

RENOVATION AND RESTORATION OF OLD BUILDINGS IN SRI LANKA

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Abstract

Sri Lanka has a great history about man- made structures. Most of the prestigious structures such as the palaces and buildings for Maha sanga were built with stone, clay bricks and timber. The dwellings of average people may have built using perishable material such as clay and timber leaving no traces.

Portuguese established in 1505 and settled in Colombo after their second visit in 1517. It was only after peace was established on the south western coast in 1594 and north western coast in 1618 that substantial Portuguese buildings worthy of the name of Architecture were built. They were military forts and churches of Catholic missionaries. The Dutch (1656- 1796) who took over in 1656 converted a lot of Portuguese buildings for their uses and in the later part of their period they built with their characters. The British occupied in 1796 but the true British styled buildings were erected after the first decade of 19th century. This will be discussed in detail under the history of buildings.

The nineteenth century was a great period for building construction. The industrial revolution influenced the building construction by introducing new materials and technology.

Most of the old buildings which were constructed in Sri Lanka after the 19th century, have built with new materials such as rolled steel and reinforced concrete.

Restoration process of ancient buildings should be approached after studying the design concepts, building characters, structural formations, materials used, durability of elements of the building ...etc.

The structural drawings are not available in those buildings and renovations or restoration has to be done without un-stabilizing the supporting systems.

The experience gained by doing renovation and restoration works in different parts of Sri Lanka such as Hanthana (central hills), Galle fort, Kekanadura (, down south) and in Colombo, will be discussed in this article. The technology, materials used ,...etc were not similar in those buildings due to topography, availability of space and construction materials.

1. INTRODUCTION

Renovation is the act of improving by renewing and restoring to a previous or better condition. It is a sustainable process as sustainability could also be defined as living and working in ways that do not jeopardize our current and future social, environmental and economic resources.

The value of a building can be elevated to a great height by renovating in professional manner.

The characters of a properly built building could witness about the construction period, richness of the owner and his social status, economic situation in the country, level of foreign influence that the country faced during the construction period, construction standards and materials availability and many more. The comfort has been a prime factor considered in old houses and the environment friendly systems have been used without depending on electricity, air conditioners and other artificial ventilation systems. So it is very important to study these systems and propose renovations without damaging the unique characters of the building.

In restoration process, it is necessary to complete the building as it was. Some of the information may not be available due to damages in parts of building. In such cases, the knowledge about the history of buildings, the main features and construction techniques used in that particular era, will be very useful.

2. HISTORY OF BUILDINGS IN SRI LANKA

A typical Portuguese houses which were built in 17th century, were two storied with a very steeply pitched roof. Thick masonry walls, small windows and timber flooring with low ceiling height were some common features.

The Dutch captured the most important Sri Lankan possessions of the Portuguese in the middle decade of 17th century. They converted a large number of Portuguese buildings to Dutch use.

In the final period of Dutch Architecture in Sri Lanka from 1770 to 1796, the building became higher and the door and windows grew more elegant.



Fig 2.1 – An old building in Galle Fort planned for renovation



Fig 2.2 – The timber floor of an Old building in Galle Fort

The British occupied Sri Lanka in 1796 and their early building characters were influenced by French Engineers serving with the Dutch forces of whose skills the British apparently used. But by the first decade of 19th century, true British styled buildings were erected.

From the middle of 19th century new materials and techniques were introduced from the industrial countries of Europe and United States of America. Wood could now be mechanically sawn and shaped using imported circular saws. Machine made nails and bolts were available. Columns and hand rails were mass produced from imported wrought iron and cast iron. Roofs and walls have been built using the revolutionary, new light weight corrugated cast iron.

The industrial structural materials, rolled steel and reinforced concrete, began to be used at the end of 19th century and the beginning of the 20th century.

3. STRUCTURAL FORMATIONS OF OLD BUILDINGS

Most of the buildings which were built during Portuguese and Dutch periods, were either single story or two storied with thick masonry walls, timber floors and high pitch tile roofs. The masonry walls have been built with rubble or clay bricks with lime mortar. These walls have been built on rubble or brick strip foundations.

The reinforced concrete was introduced in 19th century and the concrete suspended floors were begun to use as an alternative to timber floors.



Fig 3.1 The timber floor of Dutch Burger Union, Colombo



Fig 3.2 Timber used for external corridor of Dutch Burger Union, Colombo

The concrete frame structures were not common during early days and the load bearing masonry walls have been used to support upper floor slabs. Most of the floor slabs which were constructed in Colombo during early part of 20th century, have been designed with 75 mm to 100 mm thick slabs reinforced with fabric mesh or mild steel round bars. The floor slabs have been supported by evenly placed steel beams at 2.0 m intervals, in the absence of walls and these steel beams are usually covered with plaster and decorated with mouldings.

The architecture and the technology used to build bungalows in coconut states in the costal line were different. The large single story houses with verandah, internal court yards, entrance car porch ...etc were common features for these houses. The rubble with lime mortar has been used for foundations and even for thick walls.

The wall thickness at the ground level is about 375 mm to 400 mm in most of the buildings and it reduces as it goes up forming a tapering on one side or both the sides of the wall.

The bungalows which were built in up country hills, are again single storied buildings with large windows in the living area to capture more light. A fire place has become a unique feature for such buildings. The timber flooring has been used in cold climates.

The common feature in all these buildings is the use of natural light and ventilation to comfort the living. In construction of these real green buildings, more attention has been paid for the durability of buildings with proper eaves. The old clay tile roof has been provided gaps with its tapered shape to ventilate and to escape hot air. The Calicut roof tiles do not have this facility. Roof terraces and exposed walls have not been used for dwellings.



Fig 3.3 Rubble and clay mortar used to build walls in a bungalow at Hanthana, Kandy

4. APPROACHES FOR RENOVATIONS

The two major challenges that Structural Engineer faces are

1 The assessment of the durability of structural elements such as foundations, walls, roof timber, roof tiles ...etc and preparing a proposal for improvement method without rejecting them as much as possible in order to make the project feasible and cost effective.

2 Making structural changes such as introducing new walls, changing door window positions, making openings on load bearing walls, adding floors, re arranging roof layouts etc with minimum damages to the structural formation of the building.

4.1 Assessment of buildings

The strength of walls at the time of renovation varies on the material used as mortar to bond brick or rubble used for the wall. The compressive strength of brick samples collected from internal and

external walls can be tested from a testing laboratory. But in situ testing is required if the overall strength of wall is required. The roof timber samples can be collected from the site for testing. Having some idea in the depreciation of strength in different type of materials will also be very useful for the assessment. The load testing could also be used to ascertain the current load carrying capacity.

The load acting on these members can be transferred partially to a new concrete / timber or steel frame without effecting aesthetic appearance, if they are not strong enough to take the load. The members such as walls, roof timber ...etc can be strengthened by introducing strong members to act finally as a composite element.

In most of the old buildings, only the plaster has deteriorated due to exposure to different climatic conditions. Therefore, it is necessary to replace the plaster in order to extend the life time of the buildings. The properly burned clay bricks found in ancient kingdoms are much stronger than the strength of present bricks.

Sometimes, the treatment for termites and wood bores will be useful to improve the lifetime.

4.2 Making structural changes

Making an openings on a load bearing wall or removing a wall, should be done while the weight above the level concerned transfers to the ground without making them unsupported.

The arch action in a masonry wall can be used to support openings to some extent. If the arch action cannot be maintained due to the span or the shape of opening, a concrete or steel frame can be introduced. A ring which takes the load above opening, transfer it to the existing foundation through the ground beam using two columns at either sides of the ground beam.

The technology is available to improve existing foundations by improving bearing capacity or by increasing the foundation width. Introduction of concrete columns at some intervals and tying with the existing rubble foundations could also improve the carrying capacity.

5. PROJECT PHOTOGRAPHS



Fig : 5.1 - 100 years old bungalow at Hanthana, Kandy



Fig 5.2 – 100 years old bungalow at Hanthana, Kandy



Fig 5.3 – Bungalow at Kakenadura, Matara before renovation



Fig 5.4 – Bungalow at Kakenadura, Matara after renovation



Fig 5.5 – Bungalow at Kakenadura, Matara after renovation



Fig 5.6 – Building at No. 65, Rosmead Place after renovations

6. CONCLUSION

Renovation or restoration of buildings is an environment friendly process which saves our limited resources. The building debris which cannot be re used will also be a problem in future. So restoration helps to protect the environment by not dumping imperishable materials. But the most important lesson what we should learn from the ancient buildings is the environment friendly designs and details used by our ancestors.

7. REFERENCES

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