

SPECIFICATIONS

**○ CEMSEAL EGR
EXTENSIVE GREEN ROOF**

1 GENERAL

All work in this Section shall comply with the requirements of the Contract Documents. Supply and extensive green roof as shown on the drawings or specified herein.

2 MATERIALS

Cemseal EGR extensive green roof system shall be supplied by Cemseal Industries Sdn Bhd (Tel: +607-558 3320, Fax: +607-556 9127, E-mail: info@cemseal.com.my) or approved equivalent.

GENERIC SPECIFICATION

The extensive green roof shall be a complete lightweight system comprising water retention and drainage trays, geotextile filter fabric, lightweight planting media and root-resistant waterproofing membrane.

The lightweight system shall not weigh more than 50kg/m², excluding plants.

2.1 Water Retention and Drainage Tray

The water retention and drainage trays shall be CEMSEAL VERSIDRAIN 25P or approved equivalent.

GENERIC SPECIFICATION

The water retention and drainage trays shall be manufactured from UV-stabilised high density polyethylene, resistant to moisture-absorption and root-penetration. Materials such as expanded polystyrene shall not be used.

Typical properties of the drainage trays are:

PROPERTY	VALUE
Material	HDPE
Height	23 mm
Weight	~1.0 kg/m ²
Thickness	1 mm
Dimension	2.22 x 1.33 m
Water storage capacity	6.1 l/m ²
Drainage capacity of slits	0.8 l/m.s
Drainage capacity below studs @ 3% hydraulic gradient	1.5 l/m.s
Compressive strength	50 kN/m ²
Root penetration	Resistant
Biological resistance	Unaffected by moulds and algae

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2.1 Water Retention and Drainage Tray (cont'd)

PROPERTY	VALUE
Chemical properties	Resistant to rot, oils, acids, alkalis, bitumen and naturally occurring soil chemicals
Service temperature	-30°C to 80°C

2.2 Geotextile Filter Fabric

The geotextile filter fabric shall be an approved non-woven needle-punched fabric consisting of polypropylene, polyethylene, polyester or any of these combinations.

Typical properties of the geotextile filter fabric are:

PROPERTY	VALUE
Weight	≥ 100 g/m ²
Pore size	≤ 190 microns
Tensile strength @ 40% elongation	≥ 4 kN
Grab strength @ 60% elongation	≥ 440 N
Puncture resistance	≥ 800 N
Trapezoidal tear strength	≥ 270 N
Flow rate	≥ 50 l/m.s

2.3 Lightweight Planting Media

The planting media shall be CEMSEAL ENVIROMIX GR lightweight mix supplied by Cemseal Industries Sdn Bhd (Tel: +607-558 3320, Fax: +607-556 9127, E-mail: info@cemseal.com.my) or approved equivalent.

GENERIC SPECIFICATION

The planting media shall be a lightweight pH-stabilised mix comprising of predominantly inorganic planting media with high porosity, good texture, and good moisture/nutrient retention suitable for green roofs in a tropical climate and vegetation as specified by the Landscape Architect.

Unless otherwise specified, the planting media for all plants of the extensive rooftop garden shall comprise the components and properties listed below. It shall be mechanically mixed to the correct proportions, prior to placement on site.

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2.3 Lightweight Planting Media (cont'd)

Typical properties of the planting media are:

PROPERTY	VALUE
General materials	pH-stabilised mix of porous granules comprising: <ul style="list-style-type: none"> • Lightweight expanded clay • Synthesized silica and lime aggregate • Proprietary additive of carbon and cellulose modified natural silicate powder • Organic matter e.g. peat, coco peat, vegetative compost and rice husk compost and rice husk compost
Density (dry)	400 - 500 kg/m ³
Density (wet)	550 - 650 kg/m ³
Colour	Light colour earth tones
Heat absorption	Low
Grain size	~0.06 to 16 mm
Moisture and retention	~50-60% (w/w)
Organic content	Max. 3% v/v
pH value	6.5 – 7.0

2.4 Root-Resistant Waterproofing Membrane

Where required, the waterproofing membrane shall be CEMSEAL EVALON V or approved equivalent.

GENERIC SPECIFICATION

The waterproofing membrane shall be a rot-proof root-impenetrable 1.5 mm thick thermoplastic EVA/PVC terpolymer membrane. It shall be inherently bitumen and polystyrene-compatible without need for a separation layer. The membrane shall be manufactured as a single non-laminated layer that is UV-resistant without any surface coating on both sides. The non-solids (liquids) content shall be less than 10 percent and the membrane shall be dimensionally stable enough to be used as exposed membrane without any need for a centrally laid reinforcement.

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2.4 Root-Resistant Waterproofing Membrane (cont'd)

The waterproofing membrane shall be manufactured to ISO 9001 quality assurance.

The waterproofing membrane shall possess a British Board of Agrément (“BBA”) or European (“UEAtc”) Agrément certificate with durability rating of at least 30 years. For areas where the waterproofing membrane is to be fully adhered, the cold applied adhesive shall be according to the manufacturer's recommendations.

The Performance Standards of the waterproofing membrane is required to match or surpass the following:

PROPERTY	VALUE	TEST METHOD
Country of manufacture	Germany	
Thickness (measured without any adhesive or fleece backing)	1.5 mm	
Solids content (M. Wt. >100,000)	>90%	-
Bitumen resistance	Yes	DIN 16937
Vapour diffusion resistance	<15,000	DIN 5312
Fire resistance	B2	DIN 4102
Root resistance	Root impenetrable	FLL
Tensile strength	>500 N/50mm	DIN 53354
Elongation	>300%	DIN 53354
Puncture resistance drop height	600 mm	SIA 280 Part 14

3 EXECUTION

- 3.1** The proprietary materials specified herein shall be provided / installed in accordance to the project requirement as approved by the Superintending Officer.
- 3.2** Proprietary materials supplied shall be identified clearly with the product name and description. Packaged materials shall be stored in manufacturer's wrappings and containers with the manufacturer's labels and seals intact
- 3.3** Prior to installation, the Contractor shall submit Method Statements and / or Shop Drawings for the installation of the drainage tray system. The latter shall be on at least A3 size paper or larger and in a CAD-recognisable format.

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3.4 Installation of Drainage Tray, Geotextile and Growth Media

- (a) Lay drainage trays with the studs down and without any fixing on top of the root resistant waterproofing membrane. Overlap with minimum one stud in both directions. Cut, as necessary at drainage gully or plinth areas etc.
- (b) Cover the installed drainage trays with a geotextile filter fabric. The ends of all installed drainage trays shall be properly sealed with geotextile to ensure soil particles do not enter the drainage trays.
- (c) The Contractor shall organise an inspection of the drainage tray installation prior to placement of the planting mix.
- (d) The planting mix shall be mechanically mixed off site with the aid of a cylindrical mixer to the correct proportions prior to the placement on site. The planting mix is manually spread and levelled in the planting troughs / beds to the required depth.

3.5 Installation of Waterproofing Membrane

- (a) The installation of the waterproofing system shall be carried out by bona fide Specialist Waterproofing Contractor in existence under the same name for at least 8 years and meeting the following CIDB criteria:

<u>Value of waterproofing works</u>	<u>CIDB Grade</u>
up to RM10,000,000	G6

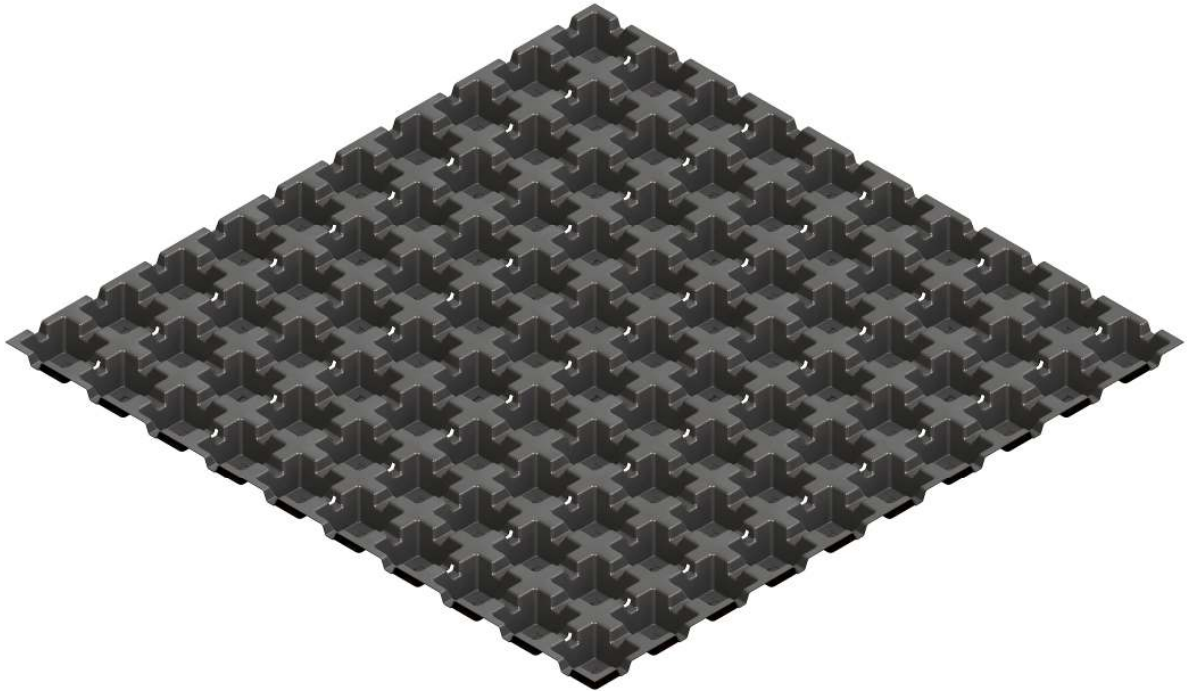
- (b) The design, supply and installation of all waterproofing systems and products specified herein include all components such as cement and sand screed to falls (if required), pre-formed corners, outlets etc. and all other measures and materials required to satisfactorily complete the waterproofing system.
- (c) Surfaces to receive waterproofing shall have at least a wood float finish and be clean and dry. Concrete substrate must be cured for a minimum 28 days and dried. All holes, joints, and cracks and honeycombs in concrete or masonry surfaces should be filled with an approved grout and allowed to cure. High spots in concrete or masonry surfaces shall be cut off or ground down.
- (d) The waterproofing system shall include procedures for testing of the membrane integrity during installation.

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- (e) The structure to be waterproofed shall be checked for structural integrity by conducting a ponding test. At the conclusion of the waterproofing treatment but prior to laying of the drainage trays, the waterproofed area shall be tested by ponding for at least 48 hours.
- (f) Prior to commencing waterproofing, all dust, dirt and foreign matter, shall be removed and the substrate shall be inspected and approved by waterproofing manufacturer's representative.
- (g) The Contractor shall provide adequate measures to protect the waterproofing system from being damaged during subsequent construction activities.

SPECIFICATIONS



CEMSEAL VERSIDRAIN 25P

PROJECT REFERENCES

Completed Projects

ARAMSA SPA GARDEN @ BISHAN PARK *Formwerkz Architects*

BOUGAINVILLEA PARK @ EAST COAST *KTB Architects*

RIDOUT ROAD NO.47 *AT-II Architects*

TOA PAYOH TOWN PARK *Surbana Consultants*

GIRLS' COMPLEX *CPG Consultants*

CORNWALL GARDEN NO.12 *Aamer Taher Design Studio*

AMOY STREET NO.90 *Aamer Taher Design Studio*

EWART PARK NO.1B *Guz Architects*

HOTEL @ IMBIAH WALK, SENTOSA *Tan + Tsakonas Architects*

ARMY MUSEUM OF SINGAPORE *Greeneearth*

PASIR RIS PARK EXTENSION *National Parks Board*

HDB @ PUNGGOL ESTATE *Surbana Consultants*

HDB @ QUEENSTOWN ESTATE *Surbana Consultants*