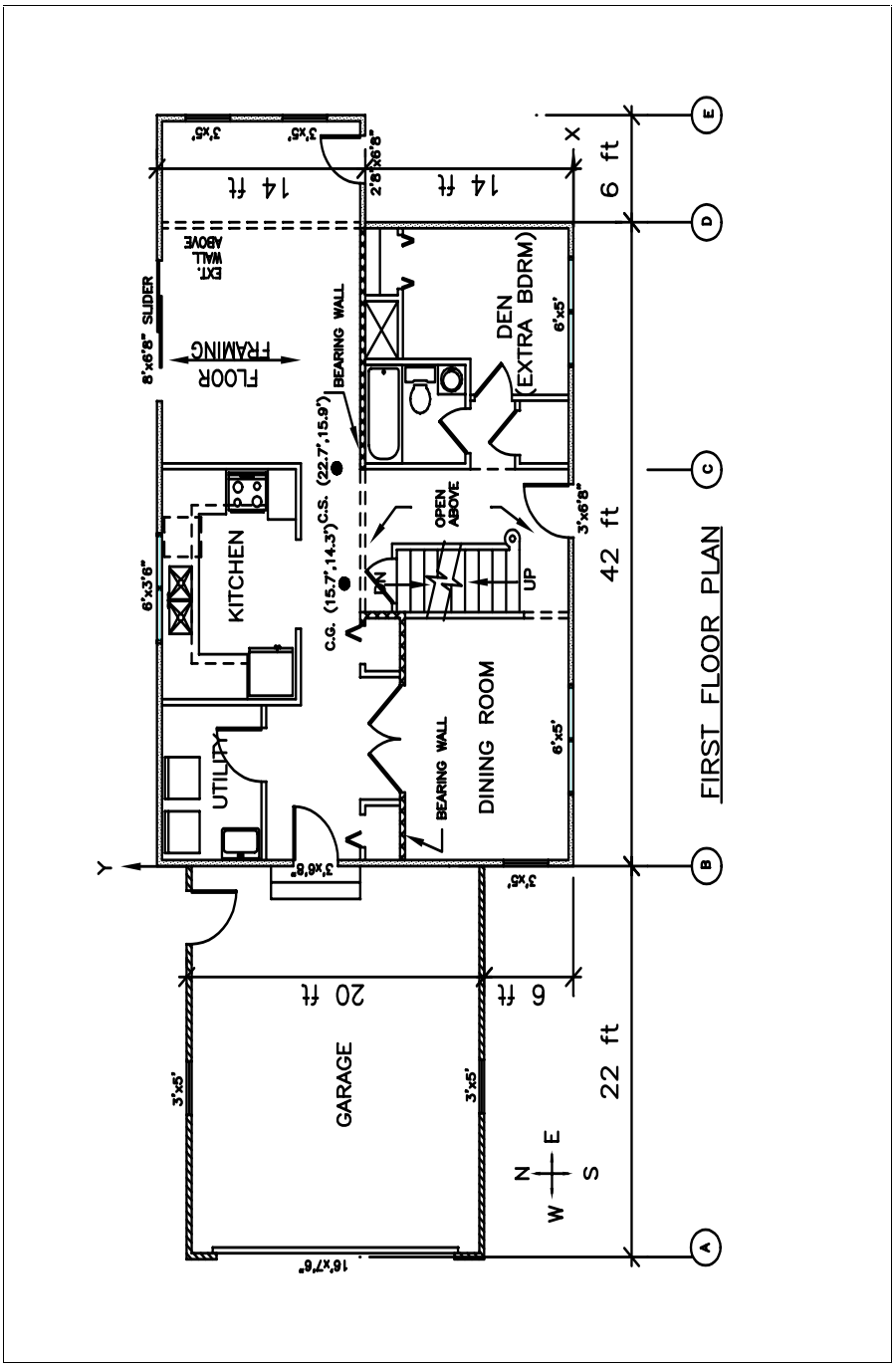
EXAMPLE 6.5 Horizontal Shear Load Distribution Methods

Given

General

In this example, the first floor plan of a typical two-story house with an attached garage (see Figure below) is used to demonstrate the three methods of distributing shear loads discussed in Chapter 6, Section 6.4.2. The first story height is 8 ft (i.e., 8 ft ceiling height). Only the load in the North-South (N-S) direction is considered in the example. In a complete design, the load in the East-West (E-W) direction would also need to be considered.



Lateral Load Conditions

The following design N-S lateral loads are determined for the story under consideration using the methods described in Chapter 3 for wind and seismic loads. A fairly high wind load and seismic load condition is assumed for the purpose of the example.

Design N-S Wind Lateral Load (120 mph gust, exposure B)

House:	17,411	lb total story shear
Garage:	3,928	lb total story shear
Total:	21,339	lb

Design N-S Seismic Lateral Load (mapped S_s = 1.5g)

House:	7,493	lb total story shear (tributary weight is 37,464 lb)
Garage:	1,490	lb total story shear (tributary weight is 7,452 lb)
Total:	8,983	lb

Designation of Shear Walls in N-S Direction

Initially, there are four N-S lines designated in the first story for shear wall construction. The wall lines are A, B, D, and E. If needed, an interior wall line may also be designated and designed as a shear wall (see wall line C in the figure above).

The available length of full-height wall segments in each N-S shear wall line is estimated as follows from the floor plan:

Wall Line A:	2 ft + 2 ft	= 4 ft	(garage return walls)
Wall Line B:	~~1.33 ft~~* + 11 ft + 9 ft	= 20 ft	(garage/house shared wall)
Wall Line D:	14 ft	= 14 ft	(den exterior wall)
Wall Line E:	2 ft + 3 ft + 2 ft	= 7 ft	(living room exterior wall)
Total:		= 45 ft	

*The narrow 1.33 ft segment is not included in the analysis due to the segment's aspect ratio of 8 ft/1.33 ft = 6, which is greater than the maximum allowable of 4. Some current building codes may restrict the segment aspect ratio to a maximum of 2 or 3.5 depending on the code and the edition in local use. In such a case, many of the useable shear wall segments would be eliminated (i.e., all of the 2 ft segments). Thus, the garage opening wall would require larger segments, a portal frame (see Section 6.5.2.7), or transfer of the garage shear load to the house by torsion (i.e., treat the garage as a cantilever projecting from the house under a uniform lateral load).