Experimental Procedure

- Test samples were obtained from Columbia Forest Products Klamath Fall facility.
- 10 - ¾” 7 ply panels fabricated with UF glue were sampled randomly from production over a two week period.
- 10 – ¾” 7 ply panels fabricated with Purebond adhesive were sampled randomly form production over two week period.

Experimental Procedure

- Sample panels were tested in accordance with Type I and II bond performance as prescribed by ANSI/HPVA HP-1-2004 at Oregon State University from 4/16 - 4/20/2007.
  - Type I and II bond performance test are durability test which are design to help predict bond performance over time.
  - The Type I is a more sever test and therefore a better predictor of long term durability.
- A simple comparison of means was used to statistically evaluate differences in bond performance between Purebond and UF where possible.

Resistance To Delamination One And Three Cycle Soak

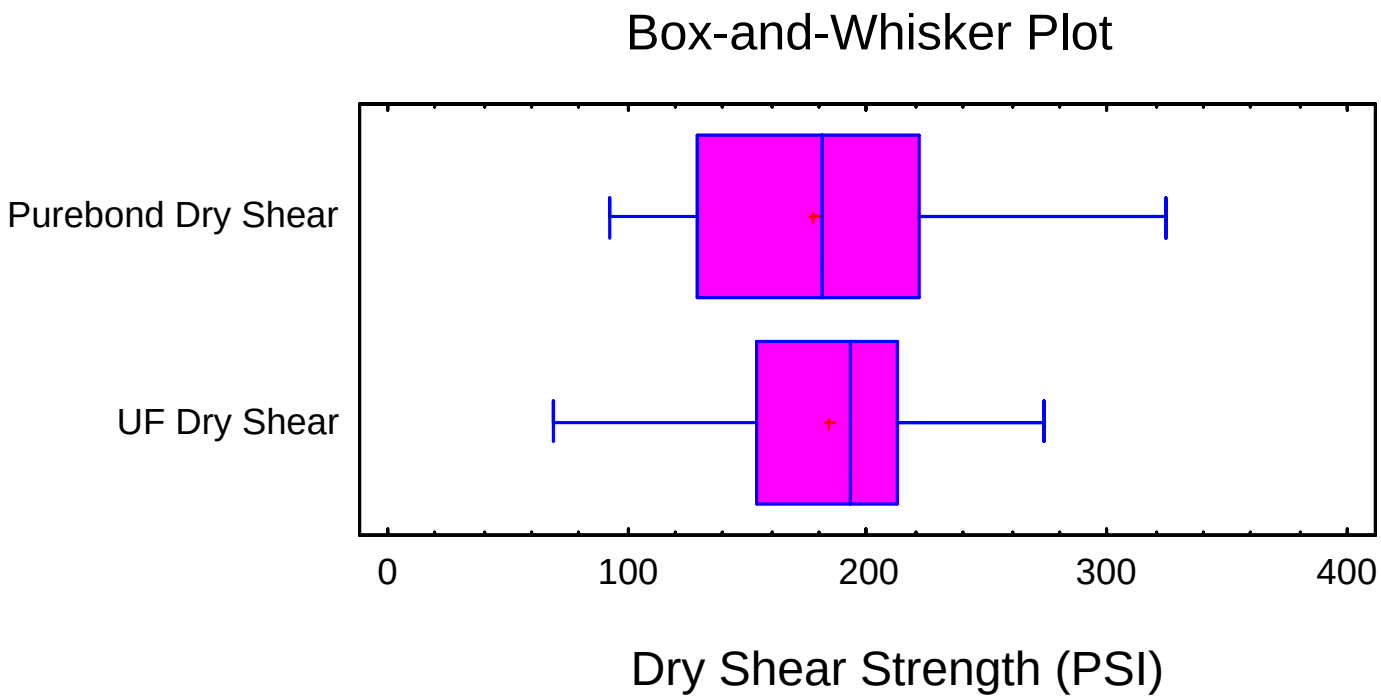
Type II Bond Performance Requirement

	Soaking Test	
Sample ID	1st cycle	3rd cycle
Soy - 1	all passed	all passed
Soy - 2	all passed	all passed
Soy - 3	all passed	all passed
Soy - 4	all passed	all passed
Soy - 5	all passed	all passed
Soy - 6	all passed	all passed
Soy - 7	all passed	all passed
Soy - 8	all passed	all passed
Soy - 9	all passed	all passed
Soy - 10	all passed	all passed
UF - 1	all passed	all passed
UF - 2	all passed	all passed
UF - 3	all passed	all passed
UF - 4	all passed	all passed
UF - 5	all passed	all passed
UF - 6	all passed	all passed
UF - 7	all passed	all passed
UF - 8	all passed	all passed
UF - 9	all passed	all passed
UF - 10	all passed	all passed

- Both the Purebond and UF passed one and three cycle soak test.

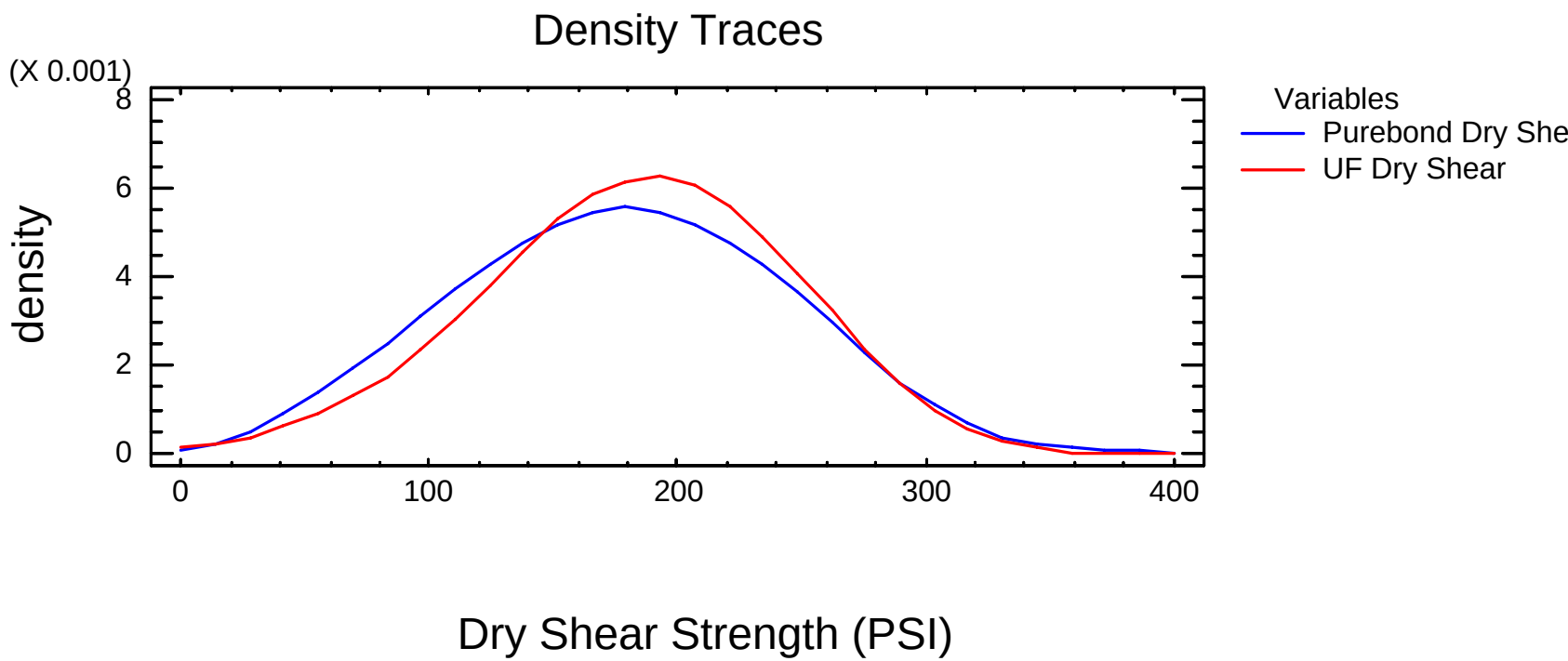
Dry Lap Shear Comparison

Type I Bond Performance Requirement



Dry Lap Shear Comparison

Type I Bond Performance Requirement



Dry Lap Shear Comparison
Type I Bond Performance Requirement

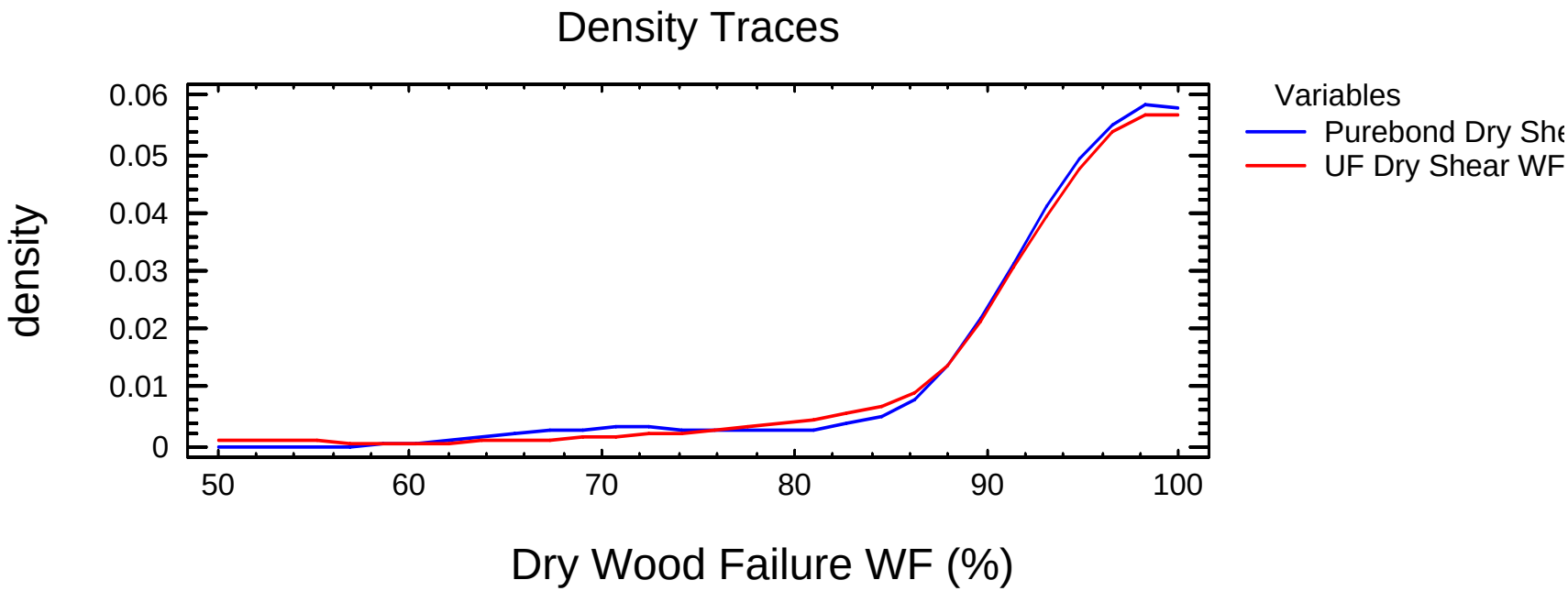
```
t test to compare means

   Null hypothesis: mean1 = mean2
   Alt. hypothesis: mean1 NE mean2
      assuming equal variances: t = 0.350389   P-value = 0.726672



The StatAdvisor
---------------
   This option runs a t-test to compare the means of the two samples.
It also constructs confidence intervals or bounds for each mean and
for the difference between the means.  Of particular interest is the
confidence interval for the difference between the means, which
extends from -3.12819 to 4.09485.  Since the interval contains the
value 0.0, there is not a statistically significant difference between
the means of the two samples at the 99.0% confidence level.
   A t-test may also be used to test a specific hypothesis about the
difference between the means of the populations from which the two
samples come.  In this case, the test has been constructed to
determine whether the difference between the two means equals 0.0
versus the alternative hypothesis that the difference does not equal
0.0.  Since the computed P-value is not less than 0.01, we cannot
reject the null hypothesis.
```

Dry Lap Shear Wood Failure
Type I Bond Performance Requirement

50% WF is allowable minimum for the average

Dry Lap Shear Wood Failure

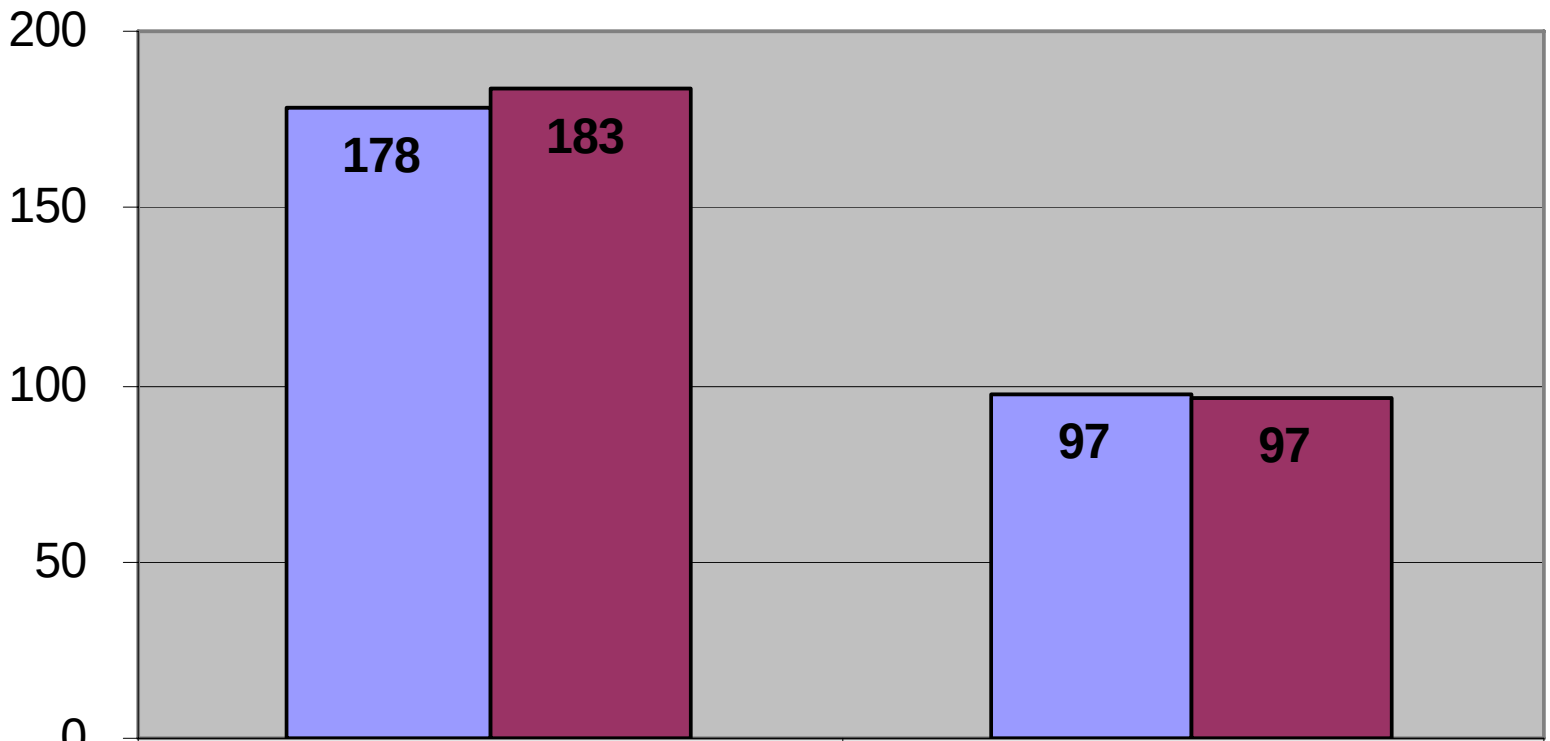
Type I Bond Performance Requirement



Dry Lap Shear Wood Failure
Type I Bond Performance Requirement

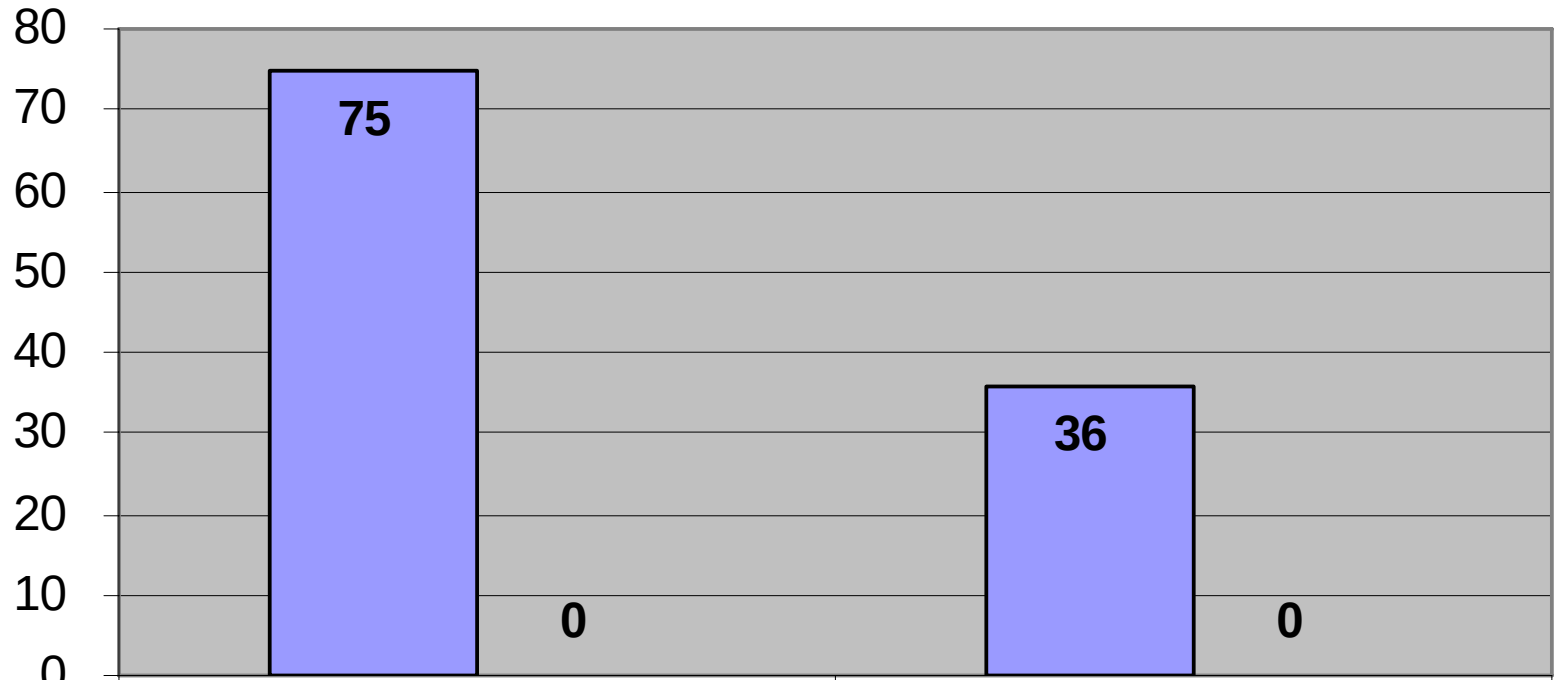
```
t test to compare means

   Null hypothesis: mean1 = mean2
   Alt. hypothesis: mean1 NE mean2
      assuming equal variances: t = -0.621319   P-value = 0.535588



The StatAdvisor
---------------
   This option runs a t-test to compare the means of the two samples.
It also constructs confidence intervals or bounds for each mean and
for the difference between the means.  Of particular interest is the
confidence interval for the difference between the means, which
extends from -29.2844 to 18.0511.  Since the interval contains the
value 0.0, there is not a statistically significant difference between
the means of the two samples at the 99.0% confidence level.
   A t-test may also be used to test a specific hypothesis about the
difference between the means of the populations from which the two
samples come.  In this case, the test has been constructed to
determine whether the difference between the two means equals 0.0
versus the alternative hypothesis that the difference does not equal
0.0.  Since the computed P-value is not less than 0.01, we cannot
reject the null hypothesis.
```

ASTM D 906-98 Dry Shear Test Results (White Fir core)



	Shear PSI	Wood Failure %
PureBond	177.84	97.2
UF	183.38	96.7

Cyclic-Boil Shear Test Results (White Fir core)

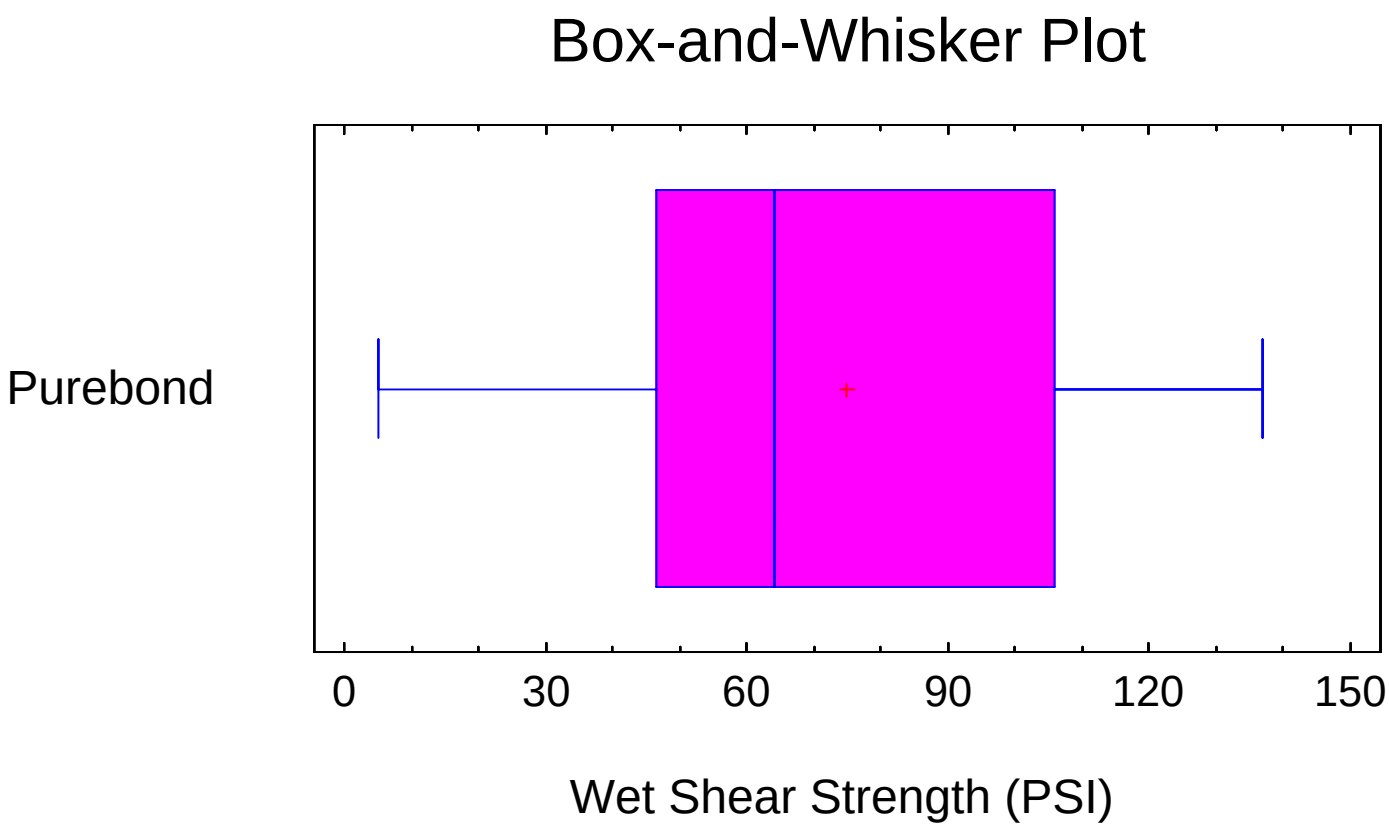


	Shear PSI	Wood Failure %
PureBond	74.93	35.8
UF	0.00	0.0

(All UF samples delaminated during the first boil cycle)

Wet Shear Strength After 2-Cycle Boil

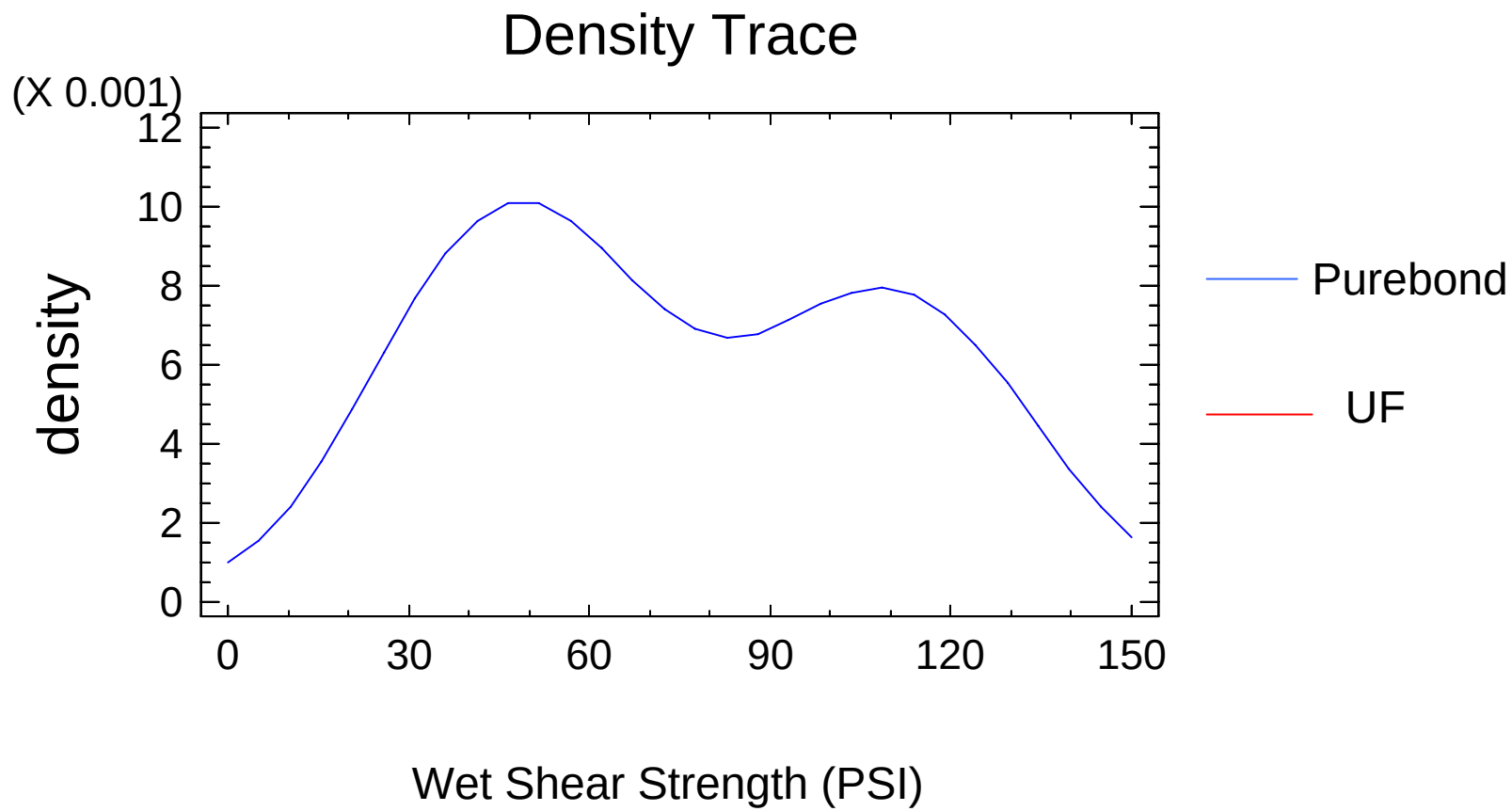
Type I Bond Performance Requirement



Note: None of the UF sample survived the first cycle, so no comparison was possible.

Wet Shear Strength After 2-Cycle Boil

Type I Bond Performance Requirement



Note: None of the UF sample survived the first cycle and so no comparison was possible.

Wet Shear Strength After 2-Cycle Boil

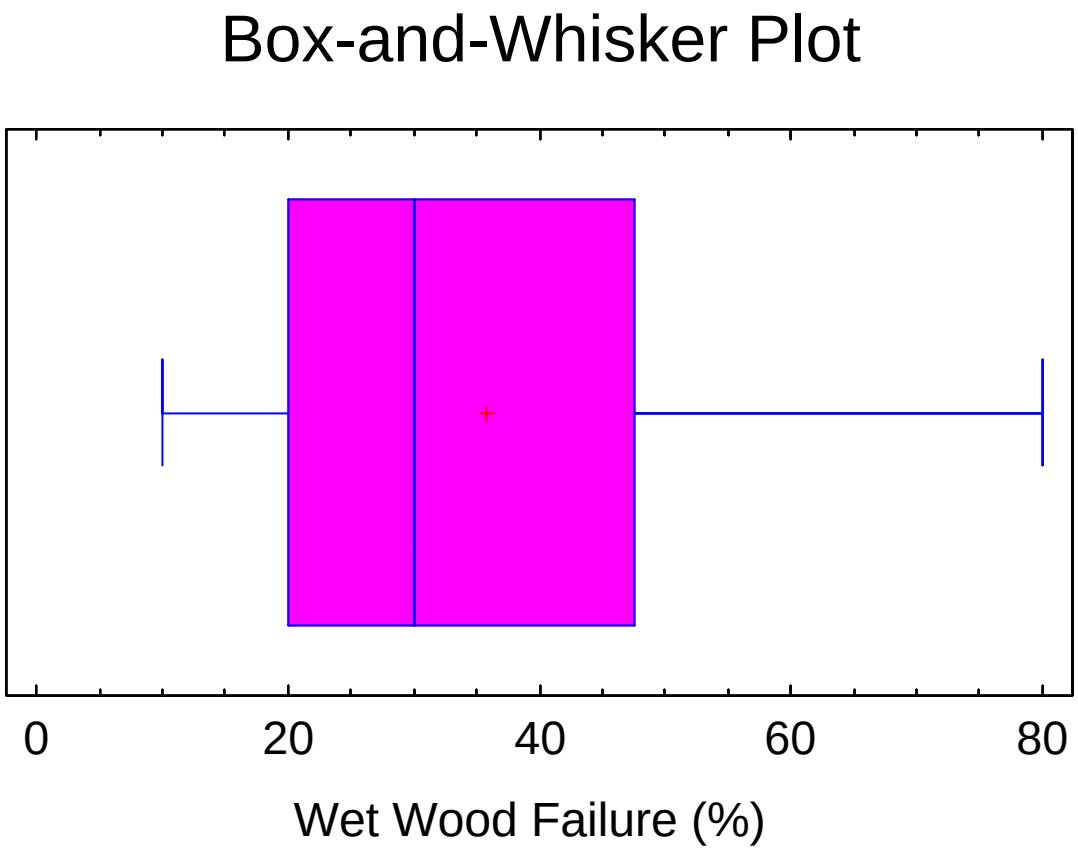
Type I Bond Performance Requirement

```
99.0% confidence interval for mean: 74.9167 +/- 11.9206   [62.996,86.8373]
99.0% confidence interval for standard deviation: [27.9763,45.1883]


The StatAdvisor
---------------
   This pane displays 99.0% confidence intervals for the mean and
standard deviation of Purebond Accerated Age Shear.  The classical
interpretation of these intervals is that, in repeated sampling, these
intervals will contain the true mean or standard deviation of the
population from which the data come 99.0% of the time.  In practical
terms, we can state with 99.0% confidence that the true mean Purebond
Accerated Age Shear is somewhere between 62.996 and 86.8373, while the
true standard deviation is somewhere between 27.9763 and 45.1883.
   Both intervals assume that the population from which the sample
comes can be represented by a normal distribution.  While the
confidence interval for the mean is quite robust and not very
sensitive to violations of this assumption, the confidence interval
for the standard deviation is quite sensitive.  If the data do not
```

Note: None of the UF sample survived the first cycle and so no comparison was possible.

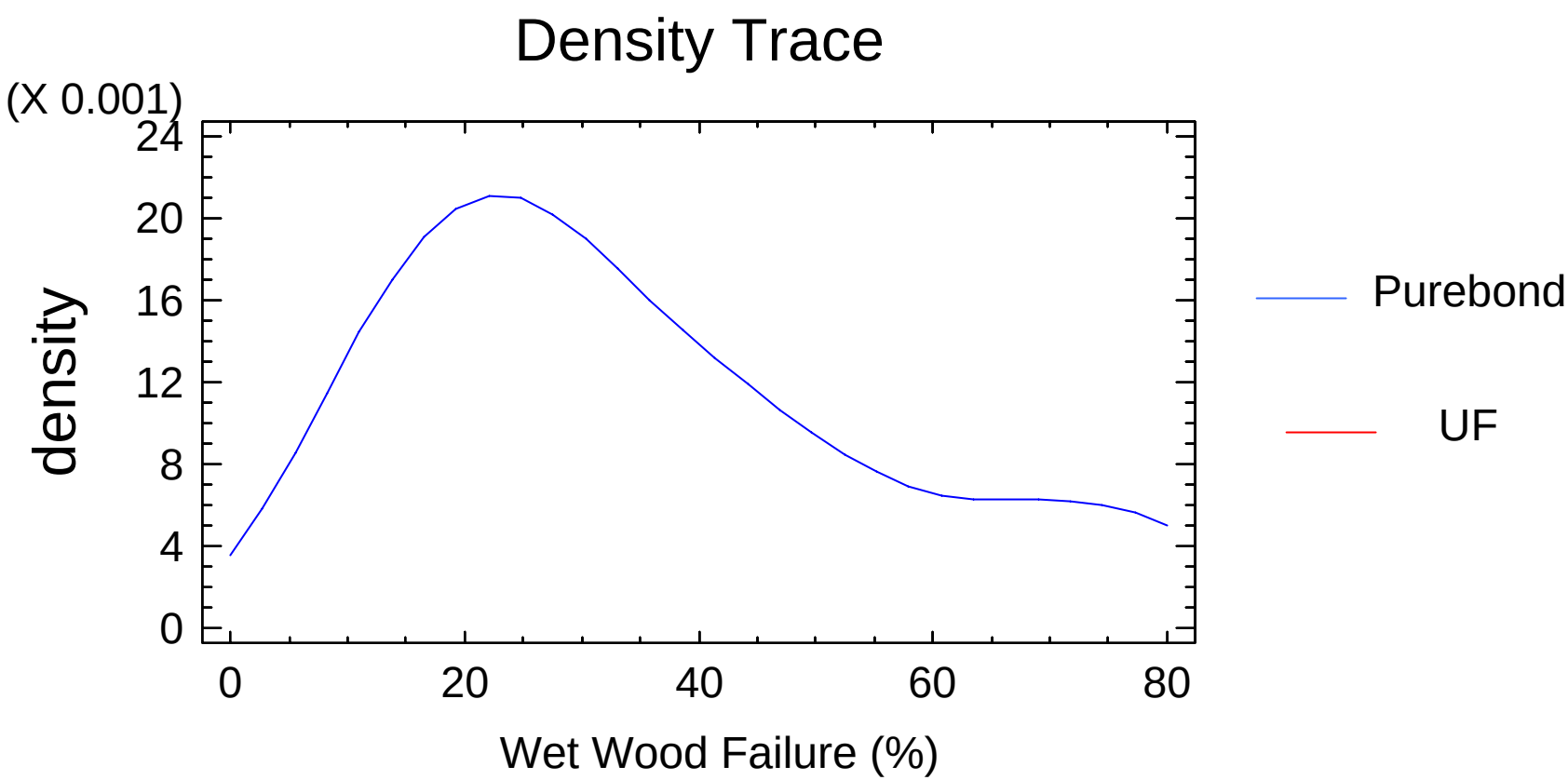
Wet Shear Wood Failure After 2-Cycle Boil

Type I Bond Performance Requirement



Note: None of the UF sample survived the first cycle and so no comparison was possible. An average of 50% WF is required for passing.

Wet Shear Wood Failure After 2-Cycle Boil
Type I Bond Performance Requirement



Note: None of the UF sample survived the first cycle and so no comparison was possible. An average of 50% WF is required for passing.

Resistance To Delamination 2-Cycle Boil

Type I Bond Performance Requirement

Sample ID	2-cycle boiling
Soy - 1	all passed
Soy - 2	all passed
Soy - 3	all passed
Soy - 4	all passed
Soy - 5	all passed
Soy - 6	all passed
Soy - 7	all passed
Soy - 8	all passed
Soy - 9	all passed
Soy - 10	all passed
UF - 1	4/4 failed
UF - 2	4/4 failed
UF - 3	4/4 failed
UF - 4	4/4 failed
UF - 5	4/4 failed
UF - 6	4/4 failed
UF - 7	4/4 failed
UF - 8	4/4 failed
UF - 9	4/4 failed
UF - 10	4/4 failed

- None of the UF samples passed the first boil cycle.

Conclusion

- Purebond and UF glue perform similarly in Type II bond performance, dry shear strength and dry shear wood failure at the 99% confidence level.

- Purebond out performs UF in all Type I accelerated aging test; 2-cycle boil wet shear and 2 – cycle boil resistance to delamination. UF glue could not survive one boil cycle.