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For attention: Mr L Scott-Turner 19 July 2002

Dear Sir

EVALUATION OF THE DRAINAGE PROPERTIES OF A WATERPROOFING DRAINAGE SYSTEM LAID ON POLYSTYRENE DRAINAGE BOARD

Please refer to your request to evaluate the abovementioned system.

The system as applied in practice (see **APPENDIX A**) was simulated in a transparent "Perspex" box with dimensions of 1265 x 885 x 200 mm. On the bottom of the box 8 drainage holes (10 mm diameter) on the 885 mm side and 2 drainage holes (10 mm diameter) on the 1265 mm side were drilled. The simulated system consisted of the following layers (from the bottom upwards):

- Patented polystyrene drainage board (see **APPENDIX B**), 25 mm thick, dimensions of 885 x 1265 mm and a density of 40 kg/m^3
- Protected with a geotextile membrane (PT 115 ex Geotextiles Africa) with a mass of 115 g/m^2
- Covered by a 50 mm thick layer of 13 mm crushed stone
- Protected with a geotextile membrane (PT 115 ex Geotextiles Africa) with a mass of 115 g/m^2
- Covered by a 50 mm thick layer of unwashed river sand

The total thickness of the simulated system varied between 120 to 135 mm.

1. Test 1

The outlet holes, on the bottom of the box, were closed and the system was flooded with water, coloured pink, to a height of 10 to 20 mm above the river sand surface. The outlet holes were opened and the system was drained completely in 4,5 minutes. Dust washed off from the river sand and the crushed stone formed a thin layer of sediment on the base of the box in the flutes formed by the channels of the drainage board. The simulated system and phases of the testing are shown in **Figures 1** to 7.

Figure 1: The flooded system before commencing with Test 1

Figure 2: Drainage through the system one minute after commencement of the test

Figure 3: Drainage through the system two minutes after commencement of the test

Figure 4: Different layers intact three minutes after commencement of the test

Figure 5: Drainage through the system 4,5 minutes after commencement of the test

Figure 6: Different layers intact after completion of the test

Figure 7: Thin layers of sediment deposited on the base below the channels in the board

2. Test 2

The system was again flooded by a pouring out 25 litres of water in the central area of the box. The water spread out and drained in 2,5 minutes. The different layers were not disturbed and the thin layer of sediment remained on the base of the box.

3. Discussions

3.1 The system drained fast and efficiently. The rate was determined by the number and size of the outlets in the box. In practice allowance should be made for sufficient drainage capacity at the perimeter of the drainage boards.

3.2 The different layers remained in position and the river sand and crushed stone were retained by the geotextile membrane.

3.3 The size and configuration of the drainage channels in the polystyrene board were more than sufficient to drain the quantities of water used in the test. The 25 litres of water poured out on the system (area 0,885 x 1,265 = 1,12 m^2) drained in 2,5 minutes (a rate of 10 litres/minute) at a rate of approximately 9 litres/ m^2. This is equivalent to a downpour of approximately 18 mm per minute which may never occur in practice.

3.4 The drainage system also protects the waterproofing membrane against mechanical damage and weathering

4. Recommendations

4.1 The 25 mm thick polystyrene drainage boards, with a density of 40 kg/m^3, refer to as the system, should provide adequate drainage under the situations simulated in these tests provided that sufficient room for drainage is allowed at the perimeter of the boards.

4.2 The system will protect the waterproofing onto which it is applied e.g. on roofs, in planter boxes and other vertical applications.

4.3 The system will provide adequate drainage to waterproofing systems (horizontal and vertical) if sufficient room for drainage is provided at the lowest levels of the drainage board.

4.4 The system will provide good insulation to the substrates onto which it is applied e.g. roofs where it will reduce air conditioning costs by saving energy.

3. Closure

The investigation is subject to the attached General Contract Conditions that form an integral part of this report.

I trust that this report will be of assistance to you. Should you wish to discuss any aspect please contact me.

Yours faithfully

M S Smit
Materials and Structures
On behalf of the Division of Building and Construction Technology – CSIR