

**ECONOMICS OF REAL ESTATE VALUATION – COST BENEFITS OF BASEMENT SHIFTING**

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**Abstract**

The real estate sector is an expanding business continuously because it provides one of the basic amenities for human being survival- shelter – Residential/Commercial. Globally real estate fetches more revenue and the business hub makes countries flourish in economic status. Infrastructure development is extending day by day everywhere on the planet earth. The new technologies and implementations causing side effects on earth's ecological system and an imbalance in the weather-meteorological conditions. Recently, China has adopted cloud seeding to obtain rainfall in regions of low rainfall. Global warming due to the emission of abundant Carbon dioxide and carbon monoxide imbalances temperature variations and rains in certain regions of the world. As a consequence, heavy rainfall fills Valleys and dams and inundation by surplus floodwater in some regions followed by drought in other regions. The Government and Private sectors taking up developmental activities for the public cause by all means by creating new avenues, projects, dam structures, irrigation canals, industrial zones, etc. The so-called industrial zone may take a new form of upgrading the entire surrounding by filling the existing ground surface or water retaining structures to cater to their needs. Such improvements will become a headache to adjacent surroundings in various forms. The nearby low-lying areas or valleys get inundation either by rainwater or water squeezing from nearby irrigation dams. Similarly, the execution of Industrial constructions carried at an elevated level leaves the nearby area as a downtrodden. The infrastructures already built in these areas getting submerged and intend to raise the basement level to safeguard from dampness. Alternatively, the structures can also be demolished and reconstructed. But due to its status, being new construction, that option of reconstruction becomes a burden and uneconomical. In such occasions, the existing basement level can be shifted vertically to the desired height. Now discussions about the methodology existing on an economic basis have been analysed.

**Keywords:** Vertical Lifting & Horizontal shifting, Renovation cost, Replacement cost, Peril, Lifting Jacks, Precautions, Superstructure, Financial analysis etc.,

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**Introduction and Statement of the Problem**

Building lifting happens in the following situations like road widening compels side sway of infrastructures on both sides, protecting archaeological monuments and sites, sudden formation of a low-lying area by unavoidable reason, to surpass contaminated stagnated rainwater or sewage, building owner's desire - recently built and possessing structurally strong physical life, overnight formation of approach roads at elevated levels by layering road materials and tarring one over the other at intervals, horizontal shifting/movement of the building becomes warranted by the raised groundwater in the vicinity leaving moisture on the surface of the floor of the house, the release

of surplus water from the nearby dams may inundate the sites in the vicinity and entry into the premises becomes an issue, landslides in mountainous terrain may create earth heap around the building and the ground floor level gets lowered, erroneously, the safe bearing capacity of soil has been wrongly predicted at a higher value than the actual, after the construction is completely over, this error has been found and needs immediate soil stabilization etc., Normally MIG-class people are affected by this problem. With his hard-earned money, he would have constructed his building. For the above reasons, there is no way except to go for adopting the lifting of the structure.

### **Review of literature:**

Jignesh K Patel(et.al 2016) has highlighted that almost in all parts of this world, the technique of building or basement lift is widely accepted. This technique was adopted in the year 1799 in Philadelphia of Pennsylvania province.

Steven D. Gregory (1998) has strong recommended that Foundation lifting and support system and method is best technique for construction.

### **Objectives**

The study is based on the following objectives:

- The authors of this article conceive the merits of the vertical lifting of building structures by the latest jacking technique as on practice and explores the economic aspects of its implementation
- Data has been collected from field contractors and workmen for the exact computation of cost estimation and the corresponding percentage of expenditure if built as of new
- The decision parameters are subject to the remaining physical life of the building structure
- Also, website search made the authors understand the reliability and dependability of basement shifting after analysing various case studies available in the portals
- This article deals with the procedural method of Building lifting techniques both horizontally and vertically with precautionary measures

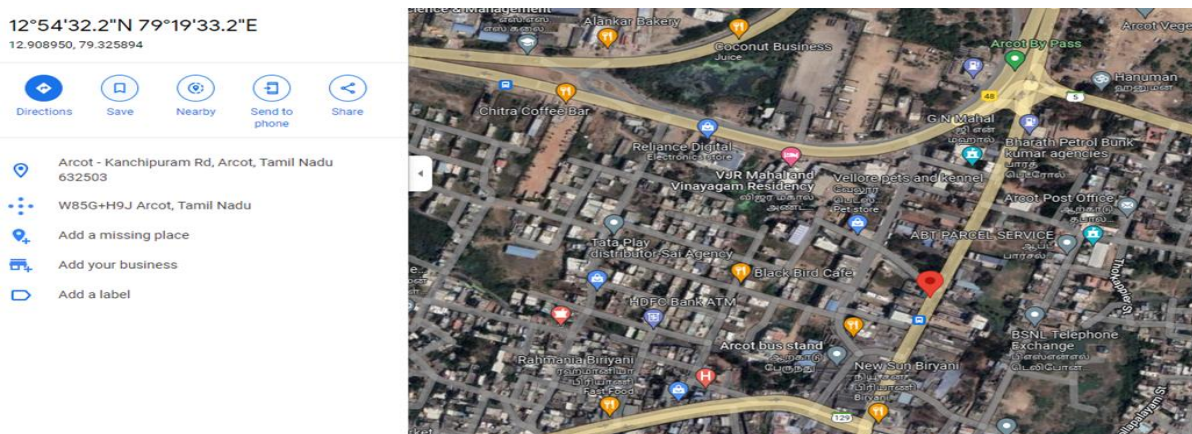
### **The methodology to plan structure:**

The locational attribute is important before taking up the lifting, namely urban, rural, or semi-urban to purview the space availability on all sides of the structure to enable easy movement of men and material. In such cases, vertical uplift of structures is only possible using Hydraulic or pneumatic jockeys and thereby positioning at the desired level. Horizontal movements are achieved by placing and transporting to the desired location through Transport Multi-axle pneumatic tyre-fitted heavy vehicles. The Horizontal/ Vertical shifting of any existing building is achieved using hydraulic jack lifting by placing an adequate number at suitable points and thereby raising the entire building at a convenient height or horizontal distance as the case may be. The capacity and number of jacks are determined through scientific computations.

- Preliminary investigation/Surveying of all structural components of a residential building is to be carried out.
- The weak members require additional lateral support or a scaffolding system to be examined carefully
- The structural calculation for the Total Weight calculation of the building is done to arrive at the number of jacks required

- Additional Jacks are required to distribute the load uniformly on the wooden log or concrete blocks
  - It is important to disconnect the service connections like electricity, gas connection, drainage connection, etc.
  - Weak members were found to be provided with additional strutting using Steel ISMC Channel or ISMB box girders to weld or tied stringently with wire ropes, so as not to cause harm to workers
  - Jacks are placed near support pillars at first to transmit the building load gently on these jacks either on firm surfaces like Steel Logs or Beams
  - Other jacks are placed beneath the wall structure or plinth level grade beam and start the hydraulic pressure equally on all portions to raise the slowly and gently the building without jerk
  - At the required level of shifting the level of basement or grade beam, brickwork masonry or concrete constructed with good quality mortar and leave for the set of full strength
  - On attainment of the full strength of Brickwork or Concrete blocks, after complete curing, the hydraulic pressure jacks are relaxed slowly and uniformly
  - On the complete release of jacks, those jacks are removed
  - Refilling the Basement and raised portion backfilled with excavated earth and sand
  - Well compacted and flooring is laid again as in its original condition before the lift
  - Also, other maintenance cracks are attended to with rich mortar mixed with chemical bond materials
- **Replacement Value** means the below value minus depreciation of the asset before the fire peril happened
  - **Renovation Value/Cost** means actual expenditure likely to be spent for complete restoration as before the fire outbreak in every order includes all escalation charges and all unexpected amounts.

### Google Location Map to identify the exact location of the building subject to basement lifting



**Case study:** In addition to fire rescue, the Management decided to elevate the building's basement level. In this context, cost analysis is made to work out the capital expenditure involved

Sl. No.	Particulars of item (RCC Roof Building)	Plinth area Sq. ft	Roof height (Feet)	Age of building (years)	The estimated replacement rate of construction (₹/ Sqft)	Replacement cost (₹)	Depreciation Value (₹)	Net value after depreciation (₹)
1	Ground Floor	2443.50	10	16	1700	41,53,950/-	9,96,948/-	31,57,002/-
2	First Floor	2443.50	10	16	1600	39,09,600/-	9,38,304/-	29,71,296/-
3	Second Floor	2443.50	10	16	1600	39,09,600/-	9,38,304/-	29,71,296/-
4	Third Floor	2443.50	10	16	1600	39,09,600/-	9,38,304/-	29,71,296/-
5	Fourth Floor	1012.50	10	16	1600	16,20,000/-	3,88,800/-	12,31,200/-
						1,75,02,750/-		1,33,02,090/-

### Calculation of the number of Jockeys required to lift the Building

#### The dead weight of Superstructure (Four storied)

**Roof Slabs (including roof beams & Floor Finish)** –  $3 \times 227.3531$  (2444 Sqft)  $\times 0.20 \times 25 = 3,410.30$  kN  
 $1 \times 94.1878$  (1012.50 Sqft)  $\times 0.20 \times 25 = 470.94$  kN

**Columns** –  $20 \text{ no} \times 3.00\text{m} \times 0.30 \times 0.45 \times 25 = 203$  kN

**Plinth Beam** –  $((2 \times 82) + (8 \times 30)) \times 0.30 \times 0.60 \times 25 = 1809$  kN

**Lintels & Sunshades** –  $3 \times 200 \times 0.23 \times 0.30 \times 25 = 1035$  kN

**Brick wall – Basement** –  $402 \times 1.20 \times 0.23 \times 20 = 2,219.04$  kN

**Outer Wall** –  $402 \times 3.00 \times 0.23 \times 20 = 5,547.60$  kN

**Total = 12,475.84 kN**

**Live Load, First Floor** -  $227.35 \times 1.50 = 341.025$

Second Floor -  $227.35 \times 1.50 = 341.025$

Third Floor -  $227.35 \times 1.50 = 341.025$

Fourth Floor –  $94.19 \times 1.50 = 141.285$

Total - 1,164.36 kN

(Note: Normally, Live load will not be allowed during the course of the uplift of structure. But anyway, only 10% live load may be permissible to permit laborers for construction activities)

$1164.36 \times 0.10 = 116.436$  or 116.44 kN

**Headroom** – 100 kN

**Machine Room** - 100 kN

**Overhead Water Tanks** – 200 kN

**Total Load Transferred = 12,992.28 kN**

Or 1300 Metric Tons

Assuming 3.00 MT capacity Jackie is likely to be used, the number of Jackie’s required = 1300/3 = **434** Nos.

Assigning 20 % as standby Jackie’s, therefore approximately 500 nos are required

Assuming Rs 50 per day rent for one Jokey, rent to be paid for 30 – 45 days, say 45 days,

Therefore, rental amount = 500 x  
Rs 50 x 45 = 11,25,000/-

Adding other fixtures renting @ 40% of Rs 11,25,000/- = 4,50,000/-  
Labour charges involved @ Rs 5000/- per day x 45 days = 2,25,000/-  
Demolition charges for excavation for placing Jackie’s = 3,00,000/-  
Rs 21,00,000/-

**Statement of Financial analysis:**

Case Study	<b>INFRASTRUCTURE – BASEMENT LIFTING CONSEQUENT TO LOSS DUE TO PERIL (OUTBREAK OF FIRE)</b>				
Dated:	<b>Location: Arcot, Ranipet</b>				
	<b>Age of the Building: 2006 (16 years)</b>				
	<b>The remaining useful life of Infrastructure: 44 years</b>				
	<b>Number of Floors: Ground, First, Second, Third &amp; Fourth Floor</b>				
Description	Reinstatement Value (₹)	Replacement Value (₹)	Renovation Value (₹)	Percent share of Renovation Value Vs Reinstatement Value	
NDT(Compulsory)	---	---	1,00,000/-		
Lifting Charges	---	---	63,48,000/-		
Total	1,75,02,750/-	1,33,02,090/-	64,48,000/-	36.83%	

The approximate cost involved in Restoration works

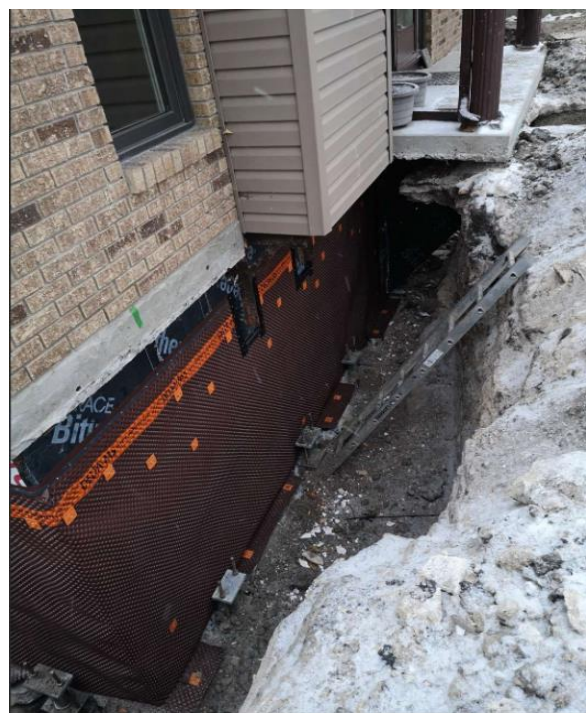
Refilling with excavated earth

First-class brick masonry above foundation up to 1.2 m

Backfilling of earth and sand including compaction with watering and leveling

Flooring with ceramic tiles on the ground floor above compacted soil backfilling

Filling of cracks by cement grouting including finishing



**Precautions:**

Before taking up any renovation process, it is essential to carry NDT to ensure structural Stability in order of satisfactory strongness of existing infrastructure and expenses so incurred to be added to the cost of renovation. Mandatory approval from Civic Authorities is an important requirement. All Electrical Power connections need to disconnect. If done already, it is to be ensured. Any untoward incident needs to be analyzed and supporting fixtures to be kept ready, when and where required. Any loosely packed debris to be cleaned with proper scaffolding and temporary supports of suitable size. The main disadvantage of the uplifting is floor in Ground Floor is to be broken away and debris removed. Sufficient sideway spacing is needed to store the appurtenances and raw materials for raising the components

**Discussions**

**Economic aspects:**

- Real Estate sector capital investment is a major concern for middle-income group citizens

- Financial commitment to analyze whether basement lifting is beneficial or to complete demolition and new building construction
- From the computations, it can be seen that only 37% to be incurred as that for a new building

#### Valuation Criteria:

- The valuation of these residential houses needs extra care during the appraisal process
- While considering the age of service of the building is much less than the estimated physical life of the asset is minimal, the lifting charge is to be analyzed and a suitable discount is to be added
- The Registered Valuer must carefully examine the feasibility study of the basement at an economical cost
- Normally Government establishes Industrial Estates in semi-urban areas near Sea and Airports.
- In such situations, existing buildings nearby these locations suffer various disturbances
- Industrial infrastructures lay new roads and the like which creates some conditions of low lying due to elevated surface roads
- Now, it is to be decided to either demolish the existing building or raise the basement lifting by some means

#### Conclusions

Renovation cost of Rs 64.48 Lakhs is 37% approximately that of a new Construction Value. The Time taken for renovation is just 30 days against 240 days for a new construction. This renovation decision avoids the new construction and hence demolition of the existing structure does not arise since the renovation process is successful. Environmentally friendly since no consumption of cement & other products except for renovation. Unnecessary business idle period is avoided since fast renovation works. The business/Manufacturing activities can be recovered immediately. The Employees can also be provided with continuous employment without a long break and the customer base link could not be break. Insurance Coverage is also possible since commitment and trade activities would be undertaken as soon as possible. Demolition charges are almost nothing & Rent is paid during the transit period

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