2. Determine the design lateral capacity of the anchor bolt and the required spacing

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

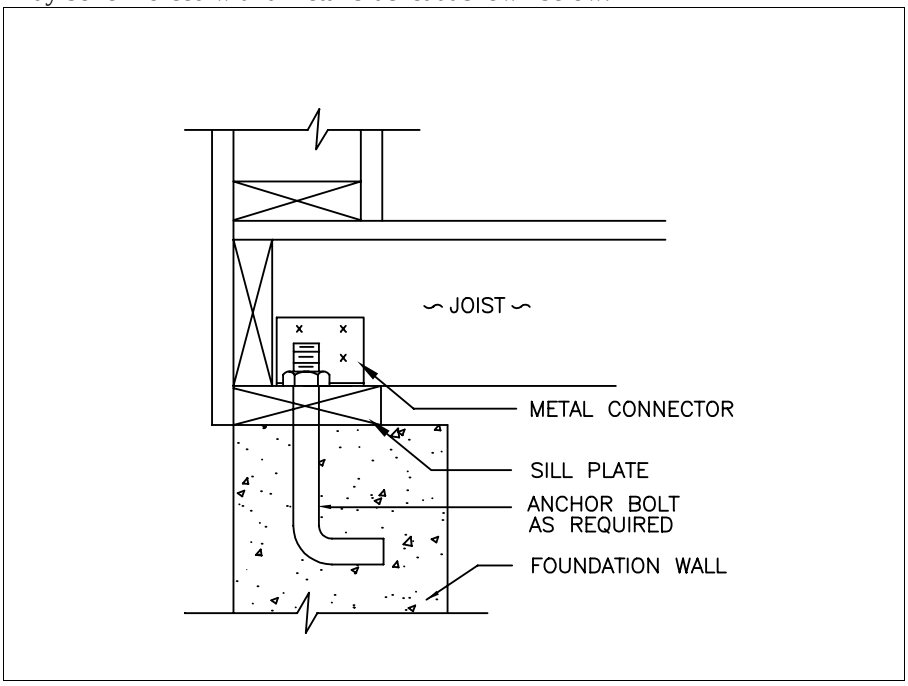
$Z_\perp = 400$ lbs* (NDS Table 8.2E)
$C_D = 0.9$ (life-time load duration, Table 5.3)
$C_M = 1.0$ (MC < 19%)
$C_t = 1.0$ (temperature < 100^oF)
$C_g = 1.0$ (bolts not configured in rows)

*The value is based on a recommended 6 inch standard embedment of the anchor bolt into the concrete wall. Based on conventional construction experience, this value may also be applied to masonry foundation wall construction when bolts are properly grouted into the masonry wall (i.e., by use of a bond beam).

$Z' = (400 \text{ lb})(0.9) = 360 \text{ lb}$

Anchor bolt spacing = (360 lb)/(264 plf) = 1.4 ft

Note: According to the above calculations, an anchor bolt spacing of about 16 inches on center is required in the sill plate. However, in conventional residential construction, extensive experience has shown that a typical anchor bolt spacing of 6 ft on center is adequate for normal conditions as represented in this design example. This conflict between analysis and experience creates a dilemma for the designer that may only be reconciled by making judgmental use of the "extensive experience" clause in NDS•7.1.1.4. Perhaps a reasonable compromise would be to require the use of a 5/8-inch-diamter anchor bolt at a 4 ft on center spacing. This design may be further justified by consideration of friction in the connection (i.e., a 0.3 friction coefficient with a normal force due to dead load of the building). The large safety factor in wood connections may also be attributed to some of the discrepancy between practice or experience and analysis in accordance with the NDS. Finally, the load must be transferred into the floor framing through connection of the floor to the sill (see Table 7.1 for conventional toenail connection requirements). In applications where the loads are anticipated to be much greater (i.e., taller foundation wall with heavier soil loads), the joint may be reinforced with a metal bracket at shown below.



Conclusion

This example demonstrates an analytic method of determining foundation lateral loads and the required connections to support the top of the foundation wall through a wood sill plate and floor construction. It also demonstrates the discrepancy between calculated connection requirements and conventional construction experience that may be negotiated by permissible designer judgment and use of conventional residential construction requirements.