ASFPM
Nonstructural/Floodproofing
Workshops

Elevation

ASFPM Nonstructural/Floodproofing Committee

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Elevation...

...is one of the most common and effective methods used to prevent flooding of living space.

... should be designed by registered engineers or architects and constructed by qualified contractors.
Appropriate Design for Risk?

Atlantic City, NJ

Lavallette, NJ

Seaside, NJ

Mantoloking, NJ
Utilizing Fill To Elevate

Add graphic from 259
Extended Foundation Walls

- Not permitted in V Zones
- Not permitted in regulatory floodway
- Not recommended in Coastal A Zones
- Not recommended in areas of high velocity or ice flows
- Acceptable in riverine A Zones
Piers, Post & Columns
Pilings

..... are mechanically driven deeper into the ground making them less susceptible to velocity flooding and scour.
WHAT ELEVATION METHOD SHOULD I USE?

The following items should be considered when evaluating elevation options:

Height lowest level to be raised
  Design Flood Elevation (DFE)
  Your choice unless substantially damaged or improved
  Base Flood Elevation (BFE)
  Freeboard as it relates to the NFIP or local ordinances

Flood Characteristics
  Velocity
  Debris/Ice
  Storm surge
  Waves

** See Foundation Selection Decision Tree – FEMA 550, Figure 5-2 for additional information, FEMA P-259, Engineering Principles and Practices or the Corps NFPC Nonstructural Matrix
### Advantages/Disadvantages of Elevation

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brings a substantially damaged or improved building into compliance with the NFIP if the lowest horizontal structural member of the lowest floor is elevated to the BFE</td>
<td>May be cost-prohibitive</td>
</tr>
<tr>
<td>Reduces flood risk to the structure and its contents</td>
<td>May adversely affect the structure’s appearance</td>
</tr>
<tr>
<td>Eliminates the need to relocate vulnerable items above the flood level during flooding</td>
<td>Does not eliminate the need to evacuate during floods</td>
</tr>
<tr>
<td>Often reduces flood insurance premiums</td>
<td>May adversely affect access to the structure</td>
</tr>
<tr>
<td>Uses established techniques</td>
<td>Cannot be used in areas with high-velocity water flow, fast-moving ice or debris flow, or erosion unless special measures are taken</td>
</tr>
<tr>
<td>Can be initiated quickly because qualified contractors are often readily available</td>
<td>May require additional costs to bring the structure up to current building codes for plumbing, electrical, and energy systems</td>
</tr>
<tr>
<td>Reduces the physical, financial, and emotional strains that accompany flood events</td>
<td>Requires consideration of forces from wind and seismic hazards and possible changes to building design</td>
</tr>
<tr>
<td>Does not require the additional land that may be needed for floodwalls or levees</td>
<td></td>
</tr>
</tbody>
</table>

Source: FEMA P-259
Other Considerations...

Building codes
  Building Type and Condition
  Height limitations
  Access
  Utilities
  Aesthetics
  Contractor
  Compliance with NFIP

Use of existing foundation
  Have design professional evaluate existing foundation

Hazards
  Hydrostatic pressure
  Hydrodynamic pressure
  Debris impact
  Erosion and scour

<table>
<thead>
<tr>
<th>Foundation Type</th>
<th>V Zone</th>
<th>Coastal A Zone</th>
<th>A Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Closed</td>
<td>X</td>
<td>NR</td>
<td>✓</td>
</tr>
</tbody>
</table>

Source: FEMA 550

✓ = Acceptable   NR = Not Recommended   X = Not Permitted
Field Investigation Checklist

Source: FEMA P-259 – Engineering Principles and Practices
Contractor Selection

1. Experience of the Contractor:
   - Recent, successful house elevation project? Yes ___ No ___
   - Satisfied clients providing good references? Yes ___ No ___
   - Quality product through your visual inspection of recent projects? Yes ___ No ___

2. Stability of Contractors:
   - Licensed? Yes ___ No ___
   - Bonded? Yes ___ No ___ Amounts: ______________
   - Insured? Yes ___ No ___ Amounts: ______________

3. Professionalism and Reputation of Contractors:
   - State Licensing Agency: ____________________________
   - Better Business Bureau: ____________________________
   - Local Officials: ____________________________
   - Professional Associations: ____________________________
   - Results of the interview: ____________________________

4. Cost of Services: ________________
Elevation Using Segmented Piles

Existing piles exposed
Hydraulic system used for driving segmented piles
Elevation using Segmented Piles
Video Demonstration of Segmented Piles Installation
Elevation using Segmented Piles
Completed Elevation on Segmented Piles
Floodproofing completed with addition being added
Elevation on Extended foundation Walls

- Site Inspection
- Obstruction removal
- Preparation for steel placement
- Steel placement
- Shimming floor joist
- Unified lift system
- Raise in place
- Unforeseen joist problems
- Constructing new foundation
- Lowering on new foundation
- Steel removal
- Decks and landings
- Final touches
Site Inspection
Obstruction removal & preparation for steel placement
Steel Placement
Shimming Floor Joist
Raising The Structure
Unforeseen Joist Problems
Constructing new foundation
Lowering on New Foundation
Steel Removal
Decks and Landings
Final Touches
Innovative Techniques along the Gulf Coast
Innovative Techniques along the Gulf Coast
Flood Resistant Design and Construction References

FEMA Building Science Publications
  http://www.fema.gov/rebuild/buildingscience/publications.shtm
  - Library of FEMA flood related publications
  - NFIP & Building Codes/Standards
  - NFIP Technical Bulletins
ASCE Standard (ASCE/SEI 24-05)
International Building Code
USACE NFPC Web Site
  https://www.nwo.usace.army.mil/nfpc/
EP 1165-2-314  Flood Proofing Regulations
E.O. 11988

Add references from P-259
QUESTIONS