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ICC Report ESR-1895 ICC Report ESR-1895 ICC



DIAMOND

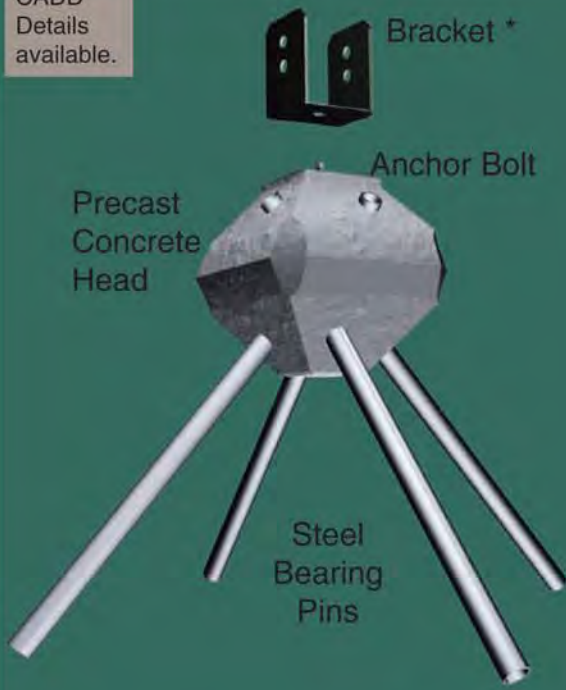
PIER®



no digging, no pouring, no waiting, no digging

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available.



What is a Diamond Pier® ?

The **Diamond Pier®** is a unique combination of pre-cast concrete and steel bearing pins. Together they form a solid foundation that reaches deep into the ground - **without having to dig or pour concrete!**

The pier is light enough to hand carry, and installs right at the surface with simple hand held tools.

It's better for the environment, and it can be used in any penetrable soil - sands, silts, clays and small rounded gravels. It is *not* intended for rocky soils, ledge, deep marine applications, loose fill, deep peats or perma-frost.

Once fixed in the ground, the foundation has an excellent bearing capacity, and the added benefit of uplift and lateral resistance. Post or beam brackets are attached to an anchor bolt pre-cast in the top of the pier, and framing can begin immediately - no digging, no waiting for the weather, no concrete curing and no soil piles to remove.

The first prototype of the Diamond Pier® was installed in 1984, supporting a deck that still stands level today. (See photo above.) The pier was patented in 1992, and has been used on public projects across the Country for more than a decade. The smaller DP-50 Pier with 36 inch Pins has now been recognized by the ICC, ESR - Report 1895, and is available with a variety of Pin lengths to builders throughout the United States.

Diamond Piers® are simple to use, and **save time, mess and money.**



First deck on prototype pier - 1984
Lawrence, New York

How are Diamond Piers® Installed?

The Piers are simple to install using small lightweight construction tools. The concrete head is simply set in a shallow hole cut into the surface soil, and the pins are driven through it and capped. Just take care lifting the heavy piers.

First, set the pier to its proper height, typically to its mid-point or deeper, depending on the structure and topography. Make sure that it is level and in its proper location, then pack the little bit of dirt removed back around the edges of the pier to fix it in place for pin driving.

Verify that there are no buried utilities and that your gloves and goggles are on. Slide pairs of pins into opposing holes, being careful not to tip the pier out of level. Hold the pin up against the top side of the concrete driving hole and sledge the Pins partway into the surrounding soil - maintaining plumb, and working around the pier on opposing pins until they begin to bite in the soil and lock the pier rigidly in place.

A small demo hammer with a pin driving bit is the optimum driving tool for finishing the Pin driving. As with the sledging, make sure the Pin is held against the top side of the driving hole as you drive it. This ensures that you will not crack or damage the concrete head.



For most structures, dead load should be applied before applying caps.

Leave the tops of the Pins protruding from the concrete approximately 3/4", apply the framing dead loads, and then seal the Pins with the rubber caps to the head with adhesive caulk. If there is enough room under the structure to drive Pins, a good part of it may be framed, squared and plumbed before finishing the Pin driving.

And the Diamond Pier is totally removable. If you put it in the wrong place, the Pins can be rotated back out and the pier relocated. The small piers should take about 10-15 minutes each to install, 20-30 minutes for the big ones - depending on Pin length and soil density. See next page for information about installing in heaving soils.

See back page for more information on removing Pins, or applying inspection plugs before Pin driving. (Visit www.pinfoundations.com for complete Installation Instructions and to view the Installation Video.)



Make sure to remove any deformations on the end of the pin, and caulk and seal the cap.



Heave Resistant

Do they work in Heave?

Yes. The spread Pin configuration works like a bell shaped footing to resist uplift, and the base of the pier is pointed to cleave shallow heaving soils. In properly drained sites, the DP-50 can absorb the strains of low to moderate heaves up to 1 inch. If in extreme conditions, some minor Pin displacement occurs, the Pins can simply be reset without affecting the structure. For the most severe soils, the larger piers, or the addition of rounded gravels around the head, may be required.

(See "Heave and Expansion" on the web site.)



Will the Pins Rust away?

No. The galvanized Pins are protected from significant corrosion because they are buried and not exposed to oxygen. Pins supplied are intended to last the life of the structure.

Some industrial sites or unique soils may require Pins with additional protection, or stainless steel.



Salt Corrosion Test

How much load can a Diamond Pier® carry?

There are currently three pier sizes. Their bearing capacities are based on Pin length and the soils they are engaged in. The DP-50, the smallest pier, is recognized by the ICC for generic load values equivalent to 1.8 square feet of bearing area. (See chart below)

The DP-75 and DP-100 pier capacities are not based on generic values, but are instead engineered for each individual site soil and loading condition. Each pier has different Pin diameters and maximum Pin lengths, and these allow for a variety of capacities in a given site soil. Their maximum capacities however are limited by the strength of the concrete head itself. For the larger piers, soils and loading information is required for a Pin Foundations engineer to provide compression, uplift and lateral capacities. (See bold text below)



DP-100, DP-75, DP-50 with corresponding Pin diameter and driving bit.

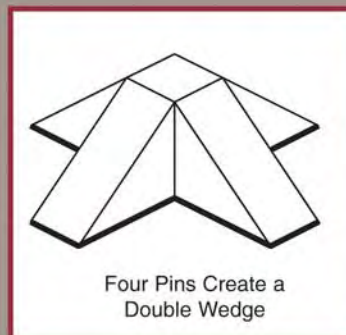


Concrete Strength Test

BEARING



Bearing Load Test - Pier and Pins Push against the Soil as a Single Solid Shape.



The Diamond Pier is a bearing system, and performs in the soil much like any flat bottom footing. Because the pins are short, very stiff, and locked in the pier under load, the entire foundation pushes against the soil as a single solid shape. Each pair of pins, acting in unison, bears on a wedge of soil immediately below it. Four pins create a double bearing wedge. In plan, this wedge has a base square footage area that can be applied to a given soil's *psf* just like a conventional concrete footing.

This chart shows the ICC recognized tested bearing strength of the DP-50 pier w/ 36" Pins, as it compares to conventional flat base round and square footings.

For the DP-75 and DP-100 pier, a site-specific capacity analysis may be required. This can be obtained from our authorized engineers, if specific soils characteristics, such as Unit Weight, Angle of Internal Friction, and Cohesive Strength, are provided by a local certified geotechnical engineer.

RESIDENTIAL SOIL TYPES IRC 2003/2006, Table R401.4.1	CAPACITIES		Diamond Pier®
	CYLINDER	CUBE	
	18" dia.	16" sq.	DP-50, 36" Pins
2000 psf soil sands, silty sand, clayey sand, gravels clayey gravels, silty gravels	3540 #	3560 #	3600 #
1500 psf soil clays, silts, clayey silts, silty clays sandy clays, sandy silts	2655 # (1.77 SF)	2670 # (1.78 SF)	2700 # (1.8 SF Equiv. Bearing)

NOTES: 1. Cylinder and Cube capacity are based on 12 inch depth into natural grade, or deeper cylinders, 2 to 4 feet down, formed in waxed or plastic forms to the full depth of the hole.
2. Pins longer than 36 inches may be required in some frost or expansive soil zones.
3. Allowable loads utilize 4 Pins per Pier. Pin length includes that portion of the Pin embedded within the Pier.



Frame Foundations for Modular Structures



Direct Connect to Grade Beams for Decks



Porches, Carports



Stairways, Walkways

What can be Built with Diamond Piers® ?

Diamond Piers® can support just about any structure that connects to a post or beam bracket. Decks, porches, carports, walkways, ramps, stairs, gazebos, sheds - even houses!

Pier spacing, size and pin length depend on the soils, the weight of the structure itself and the live loads the structure is meant to carry - snow, people, hot tubs, etc.

On sloping sites, tall posts should be braced, as with any similar structure. Steep sites greater than 2:1 are not right for the Diamond Pier®, as the downhill Pin will not have enough soil to bear in.

On gentle slopes, series of piers may be set at differing heights to adjust for level. The pier may also be set completely below grade if preferred, or recessed from the outer edge of framing members in order to allow perimeter skirting to be constructed.

Brackets are structurally interchangeable on the two pier sizes, however larger brackets may hang over the top of the DP-50, requiring a heavy duty bracket with internal blocking to redistribute the load back to the top of the pier.



Boardwalks, Bridges



Heavy Decks, Big Timbers



Houses, Additions

Field Inspections?

Inspectors can verify Pin length at any time when inspection plugs are used. The plug is inserted in the lower end of the Pin before driving, and allows the inspector to slide a tape all the way down the inside of the Pin to measure its length.

Piers suffering a structural crack during Pin driving should be removed and replaced. Surface chips are not structural cracks.

Piers installed out of plumb more than 5 degrees should be reset before loading.



Inspection Plugs



Pin Removal

Trouble Installing?

A pier set in the wrong location can be moved! Just turn and lift the Pins with a pipe wrench to corkscrew them out. The pier may be also be rotated to avoid rocks or roots, and the Pins re-driven.

Most brackets have an extra large attachment hole, also allowing for horizontal adjustment.

Rocks or roots may also be dug to and removed, as long as the soil is repacked before pin driving.

Pins may be cut off if they hit deep impenetrable obstructions. See Installation Instructions for details. A list of appropriate driving hammers and bits is also on the website.

Are they Code Approved?

The Diamond Pier® DP-50 model is now recognized by the International Code Council for residential applications. The ESR report, ESR-1895, is available on the website along with the full Third Party test results. The Piers also meet all ASTM and ACI 318 standards for pre-cast concrete products, and all ASTM standards for galvanized steel hardware. The DP-100 pier must be submitted as an engineered alternate to the code.

Limited Warranty

If properly handled and installed, Pin Foundations Inc. will replace any of its manufactured components due to defects in quality or workmanship, for a period of three years from date of purchase. No other warranties are expressed or implied. PFI shall not be liable for any consequential or other damages, including injury to persons or property, arising from the use of its supplied products.

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