public, such as cruise ship terminals and piers with retail or commercial offices or restaurants, shall be designed to comply with this standard. Piers and wharves that are not accessible to the general public are beyond the scope of this section.

The design shall account for the effects of liquefaction and soil failure collapse mechanisms, as well as consider all applicable marine loading combinations, such as mooring, berthing, wave, and current on piers and wharves as required. Structural detailing shall consider the effects of the marine environment.

15.6 GENERAL REQUIREMENTS FOR NONBUILDING STRUCTURES NOT SIMILAR TO BUILDINGS

Nonbuilding structures that do not have lateral and vertical seismic force-resisting systems that are similar to buildings shall be designed in accordance with this standard as modified by this section and the specific reference documents. Loads and load distributions shall not be less demanding than those determined in this standard. The combination of earthquake load effects, E, shall be determined in accordance with Section 12.4.2.

EXCEPTION: The redundancy factor, ρ, per Section 12.3.4 shall be taken as 1.

15.6.1 Earth-Retaining Structures

This section applies to all earth-retaining structures assigned to Seismic Design Category D, E, or F. The lateral earth pressures due to earthquake ground motions shall be determined in accordance with Section 11.8.3.

The risk category shall be determined by the proximity of the earth-retaining structure to other buildings and structures. If failure of the earth-retaining structure would affect the adjacent building or structure, the risk category shall not be less than that of the adjacent building or structure. Earth-retaining walls are permitted to be designed for seismic loads as either yielding or nonyielding walls. Cantilevered reinforced concrete or masonry retaining walls shall be assumed to be yielding walls and shall be designed as simple flexural wall elements.

15.6.2 Stacks and Chimneys

Stacks and chimneys are permitted to be either lined or unlined and shall be constructed from concrete, steel, or masonry. Steel stacks, concrete stacks, steel chimneys, concrete chimneys, and liners shall be designed to resist seismic lateral forces determined from a substantiated analysis using reference documents. Interaction of the stack or chimney with the liners shall be considered. A minimum separation shall be provided between the liner and chimney equal to C_d times the calculated differential lateral drift.

Concrete chimneys and stacks shall be designed in accordance with the requirements of ACI 307 except that (1) the design base shear shall be determined based on Section 15.4.1 of this standard; (2) the seismic coefficients shall be based on the values provided in Table 15.4-2, and (3) openings shall be detailed as required below. When modal response spectrum analysis is used for design, the procedures of Section 12.9 shall be permitted to be used.

For concrete chimneys and stacks assigned to SDC D, E, and F, splices for vertical rebar shall be staggered such that no more than 50% of the bars are spliced at any section and alternate lap splices are staggered by the development length. In addition, where the loss of cross-sectional area is greater than 10%, cross sections in the regions of breachings/openings shall be designed and detailed for vertical force, shear force, and bending moment demands along the vertical direction, determined for the affected cross section using an overstrength factor of 1.5. The region where the overstrength factor applies shall extend above and below the opening(s) by a distance equal to half of the width of the largest opening in the affected region. Appropriate reinforcement development lengths shall be provided beyond the required region of overstrength. The jamb regions around each opening shall be detailed using the column tie requirements in Section 7.10.5 of ACI 318. Such detailing shall extend for a jamb width of a minimum of two times the wall thickness and for a height of the opening height plus twice the wall thickness above and below the opening, but no less than the development length of the longitudinal bars. Where the existence of a footing or base mat precludes the ability to achieve the extension distance below the opening and within the stack, the jamb reinforcing shall be extended and developed into the footing or base mat. The percentage of longitudinal reinforcement in jamb regions shall meet the requirements of Section 10.9 of ACI 318 for compression members.

15.6.3 Amusement Structures

Amusement structures are permanently fixed structures constructed primarily for the conveyance and entertainment of people. Amusement structures shall be designed to resist seismic lateral forces determined from a substantiated analysis using reference documents.