

Do all construction defects need to be fixed?

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Probably the most famous “construction defect” of them all is the Leaning Tower of Pisa in Italy. More than 700 years after completion, it still stands, albeit a bit crooked, and seemingly defying gravity. But if it wasn’t leaning, would the tower be the tourist attraction that it is today? There’s no substitute for seeing it in person. It is breathtaking.

The construction of this bell tower for a church began in 1173 A.D. and continued in several phases over a very long period of time. There were lengthy interruptions that delayed the project’s completion, over 200 years later.

The project is unique in its design, construction, and aesthetics. The engineer, Bonanno Pisano, designed a 16,000-ton tower that is 179 feet in height on a stone base that is approximately 10 feet thick. Unfortunately, or fortunately depending on one’s perspective, it was constructed on top of a “crumbly state of the ground.” Apparently, the tower started to tilt sometime in 1185 A.D. and today has an inclination measured at about 15 feet.ⁱ Subterranean water is present and it is apparent that the soil, composed of clay and other deposits, is subsiding.

In the last century, the increasingly accurate measurements of the building and the surveys of the subsurface conducted with a wide range of devices, combined with historical and archival surveys, have shed some light on the matter. The Tower was presumably initially designed as a straight building; however, it must have begun to subside right from the first stages of the building work. The subsidence was due to the special morphological features of the ground, composed of several layers of clayey materials and silt, run through by groundwater levels at about one metre deep. These conclusions can be drawn from an observation of the soil, and the corrections made to every floor of the building. What is certain, based on the scarce information we have, is that over the centuries the oscillation of the building was minimal, since it must have eventually settled on the ground.ⁱⁱ

Movement of the Leaning Tower of Pisa continues, as do restoration efforts to stabilize it. Incredibly, despite the design and construction defects, the tower still stands. Aside from the antiquity and beauty of the structure giving it historical value, the leaning caused by a defect in construction or design certainly enhances its value.

ⁱ G. Barsali, U. Castelli, R. Gagetti, O. Parra, Pisa: History and Masterpieces (Sesto Fiorentino, IT: Casa Editrice Perseus) 8, 18.

ⁱⁱ <http://www.opapisa.it/en/miracles-square/leaning-tower.html>.