adjacent selected material zone, tested to AS 1289.6.1.2.

3.8.5 Verge and landscape areas

Backfill material: Material passing through a 75 mm sieve, not containing any organic or deleterious material or reactive clay.
Landscaped areas: Place topsoil on the subgrade to the same thickness as the surrounding topsoil.

3.8.6 Backfilling at/near trees

Backfill at trees: Backfill 300 mm minimum thickness around tree roots with a topsoil mixture. Place and compact in layers of 150 mm maximum depth, to a dry density equal to that of the surrounding soil.
Backfill level: Do not place backfill material above the original ground surface around tree trunks or over the root zone.
Backfill material: A 3:1 topsoil: well-rotted compost mixture, free from weed growth and harmful materials, and with a neutral pH value.
Watering: Thoroughly water the tree root zone immediately after backfilling.

3.8.7 Under footpaths, carriageways and heavy duty driveways

Extent: To the subgrade level.
Backfill material: Use one of the following:

- Sand: Do not use if the bedding/overlay is coarse aggregate.
- Fine crushed rock/recycled concrete: Conform to Crushed rock and recycled concrete.
- Selected backfill material with an equivalent 4 day soaked CBR value to AS 1289.6.1.2, maximum particle size of 75 mm, and does not contain organic or deleterious material or reactive clay.
- Under footpaths: 25:1 sand/cement mix, not requiring compaction testing.
- Under carriageways: 14:1 sand/cement mix, not requiring compaction testing.

3.8.8 Crushed rock

Designation: Unbound crushed rock materials are designated as follows:

- CRB20-1: 20 mm nominal sized class 1 crushed rock base.
- CRB20-2: 20 mm nominal sized class 2 crushed rock base.
- CRS20: 20 mm nominal sized crushed rock subbase.
- CRS40: 40 mm nominal sized crushed rock subbase.

3.8.9 Crushed concrete

Designation: Recycled crushed concrete materials are designated as follows:

- CCB20-1: 20 mm nominal sized class 1 recycled crushed concrete base.
- CCB20-2: 20 mm nominal sized class 2 recycled crushed concrete base.
- CCS20: 20 mm nominal sized recycled crushed concrete subbase.

3.9 Compaction

3.9.1 Relative compaction

Sand/cement backfill material: No compaction testing is required.
Layers: Compact all material in maximum 150 mm compacted thick layers, unless it can be demonstrated that the required compaction can be achieved with thicker layers.
Moisture content: During compaction, adjust the moisture content of the material to attain the required compaction at a moisture content 60% to 95% of the apparent optimum moisture content, to AS 1289.5.7.1 (modified compaction).
Compacting adjacent to utility services: Use compaction methods which will not damage or cause misalignment of underlying or adjacent utility services and adjacent structures.

3.9.2 Compacting asphalt

Requirement: Compact as soon as practicable after spreading new material, in a continuous operation conforming to the following:

- Uniformly compact each layer before starting the next layer.
- Compact the full depth of material over the entire area of placement.

3.9.3 Compaction table

Zone	**Relative compaction**	**Density index (for non-cohesive materials)**	**Moisture content (% of optimum moisture content)**
Bedding and overlay zones	To the utility authority's specification	To the utility authority's specification	To the utility authority's specification
Backfill in verge and landscape areas	90% standard	70	60% to 100%
Backfill to subgrade level under footpaths and carriageways	98% standard 95% modified	80	60% to 100%

3.10 Testing

3.10.1 General

Requirement: Test for all characteristics in conformance with ANNEXURE - **MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.
Quality verification: If material/product quality verification can be obtained from the supplier, documented tests need not be repeated.

3.11 Surface restoration preparation

3.11.1 Carriageway pavements and pathways

Rectification: Restore so that pavement/pathway is continuous and the condition is equivalent to that at start of Works.
Safety: Make sure all temporary and final restorations in carriageways and pathways is of the quality required maintain site safety for pedestrians and vehicular traffic.

3.11.2 Structures and surface pits

Levels: Set the levels of utility service surface pits, access chamber frames and lids and other affected structures, so that carriageway pavements and footpaths can be restored to the original levels. If utility service surface box requires adjustment or replacement before restoration, liaise with the Utility Authorities.

3.11.3 Restoration approval

Before paving restoration work: Form up and prepare the areas to be restored and present the prepared areas for approval.
Requirements: Conform to **ANNEXURE – Typical final restoration in footpath table**.

3.11.4 Temporary carriageways

Subbase and base: After backfilling to the subgrade level, install subbase and base material in conformance with **FINAL CARRIAGEWAY RESTORATION**.
Temporary restoration: Temporarily restore carriageway if reopening to traffic before final restoration. Maintain temporary restoration in a safe condition until the final restoration is completed.
Temporary restoration method: Restore carriageway using one of the following:

- Bituminous cold mix: 40 to 50 mm thick, on the final subbase and base material with the following mix performance properties:

  Cohesiveness of manufactured material: Cohesive and capable of being compacted readily into a semi-dense mass which is resistant to the destructive action of traffic.

  Interlock: When compacted, visual examination of the compacted material indicates good mechanical interlock of particles which are fully coated with binder.

  Mix sampling: To AS/NZS 2891.1.1 or AS 2891.1.2.
- Steel plating: Over trench, of sufficient thickness and bearing area outside the trench to support traffic loadings, and suitably secured with pins and bituminous cold mix.

Advance warning signs: If using steel plating, provide signs in conformance with AS 1742.3.

3.11.5 Temporary footpaths and driveways

Subbase and base: After backfilling to the subgrade level, install subbase and base material in conformance with **FINAL PATHWAYS AND DRIVEWAYS RESTORATION**.

Temporary restoration: Temporarily restore footpath or driveway if reopening to pedestrian traffic before final restoration. Maintain temporary restoration in a safe condition until the final restoration is completed.
Pedestrian and vehicular access: Liaise with property owners and make sure access is provided to all properties at the end of each day's work.
Temporary restoration method: Restore footpath/driveway using one of the following:

- Bituminous cold mix: 20 to 40 mm thick, with the following mix performance properties:

  Cohesiveness of manufactured material: Cohesive and capable of being compacted readily into a semi-dense mass which is resistant to the destructive action of traffic.

  Interlock: When compacted, visual examination of the compacted material indicates good mechanical interlock of particles which are fully coated with binder.

  Mix sampling: To AS/NZS 2891.1.1 or AS 2891.1.2.
- Sheeting or steel plating: Over trench of sufficient thickness and bearing area outside the trench to support traffic loadings, and suitably secured with pins and bituminous cold mix.

Connection with adjoining footpath:

- Bituminous cold mix: Smooth and evenly graded so that the temporary restoration is not a trip hazard for pedestrians.
- Sheeting or steel plating: Match the steel plating level to the adjacent bituminous cold mix surface and make sure steel plating is not a trip hazard for pedestrians.

3.11.6 Compaction and settlement of temporary pavement

Compaction: Uniformly compact each layer of the base and subbase within the trench to a relative compaction of 98% to AS 1289.5.2.1, or 102% to AS 1289.5.1.1.
Compaction method: Use methods which will not damage or cause misalignment of underlying and adjacent utility services or structures.
Settlement: If temporary restoration show signs of settlement, do not start final restoration until the cause of the settlement has been identified and rectified to approval.

3.11.7 Temporary pavement removal

Temporary pavement material: Remove and dispose off-site before final carriageway and pathway pavement restoration.
Temporary base material: If approved, the temporary base material may remain in place and be incorporated into the final pavement if it conforms to the following:

- The requirements of this worksection for the subbase (including the requirements for compaction and testing).
- Has not been disturbed or contaminated during removal of the temporary surfacing.

3.12 Final carriageway restoration

3.12.1 General

Timing: Carry out final restoration as soon as practicable and within the contract required time.
Subbase/base layers and depths: Match the existing pavement and benching.

- Cement stabilised crushed rock or a lean mix concrete subbase: Materials and layer depths to match the existing pavement.

3.12.2 Flexible pavements generally

Tack coat for asphalt or seal coat for sprayed bituminous seals: Present a waterproof surface at application.

Asphaltic limits: Conform to the following:

- Existing wearing course removal: Remove between 100 to 400 mm, in plan, beyond the perimeter of any trench excavation. Dispose removed materials off-site.
- Asphalt placed as restoration: Extend 100 to 400 mm minimum, in plan, beyond the perimeter of any trench excavation.

Joints between new and existing asphalt: Conform to the following:

- Joint: Vertical and cut by diamond saw or milling machine.
- Vertical face and subgrade surface of old asphalt: Treat by bituminous tack coating.
- Defects: Seal any joints between the existing and new asphalt during the defects maintenance period with an approved joint sealant.

3.12.3 Asphaltic concrete wearing surfaces

Material and installation: Conform to the Road Authority's requirements for the restoration of asphaltic concrete roads. Crack sealing is required within one week in accordance with Council's standard drawing.

3.12.4 Bituminous spray seal surfaces

Material and installation: Restore surface to match existing surfaces. Overlap surface restoration by a minimum of 100 mm and a maximum of 400 mm.
Thickness and aggregate size: Match the existing pavement.
Pavement with asphaltic concrete underlay: Restore the pavement in asphaltic concrete matching the total thickness of the existing pavement.
Small openings in pavement: Restore using asphaltic concrete (AS20) with minimum thickness of 50 mm to the match existing pavement.

3.12.5 Concrete carriageways

Concrete carriageways: Conform to the Road Authority's requirements for restoration of concrete roads.
Bond Breaker: Install a bond breaker at the interface of the concrete base and cementitious sub-base:

- To prevent bonding of trench backfill to the concrete base course.
- Assist in the management of cracking.
- Reduce the risk of utility service damage when the concrete base is excavated in the future.

Set Accelerators: Provide set accelerators where the Roads Authority requires the concrete road to be back in service within a specific time frame.

- Do not use Calcium Chloride admixture or other acid concrete admixtures that significantly reduce the life of steel reinforced concrete pavements.
- Use other set accelerators which are not acidic with additional skilled resources to lay, compact and finish the surface prior to the set of the concrete

Slab size and shape requirement: Conform to the following:

- Restore full slab to achieve the same slab integrity that previously existed prior to the utility works
- Restore full trafficable lane width.
- Minimum slab replacement size: Trafficable lane width x 3.5 metres long.
- Allow for existing cracks and joints and maintain the slab lengths of 3.5 metres. Make sure that the restoration does not create slab lengths less than 3.5 metres in adjoining slabs.

Jointing and crack control: Carry out joint and crack control design to ensure that joints and cracks from adjoining slabs will not induce cracking of the restored slab and vice versa.

3.12.6 Pavement markings

Markings: Reinstate to match existing markings.

3.13 Final pathways and driveways restoration

3.13.1 General

Timing: Carry out final restoration as soon as practicable and within the time required in the Contract.
Matching finishes: Restore pathways, and other public areas, with materials consistent with the existing surface before commencement of the Works, including colour patterns and finish type.
Surface levels: Match the levels existing before the surface was disturbed. Provide smooth junctions with the adjacent existing surfaces, covers and features, including dowelling or keying into existing concrete structures.

3.13.2 Pavement markings and street furniture

Pavement markings: Reinstate to match existing markings.
Street furniture: Remove and store street furniture. Obtain directions for storage location. Reinstate at locations matching the original location.

3.13.3 Subbase and base generally

Material: Provide crushed rock, CRB20-2 or CRS20 material, configured in layers and depths conforming to **ANNEXURE – Typical final restoration in footpath table**.
Compaction: Uniformly compact each layer of the subbase and base courses over the full area and depth within the trench to **COMPACTION** and **ANNEXURE - Typical final restoration in footpath carriageway or heavy duty driveway table**.
Compaction testing: Conform to **TESTING, QUALITY ASSURANCE** and the Contractor's approved Quality plan.
Compaction method: Use methods which will not damage or cause misalignment of underlying and adjacent utilities and services.

3.13.4 Flexible subbase

Material: Fine crushed rock or recycled concrete conforming to **TRENCH BACKFILL**, **Crushed rock and recycled concrete**.
Thickness: Match the existing subbase, conforming to the following:

- Footpath and light duty driveways: Minimum 50 mm.
- Medium and heavy duty driveways: Minimum 150 mm.

Compaction: To **COMPACTION** and **ANNEXURE - Typical final restoration in footpath table**.

3.13.5 Rigid base

Concrete base: Reinstate using 20 MPa concrete, match the thickness of the existing base.

3.13.6 Concrete footpaths and driveways including textured and patterned

Construct in accordance with Council's standard drawing.
Residential driveways: Construct in accordance with Council's standard drawings

Commercial/ Industrial driveways: Construct driveways serving multiple residential dwellings and light commercial developments, and heavy duty driveways in accordance with Council's standard drawings.

3.13.7 Asphalt footpaths

Materials and installation: To match existing footpath/driveway.
Thickness: Match the adjoining footpath.
Finish: Compact to a smooth even surface.

3.13.8 Segmental pavers on sand bed

Materials and installation: To match existing footpath/driveway and the following:

- Existing pavement units: Take up and store until required for laying.
- Laying: Re-lay to match the pattern and surface levels of the existing paving.
- Damaged paving units unsuitable for re-laying: Replace with new units of the same material, type, size and colour as the existing.

Paving around trees, service boxes and poles: Match the paving pattern at similar existing features in the immediate area.

3.13.9 Decorative segmental paving on concrete base

Application: The restoration of pathways or driveways with natural stone, concrete or masonry paver surface or other surface products laid on a mortar bed and concrete base.
Concrete base: Reconstruct the concrete base as follows:

- Concrete: 25 MPa.
- Driveway thickness: To match the existing concrete.
- Reinforcing: If the concrete base is reinforced, tie reinforcement to the existing reinforcing, by exposing the reinforcing either side of the restoration to allow a minimum 300 mm lap, or by installing tie bars drilled and grouted into the existing concrete.
- Tie bars: 600 mm long Y12 reinforcing bars, installed at 1000 mm centres by drilling 200 mm deep 16 mm diameter holes at mid-slab depth and grouting tie bars into holes using a 1:1 cement/sand mix.
- Unreinforced concrete base: Roughen the sawn face to allow formation of a keyed joint.

Transverse or longitudinal joints: If disturbed by the Works, reinstate to match existing joints.
Damaged or sawcut pavers: Remove pavers adjacent to the trench damaged during the Works. Remove sawcut pavers back to the nearest existing joint.
Mortar bed material and thickness: Match the existing mortar bed.
Existing pavers: If re-laying is required, replace cut or damaged pavers with new pavers of the same material, type, size, colour and decoration as the existing pavers. Liaise with the Council for supply details of pavers. If existing pavers cannot be sourced, provide an alternative in consultation with the Council.
Laying: Match existing surface levels, jointing pattern, gap width and infill material.

3.13.10 Turfed verges

Stockpiled topsoil: 50 mm minimum thickness. Place on the subgrade before restoring turfed verges.
Existing grass turf: Take up and store until required for laying. Re-lay in conformance with the original grassed surface.
Turfing: Hard butt turfs against each other in rows and top-dress the seams with topsoil. Roll and water turf until established, make sure there is direct and uniform contact with the topsoil.

Additional turf: If required, complete the affected area using turf of the same species as the existing grass or as directed.

3.13.11 Verge plants, shrubs and trees

Stockpiled topsoil: Place on the subgrade, to the same thickness as the surrounding topsoil, before replanting.
Planting holes: Excavate at locations matching the original locations and spread the topsoil material evenly around each hole.
Existing plants, shrubs and trees: If suitable for replanting, replant in prepared holes. Backfill the planting hole with topsoil and compact by foot up to surface level.
Plants unsuitable for replanting: Replace with plants of the same species and size, or as agreed with the CTPO or other appropriately authorised Council Officer.
Backfilling planting hole: Backfill with topsoil and compact by foot to the surface level.
Staking and watering: Stake, water and maintain root moisture as required for re-establishment.
Shrubs and trees which fails to re-establish: Replace with plants of the same species and size.

3.14 Completion

3.14.1 Clean up

Requirement: Upon completion of all restoration works, clean up the areas affected by the Works and associated construction activities, and restore to condition existing before commencement of the Works.
Waste: Remove and legally dispose of all formwork, waste and residue construction materials off-site including material left at stockpiles.
Surfaces stained by construction activities: Clean and restore to approval.

4 Annexures

4.1 Annexure – Typical final restoration

4.1.1 Typical final restoration in footpath table

Zone	**Zone thickness**	**Material**	**Compaction requirement**
Wearing surface (course)	Concrete to match existing: 75 mm minimum. Asphalt: To match existing. Segmental paving on sand bed: To match existing. Segmental decorative paving on concrete base: To match existing.	To **FINAL PATHWAYS AND DRIVEWAYS RESTORATION.**	To **COMPACTION**, **Compacting asphalt**.
Subbase/ base course	Match existing thickness (minimum 50 mm). Segmental decorative paving on concrete base – subbase only required	To **FINAL PATHWAYS AND DRIVEWAYS RESTORATION.**	92% MMDD or 95% MSDD.

Zone	Zone thickness	Material	Compaction requirement
	if existing.		
Subgrade	Varies.	To **TRENCH BACKFILL.**	90% MSDD or Density Index 70%.
Bedding zone	To the Utility Authority's specification.	To the Utility Authority's specification.	To the Utility Authority's specification.

4.1.2 Typical final restoration in carriageway or heavy duty driveway table

Zone	Zone thickness	Material	Compaction requirement
Base course	Match existing.	To **FINAL CARRIAGEWAY RESTORATION.**	98% MMDD or 102% MSDD.
Subbase course	Match existing.	To **FINAL RESTORATION OF CARRIAGEWAY SUBBASE AND BASE (FLEXIBLE)**.	
Subgrade	Varies.	To **TRENCH BACKFILL**.	98% MSDD or 95% MMDD or Density Index 80.
Bedding zone	To the Utility Authority's specification.	To the Utility Authority's specification.	To the Utility Authority's specification.

4.2 Annexure – Summary of hold and witness points

Reference No:	Clause and description	Type*	Submission/Inspection details	Submission/Notice times	Process held**
C13-HP01	SUBMISSIONS, Execution details Environmental management plan	H	EMP conforming to State authority requirements.	10 days before commencement on site	Commencement
C13-HP02	SUBMISSIONS, Execution details Traffic management	H	Traffic control plan for controlling vehicles and pedestrians.	10 days before commencement on site	Commencement
C13-HP03	SUBMISSIONS, Authority approvals Trenching	H	Approval for trenching from the public utilities authorities.	10 days before excavation	Excavation
C13-HP04	SUBMISSIONS, Authority approvals Existing services	H	Confirmation retired services are inactive.	10 days before excavation	Excavation
C13-HP05	INSPECTIONS, Notice Set-out of works	H	Set-out of lines and markings before excavation and clearing.	5 days before start of work	Excavation and surface clearing work, For development inspections book through "MyInspect"
C13-HP06	INSPECTIONS, Notice Excavation	H	Completed excavation to the trench/foundation level.	5 days before backfilling	Backfilling, For development inspections book through "MyInspect"
C13-HP07	INSPECTIONS, Notice Trench backfill	H	Completed bedding and overlay material installation after compaction.	5 days before completing backfill	Surface restoration preparation, For development inspections book through "MyInspect"
C13-HP08	INSPECTIONS, Notice	H	Prepared area to be restored, including set-out.	5 days before paving	Paving. For development inspections book

Reference No:	Clause and description	Type*	Submission/Inspection details	Submission/Notice times	Process held**
	Surface restoration preparation				through "MyInspect"
C13-HP09	INSPECTIONS, Notice Compaction and settlement of temporary pavement	H	Rectified settlement of temporary pavement.	3 days before final restoration	Completion of temporary pavement, For development inspections book through "MyInspect"
C13-WP10	INSPECTIONS, Notice Temporary carriageways	W	Completed temporary carriageway.	3 days before completion of works	-
C13-HP11	INSPECTIONS, Notice Surface restoration	H	Final surface installation.	3 days before completion of works	For development inspections book through "MyInspect"
C13-WP12	INSPECTIONS, Notice Verge, plants and shrubs	W	Staking of trees and shrubs.	3 days before completion of works	-
C13-WP13	INSPECTIONS, Notice Verge, plants and shrubs	W	Replanted plants, shrubs and trees.	3 days before completion of works	-
C13-WP14	INSPECTIONS, Notice Pavement markings and street furniture	W	Reinstated pavement markings and street furniture.	3 days before completion of works	-
C13-WP15	INSPECTIONS, Notice Clean up	W	Restored work after cleaning.	3 days before completion of works	-
	*H = Hold Point, W = Witness Point **Hold Point release by the Superintendent, this may involve approval from the CRO to be coordinated by the Superintendent.				

4.3 Annexure – Minimum testing frequencies

Activity	Key quality verification requirements	Minimum test frequency	Test method
Trench backfill under carriageways and footpaths, materials supply	Material properties as documented.	1/contract or source of supply for each type of material used or suppliers test certificates. Minimum 1/500 m^3.	As documented.
Trench backfill under carriageways and footpaths, placement	Compaction	1/2 layers/100 linear metres of trench or per 20 road openings for openings of less than 10 m^2 plan area whichever results in the most frequent testing.	• AS 1289.5.1.1 for MSDD • AS 1289.5.2.1for MMDD • AS 1289.5.6.1 for non-cohesive materials
	Moisture content during compaction	1/2 layers/100 linear metres of trench or 20 road openings of less than 10 m^2 plan area	AS 1289.5.7.1
Subbase and base materials supply	Material properties as documented.	Suppliers' test certificates.	As documented.
Subbase and base placement	Compaction	1/pavement layer/100 linear metres of trench or 20 road openings for openings of less than 10 m^2 plan area, whichever results in the most frequent testing.	AS 1289.5.1.1 AS 1289.5.2.1
Temporary carriageways, footpaths or driveways – bituminous cold mix	Grading	1 per contract (sampling by production lot)	AS C08.11.1
	Binder	1 per contract (sampling by production lot)	AS/NZS 2891.3.1
Wearing surface materials	Material properties as documented.	Suppliers' test certificates.	As documented.
Wearing surface placement	Testing as documented.	Check evenness of restored surface in accordance with FINAL CARRIAGEWAY RESTORATION.	As documented.

4.4 Annexure - Referenced documents

The following documents are incorporated into this worksection by reference:

AS C08		Methods for sampling and testing aggregates
AS C08.11.1	2009	Particle size distribution - Sieving method
AS 1289		Methods of testing soils for engineering purposes
AS 1289.5.1.1	2017	Soil compaction and density tests- Determination of dry density/moisture content relation of a soil using standard compactive effort
AS 1289.5.2.1	2017	Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using modified compactive effort
AS 1289.5.6.1	1998	Soil compaction and density tests - Compaction control test - Density index method for a cohesionless material
AS 1289.5.7.1	2006	Soil compaction and density tests- Compaction control test - Hilf density ratio and Hilf moisture variation (rapid method)
AS 1289.6.1.2	1998	Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil - Standard laboratory method for an undisturbed specimen
AS 1742		Manual of uniform traffic control devices
AS 1742.3	2009	Traffic control for works on roads
AS/NZS 2891		Methods of sampling and testing asphalt
AS/NZS 2891.1.1	2013	Sampling - Loose asphalt
AS 2891.1.2	2008	Sampling - Coring method
AS/NZS 2891.3.1	2013	Bitumen content and aggregate grading - Reflux method
AS 4000	1997	General conditions of contract
AS 5488	2013	Classification of Subsurface Utility Information (SUI)
Austroads AP-C087	2015	Austroads glossary of terms. 2015 edition.
Workcover NSW	2007	Work near underground assets. Guide 2007
SOCC Guide	2018	Guide to codes and practices for streets opening
Council's Standard Drawings		