

TO: DISTRIBUTION

FROM: C NEUMEYER

SUBJECT: TF TORQUE COLLAR WET LAY-UP SHEAR STRENGTH

The following table shows the E120-HP wet lay-up shear data¹ including the final results from group 6 (G6).

	Normal Stress (psi)	Shear Failure Stress (psi)
G4	232	2876
G4	240	2921
G4	287	2521
G5	301	3037
G5	363	2651
G5	994	3946
G5	1002	4429
G6-1	1018	2935
G6-2	1018	3610
G6-12	1125	3220
G5	1999	5191
G5	2004	5069
G6-4	2036	4104
G6-3	2075	3632
G6-5	3131	4259
G6-11	3878	4244
G6-7	4099	4398
G6-6	4114	4629
G6-8	5011	4223
G6-10	5365	4881
G6-9	5438	4251

¹ Data supplied by T Kozub, see final test report

A fit was made to the minimum of the data, and then a peak equivalent to that fit based on the 1.08 peak-to-average applied to the zero compression value². This result is shown superimposed, along with the prior assumption. The equation for the peak fit is...

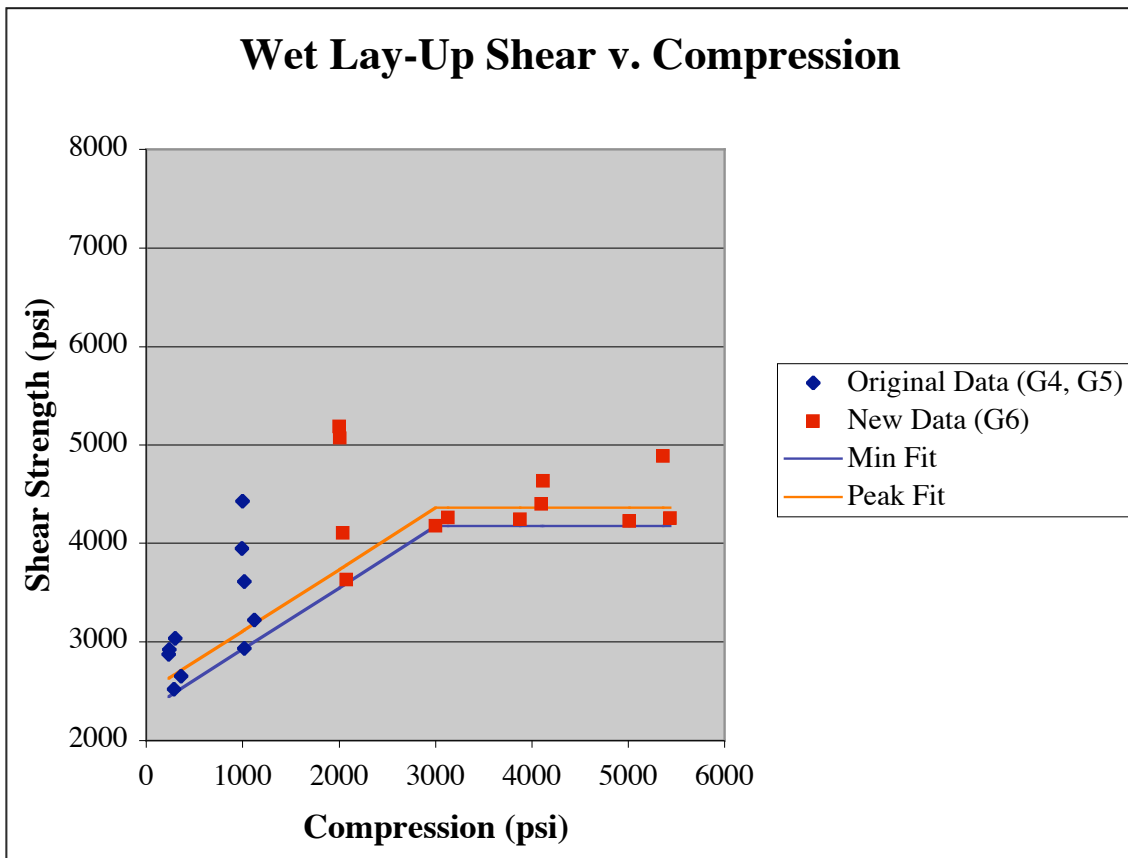
For compression ≤ 3000 psi....

$$\text{Shear Stress} = 1.08 \cdot 2300 + 0.625 \cdot \text{Compression}$$

For compression > 3000 psi....

$$\text{Shear Stress} = 1.08 \cdot 2300 + 0.625 \cdot 3000$$

...where shear and compression are in psi.



Safety factor calculations shall be based on the peak fit curve as shown.

² E-mail from C. Jun, 9/30/3 (attached)

Cc:

P Heitzenroeder C Jun M Kalish T Kozub I Zatz

-----Original Message-----

From: Chang H. Jun [<mailto:cjun@pppl.gov>]

Sent: Tuesday, September 30, 2003 11:34 AM

To: 'cneumeyer@pppl.gov'; 'pheiten@pppl.gov'; 'izatz@pppl.gov'; 'mkalish@pppl.gov'

Subject: [NSTX] About maximum shear ratio of 1.65

Gentlemen,

The E value of Hysol was measured by two compression test at PPPL.

The test results show very low E value.

The measured value is less than 0.1Mpsi (normal Epoxy is ~1.5Mpsi)

Because of this low E of Hysol material, maximum shear ratio of 1.65 is no longer valid.

I tested it by FEA analysis with 0.5MN on the 9.5cm*8.3cm*2 areas of shear plane.

Average shear is $500,000 / (0.095 * 0.083 * 2) = 31.7\text{MPa}$

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*****
                E of 1Mpsi (I used before)                E of 0.1Mpsi
*****
Max shear stress=      51.3MPa  (162%)                34MPa  (108%)
*****

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So, now new ratio is barely 1.08 or less than 1.1, instead of 1.65.

This is caused by the softness of the material. That means the stresses spread more widely in more soft material.

If you need more verification, please let me know it.

Thanks, Chang