GRA SERVICES INTERNATIONAL

5000 East 2nd Street • Edmond, Oklahoma 73034-7545 (405) 330-2395 • Fax (405) 330-1397 • info@graservices.com

Full Destructive Test Results – FRS Repair System for Class 2 Poles and below

Pole ID	Species	Ht./Class	Sleeve Length	% Remaining Section Modulus	Damage Location From Butt Of Pole	NESC Installation Load Capacity (Lbs)	Ultimate Test Load (Lbs)	Variance (Lbs)	% of Load Carried	Sleeve Failure	Pole Failure
Test #1	SYP	40/05	6’	10% or less	6’	1900	716	-1,184	37.68%	X	
Test #10	SYP	40/05	6’	10% or less	6’	1900	1753	-147	92.26%	X	
Test #11	DF	40/05	6’	10% or less	6’	1900	2224	324	117.05%		X
Test #12	DF	40/04	6’	10% or less	6’	2400	2553	153	106.38%		X
Test #13	DF	40/04	6’	10% or less	6’	2400	2491	91	103.79%		X
Test #14	DF	45/03	6’	10% or less	6.5’	3000	3212	212	107.07%		X
Test #15	DF	45/03	6’	10% or less	6.5’	3000	2957	-43	98.57%		X
Test #16	SYP	45/02	6’	10% or less	6.5’	3700	3501	-199	94.62%		X
Test #17	SYP	45/02	6’	10% or less	6.5’	3700	3855	155	104.19%		X
Test #18	SYP	45/02	6’	10% or less	6.5’	3700	3797	97	102.62%		X
Test #19	WRC	45/02	6’	50% or less	6.5’	3700	3904	204	105.51%		X
Test #20	WRC	40/01	8’	50% or less	6’	4500	4063	-437	90.29%	X	

Note 1 All poles tested were new poles or poles removed from service for reasons such as right of way relocation or pole height requirements. All poles were mechanically altered to remove 50% or greater of original pole strength (section modulus) to simulate maximum damage at or slightly above ground line.

Note 2 Test #2 through 9 were conducted at Conoco’s Material Testing Facility in Ponca City, OK. Partial sleeve sections were tested to failure to enable design improvements by altering fiber lay up and resin formulation.

Note 3 Tests #15 & 16, the poles broke above the top of the sleeve at knot clusters.

Note 4 Pole specimen in Test 20 was Class 1. FRS sleeve is designed for class 2 and below. FRS exceeded design load by approximately 10%.