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CALITRI: PIANO DI RECUPERO, RESEARCH ON SEISMIC VULNERABILITY AND INTERACTION BETWEEN DIFFERENT AUTHORITIES

ABSTRACT

In December 1985 Calitri Council demanded that the *Soprintendenza per i B.A.A.A.S. di Salerno e Avellino* write a *Piano di Recupero* for a part of the Historical centre of the small town. The *Soprintendenza* set up a Planning Office in Calitri, to be able to work closer with the inhabitants and draw up the *Piano di Recupero* .

After the earthquake of 23.11.1980 in Alta Irpinia (Southern Italy) the Italian Government made a special law to oversee the financing and repairing of the damages according to which local Councils have to make a "*Piano di Recupero*", - an urban plan - before managing the reconstruction . Any Authority with a technical office can draw up one if asked for by the local Council.

The area of the plan had serious problems both for hydrogeological and seismic reasons, due to subsidence on the south-east side and a slope inclined at more than 45_to the north-west. The old centre of the town is sigted on the top of a hill, bounded by steep slopes. Only the southern side of the hill is built up ; the houses are tightly interconnected with a network of underground vaults, often crossing the whole hill as far as the Northern side that is almost vertical.

First of all a study on the geological/seismic characteristics of the area was done by the *Osservatorio Geofisico Sperimentale di Trieste,* according to the Regional Law n. 9 /1983.

The Plan was based on great concerning for the historical and architectural qualities of the building and for their preservation, with the aim of keeping the original use of sites while providing better services and increasing the footpaths. It was also projected the stabilizing of the northern side of the castle hill, and restoration of the castle area , to be used for public activities.

The *Soprintendenza* itself intervened on the collapsing wall of the northern side of Calitri Castle. It is a relevant example of stabilization operated in dangerous conditions, after that part of the wall suddenly subsided in December 1988.

The *Soprintendenza* organised also a research on seismic vulnerability that was made by the *Gruppo Nazionale di Difesa dai Terremoti* (National Group for the Defence from Earthquakes) to understand the conditions of masonry buildings and to evaluate the size of seismic danger due to the particular geological state of the site.

The research has produced final summaries with the main objectives of enabling the local authorities to forecast the necessary expenditure and enabling the technicians and the inhabitants to realize the principal structural problems to deal with, while proceeding with the restoration.

INTRODUCTION : THE ROLES OF DIFFERENT AUTHORITIES

After the earthquake of 23.11.1980 in Alta Irpinia (Southern Italy) the Italian Government made a special law to oversee the financing and repairing of the damages due to the disaster, law 14.05.1981 n.219.

The responsibility from a financial and an operative point of view lies with different authorities according to the nature of the buildings.

The *Soprintendenza per i Beni Ambientali e Architettonici* concerns itself principally with public monuments , the *Provveditorato alla Opere Pubbliche* with government owned public buildings and local Councils with residential buildings and public buildings too.

Other Authorities such as *Regione* and *Provincia* are concerned with more different works .

These categories are not always distinct from one another and the interaction between the different authorities can either be positive or negative depending on varying factors.

Most of the responsibility and management for restoration and reconstruction, lies on the local Councils.

The *Soprintendenza per i Beni Ambientali e Architettonici* is the local office of the *Ministero per i Beni Culturali e Ambientali,* usually there is one for every region - consisting of one or more principal towns (*Capoluoghi di Provincia*)-. The *Provveditorato alle Opere Pubbliche* is the local office of the *Ministero per i Lavori Pubblici* (Public Works) and is not always concerned with the cultural implications of the works.

The *Soprintendenza* has always considered the buildings of historical village centres as an important heritage to preserve, even if it doesn't strictly deal with them, and set up a productive collaboration between many of the local Councils stricken by the earthquake, with this in mind.

Local Councils have to make a "*Piano di Recupero*", - an urban plan that regulates the repairing and reconstruction of buildings - before managing the reconstruction, but any Authority with a technical office can draw up one if asked for by the local Council.

In several villages such as Calitri, S.Angelo dei Lombardi, S.Andrea di Conza , Caposele, the *Soprintendenza per i B.A.A.A.S di Salerno e Avellino* itself set up an office to draw up a *PdR.*

An office in the centre of the earthquake stricken area enabled the *Soprintendenza* to have a better interaction with people and local Authorities, and a closer knowledge of the site.

It should also be considered that this operation, besides guaranteeing better planning quality and care for the protection of old buildings, helped Councils in cutting short completion times.

The first difficulty a project meets is that politicians have to agree with the nomination of the planner, what can take years. And often particular private convenience can prevent the local Council from having a *PdR* made. In Naples for example, 12 years after the earthquake, no *PdR* has yet been made.

In some villages as S.Andrea di Conza, Morra De Sanctis and in the city of Avellino many inhabitants have asked the *Soprintendenza* for drawing and managing the particular projects of restoration of their buildings

In other villages the *Soprintendenza* obtained from the local Councils the right to administer any single project . Villages such as Campagna , Eboli and Pontecagnano have been under control and a great amount of old buildings have been protected. In Pontecagnano there was not an interesting historical centre, but many ancient farm houses spread about in the country. They were not seriously damaged, but the owners wanted to demolish and rebuild them anew .

THE PIANO DI RECUPERO OF CALITRI

In December 1985 Calitri Council demanded that the *Soprintendenza per i B.A.A.A.S. di Salerno e Avellino* write a *Piano di Recupero* for a part of the Historical centre of the small town. The area was divided into two zones : Corso Matteotti and the Castle. It had serious problems both for hydrogeological and seismic reasons, due to subsidence on the south-east side and a slope inclined at more than 45_to the north-west.

The old centre of the town is sited on the top of a hill, bounded by steep slopes. Only the southern side of the hill is built up ; the houses are tightly interconnected with a network of underground vaults, often crossing the whole hill as far as the Northern side that is almost vertical.

First of all a study on the geological/seismic characteristics of the area was done by the *Osservatorio Geofisico Sperimentale di Trieste,* according to the Regional Law n. 9 /1983.

The *Soprintendenza* set up a Planning Office in Calitri, to be able to work closer with the inhabitants drawing up the *Piano di Recupero.* The office is directed by Arch. Nora Scirè with Arch. Vito De Nicola collaborating.

The Plan was based on the following principles:

- Great concerning for the historical and architectural qualities of the building and for their preservation, both from topological and structural point of view.
- Keeping the original use of sites and buildings, while providing better services to revive the old part of the village .
- Respecting the original urban and geological morphology of the site, increasing the footpaths
- Stabilizing the northern side of the castle hill, and restoration of the castle area , to be used for public activities.

The *Soprintendenza* itself intervened on the collapsing wall of the northern side of Calitri Castle. It is a relevant example of stabilization operated in dangerous conditions, after that part of the wall suddenly subsided in December 1988. The safety was assured by a monitoring system. Without this feat of Eng. Michele Candela and its staff, the reconstruction in the upper part of the village would have been impossible.

RESEARCH ON SEISMIC VULNERABILITY OF THE BUILDINGS IN THE HISTORICAL CENTRE OF CALITRI

The *Soprintendenza* judged that another research was necessary to understand the conditions of masonry buildings and to evaluate the size of seismic danger due to the particular geological state of the site.

The *Gruppo Nazionale di Difesa dai Terremoti* (National Group for the Defence from Earthquakes), depending from the CNR (National Committee of Research) was concerned for the first time in a research in collaboration with the *Soprintendenza*: until now they had only worked with the *Regioni.*

ORGANISATION AND GATHERING OF DATA

The Planning Office of the *Soprintendenza* organised 5 teams consisting of 2 young people from the village (either architecture or engineering students or draftsmen). In this way the local community was greatly involved .

The National Group for the Defence from Earthquakes trained them for three days in collecting data about exposure and seismic vulnerability of masonry buildings. It surveyed the site and gave the teams useful suggestions. They also taught them how to fill in the table that had been previously formulated by them (scheda Benedetti Petrini 1986).

The research began by drawing the house plans, this and the compilation of the tables took less than one month.

The area of the previous Piano di Recupero was divided into 196 buildings each having a table to be filled in.

Those parts of the village that had already been decided to be demolished and to be rebuilt for hydrogeological reasons have obviously been excluded .

A personal computer Olivetti M240 with a Data-base was installed in the *Soprintendenza* office, and the staff could type in the data at the end of the day,

The National Group for the Defence from Earthquakes pointed out the mistakes, in the first stage, and then elaborated the data.

THE TABLE

The table is made of two parts. The first one - first level table - collects data about:

- identification of the building (section 1 and 2)
- measures for each level (sec.3)
- utilization of the building (sec .4)
- age of construction and following intervention (sec. 5)
- conditions of structural elements and of plumbing or electrical utilities(sec. 6).
- structural typology for each storey of vertical and horizontal elements, stairs and roofs.

The second part of the table deals with the second level of vulnerability - the structure of the building.

Eleven caratheristic parameters of the building have to be identified in different classes, so that it is possible to achieve a summarized judgement about the seismic vulnerability, by means of an index.

The 1986 version of the table, moreover, reported a section concerning the damage suffered by the building ,due to the earthquake. It is completely independent from the rest of the table, and can be useful for following studies about the connections between Vulnerability and Damage.

The damage is made evident for each storey and structural component mentioning the worst cases of damage, the most widely spread and its diffusion. The staff was given an instruction handbook .

MANAGEMENT OF RESEARCH AND RESULTS

The first data to be analysed dealt with the calculation of the damage index and the seismic vulnerability index of each building.

The research has verified that the damage caused, by the 80's earthquake to the buildings was conspicuous mainly within the subsiding slope area and the castle area. In these sites the buildings were generally in bad conditions even before the earthquake.

The seismic vulnerability has revealed to be higher than the national average (250 instead of 180), mainly because of the bad quality of the stone masonry. and the general lack of connections between the orthogonal walls at the different levels.

The research was done after a very destructive earthquake and probably the young technicians might have been influenced in their evaluations, stressing the negative caratheristics of the buildings.

The particular morphology of the site has not greatly influenced the vulnerability level - about 10% - it must be considered that the principal aim of the research was to find out the seismic action and the probable damage due to the earthquake.

The following results were obtained from the tables:

- over 90% of the buildings need connecting between the walls, to assure a rigid movement during the earthquake.

- above 85% of the buildings need connecting between the horizontal layers and vertical walls.

- above 90% of the buildings need the masonry reinforced to increase resistance under seismic action.

- about 50% needs radical work to be done upon the ceilings and the roofs, and the rest need connections and strengthening of the roof structure.

- apart from a few cases, the vertical sections of a terrace of buildings are quite similar in their behaviour under seismic forces parallel to the walls, but not horizontal layers or roofs.

An estimate was made as to the difference in cost between the restoration of a building and the rebuilding of one of the same dimension.

The prices for the reconstruction have been calculated using the Regional Official Prices , The basic cost was L. 348.600 per sq.m. increased by some factors according to the Italian laws :

a) for seismic areas (degree 9)

b) site included in a Plan of Restoration (urban planning)

c) homogeneous historical-artistically interesting area

All the data has been reported on 3 maps by the National Group of Defence from Earthquakes, to give a clear view. The Planning Office of the *Soprintendenza* set up an exhibition, showing the drawings and explaining the results of the research. The *Soprintendenza* wanted the people to understand the work and to be involved with the new plan. The tables were collected and the main data for each unit (Unità Minima di Intervento) of the Piano di Recupero gathered.

The following information can be found on the maps for each UMI:

- Medium Vulnerability Seismic Index;
- Maximum available grant both for the restoration and for the rebuilding;
- Principal structural problems;

The research has produced final summaries with two main objectives :

1) To enable the local authorities to forecast the necessary expenditure and to consequently set up an efficient economical planning connected with the actual PdR.

2) To enable the technicians and the inhabitants to realise which are the principal structural problems to deal with, while proceeding with the restoration, and to know the approximate size of grants.

Naturally each individual project shall be based upon an exact analysis of each building, and shall respect all the rules and regulations of the PdR and of the National laws concerning seismic areas.

All buildings will be able to reach a low level of Seismic Vulnerability if rules , laws , and above all good building practise is respected.

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