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Survey and Earthquake: The Case of Visso

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Abstract: This research was carried out in the "Surveying of Architecture and Cities" course in the School of Architecture at the University of Camerino. The research focused on small old medieval villages in an area of central Italy. The towns contain castles, fortresses, towers, and town walls, which define urban hierarchies and territorial boundaries. The precise location is the Province of Macerata, andto better understand the context, special focus was placed on the medieval town of Visso. For each tower or castle, direct surveys and a photogrammetry survey were made. The results, which are also presented using axonometric representation, show the typically medieval morphological aspects of the village. Immediately following the surveying campaign, a series of strong earthquakes hit the same area as our research. Visso was severely damaged and we worked with the municipal administration to make more effective use of our survey. A new survey was also made to evidence the damage caused by the first strong earthquake.

Key words: survey, small towns, representation, middle ages, reconstruction

1. Ignorant of the Future

In 2016, a group of students from the E. Vittoria School of Architecture and Design at the University of Camerino, under the supervision of Prof. Salvatore Santuccio and with the direction of Prof. Enrica Pieragostini, began a research project entitled "The medieval age in small villages: castles, fortresses, towers, and town walls".

The purpose of the research was to survey several small villages in a particular area of the Marche Region in Italy: the ancient dukedom of Camerino. The towns still boast a large number of medieval buildings, towers in particular, and the urban quality of the villages is maintained by the typical morphology of medieval housing.

The municipalities of interest to these studies — Visso, Ussita, and Castelsantangelosul Nera — are situated along the Nera River in the Central Apennines. According to geological studies, the topography of the area emerged due to the upward displacement of the Mediterranean end of the Tethys Sea in the middle Miocene. The first inhabitants in the Sibillini Mountains date to the Neolithic Era and appear to have been primitive local tribes. In 292 BC, the Romans, led by Manius Curius Dentatus, occupied the area and surrounding territory to quash the resistance of the local inhabitants — the Sabines — to the Romans' expansion eastwards towards the Adriatic. In 568 AD, the Germanic Lombards began their push into central Italy, creating 36 ducats, one of which was Spoleto. They ruled the Umbrian plain and the Nera River valley (known as the *Valnerina*), which includes the territories of Visso, Camerino, and Agno Piceno. Under Charlemagne, many of these territories were characterized by the construction of castles that served as a defensive mechanism and became the central nuclei of the first rural communities.

Between the tenth and twelfth centuries, abbeys and monasteries, which have come to be very important for their architectural quality, were built in some of these settlements. The most important step in the growth of Visso and its surroundings came in the twelfth century when it fell under the hegemony of the Da Varano family, lords from Camerino that conditioned the

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development of the centre of Visso and the villages of Castelsantangelosul Nera and Ussita. In the following centuries, the area of Ussita gained independence; only in 1861 did Castelsantangelosul Nera become an independent medieval commune. Given its history, the area surrounding Visso held the most interest for our studies regarding the medieval settlements in the territory surrounding the University of Camerino.

Because its scope was to serve as a learning experience for the students, the survey campaign was made with different tools and addressed different topics. In all phases of the research, the students executed the necessary steps first hand. The first part of the studies dealt with a direct survey made with the use of the usual simple measuring tools such as the meter stick, metric rods, plumbs, etc. The students made sketches and produced the final drawings using computer-aided design software. The second part of this experience related to an indirect survey using camera snapshots, laser scans, and computer modelling. Both experiences were important for the students since the students were thus able to participate in the complete panorama of current surveying means. With the first type of survey, they learned the importance of direct contact with the architecture, with the buildings and their stones, their colour, their “smell”. With the second type of survey, they entered the world of new technologies, which has expanded significantly in recent years. Architectural surveying has thus been transformed into a perfect analysis, with many possibilities to apply the techniques. Starting with this basic information, students were able to develop different lines of investigation.

Throughout the research, particular focus was placed on a VERNADOC type of survey. This is a process in which high-quality hand drawings are made of some particular details. This method has now spread all over the world, the goal of which is to try to save what is known as minor architecture. Minor architecture throughout the world is likely to disappear due to different circumstances such as natural catastrophes, wars, poor economic resources, etc. To protect the architectural heritage, it is important to convey its value to people who live in close contact with these places. Architects have the possibility of showing buildings and construction techniques through illustrative drawings, and some international associations such as ICOMOS are working with these subjects to show that minor local traditions can be respected and play an irreplaceable role around the world. This way of documenting historic buildings has been developed since the 1870s by the University of Technology in Helsinki. It consists of measuring and making scaled pencil drawings *in situ* and then inking in the studio. The method has expanded internationally through the implementation of travelling workshops (Russia, Finland, Thailand, Japan, United Arab Emirates, Romania, Italy, Turkey, etc.). Today, with the sponsorship of ICOMOS, there is an international network of teachers, university students, and practicing architects who also organize international seminars on VERNADOC and the protection of the vernacular architectural heritage.

The scope of the research was divided into two aspects: the medieval town and its space and the medieval scale of the buildings.

To better understand the typical organization of medieval towns, a survey was made of the centre of Visso. The area was divided into so-called urban districts and the students were asked to provide the following for a given district: volume analysis (1:1000 or 1:2000 scale), ground-floor plan (1:500 scale), general layout (1:500 scale), roof plan (1:500 scale), elevations and sections (1:500 scale), and road elevation (1:200 scale). Data was collected from various sources, including photo correction, buildings records, catalogues of photographs, catalogues of historical maps, VERNADOC drawings, and 3D models. The urban areas of Visso were studied using the relief methodology.

The city centre was divided into 12 sectors. The analysis for each sector focused on the buildings and

empty spaces with specific interest focused on the type and use of each building (schools, churches, museums, palaces, etc.). In combination with this, the streets, squares, gardens, etc. were classified. Each individual housing unit (part of an urban block) was identified and catalogued. Photographic sheets were created to indicate the building units and photographic specifications. The ground-lines of the urban districts were drawn on graphic boards. This direct method employed metric tapes, levelling rods, laser rangefinders, etc. The direct method was used again for the façades along the streets, with the use of metric tapes, laser rangefinders, and bubble levels. Photogrammetry was made using flat photos and processed with two specific software programs: Recap and Photoscan. All of this documentation yielded significant portions of each sector, and the roof plans and building layout were reproduced using graphic boards. Thanks to planimetric and altimetricdata, axonometric views of each sector were created. Attention focused on the urban details that were processed with the VERNADOC method. Using photogrammetry and the laser scans, reliefs were created of the two main squares of the centre of Visso, where the main historic buildings are located.

All urban districts in the town were studied with the use of direct and indirect surveying techniques (laser scans and photogrammetry) and the measured data were reproduced with orthographic and axonometric projections. The results showed the typically medieval morphological aspects of the village.

For the architectural subjects, the groups of students studied three different types of buildings: castles, fortresses, and towers. The group of castles included the Castles of Pitino and Torricchio in Visso and Castelsantangelosul Nera. The group of fortresses included the Varano and Santa Lucia fortresses. Finally, the group of lookout towers included the guard towers in Visso, and the Carpignano, Castelraimondo, Castelfantellino, and Smeduccitowers. The scales used for representation ranged from 1:200 for the overall building drawings to a scale of 1:50 for the elevations and sections, and finally to the 1:20 and1:10 scales to reproduce details on the walls. A model was also made for each of the buildings using numerical control machines owned by the University of Camerino.

The medieval buildings listed above are located in the villages of Visso, Castelsantangelosul Nera,Ussita, Castelraimondo, Fiuminata, PieveTorrina, San Severino Marche, and Camerino. At the end of the survey campaign, a joint decision was made with all the municipalities to organize a travelling exhibit that would visit each of the villages. The exhibit opened in Visso in April 2016, where the mayor was interviewed and a video of the town and the exhibit was shot. The same was done in all the towns in order to document the different settings and to hear the mayors' descriptions of their individual towns. The exhibitions ended on 23 August 2016.

2. After the Earthquake

That night, at 3:00 a.m., the first disastrous earthquake hit the region, leaving many towns in ruins and causing many fatalities. The following days saw many other earthquakes that destroyed a large number of houses in these historical centres. Ussita, Castelsantangelosul Nera, and Camerino were seriously damaged. The downtown areas in all of them became "red zones", with forced evacuations of the inhabitants and isolation of the area by the fire department. The same occurred in the town of Visso.

Our documentation suddenly took on great importance. It no longer served to show how the town is, but how the town was. We concentrated our attention on Visso. For us and for the municipality, it was very important to understand the exact urban form of Visso and the configuration of all the buildings destroyed in the central area. Using the surveys made previously, a collective decision was made to carry out more surveys starting from these needs.

The first step was to use the best of the students' drawings to design varioust-shirts and bags. The scope

was to initiate a crowd funding campaign for first aid for the townspeople, and also to show the richness of the town and the strong desire to save it. At the same time, a 3Dmodel of the historical centre of Visso was created to be shown on the Internet in order to sustain the idea of the town before the earthquake.

In accordance with the municipality and the safety authorities, a new survey campaign was made using a laser scanner and drones to understand the current state of the damage and ruins. The goal was also to analyze the historical centre using two 3D models and compare its state before and after the earthquakes. Thanks to this new campaign, a lot of insight was gathered about surveying damaged buildings. As well, information was also obtained relating to the quantity and type of damage and regarding the calculation of the mass and volume of the buildings. Finally, this information helped the authorities to understand concrete needs in terms of removing the ruins.

The new survey was carried out in a circumscribed area of Visso's old town using the drone, the Pegasus Mobile Station and the laser scanner. This type of survey allowed very accurate three-dimensional data of the historical centre to be obtained. With the point cloud and the use of the Trueview software program, it was possible to make measurements of each part of the survey, thereby determining the extent of the damage and quantifying the damaged materials. By comparing the data acquired before and after the seismic event, interventions to address the reconstruction of the historical centre are currently being defined.

In the future, the results of the research will be used to create a 2D and 3D GIS database that will include all the design solutions that will be provided for Visso's historical centre. The database will be navigable through a web platform. It will enable citizens to immediately discover the many types of intervention to be implemented in the coming months (identification of emergency housing solutions, determination of areas for production activities and services, zoning according to seismic and hydrogeological risks, etc.)

Used in combination, both models can serve as guidance in how to begin a restoration project, and to understand if it is necessary to make a complete restoration or restore the building only in part. The problem of restoration is basically related to choices about rebuilding "how it was and where it was" or reorganizing the urban spaces to make them better and more functional. These choices are the most important responsibility of administrators and inhabitants, but the primary contribution we can make is to best show the situation as it was yesterday and today.

Our responsibility as researchers is also to understand some possible solutions in terms of renovating and restoring the urban centre of Visso, and we are starting to study some of these projects with our doctoral students. We are also arranging a workshop to develop proposals for the towns surrounding Visso and promoting meetings with our students and international schools in Hungary, Ukraine, and the United States to develop solutions to offer the people of Visso to help them to decide the future of their beautiful town.

3. Conclusion

Although the experience of Visso is into a very tragic situation, we can learn a lot from this. The survey of a historical center is a very precious instrument to control and project the develop of the towns, especially in case of special events. The survey is also an useful way to relate different steps of the grow or the de-grow of a urban sector. To understand which could be the lines of develop of the town. In the case of a tragic event like an earthquake, one of the most important need for the municipal administrations is to classify the damages of the buildings, and to recognize the history of the single building to understand the best way to approach in the reconstruction: if rebuild, demolish, or renew the single building and the urban sector at all. This important experience given us a very clear key to understand how protect our breakable historical centers.

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