

Strengthening for Preservation

Stella Casiello

University of Naples "Federico II", Department of Architecture History and Restoration, Naples, Italy

ABSTRACT: Our report points out that the consolidation intervention on an ancient building should not be apart from a more complex operation of restoration, based upon historical knowledge and using all the technical instruments to guarantee its duration in time and the integrity of its matter, without changing its formal characteristics. It is then necessary an interdisciplinary path between different knowledge to reach correct planning choices. Every intervention of static consolidation on buildings is a transformation work and can imply a loss of matter, that same matter we intend to preserve as an epiphany of the image, bearing historical and documentary values. The structural intervention necessary to conservation will be part of the monument history and then it will not be necessary "hiding" the new structures just to preserve the aesthetic vision of our monument.

1 CULTURAL VALUES OF CONSERVATION

The historical-architectural heritage to preserve and convey to the future presents many values: formal and documentary, as well as symbolic and psychological or material. In order to study all of them is then necessary a multi-disciplinary approach, in the awareness that every survey on the estate we have to protect must conduct to an arranged and homogeneous operative program.

Part of this program regards the structural intervention necessary to assure the stability conditions of the building we mean to preserve. The comparison between different disciplines that contribute to the correct choices is yet essential. Actually the damages registered on a monument, in consequence of a structural intervention without a careful historical-critic control, can be not only harmful for its formal values, but also for its static model, being itself an historical document and an evidence of civilization.

1.1 Crossing information and disciplines

Asserting that restoration is a mostly cultural operation, it is evident that strengthening intervention on a building has not to be parted from a more complex restoration work based on historical knowledge and using every technical instruments that can assure its staying in time. Acknowledging the monument/document as unique historical evidence, we need to pay it the highest degree of attention inside our theoretic and critic speculation and in our structural and surface interventions acting on the matter.

Only matter, indeed, constitutes the medium of cultural values, and then its preservation assures the conveyance of historical, aesthetical, symbolic meanings of building. Every intervention on existing architecture should involve the slightest loss of matter, for the material authenticity constitutes the main value conditioning every operative choice. But this material authenticity risks to be compromised also by interventions of structural consolidation acting on the fabric. Matter with its everlasting stratifications allows to investigate the structural process

that building passed through. Every intervention of static consolidation is a work of transformation and can imply a loss of matter, that same matter to preserve as an epiphany of the image, bearing historical and documentary values.

The operations on existing architecture needing static consolidation are as more dangerous as more loss of matter they involve. The criterion of the so called reversibility in restoration intervention - already affirmed in Cesare Brandi's first reflections - involve the necessity of preserving monuments from incorrect transformations resulting also by consolidation interventions.

As recently pointed out (Blasi 2005), projecting interventions on existing buildings, it's needed to afford structural problems in a different way than the ones relative to new structures. Regarding new structures there is the necessity to realize 'real' structures, acting the way that our numerical scheme does; "regarding historical buildings we need to create theoretic models bringing results corresponding to the ones shown during centuries of "exercise" and traumas".

The structural intervention has to be preceded by several investigations. For the knowledge of structural consistence, the operator has to know first matter and geometrical shape of historical buildings. He has to make a correct survey to understand the mechanic aspects of the work.

It is not necessary to talk here about survey - that structural engineer achieve usually from survey experts - but I mean to point out the importance of an historical investigation that not always is made in case of structural interventions. It is really important referring to the contributions of high scientific value given by Edoardo Benvenuto (Benvenuto 1988), regarding history of building science. In one of his essay, he writes: "This is a field of study fascinating and full of useful indications both for a better comprehension of the past works and for a more coherent definition of the techniques that have to be followed in the action of restoration".

Benvenuto adds that the structural engineer, even very skilful, when has to examine an ancient building realized with techniques no more well known, is in the difficulty of formulating both a diagnosis and a prognosis. Then he has to trust of his intuition even without following clear explicative theoretic models.

For ancient buildings, the structural engineer trusts his own knowledge of the damages. It is not sufficient conform to the new configuration of the building we have to restore, it is necessary trying to understand the way the building as been formed, the techniques it has been built with and the transformations it has passed through during the centuries. For instance the additions to the primitive core, whose static stability was consolidated during the time, introduce new loads and new solicitations: "the knowledge of the state preceding any new expansion of the building let us able to consider the joined solicitations and foreseeing the condition of structural connections between the parts" (Giuffrè 1995). It is possible to obtain knowledge affording an analysis making able to follow the building history and the structural conception leading the masters of the age in which it has realized and the ones of the following epochs in which it has been transformed. At this purpose it will be helpful the archival research, privileging the documents regarding building phases of our fabric, without neglecting the monument history. In addition to those, it has to be examined the documents about the past restoration history and the damages caused by earthquakes during the ages (Giuffrè 1988).

If individuation of the building phases of the fabric makes us able to point out possible inadequacies and intrinsic disconnections, the reports about the damages caused by past earthquakes can constitute an analysis of how the structure answers to the seismic action. Then it should be useful knowing the character of the seismic event producing those damages.

1.2 Historical knowledge and strengthening technique

On 1989 in Italy «Directives for the Drawing up of the Restoration Design including "improving" operations in architectural complexes with historical-artistic value in seismic zone» were formulated by the "Commission for the Defence by Seismic Risk of the Historical Heritage" of the Ministry for the Cultural Heritage and Activities. In this document was clearly underlined the importance of an historical analysis of the building, both for the conservation and for the comprehension of structural behaviour and of its evolution in time. The present legislation with its "Unique Text for Building" issued in the Official Gazette on September 23rd 2005 imposes the "conformation" also for the ancient buildings, making an exception only for "historical-monumental and artistic buildings of great significance and complexity". Only for those build-

ings “the safety valuation will be founded on a careful historical anamnesis of the work and on a logical-deductive process”.

We have to point out that the subdivision between buildings of “great significance and complexity” and the rest of the buildings of historical-artistic and environmental value is at least peculiar, since the whole architectural heritage might be considered in the same way.

Moreover, as already observed (Blasi 2005), for historical-monumental buildings and – I say – for the whole architectural heritage the safety valuation has to be always founded on a careful historical anamnesis.

Another problem to be afforded when we intervene on architectural heritage is the one relative to consolidation techniques. Sometimes construction techniques used in ordinary building have been applied on fabrics showing an aged stratification of building techniques, causing damages often irretrievable. Actually in restorations the principles of “reversibility” and “least intervention” should always be applied but not always we can reach those aims. We have then to increase our research on new materials and new technologies. Great part is carried on by Material Engineering and Structure Engineering that afford the structural problems using also innovative materials (i.e.: FRP) opening new sceneries in the field of building and restoration.

But the complexity of problems that architectural heritage in bad conditions shows, needs the competence and the co-operation of several experts, such as art historian, architect, restorer, that, interacting with who attend to engineering disciplines, let us reach the conservation aims. This is the conviction not only of architecture restorer, but also engineer particularly sensitive about Cultural Heritage. Carlo Viggiani writes: “The conservation of monuments and historical sites is one of the most difficult problems the modern civilization is called to confront with” (Viggiani 2005).

It is interesting to observe an engineer himself doing those assertions. In fact, it is often thought that static problems can be treated apart from the whole knowledge of the architectural organism and then can be studied only by a technical, physical, mathematical point of view, without any reference to historical-critic research.

1.3 Valuation methods

In a restoration project, the valuation of planning choices in the structural intervention meant only to the building safety, has to be done keeping in mind also the history of the fabric that can enlighten about the building modalities it has been realized with. This valuation can lead to an intervention related to those criteria, now acquired by modern restoration, such as “distinguishable way”, “compatibility”, “reversibility”, “respect of “authenticity” and the “least intervention”.

On the scientific plane, it is hard to distinguish restoration from consolidation since structural problems belong to restoration and the professional figures that have to afford them should collaborate in order to achieve the conservation. In fact the interventions on monuments cannot be reduced to mere structural facts; instead, the study of the static behaviour of the structures has to be afforded keeping in mind the history of the evidences reached until now. Also the static bond changes in time and becomes historical, and has to be analyzed together with all the transformations happened during the centuries. The state of damage of a building is also part of the history and then also the consolidation interventions constitute historical stratification.

Amedeo Bellini writes: “The structural intervention considered as an act of lengthening of the building life has not to be, therefore, in first instance, subjected to each of the criteria more often considered in past; it is not important the ideological contraposition between the use of the traditional materials and technologies, opposite to the modern ones, and moreover between invasive structure being it visible and a not invasive one that is not visible. There is no reason to hide what is necessary; what is visible will assume characters typical of an architecture that must take its place at the side of another architecture. The shape will be a consequence of the technical choices, of the expressive wills, of the relation with the antiquity and of its interpretation” (Bellini, 2005).

2 CONCLUSIONS

In conclusion, it is impossible to consider the work of the structural engineer as an accessory element, it constitute a fundamental part of the conservation process. Then this process has to be afforded with a tight collaboration between the restoration designer and the structure expert. In fact the intervention on the existing architectural heritage cannot be objective but it is the result of valuations done both on architectural and on structural level.

REFERENCES

- Bellini, A. L'intervento strutturale nel restauro come stratificazione di "rilevante interesse storico". In Aveta, A., Casiello, S., La Regina, F., Picone, R., *Restauro e consolidamento*. p. 13-18. Roma: Mancosu editore.
- Benvenuto, E. 1988. L'ingresso della storia nelle discipline strutturali, *Palladio*, n.1, p.7-14. Roma: Libreria dello Stato.
- Blasi, C. 2005. Gli interventi di consolidamento. in Strappa, G. *Edilizia per il culto*, p. 10-21. Torino: UTET.
- Blasi, C. 2005, Lettera al direttore, *L'architetto italiano*, , n.10, p. 10. Roma: Mancosu editore.
- Giuffrè, A. 1995. L'intervento strutturale quale atto conclusivo di un approccio interdisciplinare. In Gigli, L. *Il progetto di restauro*, p. 99-107. Roma: Gangemi editore.
- Giuffrè, A. 1988. Restauro e sicurezza in zona sismica. La cattedrale di Sant'Angelo del Lombardi. *Palladio*, n. 1, p. 95-120. Roma: Libreria dello Stato.
- ICOMOS Charter 2003, *Principles for the analysis, conservation and structural restoration of architectural heritage*.
- Viggiani, C: 2005. Sicurezza e conservazione: conflitto o sinergia?. in Aveta A., Casiello S., La Regina F., Picone R., *Restauro e consolidamento*. p. 139-146. Roma: Mancosu editore.