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Subject: Use of Timberlinx to resist uplift in post-base connections	

Timberlinx connectors coupled to threaded rods offer an effective approach to providing uplift resistance for posts that bear on concrete foundation elements (piers, footings, or slabs). Recommended Timberlinx products for such a connection include the A475, AA675, and AB675 connectors with corresponding expansion pins. Each connector is coupled to 7/8-inch (22 mm) diameter UNC threaded rod.

To design the post-base connection, the uplift capacity of the Timberlinx connector(s) in the post as well as that of the threaded rod(s) in the concrete foundation must be determined.

Lateral (shear) resistance of the post-base connection is not addressed in this bulletin.

Post Capacity

The capacity of the Timberlinx connector(s) in the post is determined based on parallel to grain loading. Refer to Timberlinx Technical Bulletins 1 and 2 to determine design values. For applications that use multiple Timberlinx connectors, required connector spacing and edge distances must be maintained.

Foundation Capacity

Design of anchorage to concrete is governed by the ACI 318 code. A detailed design procedure based on ACI 318 rules is described in the *PCI Design Handbook*[1]. This technical bulletin presents a simplified interpretation of the PCI design method. For designs that do not satisfy the following assumptions, consult the *PCI Design Handbook*.

The procedure described in this technical bulletin are based on the following assumptions.

- Anchorage consists of one or more 7/8-inch (22 mm) diameter UNC threaded rods with standard nuts cast in concrete. A rod and nut are assumed to behave as a conventional headed concrete stud.
- No supplementary reinforcement is used to improve anchorage capacity.

1. Precast/Prestressed Concrete Institute (2004) *PCI Design Handbook*, Sixth Edition, PCI, 209 West Jackson Blvd, Suite 500, Chicago, IL 60606-6938

- Sufficient edge distance is provided on the anchor rod(s) to prevent side-face blowout. Specifically, edge distance in both directions for each anchor rod must exceed $3h_{ef}$.
- Normal-weight concrete is use.
- The concrete is likely to become cracked.
- Sufficient mass of concrete or other foundation dead load can be mobilized to provide the required uplift capacity.

Under the above assumptions, the capacity of the concrete foundation will be governed by its breakout strength ϕN_{cb} (lbs) given in Eq. (1). In the following, the unit of length is inches and the unit of force is pounds.

$$\phi N_{cb} = \phi C_{bs}\left(X + 3h_{ef}\right)\left(Y + 3h_{ef}\right)C_{crb} \qquad \text{Eq. (1)}$$

where $\phi = 0.7$, $C_{crb} = 0.8$ and

$$C_{bs} = 3.33\sqrt{\frac{f'_c}{h_{ef}}} \qquad \text{Eq. (2)}$$

The values X and Y are the overall dimensions of the anchorage group (see Figure 1; for a single anchor rod, $X = 0$ and $Y = 0$) and h_{ef} is the effective anchor rod embedment length, measured as the distance from the top of the nut to the concrete surface. In Eq. (2), f'_c is the compressive strength of concrete (psi).

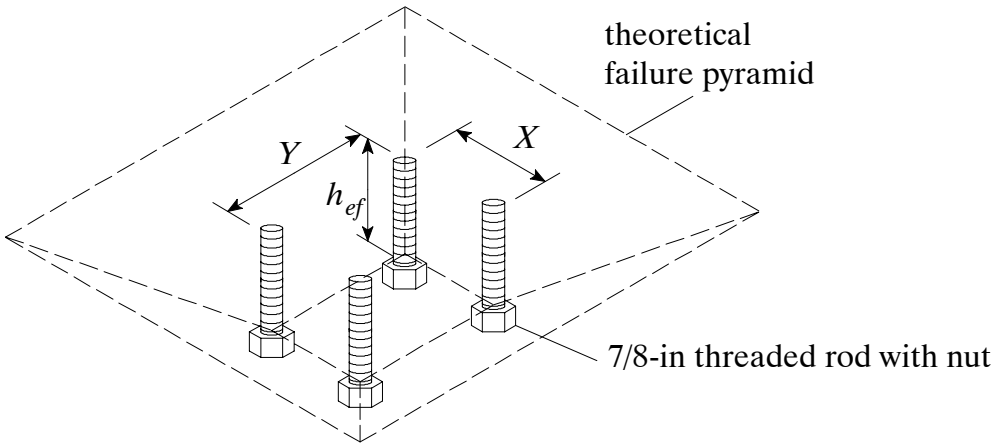

Figure 1 — Anchor group nomenclatural

Note: Eq. (1) yields an **ultimate (limit states design) value** for the concrete anchorage strength. This value must be compared to the **factored uplift** on the foundation, not the service-level applied load.