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6 CONCRETE KERBS, FOOTPATHS AND MINOR WORKS**6.01 SCOPE**

The works covered by this Section of the Specification comprise the construction of concrete kerbs and kerb and gutter of various cross sections, mower strips and edging, vehicle crossings, pram crossings, dish gutters, concrete footpaths, driveways and other minor concrete paving.

6.02 STANDARDS

Work carried out and testing performed under this Section of the Specification shall comply with the requirements of the following Standards to the extent that they are relevant and not overridden by the Specification.

AS 1012	Methods of Testing Concrete
AS 1141	Methods for Sampling and Testing Aggregates
AS 1289	Methods of Testing Soils for Engineering Purposes
AS 1379	Specification and Supply of Concrete
AS 2876	Concrete Kerbs and Channels (Gutters) - Manually or Machine Placed

Other relevant Standards are listed in the Section 15 of this Specification .

A Testing Authority shall be employed by the Contractor to carry out all testing. The Authority shall hold a current NATA (National Association of Testing Authorities) Registration for the relevant tests, and a copy of results shall be forwarded to the Superintendent without delay.

6.03 MATERIALS**6.03.1 Concrete**

Concrete and reinforcement shall comply with the requirements of Section 15 of this Specification.

Unless noted otherwise in the Contract, concrete shall meet the following requirements:

- (i) **Slip formed kerb sections:**
- Minimum characteristic strength 20MPa
 - Minimum effective cement content 280kg per cubic metre.
- (ii) **Paving and formed concrete:**
- Minimum characteristic strength 20MPa
 - Minimum effective cement content 280kg per cubic metre
 - Minimum air content 4.5%
 - Maximum slump 80min

6.03.2 Reinforcement

Where steel reinforcement is specified or shown on the drawings, it shall comply with AS 1302, AS 1304 or AS 1311 as appropriate and Section 15 of this Specification.

6.03.3 Joint Sealer

Joint sealers, where specified, shall be manufactured from bitumen impregnated canite or other approved material complying with the requirements of Clause 5.03.5(iii).

The top surfaces of bitumen impregnated canite or other approved material sealers shall be taped.

6.03.4 Curing Compound

Membrane forming curing compound shall be chlorinated rubber, wax emulsion type or acrylic resin white pigmented type complying with the requirements of Section 15 of this Specification. Wax emulsion curing compound shall not be used on areas subject to pedestrian traffic.

6.04 EARTHWORKS

Carry out earthworks and preparation of surfaces as specified in Section 2 of this Specification. Subgrades shall be compacted to 90% of modified maximum dry density as determined by Test Method AS 1289.5.4.1 for a minimum depth of 150mm. Where levels are not specified, trim surfaces to conform to the grades and cross sections specified in Clause 6.05.

Unless otherwise permitted, excavated material shall not be deposited on existing grassed areas.

6.05 GRADING OF FOOTPATHS

Unless otherwise detailed, footpaths shall be constructed to a 2% crossfall. In road reserves crossfall shall be towards the road.

Footpath shall finish flush with all abutting surfaces.

Longitudinal grades normally shall be in the range 0.5% to 10%. Longitudinal grades differing by more than 2% shall be connected by smooth vertical curves. Construct minimum earthworks to meet this requirement.

Batters in cut or fill generally shall be 1:6 where cut or fill does not exceed 300mm in depth.

6.06 SUBBASE

Unless otherwise specified or permitted, subbase material for kerbs and concrete paving shall be crusher dust or subbase material complying with the requirements of Clause 4.03.2. Crusher dust used as subbase shall have the following properties: -

- Liquid limit shall not exceed 35%
- Plasticity index shall not exceed 12%
- Linear shrinkage shall not exceed 6%

Subbase materials shall be placed as specified for subbase. Subbase to kerbs and all other concrete paving shall be compacted to 95% of modified maximum dry density as determined by Test Method AS 1289.5.4.1. Unless otherwise detailed, the subbase under kerbs and concrete paving shall be of 75mm compacted thickness.

6.07 FORMWORK

Kerb sections shall be formed by means of suitable slip forming equipment or, alternatively, by fixed formwork. The edges of paving, mowing strips and the like shall be formed by fixed formwork.

6.08 FINISHING

After placing and compaction, concrete shall be finished monolithically to a smooth, even surface by means of steel floats or other suitable equipment.

On completion of steel floating and before initial set, the surfaces of concrete paths, driveways and minor paving shall be brushed to a "non-skid" texture. This shall be achieved by drawing a moistened nylon broom lightly across the surface at right angles to the direction of the path or paving.

6.09 JOINTS**6.09.1 Kerbing**

Weakened plane (shrinkage control) joints shall be 1-3mm wide, clean cut and made vertically through the concrete at right-angles to the direction of the work. Normally they shall be spaced at 3m intervals with minor adjustments to avoid short closing lengths.

Where kerbing is laid by machine, joints shall be formed in a manner which does not cause damage to the adjoining concrete during cutting and to a depth which will prevent cracking elsewhere. A minimum of 50 percent of the section shall be cut for the full width of the section.

The resultant slot in the section shall be tooled to a depth of not less than 5mm to produce a neat groove with rounded arrises.

Where kerbing is cast against fixed forms, contraction joints shall be formed by means of a 3mm thick steel plate cut to profile which shall be withdrawn before final finishing.

Expansion joints shall be formed adjacent to drainage structures, at changes in cross-section, at tangent points of curves of less than 25m radius and at 12m intervals elsewhere. Expansion joints shall be sealed with 15mm wide joint sealer cut to the full profile of the kerb section. Remove tape from top of sealer at about the time of final set of the concrete. Joint arrises abutting joint sealer shall not be tooled off.

Where kerbing is laid as part of rigid pavement or adjacent to rigid pavement joints of the same type shall coincide with joints in the rigid pavement.

6.09.2 Footpaths, Driveways and Minor Paving

Joints shall be straight, continuous and normal to the surface of the pavement.

Weakened plane (shrinkage control) joints shall be formed by making a cut 3mm wide for at least one quarter of the depth of the paving. Arrises shall be tooled to suitable radius. Unless otherwise specified or detailed, the spacing of weakened plane joints shall approximate the width of the path with minor adjustments to avoid short closing lengths. Spacing shall not normally exceed 2m.

Expansion joints shall be constructed for the full depth of the paving using 15mm wide joint sealer. They shall be provided wherever the paving abuts fixed structures, such as buildings and manholes, transversely at maximum intervals of 15m along path and at path intersections. Joint sealer shall be bonded to the first placed concrete using a suitable contact adhesive. Remove tape from top sealer at about the time of final set of the concrete. Joint arrises abutting cork joint sealer shall not be tooled off.

Construction joints shall be located at weakened plane or expansion joint positions.

Hold Point 6.1

Process Held:	Placement of concrete for footpaths, driveways and paving.
Submission Details:	At least four (4) working hours prior to commencement of concrete paving. the Contractor shall provide notification that the works have been set out suitably on site, subgrade has been compacted as specified with submission of test results where appropriate and when any reinforcing will be ready for inspection.
Release of Hold Point:	The Superintendent will inspect the site and review the submitted details where appropriate, prior to authorising the release of the Hold Point.

6.09.3 Mower Strips and Edging

Weakened plane (shrinkage control) joints shall be 1-3mm wide, clean cut and made vertically through the concrete at right-angles to the direction of the work. The cut shall be formed prior to final finishing and shall be tooled to a depth of not less than 25mm to produce a neat groove with rounded arrises. Joints shall be spaced at 3m intervals with minor adjustments to avoid short closing lengths.

Expansion joints shall be formed adjacent to any structures or paving, at changes in cross-section, at tangent points of curves of less than 25m radius and at a minimum interval of 12m elsewhere. Expansion joints shall be sealed with 15mm wide joint sealer cut to the full profile of the kerb section, Remove tape from top of sealer at about the time of final set of the concrete. Joint arrises abutting joint sealer shall not be tooled off.

6.10 KERB MARKING

6.10.1 Kerb Bench Marks

Kerb bench mark castings shall be placed in the kerb, at locations shown on the drawings, when the concrete is being cast, as close as possible to either a tangent point, common tangent point, bend or prolongation of a block boundary. The marks shall be placed with the inscription facing the paved road and the nipple top level with the top of the kerb. The castings shall be obtained by the Contractor from the local Survey Authority.

6.10.2 Service Marks

Where services conduits pass under kerb lines, their locations shall be marked by casting a letter 100mm high, imprinted 3mm into the concrete surface, on the upper surface of kerb sections. Casting shall be formed by impressing a steel brand into the formed kerb section prior to initial set of the concrete. The letter "E" shall be adopted to mark the location of electricity supply conduits and the letters "G" and "T" for gas conduits and telecommunications respectively.

6.11 CURING AND PROTECTION

Green concrete shall be protected from rain and flowing water.

Concrete shall be cured by protection against loss of moisture and rapid temperature changes for a period of not less than 5 days from the completion of the finishing operations. Curing shall be accomplished by the application of a sprayed membrane forming curing compound to the whole of the concrete surfaces including edges exposed by the removal of formwork. If membrane curing is delayed for any reason, then suitable alternative means shall be employed to prevent drying of the concrete until the membrane can be applied.

The minimum application of the curing membrane shall be 0.5 litres per square metre or in accordance with the manufacturer's specifications.

The compound shall form a uniform, continuous, cohesive film. If discontinuities, pin holes, or abrasions exist, an additional coat shall be applied to the affected areas within 30 minutes. Concrete surfaces which are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed.

Provide protection as necessary to prevent cracking of the concrete due to temperature changes during the curing period. Whenever temperatures below 3°C are forecast, concrete shall be protected from frost for 24 hours after placing by covering with suitable heat insulating material.

As an alternative to membrane curing, the concrete shall be kept continuously wet for five (5) days by covering with wet bags or wet sand or with a waterproof membrane such as polyethylene sheeting held in intimate contact with the surface.

6.12 MAKING GOOD

Reinstate adjacent surfaces after stripping of formwork as prescribed below:

- (a) In plantation areas backfill to 75mm below finished surface as specified in Clause 2.06 for general fill. The top 75mm of backfill shall be topsoil from stockpile. Grade surfaces as specified in Clause 2.08 to remove abrupt changes of slope or level and to finish flush with new concrete.
- (b) Unless otherwise detailed, where existing road pavement has been disturbed, the pavement shall be trimmed back to a straight undisturbed edge between 150 and 300mm 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.

6.13 CONFORMANCE CRITERIA

6.13.1 Materials

All concrete shall be tested as follows:

- (a) Slump in accordance with AS1379 Clause 5.2.
- (b) Compressive strength in accordance with AS 1379 Clause 5.3.
- (c) Air content in accordance with AS1379 Clause 5.4

6.13.2 Tolerances

(i) Subbase

The level of the subbase bedding layer shall not deviate by more than 25mm above the specified level. The surface of the subbase bedding layer shall not deviate by more than 10mm from a 3m straightedge or 10mm in 3m from the true vertical curve on vertical curves.

(ii) Kerbs and Inverts

Finished concrete shall be within 10mm of the specified alignment and level, at all points. The relative deviation of any two points on the surface from their true position shall not exceed 5mm in 3m. Deviation on vertical

curves shall not exceed 5mm in 3m from the true vertical curve. These tolerances are subject to the non-accumulation of water at any point.

(iii) Footpaths and Paving

Footpaths and paving shall be within 25mm of the specified alignment and level at all points. The finished surface shall be free from abrupt irregularities. The relative deviation of any two points on the surface from their true position shall not exceed 3mm or 1 in 270 of the distance between them, whichever is the greater. These tolerances are subject to the non-accumulation of water at any point.

(iv) Mower Strips and Edging

Finished concrete shall be within 25mm of the specified alignment and level at all points. The finished surface shall be free from abrupt irregularities.

6.13.3 Nonconforming Work

A nonconformance report shall be raised if any of the following defects are present in the finished work:

- (a) It is porous, segregated or honeycombed.
- (b) A construction joint, expansion joint or weakened plane joint has been made at a location or in a manner not in accordance with this Specification,
- (c) The concrete kerb, edging or paving contains cracks exceeding 0.5mm in width at locations other than weakened plane or construction joint locations.
- (d) The concrete is subject to spalling, fretting or craze cracking.
- (e) The concrete is otherwise defective.

When the agreed disposition of a nonconformance report is to reject the concrete work, it shall be removed from the Works at no additional cost to the Principal.

6.13.4 Frequency of Testing

The frequency of testing shall be appropriate to verify conformity and shall not be less than that stated in Table 6.1. Where no minimum frequency of inspection or testing is stated, the Contractor shall nominate appropriate frequencies in their Inspection and Test Plan(s).

The Contractor shall include in the management review of the Quality System, a review of the appropriateness of the frequency of testing nominated in the Inspection and Test Plan(s). Such review shall take into account the frequency of nonconformity detected, including nonconformities remedied by simple reworking.

Table 6.1

Clause	Characteristic Analysed	Test Method	Minimum Frequency Of Testing
6.13.2	Bedding layer - Surface Irregularities - Level	AS 2876/Survey	Every 10m
6.13.2	Finished Concrete: - horizontal alignment - level - Straightness/deviation from vertical curve	AS 2876/Survey	Every 10m
6.13.2	Profile Dimensions	AS 2876	Fixed forms: Every 10m Extruded or slip formed: Once for each project.
6.13.1	Concrete Slump	AS 1012.3	For each homogeneously manufactured grade per day, one on each of the first three batches at the start of the day and after a non conforming batch, then one per four batches.
6.13.1	Concrete Compressive Strength	AS 1012.9	Sampling, testing and assessment for compliance shall be in accordance with Section 6 of AS 1379

6.14 MEASUREMENT AND PAYMENT

Payment shall be made for the activities associated with completing the work detailed in this Specification in accordance with Pay Items 603P1 to P2 inclusive.

The pay items applicable to particular activities are listed in the Specifications for these activities.

A lump sum price for any of these items shall not be accepted.

If any pay item for which a quantity of work is listed in the Contract has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

The Contractor shall allow in the pay items generally for the costs associated with all testing required to prove conformance of the works as specified.

SECTION 6

CONCRETE KERBS FOOTPATHS AND MINOR WORKS

Pay Item 603P1 Kerb Works

The unit of measurement shall be the linear metre measured along the length of the constructed kerb, including pram crossings, sumps, driveways etc.

This pay item shall include all operations involved in the forming, compaction of foundations, supply and construction of subbase, supply and placement of concrete, jointing, kerb markings, curing, and backfilling adjacent to the kerb.

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. An extra over rate is provided for kerb transitions.

An extra over rate is provided, for supply and placement of reinforcing steel where specified on the drawings.

A separate pay item shall be included in the Contract for each kerb type.

603P1.1	Mountable Kerb – Type MK
603P1.2	Mountable Kerb and Gutter – Type MKG
603P1.3	Kerb Only – Type KO
603P1.4	Kerb and Gutter – Type KG
603P1.5	Modified Layback Kerb – Type MLBK
603P1.6	Open Channel Invert – Type OCI
603P1.7	Modified Mountable Kerb – Type MMK
603P1.8	Mower Strips (200mm x 200mm)
603P1.10	Extra over rate for transitions between kerb types
603P1.20	Extra over rate for steel reinforcement as specified

Pay Item 603P2 Footpaths, Driveways, and General Paving Works

The unit of measurement shall be the square metre, measured as the horizontal surface area of the concrete footpath, driveways, median topping, or similar paving works.

This pay item shall include all operations involved in the forming, compaction of foundations, subbase, concreting, finishing, jointing, curing and backfilling.

Where specified, this pay item shall include the supply and placement of reinforcing steel.

A separate pay item shall be included in the Contract for each thickness of concrete paving specified.

603P2.1	75mm Thick Concrete Paving
603P2.2	100mm Thick Concrete Paving
603P2.3	150mm Thick Concrete Paving
603P2.10	Extra over rate for reinforced concrete paving using F82 mesh
603P2.11	Extra over rate for reinforced concrete paving using F92 mesh
603P2.12	Extra over rate for reinforced concrete paving using F981 mesh

6.15 SCHEDULE OF HOLD POINTS

Hold Points	Clause	Description
6.1	6.09.2	Placement of concrete for footpaths, driveways and paving