ACT Government

Municipal Infrastructure Technical Specification

06A Concrete Kerbs and Open Drains

Edition 1 Revision 1

July 2025

City and Environment Directorate

Machinery of Government changes: On 1 July 2025, administrative arrangements were made to establish the City and Environment Directorate (CED). As of the date of publication of this document, the transition from Transport and Canberra City Services (TCCS) to CED, including updates to internal organisational structure, are yet to be finalised. References in this document to the organisation TCCS are to mean CED.

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Endorsed by	Dr Jonathon Dragos	Senior Engineering Director, Technical Services Unit, Infrastructure Planning
Approved by	Tim Rampton	Executive Branch Manager, Roads ACT

Document information

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Revision register

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1/0	–	First Release	Ken Marshall	July 2019
1/1	All	Template update and web accessibility	Tim Rampton	July 2025
	All	Cross reference links updated		
	–	Acknowledgement of Country added		
	All	General amendments to align with layout and structure of Municipal Infrastructure Technical Specifications documents, that are non-technical in nature.		
	All	Amended and resolved incorrect references to ACT Standard Drawings		
	1.1.2	Cross references updated		
	1.1.3	Referenced documents, including standards and guidelines, updated		
	1.1.3.2, 1.2.3.1	Minor update to guidance on proprietary products		

	1.1.4	Abbreviations and definitions updated		
	1.1.5	Schedule of Hold points and Witness points updated for improved clarity. Other changes described below.		
	1.2.1.1	Update to concrete material requirements to align with and appropriately reference *MITS 10*. Removal of Hold point for submission of nominated concrete mix design (transferred to *MITS 10*).		
	1.2.4.1	Update to galvanising coating requirements for steel wires for wire mattresses		
	1.2.5.1	Update to galvanising coating requirements for steel wires for gabions		
	1.2.9	Inclusion of new specification requirement for stone faced concrete		
	1.2.12.1	Update to Australian Standard test method for measuring grab strength for geotextile filter fabric		
	1.3.5.5	Update to kerb jointing requirements for kerbs at traffic islands and noses of medians		
	1.3.5.8	Amended reference to Principal's Registered Surveyor		
	1.3.7.1	Inclusion of optional alternative Australian Standard test method for testing of subgrade compaction for wire mattresses and gabions		

Acknowledgement of Country

City and Environment Directorate (CED) acknowledges that Aboriginal people are the Traditional Owners of Australia. We acknowledge and pay respect to the Ngunnawal people as the custodians of the land and waters that we live and thrive on today and recognise any other people or families with connection to the lands of the ACT and region.

CED acknowledges that Canberra's cultural and natural heritage was maintained by the Traditional Custodians for many generations before colonial settlement on Australian soil. Aboriginal people's management of the land preserved the natural balance of local plants and animals. This knowledge of the environment in which we live is critical to the protection and restoration of our land today.

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1.1 General

1.1.1 Responsibilities

1.1.1.1 Objectives

Requirement: Provide all types of open drains, including unlined and lined open drains, kerbs, gutters, kerb laybacks, and rock filled wire mattresses and gabions, as documented.

1.1.2 Cross references

General: The following documents are related to this Specification. The latest version of the documents is to be adopted.

1.1.2.1 ACT Legislation

Work Health and Safety Act (ACT)

1.1.2.2 Technical Specifications

Requirement: The following Technical Specifications must be conformed to:

MITS 00 Preliminaries
MITS 01 Traffic Management
MITS 02 Earthworks
MITS 03 Underground Services
MITS 04 Flexible Pavement Construction
MITS 06 Concrete Kerbs, Open Drains and Paving Works
MITS 09 Landscape
MITS 10 Concrete for General Works

The full list of Technical Specifications can be accessed via the TCCS website.

1.1.2.3 Design Standards

General: The following Design Standards are related to this Specification:

MIS 03 Pavement design
MIS 08 Stormwater
MIS 10 Fences, Guardrails and Barriers

The full list of Design Standards can be accessed via the TCCS website.

1.1.2.4 TCCS Reference Documents

General: The following TCCS Reference Documents are related to this Specification:

Reference Document 4	Landscape Management and Protection Plans
Reference Document 6	Requirements for Design Acceptance Submissions
Reference Document 6A	Requirements for Design Acceptance Submissions for Infill Developments
Reference Document 7	Requirements for Operational Acceptance Submission for Hard Public Infrastructure Works
Reference Document 8	Requirements for Works as Executed Records
Reference Document 9	Requirements for Final Acceptance Submission for Hard Landscape Assets and Civil Works
Reference Document 10	Requirements for Soft Landscape Consolidation and Handover
Reference Document 11	Drafting Requirements for Summary Drawings

The full list of TCCS Reference Documents can be accessed via the TCCS website.

1.1.3 Referenced documents[1]

General: The following documents are incorporated into this Specification by reference.

1.1.3.1 Australian Standards

AS 1141.22	Methods for sampling and testing aggregates: Method 22: Wet/dry strength variation
AS 1289	Methods of testing soils for engineering purposes (Set)
AS 1289.3.1.1	Methods of testing soils for engineering purposes: Method 3.1.1: Soil classification tests – Determination of the liquid limit of a soil – Four point Casagrande method
AS 1289.3.3.1	Methods of testing soils for engineering purposes: Method 3.3.1: Soil classification tests – Calculation of the plasticity index of a soil
AS 1289.3.4.1	Methods of testing soils for engineering purposes: Method 3.4.1: Soil classification tests – Determination of the linear shrinkage of a soil – Standard method
AS 1289.5.4.1	Methods of testing soils for engineering purposes: Method 5.4.1: Soil compaction and density tests – Compaction control test – Dry density ratio, moisture variation and moisture ratio
AS 1289.5.6.1	Methods of testing soils for engineering purposes: Method 5.6.1: Soil compaction and density tests – Compaction control test – Density index method for a cohesionless material
AS 1289.5.7.1	Methods of testing soils for engineering purposes: Method 5.7.1: Soil compaction and density tests – Compaction control test – Hilf density ratio and Hilf moisture variation (rapid method)
AS 2758.4	Aggregates and rock for engineering purposes: Part 4: Aggregate for gabion baskets and wire mattresses
AS 2876	Concrete kerbs and channels (gutters) – Manually or machine placed
AS 3706	Geotextiles – Methods of test (Set)
AS 3706.2	Geotextiles – Methods of test: Method 2: Determination of tensile properties – Wide strip and grab method

[1] Not all the documents are specifically referenced in the body of this Specification. However, they may be relied upon depending on the nature of the Works.

AS 3706.3	Geotextiles – Methods of test: Method 3: Determination of tearing strength – Trapezoidal method
AS 3706.4	Geotextiles – Methods of test: Method 4: Determination of burst strength – California bearing ratio (CBR) – Plunger method
AS 3706.9	Geotextiles – Methods of test: Method 9: Determination of permittivity, permeability and flow rate
AS/NZS 4534	Zinc and zinc/aluminium-alloy coatings on steel wire

1.1.3.2 Other publications

Proprietary products: Email TCCS.RoadStandards@act.gov.au for advice on proprietary products.

Austroads

AGPT	Guide to Pavement Technology (Set)
AGPT04G	Guide to Pavement Technology Part 4G: Geotextiles and Geogrids
AGRD03	Guide to Road Design Part 3: Geometric Design
AP-C87-15	Austroads Glossary of Terms

ASTM International

ASTM A975	Standard Specification for Double-Twisted Hexagonal Mesh Gabions and Revet Mattresses (Metallic-Coated Steel Wire or Metallic-Coated Steel Wire with Poly(Vinyl Chloride) (PVC) Coating)

1.1.4 Interpretation

1.1.4.1 Abbreviations

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

ACT	Australian Capital Territory
EPSDD	Environment, Planning and Sustainable Development Directorate, ACT Government, and its successors (including City and Environment Directorate)
ACTSD	ACT Standard Drawing
AS	Australian Standard
ASTM	ASTM International (formerly American Society for Testing and Materials)
CED	City and Environment Directorate
CRM	Coordinated Reference Mark
KG	Kerb and Gutter
KO	Kerb Only
MIS	Municipal Infrastructure Standard
MITS	Municipal Infrastructure Technical Specification
MK	Mountable Kerb
MKG	Mountable Kerb and Gutter
MLBK	Modified Layback Kerb
MS	Mower Strip
NATA	National Association of Testing Authorities

NZS	New Zealand Standard
OCI	Open Channel Invert
PAP	Principal's Authorised Person
uPVC	Unplasticised Polyvinyl Chloride
TCCS	Transport Canberra and City Services, ACT Government, and its successors (including City and Environment Directorate)

1.1.4.2 Definitions

General: For the purposes of this Specification, the definitions of terms used to define the components of the road reserve are in conformance with *AP-C87-15* and *AGRD03*. The definitions given below also apply:

Authorised Person: The Authorised Person is the person or body responsible for administering the Works Contract and has the same meaning as Contract Administrator, Principal's representative, Principal's Authorised Person (PAP), Superintendent or equivalent. The powers, duties and authorities of the Authorised Person are covered in the Contract.

Contract: The agreement between the Principal and the Contractor.

Contractor: The person bound to execute the work under the Contract.

Kerb and gutter: Includes all forms of concrete gutters, inverts, concrete edging, mountable kerbs and barrier kerbing, as defined in *ACTSD-0101* and *ACTSD-0102*.

Kerb laybacks: Kerb ramps and Vehicle Crossings.

Kerb ramp: A layback section of kerb connecting the road pavement to a path, as defined in *ACTSD-0515 – ACTSD-0516.*

Kerb slot: An at-grade path crossing through a median refuge island or traffic island, as defined in *ACTSD-0517*.

Principal: Principal has the same meaning as Owner, Client and Proprietor and is the party to whom the Contractor is legally bound to construct the Works. The primary obligation of the Principal is to make payments to the Contractor.

Vehicle Crossing: A layback section of kerb connecting the road pavement to a driveway, as defined in *ACTSD-0103, ACTSD-0701* and *ACTSD-0702.*

Works: The scope of works to be executed by the Contractor in accordance with the Contract.

1.1.5 Hold points and Witness points

1.1.5.1 Notice

General: Give written notice to the Authorised Person for Hold points and Witness points in accordance with **Table 6A-1** and **Table 6A-2** respectively.

General concrete works: Refer to *MITS 10 Concrete for General Works* for additional Hold points and Witness points which apply to the construction of kerbs and open drains. All applicable Hold points and Witness points in *MITS 10 Concrete for General Works* must be adopted in addition to the Hold Points and Witness points in **Table 6A-1** and **Table 6A-2**.

Table 6A-1 Hold points

Item	Clause	Requirement	Notice for inspection	Release by
Materials				
HP6A.1	1.2.3.1 – Proprietary products – General	Submit proprietary products and manufacturer's instructions	5 working days before ordering	Authorised Person
HP6A.2	1.2.4.1 – Wire mattresses – General	Compliance certificates for proposed wire mattress	5 working days before ordering	Authorised Person
HP6A.3	1.2.5.1 – Gabions – General	Compliance certificates for proposed gabions	5 working days before ordering	Authorised Person
HP6A.4	1.2.7.1 – Rock fill material – General	NATA compliance certificates and rock fill sample for proposed rock fill material	5 working days before ordering	Authorised Person
HP6A.5	1.2.8.1 – Stone pitching material – General	NATA compliance certificates and stone sample for proposed rock fill material	5 working days before ordering	Authorised Person
HP6A.6	1.2.12.1 – Geotextile – Properties	NATA compliance certificates, sample and manufacturer's instructions	5 working days before ordering	Authorised Person
Execution				
HP6A.7	1.3.4.3 – Lining – Concrete lining	Approval for extent of lining, subsurface drainage, jointing and bedding requirements, as marked out onsite	2 working days before concreting	Authorised Person
HP6A.8	1.3.4.4 – Lining – Stone pitching	Approval for extent of stone pitching, subsurface drainage and bedding requirements, as marked out onsite	2 working days before commencing stone pitching	Authorised Person
HP6A.9	1.3.5.1 – Kerb laybacks, kerb and gutter – Foundation	Approval for shape and compaction of foundation material	1 working day before forming	Authorised Person

Table 6A-2 Witness points

Item	Clause	Requirement	Notice for inspection
Execution			
WP6A.1	1.3.3.1 – Open drains – Excavation	Unsuitable material removal and disposal to *MITS 02B Bulk Earthworks*	Progressive
WP6A.2	1.3.3.1 – Open drains – Excavation	Spoil site locations to *MITS 02B Bulk Earthworks*	Prior to placement
WP6A.3	1.3.3.3 – Open drains – Construction	Grade and compaction of open drains	Progressive
WP6A.4	1.3.3.4 – Open drains – Types	Construct channels preserving the existing stream bed outside the limits of excavation	Progressive
WP6A.5	1.3.4.1 – Lining – General	Proprietary matting installed to manufacturer's recommendations	Progressive
WP6A.6	1.3.4.4 – Lining – Stone pitching	Stone placement as set out on site	1 working day before concreting
WP6A.7	1.3.6.1 – Backfilling and reinstatement – Backfill behind kerbs	Backfilling timing, material and compaction	1 working day prior to backfilling
WP6A.8	1.3.6.2 – Backfilling and reinstatement – Pavement backfill	Backfill adjacent new gutter material and location	3 working days prior to works
WP6A.9	1.3.7.4 – Rock filled wire mattresses and gabions – Erection	Inspection of rockfill material and filling method	Progressive

1.2 Materials

1.2.1 Concrete

1.2.1.1 General

Standard: To *AS 2876*

Specification: All concrete works, including concrete mix design, supply, delivery, reinforcement, formwork, placing, compaction, finishing, curing, protection and testing, to conform to *MITS 10 Concrete for General Works* and the requirements of this Specification. All applicable Hold points and Witness points in *MITS 10 Concrete for General Works* must be adopted in addition to the applicable Hold points and Witness points in this Specification.

Concrete properties: Basic concrete parameters and performance requirements to conform to *MITS 10 Concrete for General Works*, *Annexure A*.

Submission of nominated concrete mixes: Conform to *MITS 10 Concrete for General Works*. Refer to *MITS 10 Concrete for General Works*, *Clause 1.1.6.1* for the Hold point which applies to submission of nominated concrete mixes.

1.2.2 Crusher dust

1.2.2.1 General

Crusher dust for kerbs: Unless noted otherwise, conform to the following:

(a) Liquid Limit: ≤ 35% to AS 1289.3.1.1.

(b) Plasticity Index: ≤ 12% to AS 1289.3.3.1.

(c) Linear Shrinkage: ≤ 6% to AS 1289.3.4.1.

1.2.3 Proprietary products

1.2.3.1 General

General: Conform to the manufacturer's instructions.

Approval: Email TCCS.RoadStandards@act.gov.au for advice on proprietary products.

Submit: For approval the type of product proposed.

This is a **HOLD POINT (HP6A.1)**.

1.2.4 Wire mattresses

1.2.4.1 General

Standard: To *ASTM A975.*

Submit: For approval the type of mattress proposed.

This is a **HOLD POINT (HP6A.2)**.

Dimension: Unless otherwise shown on the drawings, 6 m x 2 m x 230 mm. Cut to suit areas if required.

Diaphragms: Divide mattress into cells not exceeding 1 m centres.

Forming diaphragms: Folding the base layer of a mattress, provided that the bottom of each of the diaphragm halves is securely tied together so that the transmission of tensile forces in the mesh of the base layer is not impeded.

Mattress material: Flexible woven heavily galvanised wire to *ASTM A975.*

Mesh size: 60 mm x 80 mm.

Galvanising: Coating mass for round wire W10Z5A (Class W10) to *AS/NZS 4534*.

Body wire: 2.0 mm minimum core diameter for mattresses less than 350 mm thick. For mattresses between 350 mm and 550 mm, the minimum core diameter of mesh must be 2.4 mm.

PVC wire coating: 0.4 mm required as shown on the drawings.

Selvedge wire: 2.4 mm minimum core diameter selvedge wire for mattresses less than 350 mm thick. For mattresses between 350 mm and 550 mm, the minimum galvanised selvedge wire diameter must be 3.0 mm.

Selvedge properties: Make sure the mesh does not unravel and that the strength of the connection between the selvedge wire and the mesh is greater than or equal to the breaking strength of the mesh.

Lacing wire: 2.2 mm minimum core diameter.

1.2.5 Gabions

1.2.5.1 General

Standard: To *ASTM A975.*

Submit: For approval the type of gabions proposed.

This is a **HOLD POINT (HP6A.3)**.

Dimension: As shown on the drawings.

Diaphragms: Divide gabion into cells not greater than the width of the gabion plus 100 mm.

Material: Flexible woven heavily galvanised wire to *ASTM A975.*

Mesh size: 80 mm x 100 mm nominal.

Galvanising: Coating mass for round wire W10Z5A (Class W10) to *AS/NZS 4534.*

Body wire: 2.7 mm minimum core diameter.

PVC wire coating: 0.4 mm required as shown on the drawings.

Selvedge wire: 3.4 mm minimum core diameter.

Selvedge properties: Make sure the mesh does not unravel and that the strength of the connection between the selvedge wire and the mesh is greater than or equal to the breaking strength of the mesh.

Lacing wire: 2.2 mm minimum core diameter.

Rigid weld mesh gabions: Acceptable alternative to double twist mesh gabions, subject to the requirements of the design and this Specification.

1.2.6 Lacing and connecting wire

1.2.6.1 General

Standard: To *ASTM A975.*

Minimum diameter: 2.2 mm.

Alternative fasteners: 'C' clips conforming to *ASTM A975* may be used if approved by the Authorised Person.

1.2.7 Rock fill material

1.2.7.1 General

Standard: To *AS 2758.4.*

Rock quality: Clean, dense, durable, hard rock. No rock shall be from a source known to have acid leaching or staining problems associated with the breakdown of iron pyrites (FeS_2).

Wet strength: > 100 kN to *AS 1141.22.*

Wet/dry strength variation: < 35% to *AS 1141.22.*

Submit: For approval rock material sample and NATA (National Association of Testing Authorities) certificates of compliance of the proposed rock fill material.

This is a **HOLD POINT (HP6A.4)**.

Particle sizes for wire mattresses: Between 75 mm and two-thirds of the mattress thickness, or 250 mm, whichever is the lesser.

Particle size for gabions: Between 100 mm and 250 mm and preferably not greater than 200 mm.

1.2.8 Stone pitching

1.2.8.1 General

Material: Sound durable rock not less than 100 mm thick. Stone for pitching shall be spalls or boulders with a minimum face dimension of 200 mm and at least one face dimension of 300 mm. The minimum thickness of any stone measured normal to the pitched surface shall be the nominal thickness of the pitching. No rock shall be from a source known to have acid leaching or staining problems associated with the breakdown of iron pyrites (FeS_2).

Point load strength: > 1 MPa to *AS 1141.22.*

Wet strength: > 100 kN to *AS 1141.22.*

Wet/dry strength variation: < 45% to *AS 1141.22.*

Submit: For approval rock material sample and NATA certificates of compliance of the proposed stone pitching material.

This is a **HOLD POINT (HP6A.5)**.

1.2.9 Stone faced concrete

Specifications: To the specifications documented in the design documentation.

1.2.10 Weepholes

1.2.10.1 General

Material: DN50 uPVC (Unplasticised Polyvinyl Chloride) pipe.

Drainage plug: For each weephole, provide a drainage plug comprising 2 kg of 7 mm drainage aggregate wrapped in geotextile, embedded into the bedding material prior to placement of either the concrete blinding layer or stones.

1.2.11 Riprap

1.2.11.1 General

Nominal size: Sound durable rock in the nominal size range of 100 mm to 300 mm. Up to 10% may be in the nominal size range of 75 mm to 100 mm.

Shape: Rocks shall have regular surfaces with angular edges. The percentage of rock with smooth and curved faces shall not exceed 20%.

1.2.12 Geotextile

1.2.12.1 Properties

Type: As shown on the drawings.

Minimum material properties: Filter fabric shall be a non-woven type with the following properties:

(a) Elongation: ≥ 30% to *AS 3706.4*.

(b) Grab strength: > 900 N to *AS 3706.2, Method B*.

(c) Tear strength: > 350 N to *AS 3706.3*.

(d) Filtration: Flow rate ≥ 50 litres/m^2/second and permittivity ≥ 0.5/second to *AS 3706.9.*

Submit: For approval the proposed geotextile material and NATA certificates of compliance. Submit a sample of the fabric, the manufacturer information and installation instructions.

This is a **HOLD POINT (HP6A.6)**.

Classification: Properties, functions, design and construction requirements to *AGPT04G.*

Specification: Material type and minimum mass requirements as shown on the drawings.

Quality: Free of any flaws, stabilised against UV radiation, rot proof, chemically stable and low water absorbency. Filaments must resist delamination and maintain their relative dimensional stability.

Robustness and strength: Conform to the following:

(e) Classifications for robustness and strength cited in *AGPT04G*.

(f) Select material based on tests and subgrade conditions for the relevant location/function.

1.2.12.2 Storage

Storage: Under protective cover or wrapped with a waterproof, opaque UV protective sheeting to avoid any damage prior to installation. Store to conform to manufacturer's recommendations.

Damage: Must not be stored directly on the ground or in any manner where the material can be adversely affected by heat, dirt or damage.

Label: Make sure the geotextile material is clearly labelled showing manufacturer, type and batch number.

1.3 Execution

1.3.1 Provision for traffic

1.3.1.1 General

Requirement: Conform to *MITS 01 Traffic Management*.

1.3.2 Site establishment

1.3.2.1 Survey

Requirement: Confirm site surface and benchmarks. Conform to *MITS 00 Preliminaries*.

1.3.3 Open drains

1.3.3.1 Excavation

Clear: To *MITS 02A Clearing and Grubbing*, strip topsoil and any unsuitable material.

Excavate: To the dimensions shown on the drawings, or where not shown, to a minimum depth of 300 mm and a minimum waterway area of 0.2 m^2.

Cross section: V-shaped or trapezoidal unless otherwise shown on drawings.

Batter slope: As shown on the drawings or not steeper than 1V:4H.

Unsuitable material: Notify the Authorised Person of any unsuitable material and seek a direction for removal. Dispose of the unsuitable material as approved or directed. Replace unsuitable material to *MITS 02B Bulk Earthworks*.

This is a **WITNESS POINT (WP6A.1)**.

Surplus material: Use the excavated material in the Works or remove to spoil stockpiles as directed.

This is a **WITNESS POINT (WP6A.2)**.

1.3.3.2 Embankment

Construct: General Fill to *MITS 02B Bulk Earthworks*.

Revegetation: To *MITS 09 Landscape*.

1.3.3.3 Construction

Trimming: To a uniform surface free of irregularities.

Surfaces to be lined: Compact to 95% standard compaction to *MITS 02B Bulk Earthworks* unless noted otherwise.

Open drains: Grade to ensure the free flow of water and minimum grade of 0.5%.

This is a **WITNESS POINT (WP6A.3)**.

1.3.3.4 Types

Cut-off drains, minor diversion and contour drains: Construct before the adjacent roadway.

Location of cut-off drains: Unless noted otherwise, provide > 2 m above the tops of cuttings or > 2 m along the toes of embankments.

Table drains, swales and depressed medians: Construct as part of earthworks.

Channels: Excavate inlet, outlet and diversion channels as shown on the drawings and, unless noted otherwise, extend to join the existing stream bed, avoiding disturbance in stream flow. Preserve the existing stream bed outside the limits of the excavation.

This is a **WITNESS POINT (WP6A.4)**.

1.3.4 Lining

1.3.4.1 General

Timing: Within 7 days of shaping and compacting the foundation.

Proprietary items: Install approved proprietary matting to conform to the manufacturer's instructions.

This is a **WITNESS POINT (WP6A.5)**.

1.3.4.2 Organic fibre mat and vegetation

Conform to: *MITS 09 Landscape*.

1.3.4.3 Concrete lining

Concrete: Minimum compacted thickness 100 mm measured at right angles to the surface of the lining.

Method: Cast in situ or sprayed concrete to conform to *MITS 10 Concrete for General Works*.

Weepholes: Provide weepholes in locations shown on the drawings, at 2 m spacing in non-horizontal elements and as directed.

This is a **HOLD POINT (HP6A.7)**.

Top of finished lining: True to line and of uniform width, free from humps, sags or other irregularities.

Tolerances: Conform to the following limits:

(a) Finished levels of lining surface: Within ±10 mm of design levels.

(b) Surface deviation: Not more than 5 mm from a 3 m straightedge parallel to the direction of flow, except at kerb laybacks, grade changes or curves, or at grated sumps requiring channel depression.

Contraction joints: Conform to the following:

(c) Width: 5 mm minimum and 15 mm maximum.

(d) Depth: 20 mm minimum.

(e) Intervals: Every 3 m of lining.

Expansion joints: Conform to the following:

(f) Width: Nominal 15 mm.

(g) Depth: Full thickness of the concrete lining.

(h) Intervals: 15 m maximum.

(i) Material: Approved preformed jointing material.

1.3.4.4 Stone pitching

General: Where shown on the drawings, construct stone faces properly bedded on approved loam or sand, and mortared to present a uniform surface.

Preparation: Trimmed surface of excavated open drains to a depth of 150 mm before stone pitching.

Subsurface drainage: Provide continuous subsoil drains to *MITS 03I Subsurface Drainage*. Connect subsoil drains to weepholes. Provide weepholes in locations shown on the drawings, at 2 m centres in non-horizontal elements and as directed. Stagger rows of weepholes. The lowest row of weepholes shall finish at the toe of stone pitching.

This is a **HOLD POINT (HP6A.8)**.

Bedding: For stone pitching on slopes of 1 to 1 or greater, stones shall be embedded into a minimum 50 mm thick concrete blinding layer of characteristic compressive strength of 20 MPa at 28 days. Stones on slopes less than 1 to 1.5, shall be firmly bedded and based on compacted earth. The stones shall be based at a depth of 75 mm below the adjacent designed finished surface, at the foot of the pitching.

The exposed surface of each stone: Approximately flat and not less than 0.05 m^2 in area.

Spaces between adjacent stones or blocks: 20 mm maximum width, stones shall be random coursed.

This is a **WITNESS POINT (WP6A.6)**.

Mortar: Voids between stones or blocks and bedding, and between adjacent stones or blocks, must be filled with mortar to *MITS 10 Concrete for General Works*. At the surfaces, mortar must be raked to a depth of 12 mm in the joints between adjacent stones or blocks.

Tolerances: Construct within 50 mm of the design level at any point provided that there is a continuous downgrade in the direction of flow at not less than 0.5% at any point.

Trench crossings: Where the stone pitching is constructed over service trenches, confirm clearance from utility authority prior to construction.

Finish: The finished pitching shall have a neat, clean surface free from mortar droppings. The top of the pitching shall be finished to an even grade or vertical curve, and variations along the back edge being filled in with mortar, so as to produce a surface suitable for use as a mowing strip.

1.3.4.5 Riprap

Preparation: Trim subgrade to remove sharp level changes and drops.

Geotextile: Place geotextile on the trimmed subgrade immediately prior to rock placement, where shown on the drawings.

Rock placement: Place rock, by hand if necessary, so that the rock mass is well interlocked and there are no loose rocks. Rocks shall be placed to achieve maximum density by packing as closely as possible.

Rock subgrade: Notify the Authorised Person of rock subgrades below riprap. The Authorised Person may direct the riprap to be omitted.

1.3.4.6 Batter drains

Material: Half round precast nestable concrete units (‘Half pipe’) as shown on the drawings.

Install: The units in a carefully excavated and template-controlled trench to form an even top edge +0 mm to −50 mm from the batter line at the underside of topsoil.

Backfill and compact: Backfill over-excavation and undulations in the batter line. Compact both sides of the drain over the full length to form a firm shoulder against the top edge of the batter drain.

Taper topsoil: Over a width of 1 m to zero thickness at the rim of the drain.

Turf: Both sides of the drain for a minimum width of 600 mm to conform to *MITS 09 Landscape*.

1.3.5 Kerb laybacks, kerb and gutter

1.3.5.1 Foundation

Material: Subbase material for kerbs shall be consistent with the adjacent pavement design where the road pavement continues under the kerb. In other locations, unless noted otherwise, crusher dust shall be used in accordance with the requirements of this Specification.

Shape and compaction: Before placing any kerbs, shape and compact the foundation material. Unless otherwise detailed, the subbase under kerbs shall be of 75 mm compacted thickness. Refer to *ACTSD-0101 – ACTSD-0103 and ACTSD-0515 – ACTSD-0516.*

Relative compaction: Minimum 100% standard compaction except where placed on pavement courses, then to the subbase requirements of the respective pavement course. Refer to *MITS 04 Flexible Pavement Construction*.

This is a **HOLD POINT (HP6A.9)**.

1.3.5.2 Construction

Construct: Kerb and/or gutters in fixed forms, by extrusion or by slip forming to *AS 2876.*

1.3.5.3 Finish

Finish true to line: The top and face of the finished kerb and gutter, or kerb layback.

Top surface: Uniform width, free from humps, sags and other irregularities.

Type: Steel float finish or as otherwise shown on drawings.

1.3.5.4 Tolerances

Finished levels of gutter surface: Within ±10 mm of design levels.

Surface deviation of kerb face and gutter surface: ±5 mm from the edge of a 3 m straightedge, except at kerb laybacks, grade changes or curves, or at grated sumps requiring gutter depression.

1.3.5.5 Joints

Contraction joints: Unless shown otherwise on the drawings, conform to the following:

(a) Width: 5 mm minimum and 15 mm maximum.

(b) Interval and depth: Every 3 m of gutter length for a minimum of 50% of cross sectional area of concrete.

(c) Tooling: 20 mm in depth to form a neat groove of 5 mm minimum width.

Expansion joints: Provide where the gutter abuts against pits, retaining walls and other structures. Expansion joints are also to be provided at tangent points before and after curves, and at both sides of kerb laybacks for vehicular or pedestrian access, except at traffic islands and at the noses of medians. Unless shown otherwise on the drawings, conform to the following:

(d) Width: Nominal 15 mm.

(e) Depth: Full depth of kerb and gutter.

(f) Maximum intervals: 15 m.

Weakened plane: Provide shrinkage control joints by making a cut 3 mm wide for at least one quarter of the depth of the kerb. Arises shall be tooled to a suitable radius. Spacing shall not exceed 3 m. For traffic islands and median noses, weakened plane joints are also to be located at all tangent points for corner segments of kerb.

Joints adjacent to concrete pavement: If kerbs and/or gutters are cast adjacent to a concrete pavement, continue the transverse contraction, construction and expansion joints documented for the concrete base across the kerb and/or gutter.

Mower strips and edging:

(g) Weakened plane joints shall be 3 mm wide, cut vertically through the concrete at right angles to the direction of work. Arises shall be tooled to a suitable radius. Spacing shall not exceed 3 m.

(h) Expansion joints: Provide adjacent to structures or paving, at changes in cross section, and at tangent points before and after curves. Spacing shall not exceed 15 m.

Machine extruded kerb: Joints shall be formed in a manner which does not cause damage to the adjacent concrete during cutting.

Rigid pavements: Where kerbing is laid as part of, or adjacent to, rigid pavements, joints of the same type shall align between kerb and pavement.

1.3.5.6 Stormwater outlets

General: Reconnect and extend all existing kerb stormwater outlets through the kerb to match the existing type and size of pipe, to *ACTSD-0804.*

Pipes: Conform to *MITS 03 Underground Services*.

1.3.5.7 Kerb laybacks

Vehicle Crossings: Meet the laybacks as shown on the drawings, *ACTSD-0103 and ACTSD-0701 – ACTSD-0702,* or reinstate to match existing materials. Construct Vehicle Crossings as detailed at the time of constructing kerbs.

Kerb ramps: Meet the laybacks as shown on the drawings, *ACTSD-0515 – ACTSD-0516* or reinstate to match existing materials. Construct whole kerb ramp as detailed at the time of constructing kerbs.

1.3.5.8 Kerb marking

Coordinated Reference Marks (CRMs): CRM castings shall be placed in the kerb prior to the initial set. Drawings provided by the Authorised Person will show the locations of the CRMs as approved by the Surveyor-General. The castings shall be placed at least 1 m from kerb expansion joints with the inscription facing the paved road and the nipple top 5 mm below the top of the kerb, as shown in the EPSDD standard drawings *MISC 825, Sheets 2 and 3*. The castings shall be obtained by the Contractor from the Principal's Registered Surveyor.

Service marks: Where service conduits pass under kerb lines, provide cast in place signage prior to the initial set of the concrete, or indicator plates attached with epoxy and drive pins, in accordance with the service authority requirements.

1.3.5.9 Tolerances

General: Finished concrete shall be within 10 mm of the specified alignment and level at all locations. There shall be no areas where water will pool.

1.3.6 Backfilling and reinstatement

1.3.6.1 Backfill behind kerbs

Timing: Not earlier than 3 days after concreting, backfill and reinstate the spaces on both sides of the kerb and/or gutter to conform to the drawings, or as directed.

Backfill: General Fill compacted to *MITS 02B Bulk Earthworks*, unless noted otherwise.

Topsoil: Minimum 75 mm thickness to *MITS 09 Landscape*.

Surface treatment: Free draining, and free from undulations and trip hazards, finish flush with the back of kerb.

This is a **WITNESS POINT (WP6A.7)**.

1.3.6.2 Pavement backfill

Backfill: Unless noted otherwise, where existing road pavement has been disturbed, the pavement shall be trimmed back to a straight undisturbed edge between 150 mm and 300 mm from and parallel to the new kerb or gutter for the full depth of kerb section. Backfill with asphaltic concrete rammed solid using suitable tampers.

This is a **WITNESS POINT (WP6A.8)**.

1.3.6.3 Grated sumps

Reconstruct: The top of grated sumps or adjust precast units to suit new kerb and gutter profile.

Adjustment: Demolish and reconstruct sumps to *MITS 03D Drainage Structures*.

1.3.7 Rock filled wire mattresses and gabions

1.3.7.1 Foundations

Finished level of excavation: Prior to installation of rock filled wire mattresses or gabions, trim so the mattresses finish flush with the surrounding ground.

Shape and compaction: Not less than 95% for standard compactive effort to *AS 1289.5.4.1* or *AS 1289.5.7.1* to form a uniform channel cross section prior to installation of mattresses.

1.3.7.2 Geotextile

General: Before laying out the wire mattresses or gabions, place geotextile between the wire cage and the material being protected as shown on the drawings.

Jointing: Minimum overlap shall be 500 mm. Sewing or other methods of jointing are not permitted.

1.3.7.3 Assembly

Prior to assembly: Open the wire mesh out flat on the ground and stretch it to remove all kinks and bends.

Gabion boxes: Individually assemble by raising the sides, ends and diaphragms; make sure all creases are in the correct position and that all four sides and the diaphragms are even.

Lace: The four corners first and then the edges of internal diaphragms to the sides.

Lacing and twisting: Commence the lacing by twisting the end of the lacing wire around the selvedge(s), then pass it around the two edges being joined using alternate single and double loops through each mesh in turn and tie it off securely at the bottom.

Ends: Turn the ends of all lacing wires to the inside of the box on completion of each lacing operation.

1.3.7.4 Erection

Conform to the following:

(a) Only assembled boxes or groups of boxes must be positioned in the structure.

(b) Secure the end to either the completed work or by galvanised star pickets driven into the ground at 1 m spacing.

(c) Firmly embed the star pickets into the ground by a minimum of 900 mm.

(d) Star pickets to be at least the height of the box.

(e) Place boxes in the structure, lacing securely the proceeding one along all common corners and diaphragms.

Stretching for gabion boxes: Using a pull lift of at least 1 tonne capacity, firmly secured to the free end of the assembled gabion boxes. Whilst under tension, securely lace the gabion boxes along all edges and at diaphragm points to all adjacent boxes.

This is a **WITNESS POINT (WP6A.9)**.

Mattresses: Adjust the position of the diaphragms so that the sides hinge up on the thicker wire woven in the mesh.

1.3.7.5 Filling

Gabion boxes: Conform to the following:

(a) Fill whilst the gabion boxes are under tension.

(b) Place the rocks at the front face and other exposed faces by hand to produce a neat face free of excessive bulges, depressions and voids.

(c) Internal bracing wires: 4 per m^3 at 330 mm centres to prevent distortion.

(d) Face bracing wires: 4 per m^2 of face.

(e) Mechanical filling equipment may be used with caution to protect any PVC or galvanised coatings from abrasion.

(f) Release the tension on the gabion boxes only when fully laced so as to prevent any slackening.

Mattresses: Conform to the following:

(g) Mechanical filling equipment may be used with caution to protect any PVC or galvanised coatings from abrasion and to maintain the shape of the gabion boxes.

(h) Redistribute the filling materials by hand to make sure that all diaphragm compartments are fully filled to produce a neat and level top surface.

(i) Overfill by 25 mm to 50 mm to allow for subsequent settlement.

1.3.7.6 Final lacing

Close and lace lids: As soon as practicable after filling particularly if there is a storm or flood expected. Stretch lids tightly over the filling and lace down securely.

1.4 Completion

1.4.1 Submissions

Works as Executed Records: To *MITS 00B Quality Construction*.

2 Measurement and payment

2.1 Measurement

2.1.1 General

Payments made to the Schedule of Rates: To *MITS 00 Preliminaries*, this Specification, the drawings and **Clause 2.2**.

2.1.2 Methodology

General: The following methodology will be applied for measurement and payment:

(a) Allow for all work, materials, testing and quality assurance requirements in each Pay item.

(b) Temporary erosion and sedimentation control measures: To *MITS 00C Control of Erosion and Sedimentation*.

(c) Sprayed concrete lining of open drains: To *MITS 10 Concrete for General Works*.

(d) Cast in situ concrete or other lining of open drains: Paid under this Specification and not *MITS 10 Concrete for General Works*.

(e) Organic fibre matting: To *MITS 09 Landscape*.

(f) Miscellaneous minor concrete work not included in the Pay items in this Specification: To *MITS 10 Concrete for General Works*.

(g) Topsoiling and turfing to sides of batter drains: To *MITS 09 Landscape*.

(h) Supply and compaction of subbase and preparation of subgrade to this Specification, where the Works are not adjacent to a road pavement (e.g. mowing strips, gabions).

(i) Bulk earthworks for open drains: To *MITS 02B Bulk Earthworks*.

(j) Kerbs:

  (i) Supply and compaction of subbase to *MITS 04 Flexible Pavements* and preparation of subgrade to *MITS 02 Earthworks*, where the road pavement extends under the kerb.

  (ii) Kerb transitions are to be measured as part of the relevant kerb type length with the length of kerb through the transition split equally between the kerb types each side of the transition. No extra over rate is provided for kerb transitions.

Concrete payment rates: The following methodology will be applied for measurement and payment:

(k) Payment: At the scheduled rates provided the concrete meets the strength requirements as documented.

2.2 Pay items

Table 6A-3 Pay items

Item No	Pay items	Unit of measurement	Schedule of rates scope
6A.1	Concrete lining of open drains	m^2 of concrete in place, measured perpendicular to the batter surface	All activities associated with surface preparation, supply and placing of formwork, reinforcement, concrete and weepholes, jointing and curing. A separate Pay item shall be included in the Contract for each lining thickness: 6A.1.1 100 mm 6A.1.2 150 mm 6A.1.3 200 mm
6A.2	Stone pitching of open drains	m^2 of stone pitching in place, measured perpendicular to the batter surface	All activities associated with surface preparation, installation and compaction of foundation and bedding, supply and placing of stone formwork, reinforcement, mortar and weepholes, final trimming and mortar jointing.
6A.3	Batter drains	Linear metre along the length of the drain	All activities associated with supply of the units, surface preparation, installation, jointing, backfilling and compaction.
6A.4	Riprap	m^2 of riprap measured from the top area of the completed work, including the area folded into the trench, measured perpendicular to the batter surface	All activities associated with: • Trimming and compaction of foundations. • Supply and placement of geotextile material, where specified. • Supply and placing of the rock.
6A.5	Kerbs	Linear metre measured along the length of the nominal kerb line, including Vehicle Crossings, sumps, kerb ramps and other kerb laybacks	All activities associated with: • Surface preparation, forming, concreting and curing. • Compaction of foundations, and supply and compaction of subbase not associated with road pavements. • Transition between kerb types. • Expansion and contraction joints. • Backfilling and compaction adjacent to the completed kerb. • Supply and installation of kerb markings. A separate Pay item shall be included for each type of kerb: 6A.5.1 KG 6A.5.2 KO 6A.5.3 MK 6A.5.4 MKG 6A.5.5 MLBK 6A.5.6 OCI

Item No	Pay items	Unit of measurement	Schedule of rates scope
6A.6	Kerb reinforcement	Linear metre measured along the length of the nominal kerb line, including Vehicle Crossings, sumps, kerb ramps and other kerb laybacks	All activities extra over kerbs associated with supply and placement of reinforcing steel, where specified in the drawings, for each type of kerb: 6A.6.1 KG 6A.6.2 KO 6A.6.3 MK 6A.6.4 MKG 6A.6.5 MLBK 6A.6.6 OCI
6A.7	Kerb ramps	Number	All activities extra over kerbs associated with construction of kerb ramps, including: • Surface preparation, forming, concreting, finishing and curing. • Compaction of foundations, and supply and compaction of subbase not associated with road pavements. • Transition between kerb types. • Expansion and contraction joints. • Backfilling and compaction adjacent to the completed kerb ramp. A separate Pay item shall be included for each path width: 6A.7.1 1.5 m path 6A.7.2 2.0 m path 6A.7.3 2.5 m path 6A.7.4 3.0 m path
6A.8	Vehicle Crossings	Number	All activities extra over kerbs associated with construction of Vehicle Crossings, including: • Surface preparation, forming, concreting, finishing and curing. • Reinforcement where specified. • Compaction of foundations, and supply and compaction of subbase not associated with road pavements. • Transition between kerb types. • Expansion and contraction joints. • Backfilling and compaction adjacent to the completed Vehicle Crossing. A separate Pay item shall be included for each width (measured at the back of kerb) and type. For example: 6A.8.1 5 m unreinforced 6A.8.2 10 m unreinforced 6A.8.3 7.5 m reinforced 6A.8.4 11 m reinforced etc.

Item No	Pay items	Unit of measurement	Schedule of rates scope
6A.9	Remove existing concrete kerb	Linear metre measured along the length of the nominal kerb line	All activities associated with the saw cutting of the kerbing irrespective of depth, removal of kerb (including reinforcement), underlying pavement courses, Vehicle Crossings and kerb ramps, legal disposal of waste materials offsite and all disposal fees.
6A.10	Rock filled gabions	m^3 of rock filling measured in situ	All activities associated with: • Trimming and compaction of foundations. • Supply and placement of geotextile material. • Supply and assembly of the gabions • Supply and placing of the rock fill in the gabions. • Final lacing and finishing.
6A.11	Rock filled wire mattresses	m^2 of rock filled mattress measured from the top area of the mattress, including the area folded into the trench, measured perpendicular to the batter surface	All activities associated with: • Trimming and compaction of foundations. • Supply and placement of geotextile material, star pickets and ties. • Supply and assembly of the wire mattresses. • Supply and placing of the rock fill. • Final lacing and finishing. A separate Pay item shall be included in the Contract for each mattress thickness: 6A.11.1 170 mm 6A.11.2 230 mm 6A.11.3 300 mm 6A.11.4 500 mm 6A.11.5 1,000 mm