

With concrete being the most common material for foundations to which structures rest on, whether they be your family home or massive skyscrapers, researchers are constantly looking at ways to improve concrete strength and durability. Following the innovation of self-healing concrete with the use of bacteria, there is now a new genetically-engineered soil that is about to double concrete strength and durability!

One of the reasons for concrete foundations is to protect against land subsidence, which is a phenomenon that occurred when groundwater is withdrawn through drainage, underground mining, permafrost and thawing, among other causes. One such example of where this is taking place is the Leaning Tower of Pisa. Although mostly serving as a tourist hotspot, locations where land subsidence is taking place that are not closely monitored can present serious risk.



Photo source: Nations Online

It was through the concrete-repairing bacteria developed by British students that scientists became inspired to develop biocement - a material that genetically-engineered soil microbes would produce in its response to changing pressures in soil. This would in turn automatically reinforce the land under concrete foundations.

How does it work?

By adding *Bacillus subtilis* to soil, an enzyme called urease is subsequently produced. This enzyme causes the organic compound known as urea to break down into ammonium and

carbonate. This increases the pH in the surrounding environment. Calcium carbonate then accumulates at the cell's surface and once there is enough of this build-up a calcite deposit is created.

Growth of this bacteria is triggered by the specific pH of the concrete, which mean that growth only takes place once they have made contact with the concrete. Once germinated, the cells seep into the cracks of the concrete where they begin to clump together. It is this clumping that thus activates the concrete repair process!

Source:

<http://singularityhub.com/2016/11/14/new-thinking-soil-fixes-concrete-foundations-using-engineered-bacteria/>