

must also be connected to the diaphragm. The connection shall have minimum design strength of 5 percent of the dead plus live load reaction.

12.14.7.2 Openings or Reentrant Building Corners

Except where as otherwise specifically provided for in this standard, openings in shear walls, diaphragms, or other plate-type elements, shall be provided with reinforcement at the edges of the openings or reentrant corners designed to transfer the stresses into the structure. The edge reinforcement shall extend into the body of the wall or diaphragm a distance sufficient to develop the force in the reinforcement.

EXCEPTION: Shear walls of wood structural panels are permitted where designed in accordance with AF&PA SDPWS for perforated shear walls or AISI S213 for Type II shear walls.

12.14.7.3 Collector Elements

Collector elements shall be provided with adequate strength to transfer the seismic forces originating in other portions of the structure to the element providing the resistance to those forces (see Fig. 12.10-1). Collector elements, splices, and their connections to resisting elements shall be designed to resist the forces defined in Section 12.14.3.2.

EXCEPTION: In structures, or portions thereof, braced entirely by light-frame shear walls, collector elements, splices, and connections to resisting elements are permitted to be designed to resist forces in accordance with Section 12.14.7.4.

12.14.7.4 Diaphragms

Floor and roof diaphragms shall be designed to resist the design seismic forces at each level, F_x , calculated in accordance with Section 12.14.8.2. Where the diaphragm is required to transfer design seismic forces from the vertical-resisting elements above the diaphragm to other vertical-resisting elements below the diaphragm due to changes in relative lateral stiffness in the vertical elements, the transferred portion of the seismic shear force at that level, V_x , shall be added to the diaphragm design force. Diaphragms shall provide for both the shear and bending stresses resulting from these forces. Diaphragms shall have ties or struts to distribute the wall anchorage forces into the diaphragm. Diaphragm connections shall be positive, mechanical, or welded type connections.

12.14.7.5 Anchorage of Structural Walls

Structural walls shall be anchored to all floors, roofs, and members that provide out-of-plane lateral

support for the wall or that are supported by the wall. The anchorage shall provide a positive direct connection between the wall and floor, roof, or supporting member with the strength to resist the out-of-plane force given by Eq. 12.14-10:

$$F_p = 0.4k_a S_{DS} W_p \quad (12.14-10)$$

F_p shall not be taken less than $0.2k_a W_p$.

$$k_a = 1.0 + \frac{L_f}{100} \quad (12.14-11)$$

k_a need not be taken larger than 2.0 where

F_p = the design force in the individual anchors

k_a = amplification factor for diaphragm flexibility

L_f = the span, in feet, of a flexible diaphragm that provides the lateral support for the wall; the span is measured between vertical elements that provide lateral support to the diaphragm in the direction considered; use zero for rigid diaphragms

S_{DS} = the design spectral response acceleration at short periods per Section 12.14.8.1

W_p = the weight of the wall tributary to the anchor

12.14.7.5.1 Transfer of Anchorage Forces into Diaphragms Diaphragms shall be provided with continuous ties or struts between diaphragm chords to distribute these anchorage forces into the diaphragms. Added chords are permitted to be used to form subdiaphragms to transmit the anchorage forces to the main continuous cross-ties. The maximum length-to-width ratio of the structural subdiaphragm shall be 2.5 to 1. Connections and anchorages capable of resisting the prescribed forces shall be provided between the diaphragm and the attached components. Connections shall extend into the diaphragm a sufficient distance to develop the force transferred into the diaphragm.

12.14.7.5.2 Wood Diaphragms In wood diaphragms, the continuous ties shall be in addition to the diaphragm sheathing. Anchorage shall not be accomplished by use of toenails or nails subject to withdrawal nor shall wood ledgers or framing be used in cross-grain bending or cross-grain tension. The diaphragm sheathing shall not be considered effective as providing the ties or struts required by this section.

12.14.7.5.3 Metal Deck Diaphragms In metal deck diaphragms, the metal deck shall not be used as the continuous ties required by this section in the direction perpendicular to the deck span.

12.14.7.5.4 Embedded Straps Diaphragm to wall anchorage using embedded straps shall be attached to