

## CASE STUDY ON UPLIFTING OF STRUCTURES

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**ABSTRACT:-** This project gives the knowledge on the uplifting of structures. Lifting a structure involves raising a structure above its current foundation and building a new foundation underneath. House lifting projects are most common along the coast of eastern United States, especially in the wake of a natural disaster like a hurricane. This would involve lifting the house to the required flood protection elevation [FPE]. House lifting can also be done to add a new first story or expand a basement or crawlspace [in conjunction with an "excavation service"]. By lifting your home, add value and usable space to your home, and avoid future damage.

There's a lot that goes into lifting a house. There are some steps we need to follow before lifting any structure and that are crucial to any house moving project. There are some companies that are there for lifting the houses, buildings, etc., they use different materials for lifting the houses. Lifting of building is cheaper than the reconstruction of the building.

If your house is below the street level and sewage water regularly flows in, relocation is not the best solution. With today's technology you can easily raise the level of your house. And that too without any risks at all. It's time to save money and live in the same home which you are used to living in. Being more specific, houses that are put up in low-lying areas often face a big issue. This problem is never-ending during the cloudburst seasons when there is profound rainfall and a heavy inflow of water into the low-lying lands. Before now the rise and fall of tides engender problems to such houses; the incessant falling rains make this problem even worse. As a result, there is a solution to this problem and it would be house lifting. Masonry houses are more difficult to lift, primarily because of their design, construction, and weight, but lifting these homes is possible. Lifting of building is cheaper than the reconstruction of the building.

### 1. INTRODUCTION

Lifting the house and building a new, or one of the most common retrofitting methods is elevating a house to a required or desired Flood Protection Elevation (FPE). When a house is properly elevated, the living area will be above all but the most severe floods (such as the 500-year flood). Several elevation techniques are available. In general, they involve extending the existing foundation below it or leaving the house in place and either building an elevated floor within the house or adding a new upper story. This technique was introduced for the first time in Philadelphia, Pennsylvania 1799 for the purpose of moving a building. London's famous monument marble arch built in 1847 was originally the entrance to the newly rebuilt Buckingham palace. It was found to be narrow for the state coach, and was moved to its present location of Hyde Park in 1851.

A house is one of the greatest assets which anyone possesses and constructing one's dream home is a very tricky and difficult task. Building a house is quite intricate and puts us through quite a lot of issues and obligations more to the point; construction planning is one such complicated task, in case if you are constructing a dream house then you need to consider numerous aspects to construct a safe and secure home that stands tall for several years to come. Rebuilding involves great amount of money time and materials. This is not possible for everyone. More over people has emotional attachment with their buildings.

Today citizens are facing various problems like entering of sewage water during rains due to lowering down on road levels. Rainy water directly enters in to the house and shop and destroys the property and create great nuisance. If your house is below the road level and you have no clue as how to raise its level without rebuilding it. Specialize in lifting and shifting the houses without any damage and raising their level with the help of Jack. With this scientific technique, in the project helped many people. By opting for this cheap and effective method, they have saved lakhs of rupees and their valuable time.

### 2. NEED FOR THE STUDY

Still now many people's house in Chennai below the street level. For this case house lifting is the best technique. So, the reasons of house lifting for preventing water damage, fixing a foundation already ruined by water damage, or building an additional floor. While there are several reasons, we may need to lift a house, the main reasons are usually to maintain the road level and house level should be the same from that we can keep our house dry and protect against erosion and water damage. Lifting a house is a challenging project that requires precise skill, measurements, manpower and equipment.

### 3. SCOPE AND OBJECTIES

A house is one of the greatest assets which anyone possesses and constructing one's dream home is a very tricky and difficult task. Building a house is quite intricate and puts us through quite a lot of issues and obligations more to the point; construction planning is one such complicated task, in case if you are constructing a dream house then you need to consider numerous aspects to construct a safe and secure home that stands tall for several Years to come. Rebuilding involves great amount of money time and materials. This is not possible for everyone. Moreover, people have emotional attachment with their buildings. Today citizens are facing various problems like entering of sewage water during rains due to lowering down on road levels. Rainy water directly enters into the house and shop and destroys the property and create great nuisance. For this problem house lifting is the best and effective technique. It will substantially reduce the flood risk to the house and its contents. It does not require any additional land for the working process. It can reduce the loss of life, economic and environmental.

### 4. NECESSITY

1. When the road level is increased above the level of building, then this technique is used to lift the buildings.
2. If your house is below the street level and sewage water regularly flows in, relocation is not the best solution.
3. There is a solution to this problem and it would be house lifting.
4. There are a lot of wrong done during the construction of house or building. Many times the owner think about to correct those wrong done, but it took a lot of money and time. There was no solution in past. But now here is the solution i.e. building lifting technique.

### 5. METHODOLOGY

The methodology is that what are all the steps I followed for this phase. Project is explained in steps as well as it is detailed below.

1. Literature review.
2. Selection of area of the building.
3. Study about the building.
4. Find the level have to lift.
5. Find the no. of jacks required for lifting.

#### 5.1. Literature review: -

##### 5.1.1. House lifting from floods:



**Fig.1. Building is protected against all forms of Natural disaster**

**Source: <http://grant-ashleynz.blogspot.in/2011/06/house-lifting-from-floods.html>**

We should make sure that the building is protected against all forms of Natural disaster. If your house is lying in a low land area near the sea or the river, then there are a lot of chances that your house would be affected with floods. When

the houses were constructed, enough anti flood measures were not taken to protect it from floods. This is because the required technology was not available at that point of time. Protection from floods to a house is common in areas of Thailand, Burma etc. where these areas are subjected to heavy rainfall. It is not uncommon for these areas to get flooded quickly. That is why; most of the homes that are made in this area are made on an elevated plane. The houses are often built on a platform that is a good 4 to 5 feet above ground level. The only options remain is the lift these houses from the foundation along with the foundation. Now you might think that this is an impossible task. However, this is not. Modern technology has made it possible for a fully made concrete building to be lifted up along with the foundation. There are many home lifters available today. It is has become a common feature especially in low lying areas to lift your home and make sure that you are protected against flood. This entire process however, is a very dangerous and risky job and should be handled only by professionals. By no means should you try house lifting on your own. This however again, is quite impossible. Even if you did get your hands on a hydraulic lift, the power truck, the concrete reinforcements and other equipment that you need to complete the process, you would have to manage operating all of them at once to successfully complete the process of lifting your home. Most of the time, such a task is completed by a team of certified professionals who know how to use the equipment and those that have experience in handling such a project. You should therefore hire the right people for the job and get the job done by them.

Now you might think such a process is costly and you cannot afford it. While this is true, the good news is that you can very well afford it. In fact, you can get it done for free! The government has given out a large sum of money to aid houses that are affected by floods. Therefore, all you really need to do is fill out the paperwork and the specialists will come to you for house moving and finish the necessary work to secure your home.

## **5.2. Selection of area of the building: -**

We have to select a building before the lifting, it should be convenient for lifting.

## **5.3. Study about the building: -**

Before the lifting we have to study all the forces and we have to analyse the building for the calculation. With this calculation we can get the scrap value of the building.

## **5.4. Find the level have to lift: -**

Find the level height, how much have to lift.

## **5.5. Find no of jacks required: -**

To find the jacks requirement the Total load acting on the building including self-weight should be calculated. According to the load calculation the no. of jacks can be calculated. If the load of the building is high the jack's requirement will be increased.

## **6. ACCESSORIES AND EQUIPMENTS USED**

### **6.1. Hydraulic jack:**

In 1838 William Joseph Curtis filed a British patent for a hydraulic jack. In 1851, inventor Richard Dudgeon was granted a patent for a "portable hydraulic press" – the hydraulic jack, a jack which proved to be vastly superior to the screw jacks in use at the time. Hydraulic jacks which are used to lift house are called as a house jack, also called a screw jack, is a mechanical device primarily used to lift buildings from their foundations for repairs or relocation. A series of jacks is used and then wood cribbing temporarily supports the structure. This process is repeated until the desired height is reached. The house jack can be used for jacking carrying beams that have settled or for installing new structural beams. On the top of the jack is a cast iron circular pad that the jacking post rests on. This pad moves independently of the house jack so that it does not turn as the acme-threaded rod is turned with a metal rod. This piece tilts very slightly, but not enough to render the post dangerously out of plumb.



**Fig.2. hydraulic jack**

### **6.2. Wooden block:**

Wood has been used as a building material for thousands of years in its natural state. Today, engineered wood is becoming very common in industrialized countries. Wood is a product of trees, and sometimes other fibrous plants, used for construction purposes when cut or pressed into lumber and timber, such as boards, planks and similar materials. It is a generic building material and is used in building just about any type of structure in most climates. Wood can be very flexible under loads, keeping strength while bending, and is incredibly strong when compressed vertically. There are many differing qualities to the different types of wood, even among same tree species. This means specific species are better suited for various uses than others. And growing conditions are important for deciding quality.



**Fig.3. Wooden block**

### **6.3. Channel beam:**

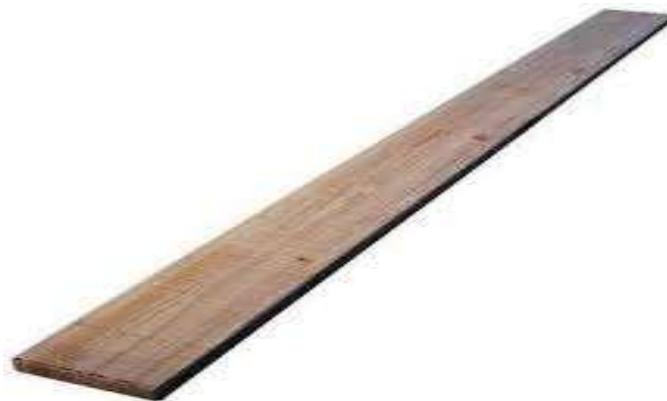
The structural channel, also known as a C-channel or Parallel Flange Channel (PFC), is a type of (usually structural steel) beam, used primarily in building construction and civil engineering. Its cross section consists of a wide "web", usually but not always oriented vertically, and two "flanges" at the top and bottom of the web, only sticking out on one side of the web. It is distinguished from I-beam or H-beam or W-beam type steel cross sections in that those have flanges on both sides of the web.



**Fig.4. Channel beams**

#### **6.4. Wooden plank:**

A plank is timber that is flat, elongated, and rectangular with parallel faces that are higher and longer than wide. Used primarily in carpentry, planks are critical in the construction of ships, houses, bridges, and many other structures. Planks also serve as supports to form shelves and tables. Usually made from sawed timber, planks are usually more than 1 1/2 in (38 mm) thick, and are generally wider than 2 1/2 in (64 mm). In the United States, planks can be any length and are generally a minimum of 2 in (51 mm) deep by 8 in (200 mm) wide, but planks that are 2 in (51 mm) by 10 in (250 mm) and 2 in (51 mm) by 12 in (300 mm) are more commonly stocked by lumber retailers. A plank used in a building as a horizontal supporting member that runs between foundations, walls, or beams to support a ceiling or floor is called a joist.



**Fig.5. Wooden plank**

#### **6.5. Drilling machine:**

Drilling machine can make a circular hole in the job by removing volume of the metal from it with the help of a cutting tool called drill bit. When drilling is performed by the drilling machine the drill bit i.e. the cutting tool is rotated along its own axis into the job. This machine is used to penetrate in earth for the excavation. A drill is a tool used to originate a hole in a solid material. A helical groove known as 'flute' is cut along the length of the drill. By penetrating in the earth we can remove all the dirt which are present in the house.



**Fig.6. drilling machine**

**7. STEP BY STEP PROCESS CARRIED OUT FOR LIFTING OF HOUSE**

These steps will explain what are all the process will be carried out for this project. And it is detailed below.

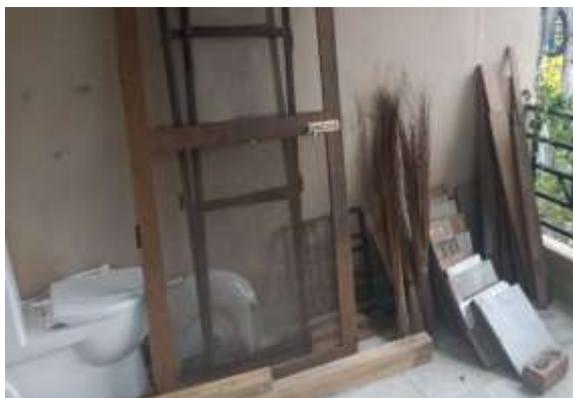
1. Evaluate the existing foundation to determine whether it will support extended house.
2. Turn off utility services and disconnect utility lines.
3. Excavate around the foundation to install the network of lifting beams.
4. Raise house with jacks.
5. Opening for flood water.
6. Extend foundation wall to desired height.
7. Removal of jack and back filling.
8. Floor finish and reconnect utility services.

**7.1. Evaluate the existing foundation to determine whether it will support extended house:**

Surveying of the residential building is to be done before starting the process of house lifting. It's important to study the existing foundation and weak members and the members of the building which requires the support before lift.

**7.2. Turn off utility services and utility lines:**

Before starting the lifting of the building it's important and necessary to disconnect the supplies of the building like electricity, gas connection, drainage connection etc. to avoid the interruption in the work and for the safety of the people working.



**Fig.7. Remove all the furniture in the house**

**7.3. Excavate around the foundation to install the Network of lifting beams:**

The support to weak members is provided to avoid the falling of members down during the process of lifting as the safety precautions to ensure the safety of the building and workers. Generally, the supports of I beams are provided as the

supports. At first the excavation is done near the walls for the application of the jacks, the jacks are applied below the ground beam or supports of steel beams.



**Fig.8. Excavate around the foundation**

#### 7.4. Raise house with jacks:

The jacks are applied in the space of the excavation and the jacks are applied and the house is lifted by jacking the jacks simultaneously. The jacks are removed and the parallel brick masonry is done to support the lifting of the building.



**Fig.9. Raising house with jacks**

#### 7.5. Openings for flood water:

An important part of the project is installing openings in the foundation walls, no higher than 1 foot above the ground, so that flood waters can enter and equalize the internal and external hydrostatic pressures. We can create these openings by only partially filling the I-beam holes.

#### 7.6. Extend foundation wall to desired height:

The brick masonry is to be done to act as the foundation of the building, it supports the whole building and this ultimately increases the height of the building.

### 7.7. Removal of jack and backfilling:

The jacks are removed after the brick masonry is completed and can sustain or bear the load of the building. The pebbles and marram are filled in the plinth area of the building. The backfilling of the sand should be well compacted to support the floor load of the building.

### 7.8. Floor finish and reconnect utility services:

The flooring is done after the compacted soil filling. After the completion of the flooring the supply connections are connected. After the lifting of the house is done the filling of cracks is done with the cement grouting is done.

## 8. ADVANTAGES OF HOUSE LIFTING

1. When your house is below the road level, it can be easily lifted and shifted without any damage and raising their level in one go with help of jacks.
2. By house lifting technology, building is protected against all forms of natural disasters.
3. Indirectly saves the construction material that helps in natural resources of the environment.
4. Remain at your current facility. No need for relocation.
5. Improve marketability of existing industrial buildings. House lifting technologies are cheap and effective and saved lakhs of rupees and valuable time
6. New construction of any building is time consuming, so it is used for faster work.

## 9. DISADVANTAGES OF HOUSE LIFTING

1. Some what about risky when there was any type was cracks are in earth.
2. Not applicable for skyscrapers, high raised buildings.
3. Force due to wind and seismic hazards must be considered.
4. Additional stairs may be required to access the structure.
5. Elevation may significantly after the appearance of the structure.
6. Special measures must be taken if the structure will be subjected to high velocity water flow, fast moving ice or debris flow, and erosion.

## 10. ESTIMATION

The demolition cost of the building is excluded for the estimation of new construction. Estimation of the house lifting method by jacks includes cost for brick masonry work, flooring, plinth filling and base material filling. The cost also includes charges of filling cracks etc. if any found during the lifting of the house.

## 11. DETAILS OF JACKS

The total weight of the jack is 80 tons. The height of the jack is 3 ft. Depends upon the load of the building the gap between the two jacks also vary. If the load is high the gap will be reduced if the load is low, gab will be increased.

## 12. CONCLUSION

Finally, the house is raised by using hydraulic jacks without any damage to the structure. Then the level of house is above than the street level. Hence it will be safe in future against flooding. House lifting Technologies are cheap and effective and saved lakhs of rupees and valuable time. The house lifting task is completed by a team of certified professionals who know how to use equipment and those that have experience in handling such a project. Construction by method of house lifting is cheaper than usual construction method and saving time. Hence it is preferred to use house lifting method for repairing of foundation and increasing. Plinth height for residential building. This method also helps to save construction material which indirectly helps in saving the natural resources of environment.

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