ASCE STANDARD

ASCE/SEI 24–14

Flood Resistant Design and Construction

This document uses both the International System of Units (SI) and customary units

ASCE

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Flood Resistant Design and Construction

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ASCE STANDARDS

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PREFACE

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The 2014 edition has a number of significant technical revisions from the 2005 edition, including

1. Defines Flood Design Class rather than using Risk/Occupancy Classification assigned under ASCE 7 and requires each building or structure governed by the standard to be assigned to Flood Design Class 1, 2, 3, or 4. Uses the assigned Flood Design Class to apply elevation requirements specified in Chapters 2, 4, 5, 6, and 7. Flood Design Class 4 buildings and facilities are equivalent to Occupancy Category/Risk Category IV buildings, which ASCE 7 identifies are essential facilities.
2. Adds definitions for Mixed Use and Residential Portions of Mixed Use in commentary to clarify limitations on use of dry floodproofing measures.
3. Changes the Coastal A Zone determination requirement from the designer's responsibility to one depending on either: (1) delineation of a Limit of Moderate Wave Action (LiMWA) on a Flood Insurance Rate Map, or (2) designation by the Authority Having Jurisdiction.
4. Separates specifications for flood openings from the installation requirements. Requires the presence of louvers, blades, screens, faceplates, or other covers and devices to be accounted for in determining net open area for non-engineered openings and in determining the performance of engineered openings. Revises coefficient of discharge table for engineered flood openings. Adds commentary regarding selection of coefficient of discharge and for grouping or stacking of flood openings.
5. For Flood Design Class 4 buildings, requires the minimum lowest floor elevation (or floodproofing level of protection) to be the higher of the Base Flood Elevation plus freeboard specified in Chapters 2, 4, and 6, the Design Flood Elevation, or the 500-year flood elevation. The 500-year flood elevation requirement is new.
6. Clarifies text pertaining to alluvial fan high risk flood hazard areas.
7. In Coastal High Hazard Areas (V Zone) and Coastal A Zones (if delineated),
   a. Makes explicit that designs must account for local scour and erosion
   b. Provides for shallow foundations in Coastal A Zones under certain circumstances
   c. Requires flood openings in breakaway walls
   d. Eliminates orientation of the lowest horizontal structural member as a factor to determine elevation for lowest floors, equipment, and flood damage-resistant materials
   e. Requires exterior doors at the top of stairways that are located inside enclosed areas with breakaway walls
   f. Consolidates requirements for all nonstructural concrete slabs
   g. Allows substantial improvement of existing buildings seaward of the reach of mean high tide in V zones (makes ASCE 24 consistent with National Flood Insurance Program and Coastal A Zones.
8. Updates flood damage-resistant material requirements.
9. Clarifies emergency escape and rescue opening requirements for dry floodproofed buildings.
10. Clarifies requirements for garages, carports, and accessory storage structures. Adds new section for multistory parking structures.
11. Consolidates requirements for tanks and more clearly distinguishes between requirements based on flood hazard area.

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This standard was prepared through the consensus standards process by balloting in compliance with procedures of ASCE's Codes and Standards Activities Committee. Those individuals who served on the ASCE 24-14 Standard Committee include

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ASCE would like to thank each member of the committee for his or her dedication and hard work during completion of ASCE 24-14.

ASCE would like to acknowledge the long-standing contributions of previous Committee Chair, Harry B. Thomas, and of those current members who have served the committee since the development of the 1998 edition: William L. Coulbourne, Shou-Shan Fan, Christopher P. Jones, Joseph J. Messersmith, Jr., and Kimberly Paarlberg.

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UNIT CONVERSIONS

Measurement	S.I. Units	Customary Units
Abbreviations	m = meter (S.I. base unit of length) cm = centimeter km = kilometer ha = hectare L = liter (S.I. base unit of volume) mL = milliliter kg = kilogram (S.I. base unit of mass) g = gram N = Newton ($m \cdot kg \cdot s^2$) Pa = Pascal (N/m^2) kPa = kilopascal J = Joule W = watt kW = kilowatt s = second (S.I. base unit of time) min = minute h = hour day °C = degrees Celsius ppm = parts per million	yd = yard in. = inch mi = mile acre gal = gallon qt = quart lb = pound oz = ounce lbf = pound-force (lb/ft) psi = pounds per square inch atm = atmosphere ft·lbf = feet per pound-force Btu = British thermal unit hp = horsepower s = second min = minute h = hour day °F = degrees Fahrenheit ppm = parts per million
Length	1 m = 3.2808 ft = 1.0936 yd 1 cm = 0.3937 in. 1 km = 0.6214 mile	1 ft = 0.333 yd = 0.3048 m 1 in. = 2.54 cm 1 mile = 0.869 nautical mile = 1.6093 km
Area	$1\ m^2 = 10.7643\ ft^2$ $1\ km^2 = 0.3861\ mi^2$ 1 ha = 2.4710 acre	$1\ ft^2 = 0.0929\ m^2$ $1\ mi^2 = 2.59\ km^2$ 1 acre = 43,560 ft^2 = 0.4047 ha
Volume	1 L = 0.2642 gal 1 ml = 1 cm^3	1 gal = 4 qt = 3.7854 L $1\ ft^3 = 7.481$ gal = 28.32 L
Mass	1 g = 0.0353 oz 1 kg = 2.2046 lb	1 oz = 28.3495 g 1 lb = 0.4536 kg
Force	1 N = 0.2248 lb/ft	1 lbf = 4.4482 N
Density	$1\ kg/m^2 = 0.2048\ lb/ft^2$ $1\ kg/m^3 = 6.2427\ lb/ft^3$	$1\ lb/ft^2 = 4.882\ kg/m^2$ $1\ lb/ft^3 = 16.018\ kg/m^3$
Pressure	1 kPa = 0.145 psi	1 psi = 6.8948 kPa 1 atm = 14.7 psi = 101.35 kPa
Energy and Power	1 J = 1.00 W·s = 0.7376 ft·lbf 1 kJ = 0.2778 W·h = 0.948 Btu 1 W = 0.7376 ft·lbf/s = 3.4122 Btu/h 1 kW = 1,3410 hp	1 ft·lbf = 1.3558 J 1 Btu = 1.0551 kJ 1 ft·lbf/s = 1.3558 W 1 hp = 550 ft·lb/s = 0.7457 kW
Flow	1 L/s = 15.85 gal/min = 2.119 ft^3/min	1 gal/min = 0.1337 ft^3/min = 0.0631 L/s
Concentration	mg/L = ppm_m (in dilute solutions)	
Temperature	°C = (°F − 32) × 5/9	°F = (°C × 9/5) + 32
Fundamental Constants and Relationships	Acceleration of gravity Density of freshwater (at 4 °C) = Density of saltwater (at 15 °C, 35 ppt) = Specific weight of freshwater (15 °C) = Specific weight of saltwater Weight of freshwater Weight of saltwater	$32.2\ ft/s^2 = 9.81\ m/s^2$ $1{,}000\ kg/m^3 = 1\ g/cm^3$ $1{,}025\ kg/m^3 = 1.025\ g/cm^3$ $62.4\ lb/ft^3 = 9{,}810\ N/m^3$ $64.0\ lb/ft^3 = 10{,}062\ N/m^3$ 1 gal = 8.345 lb = 3.7854 kg 1 gal = 8.559 lb = 3.8825 kg

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