

# City of Ryde Development Control Plan 2014

## Part: 8.5 Public Civil Works

Translation

ENGLISH

If you do not understand this document please come to Ryde Civic Centre, 1 Devlin Street, Ryde Monday to Friday 8.30am to 4.30pm or telephone the Telephone and Interpreting Service on 131 450 and ask an interpreter to contact the City of Ryde for you on 9952 8222.

ARABIC

إننا نعتذر عليك فهم محتويات هذه الوثيقة، نرجو للحضور إلى مركز بلدية رايد Ryde Civic Centre على العنوان: 1 Devlin Street, Ryde من الاثنين إلى الجمعة بين الساعة 8.30 صباحاً والساعة 4.30 بعد الظهر أو الاتصال بمكتب خدمات الترجمة على الرقم 131 450 لكي تطلب من أحد المترجمين الاتصال بمجلس مدينة رايد، على الرقم 9952 8222، نيابة عنك.

ARMENIAN

Եթէ այս գրութիւնը չէք հասկնար, խնդրեմ եկէ՛ք Րայդ Բիւիք Սենթըր, 1 Տելվին փողոց, Րայդ, (Ryde Civic Centre, 1 Devlin Street, Ryde) Երկուշաբթիէն Ուրբաթ կ.ա. ժամը 8.30 – կ.ե. ժամը 4.30, կամ հեռաձայնեցէ՛ք Հեռաձայնի եւ Թարգմանութեան Սպասարկութեան՝ 131 450, եւ խնդրեցէ՛ք որ թարգմանիչ մը Րայդ Քաղաքապետարանին հետ կապ հաստատուէ ձեզի համար, հեռաձայնելով՝ 9952 8222 թիւին:

CHINESE

如果您看不懂本文，請在周一至周五上午 8 時 30 分至下午 4 時 30 分前往 Ryde 市政中心詢問 (Ryde Civic Centre, 地址: 1 Devlin Street, Ryde)。你也可以打電話至電話傳譯服務中心，電話號碼是: 131 450。接通後你可以要求一位傳譯員為你打如下電話和 Ryde 市政廳聯繫，電話是: 9952 8222。

FARSI

اگر این مدرک را نمی فهمید لطفاً از 8.30 صبح تا 4.30 بعد از ظهر دوشنبه تا جمعه به مرکز شهرداری رايد، Ryde Civic Centre, 1 Devlin Street, Ryde مراجعه کنید یا به سرویس مترجم تلفنی، شماره 131 450 تلفن بزنید و از یک مترجم بخواهید که از طرف شما با شهرداری رايد شماره 9952 8222 تلفن بزند.

ITALIAN

Se non capite il presente documento, siete pregati di rivolgervi al Ryde Civic Centre al n. 1 di Devlin Street, Ryde, dalle 8.30 alle 16.30, dal lunedì al venerdì; oppure potete chiamare il Telephone Translating and Interpreting Service al 131 450 e chiedere all'interprete di contattare a vostro nome il Municipio di Ryde presso il 9952 8222.

KOREAN

이 문서가 무슨 의미인지 모르실 경우에는 1 Devlin Street, Ryde 에 있는 Ryde Civic Centre 로 오시거나 (월 – 금, 오전 8:30 – 오후 4:30), 전화 131 450 번으로 전화 통역 서비스에 연락하셔서 통역사에게 여러분 대신 Ryde 시청에 전화 9952 8222 번으로 연락을 부탁드립니다.

Amend. No.	Date approved	Effective date	Subject of amendment

## Table of Contents

**CONTENTS**

<b>1.0 INTRODUCTION</b>	<b>6</b>
<b>1.1 When is Construction Required</b>	<b>6</b>
1.1.1 Footways	6
1.1.2 Footpath Paving	6
1.1.3 Kerb & Gutter	6
1.1.4 Road Pavement	7
1.1.5 Ancillary Roadworks Items	8
<b>1.2 Alteration to Services</b>	<b>8</b>
1.2.1 Prevention of Damage	8
1.2.2 Alterations	8
<b>1.3 Notification</b>	<b>9</b>
<b>2.0 DESIGN &amp; CONSTRUCTION STANDARDS</b>	<b>10</b>
<b>2.1 Design of Public Roads</b>	<b>10</b>
2.1.1 Width & Alignment	10
2.1.2 Geometry	10
2.1.3 Design Speeds	10
2.1.4 Longitudinal Grades	10
2.1.5 Crossfalls	10
2.1.6 Matching Existing Road Pavement	11
2.1.7 Road Components	11
2.1.8 Levels	11
2.1.9 Retaining Along the Property Frontage	12
<b>2.2 Construction Standard for Footways</b>	<b>12</b>
<b>2.3 Design of Footpath Paving</b>	<b>12</b>
2.3.1 Concrete Footpaving	13
2.3.2 Footpaving Using Segmental Pavements	13
<b>2.4 Design of Kerb &amp; Gutter</b>	<b>14</b>
2.4.1 Kerb & Gutter Detail	14
2.4.2 Levels	14
2.4.3 Matching Existing Kerb and Gutter	14
2.4.4 Kerb Ramps	14
2.4.5 Excavation	14
2.4.6 Form Work	15

## Table of Contents

2.4.7	Material	15
2.4.8	Joints	15
2.4.9	Placing Concrete	15
2.4.10	Machine Placed Kerb and Gutter	15
2.4.11	Transition at Pits	16
2.4.12	Finish	16
2.4.13	Curing and Protection	16
2.4.14	Backfilling	16
2.4.15	Pavement Thickness	17
2.4.16	Formation	17
2.4.17	Compaction of Sub Grade	18
2.4.18	Materials	18
2.4.19	Spreading	19
2.4.20	Compacting and Trimming	19
2.4.21	Compaction Equipment	19
2.4.22	Surfacing Procedures Course	20
2.4.23	Subsoil and Subgrade Drains	20
2.4.24	Service Conduits	20
<b>2.5</b>	<b>Construction Standard for Hot Bituminous Mixtures</b>	<b>21</b>
2.5.1	Supply of Mixtures	21
2.5.2	Transport	21
2.5.3	Preparation of Pavement	21
2.5.4	Spreading	22
2.5.5	Joints	23
2.5.6	Compaction	23
2.5.7	Finished Surface	24
2.5.8	Provision for Traffic	24
<b>3.0</b>	<b>ANCILLARY ITEMS</b>	<b>25</b>
<b>3.1</b>	<b>Roundabouts</b>	<b>25</b>
<b>3.2</b>	<b>Traffic Calming Devices</b>	<b>25</b>
<b>3.3</b>	<b>Provision of Services</b>	<b>25</b>
<b>3.4</b>	<b>Street Name Signs</b>	<b>25</b>
<b>3.5</b>	<b>Street Trees</b>	<b>25</b>
<b>3.6</b>	<b>Street Furniture</b>	<b>25</b>

## Table of Contents

<b>4.0</b>	<b>STORMWATER DRAINAGE</b>	<b>26</b>
<b>4.1</b>	<b>Design of Drainage System</b>	<b>26</b>
4.1.1	Storm Water Pipes	26
4.1.2	Pit Locations	26
4.1.3	Safety	26
<b>4.2</b>	<b>Materials</b>	<b>26</b>
4.2.1	Pipes	26
4.2.2	Pits	27
4.2.3	Concrete Works	27
4.2.4	Bedding & Backfill Material	27
<b>4.3</b>	<b>Construction of Drainage System</b>	<b>27</b>
4.3.1	Excavation	27
4.3.2	Bedding	28
4.3.3	Laying	28
4.3.4	Jointing	28
4.3.5	Junctions	28
4.3.6	Backfilling	28
4.3.7	Concrete Drainage Structures	28
4.3.8	Cast Iron and Galvanised Steel Fittings	29
4.3.9	Step Irons	29
4.3.10	Channelisation of Pits	29
<b>5.0</b>	<b>STANDARDS ENFORCEMENT</b>	<b>30</b>
<b>5.1</b>	<b>Plan Submissions</b>	<b>30</b>
5.1.1	Presentation of Plans	30
5.1.2	Plan Requirements - Roads	31
5.1.3	Plan Requirements – Drainage	31
<b>5.2</b>	<b>Inspections</b>	<b>32</b>
5.2.1	Footways	32
5.2.2	Footpath Paving	32
5.2.5	Drainage Works	33
<b>5.3</b>	<b>Works as Executed Plans</b>	<b>33</b>
<b>5.4</b>	<b>Maintenance Period</b>	<b>33</b>
5.4.1	Footways	33
5.4.2	New Public Roads	33

## 1.0 INTRODUCTION

### 1.1 When is Construction Required

#### 1.1.1 Footways

The footway area is to be re-graded when:

- there is an unacceptably steep crossfall on the footway;
- the footway is rough and difficult to negotiate;
- vehicular footpath crossings into the site would result in unreasonable undulations along the footway; and
- construction of footpath paving and/or realignment of the road at a future time requires the footway to be raised or lowered. Regrading the footway at the time of undertaking the development will ensure that difficulties for vehicular and pedestrian access into the property do not arise in the future and ensure any walls or fencing constructed on the property boundary matches the future footway level.

#### 1.1.2 Footpath Paving

Footpath paving shall be constructed across the entire property frontage when:

- the development is a residential development upon land zoned other than Residential Low Density and the completed development contains two (2) or more dwellings;
- the property is a residential development and has frontage to an arterial, sub-arterial road, or collector and the completed development contains two (2) or more dwellings;
- there is an existing footpath which is in poor condition or is constructed of bitumen and the completed development contains two (2) or more dwellings;
- the development is for a commercial, industrial or other non-residential use and existing footpaving does not exist or is unsatisfactory and the cost of providing concrete footpaving would not represent more than 1% of the development costs; or
- In special circumstances, such as where unusual topographical conditions exist, or where there is no pedestrian demand for use of the footway, Council may waive the requirement to provide footpaving.

#### Who can Construct Footpaving

The applicant will generally be required to engage their own contractor to construct the footpaving.

#### 1.1.3 Kerb & Gutter

Kerb, gutter and paved road shoulder shall be constructed when:

- kerb, gutter and paved road shoulder does not exist, or is in an unsatisfactory condition or at an unsuitable level;
- the development will result in an increase in the number dwellings on the subject lot, or involves an increase in floor space associated with a commercial or industrial development;
- the development will have a presentation to the street in which the work is to be undertaken:
  - the work is necessary to protect the property from the flow of stormwater off a public road;
  - the work is necessary to ensure erosion of the road shoulder does not adversely affect access to the property; or
  - the work is necessary to ensure compatibility with new footway levels.

### Who can Construct Kerb and Gutter

Where the length of kerb and gutter to be constructed exceeds 30 metres the work is to be constructed by the applicants contractors unless otherwise specified by Council.

Where the total length is less than 30 metres, then the work will be undertaken by Council at the applicants expense. If the work will be an extension of an existing kerb or road pavement, or replacement of a damaged kerb or road pavement, Council will undertake the work as soon as practicable after receiving the payment from the applicant. If the work will be an isolated section, Council will delay its construction until such a time as further contributions have been received, or Council allocates funds towards constructing larger sections of road pavement in the locality.

## 1.1.4 Road Pavement

### Public Roads as part of a Subdivision

Where new public roads are required to service a land subdivision, the Subdivider shall, at no cost to Council, provide road pavement, kerb and gutter, footpath and all other associated works associated with providing a public road where there will be newly created lots within the proposed subdivision that will require access to a public road. These works are to meet the requirements of Council. Council will not accept ownership of a road where it is not constructed to the appropriate standard as outlined in this Part.

### Constructing Half Road

***The applicant shall provide half road pavement, along with all necessary kerb and gutter works, where the same does not exist or the existing pavement is unsatisfactory, across the entire frontage of the land adjacent the to the development site***

***Why:*** To enhance streetscape presentation.

To provide a suitable road pavement for the traffic generated by the development.

Where there is no pavement, or the existing pavement is in an unsatisfactory condition, the developer shall provide half-road pavement and kerb and gutter across the entire public road frontage of the allotment containing the development site where:

- the development will result in an increase in the number of dwellings on the subject lot, or involves an increase in floor space associated with a commercial or industrial development; and
- traffic generated by the development would increase the loads on the pavement thereby significantly reducing pavement life.

### Increasing Road Width

Where a development would increase traffic movements in a public road necessitating road widening to increase the road's traffic carrying capacity, the developer shall increase the road pavement width and provide all necessary kerb, gutter and footway works across the frontage of the subject site.

### Other Road Works

Further road construction paid for by the developer may be required where:

- Council has agreed to permit recessed parking bays within the public road; and
- Auxiliary lanes within the public roadway are required to permit safe vehicular access/egress for the property.

### **Who will Construct the Road**

Where the length of road to be constructed exceeds 30 metres the work is to be constructed by the applicant's contractor/s prior to finalisation of the application unless otherwise specified by Council.

Where the total length is less than 30 metres, Council will undertake the work at the applicant's expense. If the work is an extension of an existing kerb or road pavement, or replacement of a damaged kerb or road pavement, Council will undertake the work as soon as is practicable after receiving the payment from the applicant. If the proposed work is an isolated section, Council will delay construction until such a time as further contributions have been received, or Council allocates funds towards constructing larger sections of road pavement in the locality.

## **1.1.5 Ancillary Roadworks Items**

Council may require the construction of roundabouts, median islands, entrance thresholds and/or other traffic calming devices, depending on the needs generated by the proposed development.

## **1.2 Alteration to Services**

### **1.2.1 Prevention of Damage**

During the progress of the works care shall be taken to prevent damage to any public utility eg. gas, water, sewerage, electricity or telephone services, etc. The applicant will be responsible for any damage caused by themselves or their agents, either directly or indirectly.

### **1.2.2 Alterations**

All mains, services, poles etc that require alteration shall be altered at the applicant's expense to the satisfaction of Council and the authority concerned.

#### **House Services**

Where the alteration of a house service is required, it is to be carried out by a suitably experienced tradesperson. Twenty-four House Services (24) hours notice shall be given to the affected property owner/s before their service is to be affected.

#### **Service Mains**

In the case of public utility mains, if a main must be raised, altered, lowered or relocated, then the applicant shall be required to liaise with the relevant Authority to organise the alteration and they shall undertake all work to the satisfaction of that Authority.

#### **Surface Fittings**

The applicant shall arrange with the relevant authority for the alteration of all surface fittings of all service authorities that are Surface Fittings affected by altered finished surface levels.



## 1.3 Notification

### Notification of entry for data Collection

Prior to entering a property for the purpose of collecting survey information, the applicant shall advise the relevant property owners of their intention to do so. Such notice must be in writing prior to the day of entry and must specify the day on which entry is intended.

The initial notification will also request property owners/residents to indicate specific problems relating to their properties or specific problems that may be considered during the preparation of the detailed engineering design.

Attention is specifically drawn to Section 166 of the *Roads Act 1993*, relating to the consultation with and obtaining approval from property owners relating to property adjustments. It should be noted that Registered Surveyors and their assistants in accordance with *Survey Practise Regulations*, may enter a property after giving the notice prescribed in the regulations.

Should a property be entered for the above purposes, after giving the notice required a note shall be left for each property owner/resident indicating the situation should no one be at home on the particular day.

### Notification of Affectation by Construction Activities

The applicant is responsible for notifying all property owners when access to their property will be necessarily restricted. A minimum of 48 hours notice shall be given and all endeavours shall be taken to ensure the period of disruption is kept to a minimum.

Where the alteration of a house service is required, a minimum of twenty-four (24) hours' notice shall be to the affected property owner before their service is affected.

Such notice must be in writing.

2.0 DESIGN & CONSTRUCTION STANDARDS

2.1 Design of Public Roads

2.1.1 Width & Alignment

The minimum width and alignment of roads that will become public roads shall be as follows:

CLASS OF ROAD	WIDTH	ALIGNMENT
Residential cul-de-sacs serving 30 lots or less.	17m	4.5 - 8.0 - 4.5
Local access roads between 30 and 100 lots	18m	4.5 - 9.0 - 4.5
Collector & Sub-arterial Roads Bus Routes	20m	4.5 – 11 .0 - 4.5
Commercial & Industrial Roads	22m	4.5 – 13.0 - 4.5

The radius of a cul-de-sac bulb shall be:

- Residential areas
  - 8.5 metres to face of kerb
  - 13 metres at the property line
- Residential Flat, Commercial and Industrial areas
  - 11.5 metres to face of kerb
  - 16 metres at the property line.

2.1.2 Geometry

Geometric Design of roads, particularly in relation to horizontal and vertical curves, sight distances, intersections, etc shall be in accordance with the relevant *RTA Road Design Guide 1988*, the NAASRA publication *Guide to the Geometric Design of Rural Roads*, the principles laid down in the *AUSTROADS - Policies and Publications* and general good engineering practise

2.1.3 Design Speeds

The minimum design speed for all roads shall be 50km/hr.

2.1.4 Longitudinal Grades

The general minimum grade shall be 1% but in specific circumstances a minimum gradient of 0.5% will be permitted.

The general maximum grade shall be 12.5% for residential roads and 8.5% for distributor roads. In specific circumstances gradients up to 17% will be permitted. Special additional requirements will them apply, particularly as regards the sight distance of vertical curves.

2.1.5 Crossfalls

Normal crossfalls shall be as follows:

- Road Pavement - Asphaltic Concrete 2.5%
- Footways including concrete footpaving 3.0%
- Public Pathway 3.0%

The maximum permissible super-elevation on bends will be 6%.

### 2.1.6 Matching Existing Road Pavement

All work necessary to match the new road pavement with the existing road pavement shall be undertaken at the applicant's expense. Council will determine the extent of work required.

### 2.1.7 Road Components

Design and construction requirements for each of the components that make up the road, being the:

- footway;
- footpath paving;
- kerb & gutter;
- road pavement; and
- ancillary items.

These are dealt with in the following sections of this standard.

### 2.1.8 Levels

A suitable design of the footway depends on numerous factors including the levels of adjoining properties, degree of pedestrian usage, preservation of existing street trees and future realignment of the road.

Generally, a 3% crossfall should be provided from the property boundary down to the top of kerb. Where this design cannot be accommodated Council will specify the necessary footway levels.

The levels along the footway will need to meet the following criteria:

- the maximum longitudinal grade of the footpath is to be 1 in 6;
- the maximum change of grade along the footway is to be 1 in 10 with a minimum segment length of 4.0 metres;
- if it was necessary to increase the footpath grade, and the longitudinal grade of the footpath exceeds 1 in 8, then concrete footpaving will need to be constructed over the regraded section of footpath, if it did not previously exist; and
- consideration will be given to permit installation of stairs where the total area to be regraded is very large. Approval of stairs in the public footway will be at the discretion of Council's Development Engineer.

Where it is necessary to raise or lower the footway in front of a property, the adjoining sections of footway must be regraded to provide a smooth transition to the new level. The minimum extent of footway that must be regraded is to be determined by Council using the design constraints above.

If access to adjoining private properties is affected by footway egrading, all work necessary shall be done within those properties to ensure satisfactory pedestrian and vehicular access is restored.

If work is to be undertaken within an adjoining property written consent must be obtained from the affected property owner(s) that they will permit the applicant's contractors to enter their property and undertake all work necessary to ensure vehicles and pedestrians have satisfactory access to the property following regrading of the footpath.

### 2.1.9 Retaining Along the Property Frontage

If the ground level of the property adjacent the footpath is above or below the finished level of the footway then adequate measures must be taken to support the land by constructing either earth batters or retaining structures. These are to be fully contained within the property and are not to encroach onto the public footway.

## 2.2 Construction Standard for Footways

Material for filling shall be clean fill consisting of not less than 70 per cent granular material and must be free from vegetation, stumps, roots, rubbish and other deleterious material. Where excavation in rock is necessary, the rock shall be removed to a depth of 100mm below finished surface level.

A 75mm layer of topsoil is to be placed over the footway. The topsoil is to contain less than 40% clay. Clods in the topsoil shall not be greater than 50 mm $\phi$ . The minimum finished grade should be 1%. There should be no localised depressions that may pond or concentrate rainwater.

Couch, kikuyu and buffalo turf to match pre-existing turf types at each property should be supplied and laid over all areas of cut or fill to the finished surface levels. The Contractor will maintain the turf for two (2) months after laying it. Following the maintenance period, approved topdressing shall be spread to fill minor depressions due to the thickness of turf. The tolerance shall be  $\pm 25$  mm provided that the variations in level are not local and are over 2 m or more. The Contractor shall be responsible at his/her expense for the replacement of dead turf.

The footway will not be considered satisfactory if:

- the finished level of the footway adjacent the kerb is below the top of kerb;
- there is a step down from the any footpaving or driveway crossings to the finished level of the footway;
- there are localised depressions where water may pond or flows may be concentrated; or
- there are areas of dead turf.

## 2.3 Design of Footpath Paving

Footpath paving must provide safe and convenient passage for pedestrians.

The surface should have slip resistance appropriate for the pavement slopes as required by AS3661.1. The surface should be even. Any gaps in the pavement should be no greater than 5 mm. Abrupt level changes exceeding 5 mm will not be acceptable. The maximum crossfall at any point shall not exceed 6%.

The footpath paving should have an average 3% crossfall towards the kerblines.

The footpaving will normally be 1200 mm wide and constructed 600 mm from the property line but shall match any existing pavement if of greater width than the above.

The level of ground adjacent the path should be no greater than 10 mm below the path level.

Splays shall be constructed at the junction of all footpaths.

Shared use paths for bicycles and pedestrians must be safe and convenient. The design of shared use paths must be in accordance with mid block engineering treatment specified in Bicycle Strategy and Masterplan 2007.

### 2.3.1 Concrete Footpaving

The subgrade shall be excavated to 125 mm and all soft and other unsuitable material shall be removed and replaced with roadbase material and the subgrade shall be thoroughly compacted and finished to a firm, smooth surface.

A minimum 50 mm thick sub-base of roadbase material shall be provided. Sand shall not be used except for minor levelling work.

The footpaving shall generally be 75 mm thick and increased at vehicular crossings to the crossing thickness.

The forms shall be true to grade and line and adequately braced and without local irregularities. The tolerance shall be  $\pm 15$  mm provided that variations in level are not local and are over lengths of 3m or more. Forms shall not be removed sooner than 24 hours after the placing of the last concrete in that section.

Ready mixed concrete shall conform to the provisions of Australian Standards *AS 1379 - Ready Mixed Concrete*.

The minimum compressive strength  $F_{cp}$  of the concrete shall be 25 MPa at 28 days in accordance with Australian Standards *AS 1480 - SAA Concrete Structures Code*.

Concrete may be mixed on the job for minor works and shall consist of Portland cement and fine and coarse aggregates mixed in a rotating drum mixer in the proportions of 1:2:3 parts by volume.

The subgrade shall be checked for uniformity and all irregularities made good prior to pouring of concrete and shall be sprinkled with as much water as it will readily absorb.

Concrete shall be placed so as to avoid segregation and shall be adequately compacted. Care shall be taken to fill the edges of the forms and to work the courser aggregate back from the face.

The concrete shall be finished with a broom finish or wooden float. All edges to be rounded with a 75 mm edging tool. The concrete shall not be disturbed after it has been in the forms for twenty (20) minutes.

Full depth contraction joints composed of nominal 6 mm thick approved bituminous mastic jointing material shall be constructed every 3.6 m and dummy joints shall be struck at intervals of 1.2 m.

Bituminous joints shall also be provided at each side of a vehicular crossing footway slab and against all existing concrete structures. The bituminous mastic joints shall be struck to the level of the adjoining concrete surfaces.

Paving shall be kept damp for a period of three (3) days and shall be protected from damage. Any damaged, defaced or otherwise unsatisfactory section shall be removed and replaced.

### 2.3.2 Footpaving Using Segmental Pavements

1. Pavers will generally only be approved in commercial areas.
2. Pavers shall be a minimum 75 mm thick laid on a 100 mm unreinforced concrete base with a 30 mm layer of sand between the pavers and the concrete.
3. The sand bedding course shall be of roughly uniform thickness and not exceed 30mm after compaction.
4. Pavers should have a nominal 3mm joint between the units. Joints should be filled with appropriate sand.

5. The entire perimeter of segmental pavements should be provided with lateral edge restraints.
6. Concrete aprons (100mm wide) are to be constructed around all pits and other existing structures in the footpath as a lateral restraint for the pavers. Using the existing structure as a lateral restraint is not acceptable.

### **Footpath Paving**

Asphaltic concrete footpath paving or bituminous spray-sealed pavements are no longer permitted.

## **2.4 Design of Kerb & Gutter**

### **2.4.1 Kerb & Gutter Detail**

Kerb and gutter shall be integral construction in accordance with council requirements.

### **2.4.2 Levels**

Design plans, if available, will be issued by Council. If design plans do not exist, they will need to be prepared by the applicant and approved by Council prior to construction.

Generally the following criteria should be met when designing levels for the kerb, gutter and road shoulder:

- there should be a minimum longitudinal grade of 1% and a maximum of 12%;
- the crossfall to the centreline of the road should be 3%; and
- the designer should consider how the proposed section of kerb and gutter will match into any existing kerb and gutter in the vicinity.

### **2.4.3 Matching Existing Kerb and Gutter**

Where necessary, the applicant shall reconstructing existing kerb, gutter and road pavement to ensure appropriate integration with the new section. Council will determine the extent of reconstruction.

Any existing laybacks or roofwater drainage lines discharging into the kerb that will be affected by the reconstruction are to be replaced.

### **2.4.4 Kerb Ramps**

Kerb ramps shall be constructed at each kerb return opposite the extension of the main footpath and in the kerb opposite the extension of a public pathway. Kerb ramps shall be in accordance with plan M388c in the appendix.

### **2.4.5 Excavation**

The sub-grade shall be excavated to the pavement boxing level. All soft, yielding and other unsuitable material shall be removed and shall be replaced with crushed rock material and the sub-grade shall be thoroughly compacted and finished to a smooth surface of uniform bearing value.

The above backfilling procedure shall also be adopted in cases where over excavation of the sub-grade has occurred. At filled locations a crushed rock sub-base minimum 100 mm thick shall be provided.

### 2.4.6 Form Work

The forms shall be aligned true to grade and line and without local irregularities. The tolerance shall be  $\pm 15$  mm provided that variations in level are not local and are over lengths of 3 m or more.

Forms shall be constructed so that they can be removed without damaging the concrete and shall be adequately braced. The interior surface shall, if necessary, be oiled to ensure the non-adhesion of the concrete. The material used for forms for the exposed faces shall be sized dressed soft wood timber. Undressed timber may be used for backing to unexposed surfaces.

### 2.4.7 Material

#### Ready Mixed Concrete

Ready mixed concrete shall conform with the provisions of Australian Standards AS 1379 - *Ready Mixed Concrete*.

The minimum compressive strength  $f_{cp}$  of the concrete shall be 25 MPa at 28 days in accordance with Australian Standards AS 1480 - *SAA Concrete Structures Code*.

#### Job Mixed Concrete

Concrete may be mixed on the job for minor works and shall consist of Portland cement and fine and coarse aggregates mixed in a rotating drum mixer in the proportions of 1:2:3 parts by volume.

### 2.4.8 Joints

For hand placed kerb and gutter 6 mm thick approved bituminous mastic jointing material shall be provided at intervals not exceeding 6 m. For machine placed kerb and gutter, 6 mm thick approved bituminous mastic jointing material shall be provided at intervals not exceeding 6 m and full depth guillotined dummy grooved joints shall be provided midway between mastic joints. Joints are also required at each end of gutter crossing and gully pits. Joints shall be set vertical and square to the kerb.

### 2.4.9 Placing Concrete

Prior to placing the concrete the foundation shall be sprinkled with as much water as it will readily absorb and the surface shall be checked for uniformity and all irregularities made good.

The concrete shall be placed so as to avoid segregation and shall be adequately compacted. Care shall be taken to fill every part of the forms and to work the coarser aggregate back from the face. Exposed surfaces of concrete shall be struck off and finished with a steel float, and corners and edges so shown shall be left neatly rounded with an approved nosing tool. Concrete shall not be disturbed after it has been in the forms twenty (20) minutes.

### 2.4.10 Machine Placed Kerb and Gutter

Approval will be given for the use of a kerb moulding machine for the placing of integral kerb and gutter and semi-mountable kerbs, subject to the Contractor demonstrating to the satisfaction of the Director of Engineering Services, that the proposed machine and operators are able to produce a kerb and gutter or semi-mountable kerb to a standard at least equal to that obtained by the conventional formwork method.

#### 2.4.11 Transition at Pits

At gully pits, attention is drawn to the requirement that an additional 50mm cross-fall be provided in the gutter invert adjacent to the kerb opening.

#### 2.4.12 Finish

After removal of the forms, minor or porous sections or holes shall be repaired with a three to one (3 to 1) cement mortar. The exposed surfaces shall then be rubbed with a wooden float and clean water to leave the surfaces smooth and uniform in colour and appearance.

Any major rough or porous sections shall be removed between the construction joints. Such sections are to be removed and replaced at the applicant's cost.

#### 2.4.13 Curing and Protection

Completed works shall be kept damp for a period of three (3) days and shall be protected from damage. Any damaged section shall be removed and replaced as directed at the applicant's cost.

After the concrete has set sufficiently (and not sooner than three [3] days after placing), the foot-way behind the kerb shall be neatly trimmed or filled with clay/loan soil to within 100 mm of the finished surface level and then filled to 25 mm below the finished surface level with topsoil.

#### 2.4.14 Backfilling

After the concrete has set sufficiently (and not sooner than three [3] days after placing), the foot-way behind the kerb shall be neatly trimmed or filled with clay/loan soil to within 100 mm of the finished surface level and then filled to 25 mm below the finished surface level with topsoil.



### 2.4.15 Pavement Thickness

All road pavements to be constructed must be designed by a geotechnical engineer in accordance with the AUSTROADS Pavement Design Manual *A Guide to the Structural Design of Road Pavements (1992)*.

A full design is to be submitted to Council for approval in conjunction with the Development Application, and the final design should be tabled as follows:

PAVEMENT DETAILS	COMPACTED LAYER THICKNESS
<b>TYPE OF PUBLIC ROAD</b>	
<b>Sub Grade</b> Minimum subgrade CBR 8 otherwise lime stabilised to a depth of 150mm to achieve a CBR of greater than 8. Compacted to 100% Standard to AS1289.	Minimum = 150 mm
<b>Sub-Base Course</b> Dense Graded Road Base of nominal size 40mm (DGB40) or 75mm nominal size Crushed Sandstone with CBR greater than 30. Compacted to 98% Modified to AS1289.	Minimum = 150 mm
<b>Base Course</b> Fine Crushed Rock of nominal size 20mm (FCR20) with CBR greater than 80. Compacted to 98% Modified to AS1289.	Minimum = 150 mm
<b>Wearing Course</b> AC14 or SBS AC14 (binder A15E) at intersections and curves.	Minimum = 50mm
<b>TOTAL THICKNESS</b>	<b>Minimum = 350mm</b>

NOTE: The above pavement thickness is intended for Residential Roads and ideal sub-grade conditions. A sub-grade course is generally required where poor sub-grade conditions exist.

### 2.4.16 Formation

Scrub, stumps, boulders and the like shall be cleared to the full width of the road reserve, and grubbed to a depth below subgrade level. All existing trees are to be retained.

The finished roadway shall be graded in accordance with the longitudinal section and crossfalls shall be as shown on the appropriate cross sections with footways and side slopes neatly trimmed.

Topsoil shall not be used as filling.

Material for filling shall be approved clean filling consisting of not less than 70 per cent (70%) of granular material and be free from vegetation, stumps, roots, rubbish, iron, etc.

Embankments shall be carried up on full width layers of not greater than 300 mm thickness, loose measurement. Each layer shall be well compacted during construction by the use of approved rubber-tyre or sheep-foot rollers.

No filling shall be placed against any part of a concrete structure within 28 days of the concrete being placed unless the structure is adequately strutted and approved by the Supervising Engineer. Filling adjacent to weep holes shall be of clean broken stone for at least 300 mm in all directions from the weepholes and approved geotextile is to separate this material from surrounding backfill material.

The minimum batter slope in fill shall be 1(V):3(H).

In cuttings, the formation shall be finished with a boxing for the pavement. The boxing shall be formed by excavating to the sub- base level except in rock cuttings. In rock cuttings, the rock shall be loosened to a depth of 300 mm below subgrade level and if deemed suitable by Council, shall be re-compacted. If considered unsuitable, the material shall be treated as unsuitable subgrade, removed from the site and replaced with approved crushed sandstone.

The minimum batter in cut shall be 1(V): 2(H) or 1(V): ¼H) in rock.

Subsoil drains shall then be installed through the cutting as specified in Clause 2.4.23. Following installation of the subsoil drains placing of the first layer of the base course may proceed.

If the subgrade consists of organic material, soft and yielding clay or other unsound material it shall be removed for a depth as directed by the Supervising Engineer and replaced by approved crushed sandstone.

2.4.17 Compaction of Sub Grade

The subgrade shall be thoroughly trimmed and compacted by rolling with a roller weighing not less than 8 tonnes until it conforms to the required profile and exhibits a degree of compaction.

Any soft yielding or unstable patches that become apparent shall be removed and replaced with sound material as specified in Clause 2.4.16 and rammed or rolled until thoroughly compacted.

Any wet areas where the subgrade would be suitable if maintained in a dry state, shall be dried by tyning, wind rowing, re-levelling and compaction.

The degree of compaction required is that when tested with an approved 8 tonne three point roller, there should be negligible movement of the subgrade or be not less than 100% of the standard density obtained when tested in accordance with RMS Test Method T.111.

2.4.18 Materials

The road pavement shall consist of layers, as specified in the General Specification or as shown on the drawings, and as follows:

- |                                 |  |
|---------------------------------|--|
| a. Sub-base                     | To be crushed rock material in accordance with RMS Form 744 for crushed rock. This material shall be spread, compacted, trimmed and maintained as specified below. |
| b. Base Course                  | To be in accordance with Construction Standard for Hot Bituminous Mixtures page 26.  |
| c. Intermediate or Upper Course | To be approved by Council based on site conditions. Residential Streets with low traffic volumes to use a residential mix AC.                                      |
| d. Corrective or Binder Course  | Areas subject to heavy breaking or tight turning traffic will generally be SBS modified AC.  |
| e. Wearing Course               | All other streets will generally require AC 10.  |

### 2.4.19 Spreading

Pavement material shall be spread without segregation in uniform layers that will provide the compacted thickness' as specified.

When spread, the moisture content shall be adjusted so that it does not exceed the optimum percentage or be less than 97% of the optimum moisture content. Water shall be added using an approved watering machine. Excess moisture shall be removed to the specified content by loosening.

Pavement material shall not be spread on a waterlogged base. If at any time the subgrade or sub-base material should become rutted, or mixed with the pavement material, the applicant shall at his own expense remove the material, reshape and compact the subgrade material, and replace the pavement material with fresh material.

### 2.4.20 Compacting and Trimming

The road pavement shall be compacted by suitable means to meet the following requirements:

DESCRIPTION	MINIMUM DENSITY RATIO
Footpath Areas	95% (STD)
Subgrade	100% (STD)
Base course	98% (MOD)
Asphaltic Concrete	See Section 4.50

The top of each course shall be graded and trimmed, and material shall be added where necessary to produce a surface parallel to the finished surface of the roadway.

Variations in the compacted thickness of each course shall not exceed +25 mm or -15 mm. The finished surface level shall not vary more than 15 mm from the planned grade at any point, and in the case of upper courses the finished surface shall not deviate more than 6 mm in 3 m in any direction.

Any irregularities in excess of the tolerances stated above shall be corrected by loosening the surfaces, removing or adding pavement material as required, and compacting the area to a uniform surface conforming to the designed cross section and grade. In no case shall quarry dust or other fine material be used to build up depressions.

Traffic shall not use the pavement until it is fully compacted. Where it is not practicable to provide side-tracks or detours, the pavement may be constructed part width at a time so that traffic may use the remaining width not under construction. This procedure shall be subject to Council's prior approval of the methods of construction and the means of traffic management.

After the pavement is fully compacted it may be opened to traffic provided that, in the opinion of the Director of Engineering Services, it will not suffer damage. Notwithstanding such approval, any damage that may occur shall be made good by the Contractor at his/her own expense in the manner described in Clause 2.4.22.

### 2.4.21 Compaction Equipment

Vibrating compaction equipment cannot be used in streets where Federation Style or other older houses are located. At these locations Static Compaction equipment shall be used.

### 2.4.22 Surfacing Procedures Course

The pavement should be provided with the first layer of hot bituminous mixture as soon as possible after compaction of the base course is complete.

The final wearing course is laid after all other works are completed on the work site or as otherwise approved by the Certifier.

### 2.4.23 Subsoil and Subgrade Drains

Subsoil and subgrade drains shall be located as required by this clause or as shown on the Approved Drawings, or as directed by the Certifier.

Subsoil drains may be required at the property line of a footway formed in a cutting to prevent seepage of water onto the footpath. All locations will be treated on their merits and the construction of the necessary subsoil drains shall be undertaken as directed by Council.

The trench shall be 200 mm wider than the nominal pipeline size. If not indicated on the drawings the depth shall be a minimum of 400 mm below the road subgrade level or in the case of footpath drainage 600 mm below the finished footway level.

Subsoil drains shall be perforated plastic piping contained in a geotextile sock. The pipe size shall be 100 mm diameter.

Subgrade drainage lines located under the pavement shall be laid on a 50 mm thick bed of 5 mm crushed metal. The drainage line shall be backfilled to within 300 mm of subgrade level with 5 mm crushed metal and then covered with a geotextile (Bidim A14 or equivalent).

Subsoil drainage lines other than under the pavement as above to within 100mm of the finished surface and covered with geotextile (Bidim A14 or equivalent). The remainder of trench to be backfilled with approved top soil.

If shown on the Drawings, sumps for inspection and cleaning purposes shall be provided in subsoil or subgrade drainage lines at the locations and to the dimension shown.

### 2.4.24 Service Conduits

Service conduits are to be supplied and laid to the size and location as shown on the Drawings. In the absence of a specified size a minimum of a 100 mm diameter shall be used.

Conduits shall be laid with a minimum 100 mm cover below the subgrade level or deeper if required by the service authority and the trench backfilled and compacted with fine crushed rock or road base.

Conduits may be rubber ringed concrete pipes, cast iron (medium grade) pipe or rigid PVC tube. The conduits shall extend 300 mm behind the back of kerb on both sides.

The kerb face is to be clearly marked with a letter "C" 75 mm high recessed or cut 4 mm into the concrete kerb directly above the conduit on both sides of the road, then finished with red paint.

## 2.5 Construction Standard for Hot Bituminous Mixtures

### 2.5.1 Supply of Mixtures

All aspects of the supply of hot bituminous mixtures including aggregates, binder, proportioning of mixes, stability of mixes, voids in compacted mixes, voids filled by the binder and mixing procedure shall be in accordance with the relevant Roads and

Traffic Authority Specification and requirements.

The mixture must be supplied from an approved supplier or the applicant must undertake, at his/her own cost, to have the mix tested by an approved testing laboratory.

Mixes not complying with this specification will be rejected.

### 2.5.2 Transport

The mixed material shall be discharged into motor trucks, the bodies of which have been lightly smeared with oil, or lightly coated with lime-water or soap solution, to facilitate discharge. The complete load shall be covered with heavy canvas (or equivalent) to minimise loss of heat during transit.

Where mixed material is to be transported over long distances, or in cold conditions, the bodies of all trucks should be suitably insulated.

Except as agreed otherwise, all motor trucks shall carry not less than 6 tonnes of mixed material. Each truck shall be fitted with an approved type of adjustable tail gate to allow proper control of the mix during discharge into the spreading device.

When backing trucks against the spreader, care shall be taken not to jar the spreader out of its proper alignment. Delivery of the mix shall be at a uniform rate within the capacity of the spreading and compacting equipment. Transport shall be as expeditious as possible to minimise cooling of the mixture.

For contract works, if the contract is on the basis of a schedule of rate, then all truck loads of mix shall be weighed upon a weighbridge certified by the Department of Weights and Measures.

### 2.5.3 Preparation of Pavement

The pavement shall be dry and shall be thoroughly broomed before other works are undertaken. Any foreign matter adhering to the pavement and not swept off by the broom shall be removed by other means. Any deep depressions or uneven areas are to be tack-coated and brought up to the general level of the pavement with mixed material before the main course is laid. Such preliminary treatment shall be thoroughly rolled.

The whole of the area to be sheeted with mixed material shall be lightly and evenly tack-coated with a fine spray of rapid-setting bitumen emulsion, which shall be not less than 0.28 - 0.56 litre/metre squared. Warming of the bitumen emulsion to about 43°C and/or dilution with water may be required to facilitate spraying and permit uniform application. The tack coat shall be allowed to "break" (water separating from the bitumen) before the mix is spread.

### 2.5.4 Spreading

Spreading, except as agreed otherwise, shall be by an approved self-propelled machine having an effective spreading capacity of not less than 250 tonnes of mix per 8-hour day. It should include the following features:

- a. Means of pushing each motor truck during spreading, with a rapid acting device to engage and release trucks;
- b. A receiving hopper into which motor trucks can discharge the mixed material;
- c. Distributing screws to place the material evenly in front of screed plate, without segregation;
- d. Automatic tamping devices;
- e. An adjustable screed capable of providing a smooth even surface free from tears or other blemishes, to a width of not less than 3m. Provision shall be made for easy adjustment to permit lesser widths of spread;
- f. Heating device to control the temperature of the screed;
- g. Effective steering such that the mix can be laid to a true line;
- h. Means of adjusting depth of spread between 12 mm and 100mm compacted thickness; and
- i. Automatic screed control operated from joint matching shoe, fixed line, travelling straight edge or levelling beam.

The machine shall be so operated that material does not accumulate along the sides of the receiving hopper. Any mix in or under the machine which has become cold due to delay in the transport of mix, or for any other reason, shall be removed.

Where the end of the spread material has cooled due to delay in the delivery of mix, or when resuming work on the next day, a transverse joint shall be formed by cutting the spread material to a vertical face before any fresh mix is spread.

In the event of faulty operation of the mechanical spreader causing irregularities in the spread material, work shall be suspended until the fault is rectified. If the irregularities are of a minor nature, and the surface has not cooled appreciably, it will be permissible to spread a thin layer of fresh mix by hand, level it with broad rakes, and roll quickly. Should this treatment fail to produce a surface of acceptable texture and regularity, or if the faults left by the spreader are of appreciable depth, or if the faults left by the spreader are of appreciable depth, then the defective surface shall be removed, and fresh material shall be laid as previously described.

Mixing and placing asphaltic concrete will not be permitted when the surface of the road is wet, or is at a temperature less than 10°C or cold winds chill the mix to an extent that spreading and compaction are adversely affected.

The temperature of the mix when it is tipped into the spreader shall not be less than 130°C. Spreading shall proceed without undue delay, and initial rolling of the mix shall commence at a temperature of not less than 115°C.

The minimum compacted thickness of mix shall be as required by the approved Drawings.

### 2.5.5 Joints

Work is to be so arranged as to keep the number of joints, both longitudinal and transverse to a minimum and the daily laying pattern shall be subject to approval by Council before work commences.

Care shall be taken to provide positive bond between adjoining runs. The density of material at joints and the surface finish at joints are to be equal in all respects with those of the remainder of the course. Hot joints will be preferred. Whenever practicable the levels of adjacent runs shall be matched by the use of automatically controlled joint matching devices. Work is to be arranged so as to avoid longitudinal joint faces other than those at the extreme edge of the pavement being left exposed overnight.

Joints shall be carefully constructed and thoroughly compacted to provide a smooth riding surface, care being taken to ensure that exactly the required depth of loose materials provided at joints before rolling commences. Cold transverse joints shall be cut to a neat vertical face before work continues adjacent to them.

### 2.5.6 Compaction

Initial rolling shall be undertaken immediately behind the spreader, using a steel wheeled roller, having a minimum weight of 8 tonnes and a minimum unit load on the road roll(s) equivalent to 55 kg per cm width of roll. Steel-wheeled rollers shall be provided with adjustable scrapers to keep the rolls clean, also effective means of keeping the rolls moist with water, just sufficient to prevent the mix from sticking to the rolls. Excessive amounts of water, which may collect on the road's surface will not be permitted.

Unless otherwise approved, intermediate rolling shall be undertaken by a self-propelled pneumatic-tyred machine having a total weight of at least 10 tonnes, having minimum tyre pressure of 550 kPa and a minimum total load of 1 tonne on each type. Where practicable, the load should be increased to 2 tonnes per tyre. The tyres shall have smooth rolling surfaces and shall be maintained at pressures within 5% of the nominated figure. Final rolling should be undertaken by a steel-wheeled roller of the type described above. In the event of excessive displacement of the mix occurring at any time during rolling, further rolling shall be deferred, but only until such time as the mix has cooled sufficiently to permit proper compaction.

The transverse and longitudinal joints and edges shall be compacted first and rolling shall then proceed longitudinally at the sides and gradually progress towards the centre of the pavement, except on super-elevated curves where the rolling should begin on the low side and progress to the high side. Each transverse shall substantially overlap the previous transverse.

The rollers shall move at a steady uniform speed not exceeding 5 km/hr. Care shall be taken to avoid abrupt stops and starts that may displace the mix.

Where the edge of the spread mix is not supported laterally, it shall first be subjected to side tamping with hand tampers which should also slightly raise the level of the mix so as to secure maximum edge compaction from the subsequent rolling.

Rolling of the mix shall proceed until such time as the compaction is at least 97% of that of a laboratory specimen of the same mix, compacted by the modified Hubbard-Field method.

### 2.5.7 Finished Surface

The finished surfaces shall be smooth, dense and true to shape, shall not vary more than 12 mm from the planned grade at any point, and shall not deviate from the bottom of a 3 m straight edge, laid in any direction, be more than 12 mm for base courses or corrective courses, 6 mm for the intermediate courses and 3 mm for the surface course. Sufficient measurements of thickness shall be taken before and after compacting to establish the relationship between the thickness of the uncompacted material and the completed work. The thickness shall then be controlled by measurements taken of the uncompacted material immediately behind the paver. When the measurements indicate that an area will not be within the allowable tolerances for the completed work, the uncompacted area shall be corrected while the material is still in a workable condition by adding or loosening and removing material. Otherwise the defective area shall be removed and replaced with fresh material. Irregularities exceeding the tolerance given above in a particular course shall be corrected before a subsequent course is placed.

Where necessary, the finished surface shall be lightly sprinkled with limestone dust, or other approved filler, in quantity only sufficient to ensure that the mix will not be tacky under traffic.

### 2.5.8 Provision for Traffic

Care shall be taken to ensure that vehicles and pedestrians are not sprayed with bitumen emulsion during tack-coating and that entry to areas treated with tack coat or hot paving mixture is prevented.

Any damage or injury occasioned to vehicles or pedestrians shall be rectified at the applicant's expense.



## 3.0 ANCILLARY ITEMS

### 3.1 Roundabouts

Roundabouts should generally be designed in accordance with the requirements of the publication *AUSTROADS - Guide to Traffic Engineering Practice Part 6, Roundabouts*.

Roundabout designs should generally comply with the following:

- entry width to provide adequate capacity;
- adequate circulation width, compatible with entry width and design vehicles;
- central islands of diameter sufficient only to give guidance on the manoeuvres expected;
- adequate deflection of crossing movements to ensure low traffic speeds;
- a simple, clear and conspicuous layout; and
- a design to ensure the speed of all vehicles approaching the roundabout is less than 50 km/hr.

### 3.2 Traffic Calming Devices

Calming devices such as thresholds, slow points, speed humps, chicanes should be designed in accordance with requirements of the publication *AUSTROADS - Guide to Traffic Engineering Practice Part 10, Local Area Traffic Management*.

### 3.3 Provision of Services

Where a new public roadworks are being constructed, the applicant shall arrange and pay all costs and fees associate with providing street lighting, underground electrical power and telephone services. Council will bear the additional street lighting electricity charges.

### 3.4 Street Name Signs

If a new road is being provided, street name signs will be supplied and erected by Council at the applicant's expense.

### 3.5 Street Trees

Generally, street tree planting will be required along all newly constructed roads. There must be at least one tree on each side of the road for each 20 linear metres of road. The exact location of the tree will be determined having regard to the location of services, driveways and the like.

A tree schedule that nominates appropriate street trees for use in the Ryde local government area may be obtained from the Council.

### 3.6 Street Furniture

All proposed street furniture should comply with the relevant Council Masterplan in respect of its material, colour, size, shape and location. This is subject to aspects of safety and compatibility with the development and adjacent development being considered.

Where there is no masterplan, Council's use of a particular style of street furniture as a signature of the Council area or suburb must be respected.

## 4.0 STORMWATER DRAINAGE

### 4.1 Design of Drainage System

Stormwater systems are to be designed in accordance with Part 8.2 Stormwater of this DCP. In this section are additional guidelines that are to be used when designing drainage that will become public losses.

#### 4.1.1 Storm Water Pipes

##### Pipe Size

Pipes shall be sized to adequately convey runoff from the relevant design storm. In some circumstances pipes may need to be sized larger to accommodate a greater quantity of runoff in order to ensure proper management of overland flow during extreme storm events.

The minimum pipe size shall be 375 mm diameter.

Pipe velocities shall be between 0.5 m/s and 7.0 m/s and preferably between 1.0 m/s and 5.0 m/s during the design storm.

##### Pipe Grade

The minimum pipe grade shall be 0.5%. The maximum pipe grade shall be selected so as to comply with the desirable and maximum velocities as given above.

#### 4.1.2 Pit Locations

Kerb inlet pits shall be located and provided with inlets of adequate size to relieve the flow in gutters, such that the depth does not exceed 100mm on the high side of residential streets and 75 mm on the low side of residential streets and 75 mm in commercial areas.

The location of the gully pits on curves, kerb returns and in line with normal pedestrian traffic flows is to be avoided.

#### 4.1.3 Safety

The Depth x Velocity product of stormwater flow across the footpath and within the road reserve shall be such that the safety of children and vehicles are considered. The limiting depth velocity product shall be as set out in the report by the University of NSW Water Research Laboratory, *Car Stability on Road Floodways: Technical report No 73/12*. further, the depth velocity should not exceed 0.4 m<sup>2</sup>/s.

### 4.2 Materials

#### 4.2.1 Pipes

Pipes are to conform with the test requirements of Australian Standards *AS 4058-1992 Precast Concrete Pipes (Pressure and non-Pressure)*.

Typically, Council pipes shall be RCP class 2. PVC and FRC pipes will generally not be accepted as Council pipelines.

## 4.2.2 Pits

### Pit Chamber

Precast pit chambers will not be acceptable for use as kerb inlet pits.

### Lintels

Precast concrete lintels shall be at least equivalent to those supplied by CSR Humes.

Precast combined units will not be accepted.

### Grates

Gully pits shall consist of Weldlock GG 78/51 Galvanised steel grates at most locations. In Commercial and Industrial Areas or along State and Regional Roads the Weldlock GG78-42A grate shall be used.

## 4.2.3 Concrete Works

### Ready Mixed Concrete

Ready mixed concrete shall conform to the provisions of Australian Standards *AS 1379-1997 Specification and Supply of Concrete*.

The minimum compressive strength  $F_c$  of the concrete shall be 25 MPa at 28 days in accordance with AS 3600 - 1994 and have a minimum cement content of 240 kgs/m<sup>3</sup>. Details of the supplier and the mix shall be submitted to and approved by the Superintendent prior to the construction of gully pits.

### Job Mixed Concrete

Concrete may be mixed on the job for minor works and shall consist of portland cement and fine and coarse aggregates mixed in an approved rotating drum mixer in the proportions of 1:2:3 parts by volume.

### Reinforcement

Steel reinforcement shall be to the size, type, shape and positioned as shown on the drawings. It shall be free from mud, oil, grease or other non-metallic coating or loose rust that would reduce the bond between the concrete and the reinforcement and shall be adequately fixed and tied.

## 4.2.4 Bedding & Backfill Material

Bedding material for reinforced concrete pipes shall be as specified in Australian Standards *AS 3725-1989 Loads on Buried Concrete Pipes*. Backfill material shall be excavated from the trench or imported provided that the material is free from builders waste, bricks, pieces of concrete, roads or similar retained on a 75 mm sieve.

## 4.3 Construction of Drainage System

### 4.3.1 Excavation

Trenches shall be excavated to the grade line and shown on the Drawings and below the bedding. All soft, yielding and other unsuitable material shall be removed and the trench shall be thoroughly compacted and finished to a firm smooth surface of uniform bearing value. Excavation shall include all classes material including muck, shale or rock.

The minimum width of the trench shall be the nominal pipe diameter plus 400 mm (with local widening at pipe collars to ensure proper compaction of backfill). The Contractor's attention is drawn to the requirements of the NSW Department of Industrial Relations regarding the supporting of the sides of trenches deeper than 1.5m.

### 4.3.2 Bedding

Unless a higher standard of bedding is shown on the Drawings, type H1 support comprising a continuous cushion of 5 mm crushed blue metal shall be provided to a depth of 75 mm or 200mm in rock.

### 4.3.3 Laying

Pipes shall be laid top up as marked by the manufacturer. The space between abutting end of pipes shall not exceed ½% of the diameter of the pipe. Where socket joints are used, recesses shall be left under pipe joints to permit jointing, and to avoid bearing of the socket. Each length of pipeline shall be uniformly supported on the bedding throughout its length.

Pipelines shall be true to grade and line. Where multiple lines of pipes are to be laid side by side, the space between the lines of pipes shall be of the diameter of pipe with a minimum clearance of 300mm.

### 4.3.4 Jointing

All pipes concrete pipes of less than 600 mm diameter are to have rubber ring joints.

### 4.3.5 Junctions

Junctions shall be made by the use of pits or by direct connection to the main pipe in accordance with the pipe manufacturer's recommendations. Where a direct connection is made to the main pipeline, a short length of pipeline is to be connected to the pit and a joint used to join any full length of pipeline.

Every effort shall be made to streamline junction pits to reduce hydraulic losses. This includes benching of pit floors, alignment of inlet and outlet pipes to direct the inlet jet directly into the outlet pipe.

A 3 m long length of 100 mm diameter perforated plastic corrugated pipe shall be provided at the downstream end of every drainage trench and connected to each drainage pit. The drain shall be carried through the wall of the pit. The upstream end of the drain shall be blanked off with a plug of cement mortar or wrapped in geotextile.

### 4.3.6 Backfilling

All pipelines shall be surrounded and backfilled with 5 mm blue metal to 100 mm above the crown of the pipes. The blue metal shall then be covered/compacted with Geotextile - Bidim A14 or equivalent.

Pipelines located within existing or proposed carriageways shall then be further backfilled with either crushed rock or road base material to subgrade level.

At other locations, any of the above backfill materials shall be permitted in addition to approved excavated material free from excessively large pieces of material or other deleterious matter.

All backfilling shall be compacted in layers not exceeding 200 mm loose thickness.

### 4.3.7 Concrete Drainage Structures

The foundation shall be excavated to neat lines and formed at the required depth in accordance with the Approved Drawings. All unsuitable material shall be removed and the base shall be thoroughly compacted.

The Contractor shall furnish all necessary sheeting supports and brackets to support the excavations together with all formwork and supports to mould the concrete and shall keep the excavation free from water.

Forms shall be so designed and constructed that they can be removed without damaging the concrete, and shall be mortar-tight and adequately braced. The interior surface shall, if necessary, be oiled to prevent adhesion of the concrete.

Prior to placing concrete, the subgrade shall be sprinkled with as much water as it will readily absorb.

The concrete shall then be placed so as to avoid segregation and shall be adequately compacted. If a mechanical vibrator is used to compact the concrete, care should be taken to ensure that no segregation of the aggregate is caused by over vibration.

The exposed surfaces shall be struck off with a wooden float and neatly finished. Concrete shall not be disturbed after it has been in the forms 20 minutes.

Forms to concrete faces shall not be removed until at least 48 hours after concrete has been placed. At locations where the concrete will be under load and unsupported, a period of 28 days will be required.

After removal of forms, any rough or porous surfaces or holes shall be thoroughly scabbled and dressed and rubbed up with a 3 to 1 cement mortar. Faulty and honey-combed portions shall be taken down and rebuilt if directed by the certifying authority.

Concrete work shall be completed to the dimensions shown on the drawing with a tolerance of  $\pm 2$  mm unless otherwise approved.

Concrete work shall be kept damp for a period of three (3) days.

Inlet or outlet pipes shall be neatly rounded off with the interior surfaces of the pits and junction boxes.

#### **4.3.8 Cast Iron and Galvanised Steel Fittings**

Grates shall seat squarely within and be pinned to the frame, without rocking or other movement. Grates shall be firmly and evenly bedded. All pits located in the carriageway shall have cast iron covers.

#### **4.3.9 Step Irons**

All pits deeper than 1 m shall have step irons installed in accordance with Australian Standards *AS 1657 – 1992 Fixed Platforms Walkways Stairways and Ladders*.

#### **4.3.10 Channelisation of Pits**

The invert of all change of direction pits shall be shaped in such a manner as to minimise water turbulence.

## 5.0 STANDARDS ENFORCEMENT

### 5.1 Plan Submissions

#### 5.1.1 Presentation of Plans

Two copies of engineering plans are required to be submitted at the draft design, draft final and approved final stages.

One set of Original Approved and Certified Plans printed on drafting film shall be placed in a sealed cardboard tube and delivered to Council.

Copies of the Approved and Certified Plans shall be provided to Council on computer files in AutoCAD with the extension ".dwg" and supplied on a CD.

Unless otherwise agreed to, all drawings shall be prepared on A1 sheets (841mm x 594mm) and generally in accordance with standard drawing practise.

The standard "Ryde City Council - Engineering Service" Title block shall be used on all drawings. As well details of Council font style shall be provided prior to the commencement of design.

Scales shall be clearly indicated on all sheets and the following scales shall normally be used:

- Plans Generally 1:250 horizontal
- Long Sections Generally vertical 1:250 horizontal 1:100
- Cross Section 1:100 natural
- Special Structures or Details 1:20
- for other scale drawings, only standard engineering scales shall be used (See Australian Standard 1100.7)

Plans shall include a schedule of set out points listing:

- Point number;
- Easting;
- Northing;
- Reg Level; and
- Finished surface level.

Australian Height Datum shall be used for all levels and a permanent bench mark shall be provided by the consultant for each project.

All surveys shall be co-ordinated to a minimum of three Integrated Survey Grid (I.S.G.) marks.

### 5.1.2 Plan Requirements - Roads

The Plan shall show all relevant and useful information consistent with current Engineering Practise and include:

- a. the position of each road, and its relation to other roads; road centreline with the bearings of straight sections and the radius of curves; all recovery pegs and bench marks with the reduced levels thereof and include a schedule of set out listing Point Number, Easting, Northing Peg level and finished surface level the road chainage and details of pits and pipes; horizontal curve information including intersection angle; arc length; tangent length and secant; property boundaries; the provision made for drainage (with levels, gradients and dimensions of proposed drains, if any) and any drainage reserves and easements.
- b. longitudinal section with levels at intervals not exceeding those for cross-sections in (iii) showing the road alignment; the existing natural surface levels, the proposed levels, grades, vertical curves. RI\*'s of grade intersection points any alignments; TP SC SS locations, chainages and levels of intersecting roads. A separate row marked "WAE LEVELS" shall be included above the design levels.
- c. Cross-section and typical cross-sections showing the proposed width and convexity of carriageway, width and slope of footway, details of the proposed construction of kerbing, gutter and footway, and any proposed arrangement of tree planting, spacing shall be 10m on straight sections, curves and on transitions ie between SS and SC points.
- d. Kerb returns shall be designed using scales of 1:100 horizontal and 1:10 vertical or similar and shall indicate a longitudinal profile of kerb levels over the length of the return are between respective tangent points. Longitudinal profiles shall be included. The pit lintels at low points are to be plotted on the profile.

Sufficient survey and level information shall be obtained from the intersecting street ie for a minimum distance of 20m, to permit the design of the kerb return.

### 5.1.3 Plan Requirements – Drainage

A plan of the catchment area shall be included at a scale not less than 1:2000. All existing stormwater drainage works shall be shown.

Plan submitted shall include full details of run-off calculations entered on a flow schedule laid out in accordance with Council's standard drawing M252b.

The proposed pipelines shall be shown in heavy broken chain lines on the road plans together with the location and type of all pits, including the length of precast lintels where applicable.

A detailed longitudinal section of every pipeline shall be prepared showing:

- the existing ground surface (dotted line);
- the final or proposed surface (full line);
- the pipe size, type, class, joint type and backfill type structure number to correspond with plans and pipeline changes;
- pipe inverts and grade;
- flowrates and hydraulic grade lines; and
- pit types and pit 'k' values.

Special drainage structures eg Headwalls, scour protection shall be detailed.

## 5.2 Inspections

### 5.2.1 Footways

An Engineering Compliance Certificate (see Section 5.4) will need to be obtained after footway works have been completed.

- the levels of the footway;
- suitability of the transitions to the existing footway levels; and
- the alterations to any services within the footway.

A further Engineering Compliance Certificate must be obtained two (2) months after the turf has been laid on the public footpath. The Certifier must confirm:

- the finished level of the footway adjacent the kerb is not below the top of kerb;
- there is no step down from any footpaving or driveway crossings to the finished level of the footway;
- there are no localised depressions where water may pond or flows may be concentrated; and
- there are no areas of dead turf.

The building security deposit will not be refunded until this inspection is undertaken and the footway assessed as satisfactory.

#### Standard not met

If the development standard is not met, the sections of unsatisfactory footway will need to be repaired. If turf is dead, it will need to be replaced and maintained by the applicant for a further period of two months.

### 5.2.2 Footpath Paving

A Compliance Certificate must be obtained following placement of formwork and reinforcement, but prior to pouring of concrete.

The Certifier must check:

- thickness and alignment of the formwork;
- suitability of subgrade treatment; and
- the levels of the formwork.

#### Roller Testing

To ensure adequate compaction of the course under construction, the applicant shall make available a steel wheeled roller having a minimum weight of eight (8) tonnes and a minimum unit load on the rear roll equivalent to 5500kg per metre width of roll, and an operator.

Under the rolling test, the subgrade or pavement layer being tested shall not show any localised deflection under the roller wheel or wider scale movement, creep ahead of the roller or cracking. If the area being tested shows compaction under the test roller itself, as indicated by the roller permanently compressing the pass being tested in relation to the surrounding material further water and rolling of that layer shall take place.

Under no circumstances is any succeeding work to proceed until the compliance certificate has been obtained.



### 5.2.5 Drainage Works

Compliance certificates must be obtained at the following stages of construction;

- following excavation and bedding of the pipe but prior to backfilling, and
- following backfilling and restoration.

Inspections of any concrete structures will be required following erection of formwork and placement of reinforcement but prior to pouring.

#### Standard Not Met

Any sections of the drainage system that do not meet Council's standards must be removed and replaced.

## 5.3 Works as Executed Plans

Following satisfactory completion of the roadworks, a "works-as-executed" plan shall be prepared by a licensed surveyor and forwarded to Council prior to finalisation of the application.

On a copy of the approved road plans, the surveyor shall confirm the "as-executed" levels at each point on the plan where a level has been nominated. The plans shall show any additional work that has been carried out such as subsoil drains, service conduits, etc.

## 5.4 Maintenance Period

### 5.4.1 Footways

A maintenance period of two (2) months shall apply to the public footway. The building security deposit will not be released until this maintenance period is completed and a compliance certificate obtained to demonstrate the footway has been assessed as satisfactory.

### 5.4.2 New Public Roads

The applicant shall maintain all the works to the satisfaction of Council for a period of six (6) months after the date of final satisfactory inspection.

Prior to finalisation of the building works the applicant shall lodge with Council a cash deposit or bank guarantee which shall be refunded at the end of the maintenance period provided the work shows no defects.

The security deposit shall be calculated at 5% of the construction costs as estimated by Council.



City of Ryde  
Civic Centre  
1 Devlin Street  
Ryde NSW 2112

**[www.ryde.nsw.gov.au](http://www.ryde.nsw.gov.au)**