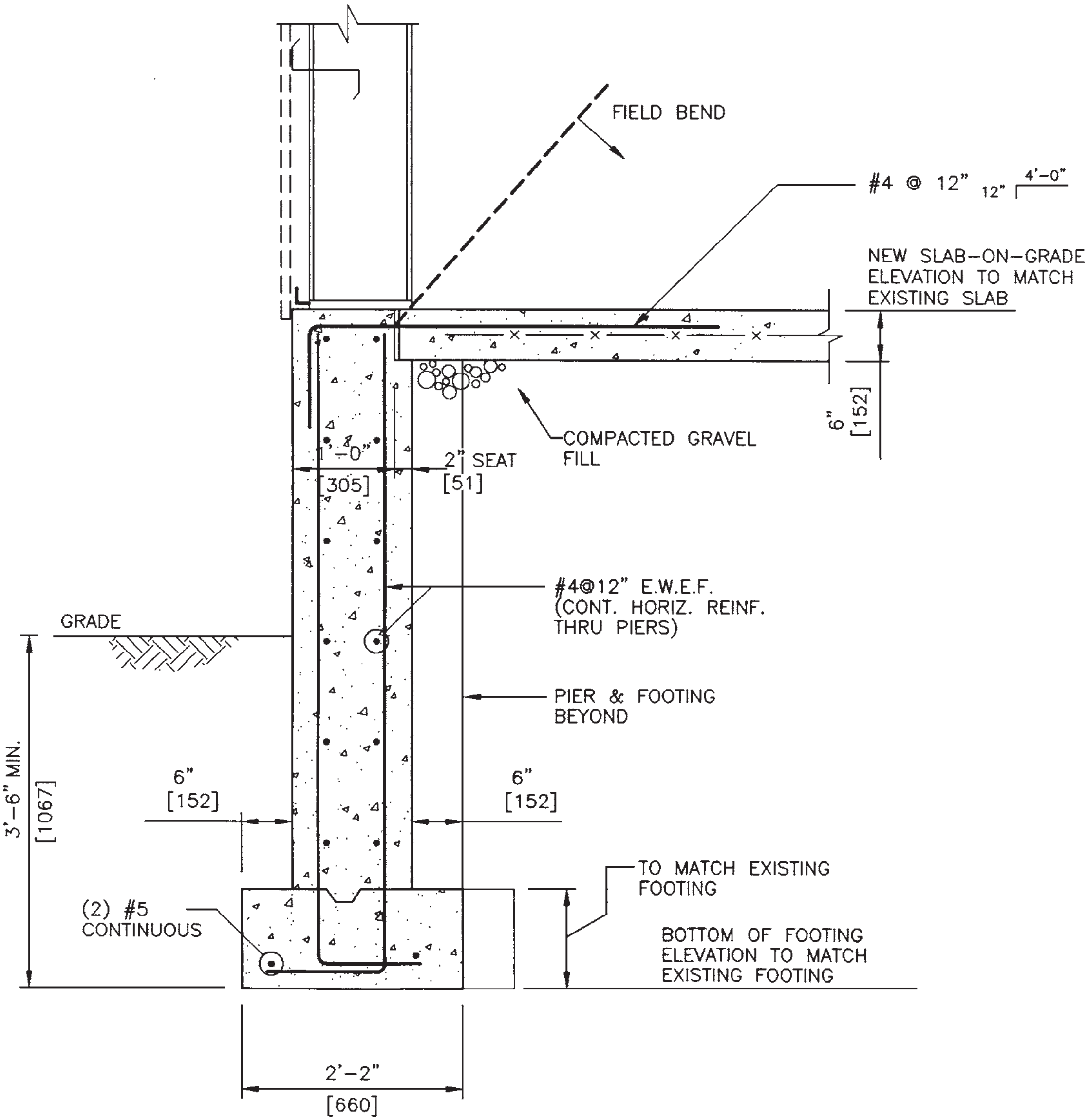

FIGURE 14.19 Section through new foundation wall in the Case Study.

The size and number of drilled-in dowels placed into the edge of the endwall was computed based on two different approaches, because at the time there was no universally applicable procedure for determination of the tensile capacity of the adhesive anchors. In one approach, a reputable anchor manufacturer's catalog (Ref. 7) was consulted to determine the ultimate steel and bond strength for rebar in concrete. That number was then divided by a factor of safety of 4 and multiplied by the adjustment factor for the edge distance of 6 in. For #5 bars with embedment depth of 10 in, the ultimate bond strength was listed as 33,820 lb, the edge-distance adjustment factor was 0.88, and the design capacity of the dowel was computed as

$$\frac{33{,}820}{4}\,\frac{1}{1000}\,0.88 = 7.44\ \text{(kip)}$$

A total of at least three dowels would be needed under this approach.

In the second approach, the ultimate pullout strength of a dowel in concrete was estimated following the procedure in BOCA 1996 Sec. 1913.1.2.1 for tension strength of headed anchors in concrete. The ultimate concrete strength P_c for a 12-in bar embedment was found as follows:

$$\phi P_c = \phi\lambda\sqrt{f_c'}\,(2.8\,A_s)$$

where A_s = the projected area of the concrete cone with a conservatively taken radius equal to the edge distance, or 6 in: $A_s = \pi\,6^2 = 113\ \text{in}^2$

λ = 1.0 for normal weight concrete

ϕ = 0.65 (strength reduction factor)

$$\phi P_c = 0.65 \times 1.0 = \sqrt{3000}\left(\frac{2.8 \times 113}{1000}\right) = 11.26\ \text{kip per dowel}$$

The ultimate steel strength P_s was found as follows:

$$P_s = 0.9\,A_b f_s'$$

where A_b = bar area (0.31 in^2 for #5)

f_s' = steel yield strength (60 ksi)

$$P_s = 0.9 \times 0.31 \times 60 = 16.74\ \text{kip}$$

Concrete capacity controls.

The factored design tension force was computed by multiplying the 17-kip service load by a combined load factor of 1.6 and by an additional factor of 1.3 to account for construction with special inspection:

$$T_u = 17 \times 1.6 \times 1.3 = 35.4\ \text{kip}$$

The minimum required number of dowels was

$$\frac{35.4}{11.26} = 3.14,\ \text{say } 4$$

An additional dowel was drilled into the footing, for a total of five. A section through the new pier is shown in Fig. 14.20.

The drilled-in dowels by themselves were not enough to make the existing wall into a tie beam: adequate transfer of load was needed from the dowels to the existing wall bars. For this reason, the existing horizontal bars could not be simply cut off at the point where the wall was cut to make space for a new foundation pier. Instead, the existing bars were to be saved, cleaned, and re-embedded into the new pier. Technically, even with these measures the existing wall could not be considered a true tie beam, because lap splice connections in tie members were not allowed by codes. However, in this case a judgment was made that keeping a 6-ft-deep wall with spliced bars and tied to the existing slab was preferable to removing the wall and replacing it with a 12-in thickened slab, as was done in the original building. The same doweled connection was made into the existing sidewall foundation.