

Fig. 3 - In seismic areas buildings are usually constructed using more accurate techniques which make them more resistant than average. But if people are not aware, neglect and modifications and further earthquakes will gradually weaken the buildings.

hoc chemical products to scientific research projects involving major funding and research teams.

Resorting to natural sciences in order to reduce the vulnerability of one's "major" examples of cultural heritage has by now become run-of-the-mill.

Minor examples of cultural heritage - a built environment which is difficult to get to know

It is essential to know how older buildings react to seismic shocks in order to strengthen them. Yet in spite of progress made in seismic engineering it is near impossible - or at best very difficult - to reproduce reliable models of scores of imbricated buildings (fig.2) because nothing is known about the history of their construction and more importantly about the modifications made to them. Also the value of the common built environment prohibits a thorough analysis being carried out to establish the technologies employed during its construction.

In short, the difficulty in applying current scientific tools and knowledge to minor historical constructions and the role played by both whoever uses and restores them, makes it difficult to get to know and protect this particular sector of the heritage of a country.

Why it is simply not enough to increase public awareness

The vulnerability of older constructions does not only stem from the patchy knowledge one has about its building methods and techniques or about the dubious modifications made to them.

These buildings normally require continuous maintenance. Earthquakes and tremors suffered over the centuries, alterations made to their use and purpose, the gradual erasure from memory of the aseismic effectiveness of traditional

technologies plus the lack of maintenance are all factors which have contributed to weaken constructions which once were highly resistant to earthquakes. (fig.3)

This has brought many researchers to the conclusion that in order to protect older constructions in seismic areas it is thoroughly important - and sometimes even enough - to encourage the general public to look after their buildings better.

However, economists and psychologists point out that if maintenance costs are the responsibility of the owners and reconstruction work the responsibility of the state (or through the help of international aid) all parties involved will tend to wait for the earthquake to happen rather than prevent it from happening.

In order to draw up an effective prevention plan it is thus necessary that all the analyses and proposed actions do not only concern what is to be protected (the building) but also the behaviour of the agents involved i.e. the owners, architects, builders and decision makers.

A NEW APPROACH

Not just Engineers are involved

If today there are seismic regions which have historical city centres to be protected, it is because the constructions have managed to withstand the effects of earthquakes throughout the centuries.

Therefore one must reconsider traditional attitudes towards older constructions.

Irrespective of the type of building (monumental or otherwise), one should not simply consider it as something to be restored. Due thought and consideration must be given to the signs indicating its particular history as these can in fact indicate the proper measures to be taken (fig.4).

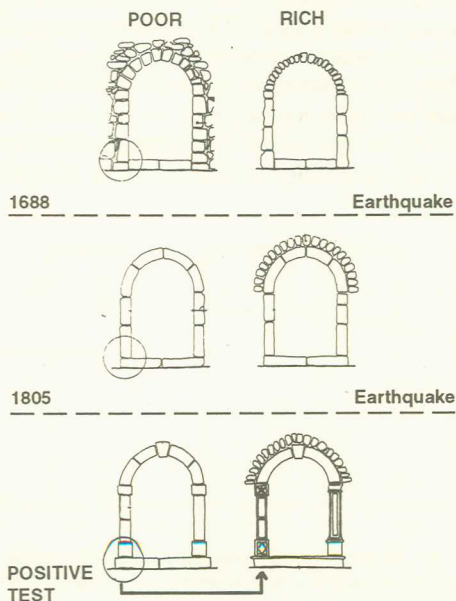


Fig. 4 - S.Lorenzello (Italy). The progressive earthquake test selects more and more efficient aseismic techniques. These then take root in the local culture as decorative elements.

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This implies that the present relationship between exact sciences and the cultural heritage is being turned on its head.

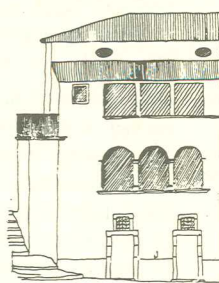
Instead of applying the engineering and technological state-of-the-art to protect older constructions, it may well prove useful to apply the methodology of behavioural sciences to enhance the exact sciences, in order to reduce vulnerability.

Rather than mobilizing teams of engineers to "assess" the stress and strain produced by earthquakes on buildings modified over the centuries, a more appropriate plan of action would be to integrate engineering know-how with the methods of archaeologists, historians and economists to be able to understand the reasons behind a specific technique or particular modification (fig.5).

Protecting the building and Local Seismic Culture

As a matter of fact, the problem today with increasing the level of protection given to older constructions does not lie in simply choosing the most sophisticated restoration techniques but also in increasing the amount of resources available and making all types of know-how (be they new or old) widely known. All of this is necessary but unfortunately it is not enough. Indeed, it all becomes useless if the techniques, know-how and resources are not applied according to the procedures which make the systematic maintenance "convenient" for the agents involved. Certain action/research projects promoted by the EUCCH proved that it was possible to reduce the vulnerability of the common built environment by first of all stimulating the community to rediscover, then master and finally regularly apply (in a critical manner obviously) its "own" aseismic techniques. These techniques have been successfully experimented during all previous

The loggias are a typical feature of Polla architecture, but...



... why two walls ?

... why is the outer wall thinner ?

... actually, the loggias take great advantage of, and transform, a reinforcing structure constructed after an earthquake in an ornamental feature

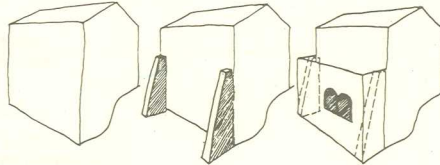


Fig 5 - In order to recognise the aseismic function of certain elements of local architecture, close collaboration is required between seismic engineers, architects and historians using methods deriving from those used by archaeologists.

earthquakes and are therefore the most suitable for the local context (resources available, characteristics of the earthquake, culture, economy etc.)

Effective protection measures can be implemented by re-evaluating the so-called "Local Seismic Culture" (LSC) i.e. the combination of the knowledge of local aseismic building techniques and its consequent effect on behaviour.

LSC, vulnerability and participation

Re-evaluating local seismic cultures does not mean that experts have simply re-discovered traditional aseismic techniques.

What is equally important, however, is that this "new" knowledge is circulated again throughout the community so that it has the effect of modifying people's behaviour.

In order for the re-evaluation of LSC to actually bring about a definite reduction in vulnerability it is thus necessary to involve the whole community in re-discovering its "own" seismic culture.

Innovation or evolution ?

Can the reduction of vulnerability of older constructions (as well as modern masonry constructions) by re-discovering and re-evaluating Seismic Cultures be said to be almost a return to the past? Is its approach not too empirical and simplistic?

These are recurring questions which are typical of experts who are used to reasoning with numbers and models.

In actual fact the re-evaluation of LSC is a complex plan of action based on the latest methodologies (systems behaviour analyses, simulation games) which requires the application of procedures which are both rigorous and generally speaking valid.

Basically, it is a matter of re-animating the permanent evolution process which has always characterised the history of civilisation, except that nowadays this is often replaced by innovation.

In any case, all interventions on older

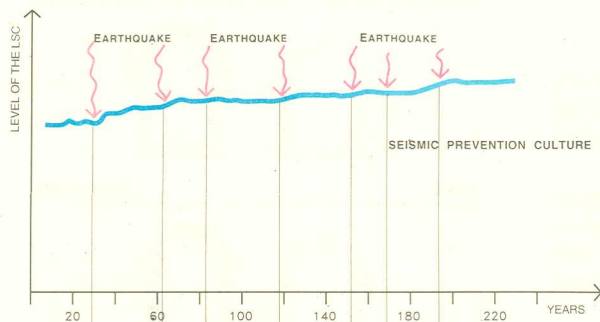


Fig. 6 - Whenever earthquakes recur frequently people do not forget. Buildings are regularly built according to techniques which have proven effective (Seismic Prevention Culture).