Manhole theft: a solution

by Farouk Shaik

On a daily basis across the length and breadth of South Africa, manhole covers are being stolen and sold as scrap metal. Pick up a newspaper most days of the week, and you will find at least one story of a car driving into an open manhole or a person stepping into one. Damage to cars can run into many thousands of rands and injuries to people can be fatal or, at the very least, crippling. The reasons for manhole cover theft are actually quite simple – poverty, survival and greed. A cast iron manhole cover is quoted to fetch up to R500 at the local scrap dealer. And, with the price of steel rising by the day, stealing cast iron manhole covers is a fast way to make a quick buck for unscrupulous scrap metal dealers.

Survey
In a survey carried out by a few manhole cover suppliers and users, it was found, in the four biggest municipalities in South Africa, that there is a total of 61 832 manhole covers missing, all presumed stolen. The problem is not only affecting big metros but also the smallest of towns. Legal claims and lawsuits are being lodged against municipalities for property damage and personal injury caused by open manholes.

Polymer concrete manhole covers
There is, however, good news. Polymer concrete manhole covers have no scrap value. They have been around since 1992 and have been widely used in the Western Cape by municipalities and private developers ever since. Slowly, Polymer concrete manhole covers are making inroads into the rest of South Africa and abroad due to their price competitiveness and proven track record. A Polymer concrete manhole cover would cost the user about 40% less than a similar manhole made from cast iron. The cost advantage alone allows the user to get more manhole covers for their money and thereby enables a quicker solution to solving the backlog of open manholes.

Technology
Polymer concrete was developed in Germany in the early 50s and has been widely used in many different applications. The application was tried on manhole covers and, with some adjustments to the initial design, polymer concrete could be safely applied to manhole covers. Polymer concrete manhole covers are made from a composite material that is bound together by resin and fibreglass.

The South African Bureau of Standards (SABS)
The South African Bureau of Standards (SABS) has formally published a standard, SANS 1882 of 2003, to recognise the need for an alternative to cast iron and concrete and to give municipalities a better choice in products to cater for their special, social and public needs. The City of Cape Town has indicated that the standard on Polymer concrete manhole covers and frames should be made a compulsory specification so as to ensure continued excellence in the industry. According to the Department of Trade and Industry should a regulation be introduced,
Polymer concrete

Definition
Polymer concrete (PC), or resin concrete, is a concrete that uses a polymer binder to supplement or replace cement as a binder. Polymers are made from simple organic molecules (monomers) that combine to form more complex structures through a process called polymerisation, hence the term polymers. Polymer concrete has a density of 2260 kg/m³ and a compressive strength of 37 Mpa.

Composition
Polymer concrete is composed of aggregates that include silica, quartz, granite, limestone, and other high-quality material. The aggregate must be of good quality, free of dust and other debris and dry. Failure of these criteria can reduce the bond strength between the polymer binder and the aggregate.

Advantages
Advantages of polymer concrete include:
- rapid curing at ambient temperatures
- high tensile, flexural, and compressive strengths
- good adhesion to most surfaces
- good long-term durability with respect to freeze and thaw cycles
- low permeability to water and aggressive solutions
- good chemical resistance
- good resistance against corrosion
- lightweight
- may be used in regular wood and steel formwork
- may be vibrated to fill voids in forms
- allows use of regular form-release agents.
Polymer concrete may be used for new construction, or repairing old concrete. The adhesion properties of polymer concrete allow patching for both polymer and cementious concretes. The low permeability of polymer concrete allows it to be used in swimming pools, sewer pipes, drainage channels, and other structures that contain liquids.

Disadvantages
Polymer concretes also cost significantly more than conventional concrete.

Some safety issues arise out of the use of polymer concrete. The monomers can be volatile, combustible, and toxic. Initiators, which are used as catalysts, are combustible and harmful to human skin. The promoters and accelerators are also dangerous.

Minimum strength requirements
According to the minimum criteria set by the SABS, a Polymer concrete manhole cover should be able to withstand a load of up to 13,500 kg. This minimum weight surpasses the maximum wheel load required and is enforced by the National Department of Transport.

Users
Polymer concrete manhole covers and frames are being used by most of the bigger municipalities, telecommunications companies and private civil engineering contractors nationwide. With variations in the specifications by municipalities, the Polymer concrete manhole covers can easily be made to suit the customer's own specifications.

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