



## Dharahara: A Multiple Times Earthquake Demolished Monument, Its Conservation Status

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### Abstract

This paper studies the changes that occur during the conservation of earthquake-demolished historical monuments in Nepal, taking “Dharahara” as an example. The tower has suffered extensive damage multiple times due to earthquake occurring in different time periods. Historical monuments respond differently during earthquake depending on the construction technology and materials used. When such monuments are destroyed, alterations in materials and technology are introduced during their reconstruction. The ancient monument Dharahara which was destroyed many times, was examined to understand how it was originally constructed, what materials were used, and what changes have been incorporated in its recent reconstruction. The purpose of this study is to highlight the importance of documenting and preserving Nepal’s unique construction techniques and materials for future generations.

Data were collected through a review of relevant literature and analysis of existing documentaries. Information was also obtained from interviews with two historic researchers, followed by thematic analysis. The data were analyzed using constant comparison and contrast with international charters for conservation and restoration prepared by ICOMOS. Findings reveal that historical structures in Nepal were traditionally built with locally developed materials and techniques. However, modern reconstruction practices increasingly rely on new construction technologies. In the case of Dharahara, its authentic building methods and materials were not retained; only its form and appearance have been restored. Therefore, historical monuments should be thoroughly documented before reconstruction, and restoration efforts should aim to preserve their original features with minimal modification.

**Keywords-** Earthquake, Dharahara, Architecture, Construction, Materials, International charters

## 1. Introduction

### 1.1 Research Background

Nepal is rich in historical heritage structures, which are very important for keeping Nepal's identity alive. One of the authentic legacy destinations of Nepal, Dharahara suffered extensive damage in the 2015

earthquake of Nepal. Dharahara is also known as *Dharwalgriha* in Sanskrit whose literal meaning is white tower. It was built in 1835 A.D. at Sundhara by the then prime minister Bhimsen Thapa for military usage as a watch tower. This nine-storey tower was damaged by the 1934 A.D. earthquake in which only two storeys remained. Rana prime minister Juddha Shumsher reconstructed it to the shape which was again destroyed by the 2015 earthquake. Only the stump of the base had remained which is still preserved. The new replica of Dharahara was started to be built in 2018 and completed in 2021 in a completely different construction technology.

The building construction technology of the original Dharahara was load bearing walls and the materials used in the construction were the locally available materials; *Vajra-Surki* (Brick dust), *Chuna* (Lime), *Maas* (Black lentil) and *Chaaku* (Caramel) along with mud mortar and bricks. This is a very unique combination of materials for construction of such a huge structure. The newly constructed Dharahara tower is of 22 stories and stands 72 meters (236 ft) high with a 48-foot (15 m) foundation. It also has a *gajur* (bronze mast) on its top roof. Its premises has spaces like museum, a garden and a fountain. But it does not have any uniqueness as the old one did since it is made by the common concrete foundation with the concrete frame structure. This is a huge disappointment for the architecture of Nepal. Research needs to be done before the restoration or rebuilding of the historical structures like Dharahara in order to preserve its original identity.

## 1.2 Literature Review

For the literature review, the keywords sorted were "earthquake" and "demolished" and "building" and "materials" and "Dharahara". There were about 43 results in the google scholar site out of which 6 were relevant. Out of them, four studies were carried out in Nepal and the other two were based on the South-Asian cities and all over the world.

The available studies have attempted to show the importance of documenting historical and cultural monuments regarding the recent devastating earthquakes in other parts of the world (Shahrokh Pourbeyranvand). One of the articles has aimed to examine the suitability of preventive heritage preservation in Southeast Asia, and explore the use of digitalization as a prospective alternative to traditional preservation, or oblivion (David Ocón, 2021). The studies have intended to identify conceptual and institutional constraints and to recommend a way for the conservation of all national level cultural monuments and sites in Nepal (Dr. Chandra Bahadur Shrestha, Mr. Bishma Banskota). The studies have not only highlighted the heritage activism for post-earthquake reconstruction (Sanjaya Uprety and Barsha Shrestha) but also aimed to investigate (Apil KC, Keshab Sharma & Bigul Pokharel) and access (Mehdi Zarel, Alireza Saeedi, Farnaz Kamranzad, Parvaneh Pishnamazi) the performance of heritage structures and disaster management with emergency responses respectively during 2015 earthquake of Nepal. All these articles impart the same thing that the cultural and historical monuments should be documented in order to preserve them by the use of various strengthening techniques.

All the six articles were collected from the method of using satellite imagery for historic monument monitoring, digitalization, interviews of informants, the event analysis method, field reconnaissance and observational assessments respectively.

The first article uncovered that some of the monuments have been reconstructed in an inappropriate manner, highlighting the need to document monuments at risk of earthquakes. It also clarified the importance of access to and use of remote sensing data, including satellite imagery, in the management, preservation and restoration of historical monuments. The second article suggested that analyses on the application of new digital technologies in the preservation of endangered cultural heritage are needed. This is particularly

urgent in urban spaces which are expanding rapidly, often engulfing their cultural heritage with that growth. The third article mentioned that the respective ministry of the government as well as the private sector should pay attention towards paving the way for the sustainability of heritage monuments and sites which ultimately will lead towards preservation of national identity. The fourth article concluded that heritage activism can serve as an important means of indirect public participation to influence the post-disaster conservation policies of heritage sites in developing countries like Nepal. The fifth article found that the performance of heritage structures is influenced by the combination of several factors, including structural and architecture type, configuration and structural deficiency, nearby location impacts and ground-motion characteristics, age and maintenance level, building materials quality, etc. Moreover, the states of disaster management, logistics were assessed and the emergency and disaster management measures were evaluated by the sixth article. Overall, this literature unveiled that for the identity of the nation, the preservation of the historical structures is the most important work that the respective governmental as well as private departments should carry out by the means of different new technologies and innovations, yet preserving their original identity.

### **1.3 Research Gap**

During the literature review, it was found that important details about the Dharahara are missing. Information about the exact materials used in the construction of the original Dharahara is lacking. Additionally, detailed historical records and facts about its initial construction are not available. Although some information about the new Dharahara has been found, a complete understanding of the materials and methods used in its construction has not been achieved. To address these gaps, more data needs to be collected. Historical documents should be examined to uncover more details about the original Dharahara construction, and comprehensive information about the materials and techniques used in the new Dharahara should be gathered. By doing so, a better understanding of both the historical and modern aspects of this important structure will be achieved.

## **2. Research Methodology**

The research was done to know more about the ancient monument Dharahara which has recently been reconstructed in a completely different way. A case study method of research was done where the site was the premises of Dharahara and the study entities were the relevant and available documents as well as people's statements. For the study, the Department of Archeology of Nepal located at Kathmandu was visited and an old document about the information of the original Dharahara was found. For further collection, another important report written by an architect Timila Dangol was found which was very informative. Additionally, a documentary regarding the legacy of Dharahara was found which was also analyzed for more information. For further data collection about the new Dharahara, the available articles from the newspapers were analyzed and an animated video of the premises of the new Dharahara was analyzed. Hence, the tentative information for analyzing the data through the comparison with the international charters was found.

## **3. Data Collection**

Dharahara has been built in three different places in different time periods. Let us name them Dharahara1, Dharahara2 and Dharahara3 for convenience.

## Dharahara1



**Figure 1:** The two Dharahara before 1834 A.D. earthquake

Source: Sushil Bikram Thapa, 6th generation of Ranabir Singh Thapa (youngest brother of Bhimsen Thapa)

The first Dharahara was constructed in 1824 A.D. by the then Prime Minister Bhimsen Thapa for himself at his residence, Janarala Bagh which is located at south-east of Sundhara, near Bhotebahal of Kathmandu. It was an 11 storied tower which got torn into half by 1834 A.D. earthquake. This affected tower completely fell to the ground by the 1934 A.D. earthquake which was never reconstructed and disappeared from the scene.

## Dharahara2

The second Dharahara, the one whose remains we can still see beside the newly constructed Dharahara was built in 1826 A.D. by Bhimsen Thapa on the order of queen Lalit Tripura Sundari at Sundhara of Kathmandu. It was not affected by the 1834 A.D. earthquake. Built originally 11 storey, the tower remained as only 2 storey on the earthquake of January 15, 1934 A.D. The prime minister of that time, Juddha Shumsher renovated it to its previous form. Similarly, it was destroyed by the 2015 A.D. earthquake leaving behind the ground floor.

### Site and Context

It had captured the essence of its time and place. It was constructed with military needs in mind, and because of its unique design, it piques people's interests in art, culture, and design. It symbolized the religions of Islam, Hinduism, and Christianity. It was based on Mugal architecture and the surrounding boundary walls were of European design since Bhimsen Thapa was highly influenced by the architecture over the different places of the world of that time. It symbolized the religions of Islam, Hinduism, and Christianity. Previously, this location served as a panorama exploring point for the Kathmandu valley. It featured the golden spout "Sundhara" in its surroundings, which was a significant tourist destination. But in modern times, it has dried up and lost significance due to a severe water shortage and a lack of water conservation.

### Religious Aspect

On the ninth storey was where the temple was located. There was a statue of Lord Shiva with Ganesh and Kumar made from black limestone. After ascending the 213 steps from the bottom level, this was the only

story with a landing. Lord Ganesh and Kumar figurines were affixed to the parapet wall. The level and stairs used to be separated by this parapet wall.

#### Architectural Characteristics

Dharahara, which was built in a postmodern style with significant Mughal and European influences, was a spotless representation of workmanship and culture. It was 250 feet tall and used to stand at 6.1m plinth. The approach to the main entryway consisted of 9 big steps, each measuring 65 cm in tread. These stairs were constructed from stone. Just over the main entry door were two metal inscriptions written in Nepali. These inscriptions included names of individuals, the date of conservation, and other information.

It had a bronze pinnacle at the top. The domical roof was made up of bricks cladding one above the other. The mortar was mainly the lime *surkhi*, black pearls and "*chaku*". There were timber struts and metal rods supporting the wall from the central shaft. The construction technology of the roof structure was different from the traditional construction method of Nepal. The single structural component that supported the whole construction was the central shaft. It was constructed with brick and lime *surkhi* mortar, as well as black pearls and "*chaku*". It had a pendulum-like effect since it was supported by the foundation. The thickness of the wall decreased from 72 inches at the base to 29 inches at the top of the tower. It was made up of brick and mortar of lime *surkhi*, black pearls and "*chaku*" with an external finish of white lime as a paint.

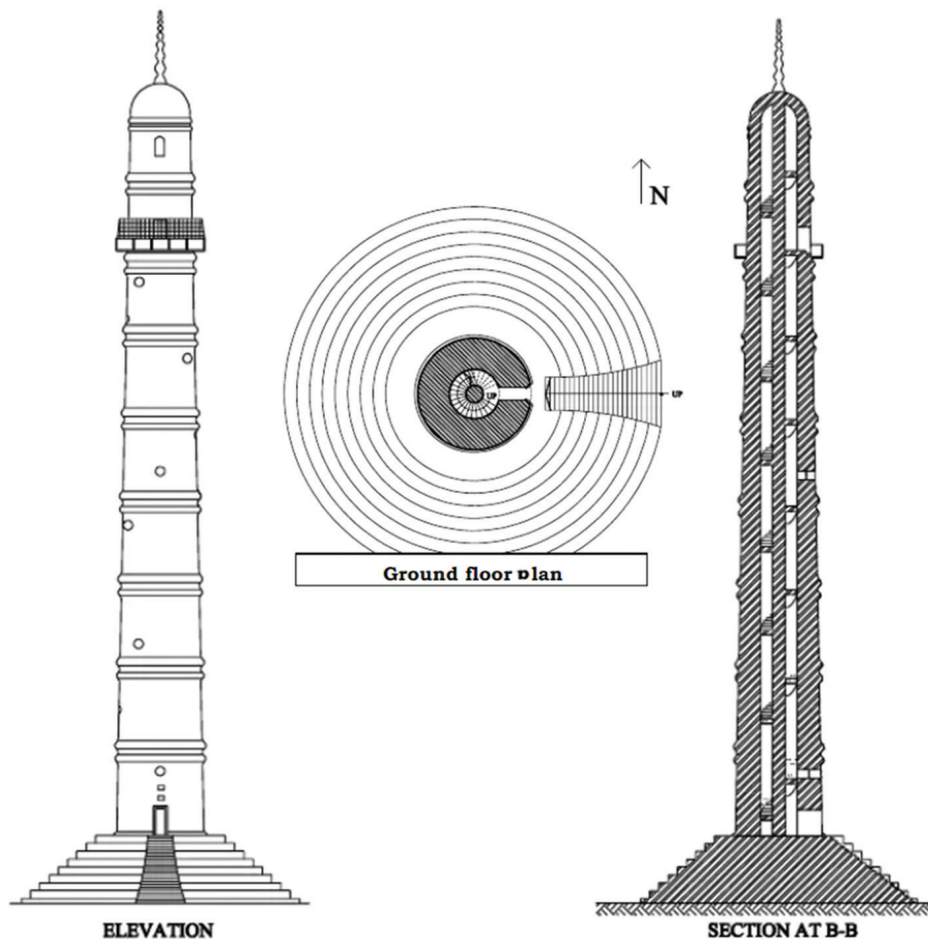


Figure 2: Architectural Drawings of Dharahara<sup>2</sup>

Source: Timila Dangol, 2016, Report on Dharahara

<https://www.scribd.com/document/334399189/Report-on-Dharahara>

Though the horizontal cornices on the tower's external surfaces gave the impression that there were storeys inside, the internal spiral staircase with its 213 steps led all the way to the top without any landing levels or storeys except for a projecting circular balcony on the 7th floor at the 188th step which was protected by the iron railings. The central shaft of the structure and the load-bearing wall supported the staircase. The diameter of the core and the breadth of the spiral stair were both 3 feet wide. The sectional steel beams, such as the balcony projection and spiral across the core and the outside wall to hold the spiral stair, had been widely employed in the building. The windows provided were circular, and the single door was the main entry door, which was built of timber shutters. The door frame's external stone components were extensively carved with flower designs, geometric forms, and human figures. The wooden shutter was grooved into the wooden frame of the door.

Dharahara was surrounded by a circular boundary wall built of brick with lime *surkhi* and mud mortar. The European-style wall contained tower-like structures in between the sloping form, similar to the smaller form of European castle walls. On this border wall, various geometric shapes and forms were created. On the main entrance area of the wall, there were various forms of punctures. It was perfectly symmetrical, complementing the monument from every angle. The main entry piece was bigger and more ornamental than the rest of the boundary wall.

The monument was renovated in 1936 AD by Prime Minister Juddha Shumsher after the tower toppled to the second story in the 1934 earthquake. The tower was proportionately shortened from its original height during reconstruction, but the vertical division of the tower was preserved. On the seventh cornice height, a projecting balcony was constructed.

### Dharahara3

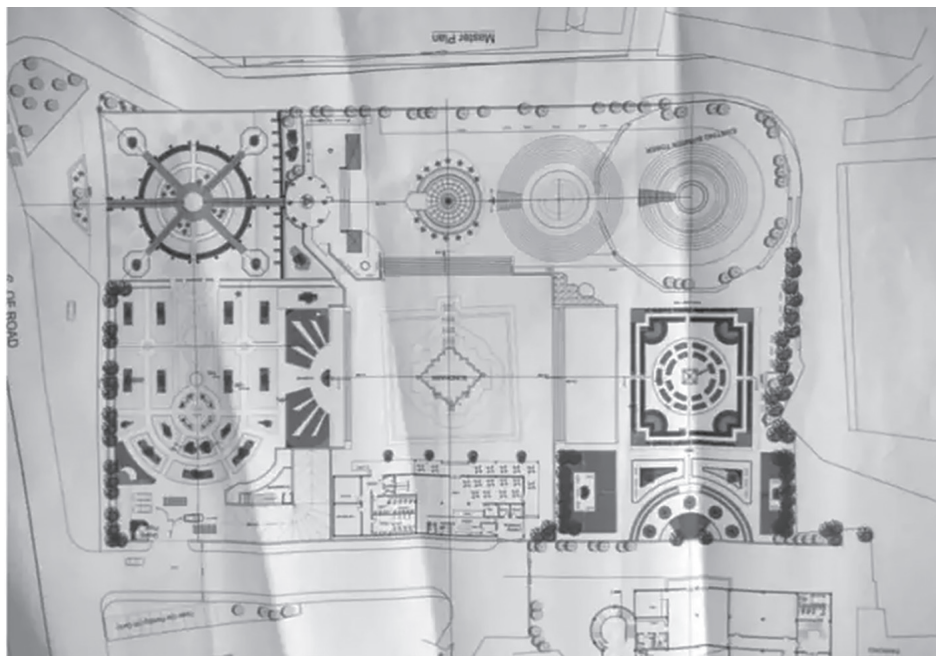


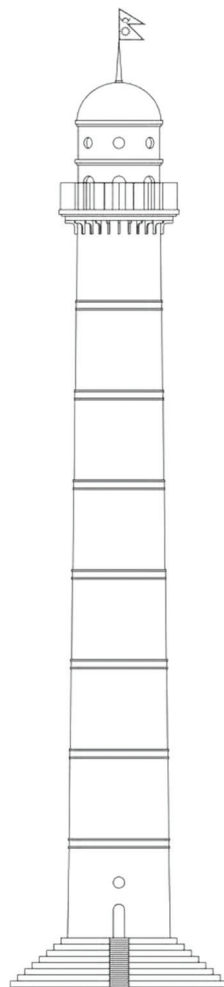
Figure 3: Master Plan of Dharahara3

Source:[https://engineerspost.com/2021/04/24/8936/?fbclid=IwAR3NShEvWR0eXa95yHD0mx4SuLpy-hD7AcqWHvaYf8\\_MI16O2S9Lj71QETk4](https://engineerspost.com/2021/04/24/8936/?fbclid=IwAR3NShEvWR0eXa95yHD0mx4SuLpy-hD7AcqWHvaYf8_MI16O2S9Lj71QETk4)

After the earthquake hit Nepal at 2015 A.D. April 25th, the Dharahara<sup>2</sup> collapsed and the 3rd Dharahara was constructed by Nepal Government through Raman Construction Pvt. Ltd. just besides the remains of the old Dharahara. It was designed by Ar. Bishnu Panthee. The premises of Dharahara was open for the general public since Ashoj 3<sup>rd</sup> 2081 B.S. The construction work had started on the order of the then prime minister Khadga Prasad Oli from October 2018, and it was officially inaugurated on 24 April 2021, just a day before the sixth anniversary of the 2015 A.D. earthquake.

The 3rd Dharahara looks similar to the old one just in appearance, however, it has been equipped with modern amenities. It is 72 m tall and has a 15 m foundation. It is 11-storeys when seen from outside and 21-storeyed from the inside. To make it more accessible, it includes two lifts with underground parking that has the capacity for 350 four-wheelers and 6,000 two-wheelers.

The construction materials that have been used are cement mortar with masonry for the walls and concrete, sand, aggregate, bricks for the foundation. The construction technology is Reinforced Cement Concrete (RCC) frame structure.



**Figure 4:** Elevation

This new Dharahara is earthquake resistant and can sustain up to 8 magnitude earthquakes. It has been made with completely new construction technology due to which it has been criticized by many people and called “jhilke tower”, “seto tower” and claimed that it only fulfills the money-making ambitions but not the historical and cultural significance since it does not have any essence of the original tower. The designer and principal architect had explained that the designs are refined by the passing of time and innovations are made in it.



**Figure 5:** The proposed aerial view of Dharahara and its premises

Source: <https://kathmandupost.com/miscellaneous/2016/08/01/designs-of-new-dharahara-made-public>

#### 4. Data Analysis

The collected data was analyzed using constant comparison and contrast with the standard data. The key points of multiple reconstructions of the Dharahara were compared to the existing international charters for conservation and restoration, prepared by The International Council on Monuments and Sites (ICOMOS). The ICOMOS is a non-governmental organization which was founded in 1965 A.D. after the adoption of the Venice Charter, in order to promote the doctrine and the techniques of conservation. These charters are the guide to any conservation works of a monumental architectural space which can be building, landscape or urban space.

S. N.	Re/construction	Original Dharahara <sup>2</sup>	Reconstructed Dharahara <sup>2</sup>	Dharahara <sup>3</sup>	Standard International Charters
1	Date	1826 A.D.	After 1934 A.D. earthquake, 1936 AD.	After 2015 A.D. earthquake, October 2018-present	
2	Re/constructed by	Bhimsen Thapa	Juddha Shumsher J.B.R.	Khadga Prasad Oli	
3	Architecture				
a	Storey	11	9	11 from outside, 21 from inside	
b	Height	Not available	Proportionately shortened, 76.2m with 6.1m plinth	72m with 15m foundation	Venice Charter 1964 (article6)- original scale must be preserved
c	Scale		Proportionately scaled down	Highly scaled up	
d	Materials				
	Brick	Sun-dried bricks, burnt bricks	Reuse of the bricks from the remains of the original	Kiln burnt bricks	Venice Charter (article9) & Built vernacular heritage charter 1999- the aim of the process of restoration is to preserve and reveal the aesthetic and historic value of the monument and is based on respect for original material and authentic documents
	Mortar	Lime surkhi+ black pearls+ chaku	Lime surkhi+ black pearls+ chaku	Cement+ sand+ aggregate	
	Stone	Small rough stones	Small rough stones	Big stones	
	External finish	No finish	White lime	Lime plaster with white paint	
e	Foundation	Stone foundation	Stone foundation	Stone foundation, 15m	
f	Plinth	Not available	9 big steps, 65 cm tread	8 steps	
g	Walls	Tapered from bottom to top	Tapered from bottom to top, 72 inches at base to 29 inches at top	Very slightly tapered from bottom to top, 15 inches at the bottom	Venice Charter 1964 (article6)- no new modification which would alter the relations of mass and color must be allowed

S. N.	Re/ construction	Original Dharahara <sup>2</sup>	Reconstructed Dharahara <sup>2</sup>	Dharahara <sup>3</sup>	Standard International Charters
h	Central shaft	Sun Dried bricks with mortar (lime surkhi+ black pearls+ chaku)	Sun Dried bricks with mortar (lime surkhi+ black pearls+ chaku) with white lime finish	Kiln burnt bricks with mortar (cement+ sand+ aggregate) with white paint finish	
i	Roof	Supported by foundation	Supported by foundation	No central shaft	
j	Style & Appearance	Domical	Domical with brick cladding having bronze gajur	Domical with the original gajur	Venice charter 1964 (article1)- concept of a historic monument embraces not only the single architectural work but also the urban or rural setting in which it is found as the evidence of a particular civilization, a significant development or a historic event.
4	Structure	Postmodern, Mugal and European influence	Postmodern, Mugal and European influence	Postmodern, Mugal and European influence	Conservation and structural restoration of architectural heritage charter 2003- the value of architectural heritage is not only in its appearance, but also in the integrity of all its components as a unique product of the specific building technology of its time
5	Use value	Load bearing walls supported by foundation	Load bearing walls supported by the central shaft (through the timber struts and metal rods) supported by the foundation (pendulum effect)	RCC frame structure with beams transferring loads to columns to foundation	Venice charter 1964 (article5)- conservation of monuments is always facilitated by making use of them for some socially useful purpose, but it must not change the lay-out or decoration of the building.
6	Conservation Approach	Important announcements	Important announcements and for the panoramic view of Kathmandu valley through the balcony	public space consisting programs like museum, exhibition hall, shops,etc	
			Renovation of the first 2 storeys, restoration of 7 storeys, addition of projecting balcony at 7 <sup>th</sup> cornice level	New construction	

According to article 2 of Venice charter 1964, the conservation and restoration of monuments must have recourse to all the sciences and techniques which can contribute to the study and safeguarding of the

architectural heritage. During the preservation before the 2015 A.D. earthquake, I-section steel beams were used heavily in the balcony spirals across the core and at the outer wall to hold the spiral stair.

According to article 1 of Venice charter 1964, the concept of a historic monument embraces not only the single architectural work but also the urban or rural setting in which it is found the evidence of a particular civilization, a significant development or a historic event. Dharahara was designed to make important announcements in the past since there were not any high-rise buildings in the surrounding area but the Dharahara that stands today is early equal to the high-rise buildings of that area. Hence, the urban setting has shattered now which has ruined the beauty and significance of the monument. Similarly, according to article 5, the conservation of monuments is always facilitated by making use of them for some socially useful purpose. Hence, this type of use is desirable but it must not change the layout or decoration of the building. It is inside these limits as it were that adjustments requested by a alter of work ought to be imagined and may be allowed. The layout of the new Dharahara has been changed drastically with the new commercial programs which is not a kind of conservation technique. The article 6 of the same charter mentions that the conservation of a monument implies preserving a setting which is not out of scale. Wherever the conventional setting exists, it must be kept. No modern development, pulverization or adjustment which would change the relations of mass and color must be permitted. The scale of the Dharahara has not been preserved. The diameter is larger than the original diameter and so the cornice levels are. The original tapered form has not also been maintained. It is only slightly tapered which is not even visible from our eye. It looks completely bold and dull. This can also be understood in relation to the principles for the analysis, conservation and structural restoration of architectural heritage 2003 which clarifies that the value of architectural heritage isn't as it were in its appearance, but too within the keenness of all its components as a one-of-a-kind item of the particular building technology of its time. In particular the removal of the inner structures maintaining only the façades does not fit the conservation criteria.

The article 9 of Venice charter and the guidelines mentioned on the charter of built vernacular heritage 1999 has not been followed by the reconstruction of the new Dharahara which says that the aim of the process of restoration 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 also says that any extra work which is indispensable must be distinct from the architectural composition and must bear a contemporary stamp but the extra flashiness of the new reconstruction does not have any contemporary essence.

According to Principle 1 of the 1999 Cultural Tourism Charter, conservation should offer appropriate and well-managed opportunities for members of the host community and tourists to experience and appreciate the community's heritage and culture firsthand. The culture of viewing important jatras, viewing the panoramic view of the Kathmandu valley has been preserved in the new Dharahara. A balcony has been provided which aids in enjoying the view.

Hence, the conservation approach of both renovation and reconstruction of Dharahara was analyzed.

## **5. Results and Discussions**

The architectural changes that have taken place in Dharahara are the changes in the construction materials, construction technology, scale, use value of the building and the context of the building which are the result of the reconstruction, renovation and addition throughout the time.

Through the method of observational assessments, interviews, historical as well as recent articles and the method of constant comparison and contrast for data analysis, the main thing which was figured out was the

conservation approach prepared by the ICOMOS was found to be not executed in the recent reconstruction of Dharahara.

## 6. Conclusion and Recommendations

The conservation of historically important monuments must be carried out by referring to the standard guidelines of preservation. The use value of the monument must be preserved yet respecting the present commercial context. In the name of strengthening material, completely new materials must not be used. The material which has been used in recent reconstruction is cement whose life is just a maximum of 50 years. What after 50 years? The original materials had survived more than that. So, the designing of the monument is a very big responsibility and it must be beautifully held keeping in mind that our monuments hold our identity and they are the monuments which help in gaining the fame of our unique architecture.

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