

APPENDIX G

Summary of NFIP Requirements and Best Practices

This table, updated from FEMA P-55, *Coastal Construction Manual* (FEMA, 2011), summarizes NFIP regulatory requirements for Zone V, Coastal A Zone, and Zone A, and best practices for exceeding the requirements. These requirements and recommendations are in addition to the minimum building code requirements.

Table G-1. Summary of NFIP Regulatory Requirements and Recommendations for Exceeding the Requirements

	Zone A		Coastal A Zone		Zone V	
	Recommendations and Requirements ⁽¹⁾	Cross-Reference ⁽²⁾	Recommendations and Requirements	Cross-Reference	Recommendations and Requirements	Cross-Reference
GENERAL REQUIREMENTS						
Siting	<p>Recommendation: Define and evaluate vulnerability to all hazards. Site building outside of SFHA or on highest and most stable part of lot.</p> <p>Requirement: For floodways, fill is permitted only if it has been demonstrated that the fill will not result in any increase in flood levels during the base flood.</p>	<p>NFIP: 60.3(d)(3)</p> <p>IRC: R301.2.4, R322.1, R322.1.4.2</p> <p>IBC: 1612.3.4, 1804.4, App. G 103.5, App. G 401.1</p> <p>ASCE 24: 2.2</p> <p>FEMA P-259: 3.2.3, 3.3.2, 3.5, Ch. 5R</p> <p>FEMA P-55: 2.3.2, Ch. 4</p>	<p>Recommendation: Follow Zone V recommendations and requirements.</p> <p>Requirement: Buildings governed by IRC – meet Zone A requirements (unless AHJ has adopted ASCE 24 for buildings governed by IRC). Buildings governed by IBC – follow Zone V requirements.</p>	<p>IBC: 1804.4</p> <p>ASCE 24: 4.3</p> <p>FEMA P-259: 3.2.3, 3.3.2, 3.5, Ch. 5R</p> <p>FEMA P-55: 2.3.2, Ch. 4</p> <p>FEMA P-499: 2.1, 2.2</p>	<p>Recommendation: Define and evaluate vulnerability to all coastal hazards and site building as far landward as possible.</p> <p>Requirement: New construction is landward of the reach of mean high tide. Manmade alterations of sand dunes and mangrove stands that increase potential flood damage are prohibited.</p>	<p>NFIP: 60.3(e)(3), 60.3(e)(7)</p> <p>IRC: R322.3.1</p> <p>IBC: App. G401.2, App. G103.7</p> <p>ASCE 24: 4.3</p> <p>FEMA P-259: 3.2.3, 3.3.2, 3.5, Ch. 5R</p> <p>FEMA P-55: 2.3.2, Ch. 4, 7.5.1</p> <p>FEMA P-499: 2.1, 2.2</p>
Design and Construction	<p>Recommendation: Follow ASCE 24 requirements.</p> <p>Requirement: Building and foundation must be designed, constructed, and adequately anchored to prevent flotation, collapse, and lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.</p>	<p>NFIP: 60.3(a)(3)(i)</p> <p>IRC: R301.1, R301.2.4, R322.1.2, R322.2</p> <p>IBC: 1603.1.7, 1604, 1605.2.2, 1605.3.1.2, 1612</p> <p>ASCE 7: Ch. 5</p> <p>ASCE 24: 1.5, 2.2</p> <p>FEMA P-259: 2.1.4, 2.4, Ch. 4, Ch. 5</p> <p>FEMA P-55: 2.3.3, 2.3.4, 5.4.1, Ch. 8, 9.1, 9.2</p> <p>Other: FEMA P-550</p>	<p>Recommendation: Follow Zone V recommendations and requirements.</p> <p>Requirement: Building and foundation must be designed, constructed, and adequately anchored to prevent flotation, collapse, and lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.</p>	<p>NFIP: 60.3(a)(3)(i)</p> <p>IRC: R301.1, R301.2.4, R322.1.2, R322.2</p> <p>IBC: 1603.1.7, 1604, 1605.2.2, 1605.3.1.2, 1612</p> <p>ASCE 7: Ch. 5</p> <p>ASCE 24: 1.5, Ch. 4</p> <p>FEMA P-259: 2.4, Ch. 4, Ch. 5</p> <p>FEMA P-55: 2.3.3, 2.3.4, 5.4.2, Ch. 8, 9.1, 9.2</p> <p>FEMA P-499: 3.1, 3.2, 3.3, 3.4, 3.5, 4.2, 4.2, 4.3</p> <p>Other: FEMA P-550</p>	<p>Recommendation: Redundant and continuous load paths should be employed to transfer all loads to the ground. Designs should explicitly account for all design loads and conditions.</p> <p>Requirement: Building and foundation must be designed, constructed, and adequately anchored to prevent flotation, collapse, and lateral movement due to simultaneous wind loads, and flood loads, including the effects of buoyancy.</p>	<p>NFIP: 60.3(a)(3)(i), 60.3(e)(4)</p> <p>IRC: R301.1, R301.2.4, R322.1, R322.3.3</p> <p>IBC: 1603.1.7, 1604, 1605.2.2, 1605.3.1.2, 1612</p> <p>ASCE 7: Ch. 5</p> <p>ASCE 24: 1.5, Ch. 4</p> <p>FEMA P-259: 2.4, Ch. 4, Ch. 5</p> <p>FEMA P-55: 2.3.3, 2.3.4, 5.4.2, Ch. 8, 9.1, 9.2</p> <p>FEMA P-499: 3.1, 3.2, 3.3, 3.4, 4.1, 4.3</p> <p>Other: FEMA P-550</p>

Table G-1. Summary of NFIP Regulatory Requirements and Recommendations for Exceeding the Requirements (continued)

	Zone A		Coastal A Zone		Zone V	
	Recommendations and Requirements ⁽¹⁾	Cross-Reference ⁽²⁾	Recommendations and Requirements	Cross-Reference	Recommendations and Requirements	Cross-Reference
Flood Damage-Resistant Materials	<p>Recommendation: Consider use of flood damage-resistant materials above BFE.</p> <p>Requirement: Structural and nonstructural building materials below the DFE must be flood damage-resistant.</p>	<p>NFIP: 60.3(a)(3)(ii) IRC: R322.1.8 IBC: 801.5,1403.5 ASCE 24: Ch. 5 FEMA P-259: 1.3.4, 2.1.4, 5W.2 FEMA P-55: 5.2.3.1, 9.4 FEMA P-499: 1.7, 1.8 Other: FEMA TB-2 and TB-8</p>	<p>Recommendation: Consider use of flood damage-resistant materials above the BFE.</p> <p>Requirement: Structural and nonstructural building materials below the DFE must be flood damage-resistant.</p>	<p>NFIP: 60.3(a)(3)(ii) IRC: R322.1.8 IBC: 801.5, 1403.5 ASCE 24: Ch. 5 FEMA P-259: 1.3.4, 5W.2 FEMA P-55: 5.2.3.1, 9.4 FEMA P-499: 1.7, 1.8, 4.3 Other: FEMA TB-2 and TB-8</p>	<p>Recommendation: Consider use of flood damage-resistant materials above BFE.</p> <p>Requirement: Structural and nonstructural building materials below the DFE must be flood damage-resistant.</p>	<p>NFIP: 60.3(a)(3)(ii) IRC: R322.1.8 IBC: 801.5, 1403.5 ASCE 24: Ch. 5 FEMA P-259: 1.3.4, 5W.2 FEMA P-55: 5.2.3.1, 9.4 FEMA P-499: 1.7, 1.8, 4.3 Other: FEMA TB-2 and TB-8</p>
Free of Obstructions	<p>Recommendation: If riverine flood velocities are high or large debris load is anticipated, open foundations are recommended. Obstructions include any building element, equipment, or other fixed objects that can transfer flood loads to the foundation, or that can cause floodwaters or waves to be deflected into the building.</p> <p>Requirement: None.</p>	<p>FEMA P-55: 10.7, 10.9</p>	<p>Recommendation: Follow Zone V recommendation and requirement.</p> <p>Requirement: No limitations are imposed on obstructions below elevated floors unless the design is governed by IBC/ASCE 24 (in which case the space below the lowest floor must be free of obstructions).</p>	<p>IBC: 1612.4 ASCE 24: 4.5.1 FEMA P-55: 5.2.3.3, 7.6.1.1.6, 10.5, 10.6 FEMA P-499: 1.2, 3.1, 8.1 Other: FEMA TB-5</p>	<p>Recommendation: Use lattice or insect screening or louvers instead of solid breakaway walls.</p> <p>Requirement: Open Foundation required. The space below the lowest floor must be free of obstructions, or constructed with non-supporting breakaway walls, open lattice, or insect screening.</p>	<p>NFIP: 60.3(e)(5) IRC: R322.3.3 IBC: 1612.4 ASCE 24: 4.5.1 FEMA P-55: 5.2.3.3, 7.6.1.1.6, Table 7-3, Table 7-4, 10.5, 10.6 FEMA P-499: 1.2, 3.1, 8.1 Other: FEMA TB- 5</p>

Table G-1. Summary of NFIP Regulatory Requirements and Recommendations for Exceeding the Requirements (continued)

	Zone A		Coastal A Zone		Zone V	
	Recommendations and Requirements ⁽¹⁾	Cross-Reference ⁽²⁾	Recommendations and Requirements	Cross-Reference	Recommendations and Requirements	Cross-Reference
ELEVATION						
Lowest Floor Elevation⁽³⁾	<p>Recommendation: See Freeboard (additional height above required lowest floor elevation).</p> <p>Requirement: Top of floor must be at or above BFE.</p>	<p>NFIP: 60.3(c)(2)</p> <p>IRC: R322.2.1, R322.1.5</p> <p>IBC: 1612.4</p> <p>ASCE 24: 1.5.2, 2.3</p> <p>FEMA P-259: 2.1.4, 5E</p> <p>FEMA P-55: 5.2.3</p> <p>FEMA P-499: 1.4</p>	<p>Recommendation: See Freeboard (additional height above required lowest floor elevation).</p> <p>Requirement:</p> <p>NFIP: Top of floor must be at or above BFE.</p> <p>IRC: Same as Zone A, plus 1 foot, if the LiMWA is delineated.</p> <p>IBC/ASCE 24: Same as Zone V.</p>	<p>NFIP: 60.3(c)(2)</p> <p>IRC: R322.2.1, R322.1.5</p> <p>IBC: 1612.4</p> <p>ASCE 24: 1.5.2, 4.4</p> <p>FEMA P-259: 5E</p> <p>FEMA P-55: 5.2.3</p> <p>FEMA P-499: 1.4</p>	<p>Recommendation: See Freeboard (additional height above required lowest floor elevation).</p> <p>Requirement:</p> <p>NFIP: Bottom of the lowest horizontal structural member (LHSM) of the lowest floor must be at or above the BFE.</p> <p>IRC: Elevation based on orientation of LHSM.</p> <p>IBC/ASCE 24: Elevation based on orientation of LHSM and structure category.</p>	<p>NFIP: 60.3(e)(4)</p> <p>IRC: R322.3.2, R332.1.5</p> <p>IBC: 1612.4</p> <p>ASCE 24: 1.5.2, 4.4</p> <p>FEMA P-259: 5E</p> <p>FEMA P-55: 5.2.3</p> <p>FEMA P-499: 1.4</p>
Freeboard (additional height above required Lowest Floor Elevation)⁽³⁾	<p>Recommendation: Elevating buildings higher than the required lowest floor elevation provides more protection against flood damage and reduces the cost of Federal flood insurance.</p> <p>Requirement: See Lowest Floor Elevation</p>	<p>IBC: 1612.4</p> <p>ASCE 24: 1.5.2, 2.3,</p> <p>FEMA P-259: 2.2</p> <p>FEMA P-55: 2.3.3, 5.4.1, 6.2.1, 7.5.2 (text box)</p> <p>FEMA P-499: 1.6</p> <p>Other: NFIP Evaluation Study</p>	<p>Recommendation: Elevating building higher than the required lowest floor elevation provides more protection against flood damage and reduces the cost of Federal flood insurance.</p> <p>Requirement: See Lowest Floor Elevation</p>	<p>IRC: R322.2.1</p> <p>IBC: 1612.4</p> <p>ASCE 24: 1.5.2, 4.4</p> <p>FEMA P-259: 2.2</p> <p>FEMA P-55: 2.3.3, 5.4.2, 6.2.1, 7.5.2 (text box)</p> <p>FEMA P-499: 1.6</p> <p>Other: NFIP Evaluation Study</p>	<p>Recommendation: Elevate buildings higher than the required lowest floor elevation to provide more protection against flood damage and to reduce the cost of Federal flood insurance.</p> <p>Requirement: See Lowest Floor Elevation</p>	<p>IRC: R322.3.2</p> <p>IBC: 1612.4</p> <p>ASCE 24: 1.5.2, 4.4</p> <p>FEMA P-259: 2.2</p> <p>FEMA P-55: 2.3.3, 5.4.2, 6.2.1, 7.5.2 (text box)</p> <p>FEMA P-499: 1.6</p> <p>Other: NFIP Evaluation Study</p>

Table G-1. Summary of NFIP Regulatory Requirements and Recommendations for Exceeding the Requirements (continued)

	Zone A		Coastal A Zone		Zone V	
	Recommendations and Requirements ⁽¹⁾	Cross-Reference ⁽²⁾	Recommendations and Requirements	Cross-Reference	Recommendations and Requirements	Cross-Reference
FOUNDATION						
Open Foundation	<p>Recommendation: If riverine flood velocities are high or large debris load is anticipated, open foundations are recommended.</p> <p>Requirement: None⁽⁴⁾</p>	<p>IBC: 1612.4</p> <p>ASCE 24: 1.5.3, 2.4, 2.5</p> <p>FEMA P-259: 1.3.1.2, 5E.1.3</p> <p>FEMA P-55: 2.3.3, 5.2.3, 10.2, 10.3</p> <p>FEMA P-499: 3.5</p> <p>Other: FEMA P-550</p>	<p>Recommendation: Follow Zone V requirement.</p> <p>Requirement(4): Not required unless the design is governed by IBC/ASCE 24 (in which case an open foundation is required).</p>	<p>IBC: 1612.4</p> <p>ASCE 24: 1.5.3, 4.5</p> <p>FEMA P-259: 1.3.1.2, 5E.1.3</p> <p>FEMA P-55: 2.3.3, 5.2.3, 10.2, 10.3</p> <p>FEMA P-499: 3.1, 3.2, 3.3, 3.4, 3.5</p> <p>Other: FEMA P-550</p>	<p>Recommendation: Follow requirement.</p> <p>Requirement: Open foundations are required.</p>	<p>NFIP: 60.3(e)(4)</p> <p>IRC: R322.3.3, R401.1</p> <p>IBC: 1612.4</p> <p>ASCE 24: 1.5.3, 4.5</p> <p>FEMA P-259: 1.3.1.2, 5E.1.3</p> <p>FEMA P-55: 2.3.3, 5.2.3, 10.2, 10.3</p> <p>FEMA P-499: 3.1, 3.2, 3.3, 3.4</p> <p>Other: FEMA P-550</p>
Solid Foundation Walls (including walls forming crawlspace, and stemwall foundations)	<p>Recommendation: If velocities are high or debris load is anticipated, open foundations are recommended in lieu of elevation on solid walls.</p> <p>Requirement(4):</p> <p>NFIP: Solid foundation walls are required to have flood openings.</p> <p>IRC: Wall height is limited, unless designed; walls are required to have flood openings.</p> <p>IBC/ASCE 24: Solid foundation walls are required to have flood openings.</p>	<p>NFIP: 60.3(c)(5)</p> <p>IRC: R322.2.2,R322.2.3</p> <p>IBC: 1612.4</p> <p>ASCE 24: 2.6</p> <p>FEMA P-259: 1.3.1.1, 5E.1.1, 5E.1.2, 5E.1.4</p> <p>FEMA P-55: 10.2, 10.3, 10.8</p> <p>FEMA P-499: 3.1, 3.5</p> <p>Other: FEMA P-550, FEMA TB-1</p>	<p>Recommendation: Use open foundations.</p> <p>Requirement(4):</p> <p>NFIP: Solid foundation walls are required to have flood openings.</p> <p>IRC: Wall height is limited, unless designed.</p> <p>IBC/ASCE 24: Solid foundation walls are not permitted if design is governed by IBC/ASCE 24.</p>	<p>NFIP: 60.3(c)(5)</p> <p>IRC: R322.2.2,R322.2.3</p> <p>IBC: 1612.4</p> <p>FEMA P-259: 1.3.1.1, 5E.1.1, 5E.1.2, 5E.1.4</p> <p>FEMA P-55: 10.2, 10.3, 10.8</p> <p>FEMA P-499: 3.1, 3.5</p> <p>Other: FEMA P-550, FEMA TB-1</p>	Not Permitted	<p>NFIP: 60.3(e)(4)</p> <p>IRC: R322.3.3</p> <p>FEMA P-259: 1.3.1.1, 5E.1.1, 5E.1.2, 5E.1.4</p> <p>FEMA P-55: 5.2.3.3, 7.6.1.1.6, 10.2, 10.3</p> <p>FEMA P-499: 3.1, 3.5</p> <p>Other: FEMA TB-5, FEMA P-550</p>

Table G-1. Summary of NFIP Regulatory Requirements and Recommendations for Exceeding the Requirements (continued)

	Zone A		Coastal A Zone		Zone V	
	Recommendations and Requirements ⁽¹⁾	Cross-Reference ⁽²⁾	Recommendations and Requirements	Cross-Reference	Recommendations and Requirements	Cross-Reference
Structural Fill (including slab-on-grade foundation)	<p>Recommendation: If velocities are high or debris load is anticipated, open foundations are recommended in lieu of elevation on fill.</p> <p>Requirement: If structural fill is used, compaction is necessary to meet requirements for stability during the base flood.</p>	<p>NFIP: 60.3(a)(3)(i) IRC: R322.1.2, R506 IBC: 1612.4, 1804.4, App. G 401.1 ASCE 24: 2.4 FEMA P-55: 10.3.1</p>	<p>Recommendation: Use open foundations.</p> <p>Requirement: If structural fill is used, compaction is necessary to meet requirements for stability during the base flood.</p>	<p>NFIP: 60.3(a)(3)(i) IRC: R322.1.2, R506 IBC: 1612.4, 1804.4 ASCE 24: 4.5.4 FEMA P-55: 10.3.1</p>	Not Permitted	<p>NFIP: 60.3(e)(6) IRC: R322.3.2 IBC: 1612.4, 1804.4, App. G401.2 ASCE 24: 4.5.4 FEMA P-55: 5.2.3.3</p>
ENCLOSURES BELOW ELEVATED BUILDINGS						
Use of Enclosed Areas Below Elevated Lowest Floor⁽⁵⁾	<p>Recommendation: Avoid storage of damageable items and hazardous materials in flood-prone spaces.</p> <p>Requirement: Enclosures are permitted only for parking of vehicles, building access, and storage.</p>	<p>NFIP: 60.3(c)(5) IRC: R322.2.2 IBC: 1612.4 ASCE 24: 2.6 FEMA P-259: 2.1.4 FEMA P-55: 5.2.3.2</p>	<p>Recommendation: Follow Zone V recommendations and requirements.</p> <p>Requirement: Enclosures are permitted only for parking of vehicles, building access, and storage.</p>	<p>NFIP: 60.3(c)(5) IRC: R322.2.2 IBC: 1612.4 ASCE 24: 4.6 FEMA P-55: 5.2.3.2 FEMA P-499: 8.1</p>	<p>Recommendation: Minimize use of enclosed areas and avoid storage of damageable items and hazardous materials.</p> <p>Requirement: Enclosures are permitted only for parking of vehicles, building access, and storage.</p>	<p>NFIP: 60.3(e)(5) IRC: R322.3.5 IBC: 1612.4 ASCE 24: 4.6 FEMA P-55: 5.2.3.3 FEMA P-499: 8.1</p>
Walls of Enclosures⁽⁶⁾	<p>Recommendation: Follow requirement.</p> <p>Requirement: Walls of enclosures must have flood openings to allow passage of floodwaters.</p>	<p>NFIP: 60.3(c)(5) IRC: R322.2.2 IBC: 1612.4 ASCE 24: 2.6 FEMA P-259: 2.1.4, 5E.1.2.1 FEMA P-55: 2.3.5, 5.2.3.2, 7.6.1.1.5 FEMA P-499: 3.1, 3.5 Other: FEMA TB-1</p>	<p>Recommendation: Follow Zone V recommendations and requirements.</p> <p>Requirement: Solid foundation wall enclosures and solid breakaway wall enclosures must have flood openings.</p>	<p>NFIP: 60.3(c)(5) IRC: R322.2.2 IBC: 1612.4 ASCE 24: 4.6 FEMA P-259: 5E.1.2.1 FEMA P-55: 2.3.5, 5.2.3.2, 7.6.1.1.5 FEMA P-499: 3.1, 3.5, 8.1 Other: FEMA TB-1 and TB-9</p>	<p>Recommendation: Enclose areas with lattice or insect screening or louvers. Use flood openings to minimize collapse of solid breakaway walls.</p> <p>Requirement: Walls must be designed to break away under flood loads without damaging the structure or supporting foundation system.</p>	<p>NFIP: 60.3(e)(5) IRC: R322.3.4 IBC: 1612.4 ASCE 24: 4.6 FEMA P-55: 2.3.5, 5.2.3.2 FEMA P-499: 8.1 Other: FEMA TB-9</p>

Table G-1. Summary of NFIP Regulatory Requirements and Recommendations for Exceeding the Requirements (continued)

	Zone A		Coastal A Zone		Zone V	
	Recommendations and Requirements ⁽¹⁾	Cross-Reference ⁽²⁾	Recommendations and Requirements	Cross-Reference	Recommendations and Requirements	Cross-Reference
UTILITIES						
Electrical, Heating, Ventilation, Plumbing and Air Conditioning Equipment	<p>Recommendation: Locate equipment on the downstream or landward side of building, and/or behind structural element.</p> <p>Requirement: Utilities and equipment must be located (elevated) and designed to prevent floodwaters from entering and accumulating in components during flooding.</p>	<p>NFIP: 60.3(a)(3)(iv)</p> <p>IRC: R322.1.6, RM1301.1.1, RM1401.5, RM1601.4.9, RM1701.2, RM2001.4, RM2201.6, RG2404.7, RP2601.3, RP2602.2, RP2705.1, RP2101.5</p> <p>IBC: 1403.5, 1612.4</p> <p>ASCE 24: Ch. 7</p> <p>FEMA P-259: 2.1.4, 5.1.5, Ch. 5W</p> <p>FEMA P-55: Ch. 12</p> <p>FEMA P-499: 8.3</p> <p>Other: FEMA P-348</p>	<p>Recommendation: Follow Zone V recommendations and requirements.</p> <p>Requirement: Utilities and equipment must be located (elevated) and designed to prevent floodwaters from entering and accumulating in components during flooding.</p>	<p>NFIP: 60.3(a)(3)(iv)</p> <p>IRC: R322.1.6, RM1301.1.1, RM1401.5, RM1601.4.9, RM1701.2, RM2001.4, RM2201.6, RG2404.7, RP2601.3, RP2602.2, RP2705.1, RP2101.5</p> <p>IBC: 1403.5, 1612.4</p> <p>ASCE 24: Ch. 7</p> <p>FEMA P-259: 5.1.5, Ch. 5W</p> <p>FEMA P-55: Ch. 12</p> <p>FEMA P-499: 8.3</p> <p>Other: FEMA P-348, FEMA TB-5</p>	<p>Recommendation: Locate equipment on the landward side of building, and/or behind structural element.</p> <p>Requirement: Utilities and equipment must be located (elevated) and designed to prevent floodwaters from entering and accumulating in components during flooding.</p>	<p>NFIP: 60.3(a)(3)(iv)</p> <p>IRC: R322.1.6, RM1301.1.1, RM1401.5, RM1601.4.9, RM1701.2, RM2001.4, RM2201.6, RG2404.7, RP2601.3, RP2602.2, RP2705.1, RP2101.5</p> <p>IBC: 1403.5, 1403.6, 1612.4</p> <p>ASCE 24: Ch. 7</p> <p>FEMA P-259: 5.1.5, Ch. 5W</p> <p>FEMA P-55: Ch. 12</p> <p>FEMA P-499: 8.3</p> <p>Other: FEMA P-348, FEMA TB-5</p>
Water Supply and Sanitary Sewerage Systems	<p>Recommendation: Follow requirement.</p> <p>Requirement: Systems must be designed to minimize or eliminate infiltration of floodwaters into systems. Sanitary sewerage systems must be located to avoid impairment or contamination during flooding.</p>	<p>NFIP: 60.3(a)(5), 60.3(a)(6)</p> <p>IRC: R322.1.7, RP2602.2, RP3001.3</p> <p>IBC: App. G401.3, App. G401.4, App. G701</p> <p>ASCE 24: 7.3</p> <p>FEMA P-259: 5.1.5, 5W.11, 5W.12</p> <p>FEMA P-55: Ch. 12</p> <p>FEMA P-499: 8.3</p> <p>Other: FEMA P-348</p>	<p>Recommendation: Follow Zone V recommendation.</p> <p>Requirement: Systems must be designed to minimize or eliminate infiltration of floodwaters into systems. Sanitary sewerage systems must be located to avoid impairment or contamination during flooding.</p>	<p>NFIP: 60.3(a)(5), 60.3(a)(6)</p> <p>IRC: R322.1.7, RP2602.2, RP3001.3</p> <p>IBC: App. G401.3, App. G401.4, App. G701</p> <p>ASCE 24: 7.3</p> <p>FEMA P-259: 5.1.5, 5W.11, 5W.12</p> <p>FEMA P-55: Ch. 12</p> <p>FEMA P-499: 8.3</p> <p>Other: FEMA P-348, FEMA TB-5</p>	<p>Recommendation: Install shutoff valves to isolate water and sewer lines that extend into flood-prone areas.</p> <p>Requirement: Systems must be designed to minimize or eliminate infiltration of floodwaters into systems. Sanitary sewerage systems must be located to avoid impairment or contamination during flooding.</p>	<p>NFIP: 60.3(a)(5), 60.3(a)(6)</p> <p>IRC: R322.1.7, RP2602.2, RP3001.3</p> <p>IBC: App. G401.3, App. G401.4, App. G701</p> <p>ASCE 24: 7.3</p> <p>FEMA P-259: 5.1.5, 5W.11, 5W.12</p> <p>FEMA P-55: Ch. 12</p> <p>FEMA P-499: 8.3</p> <p>Other: FEMA P-348, FEMA TB-5</p>

Table G-1. Summary of NFIP Regulatory Requirements and Recommendations for Exceeding the Requirements (continued)

	Zone A		Coastal A Zone		Zone V	
	Recommendations and Requirements ⁽¹⁾	Cross-Reference ⁽²⁾	Recommendations and Requirements	Cross-Reference	Recommendations and Requirements	Cross-Reference
CERTIFICATION						
Design Certifications (foundations, breakaway walls, flood openings)	<p>Recommendation: Follow requirement.</p> <p>Requirement: Registered design professional must certify performance of engineered flood openings (flood openings that do not conform to prescriptive requirement).</p>	<p>NFIP: 60.3(c)(5)</p> <p>IRC: R322.2.2(2.2)</p> <p>IBC: 1612.5(1.2)</p> <p>Other: FEMA TB-1</p>	<p>Recommendation: Follow Zone V requirement.</p> <p>Requirement: Registered design professional must certify performance of engineered flood openings (flood openings that do not conform to prescriptive requirement). If designs are governed by IBC or ASCE 24, registered design professional must certify that the design and methods of construction are in accordance with accepted standards of practice for meeting design requirements, including design of breakaway walls if designed to fail under loads more than 20 pounds per square foot.</p>	<p>NFIP: 60.3(c)(5)</p> <p>IRC: R322.2.2(2.2)</p> <p>IBC: 1612.5(1.2)</p> <p>FEMA P-55: 5.4.2</p> <p>FEMA P-499: 1.5, 3.1, 8.1</p> <p>Other: FEMA TB-1 and TB-9</p>	<p>Recommendation: Follow requirement.</p> <p>Requirement: Registered design professional must certify that the design and methods of construction are in accordance with accepted standards of practice for meeting design requirements, including design of breakaway walls if designed to fail under loads more than 20 pounds per square foot.</p>	<p>NFIP: 60.3(e)(4), 60.3(e)(5)</p> <p>IRC: R322.3.6</p> <p>IBC: 1612.5(2.2) and (2.3)</p> <p>FEMA P-55: 5.2.2.3, 5.4.2</p> <p>FEMA P-499: 1.5, 3.1, 8.1</p> <p>Other: FEMA TB-9</p>

Table G-1. Summary of NFIP Regulatory Requirements and Recommendations for Exceeding the Requirements (continued)

	Zone A		Coastal A Zone		Zone V	
	Recommendations and Requirements ⁽¹⁾	Cross-Reference ⁽²⁾	Recommendations and Requirements	Cross-Reference	Recommendations and Requirements	Cross-Reference
Certification of Elevation	<p>Recommendation: Surveyed elevation of the lowest floor should be submitted upon placement and prior to further vertical construction, and re-surveyed and submitted prior to the final inspection.</p> <p>Requirement: Surveyed elevation of the lowest floor must be submitted to the community (as-built).</p>	<p>NFIP: 60.3(b)(5) IRC: R109.1.3, R322.1.10 IBC: 110.3.3, 1612.5(1.1) FEMA P-499: 1.4, 8.3 Other: NFIP FMB 467-1</p>	<p>Recommendation: Follow Zone V recommendations and requirements.</p> <p>Requirement: Surveyed elevation of the lowest floor must be submitted to the community (as-built).</p>	<p>NFIP: 60.3(b)(5) IRC: R109.1.3, R322.1.10 IBC: 110.3.3, 1612.5(1.1) FEMA P-499: 1.4, 8.3 Other: NFIP FMB 467-1</p>	<p>Recommendation: Surveyed elevation of the bottom of the LHSM should be submitted when that member is placed and prior to further vertical construction, and re-surveyed and submitted prior to the final inspection.</p> <p>Requirement: Surveyed elevation of the bottom of the lowest horizontal structural member must be submitted to the community (as-built).</p>	<p>NFIP: 60.3(b)(5), 60.3(e)(2) IRC: R109.1.3, R322.1.10 IBC: 110.3.3, 1612.5(2.1) FEMA P-499: 1.4, 8.3 Other: NFIP FMB 467-1</p>
OTHER						
Non-Structural Fill	<p>Recommendation: Follow requirement.</p> <p>Requirement^(7,8): Encroachments into floodways are permitted only if it is demonstrated that the encroachment will not result in any increase in flood levels during the base flood.</p>	<p>NFIP: 60.3(d)(3) IRC: R301.2.4, R322.1, R322.1.4.2 IBC: 1612.3.4, 1804.4, App. G 103.5, App. G 401.1 ASCE 24: 2.2</p>	<p>Recommendation⁽⁷⁾: Follow Zone V recommendation.</p> <p>Requirement: None</p>		<p>Recommendation: Minimize use of non-structural fill if flow diversion, wave runup, or reflection are concerns. Non-structural fill should be similar to existing soils where possible.</p> <p>Requirement: Minor quantities can be used for site grading, landscaping and drainage, and to support parking slabs, patios, walkways, and pool decks. Non-structural fill must not prevent the free passage of floodwaters and waves beneath elevated buildings.</p>	<p>NFIP: 60.3(e)(5) IRC: R322.3.2 ASCE 24: 4.5.4 FEMA P-55: 5.2.3.3 Other: FEMA TB-5</p>

Table G-1. Summary of NFIP Regulatory Requirements and Recommendations for Exceeding the Requirements (continued)

	Zone A		Coastal A Zone		Zone V	
	Recommendations and Requirements ⁽¹⁾	Cross-Reference ⁽²⁾	Recommendations and Requirements	Cross-Reference	Recommendations and Requirements	Cross-Reference
Decks, Concrete Pads, Patios	<p>Recommendation: Follow requirement.</p> <p>Requirement: If located below the DFE, decks, concrete pads, patios and similar appurtenances must be stable under flood loads.</p>	<p>NFIP: 60.3(a)(3)</p> <p>ASCE 24: 9.2</p> <p>FEMA P-499: 8.2</p>	<p>Recommendation: Follow Zone V recommendations.</p> <p>Requirement: If located below the DFE, decks, concrete pads, patios and similar appurtenances must be stable under flood loads.</p>	<p>NFIP: 60.3(a)(3)</p> <p>ASCE 24: 4.8, 9.2</p> <p>FEMA P-499: 8.2</p> <p>Other: FEMA TB-5</p>	<p>Recommendation: Decks should be built using the same foundation as the main building, or cantilevered from the main building.</p> <p>Requirement: If structurally attached to buildings, decks, concrete pads and patios must be elevated.</p>	<p>NFIP: 60.3(e)(3)</p> <p>IRC: R322.3.3</p> <p>ASCE 24: 4.8, 9.2</p> <p>FEMA P-55: 9.5</p> <p>FEMA P-499: 8.2</p> <p>Other: FEMA TB-5</p>
Swimming Pools	<p>Recommendation: Follow requirement.</p> <p>Requirement: Swimming pools and pool decks must be stable under flood loads.</p>	<p>NFIP: 60.3(a)(3)</p> <p>IRC: App. G101.2</p> <p>ASCE 24: 9.5</p>	<p>Recommendation: Follow Zone V recommendation.</p> <p>Requirement: Swimming pools and pool decks must be stable under flood loads.</p>	<p>NFIP: 60.3(a)(3)</p> <p>IRC: App. G101.2</p> <p>ASCE 24: 9.5</p> <p>FEMA P-499: 8.2</p>	<p>Recommendation: Pool should be located as far landward as possible and should be oriented in such a way that flood forces are minimized.</p> <p>Requirement: Swimming pools and pool decks must be stable under flood loads and elevated, designed to break away during the design flood, or be sited to remain in-ground without obstructing flow that results in damage to adjacent structures.</p>	<p>NFIP: 60.3(e)(3)</p> <p>IRC: R322.3.3, App. G101.2</p> <p>ASCE 24: 9.5</p> <p>FEMA P-55: 9.5</p> <p>FEMA P-499: 8.2</p> <p>Other: FEMA TB-5</p>

Table G-1. Summary of NFIP Regulatory Requirements and Recommendations for Exceeding the Requirements (concluded)

	Zone A		Coastal A Zone		Zone V	
	Recommendations and Requirements ⁽¹⁾	Cross-Reference ⁽²⁾	Recommendations and Requirements	Cross-Reference	Recommendations and Requirements	Cross-Reference
Tanks Associated with Building Utilities	<p>Recommendation: Locate above-ground tanks on the landward or downstream side of buildings and raise inlets, fill openings, and vents above the DFE.</p> <p>Requirement: Tanks must be elevated or anchored to be stable under flood loads, whether above-ground or underground.</p>	<p>NFIP: 60.3(a)(3) IRC: R2201.6 IBC: App. G701 ASCE 24: 7.4.1 FEMA P-259: 5W.10 Other: FEMA P-348</p>	<p>Recommendation: Follow Zone V recommendations.</p> <p>Requirement: Tanks must be elevated or anchored to be stable under flood loads, whether above-ground or underground.</p>	<p>NFIP: 60.3(a)(3) IRC: R2201.6 IBC: App. G701 ASCE 24: 7.4.1 FEMA P-259: 5W.10 FEMA P-499: 8.3 Other: FEMA TB-5, FEMA P-348</p>	<p>Recommendation: Locate above-ground tanks on the landward side of buildings and raise inlets, fill openings and vents above the DFE. Install underground tanks below the eroded ground elevation.</p> <p>Requirement: Above-ground tanks must be elevated.</p>	<p>NFIP: 60.3(e)(3) IRC: R2201.6 IBC: App. G701 ASCE 24: 7.4.1 FEMA P-259: 5W.10 FEMA P-499: 8.3 Other: FEMA TB-5, FEMA P-348</p>
Sustainable Design	<p>Recommendation: Building for natural hazards resistance reduces the need to rebuild and is a sustainable design approach. Verify that other green building practices do not reduce the building's ability to resist flood loads or other natural hazards.</p> <p>Requirement: Meet overall NFIP performance requirements.</p>	<p>FEMA P-55: 7.7 Other: FEMA P-798, ICC 700</p>	<p>Recommendation: Building for natural hazards resistance reduces the need to rebuild and is a sustainable design approach. Verify that other green building practices do not reduce the building's ability to resist flood loads or other natural hazards.</p> <p>Requirement: Meet overall NFIP performance requirements.</p>	<p>FEMA P-55: 7.7 Other: FEMA P-798, ICC 700</p>	<p>Recommendation: Building for natural hazards resistance reduces the need to rebuild and is a sustainable design approach. Verify that other green building practices do not reduce the building's ability to resist flood loads or other natural hazards.</p> <p>Requirement: Meet overall NFIP performance requirements.</p>	<p>FEMA P-55: 7.7 Other: FEMA P-798, ICC 700</p>

NOTES

- (1) Individual States and communities may enforce more stringent requirements that supersede those summarized here. **Exceeding minimum NFIP requirements will provide increased flood protection and may result in lower flood insurance premiums.**
- (2) The references in this section cite the latest available publications at the time of publication of this Manual. The specific editions of these references are:
 - **ASCE 7:** ASCE 7-10, *Minimum Design Loads for Buildings and Other Structures*
 - **ASCE 24:** ASCE 24-05, *Flood Resistant Design and Construction*
 - **IBC:** *2012 International Building Code*. Appendix G includes provisions for flood-resistant construction. The provisions in IBC Appendix G are not mandatory unless specifically referenced in the adopting ordinance. Many States have not adopted Appendix G. Section references are the same as 2009 IBC.
 - **ICC 700:** *National Green Building Standard* (ICC 2008)
 - **IRC:** *2012 International Residential Code for One- and Two-Family Dwellings*. Section references are the same as 2009 IRC.
 - **FEMA P-55:** Specific sections or chapters of FEMA P-55, *Coastal Construction Manual* (2011a)
 - **FEMA P-259:** Specific sections or chapters of this Manual, FEMA P-259, *Engineering Principles and Practices for Retrofitting Flood-Prone Residential Structures* (2011b)
 - **FEMA P-348:** 1999 Edition of FEMA P-348, *Protecting Building Utilities From Flood Damage*
 - **FEMA P-499:** Specific fact sheets in the 2010 edition of FEMA P-499, *Home Builder's Guide to Coastal Construction Technical Fact Sheet Series*
 - **FEMA P-550:** *Recommended Residential Construction for Coastal Areas* (Second Edition, 2009)
 - **FEMA P-798:** *Natural Hazards and Sustainability for Residential Buildings* (2010)
 - **FEMA TB:** Specific numbered FEMA NFIP Technical Bulletins (available at <http://www.fema.gov/plan/prevent/floodplain/techbul.shtm>)
 - **NFIP:** *U.S. Code of Federal Regulations* – 44 CFR 60.3 “Flood plain management criteria for flood-prone areas.” Current as of June 30, 2011.
 - **NFIP Evaluation Study:** *Evaluation of the National Flood Insurance Program's Building Standards* (American Institutes for Research 2006)
 - **NFIP FMB 467-1:** *Floodplain Management Bulletin on the NFIP Elevation Certificate*. Note that this bulletin was published in 2004, while the Elevation Certificate (FEMA Form 81-31) has been updated since 2004, and is updated periodically.
- (3) State or community may regulate to a higher elevation (DFE).
- (4) Some coastal communities require open foundations in Zone A.
- (5) There are some differences between what is permitted under floodplain management regulations and what is covered by NFIP flood insurance. Building designers should be guided by floodplain management requirements, not by flood insurance policy provisions.
- (6) Some coastal communities prohibit breakaway walls and allow only open lattice or screening.
- (7) Placement of nonstructural fill adjacent to buildings in Zone AO in coastal areas is not recommended.
- (8) Some communities may allow encroachments to cause a 1-foot rise in the flood elevation, while others may allow no rise.

ACRONYMS

ASCE	American Society of Civil Engineers
BFE	base flood elevation
DFE	design flood elevation
FEMA	Federal Emergency Management Agency
FMB	Floodplain Management Bulletin
IBC	International Building Code
ICC	International Code Council
IRC	International Residential Code
LHSM	lowest horizontal structural member
NFIP	National Flood Insurance Program
SFHA	Special Flood Hazard Area
TB	Technical Bulletin

REFERENCES

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- FEMA. 2008b. *Flood Damage-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas*. NFIP Technical Bulletin 2.
- FEMA. 2008c. *Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas*. NFIP Technical Bulletin 5.
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- U.S. Code of Federal Regulations. "Flood plain management criteria for flood-prone areas." 44 CFR 60.3. June 30, 2011.