2. Determine connection requirements for use of a 5/8-inch-diameter anchor bolt in a concrete wall

$Z' = ZC_DC_gC_\Delta$ (Section 7.3.2)

$Z_\perp = 650$ lb* (NDS Table 8.2E)
$C_D = 1.0$ (normal duration load)
$C_g = 1.0$**
$C_\Delta = 1.0$***

* The $Z_\perp$ value is used since the ledger is loaded perpendicular to grain
**The bolts will be spaced and staggered, not placed in a row.
***Edge and end distance requirements of NDS•8.5.3 and NDS•8.5.4 will be met for full design value.

$Z' = (650 \text{ lb})(1.0)(1.0)(1.0) = 650 \text{ lb}$

The required anchor bolt spacing is determined as follows:

Spacing = (650 lb)/(300 plf) = 2.2 ft

Therefore, the anchor bolts should be spaced at about 2 ft on center and staggered from the top and bottom edge of the ledger by a distance of about 2 inches.

Note: In conditions where this connection is also required to support the wall laterally (i.e., an outward tension load due to seismic loading on a heavy concrete wall), the tension forces may dictate additional connectors to transfer the load into the floor diaphragm. In lower wind or seismic load conditions, the ledger connection to the wall and the floor sheathing connection to the ledger are usually sufficient to transfer the design tension loading, even though it may induce some cross grain tension forces in the ledger. The cross-grain tension stress may be minimized by locating every other bolt as close to the top of the ledger as practical or by using a larger plate washer on the bolts.

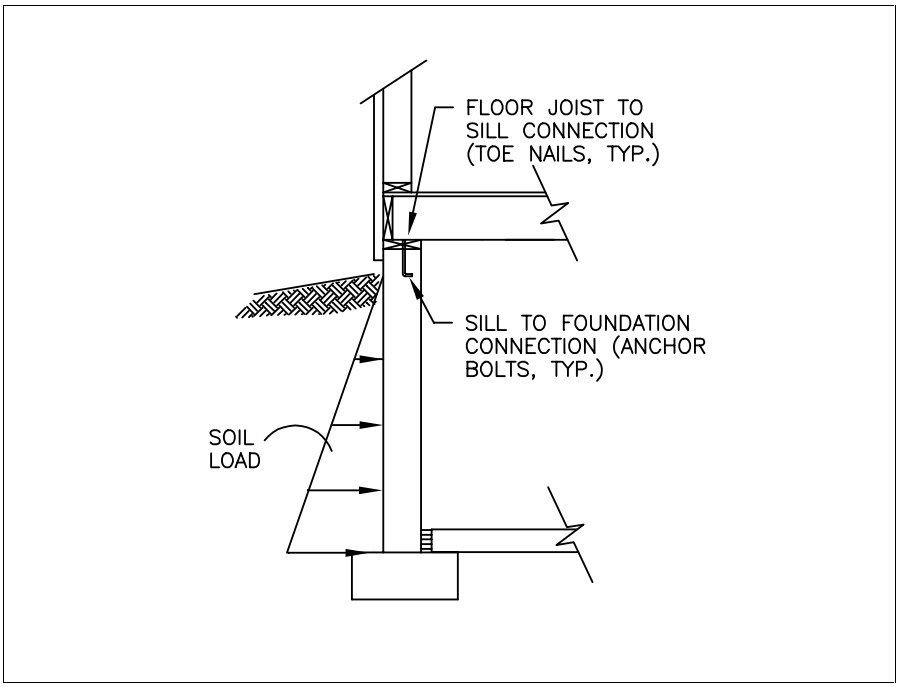
Conclusion

The design of bolted side-bearing connections was presented in this design example for two wall construction conditions. While not a common connection detail in residential framing, it is one that requires careful design consideration and installation since it must transfer the floor loads (i.e., people) through a shear connection rather than simple bearing. The example also addresses the issue of appropriate bolt location with respect to edge and end distances. Finally, the designer was alerted to special connection detailing considerations in high wind and seismic conditions.

EXAMPLE 7.7 Wood Sill to Foundation Wall

Given

- The foundation wall is connected to a wood sill plate and laterally supported as shown in the figure below.
- Assume that the soil has a 30 pcf equivalent fluid density and that the unbalanced backfill height is 7.5 ft.
- The foundation wall unsupported height (from basement slab to top of wall) is 8 ft.
- The wood sill is preservative-treated Southern Yellow Pine.



Find

1. The lateral load on the foundation wall to sill plate connection due to the backfill lateral pressure
2. The required spacing of ½-inch-diameter anchor bolts in the sill plate

Solution

1. Determine the lateral load on the sill plate connection

Using the procedure in Section 3.5 of Chapter 3 and the associated beam equations in Appendix A, the reaction at the top of the foundation wall is determined as follows:

$R_{top} = ql^3/(6L) = (30\ pcf)(7.5\ ft)^3/[6(8\ ft)] = 264\ \ plf$