DiamondPier®
FOUNDATIONS

FREQUENTLY ASKED QUESTIONS (FAQs)

Key Questions:

Q: What kind of projects can Diamond Pier® foundations be used for?

A: The intended use for Diamond Pier DP-50 and DP-75 foundations sold through retail stores is to support simple residential projects constructed with columns, posts, and beams. **The scope of project is defined as decks, covered decks, walkways, stairways, and accessory structures or similar projects that meet this intent**. The International Residential Code (IRC) defines an accessory structure as a structure that is accessory to and incidental to that of the dwelling(s) and that is located on the same lot. Projects using Diamond Pier foundations must be less than 600 square feet.

Q: What is the bearing load capacity of a Diamond Pier?

A: See table below.

Model No. / Pin Length	Bearing Load Capacity in Clays	Bearing Load Capacity in Sands
DP-50/50”	3300#	4400#
DP-75/50”	3750#	5600#
DP-75/63”	4200#	6400#

For more information, please reference the “Residential Diamond Pier Load Chart” (found at www.diamondpiers.com).

Q: What percentage of installed Diamond Pier foundations successfully resist frost heave in cold climates?

A: Over a 10-year period, Diamond Pier foundations have resisted the effects of frost heave in 99.7% of footing installations in the study area discussed in this document, which covers Minnesota and portions of neighboring states in the Northern Midwest.

Q: What is the procedure to get Diamond Pier foundations approved in a permit application?

A: Secure your permit prior to purchase. For Diamond Pier foundations, the procedure is to submit the Diamond Pier product as an alternate method with the application for the building permit. This is accomplished by attaching a detail of the Diamond Pier product in the project drawings, along with the layout and spacing of the piers in accordance with the “Residential Diamond Pier Load Chart.” Also, it is important to include a current copy of ICC-ES evaluation reports ESR-1895 and EER-1895 and, if requested, frost performance documents, all of which are available at www.diamondpiers.com.

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Q: Is the Diamond Pier foundation approved for use in the state of Wisconsin?

A: Secure your permit prior to purchase. Yes, the Diamond Pier precast concrete pier foundation assembly (Models DP-50 and DP-75) has been evaluated and approved for use as a foundation for the support of gravity loads, as well as specified lateral and uplift loads, for exterior decks, covered enclosed porches, and sunrooms as defined in the 2018 IRC R301.2.1.1.1, Categories I through IV, elevated walkways and stairways as regulated by the current Wisconsin Uniform Dwelling Code (UDC) and some site accessory detached structures not directly covered by the UDC rules. This approval is not for support of habitable enclosed dwelling areas. This approval is for installation of these footings per the manufacturer's installation manual to support/resist loads as tested and published with the adjustments as noted in the "Wisconsin UDC Approval", which can be downloaded from the website (www.diamondpiers.com/downloadable-documents).

Q: How do I install Diamond Pier foundation assemblies?

A: Read and follow the installation instructions in the *Diamond Pier Installation Manual*, which can be downloaded from the website (www.diamondpiers.com/downloadable-documents).

Q: Where can I buy Diamond Pier foundations?

A: For DP-50/50 and DP 75/63 please visit our Retail Locator (www.diamondpiers.com/retailer-locator) on our website to find a retailer near you. For larger piers for engineered projects please contact PFI.

General:

Q: How does a Diamond Pier foundation work?

A: The technology of the Diamond Pier system combines the best features of both types of common foundations, a spread footing and a pile driven footing. By grouping short stiff piles (bearing pins), which can easily be driven into intact penetrable soils, and setting them at angles to work more like a shallow footing, a sound foundation can be constructed that requires no excavation. The pin pile group simulates nature's design, resembling the roots of a tree providing bearing, uplift, and lateral capacity. In recent decades, grouped pin piling has become a reliable technology for complex, heavy-duty commercial applications, performing a superior job of transferring loads to intact undisturbed soils.

Q: What are the dimensions of a Diamond Pier foundation?

A: The DP-50 is a 50-lb concrete head that measures 10"x10"x11" with a ½" precast galvanized steel anchor bolt. The DP-75 is a 75-lb concrete head that measures 11"x11"x12" with a 5/8" precast galvanized steel anchor bolt.

Q: How does the concrete head provide the bearing force needed to support a load?

A: The high-strength, precast concrete head serves as a driving guide, a pin-piling lock, and a structural connection all in one. As a driving guide, the head maintains the pin angles so that their capacity is definable and consistent. As a lock, the head is designed to increase its grip on the pin cluster when loaded up, down, or sideways—getting stronger and tighter as loads increase. And as a connection, an embedded anchor bolt and precast post-matching shape make it a simple and proportional complement to its supported structure.

This concrete head combined with the bearing pin group forms the Diamond Pier system—a hybrid of concrete and steel materials. This system provides a solid, stable, economical foundation that both captures and preserves the supporting strength and natural functions of the Earth's soil it's engaged in and, in turn, solidly and simply connects to and protects the permanent structure above.

Q: What are the specifications for the Diamond Pier bearing pins?

A: The bearing pins provided with the system are schedule 40 galvanized pipe, Grade A electric resistance welded, with no threads. The pins can be inspected from above grade; with the pin cap removed, the weld can be verified on the inside wall of the pin, and the wall thickness can be checked. If the wall thickness is thinner than specified, the pins have been substituted with a lower schedule pipe or conduit and must be replaced with the properly specified pipe—1" nominal schedule 40 pipe has a wall thickness of 0.133" (just over 1/8"); 1-1/4" nominal schedule 40 pipe has a wall thickness of 0.140". The wall thickness tolerance is ±12%.

Q: How do I check that I have the correct pins for my model?

A: Measure the pin diameter to be sure the proper pins have been supplied for your pier model. (The DP-50 model has a 1" nominal pin with a 1.315" actual outside diameter [OD]; DP-75 has a 1-1/4" nominal pin with a 1.67" actual OD.) If the pins do not fit, contact your supplier. The inspection plugs are inserted in the bottom of each bearing pin prior to installation to keep soil from moving up inside the pins as they are driven into the ground. This allows inspectors to slide a tape measure down a pin from above as a method to verify its length.

Q: Is the Diamond Pier system designed to support all possible load types?

A: The Diamond Pier system is intended for simple structures supported by columns, posts, and beams loaded up to, but not exceeding, the stated capacities for bearing, uplift, and lateral loads on the "Residential Diamond Pier Load Chart." It is not intended for structures with asymmetrical, rotational, overturning, or dynamic forces. Intended uses are described in section 2.0 of ICC-ES prescriptive bearing evaluation report ESR-1895. For projects that exceed the capacities or limitations defined herein, or the intended uses described in ESR-1895, contact Pin Foundations, Inc. (PFI) for additional information or site-specific capacity evaluation.

Q: What determines the total load imposed on a pier?

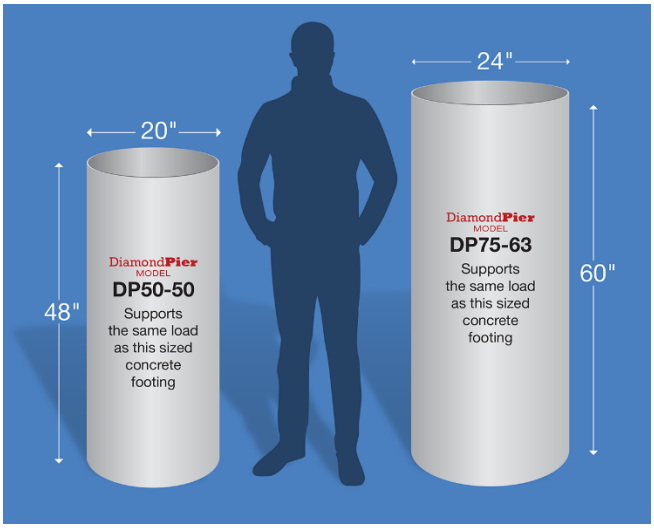
A: The total load calculated for a post or beam connected to the pier (also known as the "support column") is based on a combination of the live load (snow, people, furnishings, etc.) and the dead load (weight of structure itself). The live load and dead load requirements are provided by your local building department; loads are specified in pounds per square foot (psf). A determination must be made as to what portion of the floor area is supported by a single support column. A design professional should be able to make this determination. Once the proper area for the single support column is determined, multiply the area (A) supported by the required loads in psf (L) to determine the total tributary load (in pounds) for the single pier:

(A) x (L) = Total Tributary Load

This value should not exceed the published capacity of the Diamond Pier model and corresponding pin length intended for use.

Q: What size of traditional concrete footing is a Diamond Pier foundation equivalent to?

A: In the "Residential Diamond Pier Load Chart," values for "cylinder comparison" and "frost zone" are given. These two values define the size of the traditional concrete pier foundation that a given Diamond Pier foundation is equivalent to in bearing capacity and frost heave resistance. For example, a DP-50 with 50" bearing pins shows a cylinder comparison of 20" and a frost zone rating of 48". This compares with a traditional 20" diameter, 48" deep poured concrete foundation. For more information, please refer to the "Use and Applications" document at www.diamondpiers.com.



Q: What is the horizontal distance that the bearing pins extend from the center of the concrete head?

A: Please reference "Table 2. Horizontal Pin Distance for All Diamond Pier Models" on page 9 of the *Diamond Pier Installation Manual* found at www.diamondpiers.com.

Q: How can I tell if a Diamond Pier is damaged?

A: Inspect your Diamond Pier assemblies to ensure that no parts are flawed or have been damaged in shipping. Do not install a concrete pier if it has a structural crack. A structural crack is a fissure running internally into the head. It is perpendicular to the outer face of the head and runs inward to its core. This can weaken the strength of the pier head and/or allow water to penetrate and cause freeze/thaw problems in the concrete. Slight flaking or chipping on delivery or after installation is acceptable damage. If a concrete head has a structural crack, it should NOT be patched. It must be removed and replaced.

Q: How do I register for the Diamond Pier warranty?

A: Download the Limited Lifetime Warranty Application Form available at https://www.diamondpiers.com/installation-manual/register-product-warranty. Complete and submit the application within 30 days of project completion. Be sure to confirm receipt of your registered warranty by PFI.

Q: Can I mix Diamond Pier with traditional piers on the same project?

A: Yes, but consider the possibility of the traditional pier heaving. We have seen cases where the traditional concrete pier heaved and the Diamond Pier head held, which created opposing forces.

Soil:

Q: How do I know how strong my soils are and if they meet the requirements for Diamond Pier use?

A: Diamond Pier foundations sold through retail outlets are intended for use on a residential property. Typically, when a home is built, the soils are analyzed and recorded with the building department. Check with your local building department regarding presumptive soil values. Supporting soils that do not meet the presumptive soil strength defined in the applicable code will be communicated to you by your building department, in which case the bearing capacity may need to be determined by a soils investigation.

Q: Do I need to have soil tests performed to use Diamond Pier foundations?

A: If the presumptive soil capacity cannot be assumed in accordance with the IRC Table R401.4.1 (Presumptive Load-Bearing Values of Foundation Materials), the code official may request a soils report. This would apply to any foundation, not just Diamond Pier foundations. If the code official is allowing any other foundation types to be installed without a soils report, then the code official is utilizing presumptive soils values and should apply those values for the Diamond Pier foundation.

Q: How can I find the presumptive bearing strength of my soil?

A: Ask your local code official for soil information regarding your site. Additional soils information may also be available at the U.S. Geological Soils Survey website managed by the U.S. Department of Agriculture—see http://websoilsurvey.sc.egov.usda.gov/.

Q: Can a Diamond Pier foundation be used in all soil conditions?

A: Some soils may not be appropriate for supporting Diamond Pier foundations. Examples include soils that are weaker than 1500 psf, soils that are highly expansive, shifting or sliding soils, soils on slopes greater than 2:1 (27 degrees), contaminated soils, or soils where traditional concrete piers, accepted by local codes, are unable to provide adequate bearing to support the loads of the project or to protect the structure from the negative effects of frost heave. Where unsound soils exist, a registered design professional may be required to review the project.

Q: Can Diamond Pier foundations be installed in water/wet conditions?

A: Water is not the concern. The Diamond Pier footings may sit in water/wet conditions. The concern is the effect the presence of water may have on the strength of the soil. Soils can be weakened when they retain standing water or are improperly drained, and in certain types of soil this can also cause heave problems. A site depression with standing water or the potential for water to pond, pool, or saturate the soil may be an indication that the soil is not sound. Downspouts that discharge at or near a foundation may also cause soil problems, and setting a Diamond Pier foundation adjacent to any water body should be considered carefully. Depending on the variables involved, soils at the edge of or within lakes, ponds, rivers, streams, or tidal zones may be considerably weaker (as much as 40% or more) than dry or well-drained soils. Also, soils adjacent to existing foundations may have been improperly or loosely backfilled, which could cause poor drainage or poor soil conditions. Be sure to inform your project designer if any of these conditions exist.

Frost Heave:

Q: What is frost heave?

A: Frost is not an unusual or unsound soil condition unless the site has a history of locally accepted/code approved conventional foundations failing due to frost heave or freeze-thaw cycling. In frost zones, a properly drained, sound soil will freeze solid and hold its foundations tight. In heaving areas, water sources, the rate of temperature drop, and certain soil grain sizes can combine to cause pressures on foundations in all directions. The most important of these three factors is the soil type/grain size. The presence of water in high frost susceptible soils exacerbates the problem. Properly drained soils are important for all types of foundations.

Q: Is there an industry standard test for frost heave resistance?

A: To date there is no accepted methodology for determining the severity of frost force or for quantifying that force acting on a foundation. Therefore, no engineering calculation exists to determine “frost force,” nor is there any established testing methodology regarding frost protection for any foundation system or type. Absent any ASTM testing methodology for foundation systems in freezing conditions, the building code industry depends upon observational evidence as the basis for deriving a reasonable standard of performance for a given frost zone depth.

Q: What factors are responsible for a soil’s susceptibility to frost heave?

A: The key points from Edwin Chamberlain’s observations in *Frost Susceptibility of Soil Review of Index Tests* for the severity of heave in frost zone soils seem to revolve around some common criteria and/or the interrelationship of several possible factors. These include, but are not limited to, soil type, rate of heat removal from the soil, moisture content, overburden stress, and repeated freeze-thaw cycling.

Q: How do traditional footings resist frost heave?

A: The historical solution to mitigate negative structural impacts of frost heave on isolated point load footings for lightweight structures, such as decks, screen porches, gazebos, etc., has been to design a footing to be buried to an assigned depth. The standard practice, however, is based on trial and error. The current practice of installing an isolated point load footing in a frost zone soil is to start with setting the footing at an assigned depth based on frost history in the area. If the footing fails, then it is replaced with a deeper, bigger footing, with the belief that greater uplift resistance is achieved by making the foundation heavier. If that footing fails to resist frost heave, then best practice is to install an even bigger, deeper footing or to bell the base of the footing.

Q: How does the Diamond Pier footing resist uplift from frost heave?

A: Rather than reaching a specific vertical depth or gross weight, Diamond Pier foundations resist heave pressures with their wide-spreading pin pile groups. Embedded in the intact soil structure, the pins are prevented from changing angle under load by the concrete head, creating a stable foundation for both bearing and uplift forces. Because of the unique design of the Diamond Pier head, the pins are also free to move along their axes without compromising the position of the head or its lock on the pin cluster. This feature allows the Diamond Pier foundation to absorb soil strains caused by frost heave or expansive conditions without losing alignment or transferring these strains to the supported structure.

Q: Will a Diamond Pier footing resist frost heave in all conditions?

A: When assessing projects in extreme frost areas, be aware of sites where traditional concrete footings— 48" to 60" deep—have failed to resist frost heave, requiring larger, deeper concrete piers. Project sites that require concrete footings deeper than 60" to resist frost heave exceed the definition of normal soil conditions and the limits of a Diamond Pier footing as specified on the “Residential Diamond Pier Load Chart.”

Q: What does the "Frost Zone" depth mean on the load chart?

A: The "Frost Zone" depth indicates equivalent frost heave resistance compared to the depth of a traditional code-approved concrete footing. The corresponding Diamond Pier model resists frost heaves as well as a code-approved concrete footing with the same depth of the given frost zone.

Q: What is the study area of the 10-year frost study?

A: The study area for this discussion covers Minnesota extending into western Wisconsin, eastern North and South Dakota, northern Iowa, and Omaha, Nebraska. The total number of Diamond Pier model DP-50 and DP-75 footings installed in this area at the end of 2019 was 95,000; these were used in just over 14,200 projects.

Q: In the study area, what were the incidence rates over the 10-year period?

A: Considering all installed Diamond Pier footings in the study area, both conforming and not conforming to the *Diamond Pier Installation Manual* instructions, the following statistics were recorded:

- Percentage of projects reporting some type of movement – 70 divided by 14,200 = 0.00493, or ½ of 1%.
- Number of footings requiring intervention – 102 divided by 95,000 = 0.00107, or 1/10 of 1%.
- Number of footings requiring replacement – 39 divided by 95,000 = 0.00041, or 1/20 of 1%.

Such low incidence rates provide a statistical measure of acceptable performance, considering the many and varied soil conditions encountered in the frost zone.

Installation:

Q: What tools are required to install a Diamond Pier foundation?

A: You will need to assemble the following tools and gear:

- Automatic driving hammer with 1-1/8" hex shaft driving bit
- Square-edge shovel
- Sledgehammer
- Torpedo level
- Tape measure
- Pipe wrench
- Proper protective gear, including safety goggles, ear protection, insulated gloves, protective clothing, and boots

We recommend a minimum two-person crew for installation.

Q: What automatic hammers can be used to install a Diamond Pier foundation?

A: Any standard automatic hammer that will handle a 1-1/8" hex shaft can be used, provided it can be properly and safely controlled by the operator and not risk injury or damage to the concrete head. Soft or loose soils will allow for the use of lighter lower-energy hammers. Stiff or dense soils will require electric hammers in the higher impact range or standard jackhammers driven by compressed air. In most cases, the DP-50 and DP-75 are installed with electric hammers. Roto-hammers are not adequate.

Q: Is the automatic hammer necessary to drive in the pins?

A: Yes, do not attempt to drive the pins all the way down with just the sledgehammer; this may damage the ends of the pins or crack the concrete head. Also, do not use the pin driving bit as a hammering tool or hammer against it with the sledgehammer. It is to be used with the automatic hammer only.

Q: Does PFI have a list of some compatible electric automatic breaker/demo hammers?

A: Below is a list of some compatible breaker hammers:

- BOSCH Brute #BH2760VC 63-lb Breaker Hammer; Bit type: 1-1/8" Hex
- MAKITA Model #HM1307CB 35-lb Demolition Hammer; Bit type: 1-1/8" Hex
- HITACHI Model #H65SD2 40-lb Demolition Hammer; Bit type: 1-1/8" Hex
- BOSCH Model #11335K 35-lb Breaker Hammer; Bit type: 1-1/8" Hex
- MILWAUKEE Model #MXF368-1XC 64-lb Breaker Hammer; Bit type: 1-1/8" Hex

Q: Do underground utilities need to be identified prior to the Diamond Pier installation?

A: All underground utility lines must be located and properly marked by your local official utility locating service, and all privately run lines must also be identified and located by the proper authority. If there are any electrical lines in the area, de-energize the power source prior to installing the Diamond Pier foundations. Never allow bodily contact with uninsulated portions of the automatic breaker hammer. Wear properly rated rubber-insulated gloves and boots. In addition, if underground utilities are located on the site, check with your local utility locating service to confirm required safety zones. You must ensure that the horizontal pin distance for your foundation will have adequate horizontal clearance to be well outside all safety zones, including the 6" Diamond Pier (DP) Safety Zone (see Figure 2 and Table 2 on page 9 of the *Diamond Pier Installation Manual*). Do not install Diamond Pier foundations before all underground utilities have been located, marked, and de-energized.

Q: How closely can multiple Diamond Pier footings be placed together?

A: To meet the load bearing capacities shown in the “Residential Diamond Pier Load Chart,” Diamond Pier foundations must be spaced a minimum of 3 feet apart (from center of pier anchor bolt to center of pier anchor bolt). If they are spaced less than 3 feet apart, the bearing capacity must be reduced by 13% for each closer-spaced pier.

Q: How close can a Diamond Pier be installed to an existing foundation or other obstructions?

A: The Diamond Pier must be set in properly compacted soils, meeting the minimum requirement of 1500 psf. The piers must also be set back in the correct horizontal distance from existing foundations or other buried obstacles, as shown in Table 2 on page 9 of the *Diamond Pier Installation Manual*. Tributary loads from the supported structure must be properly calculated, and the piers spaced accordingly, so that each pier is supporting only up to its designated allowable load.

Q: How long will it take to install a Diamond Pier footing?

A: Installation time varies due to ground conditions and the experience of the installer. However, the Diamond Pier system installs much faster than other foundation systems, and you can build as soon as the system is set. See how fast it is in the “Installing Diamond Pier Foundation Systems” video found at www.diamondpiers.com/videos.

Q: How do I install the inspection plugs into the pins?

A: Install the inspection plugs in the ends of the pins that will go into the concrete head first. Align the slot in the plug with the interior weld bead and insert. The allowable tolerance in pin wall thickness means that some plugs will fit high in the end of the pin, and some will fit down almost to the plug shoulder. In either case, tap the point of the plug with a hammer to seat it firmly enough in the end of the pin so that it will not drop out as you slide it through the driving holes in the pier. Don’t worry that tapping the end of the plug with the hammer will blunt the point; it is not intended as a piercing or cutting tip, and this will happen anyway as the plug is driven into the soil. If a cut or burr is restricting the fit, try the other end of the pin.

Q: How do I easily find the intended center location of the Diamond Pier concrete head after I remove the topsoil?

A: Mark the location by using (X,Y) reference points that will easily identify the center location of the pier even after top soil is removed. Set a string line centered on the anchor bolt approximately 12-14" above the ground for a quick reference point and to maintain alignment.

Q: How do I set the concrete head in the ground?

A: Dig a tapered square hole the same size and shape as the bottom half of the concrete head. Soils directly below the head should be left loose. Then carefully lift the concrete head and position it in the hole to its midpoint. Ensure the top is level and centered on your alignment. Replace some of the removed soils back around the sides of the head at grade, lightly tamping to maintain level and alignment during pin driving.

Q: Can I bury the concrete head deeper to hide it from view?

A: The concrete head may also be buried for aesthetic considerations, but access to the top of the head needs to be maintained. Concrete slabs, patios, and other products already installed or to be installed MUST NOT interfere with the Diamond Pier foundation and the attached post/beam assembly. Expansion joints may be used to protect the foundation. Proper drainage must also be maintained.

Q: Does the post or post bracket need to line up exactly with the top of the concrete head?

A: The edges of the top of the concrete head do not have to align exactly with the sides of the post or post bracket as long as the bracket being used is fully supported by the concrete and providing proper weight distribution.

Q: How do I drive in the pins with the automatic hammer?

A: Slide the ends of the pins with the inspection plugs through the concrete head, making sure to support them so their weight does not roll the head out of the hole or out of alignment. Keeping the pin centered in the driving hole, carefully set each pin 6" to 12" into the soil tapping with the sledgehammer (gripped just below the hammer head) until the concrete head is locked into a level position. Impact the pin end squarely to minimize flaking of the concrete surface or deformation of the end of the pin.

Q: Is each pin supposed to be driven in all the way before moving onto the next pin?

A: No. Do not drive a pin all the way down at once as this may cause the head to be pulled to one side. With the pin driving bit installed on the automatic hammer, and another crew member holding the pin, drive in opposing pins alternately in increments. Temporarily drive all pins down to within 6" from the top of the head; this allows easier removal if an obstruction is encountered. When each pin is within 6” of the top of the head and alignment and level has been checked, finish driving the pins with the automatic hammer (with pin driving bit), being careful not to damage the precast concrete head or the upper ends of the pins and leaving approximately 3/4" of the pin protruding from the top of the concrete.

Q: What is the tolerance allowed for the concrete head’s levelness?

A: A 5-degree tolerance is allowed. If a concrete head is more than 5 degrees out of level, the symmetry of the pin pairs may be compromised, and the head should be removed and correctly reinstalled. Using a 6” torpedo level, the level should be within a quarter inch of level.

Q: What options are there to deal with obstructions to the pins?

A: If close to the surface, you can either dig up the obstruction and remove it, drive the pin past or through it, remove the soil plug and attempt to redrive it (requires building official approval), or remove the pins and realign the concrete head.

Q: When should I dig up and remove an obstruction?

A: If a pin stops moving when being driven in, STOP driving the pin. If the obstruction is close enough to the surface, it may be dug up and removed. Once accomplished, recompact the soils with the sledgehammer, and then reset the concrete head.

Q: When should I attempt to drive past/through an obstruction?

A: Be sure the other pins are at least half way in to stabilize the concrete head and ensure that the head will remain in place before trying to drive the obstructed pin in any further. Put a pencil mark on the pin by the head to indicate if the pin moves. Attempt to drive the obstructed pin with the automatic hammer for approximately 10 to 20 seconds, or give it one or two firm square hits with the sledgehammer, which may drive it past the obstruction. Many small rocks will roll, potentially allowing the pin to move directly past. If the pin begins to move, continue with the automatic hammer, but make sure that it is not being forced out of line. If its trajectory is off, this can cause an eccentric stress on the concrete head and crack it.

Q: When dealing with an obstruction, when should I remove the pins and rotate the head entirely?

A: If the trajectory is off or the pin will not go in at all, remove all the pins, rotate the concrete head around its center alignment, and reinstall to avoid the obstruction. The pier may also be relocated, within the parameters of your structure's design, if necessary.

Q: How do I remove pins that have already been driven into the ground?

A: The jacking method is used to spin and pry a pin out from the concrete head simultaneously by using a pipe wrench and a pry bar. This method works best when the pin is approximately 6" extended out from the concrete head. A pipe wrench, a flat bar, and a pry bar are required. Follow the instructions below to turn the pin while corkscrewing it upward. See also the pin removal video on the website (Removing Diamond Pier Foundations at https://www.diamondpiers.com/videos).

1. Using your right hand, place the pry bar flat against the concrete angle at the outer edge of the pier head and perpendicular to the pin to be removed.
2. With your left hand, place the pipe wrench on the pin and slide it down tight to the pry bar. The pipe wrench handle should be pointing up slightly and perpendicular to the pry bar to allow the pipe wrench to turn the pin as it is pried (see Figure 8 in the *Diamond Pier Installation Manual*).
3. Pull up on the pipe wrench handle to lock.
4. Pull up on the pry bar with your right hand to move the pin out approximately 1" to 2".
5. Slide the pry bar back to be flush with the concrete angle on the pier head.

Repeat lock and jack (steps 3–5) until the pin can be pulled out by hand.

Q: Are there any alternative techniques for pin removal?

A: For an alternate removal technique, an internal pipe locking tool with an electric impact wrench may be used to spin the pin and draw it from the concrete head.

Q: When should the pin caps be placed on the pins?

A: After driving the pins in fully, set the pin caps loosely on the ends of the pins so they can be removed for pin length inspection. After the field inspection has been completed, tap the caps down tight with the small hammer to seal them against the concrete.

Q: How do I fix a cap that won't go onto a pin?

A: If the caps will not go on, check the pin ends for any extreme deformations that may have occurred while driving. File or grind off any damage to re-establish the original diameter, and install the cap.

Q: What post brackets are compatible with the Diamond Pier foundation?

A: Check your local building code or building official to verify which post bases are acceptable in your area, and make sure to match the post size and loads on the post with the appropriate bracket size and bracket load ratings. Typically, these brackets come with a "standoff" design that separates the wood from contact with the base of the bracket and eliminates the need to drill into the bottom of the lumber to compensate for the raised anchor bolt. Most post-base brackets have a wide hole in the base that allows for horizontal adjustment of the final bracket location.

Q: Can a horizontal beam be set on a Diamond Pier foundation instead of a post?

A: Horizontal beams may also be set directly in an appropriate bracket for direct connection to the Diamond Pier foundation when constructing low-profile structures.

Q: When should the Diamond Pier foundation code inspection be done during installation?

A: A Diamond Pier foundation code inspection may take place at any time during or after installation and may be combined with the structural framing inspection as each jurisdiction warrants. The top ends of all pins need to be accessible for measuring pin lengths. If the project is low to the ground, make sure the inspection is done prior to installing the flooring.

Q: What is the length tolerance for Diamond Pier pins?

A: Pins are to be their full specified length without joints or coupling (length tolerance is ±1-1/2").

Q: Why am I having trouble keeping the concrete head level during installation?

A: One or more pins may be driving out of line due to obstructions in the soil or your hole for setting the concrete head may be too big. Only dig a hole the size of the head being used, and be sure to put all pins in the head before setting them. With all the pins sticking up from the head, one person can also push or pull on the pins to manipulate the leveling process and guide or steer the concrete head to a level position, being careful not to wrench on it and cause a crack.

Q: Can I install a Diamond Pier in frozen soil?

A: Check with the local building code for criteria or limitations on installing foundations in frozen soil. The soil will need to be thawed prior to installation.

Q: What do I do if the pins have risen slightly out of the concrete head?

A: This may occur when extreme loads have been applied to the pier, but the foundation is designed to relieve pressure in this way. The pins may simply be tapped back to their original position with a small hammer. Remove the caps, tap the pin, and replace the caps.

Q: What do I do if the pins will not fit into the concrete head?

A: Make sure the pins fit into the concrete head before inserting the inspection plugs. Be sure pins and concrete heads are free of dirt, and check both ends of pins for fit. Always transport and store parts in a clean environment. Measure the pin diameter to be sure the proper pins have been supplied for your pier model. (The DP-50 model has a 1" nominal pin with a 1.315" actual outside diameter [OD]; the DP-75 has a 1-1/4" nominal pin with a 1.67" actual OD.) If the pins still do not fit, contact your supplier.

Code Compliance:

Q: Is the Diamond Pier foundation compliant for use in all scenarios and locations?

A: The ICC-ES Equivalency Evaluation Report (IRC) EER-1895 addresses only conformance with the IRC sections noted below. For projects outside this equivalency evaluation subject in EER-1895, contact PFI for site-specific engineering.

Q: Which sections of the IRC are applicable to code compliance for Diamond Pier foundations?

A: The following IRC sections provide evaluations relevant to Diamond Pier foundations:

- 2024, 2021, 2018, 2015, 2012, 2009 and 2006 International Residential Code ® (IRC)
- Applicable Section(s): Figure R301.2(3) (Figure R301.2(4) for 2018 IRC and Figure R301.2(1) for 2021 IRC)
- R403.1, R403.1.4.1 with exceptions as applicable
- 2021 and 2018 IRC Section R507.3
- 2015 IRC Section R507.8.1

Q: Why are uplift and lateral loads not evaluated in the Diamond Pier foundation's code compliance?

A: Uplift and lateral loads were not evaluated by the ICC-ES in ESR-1895 because uplift and lateral loads are not a requirement of foundation assemblies. There is no requirement for uplift or lateral loads on a foundation in the IRC codes. IRC Section 507 does not apply an uplift or lateral load requirement for prescriptive deck footings. The uplift requirements in the IRC codes only reference wind uplift in Section R802, and those requirements apply to the framing structure, not the foundation. However, following Section R104 ("The intent of the code must be enforced"), it is vital that a proper plan review encompasses the intent to properly support the structure. In response, PFI has provided Third Party Accredited Tests for uplift and lateral loads. These test reports may be found at www.diamondpiers.com.

Q: What do I need to do if a project requires uplift and lateral loading capacities?

A: For conditions where uplift and lateral loading capacities are required, contact PFI for 3rd party accredited testing reports. The IAS-Accredited Diamond Pier Uplift and Lateral Load Field Tests provide evidence of equivalent or better uplift loads when compared to a traditional concrete foundation assembly. The Diamond Pier DP-50 with 50" pins provides 1200 lb of uplift resistance in 1500 psf minimum soils per 2018 IRC Table R401.4.1. The Diamond Pier DP-75 with 63" pins provides 1600 lb of uplift resistance in 1500 psf minimum soils.

Q: What documents do I need to provide to get a permit for my Diamond Pier project?

A: Along with the information requested by the municipality, it is important to submit code compliance documents, a detailed drawing of the Diamond Pier product, a drawing showing the layout and spacing of the piers, and information indicating that the design loads are in accordance with the "Residential Diamond Pier Load Chart." You may also need to include frost performance documents, which are available on the Diamond Pier website—go to www.diamondpiers.com and click on Residential.

Q: What documents are available from PFI as evidence of code compliance for permit approval?

A: PFI provides ICC-ES evaluation reports ESR-1895 and EER-1895 and the Wisconsin UDC Product Approval form 201612-O as evidence of code compliance. These code documents provide evidence of compliance for the DP-50 and DP-75 models when used for projects that meet the intent defined in ESR-1895 section 2.0 as decks, covered decks, walkways, stairways, and accessory structures. For municipalities that are not governed under the IRC structure, PFI provides the evaluation service report, state or municipal product certifications, or third-party testing reports as satisfactory evidence of compliance for your building code official.

Q: Does the compliance evaluation from Diamond Pier foundation's EER mean that I don't need to submit plans to use Diamond Pier foundations to a code official?

A: No. The end use application of the schematic plans, details, and tables in the EER must be submitted to a code official for approval. The exemptions for requirement to stamp the schematic plans, details, and tables by a registered design professional must comply with the licensing laws in the state in which the project is to be constructed.

Q: My project exceeds the scope of use for DP-50s and DP-75s but I'd still like to use Diamond Pier foundations, is there a larger model that I can use?

A: For projects that exceed the capacities defined in the "Residential Diamond Pier Load Chart," or for projects beyond the scope defined above, larger Diamond Pier models are available through PFI's "Special Order Services," which provides a site-specific capacity review. PFI offers Project Services to analyze site-specific soils data and structural loading information, which must typically be provided by a registered design professional. With this information, PFI is able to provide a Manufacturer's Capacity Analysis for an Engineer Stamped Submittal. Contact PFI for specific requirements, as well as the typical time frame and fees for Project Services review. For further information, go to www.diamondpiers.com/engineered-projects.

Q: On what basis does a code official accept or deny the use of Diamond Pier foundations for structures requiring frost protection?

A: Section 5.3 of ESR-1895 states: “In areas where the frost line exceeds 12 in. (305 mm) footing depth, decks on inclined steel foundations and their connecting heads attached to a frost protected structure may be approved by the code official, as indicated in the 2024 and 2021 IRC Section R507.3.3, Method 3 (e.g. using manufacturer’s documentation on frost depth ratings for various model sizes for specified frost line defined in Table R301.2.(1)).
For earlier IRC editions, decks on inclined steel foundations and their connecting heads attached to a frost protected structure may be approved by the code official, as a described in Section R403.1.4.1 Method 1 (e.g. using manufacturer’s documentation on frost depth ratings for various model sizes for specified frost line defined in Table R301.2.(1)). For free standing decks, reference IRC Section R403.1.4.1. Exception 3.
Per ESR-1895 and EER-1895, the code official is instructed to use the frost zone rating specified in the “Residential Diamond Pier Load Chart” to verify equivalent frost depth requirements for their jurisdiction. The plan review process renders a code-based reason for acceptance or denial on the use of a code-compliant product on a project-by-project basis. This process considers how the product is to be used and whether that use meets the intent of the code. If you feel that you have been denied the use of the Diamond Pier product without a proper code-based reason for the denial, please email PFI at code@diamondpiers.com.

Q: Can I use Diamond Pier foundations for projects in severe weathering classifications?

A: Yes, the inclined steel foundations and their connecting heads, the Diamond Pier system, are permitted for use in any of the weathering classifications defined in 2024 and 2021 IRC Figure R301.2(1), or 2018 IRC Figure R301.2(4) or 2015 and 2012 IRC Figure R301.2(3).

Q: Can I use all Diamond Pier models in Wisconsin?

A: In order to be in compliance with the frost protection requirements of SPS 321.16 of the current Wisconsin Uniform Dwelling Code (UDC), Diamond Pier Models DP-50 and DP-75 precast concrete pier foundation assemblies shall utilize steel bearing pins that are at least 50” long when frost protection is required. Minimum 50” long steel bearing pins are also required when foundations must resist uplift or horizontal loading.