Chapter 1

GENERAL

1.1 SCOPE
This standard provides minimum load requirements for the design of buildings and other structures that are subject to building code requirements. Loads and appropriate load combinations, which have been developed to be used together, are set forth for strength design and allowable stress design. For design strengths and allowable stress limits, design specifications for conventional structural materials used in buildings and modifications contained in this standard shall be followed.

1.2 DEFINITIONS
The following definitions apply to the provisions of the entire standard.

ALLOWABLE STRESS DESIGN: A method of proportioning structural members such that elastically computed stresses produced in the members by nominal loads do not exceed specified allowable stresses (also called “working stress design”).

AUTHORITY HAVING JURISDICTION: The organization, political subdivision, office, or individual charged with the responsibility of administering and enforcing the provisions of this standard.

BUILDINGS: Structures, usually enclosed by walls and a roof, constructed to provide support or shelter for an intended occupancy.

DESIGN STRENGTH: The product of the nominal strength and a resistance factor.

ESSENTIAL FACILITIES: Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from wind, snow, or earthquakes.

FACTORED LOAD: The product of the nominal load and a load factor.


LIMIT STATE: A condition beyond which a structure or member becomes unfit for service and is judged either to be no longer useful for its intended function (serviceability limit state) or to be unsafe (strength limit state).

LOAD EFFECTS: Forces and deformations produced in structural members by the applied loads.

LOAD FACTOR: A factor that accounts for deviations of the actual load from the nominal load, for uncertainties in the analysis that transforms the load into a load effect, and for the probability that more than one extreme load will occur simultaneously.

LOADS: Forces or other actions that result from the weight of all building materials, occupants and their possessions, environmental effects, differential movement, and restrained dimensional changes. Permanent loads are those loads in which variations over time are rare or of small magnitude. All other loads are variable loads (see also “nominal loads”).

MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES

1.3 BASIC REQUIREMENTS

1.3.1 Strength. Buildings and other structures, and all parts thereof, shall be designed and constructed to support safely the factored loads in load combinations defined in this document without exceeding the appropriate strength limit states for the materials of construction. Alternatively, buildings and other structures, and all parts thereof, shall be designed and constructed to support safely the nominal loads in load combinations defined in this document without exceeding the appropriate specified allowable stresses for the materials of construction.

1.3.2 Serviceability. Structural systems, and members thereof, shall be designed to have adequate stiffness to limit deflections, lateral drift, vibration, or any other deformations that adversely affect the intended use and performance of buildings and other structures.
1.3.3 Self-Straining Forces. Provision shall be made for antici-
pated self-straining forces arising from differential settlements
of foundations and from restrained dimensional changes due to
temperature, moisture, shrinkage, creep, and similar effects.

1.3.4 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 eccentricites
expected to occur during their service life.

1.3.5 Counteracting Structural Actions. All structural mem-
bers and structural components and cladding in a building or
other structure, shall be designed to resist forces due to earthquake
and wind, 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 ele-
ments, the effects of friction between sliding elements shall be in-
cluded 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.

1.4 GENERAL STRUCTURAL INTEGRITY

Buildings and other structures shall be designed to sustain local
damage with the structural system as a whole remaining stable
and not being damaged to an extent disproportionate to the origi-
nal local damage. This shall be achieved through an arrangement
of the structural elements that provides stability to the entire struc-
tural system by transferring loads from any locally damaged re-
geon to adjacent regions capable of resisting those loads without
collapse. This shall be accomplished by providing sufficient con-
tinuity, redundancy, or energy-dissipating capacity (ductility), or
a combination thereof, in the members of the structure.

1.5 CLASSIFICATION OF BUILDINGS

AND OTHER STRUCTURES

1.5.1 Nature of Occupancy. Buildings and other structures shall
be classified, based on the nature of occupancy, according to
Table 1-1 for the purposes of applying flood, wind, snow, earth-
quake, and ice provisions. The occupancy categories range from
I to IV, where Occupancy Category I represents buildings and
other structures containing toxic, highly toxic, or explosive substances.

1.5.2 Toxic, Highly Toxic, and Explosive Substances. Build-
lings and other structures containing toxic, highly toxic, or
explosive substances are permitted to be classified as Occupancy
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 does not 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 prepa-
ration and reporting of worst-case release scenarios for each
structure under consideration, and the potential effects on the
public for each. As a minimum, the worst-case event shall
include the complete failure (instantaneous release of entire con-
tents) of a vessel, piping system, or other storage structure. A
worst-case event includes (but is not limited to) a release dur-
ing the design wind 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 offsite impact must be defined in terms of population within
the potentially affected area. To qualify for the reduced clas-
sification, the hazard assessment shall demonstrate that a re-
lease of the hazardous material from a worst-case event does not
pose a threat to the public outside the property boundary of the
facility.

As a minimum, the prevention program shall consist of the
comprehensive elements of process safety management, which is
based upon accident prevention through the application of man-
agement controls in the key areas of design, construction, op-
eration, and maintenance. Secondary containment of the toxic,
highly toxic, or explosive substances (including, but not limited
to, double wall tank, dike of 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, ground water, or surface water) are permitted to be used to
mitigate the risk of release. When secondary containment is pro-
vided, 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 that alternatively
protect against harmful releases during and after hurricanes may
be used to mitigate the risk of release.

As a minimum, the emergency response plan shall address pub-
lic notification, emergency medical treatment for accidental ex-
plosion 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 po-
tential that resources for response could be compromised by the
event that has caused the emergency.

1.6 ADDITIONS AND ALTERATIONS

TO EXISTING STRUCTURES

When an existing building or other structure is enlarged or other-
wise altered, structural members affected shall be strengthened
if necessary so that the factored loads defined in this document
will be supported without exceeding the specified design effects
for the materials of construction. When using allowable stress
design, strengthening is required when the stresses due to nominal
loads exceed the specified allowable stresses for the materials of construction.

1.7 LOAD TESTS

A load test of any construction shall be conducted when required by the authority having jurisdiction whenever there is reason to question its safety for the intended occupancy or use.

1.8 CONSENSUS STANDARDS AND OTHER REFERENCED DOCUMENTS

This section lists the consensus standards and other documents which are adopted by reference within this chapter:

OSHA
Occupational Safety and Health Administration
200 Constitution Avenue, NW
Washington, DC 20210
Section 1.2

<table>
<thead>
<tr>
<th>Nature of Occupancy</th>
<th>Category</th>
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<tbody>
<tr>
<td>Buildings and other structures that represent a low hazard to human life in the event of failure, including, but not limited to:</td>
<td>I</td>
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<tr>
<td>● Agricultural facilities</td>
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<td>● Citizen temporary facilities</td>
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<td>● Minor storage facilities</td>
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<tr>
<td>All buildings and other structures except those listed in Occupancy Categories I, III, and IV</td>
<td>II</td>
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<tr>
<td>Buildings and other structures that represent a substantial hazard to human life in the event of failure, including, but not limited to:</td>
<td>III</td>
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<tr>
<td>● Buildings and other structures where more than 500 people congregate in one area</td>
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<td>● Buildings and other structures with daycare facilities with a capacity greater than 150</td>
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<tr>
<td>● Buildings and other structures with elementary school or secondary school facilities with a capacity greater than 250</td>
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<tr>
<td>● Buildings and other structures with a capacity greater than 300 for colleges or adult education facilities</td>
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<td>● Health care facilities with a capacity of 50 or more resident patients, but not having surgery or emergency treatment facilities</td>
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<td>● Jails and detention facilities</td>
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<tr>
<td>Buildings and other structures, not included in Occupancy 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, including, but not limited to:</td>
<td>IV</td>
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<td>● Power generating stations*</td>
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<td>● Water treatment facilities</td>
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<td>● Sewage treatment facilities</td>
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<td>● Telecommunication centers</td>
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<td>Buildings and other structures designated as essential facilities, including, but not limited to:</td>
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<tr>
<td>● Hospitals and other health care facilities having surgery or emergency treatment facilities</td>
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<td>● Fire, rescue, ambulance, and police stations and emergency vehicle garages</td>
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<tr>
<td>● Designated emergency preparedness, communication, and operation centers and other facilities required for emergency response</td>
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<tr>
<td>● Power generating stations and other public utility facilities required in an emergency</td>
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<tr>
<td>● Ancillary structures (including, but not limited to, communication towers, fuel storage tanks, electrical substation structures, fire water storage tanks or other structures housing or supporting water, or other fire-suppression material or equipment) required for operation of Occupancy Category IV structures during an emergency</td>
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<tr>
<td>● Aviation control towers, air traffic control centers, and emergency aircraft hangars</td>
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<td>● Water storage facilities and pump station equipment required to maintain water pressure for fire suppression</td>
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<tr>
<td>● Buildings and other structures having critical national defense functions</td>
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<td>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, hazardous waste, or explosives) containing sufficient quantities of toxic or explosive substances to be dangerous to the public if released</td>
<td></td>
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<tr>
<td>Buildings and other structures containing toxic or explosive substances shall be eligible for classification as Occupancy Category II structures if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.2 that a release of the toxic or explosive substances does not pose a threat to the public</td>
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<tr>
<td>Buildings and other structures containing highly toxic substances shall be eligible for classification as Occupancy Category II structures if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.2 that a release of the highly toxic substances does not pose a threat to the public</td>
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<td>This reduced classification shall not be permitted if the buildings or other structures also function as essential facilities.</td>
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</tbody>
</table>

*Cogeneration power plants that do not supply power on the national grid shall be designated Occupancy Category II.