

# Digging Deep:

## *History of Shoring in the D.C. Area – 1960 to Present*

Ronald W. Steele, PE

Managing Member – Steele Foundation LLC

Geo-Virginia 2019: Lessons Learned in  
Geotechnical Engineering

Smithfield, Virginia

Sept. 23-25, 2019



GEO-  
INSTITUTE

# What You'll Learn

- D.C. shoring industry
- Current state of foundation engineering
  - Is it a lost art?
- How shoring has advanced over the past half-century
  - Examples
    - Soil Condition Analysis
    - Equipment
    - Design
    - Management Changes
- Notable projects in the D.C. Area
- Failures
- Key takeaways







Running into everything – including the kitchen sink



## Sheeting for Mechanical Upgrades at Arlington Cemetery





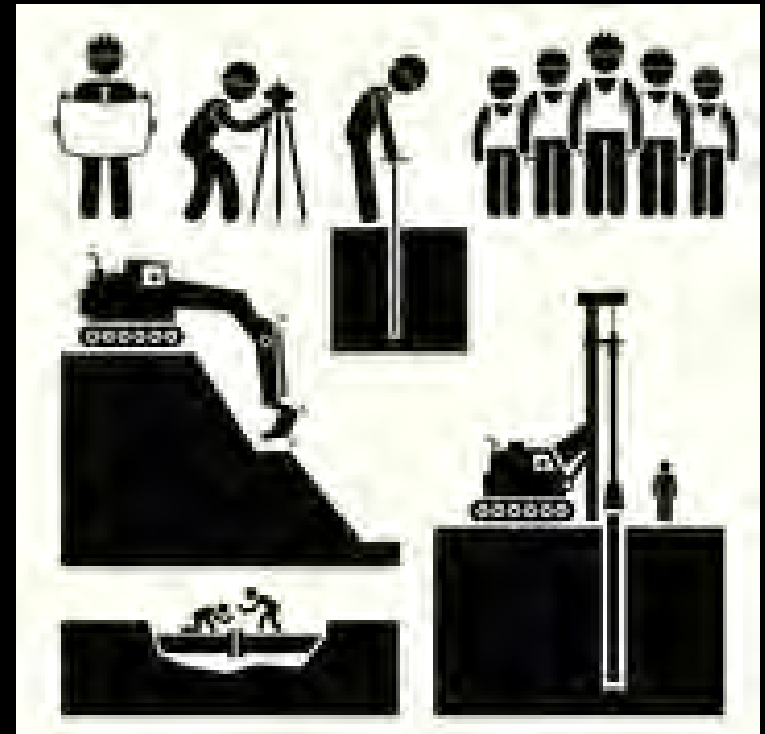
## Sheeting and Underpinning



**Hand dug underpinning  
pier supporting a  
church in Arlington, VA**

# The Lost Art of Foundation Engineering?

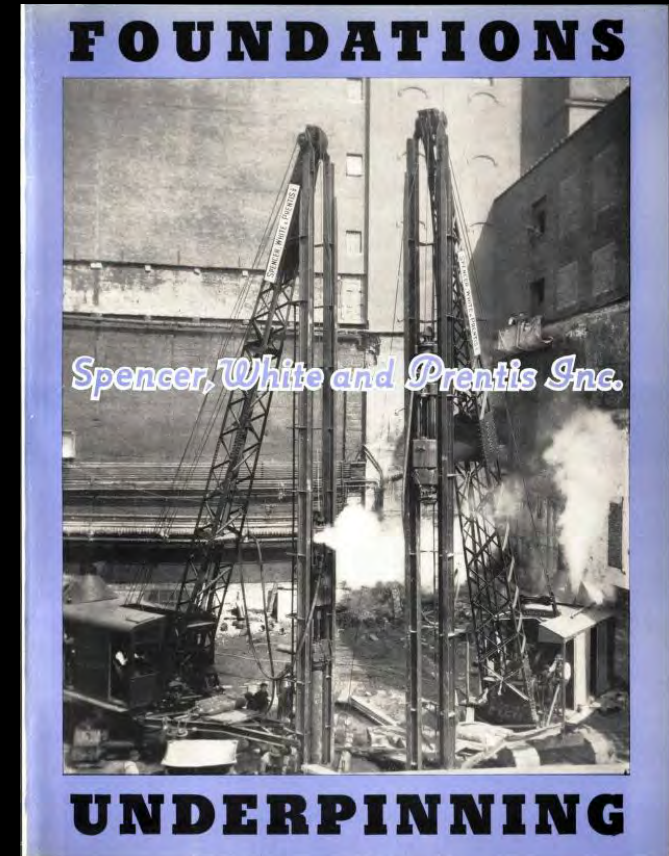
- As time has progressed over the past 60+ years, the Art of Foundation Engineering is being lost due to fragmentation among multiple parties on most construction projects and inexperienced permit reviewers and engineers.





# How Shoring Has Advanced Over the Past Half-Century

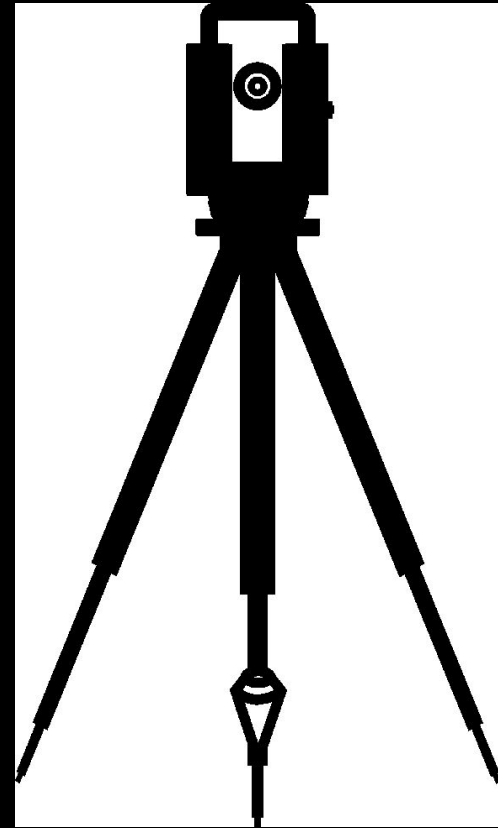
- Geotechnical Conditions
  - Solidification of basic understanding of earth pressures and loading during the 1940s and 1950s
    - Works of Karl Terzaghi and Ralph Peck
    - New York City subway excavation work of Spencer, White & Prentis
  - Good ground versus bad ground
  - Soil Testing techniques



# How Shoring Has Advanced Over the Past Half-Century

## ➤ Equipment Evolution

- Optical Surveying techniques (Manual v. Digital)
- Wang computers in the early '80s
- Drafting techniques (Hand vs. CAD)
- Driving vs. drilling
- Internal Bracing vs. tiebacks





**DRIVING**



**DRILLING**





# Internal Bracing



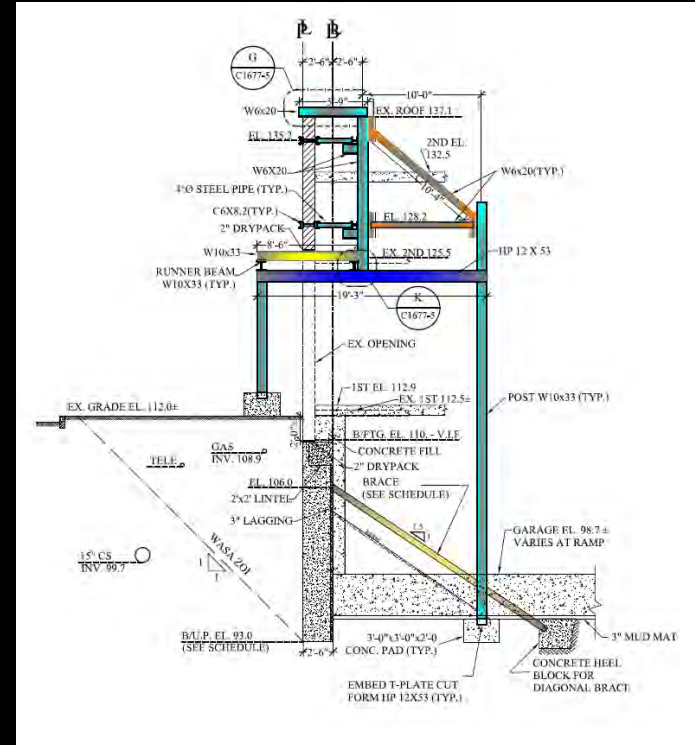


# Tieback Drill Rig

# How Shoring Has Advanced Over the Past Half-Century

## ➤ Design

- Ability to collect and disseminate information
- Design causes
- Bearing capacity
- Inspections





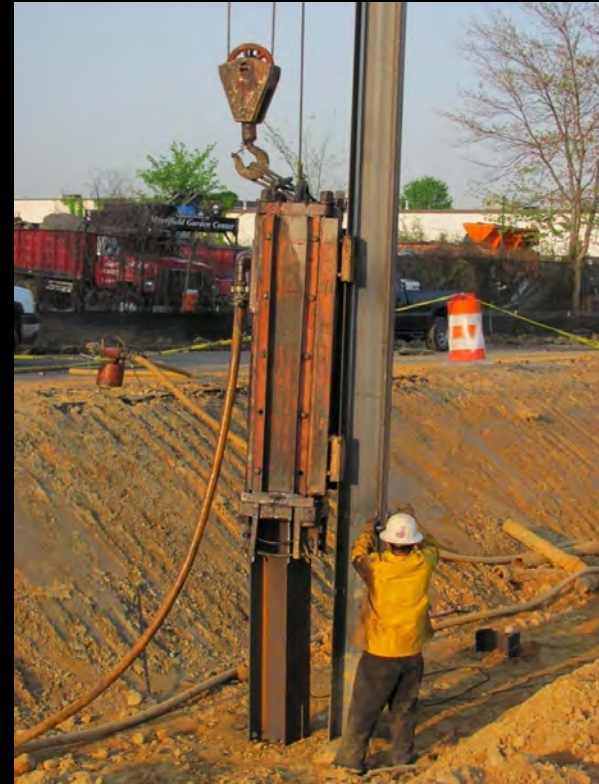
# How Shoring Has Advanced Over the Past Half-Century

- Management Changes -  
Running a shoring business
  - Many things that were formerly done by hand are now done by computer
  - Immediate communication and transmission of information
  - Archives – information stored from thousands of projects



# How Shoring Has Advanced Over the Past Half-Century

- Labor Management
  - Cost of living
  - Labor Unions
  - Wages
    - Piledrivers \$4.10/hr in 1963 vs. \$30.94 in 2019



# How Shoring Has Advanced Over the Past Half-Century

- Contracts and Insurance
  - Indemnification and hold harmless clauses
    - Arising out of or in connection with
    - Limited form indemnification (to the extent of ....negligence)
  - Payment clauses
    - Condition precedent clauses (pay if paid, pay when paid)





# Notable Projects in D.C. Area



**RESTON TOWN CENTER BLOCK 4  
RESTON, VIRGINIA**

**50,000 SF OF SOLDIER BEAMS,  
LAGGING, AND TIEBACKS**





**MOXY HOTEL, NW DC**

**SHEETING, SHORING AND  
UNDERPINNING BENEATH  
HISTORICAL STRUCTURE**



**HOWARD THEATRE, NW DC**

**UNDERPINNING AND SHORING OF  
HISTORIC STRUCTURE**



**HOWARD THEATRE  
NW DC**





**18<sup>TH</sup> AND EYE, NW DC**

**PRESERVATION OF HISTORIC  
EIGHT-STORY FAÇADE FOR DEMO**



# FAILURES



Northampton,  
Alexandria, VA (2003)





03/27/2003



Bank St. NW (2003)







13<sup>th</sup> and H NW (11/19/1990)





Excavation on passive side of heel block





Frozen ground behind sheeting

Crane operating too close to sheeting



# Key Takeaways

- Using similar techniques for 60+ years – advancements in how the work is managed has changed, but it is still steel, concrete and wood – not Rocket Science
- Failures do occur but are typically related to construction issues and not design
- Sheeting, Shoring and Underpinning is a risky business and requires detail oriented and dedicated engineers and craftsmen to remain successful





# Questions?

