POLYTECHNIC OF TORINO
FACULTY OF ARCHITECTURE
Degree in Architecture
Honors theses

Analysis of the instabilitj, institutions of provvisional support and intervention of reinforcement in the San Giuseppe church of Fossano

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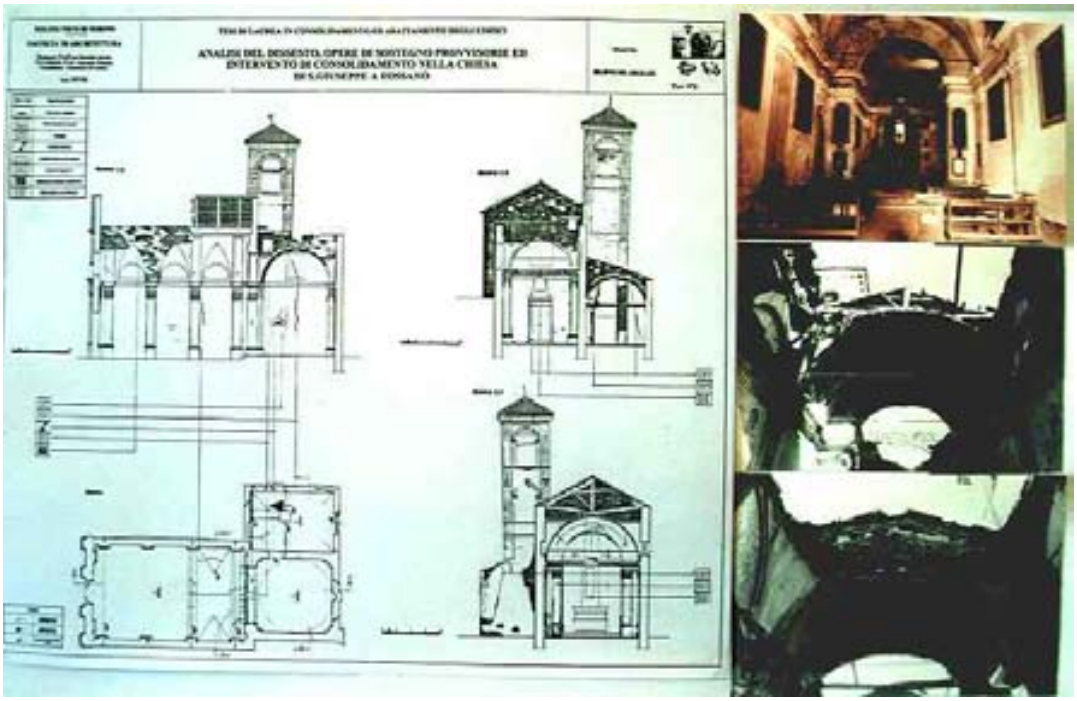
This study concerns the provisional safety procedure for the San Giuseppe Church of Fossano, Cuneo, Italy carried out by means of an adequate temporary protective framework to tackle the static shortcomings of the structure.

Reinforcement works can be theoretically divided into definitive and provisional.

While the definitive reinforcement works aim at guaranteeing permanent stability conditions of the damaged buildings, the provisional reinforcement works aim at guaranteeing temporary safety conditions as to allow building surveyors to implement all necessary measures and, in case of serious large-scale damages, to prevent the structure from suddenly falling down.

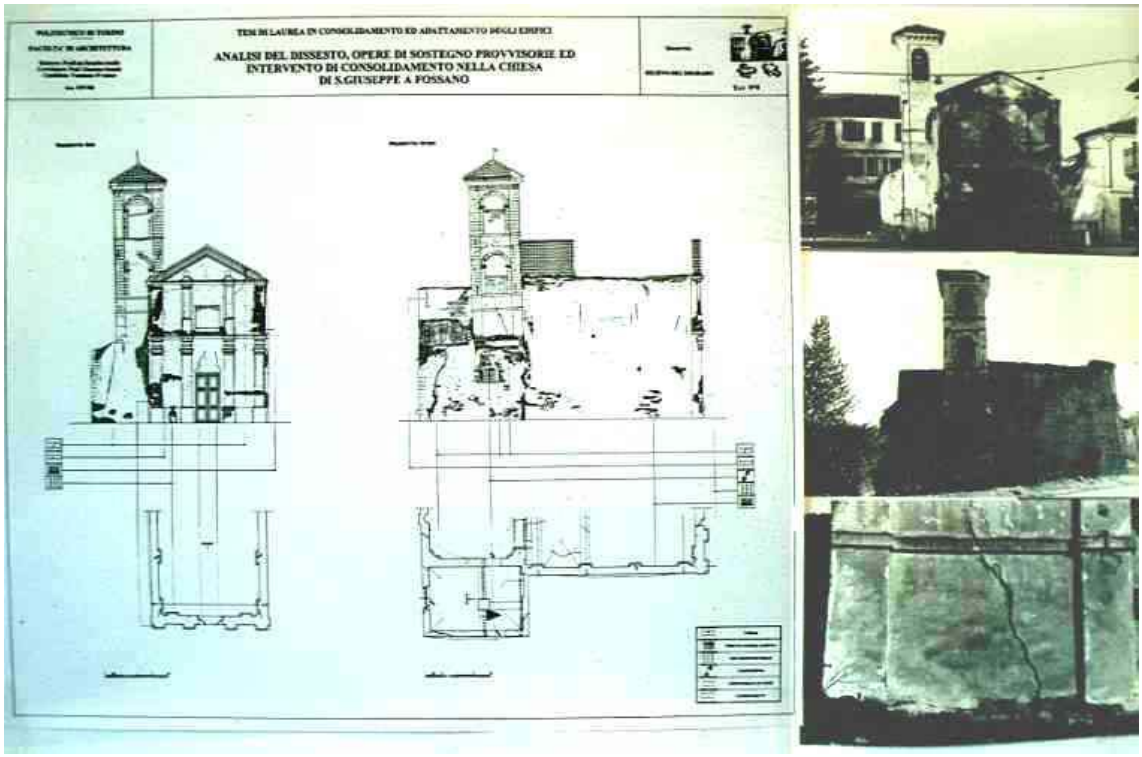
The provisional reinforcement project is the final phase of a preparatory cognitive process necessary to get an overview of the building structural layout, of the modifications in the above-mentioned layout and of the individual constructive members.



These modifications can have different causes, vary with time and influence each other.

Thanks to a critical analysis it is possible to formulate a hypothesis about the perturbing causes and therefore about the most appropriate static measures to be taken.

As was stated above, structural modifications can have different causes, vary with time and influence each other, such as the degradation of the structural components due to their old age (I refer in particular to those degradation evidences modifying the original static layout), such as the breaking or tension loss of the iron tie rods of the Welsh vault, the "unthreading" of the wooden tie beams of the trusses, or causes inherent in the structural lay-out due to errors or faults in the original static plan such as the incorrect use of the thrusting members at the base of the bell tower, in particular on its CD side, where a discharging arch is located which today, due to the serious degradation affecting the whole structure, shows three bearing points: the two wing walls and the angle pier of the bell tower corresponding to the crown section of the arch.



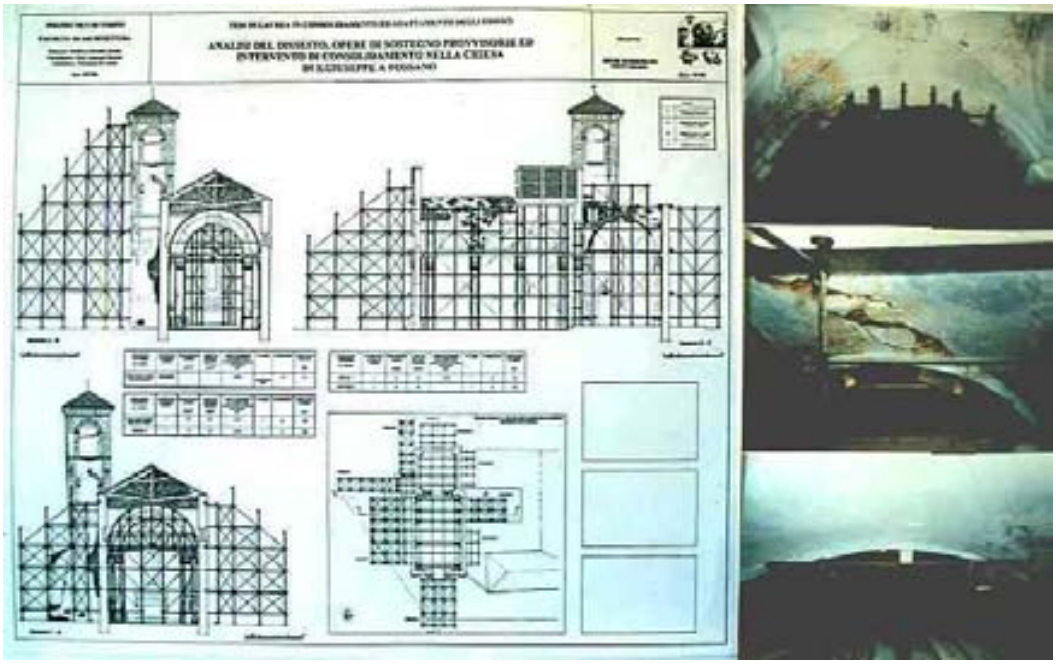
The diagnostic process is difficult since the conservation state of the San Giuseppe Church jeopardizes the possibility to carry out a critical analysis of the initial conditions.

Nonetheless during the various phases of the cognitive path, it was possible to get a closer view of the structure and track back the most probable causes of the degradation thanks to the critical correlation between the different elements available.

These elements allowed me to formulate hypotheses supported a) by a geometric survey carried out by means of an optical instrument and specifically focused on the out-of-plumb members of the bell tower, the crown elevations of arches and vaults and the coupling elevations of the tie rods; b) by a survey of the structural members and of the degradation symptoms; c) by a static analysis of the building carried out by means of technical tests for evaluating its safety level.

Safety works are eventually implemented by using light steel structures made of 48-diameter tubular members and joints with bolted jaws creating a sort of frame inside the Church.

This frame "wedges" into the structure at specific points allowing the underlying space to be widely accessed thanks to the limited dimensions of the tubular sections (a wooden boarding is located at the contrast points in direct touch with the partitions and the intrados of arches and vaults.



This boarding allows the masonry surface to be more adaptable while avoiding tension peaks, particularly dangerous for the seriously damaged structures as well as for the ground bases of the studs of the framed structure where an increase in the bearing surface is needed to reduce stresses).

The use of these framed systems is particularly beneficial to the external propping, in particular of the bell tower, where proper buttresses are used which create a supporting structure with rotational stability.

Due to the remarkable height of the walls versus the bearing plane, it would not be precautionary to use inclined props - made of welded or bolted steel sections - both because of the combined compressive and bending stresses exerted on the props and the repeated stress these props exert on the circumscribed areas of the veew to be protected which, due to the serious widespread degradation of the structure and

the lack of cross partitions in the protected wall could even cause the building to partially collapse.

In addition to this, cross connections are created in the wall - between the internal frame and the external buttresses - to achieve an adequate supporting action as well as a non-rotational action on the direct bearings.

This working practice is particularly needed in the light of the serious degradation of the entire structure.

As a matter of fact the complete weathering of the mortar in wide masonry areas has caused repeated stresses in the various layers of bricks and pabbles bringing about the breaking of the material along almost vertical lines running parallel to the compression direction as well as cracks which are the symptoms of an excessive squeezing of the direct bearing planes of the Church (such as the direct hyperboloidal crack expelling facing material on the west corner of the façade).

The precariousness and the serious dacay of the complex can be clearly perceived as soon as you cross the threshold of the Church abandoned to its fate and to the "Divine Providence".

Some immediate provisional propping works would be absolutely needed to guarantee the safety of the visitors instead of lingering in economic issues and wondering who should be responsible for the works.

We cannot but regret the negligence and indifference which necessarily lead to the loss of the historic built environment witnessing the culture of a village named San Giuseppe of Fossano.