The necessary restoration work can be divided into three main time phases: During the first phase, measures should be taken to secure structural stability – a prerequisite for all further work. The second phase would be concerned with the protection of the interior against precipitation and moisture penetration, especially with regard to the mural paintings, under consideration of essential factors such as structural physics and the preservation of the building’s traditional appearance. The third phase would focus on envisioning and completing the building’s final appearance.

**STRUCTURAL STABILITY**

**SITE**

Principally, the ground beneath the building foundations can be defined as consisting of stable areas of bedrock and relatively unstable sloping areas of loose erosive rock. It seems that the area in the south-west of the main monastery building – the white corner tower with Lochen Rinpoche’s Residence on the upper storey and the red tower with the lower and upper Protector’s Chapel – located directly next to the steep incline, is especially endangered. The extreme crack formation observed in those parts of the building would point to that assumption.

On the other hand, the Upper Temple seems to have been built completely on bedrock. An accurate analysis on the stability of the site can only be obtained by means of a geological survey. The terrace’s construction in the front area of the east facade and its surrounding supporting walls need to be renovated. However, it seems sensible to wait for the geological survey first, in case it should be necessary to meet various requirements in certain other areas.

**MAIN MONASTERY BUILDING**

Historically, the main monastery building has seen several different construction phases. Over the years, further rooms and storeys were built upon the original structures, thus adding extra weight to walls and ceilings for which their dimensions had not been designed to bear. As a result of this lengthy construction process, two problematic zones in terms of stability have particularly arisen: the bearing walls and ceiling areas. Moreover, subsequent construction activities were rarely carried out according to the principles of ideal static load transfer, nor were they done with the necessary technical care. For example, when HH Dalai-Lama’s Residence was built on the third floor, a wall was set up in an area between the entrance hall and the main hall that hardly guaranteed an optimum static load transfer to the floor below. This has resulted in the formation of many settling cracks in ceiling and wall areas.

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**CURRENT STATE OF THE BUILDINGS**

The Venice Charter - Article 9:

“The process of restoration is a highly specialized operation. Its aim is to preserve and reveal the aesthetic and historic value of the monument and is based on respect for original material and authentic documents. It must stop at the point where conjecture begins, and in this case moreover any extra work which is indispensable must be distinct from the architectural composition and must bear a contemporary stamp. The restoration in any case must be preceded and followed by an archaeological and historical study of the monument.”

The Venice Charter - Article 10:

“Where traditional techniques prove inadequate, the consolidation of a monument can be achieved by the use of any modern technique for conservation and construction, the efficacy of which has been shown by scientific data and proved by experience.”

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**SUSTAINABLE RESTORATION MEASURES**

*by Holger Neuwirth and Carmen Auer*

The Venice Charter - Article 9:

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“Where traditional techniques prove inadequate, the consolidation of a monument can be achieved by the use of any modern technique for conservation and construction, the efficacy of which has been shown by scientific data and proved by experience.”
As stated in the above damage report, the main beams of some ceiling constructions are broken. Consequently, the corresponding wall surfaces – particularly the supporting areas beneath the beams and in some parts near the openings – are showing signs of heavy damage due to load transfer. Therefore, in order to systematically improve stability of all damaged areas from bottom to top, i.e., from the ground floor to the top floor, the following measures should be taken:

1. thorough renovation of all walls (repair cracks, rebuild decayed areas, reinforce supporting wall areas) and stabilization of free-standing pillars, then
2. replacement of all damaged, weak beams of the ceiling constructions.

Accordingly, stabilizing measures are necessary for the following areas of the main building:

- Room No 4 (tower room ground storey) – replace broken ceiling beam
- Room No 5 (ramp to tower room) – replace ceiling beam and renovate walls
- Room No 7/8 (side rooms ground storey) – renew main beam and renovate beam supports
- Room No 12 (tower room first storey) – renovate beam supports
- Room No 14 (lower Protector’s chapel) – urgent renovation of walls and beam supports necessary
- Room No 16 (intermediate storey above ‘du khang) – urgent renovation entire ceiling necessary
- Room No 17 (beneath HH Dalai-Lama Residence) – insert support underneath the upper wall
- Room No 19 (rear room) – replace broken beams and renovate walls and beam supports
- Room No 21 (tower room second storey) – renovate beam supports
- Room No 23 (inner courtyard third storey) – renovate beam supports
- Room No 24/25 (HH Dalai-Lama Residence) – renovate beam supports
- Room No 27 (upper Protector’s chapel) – renovate wall and beam supports
- Room No 28 (Lochen Rinpoche’s Residence) – renovate walls and beam supports
- Room No 30 (ante room of cave) – replace broken beam and renovate beam supports

TOWER AND UPPER TEMPLE

From a structural perspective, both the tower and Upper Temple are neither threatened by their location nor statics. However, the Upper Temple’s annex (rooms 35, 36 and 37), which also forms the front part of the temple entrance, is in very bad condition. The walls are extremely unstable and the roof is leaky in many places. It is strongly recommended to demolish the derelict annex and build a new front area which would cover the entrance area of the temple.
In order to avoid further damage to ceilings and interior walls, protective measures would primarily include renovation of those roof areas that are prone to leakage through precipitation. The basin-shaped roofs pose a threat, particularly when precipitation becomes heavy, because the rainwater cannot be sufficiently drained. Additionally, the moisture absorbing capacity of the clay layer leads to a substantial increase in the weight of the roofs which, in turn, could cause serious static problems. This has probably caused recent damage to the ceiling beams on the 2nd floor of the monastery. As soon as the clay layers are no longer able to retain precipitation moisture, it will leak into the areas below.

In the long run, it will be necessary to renovate the roof areas, especially in view of the increase in precipitation during the last few years. This phenomenon has led to problems with traditional flat roof constructions throughout the Western Himalayas. Thus it will be of the utmost importance to reduce the roof load of the clay structure, which has constantly increased over the years due to additional rebuilding, as well as to prevent further water leakage. The roof insulation could be greatly improved by using foil; gently sloping roof surfaces of approx. 5° plus amply dimensioned water spouts would guarantee that all standing water be drained off as quickly as possible.

The main monastery building definitely needs renovating, especially in the upper courtyard area where the rain causes rapid puddle formation due to the lack of adequate draining facilities. The courtyard’s function as an access area to the rooms on the upper storey is thus restricted and the roof has to bear additional strain. A former roof opening, which has been closed and temporarily covered up, poses a special problem since it allows rain water to seep into the rooms below. Rain water spreads out all over the ceiling and from there penetrates the walls, thus additionally jeopardizing the stability of those areas.

In the course of renovating the roof and its clay layers, the surviving structures of the skylight area of the ‘du khang and the intermediate storey above it - with the stupas on the rear side - could be reopened. Daylight would shine through the courtyard roof creating a vertical sightline from the rooftop down to the ‘du khang and enhancing both lower rooms. The ambulatory along the courtyard walls will have to be reinforced in order to ensure safe access to the rooms even when the clay floor gets damp.

Slight moisture penetration was also detected near the Museum and the kitchen roof. An other principle question is: what would be the optimum solution for the open roof areas (toilet opening, stairs to tower)? One possibility would be to install trapdoors which could be shut when it rains. It is certain that all windows need to be renovated, both in respect of their wall fitting and glazing.
BUILDING’S FINAL APPEARANCE

EXTERIOR AREAS

In the course of external renovation work, it is also recommended to replace the existing concrete block walls in the lower area in front of the main building as well as in the ambulatory area of the Upper Temple with natural stone walls.

WINDOWS AND DOORS

Ideally, the windows and doors should be renovated in line with the traditional beautifully hand-crafted frames of the existing ones, e.g., the window in room no. 4 and the south-west facade window in room 16. Hence both new windows in the ‘du khang can be regarded as a deterrent, and they should be replaced as soon as possible.

FLOORS AND INTERIOR WALLS

Recommendations: Simple wooden flooring would upgrade the appearance of the rooms whilst the interior walls need to be newly rendered and painted in a light colour. Room 7a, which is currently inaccessible, could be reopened at the original place, which can still be easily seen on the inside.

RESTORATION OF THE MURALS

The surviving murals in the ‘du khang and in the Upper Temple will have to be secured and cleansed. In order to enable the restoration of all the murals on the north-west wall behind the glazed cabinet-altar, the latter will have to be moved to another room. Only an exact investigation will reveal whether there are murals behind the later rendering in the ‘du khang and the recent retouchings in the Upper Temple. In order to prevent any further crumbling, the cracks in the area of the murals in HH Dalai Lama Residence will have to be repaired as a minimum requirement. Finally, prior to any further procedures, an urgently recommended expert opinion on restoration details and possibilities will require a thorough inspection of the location.