

BOLT CAGE INSTALLATION WW



FOUNDATION CONSTRUCTION



Why Terracon?

Resourceful. Terracon applies new processes, methodologies, and techniques to solve project challenges cost effectively. Our innovative tools and resources enable us to customize an approach to efficiently mitigate and prevent risks.

Responsive. Through our national network of offices, accredited laboratories, and exploration fleet, Terracon can act quickly to develop a customized approach to provide you the most cost-effective program to develop the right data for you.

Reliable. We deliver high-quality, expert soil and rock characterization using diverse exploration methods and software. This ensures the accurate and precise results you need to successfully mitigate risks.

"Terracon's innovative wind foundation design will literally change the industry. As the generators increase in size, towers increase height, and rotors increase in length, our foundation design makes the most sense. The cost savings and risk reduction are irrefutable."

-BLAIR LOFTIS, VICE PRESIDENT AND NATIONAL DIRECTOR OF POWER GENERATION & TRANSMISSION, TERRACON



Contacts

Mark Underhill, RG, LHG
Wind Program Manager
D (503) 742-7180
M (971) 732-2329
mark.underhill@terracon.com

Blair Loftis
VP | National Director
D (503) 659-3281
M (503) 502-3056
blair.loftis@terracon.com

Mike Heller
National Sector Leader
D (860) 929-7838
M (860) 306-4718
mike.heller@terracon.com



Nationwide
Terracon.com

- Facilities
- Environmental
- Geotechnical
- Materials



GRIP TERRA ANCHOR FOUNDATION



PATENTED ANCHOR CONSTRUCTION
CONFIDENTIAL TEXAS LOCATION

Renewable Energy | GripTerra Anchor Foundation

Meeting Future Energy Demand Starts with Today's Projects

We recognize the need for a foundation option designed for not only today's technologies, but for tomorrow's larger turbines, longer rotors, and taller towers. Terracon's patented design addresses that very need.

Supporting wind turbines utilizing a steel monopole tower, GripTerra's Anchor Foundation is specifically created for today's renewable energy needs as well as tomorrow and beyond. This Terracon-owned, foundation consists of a large diameter, cast-in-place concrete annular cap with post-tensioned soil or rock anchors.

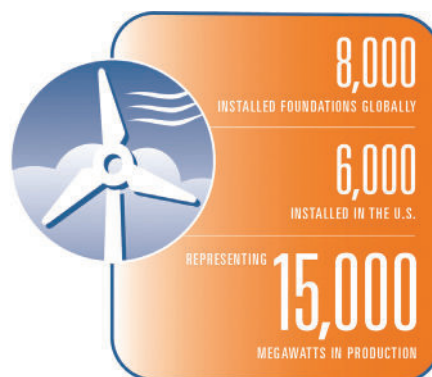
Designed in harmony, the cap and anchors can be optimized with respect to construction cost. The anchors are a significant component in resisting the loads imparted by the wind turbine and are designed to resist those loads by adjusting the quantity, diameter, and depth. Increasing the size of the cap can also help in managing loads.

Additionally, since anchor quantity and size are adjustable, and the cap can be constructed on the ground surface, this foundation is ideally suited for challenging sites with weak soils and high groundwater.



GripTerra's Anchor Foundation Benefits

- Cost savings in earthwork and materials
- Increased service life by eliminating foundation fatigue
- Ability to repower keeping pace with technology





CONCRETE FOUNDATION TESTING



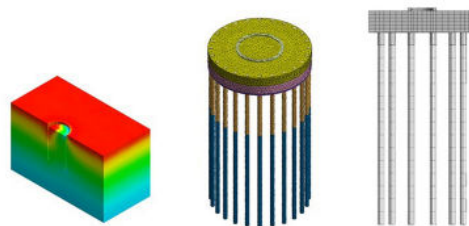
Why Terracon?

Resourceful. We can prevent or resolve a wide variety of issues through our extensive experience and in-depth knowledge of both traditional and new roof and enclosure systems and products.

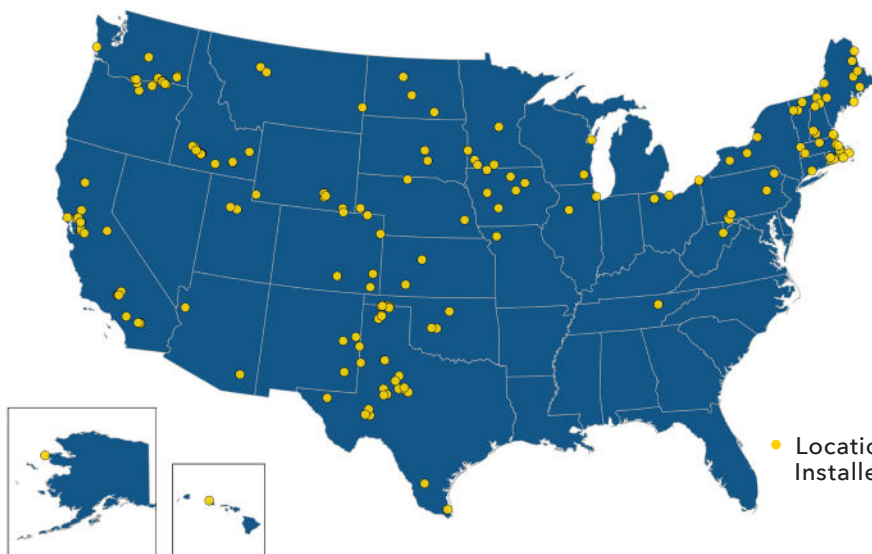
Responsive. With our national network of offices, we can mobilize quickly to deliver practical solutions that optimize your building's systems performance with the goal to extend service life and reduce cost of ownership.

Reliable. We deliver consistent service and high quality through our proactive, collaborative approach, yielding systems that perform beyond expectations and maximize your return on investment.

Component View of Finite Element Mesh



Terracon performs finite element analysis using Midas GTS NX and Plaxis 3D software to model the foundation systems and evaluate the geotechnical and structural capacities of these foundations to support the wind turbine load.



in all **50** states

Offices Nationwide



• Locations of Various Installed Foundations

Contacts

Mark Underhill, RG, LHG

Wind Program Manager

D (503) 742-7180

M (971) 732-2329

mark.underhill@terracon.com

Blair Loftis

VP | National Director

D (503) 659-3281

M (503) 502-3056

blair.loftis@terracon.com

Mike Heller

VP | National Sector Leader

D (860) 929-8738

M (860) 306-4718

mike.heller@terracon.com



Nationwide

Terracon.com

- Facilities
- Environmental
- Geotechnical
- Materials



GRIPTERRA PIER FOUNDATION



TERRACON'S GRIPTERRA CONSTRUCTION
CONFIDENTIAL CALIFORNIA LOCATION

Renewable Energy | GripTerra Pier Foundation

Answering Wind Power's Rapid Demand with New Technology and Sustainability

The wind market has seen a rapid change in recent years in that land-based turbines are generating more electricity through bigger turbines, taller towers, and longer rotors. All of this results in larger loads being imposed on the foundations. With foundations approaching 1,000 cubic yards of concrete, it is time for a new and smarter design.

Terracon's patent-pending GripTerra Pier Foundation now offers increased design and construction flexibility at the same time embracing the principals of sustainability that are key to the industries success. Enhanced by a new concrete collar, the GripTerra Pier Foundation is designed specifically to address today's 3 to 6 MW turbines.

The addition of the collar increases the resistance capacity of the pier by creating a zone of improved ground around the upper portion of the pier which reduces movement at the surface. Significant advantages of the GripTerra Pier Foundation include improved soil stability, a reduction in excavation, concrete, steel, and overall carbon footprint, and increased design flexibility. These advantages mean foundations for large turbines can be design and built at a significant cost savings and allow for

economical re-powering and design life extension solutions.



Design Optimization

The collar with the foundation is designed to support wind turbines utilizing a steel monopole tower. The collar design further augments the resistance capacity of the pier by creating a zone of improved ground directly around the upper portion of the pier, reducing movement at the surface. Significant advantages of the new design are universal soil stability and flexibility. This design also creates the ability to repower/rehabilitate existing towers with minimal modifications that extends the life of the original foundation saving considerable time and expense.

The Terracon-owned, patent-pending design is already in the market supporting today's larger turbines. This next generation turbine foundation better positions wind power in this highly competitive and increasing market and allows you to make informed decisions for your renewable energy sites.





COLLAR CONCRETE POUR
CONFIDENTIAL CALIFORNIA LOCATION



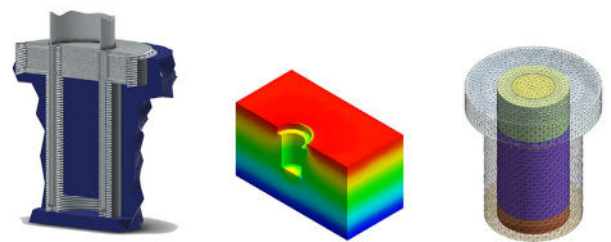
Why Terracon?

Resourceful. Terracon applies new processes, methodologies, and techniques to solve project challenges, saving time and expense. Our patent-pending collar design offers greater optimization and the ability to customize an approach to increase the service life of wind turbine foundations.

Responsive. Through our national network of offices, accredited laboratories, and exploration fleet, Terracon can act quickly to develop a customized approach for challenging ground surfaces, including weak soils and high groundwater.

Reliable. We deliver high-quality, expert soil and rock characterization using diverse exploration methods and software. This ensures the accurate and precise results you need to successfully mitigate risks.

Component View of Finite Element Mesh



Terracon performs finite element analysis using Midas GTS NX and Plaxis 3D software to model the foundation systems and evaluate the geotechnical and structural capacities of these foundations to support the wind turbine load.



• Locations of Various Installed Foundations

in all **50** states

Offices Nationwide



Contacts

Mark Underhill, RG, LHG
Wind Program Manager
D (503) 742-7180
M (971) 732-2329
mark.underhill@terracon.com

Blair Loftis
VP | National Director
D (503) 659-3281
M (503) 502-3056
blair.loftis@terracon.com

Mike Heller
VP | National Sector Leader
D (860) 929-8738
M (860) 306-4718
mike.heller@terracon.com



Nationwide
Terracon.com

- Facilities
- Environmental
- Geotechnical
- Materials