



SMITH-EMERY LABORATORIES

An Independent Commercial Testing Laboratory

781 E. Washington Boulevard, Los Angeles, California 90021 ♦ (213) 745-5333 ♦ Fax (213) 741-8621

Project Number: 45306-1

Lab Number: L18-0566R

May 8, 2018

Greg J. Buchanan
COMTECH MANUFACTURING
17892 Jamestown Lane
Huntington Beach, CA 92647

Subject: Axial Compression Load Tests on Timber Piles with J-COM GFRP Jacket by Comtech Manufacturing and Silprogrout UWR™

Dear Mr. Buchanan,

At your request, Smith-Emery Laboratories performed Axial compression tests on four pile samples according to your instructions.

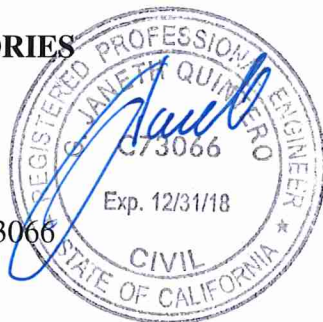
The accompanying report number L-18-0566 details description of the test performed, results of our testing, and our findings and conclusions.

Smith-Emery is pleased to be of service to you for this project, and we hope to fulfill more of your testing needs soon. If you have any questions regarding this report, please do not hesitate to contact us at (213) 749-7840.

Respectfully submitted,

SMITH EMERY LABORATORIES

G. Janeth Quintero, P.E.
Registered Civil Engineer No.: C73066
Registration Expires: 12-31-18



cc: Project File

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1904-2018

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REPORT OF:

AXIAL COMPRESSION LOAD TEST ON TIMBER PILES WITH J-COM -
COMTECH GFRP JACKETS

PREPARED FOR:

GREG J. BUCHANAN
COMTECH MANUFACTURING
17892 JAMESTOWN LANE
HUNTINGTON BEACH, CA 92647

PROJECT NUMBER:

45306-1

REPORT NUMBER:

L18-0566

REPORT DATE:

MAY 8, 2018



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1.0 INTRODUCTION

1.1 Purpose

The purpose of our testing was to determine the Axial Compression load capacity of timber piles rehabilitated with J-Com's GFRP Pile Jackets by Comtech Manufacturing and Silprogrout UWR™.

1.2 Scope of Testing

The general scope of this testing program includes performing:

1. Four (4) Axial load tests on four pile samples
2. Six (6) Compression test on Silprogrout UWR™ molded on 2-in x2-in x 2-in cubes.
3. Issue a final report detailing the test description, results, and our findings.

The tests were performed in Smith Emery Los Angeles facility Laboratory on April 17, 2018 . The test setup and results are summarized in Sections 2 and 3, respectively.

1.3 Sample Description

Samples consisted of timber piles repaired with the J-Com's GFRP Pile Jackets filled with a cementitious grout named Silprogrout UWR™, The samples were reportedly made on February 28, 2018 . Sample number one labeled BOT 3 measured approximately 3-ft- 5-in in length (timber pile) with a diameter of 1ft-3-in and the Jacket measured approximately 2 ft- 11-in in length and 1ft- 4.25-in in diameter; Sample No. 2 labeled MID 2 measured approximately 3-ft- 5-in in length (timber pile) with a diameter of 1ft-3.5-in and the Jacket measured approximately 3ft- 2-in in length and 1-ft- 5-in in diameter; Sample No. 3 labeled TOP1 measured approximately 2ft- 8.5-in in length (timber pile) with a diameter of 1ft-2.5-in and the Jacket measured approximately 2ft- 8.5-in in length and 1-ft- 4-in in diameter; and last sample No. 4 consisted only of a timber pile for control purposes measuring 2-ft long and 1-ft



and 3-in in diameter. Reportedly samples No. 2 and 3 had 40% and 31%, respectively, of their cross sectional area removed to replicate a damage pile. See Figure No.1 below, Pictures on Appendix A , Product Information on Appendix C , and drawing provided by client on Appendix D for clarification.

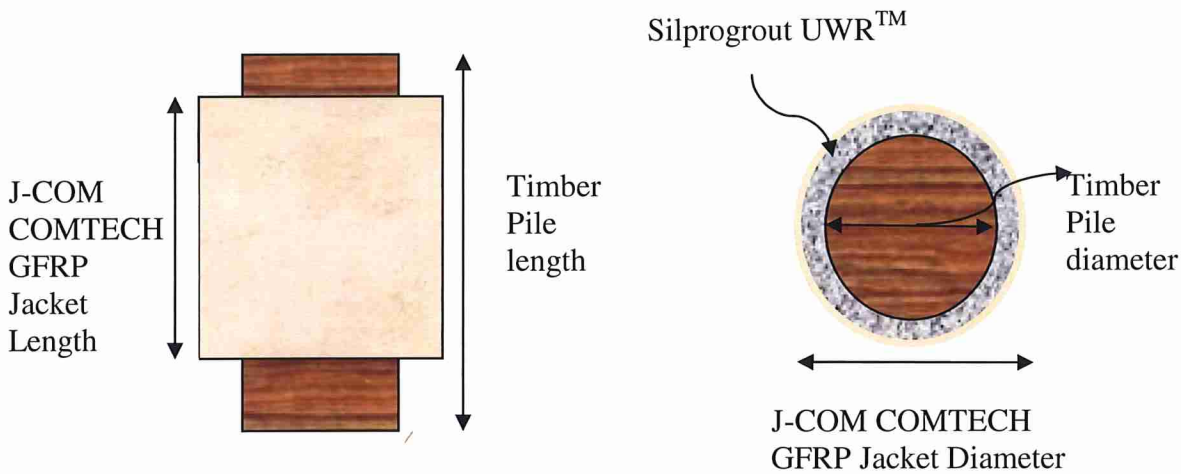


FIGURE NO.1. SAMPLE DESCRIPTION



2.0 TEST SETUP AND LOADING PROCEDURE

2.1 Axial Load Test

2.1.1 Test Setup and Loading Procedure

The specimens were subjected to axial Compression load test per clients request using a Calibrated Baldwin UTM with 1,000,000 lbs load capacity. The samples were loaded at the center of each pile with using a steel plate with a concentrated vertical load ranging from 500 to 800 lbs. per second until failure occurred or until the sample could not take any more load. Results are included in Section 3.1. and photos are included in Appendix A.



3.0 TEST RESULTS

3.1 Axial Compression Test

A total of four Compression tests were performed on the specimens and the results are tabulated below in Table 1.

Table 1 – Summary of Axial Compression Tests Results

Test No	Test ID	Maximun Load (lbs)	Observations
1	BOT 3	565,400	Timber Pile failed at the bottom.
2	MID2	664,250	Tmber Pile failed at the top
3	TOP 1	692,050	Timber Pile failed at the bottom.
4	No ID	654,350	Sample without GFRP Jacket

On samples BOT 3 and MID2 the GFRP Jacket and grout was removed on a portion of the sample to verify that the repaired section of the timber pile did not fail. See Pictures No. 9 through 13 for clarification.

3.2 Compression Test on Silprogrout UWR™

Silprogrout UWR™ samples were molded in 2-inch cube mold by the client reportedly on February 28, 2018. Prior to testing, samples were cured in a moist room at a temperature of 73°F and 100% relative humidity for 48 days. Samples were tested on April 17, 2018. Complete report is included in Appendix B.

Sample No.	No. of Days	Load, Lbs.	Area, Sq. In.	Max. Load, PSI
1	48	31,090	4.00	7,770
2	48	34,140	4.00	8,540
3	48	32,100	4.00	8,030
4	48	32,660	4.00	8,170
5	48	33,020	4.00	8,260
6	48	32,530	4.00	8,130
			Average	8,150



4.0 FINDINGS AND CLOSURE

4.1 Findings

All findings noted in this report were prepared in accordance with generally accepted material engineering and testing principles and practices. No other warranty, either expressed or implied, is made.

4.2 Closure

This report has been prepared for **Comtech Manufacturing** to be used for product evaluation and/or design purposes only. The use of this report for any other purpose shall be at the users' own discretion, based on their own interpretation of the results contained within.

Respectfully Submitted,

G. Janeth Quintero, P.E
Registered Civil Engineer No. C73066
Registration Expires: 12-31-18





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Appendix A

PHOTOGRAPHS



PHOTO No.1 SAMPLES AS RECEIVED



PHOTO No.2 TYPICAL CROSS SECTION OF THE SAMPLES



PHOTO No.3 TEST SET UP



PHOTO No.4 SILPROGROUT UWR™ AROUND THE PILE



PHOTO NO.5 SAMPLE BOT3 AFTER TESTING



PHOTO NO.6 SAMPLES MID 2 AND TOP 1 AFTER TESTING



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PHOTO No.7 SAMPLES MID 2 AND TOP1 AFTER TESTING



PHOTO No.8 CONTROL SAMPLE AFTER TESTING



PHOTO No.9 OPENING SAMPLES BOT3 AND MID2



PHOTO No.10 EXPOSING PILE REPAIRED AREA, NO WOOD DAMAGE IN REPAIRED SECTION OF PILE WAS OBSERVED.

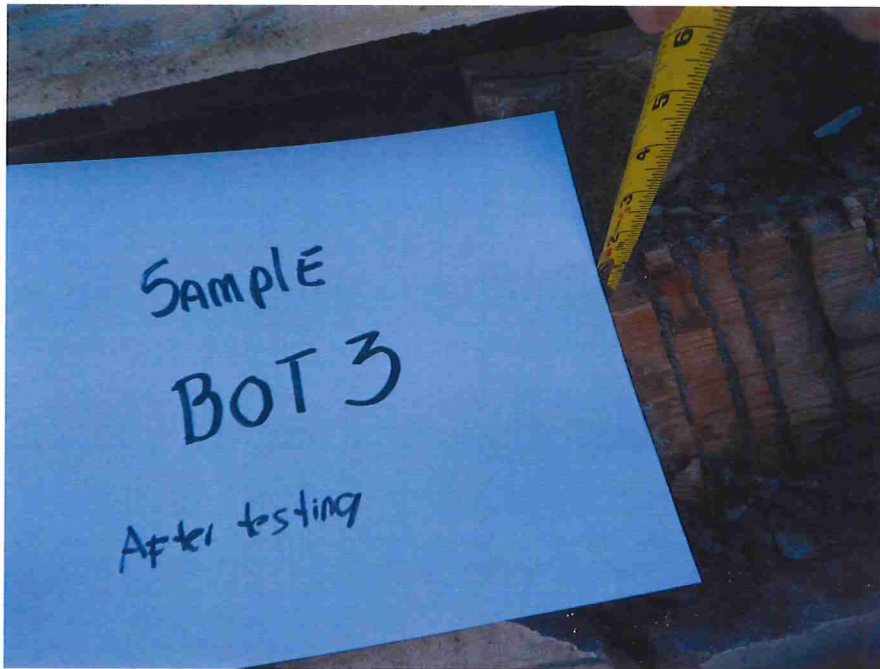


PHOTO NO.11 EXPOSING PILE REPAIRED AREA, NO WOOD DAMAGE IN REPAIRED SECTION OF PILE WAS OBSERVED.



PHOTO NO.12 EXPOSING PILE REPAIRED AREA, NO WOOD DAMAGE IN REPAIRED SECTION OF PILE WAS OBSERVED



PHOTO NO.13 EXPOSING PILE REPAIRED AREA (MID 2 SAMPLE) , NO WOOD DAMAGE IN REPAIRED SECTION OF PILE WAS OBSERVED.



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Appendix B

SILPROGROUT UWR™ COMPRESSION TEST REPORT



SMITH-EMERY LABORATORIES

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781 E. Washington Boulevard, Los Angeles, California 90021 ♦ (213) 745-5333 ♦ Fax (213) 741-8621

Proj./Job No.: 45306-1
Lab. No.: L18-0566

April 26, 2018

Client: **COMTECH MANUFACTURING**
17892 Jamestown Lane
Huntington Beach, CA 92647
Attn: Greg J. Buchanan

Project: **Axial Compression Load Tests on Timber Piles with J-COM GFRP Jacket by Comtech Manufactu**
Subject: **Compressive Strength Test on Silprogrout UWR™**
Test Procedure: ASTM C 109-02: Test Method for Compressive Strength of Hydraulic Cement Mortars
(Using 2-in. Cube Specimens)

Source: Samples Made by client picked up by Smith-Emeylabs/ Anaheim

Report of Test

Compressive Strength Test

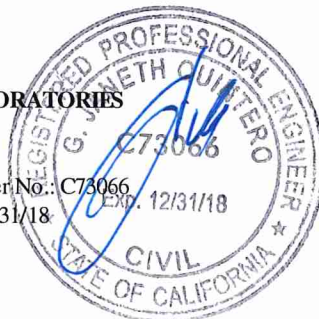
Silprogrout UWR™ samples were molded in 2-inch cube mold by the client reportedly on February 28, 2018 . Prior to testing, samples were cured in a moist room at a temperature of 73°F and 100% relative humidity for 48 days. Samples tested on April 17, 2018

Sample No.	No. of Days	Load, Lbs.	Area, Sq. In.	Max. Load, PSI
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4	48	32,660	4.00	8,170
5	48	33,020	4.00	8,260
6	48	32,530	4.00	8,130
			Average	8,150

Respectfully Submitted,

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G. Janeth Quintero, P.E.
Registered Civil Engineer No.: C73066
Registration Expires: 12/31/18



- Materials Tested Comply With Specifications.
- Materials Tested Did Not Comply With Specification
- No Established Criteria for Acceptable Limits.
- For Information Only

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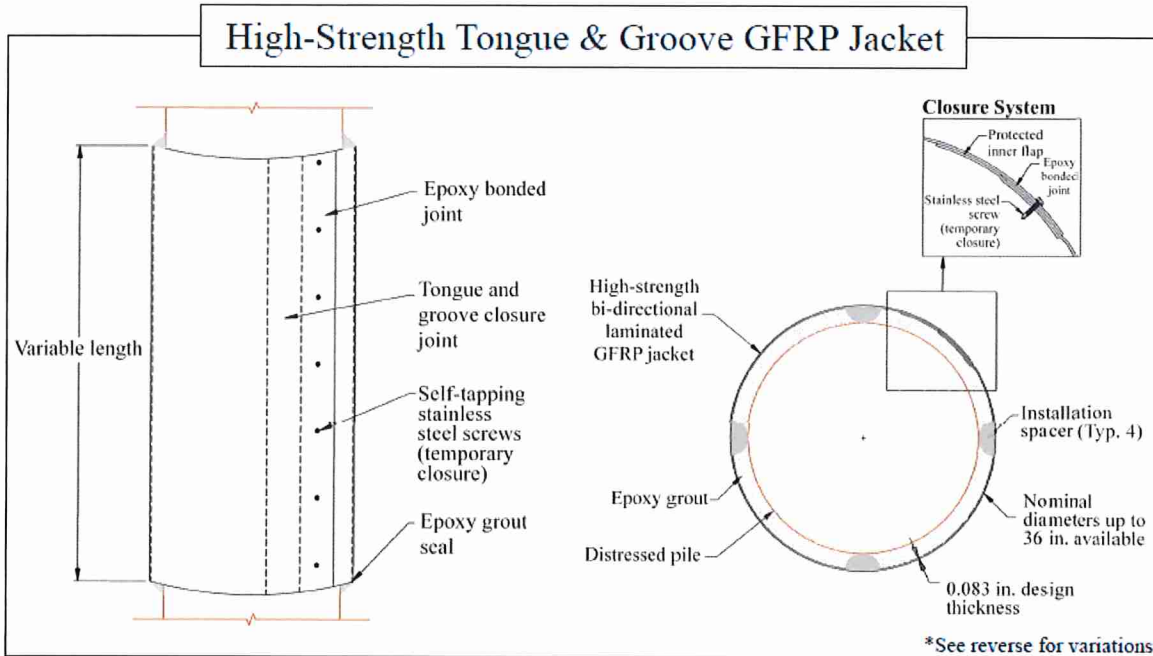


Appendix C

PRODUCT INFORMATION



J-COM Technical Data Sheet



Property	Test Method	Result
Water Absorption	ASTM D570	0.5% maximum
Ultimate Tensile Strength	ASTM D638	35,000 psi minimum
Tensile Modulus of Elasticity	ASTM D638	2,500,000 psi minimum
Flexural Strength	ASTM D790	31,000 psi minimum
Flexural Modulus of Elasticity	ASTM D790	1,300,000 psi minimum
Barcol Hardness	ASTM D2583	40 minimum
Design Wall Thickness	--	.083 in.

Recommended factor of safety is $\Omega=2.0$. Values shown are based on preliminary product testing and may vary. Information found in this document is believed to be true and accurate at time of publication. Consult with a professional engineer as to the suitability of our product for your particular application.

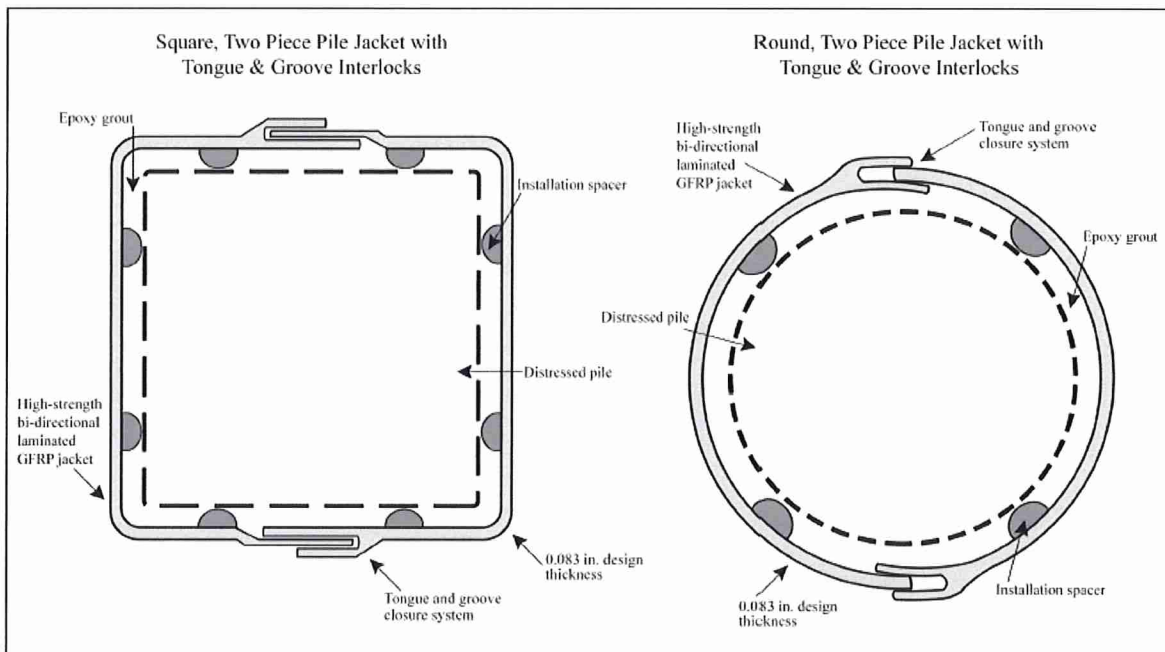
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INSTALLATION OVERVIEW

- Prepare the site by thoroughly cleaning and removing oil, grease, dirt, marine growth and any other deleterious material from the existing pile.
- Install spacers and injection ports as required by the project and engineer.
- Inject sealing compound in groove side of tongue and groove interlock.
- Position jacket around pile, engaging tongue and groove interlock.
- Secure jacket with strapping system such as nylon ratchet straps placed every 18" or as required. Use a minimum of ¼" stainless steel self-drilling/tapping screws along center of tongue and groove joint placed every 6" vertically.
- If necessary, apply a bottom seal with material such as backer rod, epoxy packing or splash zone. Let bottom seal cure to prevent fill material from slipping out.
- Fill jacket with epoxy grout as specified by the project or engineer.
- Allow fill material to cure.
- If necessary, construct a beveled top seal.
- Remove ratchet straps and any additional bracing that was used.

For detailed instructions, refer to J-COM's GFRP Pile Jacket Repair Guide or call Comtech at (714) 465-1059.



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SILPRO

SILPROGROUT UWR™

Underwater Repair
Non-Shrink
Non-Metallic
High Strength
No added epoxy

SILPRO, LLC / 2 NEW ENGLAND WAY / AYER, MA 01432-1514 / 800-343-1501 / 978-772-4444 / FAX 978-772-7456 / WWW.SILPRO.COM

SilproGroutUWR™ is a high performance, high-strength, non-shrinking, non-metallic, cement-based, non-segregating, grout for use underwater. The specialty formulation creates an anti-washout grout to complete your repair. SilproGrout UWR™ is specifically formulated to repair deteriorated wood and concrete columns and piles. In conjunction with a fiberglass CRF COLUMN REPAIR FORM™, repairs to deteriorated piles and columns can be performed in place without removing the pile or column. SilproGroutUWR™ can be mixed by drill, mortar mixer, or pump.

USE SILPROGROUT UWR™ FOR

- Repair of deteriorated wood piles
- Repair of deteriorated concrete columns
- Underwater concrete voids
- Underwater dowling
- Seawall repairs

ADVANTAGES

- High Strength
- Cures in water
- Pumpable
- Non-Shrink
- Non-Metallic
- Non-Corrosive
- Can be extended
- Just add water
- Superior bond

TEST DATA

Set Time	
Initial Set	4.5 hours
Final Set	9 hours

Splitting Tensile Strength ASTM C496	
670 psi	28 Days

Yield of 50lb bag ASTM C138	
.45 lb ft³	

Density ASTM C138	
130 lbs ft³	
2084 kg m³	

Compressive Strength ASTM C109	
1700 psi	1 day
4700 psi	3 days
6900 psi	7 days
7700 psi	28 days

Flexural Strength ASTM C348	
1484 psi	28 days

TEST DATA, (CONT.)

Bond Strength ASTM C882M	
3188 psi	28 days
Hardened to plastic grout	

Modulus of Elasticity ASTM C469 (X10 ⁶ psi)	
3.7 psi	29 days

Bleeding ASTM C232-C940	
No bleeding	

Length Change ASTM C157	
Wet Cured, Positive Expansion <0.15%	
Dry Cured, Shrinkage <0.15%	

ASTM C666 Freeze/thaw test - Pass

SURFACE PREPARATION

All bond-inhibiting materials must be removed. For concrete, wood, and steel use high-pressure water-blasting or mechanical means to remove any loose or friable material to achieve a structurally sound surface.

APPLY A TEST

When appropriate have any structural element inspected by an engineer to determine suitability for the repair. Where feasible perform a test to confirm the suitability of the application, and that the final appearance and function will be as the owner, architect, and contractor expect, install a test area at the maximum designed thickness anticipated on the project and subject it to anticipated service conditions before proceeding with the job.

MIXING

4.5 Quarts of water per 50 lb bag

Mix the SilproGrout UWR™ without aggregate for application from 3/4" to 2". Mix the amount of SilproGrout UWR™ that can be placed in 15-20 minutes. Add the required water to the mixer, then slowly add the SilproGrout UWR™ into the operating mixer. Mix for 2-3 minutes and until lump free.

For applications that do not require a CRF COLUMN REPAIR FORM™ and are 2 inches to a maximum of 8 inches in thickness extend with 20 lb to 35 lb of clean washed 1/4" to 1/2" pea stone for each 50 lbs of grout. For applications exceeding 8" contact SILPRO. Aggregate must be added once the grout has been mixed to a lump free consistency.

For Customer Service, Call Silpro at 1-800-343-1501



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APPLICATION

SilproGroutUWR™ can be applied into the repair area by bucket, pump, or tremie. When pumping grout, a port can be installed at the bottom and subsequent sections of the Form allowing the grout to easily displace the water as it is pumped. Check for leaks at the bottom of the CRF COLUMN REPAIR FORM™ and at seams during the application.

CAUTION!

SILPRO offers products that may contain cement, latex, epoxy, and other chemicals. Please review the Safety Data Sheet before the use of this product.

CURING

Keep the temperature of the grout above 35F for a minimum of 48 hours.

COVERAGE

Yield per bag ASTM C-185: 45 ft³

SHELF LIFE

2 Years

PACKAGING

50 lb bag

LIMITATIONS

- For temperatures higher than 90°F (32°C), consult with SILPRO's technical service department

GUARANTEE

Please call SILPRO, LLC for copy of guarantee.

SILPRO



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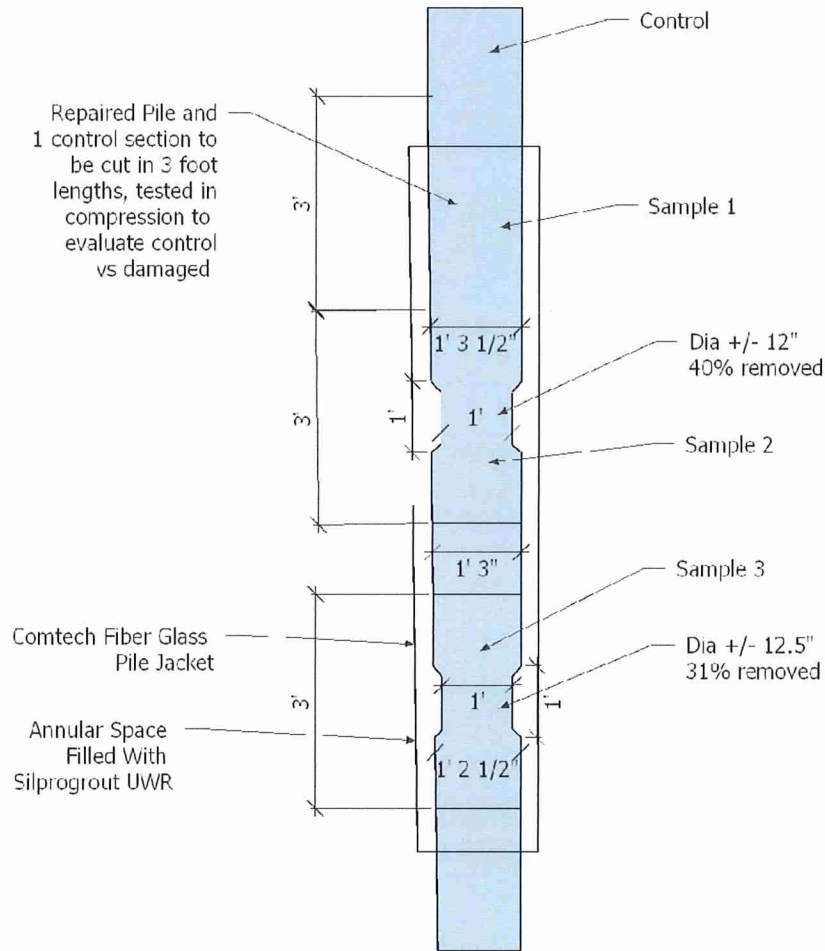


Appendix C

CLIENT'S SPECIMEN DRAWING



PILE REPAIR TEST



Comtech Manufacturing Inc. 17892
Jamestown Lane Huntington Beach,
CA, 92647



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END OF REPORT