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HOW DO BUILDINGS REACT?

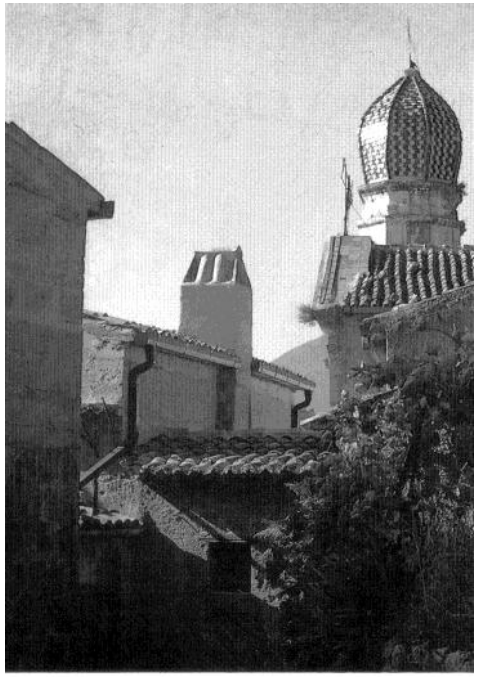
When assessing and planning measures to alter an old architectural fabric (maintaining it, strengthening it, modernising it, etc.) it is vital to understand the dynamic behaviour of buildings. We have already seen (page 23) that it is difficult if not impossible to use models when dealing with historic centres. It is thus no coincidence that static tests (and the measures subsequently taken) usually look at individual buildings and do not take account of the way in which buildings as a whole behave.

This is an aspect of earthquake culture which has major implications for the vulnerability of the system.

Erstwhile building methods enabled specifically targeted, additional measures to be carried out which were always reversible and compatible with others of their kind. Measures applied to one unit did not mean that similar measures had to be applied to neighbouring units. In particular, building and conversion techniques were based on an empirical understanding of the group as a whole.

Modern techniques, however, envisage once-and-for-all measures which are compatible provided they are explicitly planned as such (toothing reinforcement) and which sometimes introduce changes so radical that they alter the behaviour of the whole (for example where a building in the middle of a row is replaced). This is not to say that modern methods reduce the risks.

To get round these difficulties, the town planning laws often recommend that measures be taken not for a single building but for a whole sector or group. But this criterion may be wrong in methodological, historical and cultural terms if it is adopted as a blanket rule; for example if it imposes uniform and simultaneous measures on buildings which have had individual parts added to them at different times.



Furthermore, and more seriously, it often lacks scientific rigour, so that measures are applied to the fabric as a whole without recourse to the instruments which can predict how buildings which are geometrically complex, heterogenous in terms of methods and materials and greatly changed by use will react to a seismic shock.

Clearly, then, earlier generations' broad understanding of how buildings behaved overall meant that they carried out individual measures which were nevertheless compatible with the context. Nowadays we give free rein to individual measures and/or we encourage measures covering a much wider area, forgetting to assess the global effects these will have on the building fabric as a whole.

For this reason it seemed expedient, in San Lorenzello, to follow a different approach to understanding the behaviour of the architecture, which was closer to that rooted in the local system.

To this end we looked for blocks of buildings in the fabric of the historic centre which were contiguous and continuous and which very probably interact in the event of a seismic shock ("dynamic groups"). To find

any protective measures appropriate to the overall behaviour of the buildings we first analysed the urban fabric as a sequence of solids and voids, identifying the "dynamic groups" and then studying the present-day links between them (usually covered passageways). In this way we learned which links dated from the period of construction and which were later additions.

When this analysis was subsequently compared with the list of vulnerability factors in earlier times (cf. page 72) it was postulated that many of these covered passageways were built to consolidate, enhancing the dynamic interaction between different blocks. We then sought to test these hypotheses analytically and numerically. The operation was only partially completed, however, owing to the difficulty of constructing models representative of the dynamic groupings and to insufficient time and resources.

We believe, though, that a critical appraisal of the material obtained would be useful, if only to validate the method used.

For this reason we merely reproduce here a plan of the dynamic groups we identified, together with a summary estimate of the difficulty of modelling their probable reaction to a seismic shock.