

# Traditional Wooden Barns in Trentino: What About the Future?

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## *Introduction*

Vernacular architecture is nowadays widely diffused in the Alpine regions in particular in the alpine area of France, Switzerland, Germany, Austria, Italy, Slovene.

Lying in the heart of the Alps, Trentino covers an area of 6 thousand 200 square kilometres. A thick hydrographic system crosses the Trentino and originates a complex system of valleys.

An Alpine climate characterizes, nearly everywhere, the territory that is mostly a mountain landscape and it is covered with abundant forests where predominate broadleaf and conifers species that produce optimal timber.

Specific typological and constructive peculiarities characterize the traditional buildings of the Trentino.

From a typological point of view we can recognize: dwellings, technological buildings and service buildings. The dwellings are single or multi-storey buildings for one or more families. Some examples of technological buildings are saw-mills and ovens. The service buildings are barns and stores.

The buildings are placed in 3 altimetric zones: bottom of the valley (until 800 metre above sea level) , intermediate zone (between 800 - 1400 metre above sea level), high zone ( above 1400 metre above sea level).

The permanent dwellings and technological buildings are in bottom of the valley or in the medium zone where the people lives all the year.

Buildings for service activities (agriculture, stock-rearing, wood utilisation) are used during all the year, if they are in the valley and in the medium zone. If they are in the high zones, they are used as deposit, shed and mountain dairy just in the beautiful season, not more than six months a year.

From the functional standpoint, the main different typologies are three. In German language they are called: "Einhof", "Paarhof" and "Haufenhof".

The "Einhof" is a building in which all the activities and the functions are collected. In the same building there is the dwelling (Feuerhaus), the barn (Futterhaus) and the stables.

In the "Paarhof" the functions are carried out in two different buildings. One is the dwelling and the other is a service building used as stable, barn and storage.

The "Haufenhof" consists of some buildings characterised by a single function each. Depending on the richness of the family, their number is variable and they are gathered on a central courtyard.

They differ for the functions and in general there is: the family dwelling, the barn, one or more stables, a small workshop and the oven. The buildings differ also for the building systems in wood used to realise them. In general, the family dwelling is the best building from the constructive standpoint, realised with more refined techniques than the service buildings and with more attention for the details when the same building system is employed.

The functional typology of seasonal buildings is recurring. Generally they have the cowshed at ground floor and the hay-loft at first floor. All these constructions are directed according the ground slope: down there is the entrance to the cowshed, above there is the entrance to the hay-loft.

### ***Building Pathologies***

This vernacular architecture of the Alpine regions is often damaged. The causes which lead to a damage especially of the wooden building elements in the floors and in the roofs are related to structural, building, environmental, chemical factors.

The recurring pathologies which can be find out are breakings due to variation of static loads. In the roof, the most recurring pathology is the rottenness of the building elements, especially in the gables and in the more exposed parts to the rain for breaks in the roof coverings. The damage is localised mostly in the covering and on the main roof frame. Damages are due to lacks in jointing and constructive defects in general.

Pathologies on external wall are also present in these buildings. In the log buildings, which are the most of them, the main pathologies pointed out are related to the foundation logs and at the end edges of the logs where they project out of the outside edge of the orthogonal wall.

Other pathologies are related to the logs for insect attack. At the end the fire is one of the main enemy of these buildings.

### ***Conservation***

The conservation of these barns is nowadays a problem. At the moment, two are the ways which it is possible to follow:

- the building up of open air museums where the most representative and meaningful buildings can be moved or reconstructed;
- the restoration and rehabilitation of the vernacular architecture as dwellings.

For what concerns the open air museums, a lot of European regions is promoting the creation of such places for this aim. Several example are in different countries: Sweden, Germany, Austria, Norway, etc. where still new museums are starting and there is a lot of experience in this field.

In Trentino is diffused the restoration of these barns for living purposes. This produce a deep change in the functional and constructive typology, also in relation to the methodologies and modalities followed for the rehabilitation of the buildings.

In the latest years, the built environment has been deeply modified by tourism policies at the middle and at the high alpine altitudes because a lot of traditional buildings have been renovated as temporary residences.

Generally, there are greatest alteration in the building when its original use is changed. It happens, in fact, that the typological system of the building is radically changed as well as the external shape through the opening of new holes (windows, dormers, doors). In addition to this damage, concerning the morphology of the building, there are often other damages due to the use of new building techniques that deeply modify the constructive part of the building itself.

The constructive techniques of the rebuilding has been modified from the traditional methods in the last years from the changed technological context, which helped on the

introduction of new building materials used also to realise new elements or to replace building elements on wood.

Other than the structural rehabilitation of the buildings, to make them habitable it needs also to have a rehabilitation at the systems level.

The introduction of these systems can often be in contrast with the original typological arrangement and can deeply alter the whole building.

For this a careful attention is required in operating on vernacular wooden architecture when systems have to be inserted.

When rehabilitating a barn, changing the use of the building, it can easily be damaged in the inner structure more than a reused dwelling. Fixed levels for thermal resistance must be performed by the walls when not necessary previously as complementary building. Sometime an inner masonry building is realised where the outer walls just recall it was a wooden barn or stable.

Meaningful examples are the cases in which the buildings are fitted with an inner layer of thermal insulation (mineral wool) and a plastered wall of perforated blocks.

The inner space modification involves often the external shape of the buildings and it has a very heavy impact on the some building and on the landscape. An example is the opening of new windows which deeply modify the image of the building.

The same we can say about the new introduction of the dormers.

The enlargement of the volume is very bad for the image of the building and also for the landscape. More or less we have the some result with the introduction of new stairs outside the building or with the introduction of new balconies.

An other alteration at the shape of the building comes from the use of different material for the finishing of the roof as tiles instead wooden shingles or iron sheets.

Very big alteration there is when the roof is changed at all or when it uses concrete wall to replace wooden walls or it is changed the height between two floor to improve the inner space.

From a constructive point of view are not sustainable techniques the substitution of wooden floors with concrete slabs or the substitution of stone foundation or basement with reinforced concrete elements.

Only few buildings are reconstructed with right materials and with suitable techniques.

To demount the building is however more suitable because of it is possible to control directly the state of preservation of the logs of the whole building.

In the restoration of the roofing traditional techniques have been preferred too, particularly by demounting the roof and lighting up the damaged elements which were needed to be replaced.

For the covering it was used the original arrangement with placed planks. This traditional solution saves material in a long time by replacing several times the same planks according to the technique to set out that part of them which was previously covered by the others. In this case also the damaged elements are completely replaced.

### ***What we can do to save the specificity of this traditional architecture?***

In the Laboratory of Building Design of University of Trento we have developed a possible strategy for the conservation and the re-use of the traditional barns for living purposes.

The strategy is articulated in four points:

- to improve the knowledge of functional and constructive typologies
- to build new open air museums in which we can train carpenters to use traditional techniques
- to produce a code of practice for architects and carpenters on traditional building techniques
- to study sustainable architectonic solutions for the functional re-conversion of buildings

- What we are doing to improve the knowledge of the constructive typologies?

We carried out a work in which we classified the different constructive solutions of the barns in Trentino. To do this we divided the region in four parts and started with a survey of 168 selected barns we thought relevant for our research.

We synthesized the information in charts.

At the end of our work we classified in our region 27 different constructive typologies representative of the different ways to build the barns.

We studied their constructive details and we selected six meaningful examples of Trentino's buildings to be rebuilt to preserve the traditional techniques in this region and to train young carpenters.

After this selection we made a deeper survey for each area to select which building was more representative of its owner category.

In this case after the definition of the area we made the survey of all barns in the area, we estimated how they were old.

One solution was to compare the actual situation with the map of the Austro-Hungarian land Register of 1885.

In this second phase of the survey we used more detailed charts to synthesize the information. We made also the survey of the constructive details.

- What we are doing to build new open air museums in which we can train carpenters to use traditional techniques?

We rebuilt two traditional barns with basement in stone and upper floor in wood on the Ethnographic Path of Rio Caino in Cimego (Italy).

The Ethnographic Path of Rio Caino in Cimego (Italy) is a part of an Eco museum we are building in the south west part of Trentino. In the Malga Caino area we rebuilt the two first wooden buildings. To do this after the choice of the buildings we started the survey.

A careful survey has been carried on to point out the knowledge of the two buildings. It has been planned to divide it into two complementary phases: the simple geometrical survey put into drawings in a second time, the technical-structural analysis of the components summarized into synthetic charts. The geometrical survey has been made with the method of direct manual measuring ("in field" drawing)

The technical-structural analysis of the components summarized into synthetic charts.

The reconstruction plan of the two buildings has been made after the survey, together with an estimate of works regarding costs and time. The two buildings have been

redrawn using CAD software (scale 1:50) to represent a synthesis of the geometrical-structural survey.

After the classification of all the wooden building components, abacuses have been made showing the typology (component squared with axe, component sawed), the dimensions (width, height, length) and the volume of each wooden building component. The costs to buy the wood and to work it both in sawmill and in the yard have been estimated. Two models in scale 1:20 have been realized.

The reconstruction of two buildings began in January 2000 in the sawmill. After a careful choice of the wood, it has been cut according to the information included in the abacuses of the reconstruction plan. Traditional working techniques and tools have been used.

In March 2000 the work in the new open air museum began for the two buildings. The reconstruction has been made by local skilled workers. They have used the same techniques used by past carpenters to make the original components. Two old carpenters and two young apprentice carpenters formed the team of operators for the reconstruction of buildings A and B.

- construction of the wooden beam floor.
- construction of the wooden external walls with log system and post and beam system;
- construction of the wooden shingles covered roof; the carpenters have nailed the shingles to the wooden listels on a boarding;
- the larch-wood shingles have been made in yard according to the traditional technique of the split;
- construction of the balcony along the main front;
- construction of the “cetine”: the two small storage situated on the main front for the depositing; they are covered with wooden planks;
- construction in the inner part of the cattleshed of the mangers and of two small rooms for the hay that has been let down from the upper floor through a trapdoor.

Some phases for the reconstruction of the wooden part of the building A have been:

- construction of the wooden external walls with post and beam system;
- construction of the stone external walls of the annex “cascinello” and part of its roof.
- construction of the wooden shingles covered roof; the carpenters have nailed the shingles to the wooden listels on a boarding; the larch-wood shingles have been made in yard according to the traditional technique of the split;
- construction in the inner part of the cattleshed of the mangers and of two small rooms for the hay that has been let down from the upper floor through a trapdoor.

- What we are doing to produce a code of practice for architects and carpenters on traditional building techniques?

We are studying to produce a code of practice articulated in 4 sections for different interventions on the buildings.

In the first section there is the explanation of the traditional roof.

In the second section there are examples of correct and incorrect interventions made in different situations.

In the third section there is the explanation about how is the correct way to rebuild the roof with traditional techniques and some indication how is possible to improve its performances with the use of suitable new materials.

In the fourth the specific techniques to produce traditional constructive elements related to the particular part of the building.

- What we are doing to: study sustainable architectonic solutions for the functional re-conversion of buildings ?

We are developing case study to verify if it is possible to re-use a barn for living purpose without important modifications of the external look.

We have selected two building as case study. The first has a stone and wood basement in log-system and the upper floor in log-system too, the second, is the barn we rebuilt in the ecomuseum, it has a stone basement and the upper floor is a post and beam system.

In the first one the upper floor has been divided in two floors. The habitable zone has been thought as a building inside the building, made of wood, plaster-board, and door- and window-frames. The inside building is separated from the outside building and it is possible to walk in the cavity and you can see also the wood walls from inside.

The interior of the house receives air and sun-light from the existing openings and from the fissures between the tree-trunks that warrant the necessary conditions of environmental comfort.

The same idea has been developed in the second building too.

We have realised a scale-model and we have done theoretical controls about environmental comfort. A box in the house, but in this case the kitchen and the living room are in the ground floor which is double height. A stair open space connects the two floors. A ventilated aisle divide the inner box from the walls.

All rooms have the sunlight and the ventilation from the existing windows. We hope to have in future the money to do tests in real dimension in the ecomuseum. At moment we can have only a virtual visit to the house.

### ***Conclusion***

To save for the future generations the traditional architectural heritage in Trentino we should:

- increase the knowledge of functional and constructive typologies of the tradition
- conserve meaningful examples of this architecture in open air museum in which we can train carpenters to use traditional techniques in the restoration
- produce a code of practice for architects and carpenters on traditional building techniques
- study and test innovative sustainable architectonic solutions for the functional re-conversion of buildings