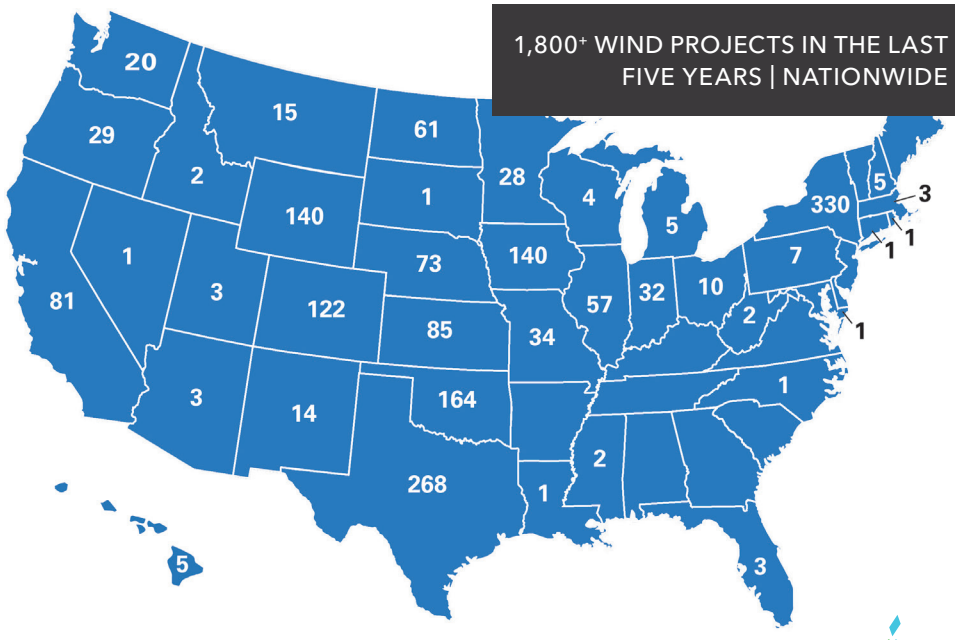
PONNEQUIN WIND TOWERS
WELD COUNTY, COLORADO



Power Generation and Transmission | Wind

GripTerra℠

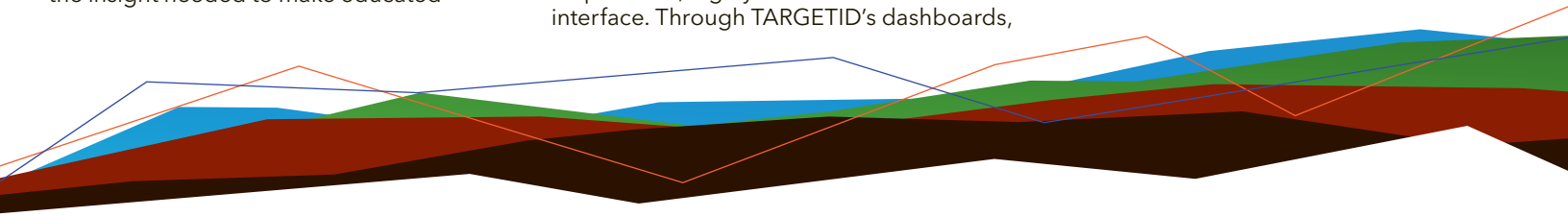
Wind energy is a growing renewable alternative for electricity generation. Terracon is uniquely qualified to help clients optimize wind energy project design and minimize risk, saving time and money. In the past five years, Terracon has supported more than 600 wind projects across 38 states. We understand the challenges of wind projects from early stage development to post-construction needs.

Development
Terracon has more than 50 years of historical projects and by using a GIS platform has retrieved more than 1,000,000 datapoints across the country, georeferenced each, and developed metadata that allows for easy and fast retrieval. Because of this, we can provide a virtual boring log with preliminary geotechnical data; and by pulling from more than 750 public databases, we can address the potential for subsurface contaminants, natural and cultural resources, wetlands/waters, and threatened and endangered species at your site. Using this data and the experience of local scientists and engineers, Terracon provides a report of anticipated conditions at a site called a Stage1. This report sets the stage for the development of a smart exploration and survey plan that focuses on areas of concern and develops the insight needed to make educated decisions in the early stages of project development, maximizing the allocation of development capital.

Design
Terracon's GripTerra℠ (GripTerra) family of wind turbine foundations are designed specifically to address today's 3 to 6 MW land-based turbines, utilizing earth-friendly designs which reduce both materials and construction time, offer re-powering and design life extension solutions, and reduce the overall carbon footprint of your next project. Terracon's GripTerra Pier Foundation offers greater optimization and sustainability with a new patent-pending collar design that is already supporting today's fleet of larger turbines. We also recognize the need for a foundation option that has the flexibility of being constructed in suboptimal geologic and hydrogeologic conditions. Terracon's patented GripTerra anchor foundations address those very needs.

Construction
During construction, our materials testing and inspection technicians utilize TARGETID, an unprecedented, technological advantage in the industry, which leverages geospatial information to collect, communicate, and report materials testing results through a map-centric, highly visual and interactive interface. Through TARGETID's dashboards, clients and project stakeholders can quickly and easily identify, assess, and address any deviations to keep the project on schedule.

Post-Construction
It is critical that a wind turbine system meets the manufacturer's specifications for rotational stiffness. Traditionally rotational stiffness is calculated using data collected from instruments placed at the tower base. Using this method, Terracon's experience showed a lack of correlation between the calculated rotational stiffness and observed conditions in foundations and surrounding soils. Partnering with GE Renewables, Terracon developed an award-winning, innovative approach utilizing an algorithm, which converts the accelerometer data already being collected at the nacelle from the time domain to the frequency domain. Once converted, we can identify the natural frequency and back calculate the rotational stiffness and overturning moment of the foundation system. The methodology, developed by Terracon, is faster, less expensive, and more accurate, can be used to evaluate wind turbine system performance for the purposes of re-powering, design life extension, and performance monitoring.



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- Materials

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

ENR Rankings 2023

- #1 *Asbestos and Lead Abatement*
- #11 *Top 100 Pure Designers*
- #20 *Top 500 Design Firms*
- #44 *Top 150 Global Design Firms*
- #63 *Top 200 Environmental Firms*

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Terracon

GripTerra

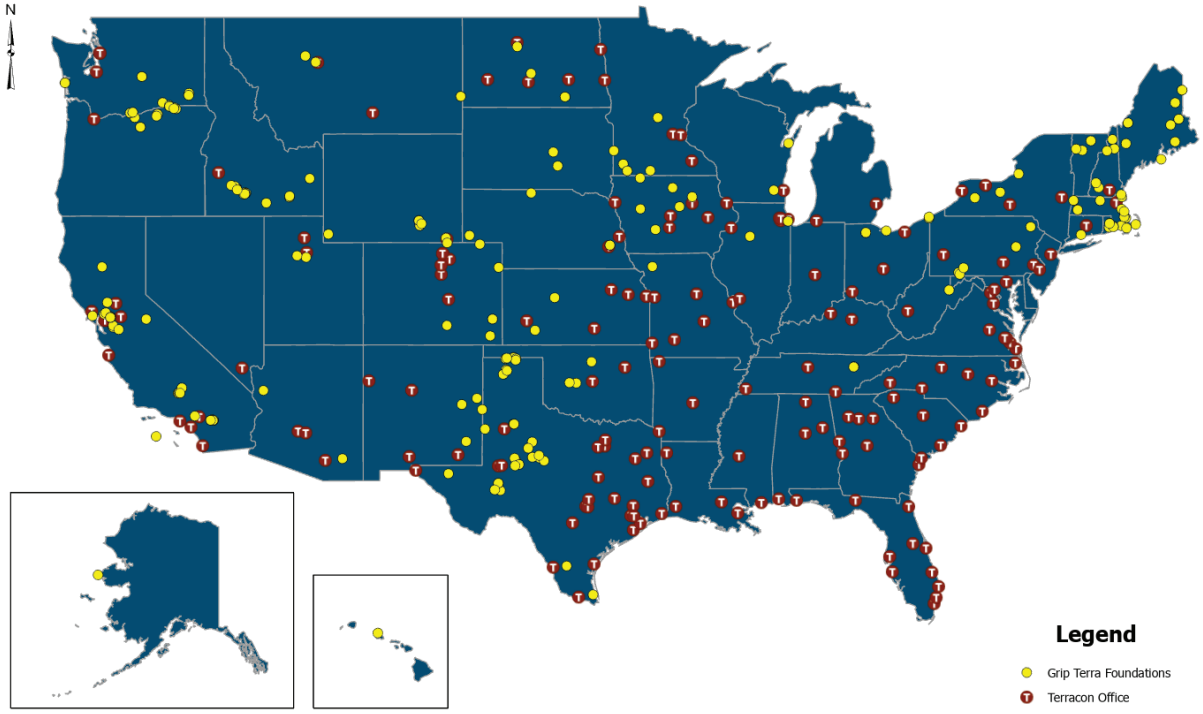
for Power Generation & Transmission

A SUSTAINABLE SOLUTION FOR BIG WIND

Larger loads and decreased material cost. Terracon's suite of innovative GripTerra foundations have been specifically designed to handle the increased loads of this generation's massive wind turbines while requiring less concrete and steel than last generation's conventional foundations.

Explore with us.

All the foundations are designed with the forward-looking expectation of repowering so that the foundation can be reused for a larger wind turbine in the future.



Benefits include:

- Designs for up to 6 MW turbines.
- The pier design is perfect for sites with a deeper water table and stiff dry soils.
- The anchor designs are optimal for sites with more challenging conditions, such as shallow groundwater, soft soils, or rock and other restrictive layers.
- The pier uses 60% less concrete, 40% less steel, and requires up to 80% less earthwork than a traditional spread foot foundation.
- The anchors use 60% less concrete and 70% less steel than the spread food foundation and they require no earthwork.
- GripTerra foundations create a smaller land disturbance footprint.
- GripTerra foundations are optimal in addressing seismic concerns.
- Extended design life due to no fatigue-related stress.
- Convenient for repowering.
- Material savings of these optimized designs results in a foundation with a reduced carbon footprint and a positive impact upon climate change.

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Scan the QR code to learn about Terracon's Environmental Services!

PROJECT LIFECYCLE

SELECT SITE

- Pivvot siting analysis
- Pivvot property area analysis
- Pivvot routing analysis
- Stage 1 – predictive geo-analytics
- Foundation Compatibility evaluation
- Predictive Foundation Analysis
- Virtual soil profiling
- Soil basis classification

DESIGN/MITIGATE

- Geotechnical exploration
- Geophysics
- Issue for bid (IFB) plans and specifications
- Issue for construction (IFC) plans and specifications

CONSTRUCT

- Observation and inspection during construction
- Ongoing consultation
- Materials testing and special inspection

MANAGE ASSETS

- Instrumented foundation performance analysis

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