This document contains excerpts of the flood provisions from the 2015 editions of the IBC, IRC, IEBC, IMC, IPC, IFGC, IFC, ISPSC, IPSDC, and ICC Performance Code.

2015 International Building Code
[a compilation of flood resistant provisions, prepared by FEMA]

CHAPTER 1
ADMINISTRATIVE

[A] 101.2 Scope. The provisions of this code shall apply to the construction, alteration, relocation, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures.

Exception: Detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories above grade plane in height with a separate means of egress, and their accessory structures not more than three stories above grade plane in height, shall comply with the International Residential Code.

SECTION 104
DUTIES AND POWERS OF THE BUILDING OFFICIAL

[A] 104.2.1 Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas. For applications for reconstruction, rehabilitation, *repair, alteration, addition* or other improvement of existing buildings or structures located in *flood hazard areas*, the *building official* shall determine if the proposed work constitutes substantial improvement or repair of substantial damage. Where the building official determines that the proposed work constitutes substantial improvement or repair of substantial damage, and where required by this code, the building official shall require the building to meet the requirements of Section 1612.

[A] 104.10.1 Flood hazard areas. The building official shall not grant modifications to any provision required in flood hazard areas as established by Section 1612.3 unless a determination has been made that:

1. A showing of good and sufficient cause that the unique characteristics of the size, configuration or topography of the site render the elevation standards of Section 1612 inappropriate.
2. A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable.
3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, cause fraud on or victimization of the public, or conflict with existing laws or ordinances.
4. A determination that the variance is the minimum necessary to afford relief, considering the flood hazard.
5. Submission to the applicant of written notice specifying the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation, and stating that construction below the design flood elevation increases risks to life and property.

[A] 105.1 [Permits] Required. Any owner or owner's authorized agent who intends to construct, enlarge, alter, repair, move, demolish or change the occupancy of a building or structure, or to erect, install, enlarge, alter, repair, remove, convert or replace any electrical, gas, mechanical or plumbing system, the installation of which is regulated by this code, or to cause any such work to be performed, shall first make application to the building official and obtain the required permit.

[A] 107.2.5 [Submittal documents] Site plan. The construction documents submitted with the application for permit shall be accompanied by a site plan showing to scale the size and location of new construction and existing structures on the site, distances from lot lines, the established street grades and the proposed finished grades and, as applicable, flood hazard areas, floodways, and design flood elevations; and it shall be drawn in accordance with an accurate boundary line survey. In the case of demolition, the site plan shall show construction to be demolished and the location and size of existing structures and construction that are to remain on the site or plot. The building official is authorized to waive or modify the requirement for a site plan where the application for permit is for alteration or repair or where otherwise warranted.

[A] 107.2.5.1 Design flood elevations. Where design flood elevations are not specified, they shall be established in accordance with Section 1612.3.1.

[A] 110.3.3 [Required inspections] Lowest floor elevation. In flood hazard areas, upon placement of the lowest floor, including the basement, and prior to further vertical construction, the elevation certification required in Section 1612.5 shall be submitted to the building official.

[A] 110.3.10.1 [Final inspection] Flood hazard documentation. If located in a flood hazard area, documentation of the elevation of the lowest floor as required in Section 1612.5 shall be submitted to the building official prior to the final inspection.

SECTION 202
DEFINITIONS

[BS] BASE FLOOD. The flood having a 1-percent chance of being equaled or exceeded in any given year.

[BS] BASE FLOOD ELEVATION. The elevation of the base flood, including wave height, relative to the National Geodetic Vertical Datum (NGVD), North American Vertical Datum (NAVD) or other datum specified on the Flood Insurance Rate Map (FIRM).

[BS] BASEMENT (for flood loads). The portion of a building having its floor subgrade (below ground level) on all sides. This definition of "Basement" is limited in application to the provisions of Section 1612.

BASEMENT. A story that is not a story above grade plane (see "Story above grade plane"). This definition of "Basement" does not apply to the provisions of Section 1612 for flood loads.

[BS] COASTAL A ZONE. Area within a special flood hazard area, landward of a V zone or landward of an open coast without mapped coastal high hazard areas. In a coastal A zone, the principal source of flooding must be astronomical tides, storm surges, seiches or tsunamis, not riverine flooding. During the base flood conditions, the potential for breaking wave height shall be greater than or equal to 1 ½ feet (457 mm). The inland limit of the coastal A zone is (a) the Limit of Moderate Wave Action if delineated on a FIRM, or (b) designated by the authority having jurisdiction.

[BS] COASTAL HIGH HAZARD AREA. Area within the special flood hazard area extending from offshore to the inland limit of a primary dune along an open coast and any other area that is subject to high-velocity wave action from storms or seismic sources, and shown on a Flood Insurance Rate Map (FIRM) or other flood hazard map as velocity Zone V, VO, VE or V1-30.

[BS] DESIGN FLOOD. The flood associated with the greater of the following two areas:

1. Area with a flood plain subject to a 1-percent or greater chance of flooding in any year.
2. Area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated.

[BS] DESIGN FLOOD ELEVATION. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. In areas designated as Zone AO, the design flood elevation shall be the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).

[BS] DRY FLOODPROOFING. A combination of design modifications that results in a building or structure, including the attendant utilities and equipment and sanitary facilities, being water tight with walls substantially impermeable to the passage of water and with structural components having the capacity to resist loads as identified in ASCE 7.

[BS] EXISTING STRUCTURE. A structure erected prior to the date of adoption of the appropriate code, or one for which a legal building permit has been issued. For application of provisions in flood hazard areas, an existing structure is any building or structure for which the start of construction commenced before the effective date of the community's first flood plain management code, ordinance or standard.

[BS] FLOOD or FLOODING. A general and temporary condition of partial or complete inundation of normally dry land from:
1. The overflow of inland or tidal waters.
2. The unusual and rapid accumulation or runoff of surface waters from any source.

[BS] FLOOD DAMAGE-RESISTANT MATERIALS. Any construction material capable of withstanding direct and prolonged contact with floodwaters without sustaining any damage that requires more than cosmetic repair.

[BS] FLOOD HAZARD AREA. The greater of the following two areas:
1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any year.
2. The area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated.

[BS] FLOOD INSURANCE RATE MAP (FIRM). An official map of a community on which the Federal Emergency Management Agency (FEMA) has delineated both the special flood hazard areas and the risk premium zones applicable to the community.

[BS] FLOOD INSURANCE STUDY. The official report provided by the Federal Emergency Management Agency containing the Flood Insurance Rate Map (FIRM), the Flood Boundary and Floodway Map (FBFM), the water surface elevation of the base flood and supporting technical data.

[BS] FLOODWAY. The channel of the river, creek or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

[BS] LIMIT OF MODERATE WAVE ACTION. Line shown on FIRMs to indicate the inland limit of the 1 ½-foot (457 mm) breaking wave height during the base flood.

[BS] LOWEST FLOOR. The floor of the lowest enclosed area, including basement, but excluding any unfinished or flood-resistant enclosure, usable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the structure in violation of Section 1612.

[BS] SPECIAL FLOOD HAZARD AREA. The land area subject to flood hazards and shown on a Flood Insurance Rate Map or other flood hazard map as Zone A, AE, A1-30, A99, AR, AO, AH, V, VO, VE, or V1-30.

[BS] START OF CONSTRUCTION. The date of issuance for new construction and substantial improvements to existing structures, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement or other improvement is within 180 days after the date of issuance. The actual start of construction means the first placement of permanent construction of a building (including a manufactured home) on a site, such as the pouring of a slab or footings, installation of pilings or construction of columns.

Permanent construction does not include land preparation (such as clearing, excavation, grading or filling), the installation of streets or walkways, excavation for a basement, footings, piers or foundations, the erection of temporary forms or the installation of accessory buildings such as garages or sheds not occupied as dwelling units or not part of the main building. For a substantial improvement, the actual "start of construction" means the first alteration of any wall, ceiling, floor or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

[BS] SUBSTANTIAL DAMAGE. Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

[BS] SUBSTANTIAL IMPROVEMENT. Any repair, reconstruction, rehabilitation, alteration, addition or other improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. If the structure has sustained substantial damage, any repairs are considered substantial improvement regardless of the actual repair work performed. The term does not, however, include either:

1. Any project for improvement of a building required to correct existing health, sanitary or safety code violations identified by the building official and that are the minimum necessary to assure safe living conditions.
2. Any alteration of a historic structure provided that the alteration will not preclude the structure's continued designation as a historic structure.

CHAPTER 8
INTERIOR FINISHES

801.5 Applicability. For buildings in flood hazard areas as established in Section 1612.3, interior finishes, trim and decorative materials below the elevation required by Section 1612 shall be flood-damage-resistant-materials.

CHAPTER 11
ACCESSIBILITY

1107.7.5 [General exceptions] Design flood elevation. The required number of Type A units and Type B units shall not apply to a site where the required elevation of the lowest floor or the lowest horizontal structural building members of nonelevator buildings are at or above the design flood elevation resulting in:

1. A difference in elevation between the minimum required floor elevation at the primary entrances and vehicular and pedestrian arrival points within 50 feet (15,240 mm) exceeding 30 inches (762 mm), and
2. A slope exceeding 10 percent between the minimum required floor elevation at the primary entrances and vehicular and pedestrian arrival points within 50 feet (15,240 mm).
   Where no such arrival points are within 50 feet (15 240 mm) of the primary entrances, the closest arrival points shall be used.

CHAPTER 12
INTERIOR ENVIRONMENT

1203.4 Under-floor ventilation.

1203.4.2 Exceptions. The following are exceptions to Sections 1203.4 and 1203.4.1:

5. For buildings in flood hazard areas as established in Section 1612.3, the openings for under-floor ventilation shall be deemed as meeting the flood opening requirements of ASCE 24 provided that the ventilation openings are designed and installed in accordance with ASCE 24.

CHAPTER 14
EXTERIOR WALLS

[BS] 1403.6 Flood resistance. For buildings in flood hazard areas as established in Section 1612.3, exterior walls extending below the elevation required by Section 1612 shall be constructed with flood damage-resistant materials.

[BS] 1403.7 Flood resistance for coastal high hazard areas and coastal A zones. For buildings in coastal high hazard areas and coastal A zones as established in Section 1612.3, electrical, mechanical and plumbing system components shall not be mounted on or penetrate through exterior walls that are designed to break away under flood loads.

CHAPTER 16
STRUCTURAL DESIGN REQUIREMENTS

SECTION 1602
DEFINITIONS AND NOTATIONS

NOTATIONS.

Fa = Flood load in accordance with Chapter 5 of ASCE 7.

SECTION 1603
CONSTRUCTION DOCUMENTS

1603.1 General. Construction documents shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.8 shall be indicated on the construction documents.

Exception: Construction documents for buildings constructed in accordance with the conventional light-frame construction provisions of Section 2308 shall indicate the following structural design information:

1. Floor and roof live loads.
2. Ground snow load, Pg.
3. Ultimate design wind speed, Vult, (3-second gust), miles per hour (mph) (km/hr) and nominal design wind speed, Vasd, as determined in accordance with Section 1609.3.1 and wind exposure.
4. Seismic design category and site class.
5. Flood design data, if located in flood hazard areas established in Section 1612.3.
6. Design load-bearing values of soils.

1603.1.7 Flood design data. For buildings located in whole or in part in flood hazard areas as established in Section 1612.3, the documentation pertaining to design, if required in Section 1612.5, shall be included and the following information, referenced to the datum on the community's Flood Insurance Rate Map (FIRM), shall be shown, regardless of whether flood loads govern the design of the building:

1. Flood design class assigned according to ASCE 24.
2. In flood hazard areas other than coastal hazard areas or coastal A zones, the elevation of the proposed lowest floor, including the basement.

3. In flood hazard areas other than coastal hazard areas or coastal A zones, the elevation to which any nonresidential building will be dry floodproofed.
4. In coastal high hazard areas and coastal A zones, the proposed elevation of the bottom of the lowest horizontal structural member of the lowest floor, including the basement.

1605.2.1 [Load combinations using strength design or load and resistance factor design] Other loads. Where flood loads, Fa, are to be considered in the design, the load combinations of Section 2.3.3 of ASCE 7 shall be used. Where self-straining loads, T, are considered in design, their structural effects in combination with other loads shall be determined in accordance with Section 2.3.5 of ASCE 7. Where an ice-sensitive structure is subjected to loads due to atmospheric icing, the load combinations of Section 2.3.4 of ASCE 7 shall be considered.

1605.3.1.2 [Load combinations using allowable stress design] Other loads. Where flood loads, Fa, are to be considered in design, the load combinations of Section 2.4.2 of ASCE 7 shall be used. Where self-straining loads, T, are considered in design, their structural effects in combination with other loads shall be determined in accordance with Section 2.4.4 of ASCE 7. Where an ice-sensitive structure is subjected to loads due to atmospheric icing, the load combinations of Section 2.4.3 of ASCE 7 shall be considered.

SECTION 1612
FLOOD LOADS

1612.1 General. Within flood hazard areas as established in Section 1612.3, all new construction of buildings, structures and portions of buildings and structures, including substantial improvement and restoration of substantial damage to buildings and structures, shall be designed and constructed to resist the effects of flood hazards and flood loads. For buildings that are located in more than one flood hazard area, the provisions associated with the most restrictive flood hazard area shall apply. [S24-03/04]

1612.2 Definitions. The following terms are defined in Chapter 2:
BASE FLOOD.
BASE FLOOD ELEVATION.
BASEMENT.
COASTAL A ZONE.
COASTAL HIGH HAZARD AREA.
DESIGN FLOOD.
DESIGN FLOOD ELEVATION.
DRY FLOODPROOFING.
EXISTING STRUCTURE.
FLOOD or FLOODING.
FLOOD DAMAGE-RESISTANT MATERIALS.
FLOOD HAZARD AREA.
FLOOD INSURANCE RATE MAP (FIRM).
FLOOD INSURANCE STUDY.
FLOODWAY.
LOWEST FLOOR.
SPECIAL FLOOD HAZARD AREA.
START OF CONSTRUCTION.
SUBSTANTIAL DAMAGE.
SUBSTANTIAL IMPROVEMENT.

1612.3 Establishment of flood hazard areas. To establish flood hazard areas, the applicable governing authority shall adopt a flood hazard map and supporting data. The flood hazard map shall include, at a minimum, areas of special flood hazard as identified by the Federal Emergency Management Agency in an engineering report entitled “The Flood Insurance Study for **[INSERT NAME OF JURISDICTION]**,” dated **[INSERT DATE OF ISSUANCE]**, as amended or revised with the accompanying Flood Insurance Rate Map (FIRM) and Flood Boundary and Floodway Map (FBFM) and related supporting data along with

any revisions thereto. The adopted flood hazard map and supporting data are hereby adopted by reference and declared to be part of this section.

1612.3.1 Design flood elevations. Where design flood elevations are not included in the flood hazard areas established in Section 1612.3, or where floodways are not designated, the building official is authorized to require the applicant to:

1. Obtain and reasonably utilize any design flood elevation and floodway data available from a federal, state, or other source; or
2. Determine the design flood elevation and/or floodway in accordance with accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas. Determinations shall be undertaken by a registered design professional who shall document that the technical methods used reflect currently accepted engineering practice.

1612.3.2 Determination of impacts. In riverine flood hazard areas where design flood elevations are specified but floodways have not been designated, the applicant shall provide a floodway analysis that demonstrates that the proposed work will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction of the applicable governing authority.

1612.4 Design and construction. The design and construction of buildings and structures located in flood hazard areas, including coastal high hazard areas and coastal A zones, shall be in accordance with Chapter 5 of ASCE 7 and ASCE 24.

1612.5 Flood hazard documentation. The following documentation shall be prepared and sealed by a registered design professional and submitted to the building official:

1. For construction in flood hazard areas other than coastal high hazard areas or coastal A zones:
   1.1. The elevation of the lowest floor, including the basement, as required by the lowest floor elevation inspection in Section 110.3.3 and for the final inspection in Section 110.3.10.1.
   1.2. For fully enclosed areas below the design flood elevation where provisions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.7.2.1 of ASCE 24, construction documents shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.7.2.2 of ASCE 24.
   1.3 For dry floodproofed nonresidential buildings, construction documents shall include a statement that the dry floodproofing is designed in accordance with ASCE 24.
2. For construction in coastal high hazard areas and coastal A zones:
   2.1. The elevation of the bottom of the lowest horizontal structural member as required by the lowest floor elevation inspection in Section 110.3.3 and for the final inspection in Section 110.3.10.1.
   2.2. Construction documents shall include a statement that the building is designed in accordance with ASCE 24, including that the pile or column foundation and building or structure to be attached thereto is designed to be anchored to resist flotation, collapse and lateral movement due to the effects of wind and flood loads acting simultaneously on all building components, and other load requirements of Chapter 16.
   2.3. For breakaway walls designed to have a resistance of more than 20 psf (0.96 kN/m2) determined using allowable stress design, construction documents shall include a statement that the breakaway wall is designed in accordance with ASCE 24.

CHAPTER 18
SOILS AND FOUNDATIONS

1801.1 Scope. The provisions of this chapter shall apply to building and foundation systems.

1804.4 [Excavation, Grading and Fill] Site grading. The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than one unit vertical in 20 units horizontal (5-percent slope) for a minimum distance of 10 feet (3048 mm) measured perpendicular to the face of the wall. If physical obstructions or lot lines prohibit 10 feet (3048 mm) of horizontal distance, a 5-percent slope shall be provided to an approved alternative method of diverting water away from the foundation. Swales used for this purpose shall be sloped a minimum of 2 percent where located within 10 feet (3048 mm) of the building foundation. Impervious surfaces within 10 feet (3048 mm) of the building foundation shall be sloped a minimum of 2 percent away from the building.

Exception: Where climatic or soil conditions warrant, the slope of the ground away from the building foundation shall be permitted to be reduced to not less than one unit vertical in 48 units horizontal (2-percent slope).

The procedure used to establish the final ground level adjacent to the foundation shall account for additional settlement of the backfill.

1804.5 [Excavation, Grading and Fill] Grading and fill in flood hazard areas. In flood hazard areas established in Section 1612.3, grading and/or fill shall not be approved:

1. Unless such fill is placed, compacted and sloped to minimize shifting, slumping and erosion during the rise and fall of floodwater and, as applicable, wave action.
2. In floodways, unless it has been demonstrated through hydrologic and hydraulic analyses performed by a registered design professional in accordance with standard engineering practice that the proposed grading or fill, or both, will not result in any increase in flood levels during the occurrence of the design flood.
3. In coastal high hazard areas, unless such fill is conducted and/or placed to avoid diversion of water and waves toward any building or structure.
4. Where design flood elevations are specified but floodways have not been designated, unless it has been demonstrated that the cumulative effect of the proposed flood hazard area encroachment, when combined with all other existing and anticipated flood hazard area encroachment, will not increase the design flood elevation more than 1 foot (305 mm) at any point.

1805.1.2.1 [Under-floor space] Flood hazard areas. For buildings and structures in flood hazard areas as established in Section 1612.3, the finished ground level of an under-floor space such as a crawl space shall be equal to or higher than the outside finished ground level on at least one side.

Exception: Under-floor spaces of Group R-3 buildings that meet the requirements of FEMA TB 11.

CHAPTER 27
ELECTRICAL

[F] 2702.1.2 Group I-2 Occupancies. In Group I-2 occupancies, in new construction or where the building is substantially damaged, where an essential electrical system is located in flood hazard areas established in Section 1612.3 of the *International Building Code*, the system shall be located and installed in accordance with ASCE 24.

CHAPTER 30
ELEVATORS AND CONVEYING SYSTEMS

3001.2 Referenced standards. Except as otherwise provided for in this code, the design, construction, installation, alteration, repair and maintenance of elevators and conveying systems and their components shall conform to ASME A17.1/CSA B44, ASME A17.7/CSA B44.7, ASME A90.1, ASME B20.1, ANSI MH29.1, ALI ALCTV and ASCE 24 for construction in flood hazard areas established in Section 1612.3.

CHAPTER 31
SPECIAL CONSTRUCTION

3102.7 Engineering design. The structure shall be designed and constructed to sustain dead loads; loads due to tension or inflation; live loads including wind, snow or flood and seismic loads and in accordance with Chapter 16.

3109.1 [Pools, Spas and Hot Tubs] General. The design and construction of swimming pools, spas and hot tubs shall comply with the International Swimming Pool and Spa Code.

CHAPTER 34
RESERVED

Action taken during the 2012 Code Development Process removed Chapter 34, Existing Structure, from the IBC. The provisions of this chapter are contained in the IEBC. See Section 101.4.7.

CHAPTER 35
REFERENCED STANDARDS

ASCE/SEI 24-14	Flood Resistant Design and Construction
FEMA-TB-11-01	Crawlspace Construction for Buildings Located in Special Flood Hazard Areas

2015 INTERNATIONAL BUILDING CODE – APPENDIX G
[a compilation of flood resistant provisions, prepared by FEMA]

APPENDIX G
FLOOD-RESISTANT CONSTRUCTION

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

SECTION G101
ADMINISTRATION

G101.1 Purpose. The purpose of this appendix is to promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific flood hazard areas through the establishment of comprehensive regulations for management of flood hazard areas designed to:

1. Prevent unnecessary disruption of commerce, access and public service during times of flooding;
2. Manage the alteration of natural flood plains, stream channels and shorelines
3. Manage filling, grading, dredging and other development that may increase flood damage or erosion potential.
4. Prevent or regulate the construction of flood barriers that will divert floodwaters or that can increase flood hazards.
5. Contribute to improved construction techniques in the flood plain.

G101.2 Objectives. The objectives of this appendix are to protect human life, minimize the expenditure of public money for flood control projects, minimize the need for rescue and relief efforts associated with flooding, minimize prolonged business interruption, minimize damage to public facilities and utilities, help maintain a stable tax base by providing for the sound use and development of flood-prone areas, contribute to improved construction techniques in the flood plain and ensure that potential owners and occupants are notified that property is within flood hazard areas.

G101.3 Scope. The provisions of this appendix shall apply to all proposed development in a flood hazard area established in Section 1612 of this code, including certain building work exempt from permit under Section 105.2.

G101.4 Violations. Any violation of a provision of this appendix, or failure to comply with a permit or variance issued pursuant to this appendix or any requirement of this appendix, shall be handled in accordance with Section 114.

SECTION G102
APPLICABILITY

G102.1 General. This appendix, in conjunction with this code, provides minimum requirements for development located in flood hazard areas, including the:

1. The subdivision of land.
2. Site improvements and installation of utilities.
3. Placement and replacement of manufactured homes.
4. Placement of recreational vehicles.
5. New construction and repair, reconstruction, rehabilitation or additions to new construction.
6. Substantial improvement of existing buildings and structures, including restoration after damage.

7. Installation of tanks.
8. Temporary structures.
9. Temporary or permanent storage, utility and miscellaneous Group U buildings and structures.
10. Certain building work exempt from permit under Section 105.2 and other buildings and development activities.

G102.2 Establishment of flood hazard areas. Flood hazard areas are established in Section 1612.3 of this code, adopted by the applicable governing authority on **[INSERT DATE].**

SECTION G103
POWERS AND DUTIES

G103.1 Permit Applications. All applications for permits must comply with the following:

1. The building official shall review all permit applications to determine whether proposed development is located in flood hazard areas established in Section G102.2.
2. Where a proposed development site is in a flood hazard area, all development to which this appendix is applicable as specified in Section G102.1 shall be designed and constructed with methods, practices and materials that minimize flood damage and that are in accordance with this code and ASCE 24.

G103.2 Other permits. It shall be the responsibility of the building official to ensure that approval of a proposed development shall not be given until proof that necessary permits have been granted by federal or state agencies having jurisdiction over such development.

G103.3 Determination of design flood elevations. If design flood elevations are not specified, the building official is authorized to require the applicant to:

1. Obtain, review and reasonably utilize data available from a federal, state or other source, or
2. Determine the design flood elevation in accordance with accepted hydrologic and hydraulic engineering techniques. Such analyses shall be performed and sealed by a registered design professional. Studies, analyses and computations shall be submitted in sufficient detail to allow review and approval by the building official. The accuracy of data submitted for such determination shall be the responsibility of the applicant.

G103.4 Activities in riverine flood hazard areas. In riverine flood hazard areas where design flood elevations are specified but floodways have not been designated, the building official shall not permit any new construction, substantial improvement or other development, including fill, unless the applicant submits an engineering analysis prepared by a registered design professional, demonstrating that the cumulative effect of the proposed development, when combined with all other existing and anticipated flood hazard area encroachment, will not increase the design flood elevation more than 1 foot (305 mm) at any point within the community.

G103.5 Floodway encroachment. Prior to issuing a permit for any floodway encroachment, including fill, new construction, substantial improvements and other development or land-disturbing activity, the building official shall require submission of a certification, prepared by a registered design professional, along with supporting technical data, demonstrating that such development will not cause any increase of the base flood level.

G103.5.1 Floodway revisions. A floodway encroachment that increases the level of the base flood is authorized if the applicant has applied for a conditional Flood Insurance Rate Map (FIRM) revision and has received approval of the Federal Emergency Management Agency (FEMA).

G103.6 Watercourse alteration. Prior to issuing a permit for any alteration or relocation of any watercourse, the building official shall require the applicant to provide notification of the proposal to the appropriate authorities of all affected adjacent government jurisdictions, as well as appropriate state agencies. A copy of the notification shall be maintained in the permit records and submitted to FEMA.

G103.6.1 Engineering analysis. The building official shall require submission of an engineering analysis, prepared by a registered design professional, demonstrating that the flood-carrying capacity of the altered or relocated portion of the watercourse will not be decreased. Such watercourses shall be maintained in a manner that preserves the channel's flood-carrying capacity.

G103.7 Alterations in coastal areas. Prior to issuing a permit for any alteration of sand dunes and mangrove stands in coastal high-hazard areas and coastal A zones, the building official shall require submission of an engineering analysis, prepared by a registered design professional, demonstrating that the proposed alteration will not increase the potential for flood damage.

G103.8 Records. The building official shall maintain a permanent record of all permits issued in flood hazard areas, including copies of inspection reports and certifications required in Section 1612.

G103.9 Inspections. Development for which a permit under this appendix is required shall be subject to inspection. The building official or the building official's designee shall make, or cause to be made, inspections of all development in flood hazard areas authorized by issuance of a permit under this appendix.

SECTION G104
PERMITS

G104.1 Required. Any person, owner or owner's authorized agent who intends to conduct any development in a flood hazard area shall first make application to the building official and shall obtain the required permit.

G104.2 Application for permit. The applicant shall file an application in writing on a form furnished by the building official. Such application shall:

1. Identify and describe the development to be covered by the permit.
2. Describe the land on which the proposed development is to be conducted by legal description, street address or similar description that will readily identify and definitely locate the site.
3. Include a site plan showing the delineation of flood hazard areas, floodway boundaries, flood zones, design flood elevations, ground elevations, proposed fill and excavation and drainage patterns and facilities.
4. Include in subdivision proposals and other proposed developments with more than 50 lots or larger than 5 acres (20,234 m^2), base flood elevation data in accordance with Section 1612.3.1 if such data are not identified for the flood hazard areas established in Section G102.2.
5. Indicate the use and occupancy for which the proposed development is intended.
6. Be accompanied by construction documents, grading and filling plans and other information deemed appropriate by the building official.
7. State the valuation of the proposed work.
8. Be signed by the applicant or the applicant's authorized agent.

G104.3 Validity of permit. The issuance of a permit under this appendix shall not be construed to be a permit for, or approval of, any violation of this appendix or any other ordinance of the jurisdiction. The issuance of a permit based on submitted documents and information shall not prevent the building official from requiring the correction of errors. The building official is authorized to prevent occupancy or use of a structure or site that is in violation of this appendix or other ordinances of this jurisdiction.

G104.4 Expiration. A permit shall become invalid if the proposed development is not commenced within 180 days after its issuance, or if the work authorized is suspended or abandoned for a period of 180 days after the work commences. Extensions shall be requested in writing and justifiable cause demonstrated. The building official is authorized to grant, in writing, one or more extensions of time, for periods not more than 180 days each.

G104.5 Suspension or revocation. The building official is authorized to suspend or revoke a permit issued under this appendix wherever the permit is issued in error or on the basis of incorrect, inaccurate or incomplete information, or in violation of any ordinance or code of this jurisdiction.

SECTION G105
VARIANCES

G105.1 General. The board of appeals established pursuant to Section 113 shall hear and decide requests for variances. The board of appeals shall base its determination on technical justifications, and has the right to attach such conditions to variances as it deems necessary to further the purposes and objectives of this appendix and Section 1612.

G105.2 Records. The building official shall maintain a permanent record of all variance actions, including justification for their issuance.

G105.3 Historic structures. A variance is authorized to be issued for the repair or rehabilitation of a historic structure upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure, and the variance is the minimum necessary to preserve the historic character and design of the structure.

Exception: Within flood hazard areas, historic structures that do not meet one or more of the following designations:

1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places.
2. Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district.
3. Designated as historic under a state or local historic preservation program that is approved by the Department of Interior.

G105.4 Functionally dependent facilities. A variance is authorized to be issued for the construction or substantial improvement of a functionally dependent facility provided the criteria in Section 1612.1 are met and the variance is the minimum necessary to allow the construction or substantial improvement, and that all due consideration has been given to methods and materials that minimize flood damages during the design flood and create no additional threats to public safety.

G105.5 Restrictions. The board of appeals shall not issue a variance for any proposed development in a floodway if any increase in flood levels would result during the base flood discharge.

G105.6 Considerations. In reviewing applications for variances, the board of appeals shall consider all technical evaluations, all relevant factors, all other portions of this appendix and the following:

1. The danger that materials and debris may be swept onto other lands resulting in further injury or damage.
2. The danger to life and property due to flooding or erosion damage.
3. The susceptibility of the proposed development, including contents, to flood damage and the effect of such damage on current and future owners.
4. The importance of the services provided by the proposed development to the community.
5. The availability of alternate locations for the proposed development that are not subject to flooding or erosion.
6. The compatibility of the proposed development with existing and anticipated development.
7. The relationship of the proposed development to the comprehensive plan and flood plain management program for that area.
8. The safety of access to the property in times of flood for ordinary and emergency vehicles.
9. The expected heights, velocity, duration, rate of rise and debris and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site.

10. The costs of providing governmental services during and after flood conditions including maintenance and repair of public utilities and facilities such as sewer, gas, electrical and water systems, streets and bridges.

G105.7 Conditions for issuance. Variances shall only be issued by the board of appeals where all of the following criteria are met:

1. A technical showing of good and sufficient cause that the unique characteristics of the size, configuration or topography of the site renders the elevation standards inappropriate.
2. A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable.
3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, nor create nuisances, cause fraud on or victimization of the public or conflict with existing local laws or ordinances.
4. A determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
5. Notification to the applicant in writing over the signature of the building official that the issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as $25 for $100 of insurance coverage, and that such construction below the base flood level increases risks to life and property.

SECTION G201
DEFINITIONS

G201.1 General. The following words and terms shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 of this code for general definitions.

G201.2 Definitions.

DEVELOPMENT. Any man-made change to improved or unimproved real estate, including but not limited to, buildings or other structures, temporary structures, temporary or permanent storage of materials, mining, dredging, filling, grading, paving, excavations, operations and other land-disturbing activities.

FUNCTIONALLY DEPENDENT FACILITY. A facility that cannot be used for its intended purpose unless it is located or carried out in close proximity to water, such as a docking or port facility necessary for the loading or unloading of cargo or passengers, shipbuilding or ship repair. The term does not include long-term storage, manufacture, sales or service facilities.

MANUFACTURED HOME. A structure that is transportable in one or more sections, built on a permanent chassis, designed for use with or without a permanent foundation when attached to the required utilities, and constructed to the Federal Mobile Home Construction and Safety Standards and rules and regulations promulgated by the U.S. Department of Housing and Urban Development. The term also includes mobile homes, park trailers, travel trailers and similar transportable structures that are placed on a site for 180 consecutive days or longer.

MANUFACTURED HOME PARK OR SUBDIVISION. A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

RECREATIONAL VEHICLE. A vehicle that is built on a single chassis, 400 square feet (37.16 m^2) or less when measured at the largest horizontal projection, designed to be self-propelled or permanently towable by a light-duty truck, and designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel or seasonal use. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect-type utilities and security devices and has no permanently attached additions.

VARIANCE. A grant of relief from the requirements of this section that permits construction in a manner otherwise prohibited by this section where specific enforcement would result in unnecessary hardship.

VIOLATION. A development that is not fully compliant with this appendix or Section 1612, as applicable.

SECTION G301
SUBDIVISIONS

G301.1 General. Any subdivision proposal, including proposals for manufactured home parks and subdivisions, or other proposed new development in a flood hazard area shall be reviewed to verify all of the following:

1. All such proposals are consistent with the need to minimize flood damage.
2. All public utilities and facilities, such as sewer, gas, electric and water systems, are located and constructed to minimize or eliminate flood damage.
3. Adequate drainage is provided to reduce exposure to flood hazards.

G301.2 Subdivision requirements. The following requirements shall apply in the case of any proposed subdivision, including proposals for manufactured home parks and subdivisions, any portion of which lies within a flood hazard area:

1. The flood hazard area, including floodways, and coastal high-hazard areas and coastal A zones, as appropriate, shall be delineated on tentative and final subdivision plats.
2. Design flood elevations shall be shown on tentative and final subdivision plats.
3. Residential building lots shall be provided with adequate buildable area outside the floodway.
4. The design criteria for utilities and facilities set forth in this appendix and appropriate International Codes shall be met.

SECTION G401
SITE IMPROVEMENT

G401.1 Development in floodways. Development or land-disturbing activity shall not be authorized in the floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice, and prepared by a registered design professional, that the proposed encroachment will not result in any increase in the base flood level.

G401.2 Coastal high-hazard areas and coastal A zones. In coastal high-hazard areas and and coastal A zones:

1. New buildings and buildings that are substantially improved shall only be authorized landward of the reach of mean high tide.
2. The use of fill for structural support of buildings is prohibited.

G401.3 Sewer facilities. All new or replaced sanitary sewer facilities, private sewage treatment plants (including all pumping stations and collector systems) and on-site waste disposal systems shall be designed in accordance with Chapter 7, ASCE 24, to minimize or eliminate infiltration of floodwaters into the facilities and discharge from the facilities into floodwaters, or impairment of the facilities and systems.

G401.4 Water facilities. All new or replacement water facilities shall be designed in accordance with the provisions of Chapter 7, ASCE 24, to minimize or eliminate infiltration of floodwaters into the systems.

G401.5 Storm drainage. Storm drainage shall be designed to convey the flow of surface waters to minimize or eliminate damage to persons or property.

G401.6 Streets and sidewalks. Streets and sidewalks shall be designed to minimize potential for increasing or aggravating flood levels.

SECTION G501
MANUFACTURED HOMES

G501.1 Elevation. All new and replacement manufactured homes to be placed or substantially improved in a flood hazard area shall be elevated such that the lowest floor of the manufactured home is elevated to or above the design flood elevation.

G501.2 Foundations. All new and replacement manufactured homes, including substantial improvement of existing manufactured homes, shall be placed on a permanent, reinforced foundation that is designed in accordance with Section R322 of the International Residential Code.

G501.3 Anchoring. All new and replacement manufactured homes to be placed or substantially improved in a flood hazard area shall be installed using methods and practices that minimize flood damage. Manufactured homes shall be securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement. Methods of anchoring are authorized to include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable state and local anchoring requirements for resisting wind forces.

G501.4 Protection of mechanical equipment and outside appliances. Mechanical equipment and outside appliances shall be elevated to or above the design flood elevation.

> **Exception:** Where such equipment and appliances are designed and installed to prevent water from entering or accumulating within their components and the systems are constructed to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to the elevation required by Section R322 of the International Residential Code, the systems and equipment shall be permitted to be located below the elevation required by Section R322 of the International Residential Code. Electrical wiring systems shall be permitted below the design flood elevation provided they conform to the provisions of NFPA 70.

G501.5 Enclosures. Fully enclosed areas below elevated manufactured homes shall comply with the requirements of Section R322 of the International Residential Code.

SECTION G601
RECREATIONAL VEHICLES

G601.1 Placement prohibited. The placement of recreational vehicles shall not be authorized in coastal high-hazard areas and in floodways.

G601.2 Temporary placement. Recreational vehicles in flood hazard areas shall be fully licensed and ready for highway use, and shall be placed on a site for less than 180 consecutive days.

G601.3 Permanent placement. Recreational vehicles that are not fully licensed and ready for highway use, or that are to be placed on a site for more than 180 consecutive days, shall meet the requirements of Section G501 for manufactured homes.

SECTION G701
TANKS

G701.1 Tanks. Underground and above-ground tanks shall be designed, constructed, installed and anchored in accordance with ASCE24.

SECTION G801
OTHER BUILDING WORK

G801.1 Garages and accessory structures. Garages and accessory structures shall be designed and constructed in accordance with ASCE 24.

G801.2 Fences. Fences in floodways that may block the passage of floodwaters, such as stockade fences and wire mesh fences, shall meet the requirement of Section G103.5.

G801.3 Oil derricks. Oil derricks located in flood hazard areas shall be designed in conformance with the flood loads in Sections 1603.1.7 and 1612.

G801.4 Retaining walls, sidewalks and driveways. Retaining walls, sidewalks and driveways shall meet the requirements of Section 1804.5

G801.5 Swimming pools. Swimming pools shall be designed and constructed in accordance with ASCE 24. Above-ground swimming pools, on-ground swimming pools and in-ground swimming pools that involve placement of fill in floodways shall also meet the requirements of Section G103.5.

G801.6 Decks, porches, and patios. Decks, porches and patios shall be designed and constructed in accordance with ASCE 24.

G801.7 Nonstructural concrete slabs in coastal high-hazard areas and coastal A zones. In coastal high-hazard areas and coastal A zones, nonstructural concrete slabs used as parking pads, enclosure floors, landings, decks, walkways, patios and similar nonstructural uses are permitted beneath or adjacent to buildings and structures provided that the concrete slabs shall be constructed in accordance with ASCE 24.

G801.8 Roads and watercourse crossings in regulated floodways. Roads and watercourse crossings that encroach into regulated floodways, including roads, bridges, culverts, low-water crossings and similar means for vehicles or pedestrians to travel from one side of a watercourse to the other, shall meet the requirement of Section G103.5.

SECTION G901
TEMPORARY STRUCTURES AND TEMPORARY STORAGE

G901.1 Temporary structures. Temporary structures shall be erected for a period of less than 180 days. Temporary structures shall be anchored to prevent flotation, collapse or lateral movement resulting from hydrostatic loads, including the effects of buoyancy, during conditions of the design flood. Fully enclosed temporary structures shall have flood openings that are in accordance with ASCE 24 to allow for the automatic entry and exit of floodwaters.

G901.2 Temporary storage. Temporary storage includes storage of goods and materials for a period of less than 180 days. Stored materials shall not include hazardous materials.

G901.3 Floodway encroachment. Temporary structures and temporary storage in floodways shall meet the requirements of G103.5.

SECTION G1001
UTILITY AND MISCELLANEOUS GROUP U

G1001.1 Utility and miscellaneous Group U. Utility and miscellaneous Group U includes buildings that are accessory in character and miscellaneous structures not classified in any specific occupancy in this code, including, but not limited to, agricultural buildings, aircraft hangars (accessory to a one- or two-family residence), barns, carports, fences more than 6 feet (1829 mm) high, grain silos (accessory to a

residential occupancy), greenhouses, livestock shelters, private garages, retaining walls, sheds, stables and towers.

G1001.2 Flood loads. Utility and miscellaneous Group U buildings and structures, including substantial improvement of such buildings and structures, shall be anchored to prevent flotation, collapse or lateral movement resulting from flood loads, including the effect of buoyancy, during conditions of the design flood.

G1001.3 Elevation. Utility and miscellaneous Group U buildings and structures, including substantial improvement of such buildings and structures, shall be elevated such that the lowest floor, including basement, is elevated to or above the design flood elevation in accordance with Section 1612 of this code.

G1001.4 Enclosures below design flood elevation. Fully enclosed areas below the design flood elevation shall be constructed in accordance with ASCE 24.

G1001.5 Flood-damage-resistant materials. Flood-damage-resistant materials shall be used below the design flood elevation.

G1001.6 Protection of mechanical, plumbing and electrical systems. Mechanical, plumbing and electrical systems, including plumbing fixtures, shall be elevated to or above the design flood elevation.

> **Exception:** Electrical systems, equipment and components; heating, ventilating, air conditioning and plumbing appliances; plumbing fixtures, duct systems and other service equipment shall be permitted to be located below the design flood elevation provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation in compliance with the flood-resistant construction requirements of this code. Electrical wiring systems shall be permitted to be located below the design flood elevation provided they conform to the provisions of NFPA 70.

SECTION G1101
REFERENCED STANDARDS

ASCE 24—14 Flood Resistance Design and Construction
HUD 24 CFR Part 3280 (2008) Manufactured Home Construction and Safety Standards
IBC—15 International Building Code
IRC—15 International Residential Code
NFPA 70—11 National Electrical Code

APPENDIX J
GRADING

J101.2 Flood hazard areas. Unless the applicant has submitted an engineering analysis, prepared in accordance with standard engineering practice by a registered design professional, that demonstrates the proposed work will not result in any increase in the level of the base flood, grading, excavation and earthwork construction, including fills and embankments, shall not be permitted in floodways that are in flood hazard areas established in Section 1612.3 or in flood hazard areas where design flood elevations are specified but floodways have not been designated.

2015 International Residential Code
[a compilation of flood resistant provisions, prepared by FEMA]

CHAPTER 1
ADMINISTRATIVE

R102.7.1 [Existing structures] Additions, alterations or repairs. Additions, alterations or repairs to any structure shall conform to the requirements for a new structure without requiring the existing structure to comply with all of the requirements of this code, unless otherwise stated. Additions, alterations or repairs and relocations shall not cause an existing structure to become unsafe or adversely affect the performance of the building.

R104.10.1 [Modifications] Flood hazard areas. The building official shall not grant modifications to any provisions required in flood hazard areas as established by Table R301.2(1) unless a determination has been made that:

1. There is good and sufficient cause showing that the unique characteristics of the size, configuration or topography of the site render the elevation standards of Section R322 inappropriate.
2. Failure to grant the modification would result in exceptional hardship by rendering the lot undevelopable.
3. The granting of modification will not result in increased flood heights, additional threats to public safety, extraordinary public expense, cause fraud on or victimization of the public, or conflict with existing laws or ordinances.
4. The modification is the minimum necessary to afford relief, considering the flood hazard.
5. Written notice specifying the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation and stating that construction below the design flood elevation increases risks to life and property, has been submitted to the applicant.

R105.2 Work exempt from permit. Exemption from permit requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this jurisdiction. Permits shall not be required for the following: *[partial shown]*

Building:

1. One-story detached accessory structures, provided that the floor area does not exceed 200 square feet (18.58 m^2).
2. Fences not over 7 feet (2134 mm) high.
3. Retaining walls that are not over 4 feet (1219 mm) in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge.
4. Water tanks supported directly upon grade if the capacity does not exceed 5000 gallons (18927 L) and the ratio of height to diameter or width does not exceed 2 to 1.
5. Sidewalks and driveways.
10. Decks not exceeding 200 square feet (18.58 m^2) in area, that are not more than 30 inches (762 mm) above grade at any point, are not attached to a dwelling do not serve the exit door required by Section R311.4.

R105.3.1.1 Determination of substantially improved or substantially damaged existing buildings in flood hazard areas. For applications for reconstruction, rehabilitation, addition, alteration, repair or other improvement of existing buildings or structures located in a flood hazard area as established by Table R301.2(1), the building official shall examine or cause to be examined the construction documents and

shall make a determination with regard to the value of the proposed work. For buildings that have sustained damage of any origin, the value of the proposed work shall include the cost to repair the building or structure to its predamaged condition. If the building official finds that the value of proposed work equals or exceeds 50 percent of the market value of the building or structure before the damage has occurred or the improvement is started, the proposed work is a substantial improvement or restoration of substantial damage and the building official shall require existing portions of the entire building or structure to meet the requirements of Section R322.

For the purpose of this determination, a substantial improvement shall mean any repair, reconstruction, rehabilitation, addition or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the building or structure before the improvement or repair is started. Where the building or structure has sustained substantial damage, repairs necessary to restore the building or structure to its predamaged condition shall be considered substantial improvements regardless of the actual repair work performed. The term shall not include either of the following:

1. Improvements to a building or structure that are required to correct existing health, sanitary or safety code violations identified by the building official and that are the minimum necessary to ensure safe living conditions.
2. Any alteration of a historic building or structure, provided that the alteration will not preclude the continued designation as a historic building or structure. For the purposes of this exclusion, a historic building shall be any of the following:
    2.1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places.
    2.2. Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district.
    2.3. Designated as historic under a state or local historic preservation program that is approved by the Department of Interior.

R106.1.4 Information for construction in flood hazard areas. For buildings and structures located in whole or in part in flood hazard areas as established by Table R301.2(1), construction documents shall include:

1. Delineation of flood hazard areas, floodway boundaries and flood zones and the design flood elevation, as appropriate.
2. The elevation of the proposed lowest floor, including basement; in areas of shallow flooding (AO Zones), the height of the proposed lowest floor, including basement, above the highest adjacent grade.
3. The elevation of the bottom of the lowest horizontal structural member in coastal high hazard areas (V Zone) and in Coastal A Zones where such zones are delineated on flood hazard maps identified in Table R301.2(1) or otherwise delineated by the jurisdiction.
4. If design flood elevations are not included on the community's Flood Insurance Rate Map (FIRM), the building official and the applicant shall obtain and reasonably utilize any design flood elevation and floodway data available from other sources.

R106.2 Site plan or plot plan. The construction documents submitted with the application for permit shall be accompanied by a site plan showing the size and location of new construction and existing structures on the site and distances from lot lines. In the case of demolition, the site plan shall show construction to be demolished and the location and size of existing structures and construction that are to remain on the site or plot. The building official is authorized to waive or modify the requirement for a site plan where the application for permit is for alteration or repair or where otherwise warranted.

R102.7.1 Additions, alterations or repairs. Additions, alterations or repairs to any structure shall conform to the requirements for a new structure without requiring the existing structure to comply with all of the requirements of this code, unless otherwise stated. Additions, alterations or repairs shall not cause an existing structure to become unsafe or adversely affect the performance of the building.

R109.1.3 Floodplain inspections. For construction in flood hazard areas as established by Table R301.2(1), upon placement of the lowest floor, including basement, and prior to further vertical

construction, the building official shall require submission of documentation, prepared and sealed by a registered design professional, of the elevation of the lowest floor, including basement, required in Section R322.

R109.1.6.1 [Final Inspection] Elevation documentation. If located in a flood hazard area, the documentation of elevations required in Section R322.1.10 shall be submitted to the building official prior to the final inspection.

R301.1 Application. Buildings and structures, and parts thereof, shall be constructed to safely support all loads, including dead loads, live loads, roof loads, flood loads, snow loads, wind loads and seismic loads as prescribed by this code. The construction of buildings and structures in accordance with the provisions of this code shall result in a system that provides a complete load path that meets the requirements for the transfer of loads from their point of origin through the load-resisting elements to the foundation. Buildings and structures constructed as prescribed by this code are deemed to comply with the requirements of this section.

CHAPTER 3
BUILDING PLANNING

R301.2 Climatic and geographic design criteria. Buildings shall be constructed in accordance with the provisions of this code as limited by the provisions of this section. Additional criteria shall be established by the local jurisdiction and set forth in Table R301.2(1).

Table R301.2(1) Climatic and Geographic Design Criteria

Ground Snow Load	Wind Design			Seismic Design Category[f]	Subject To Damage From			Winter Design Temp[e]	Ice barrier under-layment Required[h]	Flood Hazards[g]	Air Freezing Index[i]	Mean Annual Temp[j]
	Speed[d] (mph)	Topo-graphic Effects[k]	Special Wind region[l]		Weather-ing[a]	Frost line depth[b]	Termite[c]					

g. The jurisdiction shall fill in this part of the table with (a) the date of the jurisdiction's entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas), (b) the date(s) of the Flood Insurance Study and (c) the panel numbers and dates of all currently effective FIRMs and FBFMs or other flood hazard map adopted by the authority having jurisdiction, as amended.

R301.2.4 Floodplain construction. Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1), and substantial improvement and restoration of substantial damage of buildings and structures in flood hazard areas, shall be designed and constructed in accordance with Section R322. Buildings and structures that are located in more than one flood hazard area shall comply with the provisions associated with the most restrictive flood hazard area. Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

R301.2.4.1 Alternative provisions. As an alternative to the requirements in Section R322, ASCE 24 is permitted subject to the limitations of this code and the limitations therein.

R309.3 [Garages and Carports] Flood hazard areas. For buildings located in flood hazard areas as established by Table R301.2(1), garage floors shall be:

1. Elevated to or above the design flood elevation as determined in Section R322; or
2. Located below the design flood elevation provided that they are at or above grade on not less than one side, are used solely for parking, building access or storage, meet the requirements of Section R322 and are otherwise constructed in accordance with this code.

SECTION R322: FLOOD-RESISTANT CONSTRUCTION

R322.1 General. Buildings and structures constructed in whole or in part in flood hazard areas, including A or V Zones and Coastal A Zones, as established in Table R301.2(1), and substantial improvement and restoration of substantial damage of buildings and structures in flood hazard areas, shall be designed and constructed in accordance with the provisions contained in this section. Buildings and structures that are located in more than one flood hazard area shall comply with the provisions associated with the most restrictive flood hazard area. Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

R322.1.1 Alternative provisions. As an alternative to the requirements in Section R322, ASCE 24 is permitted subject to the limitations of this code and the limitations therein.

R322.1.2 Structural systems. Structural systems of buildings and structures shall be designed, connected and anchored to resist flotation, collapse or permanent lateral movement due to structural loads and stresses from flooding equal to the design flood elevation.

R322.1.3 Flood-resistant construction. Buildings and structures erected in areas prone to flooding shall be constructed by methods and practices that minimize flood damage.

R322.1.4 Establishing the design flood elevation. The design flood elevation shall be used to define flood hazard areas. At a minimum, the design flood elevation shall be the higher of the following:

1. The base flood elevation at the depth of peak elevation of flooding, including wave height, that has a 1 percent (100-year flood) or greater chance of being equaled or exceeded in any given year; or
2. The elevation of the design flood associated with the area designated on a flood hazard map adopted by the community, or otherwise legally designated.

R322.1.4.1 Determination of design flood elevations. If design flood elevations are not specified, the building official is authorized to require the applicant to comply with either of the following:

1. Obtain and reasonably use data available from a federal, state or other source; or
2. Determine the design flood elevation in accordance with accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas. Determinations shall be undertaken by a registered design professional who shall document that the technical methods used reflect currently accepted engineering practice. Studies, analyses and computations shall be submitted in sufficient detail to allow thorough review and approval.

R322.1.4.2 Determination of impacts. In riverine flood hazard areas where design flood elevations are specified but floodways have not been designated, the applicant shall demonstrate that the effect of the proposed buildings and structures on design flood elevations, including fill, when combined with other existing and anticipated flood hazard area encroachments, will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction.

R322.1.5 Lowest floor. The lowest floor shall be the lowest floor of the lowest enclosed area, including basement, and excluding any unfinished flood-resistant enclosure that is useable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the building or structure in violation of this section.

R322.1.6 Protection of mechanical, plumbing and electrical systems. Electrical systems, equipment and components; heating, ventilating, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall be located at or above the elevation required in Section R322.2 or R322.3. If replaced as part of a substantial improvement, electrical systems, equipment and components; heating, ventilating, air conditioning and plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall meet the requirements of this section. Systems, fixtures, and

equipment and components shall not be mounted on or penetrate through walls intended to break away under flood loads.

Exception: Locating electrical systems, equipment and components; heating, ventilating, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment is permitted below the elevation required in Section R322.2 or R322.3 provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation in accordance with ASCE 24. Electrical wiring systems are permitted to be located below the required elevation provided that they conform to the provisions of the electrical part of this code for wet locations.

R322.1.7 Protection of water supply and sanitary sewage systems. New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the systems in accordance with the plumbing provisions of this code. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into systems and discharges from systems into floodwaters in accordance with the plumbing provisions of this code and Chapter 3 of the International Private Sewage Disposal Code.

R322.1.8 Flood-resistant materials. Building materials and installation methods used for flooring and interior and exterior walls and wall coverings below the elevation required in Section R322.2 or R322.3 shall be flood damage-resistant materials that conform to the provisions of FEMA TB-2.

R322.1.9 Manufactured homes. The bottom of the frame of new and replacement manufactured homes on foundations that conform to the requirements of Section R322.2 or R322.3, as applicable, shall be elevated to or above the elevations specified in Section R322.2 (flood hazard areas including A Zones) or R322.3 in coastal high-hazard areas (V Zones and Coastal A Zones). The anchor and tie-down requirements of the applicable state or federal requirements shall apply. The foundation and anchorage of manufactured homes to be located in identified floodways shall be designed and constructed in accordance with ASCE 24.

R322.1.10 As-built elevation documentation. A registered design professional shall prepare and seal documentation of the elevations specified in Section R322.2 or R322.3.

R322.2 Flood hazard areas (including A Zones). Areas that have been determined to be prone to flooding and that are not subject to high-velocity wave action shall be designated as flood hazard areas. Flood hazard areas that have been delineated as subject to wave heights between 1 ½ feet (457 mm) and 3 feet (914 mm) or otherwise designated by the jurisdiction shall be designated as Coastal A Zones and are subject to the requirements of Section R322.3. Buildings and structures constructed in whole or in part in flood hazard areas shall be designed and constructed in accordance with Sections R322.2.1 through R322.2.3.

R322.2.1 Elevation requirements.

1. Buildings and structures in flood hazard areas, including flood hazard areas designated as Coastal A Zones, shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.
2. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including basement) elevated to a height above the highest adjacent grade of not less than the depth number specified in feet (mm) on the FIRM plus 1 foot (305 mm), or not less than 3 feet (15 mm) if a depth number is not specified.
3. Basement floors that are below grade on all sides shall be elevated to or above base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher.

Exception: Enclosed areas below the design flood elevation, including basements with floors that are not below grade on all sides, shall meet the requirements of Section 322.2.2.

R322.2.2 Enclosed area below design flood elevation. Enclosed areas, including crawl spaces, that are below the design flood elevation shall:

1. Be used solely for parking of vehicles, building access or storage.

2. Be provided with flood openings that meet the following criteria and are installed in accordance with Section R322.2.2.1:
2.1. The total net area of non-engineered openings shall be not less than 1 square inch (645 mm^2) for each square foot (0.093 m^2) of enclosed area where the enclosed area is measured on the exterior of the enclosure walls, or the openings shall be designed as engineered openings and the construction documents shall include a statement by a registered design professional that the design of the openings will provide for equalization of hydrostatic flood forces on exterior walls by allowing for the automatic entry and exit of floodwaters as specified in Section 2.7.2.2 of ASCE 24.
2.2. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall.
2.3 The presence of louvers, blades, screens and faceplates or other covers and devices shall allow the automatic flow of floodwater into and out of the enclosed areas and shall be accounted for in the determination of the net open area.

R322.2.2.1 Installation of openings. The walls of enclosed areas shall have openings installed such that:

1. There shall be not less than two openings on different sides of each enclosed area; if a building has more than one enclosed area below the design flood elevation, each area shall have openings.
2. The bottom of each opening shall be not more than 1 foot (305 mm) above the higher of the final interior grade or floor and the finished exterior grade immediately under each opening.
3. Openings shall be permitted to be installed in doors and windows; doors and windows without installed openings do not meet the requirements of this section.

R322.2.3 Foundation design and construction. Foundation walls for buildings and structures erected in flood hazard areas shall meet the requirements of Chapter 4.

Exception: Unless designed in accordance with Section R404:
1. The unsupported height of 6-inch (152 mm) plain masonry walls shall be not more than 3 feet (914 mm).
2. The unsupported height of 8-inch (203 mm) plain masonry walls shall be not more than 4 feet (914 mm).
3. The unsupported height of 8-inch (203 mm) reinforced masonry walls shall be not more than 8 feet (2438 mm).

For the purpose of this exception, unsupported height is the distance from the finished grade of the under-floor space to the top of the wall.

R322.2.4 Tanks. Underground tanks shall be anchored to prevent flotation, collapse and lateral movement under conditions of the base flood. Above-ground tanks shall be installed at or above the elevation required in Section R322.2.1 or shall be anchored to prevent flotation, collapse and lateral movement under conditions of the base flood.

R322.3 Coastal high-hazard areas (including V Zones and Coastal A Zones, where designated). Areas that have been determined to be subject to wave heights in excess of 3 feet (914 mm) or subject to high-velocity wave action or wave-induced erosion shall be designated as coastal high-hazard areas. Flood hazard areas that have been designated as subject to wave heights between 1 ½ (457 mm) and 3 feet (914 mm) or otherwise designated by the jurisdiction shall be designated as Coastal A Zones. Buildings and structures constructed in whole or in part in coastal high-hazard areas and Coastal A Zones, where designated, shall be designed and constructed in accordance with Sections R322.3.1 through R322.3.7.

R322.3.1 Location and site preparation.

1. New buildings and buildings that are determined to be substantially improved pursuant to Section R105.3.1.1 shall be located landward of the reach of mean high tide.
2. For any alteration of sand dunes and mangrove stands, the building official shall require submission of an engineering analysis that demonstrates that the proposed alteration will not increase the potential for flood damage.

R322.3.2 Elevation requirements.

1. Buildings and structures erected within coastal high-hazard areas and Coastal A Zones, shall be elevated so that the bottom of the lowest horizontal structure members supporting the lowest floor, with the exception of pilings, pile caps, columns, grade beams and bracing, is elevated to or above the base flood elevation plus 1 foot (305 mm) or the design flood elevation, whichever is higher.
2. Basement floors that are below grade on all sides are prohibited.
3. The use of fill for structural support is prohibited.
4. Minor grading, and the placement of minor quantities of fill, shall be permitted for landscaping and for drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways.
5. Walls and partitions enclosing areas below the design flood elevation shall meet the requirements of Sections R322.3.4 and R322.3.5.

R322.3.3 Foundations. Buildings and structures erected in coastal high-hazard areas and Coastal A Zones shall be supported on pilings or columns and shall be adequately anchored to such pilings or columns. The space below the elevated building shall be either free of obstruction or, if enclosed with walls, the walls shall meet the requirements of Section R322.3.4. Pilings shall have adequate soil penetrations to resist the combined wave and wind loads (lateral and uplift). Water-loading values used shall be those associated with the design flood. Wind-loading values shall be those required by this code. Pile embedment shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the piling. Pile systems design and installation shall be certified in accordance with Section R322.3.6. Spread footing, mat, raft or other foundations that support columns shall not be permitted where soil investigations that are required in accordance with Section R401.4 indicate that soil material under the spread footing, mat, raft or other foundation is subject to scour or erosion from wave-velocity flow conditions. If permitted, spread footing, mat, raft or other foundations that support columns shall be designed in accordance with ASCE 24. Slabs, pools, pool decks and walkways shall be located and constructed to be structurally independent of buildings and structures and their foundations to prevent transfer of flood loads to the buildings and structures during conditions of flooding, scour or erosion from wave-velocity flow conditions, unless the buildings and structures and their foundations are designed to resist the additional flood load.

Exception: In Coastal A Zones, stem wall foundations supporting a floor system above and backfilled with soil or gravel to the underside of the floor system shall be permitted provided the foundations are designed to account for wave action, debris impact, erosion and local scour. Where soils are susceptible to erosion and local scour, stem wall foundations shall have deep footings to account for the loss of soil.

R322.3.4 Walls below design flood elevation. Walls and partitions are permitted below the elevated floor, provided that such walls and partitions are not part of the structural support of the building or structure and:

1. Electrical, mechanical and plumbing system components are not to be mounted on or penetrate through walls that are designed to break away under flood loads; and
2. Are constructed with insect screening or open lattice; or
3. Are designed to break away or collapse without causing collapse, displacement or other structural damage to the elevated portion of the building or supporting foundation system. Such walls, framing and connections shall have a resistance of not less than 10 (479 Pa) and not more than 20 pounds per square foot (958 Pa) as determined using allowable stress design; or
4. Where wind loading values of this code exceed 20 pounds per square foot (958 Pa), as determined using allowable stress design, the construction documents shall include documentation prepared and sealed by a registered design professional that:

4.1. The walls and partitions below the design flood elevation have been designed to collapse from a water load less than that which would occur during the base flood.

4.2. The elevated portion of the building and supporting foundation system have been designed to withstand the effects of wind and flood loads acting simultaneously on structural and nonstructural building components. Water-loading values used shall be those associated with the design flood. Wind-loading values shall be those required by this code.

5. Walls intended to break away under flood loads as specified in Item 3 or 4 have flood openings that meet the criteria in Section R322.2.2, Item 2.
6. In Coastal A Zones, walls shall be provided with flood openings that meet the criteria of Section R322.2.2.

R322.3.5 Enclosed areas below design flood elevation. Enclosed areas below the design flood elevation shall be used solely for parking vehicles, building access or storage.

R322.3.5.1 Protection of building envelope. An exterior door that meets the requirements of Section R609 shall be installed at the top of stairs that provide access to the building and that are enclosed with walls designed to break away in accordance with Section 322.3.4.

R322.3.6 Construction documents. The construction documents shall include documentation that is prepared and sealed by a registered design professional that the design and methods of construction to be used meet the applicable criteria of this section.

R322.3.7 Tanks. Underground tanks shall be anchored to prevent flotation, collapse and lateral movement under conditions of the base flood. Above-ground tanks shall be installed at or above the elevation required in Section R322.3.2. Where elevated on platforms, the platforms shall be cantilevered from or knee braced to the building or shall be supported on foundations that conform to the requirements of Section R322.3.

R326.1 [Swimming Pools, Spas and Hot Tubs] General. The design and construction of pools and spas shall comply with the International Swimming Pool and Spa Code.

R401.1 [Foundations] Application. The provisions of this chapter shall control the design and construction of the foundation and foundation spaces for buildings. In addition to the provisions of this chapter, the design and construction of foundations in flood hazard areas as established by Table R301.2(1) shall meet the provisions of Section R322. Wood foundations shall be designed and installed in accordance with AWC PWF.

Exception: The provisions of this chapter shall be permitted to be used for wood foundations only in the following situations:
1. In buildings that have no more than two floors and a roof.
2. Where interior basement and foundation walls are constructed at intervals not exceeding 50 feet (15240 mm).

Wood foundations in Seismic Design Category D_0, D_1 or D_2 shall be designed in accordance with accepted engineering practice.

R401.2 [Foundations] Requirements. Foundation construction shall be capable of accommodating all loads according to Section R301 and of transmitting the resulting loads to the supporting soil. Fill soils that support footings and foundations shall be designed, installed and tested in accordance with accepted engineering practice. Gravel fill used as footings for wood and precast concrete foundations shall comply with Section R403.

R401.3 [Foundations] Drainage. Surface drainage shall be diverted to a storm sewer conveyance or other approved point of collection that does not create a hazard. Lots shall be graded to drain surface water away from foundation walls. The grade shall fall a minimum of 6 inches (152 mm) within the first 10 feet (3048 mm).

Exception: Where lot lines, walls, slopes or other physical barriers prohibit 6 inches (152 mm) of fall within 10 feet (3048 mm), drains or swales shall be constructed to ensure drainage away from the structure. Impervious surfaces within 10 feet (3048 mm) of the building foundation shall be sloped a minimum of 2 percent away from the building.

R404.1.9.5 [Isolated masonry piers] Masonry piers in flood hazard areas. Masonry piers for dwellings in flood hazard areas shall be designed in accordance with Section R322.

R408.6 [Under-Floor Space] Finished grade. The finished grade of under-floor surface shall be permitted to be located at the bottom of the footings; however, where there is evidence that the groundwater table can rise to within 6 inches (152 mm) of the finished floor at the building perimeter or where there is evidence that the surface water does not readily drain from the building site, the grade in the under-floor space shall be as high as the outside finished grade, unless an approved drainage system is provided.

R408.7 [Under-Floor Space] Flood resistance. For buildings located in flood hazard areas as established in Table R301.2(1):

1. Walls enclosing the under-floor space shall be provided with flood openings in accordance with Section R322.2.2.
2. The finished ground level of the under-floor space shall be equal to or higher than the outside finished ground level on at least one side.

Exception: Under-floor spaces that meet the requirements of FEMA TB-11.

R506.2.1 [Concrete Floors (on Ground)] Fill. Fill material shall be free of vegetation and foreign material. The fill shall be compacted to ensure uniform support of the slab, and except where approved, the fill depths shall not exceed 24 inches (610 mm) for clean sand or gravel and 8 inches (203 mm) for earth.

M1301.1.1 [General Mechanical System Requirements] Flood-resistant installation. In flood hazard areas as established by Table R301.2(1), mechanical appliances, equipment and systems shall be located or installed in accordance with Section R322.1.6.

M1401.5 [Heating and Cooling Equipment] Flood hazard. In flood hazard areas as established by Table R301.2(1), heating and cooling equipment and appliances shall be located or installed in accordance with Section R322.1.6.

M1601.4.10 [Duct Construction] Flood hazard areas. In flood hazard areas as established by Table R301.2(1), duct systems shall be located or installed in accordance with Section R322.1.6.

M1701.2 [Combustion Air] Opening location. In flood hazard areas as established in Table R301.2(1), combustion air openings shall be located at or above the elevation required in Section R322.2.1 or R322.3.2.

M2001.4 [Boilers and Water Heaters] Flood-resistant installation. In flood hazard areas established in Table R301.2(1), boilers, water heaters and their control systems shall be located or installed in accordance with Section R322.1.6.

M2201.6 [Special Piping and Storage Systems] Flood-resistant installation. In flood hazard areas as established by Table R301.2(1), tanks shall be installed in accordance with Section R322.2.4 or Section R322.3.7.

G2404.7 (301.11) [Fuel Gas] Flood hazard. For structures located in flood hazard areas, the appliance, equipment and system installations regulated by this code shall be located at or above the elevation required by Section R322 for utilities and attendant equipment.

Exception: The appliance, equipment and system installations regulated by this code are permitted to be located below the elevation required by Section R322 for utilities and attendant equipment provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to such elevation.

P2601.3 [General Plumbing Requirements] Flood hazard areas. In flood hazard areas as established by Table R301.2(1), plumbing fixtures, drains, and appliances shall be located or installed in accordance with Section R322.1.6.

P2602.2 [Individual Water Supply and Sewage Disposal] Flood-resistant installation. In flood hazard areas as established by Table R301.2(1):

1. Water supply systems shall be designed and constructed to prevent infiltration of floodwaters.
2. Pipes for sewage disposal systems shall be designed and constructed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.

P2705.1 [Plumbing Fixtures, Installation] General. The installation of fixtures shall conform to the following: *[partial shown]*

7. In flood hazard areas as established by Table R301.2(1), plumbing fixtures shall be located or installed in accordance with Section R322.1.6.

P3001.3 [Sanitary Drainage] Flood-resistant installation. In flood hazard areas as established by Table R301.2(1), drainage, waste and vent systems shall be located and installed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.

P3101.5 [Vent Systems] Flood resistance. In flood hazard areas as established by Table R301.2(1), vents shall be located at or above the elevation required in Section R322.1 (flood hazard areas including A Zones) or R322.2 (coastal high-hazard areas including V Zones).

CHAPTER 44
REFERENCED STANDARDS

ASCE/SEI 24-14 Flood Resistant Design and Construction

FEMA-TB-2—08 Flood Damage-Resistant Materials Requirement

FEMA-TB-11—01 Crawlspace Construction for Buildings Located in Special Flood Hazard Areas

APPENDIX E
MANUFACTURED HOUSING USED AS DWELLINGS

AE101.1 General. These provisions shall be applicable only to a manufactured home used as a single dwelling unit installed on privately owned (nonrental) lots and shall apply to the following:

1. Construction, alteration and repair of any foundation system that is necessary to provide for the installation of a manufactured home unit.
2. Construction, installation, addition, alteration, repair or maintenance of the building service equipment that is necessary for connecting manufactured homes to water, fuel, or power supplies and sewage systems.
3. Alterations, additions or repairs to existing manufactured homes. The construction, alteration, moving, demolition, repair and use of accessory buildings and structures, and their building service equipment, shall comply with the requirements of the codes adopted by this jurisdiction.

These provisions shall not be applicable to the design and construction of manufactured homes and shall not be deemed to authorize either modifications or additions to manufactured homes where otherwise prohibited.

Exception: In addition to these provisions, new and replacement manufactured homes to be located in flood hazard areas as established in Table R301.2(1) of the International Residential Code shall meet the applicable requirements of Section R322 of the International Residential Code.

AE502.3 Footings and foundations. Footings and foundations, unless otherwise specifically provided, shall be constructed of materials specified by this code for the intended use and in all cases shall extend below the frost line. Footings of concrete and masonry shall be of solid material. Foundations supporting untreated wood shall extend at least 8 inches (203 mm) above the adjacent finish grade. Footings shall have a minimum depth below finished grade of 12 inches (305 mm) unless a greater depth is recommended by a foundation investigation.

Piers and bearing walls shall be supported on masonry or concrete foundations or piles, or other approved foundation systems which shall be of sufficient capacity to support all loads.

APPENDIX J
EXISTING BUILDINGS AND STRUCTURES

AJ102.5 Flood hazard areas. Work performed in existing buildings located in a flood hazard area as established by Table R301.2(1) shall be subject to the provisions of Section R105.3.1.1.

2015 International Existing Building Code
[a compilation of flood resistant provisions, prepared by FEMA]

CHAPTER 1 SCOPE AND ADMINISTRATION

[A] 101.2 Scope. The provisions of the *International Existing Building Code* shall apply to the *repair*, *alteration*, *change of occupancy*, *addition* to and relocation of *existing buildings*.

[A] 101.3 Intent. The intent of this code is to provide flexibility to permit the use of alternative approaches to achieve compliance with minimum requirements to safeguard the public health, safety and welfare insofar as they are affected by the *repair*, *alteration*, *change of occupancy*, *addition* and relocation of *existing buildings.*

[A] 104.2.1 Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas. For applications for reconstruction, rehabilitation, repair, alteration, addition or other improvement of existing buildings or structures located in flood hazard areas, the building official shall determine where the proposed work constitutes substantial improvement or repair of substantial damage. Where the building official determines that the proposed work constitutes substantial improvement or repair of substantial damage, and where required by this code, the building official shall require the building to meet the requirements of Section 1612 of the *International Building Code*.

[A] 104.10 Modifications. For *existing buildings* located in *flood hazard areas* for which *repairs*, *alterations* and *additions* constitute *substantial improvement*, the *code official* shall not grant modifications to provisions related to flood resistance unless a determination is made that:

1. The applicant has presented good and sufficient cause that the unique characteristics of the size, configuration or topography of the site render compliance with the flood-resistant construction provisions inappropriate.
2. Failure to grant the modification would result in exceptional hardship.
3. The granting of the modification will not result in increased flood heights, additional threats to public safety, extraordinary public expense nor create nuisances, cause fraud on or victimization of the public or conflict with existing laws or ordinances.
4. The modification is the minimum necessary to afford relief, considering the flood hazard.
5. A written notice will be provided to the applicant specifying, if applicable, the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation and that construction below the design flood elevation increases risks to life and property.

[A] 109.3.3 [Inspections] Lowest floor elevation. For *additions* and *substantial improvements* to *existing buildings* in *flood hazard areas*, upon placement of the lowest floor, including basement, and prior to further vertical construction, the elevation documentation required in the *International Building Code* shall be submitted to the *code official*.

[BS] FLOOD HAZARD AREA. The greater of the following two areas:

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any year.
2. The area designated as a *flood hazard area* on a community's flood hazard map, or otherwise legally designated.

HISTORIC BUILDING. Any building or structure that is one or more of the following:

1. Listed, or certified as eligible for listing, by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, in the National Register of Historic Places.

2. Designated as historic under an applicable state or local law.
3. Certified as a contributing resource within a National Register, state designated or locally designated historic district.

[BS] SUBSTANTIAL DAMAGE. For the purpose of determining compliance with the flood provisions of this code, damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

[BS] SUBSTANTIAL IMPROVEMENT. For the purpose of determining compliance with the flood provisions of this code, any *repair*, *alteration*, *addition*, or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure, before the improvement or *repair* is started. If the structure has sustained *substantial damage*, any repairs are considered *substantial improvement* regardless of the actual *repair* work performed. The term does not, however, include either:

1. Any project for improvement of a building required to correct existing health, sanitary, or safety code violations identified by the *code official* and that is the minimum necessary to ensure safe living conditions; or
2. Any *alteration* of a historic structure, provided that the *alteration* will not preclude the structure's continued designation as a historic structure.

CHAPTER 3 COMPLIANCE METHODS

301.1 [Compliance Methods] General. The *repair*, *alteration*, *change of occupancy*, *addition* or relocation of all *existing buildings* shall comply with one of the methods listed in Sections 301.1.1 through 301.1.3 as selected by the applicant. Sections 301.1.1 through 301.1.3 shall not be applied in combination with each other. Where this code requires consideration of the seismic force resisting system of an *existing building* subject to *repair*, *alteration*, *change of occupancy*, *addition* or relocation of *existing buildings*, the seismic evaluation and design shall be based on Section 301.1.4 regardless of which compliance method is used.

Exception: Subject to the approval of the *code official*, *alterations* complying with the laws in existence at the time the building or the affected portion of the building was built shall be considered in compliance with the provisions of this code unless the building is undergoing more than a limited structural *alteration* as defined in Section 907.4.4. New structural members added as part of the *alteration* shall comply with the *International Building Code*. *Alteration*s of *existing buildings* in *flood hazard areas* shall comply with Section 701.3.

301.1.1 Prescriptive compliance method. *Repairs*, *alterations*, *additions* and *changes of occupancy* complying with Chapter 4 of this code in buildings complying with the *International Fire Code* shall be considered in compliance with the provisions of this code.

301.1.2 Work area compliance method. *Repairs*, *alterations*, *additions*, changes in occupancy and relocated buildings complying with the applicable requirements of Chapters 5 through 13 of this code shall be considered in compliance with the provisions of this code.

301.1.3 Performance compliance method. *Repairs*, *alterations*, *additions*, changes in occupancy and relocated buildings complying with Chapter 14 of this code shall be considered in compliance with the provisions of this code.

CHAPTER 4 PRESCRIPTIVE COMPLIANCE METHOD

[BS] 402.2 [Additions] Flood hazard areas. For buildings and structures in *flood hazard* areas established in Section 1612.3 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable, any *addition* that constitutes *substantial improvement* of the existing structure shall comply with the flood design requirements for new construction, and all aspects of the existing structure shall be brought into compliance with the requirements for new construction for flood design.

For buildings and structures in *flood hazard areas* established in Section 1612.3 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable, any *additions* that do not constitute *substantial improvement* of the existing structure are not required to comply with the flood design requirements for new construction.

[BS] 403.2 [Alterations] Flood hazard areas. For buildings and structures in *flood hazard areas* established in Section 1612.3 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable, any *alteration* that constitutes *substantial improvement* of the existing structure shall comply with the flood design requirements for new construction, and all aspects of the existing structure shall be brought into compliance with the requirements for new construction for flood design.

For buildings and structures in *flood hazard areas* established in Section 1612.3 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable, any alterations that do not constitute *substantial improvement* of the existing structure are not required to comply with the flood design requirements for new construction.

[BS] 404.5 [Repairs] Flood hazard areas. For buildings and structures in *flood hazard areas* established in Section 1612.3 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable, any repair that constitutes *substantial improvement* or repair of *substantial damage* of the existing structure shall comply with the flood design requirements for new construction, and all aspects of the existing structure shall be brought into compliance with the requirements for new construction for flood design.

For buildings and structures in flood hazard areas established in Section 1612.3 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable, any repairs that do not constitute *substantial improvement* or repair of *substantial damage* of the existing structure are not required to comply with the flood design requirements for new construction.

[BS] 408.2 [Historic Buildings] Flood hazard areas. Within flood *hazard areas* established in accordance with Section 1612.3 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable, where the work proposed constitutes *substantial improvement,* the building shall be brought into compliance with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable:

Exception: *Historic buildings* need not be brought into compliance that are:

1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places;
2. Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district; or
3. Designated as historic under a state or local historic preservation program that is approved by the Department of Interior.

CHAPTER 6 REPAIRS

[BS] 601.3 Flood hazard areas. In flood hazard areas, repairs that constitute *substantial improvement* shall require that the building comply with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable.

[BS] 606.2.4 [Structural] Flood hazard areas. In *flood hazard* areas, buildings that have sustained *substantial damage* shall be brought into compliance with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable.

CHAPTER 7 ALTERATIONS – LEVEL 1

[BS] 701.3 Flood hazard areas. In *flood hazard areas*, *alterations* that constitute *substantial improvement* shall require that the building comply with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable.

CHAPTER 8 ALTERATIONS – LEVEL 2

801.2 Alteration level 1 compliance. In addition to the requirements of this chapter, all work shall comply with the requirements of Chapter 7.

CHAPTER 9 ALTERATIONS – LEVEL 3

901.2 Compliance. In addition to the provisions of this chapter, work shall comply with all of the requirements of Chapters 7 and 8. The requirements of Sections 803, 804 and 805 shall apply within all *work areas* whether or not they include exits and corridors shared by more than one tenant and regardless of the occupant load.

Exception: Buildings in which the reconfiguration of space affecting exits or shared egress access is exclusively the result of compliance with the accessibility requirements of Section 705.2 shall not be required to comply with this chapter.

CHAPTER 10 CHANGE OF OCCUPANCY

1001.1 Scope. The provisions of this chapter shall apply where a *change of occupancy* occurs, as defined in Section 202.

CHAPTER 11 ADDITIONS

1101.1 Scope. An *addition* to a building or structure shall comply with the *International Codes* as adopted for new construction without requiring the *existing building* or structure to comply with any requirements of those codes or of these provisions, except as required by this chapter. Where an *addition* impacts the *existing building* or structure, that portion shall comply with this code.

[BS] 1103.5 Flood Hazard Areas. *Additions* and *foundations* in *flood hazard areas* shall comply with the following requirements:

1. For horizontal *additions* that are structurally interconnected to the *existing building*:
   1.1. If the *addition* and all other proposed work, when combined, constitute *substantial improvement*, the *existing building* and the *addition* shall comply with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable.
   1.2. If the *addition* constitutes *substantial improvement*, the *existing building* and the *addition* shall comply with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable.
2. For horizontal *additions* that are not structurally interconnected to the *existing building*:
   2.1. The *addition* shall comply with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable.
   2.2. If the *addition* and all other proposed work, when combined, constitute *substantial improvement*, the *existing building* and the *addition* shall comply with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable.
3. For vertical *additions* and all other proposed work that, when combined, constitute *substantial improvement*, the *existing building* shall comply with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable.
4. For a raised or extended foundation, if the foundation work and all other proposed work, when combined, constitute *substantial improvement*, the *existing building* shall comply with Section 1612 of the *International Building Code,* or Section R322 of the *International Residential Code*, as applicable.
5. For a new foundation or replacement foundation, the foundation shall comply with Section 1612 of the *International Building Code* or Section R322 of the *International Residential Code*, as applicable.

CHAPTER 12 HISTORIC BUILDINGS

[BS] 1201.4 Flood hazard areas. In *flood hazard areas*, if all proposed work, including repairs, work required because of a *change of occupancy*, and *alterations*, constitutes *substantial improvement*, then the *existing building* shall comply with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable.

Exception: If an *historic building* will continue to be an *historic building* after the proposed work is completed, then the proposed work is not considered a *substantial improvement*. For the purposes of this exception, an *historic building* is:

1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places;
2. Determined by the Secretary of the U.S. Department of Interior to contribute to the historical significance of a registered historic district or a district preliminarily determined to qualify as a historic district; or
3. Designated as historic under a state or local historic preservation program that is approved by the Department of Interior.

CHAPTER 13 RELOCATED OR MOVED BUILDINGS

[BS] 1302.6 Flood hazard areas. If relocated or moved into a flood hazard area, structures shall comply with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable.

CHAPTER 14 PERFORMANCE COMPLIANCE METHOD

1401.3 Acceptance. For *repairs, alterations, additions*, and *changes of occupancy* to *existing buildings* that are evaluated in accordance with this section, compliance with this section shall be accepted by the *code official*.

1401.3.3 Compliance with flood hazard provisions. In *flood hazard areas*, buildings that are evaluated in accordance with this section shall comply with Section 1612 of the *International Building Code*, or Section R322 of the *International Residential Code*, as applicable if the work covered by this section constitutes *substantial improvement*.

2015 Editions of IMC, IPC, IFGC, IFC, ISPSC, IPSDC and ICC Performance Code

[a compilation of flood resistant provisions, prepared by FEMA]

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2015 International Mechanical Code

[a compilation of flood resistant provisions, prepared by FEMA]

SECTION 101
GENERAL

[A] 101.2 Scope. This code shall regulate the design, installation, maintenance, *alteration* and inspection of mechanical systems that are permanently installed and utilized to provide control of environmental conditions and related processes within buildings. This code shall also regulate those mechanical systems, system components, *equipment* and appliances specifically addressed herein. The installation of fuel gas distribution piping and *equipment*, fuel gas-fired appliances and fuel gas-fired *appliance* venting systems shall be regulated by the *International Fuel Gas Code*.

Exception: Detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories high with separate means of egress and their accessory structures shall comply with the *International Residential Code*.

SECTION 202
GENERAL DEFINITIONS

[BS] DESIGN FLOOD ELEVATION. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard area map. In areas designated as Zone AO, the design flood elevation shall be the elevation of the highest existing grade of the building's perimeter plus the depth number, in feet, specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).

CHAPTER 3
GENERAL REGULATIONS

[BS] 301.16 Flood hazard. For structures located in flood hazard areas, mechanical systems, equipment and appliances shall be located at or above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment.

Exception: Mechanical systems, equipment and appliances are permitted to be located below the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

[BS] 301.16.1 Coastal high hazard areas and coastal A zones. In coastal high hazard areas and coastal A zones, mechanical systems and *equipment* shall not be mounted on or penetrate walls intended to break away under flood loads.

SECTION 401
[VENTILATION] GENERAL

401.4 Intake opening location. Air intake openings shall comply with all of the following:

Only pertinent item shown

4. Intake openings on structures in flood hazard areas shall be at or above the elevation required by Section 1612 of *the International Building Code* for utilities and attendant equipment.

SECTION 501
[EXHAUST SYSTEMS] GENERAL

501.3.1 Location of exhaust outlets. The termination point of exhaust outlets and ducts discharging to the outdoors shall be located with the following minimum distances:

[only item 4 shown]

4. Exhaust outlets serving structures in flood hazard areas shall be installed at or above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment.

CHAPTER 6
DUCT SYSTEMS

[BS] 602.4 Flood hazard. For structures located in flood hazard areas, plenum spaces shall be located above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment or shall be designed and constructed to prevent water from entering or accumulating within the plenum spaces during floods up to such elevation. If the plenum spaces are located below the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment, they shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

[BS] 603.13 [Duct Construction and Installation] Flood hazard areas. For structures in flood hazard areas, ducts shall be located above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment or shall be designed and constructed to prevent water from entering or accumulating within the ducts during floods up to such elevation. If the ducts are located below the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment, the ducts shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

CHAPTER 12
[HYDRONIC PIPING] PIPING INSTALLATION

1206.9.1 Flood hazard. Piping located in a flood hazard area shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the *design flood elevation*.

1210.8.6 Flood hazard. Piping located in a flood hazard area shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the *design flood elevation*.

SECTION 1305
FUEL OIL SYSTEM INSTALLATION

1305.2.1 Flood hazard. Fuel oil pipe, equipment and appliances located in flood hazard areas shall be located above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment or shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

2015 International Plumbing Code

[a compilation of flood resistant provisions, prepared by FEMA]

SECTION 101
GENERAL

[A] 101.2 Scope. The provisions of this code shall apply to the erection, installation, alteration, repairs, relocation, replacement, addition to, use or maintenance of plumbing systems within this jurisdiction. This code shall regulate non- flammable medical gas, inhalation anesthetic, vacuum piping, nonmedical oxygen systems and sanitary and condensate vacuum collection systems. The installation of fuel gas distribution piping and equipment, fuel-gas-fired water heaters and water heater venting systems shall be regulated by the International Fuel Gas Code. Provisions in the appendices shall not apply unless specifically adopted.

> **Exception:** Detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories high with separate means of egress and their accessory structures shall comply with the International Residential Code.

SECTION 202
GENERAL DEFINITIONS

[BS] BASE FLOOD ELEVATION. A reference point, determined in accordance with the building code, based on the depth or peak elevation of flooding, including wave height, which has a 1 percent (100-year flood) or greater chance of occurring in any given year.

[BS] DESIGN FLOOD ELEVATION. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. In areas designated as Zone AO, the *design flood elevation* shall be the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).

[BS] FLOOD HAZARD AREA. The greater of the following two areas:

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any given year.
2. The area designated as a *flood hazard area* on a community's flood hazard map or as otherwise legally designated.

SECTION 309
FLOOD HAZARD RESISTANCE

309.1 General. Plumbing systems and equipment in structures erected in *flood hazard areas* shall be constructed in accordance with the requirements of this section and the *International Building Code*.

[BS] 309.2 Flood hazard. For structures located in *flood hazard areas*, the following systems and equipment shall be located and installed as required by Section 1612 of the *International Building Code*.

1. Water service pipes.
2. Pump seals in individual water supply systems where the pump is located below the *design flood elevation*.

3. Covers on potable water wells shall be sealed, except where the top of the casing well or pipe sleeve is elevated to not less than 1 foot (305 mm) above the *design flood elevation*.
4. Sanitary drainage piping.
5. Storm drainage piping.
6. Manhole covers shall be sealed, except where elevated to or above the *design flood elevation*.
7. Other plumbing fixtures, faucets, fixture fittings, piping systems and equipment.
8. Water heaters.
9. Vents and vent systems.

Exception: The systems listed in this section are permitted to be located below the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment, provided that the systems are designed and installed to prevent water from entering or accumulating within their components and the systems are constructed to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

[BS] P309.3 Coastal high-hazard areas and coastal A zones. Structures located in coastal high-hazard areas and coastal A zones shall meet the requirements of Section 309.2. The plumbing systems, pipes and fixtures shall not be mounted on or penetrate through walls intended to break away under flood loads.

2015 International Fuel Gas Code

[a compilation of flood resistant provisions, prepared by FEMA]

SECTION 101 (IFGC)
GENERAL

[A] 101.2 Scope. This code shall apply to the installation of fuel-gas *piping* systems, fuel gas appliances, gaseous hydrogen systems and related accessories in accordance with Sections 101.2.1 through 101.2.5.

Exception: Detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories high with separate means of egress and their accessory structures shall comply with the *International Residential Code*.

SECTION 202 (IFGC)
GENERAL DEFINITIONS

[BS] DESIGN FLOOD ELEVATION. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. In areas designated as Zone AO, the *design flood elevation* shall be the elevation of the highest existing grade of the *building*'s perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).

[BS] FLOOD HAZARD AREA. The greater of the following two areas:

1. The area within a floodplain subject to a 1 percent or greater chance of flooding in any given year.
2. This area designated as a *flood hazard area* on a community's flood hazard map, or otherwise legally designated.

CHAPTER 3
GENERAL REGULATIONS

[BS] 301.11 Flood hazard. For structures located in flood hazard areas, the appliance, equipment and system installations regulated by this code shall be located at or above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment.

Exception: The appliance, equipment and system installations regulated by this code are permitted to be located below the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to such elevation.

2015 International Fire Code

[a compilation of flood resistant provisions, prepared by FEMA]

SECTION 101
SCOPE AND GENERAL REQUIREMENTS

[A] 101.2 Scope. This code establishes regulations affecting or relating to structures, processes, premises and safeguards regarding all of the following:

1. The hazard of fire and explosion arising from the storage, handling or use of structures, materials or devices.
2. Conditions hazardous to life, property or public welfare in the occupancy of structures or premises.
3. Fire hazards in the structure or on the premises from occupancy or operation.
4. Matters related to the construction, extension, repair, alteration or removal of fire suppression or alarm systems.
5. Conditions affecting the safety of fire fighters and emergency responders during emergency operations.

SECTION 604
EMERGENCY AND STANDBY POWER SYSTEMS

604.1 General. Emergency power systems and standby power systems required by this code or the International Building Code shall comply with Sections 604.1.1 through 604.1.8.

604.1.7 Group I-2 occupancies. In Group I-2 occupancies, where an essential electrical system is located in flood hazard areas established in Section 1612.3 of the *International Building Code* and where new or replacement essential electrical system generators are installed, the system shall be located and installed in accordance with ASCE 24.

SECTION 913
FIRE PUMPS

913.2 Protection against interruption of service. The fire pump, driver and controller shall be protected in accordance with NFPA 20 against possible interruption of service through damage caused by explosion, fire, flood, earthquake, rodents, insects, windstorm, freezing, vandalism and other adverse conditions.

CHAPTER 53
COMPRESSED GASSES

5303.16 Vaults. Generation, compression, storage and dispensing equipment for *compressed gases* shall be allowed to be located in either above- or below-grade vaults complying with Sections 5303.16.1 through 5303.16.14.

5303.16.1 Listing required. Vaults shall be *listed* by a nationally recognized testing laboratory. Exception: Where *approved* by the *fire code official*, below-grade vaults are allowed to be constructed on site, provided that the design is in accordance with the *International Building Code* and that special inspections are conducted to verify structural strength and compliance of the installation with the approved design in accordance with Section 1707 of the *International Building Code*. Installation plans for below-grade vaults that are constructed on site shall be prepared by, and the design shall bear the stamp of, a professional engineer. Consideration shall be given to soil and hydrostatic

loading on the floors, walls and lid; anticipated seismic forces; uplifting by ground water or flooding; and to loads imposed from above, such as traffic and equipment loading on the vault lid

5303.16.5 Anchoring. Vaults and equipment contained therein shall be suitably anchored to withstand uplifting by groundwater or flooding. The design shall verify that uplifting is prevented even where equipment within the vault is empty.

CHAPTER 55
CRYOGENIC FLUIDS

5504.3 Outdoor storage. Outdoor storage of containers shall be in accordance with Sections 5504.3.1 through 5504.3.1.2.3.

5504.3.1.1.4 Areas subject to flooding. Stationary containers located in areas subject to flooding shall be securely anchored or elevated to prevent the containers from separating from foundations or supports.

CHAPTER 57
FLAMMABLE AND COMBUSTIBLE LIQUIDS

5704.2.7 Design, fabrication and construction requirements for tanks. The design, fabrication and construction of tanks shall comply with NFPA 30. Each tank shall bear a permanent nameplate or marking indicating the standard used as the basis of design.

5704.2.7.8 Locations subject to flooding. Where a tank is located in an area where it is subject to buoyancy because of a rise in the water table, flooding or accumulation of water from fire suppression operations, uplift protection shall be provided in accordance with Sections 22.14 and 23.14 of NFPA 30.

5704.2.8 Vaults. Vaults shall be allowed to be either above or below grade and shall comply with Sections 5704.2.8.1 through 5704.2.8.18.

5704.2.8.1 Listing required. Vaults shall be listed in accordance with UL 2245.
Exception: Where *approved* by the *fire code official*, below-grade vaults are allowed to be constructed on site, provided that the design is in accordance with the *International Building Code* and that special inspections are conducted to verify structural strength and compliance of the installation with the *approved* design in accordance with Section 1707 of the *International Building Code*. Installation plans for below-grade vaults that are constructed on site shall be prepared by, and the design shall bear the stamp of, a professional engineer. Consideration shall be given to soil and hydrostatic loading on the floors, walls and lid; anticipated seismic forces; uplifting by groundwater or flooding; and to loads imposed from above such as traffic and equipment loading on the vault lid.

5704.2.8.5 Anchoring. Vaults and their tanks shall be suitably anchored to withstand uplifting by ground water or flooding, including when the tank is empty.

5706.3 Well drilling and operating. Wells for oil and natural gas shall be drilled and operated in accordance with Sections 5706.3.1 through 5706.3.8.

5706.3.2 Waste control. Control of waste materials associated with wells shall comply with Sections 5706.3.2.1 and 5706.3.2.2.

5706.3.2.1 Discharge on a street or water channel. Liquids containing crude petroleum or its products shall not be discharged into or on streets, highways, drainage canals or ditches, storm drains or flood control channels.

SECTION 6104
LOCATION OF LP-GAS CONTAINERS

6104.3 Container location. LP-gas containers shall be located with respect to buildings, *public ways* and *lot lines* of adjoining property that can be built upon, in accordance with Table 6104.3.

6104.3.2 Special hazards. LP-gas containers shall be located with respect to special hazards including, but not limited to, above-ground flammable or *combustible liquid* tanks, oxygen or gaseous hydrogen containers, flooding or electric power lines as specified in Section 6.4.4 of NFPA 58.

2015 International Swimming Pool and Spa Code

[a compilation of flood resistant provisions, prepared by FEMA]

CHAPTER 1
SCOPE AND ADMINISTRATION

[A] 101.2 Scope. The provisions of this code shall apply to the construction, alteration, movement, renovation, replacement, repair and maintenance of aquatic recreation facilities, pools and spas. The pools and spas covered by this code are either permanent or temporary, and shall be only those that are designed and manufactured to be connected to a circulation system and that are intended for swimming, bathing or wading.

CHAPTER 2
DEFINITIONS

[BS] FLOOD HAZARD AREA. The greater of the following two areas:

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any year.
2. The area designated as a *flood hazard area* on a community's flood hazard map, or otherwise legally designated.

SECTION 304
FLOOD HAZARD AREAS

304.1 General. The provisions of Section 304 shall control the design and construction of pools and spas installed in *flood hazard areas*.

[BS] 304.2 Determination of impacts based on location. Pools and spas located in *flood hazard areas* indicated within the *International Building Code* or the *International Residential Code* shall comply with Section 304.2.1 or 304.2.2.

Exception: Pools and spas located in riverine *flood hazard areas* that are outside of designated floodways and pools and spas located in *flood hazard areas* where the source of flooding is tides, storm surges or coastal storms.

[BS] 304.2.1 Pools and spas located in designated floodways. Where pools and spas are located in designated floodways, documentation shall be submitted to the code official that demonstrates that the construction of the pools and spas will not increase the design flood elevation at any point within the jurisdiction.

[BS] 304.2.2 Pools and spas located where floodways have not been designated. Where pools and spas are located where design flood elevations are specified but floodways have not been designated, the applicant shall provide a floodway analysis that demonstrates that the proposed pool or spa and any associated grading and filling, will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction.

[BS] 304.3 Pools and spas in coastal high-hazard areas. Pools and spas installed in coastal high-hazard areas shall be designed and constructed in accordance with ASCE 24.

[BS] 304.4 Protection of equipment. Equipment shall be elevated to or above the design flood elevation or be anchored to prevent flotation and protected to prevent water from entering or accumulating within the components during conditions of flooding.

304.5 GFCI protection. Electrical equipment installed below the design flood elevation shall be supplied by branch circuits that have ground-fault circuit interrupter protection for personnel.

2015 International Private Sewage Disposal Code

[a compilation of flood resistant provisions, prepared by FEMA]

CHAPTER 1
SCOPE AND ADMINISTRATION

[A] 101.2 Scope. Septic tank and effluent absorption systems or other treatment tank and effluent disposal systems shall be permitted where a public sewer is not available to the property served. Unless specifically approved, the *private sewage disposal system* of each building shall be entirely separate from and independent of any other building. The use of a common system or a system on a parcel other than the parcel where the structure is located shall be subject to the full requirements of this code as for systems serving public buildings.

[A] 106.2.6 Site plan. A site plan shall be filed showing to scale the location of all septic tanks, holding tanks or other treatment tanks; building sewers; wells; water mains; water service; streams and lakes; *flood hazard areas*; dosing or pumping chambers; distribution boxes; effluent systems; dual disposal systems; replacement system areas; and the location of all buildings or structures. Separating distances and dimensions shall be shown, including any distance to adjoining property. A vertical elevation reference point and a horizontal reference point shall be indicated. For other than single-family dwellings, grade slope with contours shall be shown for the grade elevation of the entire area of the soil absorption system and the area on all sides for a distance of 25 feet (7620 mm).

[A] 108.7 Unsafe systems. Any *private sewage disposal system* regulated by this code that is unsafe or constitutes a health hazard, insanitary condition or is otherwise dangerous to human life is hereby declared unsafe. Any use of *private sewage disposal systems* regulated by this code constituting a hazard to safety, health or public welfare by reason of inadequate maintenance, dilapidation, obsolescence, disaster, damage or abandonment is hereby declared an unsafe use. Any such unsafe equipment is hereby declared to be a public *nuisance* and shall be abated by repair, rehabilitation, demolition or removal.

CHAPTER 2
DEFINITIONS

[BS] DESIGN FLOOD ELEVATION. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. In areas designated as Zone AO, the *design flood elevation* shall be the elevation of the highest existing grade of the *building*'s perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).

[BS] FLOOD HAZARD AREA. The greater of the following two areas:

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any given year.
2. The area designated as a flood hazard area on a community's flood hazard map or as otherwise legally designated.

SECTION 303
FLOOD HAZARD AREAS

[BS] 303.1 General. Soil absorption systems shall be located outside of *flood hazard areas*.

Exception: Where suitable soil absorption sites outside of the flood hazard area are not available, the soil absorption site is permitted to be located within the flood hazard area. The soil absorption site shall be located to minimize the effects of inundation under conditions of the design flood.

[BS] 303.2 Tanks. In *flood hazard areas*, tanks shall be anchored to counter buoyant forces during condition of the design flood. The vent termination and service manhole of the tank shall be not less than 2 feet (610 mm) above the *design flood elevation* or fitted with covers designed to prevent the inflow of floodwater or outflow of the contents of the tanks during conditions of the design flood.

[BS] 303.3 Mound systems. Mound systems shall be prohibited in *flood hazard areas*.

CHAPTER 4
SITE EVALUATION AND REQUIREMENTS

401.2 [General] Site evaluation. Site evaluation shall include soil conditions, properties and permeability, depth to zones of soil saturation, depth to bedrock, slope, landscape position, all setback requirements and the presence of *flood hazard areas*. Soil test data shall relate to the undisturbed elevations, and a vertical elevation reference point or benchmark shall be established. Evaluation data shall be reported on approved forms. Reports shall be filed within 30 days of the completion of testing for all sites investigated.

403.4 [Soil Borings and Evaluation] Alluvial and colluvial deposits. Subsurface soil absorption systems shall not be placed in alluvial and colluvial deposits with shallow depths, extended periods of saturation or possible flooding.

406.1 [Site Requirements] Soil absorption site location. The surface grade of all soil absorption systems shall be located at a point lower than the surface grade of any nearby water well or reservoir on the same or adjoining property. Where this is not possible, the site shall be located so surface water drainage from the site is not directed toward a well or reservoir. The soil absorption system shall be located with a minimum horizontal distance between various elements as indicated in Table 406.1. Private sewage disposal systems in compacted areas, such as parking lots and driveways, are prohibited. Surface water shall be diverted away from any soil absorption site on the same or neighboring lots.

Table 406.1 Minimum horizontal separation distances for soil absorption systems

ELEMENT	DISTANCE (feet)
Cistern	50
Habitable building, below-grade foundation	25
Habitable building, slab-on-grade	15
Lake, high-water mark	50
Lot line	5
Reservoir	50
Roadway ditches	10
Spring	100
Streams or watercourses	50
Swimming pool	15
Uninhabited building	10
Water main	50
Water service	10
Water well	50

For SI: 1 foot=304.8 mm.

406.1.1 Flood hazard areas. The site shall be located outside of *flood hazard areas*.

Exception: Where suitable sites outside of the *flood hazard area* are not available, it is permitted for the site to be located within the *flood hazard area*. The site shall be located to minimize the effects of inundation under conditions of the design flood.

902.2 [Soil and Site Requirements] Prohibited locations. A mound system shall be prohibited on sites not having the minimum depths of soil specified in Table 902.2. The installation of a mound in a filled area shall be prohibited. A mound shall not be installed in a compacted area or over a failing conventional system.

Table 902.2 Minimum soil depths for mound system installation

RESTRICTING FACTOR	MINIMUM SOIL DEPTH TO RESTRICTION (inches)
High ground water	24
Impermeable rock strata	60
Pervious rock	24
Rock fragments (50-percent volume)	24

For SI: 1 inch=25.4 mm.

2015 ICC Performance Code

[a compilation of flood resistant provisions, prepared by FEMA]

CHAPTER 1
GENERAL ADMINISTRATIVE PROVISIONS

[A] 101.1 Purpose. To provide appropriate health, safety, welfare, and social and economic value, while promoting innovative, flexible and responsive solutions that optimize the expenditure and consumption of resources.

[A] 101.2 Intent.

[A] 101.2.1 Building. To provide an acceptable level of health, safety, and welfare and to limit damage to property from events that are expected to impact buildings and structures. Accordingly, Part II of this code intends buildings and structures to provide for the following:

1. An environment free of unreasonable risk of death and injury from fires.
2. A structure that will withstand loads associated with normal use and of the severity associated with the location in which the structure is constructed.
3. Means of egress and access for normal and emergency circumstances.
4. Limited spread of fire both within the building and to adjacent properties.
5. Ventilation and sanitation facilities to maintain the health of the occupants.
6. Natural light, heating, cooking and other amenities necessary for the well being of the occupants.
7. Efficient use of energy.
8. Safety to fire fighters and emergency responders during emergency operations.

[A] 102.1 Building. Part II of this code provides requirements for buildings and structures and includes provisions for structural strength, stability, sanitation, means of access and egress, light and ventilation, safety to life and protection of property from fire and, in general, to secure life and property from other hazards affecting the built environment. This code includes provisions for the use and occupancy of buildings, structures, facilities and premises, their alteration, repair, maintenance, removal, demolition, and the installation and maintenance of amenities including, but not limited to, such services as the electrical, gas, mechanical, plumbing, energy conservation and building transportation systems.

[A] 103.3.4.2.2 Design report. The design report shall document the steps taken in the design analysis, clearly identifying the criteria, parameters, inputs, assumptions, sensitivities and limitations involved in the analysis. The design report shall clearly identify bounding conditions, assumptions and sensitivities that clarify the expected uses and limitations of the performance analysis. This report shall verify that the design approach is in compliance with the applicable codes and acceptable methods and shall be submitted for concurrence by the code official prior to the design documents being completed. The report shall document the design features to be incorporated based upon the analysis. The design report shall address but not be limited to the following:

1. Project scope.
2. Goals and objectives.
3. Performance criteria.
4. Hazard scenarios.
5. Design fire loads and hazards.
6. Final design.
7. Evaluation.
8. Bounding conditions and critical design assumptions.
9. Critical design features.
10. System design and operational requirements.
11. Operational and maintenance requirements.
12. Commissioning testing requirements and acceptance criteria.

13. Frequency of certificate renewal.
14. Supporting documents and references.
15. Preliminary site and floor plans.

[A] 103.3.11.4 Additions, renovations and related construction changes. Construction activities in existing buildings, facilities, premises or processes shall be evaluated by a design professional and documented in a written report, which shall be submitted for review and approval in conjunction with the permit request. The report shall identify whether or not the proposed construction exceeds the bounding conditions, which will result in an increase in hazard or risk beyond that expected in the approved original design documents. Where bounding conditions are not exceeded, the original design documents need not be revised. Where bounding conditions are exceeded, the original design documents shall be revised so that compliance with this code is perpetuated.

CHAPTER 2
DEFINITIONS

ESSENTIAL FACILITIES. Essential facilities relates to the buildings, such as hospitals or shelters, that are needed after an event such as an earthquake or a hurricane.

CHAPTER 3
DESIGN PERFORMANCE LEVELS

[BG] 302.4 Risk factors. In determining the hazard-related risk(s) to users of buildings and facilities, the following risk factors shall be considered:

[BG] 302.4.1 Nature of the hazard. The nature of the hazard, whether it is likely to originate internal or external to the building or facility, and how it may impact the occupants, the building or facility, and the contents.

[BG] 303.3 Magnitudes of event and level of damage. Performance groups identify the minimum required performance of buildings or facilities through a relationship of the magnitude of an event to the maximum level of damage to be tolerated shown in Table 303.3. The use of Table 303.3 shall be an iterative process. It shall be used to determine the acceptable impact of certain events based upon their magnitude, and then used iteratively to evaluate various designed mitigation features. Assignment of performance groups is accomplished through consideration of building or facility uses, building or facility risk factors, and the importance of a building or facility to a community.

[BG] TABLE 303.3
MAXIMUM LEVEL OF DAMAGE TO BE TOLERATED BASED ON PERFORMANCE GROUPS AND DESIGN EVENT MAGNITUDES

		INCREASING LEVEL OF PERFORMANCE → PERFORMANCE GROUPS			
		Performance Group I	Performance Group II	Performance Group III	Performance Group IV
MAGNITUDE OF DESIGN EVENT ← INCREASING MAGNITUDE OF EVENT ←	VERY LARGE (Very Rare)	SEVERE	SEVERE	HIGH	MODERATE
	LARGE (Rare)	SEVERE	HIGH	MODERATE	MILD
	MEDIUM (Less Frequent)	HIGH	MODERATE	MILD	MILD
	SMALL (Frequent)	MODERATE	MILD	MILD	MILD

SECTION 304
MAXIMUM LEVEL OF DAMAGE TO BE TOLERATED

[BG] 304.1 General. Design performance levels establish how a building or facility is expected to perform, in terms of tolerable limits, under varying load conditions. For each magnitude of event (small to very large), considered as a design load, based on realistic event scenarios, the design shall provide high confidence that the corresponding maximum level of damage to be tolerated for the appropriate performance group will be met. This relationship is illustrated in Table 303.3.

[BG] 304.2 Level of impact. There are four design performance levels defined in terms of tolerable limits of impact to the building or facility, its contents and its occupants: mild, moderate, high and severe.

[BG] 304.2.1 Mild impact. The tolerable impacts of the design loads are assumed as follows:

1. Structural damage. The building or facility does not have structural damage and is safe to occupy.
2. Nonstructural systems. Nonstructural systems needed for normal building or facility use and emergency operations are fully operational.

[BG] 304.2.1.3 Occupant hazards. Injuries to building or facility occupants from hazard-related applied loads are minimal in numbers and minor in nature. There is a very low likelihood of single or multiple life loss. The nature of the applied load, such as fire hazards, may result in higher levels of expected injuries and damage in localized areas, whereas the balance of the areas may sustain fewer injuries and less damage.

[BG] 304.2.1.4 Overall extent of damage. Damage to building or facility contents from hazard-related applied loads is minimal in extent and minor in cost.

[BG] 304.2.1.5 Hazardous materials. Minimal hazardous materials are released to the environment.

[BG] 304.2.2 Moderate impact. The tolerable impacts of the design loads are assumed as follows:

[BG] 304.2.2.1 Structural damage. There is moderate structural damage, which is repairable; some delay in reoccupancy can be expected.

[BG] 304.2.2.2 Nonstructural systems. Nonstructural systems needed for normal building or facility use are fully operational, although some cleanup and repair may be needed. Emergency systems remain fully operational.

[BG] 304.2.2.3 Occupant hazards. Injuries to building or facility occupants from hazard-related applied loads may be locally significant, but generally moderate in numbers and in nature. There is a low likelihood of single life loss with a very low likelihood of multiple life loss. The nature of the applied load, such as fire hazards, may result in higher levels of expected injuries and damage in localized areas, whereas the balance of the areas may sustain fewer injuries and less damage.

[BG] 304.2.2.4 Overall extent of damage. Damage to building or facility contents from hazard-related applied loads may be locally significant, but is generally moderate in extent and cost. The nature of the applied load, such as fire hazards, may result in higher levels of expected injuries and damage in localized areas, whereas the balance of the areas may sustain fewer injuries and less damage.

[BG] 304.2.2.5 Hazardous materials. Some hazardous materials are released to the environment, but the risk to the community is minimal. Emergency relocation is not necessary.

[BG] 304.2.3 High impact. The tolerable impacts of the design loads are assumed as follows:

[BG] 304.2.3.1 Structural damage. There is significant damage to structural elements but there is not large falling debris; repair is possible. Significant delays in reoccupancy can be expected.

[BG] 304.2.3.2 Nonstructural systems. Nonstructural systems needed for normal building or facility use are significantly damaged and inoperable; egress routes may be impaired by light debris; emergency systems may be significantly damaged, but remain operational.

[BG] 304.2.3.3 Occupant hazards. Injuries to building or facility occupants from hazard-related applied loads may be locally significant with a high risk to life, but are generally moderate in numbers and in nature. There is a moderate likelihood of single life loss, with a low probability of multiple life loss. The nature of the applied load, such as fire hazards, may result in higher levels of expected injuries and damage in localized areas, whereas the balance of the areas may sustain fewer injuries and less damage.

[BG] 304.2.3.4 Overall extent of damage. Damage to building or facility contents from hazard-related applied loads may be locally total and generally significant. The nature of the applied load, such as fire hazards, may result in higher levels of expected injuries and damage in localized areas, whereas the balance of the areas may sustain fewer injuries and less damage.

[BG] 304.2.3.5 Hazardous materials. Hazardous materials are released to the environment with localized relocation needed for buildings and facilities in the immediate vicinity.

[BG] 304.2.4 Severe impact. The tolerable impacts of the design loads are assumed as follows:

[BG] 304.2.4.1 Structural damage. There is substantial structural damage, but all significant components continue to carry gravity load demands. Repair may not be technically possible. The building or facility is not safe for reoccupancy, as reoccupancy could cause collapse.

[BG] 304.2.4.2 Nonstructural systems. Nonstructural systems for normal building or facility use may be completely nonfunctional. Egress routes may be impaired; emergency systems may be substantially damaged and nonfunctional.

[BG] 304.2.4.3 Occupant hazards. Injuries to building or facility occupants from hazard-related applied loads may be high in numbers and significant in nature. Significant risk to life may exist. There is a high likelihood of single life loss and a moderate likelihood of multiple life loss. The nature of the applied load, such as fire hazards, may result in higher levels of expected injuries and damage in localized areas, whereas the balance of the areas may sustain fewer injuries and less damage.

[BG] 304.2.4.4 Overall extent of damage. Damage to building or facility contents from hazard-related applied loads may be total. The nature of the applied load, such as fire hazards, may result in higher levels of expected injuries and damage in localized areas, whereas the balance of the areas may sustain fewer injuries and less damage.

[BG] 304.2.4.5 Hazardous materials. Significant hazardous materials are released to the environment, with relocation needed beyond the immediate vicinity.

SECTION 305
MAGNITUDES OF EVENT

[BG] 305.1 General. Magnitude of event encompasses all loads that can be reasonably expected to impact on a building or facility, its users and its contents, during construction and throughout its intended life. This includes building and facility-related and occupancy-related loads, as well as loads resulting from natural and technological hazards. Determination of magnitude of event shall take into account the design performance levels established by this code, the risk factors identified in Section 302.4 and specific performance criteria established by relevant authoritative documents.

[BG] 305.1.1 Natural hazards. The types of loads affecting main-force-resisting systems, components and contents that may be reasonably expected to impact on the building or facility, its users and its contents during its intended life are provided in Chapter 5 of this code.

[BG] 305.1.2 Technological hazards. The types of loads due to technological hazards that may be reasonably expected to impact on the building or facility, its users and its contents during construction and throughout its intended life include, but are not limited to:

[BG] 305.1.2.1 Fires (Chapters 6, 16 and 17).

[BG] 305.1.2.2 Explosions (Chapters 5, 22 and Section 801).

[BG] 305.1.2.3 Toxic materials (Chapter 22 and Section 801).

[BG] 305.1.2.4 Corrosive materials (Chapter 22 and Section 801).

[BG] 305.1.2.5 Infectious materials or agents (Chapter 22 and Section 801).

[BG] 305.2 Definition of magnitude of event. Magnitude of event can be defined, quantified and expressed either deterministically or probabilistically in accordance with the best current practice of the relevant profession as published in recognized authoritative documents. In some authoritative documents, magnitude of event may be expressed only for a single performance group; for example, nominal live and dead loads are defined only for Performance Group II. In other cases, magnitude of event may be provided for all performance levels such as seismic provisions. In all cases, it is the responsibility of the design engineer to demonstrate that the design performance levels are met for the loads anticipated.

[BG] 305.2.1 Classification of event magnitude. For the purpose of this code, the magnitude of event shall be classified as: small, medium, large and very large. Where authoritative documents do not present magnitude of event in this format, it will be the responsibility of the designer to relate the

loads to this format and to demonstrate that the minimum design performance levels will be met by the proposed design.

CHAPTER 5
SECTION 501
STRUCTURAL FORCES

[BS] 501.3.4 Expected loads. Structures, or portions thereof, shall be designed and constructed taking into account expected loads, and combination of loads, associated with the event(s) magnitude(s) that would affect their performance, including, but not limited to:

1. Dead loads.
2. Live loads.
3. Impact loads.
4. Explosion loads.
5. Soil and hydrostatic pressure loads.
6. Flood loads (mean return period).
   Small: 100 years
   Medium: 500 years
   Large: Determined on a site-specific basis
   Very Large: Determined on a site-specific basis
7. Wind loads (mean return period).
   Small: 50 years
   Medium: 75 years
   Large: 100 years
   Very Large: 125 years
8. Wind-borne debris loads.
9. Snow loads (mean return period).
   Small: 25 years
   Medium: 30 years
   Large: 50 years
   Very Large: 100 years
10. Rain loads. See Table 501.3.4.
11. Earthquake loads (mean return period).
    Small: 25 years
    Medium: 72 years
    Large: 475 years, but need not exceed two-thirds of the intensity of very large loads
    Very Large: 2,475 years. At sites where the 2,475-year, 5-percent damped spectral response acceleration at a 0.3-second period exceeds 1.5 g and at a 1-second period exceeds 0.6 g, very large ground shaking demands need not exceed a 5- percent damped response spectrum that at each period is 150 percent of the median spectral response acceleration ordinate resulting from a characteristic earthquake on any known active fault in the region.
12. Ice loads, atmospheric icing (mean return period).
    Small: 25 years
    Medium: 50 years
    Large: 100 years
    Very Large: 200 years
13. Hail loads.
14. Thermal loads.