

SPECIFICATIONS

CEMSEAL IGR

○ INTENSIVE GREEN ROOF

1 GENERAL

All work in this Section shall comply with the requirements of the Contract Documents. Supply and install landscape roof (i.e. intensive green roof) including planters as shown on the drawings or specified herein.

2 MATERIALS

The landscape roof (i.e. intensive green roof) including planters 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 landscape roof (i.e. intensive green roof) including planters shall comprise of sub-soil drainage modules, geotextile filter fabric, planting media and root-resistant waterproofing membrane.

2.1 Sub-soil Drainage Modules

The sub-soil drainage for the landscape roof shall be CEMSEAL VERSICELL drainage modules supplied by Cemseal Industries Sdn Bhd or approved equivalent.

GENERIC SPECIFICATION

The sub-soil drainage for the landscaped roof and planter shall be 30 mm thick high strength drainage modules manufactured from 100% recycled plastics with Singapore Green Label certification. The compressive strength shall be at least 80t/m² to accommodate both static and dynamic loads during and after installation.

The drainage modules shall be able to interlock along connecting edges to form a continuous entity.

Typical properties of the drainage modules are:

PROPERTY	VALUE
Material	Polypropylene
Dimensions	500 (L) x 500 (W) mm
Height	30 mm
Weight	~ 3 kg/m ²
Maximum hole size	< 20 mm
Void horizontal area	≥ 65%
Void internal volume	≥ 95%
Compressive strength	≥ 80 t/m ²
Drainage capacity @ 1% hydraulic gradient	≥ 16.5 l/m.s

SPECIFICATIONS

2 MATERIALS

2.1 Sub-soil Drainage Modules (cont'd)

PROPERTY	VALUE
Biological resistance	Unaffected by moulds and algae
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
Minimum 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 Planting Media

The planting media shall be a pH-stabilised mix comprising of peat, compost, expanded clay aggregate/vermiculite, washed coarse river sand, free-draining loamy soil, slow release N-P-K fertilizer etc. as specified by the Landscape Architect.

Unless specified otherwise, the planting mix for all trees, palms, shrub beds and turfed areas of the intensive roof garden including landscaped roof and planter shall include the components listed below. It shall be mechanically mixed to the correct proportions, prior to placement on site.

The planting mix shall have the following properties:

- contain less than 20% silt and clay by volume
- retain more than 45% (volumetric) moisture at maximum water Capacity

SPECIFICATIONS

2 MATERIALS

2.3 Planting Media (cont'd)

- contain more than 20% air content at field capacity
- contain less than 12% organic matter (by mass)
- have a pH between 6 to 7
- have a cation exchange capacity higher than 10 cmol/kg soil
- have an apparent density of between 1200 – 1800 kg/m³ when wet

The planting mix can comprise the following:

- topsoil
- washed coarse river sand
- lightweight aggregate: expanded clay, shale, volcanic cinder, perlite
- soil conditioner 1 kg/m³ of slow release NPK 15-15-15 fertilizer (coarse granule)
- any other additives to balance pH and organic matter content as determined by the soil test
- mixed thoroughly before placing in the planting pit

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.

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

SPECIFICATIONS

2 MATERIALS

2.4 Root-Resistant Waterproofing Membrane (cont'd)

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 modules. The latter shall be on at least A3 size paper or larger and in a CAD-recognisable format.

SPECIFICATIONS

3 EXECUTION (cont'd)

3.4 Installation of drainage modules, geotextile and planting media

- (a) Lay with the drainage modules connected by proprietary interlocking, cable ties or other approved methods with adjacent drainage modules to form a continuous entity whether as panels, conduits or tanks, without any fixing on top of the root resistant waterproofing membrane. Cut, as necessary at drainage gully or plinth areas etc.
- (b) Cover the installed drainage modules with a geotextile filter fabric. The ends of all installed drainage modules shall be properly sealed with geotextile to ensure soil particles do not enter the drainage modules.
- (c) The Contractor shall organise an inspection of the drainage modules installation prior to placement of the planting media.
- (d) The planting media shall be placed with care without damaging the drainage modules. Clay material shall not be used as the planting media. The displaced clay soil shall be replaced with aggregates/sand backfill. Sharp stones that may puncture the geotextile shall be removed from the planting media before backfilling. The planting media is 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 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 works</u>	<u>CIDB Grade</u>
Up to RM10,000,000	G6

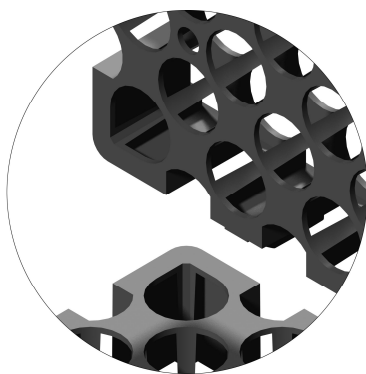
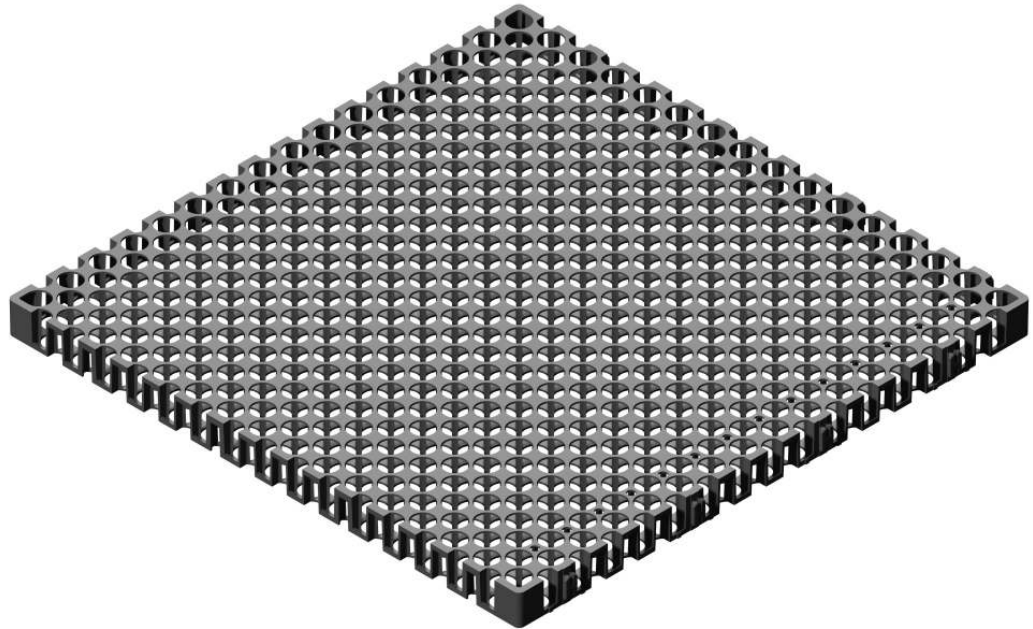
- (b) The design, supply and installation of all waterproofing systems and products specified herein include all components such as cement and sand screed to falls (if required, it should be done by Main contractor), pre-formed corners, outlets etc. and all other measures and materials required to satisfactorily 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.

SPECIFICATIONS

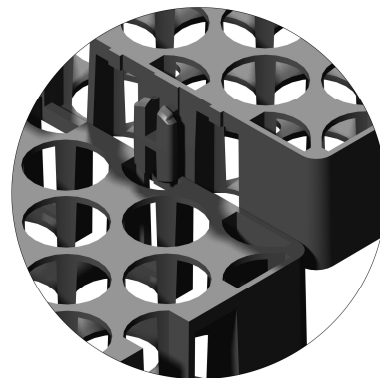
3 EXECUTION (cont'd)

- (d) The waterproofing system shall include procedures for testing of the membrane integrity during installation.
- (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



Interlocking at same plane



Interlocking at right angle

CEMSEAL VERSICELL

PROJECT REFERENCES

(Supplied by Elmich (Far East) Pte Ltd)

Residential Projects

HDB ANG MO KIO AVE 3 IUP *Housing Development Board*

HDB BEDOK N3 C19 *Housing Development Board*

HDB BUKIT MERAH RC36 *Housing Development Board*

HDB BUKIT PANJANG N6 C2 & C3 *Housing Development Board*

HDB FENGSHAN MUP 16 *Surbana Consultants*

HDB KALLANG WHAMPOA RC24 *Surbana Consultants*

HDB JURONG WEST N6 *Housing Development Board*

HDB MARINE PARADE MUP 16 *Surbana Consultants*

HDB PUNGGOL EAST C1 & C2 *Housing Development Board*

HDB PUNGGOL EAST C11 & C12 *Housing Development Board*

HDB PUNGGOL EAST C3 *Housing Development Board*

HDB PUNGGOL EAST C4 *Housing Development Board*

HDB PUNGGOL EAST C5 *Housing Development Board*

HDB PUNGGOL EAST C5 *Housing Development Board*

HDB PUNGGOL EAST C6 *Housing Development Board*

HDB PUNGGOL EAST C7 *Housing Development Board*

HDB PUNGGOL EAST C8 *Housing Development Board*

HDB PUNGGOL EAST C22A *Housing Development Board*

HDB PUNGGOL EAST C23 *Housing Development Board*

HDB PUNGGOL EAST C24 *Housing Development Board*

HDB PUNGGOL EAST C25 *Housing Development Board*

HDB PUNGGOL EAST C26 *Housing Development Board*

HDB PUNGGOL EAST C31 *Housing Development Board*

HDB PUNGGOL WEST C1 *Housing Development Board*

HDB QUEENSTOWN RC 14 *Surbana Consultants*

HDB QUEENSTOWN RC 21 *Surbana Consultants*

HDB QUEENSTOWN RC26 *Surbana Consultants*

HDB SENGKANG N1 C9 *Housing Development Board*

HDB SENGKANG N2 C31 *Housing Development Board*

HDB SENGKANG N2 C35 *Housing Development Board*

HDB SENGKANG N2 C36 *Housing Development Board*

HDB SENGKANG N3 C9 *Housing Development Board*

HDB SENGKANG N3 C11 *Housing Development Board*

PROJECT REFERENCES

(Supplied by Elmich (Far East) Pte Ltd)

Residential Projects

HDB SENGKANG N4 C1 *Housing Development Board*

HDB SENGKANG N4 C2 *Housing Development Board*

HDB SIMS DRIVE/PLACE MUP 16 *Surbana Consultants*

HDB TOA PAYOH MUP 14 *Surbana Consultants*

HDB TOA PAYOH RC 34 *Housing Development Board*

HDB WOODLANDS DESIGN & BUILD *Housing Development Board*