$F'_s = (F_{s,ext} C_{sp} C_{ns} + F_{s,int}) C_{ar}$ [1/SF]	(based on Eq. 6.5-2a)
$F_{ssw} = F'_s$ x L	(Eq. 6.5-2b)
$F_{ssw} \geq 10{,}670$ lb	(wind load requirement on wall line B)

Substituting the first equation into the second

$F_{ssw} = (F_{s,ext} C_{sp} C_{ns} + F_{s,int}) C_{ar}$ [1/SF] x L

The following parameter values are used:

$C_{sp} = 0.92$	(same as before)
$C_{ns} = 0.75$	(same as before)
$C_{ar} = 1.0$	(both segments have aspect ratios less than 2)*
SF = 2.0	(for wind design)
L = 20 ft	(total length of the two shear wall segments)*
$F_{s,int}$ = 80 plf	(minimum ultimate unit shear capacity)

*If the wall segments each had different values for C_{ar} because of varying adjustments for aspect ratio, then the segments must be treated independently in the equation above and the total length could not be summed as above to determine a total L.

Now, solving the above equations for $F_{s,ext}$ the following is obtained:

10,670 lb = [($F_{s,ext}$)(0.92)(0.75) + 80 plf](1.0)[1/2.0](20 ft)

$F_{s,ext}$ = 1,430 plf

By inspection of Table 6.1 using the above value of $F_{s,ext}$, a 4 inch nail spacing may be used to meet the required shear loading in lieu of the 3 inch nail spacing used if the wall were designed as a perforated shear wall. However, two additional hold down brackets would be required in Wall Line B to restrain the two wall segments as required by the segmented shear wall design method.

Wall Line A poses a special design problem since there are only two narrow shear wall segments to resist the wind design lateral load (1,964 lb). Considering the approach above for the segmented shear wall design of Wall Line B and realizing that $C_{ar} = 0.71$ (aspect ratio of 4), the following value for $F_{s,ext}$ is obtained for Wall Line A:

$F_{ssw} = (F_{s,ext} C_{sp} C_{ns} + F_{s,int}) C_{ar}$ [1/SF] x L

1,964 lb = [($F_{s,ext}$)(0.92)(0.75) + 0*](0.71)[1/2.0](4 ft)

*The garage exterior walls are assumed not to have interior finish. The shared wall between the garage and the house, however, is required to have a fire rated wall which is usually satisfied by the use of 5/8-thick gypsum wall board. This fire resistant finish is placed over the wood structural sheathing in this case and the impact on wall thickness (i.e. door jamb width) should be considered by the architect and builder.

Solving for $F_{s,ext}$,

$F_{s,ext}$ = 2,004 plf

By inspecting Table 6.1, this would require 15/32-inch-thick wood structural panel with nails spaced at 2 inches on center and would require 3x framing lumber (refer to footnote 3 of Table 6.1). However, the value of C_{ns} (=0.75) from Table 6.7 was based on a 0.113-inch diameter nail for which the table does not give a conversion relative to the 10d common nail required in Table 6.1. Therefore, a larger nail should be used at the garage opening. Specifying an 8d common nail or similar pneumatic nail with a diameter of 0.131 inches (see Table 6.7), a C_{ns} value of 1.0 is used and $F_{s,ext}$ may be recalculated as above to obtain the following:

$$F_{ssw} = (F_{s,ext}\ C_{sp}\ C_{ns} + F_{s,int})\ C_{ar}\ [1/SF] \times L$$

$$1{,}964 \text{ lb} = [(F_{s,ext})(0.92)(1.0) + 0](0.71)[1/2.0](4 \text{ ft})$$

$$F_{s,ext} = 1{,}503 \text{ plf}$$

Inspecting Table 6.1 again, it is now found that 15/32-inch-thick wood structural panel sheathing with 8d common nails spaced at 4 inches on center provides an ultimate rated unit shear capacity of 1,539 plf > 1,503 plf. This design does not require the use of 3x framing lumber which allows the same lumber to be used for all wall construction. The only added detail is the difference in nail type and spacing for the garage return walls. From the standpoint of simplicity, the easiest solution would be to increase the width of the garage shear wall segments; however, design simplicity is not always the governing factor. Also, a portal frame system may be designed based on the information and references provided in Section 6.5.2.7.

Finally, the garage should be adequately tied to the building to ensure that the garage section and the house section act as a structural unit. This may be achieved by fastening the end rafter or truss top chord in the roof to the house framing using fasteners with sufficient withdrawal capacity (i.e. ring shank nails or lag screws). The same should be done for the end studs that are adjacent to the house framing. Ideally, the garage roof diaphragm may be tied into the house second floor diaphragm by use of metal straps and blocking extending into the floor diaphragm and garage roof diaphragm a sufficient distance in each direction (i.e., 4 feet). With sufficient connection to the house end wall and floor diaphragm, the garage opening issue may be avoided completely. The connection load to the house discussed above can then be determined by treating the garage roof diaphragm as a cantilevered horizontal beam on the side of the home with a fixed end moment at the connection to the house. The fixed end moment (assuming the garage opening provides no lateral shear resistance) is determined based on the beam equation for a cantilever beam (see Appendix A). For the wind load on the garage, the fixed end moment due to lateral load is (3,928 lb)(11 ft) = 43,208 ft-lb. This moment may be resisted by a strap at either side of the garage roof with about a 2,500 lb design tension capacity (i.e. 43,208 ft-lb/18 ft = 2,400 lb). Preferably, the strap would be anchored to the garage roof diaphragm and house floor diaphragm as described above. Alternatively, this moment could be resisted by numerous lag screws or similar fasteners attaching the garage framing to the house framing. By this method, the garage end walls would require no special shear wall design. Of course, connections required to resist wind uplift and transverse shear loads on the garage door and return walls would still be required.