**CONCRETE BLOCK RETAINING WALLS - HOW PRICE-ALONE PURCHASE DECISIONS RESULT IN WALL FAILURES**

Talk to any savvy shopper and they will tell you that the less you pay the less you get, either in terms of quantity or quality. Of course there are exceptions to this universal rule, but the wise old maxim that “you gets what you pays for” still holds true. And while it may be acceptable to base ones purchase decisions for consumer goods such as clothing and houselhold items on price - most people having no other option - it is certainly not acceptable when it comes to safety critical items such as buildings, bridges and concrete block retaining walls (CRB).

Competition in the CRB wall business is fierce, especially so since 2010 when demand for construction projects fell dramatically. This has created an environment in which CBR work became much harder to come by. As a result some CRB contractors have cut costs to the bone and beyond and in doing so have compromised on the engineering integrity, build quality and ultimately, the safety of their walls. The net result is that since 2010 there has been an alarming increase in CRB wall failures (see article in the April 2018 issue of SAICE Civil Engineering).

Ignorance has a large role to play in this scenario as many of those charged with making CRB wall purchase decisions are not fully apprised of the importance of the critical design and engineering factors which ensure that their wall will meet their longevity and durability requirements. It is hardly surprising therefore that so many CRB purchase decisions are based on the lowest quote. Many come to regret this decision either through wall failure, which incurs huge additional expense, or through hidden items buried in the small print of a contract, which escalate costs beyond competing quotes where all the costs are clearly outlined and explained upfront.

A CRB tender only needs to be a few rand per square metres less to be won. The problem is if a wall falls down it’s not only the contractor’s problem. It becomes the whole project’s problem and the entire professional team gets dragged into the resultant mess. It involves damage to reputations and to adjacent properties, expensive litigation, in addition to the cost of rebuilding the wall.

Part of the problem is that CRB installation contractors often use the most optimistic scenarios in the design of their walls and prepare their tender submissions accordingly. This is both unrealistic and misleading. Geotechnical information, ground water conditions, and loading conditions, both structural and traffic based, have to be carefully evaluated. One cannot simply assume that the site will remain dry and that perfect conditions will prevail.

Moreover, some fat must be included in the design to allow for the unknown such as seismic events (small earthquakes) and some ground water flow. Ground is a volatile medium and is highly variable. It doesn’t help to build a wall which is only 90% compliant. All walls above 2,5m should only be designed on the basis of a geotechnical report and all walls above 1.2m must be designed by an engineer.

Cost cutting comes in many guises but all undermine the structural integrity and safety of the walls. Cheaper and lighter hollow blocks, for instance, might be used on a very high wall. This results in cracked blocks due to the large amounts of compressive force exerted by high walls. Alternatively, a block might not be made with enough cement in it (i.e. sub-standard manufacture of the block itself).

However, by far the most common problem is skimping on geo-synthetic reinforcing, either by reducing its depth and/or strength, and/or by increasing the spacing from say, every third block, to every fourth, the former being the most prevalent. In an ideal wall the ratio of geofabric wall height should be 70%, but over time this ratio has slumped, in some instances, to as low as 50%. And some contractors even use filter geosynthetics for reinforcing, which is little better than useless. In cut-face walls, where soil is removed and replaced, any reduction in the amount of material to be removed lowers the cost of the wall.

Good drainage too is absolutely critical to the stability of a wall and so is the fill material behind the wall. The latter should comprise G7 or better and be properly compacted in 150mm layers. And water should always be drained as quickly as possible. At a bare minimum, a circular drain should be installed at the back of the reinforced zone with outlet pipes spaced every five or six metres. And in cut-and-fill walls drainage at the bottom of the wall should be supplemented so that any water which reaches the face drains speedily.

Typically, the only solution for repairing collapsed walls is a rebuild, because all the other alternatives such as piling, soil nails, anchors, grouting are so specialised that they are more expensive than rebuilding. The most cost-effective solution is to rebuild with a more appropriate design, perhaps with additional drainage or better construction or a combination of all three. Better still, is to design and construct the wall correctly in the first place.

As Civil Engineering states in this year's April edition "It is imperative that the industry treats SRWs (Segmental Retaining Walls) as complex geotechnical structures to drive reliable designs". We couldn't agree more.

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