Post and Pier Foundation Design Considerations and Installation

By David R. Bohnhoff, PhD, PE

A unique feature of most post-frame buildings is an embedded post or pier foundation system. Such foundations are popular because they use less material and can be installed much more quickly than foundation systems that use continuous concrete footings or concrete slabs and grade beams.

As post-frame building use has expanded, so also have post and pier foundation options and methods and techniques for their installation. Shown in **Figures 1–8** are a few of the many post and pier foundations that have been used in practice.

Foundation design is largely controlled by overall cost (materials, transport and installation) and by the applied loads and relative strength of both the foundation elements and the surrounding soil. Other design factors often depend on building end use, building location, applicable code, and construction methods and techniques. These include such factors as durability, frost penetration depth, eco-friendliness, fire resistance, compatibility with other building components and ease and accuracy of installation.

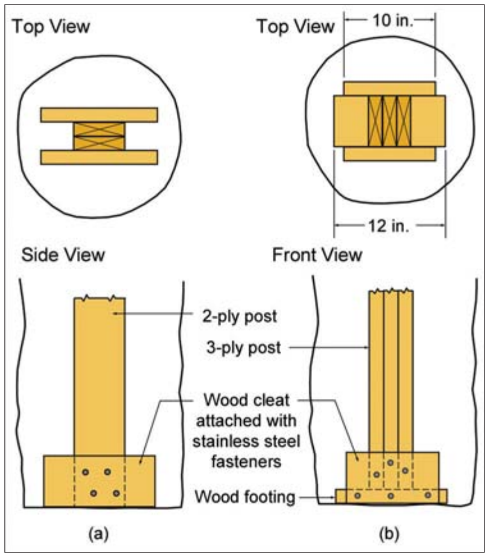


Figure 1. All-wood foundation systems (a) without, and (b) with a wood footer

FOUNDATION STRENGTH

With respect to strength, post and pier foundations and the surrounding soil must be able to handle downward-, upward- and sideways-acting forces. In technical terms these three forces are referred to as bearing, uplift, and lateral forces, respectively.

Handling Bearing Forces

To ensure that soil can handle the downward or bearing force, the base of the foundation is enlarged and/or placed at a greater depth. Enlarging the base of the foundation spreads the load over a greater area, thereby decreasing applied soil pressure. Placing the base of the foundation at a greater depth is advantageous because soil bearing strength increases with depth in homogeneous soils.

The base of the foundation is generally enlarged by placing a footing under the post or pier. Minimum footing area is simply equal to vertical downward design force divided by an allowable soil bearing pressure that is adjusted by a factor of safety.

Basically any material can be used for a footing. As shown in Figures 1–8, common types include wood plates, precast concrete, cast-in-place concrete and plastic pads. With minimal vertical loads and reasonable soil bearing strength, it is most economical to rely on an all-wood foundation system similar to those shown in Figure 1. When downward forces or soil bearing strength makes an all-wood foundation impractical, builders generally move up to circular precast concrete footings (Figures 2 and 3). Precast concrete footings are manufactured and sold by concrete block manufacturers, who generally refer to them as "post pads." The most common sizes are 4- by 12-inch and 4- by 14-inch. Thickness and diameter generally do not exceed 6 and 18 inches, respectively (note that a

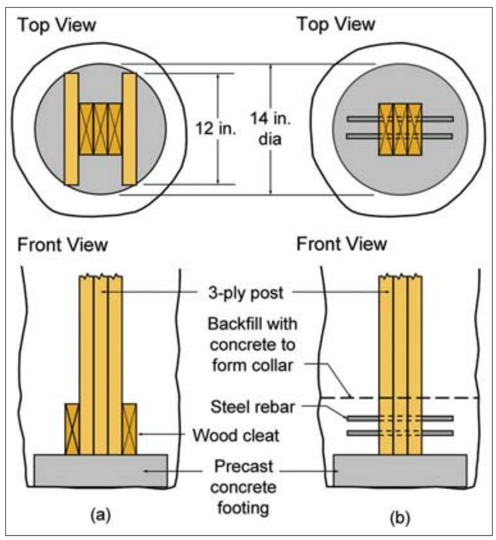


Figure 2. Post foundations featuring precast concrete footings. Uplift resistance provided by (a) wood cleats, and (b) cast-in-place concrete collar attached to the post with steel rebar.

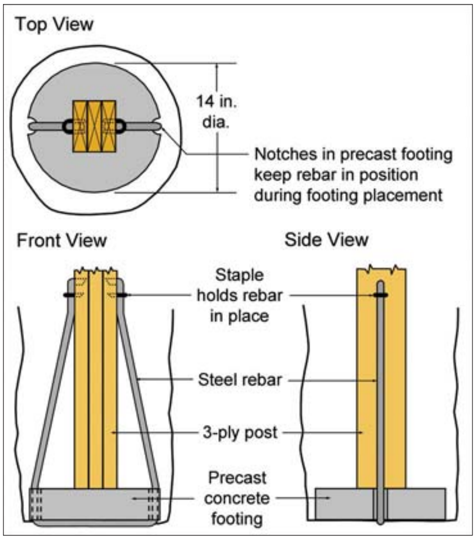


Figure 3. Post foundation featuring precast concrete footing. Uplift resistance is provided by steel rebar wrapped under the footing and attached to the post at location above grade. Proper insertion and fixing of rebar ends into post is critical to the design.

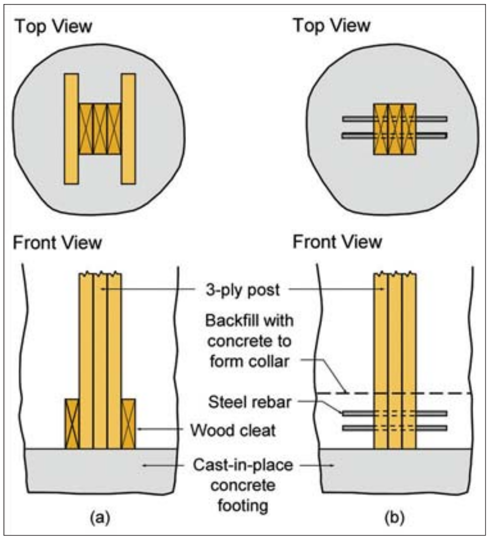
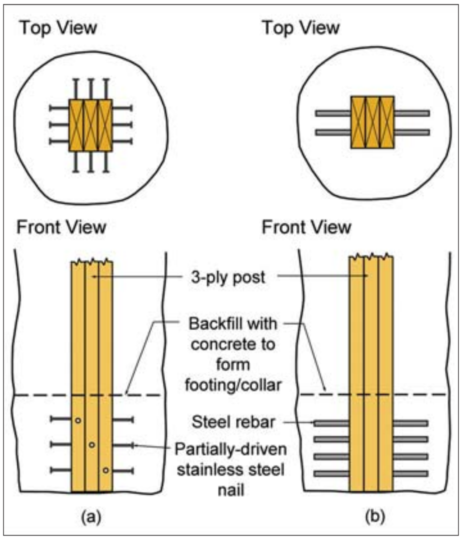


Figure 4. Post foundations with cast-in-place concrete footings. Uplift resistance is provided by (a) wood cleats, and (b) a cast-in-place concrete collar attached to the post with steel rebar.



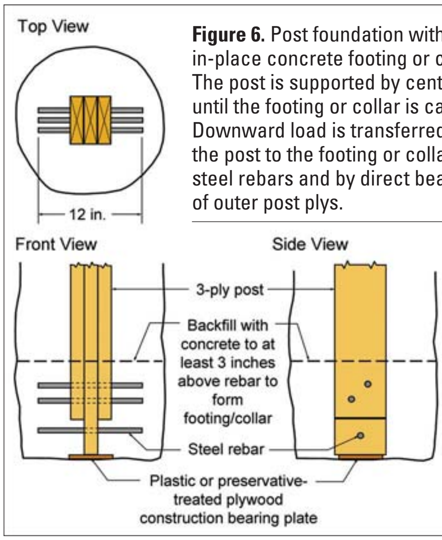


Figure 6. Post foundation with cast-in-place concrete footing or collar. The post is supported by center ply until the footing or collar is cast. Downward load is transferred from the post to the footing or collar by steel rebars and by direct bearing of outer post plys.

▲ **Figure 5.** Post foundations with cast-in-place concrete footing or collar. The post bears directly on soil. Load is transferred to the footing or collar via (a) stainless steel nails, and (b) steel rebar.

6- by 18-inch concrete footing would weigh approximately 130 lb and thus would be very difficult to place manually). For builders looking for a lighter alternative to precast concrete footings, plastic pads can be used as shown in Figure 7 (see footingpad.com).

If available precast concrete or plastic footings are not large enough for a specific application, the builder will auger larger diameter holes and either switch to a cast-in-place concrete footing (Figures 4, 5, 6 and 8) or increase the effective soil bearing area by placing nonhydrated concrete mix beneath the footing. As shown in **Figure 9b**, the effective footing diameter increases by 2 inches for every inch of concrete mix placed below the footing up to the diameter of the augered hole. A nonhydrated concrete mix is generally assumed to have the bearing capacity of a well-graded gravel when initially placed and a considerably higher strength when partially hydrated (Bohnhoff, Hartjes, Kammel, & Ryan, 2003). Note that the same high moisture conditions that reduce the bearing strength of surrounding soil will help hydrate cement and hence increase the strength of a concrete mix.

Cast-in-place concrete footings can be located completely under the post (Figure 4), completely around the post (Figure 5), or around and under the post (Figure 6). Whenever all or part of the post extends completely through the footing, post-to-footing connections must be properly designed and installed. The alternative to a footing under and/or around a post or pier is to use a cast-in-place concrete pier with an enlarged base (Figure 8b). Note that a variety of plastic footing forms are commercially available to form the bell-shaped bottom of such a pier.

Traditionally, post-frame buildings were fabricated using naturally tapered poles (hence the name pole buildings). In smaller pole buildings, the butt end of the poles was frequently large enough to provide sufficient bearing area.

Handling Uplift Forces

Wind forces acting on lightweight buildings or partially enclosed buildings can apply significant uplift forces to the foundation system. Because post-frame buildings are relatively light buildings that typically feature several large wall openings, ensuring that post foundations can adequately handle uplift forces is fundamental to post-frame building design.

Uplift resistance is obtained by fixing an "anchor" at or near the base of the post or pier. An anchor that encircles the entire post or pier is called a collar. An anchor is basically anything that increases the width of the post or pier in one or more directions near its base, thereby ensuring that some soil must be displaced in order to pull the post or pier out of the ground. The wider and/or deeper this uplift resisting system, the greater the

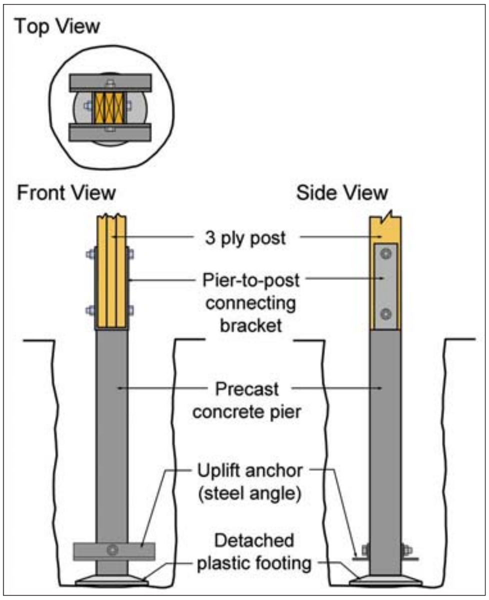


Figure 7. Precast concrete pier foundation with plastic footing and steel angles used for uplift resistance.

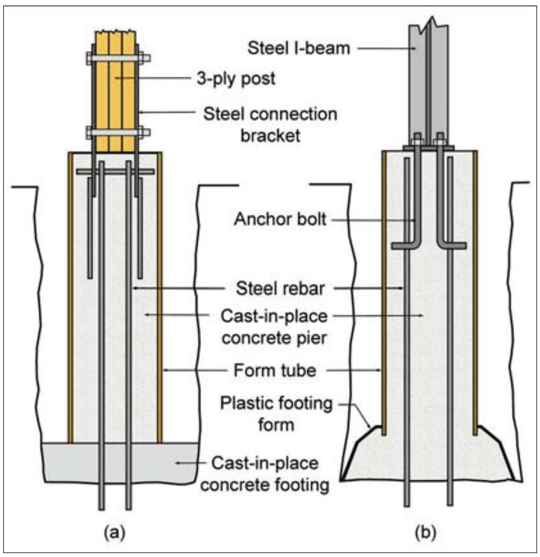


Figure 8. Front cross-sectional views of cast-in-place reinforced concrete piers. (a) Footing cast separately from column, and (b) footing cast simultaneously with pier using plastic footing form. Piers are formed using concrete forming tubes.

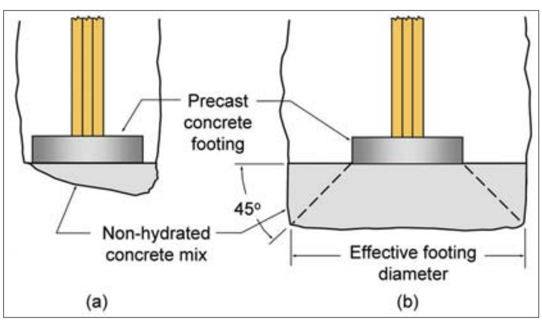


Figure 9. Concrete hydrated in-situ used to (a) even the bottom of a hole, and (b) increase the effective diameter of a footing.

amount of soil that must be displaced, and the larger the uplift resistance of the foundation. Without an uplift resisting system, the only resistance to uplift is provided by the weight of the foundation and friction between the soil and post or pier (a.k.a. skin friction), and this is minimal in coarser-grained soils (i.e., sands and gravels) and highly variant in fine-grained soils (i.e., clays and silts).

In many systems, the footing serves as the anchor. In Figure 1, wood cleats function both as footings and anchors. In Figure 3, the precast concrete footing also functions as an anchor. This is accomplished by wrapping a corrosion-protected reinforcing bar or metal banding around the pad and then securing both ends of the rebar or banding to the post at a location above grade. In Figures 5, 6 and 8, cast-in-place concrete footings also function as anchors.

Tests conducted by Bohnhoff and colleagues (Bohnhoff, Kammel, Nonn, & Shirek, 2001) demonstrated that significant uplift resistance could be obtained with relatively inexpensive uplift resisting systems. In their study, 4.5- by 5.5-inch posts without uplift resisting systems had an average withdrawal resistance of 1,400 lb when embedded 50 inches. With the addition of two 10-inch-long wood cleats to these posts, average withdrawal resistance increased to 5,630 lb. In this same study, post foundations with 19-inch diameter concrete collars (each created using two 80 lbm bags of concrete mix and locked to the post with a single 12-inch-long, 0.5-inch-diameter steel rebar) provided uplift resistances in excess of 22,000 lb when embedded to the same 50-inch depth in soil with a Unified Soil Classification SP (poorly graded sand) designation.

Handling Lateral Forces

Horizontally applied building loads induce bending moments and shears in embedded posts and piers and result in lateral foundation movements that induce soil stresses. If these soil stresses are too high, consideration must be given to increasing (1) post or pier thickness, (2) embedment depth, (3) size of attached footing or collar, (4) post or pier restraint at grade, and/or (5) lateral bearing capacity of the backfill.

With respect to lateral foundation movement, *post or pier thickness* refers to the width of the post or pier face pushing on the soil. Increasing this thickness spreads the lateral force out over more soil area, thereby decreasing soil stress. In the case of an embedded wood post, thickness can be quickly and inexpensively increased (and lateral soil pressure reduced) by adding another layer to one or both sides of that portion of the post located below grade.

Post or pier foundations must extend below code-specified frost penetration depths. Increasing embedment depth beyond frost penetration depth is often the least expensive way to decrease lateral soil pressures.

A very effective way to significantly decrease lateral soil pressures is to restrict the post or pier from moving laterally at grade by tying it to a concrete slab. In general, when a post or pier foundation is kept from moving laterally at grade (and all other design variables remain unchanged), it takes more than three times the applied load (i.e., bending and shear forces applied to the foundation) to cause a soil failure.

When concrete or a controlled low-strength material is used as backfill, it effectively forms a collar around the post or pier that increases the effective thickness of the post or pier. The downside of backfilling with concrete is its high cost and its susceptibility to frost heave when surrounded by poorly drained silt and clay soils that are subjected to subfreezing temperatures.

Strength Checks

Foundation engineering begins with determination of maximum shear, axial and bending forces to which the foundation will be subjected. When these forces have been established, the adequacy of the foundation elements and the surrounding soil can be determined.

Determining the adequacy of the soil surrounding the foundation is accomplished using ANSI/ASAE EP 486.3 *Shallow Post and Pier Foundation Design* (American Society of Agricultural and Biological Engineers [ASABE], 2017). Note that ANSI/ASAE EP 486.3 provides checks only on surrounding soil and not on the foundation elements themselves. Checks on the adequacy of foundation elements require use of the appropriate design specifications for wood, steel, reinforced concrete and so on. Like load calculations, comprehensive strength checks on foundation elements are typically done by a qualified structural engineer.

To assist designers in the use of ANSI/ASAE EP 486.3, I developed a special Microsoft Excel workbook, available at no charge from the National Frame Building Association (www.nfba.com).

Concrete Pier-to-Post Connection Strength and Stiffness

A post or column can be attached to a concrete pier in several ways, with a handful of proprietary steel connecting brackets on the market. To properly model these connections requires that the relationship between the bending force applied to the connection and the deformation of the connection be known. Connections with substantial deformation under a bending type load are referred to and modeled as pin, simple or hinge connections. Those connections that flex no more than the wood post they are connecting (i.e., they have an effective bending stiffness that equals or exceeds that of the wood post) are modeled and referred to as fixed, rigid, fully restrained or moment connections. Between these two extremes are what engineers refer to as semi-rigid, partially restrained or flexible-moment connections.

Be aware that connections made with some of the commercially available, proprietary steel connecting brackets have not been tested, and hence the information needed to properly model the connections does not exist. It is also important to note that few if any of the marketed brackets can be used to produce fixed or rigid connections. For example, connections made with Simpson Strong Tie's MPBZ bracket (connections that have been rigorously tested) fall clearly into the category of semi-rigid connections.

The bending strength and stiffness of concrete pier-to-wood post connections is typically limited by a combination of high-tension perpendicular-to-wood grain stresses and high wood shear stresses induced by the mechanical fasteners used to connect the bracket to the post (and commercially available brackets have simply not been designed to address this weakness). Also, calculations show that even some of the wider and thicker steel plates used in commercially available brackets would buckle well before the ultimate bending strength of the wood post was reached. Finally, the stiffness of many connections is significantly reduced by wood shrinkage occurring after the connection has been made.

DURABILITY

Post and Pier Material

Embedded posts are generally fabricated from preservative-treated wood, and piers are generally formed from concrete. Although some researchers have experimented with or developed reinforced plastic posts and piers over the past three decades, to the best of my knowledge, none is commercially marketed at this time, largely because of their relatively high cost.

Among practitioners, concrete piers are viewed as having a longer installed life and being more eco-friendly than preservative-treated wood posts. The actual installed life of a post or pier depends on fabrication quality and exposure conditions. Concrete will last indefinitely when kept dry or not subjected to freeze-thaw cycles and when not exposed to chemicals that break down cement bonds. Preservative-treated wood performs extremely well when it is uniformly treated to a proper level.

Uniformity of wood treatment is dependent on wood species and the percentage of sapwood— factors that control treatment penetration. Sapwood takes treatment much better than heartwood, and species such as Southern pine are easier to treat than are slower grown northern and western species (e.g., Hem fir, Doug fir, Ponderosa pine) that must generally be incised prior to treatment. It is important to note that treatment penetration to a depth of 0.75 inches ensures that virtually all wood in a post fabricated from nominal 2-inch-thick lumber (actual thickness of 1.5 inches) is protected. The same is not true for a solid-sawn, nominal 6- by 6-inch post (actual size of 5.5 by 5.5 inches), where a treatment penetration of 0.75 inches leaves a 4- by 4-inch center region without treatment. For this reason, avoid using larger solid-sawn timber when holes that expose untreated wood are located near or below grade.

Currently, post-frame building designers specify a minimum average chromated copper arsenate (CCA) retention level of 0.60 lbm of treatment per cubic foot of wood. Results of Forest Products Laboratory studies on pressure-treated stakes (Forest Products Laboratory, 1987) indicate that a *uniform* treatment with CCA to 0.40 lb/ft^3 should protect an embedded post for at least 40 years.

Post Casings and Wraps

Post casings and wraps are products that in some manner encase all or a portion of an embedded wood post. Examples are products such as those sold under the trade names of Plasti-Sleeve™ and Short Sleeve (www.plastisleeve.com), Post Protector™ and Grade Guard™ (www.postprotector.com), and the GreenPost™ or SmartPost™ system shown in **Figure 10** (www.planetsaverind.com).

Post casings and wraps are marketed as a means to reduce post rot, decay, and insect damage, as well as soil exposure to treated wood. These claims are supported by several research projects and by the solid performance of the products over the past quarter century. That said, post casing and wraps (like newer wood preservatives) have not been in use long enough to quantify their long-term (e.g., 50-plus years) effectiveness.

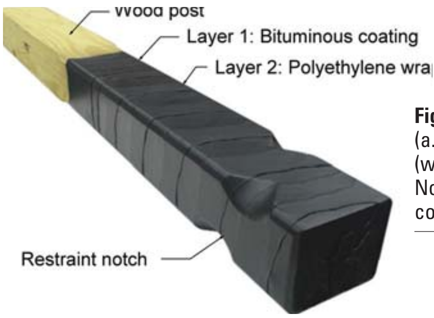


Figure 10. GreenPost™ (a.k.a. SmartPost™) system (www.planetsaverind.com). Notches lock cast-in-place concrete to the post.

Fastener Corrosion Resistance

Without corrosion protection, thin metallic components located below grade, especially in preservative-treated lumber, will disintegrate in a relatively short period of time. For this reason, it is highly recommended that smaller-diameter fasteners (i.e., nails and screws) used to attach collars or footings to treated posts be manufactured from silicon bronze or AISI type 304, 305 or 316 stainless steel. Although hot-dipped galvanized (zinc-coated) fasteners are frequently used in highly corrosive environments, studies advise against their use in treated wood located below grade (Baker, 1992).

To counter corrosion of reinforcing bars used in preservative-treated wood below grade, coat the bars with epoxy or increase the bar diameter so that adequate strength remains despite material loss to corrosion.

Frost Heave

Freezing soil results in formation of ice lenses in spaces between soil particles. Under the right conditions, these ice lenses will continue to attract water and increase in size. This expansion of lenses increases soil volume, and if this expansion occurs under a footing or along a foundation with a rough surface, that portion of the foundation will be forced upward, a situation referred to as frost heave.

Several steps can be taken to reduce frost heave. First, extend the base of an embedded post foundation below the frost line. Second, grade the site so that all water is directed away from the building. This includes filling in depressions that form around posts as backfill settles. Third, refrain from building in clay and silt soils. Fourth, guard against the *sump effect*, which occurs when a hole is drilled into, but not through, a relatively impervious soil. If coarse backfill is used in this case, water traveling horizontally above this impervious layer will move downward when it reaches the backfill and get trapped in the base of the hole. Alleviate this situation by backfilling with the same impervious material that was removed to form the hole.

Concrete backfill against irregular soil surfaces, or in holes with diameters that decrease with depth, can increase the likelihood of frost heaving.

INSTALLATION

Hole Preparation

All footings must be placed on undisturbed or properly consolidated soil. A flat metal plate welded to the end of a pipe is generally used to level or tamp the bottom of the hole.

Where precast concrete or wood footings are used, the base of the hole must be flat (i.e., void of high and low spots) and level. If it is not, any footing not attached to the post will make only line or point contact with the post, and any footing attached to the post will make only line or point contact with the compacted base. Use a posthole-bottom leveler (Bohnhoff, 2008) or similar device to ensure a flat and level hole base prior to compaction.

Rainfall occurring between drilling and foundation placement can be problematic. Holes drilled into granular material will generally collapse under heavy rains, requiring considerable re-excavation. Heavy rains in other materials will generally result in a mixture of soils (including top soil) at the base of the hole that must be removed prior to footing placement. Additionally, the material at the base of the hole is no longer consolidated to the degree it was before the rain. In such cases it is beneficial to replace several inches of material from the base with nonhydrated concrete mix. Not only does such "dry mix" provide a base with a relatively high bearing capacity, but by removing water from surrounding soil, it also improves the soil's bearing capacity. As shown in **Figure 9a**, nonhydrated concrete mix can also be used to help level the base of a hole prior to footing placement.

Cast-in-place concrete footings have an advantage over wood and precast concrete footings in that they do not require a flat, level soil surface for placement. However, if the post or pier is to bear properly on a cast-in-place footing, the footing must have a level finish, or the post or pier must be positioned on the footing surface before the concrete completely sets.

Footing Placement

After a post has been placed in a hole, it is imperative that it can be realigned and plumbed with ease. Repositioning a post is more problematic when a post is already attached to a footing or collar or when the hole is drilled at an angle or off-center. The latter is more problematic with deeper holes in rocky soils. Lateral repositioning is obviously more difficult if the post has settled into soil, concrete has partially set or dry-mix concrete has not yet been hydrated.

Precast concrete footings should be lowered into a hole with special tools (Bohnhoff, 2008) or hardware so as to maintain a flat, level, properly compacted base under the footing. With the system in Figure 3, this lowering is accomplished with the rebar used to attach the precast concrete footing to the post. Although this ensures that the base of the hole remains level, the top of the footing must be tamped to ensure that the section of rebar located under the footing is seated in the soil.

Pier Forms

Cast-in-place piers (Figure 8) are typically steel-reinforced and formed with single-use, spirally wound paper tubes. These paper-based forms are frequently referred to as concrete form tubes or construction form tubes, or by a manufacturer's trademarked name (e.g., Sonotube, Quik-Tube, Essex Tubes, Formtube, Crescent Tube). Tubes up to 4 feet in diameter and 20

Figure 11. Footing forms: (a) BigFoot™ , (b) Square-Foot™, and (c) Redibase™.

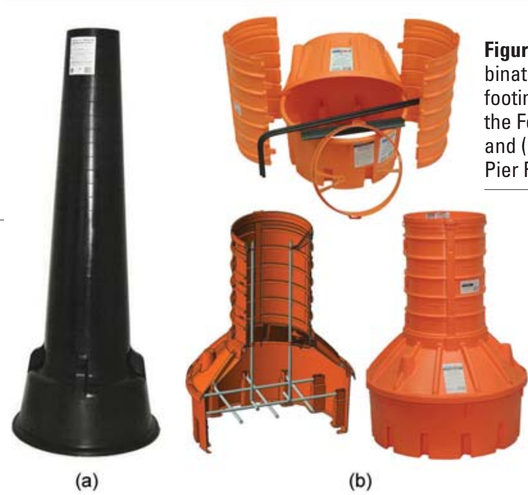


Figure 12. Combination pier and footing forms: (a) the Footing Tube™, and (b) Fail Safe Pier Footer.

feet long are available. Nominally 8- and 12-inch-diameter tubes are generally stocked locally. Note that several tubes are nested for shipping (i.e., tubes are slid inside other tubes) and thus are available in a variety of diameters close to the nominal size.

Simultaneous casting of a footing and pier saves considerable time and is facilitated with special plastic footing forms that attach to standard concrete form tubes. Three such commercially available forms are shown in **Figure 11**; these are the SquareFoot™ (www.soundfootings.com), the BigFoot™ (www.bigfootsystems.com), and the Redibase Form™ (redibase-form.com).

Alternatives to the use of a construction tube with attached plastic footing form are shown in **Figure 12** and include the one-piece Footing Tube™ (www.foottube.com) and the Fail Safe Pier Footer (failsafepierfooter.com) which is a multipiece unit designed to hold a grid of horizontal steel rebars in the footing and vertical steel rebars in the "tower" section of the assembly. Because the Footing Tube™ and Fail Safe Pier Footer are all plastic forms, there is no concern (as there is with paper tubes) about the ground around the forms getting saturated or the forms getting rain-soaked prior to concrete placement. Note that the Fail Safe Pier Footer is marketed in Canada as the FormFooter PRO™ (www.formfooterpro.com).

Rigid, waterproof pier forms can be quickly and easily fabricated from used 55-gallon HDPE drums. Depending on your location and contacts, such drums may be available at low or no cost. Because of my connection to the dairy industry in Wisconsin, I was able to secure several drums at no cost, and I used them to form the pier and beam foundation shown in **Figure 13.** In this case, drums were slit along their length after the ends had been cut off. The slit sides were then lapped and screwed together to form a smaller-diameter cylinder. In this case, outside form diameter was selected to be slightly less than the auger diameter. Drums were set in augered holes to the same elevation and backfilled. Steel EFCO™ wall forms were placed directly on top of the drums (i.e., they were supported by the drums). After rebars were placed inside the wall forms and piers, and steel post brackets were fixed in place, the entire pier and beam foundation was cast in a single pour.

An alternative to using pier forms is to auger a hole equal in width to the required footing diameter and then fill the hole with concrete. Although this method saves the cost of a form, the resulting soil-concrete interface makes it much more susceptible to frost heave, and because of the added concrete, such piers generally end up costing more than systems using special footing forms.

Figure 13. Pier form with 17.5-inch outside diameter (left) was fabricated from a used 55-gallon HDPE drum for insertion into a hole drilled with an 18-inch-diameter auger. Installed pier forms (center) were the sole vertical support for EFCO wall forms. Completed wall (right) features concrete-to-wood post brackets, exterior insulation, three runs of horizontal rebar and four vertical rebar that extend from the base of each pier to the above bracket. Concrete was simultaneously cast in pier and wall forms.

Depth and Height Control

It is ideal to complete all aspects of wood post fabrication (e.g., lamination, notching, hole placement, cutting to length) prior to delivery to the job site. This generally requires that post supports are installed to their finished elevation.

For posts supported on cast-in-place piers, height is controlled by either (1) carefully striking the pier surface to its desired height during concrete placement, or (2) fixing the concrete pier-to-post connecting bracket to its proper height prior to concrete placement and then placing concrete under and around the bracket. Three ways for accomplishing the latter are illustrated in **Figures 14, 15 and 16**. In Figure 14, threaded rods with coupler nuts and bolts are used to fix the bracket directly to the paper form. In this case, the bolts were also used to attach temporary wood braces to the pier and later used to anchor steel partitions and gates to the pier. Figure 15 shows the Concrete Pier System™ (www.concretepiersystem.com). In this case, pier-to-post connecting brackets slide into special clips attached to preset splash plank. Figure 16 shows the Strong Way Column (www.strongwaysystems.com), which features a concrete pier-to-wood post connecting bracket with an adjustable leg that can be turned in or out to move the bracket up or down. This leg extends to the base of the foundation and vertically supports and fixes the elevation of the splash plank as concrete is cast.

Figure 14. Post-to-concrete pier connection featuring straight side plates welded to steel reinforcing bars. Threaded rod with coupler nuts and bolts used to (a) fix bracket into place, (b) attach temporary wood braces to pier, and (c) provide anchoring points (at a 28-inch spacing) for steel partitions and gates.

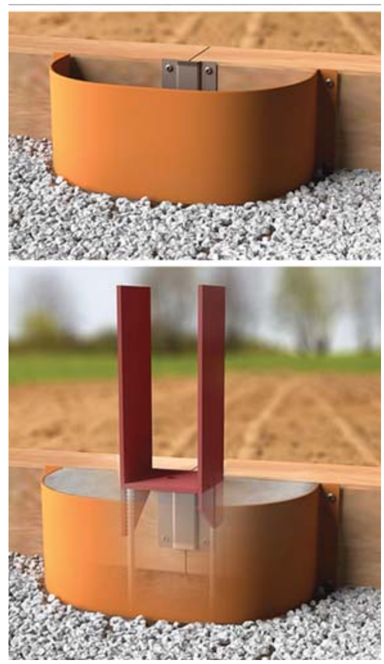


Figure 15. The Concrete Pier System™ features a special plastic concrete form that fits over the top of a concrete forming tube and is attached to the splash plank along with an Easy Mount Clip (top). Concrete is then cast in the concrete form tube, and when filling is nearly complete, a concrete pier-to-wood post connecting bracket (trademarked the Brute Force Bracket) is slid into the Easy Mount Clip, and the remainder of the form is then filled with concrete (bottom).

For embedded wood posts and posts supported by *fixed-length* precast piers, control of post height requires control of footing elevation. Control of precast concrete and plastic footings elevation is not difficult. With holes prepared with a post-hole bottom leveler with an attached laser level receiver, such footings can be installed such that their top surfaces are level and all within ½ inch of each other. To make up for the small differences in elevation between footings (differences that are quickly quantified with a laser level), shims can be placed between the footings and the piers or posts that they support. Alternatively, such small differences in footing elevation can be rectified by trimming material off the bottom of the supported wood posts.

Another option for depth control is to use an *adjustable-length* pier, a precast pier with a threaded leg that can be turned in or out to move the pier up or down. After the height of the precast pier has been set, concrete is cast around the base of the pier. This concrete not only protects and locks the threaded leg in place but also forms both a footing and uplift resisting system. An example of such a system is the Morton Foundation System (MFS) (www.mortonbuildings.com/foundation).

COST

All-wood foundation systems tend to be less expensive than concrete pier foundations in overall material costs, transportation-related costs and installation labor costs.

Ready-mix concrete for post and pier foundations is relatively expensive because of premiums charged for delivery of small quantities (e.g., quantities less than 3 cubic yards). Consequently, money is often saved by selecting a foundation design that enables all concrete to be cast at the same time (e.g., footings are not cast separate from the piers they support). Relying on an off-site batching plant for concrete requires better on-site scheduling and communication. Any time spent waiting for delivery by outside vendors increases on-site labor costs.

Don't oversize concrete piers or waste concrete in another way. Because concrete form tubes enable more precise place-

Figure 16. Strong Way Column features a vertically adjustable pier-to-post bracket (left) that vertically supports and is laterally supported by a splash plank during concrete placement.

ment of concrete as compared to casting straight into augered holes, piers cast with form tubes generally cost less, even when form tube cost is taken into account.

A major factor controlling post and pier foundation cost tends to be footing size. When required footing diameter exceeds the size of the largest available auger, the base of the hole must be belled or spooned out, or a backhoe used for footing excavation. The more material removed for footing placement, the more time and energy that must be spent tamping backfill. In addition, large concrete footings, unlike smaller concrete footings, may require a grid of steel reinforcing bars for adequate strength.

SUMMARY

Post and pier foundations are one of the identifying characteristics of post-frame buildings and are used extensively in deck and porch construction. Numerous design options are available, with plenty of proprietary products available for use. In addition to the magnitude of bearing, uplift and lateral forces, post and pier foundation design requires consideration of durability, installation and cost issues. FBN

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