This guide illustrates the similarities and highlights the differences between the National Flood Insurance Program (NFIP) minimum requirements and the requirements of the International Code Series (I-Codes) and ASCE 24, *Flood Resistant Design and Construction* (ASCE 24), a standard referenced by the I-Codes.

Communities that participate in the NFIP adopt regulations and codes that govern development in special flood hazard areas, and enforce those requirements through the issuance of permits. The International Residential Code (IRC) and International Building Code (IBC), by reference to ASCE 24, include requirements that govern the design and construction of buildings and structures in flood hazard areas. FEMA has determined that the flood provisions of the I-Codes are consistent with the requirements of the NFIP (the I-Code requirements shown either meet or exceed NFIP requirements). ASCE 24, a design standard developed by the American Society of Civil Engineers, expands on the minimum NFIP requirements with more specificity, additional requirements, and some limitations.

The illustrations that follow highlight some of the key similarities and differences between foundation types, lowest floor elevations, enclosures below elevated buildings, and utilities requirements contained within the NFIP and I-Codes for most residential and commercial buildings (classified as “Category II” structures by the building codes).

**DID YOU KNOW?**

Lowest floor elevation requirements in IBC/ASCE 24 vary with structure category, and may be higher for certain high occupancy buildings and critical and essential facilities.

**DID YOU KNOW?**

The NFIP refers to the Base Flood Elevation (BFE) for lowest floor elevation requirements, while the I-Codes and ASCE 24 refer to the Design Flood Elevation (DFE). The DFE will always be the BFE or higher. Additional height above the BFE is known as freeboard.

The NFIP, I-Codes, and ASCE 24 require the use of flood damage-resistant materials below the required lowest floor elevation (illustrated throughout this guide).
The NFIP regulations do not have provisions for Coastal A Zone (CAZ), but the I-Codes do (see map on right). The IBC, by reference to ASCE 24, requires CAZ buildings to be treated like Zone V buildings. The IRC permits the use of ASCE 24 in the CAZ as an alternative to its flood provisions, which allows CAZ buildings to be treated like Zone V buildings. Starting in 2008, revised and new coastal Digital Flood Insurance Rate Maps (FIRMs) show the Limit of Moderate Wave Action (LiMWA), which delineates the landward limit of the CAZ.

The NFIP requires that all buildings in Zone V resist the effects of wind and water loads acting simultaneously. The prescriptive wind design requirements in the IRC are applicable in regions where the basic wind speed is under 110 mph, or under 100 mph in hurricane-prone regions, which extend farther inland than Zone V in most areas. Where basic wind speeds exceed these minimum values, engineered design is required.
### Comparison of Zone A Requirements: NFIP and IRC

#### FOUNDATION TYPE

<table>
<thead>
<tr>
<th>NFIP and IRC</th>
<th>Slab-on-fill</th>
<th>Perimeter wall (crawlspace)</th>
<th>Open foundation – piers/posts/columns</th>
<th>Open foundation – piles</th>
</tr>
</thead>
</table>

- Slab
- Fill
- Slab
- Fill
- Footing
- Column
- Pile

Alternative use of ASCE 24 for CAZ buildings does not permit the use of structural fill or foundation walls.

#### LOWEST FLOOR ELEVATION at top of lowest floor

<table>
<thead>
<tr>
<th>NFIP</th>
<th>IRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>LHSM = Lowest horizontal structural member</td>
<td>BFE + 1 ft or DFE*</td>
</tr>
<tr>
<td>Top of lowest floor</td>
<td>DFE = lowest floor elevation</td>
</tr>
<tr>
<td>Floor framing</td>
<td>Floor framing</td>
</tr>
<tr>
<td>Foundation element</td>
<td>Foundation element</td>
</tr>
<tr>
<td>LHSB (beam)</td>
<td>LHSB (beam)</td>
</tr>
</tbody>
</table>

*whichever is higher

#### UTILITIES AND ENCLOSURES below elevated buildings

<table>
<thead>
<tr>
<th>NFIP and IRC</th>
</tr>
</thead>
</table>

- Flood openings on different walls to provide automatic entry and exit of flood waters.
- A minimum of 2 flood openings is required, but the total number of openings depends on the type and size of the openings and the size of the enclosed area.
- Use of enclosure is restricted to parking, building access, and storage.
- Utilities elevated to or above required lowest floor elevation
- No more than 1 foot

Alternative use of ASCE 24 for CAZ buildings requires breakaway walls and utilities to be elevated based on the orientation of lowest horizontal structural members (see page 6).
Comparison of Zone V Requirements: NFIP and IRC

**Foundation Type**

<table>
<thead>
<tr>
<th>NFIP and IRC</th>
<th>Slab-on-fill</th>
<th>Perimeter wall (crawlspace)</th>
<th>Open foundation – piers/posts/columns</th>
<th>Open foundation – piles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Slab</td>
<td>Fill</td>
<td>Foundation wall</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*Not permitted*

**Lowest Floor Elevation** at bottom of LHSM

<table>
<thead>
<tr>
<th>NFIP</th>
<th>IRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>LHSM = Lowest horizontal structural member</td>
<td>LHSM parallel to wave direction</td>
</tr>
<tr>
<td>BFE = lowest floor elevation</td>
<td>BFE + 1 ft or DFE* = lowest floor elevation</td>
</tr>
</tbody>
</table>

*whichever is higher*

**Utilities and Enclosures** below elevated buildings

<table>
<thead>
<tr>
<th>NFIP and IRC</th>
<th>Area under elevated building must be free of obstruction or use breakaway walls, open lattice, or louvers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakaway wall</td>
<td>Utilities elevated to or above required lowest floor elevation</td>
</tr>
</tbody>
</table>

*The IRC specifically prohibits mounting or penetration of utilities on breakaway walls*

Both the NFIP and IRC require design certification in Zone V. Design certification is also required for breakaway walls that exceed a design safe loading resistance of 20 pounds per square foot.

*BFE = lowest floor elevation*
## Foundation Type

<table>
<thead>
<tr>
<th>NFIP and IBC/ASCE 24</th>
<th>Slab-on-fill</th>
<th>Perimeter wall (crawl-space)</th>
<th>Open foundation – piers/posts/columns</th>
<th>Open foundation – piles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Slab</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fill</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Foundation wall</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Column</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pile</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Footing</strong></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

ASCE 24 includes specifications for the use of structural fill.

### Lowest Floor Elevation

**NFIP**

- LHSM = Lowest horizontal structural member
- **Top of lowest floor**
- BFE = lowest floor elevation
- **Floor framing**
- **Foundation element**
- LHSM (beam)

**IBC/ASCE 24**

- LHSM = Lowest horizontal structural member
- **Top of lowest floor**
- BFE + 1 ft or DFE* = lowest floor elevation
- **Floor framing**
- **Foundation element**
- LHSM (beam)

*whichever is higher

DID YOU KNOW?

The NFIP and IBC/ASCE 24 allow non-residential buildings in Zone A to be dry floodproofed. Residential buildings are not permitted to be dry floodproofed in any flood hazard zone. ASCE 24 includes limitations on the use of dry floodproofing and on measures that require human intervention.
**Comparison of Zone A Requirements: NFIP and IBC/ASCE 24**

**ENCLOSURES** below elevated buildings

**NFIP and IBC/ASCE 24**

- Use of enclosure is restricted to parking, building access, and storage.
- Flood openings on different walls to provide automatic entry and exit of flood waters. A minimum of 2 flood openings is required, but the total number of openings depends on the type and size of the openings and the size of the enclosed area.
- No more than 1 foot.

**UTILITIES**

**NFIP**

- BFE = utility elevation

**IBC/ASCE 24**

- BFE + 1 ft or DFE* = utility elevation
- LHSM parallel to wave direction
- LHSM perpendicular to wave direction

**DID YOU KNOW?**

Elevation requirements for utilities in IBC/ASCE 24 vary with structure category, and may be higher for certain high occupancy buildings and critical and essential facilities.

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*whichever is higher

LHSM = lowest horizontal structural member

FEMA Quick Reference Guide: Comparison of Select NFIP and Building Code Requirements for Special Flood Hazard Areas  March 2012  page 6 of 8
**Comparison of Zone V Requirements: NFIP and IBC/ASCE 24**

### Foundation Type

<table>
<thead>
<tr>
<th>NFIP and IBC/ASCE 24</th>
<th>Slab-on-fill</th>
<th>Perimeter wall (crawl space)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Slab</td>
<td>Fill</td>
<td>Foundation wall</td>
<td>Pile</td>
</tr>
</tbody>
</table>

\( \times \) = Not permitted

The IBC/ASCE 24 requires foundation designs to specifically account for erosion and scour.

### Lowest Floor Elevation at bottom of LHSM

**NFIP**

- LHSM = Lowest horizontal structural member
- Floor framing
- Foundation element
- BFE = lowest floor elevation

**IBC/ASCE 24**

- LHSM parallel to wave direction
- LHSM perpendicular to wave direction
- BFE + 1 ft or DFE\(^*\) = lowest floor elevation
- Foundation element
- DFE = lowest floor elevation
- *whichever is higher

### Enclosures below elevated buildings

**NFIP and IBC/ASCE 24**

- The IBC/ASCE 24 specifically prohibits mounting or penetration of utilities on breakaway walls.
- Area under elevated building must be free of obstruction or use breakaway walls, open lattice, or louvers.
- Use of enclosure is restricted to parking, building access, and storage.
- Breakaway wall

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*FEMA Quick Reference Guide: Comparison of Select NFIP and Building Code Requirements for Special Flood Hazard Areas  March 2012 page 7 of 8*
Comparison of Zone V Requirements: NFIP and IBC/ASCE 24

**UTILITIES**

<table>
<thead>
<tr>
<th>NFIP</th>
<th>IBC/ASCE 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Utility Symbol]</td>
<td>![Utility Symbol]</td>
</tr>
<tr>
<td>BFE = utility elevation</td>
<td>BFE = utility elevation</td>
</tr>
<tr>
<td><strong>LHSM</strong> parallel to wave direction</td>
<td><strong>LHSM</strong> perpendicular to wave direction</td>
</tr>
</tbody>
</table>

*DFE* = utility elevation
*whichever is higher
LHSM = lowest horizontal structural member

**DID YOU KNOW?**
The IBC/ASCE 24 places constraints on construction in high risk flood hazard areas, including alluvial fan, flash flood, mudslide, erosion-prone, high velocity flow, and ice jam and debris areas.

**For More Information**

See also CodeMaster: Flood Resistant Design, an 8 page guide to designing a structure for flood loads in accordance with the IBC, IRC, ASCE 7 and ASCE 24. It can be purchased at: http://shop.iccsafe.org/codemaster-flood-resistant-design-2009-2012-ibc-2009-2012-irc-asce-7-05-7-10-asce-24-05.html

If you need additional information, contact the FEMA Building Science Helpline by emailing FEMA Buildingsciencehelp@fema.dhs.gov or calling (866) 927 2104.