

Pro Bhutan e.V.

a philanthropic, charitable association dedicated to active development
assistance to the Himalaya Kingdom of Bhutan



The new Cantilever Bridge of Punakha in the Kingdom of Bhutan
the unique project of "Pro Bhutan, Germany" to marry medieval Bhutanese bridge architecture with modern technology



Mask dancers at inauguration 10th May 2008

by Harald N. Nestroy

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The new Cantilever Bridge of Punakha in the Kingdom of Bhutan, planned, built and financed by "Pro Bhutan, Germany" was inaugurated by

H.E. Jigmi Thinley, Prime Minister of Bhutan
and
Harald N. Nestroy, German Ambassador (rtd),
Executive Chairman of "Pro Bhutan".

In 1958, nobody in Bhutan or in the world would have believed that the holy Dzong of Punakha would ever have again its wooden, roofed cantilever bridge in 17th century architecture; and thus its breath taking beauty based on the strength, the grace and the artistic harmony of this monastery-castle which is of paramount importance for Bhutan, her Monarchy, her history, her spirituality.

1958 a glacier lake in the Bhutanese Himalayas, its glacier gate the source of the river Mo-chhu, had burst with ear shattering thunder: a gigantic piece of ice broke away from a glacier above, crashed into the lake, catapulted a tidal wave against the end moraine, the natural dam of the lake, vaporized the dam in seconds.

A terrifying flood wave rushed through the gorges cut by the river into the mountains. Everything it could grasp and what could not flee was washed away; thousands of trees, wild mountain sheep, chamois, deer, bear, cattle of the mountain herders, many an unfortunate human as well.

Reaching the valley of Punakha, the inexorable flood had lost only a fraction of its ravaging strength. It still had enough force to playfully sweep away the ancient cantilever bridge leading to the majestic Punakha Dzong. The impact

of the bow wave, reinforced by a throng of hundreds of uprooted tree trunks, disintegrated, in the blink of an eye, the right bridge tower, weighing hundreds of tons; at the same instance the wave devoured thousands of tons of earth of the 10 meters high river bank where the tower had stood, widening the river by a full 20 meters. The bridge tower at the Dzong side was spared, but the broken and splintered remains of the bridge beams, like crashed fingers, protruded accusingly above the foaming brown water.

Dzongs are monastery-castles, so typical for Bhutan and her history, mostly built in the 17th century. Within their protective confines, until today the worldly and the religious power have been living side by side under one roof: formerly the regional Prince or Penlop, nowadays the Dzongda or District Governor; and in a separate part, the monastery with its many temples under a high ranking abbot with his monks.

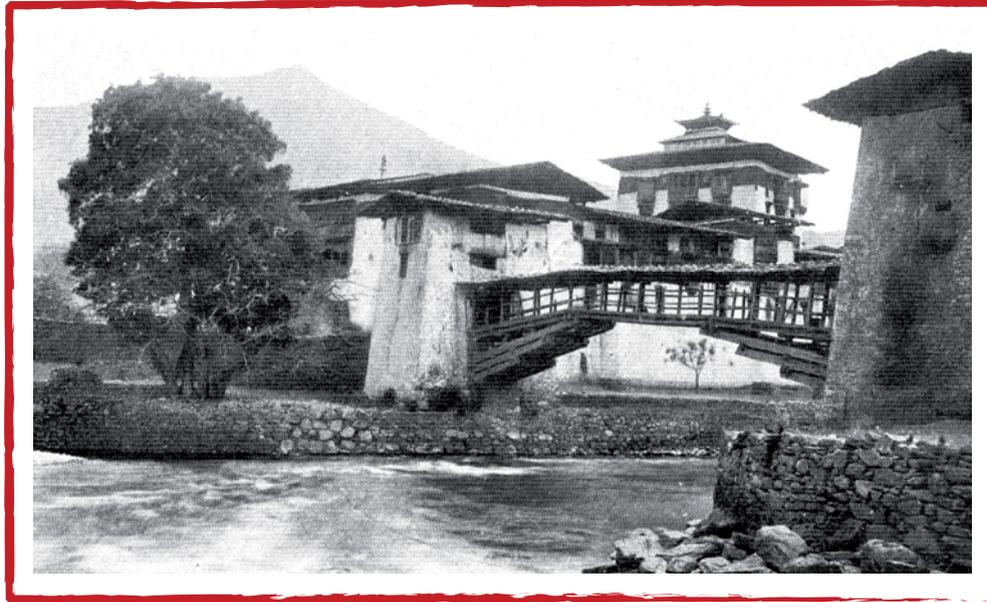
The Dzong of Punakha is the most important and holy of Bhutan because

- it was built by the founder of the Bhutan, Shabdrung Nawang Namgyel himself in 1637 where he, embalmed, lies in state and has been venerated as a living god until today;
- it is the winter residence of His Holiness the Je Khenpo, the supreme abbot of the Kingdom, with more than 500 monks;
- all the Kings of Bhutan have been, and are, coronated in this Dzong.

Partly destroyed by a devastating fire in 1984, the Dzong of Punakha has been restaurated in an exemplary way. In order to restore its all but original state, only the "bazam", Bhutanese- Dzongha for roofed wooden cantilever

bridge, in traditional architecture was amiss.

The bazam itself is of eminent cultural-religious importance: it quasi belongs to the ritual instruments of the Dzong when His Holiness the Je Khenpo with 500 monks enters his winter residence in the Dzong or when the colourful processions of monks and believers visit the Dzong at many a religious festival. After the 1958 catastrophe this was not possible any more until today.



Original bridge built about 1740, photograph from 1906

The flood wave of 1958 also had cut the Dzong from the village of Punakha, it could only be reached by travelling 15 km down river to Wangdiphodrang. A steel cable bridge, for the use of pedestrians and cattle like the original

wooden bridge, was built to reach the Dzong from Punakha. This ungainly improvised solution which offended the beauty of the Dzong lasted until 2007. Until it had to give way for the construction of the new “Pro Bhutan” bazam.

Still in 1999 nobody believed that, given the enormous additional width of the river created by the flood, a new cantilever bazam, revived in traditional Bhutanese architecture, could ever give the Dzong back its full dignity.

But in 2000, Lyonpo Sangay Ngedup, then Prime Minister, took the initiative. He approached “Pro Bhutan” president Dr. Werner Haring on visit in Bhutan. This German non-profit and humanitarian NGO had already, as a gift to Bhutan, turn-key built and financed the Punakha Hospital and the Punakha Training Centre for medical-technical Staff; both in appearance in traditional Bhutanese architecture, of course with inconspicuous modern adaptation. Lyonpo Sangay asked Pro Bhutan to rebuild the Punakha bazam; in traditional architecture; and financed by “Pro Bhutan”.

Before “Pro Bhutan” could ever think of accepting this challenge, they had to study the architecture of a traditional bazam. In particular of a bazam of such dimension: the new span had to be 55 meters instead of 35 meters of the old bazam! The experienced and dedicated “Pro Bhutan” architect and coordinator in Bhutan, Fritz Baumgartner, started long and exhaustive researches.

Although there is still a number of cantilever bridges in Bhutan, none has the required dimension. No written descriptions, drawings or plans of a bazam

could be unearthed. Only some old prints of photographs like the one of the original Punakha bazam (attached) could be found. The bazam with the longest span had been in Wangdiphodrang: It also was destroyed by the 1968 flood.

Eventually Fritz Baumgartner could make a draft of the future bazam , his son Daniel built a 1 : 100 model very useful for the discussions of the project. Soon it was evident that without the assistance of an experienced engineer, expert in designing long span bridges, responsible technical planning of the future Punakha bazam could not be achieved.

Walt +Galmarini, Zurich, a world wide renowned engineering company specialized in designing bridges of all kind, generously accepted to design the new Punakha bazam in traditional architecture with most modern technology, and free of charge. The project could start!

Harald N. Nestroy, Executive Chairman of “Pro Bhutan”, then German Ambassador in Africa, began fund raising in Germany. After encouraging financial commitments of private donors, together with Fritz Baumgartner, he discussed the bazam project with the Royal Government of Bhutan. “Pro Bhutan” would, in closest co-operation with the Bhutanese authorities, turn-keybuild the bazam, thus accepting a great responsibility. In order to guarantee - to the highest possible degree - the security of the people using the bridge in future, there was no other choice than to incorporate invisible steel elements into the structure of the overlong bazam particularly to stabilize the high bridge arch and preventing it from twisting or falling side wards.

For, in the extreme case, there will be more than 500 people on the bridge simultaneously. Such numbers will be absolutely realistic at the occasions of

the many religious processions or the moving of the cortege of His Holiness the Je Khenpo into the Dzong when He takes possession of His winter residence with His 500 monks.



Punakha Dzong with steel suspension bridge, ungainly provisional solution 1958-2007

After many discussions about various proposals for changes of the concept for the bazam, Ambassador Nestroy, during 2003 to 2004, could convince the Royal Government to accept the final technical design elaborated by

Wolfram Kuebler, engineer with Walt+Galmarini. During this period Ambassador Nestroy managed to raise another part of the required funds.

Eventually, on November 24th 2004, Ambassador Nestroy signed, for “Pro Bhutan”, the project agreement with then Minister for Home and Cultural Affairs, Lyonpo Jigme Thinley, now the first Prime Minister elected by the first democratically elected Parliament of the new born Constitutional Monarchy of Bhutan.

The “Pro Bhutan” - bazam at Punakha, with a span of 55 meters, will be, considering the applied structural methods, the wooden bridge with the longest unsupported span world wide. She is the prototype of a hybrid construction using a mix of medieval traditional design and very innovative modern technology. With the inauguration of the bazam, his technology developed by Walt+Galmarini for this bazam has a world premiere.

After completing the tendering and concluding the resp. contracts, Fritz Baumgartner started with the construction of the bazam in mid 2006.

One of the crucial and very difficult tasks was to find the required number of suitable 165 Chir Pine trees. Alone 2 dozen trees of 40 meters had to be found for the required number of 25 meters long beams for the upper layers of the cantilever structures on both sides of the river.

After tedious searches, foresters and the ingenious local “Pro Bhutan” site engineer Padam Bahadur Chuwan found these special trees only on mostly steep and inaccessible mountain slopes up to 30 km from Punakha. Apt

shorter trees for the shorter beams were not much easier to be found.

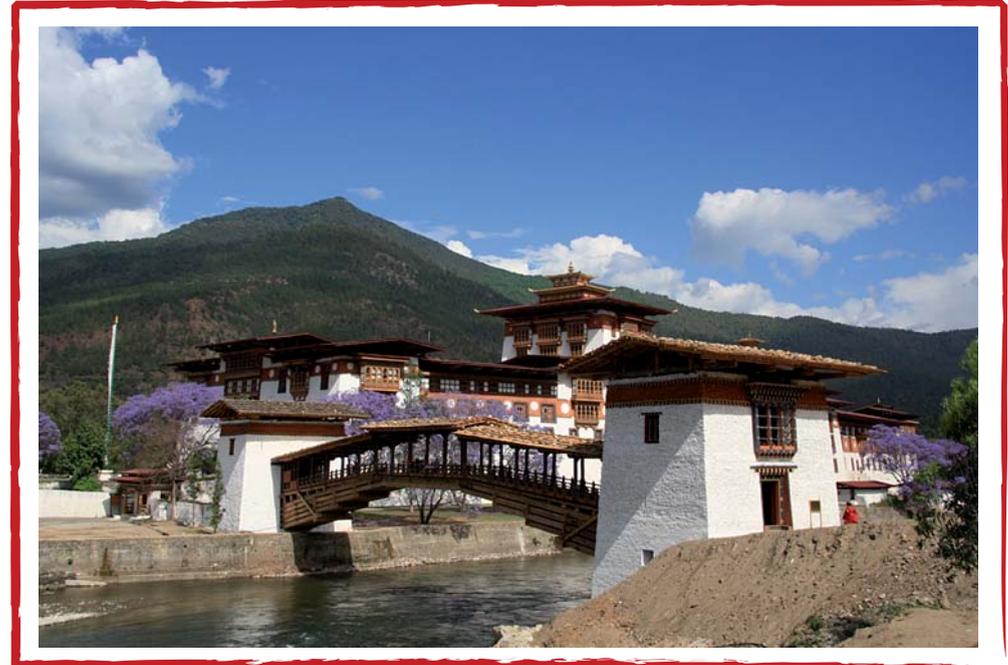
Very challenging and cumbersome was the extraction from the forest: teams of up to 50 men, after felling, had to manually haul and “abseil”, under constant danger for limbs and life, the long trees hundreds of meters down steep slopes. Reaching a river the trees were floated down river, or arriving at a gravel forest road they were lifted on trucks, by hand. The small trucks as only usable on the narrow mountain roads in Bhutan could carry only one of the raw beams, weighing about 2 tons, at the time. Hair needle curves or right angle bridge accesses often forced to unload, transport and re-load, by hand, the beams again on the truck after passing the obstacle. Accidents of the lumber men were, unfortunately, not rare.

At the construction site, after the necessary period of drying, very able Bhutanese carpenters cut and worked, of course by hand, the raw beams to the required length and form to serve as the cantilever beams. With high skill and enthusiasm, these loyal carpenters, always singing, carved and joined with their simple tools the 4 massive gates of the two bridge towers, the sections for the 2 x 55 meters of hand railings, the columns and lintels for the roof of the bazam. They are experienced carpenters as they had worked for the reconstruction of one of the main temples of the Punakha Dzong for the past many years.

A very important task was to fortify the area where the original bridge tower and 20 meters of the bank with thousands of tons of ground were washed away by the 1958 flood. New floods have to be reckoned with because of global warming. The Dzong and the bazam are situated in the “red area” of danger potentially caused by GLOFs (Glacial Lake Outburst Floods).

Therefore, following a specifically developed design by Professor Juerg Speerli of a Technical University near Zurich, the new concrete foundation of the new tower received a special protection; it is lying in the bend of the river where the strongest impact of a flood has to be expected. For this purpose, Fritz Baumgartner and site engineer Padam Chuwan had 20 armed concrete pipes, each 3.5 meters long and weighing 8 tons, cast at the site, placed vertically into the riverbed, filled with gravel. They form a semicircular barrier and serve as support for the platform on which the foundation of the tower is built. 600 “Toskanes” (double-t formed concrete blocks each weighing 700 kg) were cast at the site and placed into the riverbed in front of the pipe barrier. Hundreds of natural boulders each weighing 500 to 1000 kg were piled on top of the “Toskanes” adding to the protection and hiding the ungainly concrete pipes and blocks.

During the construction, in particular while preparing the new foundation of the old bridge tower on the Dzong side which had to be preserved, or while placing the overlong beams into place, almost every day new technical or logistical problems arose and challenged the ingenuity, energy and dedication of everybody involved; from the “Pro Bhutan” staff, in particular, Fritz Baumgartner and site engineer Padam Chuwan, to the contractors like Mr. Chimi Dorji or Mr. Kinga Namgay of Jabab Constructions and especially to his site engineer Ashok Kar who was directing his small army of workers with so much energy and efficiency.



New bridge seen from Punakha village, 10. May 2008

On 10th of May, the sacred Punakha Dzong has regained its full beauty, harmony and spirituality; it was the auspicious day, when the PUNA MOCHHU BAZAM, the cantilever bridge in adapted traditional Bhutanese architecture, was inaugurated by H.E. Jigmi Thinley, Prime Minister of Bhutan, and “Pro Bhutan, Germany” Chairman, German Ambassador (rtd) Harald N. Nestroy.

The Prime Minister praised the bridge saying that for the last half a century, the holy Punakha Dzong, without the bridge, was like a human being without a limb; he emphasized that the new Bazam is a very substantial

contribution to the celebrations of “100 years of Wangchuck Monarchy in 2008” and to the coronation of His Majesty King Jigme Khesar Namgyel Wangchuck in the Punakha Dzong. And that the bazam is a symbol of the deep friendship between the peoples of Bhutan and Germany.

The homepage www.proBhutan.com informs about the activities of „Pro Bhutan e.V.“

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