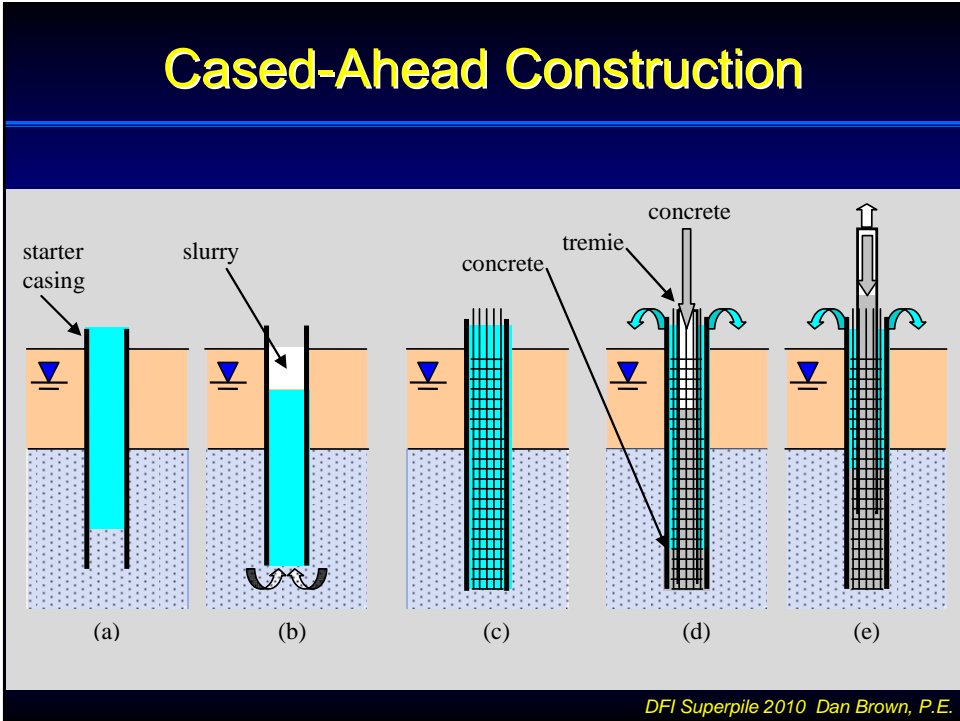


Drilled Shaft Foundations For Two Mississippi River Bridges in Louisiana

Dan Brown, P.E., Ph.D.
Dan Brown and Associates

Overview

- ◆ Two River Bridges with Drilled Shafts:
 - ◆ John James Audubon Bridge, St. Francisville
 - ◆ Huey P. Long Bridge, New Orleans
- ◆ Common Features:
 - ◆ Fully cased shaft excavations, ≈ 200ft deep
 - ◆ Base grouted



Base Grouting

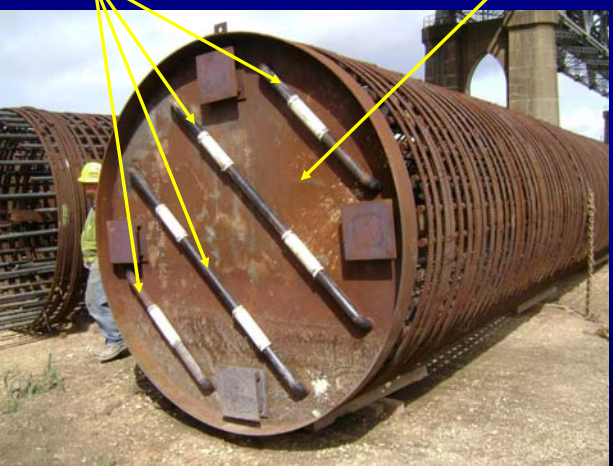
- ◆ Enhance Axial Resistance
- ◆ Improve Reliability
- ◆ Mitigate Imperfections in Base Conditions
- ◆ **Criteria:**
 - *Target Pressure*
 - *Minimum Net Volume*
 - *Limit Upward Shaft Movement*

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Base Grouting

Tube à Manchette
(using CSL tubes)

Cover Plate



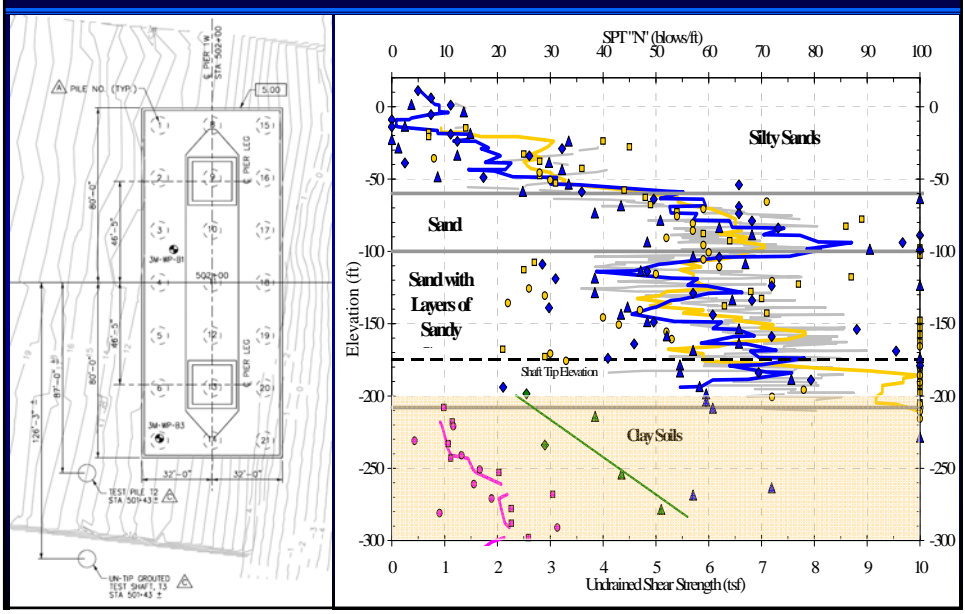
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Audubon Bridge

Cable-stayed bridge, 1583' main span
Two pylons: 3 x 7 group of 7.5' dia. Shafts
High approach: 2 column piers



Soil Conditions at Pylons



Casing & Oscillator System



Excavation

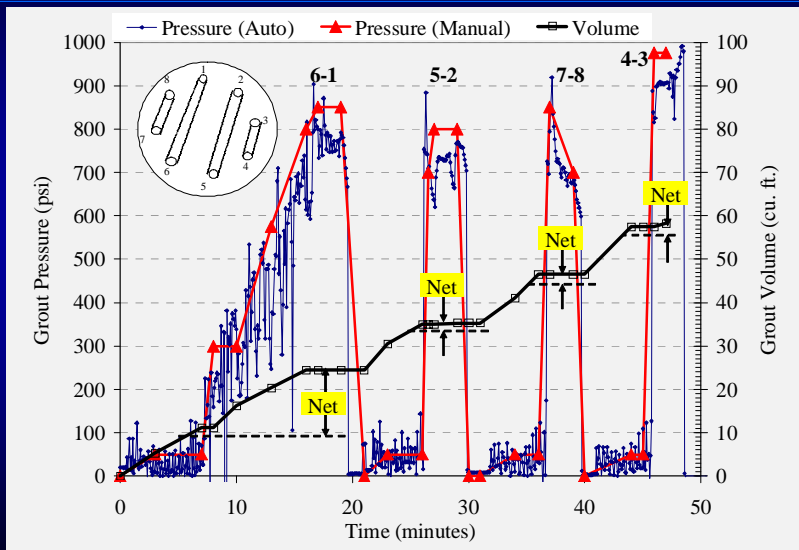


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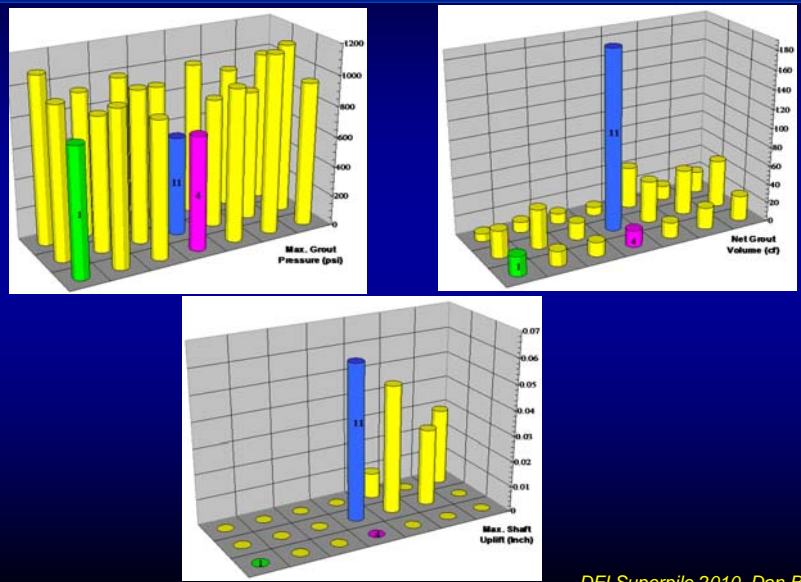


Base Grouting Measurements



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Performance During Grouting



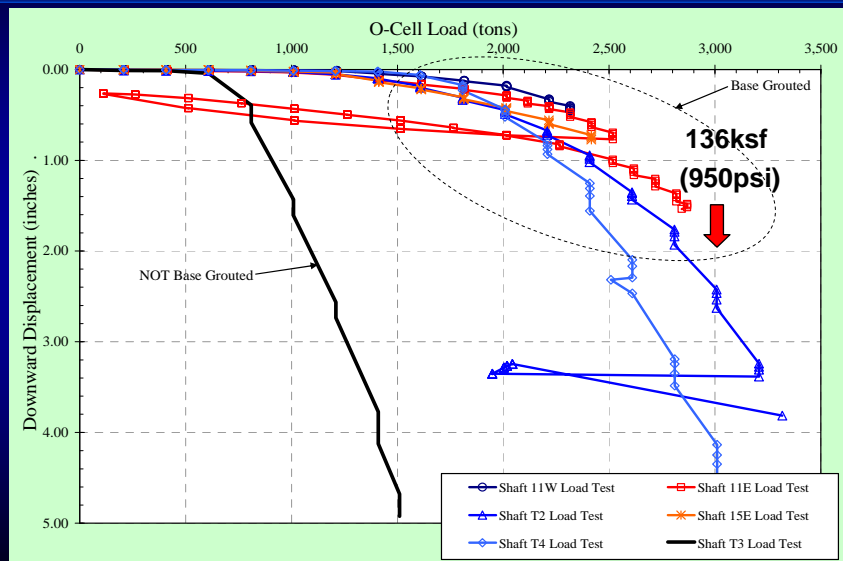
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O-cell Load Testing w/ Reaction Frame



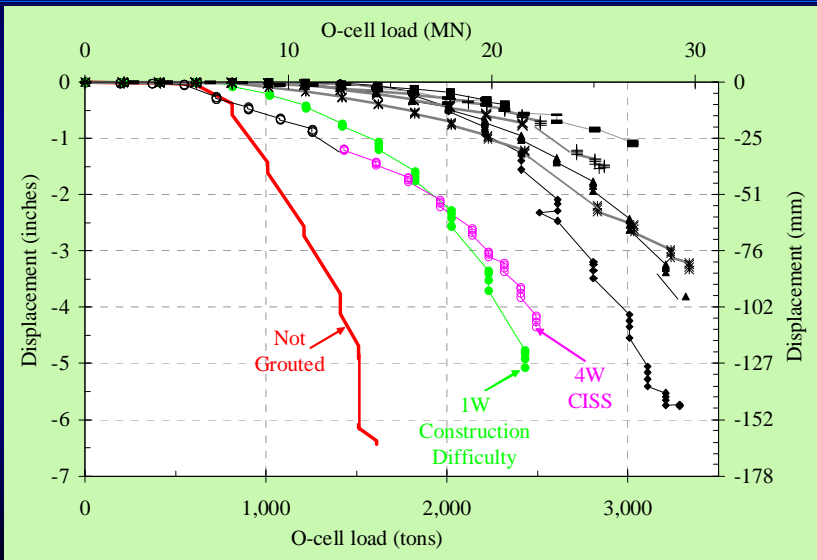
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Load Test Results



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Two Odd Shafts



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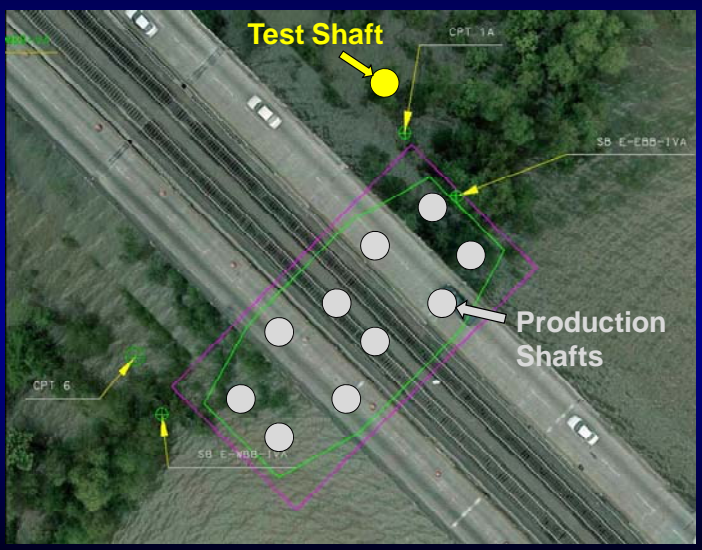
Huey P. Long Bridge Widening

- Owner:
La. DOTD
- Structural Engineers:
Modjeski and Masters
- Geotechnical Engineers:
Eustis Engineering
- General Contractor:
Kiewit/Massman/Traylor
- Subcontractor:
Malcolm Drilling Company
- Foundation Consultant:
Dan Brown and Associates

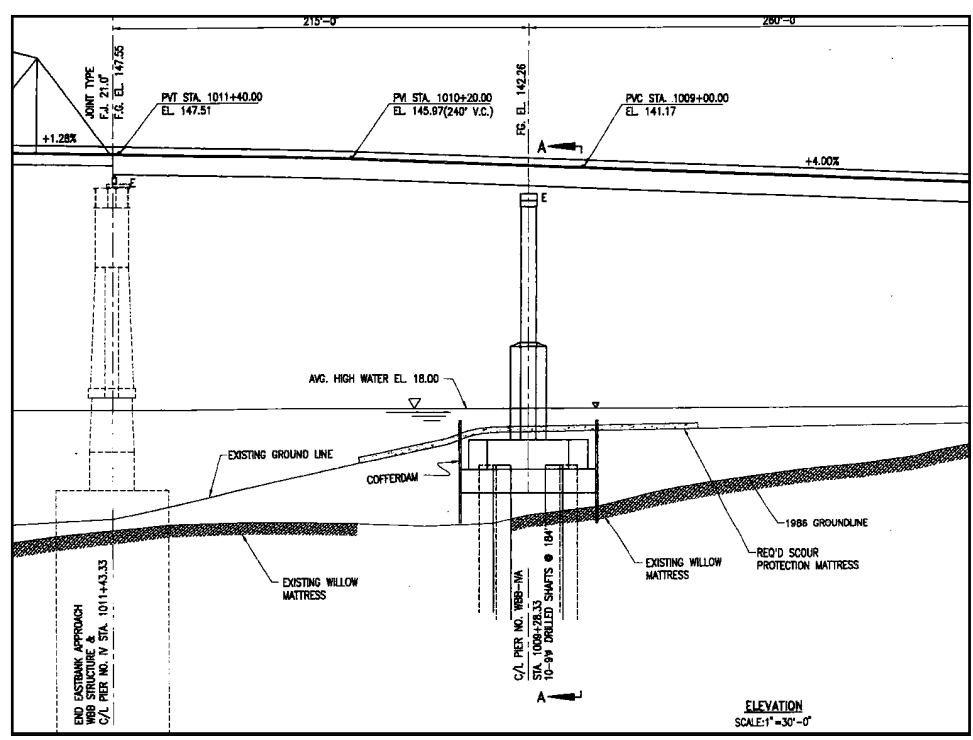


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Pier IVA



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Rotator System



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Casing



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Excavation Using Hammer-grab



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Shaft Cleaning & Inspection



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Reinforcement



Backbone Frame

Bar Splices

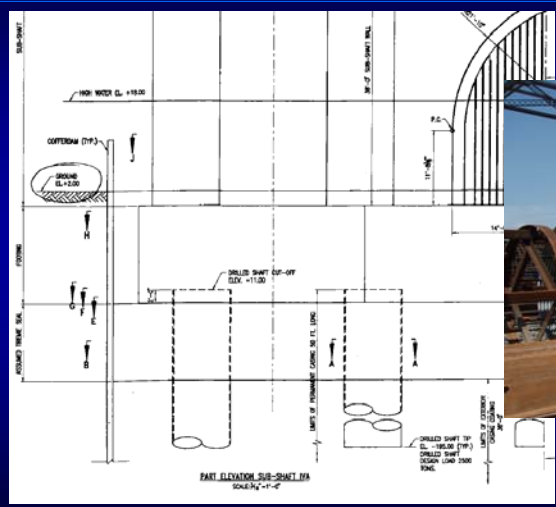
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Placement of Reinforcement



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Shaft/Cap Connection



Isolation Casing

Shaft Cutoff at -11

Concrete

Mix Proportions For One Cubic Meter (Cubic Yard) of Concrete

Cement	445.5	kg (lb)
Fly Ash	11.0	kg (lb)
Slag	244.5	kg (lb)
Fine Aggregate (SSD)	1150.11	kg (lb)
Coarse Aggregate 1 (SSD)	1148.11	kg (lb)
Coarse Aggregate 2 (SSD)	11.0	kg (lb)
Water	35.11	L (gal)
Water Reducer	114.10	mL (oz)
Air Entrainer	11.0	mL (oz)
Set Accelerator	11.0	mL (oz)
Superplasticizer	121.10	mL (oz)
Special Additive A	149.10	
Special Additive B	121.10	
Special Additive C		

Contractor KIEWIT MASSMAN TRAYLOR
 Certified Concrete Technician B. J. Cholden Code 112018
 Date Submitted 01/10/2019



Recover (7 oz/cwt)
VMA (3 oz/cwt)

Base Grouting

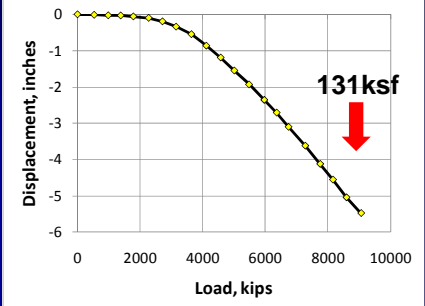
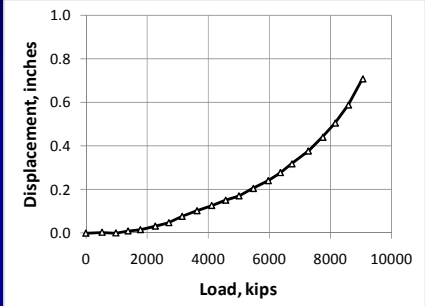


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Base Grouting QC/QA

General Information				Post Grout Criteria				
Date:	August 7, 2009			Minimum Required Grout Pressure:	650 psi (45 bar) (measured at pump)			
AFT Project No.:	808117			Maximum Permissible Displacement:	0.20 inch (measured via survey at shaft top)			
Project Description:	Huey P. Long Bridge Widening, State Project No. 005-01-0021			Minimum Grout Volume:	5 cubic feet (net pumped to the top of the shaft)			
Client Name:	Kiewit-Massman-Traylor Constructors (KMTC)			Post Grout Measurements				
Client Address:	4910 Pontchartrain Avenue Suite T, Jefferson, LA 70123			Data Acquisition System Used:	MEGADAC			
Client Contact:	Mr. Luis Paz			Pressure Transducer Used:	Hewlett Packard			
Post Grout Date:	July 29, 2009			Strain Gages:	AFT Sisterbars			
AFT Grout Specialist:	Jason Frederick			Manual Grout Pressure:	Micro-Measurements 1/2 Bridge Resistance			
AFT Data Acquisition Specialist:	Mike Muchard, P.E.			Survey Level:	Manual Oil Filled Bourdon Gage			
AFT Responsible Engineers:	Mike Muchard, P.E., Tom Santee, P.E.			Manual Grout Volume:	Molding Tank Level Manual Measurement			
Drilled Shaft Information				SUMMARY OF POST GROUT RESULTS				
Shaft Number	Bent/Pier Number	Diameter (inches)	Length (feet)	Installation Date	Maximum Grout Pressure (psi)	Upward Shaft Displacement (inches)	Maximum Gross Volume Placed (cubic feet)	Estimated Net Volume Placed ⁽¹⁾ (cubic feet)
Test Shaft	N/A	110	~190	7/21/09	800	0.081	188.8	156.8
Ground Surface Elevation (feet)	Approximate Top of Concrete Elevation (feet)			(1) Net volume calculated as follows: Net Volume = Gross Volume - measured volume of grout tubes (cu ft.) Tube I.D. = 2.0 in., Avg. tube length 210 feet.				
Cut Off Elevation (feet)	Approximate Top of Concrete Elevation (feet)			became blocked approximately 2hrs-40min. 3 cu ft.				
Installation Records provided								
Strain Gages installed: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Attached <input type="checkbox"/>				at Shaft Bottom vs Time <input checked="" type="checkbox"/> Spread Sheet via email <input checked="" type="checkbox"/> tests tests required minimum grout pressure, permissible displacement. grouted well except during grouting of 1/2 inch (1/2 mm) of each other. It is cured 115 to 130 minutes into the pier. but pressure assumed to apply over entire length of time are portions of the base area. In addition, grout tubes were grouted in a staggered pattern on the full base area. We believe this has contributed to a more uniform				
Instrumentation Installed in Strain Gages installed: Yes Installed By: Jason Frederick, AFT Number and Location: 4 gages at 9 feet above grout plate Other Instrumentation: Grout Pressure Transducer, LVDT's								
Post Grout Informa Grout Distribution: Tube-a-Manchette with plate (all) Apparatus Type: 2" steel (also used for CSL test) Grout Tube Type: B (4 - U-Tube pairs) Number of Grout Tubes: 8 (4 - U-Tube pairs) Tube Reference: Northernmost tube designated #1 Grout Plant Type: Harry LC 720 (note: had Harry LC) Grout Type: Type III Portland Cement and Water as needed in field as shown on I								

Performance of Load Test



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Completed Foundation



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Summary

Foundations for large bridges
present special challenges:
key issues

- ◆ *Construction plan to minimize risks*
- ◆ *Constructability issues of design*
- ◆ *Coordinated effort of partners*
- ◆ *Performance verification requirements*



Don't get bit!