

Understanding the change in construction technology of traditional vernacular buildings of Dhulikhel.



Buddha Shrestha, Ramesh Adhikari, Santosh Chaudhary
Kathmandu University, Nepal
buddha.shrestha@ku.edu.np

ABSTRACT

The paper documents the traditional buildings with high heritage value to understand the changes occurred in building forms, plans, construction technology and building materials. The methodology includes the first hand data acquisition from the site. Two buildings with high heritage values are selected for the study. The existing condition of the selected buildings were recorded with measured drawings, photographs and sketches. The information about the past condition of the building are discovered by the available photographs and interview with the house owners. The findings revealed that in all houses the external load bearing wall were left intact, while the internal non load bearing partition walls were added to meet the new functions. Toilet is added in the Ground floor. The two way slope roof constructed from wooden truss and clay tile roofing was replaced with the corrugated metal sheet roof. In some cases the two way slope is even reduced to one way slope and the height of top floor was increased adding some layers of brick wall.

Keywords: Traditional building, construction technology, building material, vernacular buildings.

1 INTRODUCTION

The traditional Newari towns and settlements hold the unique character of their own Architectural vocabulary. The settlements are divided by wide main routes in cardinal direction. These routes are also the festival and Jatra routes which again branches into narrow alleys. The main street and the narrow alleys are generally open and interconnected courtyards in which the daily activities and the rituals took place. The several storied brick houses and the temples on the higher plinth are built around the network of these brick paved alleys and streets [1]. Due to various factors such as modernization, migration, globalization these traditional settlements and buildings are undergoing changes in form, construction technology as well as functions. These changes need to be understood in a comprehensive manner, to be able to evolve a holistic view on the issue of changes and offer an opportunity to reinterpret the tradition while meeting the contemporary needs of the settlements. The traditional newari town Dhulikhel in the Kavre district has been chosen to understand these changes of vernacular buildings.

1.1 Overview and Historical Background

Dhulikhel is the administrative center of Kavrepalanchok District which is located 30 km east of Kathmandu (Fig. 1) and situated 1,550 m above sea level along the Araniko Highway. [2]

The town is situated on an ancient trade route to Tibet. Dhulikhel has been long considered the gateway to Tibet. Besides the spectacular Himalayan view, it is famous for its cultural heritage and traditional Newari settlement. In particular, it was the traditional domestic dwelling of the ethnic Newars- groomed to practical and symbolic unity of the purposes over the centuries.

The known history of the village has been traced back to the 5th century. Dhulikhel is said to have been a settlement established in the Palanchowk hills by goddess bijayaswori Bhagawati during Kirat period, in the region of the Licchavi King Mandeva (AD442-483). The evidence for this is found in an inscription from 481 AD (Kolligs, 2002). Another History ascribes the origin of the organized settlement in this region to Anand Dev, the Malla King of “Nepal Mandala”, Who clustered together with the far-spread patchy habitation which led to the establishment of Banepa Saat gaun(seven valleys)about 700 years ago. Dhulikhel is incorporated as one of the valleys.Two century later son of Yaksha Malla split the Kingdom into three states, kathmandu, Bhaktapur and Lalitpur, in an attempt to region independently. Dhulikhel, which lies to the east of Bhaktapur,was included in this state (Glimpse of Dhulikhel, 2015). In October AD 1877, Dhulikhel was incorporated into the greater Nepal by King Prithvi Narayan Shah.

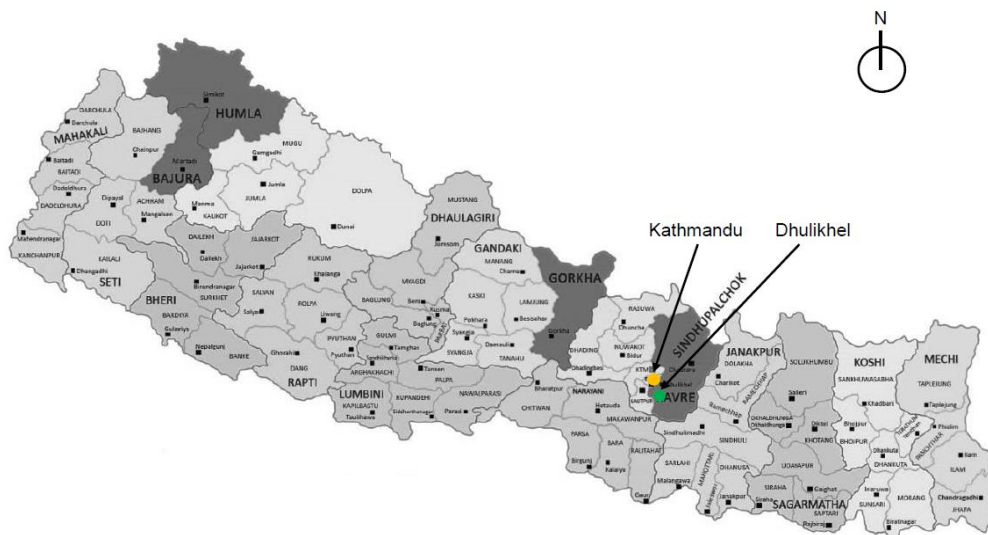


Figure 1. Map of Nepal, Location of Dhulikhel
Source: <http://www.holidaytoursnepal.com/nepal>

1.2 The Urban Setting

There are four main routes to enter the city (Fig. 2). Each route starts from four cardinal directions east, west, north and south and ends at a common place of Narayan Temple square. The route starting from each direction is believed to be an ancient philosophy of town planning.

1.3 Migration, Modernization and Earthquake

At present it has been a challenge to preserve the old traditional newari style houses in the old town. The damaging effect of rapid modernisation upon the physical cultural heritage of dhulikhel have been exacerbated by a lack of education and awareness. The local citizens feel little responsibility or inclination to preserve their historical buildings. In part this is due to the low level of cultural awareness. Unlike the temples, these dwelling do not fall under the existing government legislation on monuments. Thus, no attempts had been made by the government also to preserve it. Moreover; the recent earthquake of 2015 April 25th has made the buildings more vulnerable. So, the people have started to dismantle their old building and started to construct a new R.C.C structure.



Figure 2. Map of old town Dhulikhel showing ancient route
 Source: Hari Bhakta Khoju

Following are some of the challenges that are faced to conserve the old buildings:

- Earlier, most people of Dhulikhel engaged themselves in agriculture. As the population grew the agricultural produce was not sufficient hence the people travelled to various places for business which even extended up to India. Gradually the working age of Dhulikhel migrated to other cities for business and the elderly, women and the children remained back in Dhulikhel.
- The people of Dhulikhel are mostly businessmen who have their businesses in other cities and visit the town only during festivals. Nowadays some of the families have stopped visiting the town even during major festivals like Dashain and Tihar. Hence the old buildings in Dhulikhel are neglected as they are left uninhabited.
- The other factor is the separation of the joint family system. Once the joint family gets separated the old buildings also get divided amongst the heirs of the property. No member wants to sacrifice their ancestral property hence the buildings get vertically divided.

People of Dhulikhel though they are concerned about safeguarding the town but due to lack of resources both financial and technical they have not been able to preserve the old buildings.

After the devastating earthquake of 25th April & 12th May 2015, the people are scared to reside in the old structure and have started to demolish them and reconstruct in modern ways.

2 TYPICAL TRADITIONAL NEWARI BUILDING

The average newari house is rectangular in plan about 5-6 m in depth and 4-8 m in length. The universal feature of the building is vertical room arrangements, which is independent of the size of the houses. Generally the building is three storied with the two way slope roof along the longer side of the building. The two storied building is also found among the poorer inhabitants on the periphery of the town and four storied buildings are in the center of the city [1].

These houses are inhabited by nuclear or multiple family members. In most of the cases the front facade is connected to an alley or main street and the back facade opens up in a courtyard through the door. As the size, location and other facilities of the rooms offer certain limitations on their

usages, the courtyard becomes a major component of the house itself. It became a playground, washing area, grain drying space and other various multipurpose spaces.

This rectangular newari house is divided into two bays by a middle spine wall parallel to the longer side. The rows of wooden columns frequently replace the part of the front wall, opening the ground floor to the street (Fig. 3). The back rooms are a storage room, workshop etc open to the courtyard. The ground floor is known as Chayali.

Generally a narrow single flight wooden staircase gives access to the upper storeys. The first floor (Matan = Middle section) is normally used as sleeping spaces. Depending upon the size of the house, the two rooms are further divided by either brick wall or light timber partition to form sleeping cabins for family members [5].

The second floor known as (Chota = Upper layer) in three storey houses are used as living and family areas. The central wall is replaced by rows of twin columns to create the larger hall space. The windows at the front and the rear wall, particularly the large SanJhya, provide enough light and make these areas the favorite space for various types of activities.

The third storey (Baiga = half or small storey) attic space in a three story house is used as kitchen and religious space. Family shrine normally known as a pooja room is also placed on this floor. The central spine wall is also replaced by the row of columns similar to the second floor to create more flexible spaces.

The water for drinking and for other various purposes are collected from public/private wells or fountains located in each sector of the settlement. The toilets, formally considered as the unhygienic and unclean space are not accommodated inside the house. The children used the street or open places, while womens and mens used the segregate place, which are the narrow alleys hidden behind the walls. These spaces are found in every town district or on the periphery of the bigger settlement.

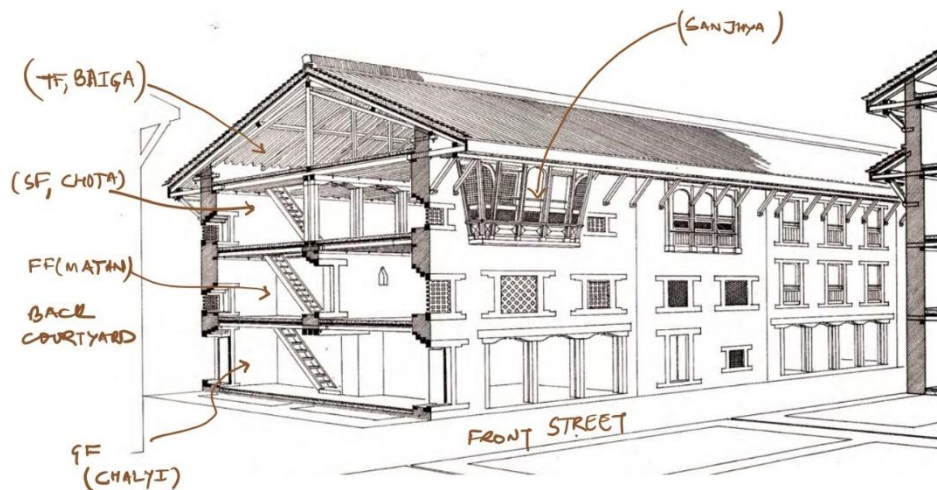


Figure 3. Sketch showing standard accomodation

3 THE TRADITIONAL DWELLING OF DHULIKHEL

A building (Fig. 4) located in the core of the traditional settlement is chosen to conduct this study. This building is chosen because it is more than 50 years old, and the architectural characteristics seem quite intact in the facade and planning well except some remarkable changes in the top storey. This building represents common building typology of that period which undergoes some changes later to accommodate modern facilities and requirements. The digitized replica shown in Fig. 5 represents the original form of the studied building.



Figure 4. Traditional building for study.



Figure 5. Replica image of studied building.

4 OBSERVING THE CHANGES

The remarkable changes that are observed in the traditional building are the addition of a toilet in the ground floor. The toilet is added as a separate structure on the left side of the back of the house. The front facade and the inner layout of the ground floor were kept intact and the front bay toward the street is still used as the shop (Fig. 6)

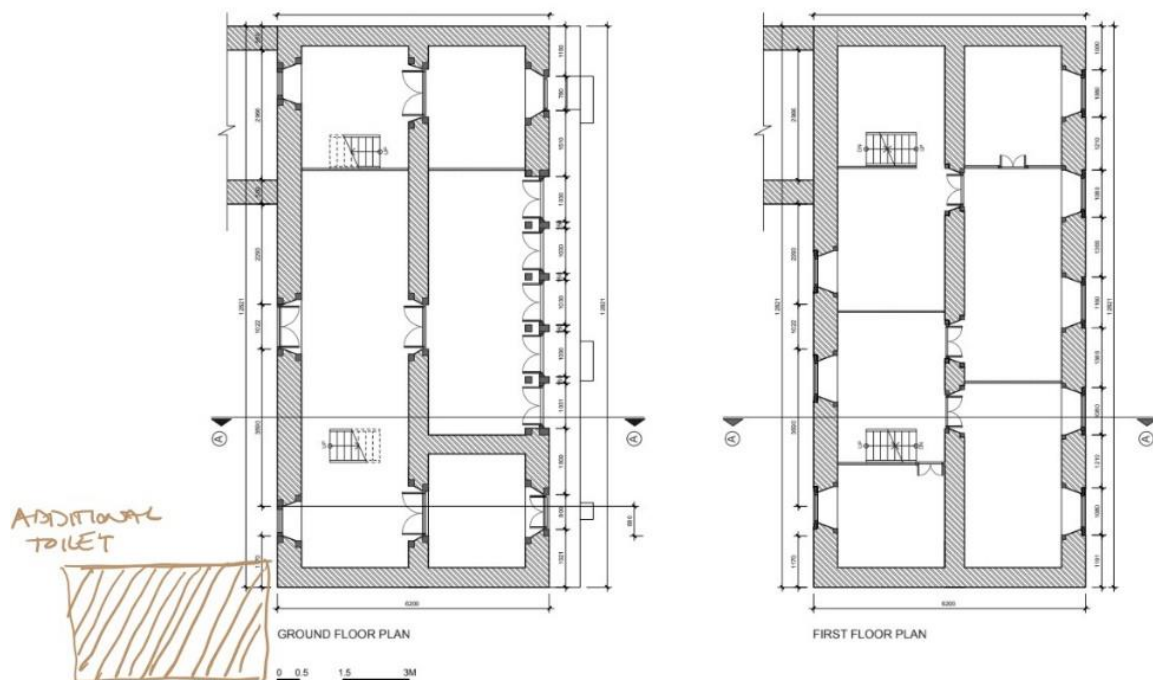


Figure 6. Observed changes in the traditional buildings at Ground and First Floor Levels

There were no changes observed in the first and second floor. The room and other spaces layout remain similar to the typical urban newari houses. (Fig. 6)

While major change was observed in the second floor. The function remains the same as the cooking space and pooja (worshipping) space. However, the two way clay tile (jhingati) [4] sloped roof was replaced by the single slope corrugated roof (Fig.). Moreover, the small balcony was also added for washing dishes on the back wall which was an unusual component for the traditional layout.

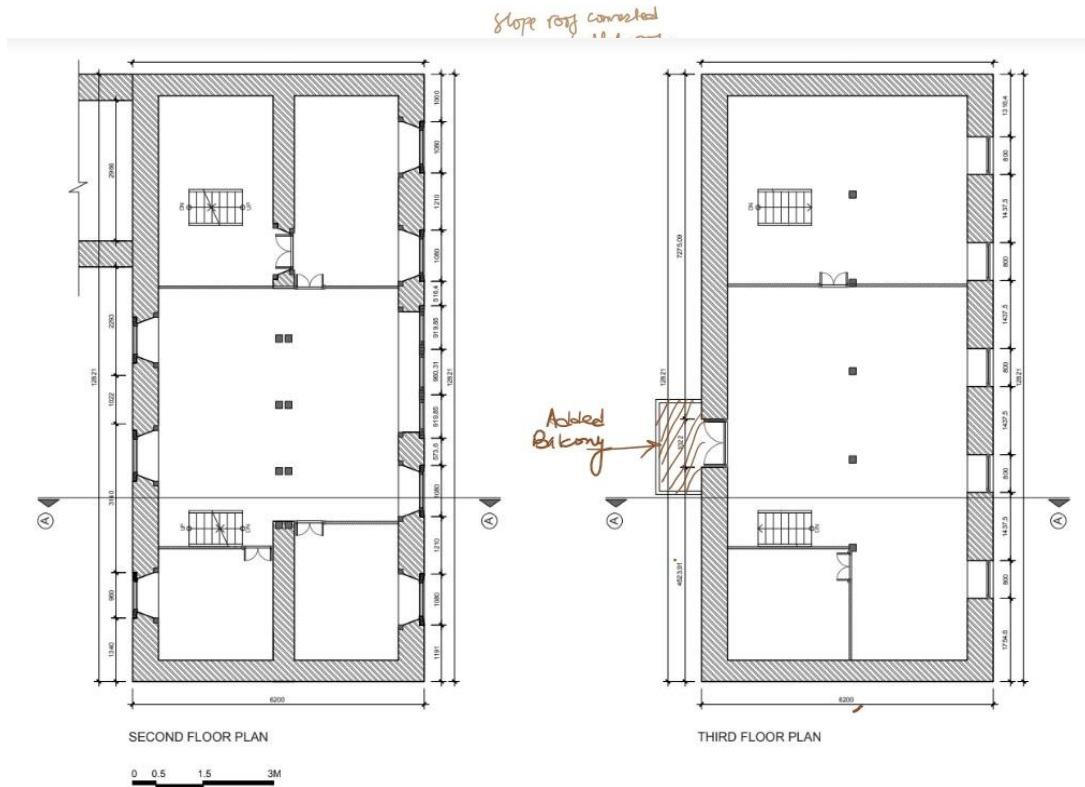


Figure 7. Observed changes in the traditional buildings at Second and Third Floor Levels

The height of the exterior wall was increased in order to achieve more head space and also to incorporate a small window on the front facade (Fig. 8). As the roofing clay tiled roof was replaced by the corrugated sheet roofing, the size and the span of the wooden members were reduced considerably.

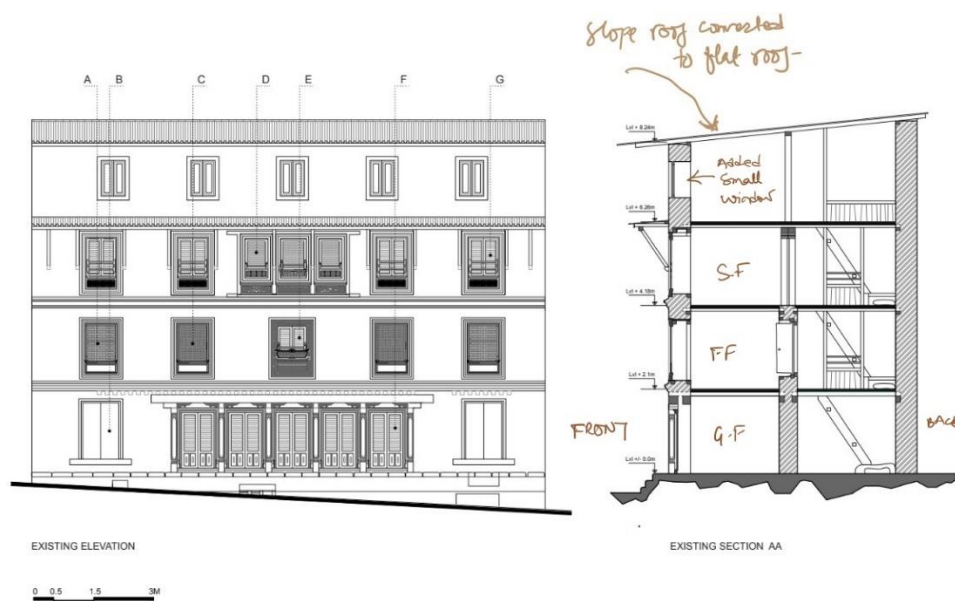


Figure 8. Elevation and section of observed changes in roof and attic wall in the traditional building.

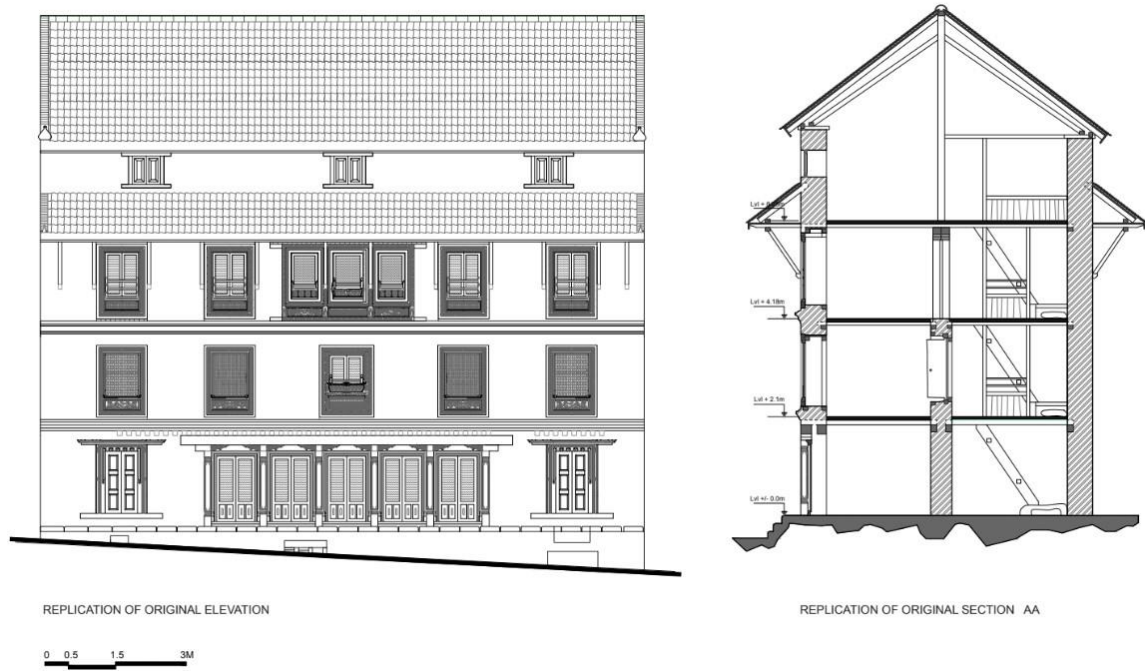


Figure 9. Original elevation and section in the traditional building.

5 CONCLUSION

As the lifestyle and the occupation changed, the traditional building were not able to meet the various spaces demanded by changed life style. So inhabitants started to transform their houses as per contemporary need and demand. There were not significant transformation observed in living and sleeping spaces. However, the addition and toilet inside or annex to house is the remarkable changes seen in the traditional building.

The major reasons behind replacement of the traditional two way clay tiled slope roof with single sloped corrugated sheet roof is due to change in cooking and dinning habit. In former time the food were prepared in primitive clay oven, locally known as *chulo* with fire wood by seating on wooden plank (*Pidka*). Moreover, people ate the foods seating on the locally woven floor mat. As the gas stoves and dinning table were introduced, the low height attic floor became inappropriate to do activities in standing position. So, the extra wall were added raise the height of top floor.

The rise in the height of wall also affect the roofing material and its construction technology. The clay tiles roof became very heavy and the increased height made it even unstable. There for it was replaced with the light weight corrugate sheet as the pragmatic solution. Moreover, the recurring small and large magnitude earthquakes became strong reasons to replace the two way claytiled slop roof.

Looking on these changes what we conclude is the major changes are made in adding toilet and Kitchen spaces. This also shows the change of lifestyle and awareness of people toward sanitary hygiene. As we know that the changes are inevitable, thus these changes need to be understood in a comprehensive manner, to be able to evolve a holistic view on the issue of changes and offer an opportunity to reinterpret the tradition while meeting the contemporary needs of the settlements.

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