

Four Operational Strategies for the Tower of Pisa

The operational strategies proposed for safeguarding the Leaning Tower all agree on the urgent need to lay a sub-foundation in order to ensure the stability of the foundation soil, considerably decreasing the current pressure to a value compatible with its resistance characteristics. Their second common property is the creation of a static beneficial effect on the material forming the monument. This effect may be achieved by reducing the pressure in the material forming the Tower, by decreasing the current inclination considerably, or by means of a reinforcement ring on the most stressed parts of the Tower - if the present inclination is to remain unchanged - or by the combined action of both the inclination decrease and the reinforcement ring.

Clearly, the choice of each operation must be made within the framework of the present and particular resistance conditions of the material. On the other hand, the four techniques differ structurally and operationally. The former aspects refer to laying structural elements, all equally effective, but different in conception and function - such as pillars, beams, hinges and tubular devices - to be laid in order to integrate the common sub-foundation and to be utilized with respect to each operational technique. The operational differences mainly depend on the different executional needs with respect to the structural elements to be laid.

The operational aspect of the fourth technique is very simple, but particularly delicate, as are all techniques concerning the Tower. In relation to this, the operation must clearly be managed by a highly qualified and professional group of technicians and workers using the most appropriate and modern technological apparatus. I believe that the considerable delicacy of the operational stage does not obstruct the application of the proposed techniques, both because of the precarious safety conditions of the building (requiring a radical solution), and because the operations put into practice by the various Experts Committees for safeguarding the Tower have always been palliatives, sometimes even harmful, intended to maintain the state of permanent instability of the Tower.

On 15 June 2001, Italian television announced that, at last, the Tower was operational. This is what they said. My opinion is that, after eleven years (from 1990 to 2001), the Experts Committee woke up from a deep “coma” and gave birth an “abortion”, and I use this term to indicate the characteristics of incompleteness and unreliability inherent in the operation. Eleven interminable and very expensive years of waiting had to pass for the Committee to decide to remove a little earth from under the Tower, thus executing an operational strategy of such extreme banality that it could have been performed in two, or at most, three months.

It was said that this operation had “rejuvenated the Tower” by two or three hundred years; in fact, the Committee should know that removing a very few centimeters from the initial huge eccentricity load did not restore the monument because this operation did not make any significant reduction to the pressures in either the soil or in the material forming the Tower. In short: the Tower has always been unstable and it still is.

Having said this, and without any desire to adopt a polemic stance, I nevertheless wish the Committee, and particularly the Italian taxpayers, full success in the operation. It should be said that the applicability of my proposed methods must be evaluated paying close attention to the basis of the current geo-technical features of the soil, of which I have only a superficial knowledge due to the following reasons:

- lack of information in the technical literature I have consulted;

- indifference from or refusal by cultural foundations – including the Engineering and Architecture Faculties of some Italian Universities – to view favorably my request for information.

In any case, the operational strategies proposed in this study allow the present inclination of the Tower to be maintained, its verticality to be restored, and in some cases also for the counter-inclination to be executed. They are contributions for safeguarding the Tower, but like any other idea, they may be refined, modified or ignored. Readers are invited to inform me of any impressions, criticisms and consequently also of any specific suggestions aimed at improving the techniques proposed.