



maitland

city council

MANUAL OF ENGINEERING STANDARDS

2014



TABLE OF CONTENTS

THE MANUAL	1
1. INTRODUCTION.....	1
2. AIMS & OUTCOMES.....	2
3. DISCLAIMER.....	2
GENERAL REQUIREMENTS	3
1. INTRODUCTION.....	3
2. PROJECT MANAGER & PRINCIPAL CERTIFYING AUTHORITY.....	3
3. DEFINITIONS.....	3
4. DESIGN & CONSTRUCTION	4
4.1. Plans.....	4
4.2. Construction.....	4
5. INSURANCE / LEVY.....	5
6. WORKS ON PUBLIC LAND	5
6.1. Council Approval.....	5
6.2. Approved Contractors.....	5
6.3. Commencement of (Minor) Works.....	6
6.4. Road Closure.....	6
7. PUBLIC UTILITY SERVICES.....	6
7.1. Electrical Power.....	6
7.2. Street Lighting.....	7
7.3. Other Authorities.....	8
8. PUBLIC RESERVES.....	8
8.1. Drainage & Nature Reserves.....	8
8.2. Parks & Playing Reserves.....	9
8.3. Plans of Management.....	9
9. SUBDIVISION CERTIFICATE	10
9.1. Lot Classification.....	10
9.2. Road Widening.....	10
10. BONDS FOR INCOMPLETE WORK	11
11. WORKS AS EXECUTED	12
12. UNAPPROVED WORKS	12
ENVIRONMENT, VEGETATION, LANDSCAPING & HERITAGE	13
1. INTRODUCTION.....	13
2. DEVELOPER RESPONSIBILITIES.....	13
2.1. Legislation.....	13
2.2. Heritage Conservation and Protection.....	13
3. VEGETATION.....	14
4. TREES AND HABITATS.....	14
4.1. Tree Disturbance.....	15
4.2. Habitat Treatment.....	15
5. ENVIRONMENT.....	16
5.1. Fire Restrictions.....	16
5.2. Noise Control.....	16
5.3. Dust Control.....	16
5.4. Site Storage.....	16
5.5. Contaminants.....	17
6. SOIL CONDITIONS.....	17
7. EROSION.....	17
7.1. Controls - during Construction	17
7.2. Controls - Post Construction	17
7.3. Material Transportation	18
8. LANDSCAPE AND VEGETATION	18
8.1. Street Landscaping.....	18



9.	BUSHFIRE PRECAUTIONS.....	20
ROAD DESIGN		21
1.	INTRODUCTION.....	21
2.	GEOMETRIC DESIGN.....	21
2.1.	Road Hierarchy and Specifications	21
2.1.1.	Road Width for Lot Catchment	21
2.1.2.	Consistent Road Width	22
2.1.3.	Impacts on Existing Roads.....	22
2.1.4.	Part-width Roads.....	22
2.1.5.	Crown Roads	25
2.2.	Pavement Treatments	25
2.3.	Horizontal Curves.....	25
2.4.	Longitudinal Grades.....	26
2.5.	Vertical Curves.....	26
2.6.	Crossfall and Superelevation.....	26
2.7.	Footways, Footpaths, Steps	27
2.8.	Batters.....	27
2.9.	Culs-de-Sac and Kerb Returns	28
3.	INTERSECTION DESIGN	29
3.1.	Traffic Signals	29
3.2.	Channelised Intersections	30
3.3.	Roundabouts	30
3.4.	Minor Intersections.....	31
3.4.1.	Urban.....	31
3.4.2.	Rural.....	31
3.5.	Kerb Returns.....	31
4.	PUBLIC TRANSPORT (BUS).....	32
5.	STRUCTURES.....	32
5.1.	Retaining Walls.....	33
5.1.1.	Location.....	33
5.1.2.	Design.....	33
6.	ANCILLARY DESIGN REQUIREMENTS.....	34
6.1.	Safety Audit	34
6.2.	Traffic Control Devices (Traffic Committee).....	34
6.3.	Street Name Signs.....	35
6.4.	Guardfence & Guideposts	35
6.5.	Pavement Edge Restraints	35
6.6.	Temporary Turning Head.....	35
6.7.	Vehicle Turning Paths	35
6.8.	Cycleways & Shared Paths.....	36
6.9.	Kerb Ramps.....	36
6.10.	Pathways.....	36
6.11.	Access Corridors for Driveways	36
6.11.1.	Dual Handles	37
6.11.2.	Rights of Carriageway (No Handle).....	37
6.11.3.	Underground Services	37
6.11.4.	Pavement	38
7.	ROADS FOR LARGE-LOT RESIDENTIAL.....	38
8.	RURAL ROADS	38
8.1.	Rural Design Elements	39
PAVEMENT DESIGN		40
1.	ROAD PAVEMENTS.....	40
1.1.	Pavement Types	40
1.2.	Design Report	40
1.3.	Minor Works.....	41



1.4.	As-Built Records	41
2.	DESIGN TRAFFIC LOADINGS.....	41
3.	SUBGRADE EVALUATION.....	43
4.	SUBSURFACE DRAINAGE	43
5.	PAVEMENT DESIGN.....	43
5.1.	Flexible Pavement	43
5.2.	Rigid Pavement (Concrete).....	45
5.3.	Segmental Block Pavement	46
5.4.	Accessways.....	46
5.5.	Roundabouts	47
5.6.	Intersection Thresholds	47
5.7.	Pavement Joints.....	47
6.	WEARING COURSE.....	47
7.	EXISTING PAVEMENT RECONSTRUCTION	48
	STORMWATER DRAINAGE	49
1.	GENERAL	49
2.	DESIGN STANDARDS	49
3.	HYDROLOGY	50
3.1.	Rainfall Data	50
3.2.	Recurrence Interval.....	50
3.3.	Catchments	51
3.4.	Fraction Impervious	51
3.5.	Coefficient of Runoff	52
3.6.	Partial Area Effects	52
3.7.	Rational Method.....	52
3.7.1.	Time of Concentration	53
3.7.2.	Coefficient of Roughness.....	53
3.8.	Alternate Hydrological Models	53
4.	HYDRAULICS	54
4.1.	Hydraulic Grade Line	54
4.2.	Underground Drainage System	54
4.2.1.	Pipe Conduits	54
4.2.2.	Box Conduits	55
4.2.3.	Pipeline Radii	56
4.3.	Trench Stops.....	56
4.4.	Pits	56
4.4.1.	Pit inlet capacity	56
4.4.2.	Pit locations.....	56
4.4.3.	Pit construction	57
4.4.4.	Extended Kerb Inlet (EKI)	57
4.4.5.	Step irons.....	57
4.4.6.	Benching.....	58
4.4.7.	Grates	58
4.5.	Hydraulic Losses.....	58
5.	OVERLAND FLOW PATHS.....	59
5.1.	General	59
5.2.	Freeboard.....	59
6.	OPEN CHANNELS.....	59
7.	MAJOR DRAINAGE STRUCTURES (BRIDGES & CULVERTS)	60
8.	STORMWATER FLOW & QUALITY CONTROL.....	60
8.1.	Detention Basins	60
8.1.1.	Type & Location	60
8.1.2.	Capacity & Discharge.....	61
8.1.3.	Overflow	61
8.1.4.	Outlet.....	61



8.1.5.	Water Depth	61
8.1.6.	Embankment	61
8.1.7.	Dams.....	62
8.1.8.	Gross Pollutant Traps & Basin Inlets.....	62
8.1.9.	Safety	62
8.2.	Stormwater Quality	62
8.3.	Constructed Wetlands	63
8.4.	Swales	64
8.5.	Bio-Retention Systems	64
8.6.	Other WSUD Treatments	65
8.7.	References for WSUD Design	65
8.8.	Fencing.....	66
9.	ALLOTMENT DRAINAGE	66
9.1.	Pipes.....	66
9.2.	Pits.....	66
10.	DRAINAGE EASEMENTS.....	67
11.	STORMWATER OUTLET	68
12.	SUBSOIL DRAINAGE.....	68
13.	ACCESS RESTRICTION TO DRAINAGE STRUCTURES	68
CONSTRUCTION - ROADS, DRAINAGE, CONCRETE	69	
1.	TRAFFIC.....	69
1.1.	Traffic Control	69
1.2.	Partial Road Closure	69
1.3.	Full Road Closure	70
1.4.	Road Opening Permit	70
1.5.	Haulage Routes	70
1.5.1.	Damage To Roads.....	70
1.5.2.	Overweight Vehicles	70
1.6.	Detour Routes	71
2.	CONTRACTORS.....	71
2.1.	Sub-Contractors	71
2.2.	Working Hours.....	71
2.3.	Safety.....	72
3.	SITE MANAGEMENT	72
3.1.	Survey Marks.....	72
3.2.	Material Storage	72
3.3.	Adjoining Land.....	72
4.	INSPECTIONS.....	72
4.1.	Limitations on Approvals.....	73
4.2.	Inspection Meetings.....	73
4.3.	Inspections Outside Normal Hours	73
4.4.	Approval of Works.....	73
4.5.	Additional Works	73
4.6.	Inspection Regime.....	73
5.	ENVIRONMENT	76
5.1.	Contamination	76
5.2.	Erosion.....	76
5.2.1.	Maintenance of Devices.....	76
5.3.	Tree Clearing.....	76
5.4.	Vegetation Disposal	77
6.	EARTH - FILL.....	77
6.1.	Standards	77
6.2.	Topsoil.....	78
6.3.	Retaining Walls.....	78
6.4.	Dams	78



6.4.1.	Redundant Dams	78
7.	ROAD FORMATION	78
7.1.	Materials & testing	78
7.1.1.	Compaction Tests	79
7.1.2.	Proof-Roll Test	79
7.2.	Fill	79
7.3.	Cut	80
7.3.1.	Catch drains	80
7.3.2.	Batter faces	80
7.4.	Sub-Grade (Natural)	80
7.5.	Sub-Grade (Select)	80
8.	STORMWATER DRAINAGE	81
8.1.	Subsoil Drainage	81
8.1.1.	Trenches	81
8.1.2.	Filter Material	81
8.1.3.	Common Trench (with water main)	83
8.1.4.	Flush Points	84
8.2.	Pipe Conduits	84
8.3.	Pipe Installation (concrete)	84
8.4.	Pipe Bed, Haunch & Sides	84
8.4.1.	Common Trench (with subsoil drainage)	86
8.5.	Pipe Overlay	86
8.6.	Pipe Backfilling	86
8.7.	Trench Compaction Testing	86
8.8.	Precast Box Culverts	86
8.9.	Base Slabs	87
8.10.	Pits	87
8.10.1.	Pit Formwork & Backfill	87
8.11.	Gross Pollutant Traps	88
8.12.	Scour Protection	88
8.13.	Open Drains	89
8.14.	Inter-Allotment Drainage	89
8.15.	Culverts	90
8.16.	Pipe Tolerances	90
9.	PAVEMENT CONSTRUCTION	90
9.1.	Flexible Pavement	90
9.1.1.	Tolerances	90
9.1.2.	Pavement Materials	91
9.1.3.	Pavement Compaction	92
9.1.4.	Pavement Testing	93
9.1.5.	Pavement Joints	95
9.2.	Rigid Pavement (Roads)	95
9.2.1.	Materials	95
9.2.2.	Components	95
9.2.3.	Concrete Testing	96
10.	KERB & GUTTER	97
10.1.	Concrete Supply & Placement	97
11.	WEARING SURFACE	98
11.1.	Bitumen Flush Seal	98
11.2.	Primer Seal	99
11.3.	Asphalt	99
12.	CONCRETE ITEMS	100
12.1.	Driveway Access Handles	100
12.2.	Paths	100
12.3.	Concrete Linings	100



12.4. Concreting Placement & Practise	100
12.4.1. Sub-Base	100
12.4.2. Reinforcement.....	101
12.4.3. Placement	101
12.4.4. Joints	101
12.4.5. Surface.....	101
12.4.6. Curing	101
12.4.7. Damage	101
12.4.8. Testing	102
12.4.9. Weather.....	102
13. CONDUITS & ROAD CROSSINGS	103
14. SURFACE RESTORATION	103
14.1. General	103
14.2. Footways.....	103
14.3. Trenches.....	103
14.4. all-Weather Surfaces.....	104
14.5. Mulch and Turf.....	104
14.6. Street Trees.....	104
15. LINEMARKING & SIGNPOSTING.....	104
16. LOCKS & KEYS.....	105
17. SITE PRESERVATION	105
18. COMPLIANCE CERTIFICATES.....	105
DEVELOPMENTS.....	106
1. INTRODUCTION.....	106
2. RESPONSIBILITIES.....	106
2.1. Insurance.....	106
2.2. Public Utilities.....	106
2.3. Safety Of Works.....	106
2.4. Removal of Defective Works.....	107
3. DRIVEWAYS (AND ASSOCIATED WORKS WITHIN THE ROAD RESERVE).....	107
3.1. Driveway Specifications	107
3.1.1. Width.....	107
3.1.2. Construction Specifications.....	108
3.1.3. Profiles.....	108
3.1.4. Clearance	108
3.1.5. Table Drain Crossings	109
3.1.6. Public Laneways (Existing)	109
3.1.7. Driveway Crossings over Paths.....	109
3.1.8. Removal of Paths	109
3.1.9. Verge Damage.....	109
3.1.10. Redundant Laybacks	109
3.1.11. Lintel & Grate Adjustments	110
4. DRIVEWAY HANDLES (WITHIN THE PROPERTY).....	110
4.1. Driveway Corridor Width.....	110
4.2. Driveway Specifications	111
4.2.1. Width.....	111
4.2.2. Construction Specifications.....	111
4.2.3. Grade.....	111
5. VEHICLE ACCESS, PARKING AND TURNING	112
5.1. Pavement.....	112
5.1.1. Sealed	112
5.1.2. Unsealed	112
5.2. Turning Paths.....	112
5.3. Intersections	113
6. ANCILLARY OFF-SITE WORKS	113



6.1.	Road, Footway and Drainage.....	113
6.2.	Concrete Works.....	114
6.3.	Inspection of Works	114
7.	STORMWATER DRAINAGE.....	115
7.1.	Aims and Objectives	115
7.2.	Design Plans.....	116
7.3.	Design Standards	116
7.4.	Calculations	116
7.5.	Discharge From The Site	116
7.5.1.	Gravity Pipe Flow.....	116
7.5.2.	Charged Pressure Head.....	117
7.5.3.	Pumping	117
7.5.4.	Footway Crossing.....	117
7.6.	Inter – Allotment Drainage (IAD)	118
7.6.1.	Pipes	118
7.6.2.	Pits.....	118
7.6.3.	Easements.....	119
7.6.4.	Structures / Easement Relationship.....	119
7.7.	Freeboard.....	119
7.8.	On Site Detention (OSD) of Stormwater	119
7.8.1.	Industrial & Business.....	120
7.8.2.	Residential.....	120
7.8.3.	Detention with “BASIX” rainwater harvesting.....	120
7.8.4.	Detention without “BASIX” rainwater harvesting.....	121
7.8.5.	General Requirements.....	122
7.9.	Certification & Works as Executed Drawings	123
8.	STORMWATER QUALITY	123
8.1.	Maintenance of Devices	123
8.2.	Water Sensitive Urban Design (WSUD)	124
8.2.1.	General Requirements.....	124
8.2.2.	Erosion & Sediment Control (ESC)	125
9.	DRAINAGE EXTERNAL TO THE SITE	126
9.1.	Discharge from Upstream	126
9.2.	Discharge Downstream.....	126
9.3.	Downstream Drainage Upgrade.....	126
APPENDIX A - GUIDELINES FOR THE PREPARATION OF DESIGN PLANS		129
1.	PLANS	129
2.	SCALES.....	129
3.	DETAILS TO BE SHOWN ON PLANS	129
3.1.	Survey.....	130
3.2.	Traffic.....	130
3.3.	Trees.....	130
3.4.	Utilities	130
3.5.	Adjoining Access.....	130
3.6.	Soil/Grass.....	130
3.7.	Erosion Control.....	131
3.8.	Subsoil Drainage.....	131
3.9.	Materials & Testing	131
4.	PLANS	131
4.1.	Layout Plans.....	131
4.2.	Longitudinal Sections	132
4.3.	Cross Sections	133
5.	KERB RETURN PROFILES AND PLANS	134
6.	STORMWATER.....	134
7.	ENGINEERING SURVEY	135



7.1.	datum / Bench Marks	135
7.2.	Cross Sections	136
7.3.	Longitudinal Sections	136
8.	EROSION & SEDIMENT CONTROL PLANS	136
9.	TRAFFIC MANAGEMENT PLANS (& TRAFFIC CONTROL PLANS)	136
10.	MISCELLANEOUS	137
APPENDIX B - EROSION & SEDIMENTATION CONTROL.....		139
1.	INTRODUCTION.....	139
2.	SOIL EROSION & SEDIMENT LOSS	139
3.	EROSION & SEDIMENT CONTROL PLAN	140
4.	MAINTENANCE	140
5.	TEMPORARY MINOR EROSION & SEDIMENT CONTROLS.....	140
5.1.	General	140
5.2.	Hay Bale Barriers.....	141
5.3.	Silt Fences.....	141
5.4.	Stormwater Pit & Inlet Traps	141
5.5.	Buffer Zones.....	141
5.6.	Diversion Banks & Drains.....	142
5.7.	Level Spreaders	142
5.8.	Shake Down Areas/Access to Sites.....	142
6.	PERMANENT OR SEMI-PERMANENT CONTROLS	142
7.	CHANNEL STABILISATION.....	143
8.	INSTALLATION OF SERVICES	143
8.1.	Wind Erosion.....	144
8.2.	Soil Stockpiles	144
9.	PROGRESSIVE REVEGETATION.....	144
10.	HAY MULCHING	145
10.1.	Surface Preparation	145
10.2.	Fertiliser	145
10.3.	Watering	146
APPENDIX C - STORMWATER DRAINAGE.....		147
APPENDIX D - PAVEMENT MATERIAL PROPERTIES.....		151

REVISION LIST

REVISION	DESCRIPTION	DATE ISSUED
1	Working Draft	Sept 2004
2	Exhibition Draft	Nov 2004
3	Adopted Final – 24/5/05 Ccl min. 9.2.7	May 2005
4	Minor Amendments	Feb 2006
5	Major and minor amendments – adopted 12/8/08 Ccl min 9.3.1	Aug 2008
6	Major Revision - draft	Feb 2013
7	Amendments in response to submissions -Adopt 13/5/14 Ccl min 11.1	May 2014