

Foundations for Renewable Energy



ENERGY
STORAGE

magnumpiering.com
800-822-7437

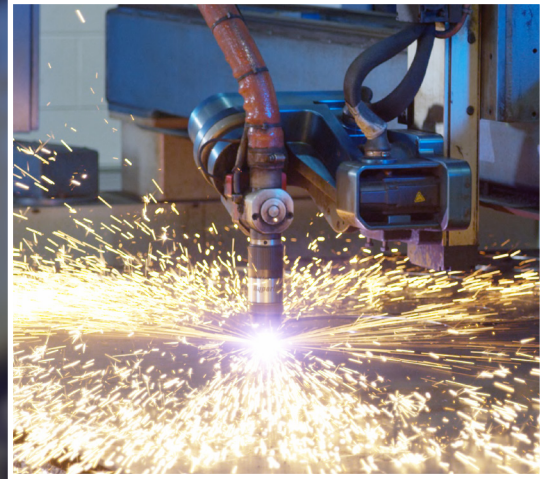
MAGNUM[®]
P I E R I N G
designed to support

Fabrication & Quality Control

“...these foundations undergo continuous, multi-step, quality control process including 3rd party inspections.”

MAGNUM's Difference

MAGNUM's process industry foundation systems are designed to order to ensure compatibility with any equipment, skid, pipe arrangement or larger foundation system. Steel foundation systems utilizing helical piles offer extremely versatile solutions for your project; overcoming difficult site conditions and increasing production rates for difficult schedules. MAGNUM® Helical piles can be installed quickly with no vibration and no soil spoils. All-steel foundation systems do not require any curing time, allowing for immediate pipe or equipment installation. Helical piles can be smaller than single concrete caissons and require minimal crew and installation equipment. These pile systems can be installed in congested areas with low headroom to minimize outages. All of this means mobilization costs and schedules are reduced and up-time is increased. Rapid construction times can be as little as a single day.



Fabrication and Quality Control

MAGNUM® foundation systems are manufactured in the USA according to our ISO 9001 approved Quality Program. Each part of these foundations undergo a continuous, multi-step, quality control process including 3rd party inspections. With highly skilled crews of fabricators, manufacturing turnaround can meet even the tightest schedules.



**Quality,
Designs,
Constructibility,
Experience,
and Safety
You Can Trust**



On Schedule

Shipping and Logistics

Timely and efficient job site deliveries are critical for keeping construction projects on schedule. Leveraging the latest technologies can provide real-time visibility, optimize routing, and streamline logistics operations, ensuring materials and equipment arrive precisely when needed.

All of Magnum's foundation systems are manufactured to order in Cincinnati, Ohio. Our 140,000+ square foot fabrication facility operates state of the art equipment increasing our manufacturing times and enabling us to better control quality.

Clear and consistent communication with suppliers and carriers is another essential aspect of efficient job site logistics. Our proactive communication ensures that all parties involved are aware of the delivery schedules, site access requirements, and any specific handling or storage needs.



Buy American Act

All MAGNUM® Piering, Inc. products are manufactured in the United States. The raw materials used to produce our products are manufactured in various United States Steel Mills. All materials meet all provisions of the Buy American Act.

If you have any questions or need any further information please do not hesitate to contact me.

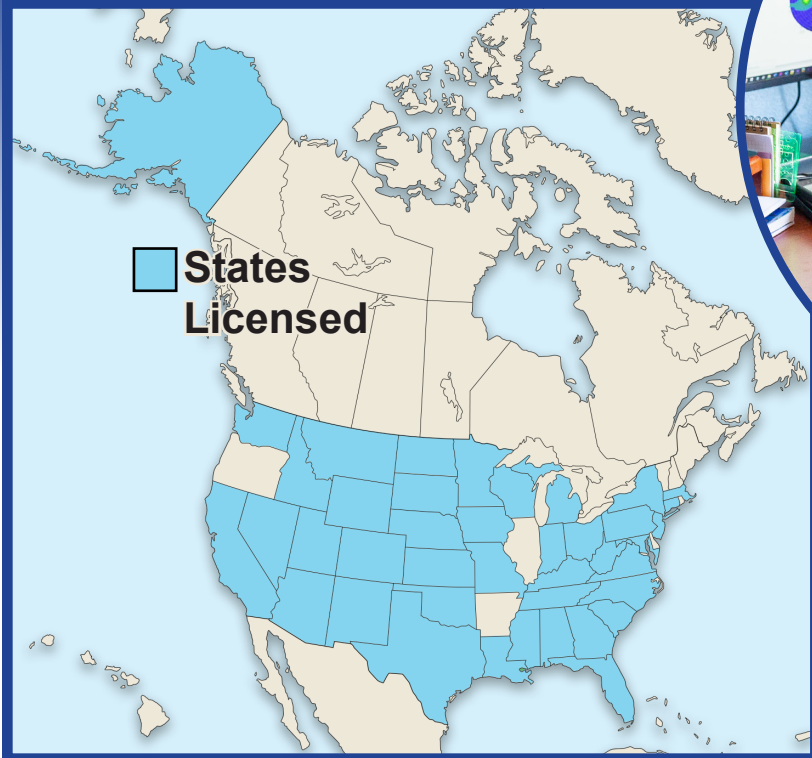
Thank you,

Todd Paddock
Vice President Manufacturing
Office 513-759-3348 ext. 237

MAGNUM[®] Geo-Solutions

Engineering Services

Licensed in nearly all states and equipped with a growing database of over 3,000 project sites, Magnum's staff of foundation engineers are able to apply its experience to assist projects throughout the United States. From support during bidding and design process to turn-key industrial foundation designs, load testing, and field observation, they ensure quality all the way through to project completion. Trust is their goal.

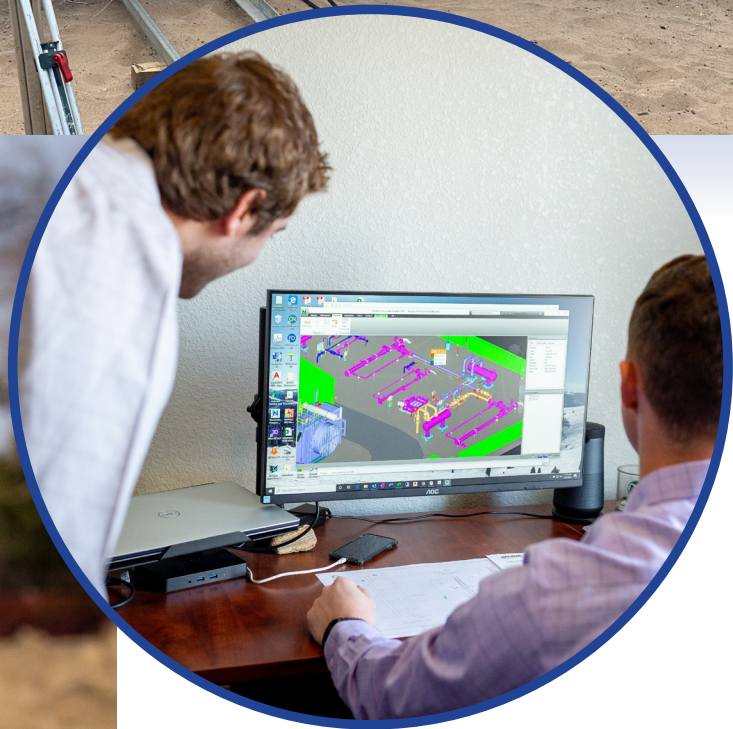


Typical Projects

- Midstream processing equipment foundations
- Process piping & pipeline supports
- Structural steel support frames & foundation
- Foundation repair and underpinning
- New construction piles
- Tension anchors
- Highway and bridge repairs
- Tiebacks, Shoring
- Concrete-less foundations
- Slab lifting and void filling
- Earth anchors and slope stabilization
- Retaining wall design
- Load testing assistance
- Structural Steel Support Frame



Tested - Proven



Services:
Compression Load Testing
Tension load Testing
Lateral Load Testing
Site Observation
Quality Control

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PIERING

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RE Renewable Energy

Industry and the Marketplace

The United States is a resource-rich country with abundant renewable energy resources. As the need for energy and a modernized grid system increases, solar, hydro, wind, and geothermal sources are being tapped into at a higher rate than ever. Storage technologies such as batteries are being coupled with these resources to capture the energy generated and ensure efficient utilization and resiliency in the system. The expansion of these generation and storage technologies is key to achieving a sustainable future.

Advantages of renewable energy projects:

- **Reduced carbon emissions and air pollution from energy production**
- **Enhanced reliability, security, and resilience of the power grid**
- **Job creation through the increased manufacturing of technologies**
- **Increased U.S. energy independence**
- **Lower energy costs**



MAGNUM's Place in this Market

Deployment of renewables and energy storage projects have started to dominate the energy construction market, representing over three-quarters of the total new capacity added. This expansion is great news, but can present many issues with supply chain and construction resources.

MAGNUM® Piering's products and services solve many challenges that developers, engineers and construction firms face. Providing value-engineered designs utilizing helical piles and directly connecting steel cap foundations creates many advantages including safety, cost, improved installation schedules, and many more.

- **Value engineering to reduce required project materials**
- **Lower carbon footprint technology vs. concrete**
- **Improve project timelines**
- **Domestic content**
- **Brownfield development friendly**
- **Removable if sites need to be upgraded or reclaimed in the future**



Helical Piles

Our product lines range from 2-7/8" diameter piles up to 18-5/8" diameter, including custom design sizes. Our value engineered pile designs make any commercial job efficient and safe. Limited access installs are not an issue when using helical piles. These piles don't create ground spoils, don't need concrete or grout and still provide high capacities.

We have a pile solution for whatever your capacity needs may be. High production rates mean no lost time on the job site. A variety of pile cap connection options are also available

We design helical piles for a rapid and precise install in the most challenging soil conditions. Our patented Dual Cutting Edge Helix helps cut through tough material. Combine this with our moment balanced helices and you will achieve an extremely accurate install with minimal to no walking or wobbling of the pile during installation.



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PILE DRILLING

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Advantages:

Capacities of 250 tons and higher

Variety of Pile Cap connection options.

Value Engineered Designs

High Production Rates

No Spoils, No Concrete or Grout, Clean

Limited Access Installs

Smaller Crew Size

SAFE!

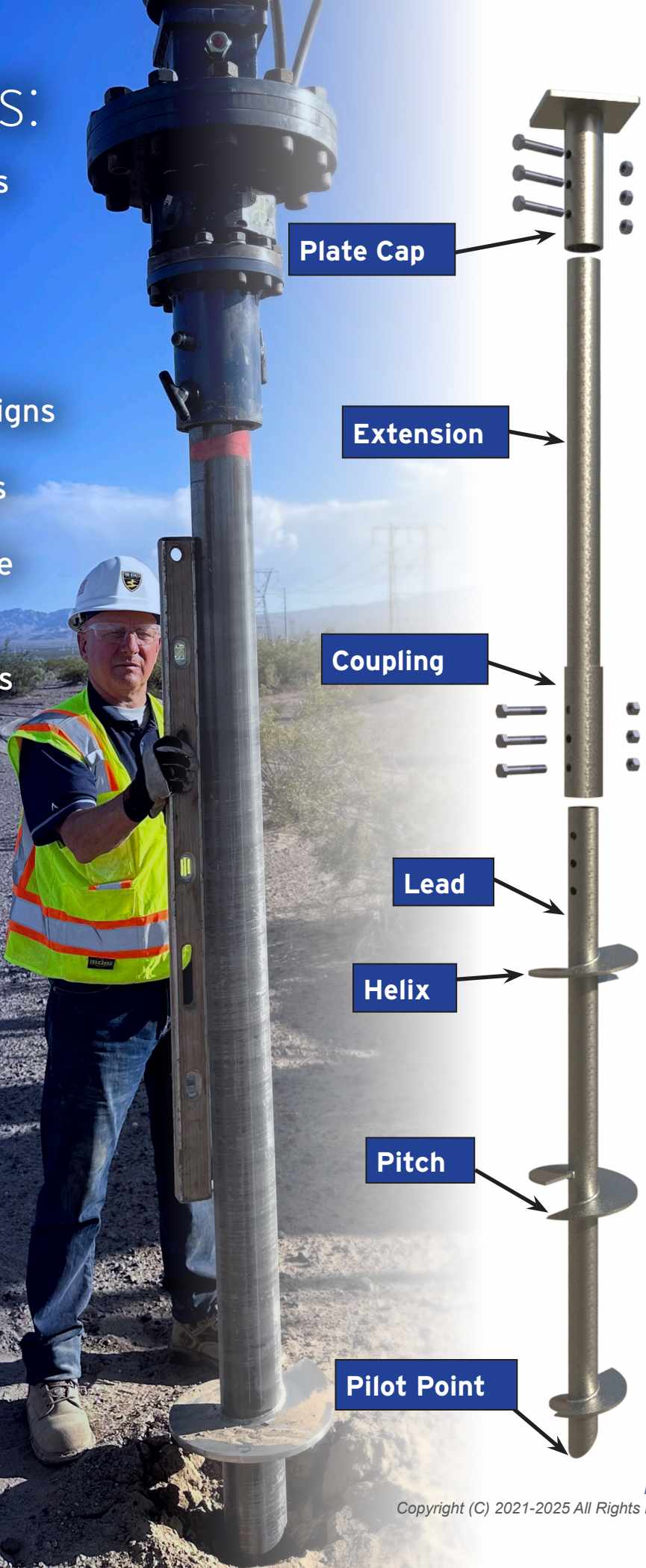


Plate Cap

Extension

Coupling

Lead

Helix

Pitch

Pilot Point

Applications: **STORAGE**

As the world transitions towards a more sustainable and reliable energy future, Battery Energy Storage Systems (BESS) are emerging as a crucial technology.

Our steel foundation systems can support more than these battery containers; any of the steel based components are candidates for elimination of concrete footings. These may include:

- **Battery containers**
- **Transformers**
- **Generator Sets**
- **Switchgears**
- **Control Enclosures and Shelters**
- **Cable Trays**
- **PCS Units**
- **MPT Units**



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When used in conjunction with a steel foundation, MAGNUM® MHC1060 caps are designed to offer vertical adjustment of the cap plate after the helical piles are installed and allow field bolting without the need for any cutting, drilling or field welding.

Compression forces are supported by direct bearing on the cap end plate. Any uplift forces are resisted by bolted connections that employ patent pending steel connections on the corner piece.

The caps also offer a horizontal position tolerance of up to 2 inches in any direction from the planned pile location

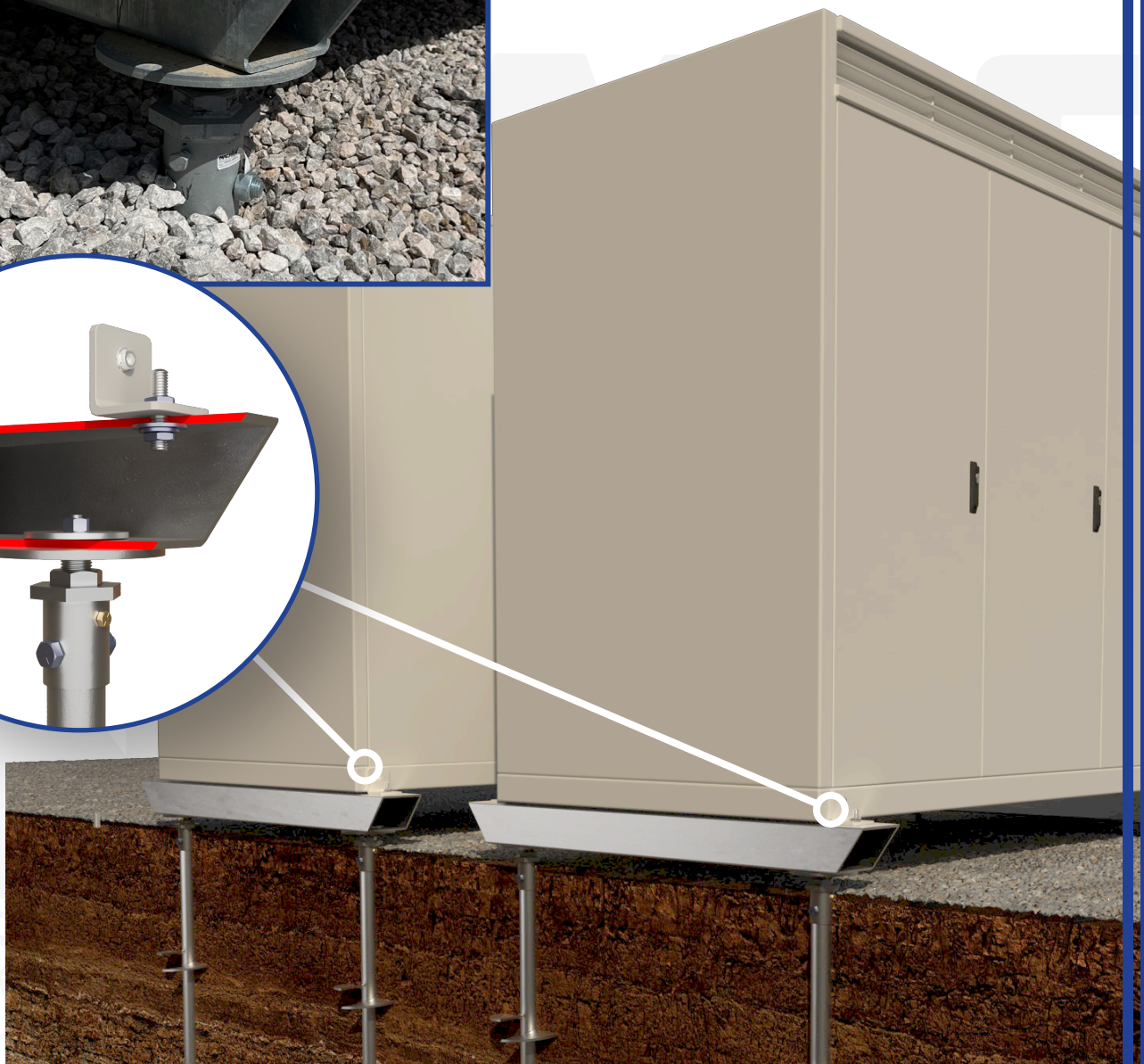
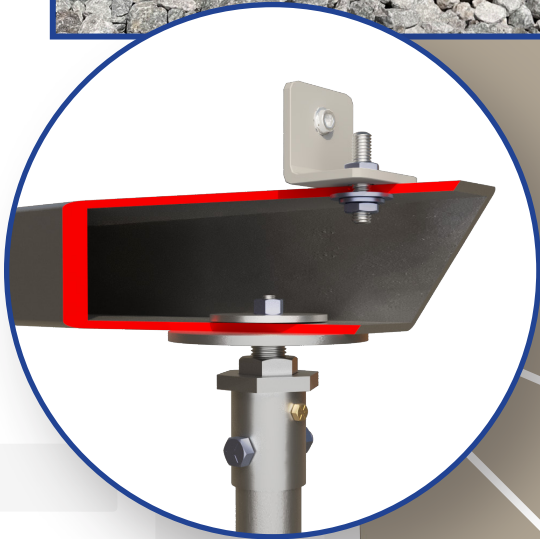
- **High production rates**
- **Cost effective solutions**
- **Small crew size**
- **Limited site prep work needed**
- **Piles can be used for grounding connection**
- **Compact construction equipment utilized**
- **Eliminate field welding**
- **Immediately set units after piles are installed**
- **Minimal environmental impact!**
- **SAFE**



Helical Container Support System (HCSS)

Some BESS container modules require continuous lines of support across the unit at various locations. This can be specified by container manufacturers or found desirable for project specific criteria. MAGNUM® offers the Helical Container Support System (HCS) to easily install and support the container. The HCSS system supports compression forces through direct bearing on the steel HSS beam spanning between helical pile pairs. Overturning forces are resisted by edge bolts between the containers and the steel HSS beam.

The MAGNUM® HCSS system utilizes MAGNUM® MHC1081 caps which are designed to offer vertical adjustment of the HSS beam via the cap plate. Oversized holes in the HSS beam offer up to two inches of horizontal adjustments for pile position tolerances. The steel HSS beams are customized to coordinate with your specific container width and provide precision fabricated anchor points to the beam. Piles, beams and containers can be rapidly installed and secured with reliable bolted connections without the need for any cutting, drilling or field welding.



BESS Unit

Install all HSS beams for the container. Place container on beams and secure using bolts, washers & nuts. Tighten snug tight per AISC.

HSS Beam

Secure the HSS beam with plate washer, hardened washer and nut. Tighten nut, snug tight per AISC utilizing the access hole on the top side of the beam.

MHC1081 Adjustable End Cap

Helical Pile



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Applications: **SOLAR**

The Foundation of Solar Energy Farms

The foundation of a solar energy farm plays a crucial role in ensuring the stability, longevity, and optimal performance of the entire system. A stable and well-designed foundation is essential for supporting the weight of the solar panels, withstanding environmental factors such as wind, seismic activities, and temperature fluctuations, and maintaining the desired orientation and tilt angle for maximum energy production.

MAGNUM® understands the importance of a stable foundation. Any structural failure or misalignment can lead to significant energy losses, costly repairs, and potential safety hazards. Our ability to design and manufacture steel foundations to suit unique conditions gives you an advantage over other foundation processes.

Factors influencing the design of solar energy farm foundations:

- **Soil Conditions**
- **Topography and Terrain**
- **Wind and Seismic Loads**
- **Environmental Factors**
- **Solar Panel Configuration**



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MAGNUM's helical pile foundations are often used in areas with challenging soil conditions, such as rocky or unstable terrain. These piles are screwed into the ground until they reach a stable layer of soil or bedrock. The solar panel racking systems are then secured to the pile foundations via a cap added to the pile head. These caps can be designed to accommodate any solar panel frame.

Advantages of helical pile foundations include:

- **Suitable for a wide range of soil conditions**
- **Frost and rain resistant**
- **Minimal site preparation required**
- **Ability to accommodate uneven terrain**
- **Compatible with solar panel frames**



Solar Canopies

Solar canopies are ground mounted shade structures with solar panels built into or directly functioning as the roof, and can often be found in parking areas and walkways of commercial facilities. Since solar carports can generate electricity, they can be used to provide energy for the commercial buildings as well as serve as electric vehicle charging ports. As structures are being retrofitted or constructed on existing facility sites, low ground disturbance is key.

- **Direct connect the steel column to the steel cap and pile**
- **Reduce spoils on potentially contaminated sites**

Applications: **WIND**

Wind energy is a renewable and sustainable source of power that has gained significant importance in recent years due to its numerous environmental and economic benefits. As the world grapples with the challenges posed by climate change and the depletion of finite fossil fuel resources, the transition towards clean and renewable energy sources has become a global imperative.

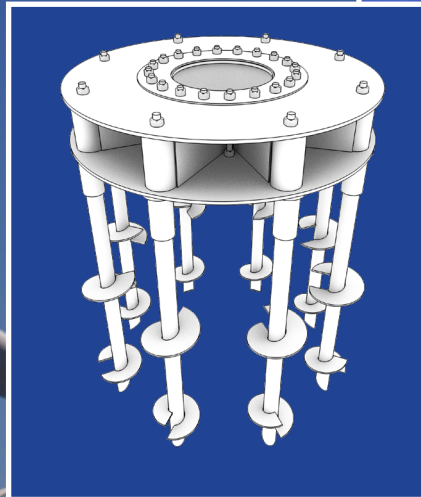
One of the primary advantages of wind energy is its minimal environmental impact. Unlike traditional fossil fuel-based power generation, wind turbines do not produce greenhouse gas emissions or other pollutants that contribute to air pollution and global warming. By harnessing the kinetic energy of wind, wind farms generate electricity without the need for combustion or the release of harmful byproducts.

The environmental benefits of wind energy extend beyond reducing greenhouse gas emissions. Wind farms have a relatively small physical footprint compared to other power generation facilities, minimizing land use and habitat disturbance. Additionally, wind turbines do not consume water resources, making them an attractive option in regions with water scarcity.

Geotechnical Considerations

Geotechnical considerations are critical in the design and construction of wind turbine foundations. The foundation's performance and stability are heavily influenced by the soil conditions at the site. Several key factors must be evaluated:

- **Soil Conditions**
- **Bearing Capacity**
- **Settlement**
- **Seismic Factors**



Onshore Wind Turbine Foundations

Shallow Foundations:

Commonly used for smaller wind turbines with lower loads.
Consist of a reinforced concrete slab or a mat foundation resting on compacted soil or rock.
Suitable for areas with good soil bearing capacity and where the water table is not too high.

Deep Foundations:

Preferred for larger wind turbines or areas with poor soil conditions.
Utilize deep foundation elements such as driven piles, drilled shafts, or grouted anchors to transfer loads to deeper, more competent soil layers. Pile foundations are commonly used, with steel pipe piles or precast concrete piles driven into the ground.

Gravity Foundations:

Massive reinforced concrete structures that rely on their sheer weight to resist overturning moments.
Suitable for areas with good soil bearing capacity and where the water table is not a concern.







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