NCSX Composite Coil Testing

Resin Impregnated Bare Conductor

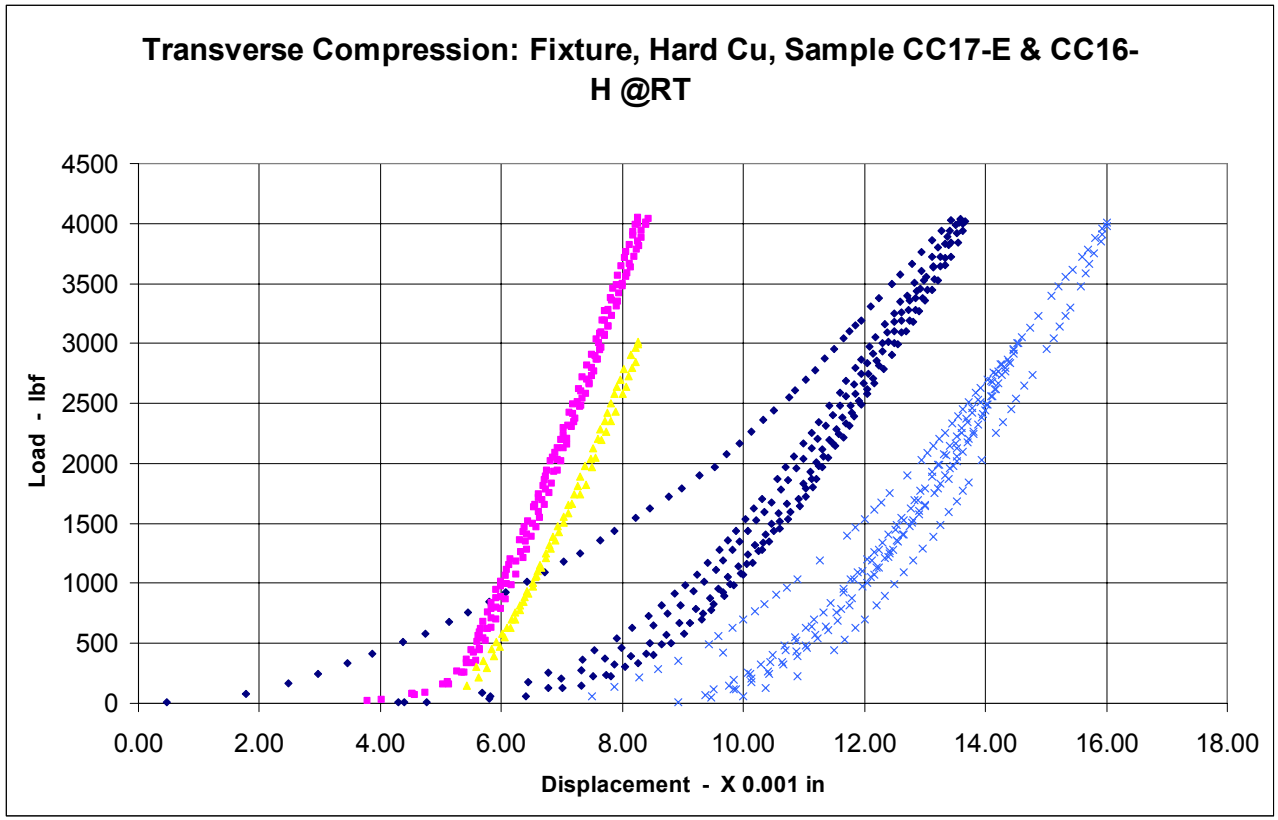
Transverse Compressive Tests

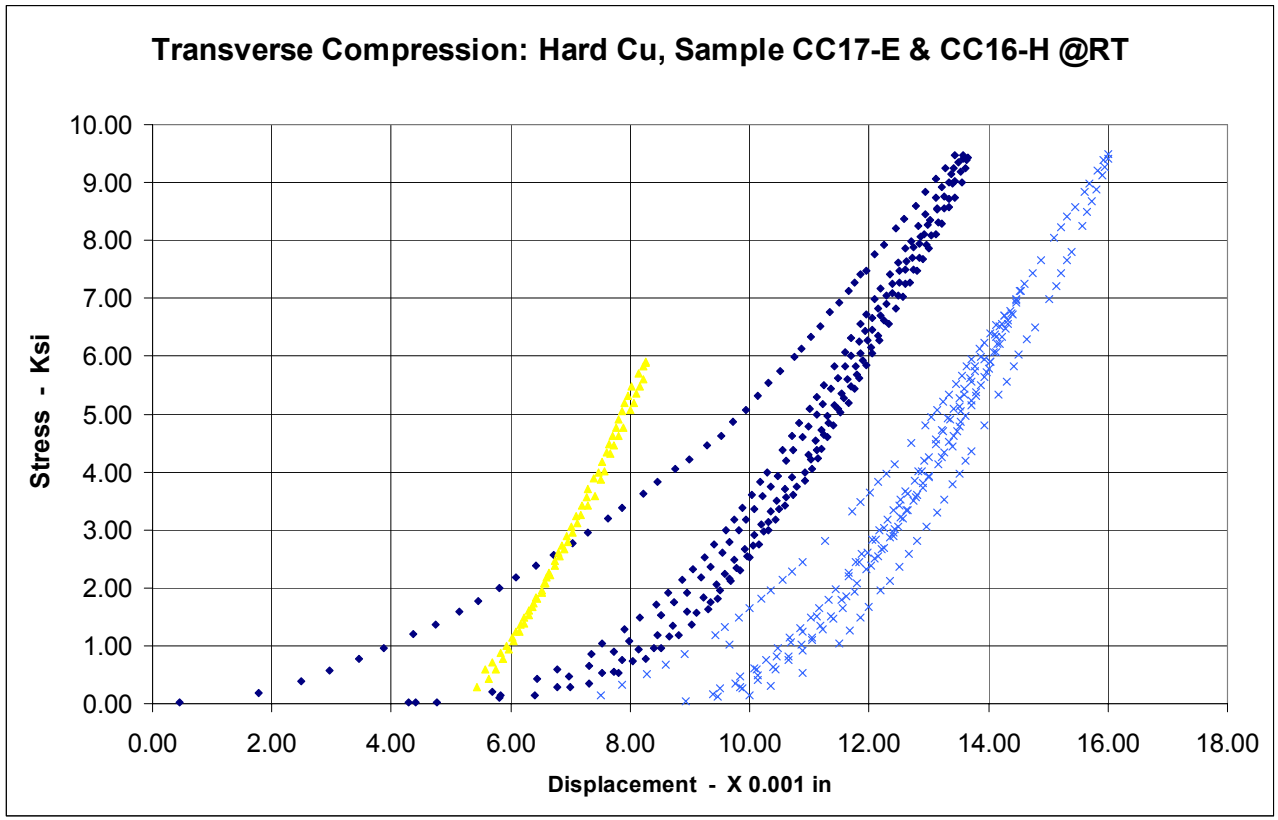
Test Description

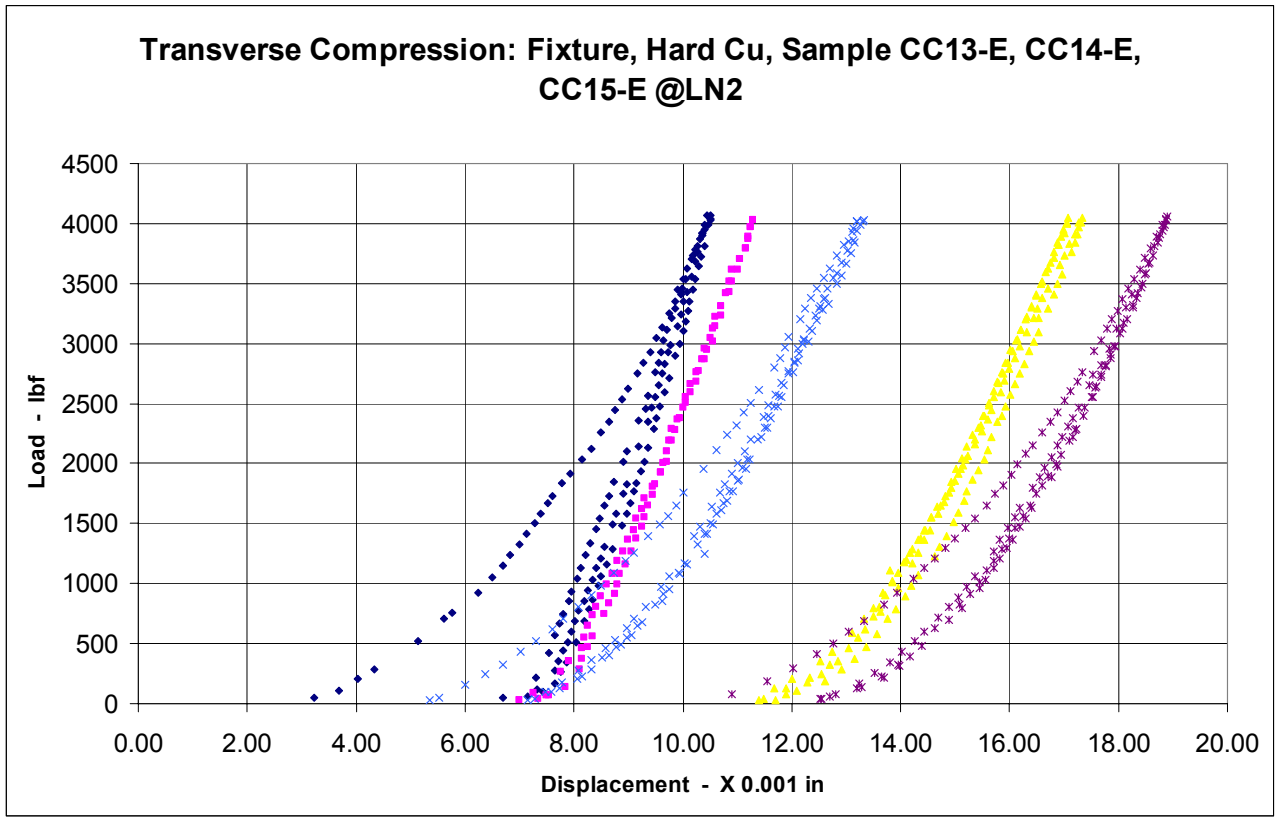
- Samples:
  - Resin impregnated bare conductor
  - Sample area 0.406 to 0.426 sq in
  - Sample depth about 0.350 in
- Test Resolution:
  - Load: 1 lbf +/- 3 lbf
  - Displacement: 0.00001” +/- 0.000025”
- Tests performed at Room and LN2 temp.

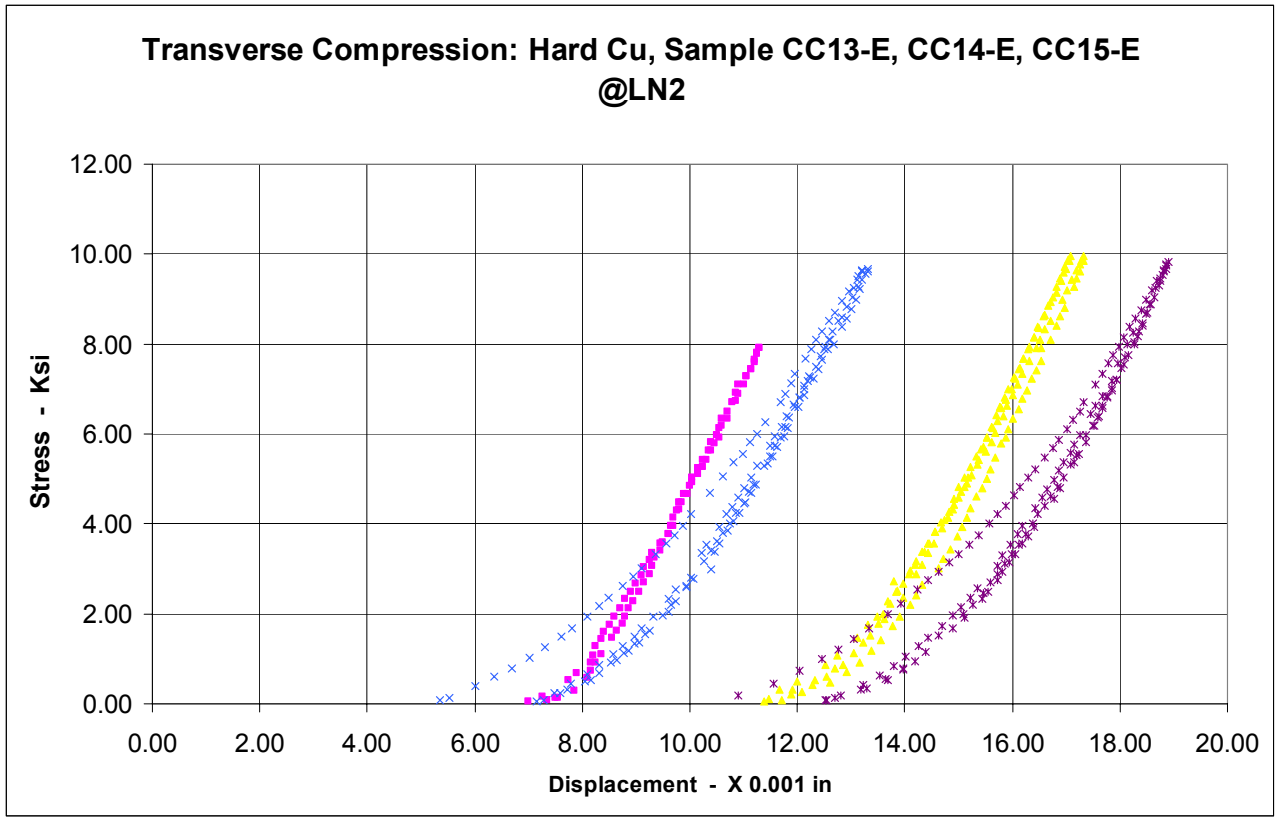
Test Description

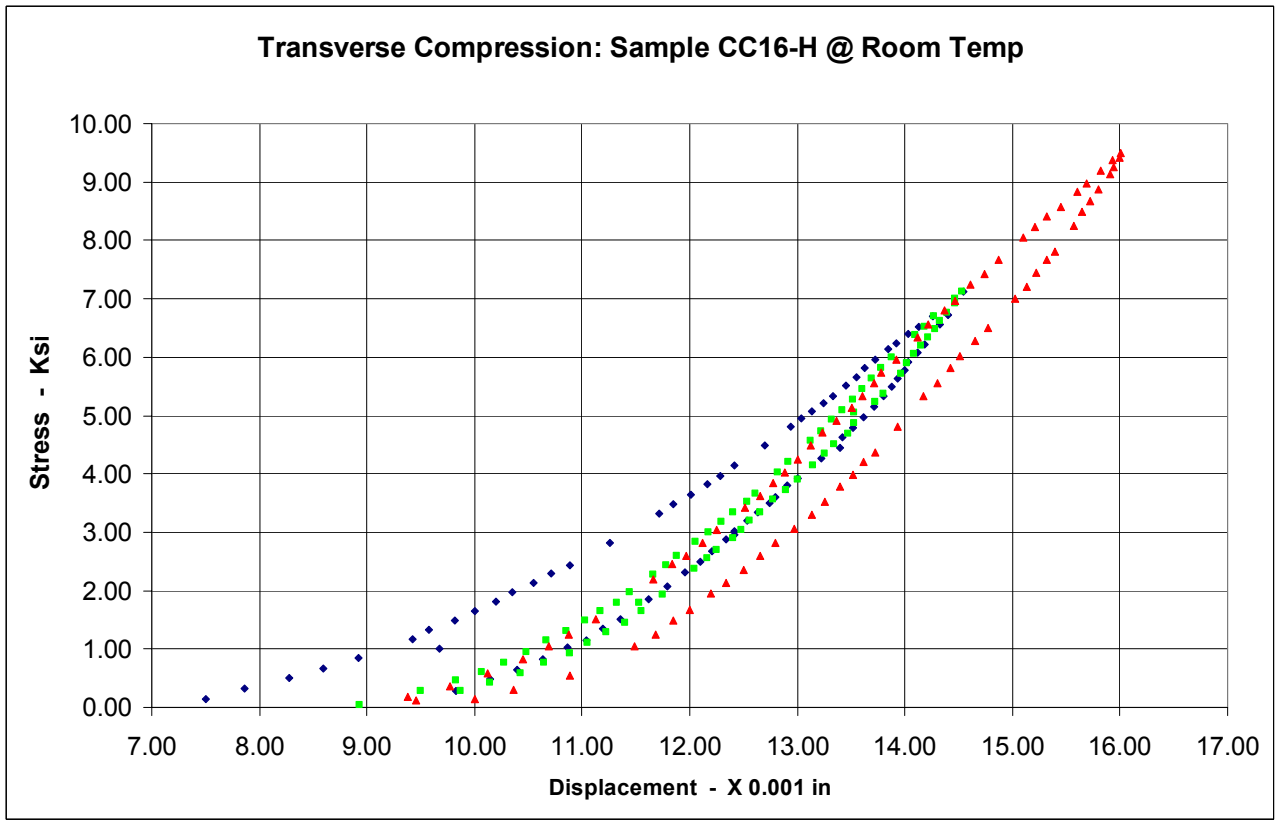
- Ran fixture and hard Cu calibrations at both room and LN2 temp.
- Initial load range from 0 to 3000 lbf, increased to 4000 lbf, still only 10 Ksi max.
- No samples were loaded to failure.


Transverse Compression: Fixture, Hard Cu, Sample CC17-E & CC16-H @RT
Load - lbf
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
Displacement - X 0.001 in


Transverse Compression: Hard Cu, Sample CC17-E & CC16-H @RT
Stress - Ksi
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
Displacement - X 0.001 in


Transverse Compression: Fixture, Hard Cu, Sample CC13-E, CC14-E, CC15-E @LN2
Load - lbf
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Displacement - X 0.001 in

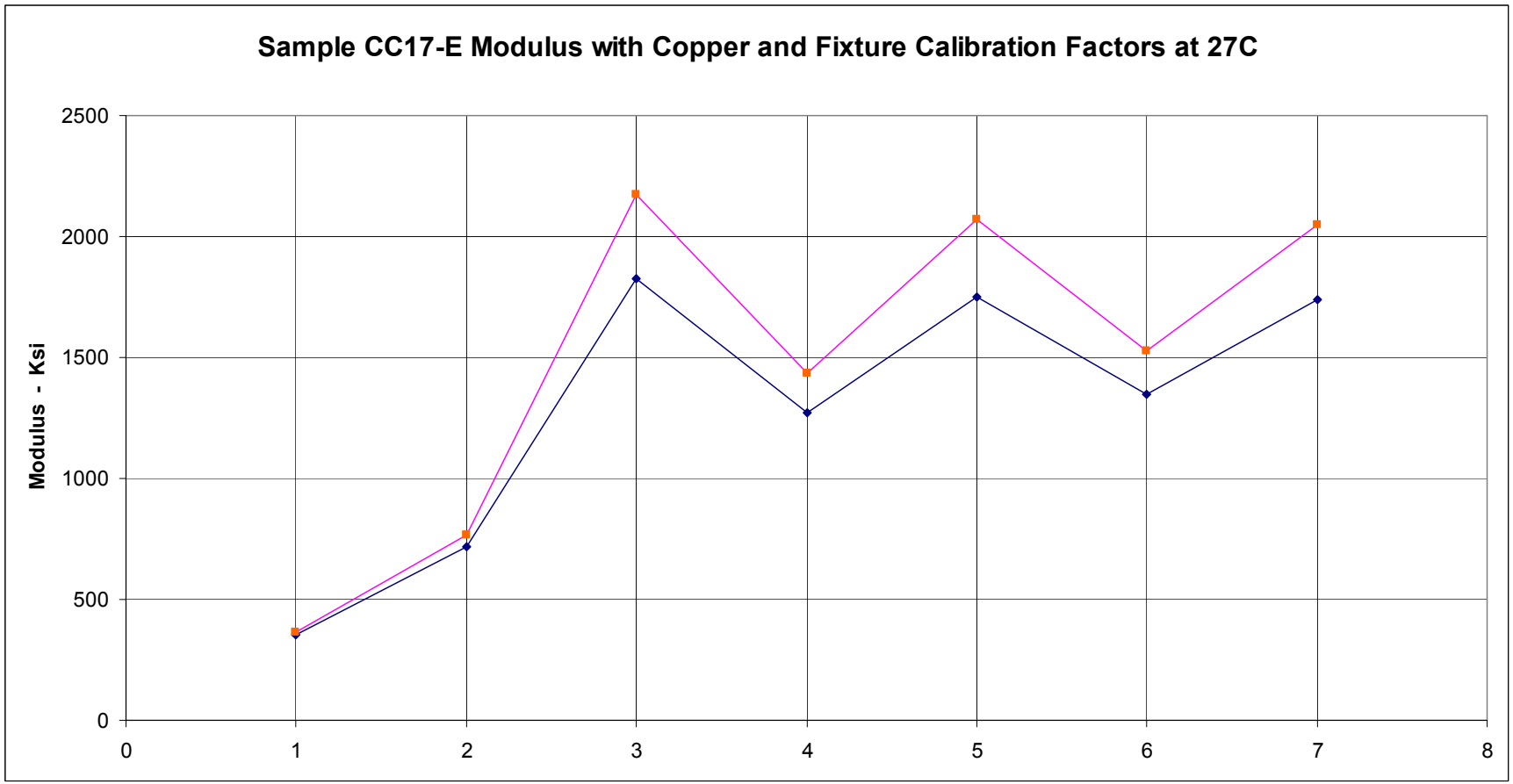

Transverse Compression: Hard Cu, Sample CC13-E, CC14-E, CC15-E @LN2
Stress - Ksi
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Displacement - X 0.001 in

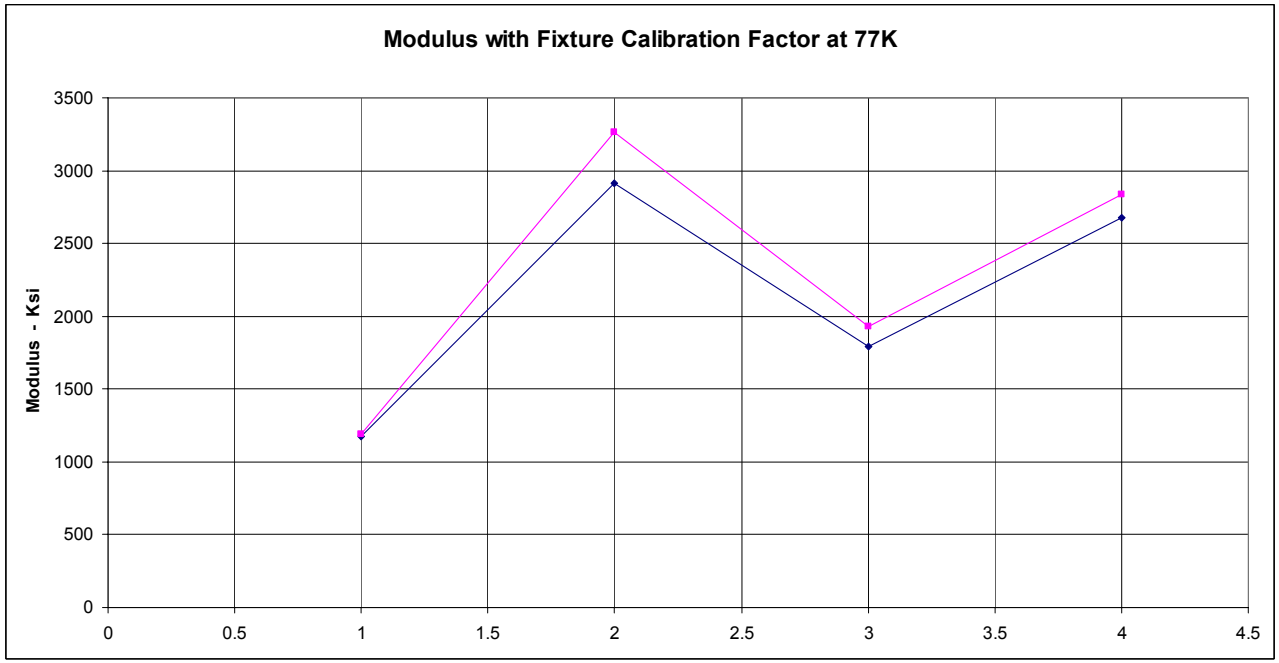

Transverse Compression: Sample CC16-H @ Room Temp
Stress - Ksi
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
7.00
8.00
9.00
10.00
11.00
12.00
13.00
14.00
15.00
16.00
17.00
Displacement - X 0.001 in

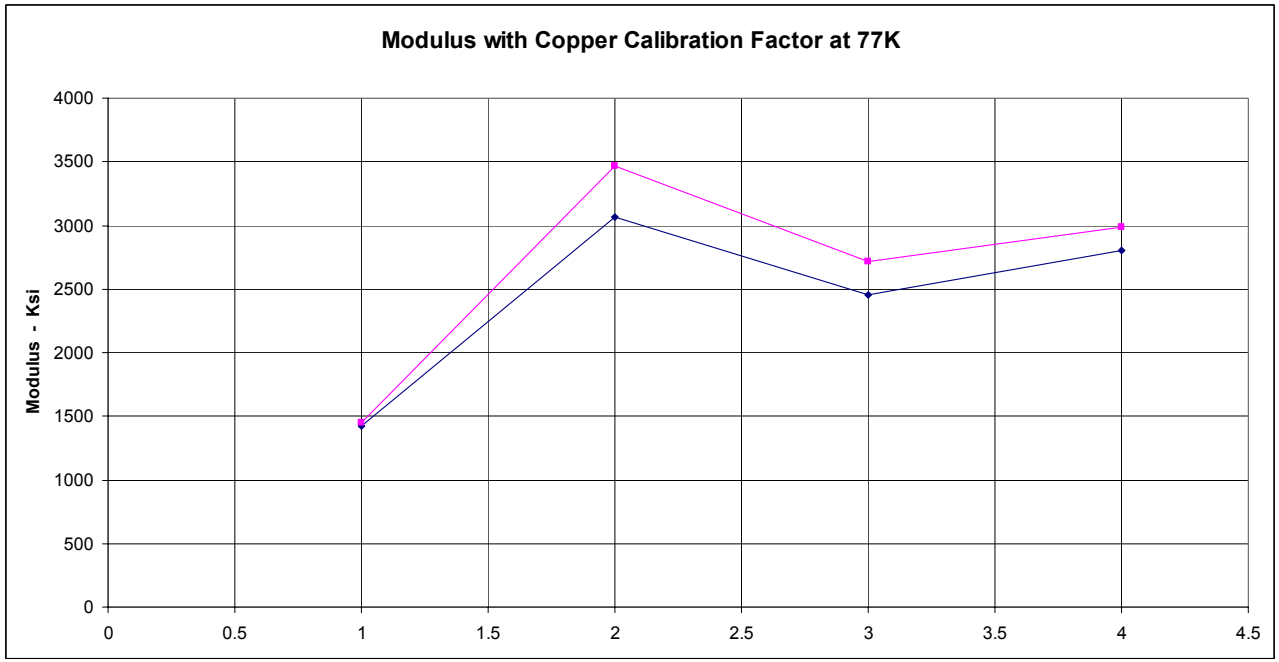
Analysis

- Using fixture correction factor with Cu gives an incorrect modulus of:
  - 6419 and 6289 Ksi at 27 C
  - 4323 and 12650 Ksi at 77 K
- Possible reasons for large error:
  - Cu deflection less than fixture with this geometry
  - Limited load range

Results


Sample CC17-E Modulus with Copper and Fixture Calibration Factors at 27C
Modulus - Ksi
2500
2000
1500
1000
500
0
0
1
2
3
4
5
6
7
8


Modulus with Fixture Calibration Factor at 77K
Modulus - Ksi
3500
3000
2500
2000
1500
1000
500
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5


Modulus with Copper Calibration Factor at 77K
Modulus - Ksi
4000
3500
3000
2500
2000
1500
1000
500
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5