



# Micropile Underpinning and Seismic Foundation Retrofit

Veterans Administration  
Medical Center

Memphis, TN

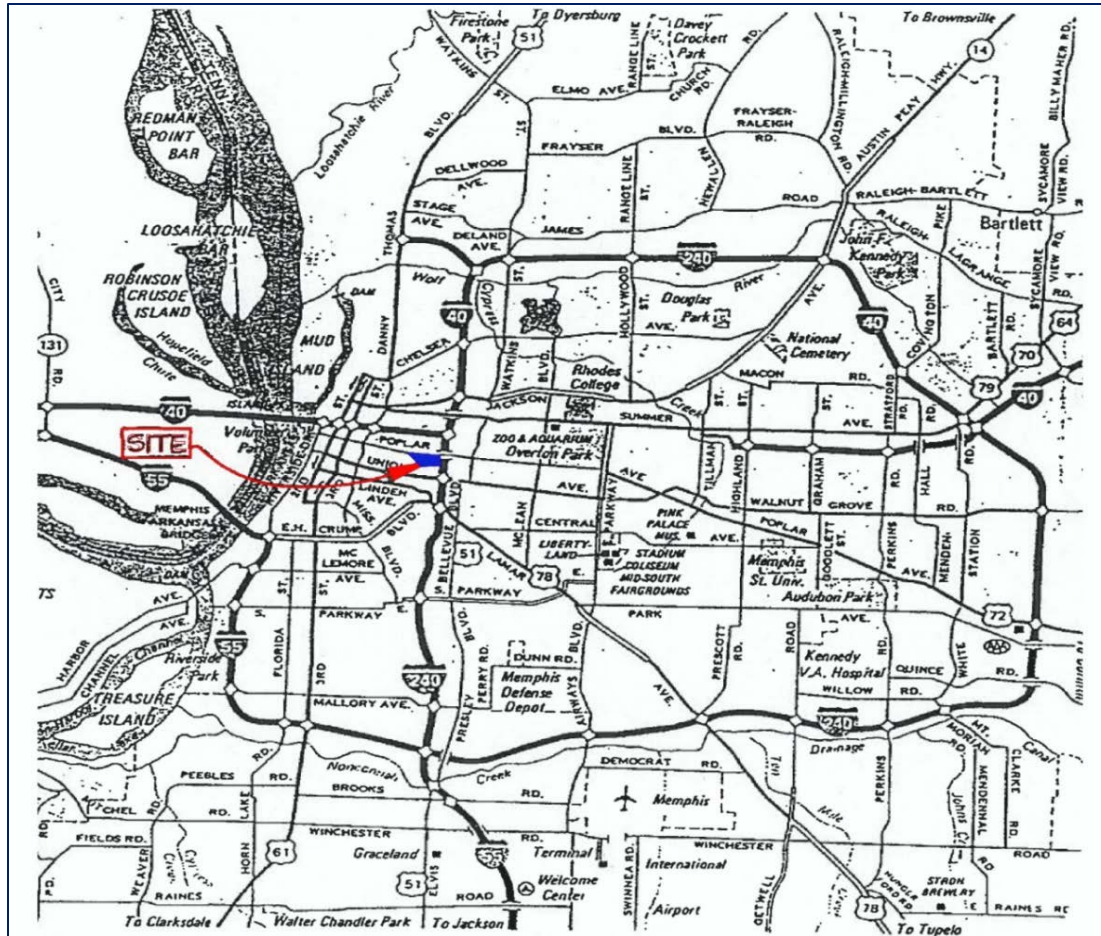
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Peter J. Nufer, PE

**HAYWARD  
BAKER**  
Geotechnical Construction  
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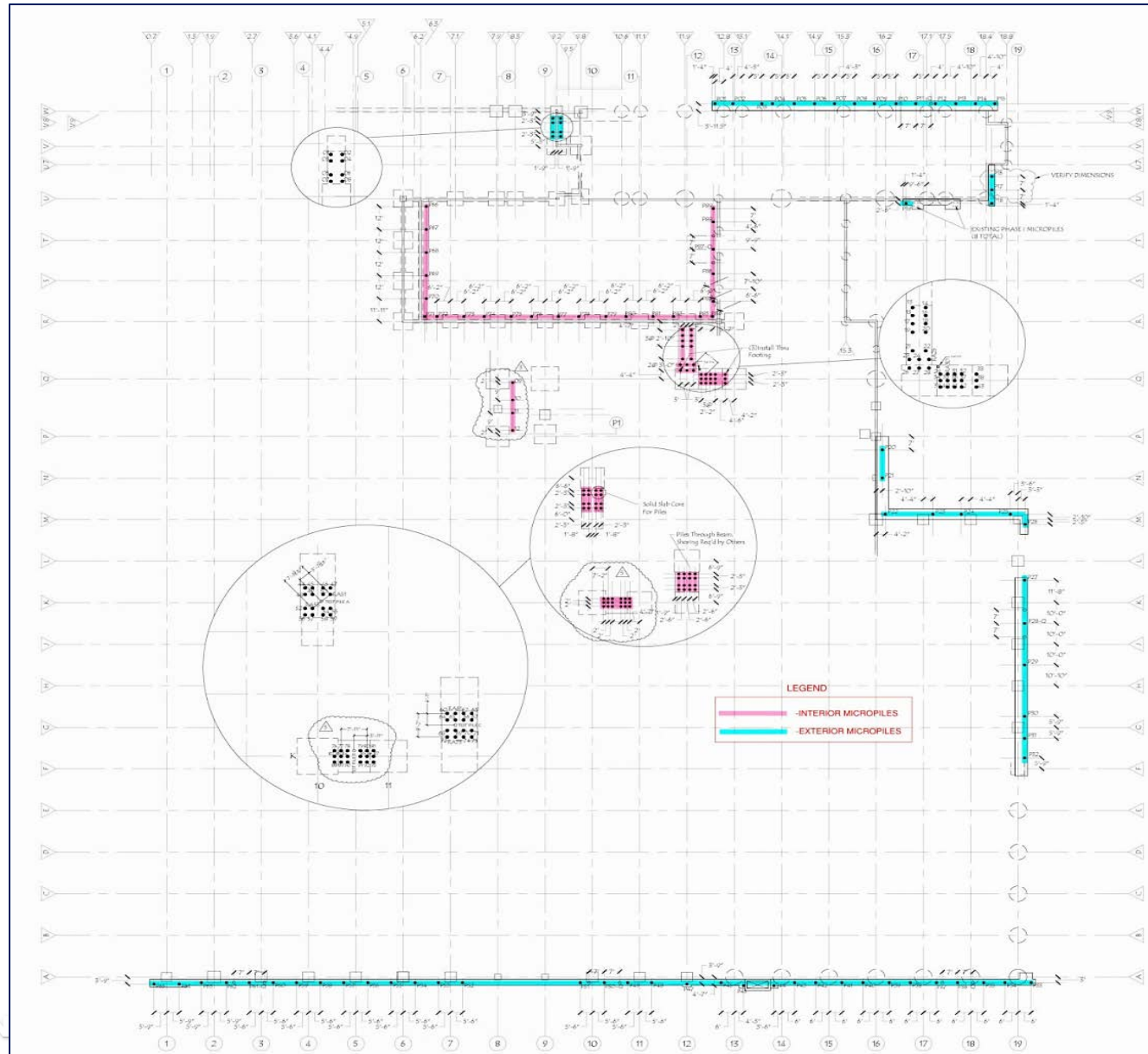
[www.HaywardBaker.com](http://www.HaywardBaker.com)

# Project Location: Memphis, TN USA





# Micropile Layout for VA Medical Center



# Micropile Design Sections

## Interior and Perimeter Micropiles



# Steel Pipe Sections and Cement





# Reinforcing Bars for Bond Zones



# Perimeter Micropile Drilling





# Perimeter Micropile Installation





# Courtyard Micropile Installation



# Courtyard Micropiles





# Courtyard Micropile Excavation for Concrete Pile Caps





# Interior Micropile Drilling





# Adding Pipe Section for Micropile



# Core Holes through Floor Slab





# Shoring and Basement Micropiles



# Basement Micropiles





# Perimeter Micropile Testing





# Exterior Load Testing





# Special Crane to Move Interior Testing Beam



# Interior Micropile Testing



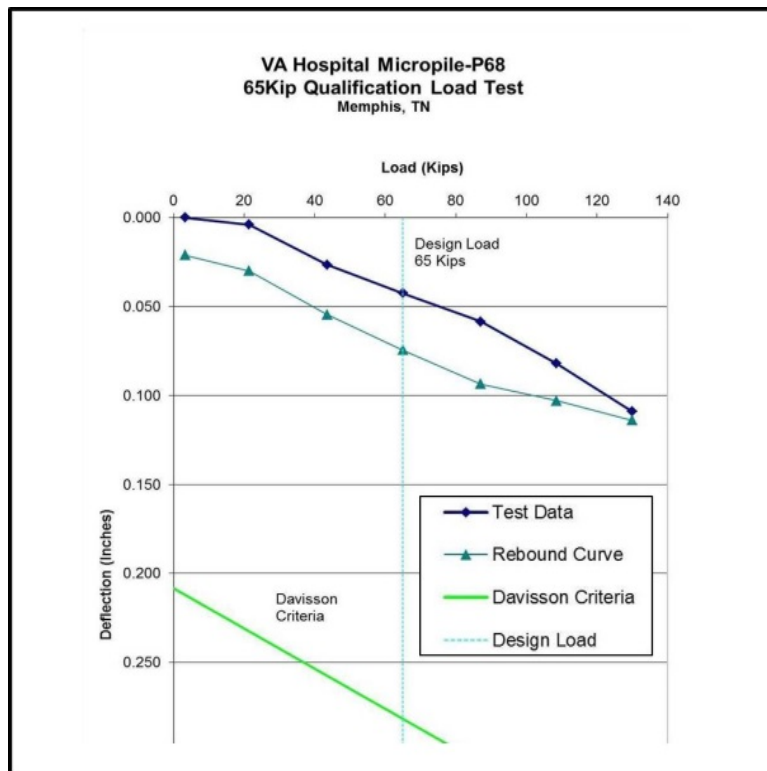


# Load Testing Summary

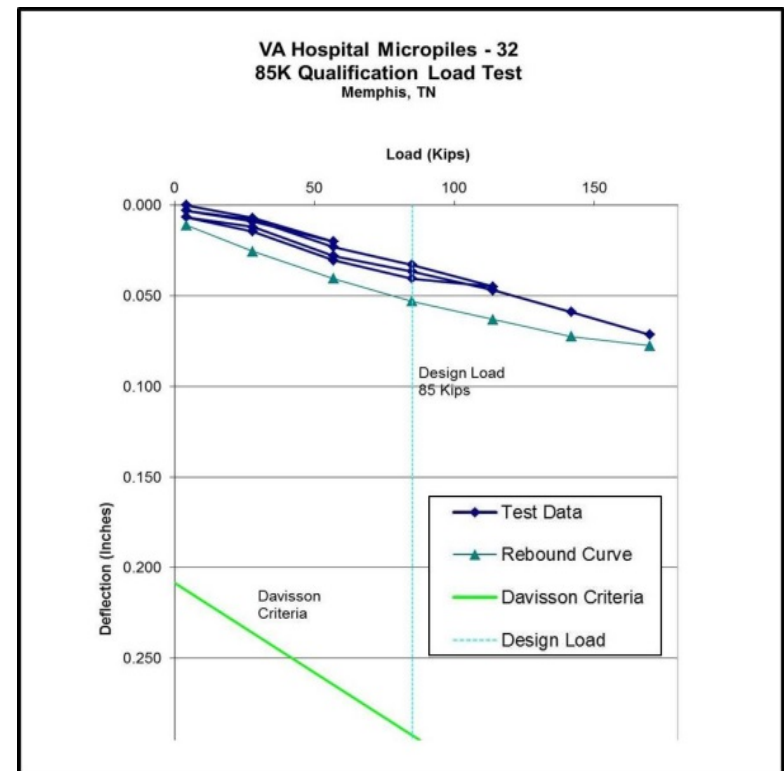
Location	Pile Number	Loading Type	Test Type	Design Load (kips)	Test Load (kips)	Test Load Factor	Cyclic/ Non-Cyclic	Comment
Courtyard	P68	Compression	Verification	65	130	2	Non-Cyclic	Production
Interior	32	Compression	Verification	85	170	2	Cyclic	Production
Perimeter	P11	Compression	Verification	65	130	2	Cyclic	Production
Perimeter	P5	Tension	Verification	55	110	2	Cyclic	Production
Perimeter	P28	Compression	Verification/ Research	65	195	3	Cyclic	Production, Extended Loading
Perimeter	P50	Tension	Verification	55	110	2	Cyclic	Production
Perimeter	P56	Compression	Verification	65	130	2	Cyclic	Production
Interior	49	Compression	Verification	85	170	2	Cyclic	Production
Interior	TP-C	Compression	Verification	85	170	2	Cyclic	Sacrificial
Interior	TP-D	Compression	Verification	85	170	2	Cyclic	Sacrificial
Courtyard	P74	Compression	Proof	65	98	1.5	Non-Cyclic	Production

# Compression Verification Tests

## ◆ Pile P68 Load Test



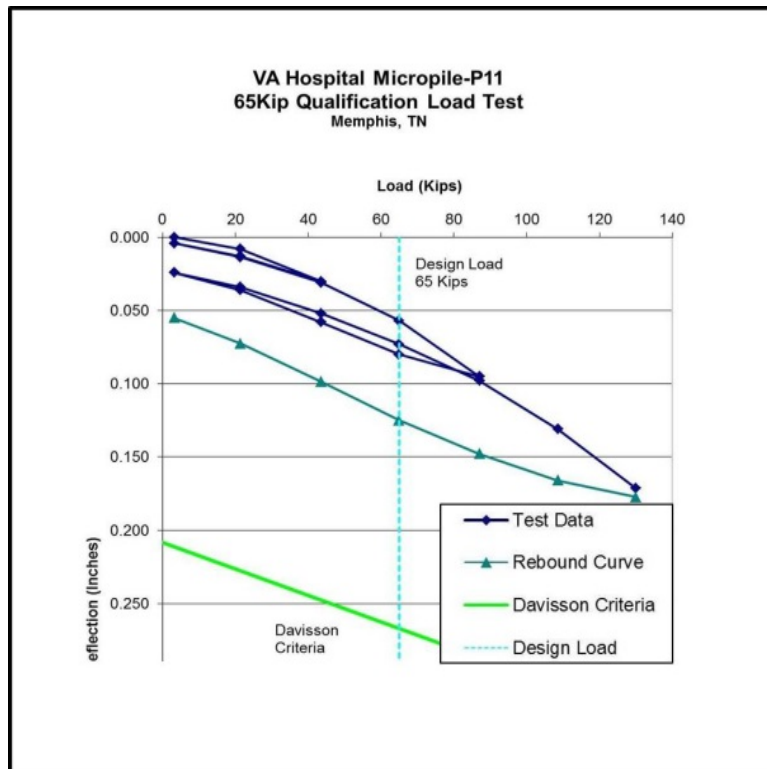
## ◆ Pile 32 Load Test



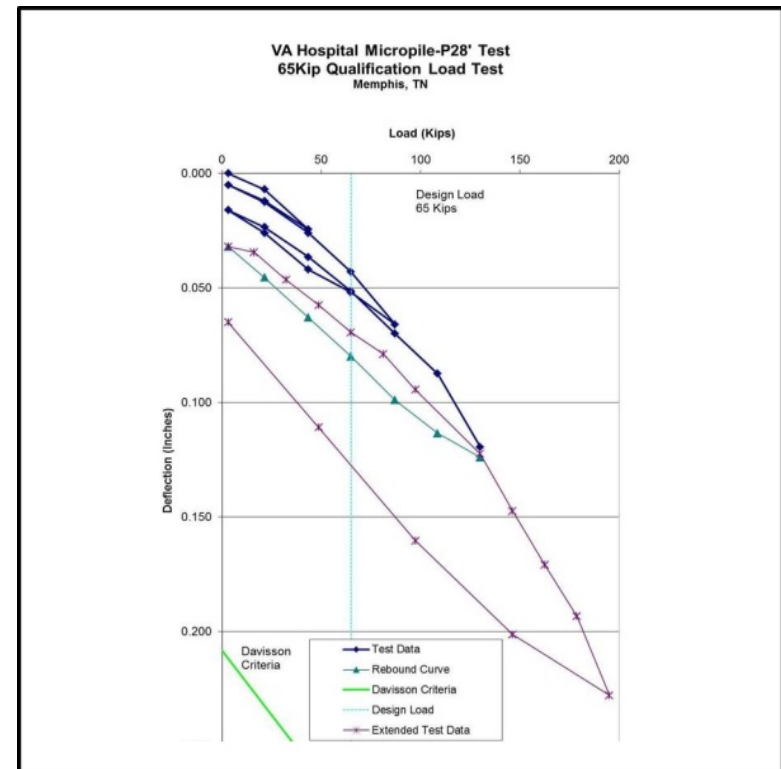


# Compression Verification Tests

## ◆ Pile P11 Load Test

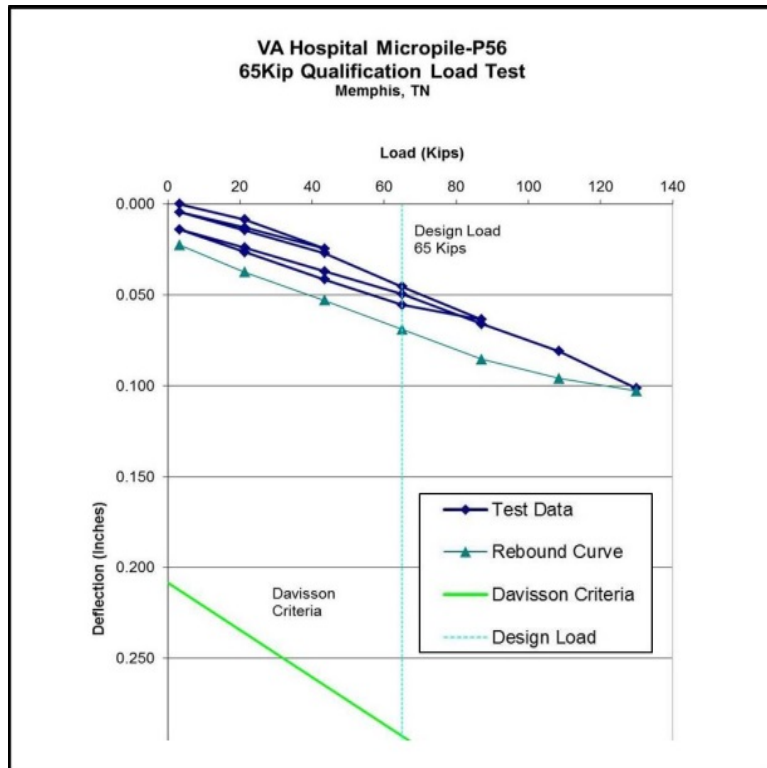


## ◆ Pile P28 Load Test

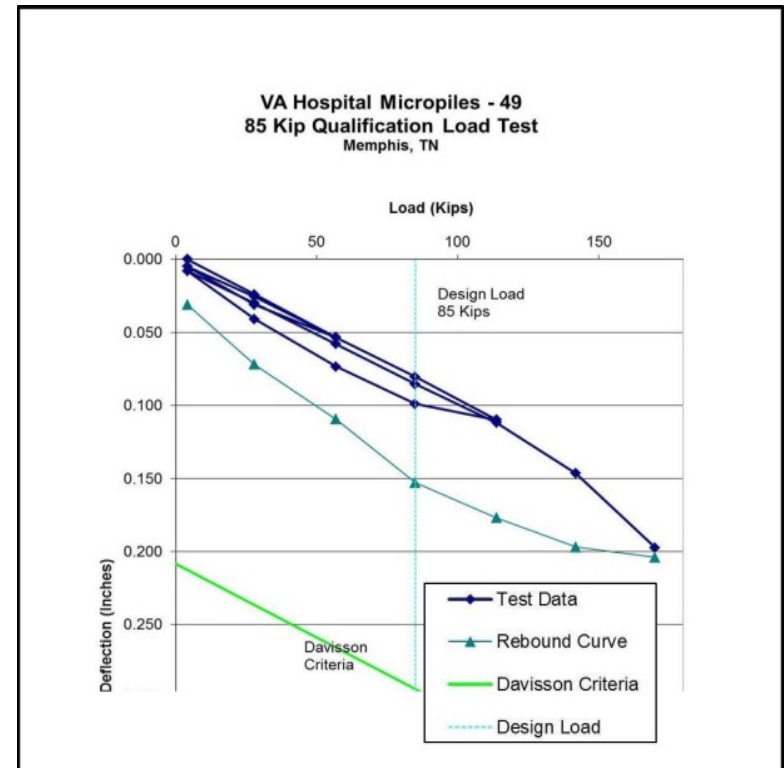


# Compression Verification Tests

## ◆ Pile P56 Load Test



## ◆ Pile 49 Load Test

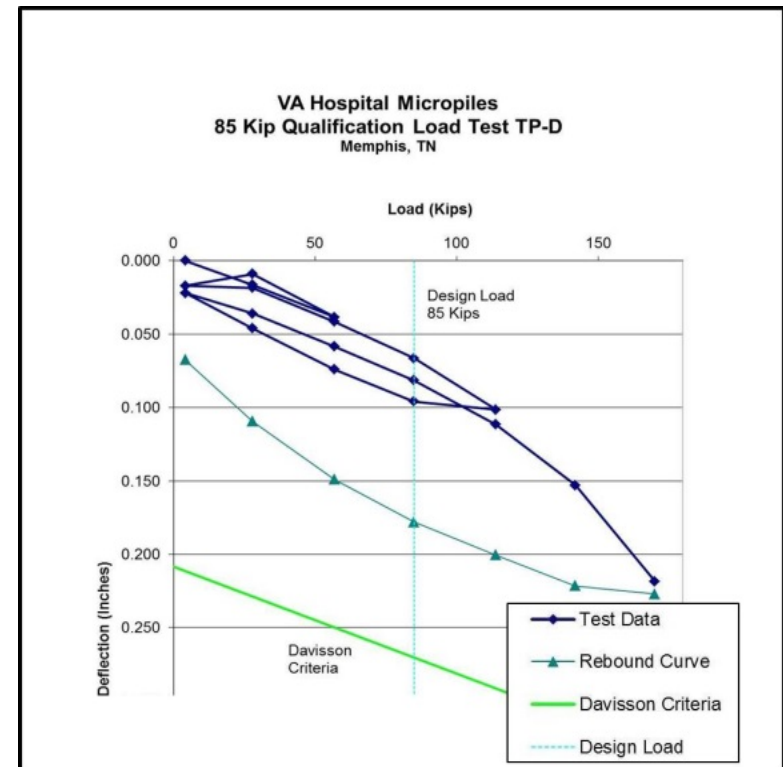
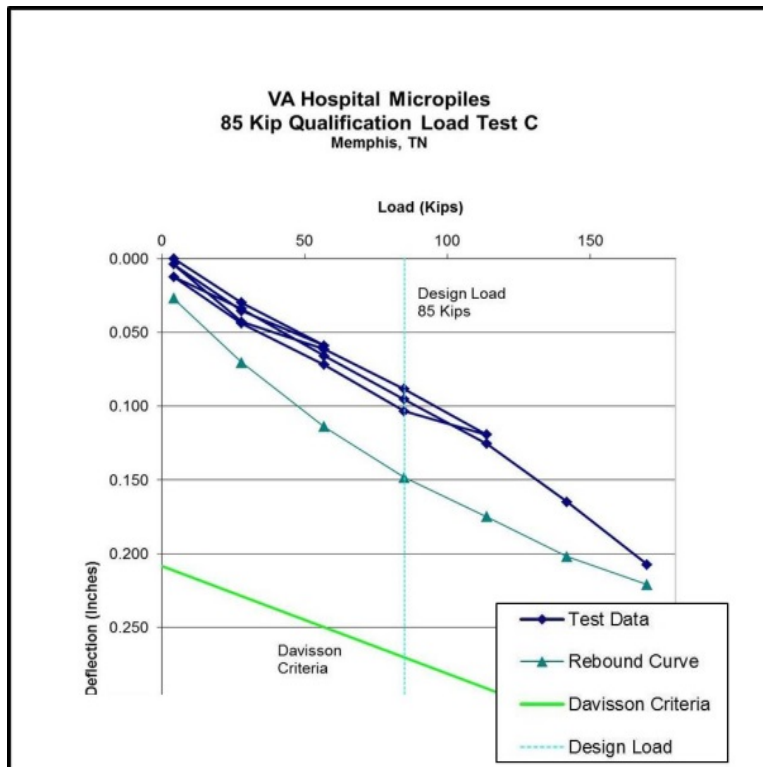




# Compression Verification Tests

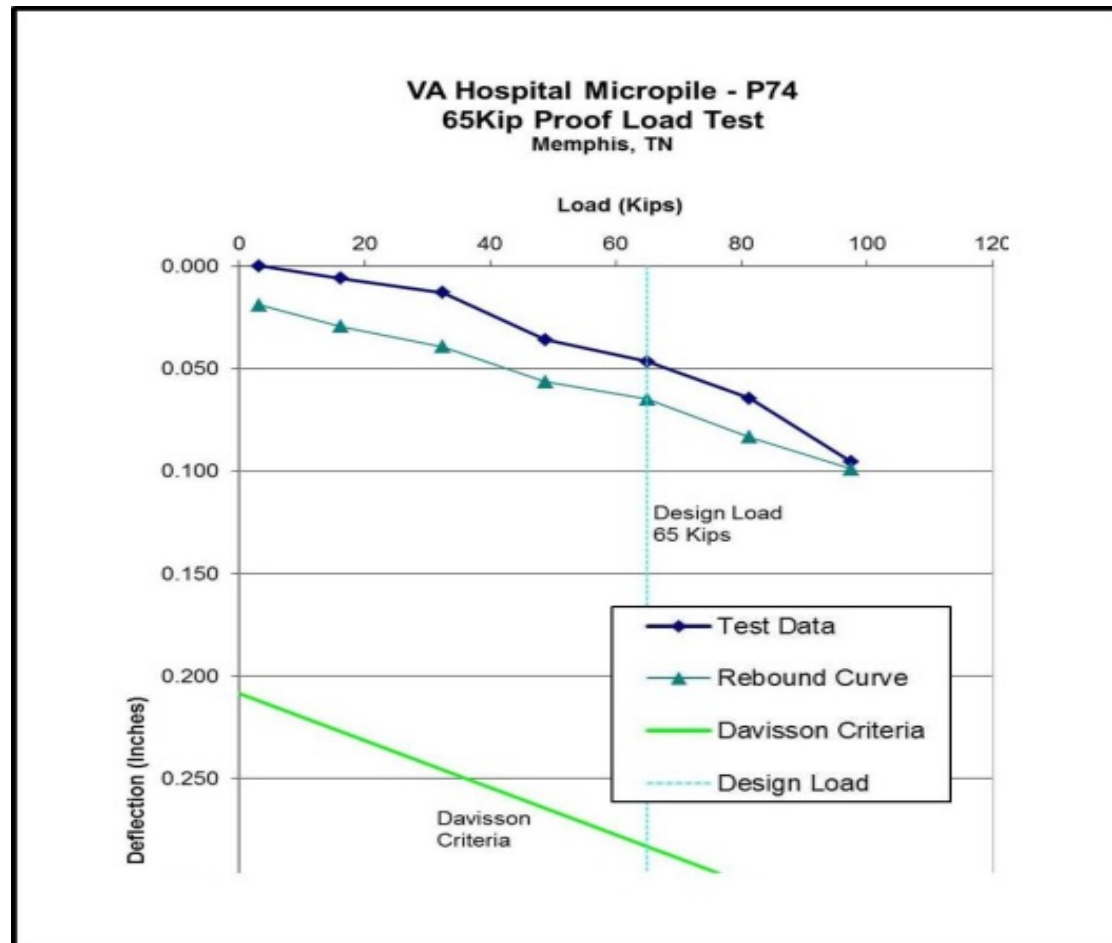
## ◆ Test Pile C Load Test

## ◆ Test Pile D Load Test



# Compression Proof Test

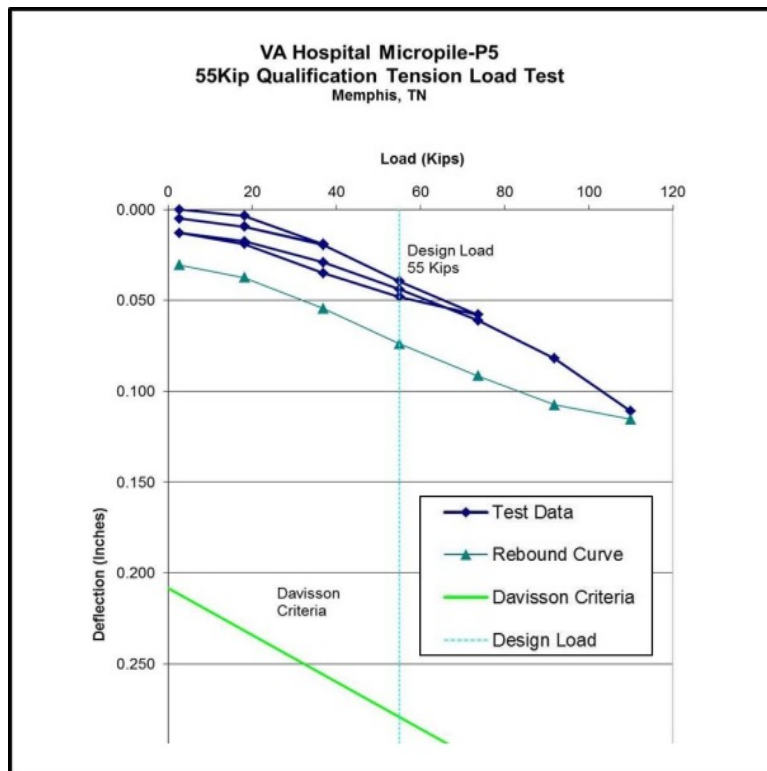
## ◆ Pile 74 Load Test



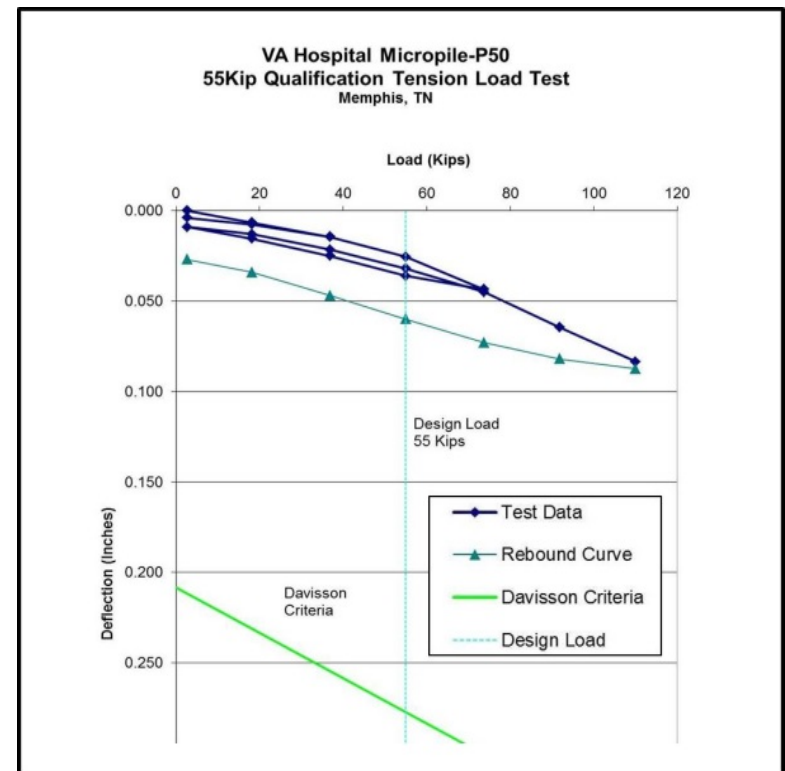


# Tension Verification Tests

## ◆ Pile P5 Load Test



## ◆ Pile P50 Load Test



**The End**

**Thank you for your Attention**

**John Wolosick**

**Hayward Baker Inc.**

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