

All structures shall be provided with a continuous load path in accordance with the requirements of Section 1.4.1 and shall have a complete lateral force-resisting system with adequate strength to resist the forces indicated in Section 1.4.2. All members of the structural system shall be connected to their supporting members in accordance with Section 1.4.3. Structural walls shall be anchored to diaphragms and supports in accordance with Section 1.4.4. The effects on the structure and its components caused by the forces stipulated in this section shall be taken as the notional load, N , and combined with the effects of other loads in accordance with the load combinations of Section 2.6. Where material resistance depends on load duration, notional loads are permitted to be taken as having a duration of 10 min. Structures designed in conformance with the requirements of this standard for Seismic Design Categories B, C, D, E, or F shall be deemed to comply with the requirements of Sections 1.4.2, 1.4.3, and 1.4.4.

1.4 GENERAL STRUCTURAL INTEGRITY

1.3.4 Self-Straining Forces and Effects Provision shall be made for anticipated self-straining forces and effects arising from differential settlements of foundations and from restrained dimensional changes caused by temperature, moisture, shrinkage, creep, and similar effects.

1.3.5 Analysis Load effects on individual structural members shall be determined by methods of structural analysis that take into account equilibrium, general stability, geometric compatibility, and both short- and long-term material properties. Members that tend to accumulate residual deformations under repeated service loads shall have included in their analysis the added eccentricities expected to occur during their service life.

1.3.6 Counteracting Structural Actions All structural members and systems and all components and cladding in a building or other structure shall be designed to resist forces caused by earthquakes, wind, and tornadoes, with consideration of overturning, sliding, and uplift, and continuous load paths shall be provided for transmitting these forces to the foundation. Where sliding is used to isolate the elements, the effects of friction between sliding elements shall be included as a force. Where all or a portion of the resistance to these forces is provided by dead load, the dead load shall be taken as the minimum dead load likely to be in place during the event causing the considered forces. Consideration shall be given to the effects of vertical and horizontal deflections resulting from such forces.

1.3.7 Fire Resistance Structural fire resistance shall be provided in accordance with the requirements specified in the applicable building code. As an alternative, the performance-based design procedures in Appendix E are permitted, where approved.

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1.5 CLASSIFICATION OF BUILDINGS AND OTHER STRUCTURES

1.5.1 Risk Categorization Buildings and other structures shall be classified based on the risk to human life, health, and welfare associated with their damage or failure by nature of their occupancy or use, according to Table 1.5-1, for the purposes of applying flood, wind, tornado, snow, earthquake, and ice provisions. Each building or other structure shall be assigned to the highest applicable risk category or categories. Minimum design loads for structures shall incorporate the applicable Importance Factors given in Table 1.5-2, as required by other sections of this standard. Assignment of a building or other structure to multiple risk categories based on the type of load condition being evaluated (e.g., snow or seismic) shall be permitted.

When the building code or other referenced standard specifies an occupancy category, the risk category shall not be taken as lower than the occupancy category specified therein.

1.5.2 Multiple Risk Categories Where buildings or other structures are divided into portions with independent structural systems, the classification for each portion shall be permitted to be determined independently. Where building systems, such as required egress, HVAC, or electrical power, for a portion with a higher Risk Category pass through or depend on other portions of

As a minimum, the prevention program shall consist of the comprehensive elements of process safety management, which includes the prevention of process safety incidents, and the prevention of accidents through the application of design, construction, and maintenance. Secondary containment of the toxic, highly toxic, or explosive substances—including, but not limited to, double-wall tank, dike or sufficient size to contain a spill, or other means to contain a release of the toxic, highly toxic, or explosive substances within the property boundary of the facility and prevent release of harmful quantities of contaminants to the air, soil, groundwater, or surface water—is permitted to be used to mitigate the risk of release. Where secondary containment is provided, it shall be designed for all environmental loads and is not eligible for this reduced classification. In hurricane-prone regions, mandatory practices and procedures that effectively diminish the effects of wind on critical structural elements, or, alternatively, that protect against harmful releases during and after hurricanes, are permitted to be used to mitigate the risk of release. As a minimum, the emergency response plan shall address public notification, emergency medical treatment for accidental exposure to humans, and procedures for emergency response to releases that have consequences beyond the property boundary of the facility. The emergency response plan shall address the potential that resources for response could be compromised by the event that has caused the emergency.

1.6 IN SITU LOAD TESTS

An in situ load test of any construction shall be conducted when required by the Authority Having Jurisdiction whenever there is

Table 1.5-1. Risk Category of Buildings and Other Structures for Flood, Wind, Tornado, Snow, Earthquake, and Ice Loads.

Risk Category	Use or Occupancy of Buildings and Structures	
	I	II, III, and IV
I	Buildings and other structures that represent low risk to human life in the event of failure	All buildings and other structures except those listed in Risk Categories I, III, and IV
II	Buildings and other structures, the failure of which could pose a substantial risk to human life	Buildings and other structures not included in Risk Category IV, with potential to cause a substantial economic impact and/or mass disruption of day-to-day civilian life in the event of failure
III	Buildings and other structures, the failure of which could pose a substantial risk to human life	Buildings and other structures not included in Risk Category IV (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing toxic or explosive substances where the quantity of the material exceeds a threshold quantity established by the Authority Having Jurisdiction and is sufficient to pose a threat to the public if released*
IV	Buildings and other structures designated as Essential Facilities	Buildings and other structures, the failure of which could pose a substantial hazard to the community
		Buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, or hazardous waste) containing sufficient quantities of highly toxic substances where the quantity of the material exceeds a threshold quantity established by the Authority Having Jurisdiction and is sufficient to pose a threat to the public if released*
		Buildings and other structures required to maintain the functionality of other Risk Category IV structures

*Buildings and other structures containing toxic, highly toxic, or explosive substances shall be eligible for classification to a lower risk category if it can be demonstrated to the satisfaction of the Authority Having Jurisdiction by a hazard assessment as described in Section 1.5.3 that a release of the substances is commensurate with the risk associated with that risk category.

1.5.3 Toxic, Highly Toxic, and Explosive Substances Buildings and other structures containing toxic, highly toxic, or explosive substances are permitted to be classified as Risk Category II structures if it can be demonstrated to the satisfaction of the Authority Having Jurisdiction by a hazard assessment as part of an overall risk management plan (RMP) that a release of the toxic, highly toxic, or explosive substances is not sufficient to pose a threat to the public.

To qualify for this reduced classification, the owner or operator of the buildings or other structures containing the toxic, highly toxic, or explosive substances shall have an RMP that incorporates three elements as a minimum: a hazard assessment, a prevention program, and an emergency response plan. As a minimum, the hazard assessment shall include the preparation and reporting of worst-case release scenarios for each structure under consideration, showing the potential effect on the public for each. As a minimum, the worst-case event shall include the complete failure, for example, instantaneous release of the entire contents of a vessel, piping system, or other storage structure. A worst-case event includes, but is not limited to, a release during the design wind, design tornado, or design seismic event. In this assessment, the evaluation of the effectiveness of subsequent measures for accident mitigation shall be based on the assumption that the complete failure of the primary storage structure has occurred. The off-site impact shall be defined in terms of the population in the potentially affected area. To qualify for the reduced classification, the hazard assessment shall demonstrate that a release of the toxic, highly toxic, or explosive substances from a worst-case event does not pose a threat to the public outside the property boundary of the facility.

Table 1.5-2. Importance Factors by Risk Category of Buildings and Other Structures for Earthquake Loads.

Risk Category	Importance Factor, I_p
I	1.00
II	1.00
III	1.25
IV	1.50

Notes: The component importance factor, I_p , applicable to earthquake loads is not included in this table because it depends on the importance of the individual component rather than that of the building as a whole, or its occupancy (see Section 13.1.3).