

SCOPE

- I 1.1 **This practice** covers the loads for the design of support structures, equipment and other facilities. The loads include gravity (dead and live) loads, process-generated loads, wind and earthquake.
- I 1.2 **An asterisk (*)** indicates that additional information is required. If a job is contracted, this additional information is furnished in the Job Specifications.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I 2.1 **Table 1** lists the specification codes and standards which shall be used as specified in this practice.
- I 2.2 **Table 2** lists the standards and practices which shall be used with this practice as applicable.

TABLE 1

STANDARDS AND SPECIFICATIONS	
ASCE Standard / Guidelines	
ASCE-7	Minimum Design Loads for Buildings and Structures
ASCE Petrochemical Energy Reports	
	Wind Loads and Anchor Bolts for Petrochemical Facilities, 1997 (ASCE Stock # 40262)
	Guidelines for Seismic Evaluation and Design of Petrochemical Facilities, 1997 (ASCE Stock # 40264)
ICBO (International Conference of Building Officials)	
Uniform Building Code (UBC)	- Structural Design Provisions

TABLE 2

PRACTICE	
IP 4-1-4	Surge Vibration Design Loads
STANDARDS AND SPECIFICATIONS	
ACI Standard	
318	Building Code Requirements for Reinforced Concrete
API Standards	
620	Recommended Rules for Design and Construction of Large, Welded, Low Pressure Storage Tanks
650	Welded Steel Tanks for Oil Storage

- I 2.3 **Local codes and standards** may be substituted for the ones referenced herein provided the following provisions are met:
 - a. The resultant design meets the safety and serviceability criteria attained through this practice.
 - b. Substitution is accepted by the authorities where the facility is to be located and by the Owner's Engineer.

DESIGN

GENERAL

- I 3.1. The following **basic loads** that shall be considered in the structural design include:
 - a. **Dead loads**
 - b. **Live loads**
 - c. **Operating loads** including fluid, impact, piping restraint, surge vibration, thermal, and vibration loads.
 - d. **Maintenance loads** include bundle pull loads.
 - e. **Environmental loads** including earthquake, snow, ice, rain, and wind loads.
 - f. **Construction loads** including erection forces and transportation loads.

- I 3.2 Basic loads shall be as defined in ASCE-7 except as clarified and supplemented below:
- Live loads** include the following loads:
 - Personnel, portable machinery, tools and equipment.
 - Material to be temporarily stored during maintenance, such as exchanger parts, pipe and fittings, valves.
 - Material normally stored during operation such as tools, maintenance equipment, catalyst and chemicals.
 - Non-fluidized solid material, catalyst and other material in the piping and equipment during operation.
 - Fluid loads** are the gravity loads resulting from liquid or fluidized solid materials in equipment and piping during operation or hydrotest.
 - Piping restraint loads** are forces on pipe anchors and guides resulting from thermal expansion, surge or internal pressure of the piping.
 - Impact loads** are loads which account for the dynamic effects from moving equipment such as traveling cranes, elevators, hoists, and vehicular traffic.
 - Bundle pull** load is force resulting from the removal of a tube bundle from a heat exchanger.
 - Surge vibration loads** are lateral inertia forces caused by the surging action of fluidized solids.
 - Erection loads** are temporary loads caused by the erection and construction of structures and equipment, such as loading from guy rigging, shoring, etc.
 - Transportation loads** are inertial loads caused by the movement of structures and equipment from a fabrication site to the installation site.
- I 3.3 **Basic loads** shall be determined according to the applicable codes and standards listed in [Tables 1 and 2](#) as modified or supplemented herein. For locations unfamiliar with referenced standards and codes in [Table 1](#), Section 2 (Design Loads) of the Exxon Civil Engineering Design Guide, TMEE022, provides a summary of the relevant requirements from these codes for petrochemical facilities.

LIVE LOADS

- R 3.4 **Minimum live loads** which shall be used to design structural elements and appurtenances shall be per ASCE-7 except as modified herein:

COMPONENT DESIGN	LOADED AREA	MINIMUM LIVE LOAD
a. Floor Plate, Grating and Slabs	1. Walkways and Access Platforms	100 psf (488 kg/m ²)
	2. Platforms for Operating Storage or Maintenance Storage Loads.	125 psf (610 kg/m ²)
b. Floor Framing and Bracing	1. Walkways and Access Platforms	60 psf (293 kg/m ²) or a Moving Concentrated Load of 1000 lb (454 kg) ⁽¹⁾
	2. Platforms for Operating Storage or Maintenance Storage Loads.	125 psf (610 kg/m ²)
c. Columns and Brackets	1. Walkways and Access Platforms	60 psf (293 kg/m ²) or a Moving Concentrated Load of 1000 lb (454 kg) ⁽¹⁾
	2. Platforms for Operating Storage or Maintenance Storage Loads.	125 psf (610 kg/m ²)
d. Roof (Sloped or Flat)	—	20 psf (98 kg/m ²)

Note:

- (1) May be reduced for members having an influence area greater than 400 ft² (37 m²), per ASCE-7.