



5R Relocation

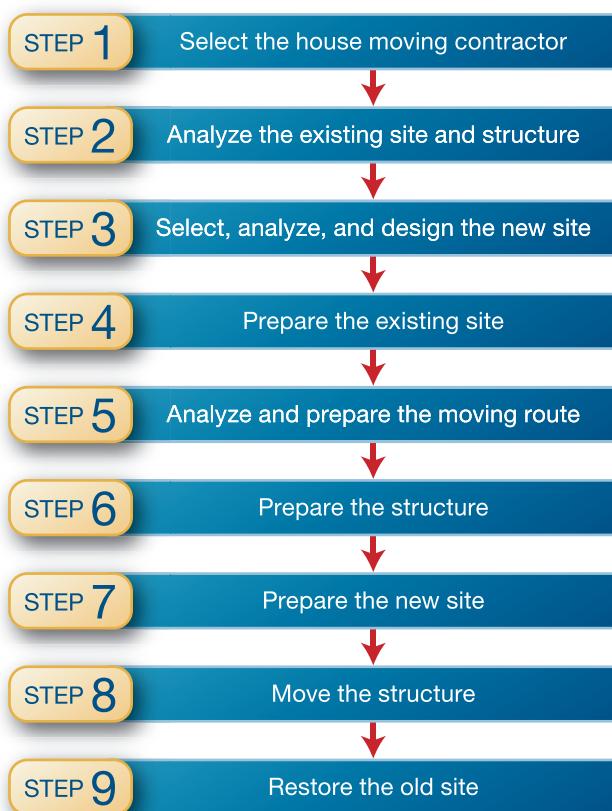
Relocation is the retrofitting measure that can offer the greatest security from future flooding (see Figure 5R-1). It involves moving an entire structure to another location, usually outside the floodplain. Selection of the new site is usually conducted by the homeowner, often in consultation with the designer to ensure that critical site selection factors such as floodplain location, accessibility, utility service, cost, and homeowner preference meet engineering and local regulatory concerns. Relocation as a retrofitting measure not only relieves anxiety about future flooding, but also offers the opportunity to reduce future flood insurance premiums.



Figure 5R-1.
House relocation (photo courtesy of Wolfe House Movers)

The relocation process, as illustrated in Figure 5R-2, is fairly straightforward. There are, however, a number of design considerations to be addressed before embarking on this retrofitting measure. The nine steps involved with the relocation of a structure are discussed in more detail throughout this chapter.

Figure 5R-2.
Relocation process



5R.1 Step 1: Select the House Moving Contractor

The selection of a moving contractor is one of the most important decisions a homeowner will make and may ultimately have the greatest impact on the success of the project. The designer can assist the homeowner in selecting an experienced home moving contractor. Some of the key elements of this selection (outlined in Figure 5R-3) include:

Experience: The homeowner and designer should visit recent projects the contractor has completed and talk to owners who recently went through the process to develop an opinion on the quality of work done.

Financial Stability: The homeowner/designer should determine whether and to what extent the contractor is licensed, insured, and bonded. A prudent homeowner will consider the potential risk of a failed project before enlisting the assistance of a contractor.

Professionalism and Reputation: The designer/homeowner may wish to check the contractor's reputation with the State licensing board, the local Better Business Bureau, local officials, and/or the International Association of Structural Movers (IASM). A critical question is whether or not the contractor is licensed to work in your area.

The designer/homeowner should also interview several contractors to determine:

- how well they may be able to work with this contractor;
- the extent of the contractor's knowledge; and
- what confidence may be had in the contractor's ability to complete the relocation project.

Cost of Services: While this should not be the sole determinant of contractor selection, cost of services is an important aspect of the relocation process. To ensure a comparison of similar levels of effort, the designer/homeowner should develop a detailed scope of services to be provided and have each contractor prepare a bid from the same scope of services. Remember, the most qualified contractor may not always have the highest cost and, conversely, the least qualified contractor may not have the lowest cost.



NOTE

The International Association of Structural Movers may be contacted at: P.O. Box 1213, Elbridge, NY 13060, (315) 689-9498, or <http://www.iasm.org> to obtain information on house relocation companies for a retrofitting project.

Relocation Contractor Selection Checklist

1. Experience of the Contractor:

- | | | |
|--|-----------|----------|
| Recent, successful house re-elevation projects? | Yes _____ | No _____ |
| Satisfied clients providing good references? | Yes _____ | No _____ |
| Met time schedules? | Yes _____ | No _____ |
| Cleaned up and restored old site? | Yes _____ | No _____ |
| Quality product through your visual inspection of recent projects? Yes _____ | No _____ | |

2. Financial Stability of Contractor:

- | | | | |
|-----------|-----------|----------|---------------|
| Bonded? | Yes _____ | No _____ | Amounts _____ |
| Licensed? | Yes _____ | No _____ | Amounts _____ |
| Insured? | Yes _____ | No _____ | Amounts _____ |

3. Professionalism and Reputation of Contractor:

- | | |
|---|-------|
| State Licensing Agency: | _____ |
| Better Business Bureau: | _____ |
| Local Officials: | _____ |
| International Association of Structural Movers: | _____ |
| Results of the Interview: | _____ |

4. Cost of Services:

5. Summary of References:

Figure 5R-3. Relocation contractor selection checklist

5R.2 Step 2: Analyze the Existing Site and Structure

The designer should help the homeowner to ensure that the contractor conducts an analysis of the existing site and structure to determine the critical criteria for the relocation of the structure. These criteria will include:

- Is there sufficient space around the structure for the installation of lifting beams and truck wheels?
- Can the structure be lifted as one piece or must it be separated into sections?
- Depending on the final assessment of the structure's conditions, how much bracing will be required to successfully move this structure?
- Will this structure survive the lift and a move of the distance proposed by the homeowner?
- Which utilities must be disconnected and where?
- What local regulations govern demolition of the remaining portions of the structure (foundation and paved areas) and to what standard must the site be restored?



WARNING

Usually the analysis of the existing site and structure is conducted by the moving contractor and not by the homeowner's designer. However, it is important that the designer/homeowner coordinate and communicate with the contractor regarding the issues related to the analysis of the existing site and structure for relocation.

The contractor usually has experience in analyzing the existing structure to determine:

- the size and placement of lifting beams, jacks, and lateral or cross beams; and
- whether the structure should be elevated and moved in one piece or elevated and moved several pieces.

The final decision on these items may not be made until an evaluation of the moving route is conducted, as the moving route can present other factors the contractor must consider (see Step 5).

Lifting Beam Placement: Each of the following factors affecting the placement of lifting beams must be considered during the elevation and relocation process:



WARNING

If the selected contractor is not familiar with factors regarding lifting beam placement, the homeowner and designer might reconsider their contractor selection.

- size and shape of the house;
- existing framing and parameters;
- deflection limitations; and
- distribution of the house's weight.

The major consideration for the placement of lifting beams is to limit cracking due to excessive deflections during preparation, moving, and settling in place. The lifting beams, in tandem with cross or lateral beams, must sufficiently support the structure. When the house is removed from the foundation, the lifting and lateral beams should provide as stable a support as the original foundation.

Deflection of any portion of the structure is normally a result of the manner in which the weight of the house is distributed, the location of the jacks under the lifting beams, and the rigidity of the lifting beam. Proper placement of lifting beams, jacks, and lateral beams will protect against cracking of both the interior and exterior finishes, as well as ensure the integrity of the entire house.

A second consideration concerning the installation of lifting beams is to ensure that they are located so that the house can be attached to truck wheel sets forming a trailer.

The route to be taken during the relocation of the house dictates the physical size and weight limitations of the structure, due to the horizontal and vertical clearances from obstructions. The house may have to be cut into sections which are moved separately to negotiate the available route. Lifting beams, therefore, would have to be placed for each section to be moved. The entire elevation framing must also be rigid enough to take the forces associated with physical movement of the house.

Heavier construction materials on certain portions of the house, such as brick veneer, chimneys, and fireplaces, causes additional deflection and warrants special attention when determining the lifting beam system. Even with minimal deflection, brick construction is subject to cracking. Therefore, extra precautions, in the form of additional beam support or removal of the brick for possible later replacement, will be needed.

The size and shape of the house also affects the placement and number of lifting beams. A simple rectangular floor plan allows for the easiest and most straightforward type of elevation project. Generally, placement of the longitudinal lifting beams, with lateral beams located as required, is the system utilized for the elevation process. Larger or more complex shapes, such as L-shaped or multi-level houses, necessitate additional lifting beams and jacks to provide a stable lifting support system. Every consideration of the load based upon the size and shape of the house should be incorporated into the design and layout of the lifting beam system.

5R.3 Step 3: Select, Analyze, and Design the New Site

The selection of a new site for a relocated house will require the examination of potential sites with regard to:

- floodplain location;
- utility extension feasibility;
- accessibility; and
- permitting feasibility.



NOTE

Information on site design standards may be obtained from the local building official, or, if there is none, from the HUD's publication ACCN-6212, Proposed Model Land Development Standards and Accompanying State Enabling Legislation (HUD,1993)..

The process is similar to selecting a lot upon which to design and build a new house. Local building codes and approval processes must be followed. In some instances, the homeowner may be required to upgrade existing mechanical, electrical, and plumbing systems to meet current code requirements.

Site Access: An important consideration in the selection of a new site is the accessibility of the site for both the house movers and the new site construction crews. Severe site access constraints can increase the cost of the retrofit measures. Constraints can also require cleaning and grading activities, which may diminish the site characteristics initially desired by the homeowner.

Permits: The designer/homeowner should make certain that, when the house is moved to the new lot, it will conform to all the zoning and construction standards in effect at the time of relocation. The designer should contact the local regulatory officials to determine the design standards and submission process requirements that govern development of a new site. All permits required for construction at the new site and for transporting the house to the new site should be obtained prior to initiating the relocation process.

5R.4 Step 4: Prepare the Existing Site

Initial preparation of the site includes clearing all vegetation from the area in and around the footprint of the house (see Figure 5R-4). This is done to clear a path beneath the house to allow the insertion of beams for lifting supports. These pathways should be deep enough to allow for the movement of both people and machinery.

Figure 5R-4.
Clearing pathways
beneath the structure for
lifting supports (photo
courtesy of Wolfe House
Movers)



5R.5 Step 5: Analyze and Prepare the Moving Route

Once the relocation site has been selected, a route for transport must be analyzed and selected. This route should be carefully chosen and planned well in advance of the design of the new site or the undertaking of any relocation process activities at the existing site.

Identify Route Hazards: Make certain that the house, as it will be moved, will be able to navigate the following:

- narrow passages, such as road cuts and widths;
- bridge weight limits and widths;

- utility conflicts, such as light poles, and electric and telephone lines;
- fire hydrants;
- road signs;
- steep grades;
- traffic signals; and
- tight turns around buildings, bridges, and overpasses.

**WARNING**

Timing may be critical in areas that have heavy traffic during morning and evening rush hours. Houses are often relocated during the late evening and early morning hours.

Care should be taken to ensure that the structure will clear all overhead utility lines. Many of these can be lifted during the move, but utility companies sometimes require the presence of their employees and will charge for this service. In some instances, an overland (non-road) route may be the best alternative.

Obtain Approvals: It may be necessary to obtain moving permits, not only for the area from which the structure is being moved, but also in jurisdictions through which the structure is passing. Approvals for transport in a public right-of-way may be required from local governments, highway departments, and utility companies. Often approvals may be necessary from private landowners whose properties are either crossed or affected by the move.

The time required to obtain approvals and the complexity of information some parties may require in order to provide approvals may vary widely. The designer/contractor and homeowner should investigate this approval process early in the relocation effort to minimize potential delays due to obtaining permits.

Coordinate Route Preparation: The moving contractor should be responsible for the necessary coordination made along the moving route. This includes:

- the raising or relocation of utilities by utility companies;
- any road/highway modifications, such as traffic lights, signage, temporary bridges, etc.; and
- clearing/grubbing of overland areas, where necessary.

The moving contractor should also be responsible for making sure that these facilities are returned to their normal operating condition as soon as the move is completed.

5R.6 Step 6: Prepare the Structure

The steps involved in preparing a structure to be moved are described below.

Disconnect Utilities: The first step in preparing the structure is to disconnect all the utilities connected to the structure. Specific requirements governing the capping, abandoning, and/or removal of specific utilities should be available from the local utility companies and/or the local regulatory officials.

Cut Holes in Foundation Wall for Beams: From beneath the structure, the pathways for lifting beams are cut into the existing foundation (see Figure 5R-5).

Figure 5R-5.
Pathways for lifting
beams (photo courtesy of
Wolfe House Movers)



Install Beams: Lifting and lateral beams are placed beneath the structure at all critical lift points and support cribbing is added as the structure is separated from its old foundation (see Figure 5R-6).

Figure 5R-6.
Beams supported by
cribbing are placed at
critical lift points (photo
courtesy of Wolfe House
Movers)



Install Jacks: Jacks are used to lift the structure from its foundation (see Figure 5R-7). Various types of jacking systems may be employed as long as gradual and uniform lifting pressures are utilized to lift the structure.



Figure 5R-7.
Hydraulic jacks installed
to lift structure from
foundation (photo
courtesy of Wolfe House
Movers)

Install Bracing as Required: Bracing may need to be installed to maintain the integrity of the structure.

Separate Structure from Foundation: The structure now stands free from its former foundation (see Figure 5R-8).



Figure 5R-8.
Structure is separated
from its foundation
(photo courtesy of Wolfe
House Movers)

5R.7 Step 7: Prepare the New Site

The new site is prepared for the arrival of the structure.

Design Foundation: The steps needed to design the new foundation have been defined in Chapter 5E.

Design Utilities: Utilities must be available to be brought directly to the structure at the new site. Construction should be accomplished in accordance with the approved set of design documents prepared for the new site and any building permit conditions specified by local officials (as explained in Step 3).

Excavation and Preparation of New Foundation: At the new site, excavation and preparation of the foundation are underway (see Figure 5R-9).

Construction of Support Cribbing: Support cribbing is put in place to allow the structure to be jacked up and the truck wheel sets are removed. With support cribbing in place, materials for completion of the foundation are readied.

Construction of Foundation Walls: The foundation wall construction begins (see Figure 5R-10).

Figure 5R-9.
Foundation preparation at
new site (photo courtesy
of Wolfe House Movers)





Figure 5R-10.
New foundation wall construction begins
(photo courtesy of Wolfe House Movers)

5R.8 Step 8: Move the Structure

Once the structure has been raised, it is transported to the new site. This process is outlined below.

Excavate/Grade Temporary Roadway: Excavation and grading of a temporary roadway is done at one end of the structure. The truck wheels, which will form the trailer that will be used to move the house, are brought to the site and placed beneath the lifting and lateral beams (see Figure 5R-11).



Figure 5R-11.
Trailer wheel sets are placed beneath the lifting beams
(photo courtesy of Wolfe House Movers)

Attach Structure to Trailer: The house is attached to the truck wheels and then attached to the tractor/bulldozer in preparation for the moving of the structure from its original site (see Figure 5R-12). The tractor/bulldozer is used to pull the house to street level, while workers continually block the wheels to prevent sudden movement. At street level, the house is stabilized and a truck is connected to the trailer for the journey to the new site.

Transport Structure to New Site: With connections to the truck completed, the actual transport of the structure to the new site begins.

Lower Structure onto Foundation: Once the desired height of the new wall is reached, the house is lowered onto its new foundation, cribbing is removed, and foundation walls are completed (see Figure 5R-13).

Figure 5R-12.
Trailer is used to pull the
house to the street (photo
courtesy of Wolfe House
Movers)



Figure 5R-13.
House is lowered
and connected to
the foundation after
foundation walls are
completed (photo
courtesy of Wolfe House
Movers)



Landscaping: Finishing touches, like preparing the foundation for backfilling and landscaping, are done to blend in the house with its new environment.

5R.9 Step 9: Restore the Old Site

Once the structure is removed from the site, certain steps need to be taken to stabilize the site in accordance with local regulations. Many homeowners have sold or deeded these abandoned properties to local municipalities for the development of parkland and/or open space. In any case, permits for the demolition of the old site, remaining foundation, and remaining utility systems, as well as grading and site vegetative stabilization are normally required.

Demolish and Remove Foundation and Pavement: The old basement may have to be backfilled to eliminate any potential hazards. Check local regulations to see if old foundation and utility connections have to be removed.

Disconnect and Remove All Utilities: Following up on the disconnection and capping of utility services previously discussed in Step 6, the homeowner may be required to remove all existing utility systems from the site. Septic tanks and oil/gas storage tanks on site may be governed by specific environmental guidelines, which must be followed to ensure that leakage to groundwater sources does not occur. Depending upon the age and condition of the tanks, the homeowner may be required to drain and remove these tanks, or drain and stabilize the underground tanks against flotation.

The homeowner may also be required to test the soil around an underground tank to determine if leakage has occurred. If leakage is confirmed, the homeowner is usually responsible for cleaning the contaminated soils. When facing this situation, the homeowner should contact a qualified geotechnical or environmental engineer. Specific requirements governing the capping, abandoning, and/or removal of specific utilities should be determined from the local utility companies and/or the local regulatory officials.



NOTE

Material from drained septic, oil, and gas storage tanks must be disposed of in a safe and legal manner.

Grading and Site Stabilization: The old site may have to be regraded after all the excavation and movement by the heavy equipment. The lot will need to be stabilized with vegetation as appropriate to its intended future use.

