

THF WORK REPORT JYEKUNDO OLD TOWN RECONSTRUCTION 2011

## RESTORATION OF KARTSOG LHAKHANG

དཀར་ཚོགས་ལྷ་ཁང་།



With Financial Support from  
the Prince Claus Foundation / Cultural Emergency Response Program,  
Trace Foundation and Fondation Carnot





## THF

Tibet Heritage Fund is an international non-profit organization working for sustainable development of communities and preservation of heritage as key to development. We work often but not exclusively within the Tibetan cultural realm.

Projects such as rehabilitation of traditional settlements and restoration of historic monuments are designed to primarily benefit the local residents. Communities, local governments and institutions are important counterparts. THF runs a large vocational training program to build up local capacities, create economic opportunities and to keep traditional building skills and crafts alive. In historic settlements and cities we carry out social surveys and develop rehabilitation proposals. We also research and document traditional Tibetan building technology.

Since over a thousand years, Tibetan culture has spread over the entire Himalayan regions, and had a profound effect on Chinese emperors and Mongolian conquerors. In the past, artisans, spiritual masters, pilgrims and traders would travel widely across the Himalayan plateau and adjacent regions. Borders had little meaning for them. The events of the 20th century has led to new borders being drawn, and ancient borders, that for centuries have marked little more than local taxation base, have become impregnable walls separating communities. This is depriving Himalayan culture of its established dynamics. As a result of the advent of modernity, many historic monuments, sites and settlements have disappeared, and traditional skills are in decline. Yet these historic monuments and settlements, and the skills that created them, hold an enormous potential to the future welfare of the people on the plateau. It seems a tragic waste to let all this slip away, so that once-unique Himalayan towns and settlements end up looking like towns anywhere else in Asia. However, it is always dangerous to romanticize, and the inhabitants of the Tibetan cultural realm have legitimate aspirations to reach the same level of comfort and economic progress as people elsewhere. THF assists local communities to find an individual balance that suits them, between tradition and modernity, village life and globalization. THF's projects are therefore aimed at generating employment and other opportunities for people to improve their livelihoods.

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André Alexander, THF Co-Director, 2011

## JYEKUNDO RECONSTRUCTION

The Qinghai Province is located on the north-eastern part of the Tibetan Plateau. The Yellow River, the originates in the central part of the province, while the Yangtze and Mekong have their sources in the south-western part. The average elevation of Qinghai is over 3,000 meters above sea level.

Jyekundo (*skye rgu mdo*) (chinese: Yushu, 玉树) is an important Tibetan town that has developed as a trading centre between Kham (today divided between Qinghai, Sichuan, Gansu and Yunann provinces), Amdo, central Tibet and central China. Presently Jyekundo is the prefecture's capital of Yushu Tibetan Autonomous Region. The city is located at the south-eastern end of Qinghai province, 800 km from the capital Xining, bordering Sichuan and TAR.

Culturally Jyekundo belongs to the Kham region. Jyekundo town has a population of about 100,000 of which 80% are officially Tibetan. Unlike in most other historic towns in the region, Jyekundo's historic centre still existed, despite rapid urban growth in recent years.

After a community survey was carried out in 2007, THF has successfully started the housing upgrading program, providing co-financing on the rehabilitation of Gya-Tsong Tsang House in the year 2009.

In April last year the town of Jyekundo was struck by a high magnitude earthquake. The earthquake has caused many deaths and a vast devastation of the entire town. The traditional structure of the Gya-Tsong Tsang House has withstood the impact of the earthquake. This has proven the endurance and adaptation of traditional building techniques to the local context and has strongly encouraged our team.



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## EARTHQUAKE AND RECONSTRUCTION

The town of Jyekundo (Gyêgu) (chinese: Yushu, 玉树) was struck by a high magnitude earthquake in April 2010. The quake caused severe damage to the entire town, many buildings were damaged or collapsed.

According to Chinese government statistics, Yushu County had an official population of 77,000 people living in 16,300 households with an average of 4.6 persons per family unit in the year 2000.

Soon after the earthquake relief the government issued plans for the reconstruction of the entire town. A new land use map was introduced for this purpose. Many households were relocated according to the new designated use of the land.

The residents were not allowed to undertake any repair on their homes by themselves. The official reconstruction plan intends to replace all former homes with uniform design concrete frame buildings. The residents had to move out of town onto the surrounding grasslands to allow the clearance works that preceded the reconstruction works. Disregarding the degree of damage about 90 % of all buildings were then demolished by bulldozers. There was no damage assessment. The demolition works have lasted until this spring, leaving the town unrecognizable.

According to the newspaper China Daily the government is planning to invest 21 billion Yuan (\$3.1 billion USD) within three years of reconstruction.

The reconstruction of schools and hospitals started the previous year. By the end of this year the work on most of the roads and bridges was completed.

Every registered household is intended to be moved to a newly constructed 80m<sup>2</sup> house. The construction of these houses in Jyekundo officially started in April this year.

In most areas these houses are constructed exactly identical, they all have the same layout, size, and color. The urban layout is facing south.

In some neighbourhoods the residents were allowed to pay additional 1200 rmb/m<sup>2</sup> for the construction of a bigger house, ranging up to 120 or 160m<sup>2</sup>. In some neighbourhoods the residents were allowed to decide about the layout of the building.

All the new constructed buildings use the same construction methods. The residential houses are build on a stone foundation, mortared with cement, reaching about one meter deep into the



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ground. A steel reinforced concrete frame is set on that base, the frame is filled with cementbricks and mortared and plastered with cement. The masonry is insulated with a five centimeter thick styrofoam and plastered with cement.

The exterior decoration differs between neighbourhoods. There are about five different styles. Mostly the houses are plainly painted. Local decorative elements are imitated in cement reliefs.

Several brick factories were constructed in town to provide an immense supply of cement bricks. The entire town became one big construction site. The larger public buildings were also all constructed as steel reinforced frame filled with cement bricks.

The construction works will continue next year and about 100,000 people remain living in tents over this coming winter.

**1 Earthquake impact, July 2010**

The quake destroyed various types of buildings, including large concrete-frame structures as well as traditional and semi-traditional buildings.

**2 Newly constructed residential buildings, October 2011**

Uniform houses were constructed with cementbricks to replace the old neighbourhoods.



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**New hospital building 2**

As all the buildings, this hospital is constructed with a steel reinforced concrete frame filled with cement bricks. The locally traditional structural slope of the building was imitated in cement masonry, cutting the bricks into shape. Lastly everything was painted, applying some local designs.



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**Middle school 4**

The construction of middle and elementary schools was mostly completed this year. The buildings are still vacant and are intended to be operated next year.  
lower picture: construction of 80 m<sup>2</sup> residential houses in process.



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**Workers tents 6**

Countless migrant workers from other Chinese provinces have come to Jyekundo working on the countless construction sites in town.



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- Elementary school, October 2011 1
- Cement masonry, July 2011 3
- Construction of 80m<sup>2</sup> houses, August 2011 5
- Reinforcement steel preparation 7



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**Steel reinforced concret frame building 2**  
All buildings use the same construction technique.



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**Hospital 4**  
Several brick factories were constructed in town to provide an immense supply of cement bricks for the reconstruction.

lower picture: cement bricks laid out to dry



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**Elementary school 6**  
The building is completed. Now paint is applied to the exterior.



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- 1 Construction of 80m<sup>2</sup> houses, August 2011
- 3 Workers piling up cement bricks
- 5 Fabrication of cement bricks
- 7 A neighbourhood tent settlement, June 2010





View on the town of Jyekundo (Yushu) after main clearance, May 2011





## དཀར་ཚོགས་ལྷ་ཁང་།

The temple is decorated with historic wall paintings in the entry and in the main hall. In the entry are depictions of the kings of the four directions. In the hall, there are Sangye Menlha surrounded by thirty-seven gods on the right, and Sakyamuni surrounded by the sixteen Arhats on the left. The paintings were made with traditional (both natural and synthetic) pigments and animal glue binder on earthen plaster on rammed earth walls. Before the earthquake, the paint layer of the compositions in the entry was already damaged and needed restoration work. Since, the need of a conservation work has increased drastically. One square meter of painted surface had fallen to the floor after the earthquake impact. They have been collected, stored in boxes and where possible refitted on the wall.

We found that fifty percent of the plaster was detached. To stabilize the paint layers again was the most urgent work. The team choose an appropriate method using natural gluing earthen grouting, which was be injected between the plaster and the wall. This method has been developed especially for the Katsu Lakhang following the method for the famous paintings of Dunhuang as well as previous THF projects.

The cracks were then filled with a material based on the original plaster consistency. Finally the paintings were cleaned.

The structural work began with the removal of the entire outside plaster to reveal hidden cracks in the rammed earth walls. Deep cracks were then bridged with wooden tie beams, a method developed by THF after a UNESCO workshop on rammed earth conservation in Ladakh 2006. Smaller cracks were filled in with local stone, a method Tibetans have been using for centuries.

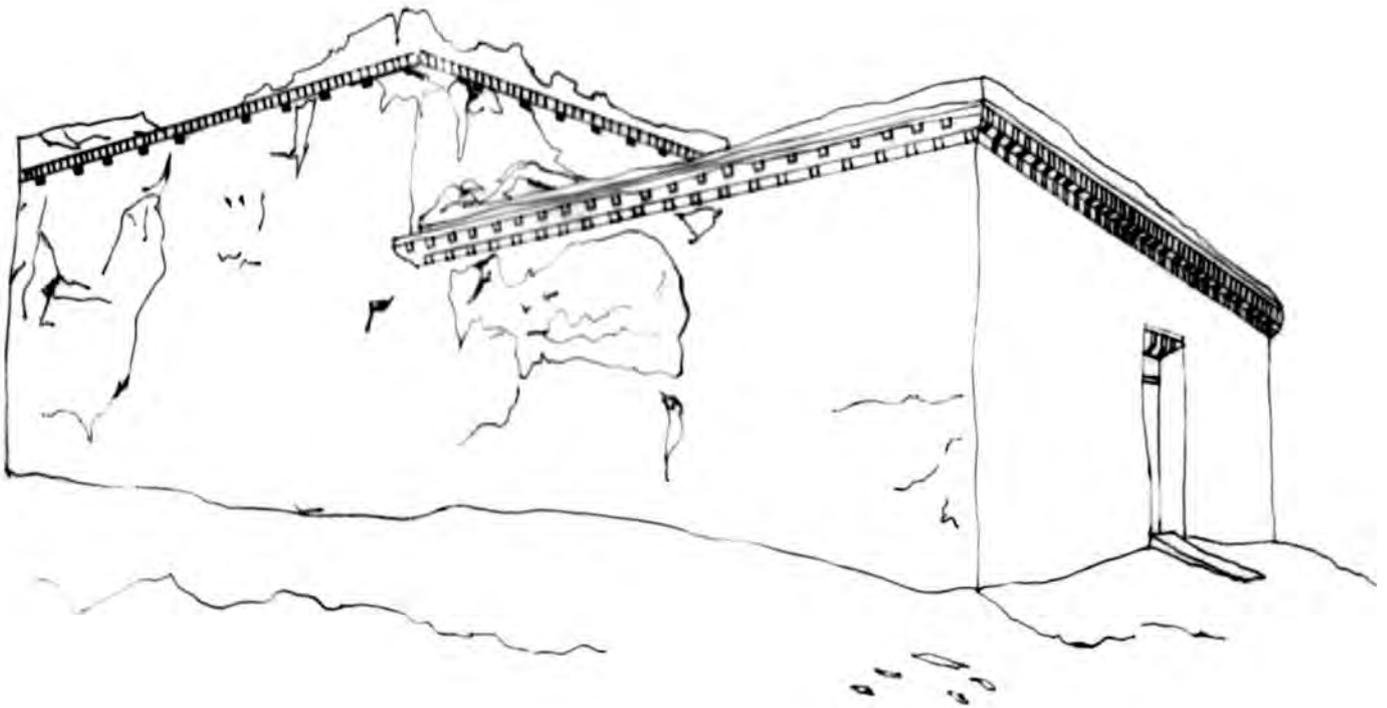
The roof was opened - the soil layers were removed and the timber structure dismantled. We found that only 50% of the roof timber elements could be re-used. After removal of the weight, the bent columns and beams could be successfully straightened, to re-create the original structural balance. The new roof timber system was improved by using better quality timbers (the old one consisted of many bent or very short timbers). On top of the traditional roof soil a new layer of flat slate stone was placed for water-proofing, and more water spouts for drainage were added. The parapet was rebuilt with mud and slate stones.

In the interior, new windows and walls in the entry were removed, and the modern metal door replaced with a traditional wooden gate. Finally, the building was replastered and painted red again.

### 2 Exterior view of the temple, November 2011

The works on the walls and the roof were completed. A double layer of slate stone was put on the edge of the wall for water protection. The walls were painted red according to local tradition.

## ARCHITECTURAL SURVEY



### Step 1: Documentation

As part of our on-going study and documentation of important historic Tibetan buildings, we had surveyed Kartosg Lhakhang in 2004. In 2010, our team documented the damages. The 2004 survey was very important for us to understand the original condition of the temple, and so to formulate the intervention plan.

In this section we show the previous and post-quake condition drawings.

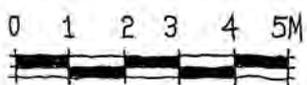
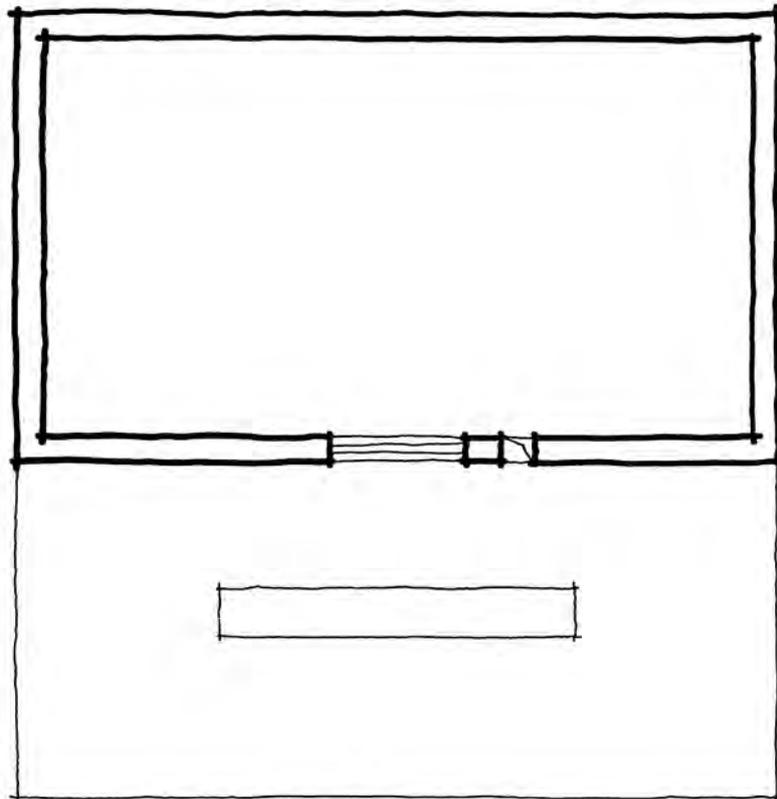
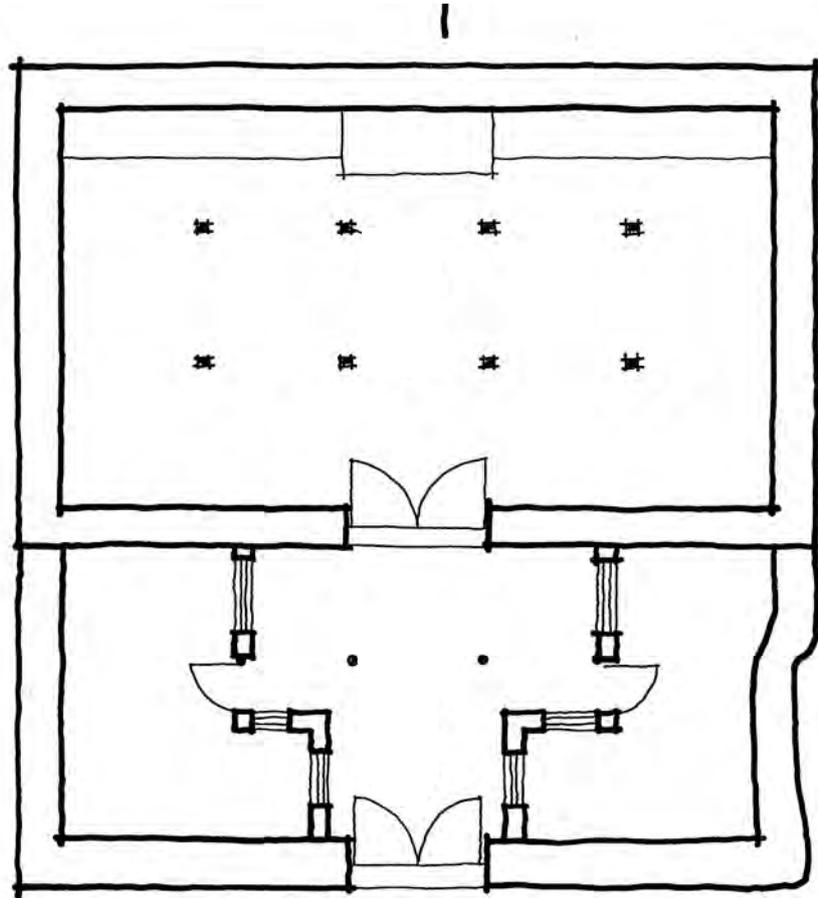


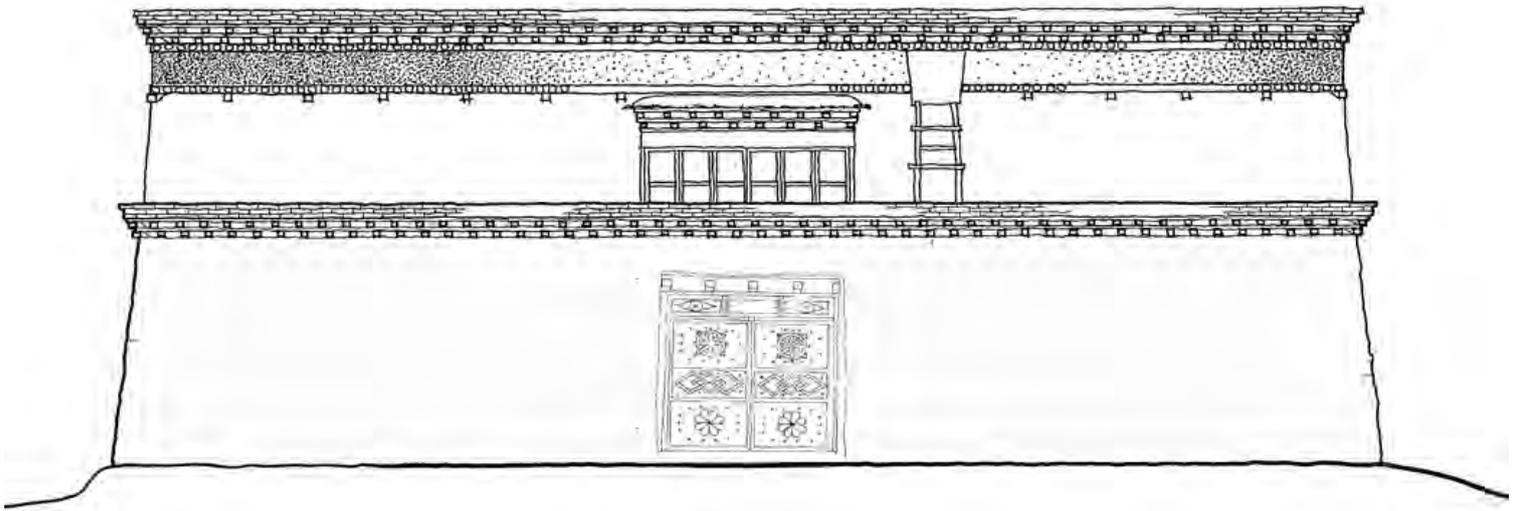
1 Exterior view of the temple, July 2010  
Sketch by Kate Crinion.

2 Location, October 2010  
The temple is located on the main access road through the old town.

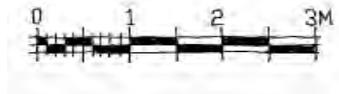
3 Ground floor plan, Autumn 2004  
Measured drawing by Liang Yaqin.

4 Upper floor plan, Autumn 2004  
Measured drawing by Liang Yaqin.

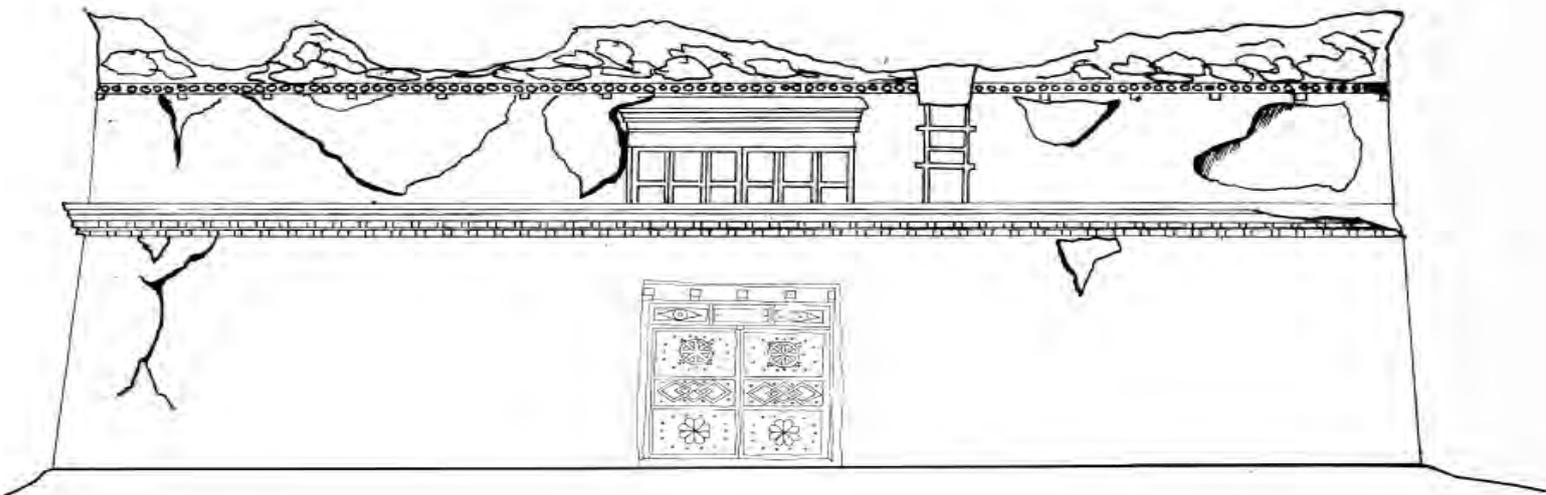


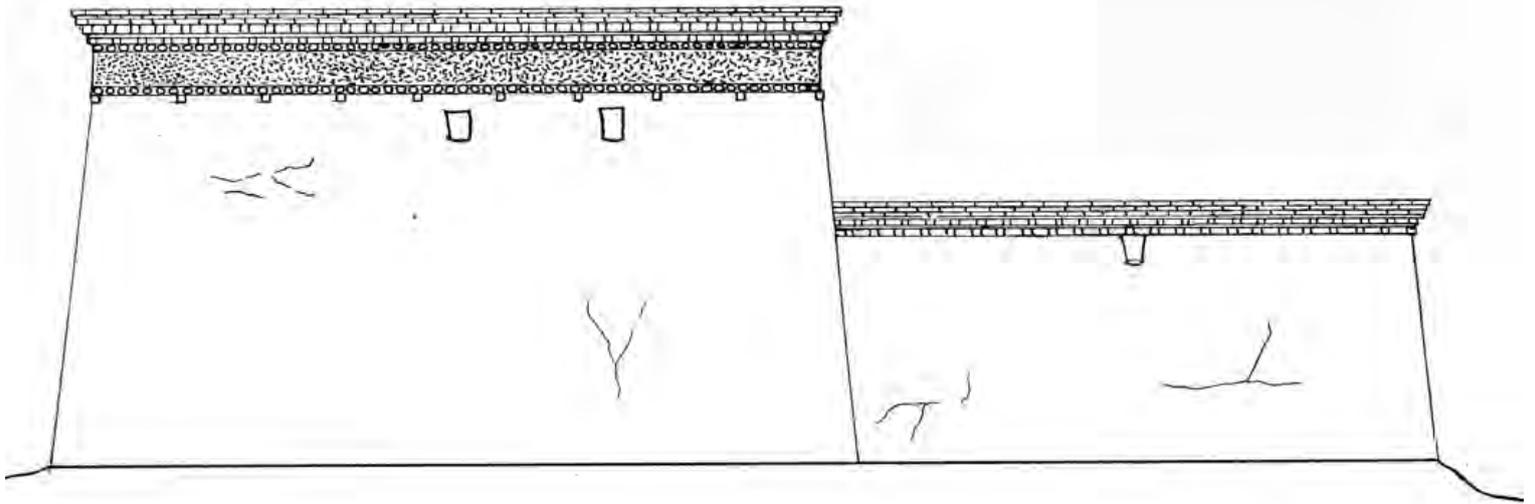


5 South elevation, Autumn 2004  
Measured drawing by Liang Yaqin.



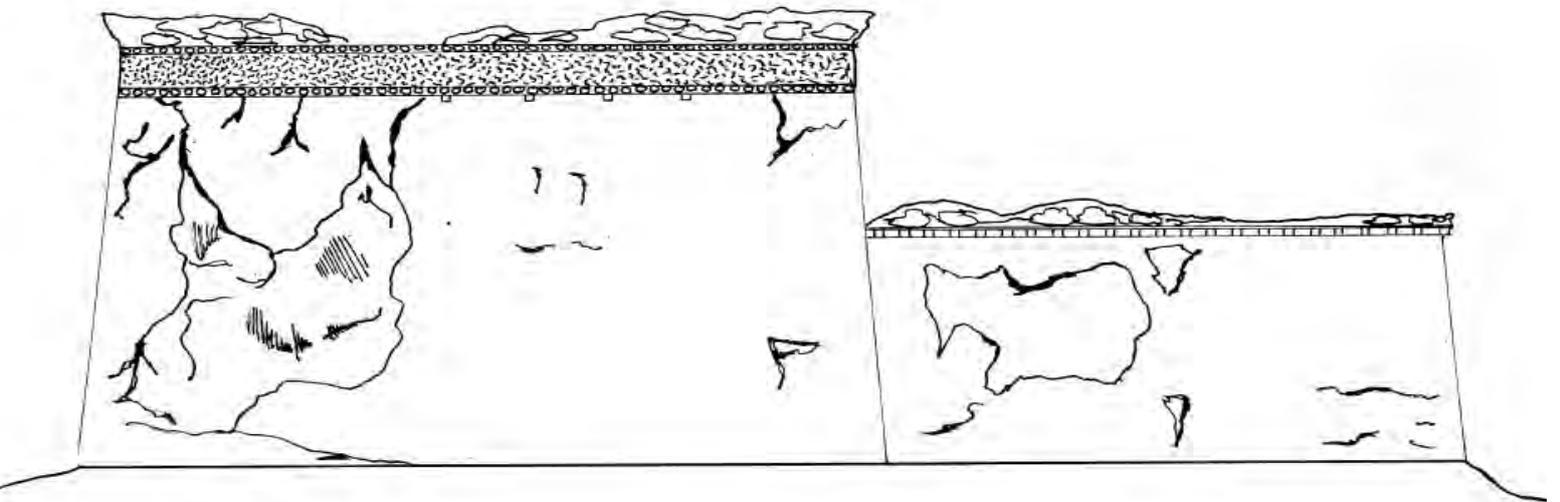
6 South elevation, July 2010  
Drawing by Kate Crinion.

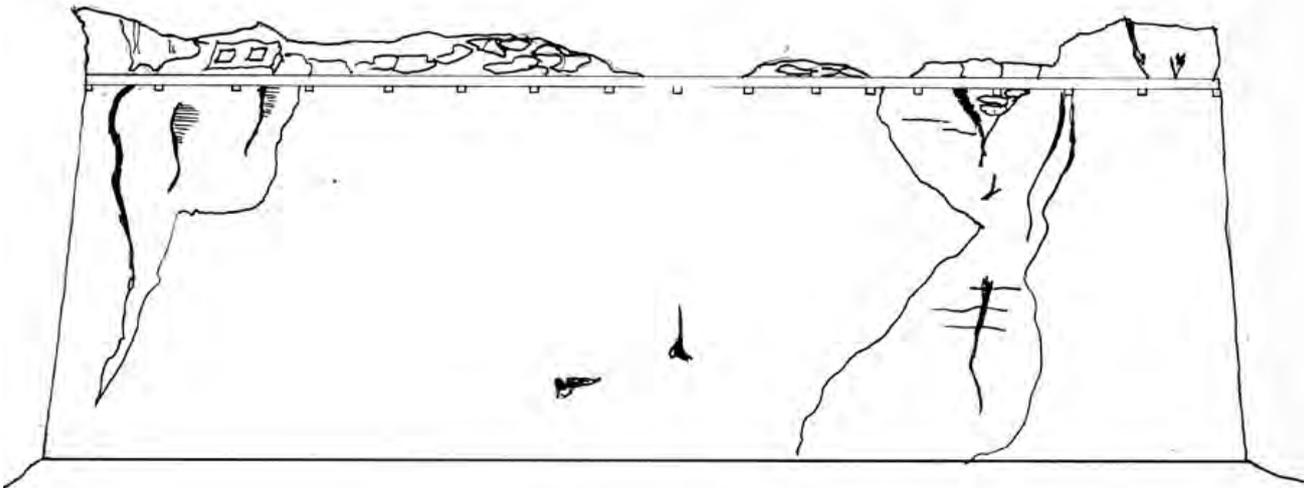




7 West elevation, Autumn 2004  
Measured drawing by Liang Yaqin.

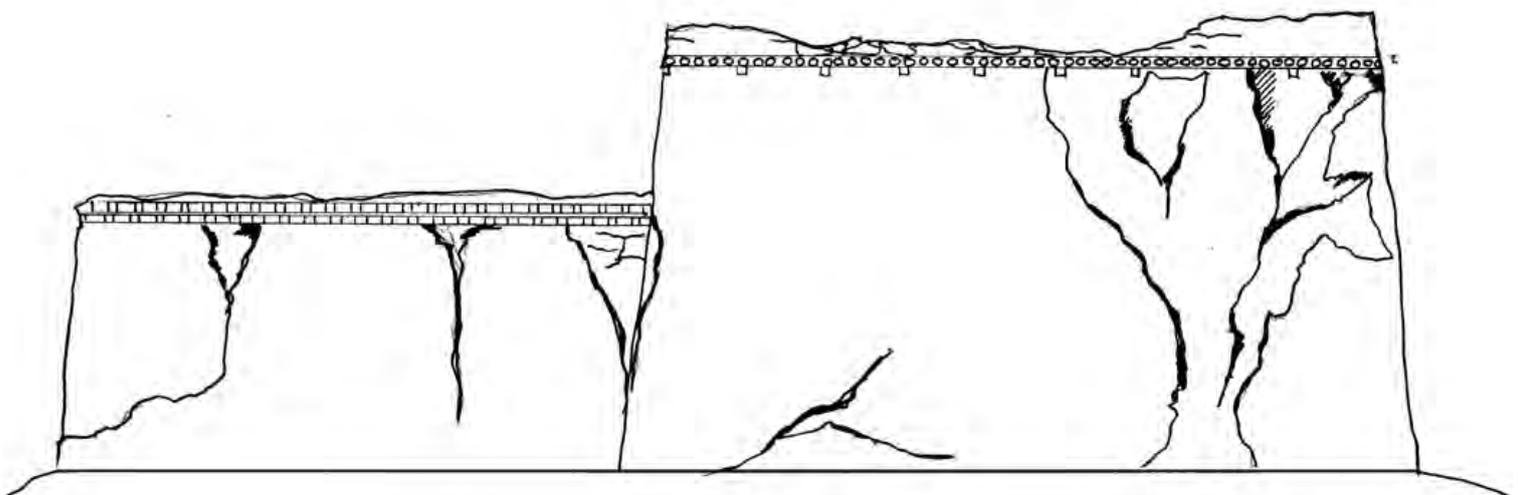
8 West elevation, July 2010  
Drawing by Kate Crinion.





9 North elevation, July 2010  
Measured drawing by Kate Crinion.

10 East elevation, July 2010  
Measured drawing by Kate Crinion.

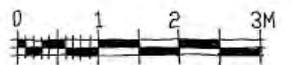
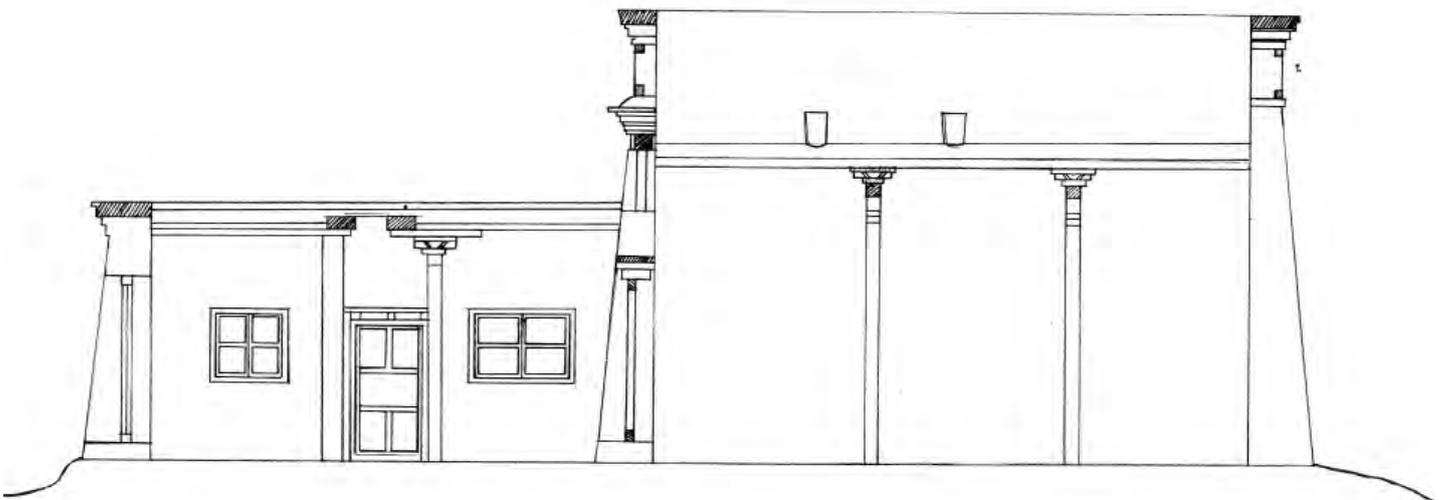




11 Main hall entry, south elevation, Autumn 2004  
Measured drawing by Liang Yaqin.

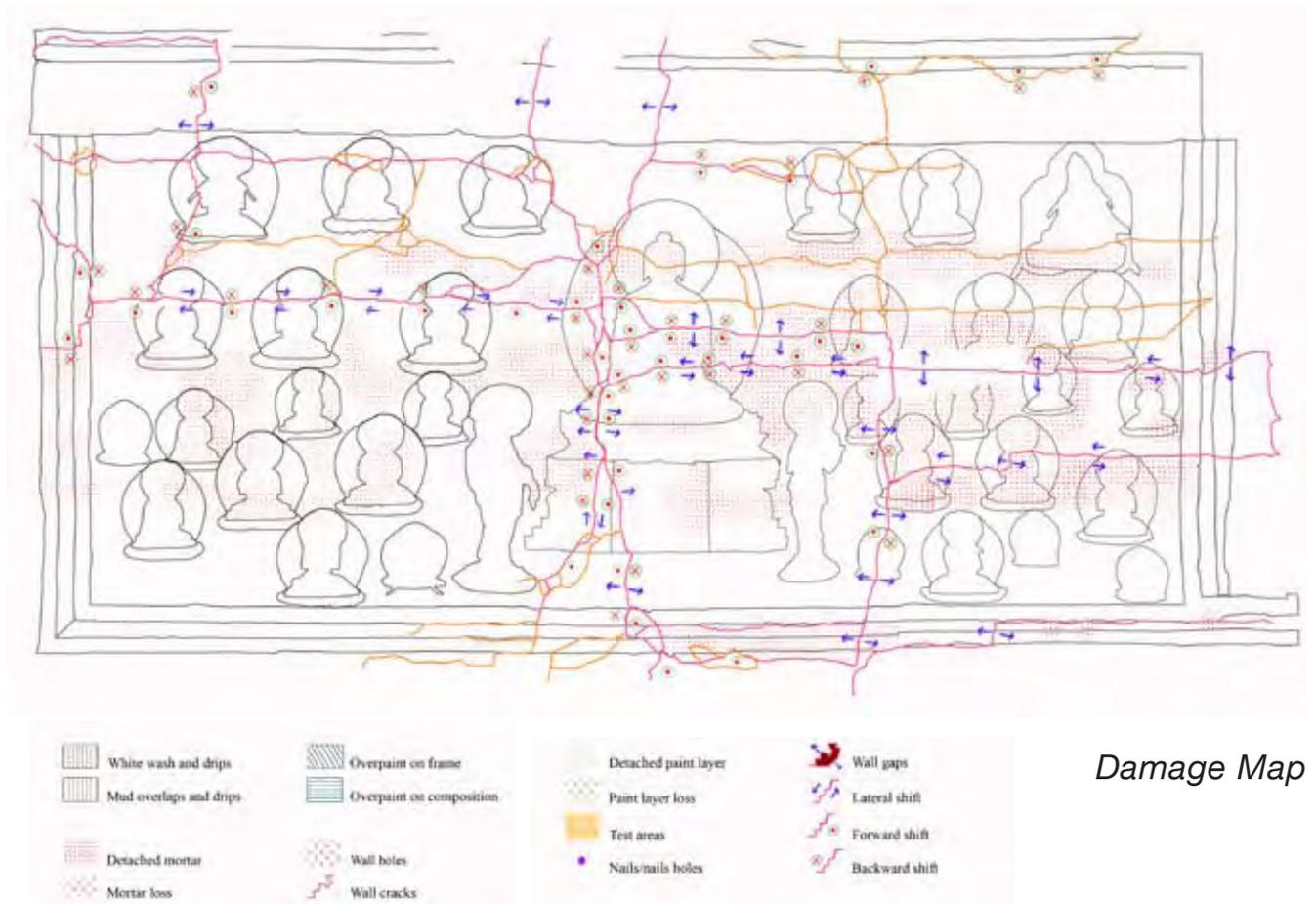


12 South-north section, Autumn 2004  
Measured drawing by Liang Yaqin.



### WALL-PAINTING DOCUMENTATION

The full documentation of the wall-paintings can be found in the separate report by Melodie Bonnat.



Damage Map





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Conservation team working in the entry hall 1  
Trainees are conducting earth sample tests 2  
Local conservation trainees are executing consolidation injections 3



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- 4 Damaged painting inside main hall
- 5 Earth sample tests
- 6 Temporary consolidation with paper
- 7 Painting after urgent consolidation work

## STRUCTURAL DAMAGE



The north west corner was the most severely damaged part.

## TEMPORARY ROOF



The team rented metal scaffolding and erected a temporary roof to prevent water leakage while the wall-paintings were being restored.





An 18 x 12 meter cloth was made to cover the temple. This was covered with light metal roof sheets, enabling extensive roof repairs without exposing the wall-paintings.



This temporary roof structure was kept for three months.

# STRUCTURAL INTERVENTION



After the wall-paintings had been conserved, it was possible to begin with the structural restoration.

In September, the team removed the exterior plaster to understand the extent of the damage to the walls (see picture on the left). More cracks were found.

All loose soil was removed from the cracked area. The largest cracks were then tied together with wooden beams, smaller cracks were filled with stone masonry (pictures in central row).

Bottom row: before, during and after crack repair.



Top: view from north-west corner during removal of exterior plaster.

Middle: masons filling cracks and tying the walls together with beam constructions prepared by the carpenters.

Bottom row: completed structural repairs.



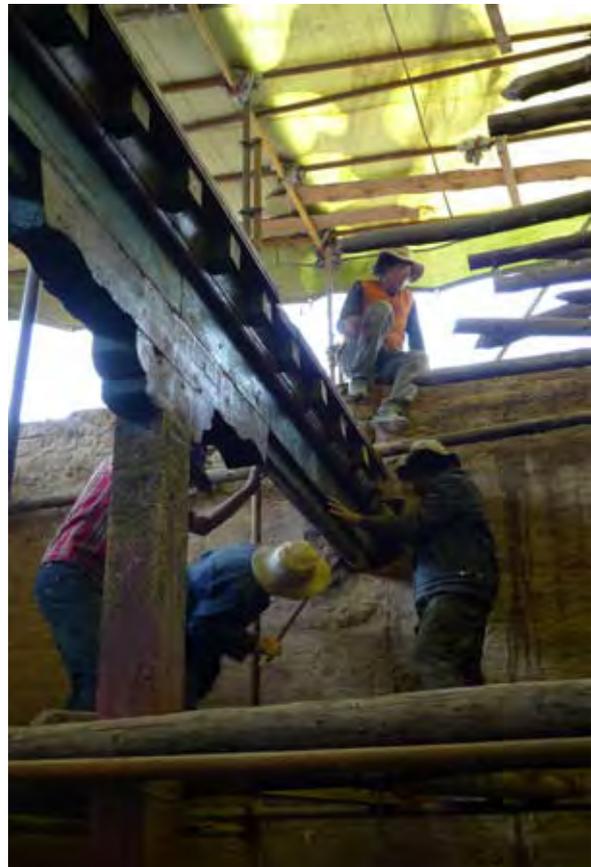


All the top soil had to be removed to expose the timber structure. As expected, over 50% of timber roof elements were rotten and had to be replaced.





The carpenters dismantled the wooden roof structure. The original structure was laid very haphazardly, presumably due to lack of money, beams of different sizes and qualities were used. After selection of the re-usable ones, we decided to lay the roof structure using beams of uniform size and strength. This looks better, and is also stronger. Once the roof load was gone, we could straighten the deformed column- and beam-structure (below right).





The carpenters have prepared the new roof timbers, and cleaned the re-usable original ones. The masons have prepared new holes in the walls. The new beam structure can be laid.





The new roof structure is more regular than the old one. Now the load is better distributed, and the structure is much denser and stronger.





The layer of rafters and joists is covered with straw and cloth mats, on which first twigs are placed, then mud.





According to local tradition, the mud is condensed by dancing on top of the (nearly-) completed roof.



To make the roof really water-proof, we added another layer of flate slate stones on top, on which rain water can run down towards the spouts (we have used this successfully elsewhere).





Work on the entrance portion included removal of later partition walls, and building a new skylight.





The wooden roof parapet structure was reinforced to create a set of tie beams that hold the entire building together.



The modern iron door was replaced with a traditional wooden gate.



The parapet was reconstructed, using the surviving original pieces, and the walls were plastered again with mud.





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**1 Conserved and cleaned wall-paintings**

All historic paintings in the temple have been stabilized, conserved and cleaned, seen here the entry area paintings of two of the four gods of the four directions.

**2 New sky-light**

A new sky-light was built for the courtyard in front of the main hall. This courtyard is used to accommodate visitors during times of important teachings and religious practice, when the main hall is often too small to accommodate everyone.

**5 Painting**

The last step was to paint the walls red, as they were before. We used the same natural earth pigments, locally available..



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**4 View of completed interior**  
The completed main prayer hall, October 2011.

**5 View of completed exterior**  
The restored Kartsog Lhakhang, October 2011.



Restored entry, November 2011

## THF TEAM KARTSOG LHAKHANG

### Carpenters

Tashi Wangdue (Dege), Uygen Dorje (Dege), Tanam (Dege), Thundu (Dege), Uygen Dorje (Dege).

### Masons

Purbu Tsering (Lhasa), Lobsang Phuntsok (Lhasa), Tsewang (Lhasa), Dhundup Norbu (Lhasa).

### Wall-painting conservation team

Melodie Bonnat (France), Lucie Pieri (France), Sebastian Kolbe (Germany), Ngawang Choekyi (Lhasa), Purbu Dolma (Amdo).

### Labour

Tsewang Tashi, Tsetan, Palmo Lhatso, Lhamo, Tsering Tso, Tsewang Gyulmey, Karma Tsewang, Nima Yangtso, Dawa, Sudar, Tse Dorje, Yongkyi, Rinchen, Norlha, Tashi Choedol, Dawa Choetso.

### Local site and logistics managers

Tenzin Dhargyal (Jyekundo), Anna Wozniak (Germany).

### Architect and site manager

André Alexander (Germany).

### THF Support

Yutaka Hirako, Pimpim de Azevedo.

### Report & Documentation

Text, layout, images and photographs by André Alexander with Anna Wozniak unless otherwise indicated.

November 2011

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Working team, August 2011

