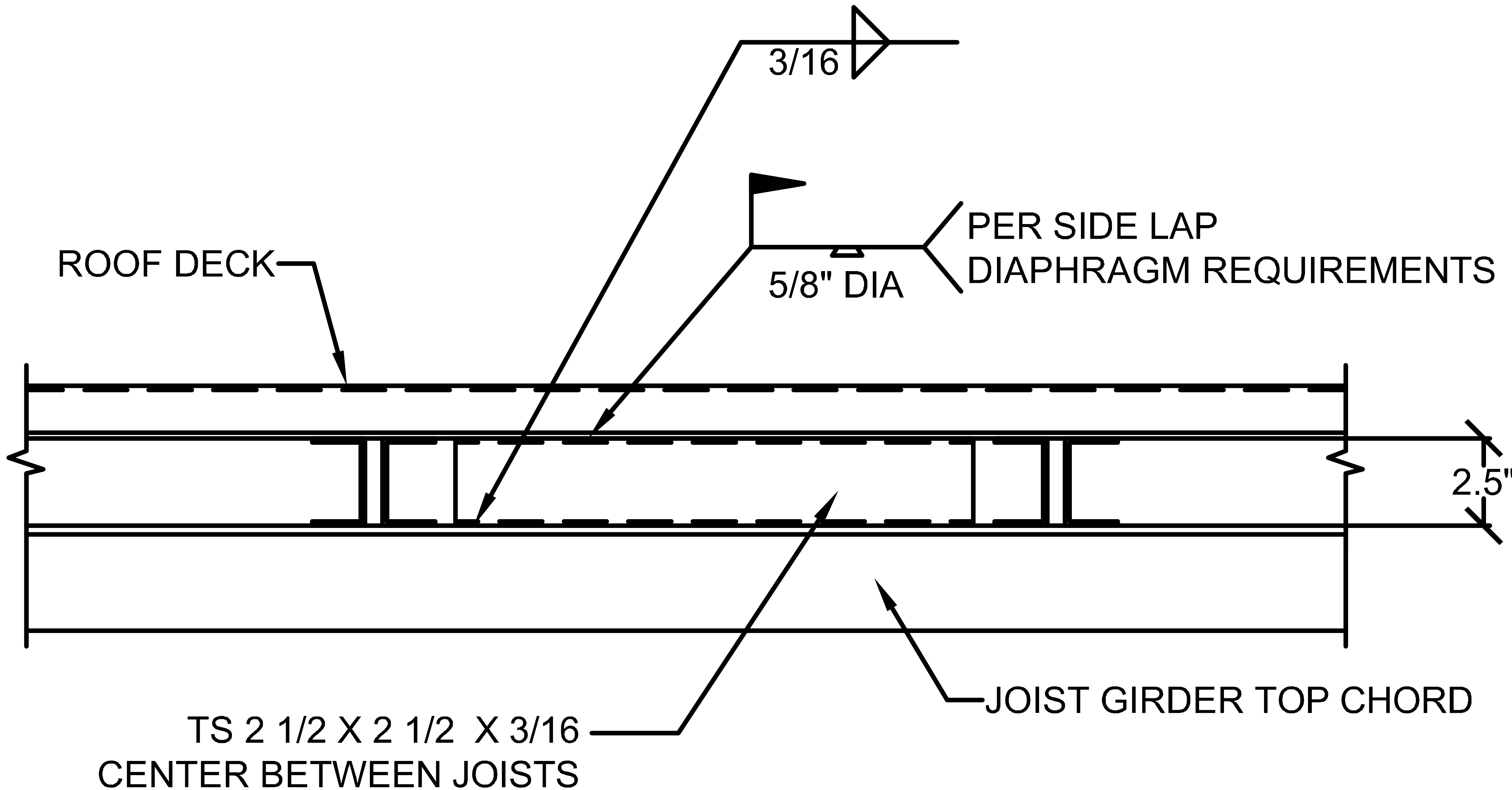

Fig. 4.2.8 Shear Transfer Member with K Joist

necessary to prevent rigid body rotation of the seat angles that will prevent development of the yield line mechanism.

Sixteen proprietary tests were conducted by Vulcraft. The results of these tests compare favorably with the above theory.

Example: 7.6.1 Joist Seat Rollover Resistance

Determine the resistance to rollover of the seat shown in Figures 7.6.1 and 7.6.2.

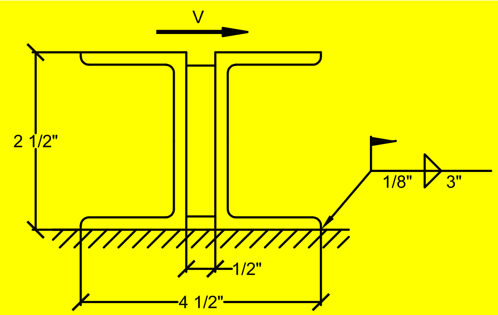

Fig. 7.6.1 Joist Seat

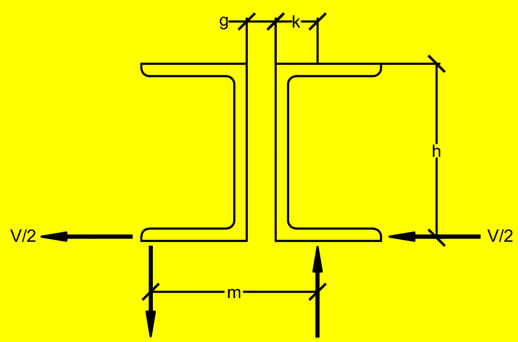

Fig. 7.6.2 Resisting Forces on Joist Seat

Given:

A seat is fabricated from 2x2x1/8 in. angles with a specified yield strength of 50 ksi. The gap between the angles is ½ in., k =0.375 in. for the seat angles.

Solution:

Z = (1.0 in.)(0.125 in.)^2/4 = 0.0039 in^3/in.

M_p = (50 ksi)(0.0039 in.^{3}/in.) = 0.195 kip-in./in.

a = 2.3(0.125 in.) = 0.288 in.

L_{YL} = 3 in. + π(0.288 in.) = 3.90 in.

T_u = (0.195 kip-in./in.)(3.90 in.)/0.288 in.) = 2.64 kips

V = $T_u(m/h)$

where

m = 2.0 in. + 0.5 in. + 0.375 = 2.875 in.

h = 2.5 in.

V = (2.64 kips)(2.875 in)/(2.5 in.) = 3.04 kips/in.

ϕV = 0.9(3.04 kips) = 2.74 kips

V/Ω= (3.04 kips)/1.67 = 1.82 kips

Check the weld strength:

R_u = (3 in.)(0.707)(0.6)(F_{EXX})(1/8 in.)

= (3 in.)(0.707)(0.6)(70 ksi)(1/8 in.)

= 11.1 kips (Directional increase not used

ϕR_u = 0.9(11.1) = 10.0 kips > 2.64 kips **o.k.**

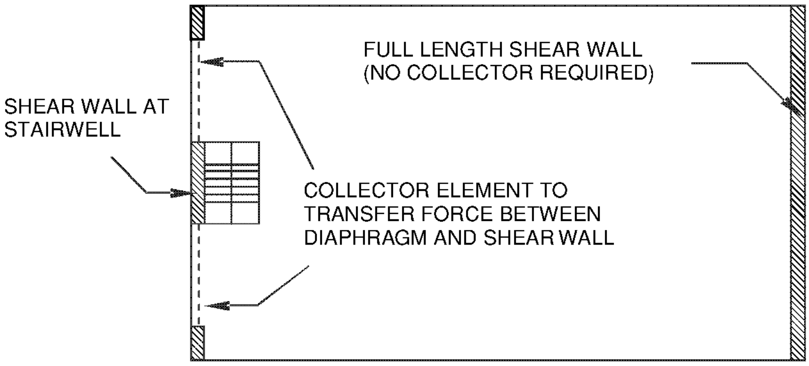

FIGURE 12.10-1 COLLECTORS

12.10.2 Collector Elements. Collector elements shall be provided that are capable of transferring the seismic forces originating in other portions of the structure to the element providing the resistance to those forces.

12.10.2.1 Collector Elements Requiring Load Combinations with Overstrength Factor for Seismic Design Categories C through F. In structures assigned to Seismic Design Category C, D, E, or F, collector elements (see Fig. 12.10-1), splices, and their connections to resisting elements shall resist the load combinations with overstrength of Section 12.4.3.2.

EXCEPTION: In structures or portions thereof braced entirely by light-frame shear walls, collector elements, splices, and connections to resisting elements need only be designed to resist forces in accordance with Section 12.10.1.1.

12.11 STRUCTURAL WALLS AND THEIR ANCHORAGE

12.11.1 Design for Out-of-Plane Forces. Structural walls and their anchorage shall be designed for a force normal to the surface equal to $0.4S_{DS}I$ times the weight of the structural wall with a minimum force of 10 percent of the weight of the structural wall. Interconnection of structural wall elements and connections to supporting framing systems shall have sufficient ductility, rotational capacity, or sufficient strength to resist shrinkage, thermal changes, and differential foundation settlement when combined with seismic forces.

12.11.2 Anchorage of Concrete or Masonry Structural Walls. The anchorage of concrete or masonry structural walls to supporting construction shall provide a direct connection capable of resisting the greater of the following:

a. The force set forth in Section 12.11.1.
b. A force of $400S_{DS}I$ lb/ linear ft ($5.84S_{DS}I$ kN/m) of wall
c. 280 lb/linear ft (4.09 kN/m) of wall

Structural walls shall be designed to resist bending between anchors where the anchor spacing exceeds 4 ft (1,219 mm).

12.11.2.1 Anchorage of Concrete or Masonry Structural Walls to Flexible Diaphragms. In addition to the requirements set forth in Section 12.11.2, anchorage of concrete or masonry structural walls to flexible diaphragms in structures assigned to Seismic Design Category C, D, E, or F shall have the strength to develop the out-of-plane force given by Eq. 12.11-1:

$$F_p = 0.8S_{DS}IW_p \qquad (12.11\text{-}1)$$

where

F_p = the design force in the individual anchors
S_{DS} = the design spectral response acceleration parameter at short periods per Section 11.4.4
I = the occupancy importance factor per Section 11.5.1
W_p = the weight of the wall tributary to the anchor

12.11.2.2 Additional Requirements for Diaphragms in Structures Assigned to Seismic Design Categories C through F.

12.11.2.2.1 Transfer of Anchorage Forces into Diaphragm. Diaphragms shall be provided with continuous ties or struts between diaphragm chords to distribute these anchorage forces into the diaphragms. Diaphragm connections shall be positive, mechanical, or welded. 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.

12.11.2.2.2 Steel Elements of Structural Wall Anchorage System. The strength design forces for steel elements of the structural wall anchorage system, with the exception of anchor bolts and reinforcing steel, shall be increased by 1.4 times the forces otherwise required by this section.

12.11.2.2.3 Wood Diaphragms. In wood diaphragms, the continuous ties shall be in addition to the diaphragm sheathing. Anchorage shall not be accomplished by use of toe nails 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.

12.11.2.2.4 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.

12.11.2.2.5 Embedded Straps. Diaphragm to structural wall anchorage using embedded straps shall be attached to, or hooked around, the reinforcing steel or otherwise terminated so as to effectively transfer forces to the reinforcing steel.

12.11.2.2.6 Eccentrically Loaded Anchorage System. Where elements of the wall anchorage system are loaded eccentrically or are not perpendicular to the wall, the system shall be designed to resist all components of the forces induced by the eccentricity.