

**REINFORCED SLOPE SUPPORTING DEVELOPMENT**  
**PANMURE STREET, GLASGOW**

**SLOPE REINFORCEMENT**

**Product: Green Terramesh**

**Problem**

A combination of poor ground and a tight footprint meant that a project to build new homes, closely overlooking Panmure Street in Glasgow, needed extra support from soil reinforcement and geosynthetics.

Main contractor and client St Andrews Homes (Scotland) is developing the land to provide two apartment blocks, but the gentle slope beside the street had to be made steeper to reclaim much needed land. In addition, one of the planning requirements stipulated that the new slope must be landscaped. As a result, the developer called on consultant Woolgar Hunter, who in turn brought in Maccaferri, to come up with a detailed design for the new embankment.

**Solution**

Maccaferri designed a new 180m long retaining slope reinforced with Green Terramesh® units and additional Paragrid geogrids.

This embankment is being reinforced as it is built up with pre-assembled Terramesh units, which arrive on site flat packed. Sub-contractor, Allma Construction installed the 600mm high and 2m long sections built one on top of the other to create a retained height of between 4.8m and 6.6m.

To reduce the amount of imported structural backfill and export of unsuitable site material, Maccaferri designed the structure to accommodate the use of site-won soils as structural backfill. Selective use of the glacial tills on site, which were overlain with unsuitable made-ground, was one of the great successes of the project in managing to create very little spoil that had to be disposed off site. The site won material was compacted in layers on top of the reinforcing geogrid tails of the Green Terramesh units; these were 6m long in the lower embankment and 4m long higher up.

Green Terramesh is an environmentally friendly reinforced soil system used for embankment construction. It can make slopes stand steeper, withstand greater loads and take less land than un-reinforced slopes, yet still offers the ability to revegetate. BBA Roads and Bridges Certified, it is made from Maccaferri galvanised and PVC coated double twist steel wire mesh forming the soil reinforcing geogrid tail and the slope face in a single unit.

**Client:**

ST ANDREW'S HOMES (SCOTLAND) LTD

**Main contractor:**

ST ANDREW'S HOMES (SCOTLAND) LTD

**Specialist sub-contractor:**

ALLMA CONSTRUCTION LTD

**Specialist element Designer:**

MACCAFERRI LTD

**Products used:**

GREEN TERRAMESH, PARAGRID

**Date of construction**

Spring 2008



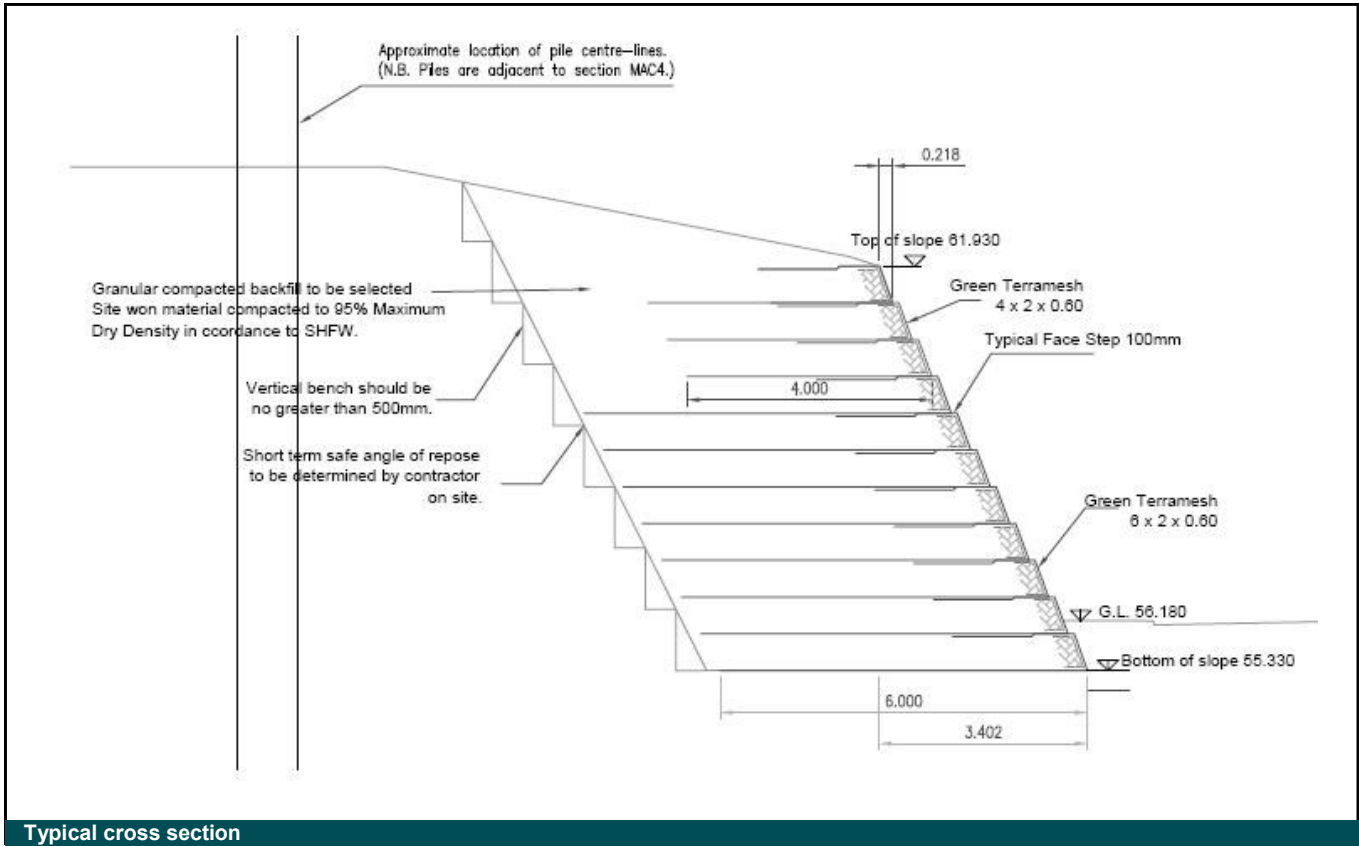
Detail of Green Terramesh unit



Green Terramesh geogrid installation



First Green Terramesh layers being installed



This removes the need for any fiddly, on-site connections between geogrid and fascia elements, providing quality and reassurance of structural continuity in the grids. The geogrid tails are sandwiched between layers of compacted structural fill, reinforcing it.

The greatest benefit of Green Terramesh is that all face components; vegetation matting, formwork and pre-set face support brackets are factory-fitted within the system. This removes the need for any external formwork, reduces setting out and greatly reduces the construction time compared to more 'manual' wrapped face structures. The internal steel 'lost-shutter' also produces a crisper front face eliminating the 'baggy' front face that is associated with wrapped face structures.

A 300mm thick layer of topsoil is placed immediately behind the front face of each unit. This is contained by Biomac C biodegradable soil blanket, again, factory installed to reduce on-site work. Seed is either mixed with the topsoil, or the slope is hydroseeded afterwards, in order that the apartment buildings, supported on piles, would be very close to the face of the Green Terramesh structure. For extra reinforcement in these areas, Paragrid 80/15 polyester geogrids were installed both perpendicular and parallel to the face.



As piling through permanent geogrids is not desirable due to the unknown consequences to the integrity of the geogrid, the contractor cut holes in the geogrids, during construction, in the locations where the piles would be driven.

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