6. ROAD DESIGN ............................................................................................................................................................. 28

5.1.11 Cross-Sections of Roads ........................................................................................................................................ 24
5.1.12 Longitudinal Sections of Drainlines ...................................................................................................................... 24
5.1.13 Scales ...................................................................................................................................................................... 25
5.1.14 Dimensioning on Plans ........................................................................................................................................... 25
5.1.15 Standard Pegging Intervals ................................................................................................................................... 25
5.1.16 Chainage .................................................................................................................................................................. 25
5.1.17 Levels ...................................................................................................................................................................... 25
5.1.18 Protection of Existing Subdivisions .......................................................................................................................... 25
5.1.19 Site Fencing ............................................................................................................................................................ 25

6. ROAD DESIGN ............................................................................................................................................................. 28

6.1 STANDARD CROSS-SECTION ......................................................................................................................................... 28
6.1.1 Cross-Section Elements .............................................................................................................................................. 28
6.2 DESIGN SPEED ............................................................................................................................................................. 28
6.3 GRADE ........................................................................................................................................................................ 29
6.3.1 Maximum Grades ....................................................................................................................................................... 29
6.3.2 Minimum Grades ......................................................................................................................................................... 29
6.4 VERTICAL CURVES ..................................................................................................................................................... 29
6.4.1 General ....................................................................................................................................................................... 29
6.5 SIGHT DISTANCE .......................................................................................................................................................... 30
6.6 CROSSFALL .................................................................................................................................................................. 30
6.6.1 Normal Cross Section ................................................................................................................................................. 30
6.6.2 Normal Crossfall ......................................................................................................................................................... 30
6.6.3 Maximum and Minimum Crossfall ............................................................................................................................. 30
6.7 HORIZONTAL ALIGNMENT ............................................................................................................................................ 30
6.7.1 General ....................................................................................................................................................................... 30
6.8 CUL-DE-SACS .............................................................................................................................................................. 31
6.8.1 Length ....................................................................................................................................................................... 31
6.8.2 A Turning Area ............................................................................................................................................................ 31
6.8.3 The Minimum Radius .................................................................................................................................................. 31
6.8.4 Hammer Head ............................................................................................................................................................. 31
6.8.5 Footpath and Nature Strip Width .................................................................................................................................. 31
6.9 ROUNDABOUTS ........................................................................................................................................................... 31
6.10 ACCESS TO FRONTAGE ALLOTMENTS .......................................................................................................................... 31
6.10.1 General ....................................................................................................................................................................... 31
6.10.2 Driveway Grades ......................................................................................................................................................... 32
6.10.3 Maximum Sideslope .................................................................................................................................................... 32
6.11 ALTERNATIVE CROSS-SECTIONS ................................................................................................................................. 32
6.12 EXCAVATION OF DRIVEWAYS AND GARAGE SITES .................................................................................................... 32
6.12.1 Offsetting of the Crown ............................................................................................................................................. 32
6.12.2 Reverse Crossfall ....................................................................................................................................................... 32
6.12.3 Median Crossfall ......................................................................................................................................................... 33
6.12.4 Pavement Crossfalls ................................................................................................................................................ 33
6.12.5 Modification of the Footpath Cross-Section ............................................................................................................ 33
6.12.6 A Split-Level Road .................................................................................................................................................... 33
6.13 FOOTPATHS & NATURE STRIPS ................................................................................................................................... 33
6.13.1 Cross-section ............................................................................................................................................................. 33
6.13.2 Crossfall ................................................................................................................................................................... 33
6.13.3 Provision .................................................................................................................................................................. 34
6.13.4 Location .................................................................................................................................................................... 34
6.13.5 Thickness - Residential ............................................................................................................................................. 34
6.13.6 Thickness - Industrial ................................................................................................................................................ 34
6.13.7 Interlocking Paving ................................................................................................................................................... 34
6.13.8 Shared Paths ............................................................................................................................................................. 34
6.13.9 Grassing .................................................................................................................................................................. 34
6.14 UTILITY ALLOCATIONS .................................................................................................................................................. 34
6.15 KERB AND CHANNEL .................................................................................................................................................... 35
6.15.1 Location ................................................................................................................................................................... 35
7. DRAINAGE DESIGN .................................................................................................................................................... 40
   7.1 INTRODUCTION ................................................................................................................................................. 40
   7.2 PLANNING & LAYOUT ........................................................................................................................................ 40
   7.3 COMPUTATION OF RUNOFF ................................................................................................................................. 41
   7.4 RAINFALL INTENSITY ........................................................................................................................................ 41
   7.5 RETURN PERIOD ................................................................................................................................................ 41
   7.6 TIME OF CONCENTRATION ................................................................................................................................. 41
   7.7 RUNOFF COEFFICIENT C ................................................................................................................................ 42
   7.8 HYDRAULICS ...................................................................................................................................................... 42
   7.9 ALIGNMENT AT PITS .......................................................................................................................................... 42
   7.10 PIT LOCATIONS ................................................................................................................................................ 43
   7.11 KERB INLETS .................................................................................................................................................... 43
   7.12 PIT HEADLOSSES ............................................................................................................................................. 43
   7.13 PIPE FRICTION ................................................................................................................................................ 43
   7.14 MINIMUM PIPE SIZE ..................................................................................................................................... 44
   7.15 PIPE JOINTS ..................................................................................................................................................... 44
   7.16 PIPE FLOW VELOCITY AND GRADE .................................................................................................................. 44
   7.17 PIPE ALIGNMENT ........................................................................................................................................... 44
   7.18 MINIMUM COVER (TO TOP OF PIPE) .............................................................................................................. 44
   7.19 FREEBOARD ..................................................................................................................................................... 44
   7.20 ANCHOR BLOCKS ............................................................................................................................................ 44
   7.21 PROPERTY CONNECTIONS ............................................................................................................................. 45
   7.22 WATER QUALITY ......................................................................................................................................... 45
8. PAVEMENT DESIGN .................................................................................................................................................. 48
   8.1 RESIDENTIAL AND RURAL ................................................................................................................................. 48
   8.2 INDUSTRIAL ....................................................................................................................................................... 48
   8.3 ASPHALT SURFACING .................................................................................................................................... 48
9. SERVICE CONDUITS ................................................................................................................................................. 51
   9.1 LOCATION ......................................................................................................................................................... 51
   9.2 COVER .............................................................................................................................................................. 51
   9.3 MARKING ......................................................................................................................................................... 51
   9.4 TRENCH BACKFILL .......................................................................................................................................... 51
10. SUB-SOIL DRAINAGE ........................................................................................................................................... 54
11. STREET SIGNS ......................................................................................................................................................... 57
   11.1 INSTALLATION ............................................................................................................................................... 57
   11.2 GRAPHICS ...................................................................................................................................................... 57
12. STREET LIGHTING ...................................................................................................................................................... 60
13. STREETS CAPE ............................................................................................................................................................ 63
14. CONSTRUCTION .......................................................................................................................................................... 66
14.1 NOTICE PERIOD...................................................................................................................................................... 66
14.2 PRE COMMENCEMENT SITE MEETING .................................................................................................................. 66
14.3 ENVIRONMENTAL MANAGEMENT .......................................................................................................................... 66
14.4 TRAFFIC MANAGEMENT ........................................................................................................................................ 66
14.5 NOTICE FOR INSPECTION...................................................................................................................................... 66
14.6 COUNCIL INSPECTIONS ....................................................................................................................................... 66
14.7 INSPECTION AFTER NORMAL HOURS .................................................................................................................. 67
14.8 SPECIFICATIONS ..................................................................................................................................................... 69
14.9 SPECIFICATIONS AND STANDARD DRAWINGS ................................................................................................. 69
14.10 INSPECTION OF WORKS AND RELEASE OF HOLD POINTS ............................................................................. 69
14.11 BONDING OF WORKS ........................................................................................................................................... 69
14.12 START OF MAINTENANCE INSPECTION ............................................................................................................ 69
14.13 MAINTENANCE ...................................................................................................................................................... 69
14.13.1 Applicant Responsible for Maintenance ........................................................................................................... 69
14.13.2 Maintenance Bond ........................................................................................................................................... 69
14.14 END OF MAINTENANCE INSPECTION ................................................................................................................ 70
14.15 RE-ESTABLISHMENT SURVEY .......................................................................................................................... 70
15. STATEMENT OF COMPLIANCE ............................................................................................................................... 73
16. AS CONSTRUCTED DOCUMENTATION .................................................................................................................. 76
17. APPENDICES .................................................................................................................................................................. 78

Appendix A - Pavement Design Guidelines for New Subdivision – April 2002
Appendix B - Standard Drawings – Roads and Drainage
Appendix C - Specification for Road and Drainage Works
Appendix D - Out of Hours Inspection Agreement
Appendix E - Memorandum of Consent for Major Traffic Control Hours at Road Worksites
Appendix F - Quality Control Inspection Report Sheet
Appendix G - Non Standard Street Lighting Policy
Appendix H - Hume General Notes
1. INTRODUCTION

These guidelines have been prepared to assist developers, surveyors, consulting engineers, Hume Staff and planners in the preparation, submission, and examination of plans of subdivision and engineering documentation to facilitate subdivisional works.

It is expected that by clearly setting out Council’s procedure and design criteria for subdivisional development, time and effort will be saved on the part of both designers and Council officers.

These guidelines are intended to be a general guide, and it is expected there will occasionally be circumstances where a departure from the standards contained herein can be justified.

The issue of these guidelines should not inhibit the submission by Consultants of alternative designs, based on professional experience and established engineering practice and such alternative solutions will always be considered by Council on their merits.

The distribution of these guidelines does not imply limitation in any way of Council’s rights to impose differing conditions when assessing subdivision proposals, nor limitation of Manager Subdivisions discretion to vary as it considers necessary the engineering requirements in respect of a particular subdivision, having regard to good engineering practice.

It is to be noted that in the event of a conflict, the provisions of the Subdivisions Act, Planning and Environment Act, and regulations made pursuant to the provisions of these Acts, as amended from time to time, take precedence over these guidelines.
2. RESIDENTIAL SUBDIVISION ENGINEERING PLAN AND SUPERVISION APPROVAL PROCESS

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<th>Date</th>
<th>Affected Clause</th>
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</table>
2. RESIDENTIAL SUBDIVISION ENGINEERING PLAN AND SUPERVISION APPROVAL PROCESS

2.1 Initial Plan Submission

Consultant/Developer responsibilities

The following items must be included with the initial submission:

(a) one complete set of A1 engineering drawings.
(b) one set of layout drawings only, preferably A3 size.
(c) an overall drainage concept for the entire development and details of the impacts of upstream and downstream catchments.
(d) a catchment plan showing Q100 flow path for the entire development.
(e) drainage computations for Q5 & Q100 storms. Drainage computations shall also be provided within the body of the complete set of plans referred to in (a) above.
(f) a traffic study for multi stage developments to establish road hierarchy in accordance with Rescode definitions as required.
(g) a soil report and pavement design based on Standard Drawings SD 02-SD 08.
(h) An Environmental Management Plan (EMP)

Council Responsibilities

(a) Check that a Planning Permit has been issued for the Development and that an approved Overall Development Plan (1:2500) showing contours has been submitted.
(b) Check all data submitted against Council’s “Subdivision Development Guidelines”.
(c) Arrange where required a meeting with consultant to discuss design issues, seek clarification and further information as required.
(d) Respond in writing within 28 days of receipt of plans outlining any amendments required before plans are approved.

2.2 Amended Plan Submission

Consultant/Developer Responsibilities

(a) Submit one complete set of amended drawings for further review.
(b) Submit a detailed estimate, with a schedule, for all works to be supervised by Council.
(c) Include a Certified Plan of Subdivision (this plan should be provided within engineering plans referred to in 1(a) above)
(d) Third party Road Safety Audit if required.
(e) Provide evidence of any agreement/approval from a responsible authority or a referral authority.
(f) Make a payment for plan checking based on 0.75% of estimated cost referred to in (2.2(b)) above.
(g) Submit digital plan copies in pdf file format.

Council Responsibilities

(a) Check amended plans.
(b) Check that the following documents have been received.
   (i) Detailed Estimate and Schedule
   (ii) Certified Plan of Subdivision
   (iii) Agreement /approval from a responsible authority or referral authority
   (iv) Plan checking fee.
(c) If requirements of (a) & (b) have been met advise consultant by letter that the plans have
been approved.
(d) Forward stamped copy of the approved plans to the consultant.

2.3 Post Plan Approval - Preconstruction

Consultant Responsibilities
(a) Submit for approval a “construction site management plan”.
(b) Inform Council in writing one week before commencement of works, the name, address
    and contact details of the contractor.
(c) Arrange on-site meeting of the consultant, contractor and Council’s representatives before
    works commence.

Council Responsibilities
(a) Check the “construction site management plan”.
(b) Council representatives to be available for the pre construction meeting

2.4 Post Construction – Prior To Issue of “Statement of Compliance” or Prior to Placing Works
On Maintenance

Consultant Responsibilities
(a) Submit a certified copy of the construction cost tender schedule for purposes of calculating
    the supervision fee. Note that the Schedule is to reflect “As Built” costs and is to include all
    works within the road reserve, street trees, nature strip seeding and landscaping works
    within the road reserve.
(b) Submit all outstanding fees as required
   (i) Supervision fee - 2.5% of actual construction cost.
   (ii) Non-standard street lighting fee - $150 per pole, $20 for painted standard street
        light.
   (iii) Developer contribution (if required).
   (iv) Street tree contribution (if required).
   (v) Outstanding works bond (if required).
   (vi) Maintenance bond (if required).
(c) Submit electronic and hard copy version of “as-built” plans. The electronic copy of the plans
    shall be an AutoCAD Map DWG file (recent version) in GDA94-MGA Zone 55 mapping
    coordinates in accordance with the D-SPEC Standard, stored on a CD.
(d) Request issue of “Statement of Compliance”

Council Responsibilities
(a) Process the issue of Statement of Compliance expeditiously if all consultant responsibilities have been met.
(b) Upon written request from consultant return all Bank Guarantees and bonds no longer required.
### 3. POLICIES

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3. Policies

3.1 General

The provision of infrastructure within all subdivisions must where appropriate make reference to the following documents:

- Rescode
- Planning and Provision of Open Space (Part 1)
- Design Details and Technical Notes for Open Space Infrastructure (Part 2)
- Pavement Design Guidelines for New Subdivisions - RW Stamp and Associates – Appendix A
- Standard Road and Drainage Infrastructure Drawings – Appendix B
- Specification for the Construction of Roads and Drains - Version 2 – Appendix C
- Non Standard Street Lighting Policy – Appendix G
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## 4. ENGINEERING PLANNING

<table>
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<tr>
<td>1</td>
<td>26 July 2004</td>
<td>4.2</td>
</tr>
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*Revision No. indicates the version of the document.*
4. Engineering Planning

4.1 Subdivision Layout

The layout of roads and streets within areas to be subdivided requires most careful consideration. When designing the road layout, cognisance must be taken of the following factors:

- Character of the neighbourhood;
- Type of residential development;
- Location and inter-relationship of schools, shops and open space;
- Ingress and egress from the subdivision;
- Public transport system and routing;
- Conveyance of flood flows;
- Nature and topography of the terrain;
- Hierarchy of roads; and
- Costs of works.

Individual layouts must conform with Council’s outline development plan for the area. Should no such plan be available for a particular location, the owner or surveyor is to liaise with Council’s Manager Subdivisions to determine the most suitable configuration.

Although the engineering design of roads is the province of the Consulting Engineer, it is essential that the Surveyor or Planner preparing the subdivision proposal plan be fully aware of the engineering requirements for the various types of roads, and ensure that the road locations proposed are satisfactory. Should this not be the case, major alterations to the subdivision layout may be necessary to enable engineering criteria to be fulfilled.

The engineering factors affecting road location include: grades, site distances, alignment, intersection location, and design and access to lots.

It is essential also, that full and accurate topographical information be available at this stage, to enable an accurate assessment of the suitability of the proposed road locations.

4.2 Traffic Assessment

Council may request submission of a detailed report on the traffic impact, both internal and external, to a proposed subdivision.

Council may also request a Road Safety Audit. Such Audit is to comply with AustRoads, Standards Australia Publication HB 43:2002.

These Reports and Audits may be requested at the time of the Planning Permit application, or at a later date, if considered necessary by Council’s Manager Subdivisions.

4.3 Hierarchy of Roads

A description of various categories of roads with their specific requirements are as follows:-

4.3.1 Arterial Road

An arterial road is one that provides direct access from one district to another. Generally speaking, arterial roads have restricted frontage development and have dual carriageway pavements. In general, the location of arterial roads will be determined by the overall development plan.
4.3.2 Connector Street – Level 2

A street that carries higher volumes of traffic. It connects Access Places and Access Streets through and between neighbourhoods. The traffic volume varies between 3000vpd to 7000vpd. The target speed for this street is 60km/h.

The general location of Connector Streets should provide traffic routes as direct as possible between each “pocket” of the subdivision and traffic foci either within or external to the subdivision, such as nearby arterial roads, neighbourhood shopping centres, neighbourhood sporting facilities etc.

4.3.3 Connector Street – Level 1

A street that carries higher volumes of traffic. It connects Access Places and Access Streets through and between neighbourhoods. The maximum traffic volume is 3000vpd. The target speed for this street is 50km/h.

4.3.4 Access Street – Level 2 (As per Rescode there are two categories of Access Streets specified)

A street providing local residential access where traffic is subservient, speed and volume are low pedestrian movements facilitated. The traffic volume varies between 2000vpd to 3000vpd. The target speed for this street is 40km/h.

4.3.5 Access Street – Level 1

A street providing local residential access where traffic is subservient, speed and volume are low pedestrian movements facilitated. The traffic volume varies between 1000vpd to 2000vpd. The target speed for this street is 30km/h.

4.3.6 Access Place

A minor street providing local residential access with shared traffic, pedestrian and recreation use, but with pedestrian priority. The traffic volume varies between 300vpd to 1000vpd. The target speed for this street is 15km/h.

4.3.7 Access Lane

A side or rear lane principally providing access to parking on lots with another street frontage. The maximum traffic volume is 300vpd. The target speed for this street is 10km/h.

4.3.8 Industrial Road

An industrial road is one that services a subdivision which is zoned for industrial development.

4.3.9 Residential Rural Road

A residential rural road is one within a low density residential development where lot sizes are in excess of 1 hectare.

4.3.10 Service Road
A service road is one located at the side of a through carriageway to provide frontage access to the adjacent properties.

4.3.11 *Pathways – Pedestrian and Bicycle*

Provision shall be made for Pedestrian and Bicycle Pathways where required by Council. Such locations shall be to the satisfaction of Council, and should address the objectives of Council’s Open Space and Bicycle Strategies.
4.4 Road Reserves

4.4.1 Widths

<table>
<thead>
<tr>
<th>Road Category</th>
<th>Road Reserve Width</th>
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<tr>
<td>Arterial Road</td>
<td>32.00 metres (plus a tree reserve on each side to prevent vehicular access to abutting properties.)</td>
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<tr>
<td>Connector Street – Level 2</td>
<td>22 metres</td>
</tr>
<tr>
<td>Connector Street – Level 1</td>
<td>22 metres</td>
</tr>
<tr>
<td>Access Street – Level 2</td>
<td>16 metres</td>
</tr>
<tr>
<td>Access Street – Level 1</td>
<td>16 metres</td>
</tr>
<tr>
<td>Access Lane</td>
<td>5.5 metres</td>
</tr>
<tr>
<td>Industrial Road</td>
<td>22 metres</td>
</tr>
<tr>
<td>Residential Rural Road</td>
<td>20 metres</td>
</tr>
<tr>
<td>Service Road</td>
<td>12 metres</td>
</tr>
<tr>
<td>Pathway</td>
<td>5 metres</td>
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4.4.2 Splays

In residential areas, the minimum splay at the intersection of access, collector and trunk collector roads shall be 3 metres by 3 metres. Intersections of all other roads shall have minimum splays of 5 metres.

4.5 Public Open Space Requirements

Where a plan of subdivision creates land set aside for use as public open space.

* Reference is to be made to the following parts of this document:

Part 1 Guidelines for the Planning and Provision of Open Space

Part 2 Design details and Technical Notes for Open Space

4.6 Drainage & Flood Prevention

For all subdivisions Hume City Council is the responsible drainage authority for catchments under 60 hectares. For catchments, above 60 hectares, Melbourne Water is the Regional Drainage Authority.

Melbourne Water is the responsible Catchment Authority, and all cross drainage works on creeks and waterways shall be to the approval of that Authority. For other minor and major drainage, Hume City Council is the Responsible Drainage Authority.

Southern Rural Water is responsible for the licensing of farm dam construction works and the take and use of water from surface and groundwater resources.

Before a Plan of Subdivision is sealed, the developer must submit an overall catchment plan and a subdivision layout plan showing:-

i. contour lines;
ii. the total catchment;
iii. zoning;
iv. proposed property boundaries and construction stages;
v. drainage layout;
vi. contributing area and calculated discharge capacity of all drains serving an area greater than 10ha and all drains discharging out of the proposed development;
vii. proposed drainage works upstream and downstream of the proposed development; and
viii. water quality treatment measures.

4.6.1 Drainage Available to All Lots

Care is to be taken when subdivisional layouts are being designed to ensure that every lot can be adequately drained to either street drainage or a drainage easement provided for the purpose.

4.6.2 Provision for Q100 Storm

Provision shall also be made to ensure that the run-off resulting from a storm having a 100 year frequency of occurrence is able to pass through the subdivision along streets and reserves. This is to ensure that there is no likelihood of dwellings being flooded by a storm of this magnitude. For this purpose it is desirable that a road or a drainage and sewerage reserve be located along each natural drainage line, as the roadway will then provide a channel for overland stormwater flow during storms of greater than capacity of underground drainage system. Surcharging of the stormwater drainage system that results in overland flow through allotments will not be permitted.

4.7 Easements

4.7.1 Provision

Where it is necessary that drains, sewers, electricity cables, telecom cables etc., be located within a lot, an easement in favour of the relevant authority is to be provided.

4.7.2 Size

The width of an easement is to be determined by the relevant authority, however for drainage, the minimum width is 2.00 metres and for drainage and sewerage, the minimum width is 3.00 metres.

4.7.3 Location

Easements are to be matched with those existing on adjacent properties to ensure the proposed locations conform therewith and the use for which the easement is created can be achieve.

4.8 Planning Permit and Certification of Plan of Subdivisions

Refer to Development Services Department Procedures for issue of Planning Permit and certification of Plan of Subdivision.
4.9 Building Permit

Building permits will be required for any of the following infrastructure items constructed in conjunction with a subdivision development.

- Buildings
- Retaining walls in excess of 1000mm in height
- Entrance structures
- Gazebo’s
- Bridges/walkways

4.10 Construction of Works

4.10.1 Works to Comply with Plans

All works shall comply with the certified plan, the approved engineering plans and specifications and the requirements of the Planning Scheme or permit.

4.10.2 Works May Commence After Certification

Works shall not be commenced until the plan has been certified, the engineering plans and specifications have been approved and any agreement required by a Responsible Authority or referral authority has been entered into.

4.10.3 Supervision Fee

Works required by Council will be supervised by Officers of Council and a charge of 2.5% of the certified cost of the work will be made.
## 5 ENGINEERING PLANS

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5. Engineering Plans

5.1 Presentation

5.1.1 Preparation

Full engineering plans for all roadworks and associated stormwater drainage, easement drains and allotment improvement works are to be prepared and certified by a qualified Civil Engineer.

5.1.2 Size of Sheets

All engineering plans shall be drawn on standard size sheets, the following sheet sizes only being acceptable:

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<tr>
<td>A2</td>
<td>594mm x 420 mm</td>
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<td>A3</td>
<td>420mm x 297mm</td>
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5.1.3 Content

Plans should, in general, include the following:

- Title Block
- Locality Plan
- Layout and Stage Plan
- Plan of each new road
- Detail Plan of each Intersection
- Longitudinal Section of each road
- Standard Cross-Sections
- Cross Sections of each road
- Longitudinal Section of each drainage line
- Hume City Council General Notes on the face sheet. See Appendix H for Hume General Notes.

The following information should be included in each of the above.

5.1.4 Title Block

1. Estate Name (if any)
2. Scales
3. Plan Number and Sheet Number
4. Schedule and Date of Amendments
5. Signed design certification, by a qualified Civil Engineer
6. Signed checking certification, by a qualified Civil Engineer

5.1.5 Locality Plan

Location of the subdivision in relation to adjacent suburbs, main roads, major streets etc.
5.1.6  **Layout and Stage Plan**

For large subdivisions, the layout plan should show the relationship of all new roads to each other, and to existing roads adjoining the subdivision.

Where development is to be carried out by stages, the boundaries of proposed stages should be shown on this plan, and the stages identified by numbering.

For small subdivisions, where all new roads can be shown on one detail plan, the layout plan may be omitted.

5.1.7  **Plan**

The plan of each road shall include:-

a  Road reserve boundaries;
b  Allotment boundaries, both existing and proposed;
c  Centre-line, or other construction line;
d  Chainages, on centre-line or construction line;
e  Bearings of the centreline or construction line;
f  Offsets, if the construction line is not the centreline;
g  Tangent point of chainages of each curve;
h  Radius, arc length, tangent length and secant distance of each curve;
i  Road reserve boundaries, centreline, and bearing of each intersection road;
j  Chainage of the Intersection Point of road centrelines;
k  Kerb lines, kerb radii, and chainage of all tangent points of the kerb line;
l  Edge of pavement where no kerb is to be constructed;
m  Dimensioned road reserve, footpath, and pavement widths, where these differ from the standard cross-section;

n  Location and details of signs, and roadmarkings to be provided;
o  Drainage line locations, diameters, and class of pipe;
p  Manhole locations, and inlet and outlet invert levels;
q  Gully locations, and invert and kerb levels;
r  Location and levels of existing utilities or other existing works within the site;
s  Limits and levels of allotment filling or grading;
t  Location and levels of Bench Marks and reference pegs;
u  North Point; and
v  Overland flows shown by direction arrow on each allotment.

5.1.8  **Detail Plan of Intersections**

Intersection detail plans shall include all the relevant information required for Plans, as listed above, together with additional details such as kerb levels on all kerb returns, pavement contours, and channelisation works.
5.1.9 Longitudinal Sections of Roads

The longitudinal section of each road shall include:-

a. Chainages;
b. Existing surface and peg levels; (Natural surface levels on both building lines)
c. Design road centreline and kerb invert levels; (Including low points and pits)
d. Cut or fill depths;
e. Design grades; (minimum grade is 0.5%)
f. Chainage and levels of grade intersection points;
g. Chainage of tangent points of vertical curves;
h. Lengths of vertical curves; (Minimum length of vertical curve is 15m)
i. Sections on control lines on superelevated curves (i.e. pavement edges, kerb, or lane edges).
j. Grading for future stages showing a minimum 100m

5.1.10 Standard Cross-Sections

A standard cross-section shall be shown for each road, including:-

a. Road reserve width;
b. Pavement widths;
c. Footpath widths;
d. Crossfalls of pavement and footpaths;
e. Pavement depth
f. Type of kerb and channel
g. Type of pavement surfacing
h. Natural surface levels at boundary lines
i. Desirable crossfalls of pavement, footpath, nature strip and batters.

5.1.11 Cross-Sections of Roads

A cross-section shall be shown for each pegged chainage on each road, except in flat country where all cross-sections conform to the standard cross-section.

Cross-sections shall show:-

a. Road reserve boundaries;
b. Pavement centre-line (or other construction line);
c. Natural surface;
d. Design Cross-Section;
e. Crossfall of pavement and footpath, pavement and footpath widths, and pavement depths wherever these differ from the standard cross-section.

5.1.12 Longitudinal Sections of Drainlines
A longitudinal section of each drainage line shall be shown, including:

a. Chainages;
b. Existing surface levels;
c. Design invert levels;
d. Manhole chainages, and inlet and outlet invert levels;
e. Distances between manholes;
f. Grade of each pipe;
g. Diameter of each pipe length;
h. Class of each pipe length; and
i. Design flow and velocity for each pipe.
j. Actual discharge and pipe capacity
k. Pipe type (other than RCP)
l. Depth to invert from finished surface
m. Joint Type
n. Crushed rock backfill limits

5.1.13 Scales

a) General

Scales used for all plans should preferably to those recommended by the Standards Association and N.A.A.S.R.A. namely 1:1, 1:2 and 1:5 and multiples of 10 of these scales.

Although not preferred, the following scales will be accepted 1:25 and 1:125 and multiples and sub multiples of 10 of these scales. No other scales are acceptable.

b) Typical Scales

The following scales are suggested for particular uses but these may be varied as appropriate to the works concerned.

<table>
<thead>
<tr>
<th>Plan</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Section</td>
<td>1:1000 or 1:500</td>
</tr>
<tr>
<td>Longitudinal Section</td>
<td></td>
</tr>
<tr>
<td>Horizontal</td>
<td>1:1000 or 1:500</td>
</tr>
<tr>
<td>Vertical</td>
<td>1:100 or 1:50</td>
</tr>
<tr>
<td>Intersection Details</td>
<td>1:200 or 1:100</td>
</tr>
<tr>
<td>Cross-Sections</td>
<td></td>
</tr>
<tr>
<td>Horizontal</td>
<td>1:100</td>
</tr>
<tr>
<td>Vertical</td>
<td>1:100 or 1:50</td>
</tr>
</tbody>
</table>

5.1.14 Dimensioning on Plans

Linear dimensions on all roadworks plans will be in metres, with the exception of some detail plans of small structures (eg manholes) and some standard plans (e.g. kerb and channel), which may be in millimetres.
Details of methods of dimensioning shall be in accordance with A.S 1155 - Appendix A - Metric Units in Construction.

5.1.15  **Standard Pegging Intervals**

Centrelines (or other construction lines) should be pegged and levelled at 20.0m intervals, with further subdivision to 10.0m to 5.0m intervals where necessary due to horizontal or vertical curvature.

5.1.16  **Chainage**

Chainage on plans shall be expressed to 0.01 metre.

5.1.17  **Levels**

All levels shall continue to be reduced to Australian Height Datum.

In general, all levels on plans shall be expressed to two decimal places of a metre.

Reduced levels of Bench Marks and Reference Pegs shall be expressed to 0.001 metre.

5.1.18  **Protection of Existing Subdivisions.**

Protection of existing adjoining subdivisions from overland flows is to be shown with appropriate cut off drains, inlet pit structures, grated pits etc. Note that easements may be required over cut-off drains. Where cut-off drains may be required on land adjoining the subdivision, then written clearance agreeing to the proposal is to be obtained from the affected land owner by the Developer. This clearance is to be forwarded to Council at the same time as the Engineering Plans are submitted for approval.

5.1.19  **Site Fencing.**

Temporary security site fencing is required around the perimeter of all “infill” subdivisions. The fencing of “Greenfield” subdivisions will be considered for each site, however a minimum of fencing across all traffic access points is to be provided. Fencing is to be of a type similar to Builders Site Fencing, ie, rigid chain mesh panels at least 1.5m high secured by pegs or concrete blocks.
6. ROAD DESIGN

<table>
<thead>
<tr>
<th>Revision No.</th>
<th>Date</th>
<th>Affected Clause</th>
</tr>
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<td>6.10.2, 6.13.1, 6.18, 6.18.1, 6.18.2, 6.18.3</td>
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<td>May 2007</td>
<td>6.1, 6.2, 6.6.3, 6.10.3, 6.13.3</td>
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<td>14 June 2005</td>
<td>6.4.1, 6.6.2, 6.6.3, 6.8.4, 6.10.1, 6.12.1, 6.13.8, 6.15.2, 6.15.3, 6.16.2</td>
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<td>6.8.4 &amp; 6.13.6</td>
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Revision No. | Date            | Affected Clause |
--------------|-----------------|-----------------|
5             | August 2008     | 6.10.2, 6.13.1, 6.18, 6.18.1, 6.18.2, 6.18.3 |
4             | May 2007        | 6.1, 6.2, 6.6.3, 6.10.3, 6.13.3           |
2             | 14 June 2005    | 6.4.1, 6.6.2, 6.6.3, 6.8.4, 6.10.1, 6.12.1, 6.13.8, 6.15.2, 6.15.3, 6.16.2 |
1             | 22 July 2004    | 6.8.4 & 6.13.6 |
6. Road Design

6.1 Standard Cross-Section

The standard Cross Section for various roads is shown in new subdivisions shall be as follows:

- Urban Residential Streets - Refer to Standard Drawings SD02-SD06.
- Industrial Roads – Refer to Standard Drawing SD07
- Rural Residential Streets - Refer to Standard Drawing SD08

6.1.1 Cross-Section Elements

Standard Cross Section elements for use in any special cases where standard road types are inapplicable, shall be as follows:-

<table>
<thead>
<tr>
<th>Element</th>
<th>Min.</th>
<th>Std.</th>
<th>One-Way</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Lane</td>
<td>3.0m</td>
<td>3.4m</td>
<td>4.0m</td>
</tr>
<tr>
<td>Parking Lane</td>
<td>2.6m</td>
<td>3.0m</td>
<td></td>
</tr>
<tr>
<td>Turn Lane</td>
<td>3.0m</td>
<td>3.4m</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>1.2m</td>
<td>2.0m</td>
<td>5.2m</td>
</tr>
<tr>
<td>Shoulders</td>
<td>1.20m</td>
<td>1.20m</td>
<td>2.00m</td>
</tr>
</tbody>
</table>

6.2 Design Speed

The design speed, on which the geometric design of each road type is based, shall be:-

<table>
<thead>
<tr>
<th>Road Type</th>
<th>DESIGN SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Access Street</td>
<td>60 km/h</td>
</tr>
<tr>
<td>Connector Road Level 1</td>
<td>60 km/h</td>
</tr>
<tr>
<td>Connector Road Level 2</td>
<td>70 km/h</td>
</tr>
<tr>
<td>Commercial &amp; Industrial Access</td>
<td>60 km/h</td>
</tr>
</tbody>
</table>
6.3.1 Maximum Grades

The desirable maximum grades, listed below, are to be considered the maximum for normal design purposes.

Where the topography makes it difficult to provide a road location which will conform to these grades, grades up to those shown as "Absolute Maximum" may be used.

In extreme cases, the Council may give approval to the use of grades steeper than “Absolute Maximum” values, but such approval will only be given when all other possible alternatives have been fully investigated, and proven to be impracticable.

<table>
<thead>
<tr>
<th></th>
<th>DESIRABLE MAXIMUM</th>
<th>ABSOLUTE MAXIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Access</td>
<td>10%</td>
<td>16%</td>
</tr>
<tr>
<td>Collector Connector</td>
<td>8%</td>
<td>12%</td>
</tr>
<tr>
<td>Trunk Collector</td>
<td>6%</td>
<td>10%</td>
</tr>
<tr>
<td>Commercial &amp; Industrial Access</td>
<td>6%</td>
<td>10%</td>
</tr>
<tr>
<td>Trunk Collector</td>
<td>6%</td>
<td>8%</td>
</tr>
<tr>
<td>Arterial Frontage Access</td>
<td>6%</td>
<td>8%</td>
</tr>
<tr>
<td>No Frontage Access</td>
<td>5%</td>
<td>7%</td>
</tr>
</tbody>
</table>

6.3.2 Minimum Grades

The minimum grade for all roads, based on kerb and channel drainage requirements, shall be:

Desirable Minimum 1.0%
Absolute Minimum 0.5%

6.4 Vertical Curves

6.4.1 General

A vertical curve, of parabolic form, shall be provided at every change of grade where the algebraic change of grade is more than:

- Access, Collector and Trunk Collector - 1.0%
- Arterial roads - 0.6%

Every effort should be made to provide vertical curves as long as possible, for improved appearance. Generally, the minimum length of a vertical curve shall be 15m.

All vertical curves shall be designed in accordance with the current VicRoads Road Design Guidelines.
6.5 Sight Distance

Absolute Minimum sight distance is that required for a driver to perceive an object 0.20m high on the road ahead, and to stop the vehicle before reaching the object.

This sight distance shall be available at every point on every road.

Absolute minimum sight distance is measured from a point 1.15m above the road centreline to a point 0.20m above the centreline.

The requirements of the sight distance, both on straights and at intersections, shall be in accordance with the current VicRoads Road Design Guidelines.

6.6 Crossfall

6.6.1 Normal Cross Section

(a) On straight lengths of two-way road the pavement cross section will normally be graded with the high point (crown) on the pavement centreline, with a fall to each channel.

However, on steep side slopes, the crown may be offset, towards the higher side of the road to obtain better conformity of road levels with the natural side slope.

(b) On divided roads each pavement will normally be graded to fall from the median to the outer channel.

6.6.2 Normal Crossfall

The normal crossfall of pavement and shoulders on straight alignment shall be:-

(a) Asphaltic Concrete surfaced pavements - 1 in 30
(b) Bituminous Sealed Shoulders - 1 in 30
(c) Gravelled Shoulders - 1 in 25

6.6.3 Maximum and Minimum Crossfall

Where steeper or flatter crossfalls than the normal are required, for example at intersections, or turning circles of cul-de-sacs, the maximum and minimum permissible pavement crossfalls shall be:-

<table>
<thead>
<tr>
<th>Maximum Crossfall</th>
<th>Minimum Crossfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in 20</td>
<td>1 in 40</td>
</tr>
</tbody>
</table>

6.7 Horizontal Alignment

6.7.1 General

The minimum permissible radius of horizontal curve is dependent on the design speed, and the maximum acceptable superelevation of the curve.

Horizontal alignment of all roads shall be designed in accordance with the requirements of VicRoad Design Guidelines.

6.8 Cul-De-Sacs
6.8.1 Length

The length of a cul-de-sac shall not exceed 200m in an Urban Residential Subdivision, 200m in an Industrial Subdivision, or 500m in a Rural Residential Subdivision.

6.8.2 A Turning Area

A turning area shall be provided at the end of every cul-de-sac.

6.8.3 The Minimum Radius

For a cul-de-sac with a circular court bowl, the minimum radius of the kerb and channel invert shall be:

i) within the turning circle
   a) in an Urban Residential or Rural Residential Subdivision - 9m;
   b) in an Industrial Subdivision - 16m.

ii) in the approaches to the turning circle
    a) in an Urban Residential or Rural Residential Subdivision - 15m;
    b) in an Industrial Subdivision - 20m.

6.8.4 Hammer Head

For a hammer head in an Urban Residential Subdivision, the size of the head shall be a minimum of 17.0m x 5.50m to face of kerb / invert and the minimum radius of the kerb and channel face of kerb / invert at the approach returns shall be 8.0m, all contained within a Road Reserve minimum of 22.0m x 7.50m.

6.8.5 Footpath and Nature Strip Width

The footpath and nature strip width shall be not less than 4.0m, at any point in the turning area, or in the approach to the turning circle.

The minimum diameter of the circle which can be contained within the road reserve is therefore:

(a) In an Urban Residential or Rural Residential Subdivision - 26.0m
(b) In an Industrial Subdivision - 40.00m.

6.9 Roundabouts

Roundabouts should be designed according to Austroads Handbook HB 69.13 – 1993, Part 6: Roundabouts.

6.10 Access To Frontage Allotments

6.10.1 General

Steep sideslope of the natural surface can result in difficulty in provided vehicular access to allotments fronting the road. Generally, a driveway should be constructed on the low side of an allotment.

6.10.2 Driveway Grades
The desirable maximum driveway grade is 25% (1 in 4) for a residential allotment, and 16% (1 in 6) for an industrial lot. In steep terrain, driveway cut or fill earthworks into the allotments are to be shown on the plans so that Builder access is created with the subdivision works.

6.10.3 Maximum Sideslope

The maximum acceptable sideslope, based on grading driveways to the natural surface at 6.0m from the alignment (ie. at the standard buildings line), for various standard road cross-sections, is:-

a) Residential Access Road - 1 in 8.4
b) Residential Collector - 1 in 9.0
c) Residential Distributor - 1 in 9.6
d) Industrial Access - 1 in 13.7
e) Industrial Collector or Trunk Collector - 1 in 18.0
f) Sub-Arterial - 1 in 12.6
g) Arterial with Access - 1 in 15.0

6.11 Alternative Cross-Sections

Where steeper side-slopes than the above occur, the following variations of the standard cross-section may be adopted, used either separately or in combination, subject to the approval of Council.

6.12 Excavation of Driveways and Garage Sites

Excavation of Driveways and garage sites, on lots on the high side of the road, is a possible solution where only a small number of lots (e.g 4 or 5) is affected, such as in a short cutting or at the end of a cul-de-sac.

6.12.1 Offsetting of the Crown

Offsetting of the crown, on a two-way road, is permissible, provided that sufficient stormwater capacity is retained in the channel and roadway on the high side of the road. Required capacity will depend on catchment, and on the spacing of storm water entry pits. Offset crown widths to be determined in consultation with Asphalt Companies to ensure that the crown is able to be laid with asphalt machinery.

In extreme cases, where drainage requirements can be adequately provided, a pavement with one-way crossfall may be approved.

6.12.2 Reverse Crossfall

Reverse Crossfall, on the uphill lane of divided roads, is permissible provided that adequate drainage capacity is provided in the uphill median channel, and precautions taken to intercept flow at median openings.
6.12.3 Median Crossfall

Median Crossfall, on divided roads, is acceptable with a maximum of 0.16 (1 in 6) being desirable, and 0.33 (1 in 3) as an absolute maximum, unless a retaining wall is provided.

At median openings however, the pavement crossfall shall not exceed 0.05 (1 in 20).

6.12.4 Pavement Crossfalls

Pavement Crossfalls, may be steepened if required, to an absolute maximum of 0.05 (1 in 20).

6.12.5 Modification of the Footpath Cross-Section

Modification of the footpath cross-section, on the downhill side of the road, by reducing the width of the area graded to the kerb to an absolute minimum of 3m, may be carried out subject to the approval of Council.

As this solution increases the catchment area discharging stormwater into the downhill frontage lots, it should be avoided where possible.

6.12.6 A Split-Level Road

A split level road, will permit access to allotments on each side of the road on sideslopes up to the maximum acceptable for subdivision.

Preferably, subdivision layout should be such that one-way operation is possible on each level.

Where this is not possible, the standard split level cross-section may still be used, provided that the number of allotments with access to each level of the road does not exceed six. Where the number of lots with access to either level of the road exceeds six, the pavement width of that level of the road shall be the same widths as for a standard road of that type.

Where split levels are used in a cul-de-sac, the levels shall come together at the neck of the court bowl.

6.13 Footpaths & Nature Strips

6.13.1 Cross-section

The Cross-section of the footpath and nature strip, shall conform to the standard cross-section shown on Standard Drawing, unless otherwise approved by Council. Footpaths are generally built at an offset of 50mm from the title boundary, including around corner splays / radii.

The standard crossfalls shown on the Standard Drawing, must not be exceeded at any location where vehicular access to allotments may be required.

6.13.2 Crossfall

Where full width concrete footpath paving is to be provided, the footpath crossfall shall be 1 in 33.

6.13.3 Provision
Urban Residential Streets - In accordance with the requirements of Section 56.04 and 56.07, tables C6 & C7 of the ResCode.

Every Court, footpaths shall be shown at least on one side.

Rural Residential Streets - Generally not required unless specifically provided for in the Development Plan.

Industrial Streets - 1.5m wide footpath shall be provided on at least one side of the street.

6.13.4 Location

Adjacent to commercial sites, paving shall extend the full width of the footpath, from the property alignment to the kerb. The footpath shall be located abutting the property alignment unless otherwise directed by Council. Footpaths shall not be placed against kerb lines unless site restrictions dictate otherwise, which still will be subject to Council approval.

6.13.5 Thickness - Residential

Concrete footpath paving shall be minimum 125mm thick, reinforced with SL62 mesh, in residential subdivisions.

6.13.6 Thickness - Industrial

Concrete footpath paving shall be minimum 125mm thick, with SL62 mesh centrally located.
Concrete driveways to be a minimum of 200mm thick, with SL82 mesh centrally located.

6.13.7 Interlocking Paving

The use of interlocking paving blocks as an alternative to concrete will be considered in individual cases and approval determined by Council’s Engineer.

6.13.8 Shared Paths

All shared off-road bicycle and pedestrian paths shall be 2.50m wide.

6.13.9 Grassing

One Hundred millimetres of loosely compacted thickness of approved topsoil shall be placed over cut and fill areas on all nature strips and on all areas where scour may be a problem in accordance with the Standard Specification.

Such areas shall be grass seeded, fertilised and maintained in accordance with the Standard Specification.

6.14 Utility Allocations

The location of utility services is to be in accordance with the recommendation of the Co-ordinations of Streetworks Code of Practice, Victoria.
6.15 Kerb and Channel

6.15.1 Location

Concrete kerb and channel shall be provided on both sides of all urban residential, commercial and industrial roads.

6.15.2 Kerb and Channel Types

The standard kerb and channel profile shall be as shown on standard drawing number SD 101. In general the SM2M profile is to be used in residential developments.

The exception to the use of this profile kerb and channel may occur at the following locations:-

a) Kerb only may be used with one-way crossfall pavements and reverse fall nature strip on high side;
b) Industrial streets shall have barrier type kerb and channel unless approved otherwise;
c) Medians & Traffic Islands, where semi-mountable is shown, shall be M1 and in accordance with Standard Draining No. SD102
d) Roundabout outer kerbs are to be SM2 from TP to TP. Roundabout splitter islands are to be SM1. Roundabout central island outer kerb is to be SM3
e) Barrier kerb shall be used where kerb abuts a Council reserve.

6.15.3 Grading

The grading of kerb and channel will normally conform to the road centreline grading and shall not be less than 0.5% (1 in 200).

a) Minimum kerb and channel grade shall be 0.5% (1 in 200);
b) Every endeavour to provide vertical curves of as long a length as possible, at all changes of grade. Generally a minimum length of 15m shall be used.

6.15.4 Kerb Radii

The minimum radius of the kerb and channel, measured to back of kerb, at an intersection shall be as follows:-

<table>
<thead>
<tr>
<th>Type of Intersection</th>
<th>Minimum Radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access Street to any Street</td>
<td>8.0m</td>
</tr>
<tr>
<td>Collector or Trunk Collector Street to Trunk Collector or Arterial</td>
<td>12.50m</td>
</tr>
<tr>
<td>Arterial to Arterial</td>
<td>15.00m</td>
</tr>
</tbody>
</table>

6.16 Surface Drainage

6.16.1 Grade

The minimum grade of kerb and channel shall be 0.5% (1 in 200).

6.16.2 Flow
a) The maximum depth of flow in the channel, for a design storm, shall be 0.14m for barrier type kerb and channel, 0.11m for SM2 roll-over type kerb and channel, and 0.075m for SM2M roll-over type kerb and channel.

b) The maximum width of flow in the channel and roadway for a design storm shall be not greater than the parking lane width or 3.0m, whichever is the lesser;

c) These requirements will determine the maximum spacing of entry pits, and this, at flat locations, determine the road grade line;

d) At locations where the level at the property alignment is below the kerb level, particular care must be taken that the maximum allowable depth of flow (in Clause 16.1.2 above) is not exceeded, to prevent flooding of frontage properties.

6.16.3 Crossfall

The minimum crossfall of the pavement shall be 2.5% (1 in 40) for asphaltic concrete, and 3.0% (1 in 33) for bituminous sealed pavement.

6.16.4 Superelevated

Where curves are superelevated, it is necessary to ensure that any low points in the kerb and channel resulting from the application of superelevation, are adequately drained.

6.16.5 Intersection Drainage

a) At intersections, particularly where traffic islands are provided, care must be taken to ensure that all low points are drained;

b) Concentrated flow across the pavement, eg. from the end of a traffic island to the channel, must be prevented by the provision of additional entry pits as necessary;

c) Drainage entry pits at intersections should, where possible, be located where they are unlikely to be run over the traffic, eg. preferably at the tangent points of kerb returns rather than on the return, to prevent possible damage to the pit, and danger to cyclists.

6.17 Bridges

6.17.1 Cross Section

A bridge, or a box culvert with the top of the deck at road level, with a length measured along the centre line of the road of 6.0m or less, shall extend the full width of the road reserve.

A bridge, or box culvert with the deck at road level, with a length measured along the road centreline of greater than 6.0m, shall have a width between kerbs equal to that of the approach road, ie. the road in which it is located.

In the case of roads with dual carriageways, a bridge is to be built on the alignment and width between kerbs (excluding emergency stopping lanes) of each pavement.

a) A bridge on an Access Street or a Collector Road shall have a pedestrian footway on one side only;
b) Bridges on an Arterial Road with frontage lots shall have a footway on each side of the road. (ie. on the outer side of each bridge); and

c) Bridges on an Arterial Road with no frontage lots shall, in general, not require footways.

6.17.2 Footway Clearance

A pedestrian footway shall have a clear width of not less than 1.8m, from the inside face of the handrail to the top of the kerb.

6.17.3 Surfacing

A bridge or box culvert with the deck at road level, shall be surfaced with asphaltic concrete of minimum thickness 50mm.

6.18 Vehicular Crossings

6.18.1 Industrial Vehicle Crossings.

Unless required under conditions of the Planning Permit, vehicle crossings for Industrial Subdivisions are not required to be built with the subdivision. Construction of these crossings will be the allotment owner’s responsibility to arrange the construction at their cost. Industrial crossings are to be in accord with standard drawing SD 302.

6.18.2 Residential Vehicle Crossings.

Unless required under conditions of the Planning Permit, the Developer can elect to either construct or not construct the vehicle crossings for Residential Subdivisions. Crossings not built with the subdivision will then become the allotment owner’s responsibility to arrange the construction at their cost. Residential crossings are to be in accord with standard drawing SD 300.

6.18.2 Rural Vehicle Crossings & Culverts.

Unless required under conditions of the Planning Permit, the Developer can elect to either construct or not construct the vehicle crossing for Rural Subdivisions. Crossings not built with the subdivision will then become the allotment owner’s responsibility to arrange the construction at their cost. Rural crossings are to be in accord with standard drawing SD 269.
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# 7. DRAINAGE DESIGN

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<th>Revision No.</th>
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<td>7.6</td>
</tr>
<tr>
<td>2</td>
<td>20 April 2006</td>
<td>7.2</td>
</tr>
<tr>
<td>1</td>
<td>14 June 2005</td>
<td>7.5, 7.6, 7.18, 7.19 &amp; 7.21</td>
</tr>
</tbody>
</table>

- Revision No. 5, 4, 2, and 1 correspond to dates August 2008, May 2007, 20 April 2006, and 14 June 2005 respectively. The affected clauses are indicated below each date.
7. Drainage Design

7.1 Introduction

This section sets out the requirements for drainage works to be installed within the municipality. It is not intended to prohibit any alternative arrangements or approaches. Innovative or non-standard designs may be considered, but not necessarily accepted. Sufficient data and principles of design for any innovative or non-standard design must be submitted for consideration. Council reserves the right to impose additional requirements, or permit exceptions to any design.

Aspects not specifically referred to in these notes should be generally in accordance with one or more of the following documents:

- “Australian Rainfall and Runoff”, Institution of Engineers, Australia (AR&R).
- “Land Development Manual”, Melbourne Water
- “Drainage Design Guidelines”, Vic Roads
- “Workshop on Urban Piped Drainage Systems”, Swinburne University of Technology.

7.2 Planning & Layout

In proposed subdivisions, the drainage system must have provision for runoff from the upstream catchment, and downstream drainage works if required.

Main drains should follow the valleys in reasonably straight alignments, with a minimum of deviation. Natural drainage paths serving areas greater than 5ha shall be preserved, in the form of roadways, parkland, walkways, etc., and shall have a discharge capacity at least equal to that of the pipe drain. Private allotments will not be permitted downstream of low points in roadways, downhill court bowls, or any other locations where drainage flows may concentrate.

The Q100 overload flow must be confined to roadways and reserves and under no circumstances encroach on private allotments.

Under exceptional circumstances Q100 through an easement will be permitted provided pit entry and pipe capacity can cater for the Q100 flow.

Where a low point occurs in a longitudinal road grading or at the end of a court bowl or any other location, the footpath shall be 75mm above the top of kerb at the low point.

The drainage design shall incorporate water quality treatment measures to enhance quality of the drainage runoff before discharging it to a creek or other main drainage network.

For all subdivisions Hume City Council is the responsible drainage authority for catchments under 60 hectares. For catchments, above 60 hectares, Melbourne Water is the Regional Drainage Authority.

Melbourne Water is the responsible Catchment Authority, and all cross drainage works on creeks and waterways shall be to the approval of that Authority. For other minor and major drainage, Hume City Council is the Responsible Drainage Authority.

7.3 Computation of Runoff
Computation of runoff shall be determined using the Rational method:

\[ Q = CIA/360 \]

Where \( Q \) = design discharge (m\(^3\)/s)
\( C \) = runoff coefficient
\( I \) = rainfall intensity (mm/h)
\( A \) = catchment area (ha)

7.4 Rainfall Intensity

Refer to design charts at the end of this Section.
Sunbury Chart : For areas west of Oaklands Road
Craigieburn Chart: For areas east of Oaklands Road

7.5 Return Period

Urban Residential Areas : Q5 *
Rural Residential Areas : Q2
Industrial and Commercial Areas : Q10
Floodways : Q100

* 2 Years will be acceptable for subdivisions which satisfy all performance requirements of the Rescode. It should be noted however that drainage associated with collector or Trunk Collector roads shall be designed to Q5.

7.6 Time of Concentration

To first Pit from Allotments 6 minutes
To first Pit from Road reserve 5 minutes

\[ t_c = t_1 + t_2 + t_3 \]

where

\( t_c \) = time of concentration
\( t_1 \) = time to reach the pipe or gutter

- 5 minutes for commercial or industrial zones
- 6 minutes for residential zones
- or From Vic Roads “Drainage Design Guidelines”.

\( t_2 \) = gutter travel time

- From Vic Roads “Drainage Design Guidelines”.

\( t_3' \) = pipe travel time

- From Vic Roads “Drainage Design Guidelines”.

or \( t_3 = L/V \)
where \( L \) = pipe length
\( V \) = flow velocity

\( t_3 \) should be determined up to but not including the pipe reach being designed.
7.7 Runoff Coefficient C

<table>
<thead>
<tr>
<th>General slope of catchment</th>
<th>C Values:</th>
<th>&lt;1.5%</th>
<th>1.5-5%</th>
<th>&gt;5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roofs, pavement, commercial</td>
<td></td>
<td>0.8</td>
<td>0.9</td>
<td>1.0</td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td>0.8</td>
<td>0.85</td>
<td>0.9</td>
</tr>
<tr>
<td>Residential</td>
<td></td>
<td>0.40</td>
<td>0.45</td>
<td>0.50</td>
</tr>
<tr>
<td>Parkland</td>
<td></td>
<td>0.25</td>
<td>0.30</td>
<td>0.35</td>
</tr>
</tbody>
</table>

7.8 Hydraulics

Drainage design shall be based on computation of the hydraulic grade line, generally as in Australian Rainfall & Runoff, but incorporating realistic assessment of pit headlosses.

7.9 Alignment at Pits

Drops and deflections should be minimised to maintain the flow through pits as a jet, with minimum headloss.

Required drops (at invert):
- Generally 60mm to 100mm for same size pipes.
- Match springing lines for change in diameter, but the drop should not be less than 60mm.

Drops in the range 100mm to 1.5D₀ are not permitted except:

i. where springing lines are matched
ii. for minor branches (D₀ < 1/3D₀) (D₀ = branch diameter) (D₀ = outlet diameter)
iii. to dissipate head in steep terrain.

Drops greater than 1.5D₀ are acceptable on long pipe reaches (where there are considerable savings in excavation) for pipe sizes up to 450mm.

Deflections:

Do < 600mm :  
0° - 50° : align as in standard detail
50° - 90° : provide deflector in pit floor
>90° : not permitted

Do > 675mm : Maximum deflection - 22½°

For larger changes of direction, construct segmented curves using splayed pipes or bandage joints, with deflections of 12 - 22½° and segment lengths in the range D - 2D.

7.10 Pit Locations
Pits shall be located to minimise the chance of them coinciding with vehicle crossings. Pits within 1m of a vehicle crossing are to have a Class D cover.

Pits should, preferably, be located at or about the mid-point of the frontage of allotments, to reduce the likelihood of conflict with future driveway locations.

7.11 Kerb Inlets

- Pit spacing: From Vic Roads “Drainage Design Guidelines”.
- Maximum spacing 90m.

Kerb inlet locations:

i. adjacent to tangent points at intersections where the channel falls towards the intersection;
ii. at low points; and
iii. at construction boundaries, unless existing drainage inlets are adequate.

Additional kerb inlets shall be provided:

i. near low points of streets where one or both channel grades are greater than 7%.
ii. at large “flat” vertical curves approximately 10m either side of the low point. (i.e. where the channel levels 10m either side of the low point are not more than 100mm above the channel level at the low point).

Inlets shall be properly shaped, as in the standard drawings, to achieve maximum capture of gutter flows.

Inlet capacity for overland Q greater than Q5 shall be calculated to ensure flows enter pipe system.

7.12 Pit Headlosses

To be calculated using procedure in the Vic Roads “Drainage Design Guidelines” a Australian Rainfall & Runoff.

7.13 Pipe Friction

<table>
<thead>
<tr>
<th>Manning</th>
<th>Colebrook - White</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>0.013</td>
</tr>
</tbody>
</table>

7.14 Minimum Pipe Size

Easement: 150mm for a maximum of one residential property, otherwise minimum pipe size is 225mm.
Within road reservation: 300mm
Industrial Property Connection: 225mm*

* For allotments larger than 1 hectare it will be necessary to design the pipe size.

Downsizing of pipes may be permitted for 450mm pipes and above.

7.15 Pipe Joints

All pipes up to and including 600mm in diameter must be rubber ring jointed. Pipes above this size may be flush jointed with external bands.

7.16 Pipe Flow Velocity and Grade

The following is based on pipes running full but not under head.

<table>
<thead>
<tr>
<th></th>
<th>Desirable</th>
<th>Absolute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>1.0 m/s</td>
<td>0.9 m/s</td>
</tr>
<tr>
<td>Maximum</td>
<td>4.0 m/s</td>
<td>5.5 m/s</td>
</tr>
</tbody>
</table>

Minimum and maximum grades are to be based on these velocities, but grades must not be less than 1 in 300.

Consideration may be given to grades less than 1 in 300 in special circumstances only.

7.17 Pipe Alignment

Pipes shall be uniformly graded and shall be constructed on a straight alignment between pits.

7.18 Minimum Cover (to top of pipe)

In road reserve 750mm
Elsewhere 450mm

NOTE: Pipe Class may need to be increased if cover is not sufficient under subgrade due to construction traffic loading

7.19 Freeboard

The hydraulic grade line should be at least 300mm below the surface, and not more than 2m above the pipe obvert.

7.20 Anchor Blocks

Anchor blocks shall be provided where the pipe slope is steeper than 1 in 6 and the pipe length is greater than 15m.

7.21 Property Connections

Each property connection shall be placed at the lowest point of the property.

Stormwater outlets for all allotments shall be connected to an underground drain.
The depth of a connection to an underground drain shall be computed from the following:

\[(0.02 - \text{%slope of Allotment}) \times \text{side boundary length}) + 0.2\]

### 7.22 Water Quality

The drainage design shall incorporate water quality treatment measures to enhance quality of the drainage runoff before discharging it to a creek or other main drainage network. Reference is to be made to Volume 1 - Design Details and Technical Notes for Open Space for design and water quality parameters.
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# 8. PAVEMENT DESIGN

<table>
<thead>
<tr>
<th>Revision No.</th>
<th>Date</th>
<th>Affected Clause</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>May 2007</td>
<td>8.2</td>
</tr>
</tbody>
</table>
8. Pavement Design

8.1 Residential and Rural

Council has developed a series of charts (SD02-SD08) that can be used to simplify the design of pavements within the municipality of Hume.

These charts have been developed using the following publications:

- Pavement Design Guidelines for New Subdivision - April 2002 - (Appendix A)
- VicRoads Technical Bulletin 37
- Pavement Design: A guide to the structural design of road pavements, Austroads
- VicRoads Pavement Design Notes and Guidelines
- Selection and Design of Pavements and Surfacing, and Code of Practice, VicRoads
- Consultants will be required to establish the road hierarchy classification; the subgrade CBR and whether or not the underlying soil type is reactive or non reactive. Details of the requirements of geological investigation can be found in Section 2 of Appendix A.
- With this data the acceptable pavement thickness and composition can be determined from Standard Drawings SD02-08.

8.2 Industrial

Pavements for industrial subdivisions shall be designed using a mechanistic approach and shall incorporate a design reliability factor of 4.5. Minimum pavement requirement for industrial subdivisions shall be adopted as shown on SD 07.

Details on the geotechnical investigation and design methodology are set out in Appendix A.

8.3 Asphalt Surfacing

All urban streets shall be surfaced with asphaltic concrete. The thickness of the asphalt for residential streets shall be as shown on the Standard Drawings and applied as one layer only over a primed fine crushed rock pavement.
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### 9. SERVICE CONDUITS

<table>
<thead>
<tr>
<th>Revision No.</th>
<th>Date</th>
<th>Affected Clause</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>August 2008</td>
<td>9.5</td>
</tr>
<tr>
<td>1</td>
<td>14 June 2005</td>
<td>9.1, 9.2, 9.4 &amp; 9.5</td>
</tr>
<tr>
<td>Revision No.</td>
<td>Date</td>
<td>Affected Clause</td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>
9. SERVICE CONDUITS

9.1 Location

Service conduits to each allotment, on the opposite side of the road to the proposed gas and/or water main, shall be provided under the pavement of all subdivision roads. Conduits are also required under footpaths and retaining walls. Generally, conduits should be located towards the centre of residential allotments and large (>2000 m$^2$) industrial allotments. For smaller industrial allotments (<2000 m$^2$) conduits should be located within 4m of the side boundaries.

9.2 Cover

The cover to conduits is to be 450mm below the finished pavement surface, or within the subgrade layer, whichever is the deeper. Conduits are not to be placed within the pavement layers. Conduits are to be laid at a grade of 1 in 100 falling to side of the proposed gas or water main.

9.3 Marking

The position of conduit is to be marked on the face of the kerb on each side of the road with a 50mm high letter G for gas conduit and W for water conduit imprinted into the concrete.

9.4 Trench Backfill

Trenches in which conduits are laid are to be backfilled with 20mm Class 3, 3% Cement Treated Crushed Rock.

9.5 Conduit Pipes

Conduit pipes are to be the Class shown or equivalent in the following sizes:

<table>
<thead>
<tr>
<th>Class</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Allotments:</td>
<td>50mm  Class SN6</td>
</tr>
<tr>
<td>School &amp; Multi-Use Sites:</td>
<td>150mm Class SN8</td>
</tr>
<tr>
<td>Commercial / Industrial:</td>
<td>225mm Water Class SN8</td>
</tr>
<tr>
<td></td>
<td>100mm Gas Class SN6</td>
</tr>
<tr>
<td></td>
<td>125mm Electrical Class SN8</td>
</tr>
<tr>
<td></td>
<td>50mm Telecom Class SN6</td>
</tr>
</tbody>
</table>

*All other requirements for conduits shall be in accordance with Section 35: Underground Stormwater Drains and Conduits of Council Specifications.*
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## 10. SUB-SOIL DRAINAGE

<table>
<thead>
<tr>
<th>Revision No.</th>
<th>Date</th>
<th>Affected Clause</th>
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<tr>
<td>5</td>
<td>August 2008</td>
<td>10</td>
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<tr>
<td>2</td>
<td>14 June 2005</td>
<td>10</td>
</tr>
<tr>
<td>1</td>
<td>22 July 2004</td>
<td>10</td>
</tr>
</tbody>
</table>
10. SUB-SOIL DRAINAGE

Sub-soil drainage is to be provided by means of agricultural drains placed immediately at the back of kerb. The drainage trench shall be backfilled with 20mm size “Blue Stone Screenings”. Scoria screenings are not permitted.

Sub-soil drainage shall also be provided at the interface of a widening on an existing road. The drainage trench in this instance shall be backfilled using “No Fines Concrete”.

The pipe for agricultural drains shall be 100mm corrugated PVC Class 400 with fitted filter sock. Class 1000 pipe is to be used under trafficable areas with “No Fines Concrete” backfill.

The pipes shall discharge into pits at a level above the highest overt and any stormwater pipe open to the pit.

In situations where the swell potential of the subgrade is 2.5% or more (ie. Highly expansive subgrade), a continuous unbroken capping layer is generally required. In this case the invert of the AG drain is to be raised such that they drain the pavement only. Trenches for the AG drains are only required to be approx 150mm deep into the capping layer, not below the capping layer into the subgrade.

Stormwater drains, water, gas, sewer services and conduits are to be installed prior to placing the capping layer. It is most important that the capping layer remains unbroken after installation.

Refer to Standard Drawing SD 282 for details.
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## 11. STREET SIGNS

<table>
<thead>
<tr>
<th>Revision No.</th>
<th>Date</th>
<th>Affected Clause</th>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>
11. Street Signs

11.1 Installation

All street signs shall be installed in accordance with Section 90 of Hume City Council Specifications for Road and Drainage Works and Standard Drawing No. SD 408.

11.2 Graphics

Graphics on all street signs will be as detailed on Standard Drawing SD408.
## 12. STREET LIGHTING

<table>
<thead>
<tr>
<th>Revision No.</th>
<th>Date</th>
<th>Affected Clause</th>
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<tbody>
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</tbody>
</table>
12. Street Lighting

All roads created by the subdivision, intersections, and any traffic management devices shall be provided with street lighting in accordance with the requirements of AS 1158.1.1-1997, Road Lighting, Vehicular Traffic (Category V) Lighting, and AS 1158.1.3-1999, Road Lighting, Pedestrian Areas (Category P) Lighting.

When it is proposed to use street lighting poles and lanterns other than the standard poles and lanterns installed by the Electricity Supply Company, all such non standard lighting must accord with Hume City Council Policy for Non Standard Lighting. (Refer Appendix G)
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13. STREETSCAPE

<table>
<thead>
<tr>
<th>Revision No.</th>
<th>Date</th>
<th>Affected Clause</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
13. Streetscape

All streetscape works, including landscaping, tree planting, and estate entrance treatments shall be undertaken in accordance with the plans approved by Council. The Consulting Engineer shall liaise with Council’s Open Space Planner on matters relating to Streetscape.

Reference should be made to Volume 2 of the Infrastructure Standards Manual.
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14. CONSTRUCTION

<table>
<thead>
<tr>
<th>Revision No.</th>
<th>Date</th>
<th>Affected Clause</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14 June 2005</td>
<td>14.1, 14.2, 14.4, 14.8, 14.13.1</td>
</tr>
</tbody>
</table>

Revision No.  Date  Affected Clause
14. Construction

14.1 Notice Period

A minimum 7 day written notice shall be given to Manager Subdivisions prior to the proposed commencement date of works.

14.2 Pre Commencement site meeting

Upon construction plan approval and prior to any works commencing on site, the Consulting Engineer is to arrange a pre-commencement site meeting that will involve Council’s Subdivision Supervisor, the contractor and the consultants.

14.3 Environmental Management

When subdivisional works are to be undertaken near a creek or a conservation area, an Environmental Management Plan shall be submitted and approved prior to commencing construction works. The Environmental Management Plan shall aim at minimising the impact of construction works and prepared with due consideration to the recommendations in EPA Publication “Techniques for Sediment Control at Construction Sites”.

14.4 Traffic Management

When subdivisional works are likely to impact on the traffic flow on an existing Road, be it Government or Private, an appropriately certified Traffic Management Plan shall be prepared and submitted to Council. The plan shall be submitted together with a “Memorandum of Consent” if required at least two weeks prior to the proposed commencement date of works.

In instances, where the legal speed on a Government Road is proposed to be reduced for the duration of works, such reduction shall be at written approval from the Manager Subdivisions and shall be obtained using the attached “Memorandum of Consent” form (Appendix E).

14.5 Notice for Inspection

The Contractor shall give 24 hours notice to the Construction Supervisor when inspection is required.

14.6 Council Inspections

The Contractor shall at all times allow Council’s Construction Supervisor to inspect and measure any part of the works. No part of the works shall have further works placed there or shall be covered up or put out of view without the approval of the Construction Supervisor, whose approval shall not be unreasonably withheld or delayed.

Regular inspections are required at the various stages of the works and additional inspections may be required from time to time at the direction of the Construction Supervisor. Table 1 details required inspections.
14.7 Inspection After Normal Hours

When construction works are carried on outside normal working hours of 7.30 AM to 4.30 PM weekdays, or on week-ends or holidays, it will be necessary for the Contractor to give Council 24 hours notice of its intention to work so that the necessary arrangements of staff may be carried out. Costs for inspections outside of normal working hours must be paid for by the relevant consulting engineer. An agreement form Appendix D must be signed in advance of out of hours inspection.
<table>
<thead>
<tr>
<th>WORK</th>
<th>STAGE</th>
<th>INSPECTION OF</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthworks</td>
<td>Prior to placing filling</td>
<td>Stripped Area</td>
<td></td>
</tr>
<tr>
<td>Stormwater Drains</td>
<td>a) Prior to backfilling b) After backfilling</td>
<td>Levels, laying jointing and haunching Material &amp; compaction</td>
<td></td>
</tr>
<tr>
<td>Stormwater Drainage Pits</td>
<td>Prior to pouring</td>
<td>Pit type, wall length thickness, A.G. connections Weep holes</td>
<td></td>
</tr>
<tr>
<td>Agricultural Drains</td>
<td>Prior to backfilling</td>
<td>Levels, line and laying</td>
<td></td>
</tr>
<tr>
<td>Conduits</td>
<td>Prior to backfilling</td>
<td>Laying and jointing, Location and Length</td>
<td>Locations to be verified with Superintendent prior to laying</td>
</tr>
<tr>
<td>Kerbs and Channel</td>
<td>a) Prior to placing bedding b) Prior to pouring concrete</td>
<td>Base and Agricultural drains Bedding, line &amp; level, formwork reinforcement</td>
<td>House drains, sewer drains, and electrical conduits to be laid prior to inspection</td>
</tr>
<tr>
<td>Footpath</td>
<td>Prior to pouring</td>
<td>Bedding line &amp; level, formwork</td>
<td>House drains, sewer drains, and electrical conduits to be laid prior to inspection</td>
</tr>
<tr>
<td>House Drains</td>
<td>Prior to backfill</td>
<td>i) Laying and jointing ii) Connection to SW drains</td>
<td></td>
</tr>
<tr>
<td>Vehicle crossings</td>
<td>Prior to pouring</td>
<td>Bedding, line, level, formwork</td>
<td></td>
</tr>
<tr>
<td>Road pavement</td>
<td>a) Prior to first pavement course b) Prior to placement of each Pavement course c) Prior to priming d) Prior to placing first asphalt course e) Prior to placing wearing course asphalt</td>
<td>(i) Line level and shape (ii) Subgrade material and Compaction (iii) Conduits for depth, marking of location and distance behind kerbs (i) Line, levels &amp; shape (ii) Compaction (iii) Swept surface (iv) Primed surface (v) Kerb and channel (vi) Nature Strips</td>
<td>All road crossings and conduits for water, gas, sewer, drainage and underground electricity are, where applicable to be completed prior to placing of first layer of F.C.R. A &quot;skin&quot; of FCR may be placed on the approved subgrade prior to construction of these crossings. All broken concrete is to be replaced, all nature strips topsoiled and all services laid, prior to laying wearing course asphalt.</td>
</tr>
<tr>
<td>Completion</td>
<td>Prior to commencement of Maintenance period</td>
<td>All works</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 1 - Inspection Schedule**
14.8 Specifications

All works shall be in accordance with the current Hume City Council Standard Specifications. Where no Council Standard Specification exists for a particular type of work, Consultants may use their own standard specification for that work subject to the approval of the Manager Subdivisions.

14.9 Specifications and Standard Drawings

All works shall be constructed using Hume City Council Specifications and Standard Drawings for Road and Drainage Works (Refer Appendix C).

14.10 Inspection of works and release of hold points

The Construction Supervisor shall use the Quality Control documentation in Appendix E for the inspection of works in the subdivision.

14.11 Bonding of Works

Council or a referral authority may enter into an agreement with the developer by bonding outstanding works that are to be completed after Certification of the Plan of Subdivision. Note that it is Council procedure that construction works are to be completed prior to release of construction requirement and bonding of uncompleted works will only be considered in exceptional circumstances.

The amount of bond shall be 1.5 times the certified cost of all outstanding works.

The only acceptable form of bond shall be cash, cheque, or a bank guarantee. When a bank guarantee is to be submitted, it shall be for an unlimited time and must be provided by a Bank. A reinsurance bond will not be accepted under any circumstances.

14.12 Start of Maintenance Inspection

At the completion of all works required under the Planning Permit, an inspection shall be arranged with the Council’s Construction Supervisor. Following the inspection, and if in the opinion of the Construction Supervisor, the works are practically complete; the works shall be placed on maintenance. As Constructed Plans shall be submitted to Council and Council shall receive all outstanding payments prior to the works being placed on maintenance. Items identified as requiring attention during the maintenance period shall be notified in writing to the Consulting Engineer.

14.13 Maintenance

14.13.1 Applicant Responsible for Maintenance

The applicant is responsible for maintaining the completed works for 3 months, or other agreed period, after which the maintenance will become the responsibility of the Council.

14.13.2 Maintenance Bond

To facilitate the registration of a plan of subdivision before the maintenance period on road and drainage work has expired, Council is prepared to accept a bond in the form of cash or a bank guarantee for 5% of the certified final cost of the work which is to be held and used to maintain the works, during or at the end of the maintenance period, should the applicant fail to do so.
14.14 End of Maintenance Inspection

The works shall be maintained for a period of three months from the date of start of maintenance. At the end of three month maintenance period, the Consulting Engineer shall request Council to undertake a final inspection. It shall be ensured that all items identified for attention at the time of start of maintenance period, plus any other matters requiring attention due to bad workmanship or materials are completed before this inspection is convened. After the works have been satisfactorily maintained, a written advice shall be sent to the Consulting Engineer, and Council shall take over the ownership and ongoing management of the works.

14.15 Re-Establishment Survey

When construction works required by Council and referral authorities have been completed, the Surveyor shall re-establish any title boundary pegs that may for any reason be missing.
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### 15. STATEMENT OF COMPLIANCE

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15. Statement of Compliance

Generally all works are required to be completed with all allotments clear and ready for builder access prior to the issuing of a Statement of Compliance. In special cases, outstanding works of a minor nature only may be bonded as approved by the Manager Subdivisions.

Following the completion of all works required by Council in the Planning Permit, and execution of any agreement required in the Planning Permit, the Manager Subdivisions shall “Release” Council requirements for all Road and Drainage works and send written advice to Council’s Subdivision Officer.

Minor works may be bonded as approved by Council, providing it can be demonstrated that vehicular access can be given to each lot in the subdivision and provision is made for interim traffic control and public safety, in accordance with the relevant Australian Standards, until the works are 100% complete.

Separate “Release” shall be issued for Open Space Requirements by the Council’s Landscape Planner.
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16. AS CONSTRUCTED DOCUMENTATION

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16. As Constructed documentation

At the completion of all works and prior to Council taking over ownership of subdivisional works, the Consulting Engineer shall provide Council with the following “As Constructed” documentation.

- Construction Plan Transparencies
- Electronic copy of drawing in AutoCAD MAP DWG file (recent version) in GDA94 MGA Zone 55 mapping coordinates in accordance with the D-SPEC Standard.

The works will not be placed on maintenance until this documentation is provided.
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17. APPENDICES


Appendix B - Standard Drawings - Roads and Drainage

Appendix C - Specification for Road and Drainage Works Version 2

Appendix D - Out of Hours Inspection Agreement

Appendix E - Memorandum of Consent for Major Traffic Control Hours at Road Worksites

Appendix F - Quality Control Inspection Report Sheet

Appendix G - Non Standard Street Lighting Policy

Appendix H - Hume General Notes
Appendix A

Pavement Design Guidelines for New Subdivisions - April 2002

RW Stamp and Associates
Appendix B

Standard Drawings - Roads and Drainage
Appendix C

Specification for Road and Drainage Works
Appendix D

Out of Hours Inspection Agreement
Appendix E

Memorandum of Consent for Major Traffic Control Items at Road Worksites
Appendix F

Quality Control

Inspection Report Sheets

INDEX

Stormwater Drainage
Subgrade
Pavement
Concrete Works
On Maintenance
Take Over
Appendix H

Hume General Notes