

ACO TECHNOLOGIES

SolidWorks software and smarts solve challenges on the road



The ACO KerbDrain lets water flow through holes in the curbstone and channel it down the center, essentially using the curb itself as the drain.

Designing a flat highway may seem like a relatively simple engineering task, but it is more complex than it looks, particularly when it comes to drainage. Without proper drainage, water can gather in huge pools during rainstorms, making for treacherous driving conditions. To avoid these problems, highways have curbs with gullies that direct water into grated openings. But even this seemingly simple solution has significant engineering challenges. Cars pound on gratings mercilessly 24 hours a day, and drains must provide access to sewers, pipes, and cables, yet be safe enough for bicyclists and pedestrians to walk over.

Because drains are built into curbs, another set of challenges arises. Concrete curb units are very heavy, making them dangerous to install. The curbs must endure severe impacts, gas and oil leaks from passing cars, de-icing salts from plows, and freezing and thawing with the change of seasons. To maintain the curb's drains and conduits, construction personnel must dig up roads, putting their safety at risk and creating traffic congestion.

Other products had combined a curb and drain before, but they were large and bulky. The KerbDrain's advantage is its construction of resin concrete. Though it is hollow, the resin concrete makes it at least as strong as a regular concrete curb. The KerbDrain is also much lighter, weighing 25 to 32 kilograms versus 150 kilograms for a standard unit, making it easier and safer to handle. ACO Drain faced several obstacles in developing the KerbDrain. It had to learn the ins and outs of a new market, highway design and maintenance, and develop new production techniques to cast the product in a single pour and color it during the process.

To design the KerbDrain, ACO used SolidWorks® 3Premium, which includes SolidWorks Simulation finite element analysis software. The product proved instrumental in making a successful drainage unit.

Results:

- Reduced prototypes from two or three to just one
- Reduced prototype testing from eight weeks to one day
- Estimated savings of over \$45,000 in prototype tooling costs alone

Designing a durable drain

ACO began by creating a 3D model of the KerbDrain using SolidWorks Premium. It then used the seamlessly integrated SolidWorks Simulation software to analyze the KerbDrain's load-bearing capacity. The software graphically showed the product's tensile and compressive properties under pressure.

SolidWorks Simulation helped the designers understand exactly where KerbDrain might fail under certain load conditions. Identifying the failure points would have been difficult in a physical test, because prototypes can collapse without warning. The computer model provided a more realistic picture of the loads the KerbDrain could withstand.

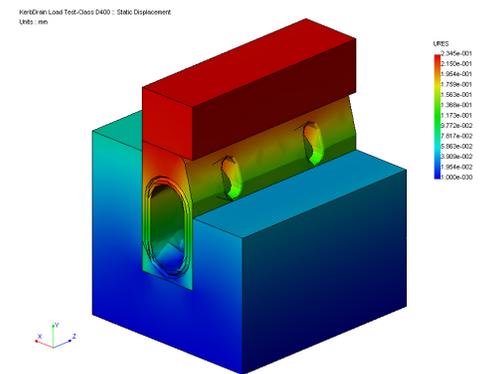
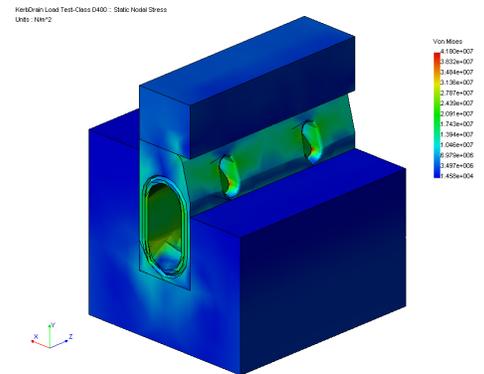
SolidWorks Simulation also showed the nature of potential failures. The designers tried different "what if" scenarios and optimized the results. They learned which areas of the installation detail (the supporting concrete) were critical and couldn't be neglected by the installer.

In the past, ACO had to test two or three prototypes before arriving at a final product. The tests often involved installations at construction sites, which was time-consuming and expensive. With SolidWorks software, ACO needed only one prototype for the KerbDrain. By the time it reached the prototyping stage, it had a nearly finished product.

Expensive prototypes eliminated

ACO continues to use SolidWorks Premium and SolidWorks Simulation to assess its other product designs. For instance, it has simulated the way concrete would crush an underground conduit product, then used that information to reinforce the conduit. This analysis would have been very difficult without SolidWorks software, requiring several prototypes and hours of work in the test lab. For cast-iron products such as manhole covers, creating a prototype for testing can take up to eight weeks. Even with the rapid prototyping possible for plastic products, it could take two or three days. With SolidWorks Simulation, ACO can validate a design in a day. The company estimates it saves £25,000 a year in prototype tooling costs alone. The KerbDrain has been extremely successful for ACO. Local authorities are enthusiastic about it, with one Blackpool official calling it "a positive drainage solution which is highly cost-effective for us." KerbDrain has also won broader recognition for its innovative design; in 2001 it received the prestigious Queen's Award for Enterprise: Innovation, and the United Kingdom Design Council awarded the company its Millennium status.

All these accolades attest to the power of smart thinking, smart design, and smart software.



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