

Recommendations for the Conservation of Earthen Architectural Heritage in Chile

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Abstract Developing earthen architecture conservation in Chile is a widespread challenge present in different organizations in our country, although a clear legislation has not been defined in order to preserve this important legacy.

An extended look throughout the country allows us to understand the state of the art of restoration in Chile. In this respect, the recommendations in this paper are strategic to earthen architecture conservation in the Altiplano and in the Central Valley in the sense that they promote ideas for discussion of a national legislation on conservation and restoration.

We believe that understanding how earthen architecture in Chile has been preserved until now enables stakeholders to make better decisions in the long-term; we have focussed this paper on the generation of an emergency strategy that can make it possible for our scarce remaining heritage to resist the next earthquake.

Keywords: Earthen architecture, conservation, architectural restorations, preservation, legislation, seismic areas, Chile.

Introduction

Chilean History has been created and built among numerous and significant earthquakes, which have destroyed our cities and buildings on various occasions, undoubtedly affecting the conservation of our architectural heritage, mainly of adobe, which has been disappearing with each telluric event. In spite of the fact that there have been several instances and initiatives leading to its protection, there are no effective laws or policies to allow its preservation in time.

On 27th February 2010, a strong earthquake (8.8° Richter) rocked our country destroying, once again, important historic buildings which were, paradoxically, in the process of recovery after the 1985 earthquake. This changed our view about the way and process of adobe recovery and restoration, as we believe it is essential to act from the moment of the emergency, with fast and efficient solutions leading to the temporary protection of the monument while definite laws are passed to give the corresponding final structural consolidation.

Architectural Adobe Heritage in Chile

Adobe has had a fundamental role in historic buildings of the country, mainly in the northern and central zones of Chile, creating simple constructions, generally having a long and narrow nave, thick walls, where the full areas predominate over the empty spaces, with stone foundations and wooden structures with tile or mud finishes.

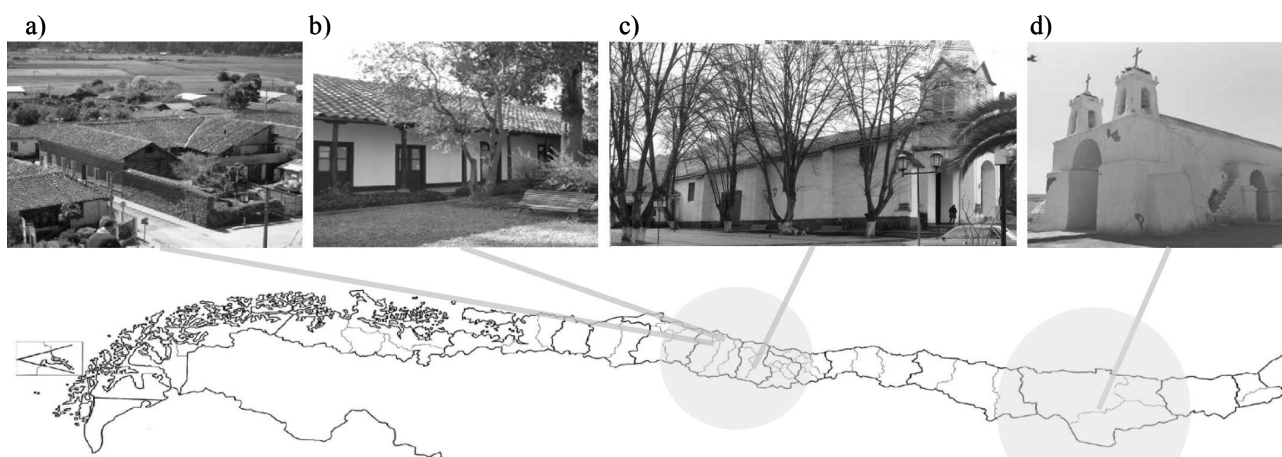


Figure 1: a) The town of Cobquecura, b) house in the central zone, c) Guacarhue church, d) Chui church

The strength of this architecture lies in its capacity to adopt regional values, it is the construction tradition, the availability of materials, the diverse typology of soil, stone, wood and clay which characterize the building of every zone; however, the spatial simplicity and the use of natural materials are a common pattern of all the original monuments, that have become a faithful testimony of how past generations built our architectural foundations, that is why, preserving this legacy is of vital importance to establish the wealth of our heritage and culture.

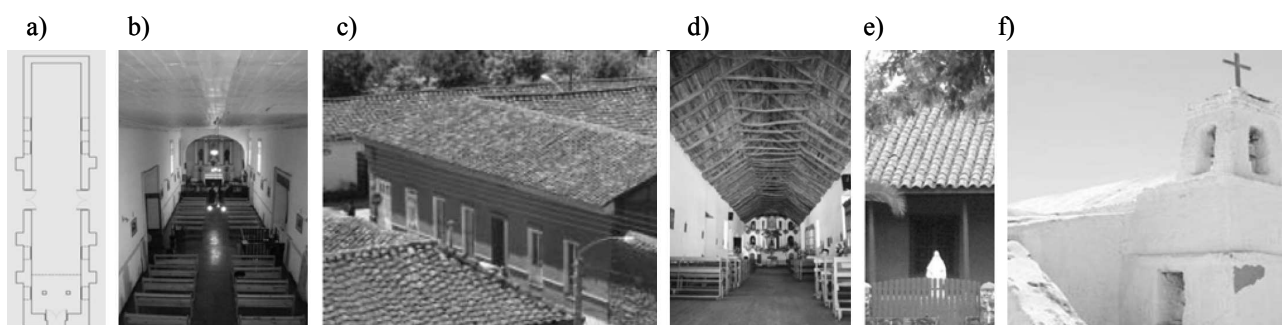


Figure 2: a) simple architectural partitions, b) a nave, c) thick walls, d) wooden cover structures, e) tile roofing, f) mud covering

Damage to Historic Adobe Structures

Several have been the causes of damage suffered by our adobe architectural heritage along our history, which can be classified into three large groups:

Physical Causes Lack of building maintenance, humidity of foundations and walls, damage caused by biotic agents, failure of materials and obsolescence of structures, in addition to the incapacity of the material to resist flexions or tractions caused by seismic movement, which have had devastating and irreparable consequences for our architectural past.

Political Causes Undoubtedly, the lack of a government policy to protect, value and consolidate this type of building together with the lack of resources, has produced a stagnation and deviation of the different private initiatives in this subject.

Cultural Causes Last but not least, it is the culture of collective “fear” which has been generated regarding adobe constructions; the people and the government have adopted an immediate response to “clean” cities by demolishing every structure which has some indication that it might be a hazard, without previous assessment.



Figure 3: a) Guacarhue Church before the 2010 earthquake, b) Guacarhue Church after the 2010 earthquake

Principles of conservation and the Chilean Norm

We understand that the conservation of monuments “is the complex of attitudes of a community that contributes to making the heritage and its monuments endure. Conservation is achieved with reference to the significance of the entity, with its associated values.” (Charter of Crakow, 2000). These attitudes must be based on the principles of the Athens Charter (1933) and the Charter of Cracow (2000).

When reviewing what has been taken into consideration in the conservation of the adobe architectural heritage in Chile, regarding the principles of minimum intervention, reversibility, the use of identical materials or constant building maintenance, we find that, generally, these principles have not been respected, and the fact that they have not been applied might be the fundamental cause of the great detriment of our adobe architectural heritage we can see today.

Why is this so? The 1985 earthquake in the central zone of our country, once more made the structural incapacity of adobe against the strength of the seismic impact evident and was eliminated as a construction option in the country, without taking into consideration that a large part of our heritage is defined by this material; therefore, it should have been taken into account as a specific case to be dealt with and have a draft norm already in progress.

At the moment, every time an architectural work is intervened with, it must be defined by the current norm, that is to say, the distribution of the adobe in the structure is not taken into consideration. This has generated two trends, one that suggests leaving the monument untouched so as not to affect its architecture and spatiality, but leaving its survival up to the following earthquake. The other adapts the structure to the current norm, intervening walls with concrete or metal elements, reducing the value of its heritage condition and without taking into account the basic principles of the Athens Charter.

The use of structural conservation and consolidation techniques that respect the originality of the work, the value of its spatial and structural characteristics and the use of natural materials, should be a fundamental part of the new rehabilitation policies, which should be added to an intermediate instance structurally to ensure buildings in the short term, while the State policy is implemented, otherwise, we will continue to collect rubble.



Figure 4: National Newspapers

Recommendations for the structural consolidation of adobe monuments.

In order to generate an urgent and immediate intervention of heritage buildings, we have determined a requirements and criteria frame which defines our recommendations.

Requirements

1. This is an emergency situation and we need emergency solutions.
2. The structural consolidation of adobe monuments cannot wait, this includes all the areas or the country, mainly those which did not suffer with this earthquake, since they will most certainly have to resist the next one.
3. It must be applied to all the monuments, with and without damages.
4. There is a lack of specialised labour and construction materials.
5. Standard solutions that can be applied to different realities must be proposed.
6. The consolidation must be thought for a determined time term waiting for a deep and definite restoration.
7. There must be care and maintenance training for users.

Criteria for Intervention of Heritage Works

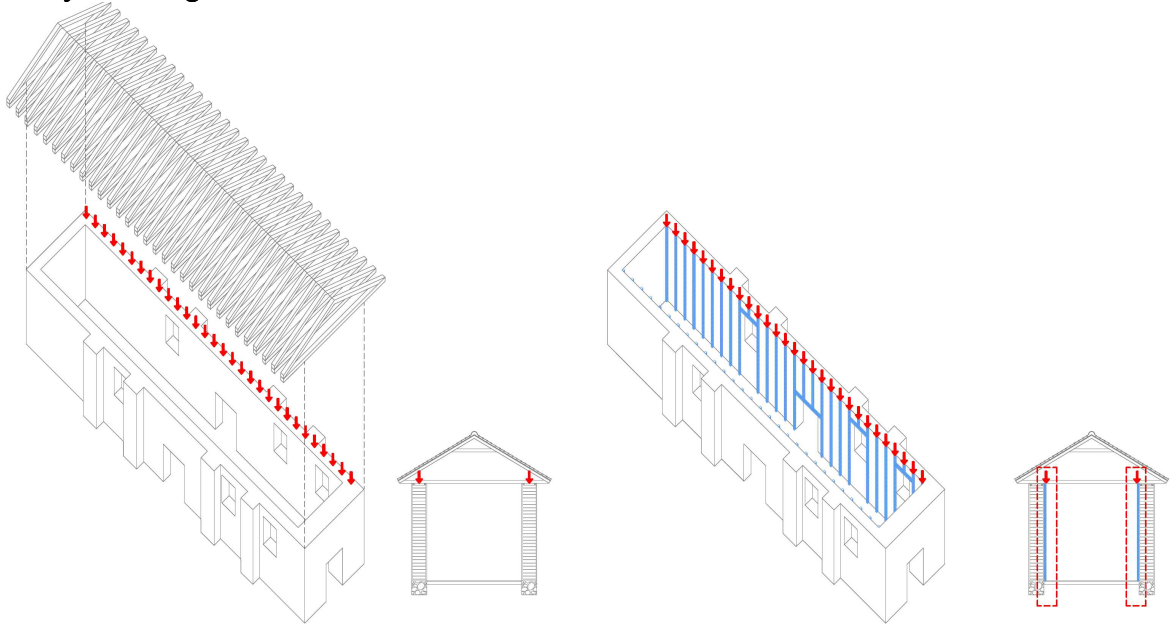
1. Study and knowledge of the building, photographic and planimetric safeguarding record of the historic as well as the present building.
2. Minimum intervention, addressed specifically to structural reinforcement of adobe so that it can resist seismic strength.
3. Of additive nature, the intervention must complement what already exists; there must be no “insertions” of any kind.
4. Reversibility, as it is an emergency intervention, it must be possible to eliminate all the elements that have been used.
5. Use of identical and/or compatible materials, the use of natural materials such as wood, stone or mud should be privileged and maximized.
6. Use of a similar or compatible construction system, the adobe system shall be complemented to allow for structure flexion and traction.
7. Respect building volumetry, spatiality and appearance.



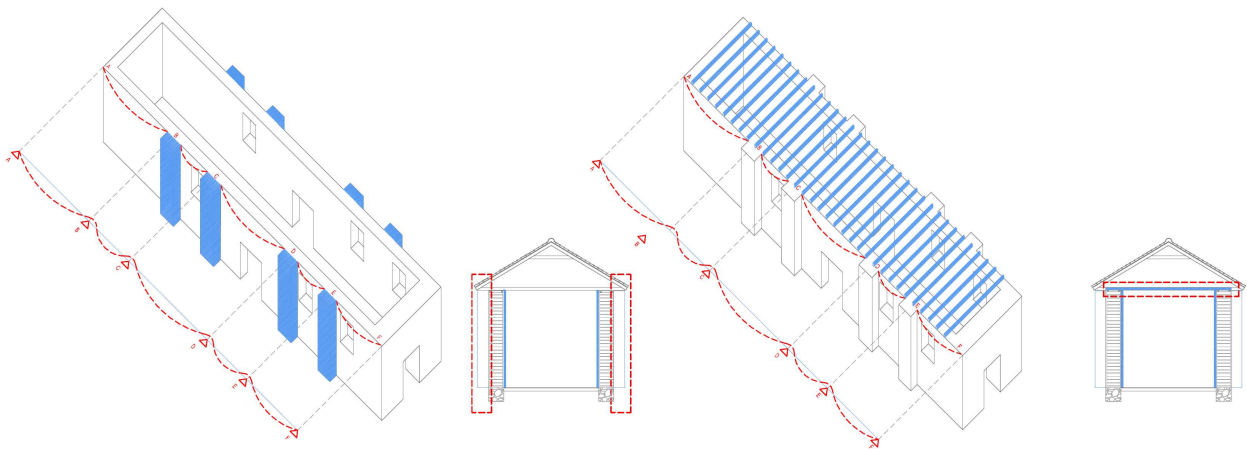
Figure 5: Guacarhue square, June 2009, no longer existing

Recommendations

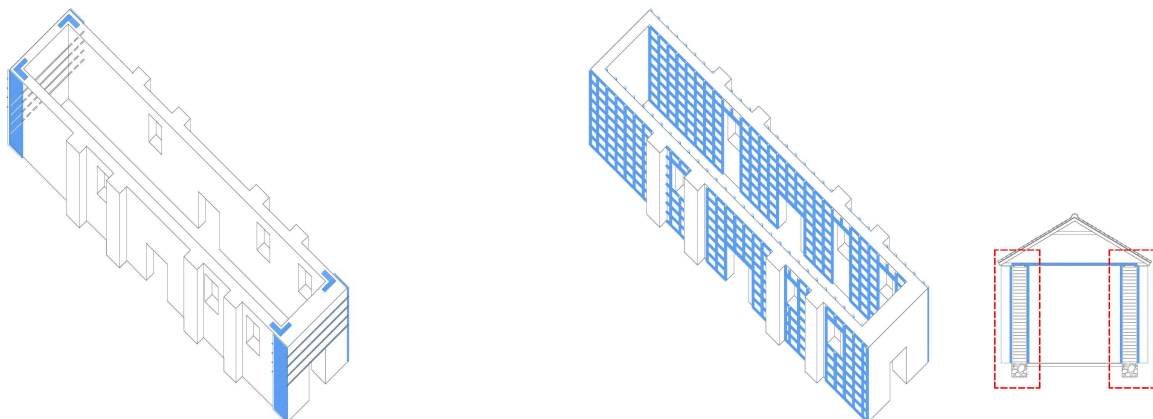
1. Eliminate the weight of the cover on the walls to reduce considerably the horizontal strengths directly affecting the adobe.



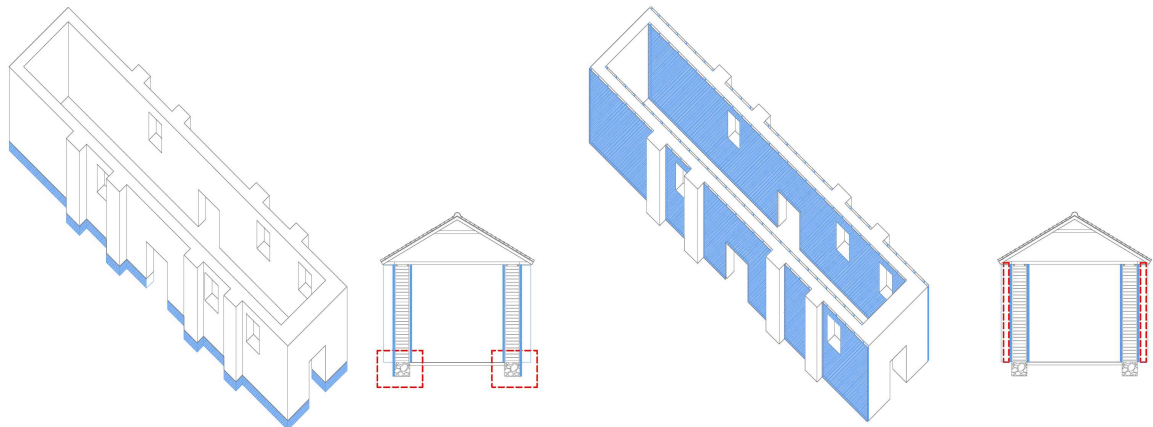
2. Reinforce existing buttresses to give effective support to the vertical faces, to increase its inertia as far as possible.
3. Reduce the horizontal deformation by incorporating a rigid horizontal diaphragm at the level of the cover, which joins and ties the structure.



4. Avoid tumbling down of the walls by fixing the corners.
5. If the walls are very cracked, it is recommended to fix them from the outside, so as to avoid its collapse and give their structural capacity to the new elements.



6. Eliminate humidity, protect foundations from underground water, protect walls from the rain and capillarity by mad plaster and repair of the cover.



7. Avoid collapse and favour disassembly.

Conclusion

When we think of Chile as an *active continental border* we became aware that we are at about 80 km from the place where two tectonic plates collide in the sea, the Nazca Plate and the Southamerican Plate. This collision has shaped and continues to shape our Andean geology. Its multiple results have defined a geomorphology characterized by a series of North to South boulders, which go from the Pacific Ocean to the Andes mountain range, with a very strong seismic activity. A certain type of architecture has been defined among these tectonic boulders, which has responded to the difficulties of the terrain. And which, in its colonial beginnings, knew how to recognize local materials and the knowledge the native people had in order to develop the diverse typologies that constitute our architectural heritage today.

Our architectural heritage is about to disappear, and although the material with which it was constructed did not take into consideration the seismic nature of the place, some buildings are still standing today, thus, it is necessary and essential to adopt measures to complement its structural capacity to allow its continuity and to strengthen the incipient and fragile cultural and historic heritage of our country.

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