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Appendix A: Preparation of Development & Engineering Design Plans

1. Plans

Plans shall be presented in a professional manner to normal industry standards and generally in accordance with AS1100. Any plan sets submitted to Council shall be marked with an <u>issue/revision</u> <u>number</u>, together with the associated date on each sheet.

DWG files shall be provided to Council. All hardcopy plans shall be presented in A1 drawing size.

2. Scales

PLAN TYPES	SCALE REQUIREMENTS
Roads and drainage	1:500 minimum or as required for clarity.
Site plans	1:1000 min.
Long sections	1:500 horizontal & 1:100 vertical
Cross sections	1:100 natural or 1:200
Catchment plans	1:1000 or sufficient to cover area and provide clarity.
Kerb profiles	1:200 H and 1:20 V

3. Details to be Shown on Plans

The plan set should have the following information:

- Property description.
- Owner/developer.
- Surveyor/engineer/designer and contact details.
- Scale, benchmark, and datum.
- Plan number and sheet number (sequential).



- Description of works on each sheet.
- Panel for signature of designated Council officer or Accredited Certifier.
- Plans shall show the location by survey or by service authority plans of all utility services.
- General, or Construction notes must include the following statement:

All works shall be carried out in accordance with the approved plans, subject to Maitland City Council's "Manual of Engineering Standards".

Other notes such as the following are recommended for inclusion.

3.1 Survey

All levels shall be obtained from established benchmarks to Australian Height Datum (AHD).

3.2 Traffic

Traffic control measures shall be in accordance with the RMS document "Traffic Control at Worksites"

3.3 Trees

All trees within the allotments and reserves (other than road reserves) shall be retained, unless otherwise nominated by an approved landscape plan and/or consent condition.

3.4 Utilities

Points of conflict between new construction and existing utility service mains shall be identified, exposed, and reported to the Project Manager prior to construction.

Service conduits shall be laid in positions as approved by the relevant authority.

3.5 Adjoining Access

Provision shall be made for suitable protection of the existing road pavement, kerb and gutter and footpath formation.

Vehicular access and all services to adjoining properties affected by construction works, shall be maintained at all times.

3.6 Soil/Grass

Topsoil, 150mm thick shall be applied to all footpaths and filled areas. Where turf is not requested, all exposed topsoil shall be seeded immediately upon completion of the soil spreading operation.

A turf strip shall be placed along each side of concrete pathways, drainage structures, driveways, pedestrian/cycleways and at rear of all kerbs.

3.7 Erosion Control

All silt control measures shall be placed prior to the commencement of earthworks. Such measures shall be subject to further additions or alterations, where considered necessary, as directed by the Project Manager or Council, during the progression of works.



All final erosion prevention measures including establishment of grass shall be completed prior to the "final" inspection.

3.8 Subsoil Drainage

Subsoil drains shall be provided as shown on the plans. Additional drains shall be provided where considered necessary, by Council or a geotechnical engineer.

3.9 Materials & Testing

All materials and products for installation and construction shall comply with Australian Standards.

Monitoring testing ("stringline" and "roll") where specified by Council's Manual of Engineering Standards, to be performed by Council, shall be arranged 24 hours in advance. Where a Council officer is not available, a geotechnical engineer may perform such tests.

4.Plans

4.1 Layout Plans

Road plans as a minimum shall contain the following:

- Locality sketch.
- Site location.
- Centreline chainages as pegged.
- The chainage shall be aligned with the long section and run left to right across the plan for plans and long section.
- North point.
- Location and description of benchmarks (BM's) to AHD or other appropriate datum.
- Subsoil drainage location and a typical section.
- Existing road names and proposed road names, (determined prior to release of engineering plans).
- Proposed lane widths and types of kerbs.
- Dimensions of all linemarking.
- All existing services to location and level.
- All drainage and structures with pipe and lintel sizes.
- Kerb radii.
- Existing drainage and road feature and their levels.
- Existing and proposed contours at 0.5 metres interval or 0.2 metres in flat terrain.
- The determined High Flood Level (HFL).
- Cut and fill batter limits and road reserve boundaries.



- Major trees or natural features affected by the design.
- Intersection and cul-de-sac details including lot boundaries, street sign location, pram ramps, pits, vehicular crossings, pipe crossing locations and contours (for abnormal complex shapes).

4.2 Longitudinal Sections

The chainage should run left to right across the page and shall include:

- Chainages.
- Natural surface levels on pegged centreline or design control line.
- Design surface levels.
- Vertical alignment details.
- Grade lines, vertical curves and lengths, high points (HP), low points (LP) and RL of intersection points (IP).
- Datum of long section.
- Chainage, conduit size and location of public utilities.

4.3 Cross Sections

Cross sections shall be shown generally at no more than 20 metres intervals and at all key points for design purposes, i.e. access, intersection or kerb service locations. Where appropriate for level control designs may require cross-sections down to 5 metres intervals.

Cross sections shall be laid out from left to right, bottom to top, on sheets sequentially numbered with the appropriate chainage shown in the title block.

Cross sections shall extend for the full width of the road reserve or sufficient to detail batters and shall show enough detail to transition to existing works such as grades, distances, etc. and crossfalls to such new works shall be generally within the range of 2% to 7%.

Details on cross sections shall include:

- Road centreline.
- Offset chainage.
- Existing surface RL and design surface RL.
- Design crossfall in % batter slope ratio and access grades.
- Design centreline shift, offset crown or transitions if applicable.
- Public utility location for offset distance and RL.
- Existing and proposed road reserve boundaries and levels.

A Typical Cross Section shall be included and shall show (in addition to the points above):

• Crossfalls & batter slopes.

- Subsoil drainage.
- Footpath and/or cycle path.
- Turfing (strip & full).
- Road pavement details including a table of pavement parameters, with design CBR and ESA details.
- Dimensioned widths.

5.Kerb Return Profiles and Plans

Each profile should have a kerb return number (e.g. KR1) corresponding with a KR1 number shown on the plan view. The profile chainages should follow the flow of traffic direction.

- The details to be shown include:
- The horizontal and vertical scale.
- Chainage. The running face of kerb chainage related to the profile, together with the chainage related to the road centrelines, generally tangent points (TPs).
- Design level, specifying either top of kerb or lip of gutter.
- Existing kerb levels where appropriate.
- The applicable road/street names/numbers leading into the profile.
- An extension of a minimum of 15 metres beyond the tangent points to ensure a smooth profile is achieved.
- Show location and number of proposed drainage structures.
- Datum RL of kerb return.

Kerb or pavement profiles should be provided for traffic islands etc. at large, complex intersections and roundabouts to provide additional level control.

6.Stormwater

The stormwater detail sheets shall show catchment plans including areas outside of the development, calculations, pit sub-catchments numbered or referenced, and overland flow paths for the 100-year ARI storm event including flow path capacity calculations.

Stormwater plans shall include the following:

- North point.
- Numbering of drainage lines.
- The pit/structure nomenclature.
- The location of any pit utility mains/services crossing influenced by the pipeline or pit.
- The location and centreline chainage of any applicable drainage structure.



- Note referring to type of bedding.
- Location and width of existing or proposed drainage easements.
- Overland flow paths, typical sections, and capacities.
- The 100-year flood contour/line, whether from the Hunter River or the local catchment.

Drainage longitudinal section sheet shall show the chainages running left to right across the sheet starting at the upstream end of the system.

Details on the longitudinal section shall include:

- Consecutive centreline chainages and finished surface levels.
- Pipe design invert level, grade, and existing surface level.
- Inverts of existing drainage open channels where necessary.
- Pipe size, class and type and hydraulic grade line.
- Public utilities affected.
- Pit structure, type, and reference number.
- Datum RL to AHD.
- Capacity and design flow.
- Bulkheads, trench stops and any bedding requirements.

7. Engineering Survey

Engineering survey of the proposed development/subdivision shall accurately show landform and features. Prior to any layout design all physical features that may affect design and construction shall be located, levelled, and plotted on the plan including: -

- Rock outcrops.
- Trees, their diameter and canopy spread.
- Watercourses, dams, springs, etc.
- Any manmade structures, drainage, kerb and gutter, buildings, fences, property access etc.
- Existing utilities and services.
- Top and bottom of banks, gullies, etc.
- Contours to 0.5 metres intervals (or 0.2 metres in flat terrain).

7.1 Datum / Benchmarks

Benchmarks related to Australian Height Datum (AHD), shall be located clear of any proposed works with a maximum spacing of 150 metres. Benchmarks shall be clearly shown on the plans with origin of levels and datum. Road pegging shall commence at zero at the centreline of any intersecting road. The centreline shall be approximately indicated and labelled at each chainage.



Unless adequately justified, all survey shall be related to Australian Height Datum (AHD) and the appropriate grid, in accordance with Survey Practise Regulations.

7.2 Cross Sections

Cross sections shall be located at 20 metres (max.) intervals on straights and 15 metres (max.) on curves. Cross sections shall also be located at tangent points (TP) of curves and to superelevation widening transitions. The above spacings are a maximum and additional cross section may be necessary in difficult terrain or unusual features.

Cross sections shall be provided at least 60 metres along any existing intersecting roads to assist a satisfactory design match.

7.3 Longitudinal Sections

Longitudinal sections shall extend a minimum of 60 metres along any intersecting roads to assist a satisfactory design match. The long section for cul-de-sacs shall be carried 20 metres beyond the kerb or to the recovery peg on the centreline prolongation.

Long sections on offset cul-de-sac heads shall be along a curve between the TP and centreline and shall also extend beyond the kerb a minimum of 20 metres. Hammerhead turning areas shall be treated similarly.

8. Erosion & Sediment Control Plans

These plans shall be clear and legible and show the location and type of each structure or device.

Details on sediment control plans shall show:

- Capacity of structures.
- Batter slopes and lengths.
- Maintenance access fences, spillways.
- Proposed staging of restoration/vegetation works.
- Stockpile sites and treatment.
- Construction entry/exits.
- Details of the type of control (sketch).

9. Traffic Management Plans (& Traffic Control Plans)

Traffic/Pedestrian Management Plans shall be provided where the works impact on public roads and footpaths, in accordance with AS 3742.3 or RMS Traffic Control at Worksites.

The plan shall be certified by an approved designer and shall include (but not be limited to) the following:

- Total area of works and management features.
- Constructional stages resulting in changed provisions.
- Pedestrian movements and safe barriers.



- Detailed signposting, barricading, linemarking, lighting or any temporary works of such nature.
- Construction Zone speed restrictions including traffic control signals and signposting will necessitate liaison with the RMS for approval.
- Partial or full road closures (if permitted) will require liaison with Council and/or the RMS through Traffic Committee. Any advertising or public notification of such requirements will require adequate lead-time.

The Traffic Management Plan may be amended by Council's engineer, (or the RMS or Police where necessary), at any time during construction, as the need arises. No works shall commence prior to Council or RMS concurrence to the plan.

10. Miscellaneous

Sufficient survey, design and drawing detail to define all works on the plan of the proposed development or subdivision shall be shown. These details shall include:

- Site regrading (cut and fill).
- Batters.
- Retaining walls and structures, heights, structural design details.
- Drainage transitions/connections.
- Limits of works.
- Terraced areas including long sections and typical cross sections.
- Treatment of trees to be retained.
- Restoration or transition of new works to existing infrastructure.
- Pathways and overland flow routes.
- Detention basins/gross pollutant traps.
- Battleaxe handle, access grades and transitions/connections.



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Appendix B: Erosion and Sedimentation Control

1. Introduction

Works shall be carried out in accordance with this document relating to the design, construction and maintenance of erosion and sediment control structures. Such structures may be either temporary or permanent.

The contractor shall carry out all works with an approach that is well planned, and which minimises the likelihood of erosion and sediment affecting downstream lands, watercourses, wetlands, or water bodies.

Developers are reminded of their obligations under the Environmental Planning & Assessment Act, the Protection of the Environment Operations Act and regulations and ordinances under those Acts, and the Local Government Act.

It is the responsibility of the developer, and/or representative, to be fully informed of their obligations with respect to legislative requirements. Neglect of these requirements may result in the issue of infringement notices, attracting appropriate fines.

The following guidelines should be understood in their context with the overriding parent publication "Managing Urban Stormwater – Soils & Construction," the "*Blue Book*".

2. Soil Erosion & Sediment Loss

Soil erosion and sediment loss can either result from disturbance to land by the subdivision construction processes or development.

Soil disturbance is an integral part of development however it is essential that construction activities limit exposure to erosion. This may be achieved by:

- Limiting the area of site disturbance.
- Isolating catchment areas of the site so that clean (upstream) water is not directed through the works area.
- Retain and stockpile topsoil for reuse and revegetation.
- Control runoff and sediment movement at point source by the implementation of protection measures.
- Progressively vegetate disturbed areas as the work proceeds to minimise area of exposure.
- Provide large sediment capture systems where appropriate sized to the contributing catchment.



• Filtering/polishing of the trapped water prior to release to receiving watercourses/drainage system.

3. Erosion & Sediment Control Plan

Designers and consultants must be familiar with the principles and objectives of soil erosion and sediment control prior to the preparation of such plans.

No works shall commence on the site until the erosion and sediment control plan has been approved by the Engineer or Accredited Certifier. The design plan shall in all cases be site specific and not a generalisation of soil erosion and sediment control philosophies.

The erosion and sediment control plan shall include, but not be limited to, the following:

- Existing site catchment topographic details and contours of natural surface and regrade areas.
- Lot layout, sewer, water, roads, and areas of disturbance.
- Nominated and fenced "NO-GO" areas to retain existing vegetative cover.
- Site works staging where appropriate and location of critical vegetation areas & watercourses.
- Location of soil stockpiles, sediment control fences and other sediment control works.
- All hydrological information and calculations relative to sediment traps and basin designs.
- Type and location of 'clean water' diversion works.

Council must be provided with at least two days' notice, prior to the commencement of construction.

The contractor shall strictly follow the works and recommendations contained within the soil erosion and sediment control plan and must discuss and gain approval for any possible changes for improvement.

4. Maintenance

Transportation of materials to and from the site shall not cause deposition of material onto surrounding roads. Any inadvertent deposition shall be immediately removed from the road.

The contractor shall maintain all erosion control devices such that runoff from all disturbed areas shall be free from sediments and pollutants.

5. Temporary Minor Erosion & Sediment Controls

5.1 General

Such barriers, traps and point source control measures shall generally cater for catchments of less than 0.5 hectares. They shall be used on the downstream side of disturbed areas or around drainage pits below water outlet sites, and around culvert inlets and outlets.

5.2 Hay Bale Barriers

Straw bales should be installed on a similar basis to Silt Fences.



5.3 Silt Fences

Silt fences shall be employed to filter runoff leaving the site, to trap sediment. They are normally placed on the contour with slight convex to the contour to form a pond for water collection. Each fence should be no longer than 20 metres, should be overlapping, and they should not capture large or concentrated flows.

Areas below silt fences should be undisturbed or revegetated. They should also have a stable outlet condition. Silt fences shall receive regular maintenance. The base of silt fences should be buried to prevent stormwater flows passing beneath the fence.

5.4 Stormwater Pit & Inlet Traps

Such sediment traps shall be used to protect constructed inlet pits, stormwater piping, culvert inlets and outlets etc. They can either be built from hay bales, silt fence or silt fence 'sausages', gravel filled, or rock filled wire baskets. The choice of material depends upon the catchment area, type of material and the structure type shall be protected. These traps must be regularly maintained.

5.5 Buffer Zones

Buffer zones are corridors of existing vegetation intervening between the area of works and necessary areas of stormwater, gullies, creeks, Hunter River, and the like. The vegetation filters impede solids and reduce nutrient levels in runoff. Wetlands, streams, rivers and remnant bushland on Council reserves and public land shall be protected by buffers. Buffer zone performance increases as catchment area and slope gradient decreases. 35 metres wide buffer zones generally provide adequate protection.

SLOPE (%)	BUFFER LENGTH (M)
2	15
4	20
6	30
8	40
10	50
12	60
14	70

Batter Slopes

Such areas are required to be fenced where shown on the approved engineering plans as directed by the Engineer. Such fencing must be plainly visible to all machine operators.

Buffer zones and "no access" vegetation areas may sometimes be utilised as minor filter systems for small catchments. Council may also require binding upstream of buffer zones to divert surface waters



and/or stilling ponds to slow water and stop weed invasion into bushland areas, particularly adjoining sensitive environmental sites, or wetlands.

5.6 Diversion Banks & Drains

Runoff from natural areas and disturbed areas shall be controlled by the construction where appropriate of diversion drains. These may be in the form of earth or lined drains/banks, hay bales, sandbags, or pipelines. They may require progressive implementation and frequent alteration as works proceed. Diversion drains shall be provided along haul roads and access tracks where such roads are considered to constitute an erosion hazard.

5.7 Level Spreaders

These are generally used at the outlet to diversion drains and have a level cross section to convert concentrated flows into non-erosive sheet flows. They may only be used to dissipate flows from small catchments.

5.8 Shake Down Areas/Access to Sites

Shake down areas shall be provided to vibrate loose material adhering to the wheels and bodies of vehicles and plant. They shall be provided at the entry/exit to construction sites and are to reduce the tracking of sediments onto roadways from sites. They can be provided by a bed of large aggregate or cattle grid or similar.

6.Permanent or Semi-Permanent Controls

These are control devices that intercept sediment from catchments generally greater than 0.5ha and mainly at the outlet or discharge point of the site. They should not be considered for use in isolation of the temporary or point source measures. There are generally two types:

- The dry basin.
- The wet basin (wetland).

Basin designs must meet the following:

• Volume/capacity of the trap shall be at least 250m3/ha of the site for the undisturbed area of the contributing catchment, dependent on soil types.

The capacity shall be measured below the invert of the lowest incoming flow into the trap. A secondary or emerging stabilised spillway shall be provided to prevent overtopping the structure. The basin shall have a 0.3 metres freeboard at the spillway.

The basin internal batter slopes shall be no steeper than 6h:1v in accordance with safety requirements of Australian Rainfall and Runoff. External batter slopes shall be no steeper than 2h:1v.

An all-weather access shall be provided to the basin to allow access for maintenance in all conditions.

The basin shall have an arbitrary length to width ratio of 3:1 to encourage sediment settlement and longer distance travel.

Depending on the type of basin, discharge from the basin shall usually be via a perforated riser outlet encapsulated within a filter medium adequately joined to a pipe extending through the embankment to outlet to an approved area.



7. Channel Stabilisation

Channels should be stabilised where high flows or velocities may cause erosion and scouring of the channel. Techniques employed depend upon the velocity of the flow and materials. Materials for stabilisation should be chosen accordingly. Such materials comprise:

- Jute mesh.
- Reinforced turfing.
- Revetment mattress.
- Geotextile or plastic lining.
- Stone pitching concrete or rip rap.

8.Installation of Services

It is the responsibility of the contractor and developer to install the necessary structures to services, which require protection. Such protection shall include the following:

- Minimise the time any trench is open.
- Protect all road drainage pits and inlets.
- Progressively backfill all other service authority trenches.
- Revegetate specific areas, i.e. turf strip, or grass seed and mulch.
- Place backfill on side of trench away from road.
- Surplus material removed immediately to stockpile.
- Protect stockpiles with silt control.
- Divert runoff away from trenches.

8.1 Wind Erosion

The developer shall comply with statutory controls.

An exposed site that is susceptible to wind generated dust particles, shall be progressively vegetated and watered. Where vegetation is not yet possible, dust suppression by constant watering shall be provided.

Mulching should be provided to minimise wind erosion. In some cases, the provision of windbreaks may be necessary in highly exposed or sensitive areas. These requirements will be considered on merits.

8.2 Soil Stockpiles

Soil stockpiles shall be located as shown on the approved plans and shall:

- Be located outside of watercourses or flow paths.
- Be no higher than 3.0 metres, (however 1.0 metre is preferable).

- Slopes shall not exceed 2:1.
- Revegetated with a seed mix of oats, rycorn or Japanese millet or similar.
- Provision of soil erosion protective measures shall be placed around the stockpile.

9. Progressive Revegetation

- All disturbed areas should be revegetated immediately after construction with the provision of topsoil, grass seeding or turf, or a combination of each.
- Footpaths shall be topsoiled following provision of all services and a turf strip placed behind the kerb.
- Staging of works shall allow for the progressive revegetation of disturbed areas to minimise potential for erosion.
- All large disturbed areas (such as within lots) must be scarified to a depth of 75mm and topsoiled to a minimum depth of 50mm. Should the Engineer or Accredited Certifier deem that the topsoil stockpiled is unsuitable for use, then he/she will direct that the contractor imports suitable topsoil for the works.
- Hydromulching of all disturbed areas is recognised as an effective and speedy method of achieving revegetation and will be considered by the Engineer or Accredited Certifier as an acceptable practice where appropriate. Hydromulching shall be provided in accordance with the experienced and accredited supplier's specifications.

10. Hay/Straw Mulching

10.1 Surface Preparation

Surface preparation shall comprise topsoil over the area scarified to achieve a 50mm depth massed into a scarified 75mm subgrade. Seed and fertiliser to be sown at specified rates. Hay/straw shall be applied must be free from thistle or other woody species of acceptable quality and not rain affected.

Hay/straw shall be applied at the rate of 5 tonne/ha evenly spread over the soil surface. The hay/straw shall be tacked with nontoxic biodegradable binder at the rate of 2,500 litres/ha.

The following is a recommended seed mix:

- Spring/Summer
 - 12 kilograms per hectare of Japanese millet.
 - 8 kilograms per hectare of Perennial rye grass.
 - 3 kilograms per hectare of Red Clover.
 - 3 kilograms per hectare of White Clover.
 - 5 kilograms per hectare of Hulled Couch.
- Autumn/Winter
 - 15 kilograms per hectare of Oats or Black Winder rye corn.
 - 10 kilograms per hectare of Wimmera rye grass.



- 5 kilograms per hectare of Red Clover.
- 5 kilograms per hectare of White Clover.
- 5 kilograms per hectare of Couch.

The above seed mixtures are appropriate for urban areas only. Where any "bush" areas or reserves shall be seeded with native species these will be determined by Council.

"Rhodes Grass" sown at 3kg/ha may be included in harsh environments, e.g. quarry sites or similar.

10.2 Fertiliser

Fertiliser at the rate of 250kg/ha should be provided where approved.

10.3 Watering

The developer is responsible for the adequate watering of all revegetated areas and turf to ensure its natural regrowth from the time of planting through to issue of the subdivision certificate, although, if within a reasonable time beyond that date it is determined by Council that the works have failed to provide the intended result, the developer shall make good the defect.

Upon completion of construction works and full revegetation temporary sediment control structures shall be removed and those areas once containing the structures shall be revegetated and made good.

Mowing of revegetated areas and turf strips adjacent to kerb and gutter and pathways etc. shall be carried out to maintain the subdivision/development works in a tidy and presentable state.



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Appendix C: Stormwater Drainage

Surface Roughness or Retardance Factors

SURFACE TYPE	ROUGHNESS COEFFICIENT
Concrete or Asphalt	0.010 - 0.013
Bare Sand	0.010 - 0.016
Gravelled Surface	0.012 - 0.030
Bare Clay-Loam Soil (eroded)	0.012 - 0.033
Sparse Vegetation	0.053 - 0.130
Shod Grass Prairie	0.100 - 0.200
Lawns	0.170 - 0.480

Eg: For a sub-catchment length of 60 metres, a slope of 2 percent and a roughness of 0.05.

K = 43.38 For a 10-year ARI and the Overland Land Travel Time is 6 minutes.











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Appendix D: Pavement Material

Unbound Base Material Properties – AUS-SPECS

TEST METHOD			BASE MATERIAL REQUIREMENTS				
		DGB20	GMB20	NGB20-2C	NGB20-2D		
AS1289.3.6.1	Coarse Particle Size Distribution						
	% pass 75.0mm sieve	-	-	-	-		
	% pass 53.0mm sieve	-	-	-	-		
	% pass 37.5mm sieve	-	-	-	-		
	% pass 26.5mm sieve	100	100	100	100		
	% pass 19.0mm sieve	95-100	95-100	93-100	93-100		
	% pass 13.2mm sieve	-	-	-	-		
	% pass 9.5mm sieve	-	-	71-87	71-87		
	% pass 6.7mm sieve	50-70	30-55	-	-		
	% pass 4.75mm sieve	-	-	47-70	47-70		
	% pass 2.36mm sieve	35-55	20-30	35-56	35-56		
	% pass 0.425mm sieve	-	-	14-32	14-32		
	% pass 0.075mm sieve	-	-	6-20	6-20		
AS1289.3.6.3	Fine Particle Size Distribution Ratios expressed as % (for that portion of the material passing 2.36mm sieve)						
	A. Pass 425µm sieve %	35-55	30-50	-	-		



	B. Pass 75µm sieve %	35-55	30-50	-	-
	C. Pass 13.5µm sieve %	35-60	-	-	-
AS1289.3.1.1	Liquid Limit (if non plastic) 🛛	max 20	max 20	max 20	max 20
AS 1289.3.3.1	Plastic Limit (if plastic)	max 20	max 20	max 20	max 20
AS 1289.3.3.1	Plasticity Index ■	max 6	max 6	max 6	max 8
T114	Maximum Dry Compressive Strength on fraction passing 19mm sieve. (only applies if Plasticity Index is less than 1)	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa
AS 1141.14	Particle Shape by Proportional Calliper. % misshapen (2: 1)	max 35	max 35	-	-
AS 1141.22	Aggregate Wet Strength (kN) 🛇				
	For category 1 or 2a	min 80	min 150	-	-
	For category 2b or 2c	min 70	min 130	-	-
	For category 2d	min 60	min 100	-	-
AS 1141.22	Wet/Dry Strength Variation ◊				
	<u>Dry - Wet %</u>				
	Dry				
	For category 1 or 2a	max 35	max 30	-	-
	For category 2b or 2c	max 40	max 30	-	-
	For category 2d	max 45	max 30	-	-
AS 1289.F1.1	4 days Soaked CBR (98% Modified Compaction)	-	-	80	60

Notes:

Material consisting of rounded river stone shall have a minimum of two fractured faces on at least 75 per cent of the particles larger than 6.70mm.

Y The maximum value of the Liquid Limit may be increased to 23 for non-plastic material, provided that the value determined is not influenced by the presence of adverse constituents.

■ For category 2d base materials the maximum Plasticity Index shall be 8.

• All fractions of the sample specified by AS 1141.22 must be within specification. The fraction with the highest wet/dry strength variation is the value for determining conformance with the specification. The fractions 19.0mm to 13.2mm and 6.7mm to 4.75mm must be tested. The other fractions do not need to be tested unless there is a risk in the opinion of the Superintendent that such fraction may fail the specification. Any fraction at risk of failing must be tested.



Unbound Sub-Base Material Properties – AUS-SPECS

			BASE MATERIAL REQUIREMENTS			
	DESCRIPTION	DGS20	DGS40	GMS40	NGS20	NGS40
AS1289.3.6.1	Coarse Particle Size Distribution					
	% pass 75.0mm sieve	-	-	-	-	-
	% pass 53.0mm sieve	-	100	100	-	100
	% pass 37.5mm sieve	-	-	-	-	95-100
	% pass 26.5mm sieve	100	-	-	100	80-97
	% pass 19.0mm sieve	95-100	50-85	50-75	96-100	-
	% pass 13.2mm sieve	-	-	-	-	-
	% pass 9.5mm sieve	-	-	-	65-89	48-85
	% pass 6.7mm sieve	50-70	30-55	15-35	-	-
	% pass 4.75mm sieve	-	-	-	47-80	35-73
	% pass 2.36mm sieve	35-55	25-50	5-15	32-67	25-58
	% pass 0.425mm sieve	-	-	-	14-42	10-33
	% pass 0.075mm sieve	-	-	-	6-26	3-21
AS1289.3.6.3	Fine Particle Size Distribution Ratios expressed as % (for that portion of the material passing 2.36mm sieve) A. Pass 425µm sieve %	35-55	35-60	25-50	-	-
	B. Pass 75µm sieve %	35-55	35-60	25-50	-	-
	C. Pass 13.5µm sieve %	35-60	35-65	-	-	-
AS1289.3.1.1	Liquid Limit (if non plastic)	max 23	max 23	-	max 23	max 23
AS 1289.3.3.1	Plastic Limit (if plastic)	max 20	max 20	-	max 23	max 23
AS 1289.3.3.1	Plasticity Index	max 12	max 12	max 12	max 12	max 12



T114	Maximum Dry Compressive Strength on fraction passing 19mm sieve. (only applies if Plasticity Index is less than 1)	min 1.0 MPa	min 1.0 MPa	-	1.0 MPa	1.0 MPa
AS 1141.14	Particle Shape by Proportional Calliper. % misshapen (2: 1)	max 35	max 35	max 35	-	-
AS 1141.22	Aggregate Wet Strength For category 1 or 2a For category 2b or 2c For category 2d	min 50kN	min 50kN	min 130kN	-	-
AS 1141.22	Wet/Dry Strength Variation ♦ <u>Dry - Wet %</u> Dry	max 60	max 60	max 30	-	-
AS 1289.F1.1	4 days Soaked CBR (98% Modified Compaction)	-	-	-	30	30

Notes:

Material consisting of rounded river stone shall have a minimum of two fractured faces on at least 75 per cent of the particles larger than 6.70mm.

♦ All fractions of the sample specified by AS 1141.22 must be within specification. The fraction with the highest wet/dry strength variation is the value for determining conformance with the specification. The fractions 19.0mm to 13.2mm and 6.7mm to 4.75mm must be tested. The other fractions do not need to be tested unless there is a risk in the opinion of the Superintendent that such fraction may fail the specification. Any fraction at risk of failing must be tested.

Where the proposed unbound base material complies with all of the requirements of the Unbound Base except gradings (AS1289.3.6.1 and AS1289.3.6.3), the Contractor may propose the use of the material, subject to approval of the Superintendent, if the material complies with the RMS Modified Texas Triaxial Classification Number (T171) requirements specified in table below, (T171 tested at not less than 85 per cent of Optimum Moisture Content and 98 per cent of Maximum Dry Density as determined by AS1289.5.2.1).



RMS Modified Texas Triaxial Classification Number Requirements

TRAFFIC CATEGORY	MODIFIED TEXAS TRIAXIAL CLASSIFICATION NUMBER (TEST METHOD T171)
1	max 2.0
2α	max 2.2
2b	max 2.5
2c	max 3.0
2d	max 3.0



Version: 1.0

Appendix E: Best Practice

Engineering submissions shall be prepared by a suitably qualified and accredited professional in accordance with Council's Manual of Engineering Standards (MoES), Maitland Development Control Plans (MDCP), and the following supplements. These documents expand on and provide further guidance to MoES, as well as professional and reasonable design and construction standards.

Some publications may overlap into other Topics but have not been listed again for brevity. For example, Road Design, Traffic and Transport, and Movement and Place share many linkages.

ТОРІС	PUBLICATIONS AND REFERENCE MATERIAL
Road Design	 Transport for NSW (TfNSW) publications - supplements, technical directions, specifications, etc.
	Austroads Guide to Road Design
	Australian Road Research Board (ARRB)
	Australian Standards
	 Fire and Rescue NSW: Fire Safety Guideline – Access for Fire Brigade Vehicles and Firefighters
	TfNSW Delineation Guidelines
Traffic and Transport	TfNSW publications
	TfNSW Guide to Transport Impact Assessment
	Australian Standards AS 1742: Traffic Control Devices
	 SOCC Guide to Codes and Practices for Streets Opening (7th edition)
	Austroads Guide to Traffic Management
	MCC Integrated Land Use and Transport Study



Movement and Place (Urban Design within road reserves) Geotech Road Pavement and sealing	 TfNSW Movement and Place: Design of Roads and Streets NSW SES Design Safer Subdivisions NSW Architect (Greener Places, Urban Design Guide for Regional NSW, etc) TfNSW Supplements Austroads Design Guides
	 ARRB TfNSW Supplement to Austroads Guide to Pavement Technology Part 2: Pavement Structural Design
Earthwork	Australian Standards AS 3798: Guidelines on Earthwork
Geotech	Australian Standards AS 1726: Site Investigations
Parking	Australian Standards AS 2890
Bridges and Structures	 Austroads Australian Standards Australian Standards AS 1170: Structural Design Actions Australian Standards AS 5100: Bridge Design Australian Standards AS 3600: Concrete Structures Australian Standards AS 4100: Steel Structures Australian Standards AS/NZS 3845: Road Safety Barrier Systems
Bus	 TfNSW State Transit Bus Infrastructure Guide TfNSW Guidelines for Public Transport Capable Infrastructure in Greenfield Sites
Stormwater	 Australian Rainfall and Runoff EA Australian Runoff Quality: A Guide to Water Sensitive Urban Design Australian Standards AS 3500.3: Plumbing and Drainage Australian Standards AS/NZS 3798: Precast Concrete Pipes



	 CRC Adoption Guidelines for Stormwater Biofiltration Systems Water by Design WSUD Publications FAWB Guidelines for Filter Media in Biofiltration Systems
Cycling	 Austroads Guide to Road Design TfNSW Planning Guidelines for Walking and Cycling
Street Lighting	Australian Standards AS 1158
Erosion and Sediment Control	 Landcom Managing Urban Stormwater: Soils and Construction (Volume 1) Department of Planning Guidelines for Erosion and Sediment Control on Building Sites
Bushfire	• NSW Rural Fire Service (RFS) Planning for Bushfire Protection

