

Flood Hazard Mitigation: Elevation Strategies

Presented by the International Association of Structural Movers (IASM)
and Roderick Scott, CFM
October 2017



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RESILIENCY AND
SUSTAINABILITY**



International Association of Structural Movers

Flood Hazard Mitigation-Elevation

The International Association of Structural Movers – IASM is the 501c-4 professional organization whose members are involved with the flood hazard mitigation elevation of buildings.

Flooding is increasing across the US, requiring communities to examine alternatives to the cycle of repetitive flooding. The cost of the flood recovery cycle is very expensive, not only monetarily but everyone involved has lifetime challenges as they navigate flood recovery. This is now compounded by rapidly rising flood insurance policy rates on all older buildings built before the first flood insurance rate map for the community. These buildings are known as pre-FIRM.

The flood hazard mitigation-elevation of pre-FIRM buildings has many benefits. The benefits of elevation include:

1. Significantly reduces the risk of flooding.
2. Significantly reduces flood insurance policy rates.
3. Reduced expenditures on recovery – Every dollar invested in elevation saves \$4 dollars of recovery expenditures.
4. Reverses the cycle of flooding.
5. Engages multiple construction trades and labor.
6. Stabilizes the real estate market and values of the property in a community.
7. Preserves property tax revenues which support schools and government operations, infrastructure and public safety as well as bonding for public projects.
8. Increases community resiliency.
9. Preserves the historic buildings which provide the sense of place of a community.
10. Environmentally responsible. The recycling and re-use of existing buildings results in a reduction of tons of solid waste to the landfill.
11. Natural resource savings. Every 1,000 sq ft of wood frame building uses ~ 250 trees.

Building elevation for flood mitigation works.

IASM member companies are a very specialized professional group of contractors and associated professionals that are involved in projects to elevate and or relocate buildings. The members are industry leaders providing the most professional, experienced flood mitigation work force in the world.

For more information:

IASM Web site – www.iasm.org

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Steps to Elevation: Pier & Beam

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STEPS TO ELEVATION - PIER & BEAM

1. Before project planning begins, a property owner needs to evaluate financing options:
 - Are there elevation grants available. Local Government will have information.
 - If the property has flood insurance, the Initial Cost of Compliance (ICC) is currently a \$30,000 onetime payment to the policy holder if the home is over 50% damaged and there is a claim on the policy.
 - FHA203 K loan/mortgage – This is a financing package available from any bank. It is a bit time consuming and the total funding available is \$240,000. There is a construction loan followed by a conversion into a 30 year mortgage.
 - As always cash or equity financing is the easiest for the contractors and the customer.

2. ELEVATION CERTIFICATE AND OR A LAND SURVEY(if required):

The FEMA elevation certificate is the document that establishes the current elevation and final required elevation of the building and adjacent land. It is also the form that sets the National Flood Insurance Program flood policy rates. A current land survey is required by certain communities so they can evaluate the project designs in relation to the zoning requirements like set-backs and height.

3. ENGINEERED FOUNDATION AND ARCHITECTURAL DESIGNS:

In some areas of the country, the elevation contractor is the general contractor and in other areas the elevation contractor is a sub-contractor to the GC. In some areas the property owner commissions the construction plans and in other areas the GC is selected prior to the plans designs and the GC guides the design process. In a few remaining areas the community that applied for the grant develops the construction documents as a municipal project which has tended to increase the costs of the projects. All of the above methods work. The new or additional foundation must be designed in compliance with the American Society of Civil Engineers(ASCE) flood zone construction requirements, ASCE-24 & 7 are the publication numbers. FEMA publication P-55 “Coastal Construction Manual” and foundation design types are seen in Figure 1 and Figure 2 below. The foundation work on these projects is always more than half of

the project costs. In addition to the foundation structural design requirements we need to consider what the result of the project looks like. Remember these buildings are now built much more solid than originally and they will be around for some time. The owners and the community care about this and if the building is designated historic there may be a pre-permit design review if required by community or Federal funding. The site soils determine the design of the foundation and a soil sample is the best way to go at this point. The soil strata and load bearing capacity will determine if piles or helicals will need to be driven below the new foundation. Some communities and design professionals require this testing.

4. CONTRACTOR ESTIMATES:

After the construction plans are completed, it is time to get contractor estimate(s). If it is a grant program job most states/communities require 2 - 3 estimates using the plans generated in #2. If it is a "turn key" job where the GC manages the entire project the estimate is generated after the design phase in number 3. IASM members need to carry workman's compensation, liability and riggers/cargo/care and custody type insurance, because once the building is off of its foundation the homeowners policy no longer covers the building and contents. The community and property owners should have a copy of your coverages.

5. CONTRACT SIGNING AND PERMITS:

If the project is grant funded there are often additional contract documents the GC will need to sign that are approved by the community and usually the state. In addition, many communities are now requiring bonding to insure completion of the project. If the project is a private contract then just your contract is sufficient. Some communities require a beam/crib design be submitted as part of the permitting processes. The permitting authority will review the plans, note any needed plan changes and issue a construction permit.

6. UTILITY DISCONNECTS/PREPARE STRUCTURE FOR ELEVATION:

Now is the time to get started at the site. Once the permits are in place, port o potty is on site and any fencing required by local government is installed, any vegetation salvage needs to be accomplished. Then bracing of the building and or porches in addition to stair removal needs to be done. Utilities preparation are different in every community. Make sure to check with the building department for their requirements. Some communities allow gas shut off and sewer/water disconnect, this is the easiest and least expensive. Other communities require complete capping of some or all utilities with a demolition permit and all new utilities installed. This is a very expensive alternate way of doing things.

7. STRUCTURE ELEVATION/RELOCATION:

At this point the cribs and structural steel are delivered to the site and the existing foundation, crawl space or basement, is opened up to receive the steel. The cribbing is "bedded" into the ground in pre-determined areas according to the new foundation

design. Some communities require deeper crib bedding so double check on their requirements. Next the lifting steel is inserted under the building/wood frame of the building and lifting equipment is installed. Lift the building to more than the final required height for foundation work lift off foundation and roll off to perform the foundation work.

8. FOUNDATION:

- A. REMOVE OLD AND BUILD NEW – Many older buildings have substandard foundation design and construction. These foundations need to be removed completely and a new foundation constructed to the plans design.
- B. Add to the old foundation. In some cases, the structural engineer design will allow the reuse of the existing foundation and the new elevated porting to be added.

9. LOWER HOME ONTO NEW/IMPROVED FOUNDATION: This step is where the relocated or elevated building is placed onto the new foundation. The building always needs to be strapped down to the new foundation in order to meet the building codes. Some property owners may wish to strap several or all of the vertical studs to improve high wind survivability. An added wind measure is to strap the wall studs to the rafters at the top plate/rafter connection.

10. RECONNECT UTILITIES, BUILD STAIRS/RAMPS:

This step involves all the utilities reconnections or new construction depending on the community requirements. The final stairs, landings and any exterior porches are now built according to the construction plans.

11. FINISH CLEANING, CONCRETE WORK, SOD/GRASS: This is the final stage of the flood mitigation elevation project. All final flat work/concrete slabs, walkways and driveways are completed here. The site is cleaned, salvaged vegetation shrubbery is installed, new shrubs installed and sod or grass seed is installed. A final cleaning and the final code inspection is completed to finish the job.

Steps to Elevation: Slab on Grade

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INTERNATIONAL ASSOCIATION
OF STRUCTURAL MOVERS

STEPS TO ELEVATION – SLAB ON GRADE

Many IASM member companies have been, are now or will become involved in projects to elevate and or relocate buildings for flood hazard mitigation. Flood mitigation projects reduce the risk of flooding and keep flood insurance policies reasonable. The elevation/retrofit of a building to the higher current elevation requirement is a common project for our association members. Tens of thousands of these projects have been completed in the last 30 years. IASM members are industry leaders providing the most professional, experienced flood mitigation work force in the world.

Remember the flood insurance policy rates are going up on all buildings in the United States, built before the first flood map was adopted in the community that you are looking to do work in. This document outlines the required steps to plan, finance and execute the flood mitigation project in the US. This document can certainly be used to guide property owners and structural companies in other countries as well.

Often the local municipality has an extra height added, above the required elevation and that is known as “freeboard”. When considering elevating a building it is important to contact the local government building/permit offices to determine if there are any contractor requirements for your company to do elevations/relocations and the processes required for elevation of the building. It is always a good idea to visit with these folks in the building department/permitting offices and get to know them because you will be working with them during the mitigation project and be in a position to have them contact you directly about possible flood mitigation work challenges they are experiencing. Remember the property owners are their citizens/tax payers. They have their best interests in mind and you are there to help all of them.

There are three main phases in these flood hazard mitigation elevation/relocation projects. Planning-Design, financing and implementation.

The slab on grade has two types of construction and therefore has two types of projects to elevate. If the slab is structural, on piles with big grade beams then most likely it can be lifted. If it is not a structural slab, then the building must be separated from the slab and elevated. A new wood floor system is then created.

1. Before project planning begins, a property owner needs to evaluate financing options:
 - Are there elevation grants available.
 - If the property has flood insurance, the Initial Cost of Compliance (ICC) is currently a \$30,000 onetime payment to the policy holder if the home is over 50% damaged and there is a claim on the policy.
 - Small Business Administration (SBA) – If the building is 50% or more damaged by flooding the SBA allows up to \$200,000 in additional loan funding to elevate the building.
 - FHA203 K loan/mortgage – This is a financing package available from any bank. It is a bit time consuming and the total funding available is \$240,000. There is a construction loan followed by a conversion into a 30 year mortgage.
 - As always cash or equity financing is the easiest for the contractors and the customer.

2. ELEVATION CERTIFICATE AND OR A LAND SURVEY(if required):

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In some areas of the country, the elevation contractor is the general contractor and in other areas the elevation contractor is a sub-contractor to the GC. In some areas the property owner commissions the construction plans and in other areas the GC is selected prior to the plans designs and the GC guides the design process. In a few remaining areas the community that applied for the grant develops the construction documents as a municipal project which has tended to increase the costs of the projects. All of the above methods work. The new or additional foundation must be designed in compliance with the American Society of Civil Engineers(ASCE) flood zone construction requirements, ASCE-24 & 7 are the publication numbers. FEMA publication P-55 “Coastal Construction Manual” and foundation design types are seen in Figure 1 and Figure 2 below. The foundation work on these projects is always more than half of the project costs. In addition to the foundation structural design requirements we need to consider what the result of the project looks like. Remember these buildings are now built much more solid that originally and they will be around for some time. The owners and the community care about this and if the building is designated historic there may be a pre-permit design review if required by community or Federal funding. The site soils determine the design of the foundation and a soil sample is the best way to go at this point. The soil strata and load bearing capacity will determine if piles or helicals will need to be driven below the new foundation. Some communities and design professionals require this testing.

4. CONTRACTOR ESTIMATES:

After the construction plans are completed, it is time to get contractor estimate(s). If it is a grant program job most states/communities require 2 - 3 estimates using the plans generated in #2. If it is a "turn key" job where the GC manages the entire project the estimate is generated after the design phase in number 3. IASM members need to carry workman's compensation, liability and riggers/cargo/care and custody type insurance, because once the building is off of its foundation the homeowners policy no longer covers the building and contents. The community and property owners should have a copy of your coverages.

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6. UTILITY DISCONNECTS/PREPARE STRUCTURE FOR ELEVATION:

Now is the time to get started at the site. Once the permits are in place, port o potty is on site and any fencing required by local government is installed, any vegetation salvage needs to be accomplished. Then bracing of the building and or porches in addition to stair removal needs to be done. If the building is brick clad, many companies remove the brick and later install siding. If there is a brick edge incorporated in the slab then the brick façade can be elevated with the building. Utilities preparation are different in every community. Make sure to check with the building department for their requirements. Some communities allow gas shut off and sewer/water disconnect, this is the easiest and least expensive. Other communities require complete capping of some or all utilities with a demolition permit and all new utilities installed. This is a very expensive alternate way of doing things.

7. STRUCTURE ELEVATION:

The two types of slabs offer 2 different types of lifting:

- A. Structural slab on piles: These foundations feature a monolithic pour with slab and grade beam footings poured at one time. These foundations usually have piles, usually wood, to support the foundation. Excavation exposes the piles under the foundation and helical or segmented block piles are driven next to the original piles. The grade beams are excavated at the site of lifting cribs. Crib jacks and slab support jacks are installed.
- B. Non-structural slab – separate footing and slab:
This foundation type features a separate footing and slab. Sometimes structural engineers will certify the original foundation is strong enough to support additional vertical walls or piers to set the building back down on. To elevate the building off of the original foundation all furnishings need to be removed and stored. Carpet or wood floors need to be removed. The lower 4 ft of drywall needs to be removed along with lower kitchen cabinets, bathroom fixtures and cabinets. The entire building must have horizontal boards fastened to the vertical studs and steel lifting beams placed under the horizontal boards on cribs. Crib jacks and or toe jacks are installed.

8. FOUNDATION:
 - A. REMOVE OLD AND BUILD NEW – Many older buildings have substandard foundation design and construction. These foundations need to be removed completely and a new foundation constructed to the plans design.
 - B. Add to the old foundation. In some cases, the structural engineer design will allow the reuse of the existing foundation and the new elevated porting to be added.
9. LOWER HOME ONTO NEW/IMPROVED FOUNDATION: This step is where the relocated or elevated building is placed onto the new foundation. The building always needs to be strapped down to the new foundation in order to meet the building codes. Some property owners may wish to strap several or all of the vertical studs to improve high wind survivability. An added wind measure is to strap the wall studs to the rafters at the top plate/rafter connection.
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2. FINISH CLEANING, CONCRETE WORK, SOD/GRASS