

## Appendix to Chapter 14

### OTHER NONBUILDING STRUCTURES

**PREFACE:** This appendix is a resource document for future voluntary standards and model code development. The guidelines contained in this appendix represent the current industry design practice for these types of nonbuilding structures.

These sections are included here so that the design community can gain familiarity with the concepts and update their standards. It is hoped that the various consensus design standards will be updated to include the design and construction methodology presented in this appendix. Please direct all feedback on this appendix to the BSSC.

#### A14.1 GENERAL

**A14.1.1 Scope.** This appendix includes design requirements for electrical transmission, substation, and distribution structures, telecommunications towers, and buried structures and performance criteria for tanks and vessels.

#### A14.1.2 References

IEEE 693 Institute of Electrical and Electronics Engineers, *Recommended Practices for Seismic Design of Substations*, Power Engineering Society, Piscataway, New Jersey, 1997.

#### A14.1.3 Definitions

**Base shear:** See Sec. 4.1.3.

**Buried structures:** Subgrade structures such as tanks, tunnels, and pipes.

**Dead load:** See Sec. 4.1.3.

**Registered design professional:** See Sec. 2.1.3.

**Seismic Use Group:** See Sec. 1.1.4.

**Structure:** See Sec. 1.1.4.

#### A14.1.4 Notation

$C_d$  See Sec. 4.1.4.

$C_S$  See Sec. 5.1.3.

$I$  See Sec. 1.1.5.

$R$  See Sec. 4.1.4.

$S_{DI}$  See Sec. 3.1.4.

$S_{DS}$  See Sec. 3.1.4.

$T$  See Sec. 4.1.4.

$V$  See Sec. 5.1.3.

$W$  See Sec. 1.1.5.

$\Omega_0$  See Sec. 4.1.4.

## A14.2 DESIGN REQUIREMENTS

**A14.2.1 Buried structures.** Buried structures that are assigned to Seismic Use Group II or III, or warrant special seismic design as determined by the registered design professional, shall be identified in the geotechnical report. Such buried structures shall be designed to resist minimum seismic lateral forces and expected differential displacements determined from a properly substantiated analysis using approved procedures.

## A14.3 PERFORMANCE CRITERIA FOR TANKS AND VESSELS

Tanks and vessels shall be designed to meet the minimum post-earthquake performance criteria as specified in Table A14.3-1. These criteria depend on the Seismic Use Group and content-related hazards of the tanks and vessels being considered.

**Table A14.3-1 Performance Criteria for Tanks and Vessels**

<b>Performance Category <sup>a</sup></b>	<b>Minimum Post-earthquake Performance</b>
I	The structure shall be permitted to fail if the resulting spill does not pose a threat to the public or to adjoining Category I, II or III structures.
II	The structure shall be permitted to sustain localized damage, including minor leaks, if (a) such damage remains localized and does not propagate; and (b) the resulting leakage does not pose a threat to the public or to adjoining Category I, II or III structures.
III	The structure shall be permitted to sustain minor damage, and its operational systems or components (valves and controls) shall be permitted to become inoperative, if (a) the structure retains its ability to contain 100% of its contents; and (b) the damage is not accompanied by and does not lead to leakage.
IV <sup>b</sup>	The structure shall be permitted to sustain minor damage provided that (a) it shall retain its ability to contain 100% of its contents without leakage; and (b) its operational systems or components shall remain fully operational.
<sup>a</sup> Performance Categories I, II, and III correspond to the Seismic Use Groups defined in Sec. 1.2 and tabulated in Table 14.2-1.	
<sup>b</sup> For tanks and vessels in Performance Category IV, an Importance Factor, $I = 1.0$ shall be used.	