

Case Study

Saving Egypt's oldest pyramid:

The Step Pyramid of Djoser

Saqqara Necropolis, Egypt



Project Highlights

First Pyramid the Egyptians ever built (about 4,700 years ago)



(See video)

Application:

Structural Strengthening

The outcome:

Preservation of the ancient structure

Completion date: 2019

The History

The Step Pyramid of Djoser, built around 4,700 years ago in Saqqara, serves as the **focal point of an extensive mortuary complex** within the Saqqara necropolis.

This pyramid represented a transformation of previous Egyptian architectural styles into stone. Its six-tiered "step" design, consisting of **stone and clay**, reached approximately 200 feet (61 meters) in height and was originally clad in bright white limestone. The four sides of the pyramid's square base were typically aligned with the cardinal directions.

While there were several gates, the main entrance was located between two columns and led to a central courtyard. It is thought that the pyramid contained statues of Egyptian deities, as well as figures of Djoser and his family, including a life-sized representation of him seated on his throne. Below the pyramid was an **underground complex of remarkable size and intricacy**, featuring galleries and around 400 rooms.



Some publications on the Project:

- **BBC:** [Newport engineers save Egyptian Step Djoser pyramid](#)

- **The Telegraph:** [Egypt's oldest pyramid saved by engineers from Newport](#)

Archaeology Magazine: [Egypt's Step Pyramid of Djoser Restored](#)



Entrance into the 4700+ years old Pyramid built by Djoser

The Requirement

The ancient structure was badly damaged in a 5.8 magnitude earthquake that hit Egypt in 1992. As a result, the **burial chamber partially collapsed**, and the central chamber was also in danger of collapsing.

The Solution



Cintec proposal included a technique based on putting **large airbags** inside the structure to hold it together before knitting it using more than **100 Cintec Reinforcement stainless-steel anchors**.

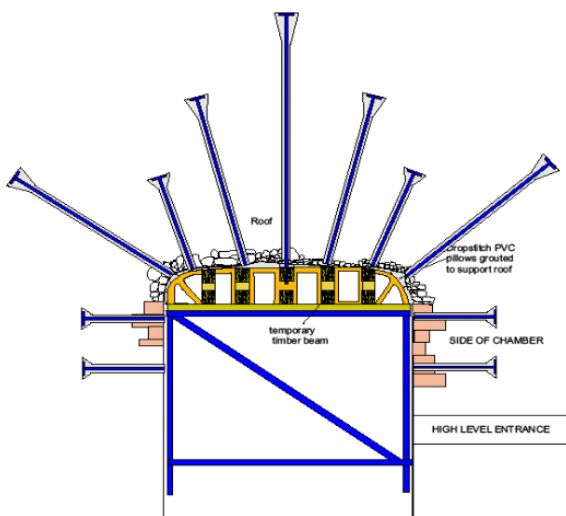
To the left, originally a flat ceiling the delicately balanced stonework has formed a rough self-supporting arch.

The successful implementation of the Cintec system has ensured that this **iconic monument** can withstand future challenges posed by environmental conditions and geological shifts, thereby **safeguarding its cultural heritage** for future generations.



The Details

UNDERCUT ANCHOR ARRANGEMENT



A temporary scaffolding was erected, with a timber frame made to closely match the roof of the chamber.

Cintec air bags were then inflated to take the roof profile.

Anchor holes were drilled through the bags and into the structure. Thus, preventing collapse.

Cintec anchors were installed and allowed to cure.

Then temporary air bags and wooden framework were removed.

