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# Building Relocation Case Study in Pakistan

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## Abstract

The building relocation system is primarily a new tool and technique emerged significantly in the field of construction management, focused on repositioning the structures to utilize the vacant space in an urban city for another structure to fit in. However, many building constructors discourage this system as they are considered a part of our environment which may include streetscape, fences, gardens etc. and removing these buildings from these settings disorients the infrastructure planning of the city. Subsequently, the relocation should only be appreciated in cases of saving a heritage or normal building as a last resort, encouraged by the New Zealand Historic Places Trust (NZHPT) for preserving significant heritage buildings and structures by removing from their original sites while keeping their originality. Similarly, this study focuses on the case study of Nusserwanjee Building, a century old cultural heritage in the city of Karachi, Pakistan, said to be demolished, yet preserved by moving the structure from the city center to the open outskirts of the city, near beach, to rehabilitate and transform it into the educational institute standing today. Currently, this building is the South Asia's first ever relocated building where this study distinguishes the cost comparison b/w development of a new institutional structure and displacement of an old structure as it was converted into an operational institute, along with the new innovation and techniques introduced by the architects and contractors during the construction phase.

## Keywords
Building relocation system, cultural heritage, institutional campus.

## 1. Introduction

The building relocation system is the process of moving structure from one location to another. There are two ways of relocating a building, one is for long distance where the structure is dismantled and then reassembled at different location, while the other is short distance where the structure is lifted from foundations using hydraulic jacks or screw jacks and then pushed using a flatbed truck, temporary rails or

hydraulic dollies upto the destination point.

There may be several reasons behind the relocation of the building. The most common reason is the preservation of historic building with cultural interest. Other reasons may include utilization of space for infrastructure development; obstructions of scenery as well as the owner desire to separate the building from its current plot or land. Similarly, the very reason behind the relocation of Nusserwanjee building was to preserve it in its natural characteristics.

## 2. Building Relocation in Developed Countries

There are many buildings that have been relocated over the last century out of which few prominent buildings have been discussed below:

In the late 1960s, the Abu Simbel Temple of Ramesses II in Egypt is the only biggest building relocated in the sub-continent, which was dismantled and reassembled at an alternate location (similar to Nusserwanjee Building construction methodology) in order to submerge its original site in the Aswan dam reservoir (Fitzgerald, 2008)

In 1974, Cudecom Building (8 storeys) located in Bogota, Colombia was moved about 95 feet from its original location weighing approx. 7000 metric tons considered as the heaviest building ever moved of that time (Guinness World Records, 1974)

In 1999, Cape Hatteras Lighthouse tower located in Buxton, North Carolina (208 feet tall) was moved 2900 feet from its original location weighing approx. 2540 tons in order to protect its structure (concrete walls and steel sections) from beach erosion caused by the sea exposure (Tice and Knott, 2000; Schierhorn, 1999).

In 2004, Fu Gang Building (111 feet high) in Guangxi province, China was moved about 117 feet from its original location weighing approx. 15,140 metric tons considered as the heaviest building ever moved of today's time by being successor of Cudecom building (Guinness World Records, 2006).

In 2006, the 3200 year old statue of Ramesses II in Cairo was moved 660 feet from Ramses square to the new museum location weighing approx. 90 tons to avoid damaging of statue from pollution in the main city area (Nevine, 2006).

Now, Nusserwanjee Building is also considered a well-known building in the world records as the South Asia's 1$^{st}$ ever relocated building moved an approximately 10 kilometers away from its original site location by dismantling the entire building and reassembling at another site location.

## 3. History of the Relocated Building

The Nusserwanjee Building is a century old landmark located in the Kharadar market area in Karachi, named after a philanthropist, Jamshed Nusserwanjee Mehta. However, this building was first constructed by Nusserwanjee Rustomji Mehta, father of Jamshed Nusserwanjee Mehta in 1903, during the British Empire. This building was originally used as an office of Nusserwanjee and Co., a successful manufacturing and trading establishment of that time. As a consequence of growth enhancement, an additional wing was constructed in 1919 using RCC beams, columns and roof along with coursed stone masonry and plastered rubble stone, the latest technology of their current time. As time passed by, business of Nusserwanjee started to liquefy from the Karachi sector and the building was used as a warehouse and storage for all the nearby market shops and general stores.

Thus, this building was put on sale and soon to be demolished in replacement of a new construction commercial project in the Kharadar area. At that same time, in 1991, twelve flagrant architects of this city were given the design of the Indus Valley School (IVS) Institute of Arts and Architecture in the Clifton area, near beach. Shahid Abdullah, the founder of the IVS, founded the old and abandoned Nusserwanjee building of 3-4 storeys with high ceilings and vast halls. He provided the lead architects an idea to purchase the building that was put on sale and move it to Clifton, 10kms away from its original location, well suited for the arts and design studios.

Subsequently, the architectural edifice that suddenly became famous repaid its gratitude to its savior architects and constructors by suddenly stealing the limelight and bringing enormous publicity to the school for the magnificent work that was accomplished. Hence, this cultural heritage is the only structure in the history of Pakistan that has been relocated from one place to another. Thus, the IVS constructed is a not-for profit, Higher Education, Degree Awarding Institution, providing a comprehensive education in Art & Design, based on rigorous studio practice as well as in-depth academic study.

## 4. Categories Of Heritage

The categories of heritage have been summarized in form of grades:

- **Grade 1** represents a monument which is one of a kind where a conservation strategy is implemented to preserve the building in its present state and delay its decay process.
- **Grade 2** signifies more than a single type of heritage buildings older than 100 years where a conservation strategy is implemented to preserve only one building among them all in its present state and delay its decay process. The Nusserwanjee Building lies in Grade 2.
- **Grade 3** symbolizes any building older than 50-75 years old where a minor conservation strategy is implemented to remove its bird droppings and vegetation grown overtime along with any cleaning and maintenance.

## 5. Nusserwanjee Building Relocation Methodology

The initial planning and feasibility phase that started from 1991 continued for several years which involves viewing, innovating and approving all documentation of the building using detailed measured drawings and photographs during which three reputable contractors were invited to offer bids for the process of disassembling, transferring, storing and reassembling. Thus, the property was finally sold in the beginning of 1995, after which the process of bidding phase came to an end with the selection of contractor Haji Mohammed Shah Akram Baloch, as his bid matched the fair cost estimate for the relocation process along with its plan to soundly relocate the buildings. The construction phase started in April 1995, divided into three process or steps:

### 5.1 Dismantling Process

This process began in April 1995 which initially involved marking the stones embedded in the walls of the building where each piece of timber and stone was tagged or marked with a particular number for identification. This process of marking the stones was completed in three months. Then the process of dismantling began of stone and timber, piece by piece, along with the simultaneous process of accurately documenting these identified items.

### 5.2 Transportation Process

The dismantle pieces were carried to the ground floor, piled temporarily and loaded in the heavy vehicles

such as trucks for transporting these items to the Clifton site where they were unloaded and stored temporarily until the assembly process began. This process of repeatedly loading the items and transporting them to the other location averted the storage cost at the old site.

### 5.3 Conservation Process

Initially storage cost was incorporated as the transported items were stockpiled at the new site but as the items stored were sufficient enough, the conservation process began simultaneously along with the storing process where the pieces were re-organized inverted as per the layout. Thus, the interior spacing and exterior view of the building was almost same as the original (before being dismantled) as shown in figure 1.

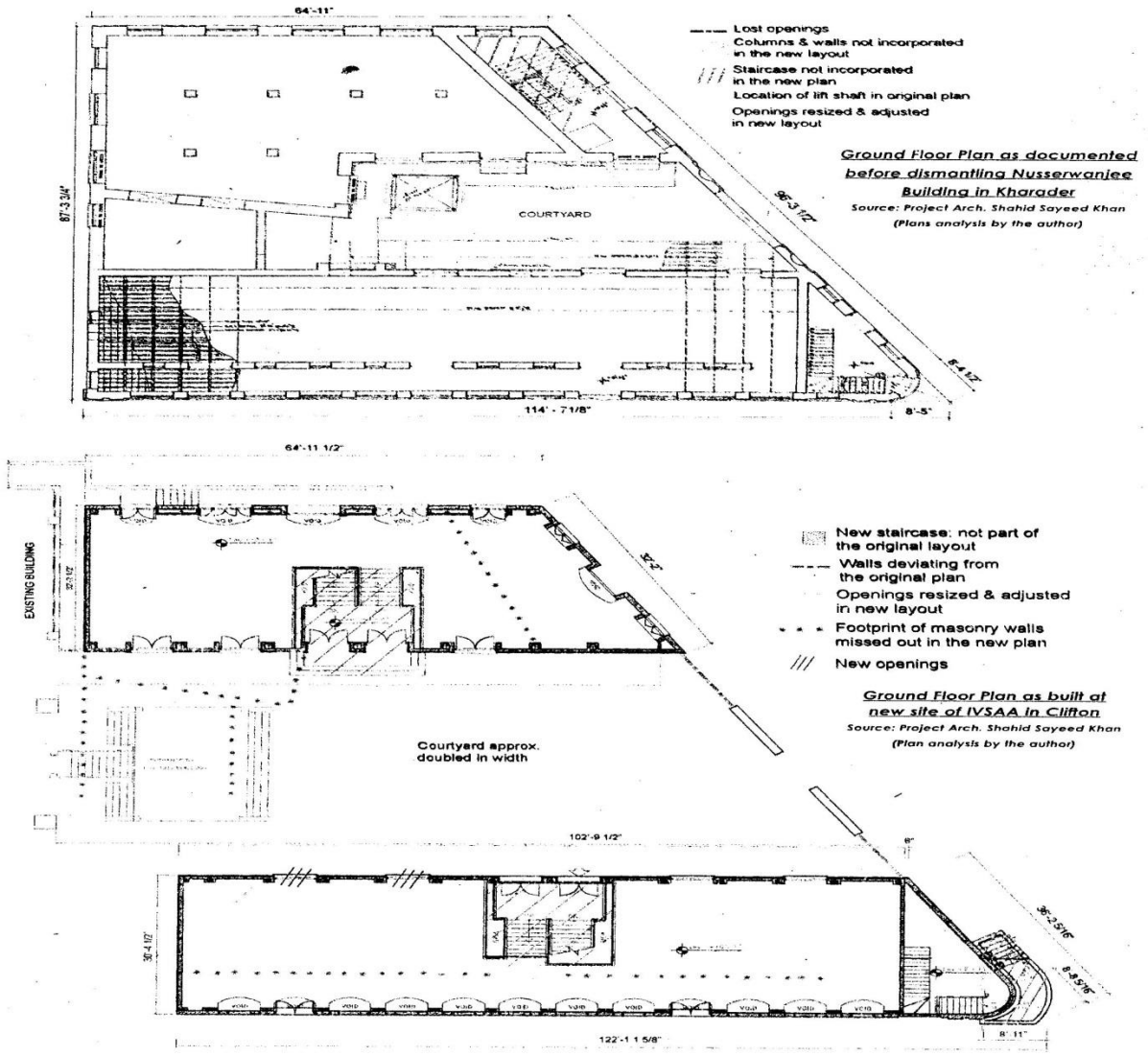


**Figure 1: Architectural Layout of the old and new version of the relocated building**

As shown in figure 2, the building was relocated, stone by stone, consisting of approximately 26,000 stones transported to the new location near the sea becoming a part of the IVS Campus with an estimated covered area of 27,142 sq.ft. for the re-erected building where the east block (basement + ground + 3) and west block (basement + ground + 2) consist of 13,770 sq.ft. and 13,372 sq.ft. close to the approximate area of 25,000 sq.ft. proposed in many newspaper articles of their current time.

**Figure 2: Stone facing, inner and outer walls for masonry of East wing**

Similarly, repaired doors, windows and ventilators were made of barmateek wood so the new remade openings were also made using the same type of wood as shown in figure 3.

**Figure 3: Doors, windows, ventilators and railing holders made of barmateek wood**

A number of issues aroused regarding decision to be taken for constructing the building with reference to the present day building technology where coping with such changes was a difficult task for all workforce and managers. However, some special measures were initiated due to the seismic zone of Karachi and the original site location which had firm land as opposed to the new site location near the sea, expected to have a sandy beach.

Since, the construction was done using building authority rules and regulations, the reinforced structures such as steel columns, concrete slabs and steel girders were used throughout the four floors including the mezzanine to increase the overall strength of the building to persevere for a lifespan of at least 50 years as shown in figure 4.

**Figure 4: Laying of girders in the roofs of basement, 1st floor, 2nd floor and 3rd floor for East wing**

Consequently, in the mid of year 2001, the east wing was completed (as shown in figure 5) and the west wing was completed by the end of the year 2003, yet the project was dragged due to the finishing and punch list items till the end of the 2004 to be handed over.

**Figure 4: Completed East wing in 2001 with work progress on West wing**

## 6. Cost Comparison with New Constructed Building

All the constructors and architects who have ever been involved in the building relocation are aware of the fact that relocating a building is always more costly or expensive than building a new structure as well as more complicated. That is why cost of new built-institute (IVS building project constructed normally) was estimated and compared with the relocated institute.

**Table 3: Financial Summary - Comparison b/w the relocated building and the new construction**

**building**

| Cost Evaluation of Relocated Building | | Cost Evaluation of New Constructed Building | | % Comparison |
|---|---|---|---|---|
| **Building Purchased from owner** | Rs. 15,00,000 | - | - | - |
| **Estimated Cost of Re-erection** | Rs. 1,83,60,000 | - | - | - |
| **Total Estimated Cost of Re-erection** | Rs 1,98,60,000 | **Total Estimated Cost as per labor rate and materials** | Rs 1,44,00,000 | 38% more |
| **Final Actual Cost of Re-erection** | Rs. 2,89,31,000 | - | - | - |
| **Total Actual Cost of Re-erection** | Rs 3,04,31,000 | - | - | - |
| **% Comparison (b/w total estimated and actual cost)** | 53% more | - | - | - |

**Notes**

- *The total estimated cost of re-erection includes the old building purchased cost, dismantling cost, transportation cost, site storage cost and reassembly cost at new site which includes new steel sections, doors, windows, ventilators, paints and floor finishes as per the package.*
- *The total actual cost of re-erection increased due to the internal profit/ mark-up, new building plot cost and the level of customizations made by the customer in the standardized building along with the few external factors such as rehabilitation cost faced during the re-erection.*
- *The total estimated cost for constructing a new building as per labor rate and material imposed on the contractor is Rs 530/ sq. ft. (as per 2002 rates) which includes the reinforced concrete structures, doors, windows, ventilators, paints and floor finishes as per the package. It does not include the internal profit/markup, new building plot cost and other external factors.*
- *It shows an approximate comparison of 38% more cost in contrast to portray a maximum realistic cost comparison between the relocated building and new constructed building proving that relocated building cost is higher than new constructed building and should only be used when extremely necessary like relocating a heritage building.*

## 7. Advantages and Disadvantages of Relocation

There were many reasons behind achieving this building prescribed as a plus point in the advantages section along with the few limitations prescribed under the advantages section:

**Advantages:**

- To avoid demolition of a cultural heritage building by preserving the legacy of Nusserwanjee Mehta.
- To initiate an innovative method of saving heritage buildings in terms of all features (shape, area etc.) with respect to architectural and structural point of view.
- The approx. 26000 stones used in relocation saved the money for new blocks where only the cost of transportation and remedial of old blocks was implied, considered to be a great achievement.
- To provide a hands-on-experience to the architects, constructors and managers a lifetime opportunity of learning a new technique in construction industry.
- To construct South Asia's 1st ever relocated building

**Disadvantages:**

- The project was not economically feasible as it was very difficult to relocate original building at new place. The new location of sea side causes problems and requires maintenance at regular interval
- Constant maintenance is required for the building at an annual basis whether it can withstand the everyday dynamic load of students and faculty members in the future.

## 8. Conclusions

This research study concludes that this entire relocation system (demolition, transporting and assembly process) was achieved using illiterate contractor with unskilled workforce and team members with a minimum damage where the remaining structural pieces were utilized in the assembly and conservation process. Now, this expensively built institute enjoys the reaped fruits of its constructors as the South Asia's first ever relocated building. However, one must not forget that it may be a new emerging tool yet expensive, thus, reminding the constructors to be strictly selective in relocating buildings from one place to another. In the end, this research study owes deep gratitude to Ms. Shumaila Noorani, manager at IVS institute for providing the necessary drawings and billing documents to complete the estimated and actual cost evaluation.

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