

## Hanuman Dhoka Palace

**From:** Kai Weise [mailto:paharnepal@hotmail.com]

**Sent:** Sunday, May 10, 2015 6:15 AM

**To:** Randolph Langenbach; Forbes, Catherine; Kai Weise G; c.manhart@unesco.org; Jitendra K Bothara; Dipendra Gautam; Richard Sharpe; Rohit Ranjitkar; Andreas Stavridis; Vincent Michael; Sahar Derakhshan; Jay Berger; Heidi Tremayne; Amod Mani [NEPAL] Dixit; Roger Bilham; Martin Hammer; Eduard Sekler; Raju Shrestha; matt@smashon.com; John Hurd; meltem vatan

**Subject:** RE: Nepal post-earthquake - REPLY to KAI WEISE & CATHERINE FORBES

Greetings,

We will have to see how we move forward on the monuments and what our philosophy will be for reconstruction or restoration or whatever might be required. This we will probably only start after the monsoon, since our immediate task would be safeguard and stabilize whatever might remain of the monuments. The next question would be concerning the structures within the historic towns - whether World Heritage, Tentative List or identified as ancient settlements. Large parts of Bhaktapur have been impacted. Sankhu is in bad shape. Beyond these, the question arises of the reconstruction of the villages which would need a different set of considerations.

I am not going to propose what exactly I would consider appropriate for each of these situations, but it would be great if we could figure out how best to approach these problems when considering appropriateness, sustainability, etc. I fear that we will go for concrete frame structures which when they age will be creating a major risk for future earthquakes. Whatever we use must be based on a system of cyclical renewal. Even if we use concrete, the elements need to be replaceable. With this, a certain focus on maintenance must be included and become part of the use.

In any case, we are right now wondering what to do with the Hanuman Dhoka palace structures. How do we stabilize them before the monsoon?

Thank you for your continued input and comments,

Regards, Kai

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**From:** owner-icorp-l@lists.icomos.org [mailto:owner-icorp-l@lists.icomos.org] **On Behalf Of** Kai Weise .

**Sent:** Sunday, May 10, 2015 5:12 AM

**To:** icorp-l@lists.icomos.org; Gaia Jungeblodt; Gustavo Araoz

**Subject:** [ICORP-L] Fwd: Around Hanuman Dhoka photos for analysis

Please find some photos of still standing structures around Hanuman Dhoka Palace. For those who are interested I can send some 50 more of the palace itself. Should I send them to all or only the interested person?

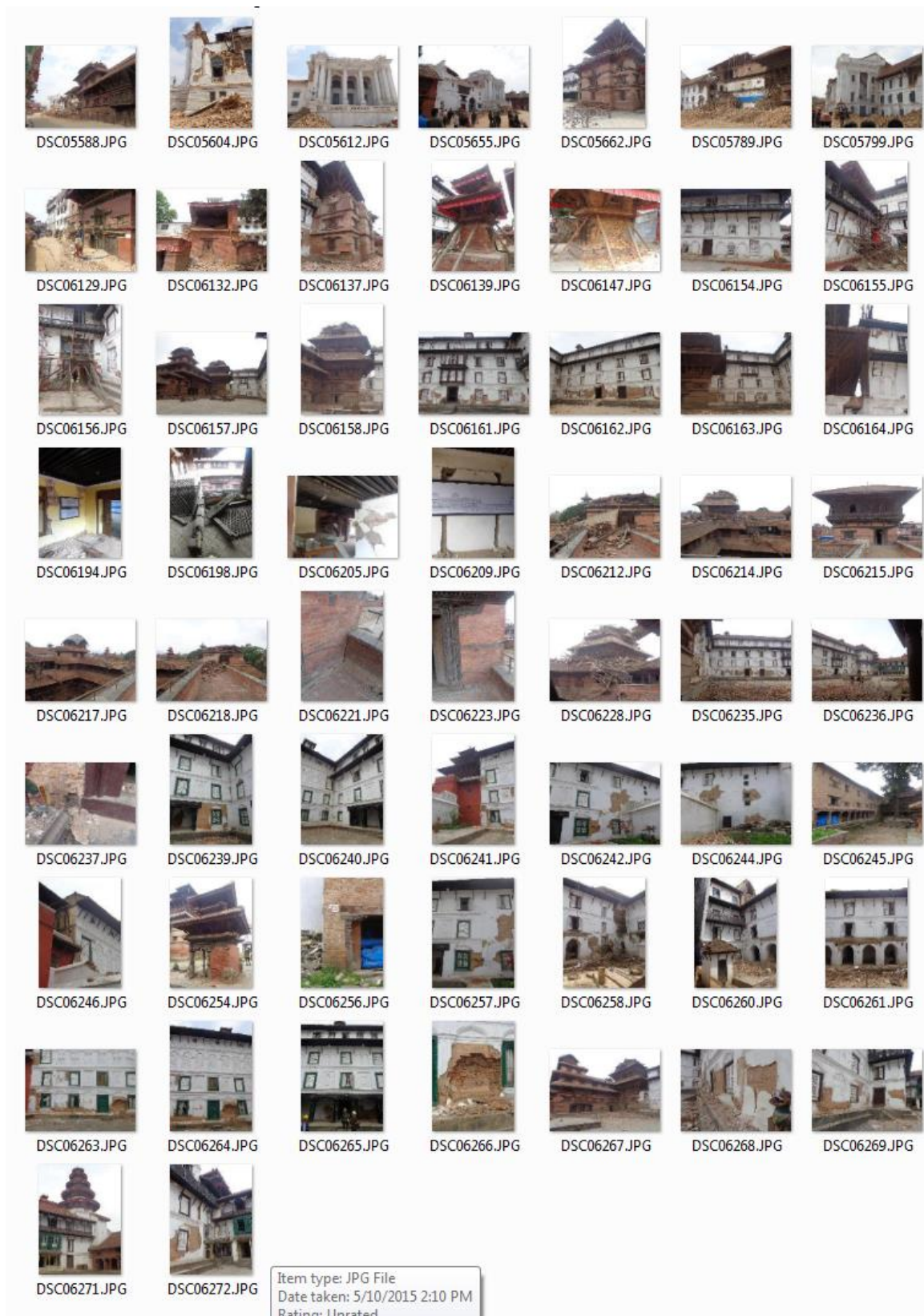
We had an Italian team there this afternoon to help us begin thinking of how to deal with these structures in their precarious state (and before the monsoons arrive) and how to get the museum artifacts out.

Those interested in commenting please send me at paharnepal@hotmail.com these directly or with cc to a smaller group that we don't flood everyone's emails.

Thank, Kai

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# Hanuman Dhoka Palace



Photographs by Kai Weise after the earthquake



**My text on this and the following pages is addressed to Kai Weise in Nepal**

**Dear Kai,**

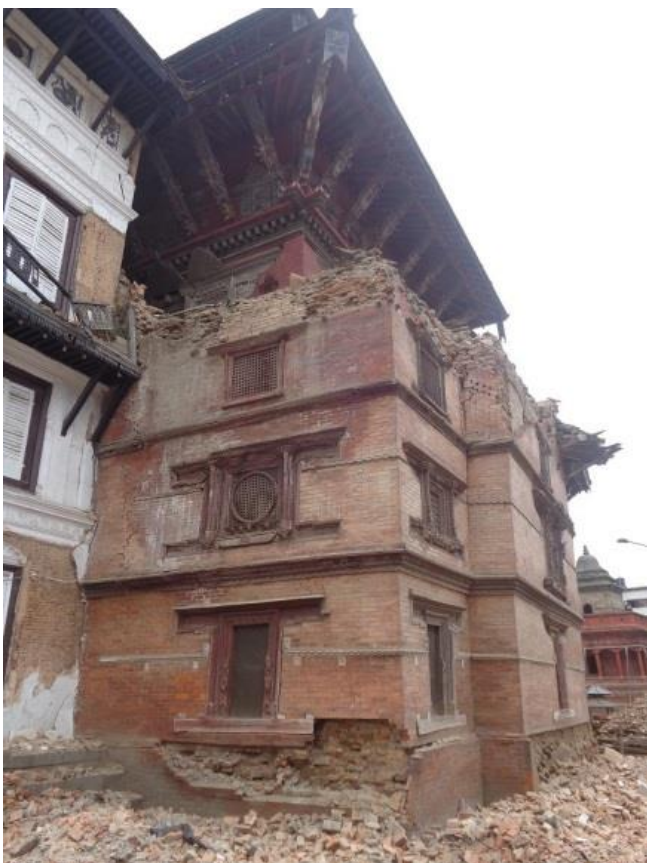
**One Question:** Your photo # 5662 taken on the 26<sup>th</sup> of April (a day after the quake, if the Date and Time setting of your camera is correct) shows the exterior brick wall of the same section of the palace as Photo 6177, taken today, the 10<sup>th</sup> of May. In between, I have seen this same wall published by the New York Times – showing before and after shots (attached between your photos), so I am familiar with it because I had an email conversation with Richard Hughes about exactly that spot.



Your earlier shot is striking because it shows, if I am not mistaken, that the lower roof collapsed in an aftershock, after you took the 1st picture! Can you confirm for me that this is the case – and if you know what happened to bring down the roof in what was a much smaller aftershock, than the original earthquake, or were there some large aftershocks?

Have there been any other examples of such a dramatic increase in damage between the main shock, and collapses like this days later?

The New York Times pair of images was published on April 28, New York City time, which means it went to press at about noon your time on the 28<sup>th</sup>.



## Hanuman Dhoka Palace



Since you mention having an Italian team with you in Kathmandy, I wish to share with you these photos and recommendation.

**A perfect solution for shoring** of vulnerable outward leaning walls are used in Italy after earthquakes as seen here – polypropylene straps that can be wrapped and tightened around buildings with outward leaning damaged walls. This is far more efficient and less expensive than external bracing.

Try to get your Italian team to arrange to send these to you, or tell you how to get them.



Here (middle row) shows the same way of solving the problem, but with steel cables rather than polypropylene straps.



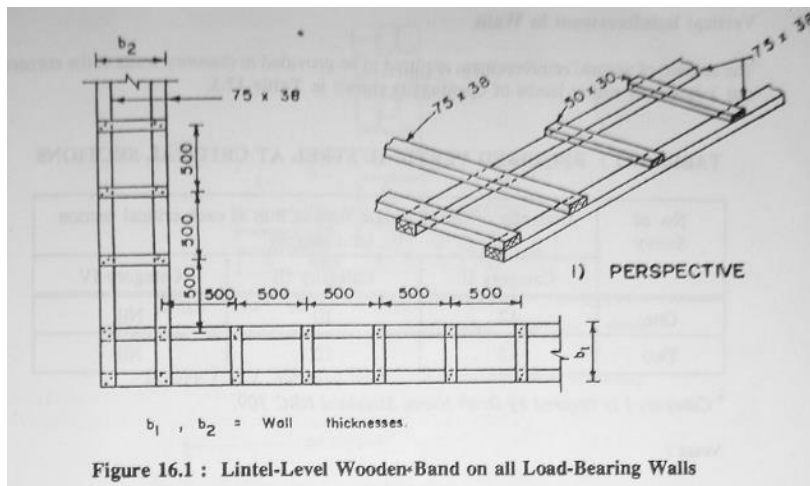
Bottom: The Italians are masters at the design and engineering of shoring. Here is an example of external shoring in timber.



On page 5 I have pasted your photos that appear to show timber lacing in the walls of parts of the Palace. From your photographs, it looks like parts of the palace, but not all of it, had timber bands. It seems clear that the later classical revival parts of the structure, and also the long whitewashed range, do not have timber lacing. It also looks like that in some places – as can be seen in the last photo pasted on page 5, that the timber bands may not always wrap around the structure as can be seen here:



The two interior photos show that the timbers are on the interior surface as well as the exterior surface – thus they are probably configured not unlike those in Kashmir shown the Nepal Building code shown here, except that the cross pieces lie below the timber runners. These are the kinds of timber bands that are described by Dipendra Gautam, whom I am copying in this email.



These interior photos on page 5 serve to give evidence of the effectiveness of these timbers in holding the walls together to prevent collapse of the building. Notice how the plaster has fallen off of the wall. It is clear from this that the walls felt the strain from the earthquake shaking.

However, there are cracks visible in the remaining plaster, but they do not form a single large “X” as is characteristic of shear failure of the wall, which is the precursor of collapse. The timber bands on the inside and outside of the wall have served to stop these cracks, and keep the walls from spreading.



In my opinion, from looking at these pictures (without the benefit of being there to look more carefully), these parts of the palace with the timber lacing look quite sound, and not on the verge of collapse, although it suffered the loss of the tops of some of its pagoda towers.

One important survey that I recommend be conducted is to record onto the drawings the locations within the building that have the timber lacing, and inspect it carefully to see its condition. Also, make note of those areas where it does not carry around the whole structure. An important point: the bands at the floor levels are not visible in the photographs, but are of critical importance structurally, as they hold the floor diaphragms to the walls. It would be good to see during the restoration work where they are, and determine if the floor joists extend through the walls, and check to see if there is any decay in the embedded timbers.

# Hanuman Dhoka Palace



It appears from the exterior that this wing has survived with little or no damage, so it would be good to determine if this is true, and what features of its structure and age may have contributed to this.

It does not appear that the classical revival section and the long white range of the palace, as well as the unpainted brick wing shown here have timber lacing in the walls. In the case of the classical revival wing, shoring is needed, and the strapping technique shown on page 4 may work well for this.

In the case of the long white range, it appears that the most strain was felt at the base of the structure where the plaster surface has fallen off. It appears that the bricks are under-fired, and thus weak, perhaps further weakened by rising damp. The strain may have been from the building rocking back and forth, which compressed the bricks and caused the plaster to shed.

There one particular feature to the traditional construction in Nepal which I wish to address once again – as I had mentioned it in one of my earlier newsgroup emails – is the traditional design of the face bricks. In Nepal, as I have not seen this anywhere else, the specially made face bricks for the more important buildings – temples and palaces – are manufactured with a wedge shape, which allows the mortar bed to be hidden, giving the facades their iconic pencil-thin mortar joints. Kai – perhaps you could help me learn about the history of this, but I have seen it on my trips to Nepal, both at the brick yards, and also at a restoration project of one of the temples next to the **Hanuman Dhoka Palace**, and at the restoration of the **55 Windows Palace**. These are photos I took of them in front of the Hanuman Dhoka Palace in 2005.



While this is both unique, and contributes to the architectural distinction of the Kathmandu buildings, I wish to point out a concern that I have about it from a conservation and earthquake hazard perspective that I have not yet seen discussed. As buildings age, the mortar – particular mud or mud/lime mortars, tend to erode and dry out and deteriorate in the walls. With ordinary rectangular bricks, the structure of the wall may weaken, but the position of the bricks does not change, nor their ability to carry the loads. With the wedge-shaped bricks, a loss of mortar can cause the bricks to rotate slightly, such that their fronts are no longer truly vertical. In ordinary circumstances, this may not be noticed, but as the compressive strength of the mortar weakens, and an earthquake comes, the added force can suddenly cause the face brick layer to pull away from the core of the wall. The shape of the bricks combined with the infrequency of having true bond courses, thus may account for some of the areas of delamination that we see.

It may be worth studying this feature in detail by surveying earthquake damage to try to recognize where this brick shape may have played a role in the damage. When rebuilding the walls, it may be worth considering the addition of a thin wedge or pencil-sized piece of fired ceramic into the mortar joints towards the rear of the bricks so that the vertical compression on the wall would not bear unevenly onto the facebricks. This is just an idea that will need further investigation, but I suggest a solution so that one can see a way to fix the problem without changing the traditional architecture if it can be determined to be a contributing cause of damage to the buildings.



This is a photo I took of the walls of the Hanuman Dhoka Palace in 2005. It is possible to see some crude repairs which may be where bricks fell out of the wall. Also, some have lost their front surface from spalling, and there is evidence of salt attack at the base from rising damp – which also serves to weaken the bricks. It is possible that the string courses visible on the wall are tiles which cover timber bands, so I will be pleased to know if this is true here.

**In conclusion**, there is much further study needed to know how best to restore the walls of the palace, and determine where it needs to be strengthened. It may be possible to grout the walls to consolidate them, but that will require serious on-site consulting. The one important caveat is to avoid any grouting with Portland cement as it would be highly destructive to the historic fabric in walls that appear to have survived the earthquake remarkably well.



**This is a photograph from my collection of 160 photographs just of the Hanuman Dhoka Palace taken in 2005.**

I will be pleased to contribute any and all of these photographs to you, to UNESCO, and the agency of the Nepal Government in charge of the restoration if they will be of help to the project. They are almost all of the exterior of the buildings, including views of the inner courtyards. Since many will need work in Photoshop, this is not without some significant time needed to do it, but let me know what you particularly need, and I will see if I have the views.