



Extremely soft, heaving sub grade

Completed sealed road

Installation of DUX CG30 Geogrid. Note: spreading rock with light machine

Geogrid Reinforced Pavements Come of Age

Geogrids have been used to stabilise soft roadway subgrades for more than 30 years, but the design is often based on an empirical, rather than a rigorous technical approach. Southern Geosynthetics has introduced new design software that allows simple, effective designs to be generated, increasing options for engineers.

At the new Essendon FC base, “The Hanger” at Tullamarine, designer Aurecon was faced with a real dilemma. The very soft reactive clay subgrade had repeatedly failed proof-rolling.

Traditional options of dig-out and replacement with good quality fill, or in-situ cement-stabilisation were not possible due to the presence of a wide shallow service trench along the middle of the roadway alignment. With very little cover over services no further excavation was possible.

Assuming a design CBR of 1%, and design traffic of 100,000 ESA, the design program solution called for placement of DUX CG30, a 30kN/m biaxial geogrid combined with a non-woven geotextile at subgrade together with a 280mm “stabiliser” layer of crushed rock; this would then provide a working platform with CBR=11% and allow compaction of a second 180mm thick crushed rock pavement layer. The total pavement thickness of 460mm represents a saving of some 200mm, or 30% over traditional design.

Designer Aurecon opted for reduced thickness of 180mm of cement-treated first lift, followed by 200mm of Class 2 FCR and a wearing course of 40mm AC. Upon setting after a few days the cement increases the strength and stiffness of the first stabiliser layer and provides an improved base for compaction of the second lift. But even on initial placement, before the cement “went off”, the grid and 180mm layer virtually eliminated rutting under construction truck traffic.

One of the concerns of the contractor was how to achieve satisfactory compaction of pavement layers. Standard road construction practice requires satisfactory “proof-rolling” of the sub grade, with no visible movement or cracking of the subgrade. Any soft, “unsuitable” areas are dug out and replaced with engineered fill to achieve a typical CBR of 15%. However, when building on very soft soils, construction practice must be modified. Roadbase must be placed more carefully, dump trucks should avoid directly trafficking the grid wherever possible. Materials should be spread with light, low ground-pressure, such as the tracked bobcat such used here. Lighter compaction equipment with no vibration, and lower compaction levels, at least on the initial lift, are necessary.

The success of this well documented project proves that geogrid-reinforced pavements have now “Come Of Age”. Engineers can now design with geogrids in pavements with confidence. As a construction aid when building over soft, wet areas geosynthetics have always been invaluable, but in addition, geogrids allow up to a 30% reduction in total pavement thickness, as well as avoiding the costs of deep dig-out and replacement of sub grades, and the associated and rising costs of disposal of unsuitable soil.

Geogrid reinforcement provides a radical new approach to pavement design and construction, challenging traditional practice. True our motto “Melior Via” (A Better Way), with over 30 years industry experience Southern Geosynthetics leads the way with pavement geosynthetics.

Contact Wayne to see if we can help in your project.



In October 2019 Multipro Civil installed a 600,000L rainwater harvesting tank at Coburg Oval, Harding St, Coburg. Ellipse Penta Modules were chosen as a cost effective alternative to the specified concrete tank.

Rainsmart Ellipse and STM modules have achieved MRWA (Melbourne Retail Water Authority) approval. These modules are widely used in civil and landscape projects for stormwater management including soakpits, detention and rainwater storage and reuse. In a separate application the same modules can be filled with soil and installed around tree pits for structural soil support. In this application the modules are marketed under the “Terravault” brand.

Priced around \$200 per cubic metre Ellipse modules are the most cost effective method for stormwater management. Contact Wayne for design assistance and email any plan for a competitive supply quote.

PRODUCT SUMMARY			
Manufacturer	Rainsmart Solutions (Southern Geosynthetics Supplies)	Product Sub Type	Stormwater Storage
Brand	—	Application(s)	Pressure
Product Type	Storm Water Harvesting	System(s)	Non-Drinking Water

SCOPE OF APPROVAL	
Rainsmart ‘Ellipse 5 plate’ and STM-01 and STM-02 underground Storage/Infiltration modules. Single or multiple of 300mm inlets; with Concrete MHs of access 600/900mm at inlet/outlet to suit tank depth and incoming/outgoing pipe. Cushion Geotextile 200 gsm; Flush Out Row high flow geotextile is a Woven geotextile 150 gsm; liner (UPVC/PP/HDPE) 1mm minimum up to 1.5mm thickness (1.5mm is for PP and UPVC as it is easily bend and flexible). Ellipse is made of recycled reinforced PP and STM virgin reinforced PP (can be made in recycled PP as well).	
Min service life 50 years with 15 years warranty for PP modules. Rainsmart modules meets AS5100.2, AAHSTO H-20 & H-25 and CIRIA C680/C609 loading requirements. Both Ellips and STM are 100% accessible and inspectable for flushing and CCTV, in both X and Y direction via bottom Inspect Modules of 300mm dia access. High Ultimate Crushing Strength of Ellipse (5 plate) – 26 tons/sqm; STM-01 is 85 tons/sqm and STM-02 is 65 tons/sqm.	
Pressure Rating(PN)/Stiffness(SN): PN 8 • Jointing: Mechanical • Special Condition(s):	
Size Range: a) Ellipse 5 plate module - Width 400mm, Length 715mm, Height 440mm, Module volume 125.77 Lit, Module storage volume 119.47 Lit; available in quarter/half/single/double/triple/quad/penta versions; weight of single module is 7.8kg b) STM-01 & STM-02 – Length & width 600mm, height 360mm, Module volume 0.13 m3, Module storage volume 0.123 m3, weight is 9.8kg c) Ellipse 5 plate module – min/max backfill for non-trafficable is 0.6m and 1.75m; min/max backfill for trafficable is 0.85m and 1.5m d) STM-01 module – min/max backfill for non-trafficable is 0.5m and 3.5m; min/max backfill for trafficable is 0.5m and 2.5m e) STM-02 module – min/max backfill for non-trafficable is 0.5m and 2.2m; min/max backfill for trafficable is 0.5m and 2.5m	

WATER AGENCIES APPROVAL	
City West Water	Limitations of Use: Special Conditions:

PRODUCT DETAILS	
Supplier’s Product Code	—
Model Number	—
WSAA Product Appraisal Number	N/A
WSAA Product Specification	N/A
MRWA Standard Drawing	—
Relevant Industry	Standard(s) a) AS5100.2 – Complies with Australian Bridge Design Wheel loads at 600mm cover (M1600 moving load and W80 wheel load). b) ASTM D2412 and ASTM F2418 – Compressive strength test and deflection c) AAHSTO Truck Loads H-20 & H-25 – Complies with HL93 American Truck Loads at the recommended 600mm cover. d) CIRIA C680/C609 – long-term 40/50 years creep testing for Ellipse, STM-01 & STM-02 modules as per CIRIA C609 guide
Product Description	Ellipse and STM modules Polypropylene Chamber
Useful Links	<ul style="list-style-type: none"> Rainsmart Solutions Min and max cover for Rainsmart modules.JPG Rainsmart Ellipse tank installation guide.pdf

Inside:

Rainsmart

DUX® Geosynthetic Clay Liner (“GCL”)

DUX® Geogrids

Geogrids in Pavements



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Installing DUX GCL at Wentworth



Covering GCL with 300mm Soil

DUX Geosynthetic Clay Liner (“GCL”)



Geosynthetic Clay Liners (known as “GCL”) are widely used in civil construction as alternative to compacted natural clays. GCL’s comprise bentonite, granular or powdered, sandwiched between two geotextile layers. Granular bentonite GCL’s are by far the most popular worldwide. A 5mm GCL can replace a metre thick CCL layer.

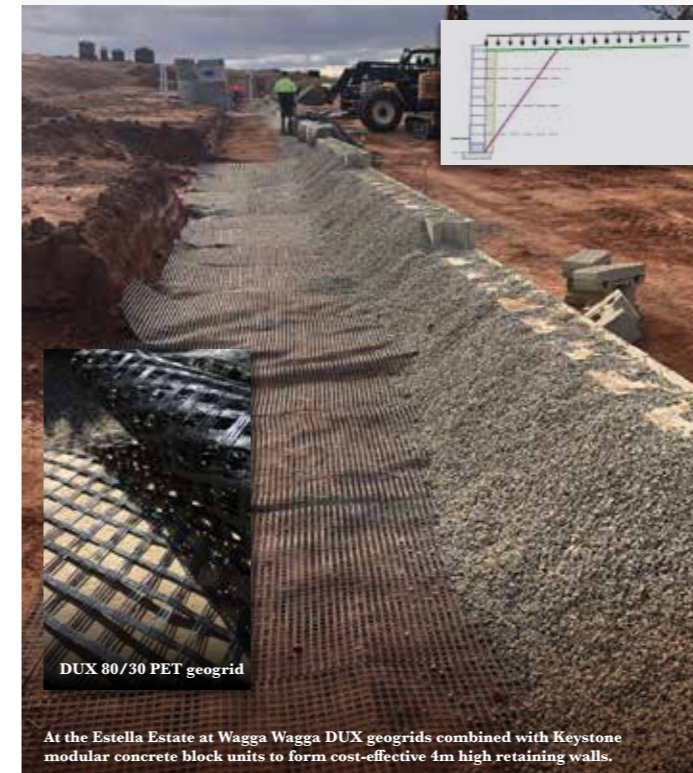
The key advantage of a Granulated Bentonite GCL is that it creates less dust during installation than powdered bentonite and the bentonite is less likely to shift through the needle-punch reinforcement process resulting in a more consistent hydraulic performance. It is interesting to note that in Australia powdered bentonite is almost always specified, but this has nothing to do with functional requirements and a lot to do with good marketing.

Standard industry specifications, such as USA GRI-GCL3 and GRI-GCL5 make no stipulation about the type of bentonite to be used. If you are paying more than \$5/sqm for a GCL you should ask your designer why they are specifying powdered GCL’s only and restricting your market choices. Contact me on 0419 478 238 for more info on specifying GCL’s by properties relevant to function.

10,000sqm of **DUX SPL40** Geosynthetic Clay Liner (GCL) has recently been installed by Waters Excavations at the Wentworth sewage ponds near Dareton, NSW. The leaking ponds required re-lining and SPL40 was installed together with a 300mm soil cover layer for surcharge. GCL’s are simple to install, simply roll out, overlap and paste joints and cover.

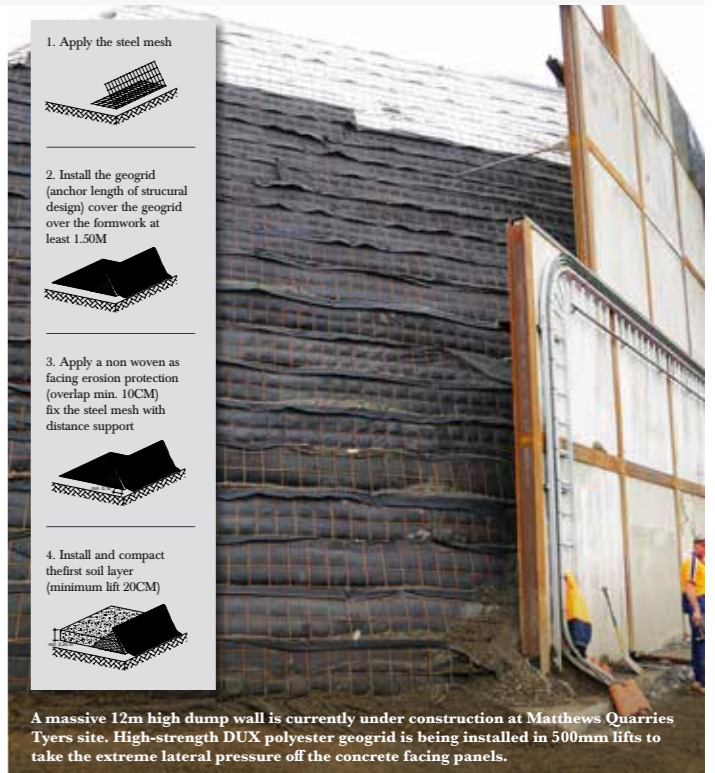
DUX SPL40 GCL is a multi-component system made from a high-tensile PP woven base, internal sealing material consisting of granulated sodium bentonite and a robust PP nonwoven as the top layer. A special precision needling technique, based on state-of-the-art engineering, is used to join together the three components to produce a homogeneous, structurally continuous liner sheet.

DUX Geogrids



DUX 80/30 PET geogrid

At the Estella Estate at Wagga Wagga DUX geogrids combined with Keystone modular concrete block units to form cost-effective 4m high retaining walls.



1. Apply the steel mesh
2. Install the geogrid (anchor length of structural design) cover the geogrid over the formwork at least 1.50M
3. Apply a non woven as facing erosion protection (overlap min. 10CM) fix the steel mesh with distance support
4. Install and compact the first soil layer (minimum lift 20CM)

A massive 12m high dump wall is currently under construction at Matthews Quarries Tyers site. High-strength DUX polyester geogrid is being installed in 500mm lifts to take the extreme lateral pressure off the concrete facing panels.

Flexible, high-strength DUX geogrids are used for reinforcing soils. DUX geogrids are manufactured from high-modulus, low-creep polyester (PET) and coated with a layer of protective polymer.

DUX geogrids are ideal for use in a wide range of soil reinforcement applications including modular block walls, wraparound “green” walls, piled embankments and road-slip repair. Southern Geosynthetic has over 30 years experience in geogrid-reinforced slopes and walls and provides no-charge design support.

DUX POLYESTER UNI-AXIAL GEOGRIDS								
Properties	Test Method	Unit	DUX60	DUX80	DUX100	DUX120	DUX150	
Carboxyl End Group (CEG)*1	GRI GG7	mmol/kg	15.5	15.5	15.5	15.5	15.5	
Molecular Weight*1	GRI GG8	g/mol	33,487	33,487	33,487	33,487	33,487	
Ultimate Tensile Strength (MD/CD)	ASTM D 6637	kN/m	60/30	80/30	100/30	120/30	150/30	
Tensile Strength @ 2% Strain (MD)	ASTM D 6637	kN/m	16	17	22	25	32	
Tensile Strength @ 5% Strain (MD)	ASTM D 6637	kN/m	32	35	44	50	64	
Elongation (MD&CD)	ASTM D 6637	%	12	12	12	12	12	
Creep Limited Strength (LTDS) 114 years	GRI-GG4b	TCR@20°C	kN/m	40	53.7	67.1	80.5	100.7
		TCR@30°C	kN/m	38.7	51.6	64.5	77.4	96.8
		TCR@40°C	kN/m	38	50.6	63.3	75.9	94.9
Min. Reduction Factor for Installation Damage*2 (RFID)	ASTM D5818	—	1.16	1.16	1.16	1.16	1.16	
Reduction Factor for Creep for 114 years design life (RFCR)	ASTM D5262	—	1.49	1.49	1.49	1.49	1.49	
Min. Reduction Factor for Durability (RFD)		—	1.15	1.15	1.15	1.15	1.15	
Reduction Factor for Manufacturing, Extrapolation and Database		—	1.01	1.01	1.01	1.01	1.01	
Roll Width	—	m	1.0-6.0	1.0-6.0	1.0-6.0	1.0-6.0	1.0-6.0	
Roll Length	—	m	50/100	50/100	50/100	50/100	50/100	