

PRODUCT REPORT AND SPECIFICATION 2008

ANTI-CONTAMINATION STEPPING PLATES

In 2008 Forensic Pathways contracted Pera to redesign, facilitate the manufacture of and subsequently validate by testing a stepping plate for crime scene investigation. The first stage in the project was to create a detailed product specification; Pera gathered information, from Forensic Pathways and other sources, to understand the requirements for the stepping plate in service. Particular attention was paid to the loads that the stepping plates may be subjected to and the chemicals that they might come into contact with.

Referencing the product specification, Pera carried out an investigation to identify suitable materials for the stepping plate. The range of thermoplastic materials that would be suitable is limited by the need for it to be transparent and to have significant strength and impact resistance. The material selected by Forensic Pathways, in consultation with Pera, was a type of polycarbonate that is modified to improve toughness and low temperature impact strength.

Development of the product design was carried out by a team of Pera engineers with reference to the product specification and the properties of the material identified. Three dimensional computer aided design (CAD) models of the design concepts were produced. These were then evaluated using finite element analysis (FEA) to assess their performance when subjected to the loads identified in the product specification. The design was developed iteratively using the FEA to establish a design with the required performance.

In addition to the strength of the stepping plate, the manufacturing process was also taken into consideration; its suitability for injection moulding was an important factor in the design development. The final design was evaluated using mould filling simulation software to reduce the risk of moulding faults that may compromise the performance of the stepping plate.

Pera assisted Forensic Pathways in identifying suitable companies to make the mould tool and manufacture the stepping plates. The mould tool design was created by the toolmaker and then agreed by Pera and the company carrying out the moulding.

The initial trial run of the mould tool was carried out at the moulding facility where we understand the stepping plate production will be carried out. No issues were identified with the mould tool and the processing parameters used were within the range that is specified for the grade of material selected. In our opinion the quality of the mould tool and the parts produced from it was good.

Sample parts produced at the trial run were tested by an independent test house. Two tests were carried out; five parts were tested to establish the maximum load they would take before failing and another five were subjected to a cyclic fatigue test. The maximum load reached was on average 837Kg, over four times the maximum load the stepping plates are expected to see in service. This load did not cause any breakage although significant deformation of the stepping plates did occur. The cyclic test showed that, on average, the samples withstood over 700 cycles at the maximum load the stepping plates are expected to see in service.

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TRANSPARENT ANTI-CONTAMINATION STEPPING PLATES

SPECIFICATION

Transparent Anti-Contamination Stepping Plates available in two sizes 350 x 350 and 350 x 150 produced in **Sabic Lexan EXL** material.

Sabic Lexan EXL

Lexan EXL resins are copolymers of polycarbonate and siloxane. By combining the best of polycarbonate and siloxane properties, a significantly upgraded 'polycarbonate' material is produced. It is the low-temperature ductility of the siloxane that gives these materials their outstanding impact performance.

Polycarbonate has good hydrolysis resistance at ambient temperature and good chemical resistance to ethanol (90%) and therefore one would expect Lexan EXL resins to behave similarly as siloxane (silicone) is an extremely chemically resistant material.

Polycarbonate is resistant to detergent and most substances used for disinfecting, as long as the concentrations are low. It is therefore anticipated that Lexan EXL resins would be stable to Virasolve and Virkon.

Polycarbonate has good resistance to blood and blood plasma at ambient temperature.

Although there is no specific literature on the chemical resistance of polycarbonate to Luminol based on its composition we would expect it to be resistant

Polycarbonate is not resistant to sodium hypochlorite or other alkali cleaners as determined by standard chemical resistance testing which involves immersion for 24 hours, however many kitchen sinks are made from polycarbonate and there is no reported problem with chemical attack despite many of them being exposed to bleach for short periods of time on an occasional basis so expose for a few minutes during washing may be satisfactory provided the steps are rinsed in water thoroughly afterwards.

Storage Temperature

40°C to +50°C

Working Temperature

10°C to +50°C

Loading

Average maximum load 837Kg (1841 lbs)

Protocols (See Protocol Sheet for full details)

Rubber Pads to be used on all occasions

Non-slip Overshoes to be used on all occasions