
24.00 Landscaping

24.01 Generally

Materials and workmanship shall be in accordance with the relevant Australian Standards AS 4419 - Soils for Landscaping and Garden Use.

The finished floor level of buildings shall be a minimum 200mm above the finished level of external landscaping.

Minimise hard landscapes (except adjacent to building entrances or courtyards) and use permeable paving and surface materials to maximise site water absorption.

Particular consideration shall be given to creating designated 'smoking' areas outside buildings, adjacent to but clear of building entries. The extent of furniture, fittings and any shelter structures shall be subject to consultation with, and the approval of, CLF.

24.02 Red Imported Fire Ants (RIFA)

Any materials sourced or originating from a current Red Imported Fire Ant (RIFA) treatment Zone is to be assured, certified or guaranteed in writing to be visually free of RIFA by the material supplier. Refer to [Section 4.00 Project Preliminaries](#) for the full requirements associated with RIFA.

24.03 Water Supply to Hosecocks, Drinking Fountains and Irrigation Systems

All external hose cocks and drinking fountains are serviced by a separate valved water supply from the building Valve Room. Refer to [Section 17.00 Hydraulic Services](#).

24.04 Hosecocks

Hosecocks will be provided in each courtyard and/or garden bed/planter box and at a spacing not exceeding 30m around the perimeter of the building in accordance with the requirements of [Section 17.00 Hydraulic Services](#).

24.05 Landscape Drainage

Surface Drainage – All surface water shall be collected in grated sumps. Each sump shall incorporate a silt trap and be of sufficient capacity to drain the area under all conditions.

Subsoil Drainage - Provide at least one 100mm diameter slotted subsoil drain to service each 10m² of garden/lawn. All drains shall be enclosed in a geofabric sock and laid in a trench in the subsoil with a 150mm gravel surround. Where connected to the stormwater drainage system, an air gap must exist between the end of the drain and the storm water pipe.

Where drainage is installed under paved areas, rigid PVC shall be used. The outfall of drainage from courtyards is to discharge into planted landscapes.

The high end of all drainage lines is to be turned up to provide a flushing point and shall be fitted with a removable cap. The final level for the capped end shall be 75mm above mulching, or set flush with turf.

Planter Boxes - All planter boxes and planter beds within paved areas shall be properly drained, using gravel and filter fabric.

Where boxes or beds are to be planted with trees, ensure that the possible intrusion of roots into the subsoil/stormwater drainage system is prevented utilising root barriers where plant roots may cause damage to surrounding infrastructure.

24.06 Topsoil & Planting Soil

Material - All soil for grassing and planting shall comply with AS 4419 and generally be an approved friable sandy loam with a sand content of between 50% and 70% by volume and a humus content of between 5% and 10% by volume. The pH shall be 6.0 to 7.0. All soil shall be free from stones, weeds, sticks and rubbish.

Subsoil Preparation – Before placing soil, the subsoil shall be properly prepared by ripping, cultivating and removing unwanted materials including any necessary treatment of acid or alkali content.

Cultivate the sub grade of all garden areas prior to placement of soil by ripping to a minimum depth of 400mm to loosen the compacted ground. Do not disturb services or existing tree roots. If necessary, cultivate these areas by hand.

Placing – Soil shall be spread on the prepared subsoil including mixing in any required fertiliser and making allowance to achieve minimum soil depths after light compaction.

Soil Depth For Gardens and Turfed Areas - A minimum depth of 300mm of topsoil is required for garden beds and a minimum depth of 100mm topsoil for turfed or seeded areas.

Soil Depth for Planter Boxes and Beds within Paved Areas - A minimum depth of 1 metre of topsoil is required for planter boxes and beds.

24.07 Turf

Turf shall be of an approved species of good quality and free from weeds.

The area to receive turf shall be lightly consolidated after preparation to avoid settlement and be graded to an even slope. Topsoil shall be spread over the area so that grass finishes level with adjoining paving and kerbs. Turf shall be laid along the contours with the joints staggered. The turfed surface shall be lightly and evenly top dressed with sandy loam or sand to fill any depressions. Turf shall be well and regularly watered after laying. All turfed areas are to be irrigated with a system designed to suit the turf zone for efficient watering.

24.08 Planting

A Plant Species List for all campuses is available from PD&C. Preference shall be given to the use of drought tolerant plants which do not require regular watering.

Plants shall be sun-hardened nursery stock, grown in soil, and free from weeds.

If there is doubt about adequate drainage, the holes need to be water-tested prior to planting to ensure proper drainage.

Partly fill holes with soil containing blood and bone well mixed in to manufacturer's recommendation and covered with 25-50mm of fertiliser-free soil.

Water all plants before and immediately after planting.

24.09 Garden Mulch

Mulch shall be free from soil, weed growth and green material or other matter.

Mulch may be of the following types:

- **Timber Chips** - Derived from trees and vegetation removed from the site during site clearing and stockpiled on the campus.
 - **Pine Bark Mulch** - Medium grade with minimum bark size of 20mm square and maximum of 75mm square.
 - **Hoop Pine Bark Mulch** - For use on steep slopes to the approval of CLF.
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- **Riverstone Mulch** - Smooth, washed river stones in sizes varying from 100mm to 25mm to a minimum depth of 150mm.
- **Gravel Mulch** - Washed river gravel of 30mm maximum size to a minimum depth of 75mm. Use in external areas (other than under buildings) shall be avoided.

Generally mulch is to be placed to a minimum depth of 75mm unless noted otherwise and in all cases shall finish flush with edge retainer or adjoining surfaces. Black plastic is not to be used below mulch.

The selection of the garden mulch type is to be approved by CLF.

24.10 Landscape Timber

All timber shall be LOSP (Light Organic Solvent Preservative) treated to AS 1604 – 1993 with a minimum stress grade of F5. All timber faces are to receive 2 no. coats of clear water repellent timber preservative after cutting, arising etc. and prior to assembly. All exposed edges are to receive a 5mm wide arris. All fixings to be hot dipped galvanised.

Timber edges to gardens are **not** permitted.

24.11 Garden Edges

Garden edges to be brown or other approved coloured concrete 100mm wide x 125mm deep, finished with a steel float with arrised edges and construction joints at 1500mm maximum centres.

24.12 Retaining & Planter Box Walls

Retaining walls to changes in site levels within the landscaped areas may be as follows;

- **Rock Walls** - Rock retaining walls are to be constructed of weathered sandstone or an approved alternative stone. Walls are to be constructed to an angle of repose of approximately 60° maximum, with all rocks set horizontally into wall face. Install Geotextile filter fabric to rear of rocks.
- **Concrete Crib Walls** - Concrete crib type retaining walls constructed from interlocking precast concrete components and filled with free draining material and earth backfill, all in accordance with the manufacturers' instructions.
- **Concrete Block Interlocking Walls** - Caps shall be adhered to tops of all walls, and where walls have stepped tops, the caps are to be cut to suit. Installation of walls is to conform to manufacturers' instructions. Backfill behind wall to depth of 300mm with top soil.
- **In situ Concrete Walls** – Walls shall be constructed with an approved off form finish. Coloured concrete may be used.

Planter box walls shall generally be constructed in concrete or reinforced concrete masonry. The finish to retaining and planter box walls shall be selected to minimise maintenance.

All planter box walls shall be fully tanked, properly drained and water tested prior to placing soil.

Tops of retaining and planter box walls shall be designed to eliminate damage from skateboards, roller blades and bicycles.

The material, colour and finish of retaining and planter box walls shall be approved by OFM.

24.13 Paving & Footpaths

In all cases, the finished paving level shall be not less than 200mm below internal floor level or 100mm below damp proof course level, except at entries where paths shall be ramped to doorways to conform to AS 1428.1.

Design pavements and locate them in such a manner as to reduce stormwater velocity. The surface of paving should be finished to falls and cross-falls to allow drainage to gardens or grassed areas where possible.

Gratings to sumps in courtyards and feature paving shall be stainless steel of a type that is compatible with wheelchair traffic.

Paving types may be as follows;

- **Concrete** - Footpaths and general paving may be either exposed aggregate or broom finished and set out with jointing or patterning. The concrete colour should generally be to match any adjoining paving however the use of coloured concrete is desirable. Refer to GU Standard Detail Drawing No. GSD-100 for expansion and contraction joints in concrete paving.
- **Clay or Concrete Paving Units (including quarry tiles)** - Where existing unit paved areas are to be extended or modified, paving units shall be to match existing. If no matching paving units are available, then consideration shall be given to removing all existing paving units and replacing with an alternative approved by the Superintendent. Refer to Section 6.00 Staircases & Ramps Clause 6.06 for details of permitted tactile indicators in existing paving.
- **Stone Paving** – GU has selected Australian granite as its preferred unit paving for all campuses. The selected stone is 'Austral Juparana' in 605 x 300 x 20mm thick units as the main base colour, with 'Austral Coffee' in 148 x 148 x 20mm thick units for the contrast features. Examples of the use of this paving can viewed at the Nathan campus in the Campus Heart Plaza and along the Johnson Path pedestrian spine. Black granite/basalt warning and directional tactile pavers 300 x 300 x 25mm thick shall be used in conjunction with all stone paving. The nosing to step treads shall be black in 75 x 20 x 300mm long units with the front edge bevelled to 10mm high to satisfy Code requirements. Pavers on step risers shall have a bevelled top edge to fit the nosing. All paving units, tactile pavers, nosing units and step risers are available from J.H. Wagner & Sons.

Where stone paving is subject to heavy vehicular traffic, the thickness shall be increased to 30mm.

All paving units shall be laid on a reinforced concrete base slab. The thickness of base slabs shall be shall be 100mm min. thick for pedestrian traffic and 150mm. min thick for vehicular traffic areas.

Set pavers on a nominal 10mm thickness of mortar bedding, fill joints with matching sand and cement/colour agent and install 10mm thick 'Ableflex' to expansion joints in new paving and where new paving abuts existing paths or structures.

Provide a concrete haunch along any unsupported edge to paving.

24.14 Irrigation System Generally

Garden beds and turfed areas shall not be irrigated unless instructed by the Superintendent. Water for irrigation shall only be taken from the rainwater storage tank provided for the building.

If irrigation is required, the Contractor shall supply an irrigation plan before the commencement of the landscaping.

The landscape contract must include for the supply, installation, testing and commissioning of all the equipment necessary for the completion of the works described or inferred in the tender specification and drawings.

The irrigation system shall be controlled from a Central Controller unit.

All necessary approvals must be obtained from the local authorities, Department of Environment and Heritage and other regulatory authorities.

The system installer must undertake the commissioning of the irrigation system in the presence of the Superintendent.

24.15 Irrigation System Materials & Equipment

The irrigation system shall be installed using the following equipment and materials;

Water Supply Equipment - Measurable quantities of filtered water at the optimum supply pressure must be provided at the Point of Connection using the following equipment. The equipment must all be flanged drill table D&E.

- **Filter** - 'Amiad' or equivalent with 80 mesh filter and a pressure 'Binda' cock.
- **Backflow Prevention** – 'RMC' or equivalent testable backflow prevention device (on site) to Australian Standards
- **Control Valves** - 'Irritroll' either 'Century' or 'Toro 250' or equivalent.
- **Solenoid Cable** - Solenoid cable must consist of polythene insulated multi-strand, multi-core copper wire in a sheath suitable for direct burial. HTE cable to AS 3147/1988. Cables must run continuously, without joints from controller to converters, valves and switches.
- **Cable Connectors** - Cable joints must be made waterproof and corrosion proof using solder and 'TYFLO' Heat shrink, or '3 DBY' or equivalent.

Pipework – All pipework shall be uPVC minimum Class 12 pipe for all main lines, laterals and sub-laterals with solvent welded joints. Class 10 may be used where laterals are down stream from solenoid valves. Sizes 80mm and upward must be rubber ring jointed to AS 1477. MDPE pipe PN 12.5 Class 12 polythene may be substituted for uPVC. Fused joints, or compression fittings must be used, and must have matching pressure ratings.

Drip Line – 19mm dia. standard uPVC pipe as nominated above perforated as required to suit the application.

Pipe Fittings - Galvanized or black iron fittings or pipe **must not** be used.

uPVC pipe fittings must be Class 18 and complying with AS 1477, and must be made by the same manufacturer as the PVC pipe.

MDPE pipe fittings must be 'Philmac' or equivalent.

Screwed fittings must be 'Philmac' or equivalent with tapered threads.

Drip tape fittings must be 'Wingfield'.

Fittings selection and use should be as follows:

Item	Fittings Descriptions
uPVC Pipe, bends	Cat P12 rubber ring long radius fittings
uPVC Pipe 50mm	uPVC fittings
uPVC Mainline to control valves	Screwed bronze tapping saddles
MDPE Pipe to sprinklers	Plastic tapping saddles complete with 4 stainless steel bolts and stainless steel reinforcing rings; Plasson or equivalent
uPVC Mainline to Air Valves	Screwed bronze tapping saddles with valve sized outlet mounted vertically, Philmac nipples to ball valve and air valve
uPVC termination	uPVC rubber ring end cap and concrete thrust block.

Sprinklers - Spray heads must be Toro, Hardie or approved equivalent. Use 12" Pop-up for shrubs and 6" Pop-up for ground covers. Sprinkler heads shall be as follows;

- **Small Rotor Heads** - 'Toro 300' series.
- **Small Spray Heads** – 'Toro 570' series
- **Large Rotor Heads** – 'Toro 640' series.
- **Pop-up Sprinklers** – 'Spears' on articulated risers sized to match the sprinkler inlet size.

Valves – Valves shall be as follows;

- **Air Valves** – 'Bermad' 25 and 50mm double purpose air release model 4415 or equivalent.
- **Isolating Valves** – Refer to **Section 12.00 Hydraulic Services**
- **Valve Boxes** - Must be made of structural foam and must be fitted with locking lids. Valve boxes for control valves must be Carson 910 or equal. Other boxes must be large enough to house, and allow service of, their valves.

24.16 Irrigation System Installation

Controller – The controller must be hard wired to a dedicated circuit breaker and must be identified at fuse box as being 'Irrigation Only'.

Water Meter and Pressure Regulating Valve – This shall be installed as a single assembly, comprising filter, water meter, pressure regulating valve and backflow device in accordance with current AS 3500 and associated codes. The assembly connections are to be dezincified brass with inlet/outlet isolation ball valves. The assembly must be supported by a hot dipped galvanized mild steel stand and be contained within a lockable, purpose made, galvanized box.

Rain Sensor – A Rain Sensor 'Mini-Click™' or 'Toro' with a 'Irritrol' Code 2595 Moisture Sensor Override is to be installed on each system aesthetically positioned in a location safe from vandals, and where rain will always fall on it. If the sensor must be on a field post see sample at Nathan Oval No. 1.

Sprinklers - Sprinkler positions must be set out by a certified irrigation designer with a minimum of head to head spacings.

Shrub sprinklers must be installed on risers.

Pop-up sprinkler risers must be installed allow free movement of the sprinkler before backfilling, and sprinklers shall be set to grade.

Control valves with flow control must all be adjusted to provide optimum sprinkler performance without misting or overthrow.

Drip Lines - Installation must commence at the control valve where the 20mm, 200 mesh filter and air vent are fitted. The 40mm MDPE sub main is to be connected to a pressure regulating valve with 68 kPa discharge pressure, and at each group of two or three lines. The pressure reducing valve is connected to the line by 19mm Polythene pipe. The drip line must be buried 75mm below ground level and must be laid in row spacings of 600mm.

Control Valves - Control valves must be identified by permanent engraved labels securely fastened to the valve flow stem.

Valve boxes must be set to grade with the base supported on bricks to ensure there can be no contact with irrigation pipe works.

Excavation & Backfilling - The system installer must not excavate by machine within 1 metre of existing underground services. All surfaces (turf, concrete, bitumen etc) and any existing underground services damaged or cut as a result of excavations by the installer must be restored to their original condition.

Trench widths must be equivalent to 3 nominal pipe diameters to provide working room and to ensure ample sand bedding all round the pipes.

Trench depths must be sufficient to allow 75mm of sand underlay under the pipe, + the pipe diameter of pipe + 150mm sand + 150mm of topsoil. The trench bottom must be level, free of rocks and sharp objects and must support the whole length of the pipe.

Backfilling to trenches for all pipes, and cables and conduits shall be screened bedding sand. The minimum underlay shall be 75mm and the minimum overlay 150mm.

Install pipe marker tape over sand before backfilling with top soil.

Suitable spoil from the trench excavation, free from rocks, clay, rubbish and building debris may be used to top up the trench if necessary.

Where separate trenching is needed for the power or communication cable, the minimum depth **must** be 450mm and minimum width 100mm.

Pipelaying - PVC pipe must be installed to conform with the current AS 2032.

MDPE pipe **must** be installed to current AS 2033 and AS 1460 parts 1 & 2. Care **must** be taken not to kink pipe.

Control Wiring - Control wire (24V AC) must be run continuously without joins from each pilot valve to the Controller. The common and actives must be taped together at 1 metre intervals and laid in a trench on the sand bedding beside the pipe.

Wires must be laid loosely in the trench, with a 300mm loop at each valve connection and at each change of direction, so that they are not under tension when the trench is backfilled.

Any exposed wire or installation below concrete must be installed in grey conduit.

All solenoid cables must be tested for electrical conductivity to ensure no leaks to earth or other faults occur. Any problems must be fixed prior to connection to the controller.

Flushing of New Pipework - After pressure testing has been carried out the new pipework must be flushed thoroughly with the available water pressure before the sprinklers are attached to the risers.

Hydraulic Testing - The whole of the system must be tested at 1000 kPa. The tests must be carried out by the installer at his own risk and expense.

All work shall withstand the test pressure for a period of two hours.

Thrust Blocks - Thrust blocks are required on all rubber ring jointed pipe, uPVC pipe sizes 80mm and above and Poly pipe 100mm and above or where fabricated fittings are used AS 3500

Thrust blocks shall must be placed at all tees, and bends, (whether horizontal or vertical), and blank ends and changes in diameter or direction, or where it is expected to develop thrust eg. valves or in unstable soil conditions. in rubber ring jointed pipe. Ductile iron isolating valves must be tied down to thrust blocks by galvanised iron straps using galvanised bolts. Thrust blocks must be placed so that pipe and fittings will be accessible for repair.

Thrust blocks must not be covered until they have been inspected by the Superintendent.

Restoration of Existing Surfaces - All existing surfaces, concrete, turf, or bitumen where disturbed by the system installation shall be restored by the installer unless otherwise advised by the Superintendent.

Warranty – The Contractor must provide a warranty on workmanship for a period of twelve (12) months after the date of Practical Completion to GU.

As Constructed Drawings - As constructed drawings of the irrigation system shall be submitted according to requirements in [Section 27.00](#).

All piping, wiring and major components must be shown using triangulation from at least two fixed ground permanent points.

Provide a list of components and show typical layouts and fittings.

24.17 Landscape Furniture

The selection of landscape furniture including seats, bins, bollards, lighting, fencing and signs is to be to the approval of CLF. In all cases, consideration is to be given to matching existing adjacent furniture or that which is generally adopted for use on the particular campus.

Drinking fountains in external landscaped areas shall be 'Street & Garden Furniture Co.' FL100 cast aluminium fountains with selected powdercoat finish. Fountains shall be securely fixed to concrete slabs or pad footing in accordance with the manufacturer's instructions, and waste water disposal shall be to the approval of CLF.

Furniture on the Nathan campus shall be in accordance with the Furniture Catalogue developed from the Nathan Master Plan. This catalogue is available from the CLF Principal Architect, who shall be consulted on the type and colours of furniture items to be incorporated into the Landscape design.

24.18 Supervision of Landscaping Work

The Landscaping Design Consultant shall be responsible for the supervision of all landscaping works carried out in accordance with its specification and drawings and these Guidelines and Procedures. The Design Consultant shall submit a report on the completion of the works certifying that the work has been completed to the satisfaction of the Consultant and in compliance with all the abovementioned documentation.

24.19 The Landscape Maintenance Period

The Landscape Maintenance period shall commence from the date of Practical Completion of the Works and shall extend for a period of twelve (12) months. Maintenance of landscape works to include watering, mowing, pruning, weeding, fertilising, pest and disease control, replacement of dead or missing plants and the like for grassed and garden areas.

Any replacement plants shall be of a size and maturity which matches those in the landscaping at the time of replacement.

24.20 External Signage

All external signage shall be in accordance with the GU Signage Manual. The CLF Principal Architect shall be consulted on the type and location of all signage units.