Federal Engineering & Testing, Inc.

Excellence in Engineering & Testing Services

www.fed-eng.com

954-784-2941

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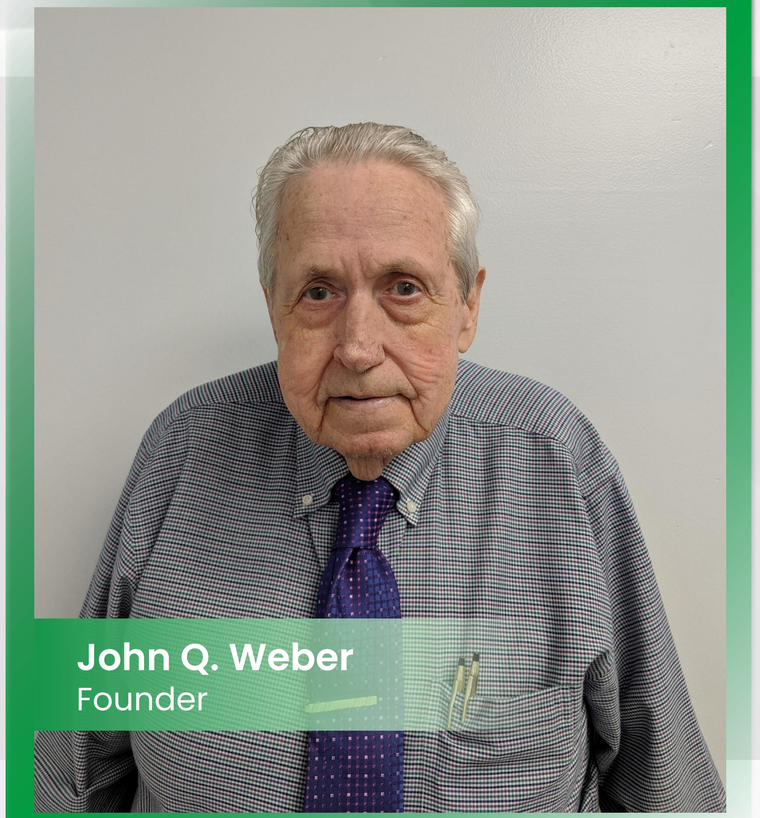
How We Began



John Q. Weber
Founder

1989

Establishment

Founded in Pompano Beach, Florida, by John Weber as a small family business.

2020

Leadership Transition

John Weber passed the leadership to his daughter, Jodie Weber, ensuring the company's legacy continues.

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About Our Company

Our Vision

Committed to providing efficient and fairly priced Geotechnical Engineering Services.

The company is built on the understanding that in order to grow responsibly, local businesses need to work together and have each others backs

Our Diverse Services

Our diversified range of services continues to grow by following trends, improving our standard services and listening to our clients.

Customer Satisfaction

We pride ourselves in providing customer satisfaction at reasonable rates, which means that change orders are not on the top of our “must do” list.

Jodie Weber

CEO

- Owner and operator of FET.
- 12+ years with the company.
- Over 15 years of experience in engineering, specializing in roof testing and inspections.
- Roofing certified.

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Sven Jetzkewitz

Executive Vice President

- Oversees daily operations at FET.
- 15+ years with the company.
- Over 24 years of experience in geotechnical engineering, construction material testing, and inspections.
- Licensed building inspector.
- ACI, CTQP, EAA, and FDOT certified.

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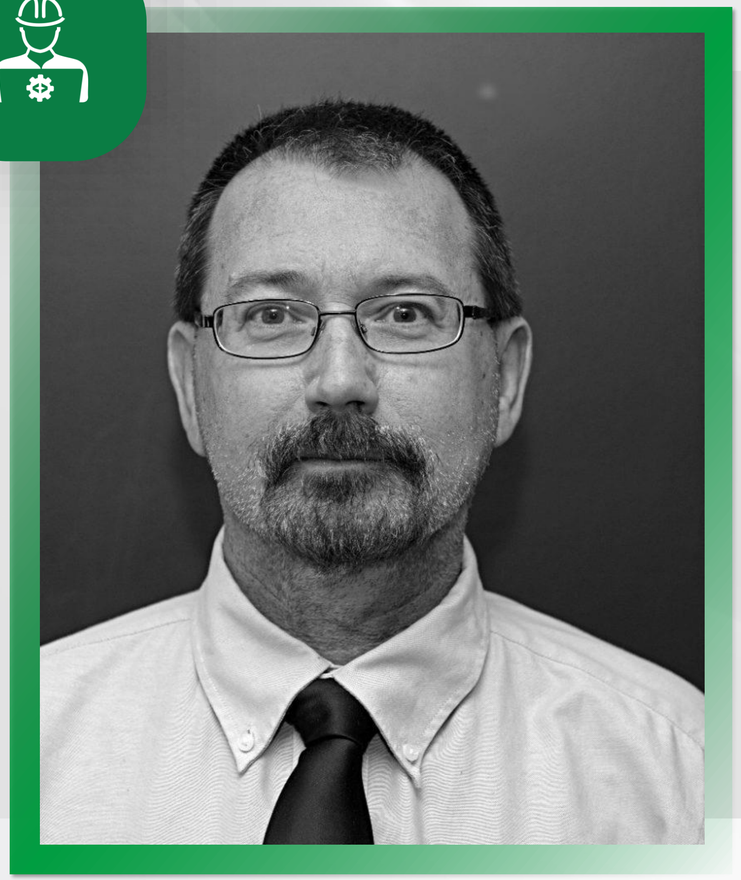
Keith J. LeBlanc, P.E.

President/Professional Engineer



- Lead engineer and qualifier at FET.
- 35+ years with the company.
- Over 35 years of experience in geotechnical engineering, construction material testing, inspections, and roof testing.
- Licensed professional engineer, well contractor, and building inspector.
- ACI, CTQP, EAA, and FDOT certified.

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Scott Dyson

P.G., Geotechnical Dept. Mngr.

- 6 years of experience
- Licensed Professional Geologist

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Our Services

Geotechnical

Expertise in soil mechanics, foundation engineering, and earthworks.

Material Testing

Quality and compliance testing for construction materials.

Building Inspection

Assessments for structural integrity and safety.

Roof Testing

Specialized testing for roofing systems' durability and performance.

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Geotechnical Engineering

Geotechnical engineering is the branch of civil engineering concerned with the engineering behavior of earth materials.

Services :

- Drilling & Subsoil Investigations
- Geotechnical Analysis & Recommendations
- Geotechnical Inspections

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Construction Materials Testing (CMT)

Materials Testing

Laboratory and field services required to evaluate a variety of construction materials for quality assurance and quality control.

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Soil Testing

Asphalt Testing

Materials Testing Services

Concrete Testing

Aggregate Testing

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Building Inspections

Federal Engineering & Testing can perform several building and roofing inspections.

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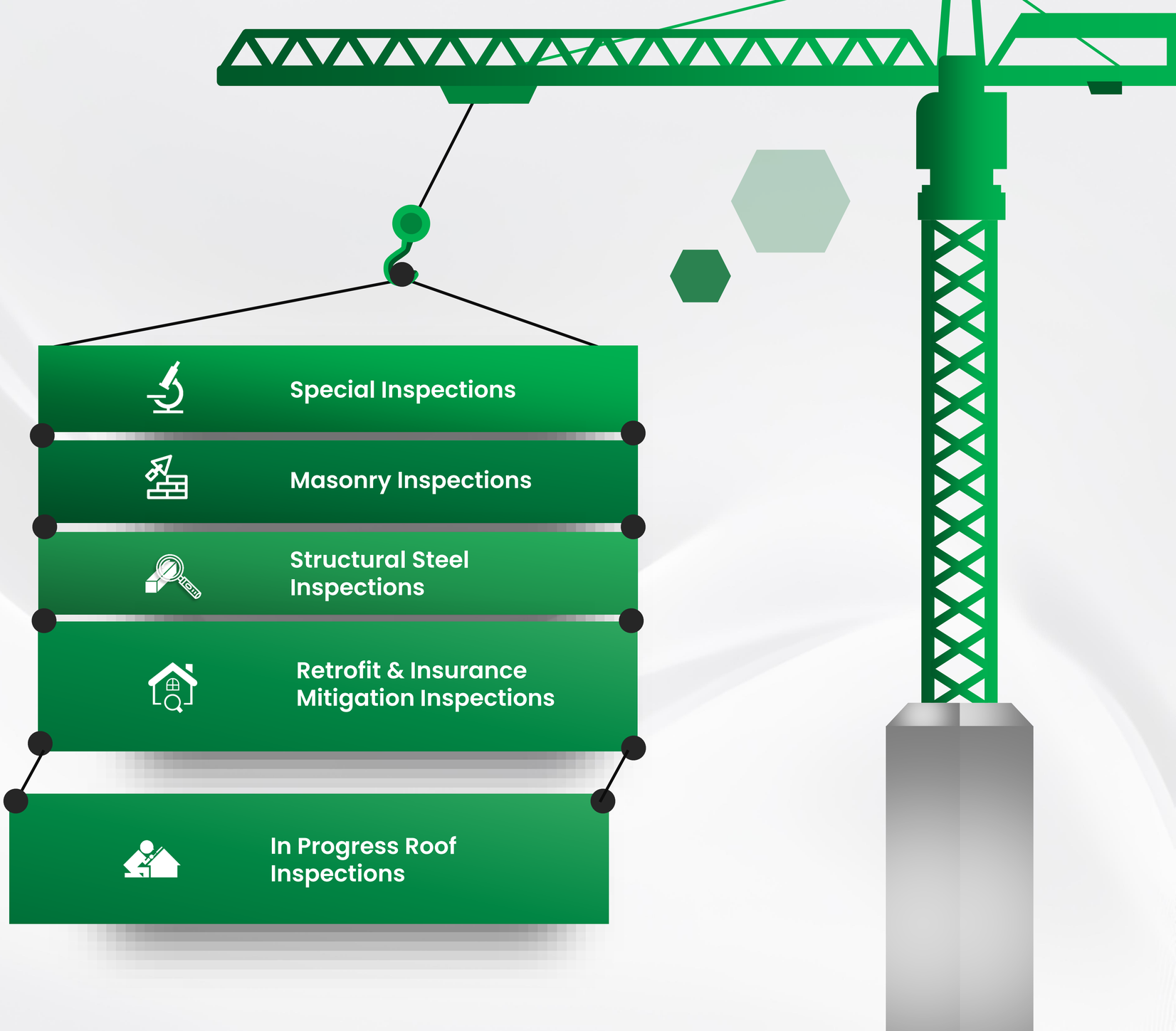
Building Inspection Services



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Roof Testing

Our roof testing and inspection team is a group of skilled workers trained specifically for our industry's evolving needs.

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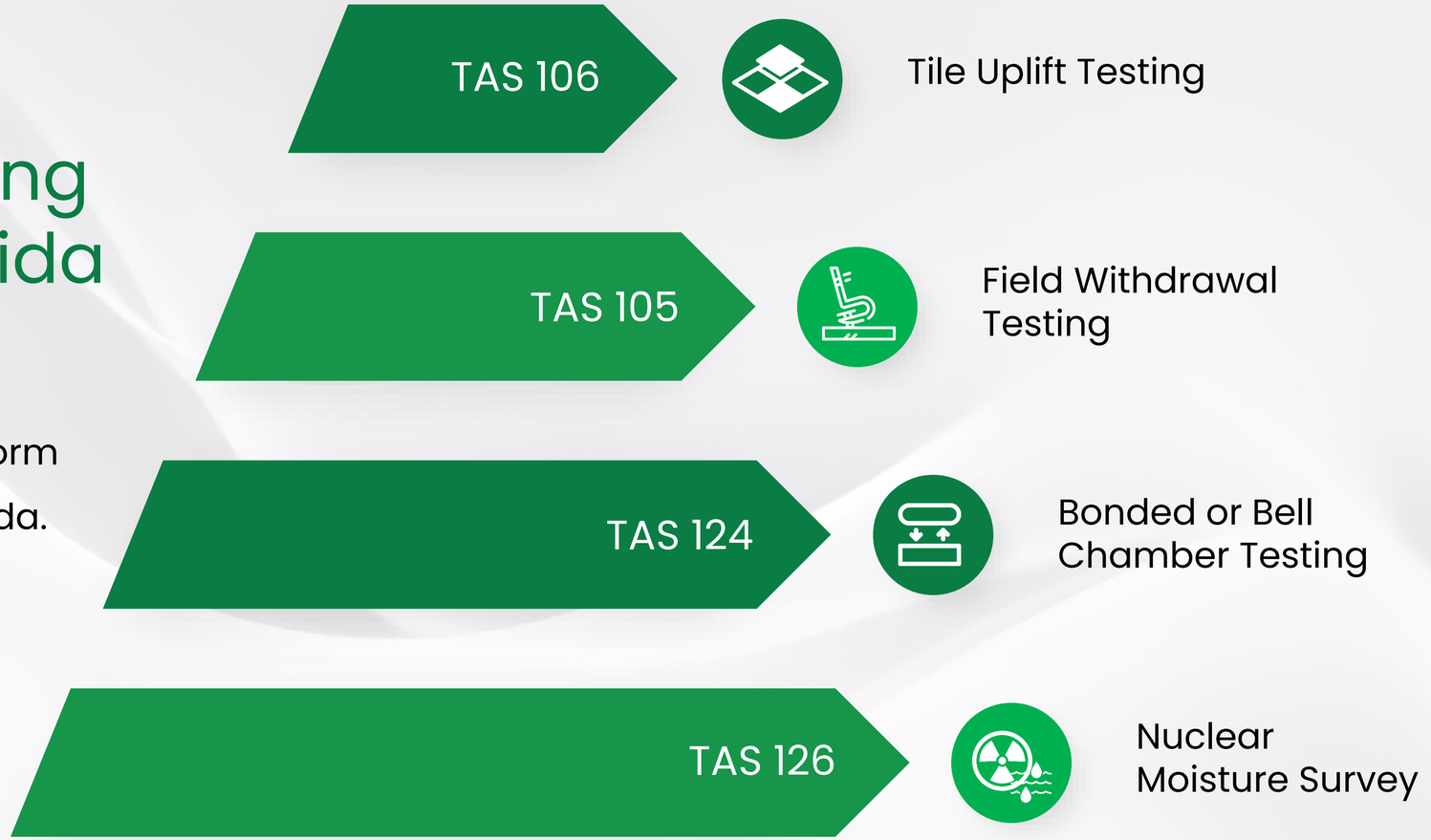
Accredited Roof Testing Services in South Florida

FET is accredited by Miami-Dade to perform the following tests required in South Florida.



How To Read A Geotechnical Report

Understanding Geotechnical Reports

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1. Introduction and Scope

Begin by reading the introduction, scope, objectives, and summary sections of the report.
Understand the project context, the tests conducted, and the results obtained

2. Site Investigation

Review the field investigation section:

- Learn about the soil strata, depth, thickness, and strength at different locations.
- Check the water table level and subsoil profile.

Pay attention to borehole logs, which provide detailed information about soil layers and rock formations.

3. Laboratory Test Results

Refer to the appendix for laboratory test results:

- Grain size distribution curves.
- Soil properties (e.g., cohesion, angle of internal friction).
- Borehole location plan.
- Soil classification.
- Bearing capacity calculations.

4. Recommendations and Conclusions

Follow the recommendations given by the soil consultant:

- Foundation type (shallow or deep).
- Foundation size and depth.
- Precautions based on soil conditions.

Address any compressive soil layers (soil that becomes softer and weaker at deeper depths) to avoid settlement problems.

5. Special Considerations

Be aware of any site-specific risks:

- Landslides, sinkholes, soil liquefaction, and rockfalls.
- Recommendations for retaining walls, earthworks, and pavement subgrades.
- Groundwater presence and its impact on design and construction.

Remember that geotechnical reports are essential for informed decision-making during construction

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Standard Penetration Test (SPT)

Standard Penetration Test (SPT) results provide valuable information about soil properties. Here's how to interpret soil classification based on the number of blows required for penetration (the N-value):

1. SPT Basics
2. Interpreting Soil Classification
3. Correlations & Limitations

Standard Penetration Test (SPT)

1. SPT Basics

- The SPT involves driving a thick-walled sampling tube into the ground using a hammer.
- The N-value represents the number of blows needed to drive the sampler the last 1 foot (30 cm) into the soil.
- After the test, the soil is classified, and a moisture specimen is obtained.

2. Interpreting Soil Classification

- **Cohesionless Soils (Sands):**
  The SPT can predict the relative density of sands:
  - Very loose (0 - 4)
  - Loose (5 - 10)
  - Firm (11 - 20)
  - Very Firm (21 - 30)
  - Dense (31 - 50)
  - Very Dense (> 50)
- **Other Properties:**
  While N-values don't directly provide specific properties, they guide engineers in:
  - Compaction characteristics
  - Shear strength estimation
  - Settlement potential assessment

3. Correlations and Limitations

- Correlations exist between N-values and soil properties.
- SPT results are approximate but useful where advanced lab testing isn't feasible.
- Remember that sample quality is disturbed, so lab testing is needed for accurate engineering design

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What is a DCP Test?

Dynamic Cone Penetrometer (DCP):

Similar to SPT, the cone is driven by a standard force from a hammer, and the penetration of the cone after each blow is measured to determine soil density. Provides a continuous measure of shearing resistance up to 15 feet below the ground surface.

Correlation of Penetration Resistance with Relative Density and Consistency		
Sands		
Dynamic Cone Penetrometer *Penetrometer Resistance*	Standard Penetration *Hammer Blows*	Relative Density
0 - 10	0 – 4	Very Loose
11 – 25	5 – 10	Loose
26 – 45	11 – 20	Firm
45 – 75	21 – 30	Very Firm
76 – 120	31 – 50	Dense
> 120	> 50	Very Dense

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Laboratory Soil Classifications

01

Foundation Design and Stability

- Soil classification helps engineers select appropriate foundation types (shallow or deep) based on soil properties.
- It guides the design of foundations to ensure stability, prevent settlement, and distribute loads effectively.

02

Earthwork and Slope Stability

- Soil classification informs earthwork design (cut and fill operations).
- It helps assess slope stability and design retaining walls.

03

Permeability and Drainage

- Soil classification determines permeability (how easily water flows through soil).
- Proper drainage design relies on understanding soil types.

04

Shear Strength and Bearing Capacity

- Different soil types exhibit varying shear strength.
- Soil classification aids in estimating bearing capacity for foundations.

05

Construction Materials Selection

- Soil classification guides material selection for embankments, road bases, and backfill.
- It ensures compatibility between soil and construction materials.

06

Quality Control & Specifications

- Soil classification ensures compliance with project specifications.
- It helps monitor soil quality during construction.

Shallow Foundations

- Stripping Footings and Building Construction Areas
- Compaction of Construction Areas to ASTM D-1557 Standard
- Addressing Vibration Concerns Near Existing Structures
- Backfilling Construction Areas to Proper Elevation
- Testing and Classification of On-Site and Fill Material
- Requirements for Construction Fill Material Above Water Table
- Fill Material Specifications Below Water Table
- Field Density Tests for Compacted Material Layers
- Recompaction and Testing After Pipe Installation
- Bearing Capacity and Foundation Recommendations

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Stabilizing Shallow Foundations

Load Distribution

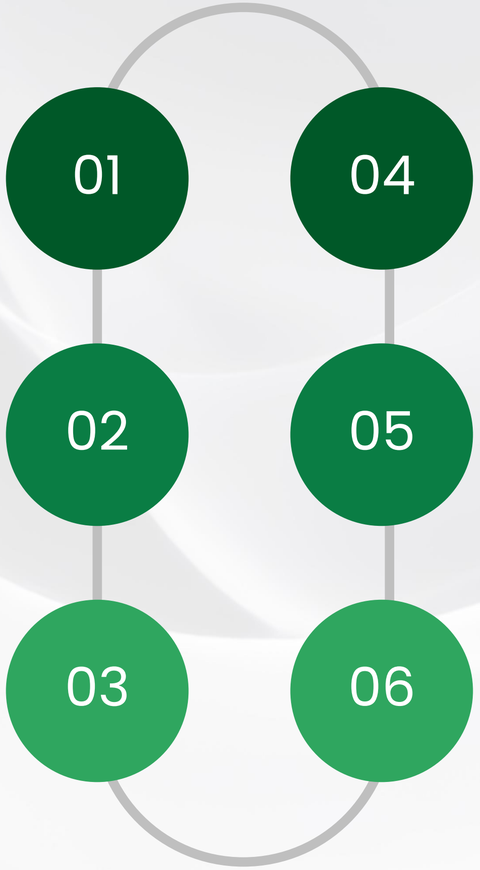
- Rock provides a stable and load-bearing layer beneath footings.
- It helps distribute the load from the structure more evenly across the soil.
- Footings resting on rock experience less settlement and differential movement.

Stability and Settlement Control

- Rock is less compressible than soil.
- By placing rock under footings, engineers reduce the risk of excessive settlement.
- Stability is enhanced, especially in areas with weak or compressible soils.

Reducing Erosion and Scour

- In areas prone to erosion or scour (such as riverbanks), rock acts as a protective layer.
- It prevents soil erosion and maintains the stability of footings.



Mitigating Expansive Soils

- Expansive soils (such as clay) can swell and shrink with changes in moisture content.
- Rock fill helps counteract the effects of expansive soils by providing a stable base.

Improving Bearing Capacity

- Rock has high bearing capacity compared to loose or soft soil.
- Footings placed on rock can safely support heavier loads.

Construction Over Soft Ground

- In areas with soft or wet ground (such as marshes or swamps), rock foundations are essential.
- They allow construction without extensive soil improvement.

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Demucking

Demucking, from a geotechnical perspective, involves the process of excavating and removing excess wet soil or muck from the surface of the land. Here are some key points about demucking:

Definition

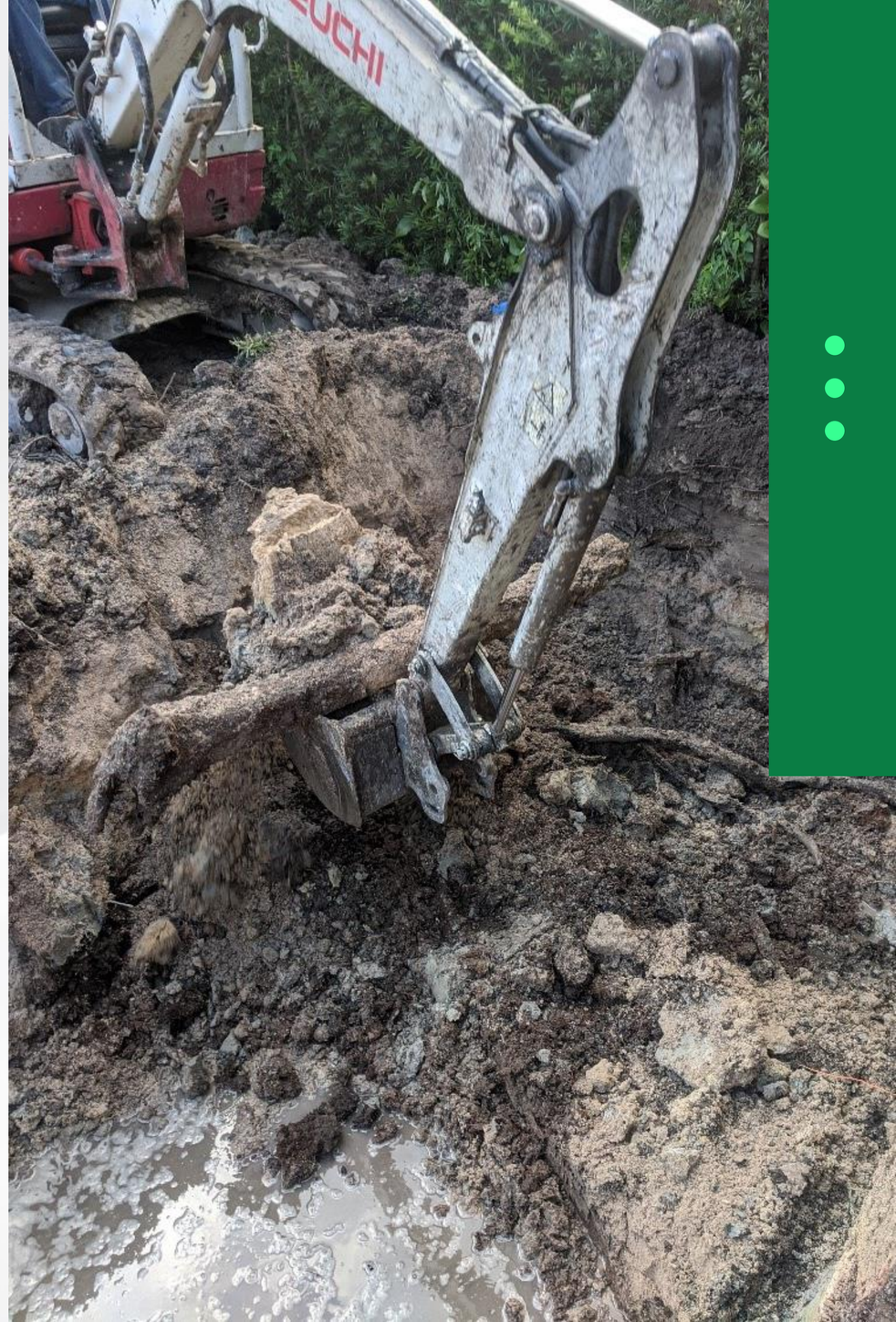
- Demucking refers to the removal of soft, saturated, and often organic material (such as peat or mud) from construction sites.
- The goal is to prepare the site for construction by eliminating unstable or unsuitable soil.

Challenges

- Compressibility: Organic soils (like peat) are highly compressible and exhibit long-term settlement behavior.
- Structural Integrity: Building directly on muck can lead to structural problems due to ongoing settlement.
- Lawsuits: Improper site preparation may result in legal issues down the road.

Methods for Demucking

- Overexcavation and Backfilling:
  - Excavate deeper than necessary and backfill with better soil (e.g., gravel or sand).
  - This method redistributes the load and provides a stable base.



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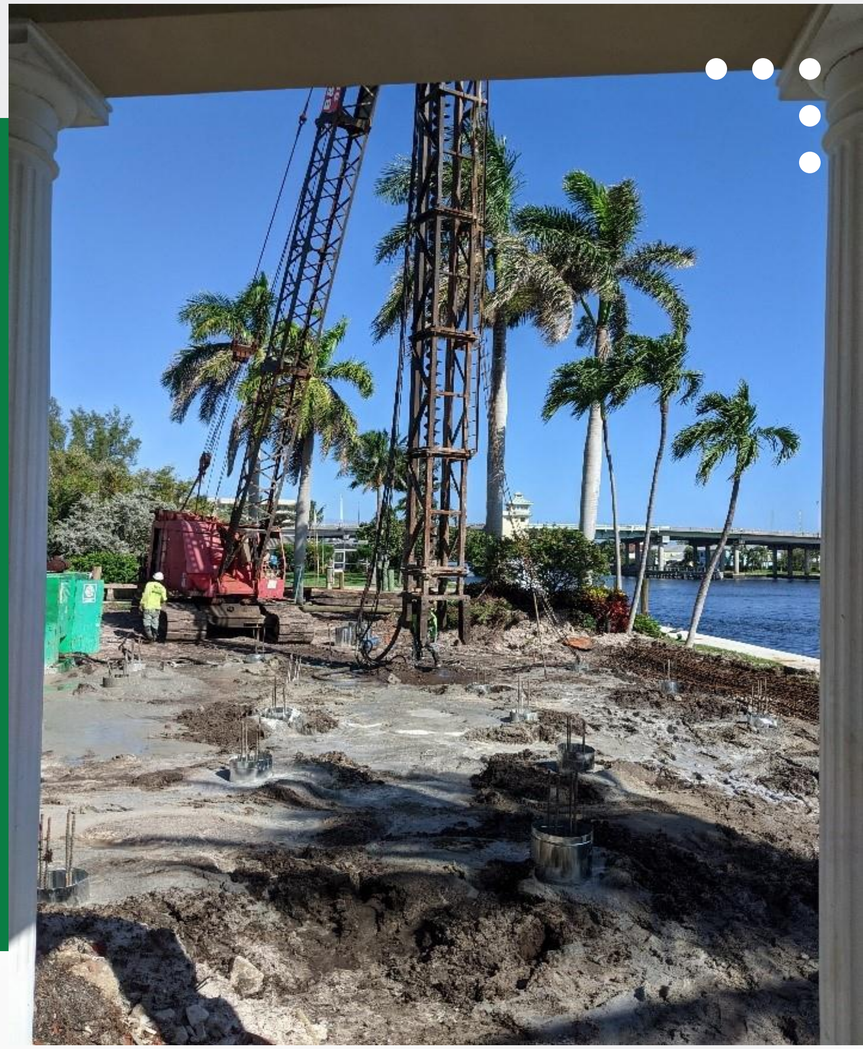
Deep Foundations

ACIP piles, also known as continuous flight auger (CFA) piles, are a versatile foundation solution. Here are scenarios where they are commonly employed:

Auger Cast-In-Place Piles (ACIP)

- Structural Support
- Earth Retention
- Cost-Efficiency
- Soil Conditions
- Quick Construction



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Deep Foundations

Quality Control During ACIP Installation :

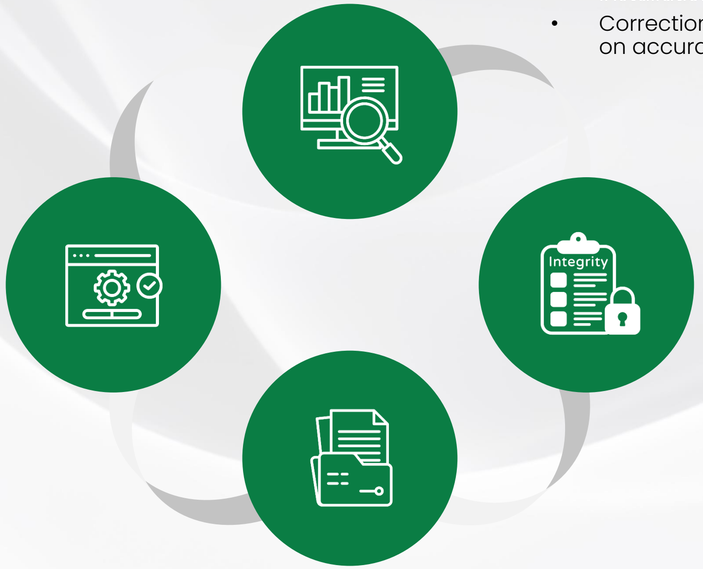
Ensuring high-quality ACIP installation involves several key steps.

Load Testing

- Compressive, tension, and lateral load tests evaluate ACIP pile capacity.
- Dynamic low strain impact load testing is commonly used for assessment

Grout Volume Monitoring

- The grout volume pumped versus depth is critical for proper installation.
- A geotechnical technician measures and records grout volume versus depth during installation.
- Corrections can be made in real time based on accurate measurements.



Pile Integrity Testing (PIT)

- PIT evaluates shaft integrity non-destructively.
- It uses one-dimensional sonic wave propagation theory.
- PIT can be applied to a portion of piles or every pile on a project.
- Valuable for quality control and integrity assessment4.

Documentation

- Modern ACIP rigs come equipped with sensitive instrumentation.
- Parameters monitored include pile depth, auger rotation, penetration rate, concreting pressure, and extraction rate.
- Detailed logs are generated for each pile, aiding quality assurance.

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Helical Piles

New Construction

- Helical piles are suitable for new construction projects in limited access situations.

Additions & Extensions

- When adding on to existing properties, helical piles are an excellent choice.
- They offer a quick and easy solution for supporting auxiliary structures like outbuildings, sheds, patios, mezzanines, balconies, garages, and parking covers.

Minimal Site Impact

Unlike concrete footings or stem walls, helical piles don't require extensive excavation. They minimize disruption to the building site and surrounding environment.

Foundation Repairs & Reinforcement

- Helical piles are commonly used in residential work for foundation repairs and reinforcement.
- They stabilize existing structures and prevent further settlement or movement.

Budget-Conscious Projects

- Helical piles are cost-effective compared to other foundation support systems.
- If you're mindful of your budget, helical piles offer an economical solution.

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Helical Piles

When installing helical piles, several issues can arise.

- Construction Challenges
- Cost
- Soil Density & Rockiness
- Depth Limitations
- Excessive Settlement
- Lateral Movement Resistance
- Shaft Buckling
- Uncertainty of Load Carrying Capabilities

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Push Piles (Push Piers)

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Push piers, also known as jacked piles or resistance piers, are structural support elements used in foundation repair and stabilization.

Identification of Problem Areas:

- Engineers assess the foundation's condition to identify areas that are sinking due to weak or shifting soil.

Installation of Piers:

- Small holes are excavated near the foundation's footing.
- The steel pier sections are then driven deep into the ground using hydraulic force until they reach stable soil or bedrock beneath the problematic soil layers.
- The installation process utilizes the resistance force of the weight of the building.

Bracket Attachment:

- A bracket is attached to the foundation footing.
- The purpose of the bracket is to transfer the load from the foundation to the stable soil layer through the push piers.

Types of Brackets:

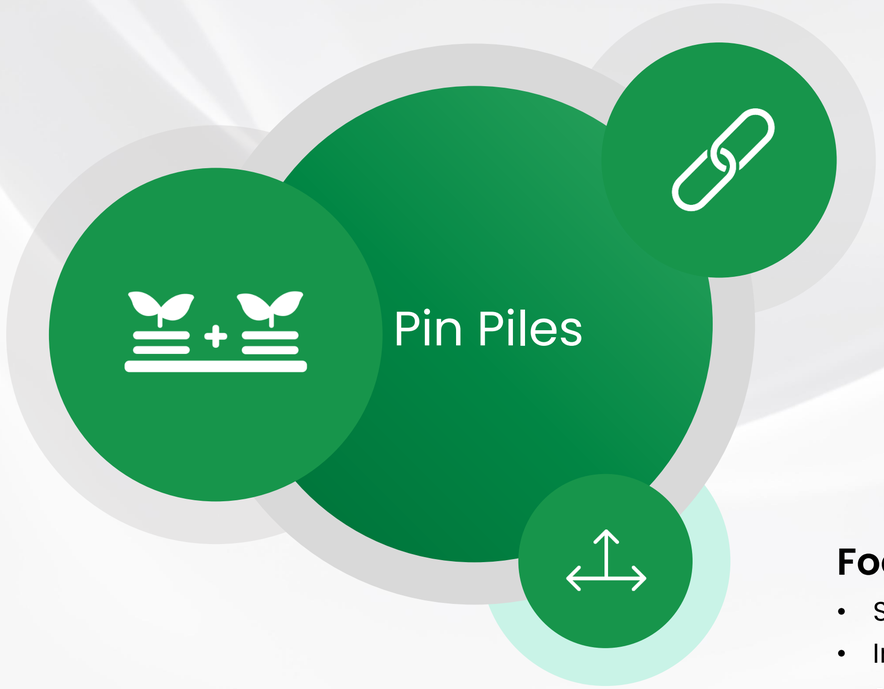
- Under-footing bracket: Used in retrofit works, fixed below the existing footing.
- Concentric bracket: Used in new construction, secured directly beneath the footing and foundation wall.
- Flush-mounted bracket: Employed when the support is strong, fixed to the side of the footing or foundation wall.
- Slab pier bracket: Used in slab repair, fixed below existing slabs.

Pin Piles (Pin Pile Technology)

Pin piles combine the best features of both pilings and footings. Here's how they work:

Pin Pile Technology:

- Utilizes the best of both worlds.
- Provides stability without compromising soil integrity.
- Installation involves driving the piles without significant soil disturbance.



Pilings:

- Keep existing soil strength and structure intact.
- Easy to install if they don't have to go too deep.

Footings:

- Spread loads more widely.
- Installation breaks apart the soil, weakening it and blocking or exaggerating water flow.

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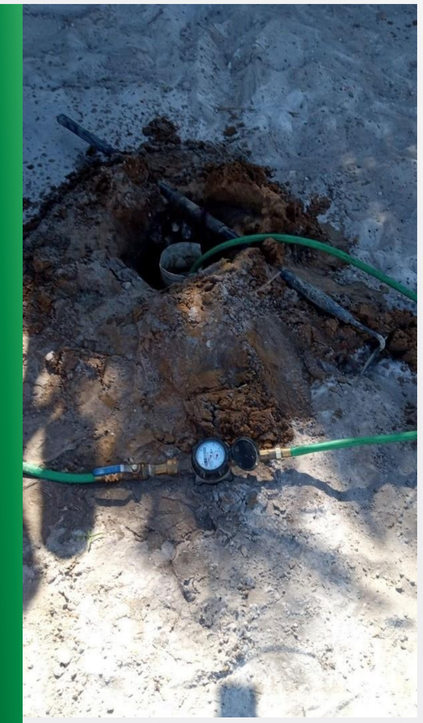
Percolation Testing

A percolation test, colloquially known as a perc test, is conducted to determine the water absorption rate of soil. This test is crucial in preparing for the construction of a septic drain field (leach field) or an infiltration basin.

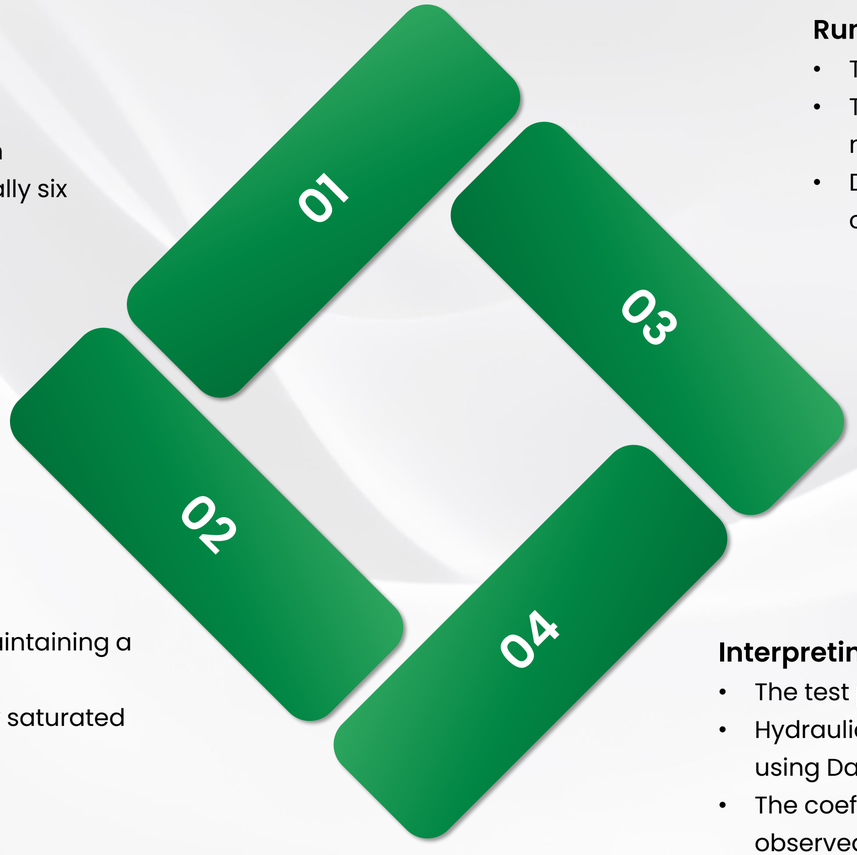
Test Setup:

- One or more holes are dug in the soil at the proposed leach field location.
- These holes are typically six to eight inches in diameter and drilled to different depths (ideally six to fifteen feet below the surface).



Presoaking:

- The holes are presoaked by maintaining a high water level in them.
- This ensures that the soil is fully saturated before the actual test begins.



Running the Test:

- The holes are filled with water to a specific level.
- The water level (head) in this control well is maintained at a constant level.
- Discharge (flow rate) is monitored over time at the control well.

Interpreting Results:

- The test provides data on the rate of water flow.
- Hydraulic conductivity (permeability) can be calculated using Darcy's law.
- The coefficient of permeability is determined based on the observed flow rate and other parameters.
- Sandy soil tends to absorb more water than clay-rich soil or soil with a high water table.

Geotextile Fabric

Definition:

Geotextile fabric is a permeable textile material used to improve soil characteristics. It can filter, separate, reinforce, protect, and drain when used in association with soils.

Materials:

Geotextiles are typically made from polyester or polypropylene fibers..

Forms:

Geotextiles come in three primary forms:

1. Woven: These are fabrics created by weaving fibers together.
2. Needle-Punched: These are non-woven fabrics formed by bonding fibers together.
3. Heat-Bonded: These are also non-woven fabrics created through heat bonding.

Natural Fiber Geotextiles:

- Jute: Biodegradable and can mix with soil, providing nutrients for vegetation. Lifespan can be extended through treatments.
- Coir (Coconut Fiber): Used in turf reinforcement mats (TRMs) and resistant to saltwater damage.

Application:

- Separation: Geotextiles prevent the mixing of different soil layers (e.g., separating gravel from soil).
- Stabilization: They enhance soil stability by distributing loads and preventing differential settlement.
- Reinforcement: Geotextiles reinforce soil, especially in areas with weak or compressible soils.
- Filtration: They allow water to pass through while retaining soil particles.
- Moisture Barrier: Geotextiles can act as moisture barriers to protect structures.
- Drainage: They facilitate water drainage, preventing water buildup.

MAT Foundations

A mat slab foundation, also known as a raft foundation, is a thick concrete slab placed directly on the soil. It spreads heavy loads from high-rise buildings across the soil, reducing contact pressure.

Comparison with Slab on Grade

- Slab on Grade: For light loads, no reinforcements, individual footings.
- Mat Slab: Handles heavier loads, includes reinforcements, distributes load across soil.

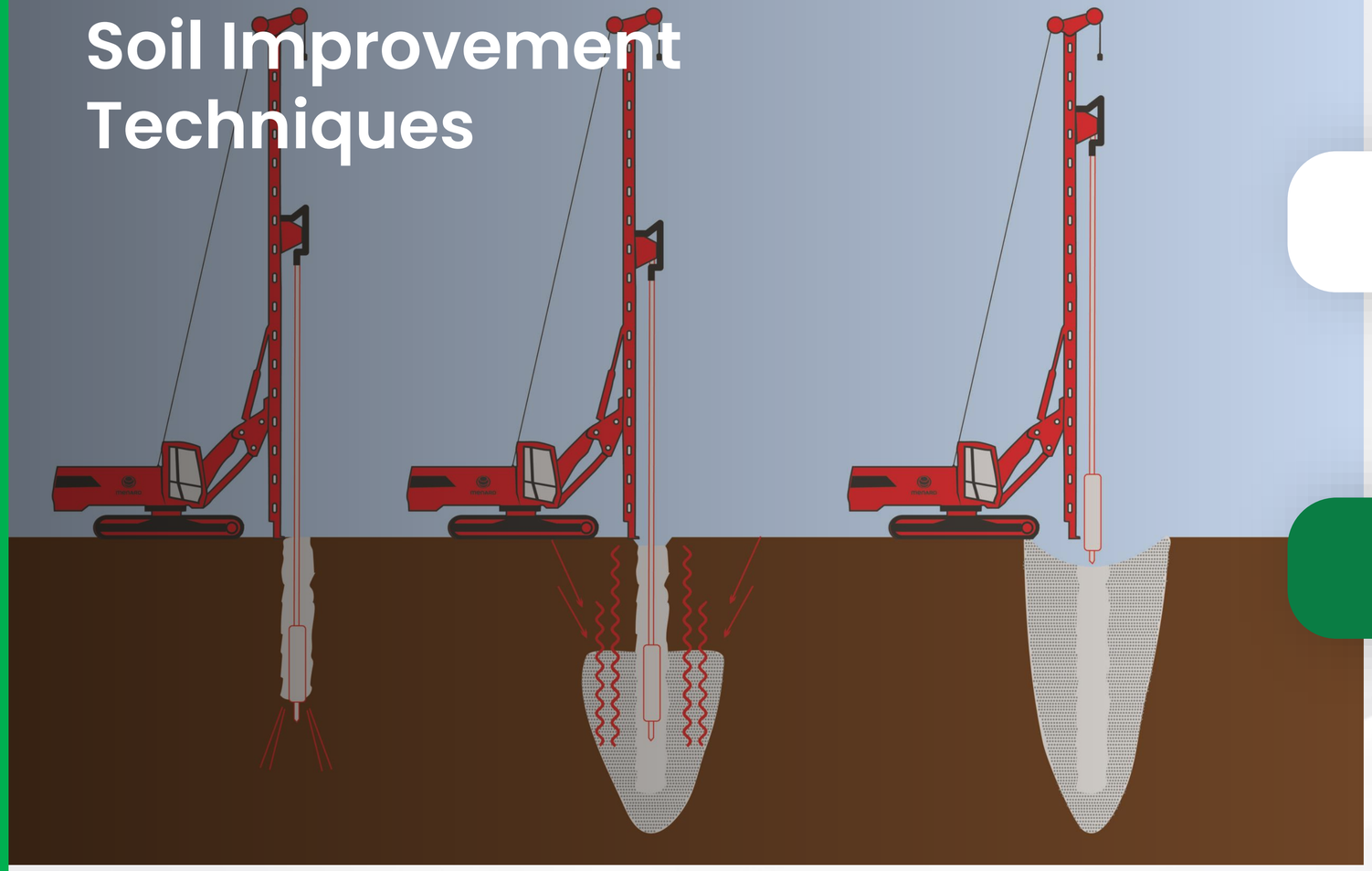
Pros of Mat Slab Foundations

- Reduced Construction Time: Foundation and floor slab poured together, saving time and costs.
- Less Excavation: Thinner slab requires minimal excavation.
- Loads Transferred Over a Wider Area: Can handle heavier loads due to larger spread footing

Uses in Commercial Construction

- Commonly used for tall buildings (especially with basements).
- Suitable for structures requiring heavy loads (e.g., industrial facilities, bridges, power plants).

Soil Improvement Techniques



Vibro-Compaction / Vibro-Replacement process :

Involves water jetting and vibration into the soils. The vibration action causes the granular soils to rearrange in a more densified state. The increase in density of the soils causes a loss of volume. The addition of stone material provides additional densification.

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Soil Improvement Techniques

Mat Foundation :

A large continuous concrete slab, either rectangular or circular, that carries the entire load of the superstructure and spreads it over the whole area beneath the building.

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Geotextiles

Soil Improvement Techniques

Geotextiles -

An effective method for soil improvement. When geosynthetics are placed between the subgrade and subbase layers, they can increase the bearing capacity.

Get In Touch

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Office Hours

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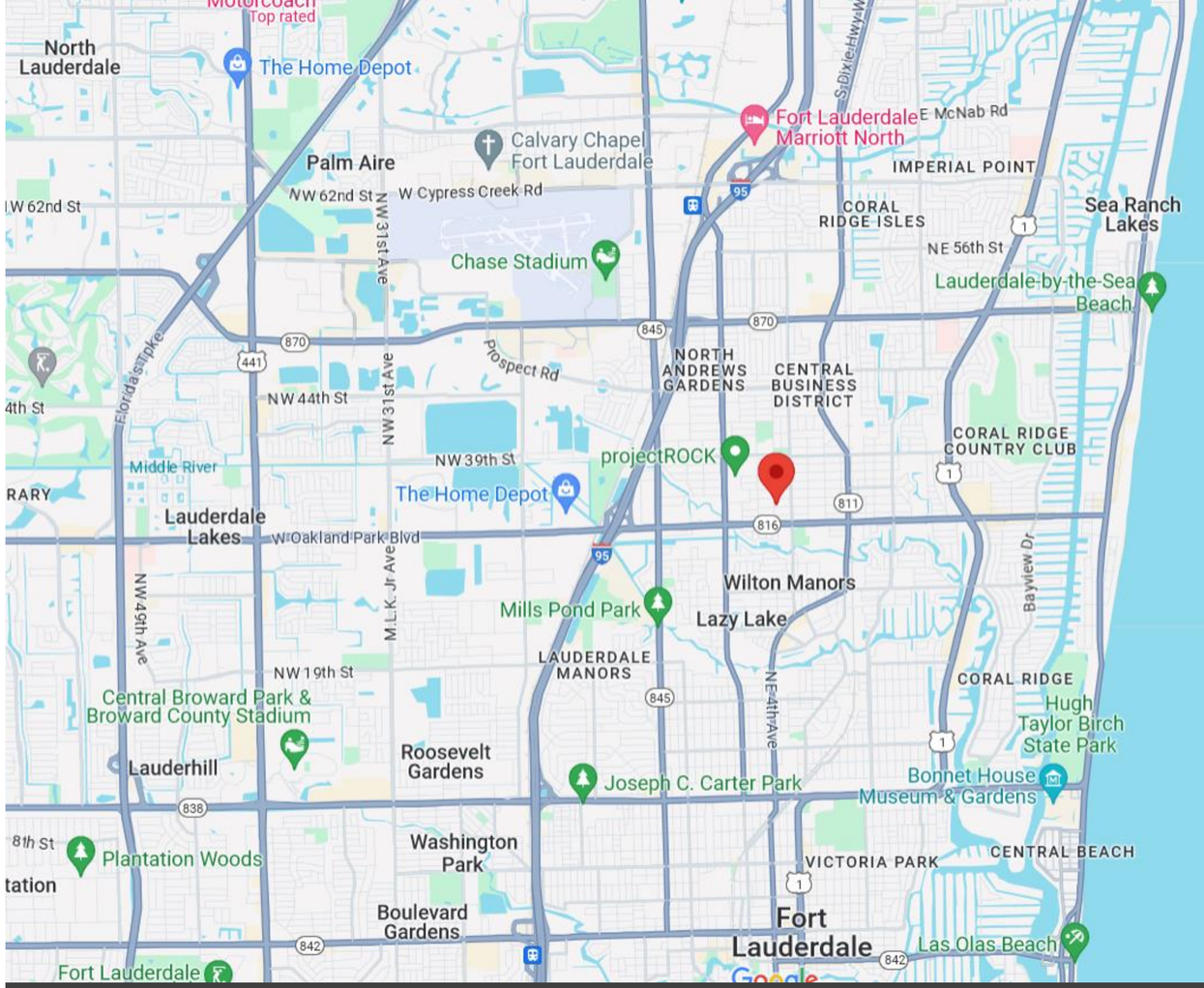

Federal Engineering and Testing has been in business now for over three decades. We will confidently provide your company all the testing you need to keep your construction project moving

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