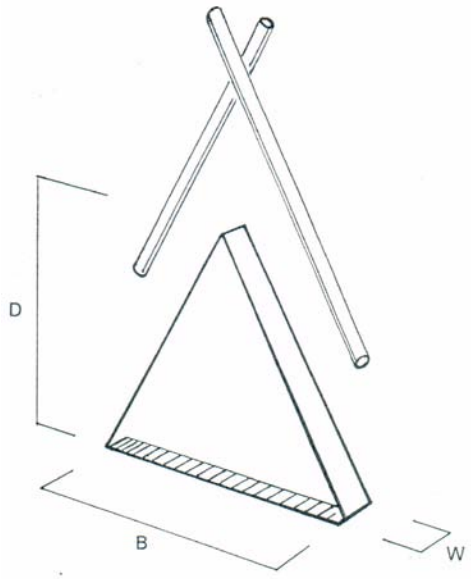
DiamondPier®
FOUNDATION SYSTEM

# PIER CAPACITY ANALYSIS OVERVIEW

This overview presents the techniques that we use in determining the capacity for the Diamond Pier system. Our design methods are based on sound and accepted geotechnical engineering principles and have been reviewed by qualified and competent professional engineers. The capacity calculations result from over two decades of study and testing and will continue to evolve as our knowledge and experience grow.

Diamond Pier foundations differ from traditional vertical pile foundations in that the length of the pin is determined before construction, and no driving resistance has to be achieved before installation is complete. This is possible because the mechanism a Diamond Pier foundation uses to transfer load at the pile-soil interface is unique. Vertical piles rely on sliding frictional resistance along the length of the pile and point resistance at the pile tip to transfer the applied load. Diamond Pier foundations, however, utilize the pressing action of the pin against the soil around it and along the length of the pin to transfer load. Our bearing capacity analysis works on the principle that a coherent soil mass develops around the pin and propagates the applied load downward and radially outward, the degree of which is dependent on the soil conditions encountered. Although the pin does develop some sliding and tip resistance, those benefits are not considered in the interest of being conservative and eliminating complexity from the calculations. The Diamond Pier uplift and lateral resistance works on the same pile-soil interface principle, but bearing capacity usually governs most designs.

Our bearing analysis combines two pins to form a rigid A-frame and calculates the capacity of the soil wedge between the pins. That soil wedge (shown) represents an equivalent spread footing along its base, with the length (B) being the distance between the pin tips and the width (W) defined by the arching factor. The arching factor, a function of specific soil characteristics, describes how the load radiates outward and engages soils beyond those immediately below the pin, typically 2 to 3 times the pin diameter. The depth (D) of the equivalent footing is measured vertically from the surface of the soil down to the tip of the pin. This value can be adjusted, if needed, to account for neglected soil near the surface that does not contribute to the overall bearing capacity of the system. Using these dimensions, along with the soil's phi angle, unit weight, and cohesion, we calculate the Diamond Pier foundation's capacity using the same accepted general bearing capacity equation used to design traditional shallow foundations. The Diamond Pier foundation's design capacity is made more conservative by assigning factors of safety to the derived values.




The concrete portion of the Diamond Pier foundation combines four pins into two rigid A-frames and provides a flexible connection system to the supported structure. The concrete pier head has undergone significant research and development to ensure it is strong and durable. The concrete has been laboratory and field tested to simulate the conditions that will be encountered in many service environments, including freeze-thaw conditions. We continuously test new concrete designs and reinforcement options in an effort to improve the Diamond Pier foundation and its maximum load rating.



4810 Pt Fosdick Dr NW, PMB 60
Gig Harbor, Washington 98335
**www.pinfoundations.com**

PIN FOUNDATIONS INC

**Toll Free:** 866-255-9478
**Main Office:** 253-858-8809
**General Email:** info@pinfoundations.com