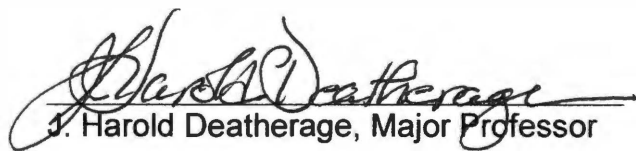


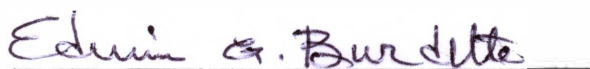
To the Graduate Council:

I am submitting herewith a thesis written by Sally Summers Nichols entitled "Determining End & Edge Distance Criteria for Tenon Joints in Timber Structures." I have examined the final paper copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Civil Engineering.

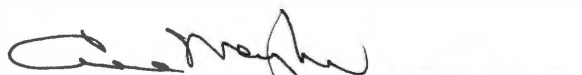

J. Harold Deatherage, Major Professor

We have read this thesis and
recommend its acceptance:





Acceptance for the Council:



Vice Chancellor and Dean of
Graduate Studies

Determining End & Edge Distance Criteria for Tenon Joints in Timber Structures

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Sally Summers Nichols
August 2004

DEDICATION

This thesis is dedicated to my parents, Joseph and Frances Summers, to my husband, Trent, and children, Ted and Frances. Their encouragement and understanding helped make the thesis possible.

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I would like to thank all those who assisted me in completing this research. I thank Dr. Deatherage for his guidance and assistance and Dr. Bennett for his assistance in background timber research. My appreciation to the shop staff for allowing me to use the equipment needed to prepare the experiments. To my son, Ted, whose help to statistically analyze the data was invaluable. I would like to extend a special thanks to my parents, Joe and Frances Summers, for their time and energy in assisting me in collection and organization of the data. Also, my sincere thanks to the Northcott Wood Turning Company whose donation of the wood pegs made this research possible.

Abstract

Traditionally, timber-frame connections use hardwood pegs to hold the main member within the joint. Currently the end and edge distance criteria for these connections have either been established by tradition or by an equivalent steel bolt diameter approximation. The object of this research is to determine a more specific method to establish the end and edge distances for wood pegs in wood connections. This investigation entails two separate tests that were developed from the standard American Society for Testing and Materials (ASTM) testing methods for steel bolts in wood members.

End and edge distance tests were performed on $\frac{3}{4}$ inch and 1 inch diameter Red Oak and White Oak pegs. The test method simulated a tenon joint. Main member species tested were Southern Pine and Douglas Fir. These combinations of material thus generated eight sets of data depicting behavior at various edge and end distances.

Analysis of these test data resulted in recommending the following end and edge distances in order to develop the full shear strength of the peg. For 1 inch diameter pegs, the recommended edge distance is approximately 2.6 diameters from the edge. For 1 inch diameter pegs loaded in the end direction, the recommended end distance is approximately 2.8 diameters from the end. For $\frac{3}{4}$ inch diameter pegs, the recommended edge distance is approximately 3 diameters and the recommended end distance is approximately 2.5 diameters.

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CHAPTER 1

INTRODUCTION

1.1 Background

Traditional timber structures, as referred to in this paper, are composed of wood members of at least 6"x 8" in size (SBC 1999), which are fitted together with carved joints and wooden pegs. The most common connection used in these types of structures is the mortise and tenon joint. The beam in this type of joint is cut as a tenon and the column obtains a mortise cut (Figure 1.1). In this type of connection the pegs are in double shear. The wooden pegs used in the connection can range from $\frac{3}{4}$ " to 1" in diameter. Mallets are used to drive the wooden pegs into the holes, and the excess peg length is trimmed. The most common number of pegs per connection is two. The size of the tenon is approximately 4" long x 2" wide x the depth of the member. In past research, the tenon has been successfully represented in tests by a 2x6 piece of lumber (McKay & Schmidt, 1997). The end distance in wood is the distance from the

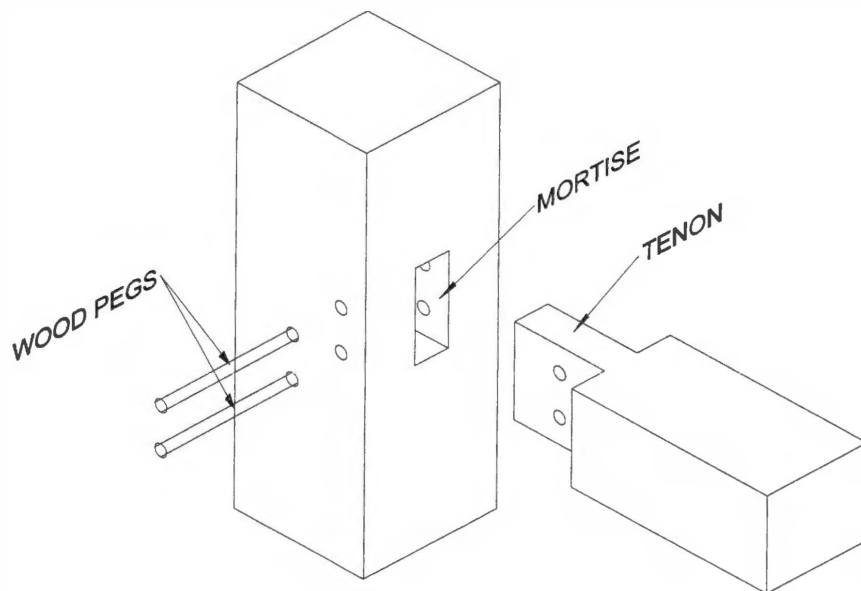


Figure 1.1: Mortise and tenon connection

center of the peg to the end. The end of the wood is defined as the surface located in the opposite direction of an applied force that is parallel to the wood grain. The edge distance in wood is the distance from the center of the peg to the edge. The edge of the wood is defined as the surface located in the opposite direction of an applied force that is perpendicular to the wood grain (see Figure 1.2). Historically edge and end distances have been determined by past practices. Benson carefully measured old timber structures in America and created layouts of these traditional distances. The traditional peg diameter was 1". Considering the tenon length of 4" and a center to the peg diameter of 1.5" from the edge of the column creates the traditional end distance of 2.5". The traditional edge distance was determined to be 2" (Gruber & Benson 1995) (Figure 1.3).

The approach of recent researchers has been based on an equivalent bolt distance. In this method, the European model of steel bolts in wood connections

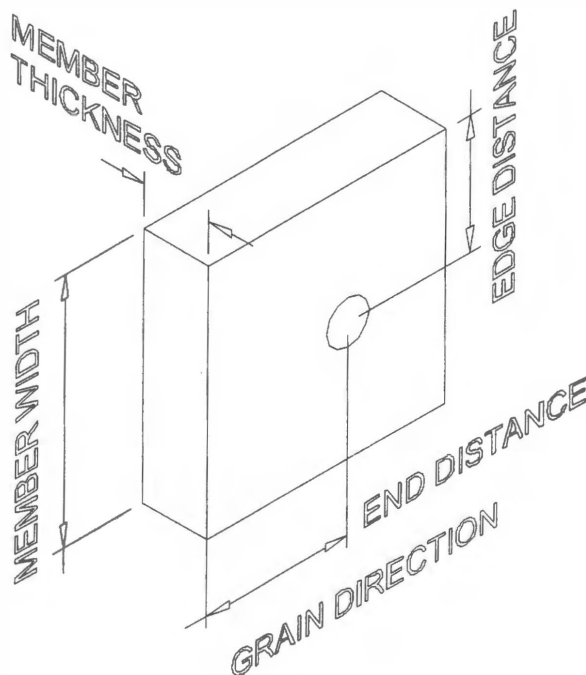


Figure 1.2: Edge and end distances

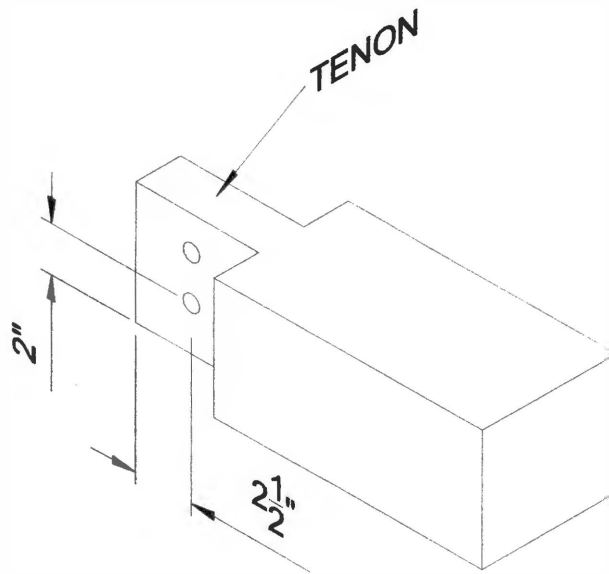


Figure 1.3: Traditional edge and end distances

is used to compare the wood pegs to steel bolts to develop an equivalent steel bolt diameter. From this equivalent bolt the end distance formula contained in the AISC Steel Manual determines the distances required. Unfortunately, this can lead to distances that cannot be accomplished in the traditional length of the 4" tenon. In Robert McKay's dissertation, he applies this method to a 1" diameter Red Oak peg with the results that the end distance should be 3.71". This cannot be done in a 4" tenon. He later recommends an edge distance of 3.0D or greater and an end distance of 3.0D (McKay & Schmidt, 1997). Yet, he also concludes that more specific tests should be done to verify these distances.

1.2 Purpose

The purpose of this thesis is to determine the minimum edge and end distance criteria for tenon joints and to describe these procedures for use in possible future testing. In this research, separate tests were developed to determine end and edge distances. For simplification, only one wooden peg was

used per test connecting 3-2x6 members. Peg diameters were limited to $\frac{3}{4}$ " and 1" and their orientation to the load was keep constant. Two wood species, Red Oak and White Oak, were used for the pegs. Two wood species, Douglas Fir and Southern Pine, were used for the main members. Approximately 100 simplified mortise and tenon joints were loaded in compression to determine edge distances. Another 100 simplified mortise and tenon joints were loaded in tension to determine end distances.

1.3 Timber Frame History

Timber structures built using tenon joint construction can be dated around 200 B.C. by archaeological studies in the Far East and Europe. Of these early structures, only religious buildings have survived. In Japan, where typhoons and earthquakes can be common, timber frames with their hinge like construction have a definite advantage over masonry. Its flexibility in movement without collapsing established timber as the desirable structure for long-term use. In fact, the oldest surviving wooden structures in the world are located in Japan, the Golden Hall built in 679 A.D. and the Pagoda built in 693 A.D. (Benson and Gruber 1995). The stave churches of Norway represent the oldest timber buildings in existence in Europe. The stave church at Urnes dates from about 1130-1150. One reason these structures endured was the care in which the exteriors were protected from decay by coatings of pine pitch. There are 32 such churches that have survived into this century. The Norwegians have restored these churches and they are under careful protection (Moffett & Wodehouse 1989).

The differences between the Far East and Europe timber frame buildings are based on the goals of the timber guilds of the regions. In Japan, timber joinery became trade family secrets and these family guilds competed against each other for honor by the complexity of their structures. Timber frame guilds in Europe saw themselves as craftsman brothers. Therefore, timber joinery in

Europe developed in more simple and utilitarian designs. In Europe, to add more complexity, elaborate designs were carved into the beams and posts.

American timber frame architecture developed quickly into a distinctive style. The virgin forests of the New World became a resource for the first European settlers in America. People came from all over Europe each bringing the traditions of their homelands; American timber framing became a blend of these various styles. The new World had an abundance of trees with great length and breadth; there was little need for the sophisticated splicing joints used in the Old World. The temperature variation was greater in America making the in-fill between timbers prone to crack and shrink. Soon sheathing skins were built over the structure to provide protection from drafts and decay (Benson and Gruber 1995).

Heavy timber framing in America began to die out in the mid 1800's, because western expansion required faster ways of building using less skilled labor (Benson 1990). Manufactured nails, stud platform framing, and balloon framing helped provide the raw materials for marginally skilled labor to erect homes in less time. The decline in heavy timber construction was fairly rapid and by the 1920's, it had become a forgotten craft in most of America (Benson 1999). There was a brief revival of the craft during the Arts and Craft movement in the early part of the twentieth century. This movement was inspired by Japanese architecture, the most notable preserved in the Greene and Greene homes in California. However, the labor cost involved in these buildings meant that only the wealthy could afford such a structure (Davidson 1971).

The revival of the timber frame industry in America can be appropriately attributed to a New England carpenter named Tedd Benson who in the 1970's bought an old barn to dismantle it for its wood. Soon he discovered that this was a difficult job. In fact the timbers had to be removed one at a time from the frame. He became so impressed with the strength, resilience and durability of the structure that he resolved to learn all he could about the craft (Benson and Gruber 1995). His scholastic efforts would have mostly likely not been noticed if

there had not been an alternative house building movement that had begun about the same time brought on by the energy crisis of the late 1970's (McClintock 1984). Manufacturing techniques using chain saws and other modern equipment soon made this structure affordable. Now there exists an entire industry of timber frame manufacturers who will cut, transport and erect a timber frame structure in most regions of the country.

There are several reasons timber frames are desirable for construction. It provides a structure that is resistant to both earthquakes and fire. Its flexible nature allows the structure to withstand most earthquakes. The Standard Building Code lists heavy timber construction as Type III with a fire resistance not less than one hour for the smallest members (SBC 1999). This fire protection is enhanced by the connections being wooden pegs instead of metal connectors.

The modern North American timber framing industry has evolved from small businesses, with do-it-yourself homesteading clients, to multi-million dollar commercial builders. Today there are approximately 400 companies building about 4000 buildings a year. Perhaps the demand for such structures lies in the admiration of the exposed craftsmanship and the warmth which wood naturally gives an interior space. For the twenty-first century the modern timber frame home with its separate structure gives more flexibility to future services (Goldstein 1999).

The beauty and durability combined with the ability of the structure to withstand earthquakes and fires has made timber frames a desirable structure for architects today. One of the reasons timber frames with wood pegs are infrequently used in structures outside of private residences is the lack of engineering research in the field. Until more research is done, engineers will be reluctant to use these structures in commercial buildings.

1.4 Research Background

The building codes of today that concern heavy wood structures assume that the connections use steel fasteners. Traditionally, this has been the focus of the majority of the research in wood construction. The earthquake and fire

advantages of wood pegged timber frames, along with the time-saving equipment to construct the joints, has created a new demand for pegged connections in timber structures. Since scientific engineering methods of research began about the same time timber frames were considered passé, research on these structures did not occur until the later half of the twentieth century. Interest in timber frames in the engineering community was renewed when Brungraber made the first effort to apply structural analysis to two timber frame bents. After racking the bents, he discovered that understanding mortise and peg failure was crucial (Brungraber 1985). The European Yield Model developed for wood with steel bolt connection and used in the National Design Specification (NDS) for Wood Construction (NFPA 1997) was compared to wood peg connection by Reid. She concluded that European Yield Model failure mechanisms were similar but that more experimental research was needed to successfully model the joints (Reid 1997). At the University of Wyoming, larger joints were tested. Here it was concluded that the European Yield Mode III_s did not seem to apply to wood pegged connection because the shear deformation of the peg did not correspond to the model. From these experiments the first basic end and edge distances were recommended. These recommendations were based on end and edge failures experienced in the experiment. Since their intention was to place the pegs at end and edge distances that would insure no failures, there were few data points. MacKay proposed an equivalent steel bolt method. He concluded with the suggestion that specific tests to determine and verify end and edge distances should be explored (MacKay and Schmidt 1997). A standard test for determining the bearing strength of wood pegs was designed by Church and Tew. Their research suggested that peg orientation to applied load affected peg strength. They found that the average strength of White Oak pegs radially orientated were higher than tangentially orientated (Church and Tew 1998). This was not verified by later studies. Sandberg's conclusion was that peg orientation had little effect on the White Oak pegs and that the Red Oak pegs were actually weaker in the radial orientation (Sandberg et al. 2000).

Goldstein stated that engineers in the timber industry were using an equivalent steel bolt diameter in order to determine the end and edge distances required for construction. These peg and mode failure studies were used to develop a ratio between steel bolts and wood pegs. The ratio of the strength of the peg compared to a steel bolt creates an equivalent steel bolt diameter for the peg. NDS recommended edge and end distances for the new equivalent diameter were applied. There was a reduction in the end and edge distances because of the reduced allowable loads of the wood pegs compared to the steel bolts. (Goldstein 1999) 'At this time there was no verification that these assumptions were true. In 2003, the first systematic study of end distances versus stiffness was conducted. The purpose of this research was to determine what reduced percentages of the NDS required distances for steel bolts would do to the stiffness of the joint. It was determined that the reduction of end distances did not significantly influence joint stiffness (Burnett 2003).

Each of these experiments had different test procedures. Reid had the joint constricted by a clamp (Reid 1997). MacKay set up a large joint approximately 3 feet long. The wood members being loaded were not restrained (MacKay and Schmidt 1997). The study done by Burnett also tested the connection with only the peg constraining the joint (Burnett 2003).

CHAPTER 2 GENERAL TEST INFORMATION

2.1 General Considerations

In this study, standard tests for end and edge distances similar to the ASTM standard test methods for bolted connections in wood and wood-based products were devised. Similar assemblies, procedures, reporting methods, and interpretation of results were also used (ASTM 2000). In an effort to produce the constrained condition of the timber connection, the side members were connected with steel bolts. Figure 2.1 shows the two test configurations side by side. Templates for data collected for the various tests were created that are similar to the ASTM sample data sheets for compression perpendicular to grain test and tension parallel to grain tests. Since a standard test for wood peg connections was one of the goals of this research, the data sheets contain more information than was needed for only edge and end distance testing.

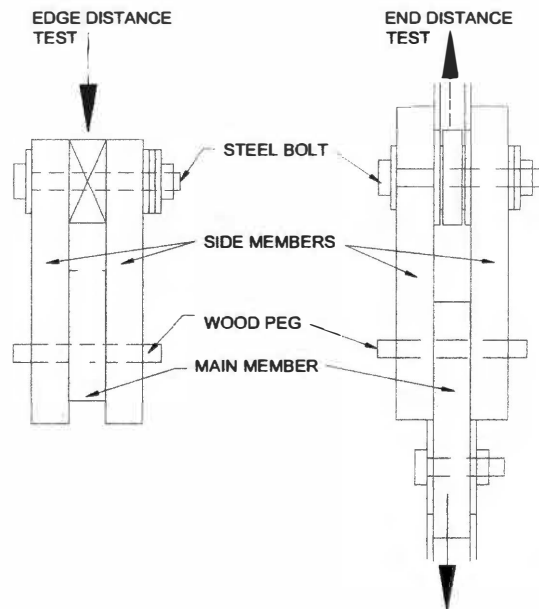


Figure 2.1: Edge and end test configurations

In these experiments, all the side and main members were constructed from standard 2x6 Douglas Fir or Southern Pine boards. These species were selected because they are commonly used in the timber framing industry. Each main member was labeled as follows: the parent board listed first, the wood species of the main member, the diameter of the wood peg, its wood species and the distance to the center of the peg. A sample of this labeling system is shown in Figure 2.2. The same drill press was used to drill all the holes needed for the two different tests. This insured that the holes would be perpendicular to the applied load.

The wood pegs were donated by Northcott Wood Turning Company which is located in New Hampshire. This company provides pegs for the timber industry. Both the species and the diameters of the wood pegs were selected because they are commonly used in timber construction. The peg diameters, 1" and $\frac{3}{4}$ ", were consistently true to these dimensions. The species were Red Oak and White Oak. These pegs were placed into the main member with the applied load perpendicular to the grain of the peg. This is referred to as radially loaded because it is radial to the annual rings of the tree (AITC, 1985 p.2-33). A rubber mallet was used to drive the pegs into the holes.

A universal testing machine, standard scale, Wagner moisture meter, humidity meter, and standard displacement meter were used in gathering the various data for each test. The universal testing machine was calibrated on July 24, 2002 (Figure 2.3). The standard scale and displacement meter was tested for accuracy and zeroed. The Wagner moisture meter is a hand held construction inspection model and reads moisture from the wood surface to a depth of 2". Moisture measurement of wood peg and main member was made immediately prior to testing. This information was recorded on data sheets similar to standard ASTM data sheets for wood testing. These data sheets are located in appendices A through P (each appendix contains the load-distance graph, followed by the data sheets for that load-distance graph).

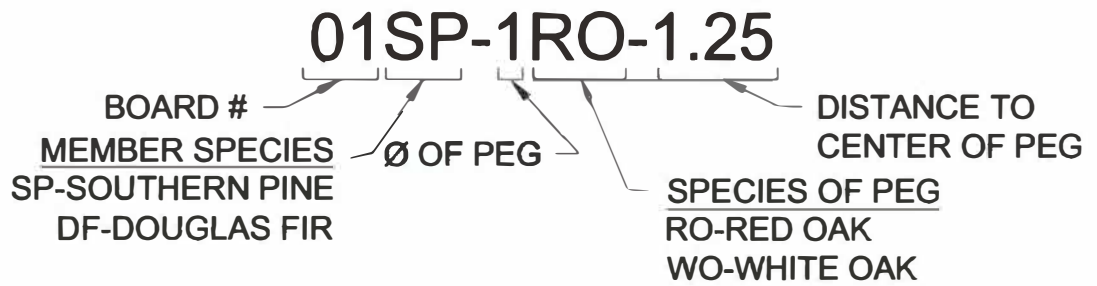


Figure 2.2: Labeling system of main members

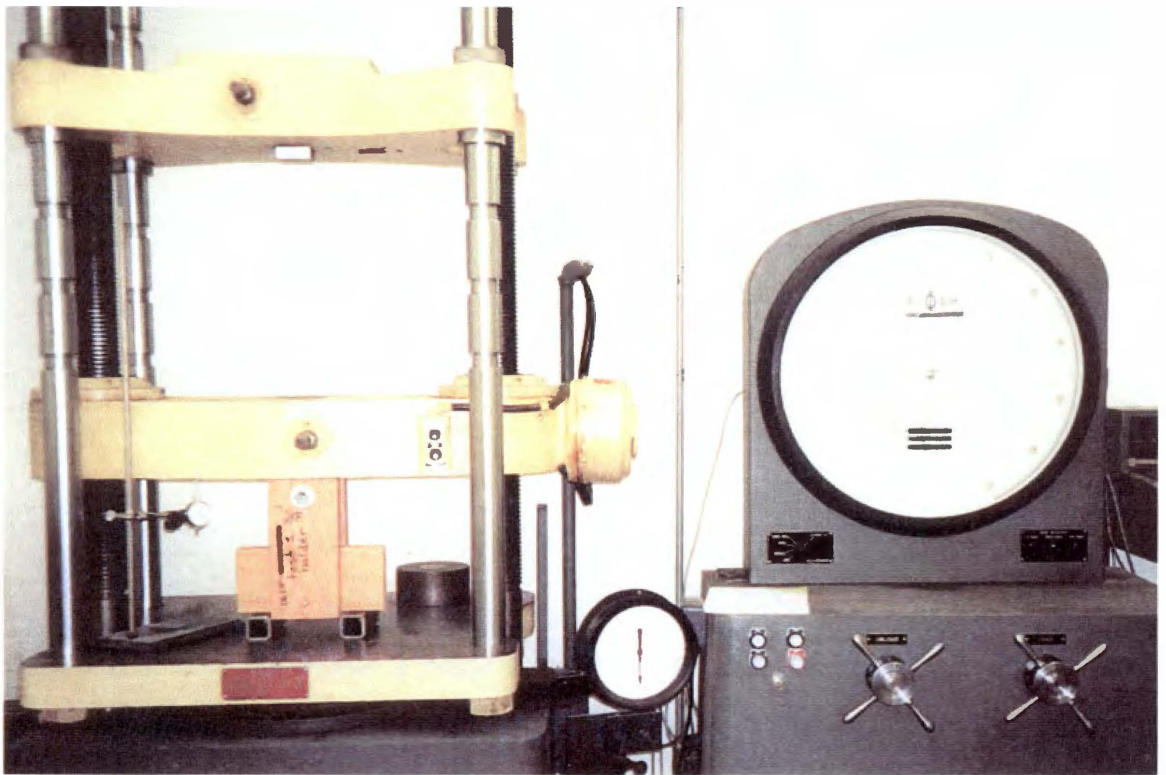


Figure 2.3: Universal testing machine

2.2 Yield Load

The yield load of the joint was determined by the 5% offset method. In this method the load versus displacement was plotted. Notice at the beginning of the graph a discontinuity, this represents the looseness in the test at the start of loading. A line was computed through a linear portion of the curve. An offset line then was translated along the x-axis a distance equal to 5% of the peg diameter. The yield point is defined as the greater of either the largest load within the two lines or the yield point, which is the point at which the offset line intersects the curve (Figure 2.4). Wilkinson used this method to determine the yield load for steel bolts in wood connections (Wilkinson 1991). This method has become a standard in wood research. Each data sheet contains the load versus displacement graph for that test.

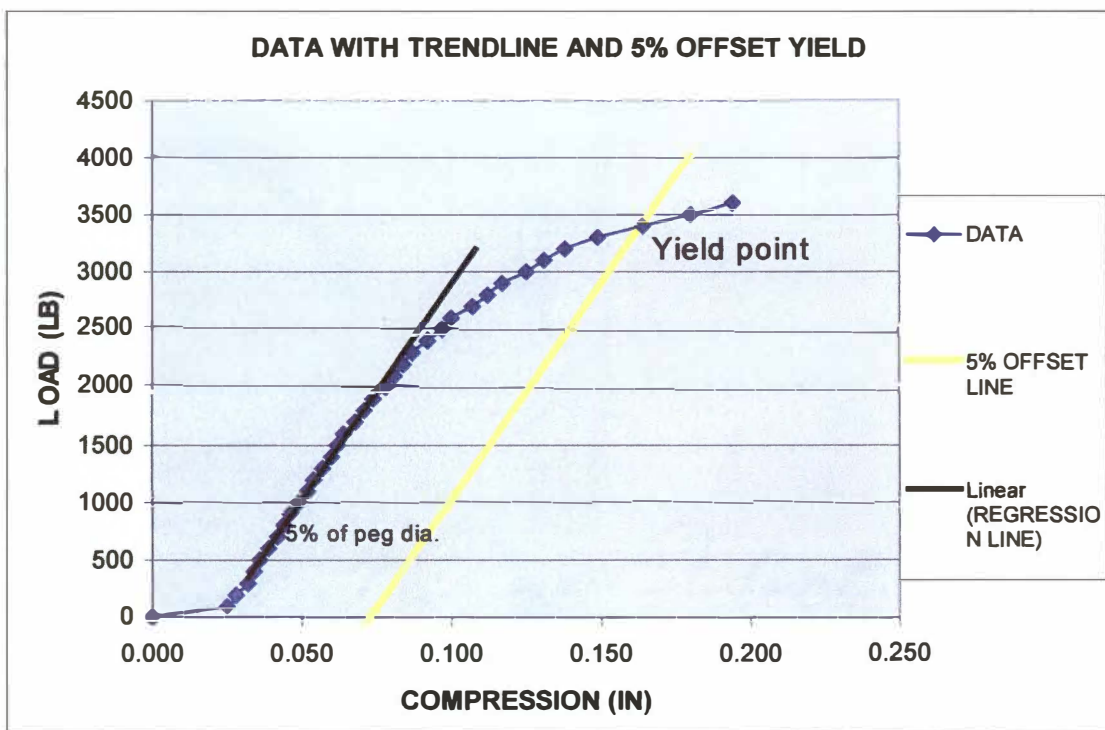


Figure 2.4: Sample graph with 5% offset yield point

2.3 Graphing the Results

After the individual tests were graphed and the yield points determined, yield load (lb) versus distance (in) were graphed as a scatter plot. Since there were two species of main members, two species of pegs, and two diameters of pegs used, eight (8) graphs per test were generated. The variation of strength within the same wood species creates outlying points. The mathematical program SigmaPlot Version 6.0 was used to statistically analyze the raw data (Brannan, (2000)). A sigmoid curve with 3 parameters was the best fit. The three parameters were chosen because of the three distinct areas of the raw data. When the edge distance or end distance to the peg diameter is very small, the member typically fails at a low load. As the amount of wood between the peg and edge distance or end distance increases, the scatter becomes more linearly uniform. Then when the edge distance or end distance is great enough so that only the peg fails, the curve flattens. The load-edge distance or end distance curves were then evaluated to determine the type of failure mode. These areas were graphically shown as vertical lines on the graph. A horizontal line at the flat part of the curve was drawn to locate the point at which the failure mode changes to peg shear failure. Figure 2.5 represents a sample load-end distance graph.

END TEST -DOUGLAS FIR-1" WHITE OAK PEGS

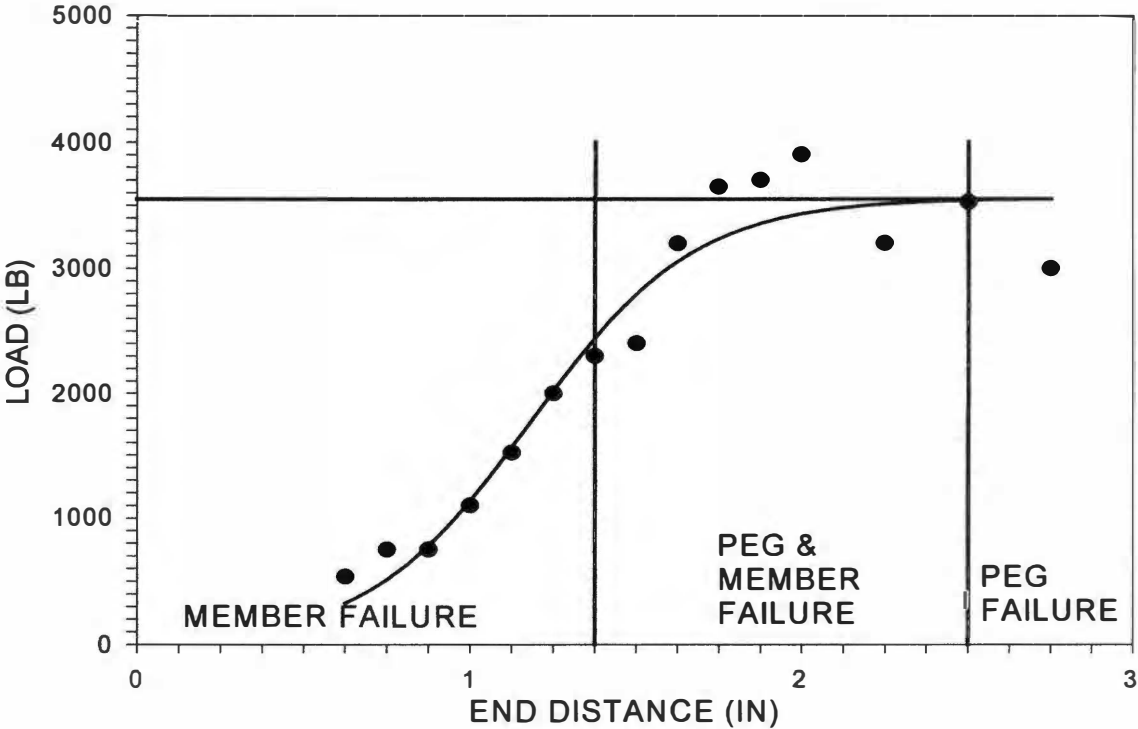


Figure 2.5: Sample graph of load-end distance graph

CHAPTER 3

EDGE DISTANCE TESTS

3.1 Experimental Configuration

Two side members were placed in the vertical position on each side of the horizontal main member to be tested. The two side members were drilled with a $\frac{3}{4}$ " diameter hole located as indicated in Figure 3.1 and centered in the board. Four sets of side members were constructed; one for each wood peg diameter and each side wood species. A filler block the same thickness as the main member was bolted with a $\frac{3}{4}$ " diameter steel bolt between the side members to insure that the side members acted together. The bolt was long enough so that no threads were included in the connection. Each main member and wood peg was then measured, weighed, visually inspected and measured for moisture content. At no time did the moisture content of either the main member or the wood pegs exceed 19%. The wood was visually inspected to be free of defects. The main member was then placed between the side members and connected with the wood peg (Figure 3.1). Wood pegs were always orientated with the peg grain perpendicular to the load. The entire joint was then placed with the main member resting on two steel tubes on the platform of the universal testing machine. The machine was lowered until the load head just touched the joint at which time there was no load applied to the specimen. The displacement meter was then zeroed. Displacement was recorded at one hundred (100) pound intervals as the specimen was loaded to failure (Figure 3.2). Appendix A-H contains the data sheets and load-edge distance graphs organized by peg type and diameter.

3.2 Main Member Failure Modes

In this test the main member failed in one of three ways. When the distance to the edge is small, the member would crack in tension parallel to the grain (Figure 3.3). As the distance increased, the hole elongated as well as cracked (Figure 3.4). As the distance increased the hole would elongate slightly.

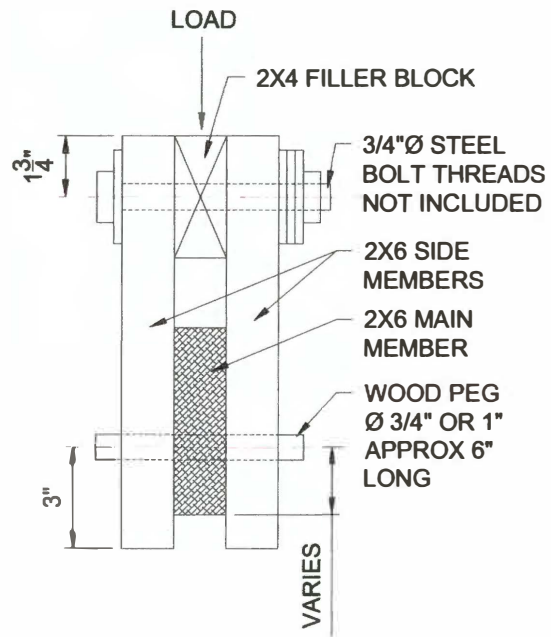


Figure 3.1: Edge test side view

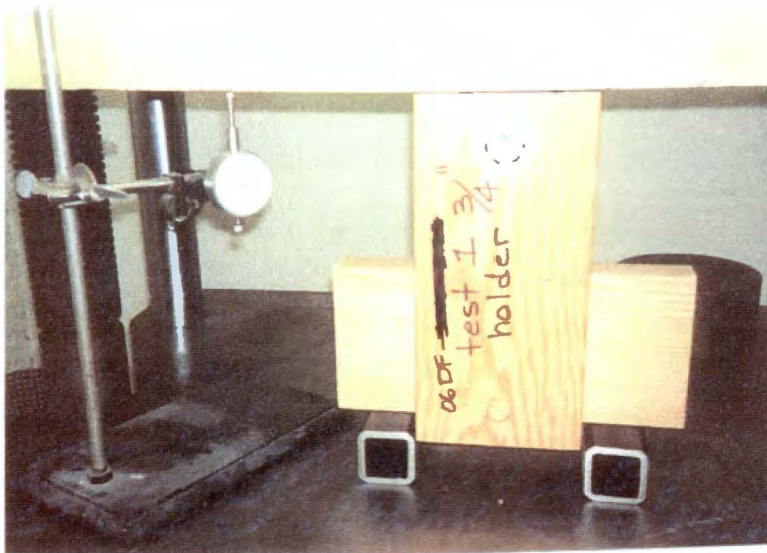


Figure 3.2: Compression set-up

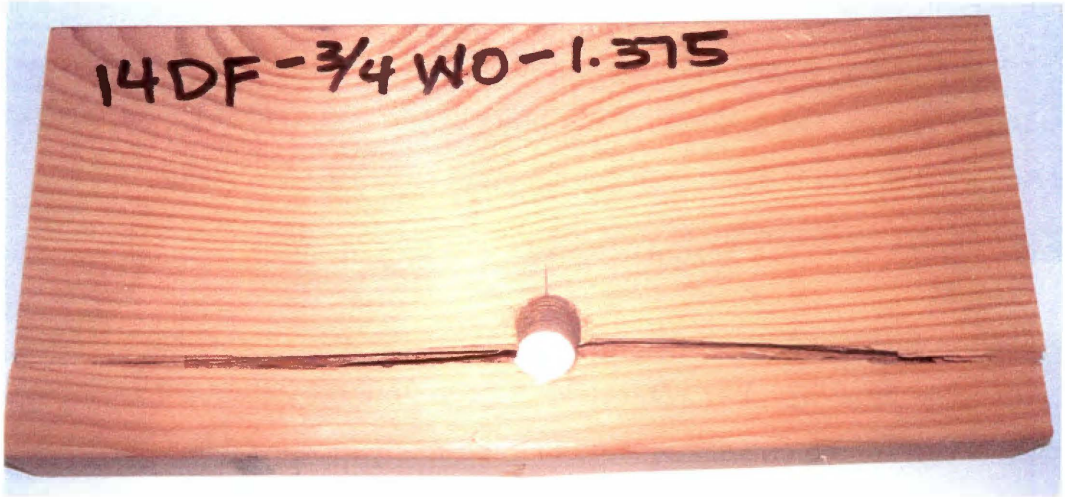


Figure 3.3: Main member cracked

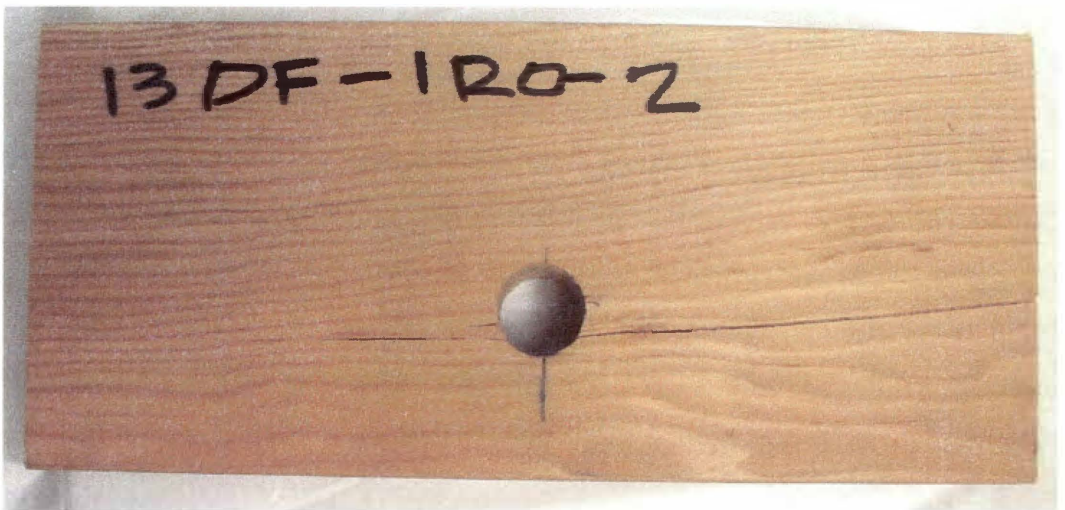


Figure 3.4: Main member with elongated hole and cracked

3.3 Peg Failure Modes

The first sign of peg failure was crushing (Figure 3.5). As the edge distance increases, the peg elongated the hole and began to fail in bending as well (Figure 3.6). As the distance continues to increase, the failure mode changed from peg bending to shear (Figure 3.7)

3.4 Results

The individual data sheets for each experiment in the edge distance test are located in Appendix A-H. The yield loads were then plotted on a load-edge distance graph and a curve was fitted to the data as explained in Chapter 2. Vertical lines on these graphs indicate the edge distances at which the failure modes change. A horizontal line was drawn through the flat part of the curve to indicate the load at which shear failure in the peg occurred. These combined graphs are found in Appendix A-H located in front of the data sheets. The important distance for structural considerations is the edge distance at which only the peg fails. Table 1 lists these distances for 1" White and Red Oak pegs. The data were statistically analyzed to determine the edge distance with a 95% confidence level (Table 2). The 95% confidence edge distance for 1" peg diameter was 2.636 times the peg diameter. Table 3 lists these distances for $\frac{3}{4}$ " White and Red Oak pegs. In these data, there was a difference between the species of peg. The Red Oak pegs failed at shorter distances than the White Oak. Since the $\frac{3}{4}$ " pegs have a small cross section compared to 1" pegs, small defects in the grain structure could explain this difference. The data were statistically analyzed to determine the edge distance with a 95% confidence level (Table 4). The 95% confidence edge distance for $\frac{3}{4}$ " peg diameter was 3.091 times the peg diameter.



Figure 3.5: Vertical marks on peg show signs of crushing failure

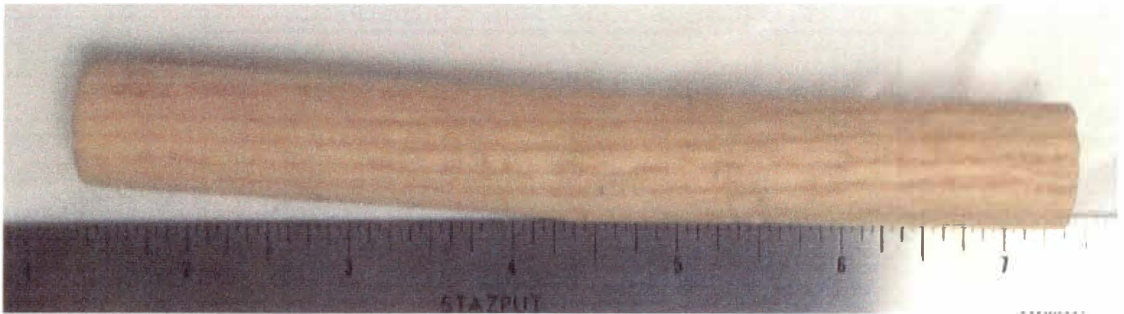


Figure 3.6: Bending failure in peg

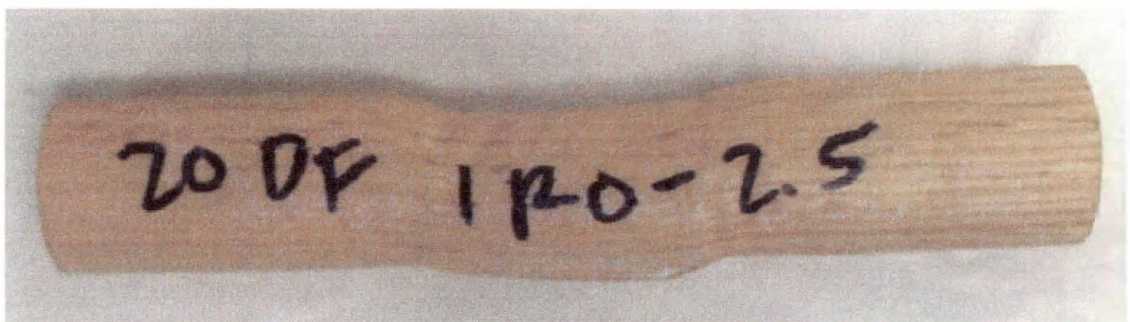


Figure 3.7: Shear failure in peg

Table 1: Edge distances for 1" pegs

Main member species	Peg species	Peg Dia (in)	Edge distance (in) to only peg failure	Shear load (lb) at peg failure
Southern Pine	White Oak	1.00	2.50	2833
Douglas Fir	White Oak	1.00	2.50	3648
Southern Pine	Red Oak	1.00	2.50	2374
Douglas Fir	Red Oak	1.00	2.25	3155

Table 2: Statistical information for Table 1 data

1" Dia Pegs Edge Distance Statistics	
Mean	2.4375
Standard Error	0.0625
Median	2.5
Mode	2.5
Standard Deviation	0.125
Sample Variance	0.015625
Kurtosis	4
Skewness	-2
Range	0.25
Minimum	2.25
Maximum	2.5
Sum	9.75
Count	4
Confidence Level(95.0%)	0.19890308
Edge distance to 95% level(in)	2.636
Edge distance factor of dia.	2.636

Table 3: Edge distance for ¾" pegs

Main member species	Peg species	Peg Dia (in)	Edge distance (in) to only peg failure	Shear load (lb) at peg failure
Southern Pine	White Oak	0.75	2.125	1698
Douglas Fir	White Oak	0.75	2.125	2427
Southern Pine	Red Oak	0.75	1.875	1862
Douglas Fir	Red Oak	0.75	1.625	1921

Table 4: Statistical information for Table 3 data

.75" Dia Pegs Edge distance Statistics	
Mean	1.9375
Standard Error	0.119678388
Median	2
Mode	2.125
Standard Deviation	0.239356777
Sample Variance	0.057291667
Kurtosis	-1.289256198
Skewness	-0.854563038
Range	0.5
Minimum	1.625
Maximum	2.125
Sum	7.75
Count	4
Confidence Level(95.0%)	0.380870403
Edge distance to 95% level (in)	2.318
Edge distance factor of dia.	3.091

CHAPTER 4

END DISTANCE TEST

4.1 Experimental Configuration

The end distance test was essentially a tension test. For this test four steel holders were made to connect the specimen to the universal testing machine (Figure 4.1). Four $\frac{3}{4}$ " steel bolts were used to secure the wood to the holders. In all cases the bolts were long enough so that no threads were included in the connections. Steel washers were used as indicated. Two side members were drilled with two $\frac{3}{4}$ " diameter holes both located for the holder. Two sets of side members were constructed of Douglas Fir; one for each wood peg diameter. A 1"x4" filler block plus two $\frac{1}{8}$ " steel washers combined with the two holders to equal the same thickness as the main member. These were bolted with two $\frac{3}{4}$ " diameter steel bolts to insure that the side members acted together. The steel holders in this assembly were placed through the opening in the upper part of the universal testing machine and a $\frac{3}{4}$ " diameter steel pin was placed through the hole provided. The main member and wood peg were measured, weighed, visually inspected and measured for moisture content. The wood was visually inspected to be free of defects. At no time did the moisture content of either the main member or the wood pegs exceed 19%. The second pair of holders were then bolted to the main member with two $\frac{3}{4}$ " diameter steel bolts. The steel holders in this assembly were positioned in the bottom part of the universal testing machine and secured with a $\frac{3}{4}$ " diameter steel pin. The machine was then raised until the main member was located between the side members and connected with the wood peg (Figure 4.1). The wood pegs were always orientated with the peg grain perpendicular to the load. The machine was lowered until the bottom steel pin touched the machine at which time there was no load applied to the specimen. The displacement meter was then zeroed. Displacement was recorded at 100 pound intervals as the specimen was loaded until failure (Figure 4.3). Appendix I-P contains the data sheets and load-edge

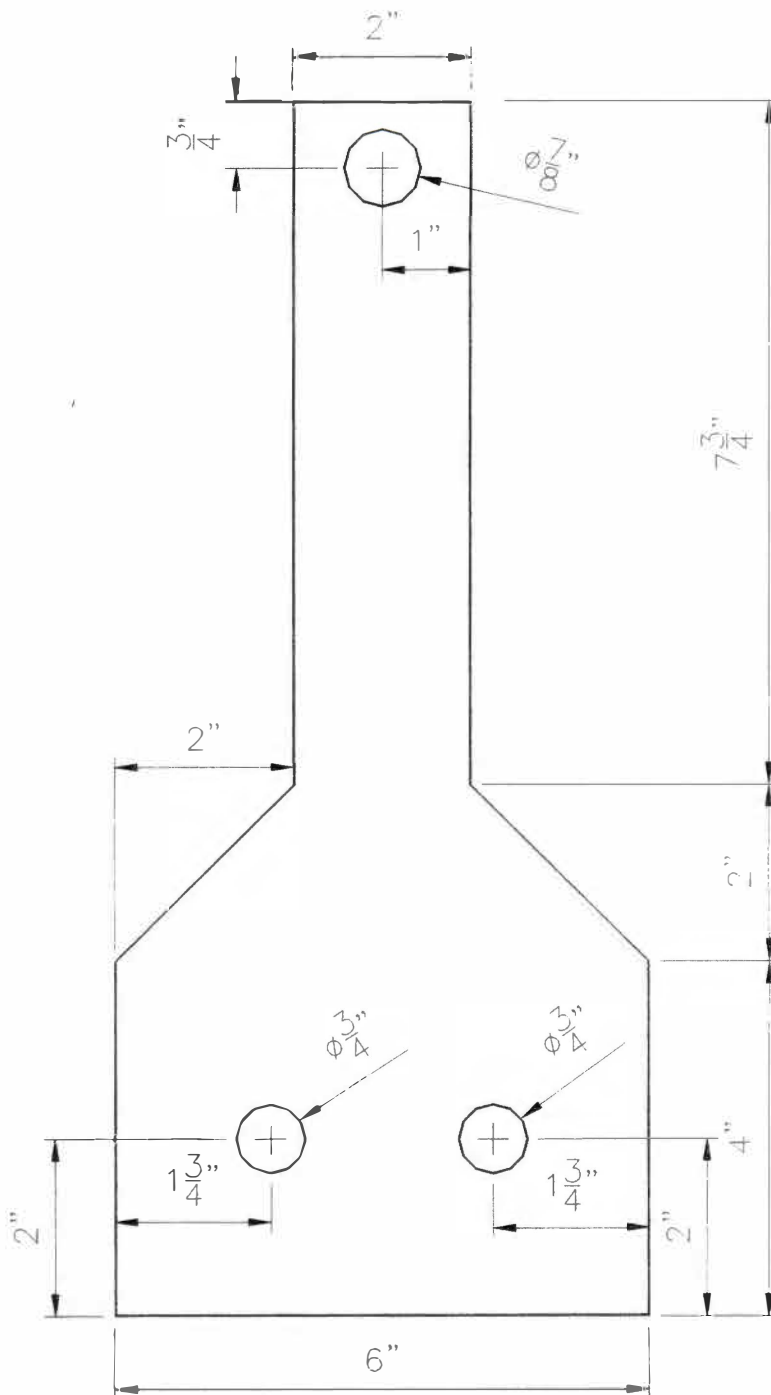


Figure 4.1: Drawing of steel holder

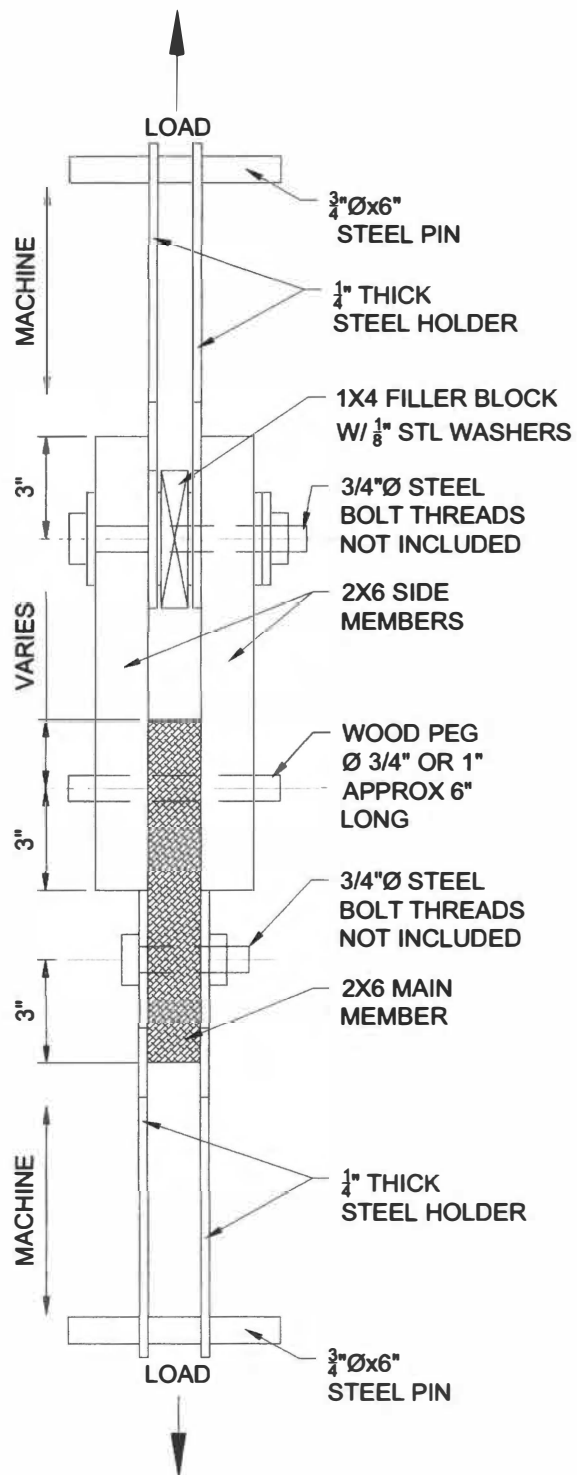


Figure 4.2: Side view of end test

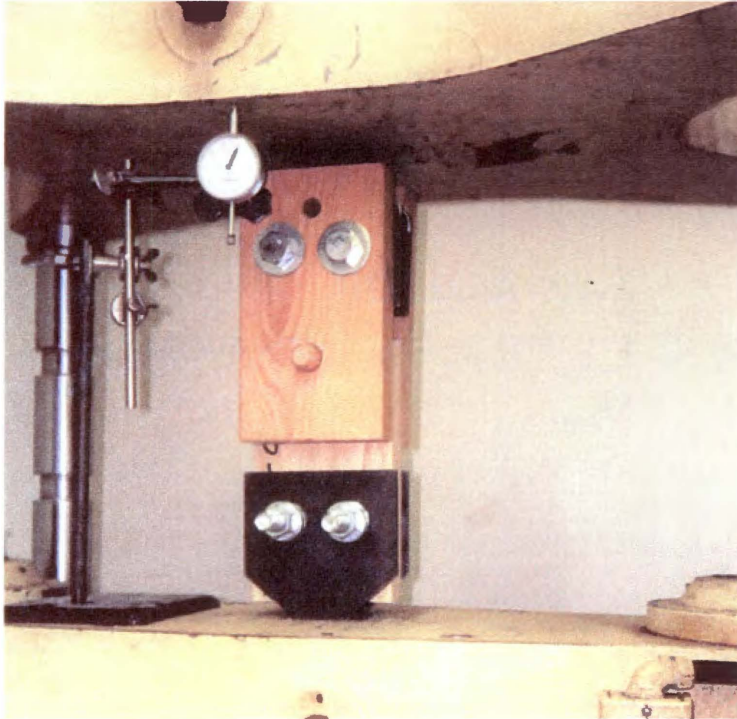


Figure 4.3: End test set-up

distance graphs organized by peg type and diameter.

4.2 Main Member Failure Modes

During the tension tests, the main member failed in three different modes. When the distance to the end was small, the member failed in a “relish” failure. A “relish” failure is when the wood between the peg and the end was displaced (Figure 4.4). As the end distance increased, the main member began to crack as well as relish (Figure 4.5). As the end distance continued to increase, the hole would elongate slightly.

4.3 Peg Failure Modes

The first indication of peg failure was crushing (Figure 4.6). As the end distance became greater, the peg elongated the hole and began to fail in bending and shear (Figure 4.7). Finally, the end distance became great enough that the peg failed in shear (Figure 4.8).

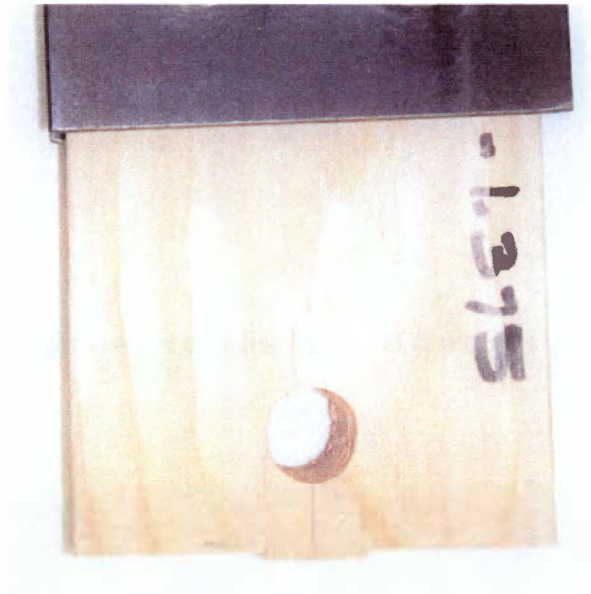


Figure 4.4: Relish failure

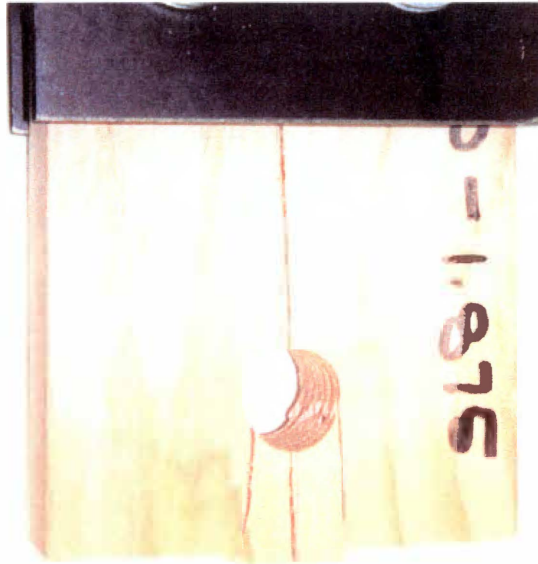


Figure 4.5: Relish and cracked failure

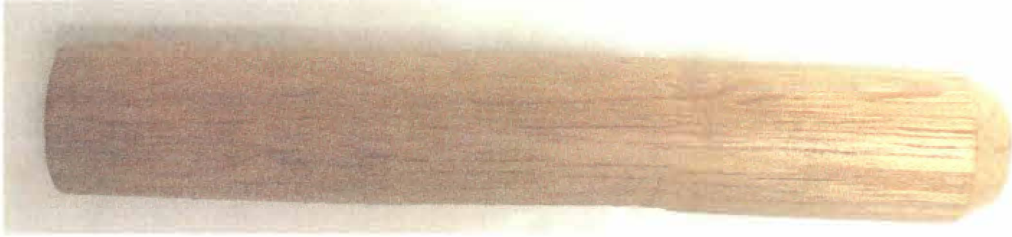


Figure 4.6: Peg fails in crushing

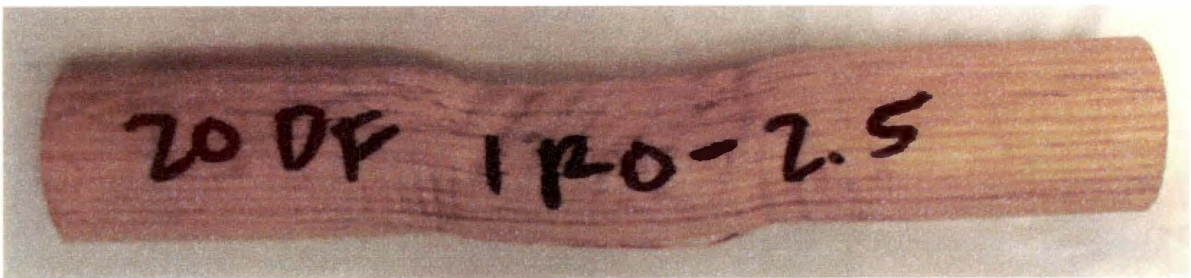


Figure 4.7: Peg fails in bending and shear

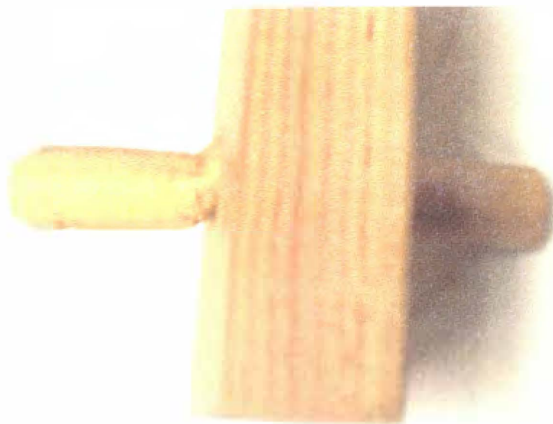


Figure 4.8: Shear peg failure

4.4 Results

The individual data sheets for each experiment in the end distance test are located in Appendix C. The yield loads were then plotted on a load-end distance graph, and a curve was fitted to the data as explained in Chapter 2. Vertical lines on these graphs indicate the end distances at which the failure modes change. A horizontal line was drawn through the flat part of the curve to indicate the load at which shear failure in the peg occurs. These combined graphs can be found in Appendix I-P located in front of the data sheets. The important distance for structural considerations is the end distance at which only the peg fails. Table 5 lists these distances for 1" White and Red Oak pegs. The information from this table was statistically analyzed to determine the end distance with a 95% confidence level (Table 6). The data indicated that the 95% confidence end distance for 1" peg diameter was 2.847 times the peg diameter. Table 7 lists these distances for ¾" White and Red Oak pegs. The information from this table was statistically analyzed to determine the edge distance with a 95% confidence level (Table 8). The data indicated that the 95% confidence edge distance for ¾" peg diameter was 2.508 times the peg diameter.

Table 5: End distances for 1" pegs

Main member species	Peg species	Peg dia (in)	End distance (in) to only peg failure	Shear load (lb) at peg failure
Southern Pine	White Oak	1.00	2.50	2950
Douglas Fir	White Oak	1.00	2.50	3549
Southern Pine	Red Oak	1.00	2.00	2423
Douglas Fir	Red Oak	1.00	2.625	2735

Table 6: Statistical information for Table 5 data

1" Dia Pegs End Distance Statistics	
Mean	2.40625
Standard Error	0.138584736
Median	2.5
Mode	2.5
Standard Deviation	0.277169473
Sample Variance	0.076822917
Kurtosis	3.264579144
Skewness	-1.71986803
Range	0.625
Minimum	2
Maximum	2.625
Sum	9.625
Count	4
Confidence Level(95.0%)	0.441038896
End distance to 95% level (in)	2.847
End distance factor of dia.	2.847

Table 7: End distances for ¾" pegs

Main member species	Peg species	Peg Dia (in)	End distance (in) to only peg failure	Shear load (lb) at peg failure
Southern Pine	White Oak	0.75	1.875	2127
Douglas Fir	White Oak	0.75	1.75	2618
Southern Pine	Red Oak	0.75	1.75	2043
Douglas Fir	Red Oak	0.75	1.75	2273

Table 8: Statistical information for Table 7 data

.75" Dia. End Distances Statistics	
Mean	1.78125
Standard Error	0.03125
Median	1.75
Mode	1.75
Standard Deviation	0.0625
Sample Variance	0.00390625
Kurtosis	4
Skewness	2
Range	0.125
Minimum	1.75
Maximum	1.875
Sum	7.125
Count	4
Confidence Level(95.0%)	0.09945154
End distance to 95% level (in)	1.881
End distance factor of dia.	2.508

CHAPTER 5 CONCLUSIONS

5.1 Conclusions

It can be concluded from the results that the diameter of the peg seems to be a major factor in determining the edge and end distances for tenon timber joints. The different species of the main member did not seem to significantly affect the edge and end distances needed to achieve peg failure. The species of the peg, as it relates to the edge and end distances, was only significant in the edge (compression) test and then only concerning the $\frac{3}{4}$ " pegs. Small defects in the pegs could explain these differences which created a larger edge distance recommendation for $\frac{3}{4}$ " pegs concerning edge distances.

In summary, edge distance recommendations for 1" pegs have been determined to be 2.636 times the peg diameter. End distances for 1" pegs have been determined to be 2.847 times the peg diameter. The edge distance recommendation for $\frac{3}{4}$ " wood pegs was determined to be 3.091 times the peg diameter. The end distance for $\frac{3}{4}$ " wood pegs have been determined to be 2.508 times the peg diameter. Wood connections can be designed to accommodate the peg strength in shear if placed at these distances.

5.2 Recommendations for Further Research

A standardization of tests for wood pegs would benefit the industry. If the two tests in this study were used as a standard, more research could be performed and directly compared on different peg species to determine if species would affect the end and edge distances. Also different diameters of pegs need to be tested to determine additional safe edge and end distances. Although these tests required approximately 200 tests to failure, the statistical confidence levels may be questionable. Therefore, it is recommended that additional testing be done to verify the 95% confidence levels.

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LIST OF REFERENCES

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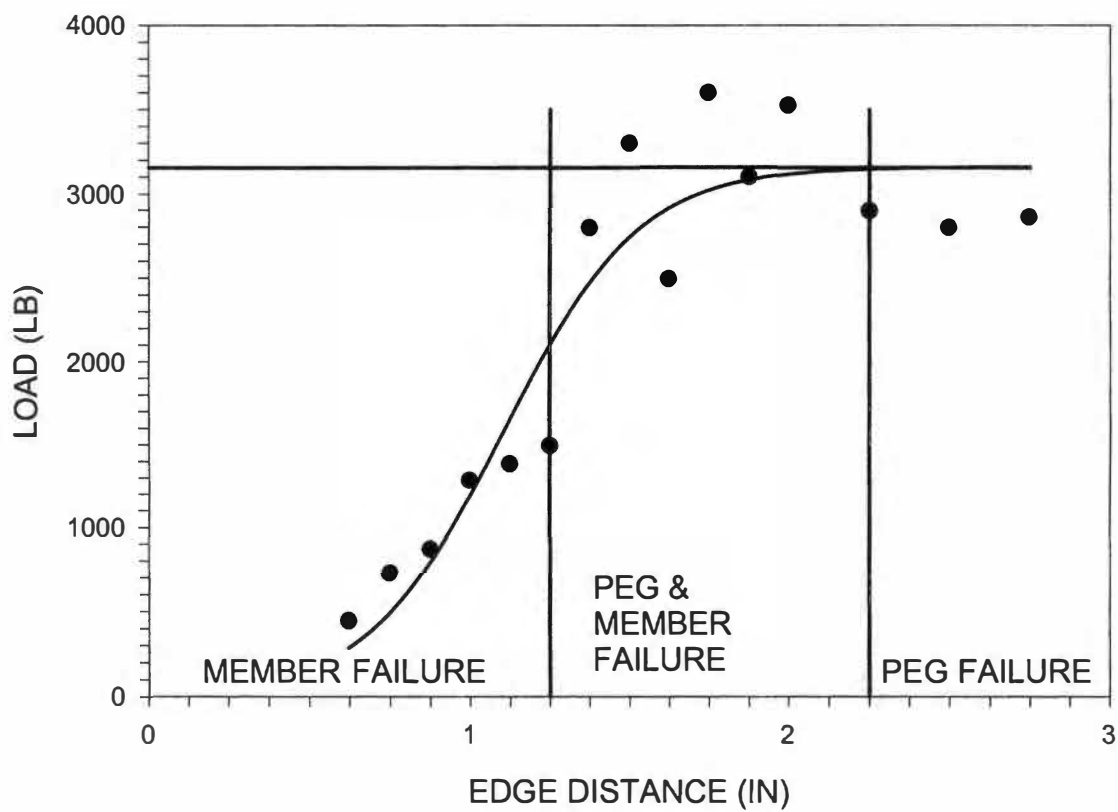
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APPENDICES

APPENDIX A – EDGE TEST-DOUGLAS FIR-1” RED OAK PEGS

EDGE TEST-DOUGLAS FIR-1" RED OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 15-May-03

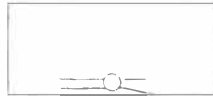
PIECE NO _05DF

PEG NO. 1 RO -0.625

KIND OF TEST EDGE DISTANCE TEST

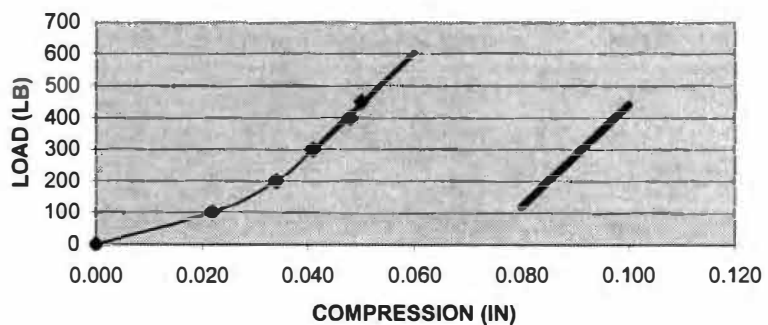
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.09 LBS
 *RINGS PER INCH 8
 *SAP 10%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE
 DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.022
200	0.034
300	0.041
400	0.048
450	0.050



*LOAD @ FAILURE 450 LBS
47%R.H.
0.625 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 7
 *SAP 10%
 *SUMMERWOOD 75%
 *SEASONING GREEN
 *MOISTURE 6%
 *KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

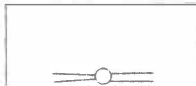
DATE: 25-Mar-03 PIECE NO _05DF PEG NO. 1 RO -0.75

KIND OF TEST EDGE DISTANCE TEST

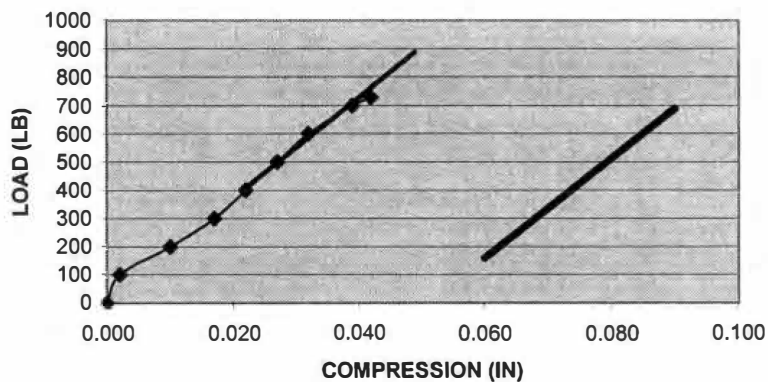
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.03 LBS
 *RINGS PER INCH 8
 *SAP 10%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 4%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 730 LBS
28%R.H.
0.75 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.1 LBS
 *RINGS PER INCH 12
 *SAP 0%
 *SUMMERWOOD 2%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.002
200	0.010
300	0.017
400	0.022
500	0.027
600	0.032
700	0.039
730	0.042



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO 05DF

PEG NO. 1 RO -0.875

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.99 LBS
 *RINGS PER INCH 8
 *SAP 10%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 6%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 870 LBS
28%R.H.

0.875 in

*SPECIES OF PEG

RED OAK

*DIA. 1"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.11 LBS

*RINGS PER INCH 6

*SAP 0%

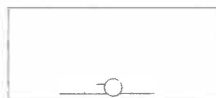
*SUMMERWOOD 50%

*SEASONING GREEN

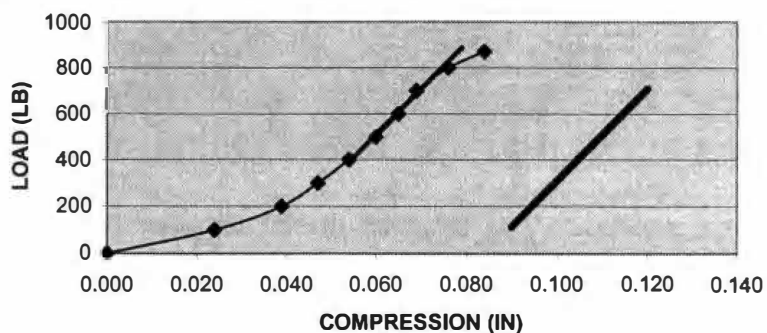
*MOISTURE DRY

*KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.024
200	0.039
300	0.047
400	0.054
500	0.060
600	0.065
700	0.069
800	0.076
870	0.084



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO 05DF

PEG NO. 1 RO -1

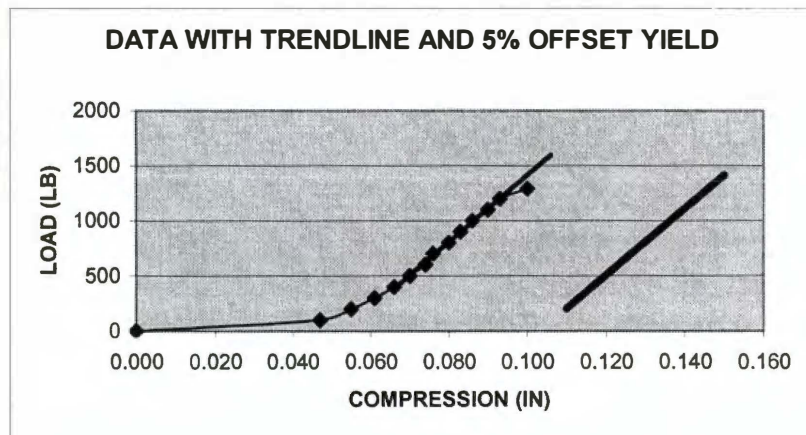
KIND OF TEST EDGE DISTANCE TEST

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 *TESTED AT 73.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11-7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.01 LBS
 *RINGS PER INCH 8
 *SAP 10%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE

*LOAD @ FAILURE 1290 LBS
28%R.H.
1 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.1 LBS
 *RINGS PER INCH 8
 *SAP 1%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.047
200	0.055
300	0.061
400	0.066
500	0.070
600	0.074
700	0.076
800	0.080
900	0.083
1000	0.086
1100	0.090
1200	0.093
1290	0.100



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 18-Sep-03

PIECE NO 13DF

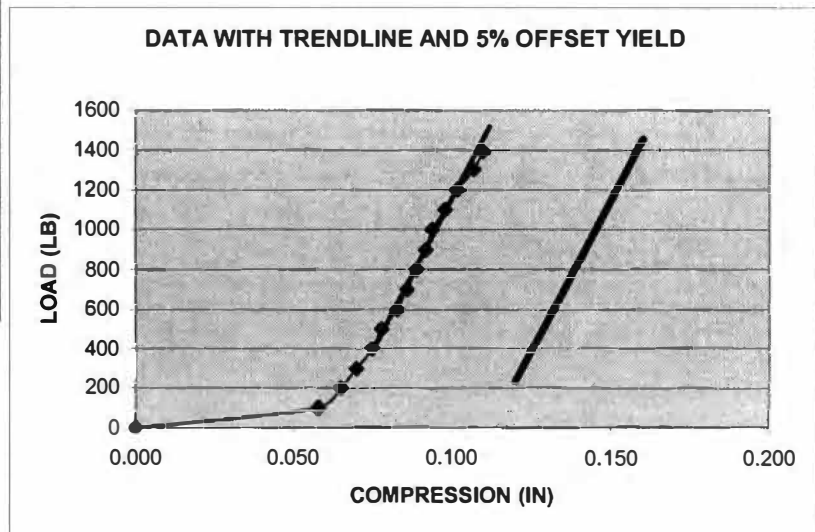
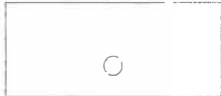
PEG NO. 1 RO -1.125

KIND OF TEST EDGE DISTANCE TEST

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 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11-7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.20 LBS
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE hole elongated
 DATA

*LOAD @ FAILURE 1390 LBS
75%R.H.
1.125 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 14
 *SAP 5%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 5%
 *KIND OF FAILURE:

LOAD(lb)	COMP(in)
0	0.000
100	0.058
200	0.065
300	0.070
400	0.075
500	0.078
600	0.083
700	0.086
800	0.089
900	0.092
1000	0.094
1100	0.098
1200	0.102
1300	0.107
1390	0.110



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 18-Sep-03 PIECE NO 13DF PEG NO. 1 RO -1.25

KIND OF TEST EDGE DISTANCE TEST

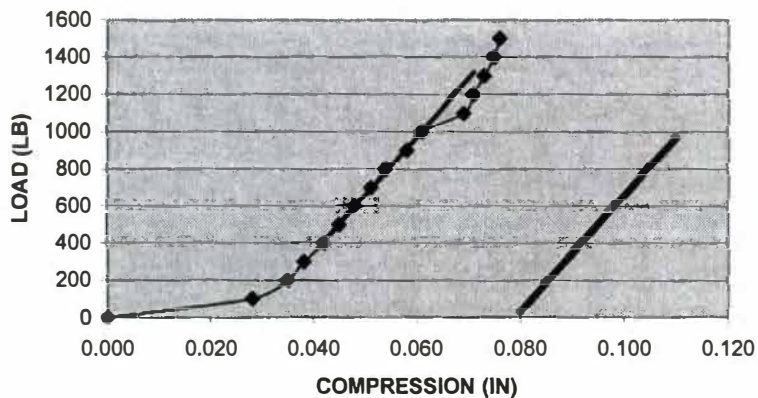
*MACHINE: <u>Universal Testing Machine</u> *SPEED ON MACH. <u>0.04 IN PER MIN. 1</u> *TESTED AT <u>74.5 degrees</u> TEMP * DISTANCE OF CENTERLINE OF HOLE TO EDGE *SPECIES OF MAIN MEMBERS <u>DOUGLAS FIR</u> *LENGTH <u>11-7/8"</u> *HEIGHT <u>5.5"</u> *WIDTH <u>1.5"</u> *ANGLE OF GRAIN TO LOADING: <u>PERP</u> *WEIGHT <u>2.23 LBS</u> *RINGS PER INCH <u>15</u> *SAP <u>30%</u> *SUMMERWOOD <u>40%</u> *SEASONING <u>GREEN</u> *MOISTURE <u>12%</u> *KIND OF FAILURE <u>elongated hole</u>	*LOAD @ FAILURE <u>1500 LBS</u> *75%R.H. *1.25 in *SPECIES OF PEG *RED OAK *DIA. <u>1"</u> *LENGTH <u>6"</u> *ANGLE OF GRAIN TO LOAD *PERP *WEIGHT <u>0.13 LBS</u> *RINGS PER INCH <u>16</u> *SAP <u>35%</u> *SUMMERWOOD <u>40%</u> *SEASONING <u>GREEN</u> *MOISTURE <u>5%</u> *KIND OF FAILURE: <u>crushed</u>
---	---

DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.028
200	0.035
300	0.038
400	0.042
500	0.045
600	0.048
700	0.051
800	0.054
900	0.058
1000	0.061
1100	0.069
1200	0.071
1300	0.073
1400	0.075
1500	0.076



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 18-Sep-03

PIECE NO 13DF

PEG NO. 1 RO -1.375

KIND OF TEST EDGE DISTANCE TEST

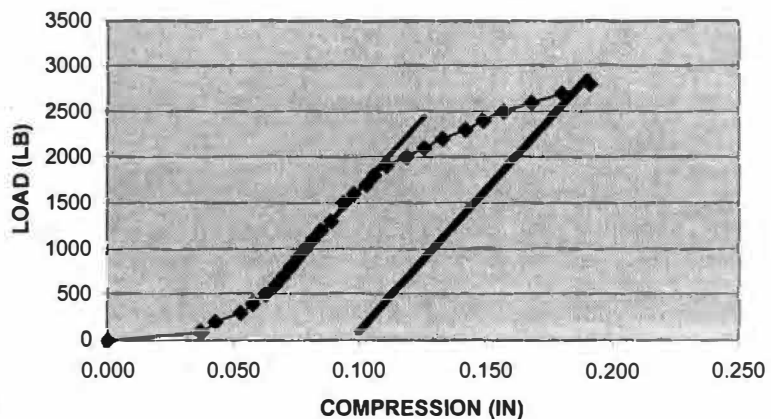
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11-7/18"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.23 LBS
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE elongated hole
 DATA

*LOAD @ FAILURE 2800 LBS
74.9%R.H.
1.375 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 18
 *SAP 10%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 6%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.037
200	0.043
300	0.053
400	0.058
500	0.063
600	0.067
700	0.070
800	0.073
900	0.076
1000	0.079
1100	0.082
1200	0.085
1300	0.089
1500	0.094
1600	0.098
1700	0.103
1800	0.106
1900	0.111
2000	0.119
2100	0.126
2200	0.133
2300	0.142
2400	0.149
2500	0.157
2600	0.168
2700	0.180
2800	0.191



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 18-Sep-03 PIECE NO 13DF PEG NO. 1 RO -1.5

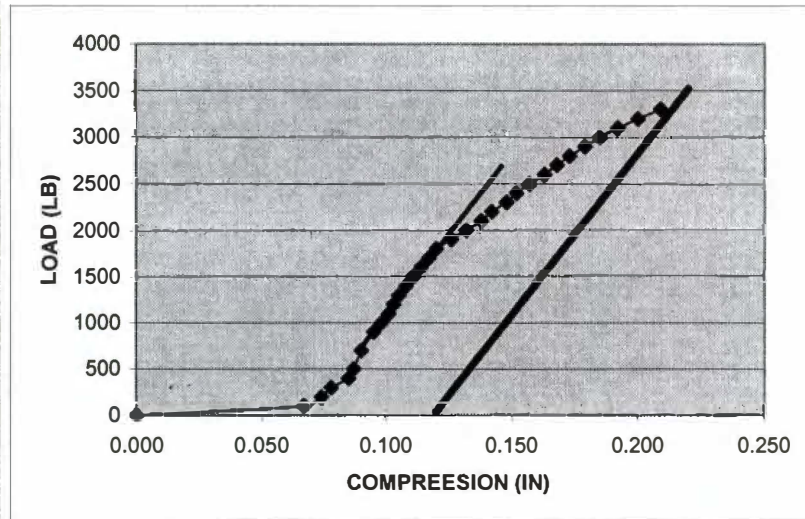
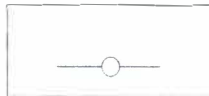
KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11-7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.23 LBS
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE elongated hole
 DATA cracked

*LOAD @ FAILURE 3300 LBS
74.9%R.H.
1.5 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 13
 *SAP 20%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.067
200	0.074
300	0.078
400	0.085
500	0.087
700	0.090
900	0.095
1000	0.098
1100	0.101
1200	0.103
1300	0.105
1400	0.108
1500	0.111
1600	0.114
1700	0.117
1800	0.120
1900	0.126
2000	0.132
2100	0.138
2200	0.142
2300	0.148
2400	0.152
2500	0.157
2600	0.163
2700	0.168
2800	0.173
2900	0.179

LOAD(lb)	COMP(in)
3000	0.185
3100	0.192
3200	0.200
3300	0.209



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 18-Sep-03

PIECE NO 13DF

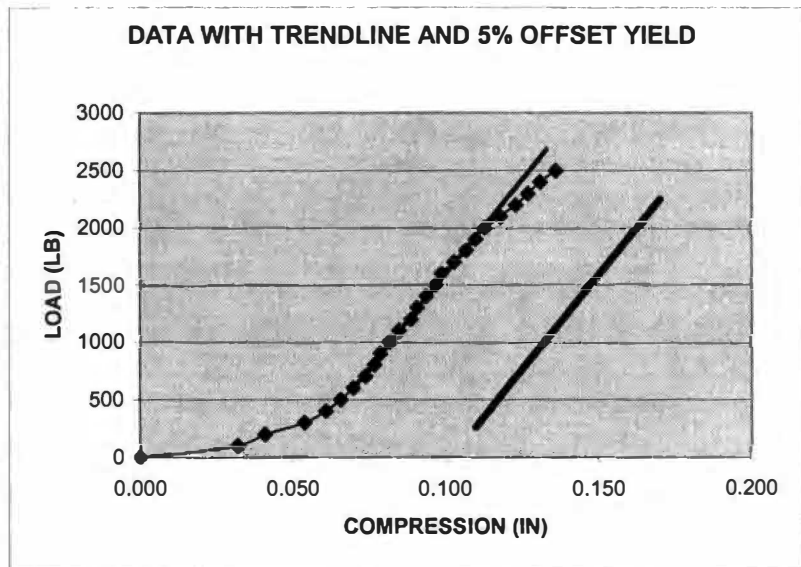
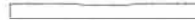
PEG NO. 1 RO -1.625

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11-7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.19 LBS
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE elongated hole
 DATA

*LOAD @ FAILURE 2500 LBS
74.6%R.H.
1.625 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 8
 *SAP 30%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.032
200	0.041
300	0.054
400	0.061
500	0.066
600	0.070
700	0.074
800	0.077
900	0.079
1000	0.082
1100	0.085
1200	0.089
1300	0.091
1400	0.094
1500	0.097
1600	0.099
1700	0.103
1800	0.107
1900	0.110
2000	0.113
2100	0.118
2200	0.123
2300	0.127
2400	0.131
2500	0.136



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

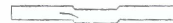
DATE: 18-Sep-03 PIECE NO 13DF PEG NO. 1 RO -1.75

KIND OF TEST EDGE DISTANCE TEST

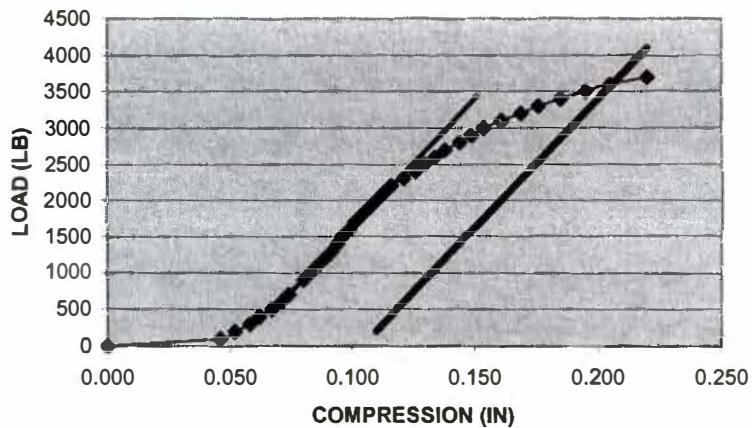
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.7 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11-7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.16 LBS
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 3600 LBS
74.5%R.H.
1.75 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 11
 *SAP 15%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: crushed
bent

LOAD(lb)	COMP(in)
0	0.000
100	0.046
200	0.052
300	0.058
400	0.062
500	0.067
600	0.071
700	0.074
900	0.080
1000	0.083
1100	0.086
1200	0.089
1300	0.092
1400	0.094
1500	0.096
1600	0.099
1700	0.101
1800	0.104
1900	0.107
2000	0.110
2100	0.113
2200	0.116
2300	0.121
2400	0.126
2500	0.130
2600	0.134
2700	0.138
2800	0.144
2900	0.149



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	COMP(in)	LOAD(lb)	COMP(in)
3000	0.154	3400	0.185
3100	0.161	3500	0.195
3200	0.169	3600	0.205
3300	0.176	3700	0.220

DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 18-Sep-03 PIECE NO 13DF PEG NO. 1 RO -2.00

KIND OF TEST EDGE DISTANCE TEST

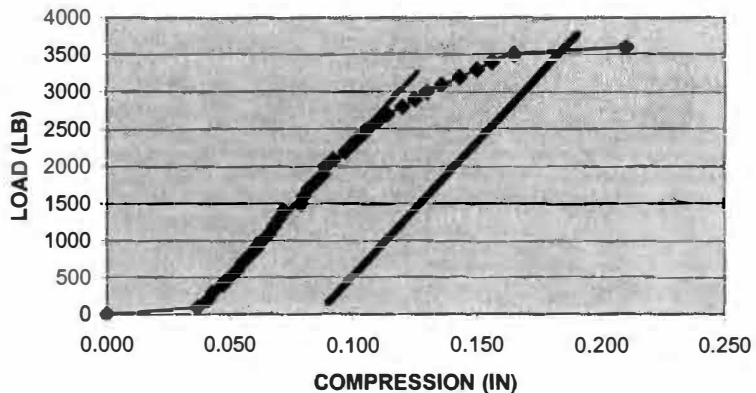
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11-7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.18 LBS
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE elongated hole
 DATA cracked

*LOAD @ FAILURE 3525 LBS
72.4%R.H.
2.00 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 8
 *SAP 10%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: bent
cracked

LOAD(lb)	COMP(in)
0	0.000
100	0.037
200	0.041
300	0.043
400	0.047
500	0.050
600	0.053
700	0.055
800	0.058
900	0.061
1000	0.063
1100	0.066
1200	0.068
1300	0.070
1400	0.072
1500	0.079
1600	0.080
1700	0.082
1800	0.085
1900	0.088
2000	0.089
2100	0.092
2200	0.097
2300	0.100
2400	0.103
2500	0.106
2600	0.110
2700	0.114
2800	0.120



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	COMP(in)	LOAD(lb)	COMP(in)
2900	0.125	3300	0.150
3000	0.130	3400	0.156
3100	0.136	3500	0.165
3200	0.143	3600	0.210

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO 20DF

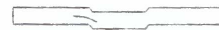
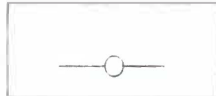
PEG NO. 1 RO -2.25

KIND OF TEST EDGE DISTANCE TEST

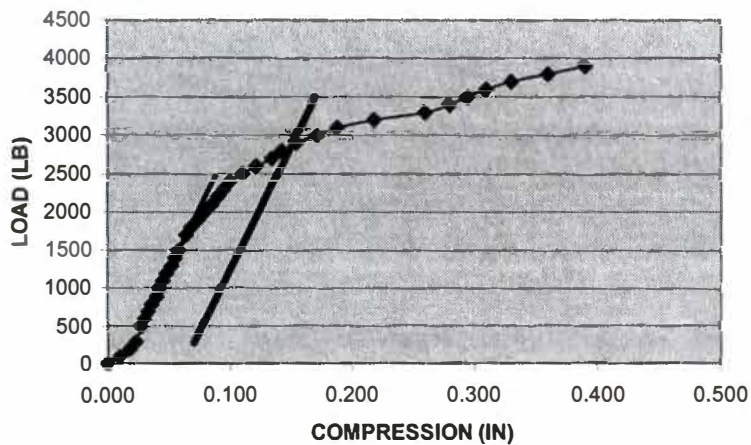
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9-7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.72 LBS
 *RINGS PER INCH 9
 *SAP 40%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE elongated hole
 DATA cracked

*LOAD @ FAILURE 2900 LBS
 *11%R.H.
 *2.25 in
 *SPECIES OF PEG RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 8
 *SAP 25%
 *SUMMERWOOD 75%
 *SEASONING GREEN
 *MOISTURE 7.0%
 *KIND OF FAILURE: bent
crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.010
200	0.018
300	0.023
500	0.027
600	0.030
700	0.033
800	0.036
900	0.040
1000	0.042
1100	0.045
1200	0.048
1300	0.052
1400	0.055
1500	0.058
1700	0.064
1800	0.068
1900	0.074
2000	0.079
2100	0.085
2200	0.090
2300	0.095
2400	0.100
2500	0.110
2600	0.121
2700	0.134
2800	0.142
2900	0.154
3000	0.172



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	COMP(in)	LOAD(lb)	COMP(in)	LOAD(lb)	COMP(in)
3100	0.188	3500	0.295	3900	0.390
3200	0.218	3600	0.310		
3300	0.260	3700	0.330		
3400	0.28	3800	0.360		

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO 20DF

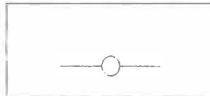
PEG NO. 1 RO -2.5

KIND OF TEST EDGE DISTANCE TEST

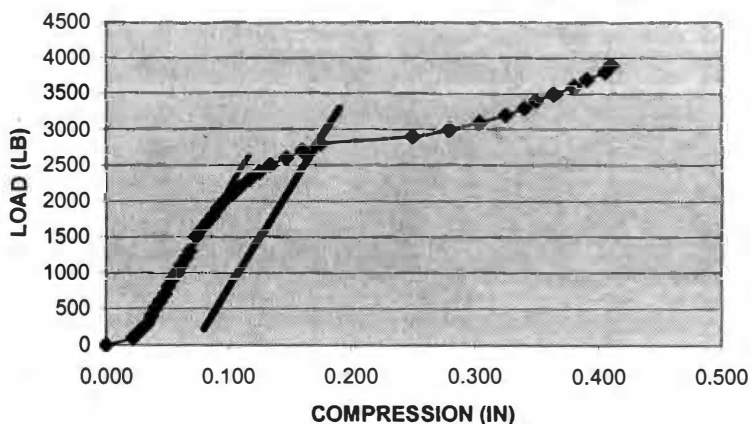
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.75 LBS
 *RINGS PER INCH 9
 *SAP 40%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE elongated hole
 DATA cracked

*LOAD @ FAILURE 2800 LBS
11%R.H.
2.5 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 12
 *SAP 40%
 *SUMMERWOOD 55%
 *SEASONING GREEN
 *MOISTURE 9.0%
 *KIND OF FAILURE: bent
crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.022
200	0.028
300	0.034
400	0.037
500	0.040
600	0.044
700	0.048
800	0.051
900	0.054
1000	0.058
1100	0.061
1200	0.065
1300	0.068
1500	0.073
1600	0.077
1700	0.082
1800	0.087
1900	0.091
2000	0.096
2100	0.103
2200	0.109
2300	0.117
2400	0.125
2500	0.134
2600	0.147
2700	0.160
2800	0.175
2900	0.250



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	COMP(in)	LOAD(lb)	COMP(in)	LOAD(lb)	COMP(in)
3000	0.280	3400	0.349	3800	0.405
3100	0.304	3500	0.364	3900	0.410
3200	0.325	3600	0.380		
3300	0.340	3700	0.390		

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO 20DF

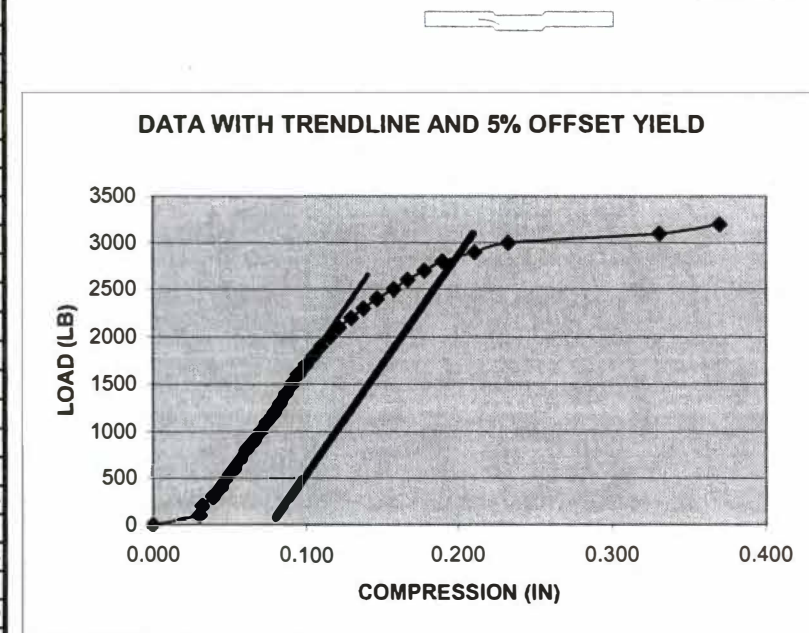
PEG NO. 1 RO -2.75

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.76 LBS
 *RINGS PER INCH 9
 *SAP 40%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 14%
 *KIND OF FAILURE elongated hole slightly
 DATA

*LOAD @ FAILURE 2862 LBS
 *11%R.H.
 *2.75 in
 *SPECIES OF PEG
 *RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
 *PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 10
 *SAP 25%
 *SUMMERWOOD 65%
 *SEASONING GREEN
 *MOISTURE 7.0%
 *KIND OF FAILURE: shear
bent
crushed

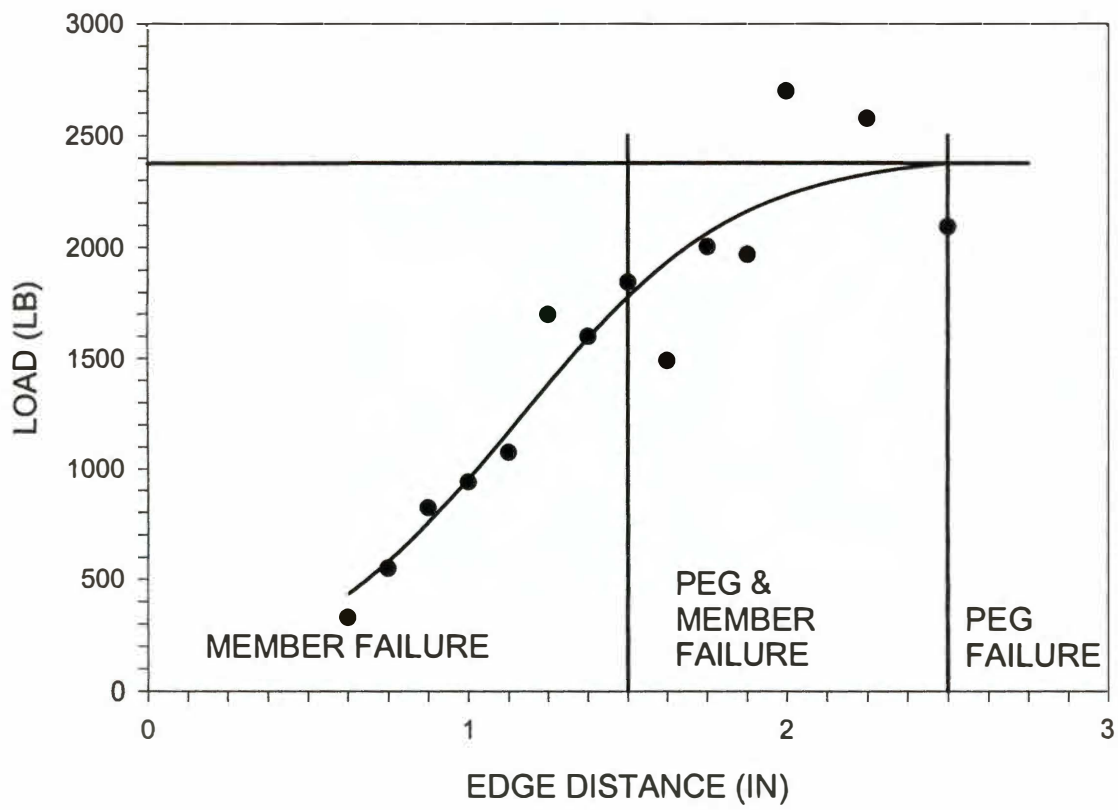
LOAD(lb)	COMP(in)
0	0.000
100	0.030
200	0.032
300	0.039
400	0.044
500	0.048
600	0.053
700	0.057
800	0.061
900	0.066
1000	0.070
1100	0.074
1200	0.079
1300	0.083
1400	0.087
1500	0.091
1600	0.095
1700	0.100
1800	0.105
1900	0.110
2000	0.116
2100	0.122
2200	0.130
2300	0.138
2400	0.147
2500	0.158
2600	0.167
2700	0.178
2800	0.190



LOAD(lb)	COMP(in)
2900	0.211
3000	0.233
3100	0.331
3200	0.370

APPENDIX B – EDGE TEST-SOUTHERN PINE-1” RED OAK PEGS

EDGE TEST -SOUTHERN PINE-1" RED OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

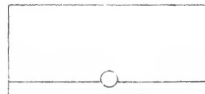
PIECE NO. 01SP

PEG NO. 1RO 0.625

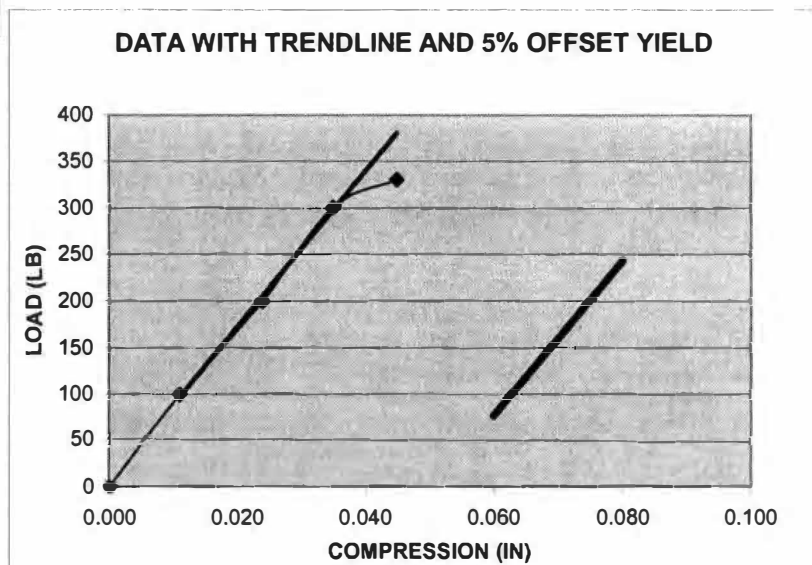
KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8"
 *HEIGHT 5 3/8"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.34 LBS
 *RINGS PER INCH 20
 *SAP 20%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 4%
 *KIND OF FAILURE elongated hole
 DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.011
200	0.024
300	0.035
330	0.045



*LOAD @ FAILURE 330 LBS
28 %R.H.
0 625
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.11 LBS
 *RINGS PER INCH 8
 *SAP 0%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail



DEPARTMENT OF CIVIL ENGINEERING
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DATE: 25-Mar-03

PIECE NO. 01SP

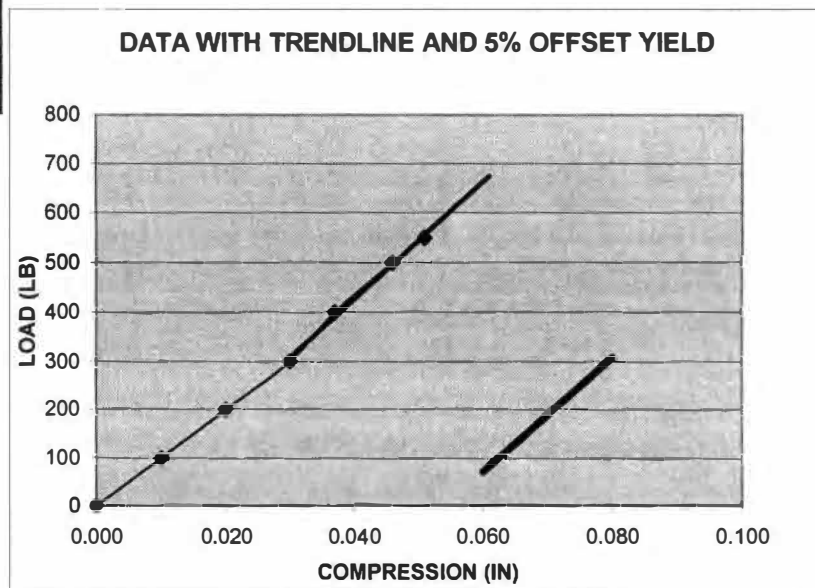
PEG NO. 1RO 0.75

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 12 2/8"
 *HEIGHT 5 3/8 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.37 LBS
 *RINGS PER INCH 20
 *SAP 20%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 4%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 550 LBS
28 %R.H.
0.75
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.11 LBS
 *RINGS PER INCH 8
 *SAP 0%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.010
200	0.020
300	0.030
400	0.037
500	0.046
550	0.051



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 01SP

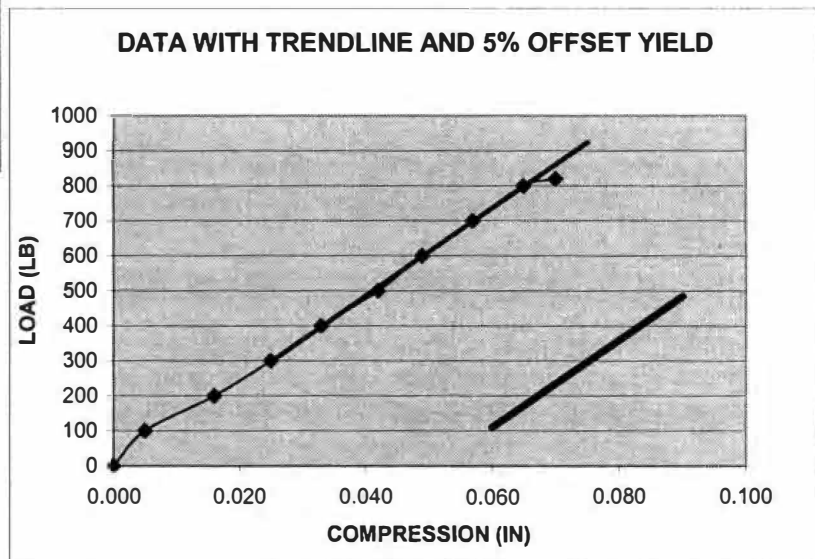
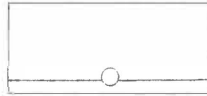
PEG NO. 1RO 0.875

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8"
 *HEIGHT 5 3/8 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.36 LBS
 *RINGS PER INCH 20
 *SAP 20%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 5%
 *KIND OF FAILURE cracked
 DATA

*LOAD @ FAILURE 820 LBS
28 %R.H.
0.875
 *SPECIES OF PEG RED OAK
 *DIA. 1 "
 *LENGTH 6 "
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.9 LBS
 *RINGS PER INCH 8
 *SAP 0%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.005
200	0.016
300	0.025
400	0.033
500	0.042
600	0.049
700	0.057
800	0.065
820	0.070



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 01SP

PEG NO. 1RO 1

KIND OF TEST EDGE DISTANCE TEST

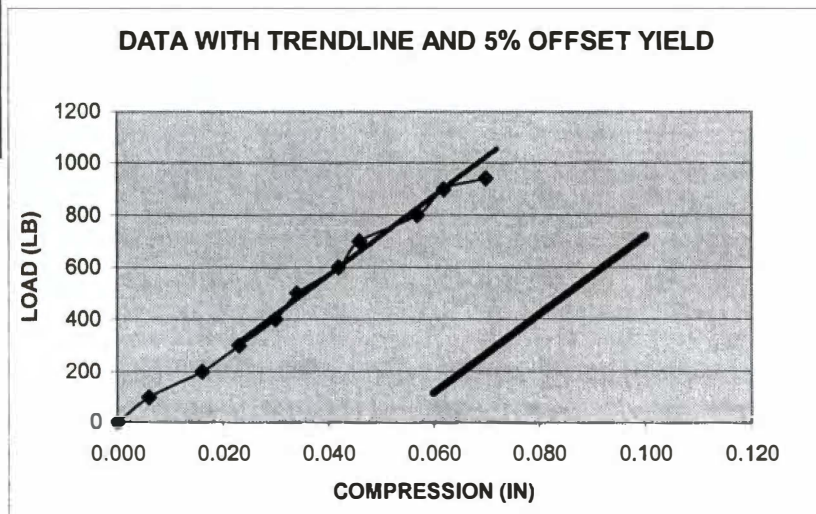
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 12 "
 *HEIGHT 5 3/8 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.37 LBS
 *RINGS PER INCH 20
 *SAP 20%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 5%
 *KIND OF FAILURE Cracked

*LOAD @ FAILURE 940 LBS
28 %R.H.

*SPECIES OF PEG 1
RED OAK
 *DIA. 1 "
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP

*WEIGHT 0.11 LBS
 *RINGS PER INCH 18
 *SAP 0%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.006
200	0.016
300	0.023
400	0.030
500	0.034
600	0.042
700	0.046
800	0.057
900	0.062
940	0.070



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 01SP

PEG NO. 1RO 1.125

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 73 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*LOAD @ FAILURE 1075 LBS

28 %R.H.

1.125

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 121 3/4"

*HEIGHT 5 3/8 "

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PERP

*WEIGHT 1.39 LBS

*RINGS PER INCH 20

*SAP 20%

*SUMMERWOOD 50%

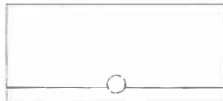
*SEASONING GREEN

*MOISTURE 5%

*KIND OF FAILURE cracked

DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.050
200	0.070
300	0.080
400	0.087
500	0.095
600	0.102
700	0.108
800	0.113
900	0.120
1000	0.126
1075	0.140



*SPECIES OF PEG

RED OAK

*DIA. 1 "

*LENGTH 6 "

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.11 LBS

*RINGS PER INCH 8

*SAP 6%

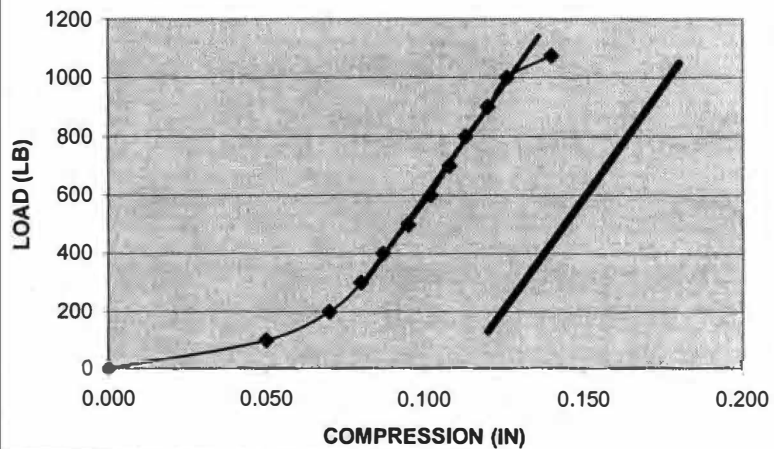
*SUMMERWOOD 90%

*SEASONING GREEN

*MOISTURE DRY

*KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 09SP

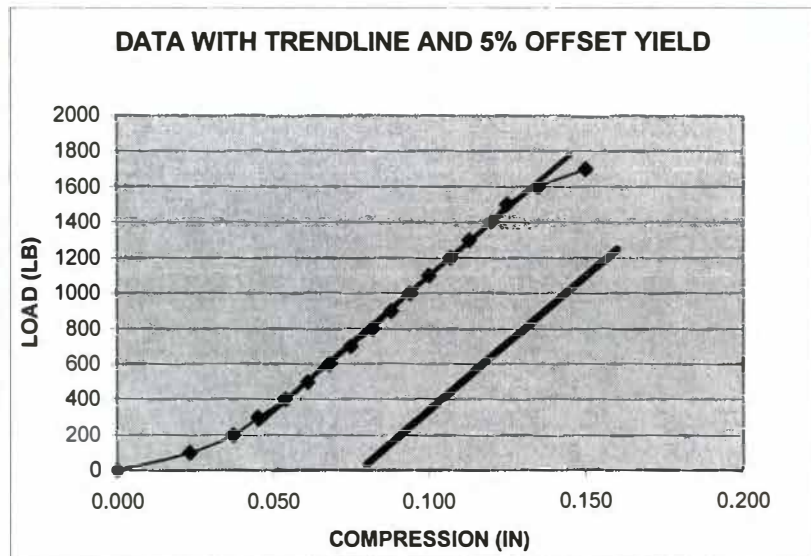
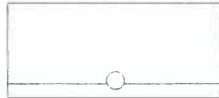
PEG NO. 1RO 1.25

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 76.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8"
 *HEIGHT 5.3/8"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.65 LBS
 *RINGS PER INCH 15
 *SAP 20%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 16%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 1700 LBS
 48% R.H.
1.25
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 11
 *SAP 15%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE dry
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.023
200	0.037
300	0.045
400	0.054
500	0.061
600	0.068
700	0.075
800	0.082
900	0.088
1000	0.094
1100	0.100
1200	0.107
1300	0.113
1400	0.120
1500	0.125
1600	0.135
1700	0.150



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 09SP

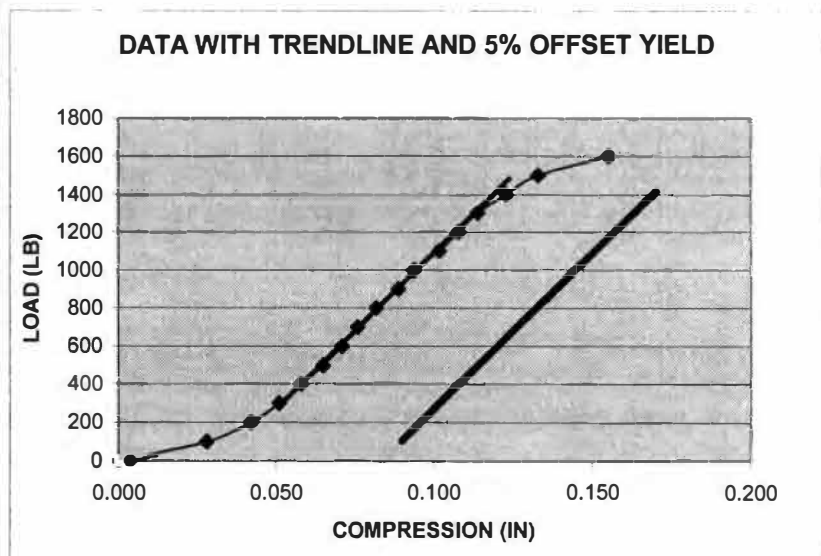
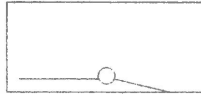
PEG NO. 1RO 1.375

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 76.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 12.5"
 *HEIGHT 5 3/8 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.82 LBS
 *RINGS PER INCH 15
 *SAP 20%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 17.5%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 1600 LBS
47 %R.H.
1.375
 *SPECIES OF PEG
RED OAK
 *DIA. 1 "
 *LENGTH 6 "
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 7
 *SAP 10%
 *SUMMERWOOD 100%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.028
200	0.042
300	0.051
400	0.058
500	0.065
600	0.071
700	0.076
800	0.082
900	0.089
1000	0.094
1100	0.102
1200	0.108
1300	0.114
1400	0.123
1500	0.133
1600	0.155



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 09SP

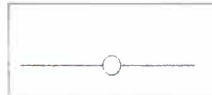
PEG NO. 1RO 1.5

KIND OF TEST EDGE DISTANCE TEST

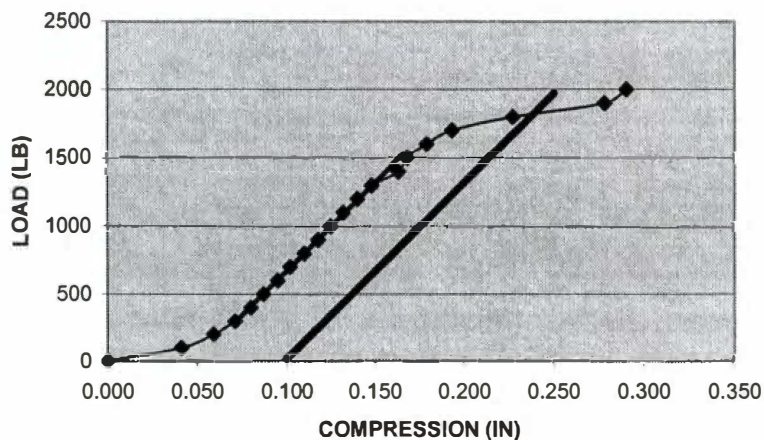
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 76.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE 1.5
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8"
 *HEIGHT 5 3/8 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.64LBS
 *RINGS PER INCH 15
 *SAP 20%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 1843 LBS
 *47 %R.H.
 *SPECIES OF PEG RED OAK
 *DIA. 1 "
 *LENGTH 6 "
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 11
 *SAP 10%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: slightly crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.041
200	0.059
300	0.071
400	0.080
500	0.087
600	0.095
700	0.102
800	0.110
900	0.118
1000	0.125
1100	0.132
1200	0.140
1300	0.148
1400	0.163
1500	0.168
1600	0.179
1700	0.193
1800	0.227
1900	0.278
2000	0.290



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 09SP

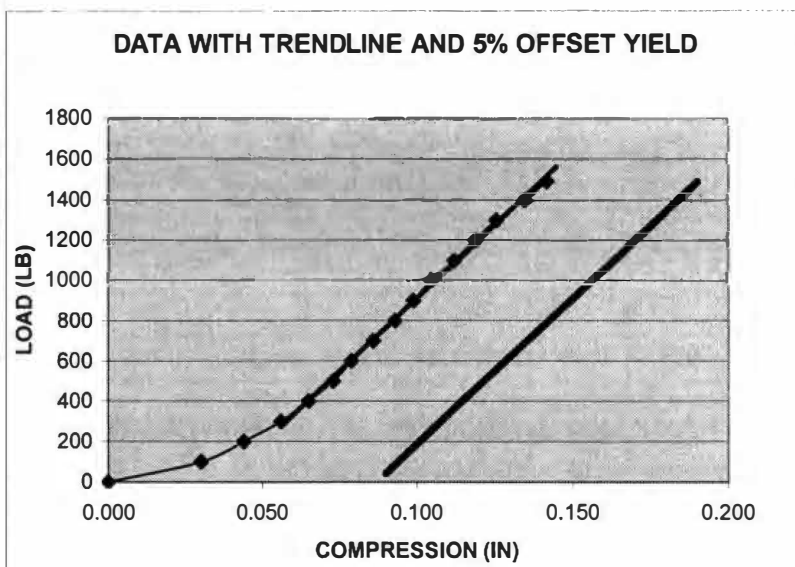
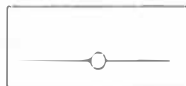
PEG NO. 1RO 1.625

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 76.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE 1.625
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8"
 *HEIGHT 5 3/8 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.60 LBS
 *RINGS PER INCH 15
 *SAP 20%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 11.5%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 1490 LBS
 *46 %R.H.
 *SPECIES OF PEG RED OAK
 *DIA. 1 "
 *LENGTH 6 "
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 12
 *SAP 10%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: slightly crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.030
200	0.044
300	0.056
400	0.065
500	0.073
600	0.079
700	0.086
800	0.093
900	0.099
1000	0.105
1100	0.112
1200	0.119
1300	0.126
1400	0.135
1490	0.142



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 09SP

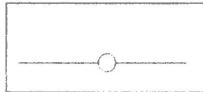
PEG NO. 1RO 1.75

KIND OF TEST EDGE DISTANCE TEST

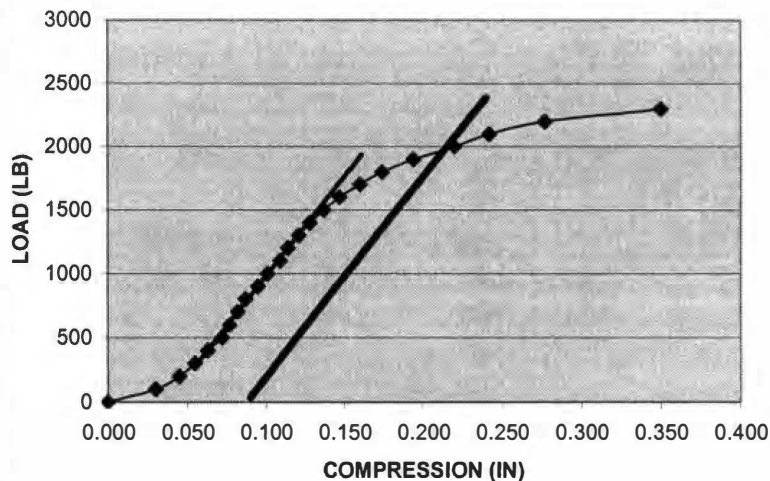
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 76 degrees TEMP
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8"
 *HEIGHT 5 3/8"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.64 LBS
 *RINGS PER INCH 15
 *SAP 20%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 13%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 2000 LBS
 *45 %R.H.
 *SPECIES OF PEG RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.1 LBS
 *RINGS PER INCH 7
 *SAP 5%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.030
200	0.045
300	0.055
400	0.063
500	0.072
600	0.077
700	0.082
800	0.087
900	0.095
1000	0.101
1100	0.109
1200	0.114
1300	0.121
1400	0.128
1500	0.137
1600	0.147
1700	0.160
1800	0.174
1900	0.194
2000	0.220
2100	0.242
2200	0.277
2300	0.350



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO. 18SP

PEG NO. 1RO 2.00

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 78.9 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 9 7/8 "

*HEIGHT 5 3/8 "

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PERP

*WEIGHT 1.38 LBS

*RINGS PER INCH 4

*SAP 80%

*SUMMERWOOD 20%

*SEASONING GREEN

*MOISTURE 15%

*KIND OF FAILURE cracked
elongated hole

*LOAD @ FAILURE 2700 LBS

11 %R.H.

2.00

*SPECIES OF PEG

RED OAK

*DIA. 1 "

*LENGTH 6 "

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.13 LBS

*RINGS PER INCH 8

*SAP 45%

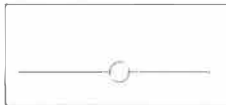
*SUMMERWOOD 55%

*SEASONING GREEN

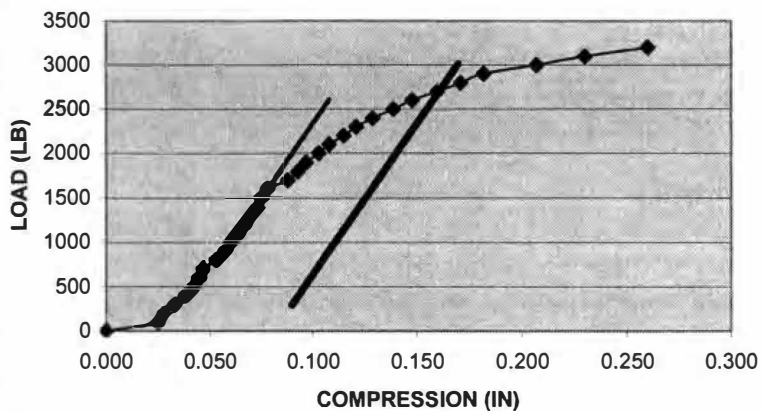
*MOISTURE 8%

*KIND OF FAILURE: crushed
bent

LOAD(lb)	COMP(in)
0	0.000
100	0.025
200	0.028
300	0.033
400	0.038
500	0.042
600	0.045
700	0.047
800	0.053
900	0.057
1000	0.060
1100	0.064
1200	0.067
1300	0.070
1400	0.073
1500	0.075
1600	0.078
1700	0.088
1800	0.093
1900	0.097
2000	0.103
2100	0.108
2200	0.115
2300	0.121
2400	0.129
2500	0.139
2600	0.148
2700	0.160
2800	0.171



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	COMP(in)
2900	0.182
3000	0.207
3100	0.230
3200	0.26

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO. 18SP

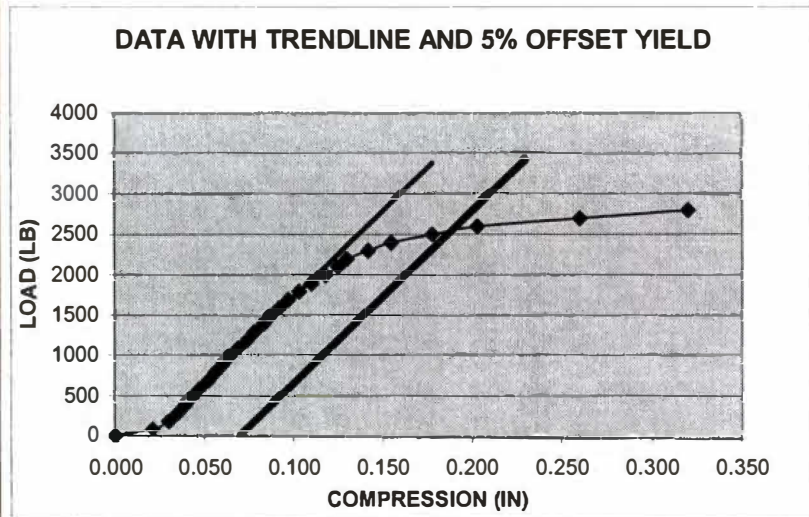
PEG NO. 1RO 2.25

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 79.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8 "
 *HEIGHT 5 1/4 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.32 LBS
 *RINGS PER INCH 4
 *SAP 80%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 15%
 *KIND OF FAILURE cracked
 DATA elongated hole

*LOAD @ FAILURE 2578 LBS
 11 %R.H.
2.25
 *SPECIES OF PEG RED OAK
 *DIA. 1 "
 *LENGTH 6 "
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 8
 *SAP 35%
 *SUMMERWOOD 60%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE: cracked
bent
crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.021
200	0.030
300	0.035
400	0.039
500	0.043
600	0.047
700	0.052
800	0.056
900	0.060
1000	0.064
1100	0.069
1200	0.074
1300	0.078
1400	0.083
1500	0.087
1600	0.092
1700	0.097
1800	0.103
1900	0.110
2000	0.118
2100	0.125
2200	0.130
2300	0.142
2400	0.155
2500	0.178
2600	0.203
2700	0.260
2800	0.320



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO. 18SP

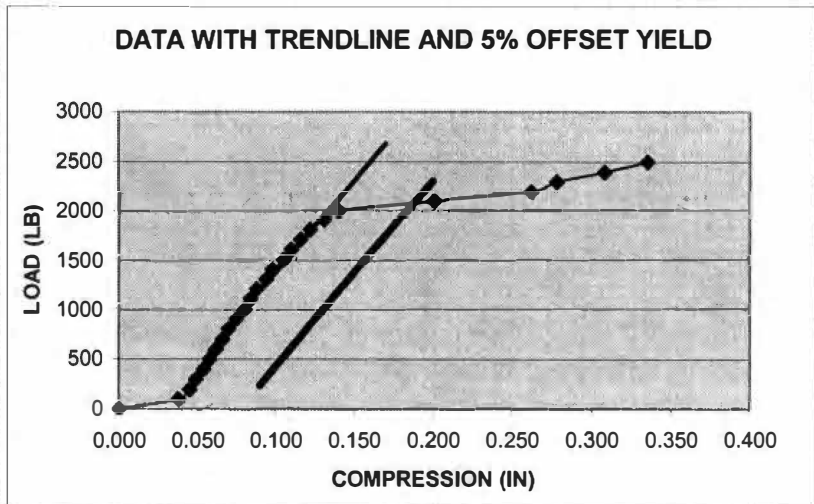
PEG NO. 1RO 2.5

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE 2.5
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8 "
 *HEIGHT 5 3/8 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.26 LBS
 *RINGS PER INCH 4
 *SAP 80%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 15%
 *KIND OF FAILURE did not fail

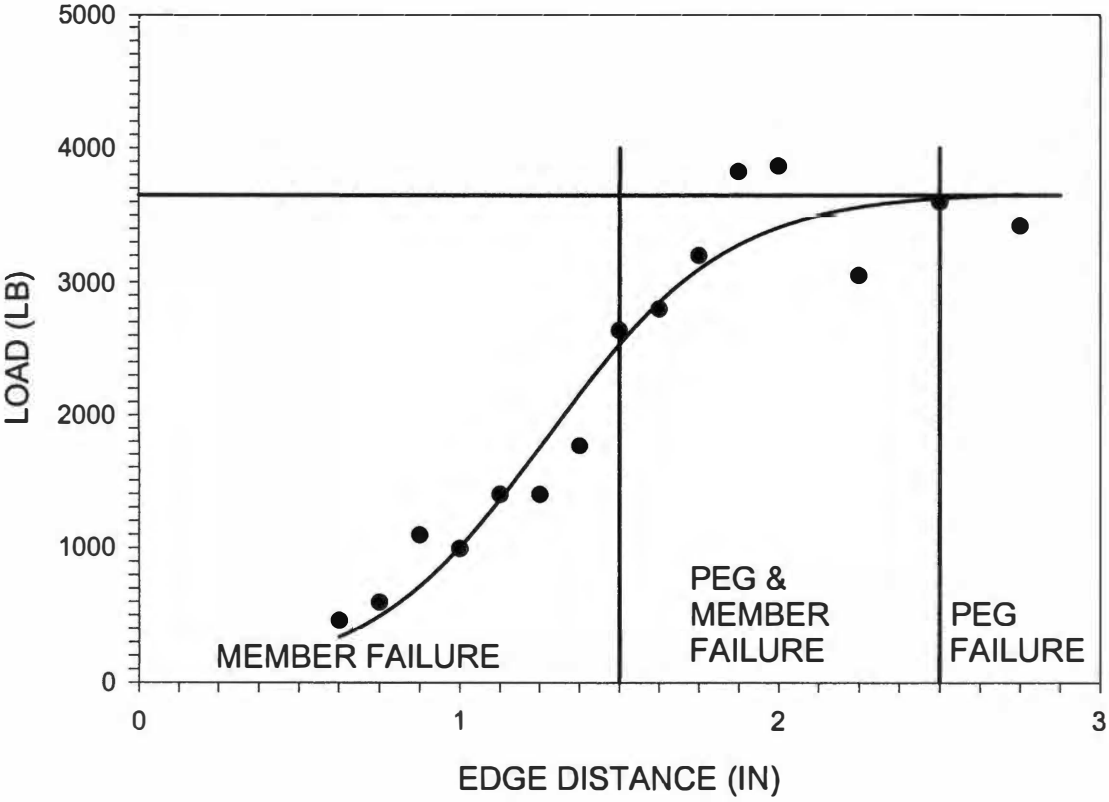
*LOAD @ FAILURE 2090 LBS
 *11 %R.H.
 *SPECIES OF PEG RED OAK
 *DIA. 1 "
 *LENGTH 6 "
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.15 LBS
 *RINGS PER INCH 13
 *SAP 45%
 *SUMMERWOOD 65%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE: crushed bent

LOAD(lb)	COMP(in)
0	0.000
100	0.038
200	0.045
300	0.049
400	0.054
500	0.058
600	0.062
700	0.066
800	0.070
900	0.075
1000	0.080
1100	0.084
1200	0.088
1300	0.094
1400	0.098
1500	0.105
1600	0.110
1700	0.116
1800	0.122
1900	0.131
2000	0.140
2100	0.201
2200	0.262
2300	0.278
2400	0.308
2500	0.335



APPENDIX C – EDGE TEST-DOUGLAS FIR-1” WHITE OAK PEGS

EDGE TEST-DOUGLAS FIR-1" WHITE OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING

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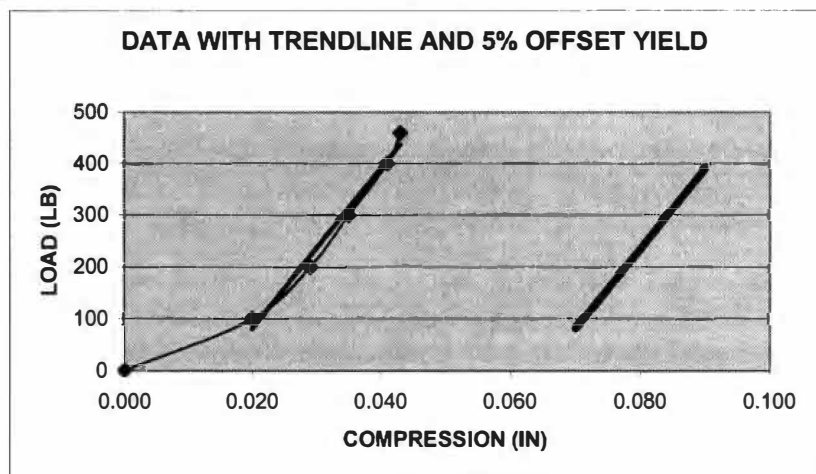
DATE: 15-May-03 PIECE NO 06DF PEG NO. 1 WO-0.625

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 75.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11-7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.33 LBS
 *RINGS PER INCH 15
 *SAP 10%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 460 LBS
45%R.H.
0.625 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.11 LBS
 *RINGS PER INCH 12
 *SAP 5%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.020
200	0.029
300	0.035
400	0.041
460	0.043



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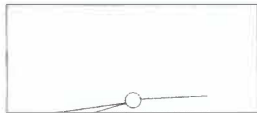
DATE: 15-May-03 PIECE NO 06DF PEG NO. 1 WO -0.75

KIND OF TEST EDGE DISTANCE TEST

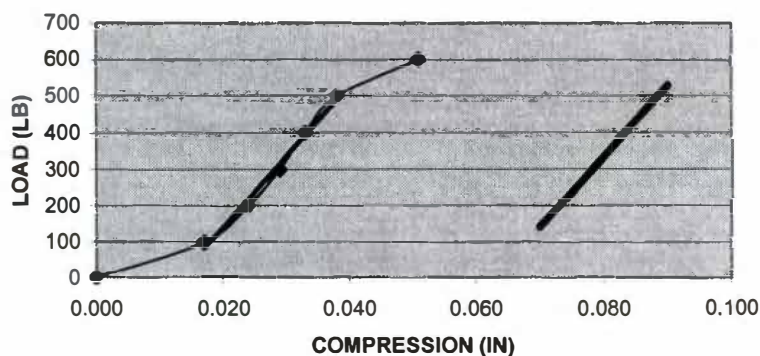
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 75.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.34 LBS
 *RINGS PER INCH 15
 *SAP 10%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 600 LBS
45%R.H.
0.75 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 12
 *SAP 5%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.017
200	0.024
300	0.029
400	0.033
500	0.038
600	0.051



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

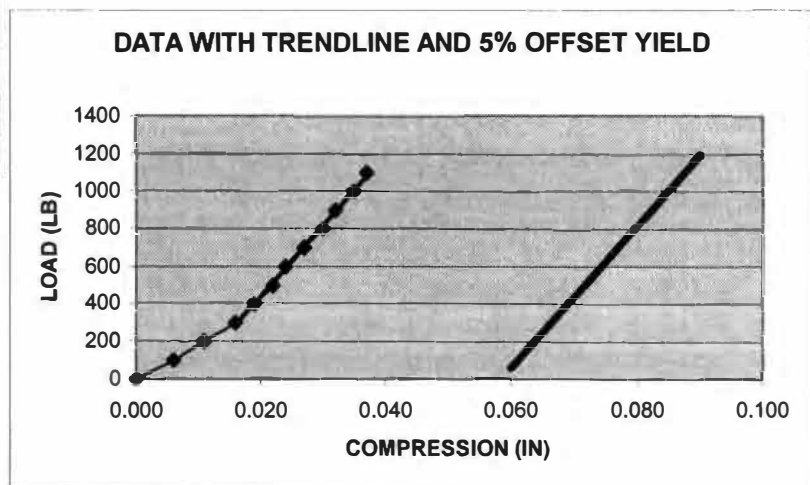
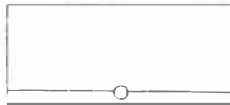
DATE: 15-May-03 PIECE NO 06DF PEG NO. 1 WO 0.875

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 76.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.14 LBS
 *RINGS PER INCH 15
 *SAP 10%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 1100 LBS
45% R.H.
0.875 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 10
 *SAP 2%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.006
200	0.011
300	0.016
400	0.019
500	0.022
600	0.024
700	0.027
800	0.030
900	0.032
1000	0.035
1100	0.037



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 15-May-03

PIECE NO 06DF

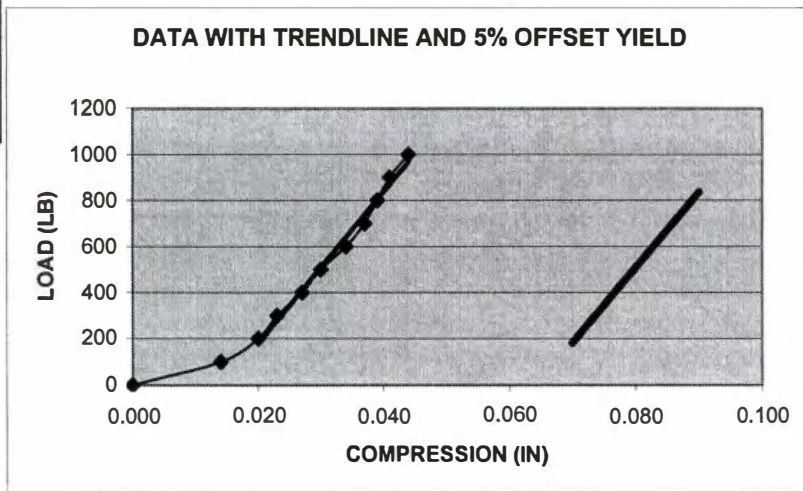
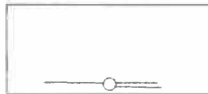
PEG NO. 1 WO 1

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 76.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.25 LBS
 *RINGS PER INCH 15
 *SAP 10%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 1000 LBS
45% R.H.
1 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 14
 *SAP 5%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.014
200	0.020
300	0.023
400	0.027
500	0.030
600	0.034
700	0.037
800	0.039
900	0.041
1000	0.044



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

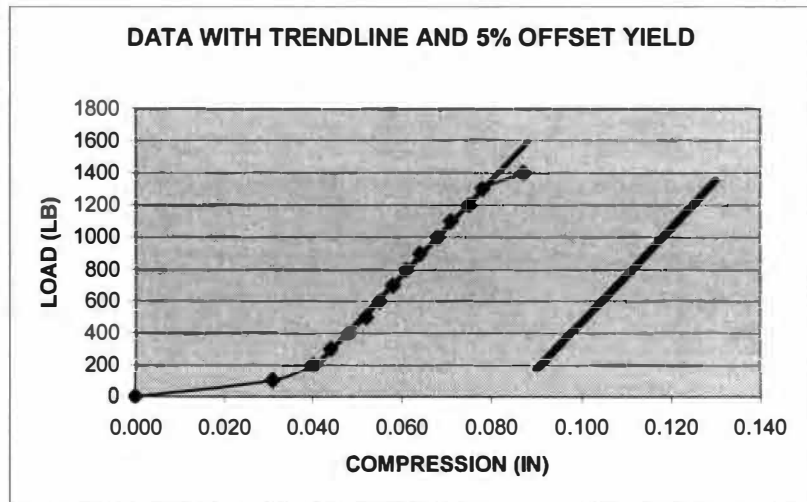
DATE: 18-Sep-03 PIECE NO _13DF PEG NO. 1 WO 1.125

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 75.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.02 lbs
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 1400 LBS
 *75.1% R.H.
1.125 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 15/16"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 13
 *SAP 75%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 5%
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.031
200	0.040
300	0.044
400	0.048
500	0.052
600	0.055
700	0.058
800	0.061
900	0.064
1000	0.068
1100	0.071
1200	0.075
1300	0.078
1400	0.087



DEPARTMENT OF CIVIL ENGINEERING

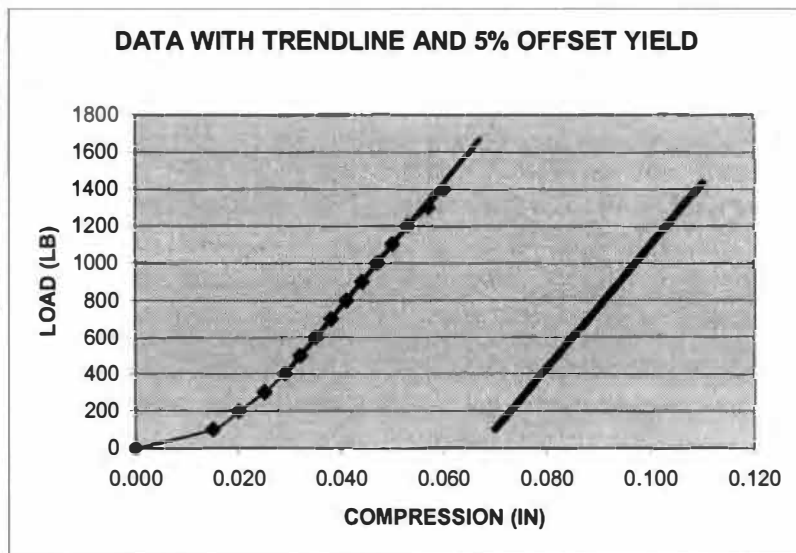
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 18-Sep-03 PIECE NO 13DF PEG NO. 1 WO 1.25

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: <u>Universal Testing Machine</u> *SPEED ON MACH. <u>0.04 IN PER MIN. 1</u> *TESTED AT <u>75.5 degrees</u> TEMP <u>74.9% R.H.</u> *DISTANCE OF CENTERLINE OF HOLE TO EDGE <u>1.25 in</u> *SPECIES OF MAIN MEMBERS <u>DOUGLAS FIR</u> *LENGTH <u>11 7/8"</u> *HEIGHT <u>5.5"</u> *WIDTH <u>1.5"</u> *ANGLE OF GRAIN TO LOADING: <u>PERP</u> *WEIGHT <u>2.0 lbs</u> *RINGS PER INCH <u>15</u> *SAP <u>30%</u> *SUMMERWOOD <u>40%</u> *SEASONING <u>GREEN</u> *MOISTURE <u>11%</u> *KIND OF FAILURE <u>elongated hole</u>	*LOAD @ FAILURE <u>1400 LBS</u> *SPECIES OF PEG <u>WHITE OAK</u> *DIA. <u>1"</u> *LENGTH <u>5 15/16"</u> *ANGLE OF GRAIN TO LOAD <u>PERP</u> *WEIGHT <u>0.14 LBS</u> *RINGS PER INCH <u>14</u> *SAP <u>6%</u> *SUMMERWOOD <u>10%</u> *SEASONING <u>GREEN</u> *MOISTURE <u>5%</u> *KIND OF FAILURE: <u>crushed</u>
---	---

LOAD(lb)	COMP(in)
0	0.000
100	0.015
200	0.020
300	0.025
400	0.029
500	0.032
600	0.035
700	0.038
800	0.041
900	0.044
1000	0.047
1100	0.050
1200	0.053
1300	0.057
1400	0.060



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 18-Sep-03

PIECE NO 13DF

PEG NO. 1 WO 1.375

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 75.3 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 11 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PERP

*WEIGHT 2.02 lbs

*RINGS PER INCH 15

*SAP 30%

*SUMMERWOOD 40%

*SEASONING GREEN

*MOISTURE 11%

*KIND OF FAILURE elongated hole

DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.026
200	0.033
300	0.036
400	0.039
500	0.042
600	0.044
700	0.046
800	0.048
900	0.050
1000	0.052
1100	0.055
1200	0.057
1300	0.060
1400	0.062
1500	0.064
1600	0.067
1700	0.070
1770	0.078



*LOAD @ FAILURE 1770 LBS

74.8% R.H.

1.375 in

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.14 LBS

*RINGS PER INCH 10

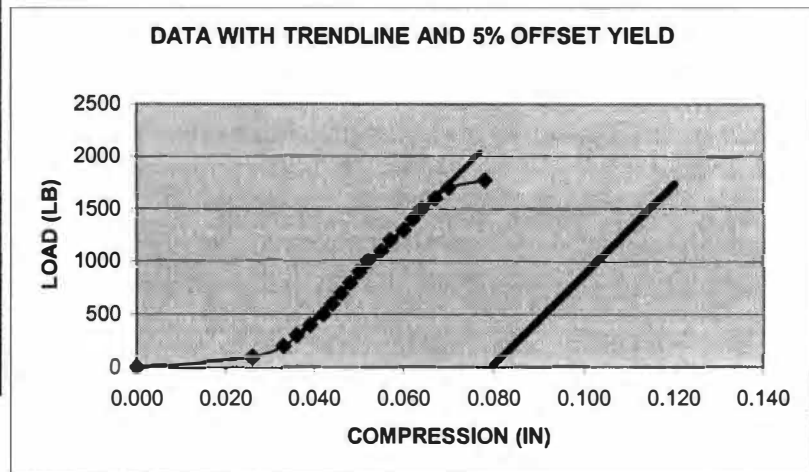
*SAP 10%

*SUMMERWOOD 10%

*SEASONING GREEN

*MOISTURE 5%

*KIND OF FAILURE: did not fail



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UNIVERSITY OF TENNESSEE KNOXVILLE

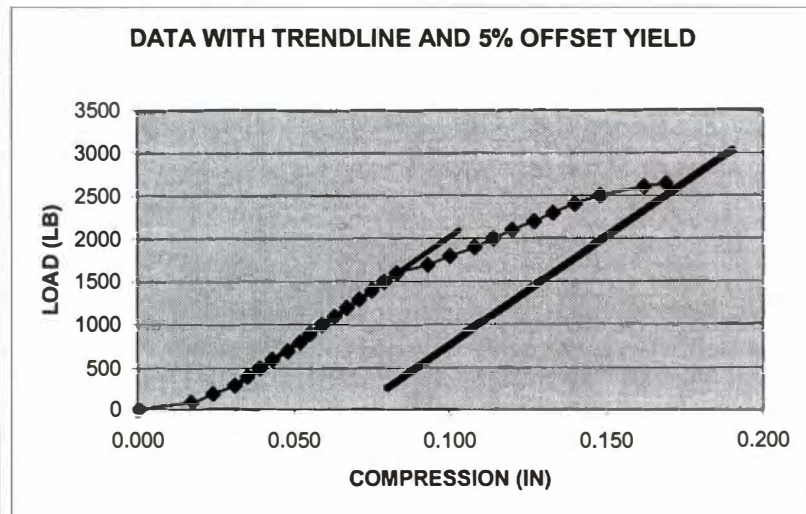
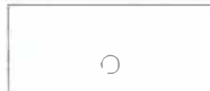
DATE: 18-Sep-03 PIECE NO 13DF PEG NO. 1 WO 1.5

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 75.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.99 lbs
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 2640
74.8% R.H.
1.5 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 15/16"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 12
 *SAP 40%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 5%
 *KIND OF FAILURE: crushed
cracked

LOAD(lb)	COMP(in)
0	0.000
100	0.017
200	0.024
300	0.031
400	0.035
500	0.039
600	0.043
700	0.048
800	0.052
900	0.055
1000	0.059
1100	0.063
1200	0.067
1300	0.071
1400	0.075
1500	0.079
1600	0.083
1700	0.093
1800	0.100
1900	0.108
2000	0.114
2100	0.120
2200	0.127
2300	0.133
2400	0.140
2500	0.148
2600	0.162
2640	0.169



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 18-Sep-03

PIECE NO 13DF

PEG NO. 1 WO 1.625

KIND OF TEST EDGE DISTANCE TEST

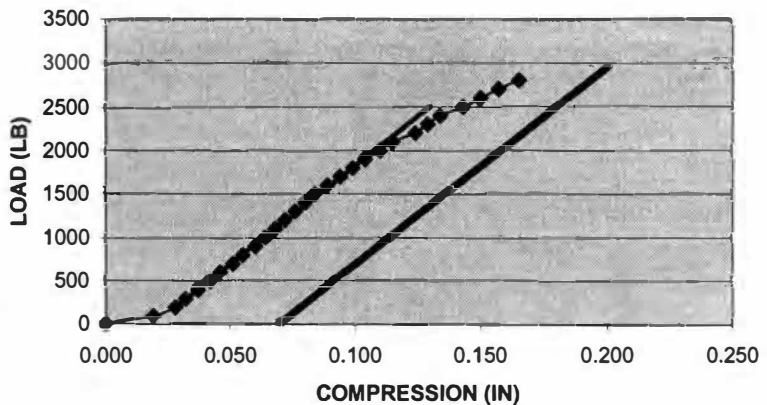
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 75.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.98 lbs
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 2800
74.8% R.H.
1.625 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 16
 *SAP 35%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 5%
 *KIND OF FAILURE: crushed
cracked

LOAD(lb)	COMP(in)
0	0.000
100	0.019
200	0.028
300	0.032
400	0.037
500	0.042
600	0.046
700	0.051
800	0.055
900	0.060
1000	0.064
1100	0.068
1200	0.072
1300	0.076
1400	0.080
1500	0.084
1600	0.089
1700	0.094
1800	0.099
1900	0.104
2000	0.110
2100	0.115
2200	0.124
2300	0.129
2400	0.134
2500	0.143
2600	0.150
2700	0.157
2800	0.165



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 18-Sep-03 PIECE NO 13DF PEG NO. 1 WO 1.75

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 74.8 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 12 1/4"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PERP

*WEIGHT 2.02 lbs

*RINGS PER INCH 15

*SAP 30%

*SUMMERWOOD 40%

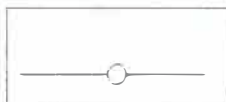
*SEASONING GREEN

*MOISTURE 11%

*KIND OF FAILURE cracked

DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.016
200	0.025
300	0.031
400	0.035
500	0.040
600	0.043
700	0.047
800	0.051
900	0.053
1000	0.057
1100	0.060
1200	0.064
1300	0.068
1400	0.072
1500	0.076
1600	0.080
1700	0.083
1800	0.088
1900	0.093
2000	0.099
2100	0.106
2200	0.111
2300	0.115
2400	0.121
2500	0.128
2600	0.133
2700	0.141
2800	0.149



**LOAD @ FAILURE 3220

74.9% R.H.

1.75 in

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.14 LBS

*RINGS PER INCH 11

*SAP 5%

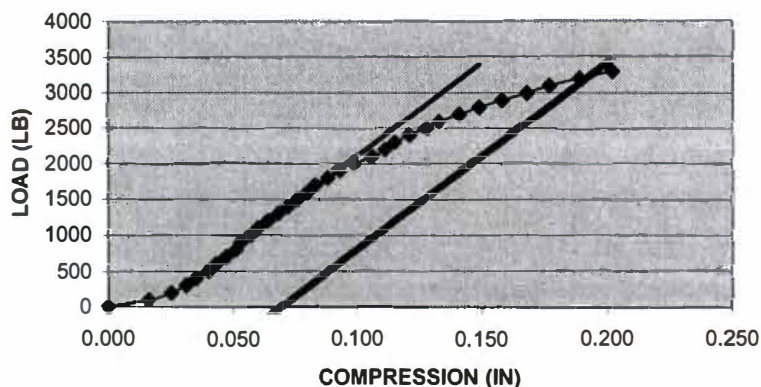
*SUMMERWOOD 15%

*SEASONING GREEN

*MOISTURE 5%

*KIND OF FAILURE: crushed

DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	COMP(in)	LOAD(lb)	COMP(in)
2900	0.158	3300	0.202
3000	0.168		
3100	0.177		
3200	0.189		

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 18-Sep-03

PIECE NO 14DF

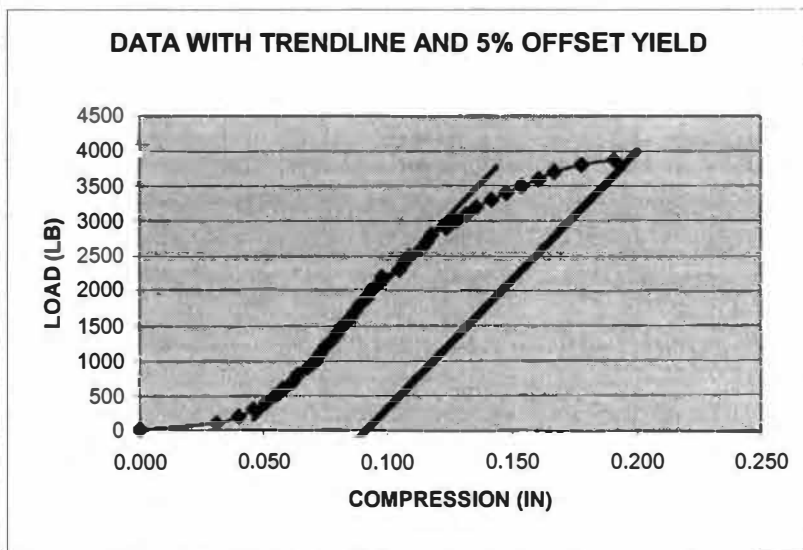
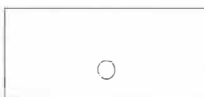
PEG NO. 1 WO 2.00

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.38 lbs
 *RINGS PER INCH 9
 *SAP 25%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE elongated hole
 DATA

**LOAD @ FAILURE 3870
74.6% R.H.
2.00 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 12
 *SAP 10%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 4%
 *KIND OF FAILURE: crushed
bent

LOAD(lb)	COMP(in)
0	0.000
100	0.031
200	0.040
300	0.046
400	0.051
500	0.055
600	0.058
700	0.062
800	0.064
900	0.068
1000	0.071
1100	0.073
1200	0.075
1300	0.078
1400	0.080
1500	0.082
1600	0.085
1700	0.087
1800	0.089
1900	0.092
2000	0.094
2100	0.097
2200	0.098
2300	0.105
2400	0.107
2500	0.109
2600	0.114
2700	0.116
2800	0.118



LOAD(lb)	COMP(in)	LOAD(lb)	COMP(in)	LOAD(lb)	COMP(in)
2900	0.124	3300	0.142	3700	0.167
3000	0.128	3400	0.148	3800	0.178
3100	0.132	3500	0.154	3870	0.191
3200	0.136	3600	0.161		

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO 20DF

PEG NO. 1 WO 2.25

KIND OF TEST EDGE DISTANCE TEST

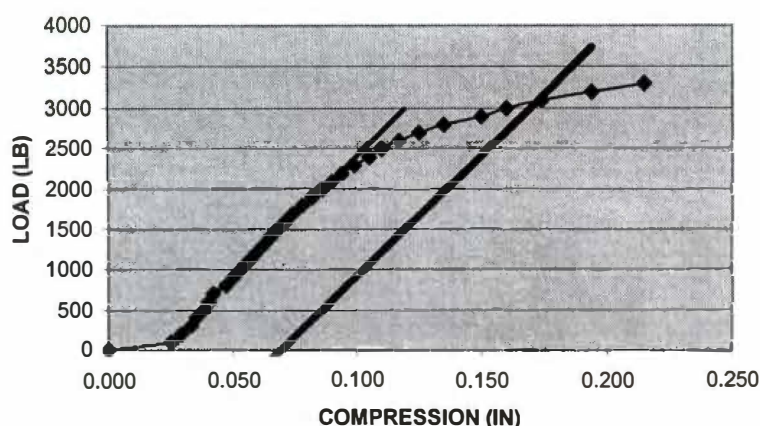
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.76 lbs
 *RINGS PER INCH 9
 *SAP 40%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE elongated hole
 DATA

**LOAD @ FAILURE 3137
 11% R.H.
 2.25 in
 *SPECIES OF PEG
 WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
 PERP
 *WEIGHT 0.15 LBS
 *RINGS PER INCH 18
 *SAP 30%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 9%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.025
200	0.029
300	0.033
400	0.035
500	0.038
600	0.040
700	0.042
800	0.047
900	0.050
1000	0.053
1100	0.056
1200	0.059
1300	0.062
1400	0.065
1500	0.068
1600	0.071
1700	0.074
1800	0.078
1900	0.082
2000	0.086
2100	0.090
2200	0.094
2300	0.099
2400	0.105
2500	0.110
2600	0.117
2700	0.125
2800	0.135



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	COMP(in)	LOAD(lb)	COMP(in)
2900	0.150	3300	0.215
3000	0.160		
3100	0.174		
3200	0.194		

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO 20DF

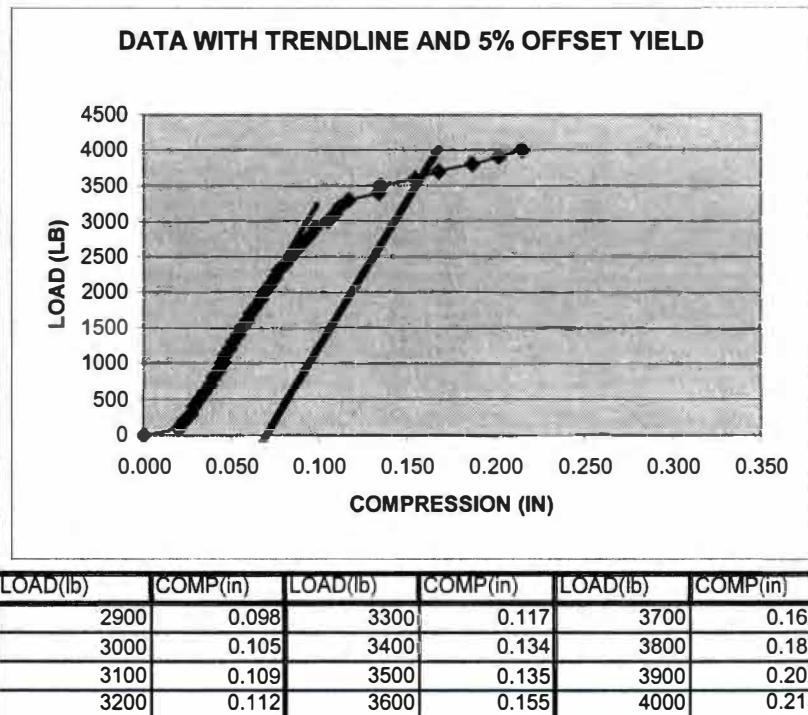
PEG NO. 1 WO 2.5

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.78 lbs
 *RINGS PER INCH 9
 *SAP 40%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE elongated hole
 DATA slightly

**LOAD @ FAILURE 3600
11% R.H.
2.5 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.16 LBS
 *RINGS PER INCH 11
 *SAP 5%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.020
200	0.023
300	0.027
400	0.029
500	0.032
600	0.035
700	0.038
800	0.040
900	0.043
1000	0.045
1100	0.046
1200	0.049
1300	0.051
1400	0.054
1500	0.056
1600	0.059
1700	0.061
1800	0.064
1900	0.067
2000	0.069
2100	0.072
2200	0.075
2300	0.077
2400	0.081
2500	0.084
2600	0.087
2700	0.091
2800	0.095



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

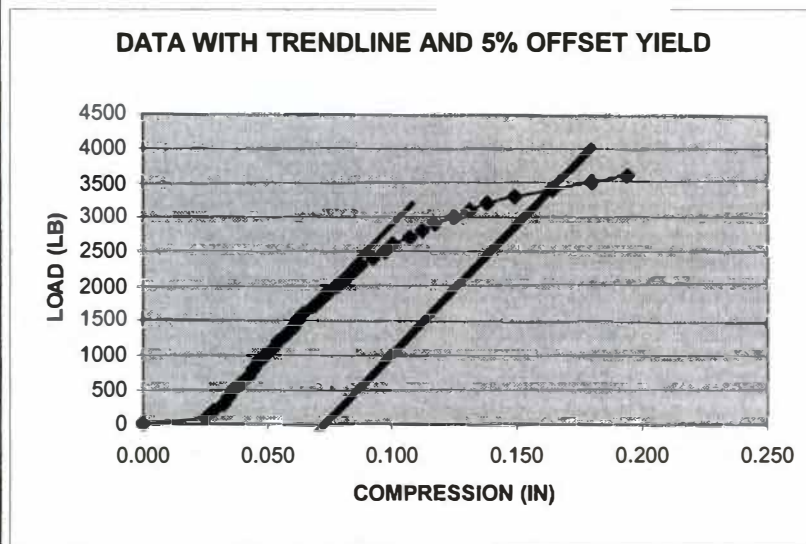
DATE: 24-Feb-04 PIECE NO 20DF PEG NO. 1 WO 2.75

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.85 lbs
 *RINGS PER INCH 9
 *SAP 40%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE elogated hole slightly
 DATA

**LOAD @ FAILURE 3421
11% R.H.
2.75 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.15 LBS
 *RINGS PER INCH 14
 *SAP 15%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE 9%
 *KIND OF FAILURE: crushed
bent
shear

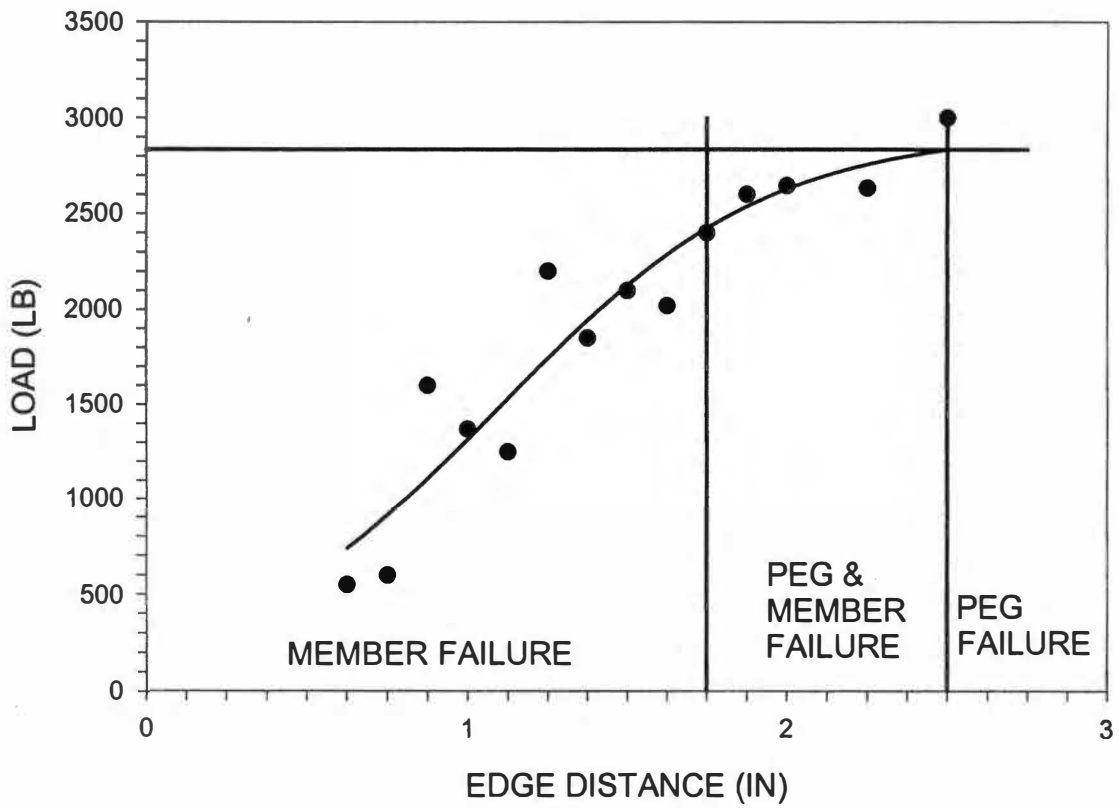
LOAD(lb)	COMP(in)
0	0.000
100	0.025
200	0.028
300	0.032
400	0.034
500	0.036
600	0.039
700	0.042
800	0.044
900	0.046
1000	0.049
1100	0.052
1200	0.054
1300	0.057
1400	0.060
1500	0.062
1600	0.064
1700	0.068
1800	0.071
1900	0.074
2000	0.078
2100	0.081
2200	0.084
2300	0.087
2400	0.092
2500	0.097
2600	0.100
2700	0.107
2800	0.112



LOAD(lb)	COMP(in)	LOAD(lb)	COMP(in)
2900	0.117	3300	0.149
3000	0.125	3400	0.164
3100	0.131	3500	0.180
3200	0.138	3600	0.194

APPENDIX D – EDGE TEST-SOUTHERN PINE-1” WHITE OAK PEGS

EDGE TEST-SOUTHERN PINE-1" WHITE OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 02SP

PEG NO. 1WO 0.625

KIND OF TEST EDGE DISTANCE TEST

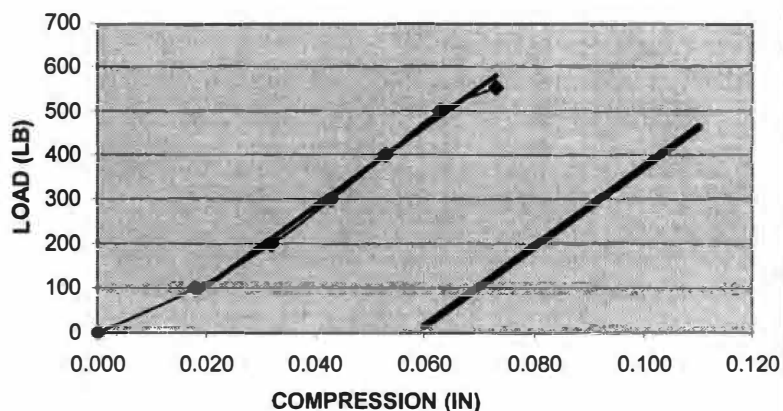
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.59 LBS
 *RINGS PER INCH 16
 *SAP 30%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 6%
 *KIND OF FAILURE cracked
 DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.018
200	0.032
300	0.043
400	0.053
500	0.063
552	0.073



*LOAD @ FAILURE 552 LBS
 28 %R.H.
0.625
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 3/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .12 LBS
 *RINGS PER INCH 12
 *SAP 0%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 02SP

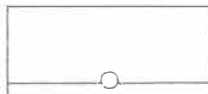
PEG NO. 1WO 0.75

KIND OF TEST EDGE DISTANCE TEST

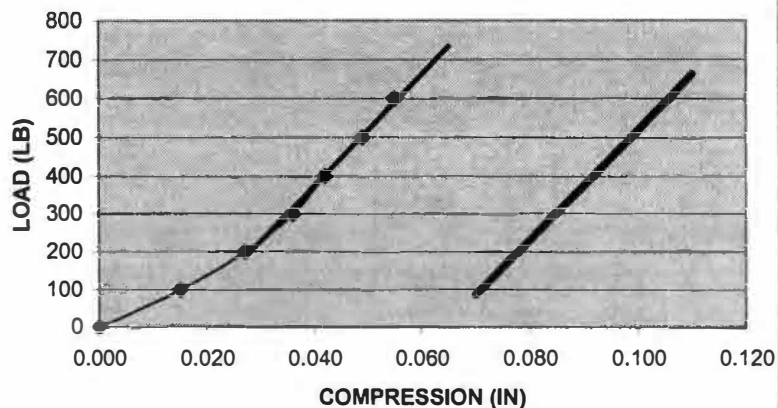
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 12 1/8"
 *HEIGHT 5 3/8"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.66 LBS
 *RINGS PER INCH 16
 *SAP 30%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 6.5%
 *KIND OF FAILURE CRACKED

*LOAD @ FAILURE 600 LBS
 28 %R.H.
0.75
 *SPECIES OF PEG WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT .11 LBS
 *RINGS PER INCH 12
 *SAP 0%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.015
200	0.027
300	0.036
400	0.042
500	0.049
600	0.055



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 02SP

PEG NO. 1WO 0.875

KIND OF TEST EDGE DISTANCE TEST

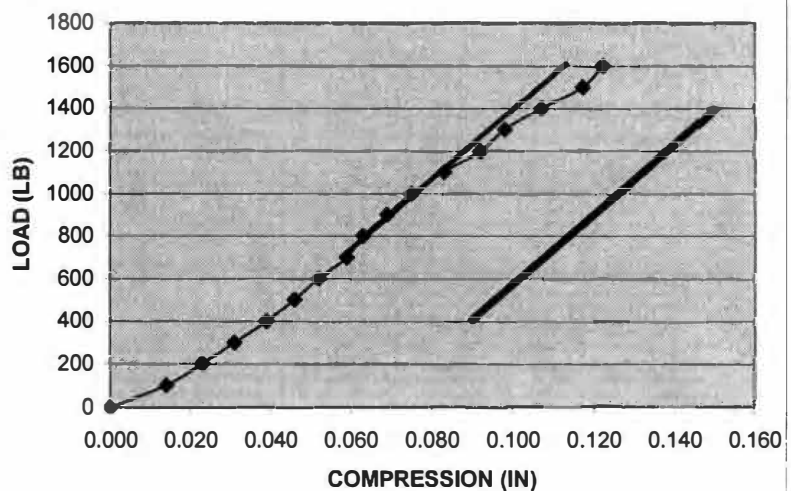
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.7 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 3/4"
 *HEIGHT 5 3/8"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.59 LBS
 *RINGS PER INCH 16
 *SAP 30%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 6.5%
 *KIND OF FAILURE CRACKED
 DATA

*LOAD @ FAILURE 1600 LBS
 *28 %R.H.
0.875
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8 "
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .12 LBS
 *RINGS PER INCH 14
 *SAP 0%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.014
200	0.023
300	0.031
400	0.039
500	0.046
600	0.052
700	0.059
800	0.063
900	0.069
1000	0.075
1100	0.083
1200	0.092
1300	0.098
1400	0.107
1500	0.117
1600	0.122



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 02SP

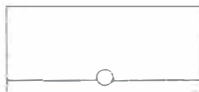
PEG NO. 1WO1

KIND OF TEST EDGE DISTANCE TEST

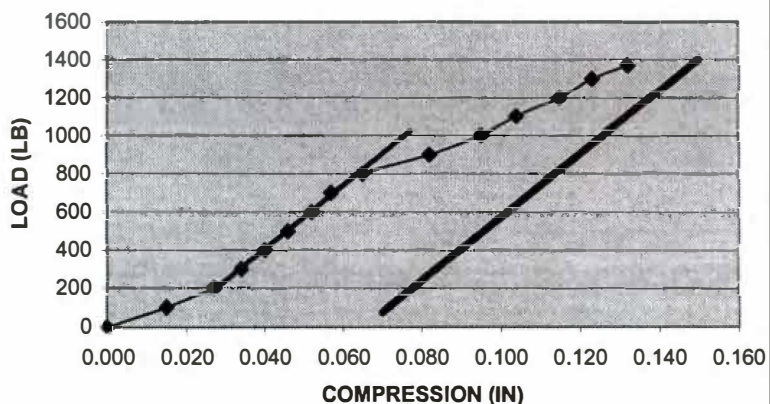
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.7 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 12"
 *HEIGHT 5 3/8"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.55 LBS
 *RINGS PER INCH 16
 *SAP 30%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 8.5%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 1370 LBS
 *28 %R.H.
1.00
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1 "
 *LENGTH 5 7/8 "
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .12 LBS
 *RINGS PER INCH 12
 *SAP 0%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.015
200	0.027
300	0.034
400	0.040
500	0.046
600	0.052
700	0.057
800	0.065
900	0.082
1000	0.095
1100	0.104
1200	0.115
1300	0.123
1370	0.132



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 02SP

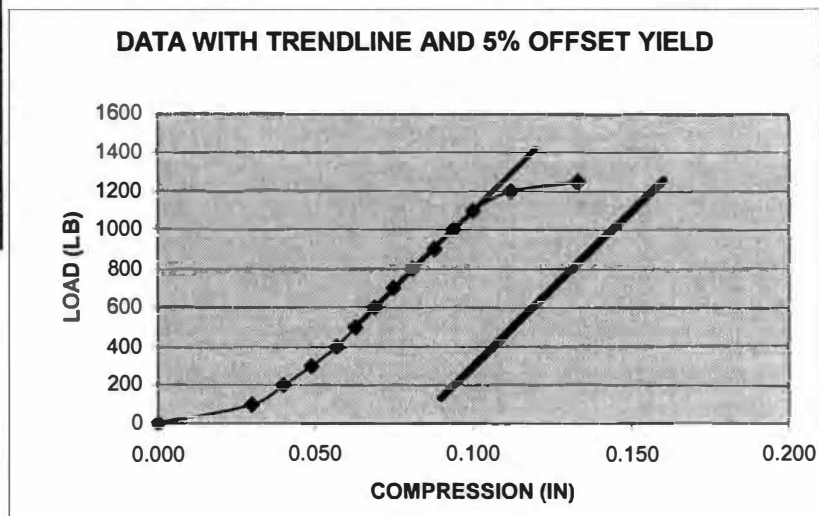
PEG NO. 1WO 1.125

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8"
 *HEIGHT 5 3/8"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.557 LBS
 *RINGS PER INCH 16
 *SAP 30%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 7.5%
 *KIND OF FAILURE cracked
 DATA

*LOAD @ FAILURE 1250 LBS
28 %R.H.
1.125
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 3/4"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .11 LBS
 *RINGS PER INCH 14
 *SAP 0%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.030
200	0.040
300	0.049
400	0.057
500	0.063
600	0.069
700	0.075
800	0.081
900	0.088
1000	0.094
1100	0.100
1200	0.112
1250	0.133



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 10SP

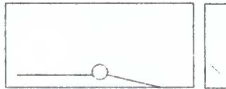
PEG NO. 1WO 1.25

KIND OF TEST EDGE DISTANCE TEST

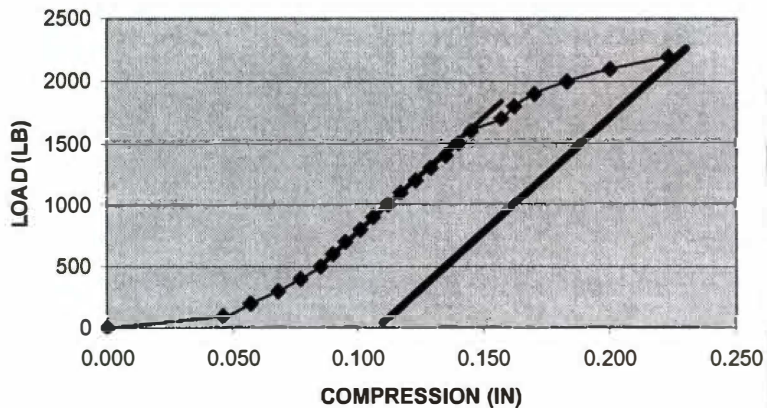
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 77.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 5/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.73 LBS
 *RINGS PER INCH 8
 *SAP 15%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 17.0%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 2200 LBS
 *52 %R.H.
 *1.25
 *SPECIES OF PEG WHITE OAK
 *DIA. 1 "
 *LENGTH 5 7/8 "
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT .10 LBS
 *RINGS PER INCH 4
 *SAP 10%
 *SUMMERWOOD 75%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.046
200	0.057
300	0.068
400	0.077
500	0.085
600	0.090
700	0.095
800	0.101
900	0.106
1000	0.112
1100	0.117
1200	0.123
1300	0.129
1400	0.135
1500	0.140
1600	0.145
1700	0.157
1800	0.162
1900	0.170
2000	0.183
2100	0.200
2200	0.223



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 10SP

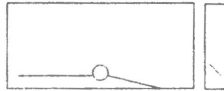
PEG NO. 1WO 1.375

KIND OF TEST EDGE DISTANCE TEST

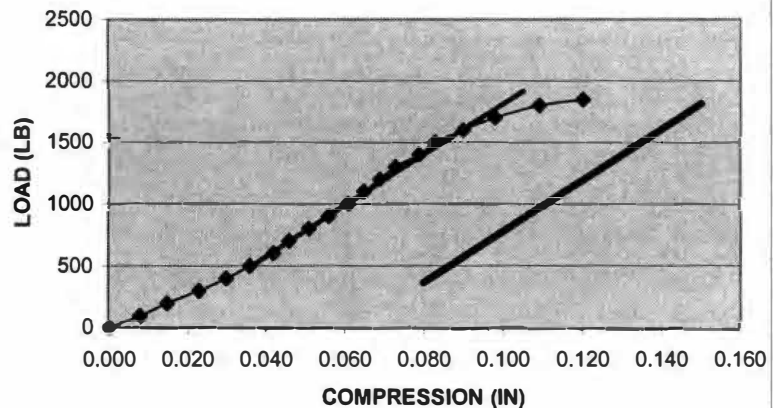
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 77.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 5/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.73 LBS
 *RINGS PER INCH 8
 *SAP 15%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 14.5%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 1850 LBS
 *52 %R.H.
1.375
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1 "
 *LENGTH 5 7/8 "
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .13 LBS
 *RINGS PER INCH 14
 *SAP 2%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.008
200	0.015
300	0.023
400	0.030
500	0.036
600	0.042
700	0.046
800	0.051
900	0.056
1000	0.061
1100	0.065
1200	0.069
1300	0.073
1400	0.079
1500	0.083
1600	0.090
1700	0.098
1800	0.109
1850	0.120



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 10SP

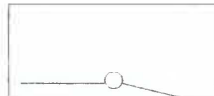
PEG NO. 1WO 1.5

KIND OF TEST EDGE DISTANCE TEST

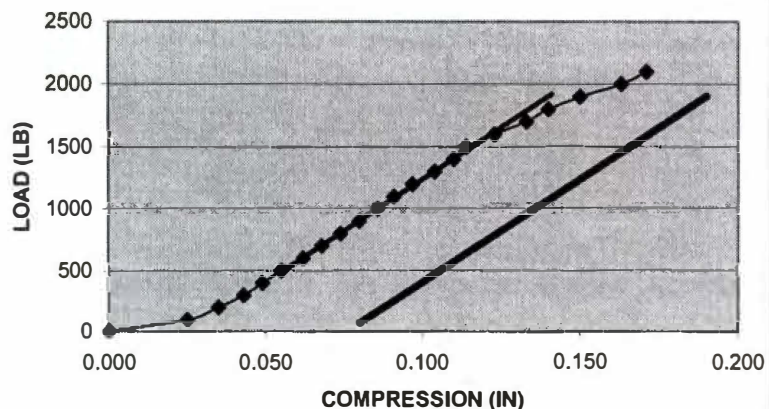
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 77.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.81 LBS
 *RINGS PER INCH 8
 *SAP 15%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 13.0%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 2100 LBS
 *52 %R.H.
 *1.5
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .13 LBS
 *RINGS PER INCH 14
 *SAP 1%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.025
200	0.035
300	0.043
400	0.049
500	0.055
600	0.062
700	0.068
800	0.074
900	0.080
1000	0.086
1100	0.091
1200	0.097
1300	0.104
1400	0.110
1500	0.114
1600	0.123
1700	0.133
1800	0.140
1900	0.150
2000	0.163
2100	0.171



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 10SP

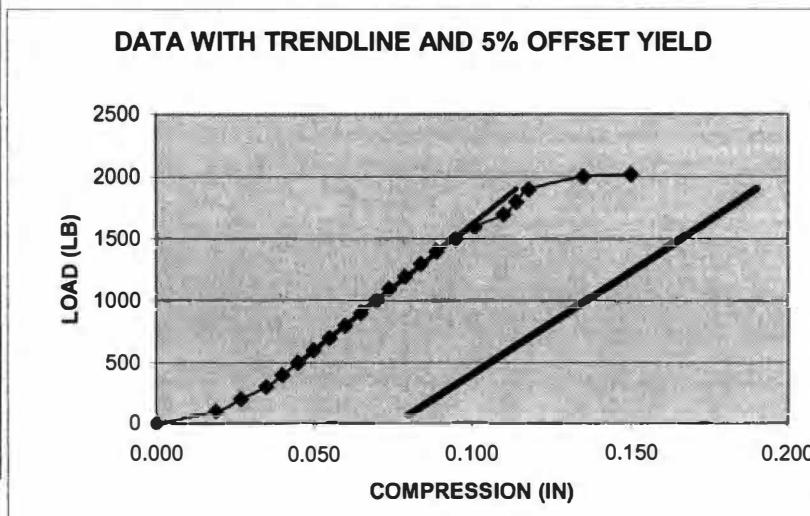
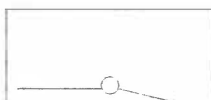
PEG NO. 1WO 1.625

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 77.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.77 LBS
 *RINGS PER INCH 8
 *SAP 15%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 15.0%
 *KIND OF FAILURE cracked
 DATA

*LOAD @ FAILURE 2020 LBS
51%
1.625
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .11 lbs
 *RINGS PER INCH 14
 *SAP 20%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.019
200	0.027
300	0.035
400	0.040
500	0.045
600	0.050
700	0.055
800	0.060
900	0.065
1000	0.070
1100	0.074
1200	0.079
1300	0.084
1400	0.089
1500	0.095
1600	0.101
1700	0.110
1800	0.114
1900	0.118
2000	0.135
2020	0.150



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 10SP

PEG NO. 1WO 1.75

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 77.1 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 13"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PERP

*WEIGHT 1.92 LBS

*RINGS PER INCH 8

*SAP 15%

*SUMMERWOOD 20%

*SEASONING GREEN

*MOISTURE 12.0%

*KIND OF FAILURE cracked

DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.021
200	0.030
300	0.038
400	0.045
500	0.051
600	0.056
700	0.061
800	0.065
900	0.070
1000	0.075
1100	0.080
1200	0.085
1300	0.089
1400	0.094
1500	0.100
1600	0.105
1700	0.110
1800	0.116
1900	0.123
2000	0.131
2100	0.140
2200	0.152
2300	0.172
2400	0.190
2450	0.203



*LOAD @ FAILURE 2400 LBS

51%

1.75

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT .13 lbs

*RINGS PER INCH 12

*SAP 20%

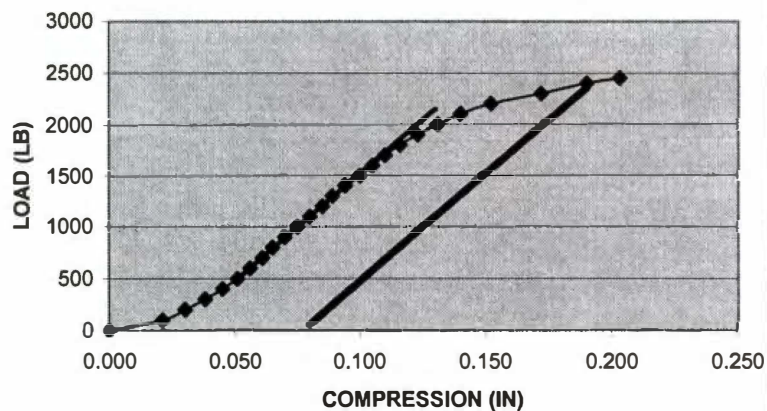
*SUMMERWOOD 2%

*SEASONING GREEN

*MOISTURE dry

*KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 10SP

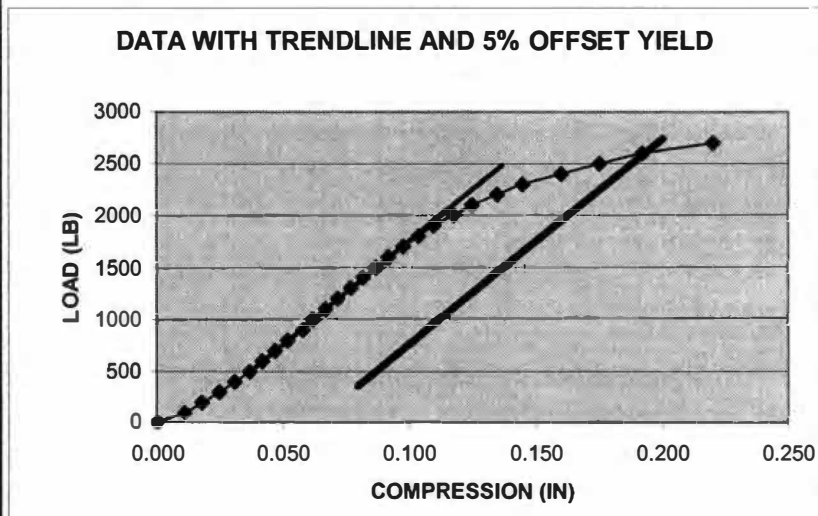
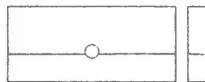
PEG NO. 1WO 1.875

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 77.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 5/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.79 LBS
 *RINGS PER INCH 8
 *SAP 15%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 14.5%
 *KIND OF FAILURE cracked
 DATA

*LOAD @ FAILURE 2600 LBS
50%
1.875
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .12 lbs
 *RINGS PER INCH 11
 *SAP 1%
 *SUMMERWOOD 2%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: crushed
slightly

LOAD(lb)	COMP(in)
0	0.000
100	0.011
200	0.018
300	0.025
400	0.031
500	0.037
600	0.042
700	0.047
800	0.052
900	0.058
1000	0.062
1100	0.067
1200	0.072
1300	0.077
1400	0.082
1500	0.087
1600	0.092
1700	0.098
1800	0.104
1900	0.110
2000	0.118
2100	0.125
2200	0.135
2300	0.145
2400	0.160
2500	0.175
2600	0.192
2700	0.220



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-03 PIECE NO. 18SP PEG NO. 1WO 2.00

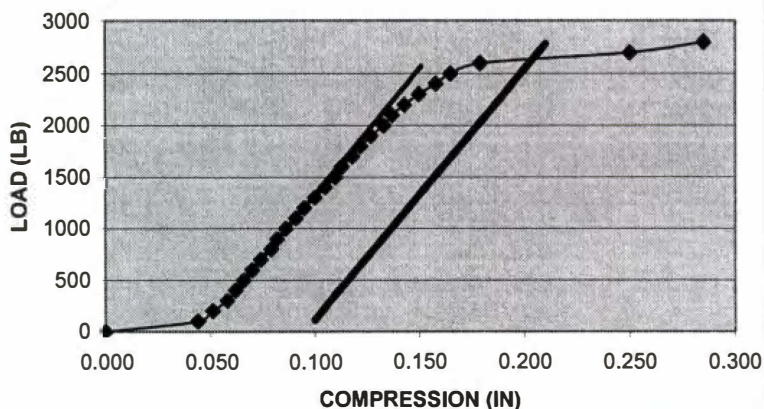
KIND OF TEST EDGE DISTANCE TEST

*MACHINE: <u>Universal Testing Machine</u> *SPEED ON MACH. <u>0.04 IN PER MIN. 1</u> *TESTED AT <u>78.7</u> degrees TEMP *DISTANCE OF CENTERLINE OF HOLE TO EDGE *SPECIES OF MAIN MEMBERS <u>SOUTHERN PINE</u> *LENGTH <u>9 7/8"</u> *HEIGHT <u>5 3/8"</u> *WIDTH <u>1.5"</u> *ANGLE OF GRAIN TO LOADING: <u>PERP</u> *WEIGHT <u>1.48 LBS</u> *RINGS PER INCH <u>4</u> *SAP <u>80%</u> *SUMMERWOOD <u>20%</u> *SEASONING <u>GREEN</u> *MOISTURE <u>15.0%</u> *KIND OF FAILURE <u>elongated hole</u> DATA <u>cracked</u>	*LOAD @ FAILURE <u>2645 LBS</u> <u>11% R.H.</u> <u>2.00</u> *SPECIES OF PEG <u>WHITE OAK</u> *DIA. <u>1 "</u> *LENGTH <u>6"</u> *ANGLE OF GRAIN TO LOAD <u>PERP</u> *WEIGHT <u>.14 lbs</u> *RINGS PER INCH <u>16</u> *SAP <u>35%</u> *SUMMERWOOD <u>40%</u> *SEASONING <u>GREEN</u> *MOISTURE <u>12%</u> *KIND OF FAILURE: <u>crushed</u>
---	--

LOAD(lb)	COMP(in)
0	0.000
100	0.044
200	0.051
300	0.058
400	0.062
500	0.066
600	0.070
700	0.074
800	0.079
900	0.082
1000	0.086
1100	0.091
1200	0.095
1300	0.100
1400	0.105
1500	0.110
1600	0.113
1700	0.118
1800	0.122
1900	0.127
2000	0.133
2100	0.137
2200	0.143
2300	0.150
2400	0.158
2500	0.165
2600	0.179
2700	0.250
2800	0.285



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-03

PIECE NO. 18SP

PEG NO. 1WO 2.25

KIND OF TEST EDGE DISTANCE TEST

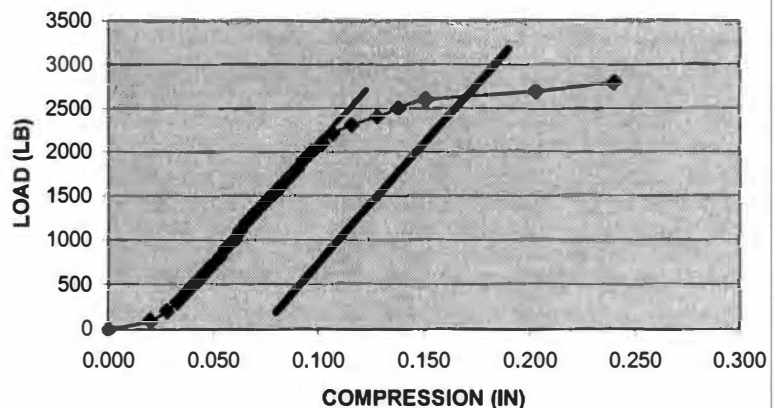
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5 3/8"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.48 LBS
 *RINGS PER INCH 4
 *SAP 80%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 13.0%
 *KIND OF FAILURE elongated hole
 DATA cracked

*LOAD @ FAILURE 2633 LBS
 *11% R.H.
 *2.25
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .16 lbs
 *RINGS PER INCH 8
 *SAP 15%
 *SUMMERWOOD 75%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.020
200	0.028
300	0.033
400	0.037
500	0.041
600	0.045
700	0.049
800	0.053
900	0.056
1000	0.060
1100	0.063
1200	0.066
1300	0.070
1400	0.074
1500	0.078
1600	0.082
1700	0.086
1800	0.090
1900	0.093
2000	0.097
2100	0.102
2200	0.107
2300	0.116
2400	0.128
2500	0.138
2600	0.151
2700	0.203
2800	0.240



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-03

PIECE NO. 18SP

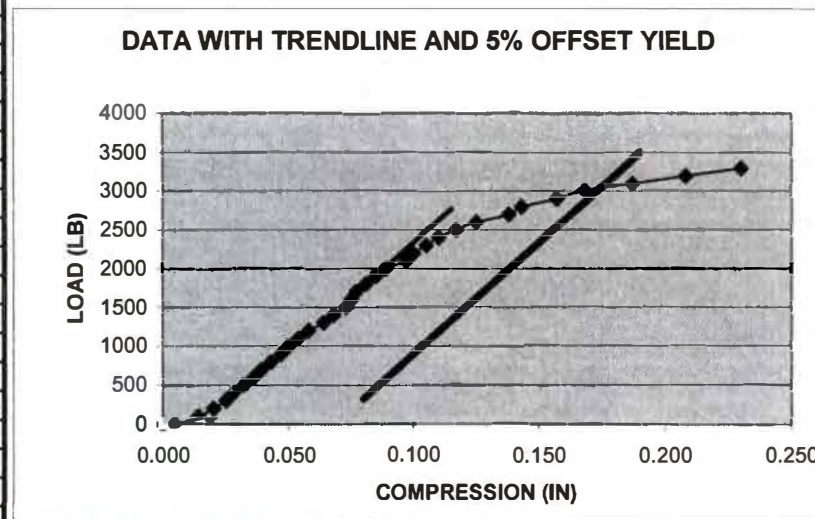
PEG NO. 1WO 2.5

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5 3/8"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.48 LBS
 *RINGS PER INCH 4
 *SAP 80%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 13.0%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 3000
 *11% R.H.
 *2.50
 *SPECIES OF PEG WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT .12 lbs
 *RINGS PER INCH 12
 *SAP 75%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 6%
 *KIND OF FAILURE: crushed
bent
cracked

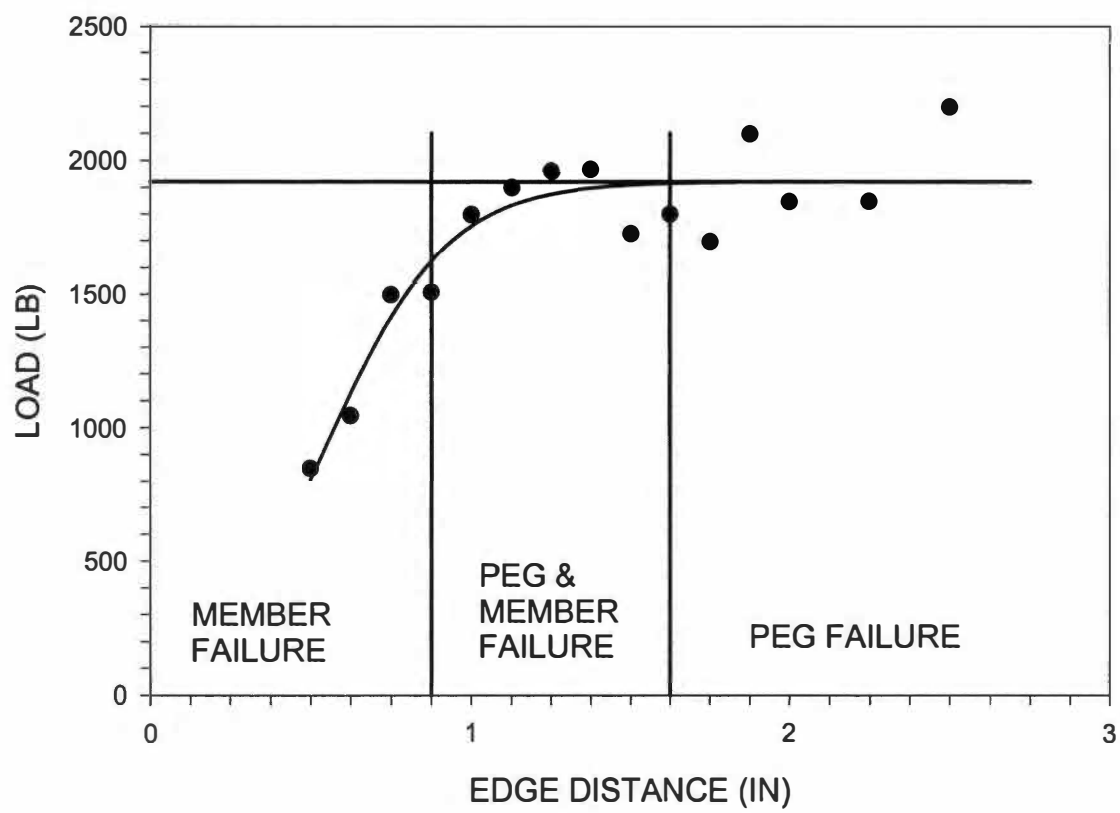
LOAD(lb)	COMP(in)
0	0.000
100	0.014
200	0.020
300	0.025
400	0.028
500	0.032
600	0.036
700	0.039
800	0.043
900	0.047
1000	0.050
1100	0.054
1200	0.058
1300	0.064
1400	0.068
1500	0.073
1600	0.075
1700	0.077
1800	0.081
1900	0.085
2000	0.089
2100	0.097
2200	0.100
2300	0.105
2400	0.110
2500	0.117
2600	0.125
2700	0.138
2800	0.143



LOAD(lb)	COMP(in)	LOAD(lb)	COMP(in)
2900	0.157	3300	0.230
3000	0.168		
3100	0.187		
3200	0.208		

APPENDIX E – EDGE TEST-DOUGLAS FIR-3/4” RED OAK PEGS

EDGE TEST-DOUGLAS FIR-3/4" RED OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 15-May-03

PIECE NO 07DF

PEG NO. 3/4 RO -0.5

KIND OF TEST EDGE DISTANCE TEST

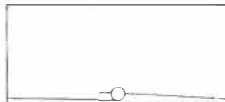
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2 LBS
 *RINGS PER INCH 6
 *SAP 10%
 *SUMMERWOOD 30%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 853 LBS
47%R.H.

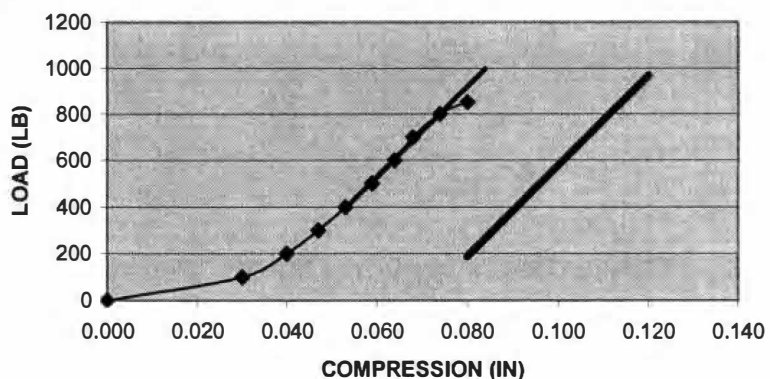
0.5 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP

*WEIGHT 0.06 LBS
 *RINGS PER INCH 14
 *SAP 2%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE dry
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.030
200	0.040
300	0.047
400	0.053
500	0.059
600	0.064
700	0.068
800	0.074
853	0.080



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

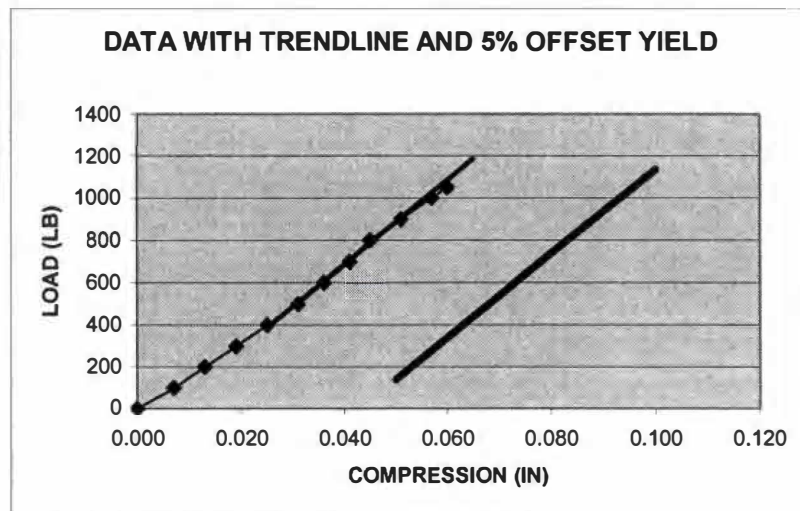
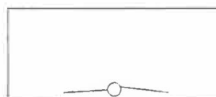
DATE: 15-May-03 PIECE NO 07DF PEG NO. 3/4 RO -0.625

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.96 LBS
 *RINGS PER INCH 7
 *SAP 10%
 *SUMMERWOOD 30%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE cracked
 DATA

*LOAD @ FAILURE 1050 LBS
47%R.H.
0.625 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.06 LBS
 *RINGS PER INCH 6
 *SAP 10%
 *SUMMERWOOD 75%
 *SEASONING GREEN
 *MOISTURE dry
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.007
200	0.013
300	0.019
400	0.025
500	0.031
600	0.036
700	0.041
800	0.045
900	0.051
1000	0.057
1050	0.060



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

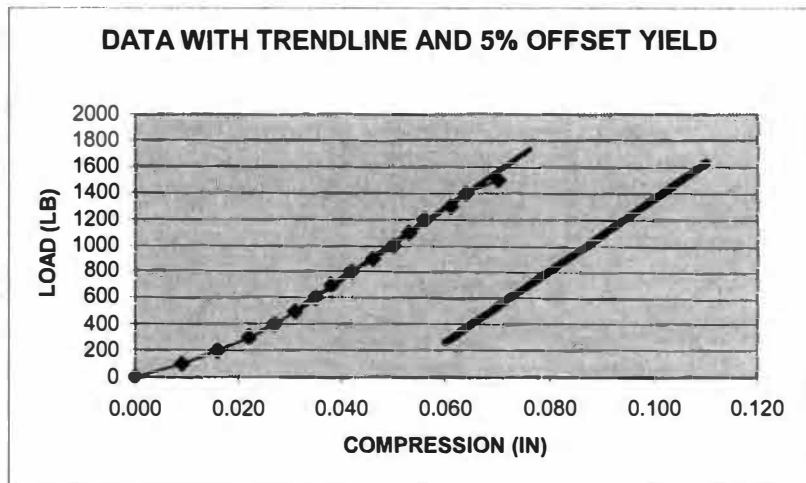
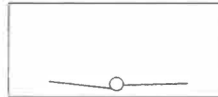
DATE: 15-May-03 PIECE NO 07DF PEG NO. 3/4 RO -0.75

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 75.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.88 LBS
 *RINGS PER INCH 7
 *SAP 10%
 *SUMMERWOOD 30%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE
 DATA

*LOAD @ FAILURE 1500 LBS
 *46%R.H.
0.75 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.06 LBS
 *RINGS PER INCH 12
 *SAP 10%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.009
200	0.016
300	0.022
400	0.027
500	0.031
600	0.035
700	0.038
800	0.042
900	0.046
1000	0.050
1100	0.053
1200	0.056
1300	0.061
1400	0.064
1500	0.070



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 15-May-03 PIECE NO 07DF PEG NO. 3/4 RO -1

KIND OF TEST EDGE DISTANCE TEST

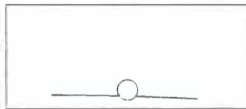
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE

*LOAD @ FAILURE 1800 LBS
47%R.H.
1 in

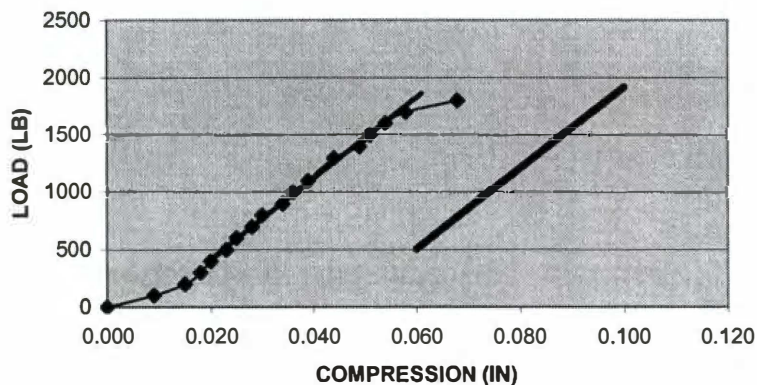
*SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11-7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.91 LBS
 *RINGS PER INCH 6
 *SAP 10%
 *SUMMERWOOD 30%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE DATA cracked

*SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 3
 *SAP 75%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: crushed slightly

LOAD(lb)	COMP(in)
0	0.000
100	0.009
200	0.015
300	0.018
400	0.020
500	0.023
600	0.025
700	0.028
800	0.030
900	0.034
1000	0.036
1100	0.039
1300	0.044
1400	0.049
1500	0.051
1600	0.054
1700	0.058
1800	0.068



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 15-May-03

PIECE NO 07DF

PEG NO. 3/4 RO -1.125

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 74.8 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*LOAD @ FAILURE 1900 LBS

47%R.H.

1.125 in

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 11-7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PERP

*WEIGHT 1.99 LBS

*RINGS PER INCH 7

*SAP 10%

*SUMMERWOOD 30%

*SEASONING GREEN

*MOISTURE 10%

*KIND OF FAILURE elongated hole

DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.006
200	0.012
300	0.017
400	0.020
500	0.023
600	0.026
700	0.029
800	0.032
900	0.035
1000	0.038
1100	0.041
1200	0.044
1300	0.048
1400	0.053
1600	0.059
1700	0.063
1800	0.069
1900	0.074



*SPECIES OF PEG

RED OAK

*DIA. 3/4"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.07 LBS

*RINGS PER INCH 14

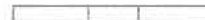
*SAP 0%

*SUMMERWOOD 70%

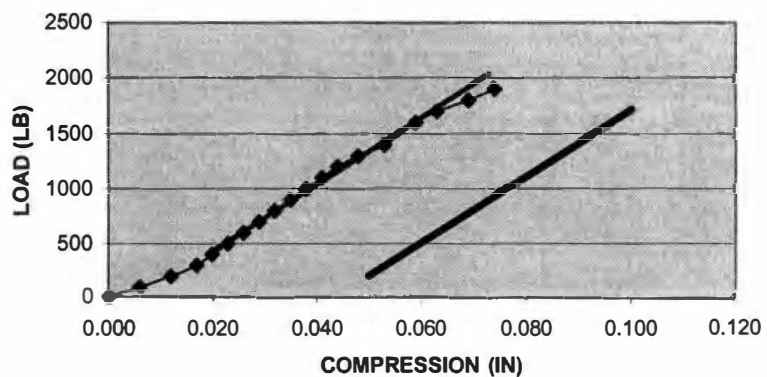
*SEASONING GREEN

*MOISTURE DRY

*KIND OF FAILURE: slightly crushed



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 17-Sep-03

PIECE NO 14DF

PEG NO. 3/4 RO -1.25

KIND OF TEST EDGE DISTANCE TEST

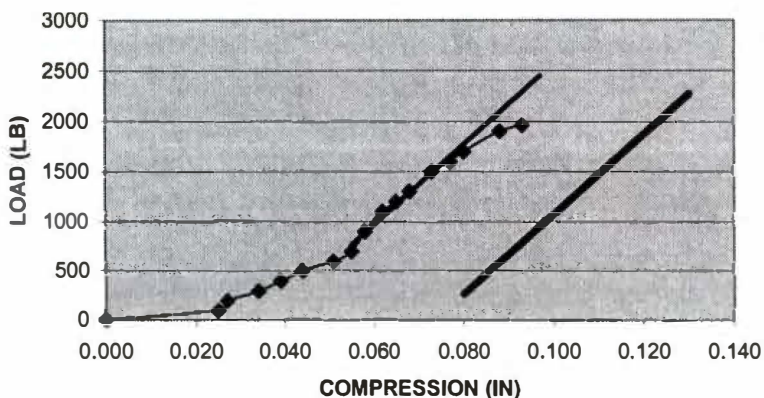
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11-7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.36 LBS
 *RINGS PER INCH 9
 *SAP 25%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 1960 LBS
 *75%R.H.
 *1.25 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 8
 *SAP 25%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.025
200	0.027
300	0.034
400	0.039
500	0.044
600	0.051
700	0.055
900	0.058
1100	0.062
1200	0.065
1300	0.068
1500	0.073
1600	0.077
1700	0.080
1900	0.088
1960	0.093



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 17-Sep-03

PIECE NO 14DF

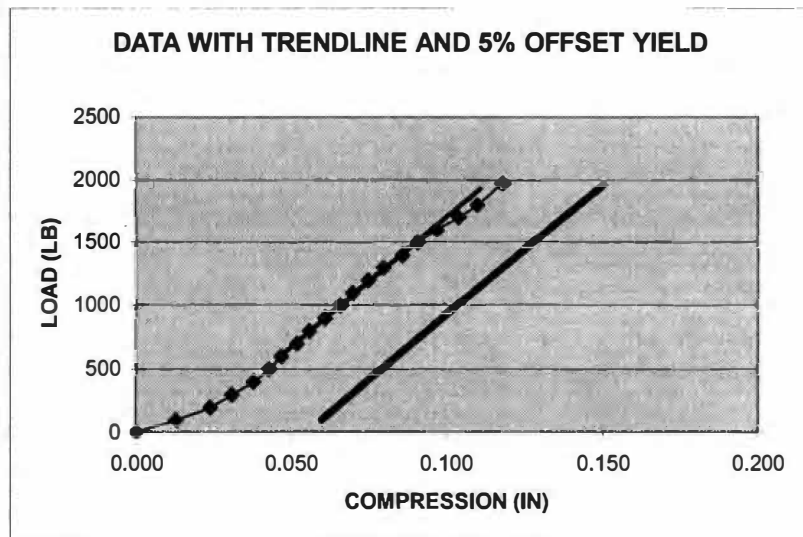
PEG NO. 3/4 RO -1.375

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.33 LBS
 *RINGS PER INCH 9
 *SAP 25%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 1970 LBS
75.3%R.H.
1.375 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 6
 *SAP 15%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.013
200	0.024
300	0.031
400	0.038
500	0.043
600	0.047
700	0.052
800	0.056
900	0.061
1000	0.066
1100	0.070
1200	0.075
1300	0.080
1400	0.086
1500	0.091
1600	0.097
1700	0.104
1800	0.110
1970	0.118



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 17-Sep-03

PIECE NO 14DF

PEG NO. 3/4 RO -1.5

KIND OF TEST EDGE DISTANCE TEST

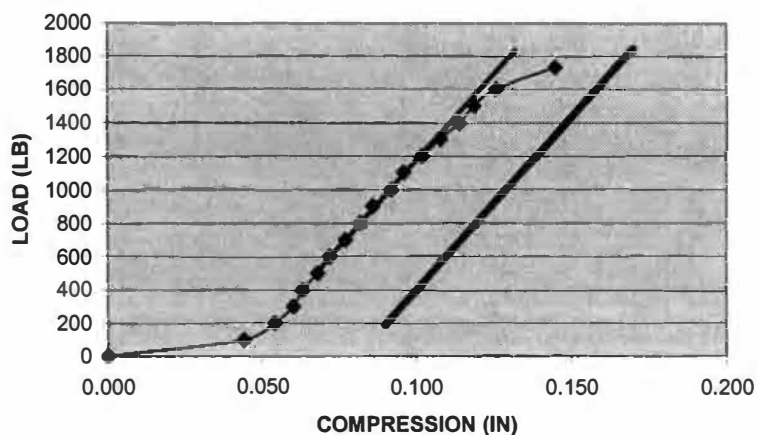
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.33 LBS
 *RINGS PER INCH 9
 *SAP 25%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE elongated hole
 DATA

*LOAD @ FAILURE 1730 LBS
75.2%R.H.
1.5 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 8
 *SAP 25%
 *SUMMERWOOD 30%
 *SEASONING GREEN
 *MOISTURE 6.5
 *KIND OF FAILURE: crushed
bent

LOAD(lb)	COMP(in)
0	0.000
100	0.044
200	0.054
300	0.060
400	0.063
500	0.068
600	0.072
700	0.077
800	0.082
900	0.086
1000	0.092
1100	0.096
1200	0.102
1300	0.108
1400	0.114
1500	0.119
1600	0.126
1730	0.145



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 17-Sep-03

PIECE NO. 14DF

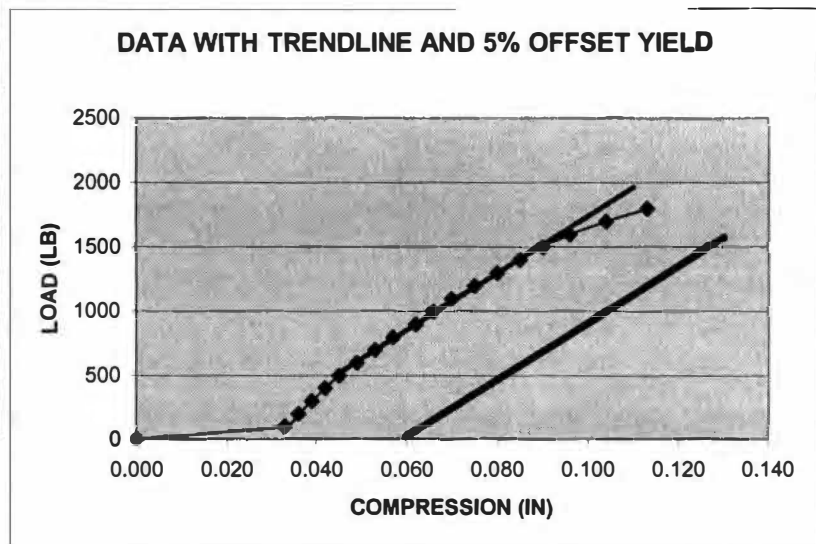
PEG NO. 3/4 RO -1.625

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.34 LBS
 *RINGS PER INCH 9
 *SAP 25%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 1800 LBS
75.2%R.H.
1.625 in
 *SPECIES OF PEG RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 8
 *SAP 10%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 5.50%
 *KIND OF FAILURE: crushed bent

LOAD(lb)	COMP(in)
0	0.000
100	0.033
200	0.036
300	0.039
400	0.042
500	0.045
600	0.049
700	0.053
800	0.057
900	0.062
1000	0.066
1100	0.070
1200	0.075
1300	0.080
1400	0.085
1500	0.090
1600	0.096
1700	0.104
1800	0.113



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 17-Sep-03

PIECE NO. 14DF

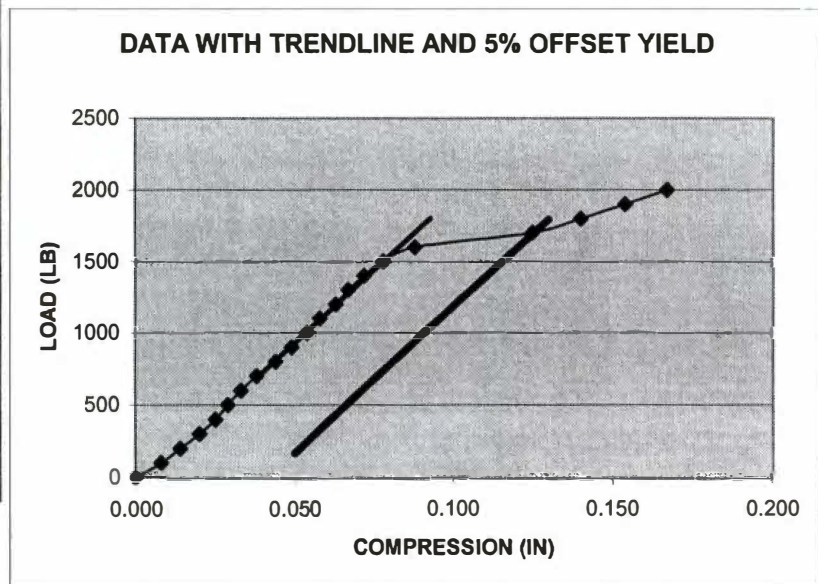
PEG NO. 3/4 RO -1.75

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.34 LBS
 *RINGS PER INCH 9
 *SAP 25%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 1700 LBS
 *75.1%R.H.
 *1.75 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 10
 *SAP 15%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 5.50%
 *KIND OF FAILURE: crushed bent

LOAD(lb)	COMP(in)
0	0.000
100	0.008
200	0.014
300	0.020
400	0.025
500	0.029
600	0.033
700	0.038
800	0.044
900	0.049
1000	0.054
1100	0.058
1200	0.063
1300	0.067
1400	0.072
1500	0.078
1600	0.088
1700	0.125
1800	0.140
1900	0.154
2000	0.167



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO. 16DF

PEG NO. 3/4 RO -1.875

KIND OF TEST EDGE DISTANCE TEST

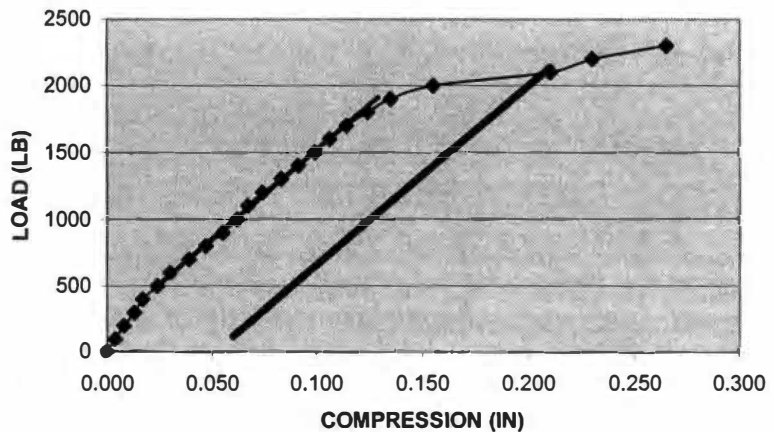
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 70.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 6 3/4"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.3 LBS
 *RINGS PER INCH 7
 *SAP 1%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 2100 LBS
7.16% R.H.
1.875 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 10
 *SAP 40%
 *SUMMERWOOD 25%
 *SEASONING GREEN
 *MOISTURE 5%
 *KIND OF FAILURE: crushed bent

LOAD(lb)	COMP(in)
0	0.000
100	0.004
200	0.008
300	0.013
400	0.017
500	0.024
600	0.030
700	0.039
800	0.047
900	0.055
1000	0.062
1100	0.067
1200	0.074
1300	0.083
1400	0.091
1500	0.099
1600	0.106
1700	0.114
1800	0.124
1900	0.135
2000	0.155
2100	0.210
2200	0.230
2300	0.265



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO. 20DF

PEG NO. 3/4 RO -2.00

KIND OF TEST EDGE DISTANCE TEST

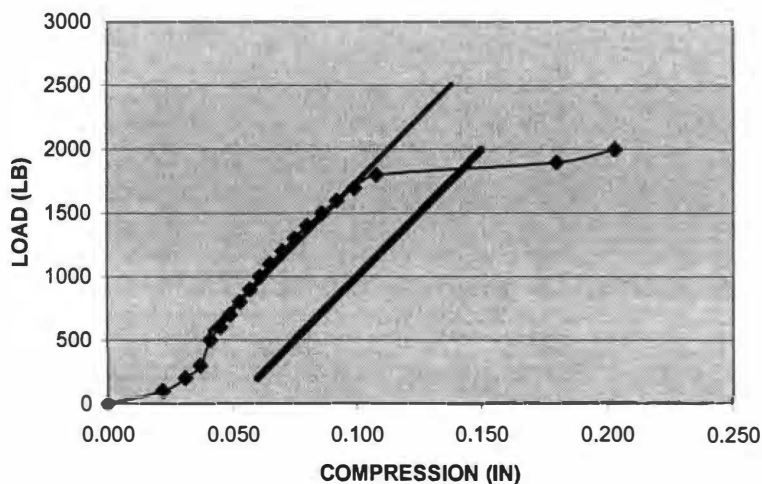
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 3/4"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.86 LBS
 *RINGS PER INCH 9
 *SAP 40%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 1850 LBS
11%R.H.
2.00 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.06 LBS
 *RINGS PER INCH 8
 *SAP 40%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 3%
 *KIND OF FAILURE: shear bent

LOAD(lb)	COMP(in)
0	0.000
100	0.022
200	0.031
300	0.037
500	0.041
600	0.045
700	0.049
800	0.053
900	0.057
1000	0.061
1100	0.065
1200	0.070
1300	0.075
1400	0.080
1500	0.086
1600	0.092
1700	0.099
1800	0.108
1900	0.180
2000	0.203



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

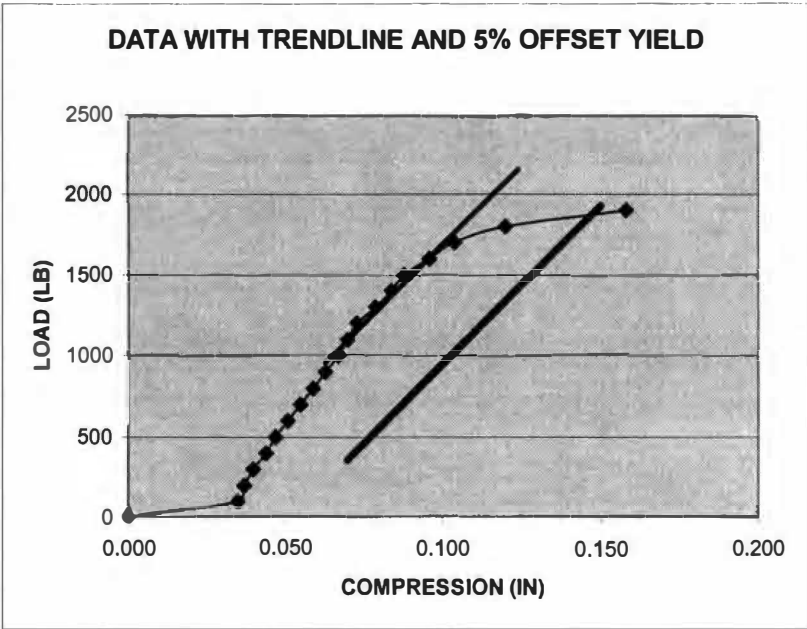
DATE: 24-Feb-04 PIECE NO. 20DF PEG NO. 3/4 RO -2.25

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
*SPEED ON MACH. 0.04 IN PER MIN. 1
*TESTED AT 78.4 degrees TEMP
*DISTANCE OF CENTERLINE OF HOLE TO EDGE
*SPECIES OF MAIN MEMBERS DOUGLAS FIR
*LENGTH 9 7/8"
*HEIGHT 5.5"
*WIDTH 1.5"
*ANGLE OF GRAIN TO LOADING: PERP
*WEIGHT 1.84 LBS
*RINGS PER INCH 9
*SAP 40%
*SUMMERWOOD 15%
*SEASONING GREEN
*MOISTURE 11%
*KIND OF FAILURE did not fail

*LOAD @ FAILURE 1875 LBS
11%R.H.
2.25 in
*SPECIES OF PEG RED OAK
*DIA. 3/4"
*LENGTH 6"
*ANGLE OF GRAIN TO LOAD PERP
*WEIGHT 0.06 LBS
*RINGS PER INCH 6
*SAP 40%
*SUMMERWOOD 50%
*SEASONING GREEN
*MOISTURE 3%
*KIND OF FAILURE: shear bent

LOAD(lb)	COMP(in)
0	0.000
100	0.035
200	0.037
300	0.040
400	0.044
500	0.047
600	0.051
700	0.055
800	0.059
900	0.063
1000	0.067
1100	0.070
1200	0.073
1300	0.079
1400	0.084
1500	0.088
1600	0.096
1700	0.104
1800	0.120
1900	0.158



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO. 20DF

PEG NO. 3/4 RO -2.5

KIND OF TEST EDGE DISTANCE TEST

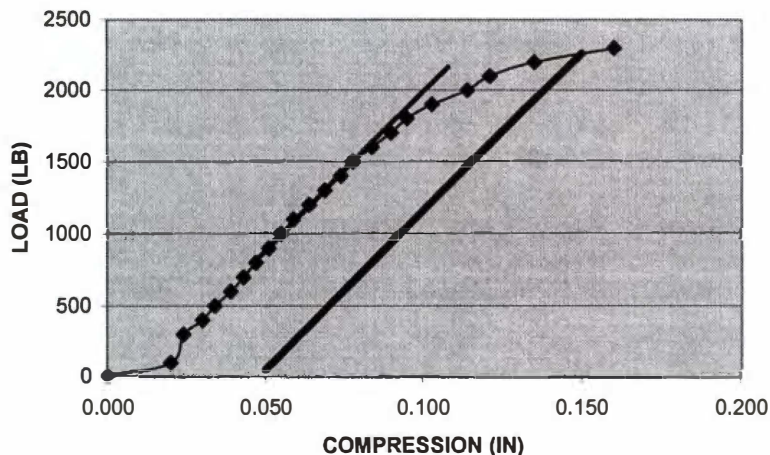
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.83 LBS
 *RINGS PER INCH 9
 *SAP 40%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 2264
11%R.H.
2.5 in
 *SPECIES OF PEG RED OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 7
 *SAP 35%
 *SUMMERWOOD 30%
 *SEASONING GREEN
 *MOISTURE 4%
 *KIND OF FAILURE: shear bent

LOAD(lb)	COMP(in)
0	0.000
100	0.020
300	0.024
400	0.030
500	0.034
600	0.039
700	0.043
800	0.047
900	0.051
1000	0.055
1100	0.059
1200	0.064
1300	0.069
1400	0.074
1500	0.078
1600	0.084
1700	0.090
1800	0.095
1900	0.103
2000	0.114
2100	0.121
2200	0.135
2300	0.160

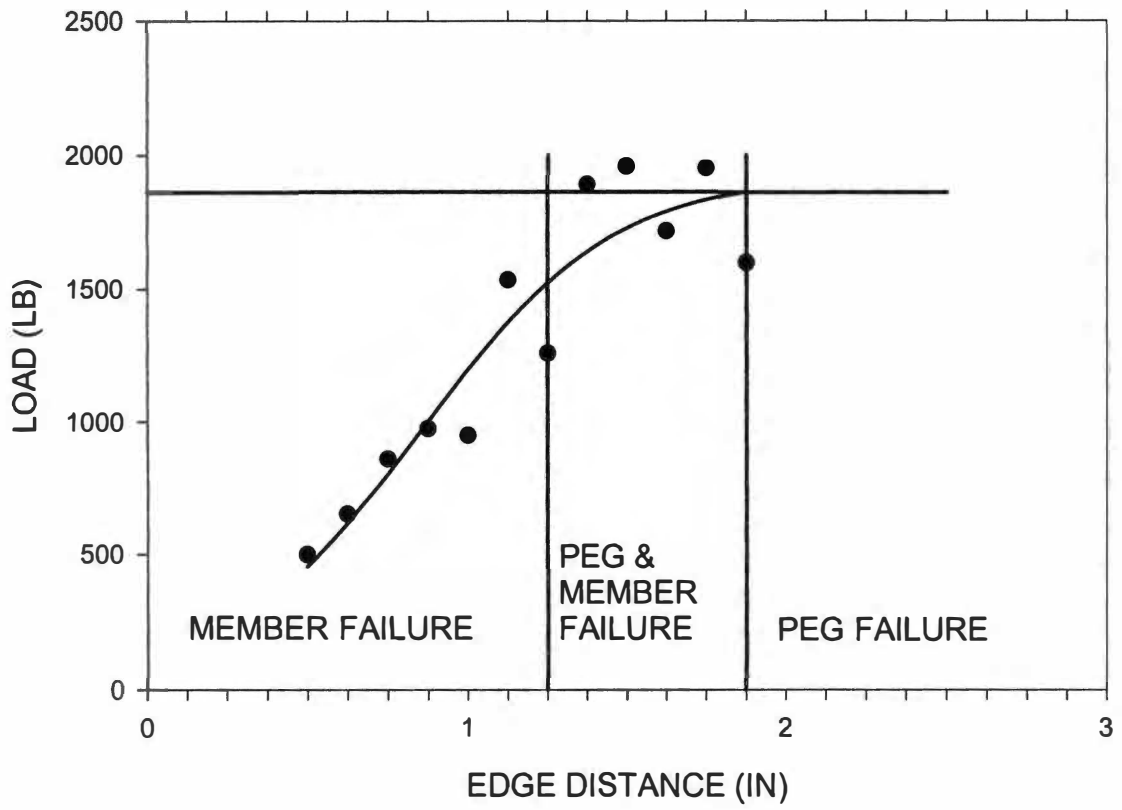


DATA WITH TRENDLINE AND 5% OFFSET YIELD



APPENDIX F – EDGE TEST-SOUTHERN PINE-3/4” RED OAK PEGS

EDGE TEST-SOUTHERN PINE-3/4" RED OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 03SP

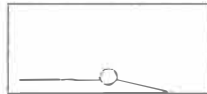
PEG NO. 3/4 RO -0.5

KIND OF TEST EDGE DISTANCE TEST

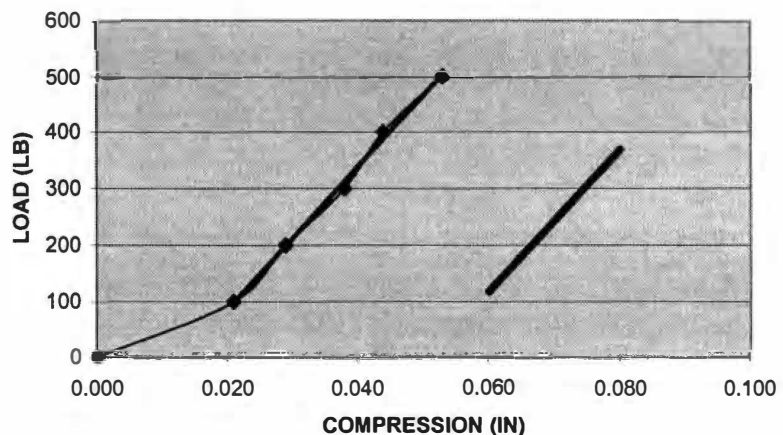
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLASS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.73
 *RINGS PER INCH 20
 *SAP 20%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 4%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 500 LBS
28%R.H.
0.5
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.06 LBS
 *RINGS PER INCH 16
 *SAP 0%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE dry
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.021
200	0.029
300	0.038
400	0.044
500	0.053



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 03SP

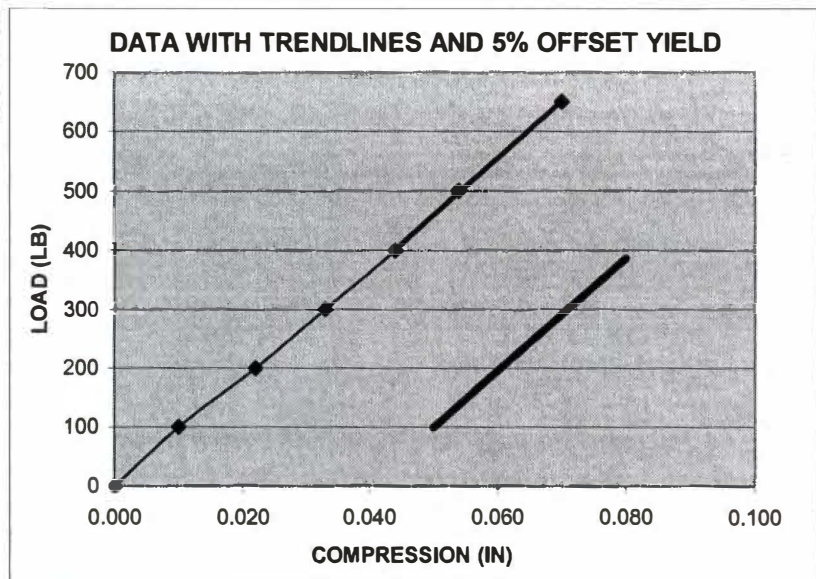
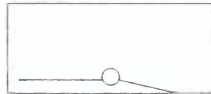
PEG NO. 3/4 RO -0.625

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8"
 *HEIGHT 5.3/8"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.71 LBS
 *RINGS PER INCH 20
 *SAP 20%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 1.4%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 650 LBS
28% R.H.
0.625
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 6 5/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.06 LBS
 *RINGS PER INCH 10
 *SAP 0%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE dry
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.010
200	0.022
300	0.033
400	0.044
500	0.054
650	0.070



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 03SP

PEG NO. 3/4 RO -0.75

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 72.4 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*LOAD @ FAILURE 860 LBS

28% R.H.

0.75

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 11 7/8"

*HEIGHT 5 3/8"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PERP

*WEIGHT 1.67 LBS

*RINGS PER INCH 20

*SAP 20%

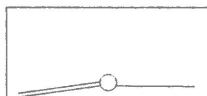
*SUMMERWOOD 20%

*SEASONING GREEN

*MOISTURE 9.5%

*KIND OF FAILURE cracked
DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.007
200	0.016
300	0.023
400	0.027
500	0.031
600	0.035
700	0.039
800	0.045
860	0.062



*SPECIES OF PEG

RED OAK

*DIA. 3/4"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.065 LBS

*RINGS PER INCH 6

*SAP 0%

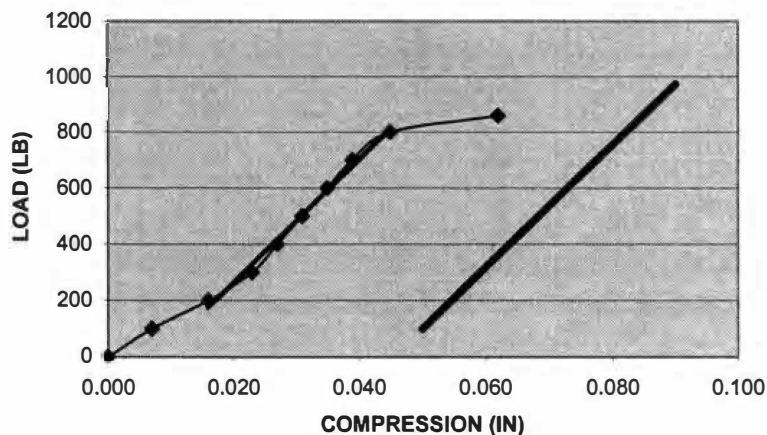
*SUMMERWOOD 100%

*SEASONING GREEN

*MOISTURE dry

*KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 03SP

PEG NO. 3I4RO 0.875

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 72.4 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 12 75"

*HEIGHT 5.718"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PERP

*WEIGHT 1.70 LBS

*RINGS PER INCH 20

*SAP 20%

*SUMMERWOOD 20%

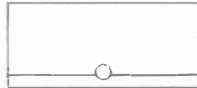
*SEASONING GREEN

*MOISTURE 10.5%

*KIND OF FAILURE cracked

DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.010
200	0.021
300	0.031
400	0.036
500	0.042
700	0.050
800	0.060
975	0.075



*LOAD @ FAILURE 975 LBS

28%R.H.

0.875

*SPECIES OF PEG

RED OAK

*DIA. 3/4"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.06 LBS

*RINGS PER INCH 6

*SAP 0%

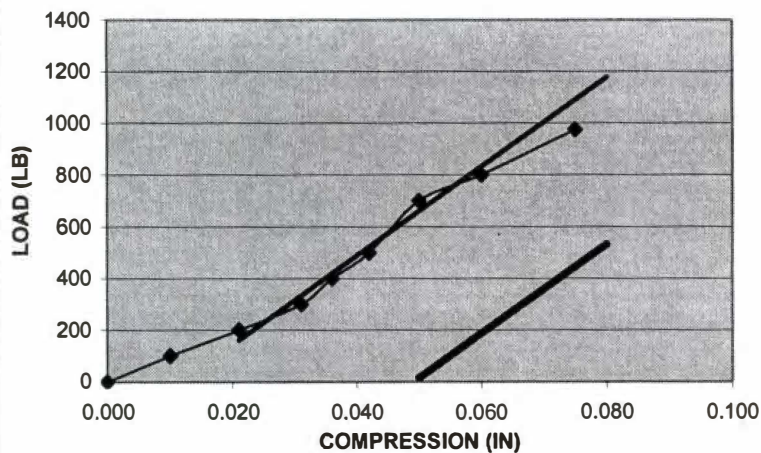
*SUMMERWOOD 100%

*SEASONING GREEN

*MOISTURE dry

*KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 03SP

PEG NO. 3/4RO 1

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 71.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 12 1/8"
 *HEIGHT 5.3/8"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.81 LBS
 *RINGS PER INCH 20
 *SAP 20%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 4 5%
 *KIND OF FAILURE ends cracked

*LOAD @ FAILURE 950 LBS
28%R.H.

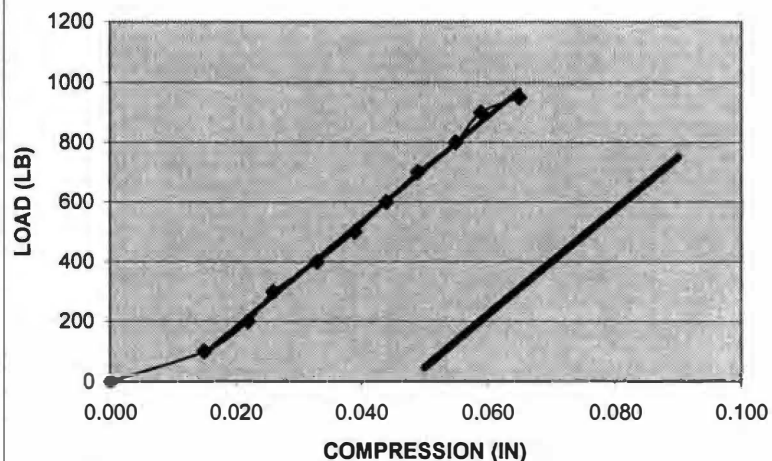
*SPECIES OF PEG 1
RED OAK
 *DIA. 3/4"
 *LENGTH 5 3/4"
 *ANGLE OF GRAIN TO LOAD
PERP

*WEIGHT 0.06 LBS
 *RINGS PER INCH 8
 *SAP 0%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE dry
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.015
200	0.022
300	0.026
400	0.033
500	0.039
600	0.044
700	0.049
800	0.055
900	0.059
950	0.065



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 03SP

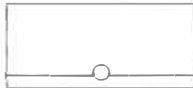
PEG NO. 3/4RO 1.125

KIND OF TEST EDGE DISTANCE TEST

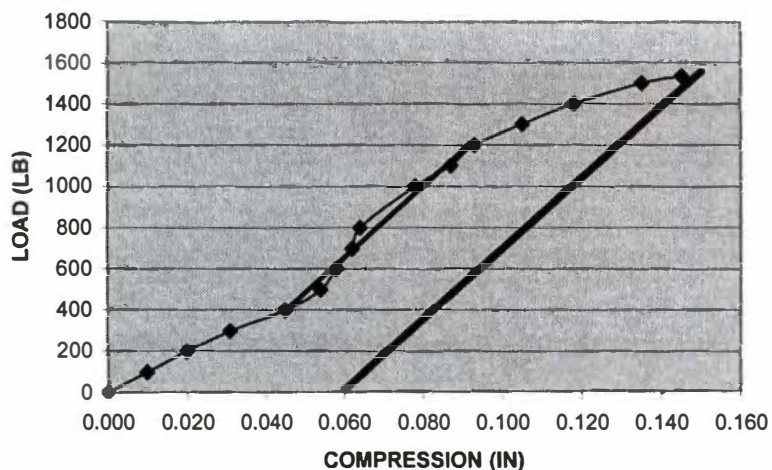
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 71.7 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11.75
 *HEIGHT 5.3/8"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.74 LBS
 *RINGS PER INCH 20
 *SAP 20%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 4.5%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 1535 LBS
 *28%R.H. 1.125
 *SPECIES OF PEG RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.05 LBS
 *RINGS PER INCH 8
 *SAP 0%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE dry
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.010
200	0.020
300	0.031
400	0.045
500	0.054
600	0.058
700	0.062
800	0.064
1000	0.078
1100	0.087
1200	0.093
1300	0.105
1400	0.118
1500	0.135
1535	0.145



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 11SP

PEG NO. 3/4RO 1.25

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 77.9 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 11 75

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PERP

*WEIGHT 1.57LBS

*RINGS PER INCH 9

*SAP 30%

*SUMMERWOOD 40%

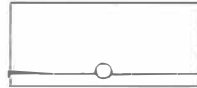
*SEASONING GREEN

*MOISTURE 12%

*KIND OF FAILURE cracked

DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.019
200	0.030
300	0.038
400	0.043
500	0.048
600	0.053
700	0.058
800	0.064
900	0.070
1000	0.070
1100	0.077
1200	0.084
1260	0.096



*LOAD @ FAILURE 1260 LBS
53%R.H.

1.25

*SPECIES OF PEG

RED OAK

*DIA. 3/4"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.05 LBS

*RINGS PER INCH 8

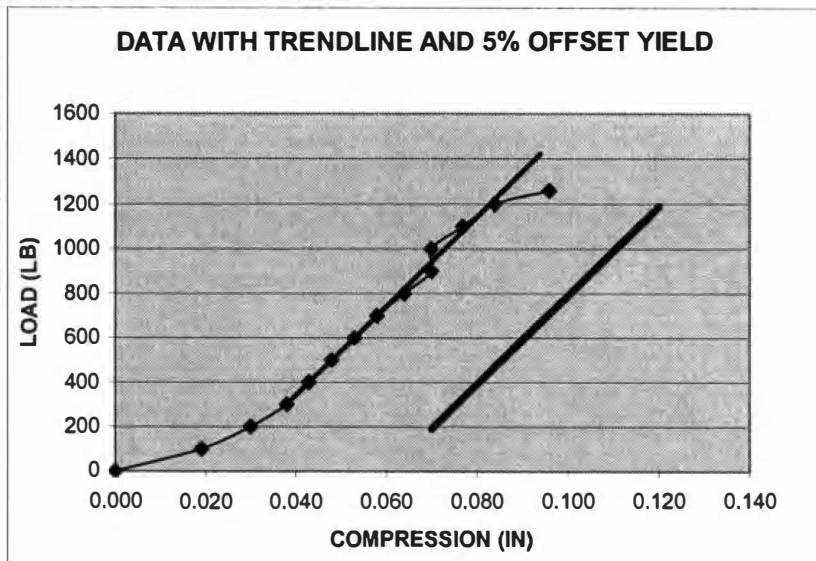
*SAP 0%

*SUMMERWOOD 10%

*SEASONING GREEN

*MOISTURE dry

*KIND OF FAILURE: did not fail



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 11SP

PEG NO. 3/4RO 1.375

KIND OF TEST EDGE DISTANCE TEST

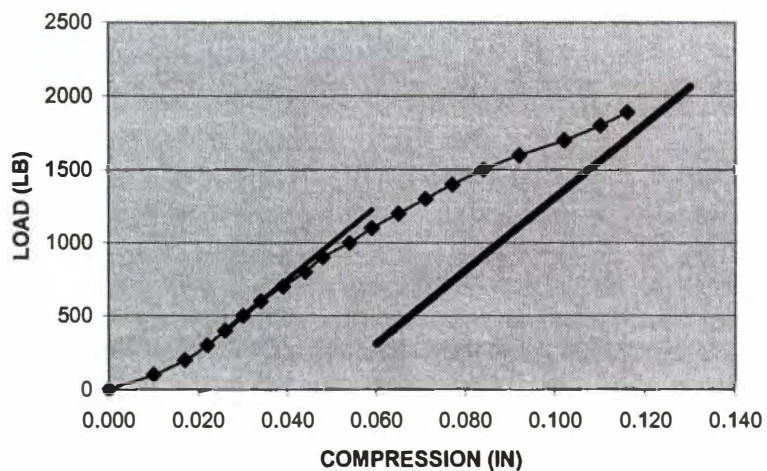
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 77.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 13"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.75 LBS
 *RINGS PER INCH 9
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 13%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 1890 LBS
 *53%R.H.
1.375
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 14
 *SAP 20%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: crushed
slightly

LOAD(lb)	COMP(in)
0	0.000
100	0.010
200	0.017
300	0.022
400	0.026
500	0.030
600	0.034
700	0.039
800	0.044
900	0.048
1000	0.054
1100	0.059
1200	0.065
1300	0.071
1400	0.077
1500	0.084
1600	0.092
1700	0.102
1800	0.110
1890	0.116



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 11SP

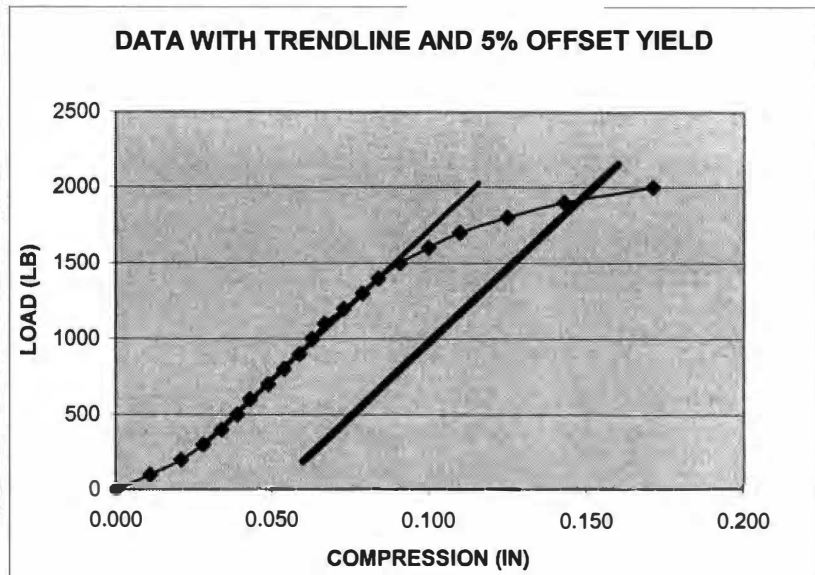
PEG NO. 3/4RO 1.5

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 77.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 3/4"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.59 LBS
 *RINGS PER INCH 9
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 1959 LBS
 *52 %R.H.
 *1.5
 *SPECIES OF PEG RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
 *PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 12
 *SAP 10%
 *SUMMERWOOD 30%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE: crushed bent

LOAD(lb)	COMP(in)
0	0.000
100	0.011
200	0.021
300	0.028
400	0.034
500	0.039
600	0.043
700	0.049
800	0.054
900	0.059
1000	0.063
1100	0.067
1200	0.073
1300	0.079
1400	0.084
1500	0.091
1600	0.100
1700	0.110
1800	0.125
1900	0.143
2000	0.171



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 11SP

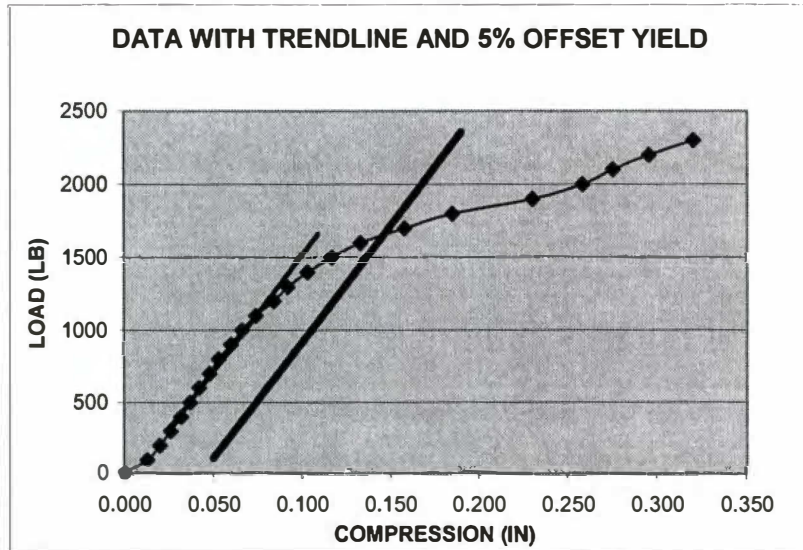
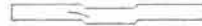
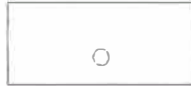
PEG NO. 3/4RO 1.625

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 77.7 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 5/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.62 LBS
 *RINGS PER INCH 9
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 14%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 1716 LBS
 *53 %R.H.
1.625
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.06 LBS
 *RINGS PER INCH 16
 *SAP 15%
 *SUMMERWOOD 25%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE: crushed bent

LOAD(lb)	COMP(in)
0	0.000
100	0.013
200	0.020
300	0.026
400	0.032
500	0.037
600	0.042
700	0.048
800	0.053
900	0.060
1000	0.066
1100	0.074
1200	0.084
1300	0.092
1400	0.103
1500	0.117
1600	0.133
1700	0.158
1800	0.185
1900	0.230
2000	0.258
2100	0.275
2200	0.295
2300	0.320



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 11SP

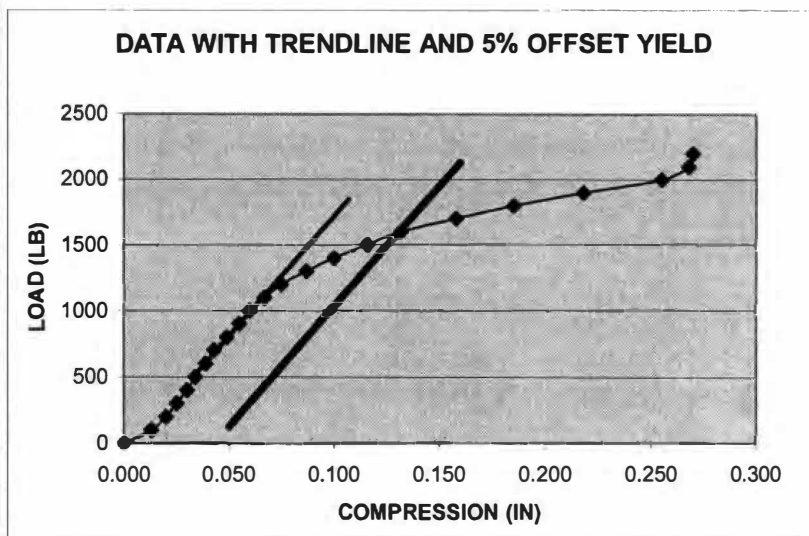
PEG NO. 3/4RO 1.875

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 77.7 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 6/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.59 LBS
 *RINGS PER INCH 9
 *SAP 30%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 13%
 *KIND OF FAILURE
 DATA

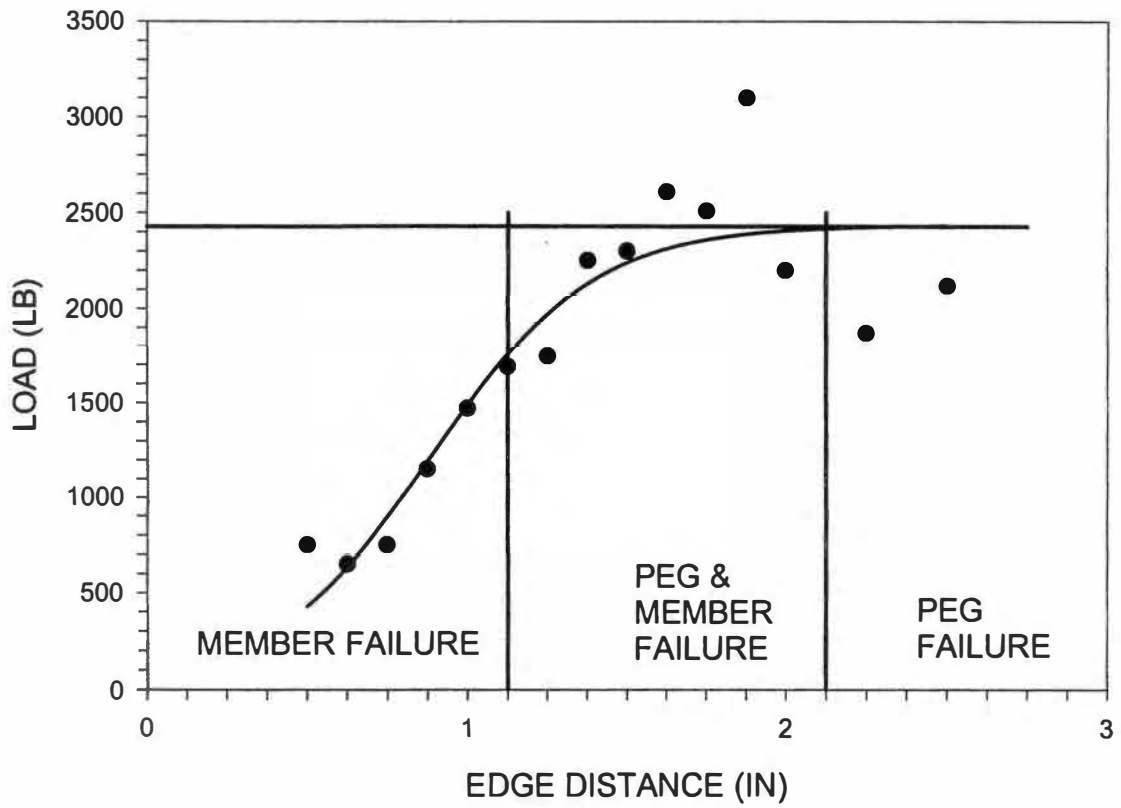
*LOAD @ FAILURE 1600 LBS
52 %R.H.
1.875
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.06 LBS
 *RINGS PER INCH 10
 *SAP 10%
 *SUMMERWOOD 25%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.013
200	0.020
300	0.025
400	0.030
500	0.034
600	0.039
700	0.043
800	0.049
900	0.055
1000	0.060
1100	0.067
1200	0.075
1300	0.087
1400	0.100
1500	0.116
1600	0.132
1700	0.158
1800	0.185
1900	0.218
2000	0.255
2100	0.268
2200	0.270



APPENDIX G – EDGE TEST-DOUGLAS FIR-3/4” WHITE OAK PEGS

EDGE TEST-DOUGLAS FIR-3/4" WHITE OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 15-May-03

PIECE NO _08DF

PEG NO. 3/4 WO 0.5

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.71 LBS
 *RINGS PER INCH 9
 *SAP 0%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE dry
 *KIND OF FAILURE cracked

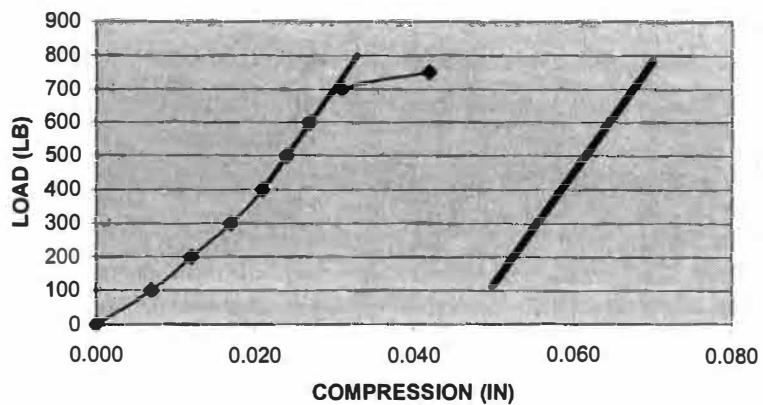
*LOAD @ FAILURE 750 LBS
45% R.H.
0.5 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.09 LBS
 *RINGS PER INCH 18
 *SAP 0%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE dry
 *KIND OF FAILURE: did not fail

DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.007
200	0.012
300	0.017
400	0.021
500	0.024
600	0.027
700	0.031
750	0.042



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

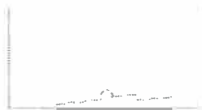
DATE: 15-May-03 PIECE NO 08DF PEG NO. 3/4 WO 0.625

KIND OF TEST EDGE DISTANCE TEST

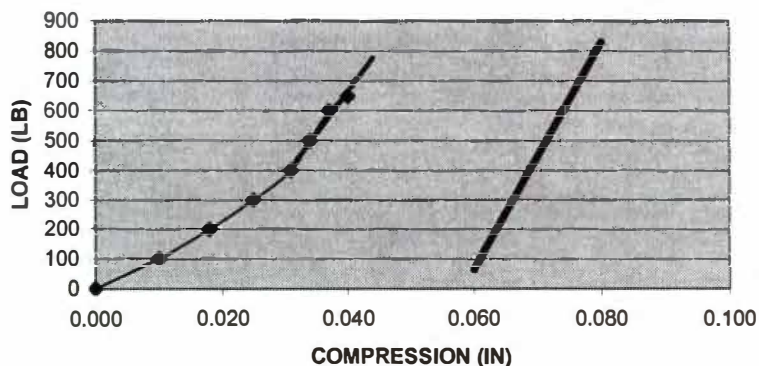
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 75.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.63 LBS
 *RINGS PER INCH 9
 *SAP 0%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 650 LBS
45% R.H.
0.625 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 14
 *SAP 1%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.010
200	0.018
300	0.025
400	0.031
500	0.034
600	0.037
650	0.040



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 15-May-03

PIECE NO 08DF

PEG NO. 3/4 WO 0.75

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 75.4 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 12"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PERP

*WEIGHT 1.69 LBS

*RINGS PER INCH 9

*SAP 0%

*SUMMERWOOD 45%

*SEASONING GREEN

*MOISTURE 7%

*KIND OF FAILURE cracked

DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.009
200	0.014
300	0.018
400	0.022
500	0.024
600	0.027
700	0.032
750	0.039



*LOAD @ FAILURE 750 LBS

45% R.H.

0.75 in

*SPECIES OF PEG

WHITE OAK

*DIA. 3/4"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.07 LBS

*RINGS PER INCH 16

*SAP 2%

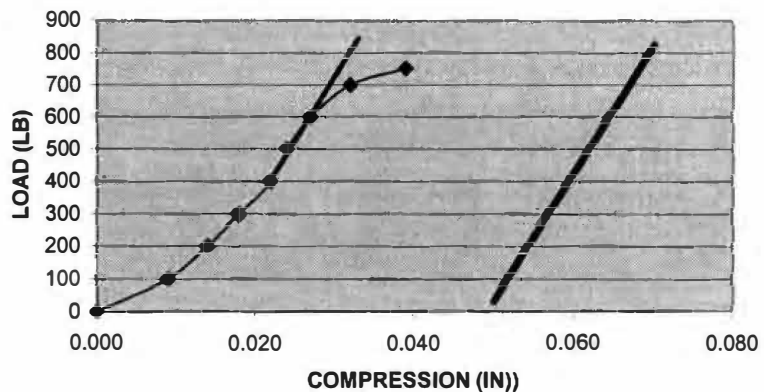
*SUMMERWOOD 60%

*SEASONING GREEN

*MOISTURE 7%

*KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

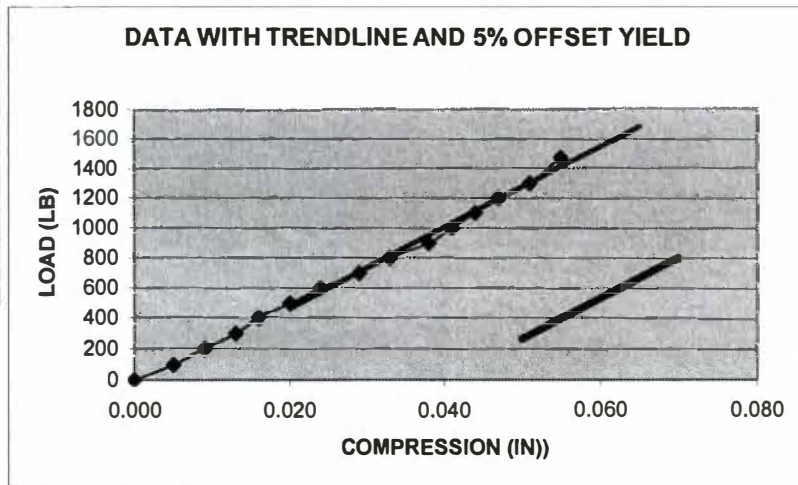
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 15-May-03 PIECE NO 08DF PEG NO. 3/4 WO 1.00

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: <u>Universal Testing Machine</u> *SPEED ON MACH. <u>0.04 IN PER MIN. 1</u> *TESTED AT <u>75.7 degrees</u> TEMP *DISTANCE OF CENTERLINE OF HOLE TO EDGE *SPECIES OF MAIN MEMBERS <u>DOUGLAS FIR</u> *LENGTH <u>11 7/8"</u> *HEIGHT <u>5.5"</u> *WIDTH <u>1.5"</u> *ANGLE OF GRAIN TO LOADING: <u>PERP</u> *WEIGHT <u>1.64 LBS</u> *RINGS PER INCH <u>9</u> *SAP <u>0%</u> *SUMMERWOOD <u>45%</u> *SEASONING <u>GREEN</u> *MOISTURE <u>7%</u> *KIND OF FAILURE <u>cracked</u>	*LOAD @ FAILURE <u>1470 LBS</u> *45% R.H. <u>1.00</u> *SPECIES OF PEG <u>WHITE OAK</u> *DIA. <u>3/4"</u> *LENGTH <u>6"</u> *ANGLE OF GRAIN TO LOAD <u>PERP</u> *WEIGHT <u>0.08 LBS</u> *RINGS PER INCH <u>8</u> *SAP <u>0%</u> *SUMMERWOOD <u>25%</u> *SEASONING <u>GREEN</u> *MOISTURE <u>6%</u> *KIND OF FAILURE: <u>did not fail</u>
--	--

LOAD(lb)	COMP(in)
0	0.000
100	0.005
200	0.009
300	0.013
400	0.016
500	0.020
600	0.024
700	0.029
800	0.033
900	0.038
1000	0.041
1100	0.044
1200	0.047
1300	0.051
1470	0.055



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 15-May-03 PIECE NO 08DF PEG NO. 3/4 WO 1.125

KIND OF TEST EDGE DISTANCE TEST

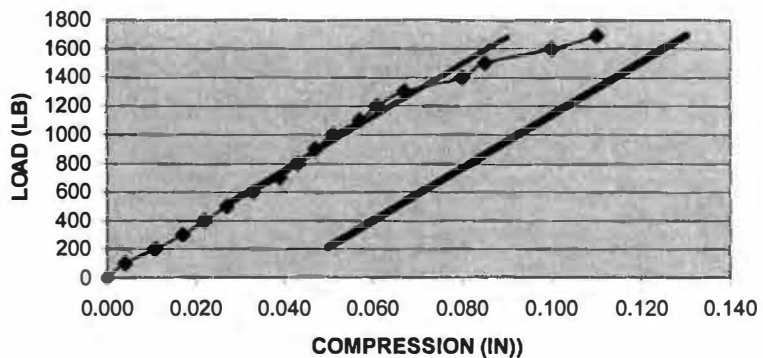
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 75.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.66 LBS
 *RINGS PER INCH 9
 *SAP 0%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 1690 LBS
46% R.H.
1.125
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 6
 *SAP 0%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE 6%
 *KIND OF FAILURE: crushed slightly

LOAD(lb)	COMP(in)
0	0.000
100	0.004
200	0.011
300	0.017
400	0.022
500	0.027
600	0.033
700	0.039
800	0.043
900	0.047
1000	0.051
1100	0.057
1200	0.061
1300	0.067
1400	0.080
1500	0.085
1600	0.100
1690	0.110



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 17-Sep-03

PIECE NO 14DF

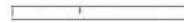
PEG NO. 3/4 WO -1.25

KIND OF TEST EDGE DISTANCE TEST

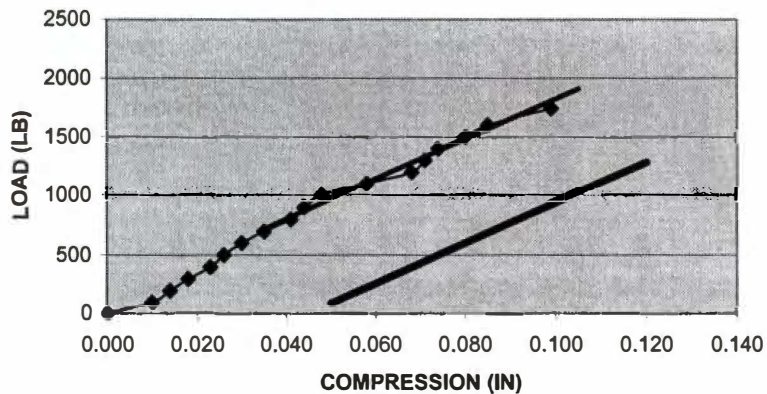
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.34 LBS
 *RINGS PER INCH 9
 *SAP 25%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 1744 LBS
 *40%R.H.
1.25 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 6
 *SAP 10%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.010
200	0.014
300	0.018
400	0.023
500	0.026
600	0.030
700	0.035
800	0.041
900	0.044
1000	0.048
1100	0.058
1200	0.068
1300	0.071
1400	0.074
1500	0.080
1600	0.085
1744	0.099



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 17-Sep-03

PIECE NO 14DF

PEG NO. 3/4 WO -1.375

KIND OF TEST EDGE DISTANCE TEST

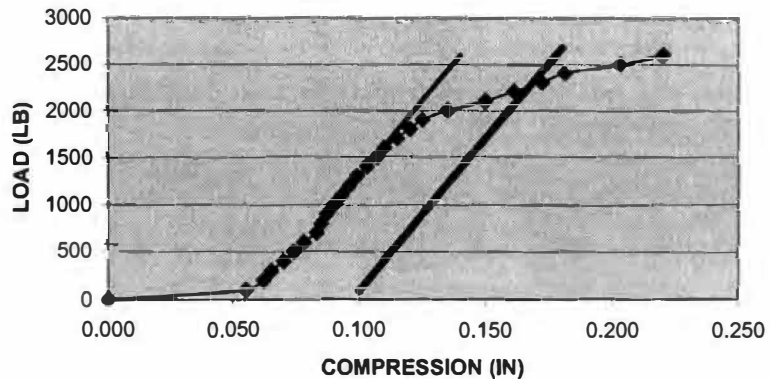
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.34 LBS
 *RINGS PER INCH 9
 *SAP 25%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE cracked
 DATA

*LOAD @ FAILURE 2250 LBS
39%R.H.
1.375 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 16
 *SAP 10%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 4.5%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.055
200	0.062
300	0.065
400	0.070
500	0.074
600	0.078
700	0.083
800	0.085
900	0.087
1000	0.090
1100	0.093
1200	0.096
1300	0.099
1400	0.103
1500	0.107
1600	0.110
1700	0.115
1800	0.120
1900	0.125
2000	0.135
2100	0.150
2200	0.161
2300	0.172
2400	0.181
2500	0.203
2600	0.220



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 17-Sep-03

PIECE NO 14DF

PEG NO. 3/4 WO -1.5

KIND OF TEST EDGE DISTANCE TEST

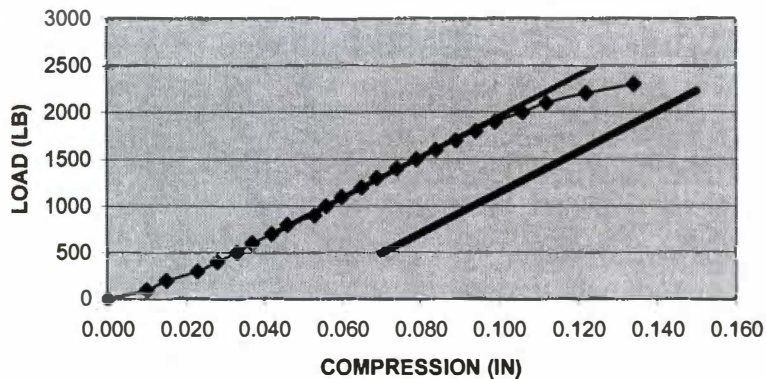
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.34 LBS
 *RINGS PER INCH 9
 *SAP 25%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE cracked

*LOAD @ FAILURE 2300 LBS
 *39%R.H.
 *1.5 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 16
 *SAP 10%
 *SUMMERWOOD 30%
 *SEASONING GREEN
 *MOISTURE 4.5%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.010
200	0.015
300	0.023
400	0.028
500	0.033
600	0.037
700	0.042
800	0.046
900	0.053
1000	0.056
1100	0.060
1200	0.065
1300	0.069
1400	0.074
1500	0.079
1600	0.084
1700	0.089
1800	0.094
1900	0.099
2000	0.106
2100	0.112
2200	0.122
2300	0.134



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 17-Sep-03

PIECE NO 14DF

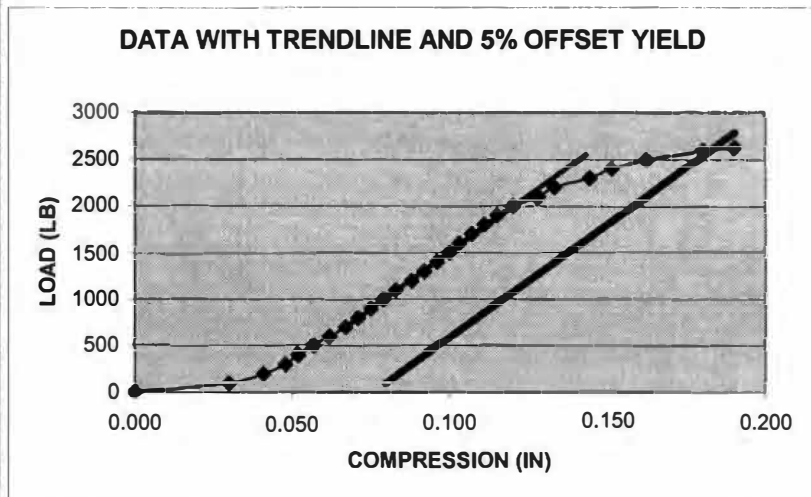
PEG NO. 3/4 WO -1.625

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.3 LBS
 *RINGS PER INCH 9
 *SAP 25%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE elongated hole
 DATA

*LOAD @ FAILURE 2610 LBS
 *40%R.H.
1.625 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.09 LBS
 *RINGS PER INCH 8
 *SAP 20%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 7.0%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.030
200	0.041
300	0.048
400	0.052
500	0.057
600	0.062
700	0.067
800	0.071
900	0.075
1000	0.079
1100	0.083
1200	0.088
1300	0.092
1400	0.096
1500	0.100
1600	0.103
1700	0.107
1800	0.111
1900	0.115
2000	0.120
2100	0.128
2200	0.133
2300	0.144
2400	0.151
2500	0.162
2600	0.180
2630	0.190



DEPARTMENT OF CIVIL ENGINEERING

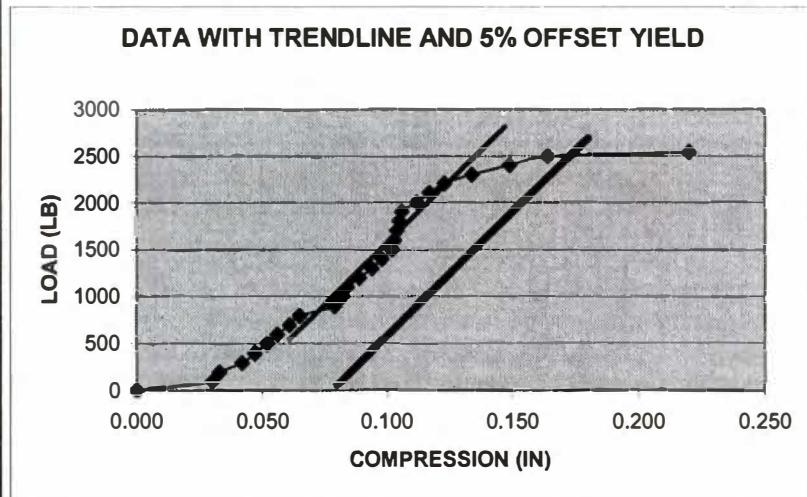
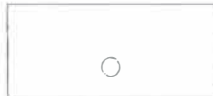
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 17-Sep-03 PIECE NO 14DF PEG NO. 3/4 WO -1.75

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: <u>Universal Testing Machine</u> *SPEED ON MACH. <u>0.04 IN PER MIN. 1</u> *TESTED AT <u>73.4 degrees</u> TEMP *DISTANCE OF CENTERLINE OF HOLE TO EDGE <u>1.75 in</u> *SPECIES OF MAIN MEMBERS DOUGLAS FIR *LENGTH <u>12"</u> *HEIGHT <u>5.5"</u> *WIDTH <u>1.5"</u> *ANGLE OF GRAIN TO LOADING: <u>PERP</u> *WEIGHT <u>2.36 LBS</u> *RINGS PER INCH <u>9</u> *SAP <u>25%</u> *SUMMERWOOD <u>45%</u> *SEASONING <u>GREEN</u> *MOISTURE <u>12%</u> *KIND OF FAILURE <u>elongated hole</u> DATA	*LOAD @ FAILURE <u>2510 LBS</u> 40%R.H. *SPECIES OF PEG <u>WHITE OAK</u> *DIA. <u>3/4"</u> *LENGTH <u>6"</u> *ANGLE OF GRAIN TO LOAD <u>PERP</u> *WEIGHT <u>0.08 LBS</u> *RINGS PER INCH <u>10</u> *SAP <u>10%</u> *SUMMERWOOD <u>15%</u> *SEASONING <u>GREEN</u> *MOISTURE <u>7.0%</u> *KIND OF FAILURE: <u>crushed</u>
---	--

LOAD(lb)	COMP(in)
0	0.000
100	0.030
200	0.033
300	0.042
400	0.047
500	0.052
600	0.056
700	0.061
800	0.065
900	0.079
1000	0.082
1100	0.084
1200	0.089
1300	0.094
1400	0.098
1500	0.102
1600	0.103
1700	0.104
1800	0.105
1900	0.106
2000	0.112
2100	0.117
2200	0.123
2300	0.134
2400	0.149
2500	0.164
2540	0.220



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 17-Sep-03

PIECE NO 14DF

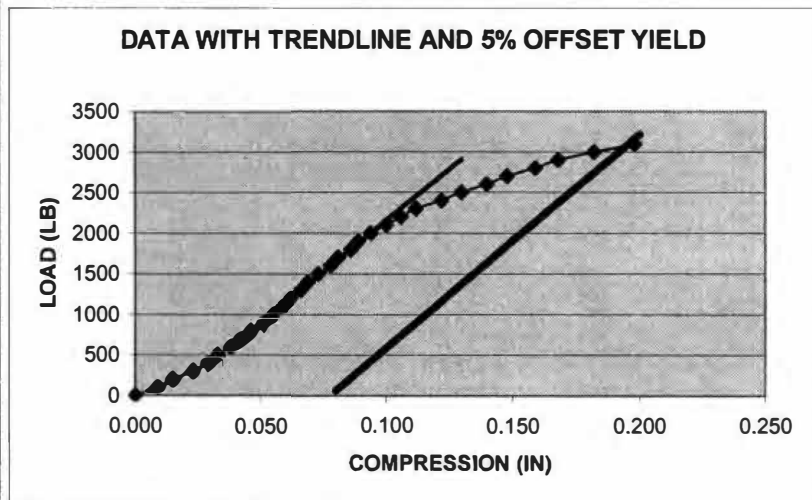
PEG NO. 3/4 WO -1.875

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 2.42 LBS
 *RINGS PER INCH 9
 *SAP 25%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 3100 LBS
 *41% R.H.
 *1.875 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 6
 *SAP 5%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 7.0%
 *KIND OF FAILURE: crushed bent

LOAD(lb)	COMP(in)
0	0.000
100	0.009
200	0.015
300	0.023
400	0.029
500	0.033
600	0.038
700	0.042
800	0.046
900	0.051
1000	0.055
1100	0.059
1200	0.062
1300	0.066
1400	0.069
1500	0.073
1600	0.078
1700	0.081
1800	0.086
1900	0.089
2000	0.094
2100	0.100
2200	0.106
2300	0.112
2400	0.122
2500	0.130
2600	0.140
2700	0.148
2800	0.159



LOAD(lb)	COMP(in)
2900	0.168
3000	0.182
3100	0.198

DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO 20DF

PEG NO. 3/4 WO 2.0

KIND OF TEST EDGE DISTANCE TEST

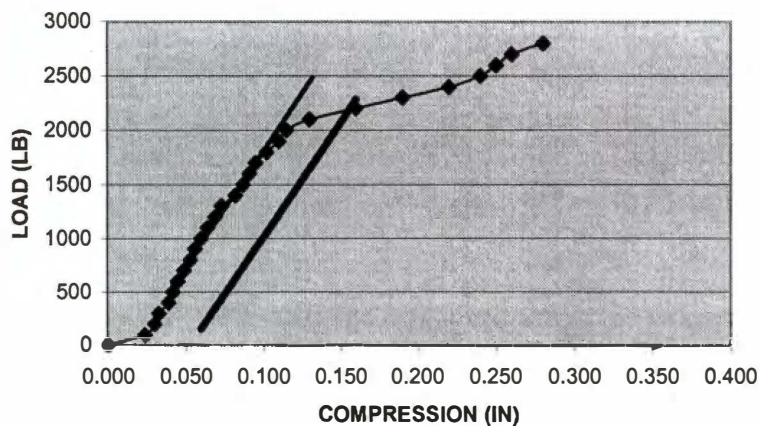
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.86 lbs
 *RINGS PER INCH 9
 *SAP 40%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 13%
 *KIND OF FAILURE elongated hole
DATA cracked

**LOAD @ FAILURE 2200
11% R.H.
2.00 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6 1/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 8
 *SAP 15%
 *SUMMERWOOD 25%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE: crushed
bent

LOAD(lb)	COMP(in)
0	0.000
100	0.024
200	0.030
300	0.033
400	0.039
500	0.042
600	0.045
700	0.049
800	0.053
900	0.056
1000	0.060
1100	0.064
1200	0.069
1300	0.073
1400	0.082
1500	0.087
1600	0.091
1700	0.095
1800	0.102
1900	0.110
2000	0.115
2100	0.130
2200	0.160
2300	0.190
2400	0.220
2500	0.240
2600	0.250
2700	0.260
2800	0.280



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: **24-Feb-04**

PIECE NO. **20DF**

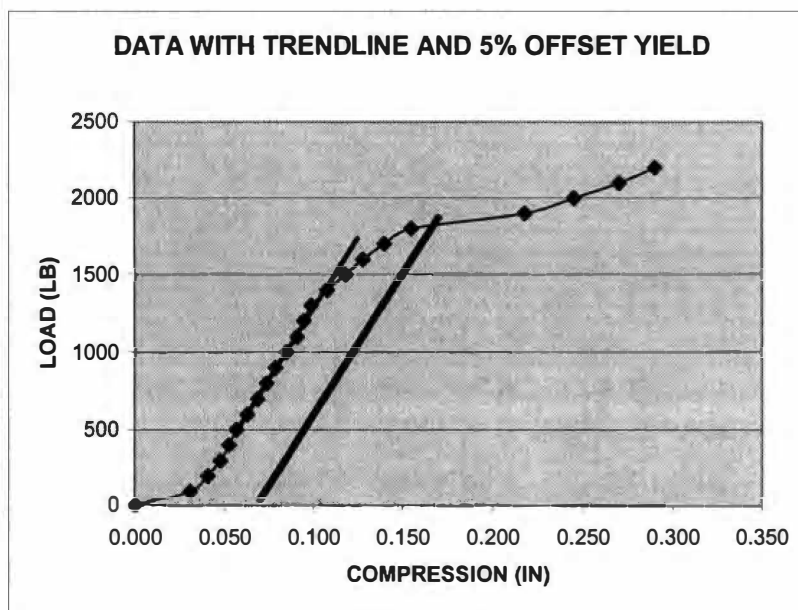
PEG NO. **3/4 WO -2.25**

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 3/4"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.81 LBS
 *RINGS PER INCH 9
 *SAP 40%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE did not fail
 DATA

*LOAD @ FAILURE 1871 LBS
 *11%R.H.
 *2.00 in
 *SPECIES OF PEG WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
 *PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 10
 *SAP 30%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE: shear
bent

LOAD(lb)	COMP(in)
0	0.000
100	0.031
200	0.041
300	0.048
400	0.053
500	0.057
600	0.063
700	0.069
800	0.074
900	0.079
1000	0.085
1100	0.091
1200	0.095
1300	0.099
1400	0.108
1500	0.118
1600	0.128
1700	0.140
1800	0.155
1900	0.218
2000	0.245
2100	0.270
2200	0.290



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO. 20DF

PEG NO. 3/4 WO -2.5

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 77.8 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PERP

*WEIGHT 1.86 LBS

*RINGS PER INCH 9

*SAP 40%

*SUMMERWOOD 15%

*SEASONING GREEN

*MOISTURE 10%

*KIND OF FAILURE did not fail
DATA

LOAD(lb)	COMP(in)
0	0.000
100	0.014
200	0.019
300	0.025
400	0.030
500	0.033
600	0.038
700	0.042
800	0.045
900	0.049
1000	0.054
1100	0.060
1200	0.065
1300	0.070
1400	0.075
1500	0.079
1600	0.084
1700	0.090
1800	0.097
1900	0.104
2000	0.112
2100	0.121
2200	0.233
2300	0.250

*LOAD @ FAILURE 2120 LBS

11%R.H.

2.5 in

*SPECIES OF PEG

WHITE OAK

*DIA. 3/4"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.085 LBS

*RINGS PER INCH 8

*SAP 15%

*SUMMERWOOD 25%

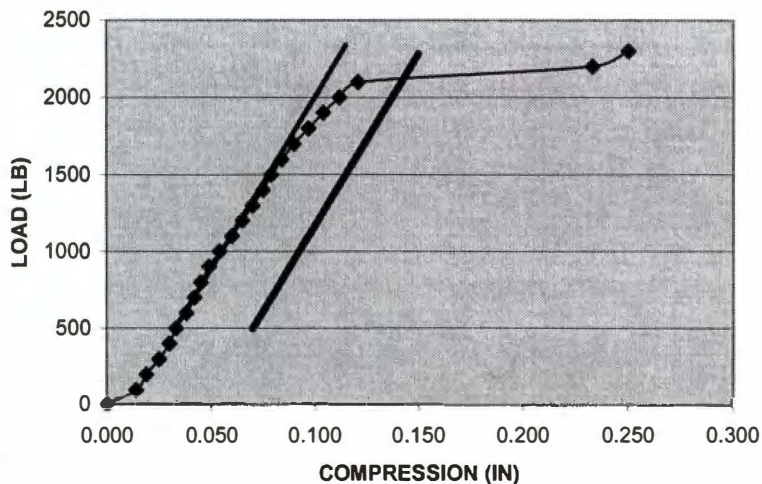
*SEASONING GREEN

*MOISTURE 6%

*KIND OF FAILURE: shear
bent

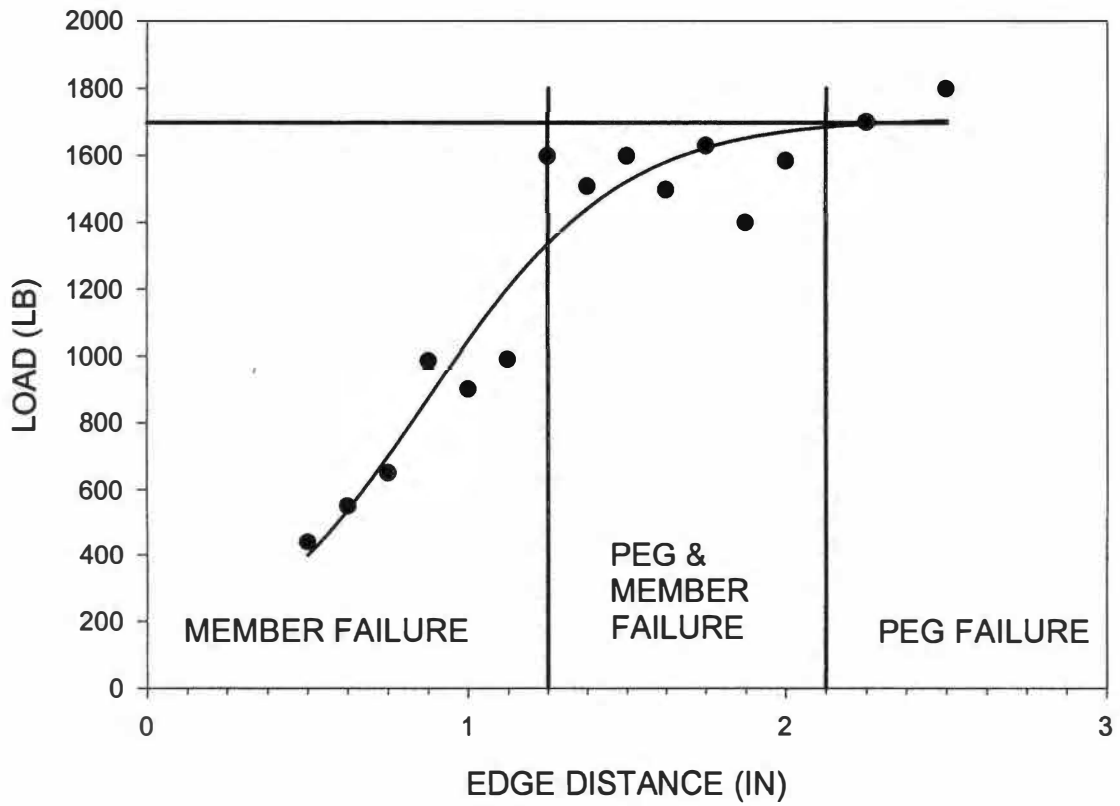


DATA WITH TRENDLINE AND 5% OFFSET YIELD



APPENDIX H – EDGE TEST-SOUTHERN PINE-3/4” WHITE OAK PEGS

EDGE TEST-SOUTHERN PINE-3/4" WHITE OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 04SP

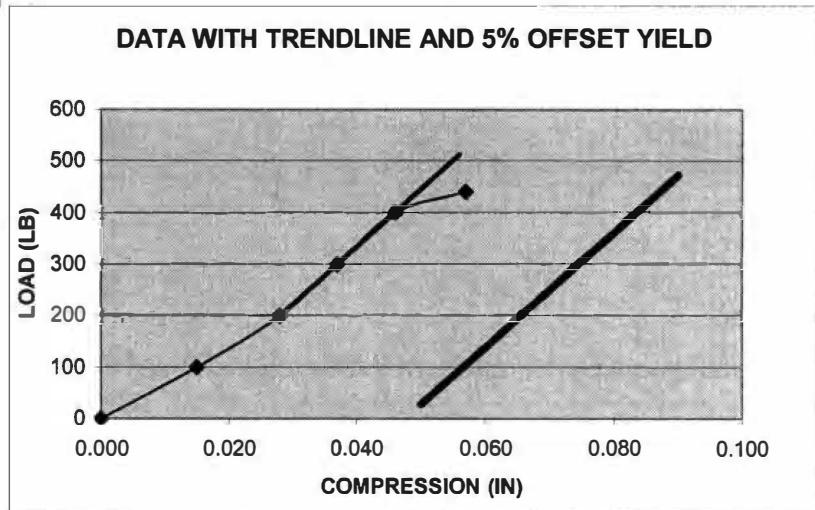
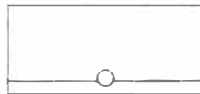
PEG NO. 3/4WO 0.5

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 71.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8 "
 *HEIGHT 5 5 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.315 LBS
 *RINGS PER INCH 6
 *SAP 30%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 1.5%
 *KIND OF FAILURE CRACKED

*LOAD @ FAILURE 440 LBS
28%R.H.
0 5
 *SPECIES OF PEG WHITE OAK
 *DIA. 3/4 "
 *LENGTH 6 "
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.8 LBS
 *RINGS PER INCH 4
 *SAP 0%
 *SUMMERWOOD 100%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.015
200	0.028
300	0.037
400	0.046
440	0.057



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 04SP

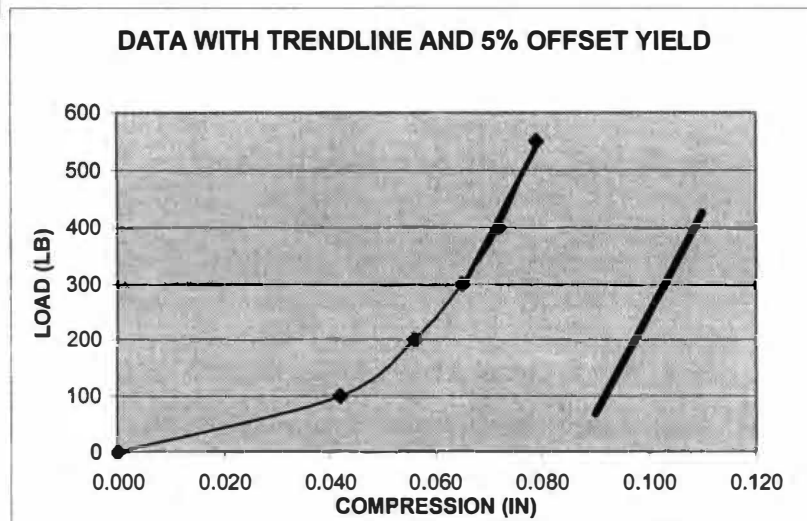
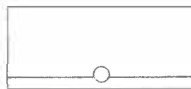
PEG NO. 3/4WO-0.625

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 71.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8 "
 *HEIGHT 5.5 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.22 LBS
 *RINGS PER INCH 6
 *SAP 30%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 1.5%
 *KIND OF FAILURE CRACKED

*LOAD @ FAILURE 550 LBS
28%R.H.
0 625
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4 "
 *LENGTH 6 "
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.75 LBS
 *RINGS PER INCH 10
 *SAP 0%
 *SUMMERWOOD 0%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.042
200	0.056
300	0.065
400	0.072
550	0.079



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 04SP

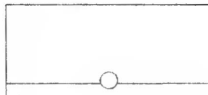
PEG NO. 3/4WO 0.75

KIND OF TEST EDGE DISTANCE TEST

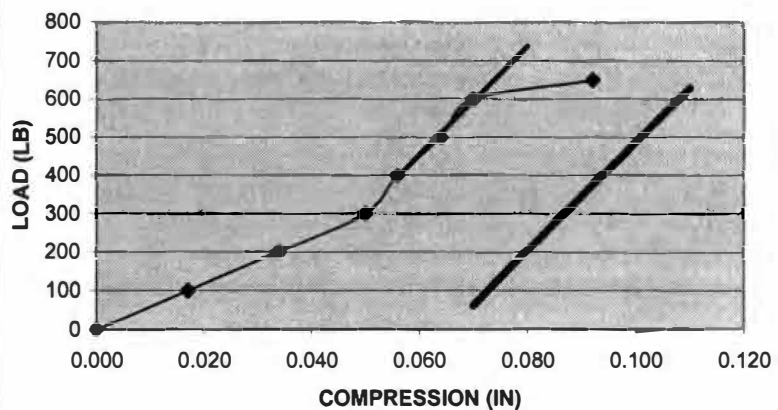
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 71.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11.75
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.28 LBS
 *RINGS PER INCH 6
 *SAP 30%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 1.5%
 *KIND OF FAILURE CRACKED

*LOAD @ FAILURE 650 LBS
 *28%R.H.
 *0.75
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6 3/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .075 LBS
 *RINGS PER INCH 18
 *SAP 0%
 *SUMMERWOOD 0%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.017
200	0.034
300	0.050
400	0.056
500	0.064
600	0.070
650	0.092



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 04SP

PEG NO. 3/4WO 0.875

KIND OF TEST EDGE DISTANCE TEST

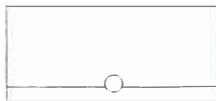
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 71.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11.75
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.26 LBS
 *RINGS PER INCH 6
 *SAP 30%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 1.5%
 *KIND OF FAILURE CRACKED
 DATA

*LOAD @ FAILURE 985 LBS
28%R.H.

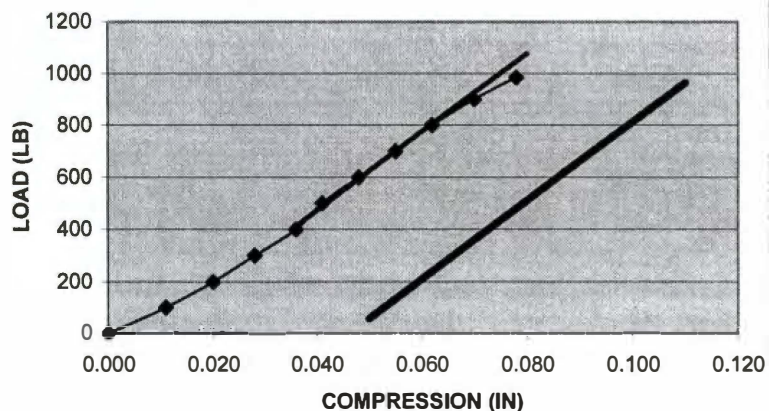
*SPECIES OF PEG WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"

*ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT .08 LBS
 *RINGS PER INCH 12
 *SAP 0%
 *SUMMERWOOD 0%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.011
200	0.020
300	0.028
400	0.036
500	0.041
600	0.048
700	0.055
800	0.062
900	0.070
985	0.078



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 04SP

PEG NO. 3/4WO1.00

KIND OF TEST EDGE DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 70.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 12.25
 *HEIGHT 5.5 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.265 LBS
 *RINGS PER INCH 6
 *SAP 30%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 1.5%
 *KIND OF FAILURE CRACKED

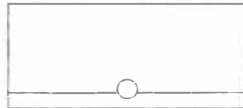
*LOAD @ FAILURE 900 LBS
28%R.H.

1
 *SPECIES OF PEG WHITE OAK

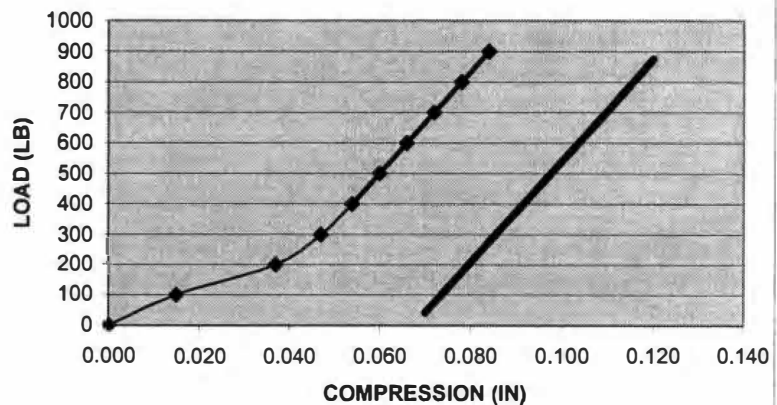
*DIA. 3/4 "
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP

*WEIGHT .17 LBS
 *RINGS PER INCH 6
 *SAP 20%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.015
200	0.037
300	0.047
400	0.054
500	0.060
600	0.066
700	0.072
800	0.078
900	0.084



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 25-Mar-03

PIECE NO. 04SP

PEG NO. 3/4WO1.125

KIND OF TEST EDGE DISTANCE TEST

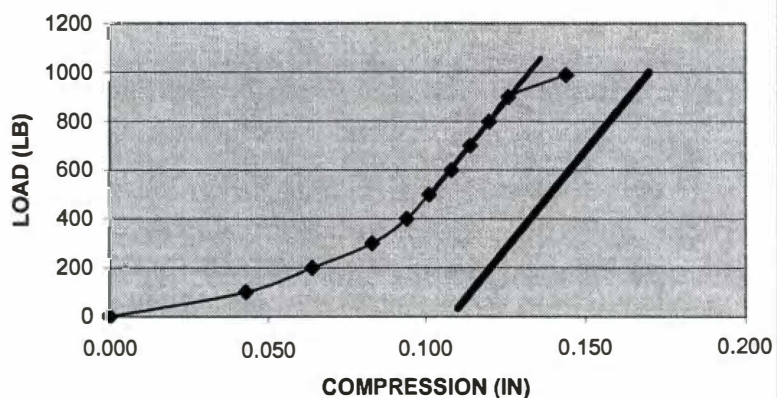
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 71.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11.78
 *HEIGHT 5.5 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.31 LBS
 *RINGS PER INCH 6
 *SAP 30%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 1.5%
 *KIND OF FAILURE CRACKED

*LOAD @ FAILURE 990 LBS
28%R.H.
1.125
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4 "
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .07 LBS
 *RINGS PER INCH 12
 *SAP 0%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.043
200	0.064
300	0.083
400	0.094
500	0.101
600	0.108
700	0.114
800	0.120
900	0.126
990	0.144



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 12SP

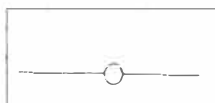
PEG NO. 3/4WO 1.25

KIND OF TEST EDGE DISTANCE TEST

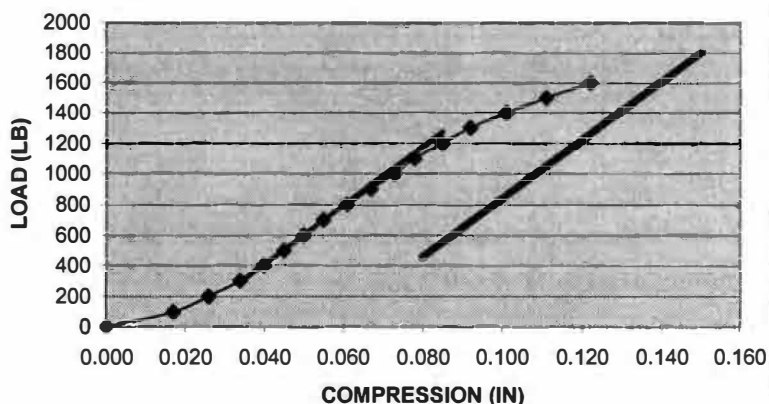
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8 "
 *HEIGHT 5.5 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.67 LBS
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 17.5%
 *KIND OF FAILURE elogated hole

*LOAD @ FAILURE 1600 LBS
 *53%R.H.
 *1.25
 *SPECIES OF PEG WHITE OAK
 *DIA. 3/4 "
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT .07 LBS
 *RINGS PER INCH 16
 *SAP 10%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.017
200	0.026
300	0.034
400	0.040
500	0.045
600	0.050
700	0.055
800	0.061
900	0.067
1000	0.073
1100	0.078
1200	0.085
1300	0.092
1400	0.101
1500	0.111
1600	0.122



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 12SP

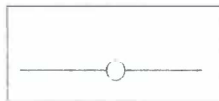
PEG NO. 3/4WO 1.375

KIND OF TEST EDGE DISTANCE TEST

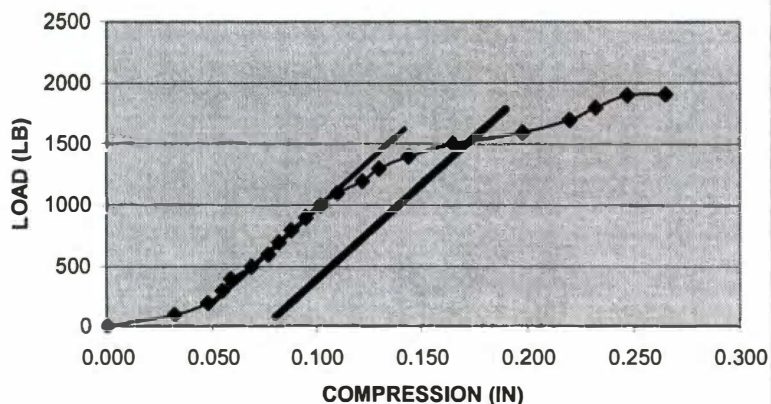
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 3/4 "
 *HEIGHT 5.5 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.66 LBS
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 19%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 1510 LBS
 *53%R.H.
1.375
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4 "
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .08 LBS
 *RINGS PER INCH 16
 *SAP 10%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	COMP(in)
0	0.000
100	0.032
200	0.048
300	0.055
400	0.059
500	0.069
600	0.077
700	0.082
800	0.088
900	0.095
1000	0.102
1100	0.110
1200	0.122
1300	0.130
1400	0.144
1500	0.165
1600	0.198
1700	0.220
1800	0.232
1900	0.247
1908	0.265



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 12SP

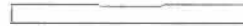
PEG NO. 3/4WO1.5

KIND OF TEST EDGE DISTANCE TEST

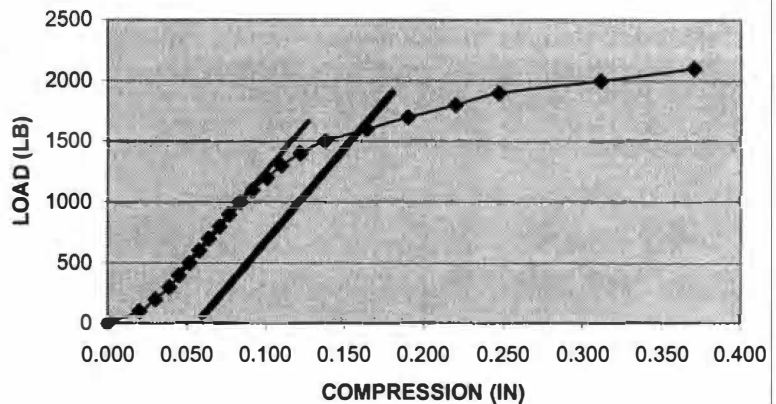
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8 "
 *HEIGHT 5.5 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.65 LBS
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 16%
 *KIND OF FAILURE elagated hole
 DATA cracks

*LOAD @ FAILURE 1600 LBS
 *53%R.H.
 *1.5
 *SPECIES OF PEG WHITE OAK
 *DIA. 3/4 "
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
 *PERP
 *WEIGHT .08 LBS
 *RINGS PER INCH 16
 *SAP 1%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.020
200	0.030
300	0.039
400	0.045
500	0.052
600	0.058
700	0.064
800	0.071
900	0.077
1000	0.084
1100	0.092
1200	0.101
1300	0.110
1400	0.122
1500	0.138
1600	0.164
1700	0.190
1800	0.220
1900	0.247
2000	0.311
2100	0.370



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 12SP

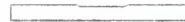
PEG NO. 3/4WO 1.625

KIND OF TEST EDGE DISTANCE TEST

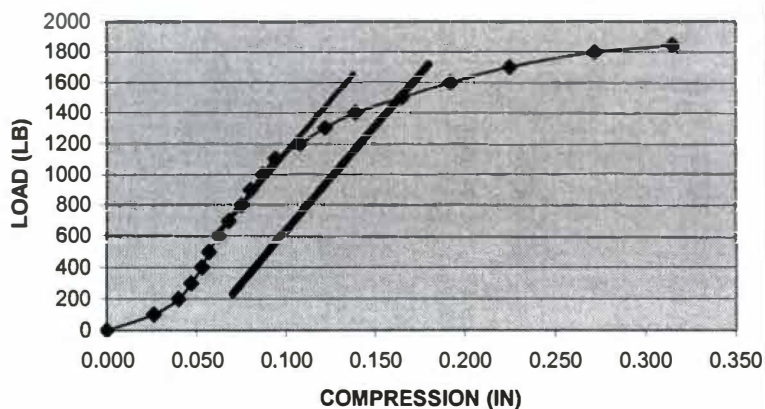
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8 "
 *HEIGHT 5.5 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.62 LBS
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 13%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 1500 LBS
 *53%R.H. 1.625
 *SPECIES OF PEG WHITE OAK
 *DIA. 3/4 "
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT .08 LBS
 *RINGS PER INCH 22
 *SAP 10%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE: crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.026
200	0.040
300	0.047
400	0.053
500	0.057
600	0.062
700	0.068
800	0.075
900	0.080
1000	0.087
1100	0.094
1200	0.108
1300	0.122
1400	0.139
1500	0.165
1600	0.192
1700	0.225
1800	0.272
1850	0.315



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 12SP

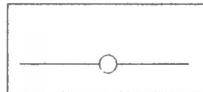
PEG NO. 3/4WO 1.75

KIND OF TEST EDGE DISTANCE TEST

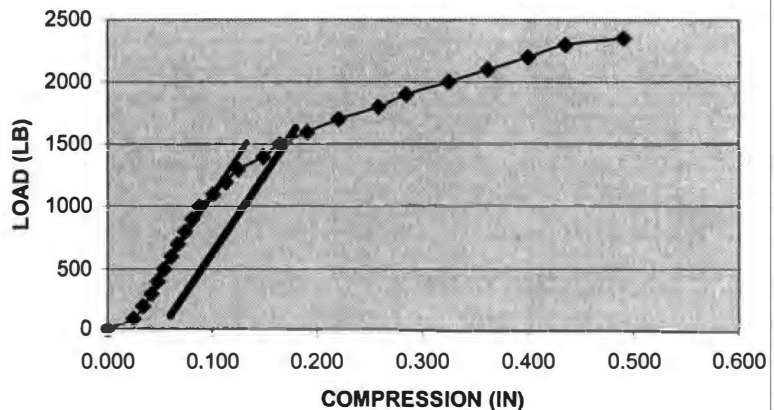
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 3/4 "
 *HEIGHT 5.5 "
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.60 LBS
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 19%
 *KIND OF FAILURE cracked
 DATA elagated hole

*LOAD @ FAILURE 1630 LBS
53%R.H.
1.75
 *SPECIES OF PEG WHITE OAK
 *DIA. 3/4 "
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT .08 LBS
 *RINGS PER INCH 12
 *SAP 5%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: slightly
crushed

LOAD(lb)	COMP(in)
0	0.000
100	0.025
200	0.034
300	0.042
400	0.048
500	0.054
600	0.061
700	0.067
800	0.074
900	0.081
1000	0.088
1100	0.101
1200	0.113
1300	0.125
1400	0.149
1500	0.165
1600	0.191
1700	0.221
1800	0.259
1900	0.285
2000	0.325
2100	0.362
2200	0.400
2300	0.435
2350	0.490



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-May-03

PIECE NO. 12SP

PEG NO. 3/4WO 1.875

KIND OF TEST EDGE DISTANCE TEST

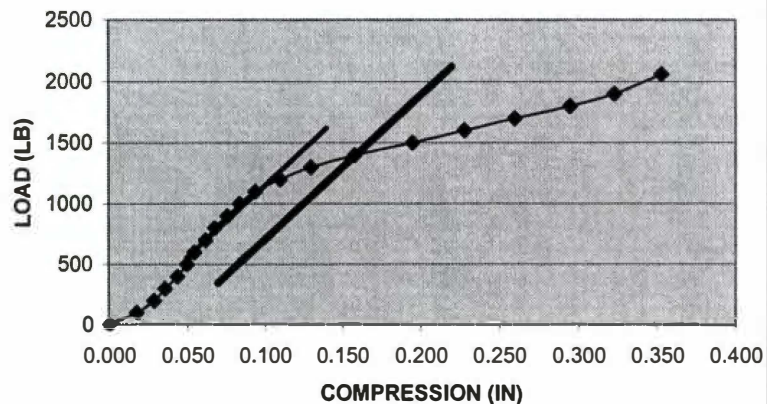
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 11 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.63 LBS
 *RINGS PER INCH 15
 *SAP 30%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 18.5%
 *KIND OF FAILURE elagated hole
 DATA cracked

*LOAD @ FAILURE 1400 LBS
 *53%R.H.
 *1.875
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .08 LBS
 *RINGS PER INCH 14
 *SAP 5%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 9%
 *KIND OF FAILURE: slightly

LOAD(lb)	COMP(in)
0	0.000
100	0.018
200	0.029
300	0.036
400	0.044
500	0.050
600	0.055
700	0.062
800	0.068
900	0.076
1000	0.084
1100	0.094
1200	0.110
1300	0.130
1400	0.158
1500	0.195
1600	0.228
1700	0.260
1800	0.295
1900	0.323
2060	0.353



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 19-Feb-03

PIECE NO. 18SP

PEG NO. 3/4WO 2.0

KIND OF TEST EDGE DISTANCE TEST

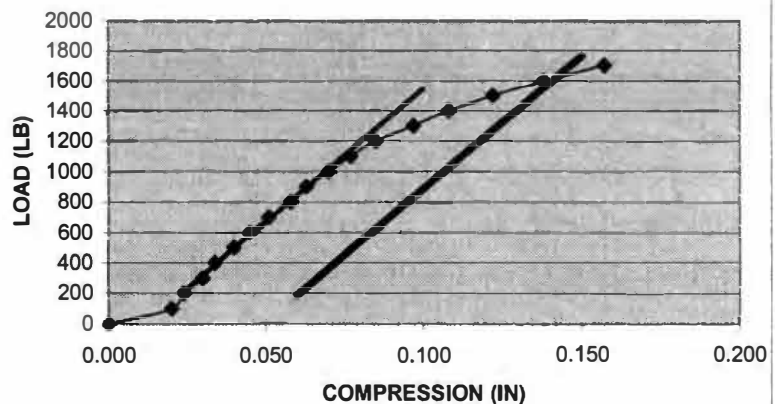
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.28 LBS
 *RINGS PER INCH 4
 *SAP 80%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE elogated hole

*LOAD @ FAILURE 1586 LBS
 *11 %R.H.
 *2.00
 *SPECIES OF PEG WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
 *PERP
 *WEIGHT .08 LBS
 *RINGS PER INCH 18
 *SAP 50%
 *SUMMERWOOD 75%
 *SEASONING GREEN
 *MOISTURE 5%
 *KIND OF FAILURE: shear bent

LOAD(lb)	COMP(in)
0	0.000
100	0.020
200	0.024
300	0.030
400	0.034
500	0.040
600	0.045
700	0.051
800	0.058
900	0.063
1000	0.070
1100	0.077
1200	0.085
1300	0.097
1400	0.108
1500	0.122
1600	0.138
1700	0.157



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Feb-04

PIECE NO. 18SP

PEG NO. 3/4WO 2.25

KIND OF TEST EDGE DISTANCE TEST

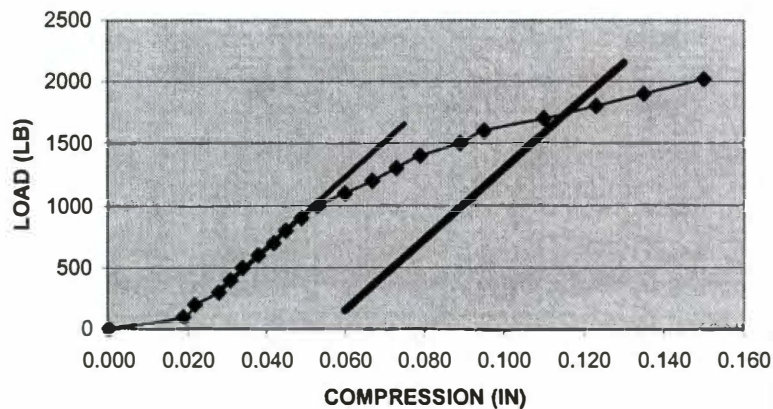
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.44 LBS
 *RINGS PER INCH 4
 *SAP 80%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 1700 LBS
 *11 %R.H.
2.25
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .095 LBS
 *RINGS PER INCH 14
 *SAP 25%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 3%
 *KIND OF FAILURE: bent

LOAD(lb)	COMP(in)
0	0.000
100	0.019
200	0.022
300	0.028
400	0.031
500	0.034
600	0.038
700	0.042
800	0.045
900	0.049
1000	0.053
1100	0.060
1200	0.067
1300	0.073
1400	0.079
1500	0.089
1600	0.095
1700	0.110
1800	0.123
1900	0.135
2020	0.150



DATA WITH TRENDLINE AND 5% OFFSET YEILD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO. 18SP

PEG NO. 3/4WO 2.5

KIND OF TEST EDGE DISTANCE TEST

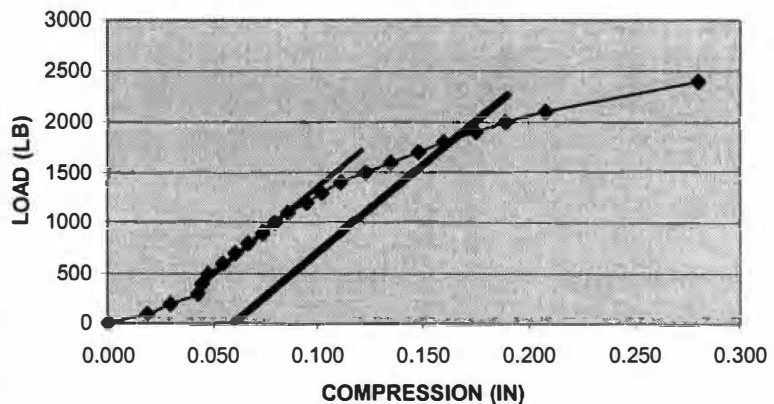
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 77.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PERP
 *WEIGHT 1.42 LBS
 *RINGS PER INCH 4
 *SAP 80%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 14%
 *KIND OF FAILURE elongated hole
 DATA

*LOAD @ FAILURE 1800 LBS
 *11 %R.H.
2.5
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6 1/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT .1 LBS
 *RINGS PER INCH 6
 *SAP 10%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE: shear
bent

LOAD(lb)	COMP(in)
0	0.000
100	0.019
200	0.030
300	0.043
400	0.045
500	0.048
600	0.055
700	0.061
800	0.067
900	0.074
1000	0.080
1100	0.086
1200	0.095
1300	0.102
1400	0.111
1500	0.123
1600	0.135
1700	0.148
1800	0.160
1900	0.175
2000	0.189
2100	0.208
2400	0.280

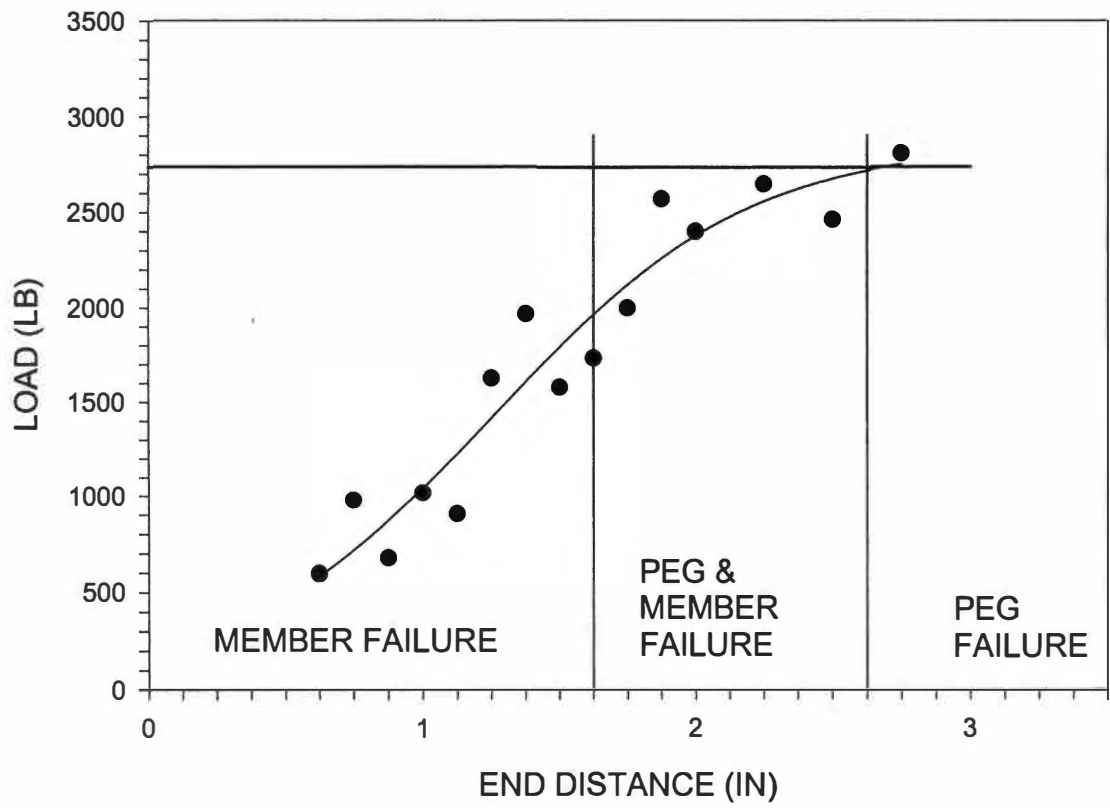


DATA WITH TRENDLINE AND 5% OFFSET YIELD



APPENDIX I – END TEST-DOUGLAS FIR-1” RED OAK PEGS

END TEST-DOUGLAS FIR-1" RED OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

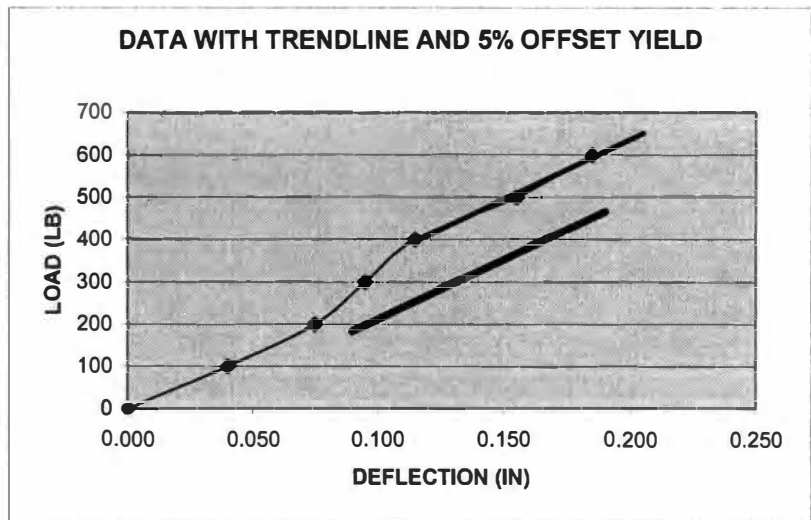
PEG NO. 1 RO -0.625

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.49 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 600 LBS
73.5%R.H.
0.625 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 5
 *SAP 15%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.040
200	0.075
300	0.095
400	0.115
500	0.155
600	0.185



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

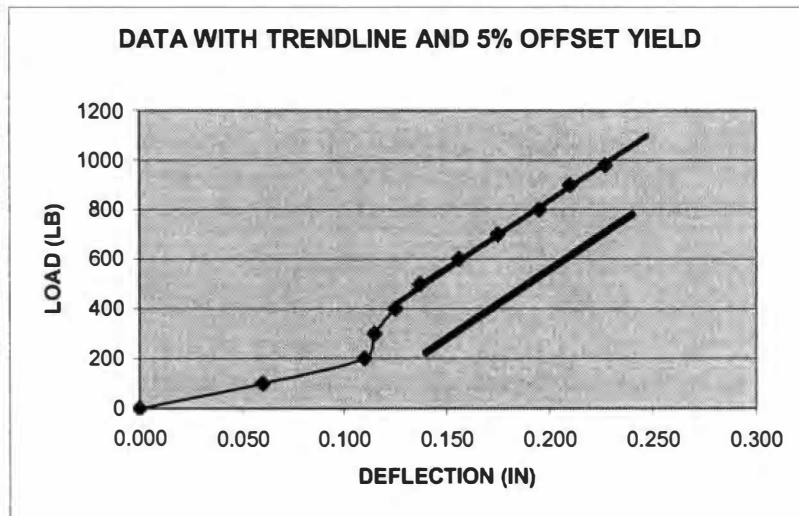
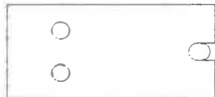
PEG NO. 1 RO -0.75

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.7 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.36 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 980 LBS
73.7%R.H.
0.75 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 7
 *SAP 25%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.060
200	0.110
300	0.115
400	0.125
500	0.137
600	0.156
700	0.175
800	0.195
900	0.210
980	0.227



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

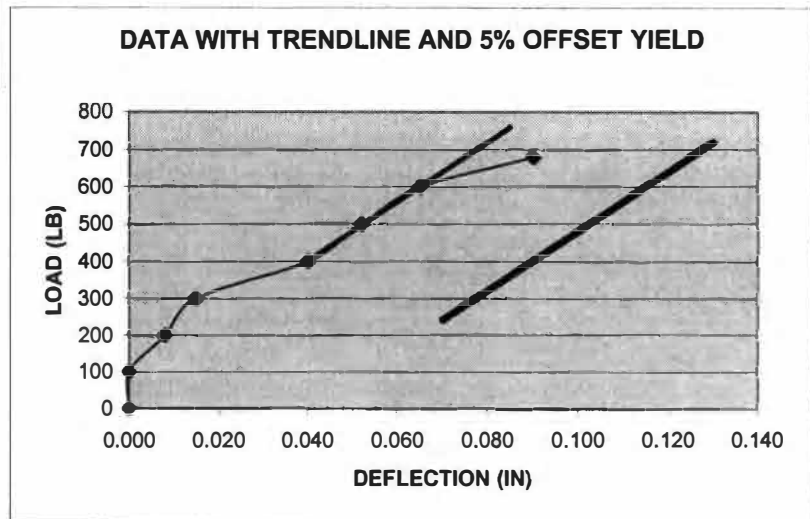
PEG NO. 1 RO -0.875

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 72.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.37 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 9%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 680 LBS
73.9%R.H.
0.875 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.11 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 5.0%
 *KIND OF FAILURE:

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.000
200	0.008
300	0.015
400	0.040
500	0.052
600	0.065
680	0.090



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UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

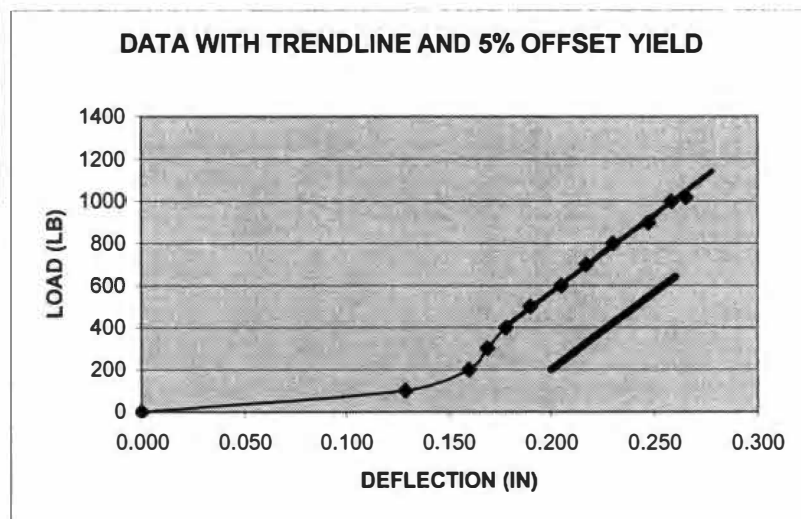
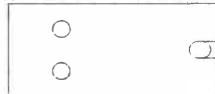
PEG NO. 1 RO -1.00

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.37 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 9%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 1020 LBS
74.1%R.H.
1.00 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 7
 *SAP 25%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 5.0%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.129
200	0.160
300	0.169
400	0.178
500	0.190
600	0.205
700	0.217
800	0.230
900	0.247
1000	0.258
1020	0.265



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DATE: 24-Sep-03

PIECE NO 15DF

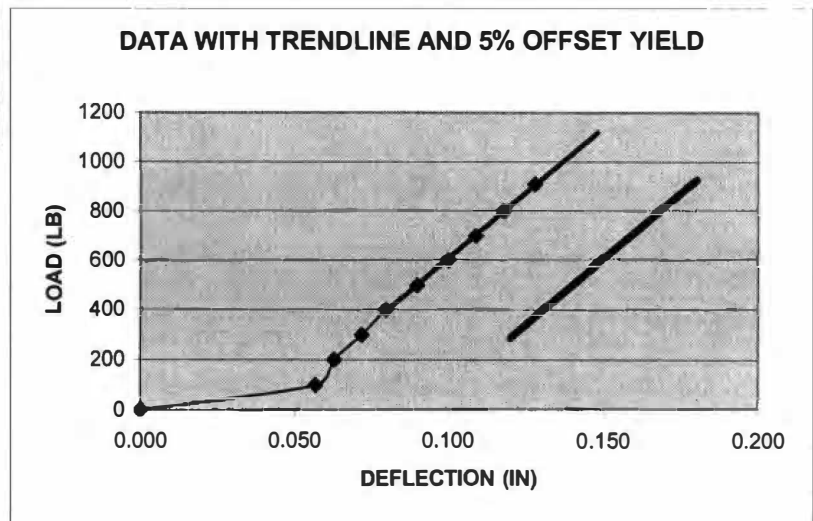
PEG NO. 1 RO -1.125

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.138 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 910 LBS
 *74.2%R.H.
 *1.125 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 6
 *SAP 10%
 *SUMMERWOOD 5%
 *SEASONING GREEN
 *MOISTURE 5.0%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.057
200	0.063
300	0.072
400	0.080
500	0.090
600	0.100
700	0.109
800	0.118
910	0.128



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

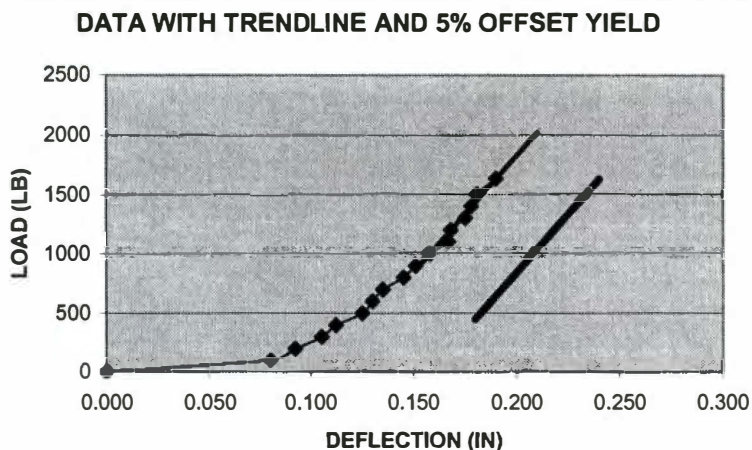
PEG NO. 1 RO -1.25

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.40 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 1630 LBS
74.3%R.H.
1.25 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 9
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.080
200	0.092
300	0.105
400	0.112
500	0.125
600	0.130
700	0.135
800	0.145
900	0.151
1000	0.158
1100	0.167
1200	0.168
1300	0.175
1400	0.178
1500	0.181
1630	0.190



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

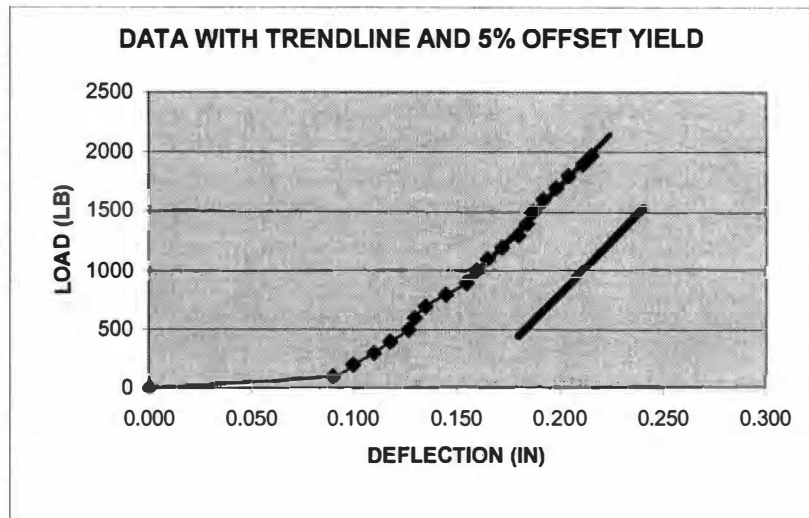
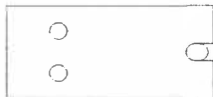
PEG NO. 1 RO -1.375

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.40 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 9%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 1970 LBS
74.3%R.H.
1.375 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 8
 *SAP 30%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.090
200	0.100
300	0.110
400	0.118
500	0.127
600	0.130
700	0.135
800	0.145
900	0.155
1000	0.160
1100	0.165
1200	0.172
1300	0.180
1400	0.184
1500	0.187
1600	0.192
1700	0.198
1800	0.204
1900	0.211
1970	0.215



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

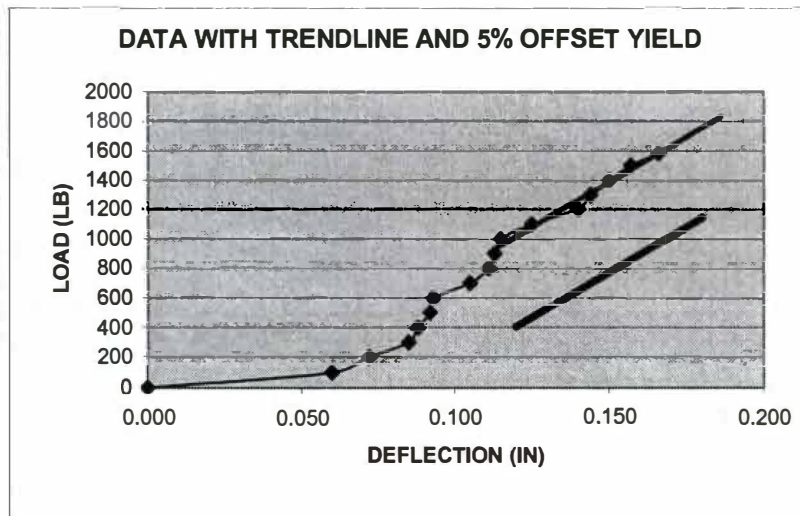
PEG NO. 1 RO -1.5

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.40 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 1580 LBS
74.4%R.H.
1.5 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 5
 *SAP 20%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.060
200	0.072
300	0.085
400	0.088
500	0.092
600	0.093
700	0.105
800	0.111
900	0.113
1000	0.115
1100	0.125
1200	0.140
1300	0.144
1400	0.15
1500	0.157
1580	0.166



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

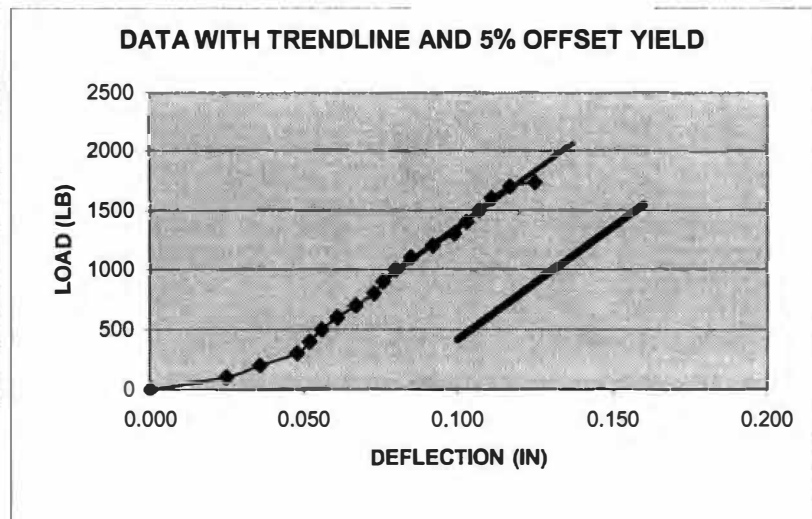
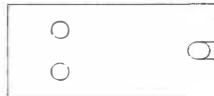
PEG NO. 1 RO -1.625

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.49 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 1735 LBS
 *74.3%R.H.
 *1.5 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 9
 *SAP 15%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 5.0%
 *KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.025
200	0.036
300	0.048
400	0.052
500	0.056
600	0.061
700	0.067
800	0.073
900	0.076
1000	0.080
1100	0.085
1200	0.092
1300	0.099
1400	0.103
1500	0.107
1600	0.111
1700	0.117
1735	0.125



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

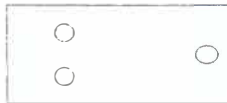
PEG NO. 1 RO -1.75

KIND OF TEST END DISTANCE TEST

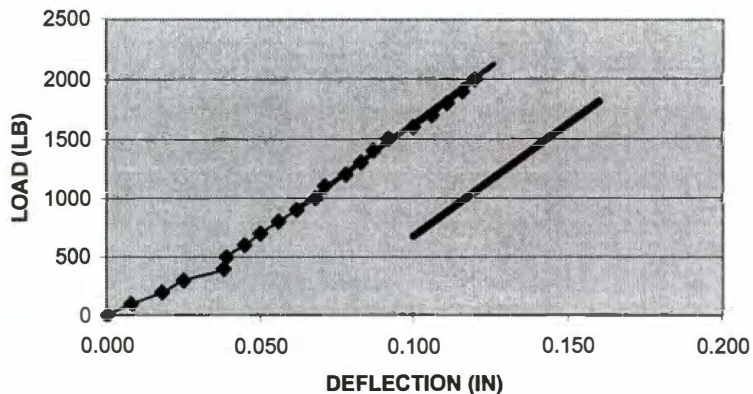
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.41 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE elogated hole
 DATA

*LOAD @ FAILURE 2000 LBS
74.3%R.H.
1.75 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 7
 *SAP 20%
 *SUMMERWOOD 60%
 *SEASONING GREEN
 *MOISTURE 6.5%
 *KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.008
200	0.018
300	0.025
400	0.038
500	0.039
600	0.045
700	0.050
800	0.056
900	0.062
1000	0.068
1100	0.071
1200	0.078
1300	0.083
1400	0.087
1500	0.092
1600	0.100
1700	0.106
1800	0.111
1900	0.116
2000	0.120



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

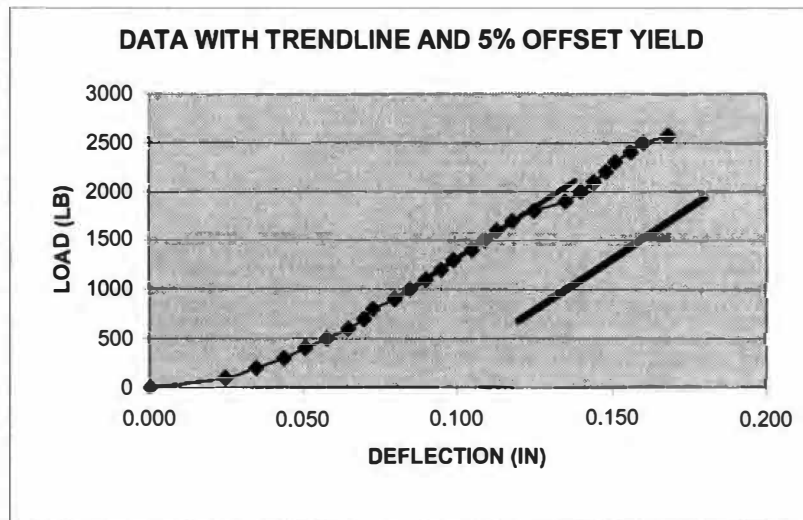
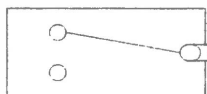
PEG NO. 1 RO -1.875

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.41 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE cracked
 DATA relish

*LOAD @ FAILURE 2570 LBS
74.4%R.H.
1.875 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 10
 *SAP 25%
 *SUMMERWOOD 65%
 *SEASONING GREEN
 *MOISTURE 6.5%
 *KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.025
200	0.035
300	0.044
400	0.051
500	0.058
600	0.065
700	0.070
800	0.073
900	0.080
1000	0.085
1100	0.090
1200	0.095
1300	0.099
1400	0.105
1500	0.109
1600	0.113
1700	0.118
1800	0.125
1900	0.135
2000	0.140
2100	0.144
2200	0.148
2300	0.151
2400	0.156
2500	0.160
2570	0.168



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

PEG NO. 1 RO -2.00

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 71.8 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.42 LBS

*RINGS PER INCH 5

*SAP 25%

*SUMMERWOOD 20%

*SEASONING GREEN

*MOISTURE 8%

*KIND OF FAILURE cracked
DATA relish

*LOAD @ FAILURE 2400 LBS

72.4%R.H.

2.00 in

*SPECIES OF PEG

RED OAK

*DIA. 1"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.12 LBS

*RINGS PER INCH 7

*SAP 10%

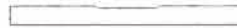
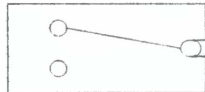
*SUMMERWOOD 15%

*SEASONING GREEN

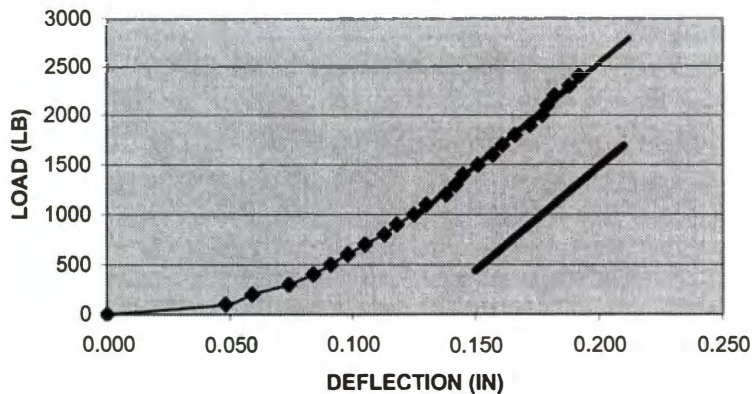
*MOISTURE 5.5%

*KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.048
200	0.059
300	0.074
400	0.084
500	0.091
600	0.098
700	0.105
800	0.113
900	0.118
1000	0.125
1100	0.130
1200	0.138
1300	0.142
1400	0.145
1500	0.151
1600	0.157
1700	0.161
1800	0.166
1900	0.172
2000	0.177
2100	0.179
2200	0.182
2300	0.188
2400	0.192



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO 19DF

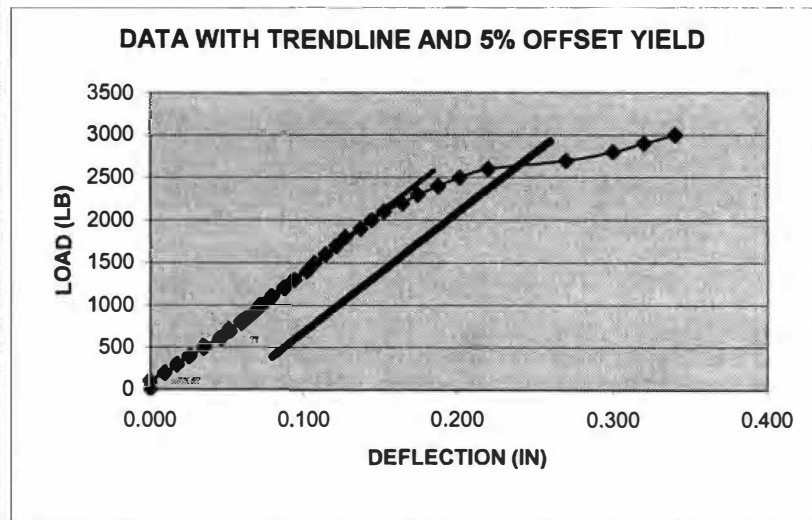
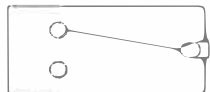
PEG NO. 1 RO -2.25

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 79 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 2.1 LBS
 *RINGS PER INCH 19
 *SAP 25%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE cracked
 DATA relish

*LOAD @ FAILURE 2648 LBS
 *11%R.H.
 *2.25 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 13
 *SAP 50%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 7.0%
 *KIND OF FAILURE: cracked
bent

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.000
200	0.010
300	0.018
400	0.026
500	0.035
600	0.046
700	0.052
800	0.060
900	0.067
1000	0.073
1100	0.080
1200	0.088
1300	0.095
1400	0.103
1500	0.108
1600	0.115
1700	0.122
1800	0.128
1900	0.138
2000	0.145
2100	0.153
2200	0.165
2300	0.175
2400	0.188
2500	0.202
2600	0.220
2700	0.270
2800	0.300



LOAD(lb)	DEFLECT(in)
2900	0.320
3000	0.340

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO 19DF

PEG NO. 1 RO -2.5

KIND OF TEST END DISTANCE TEST

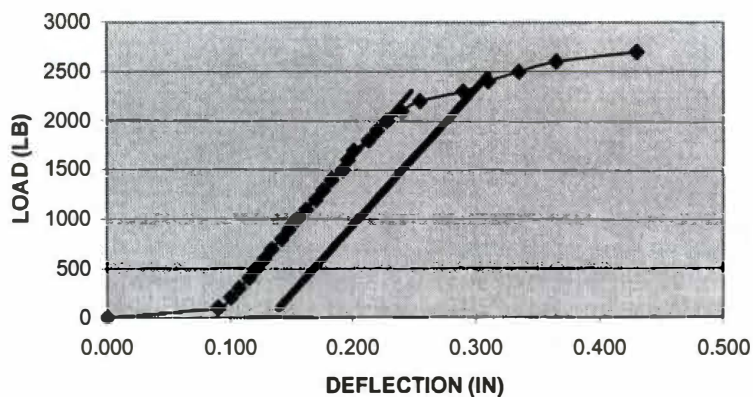
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 79 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 2.14 LBS
 *RINGS PER INCH 19
 *SAP 25%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE cracked
 DATA relish

*LOAD @ FAILURE 2463 LBS
11%R.H.
2.5 in
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 15
 *SAP 35%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 8.0%
 *KIND OF FAILURE: cracked
bent

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.090
200	0.100
300	0.107
400	0.115
500	0.121
600	0.128
700	0.134
800	0.142
900	0.148
1000	0.155
1100	0.162
1200	0.170
1300	0.176
1400	0.183
1500	0.192
1600	0.196
1700	0.201
1800	0.213
1900	0.220
2000	0.228
2100	0.240
2200	0.255
2300	0.290
2400	0.310
2500	0.335
2600	0.365
2700	0.430



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO 19DF

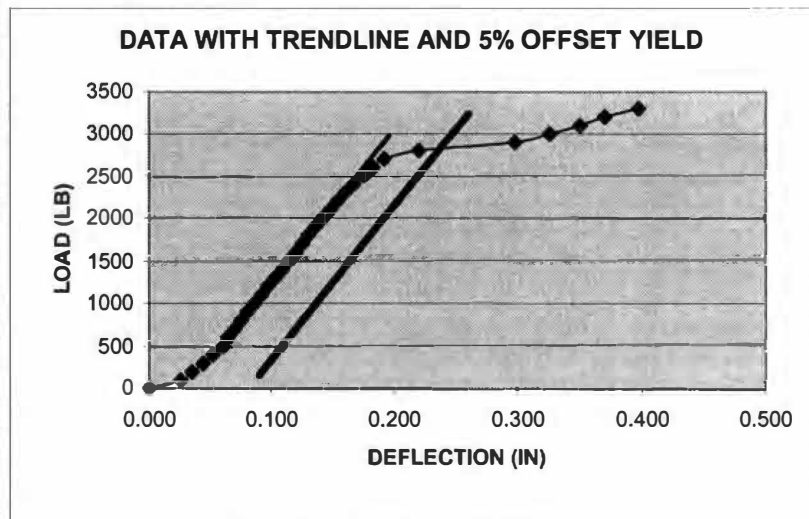
PEG NO. 1 RO -2.75

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 2.19 LBS
 *RINGS PER INCH 19
 *SAP 25%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 2810 LBS
 *11%R.H.
 *2.75 in
 *SPECIES OF PEG RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 12
 *SAP 35%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 8.0%
 *KIND OF FAILURE: cracked bent

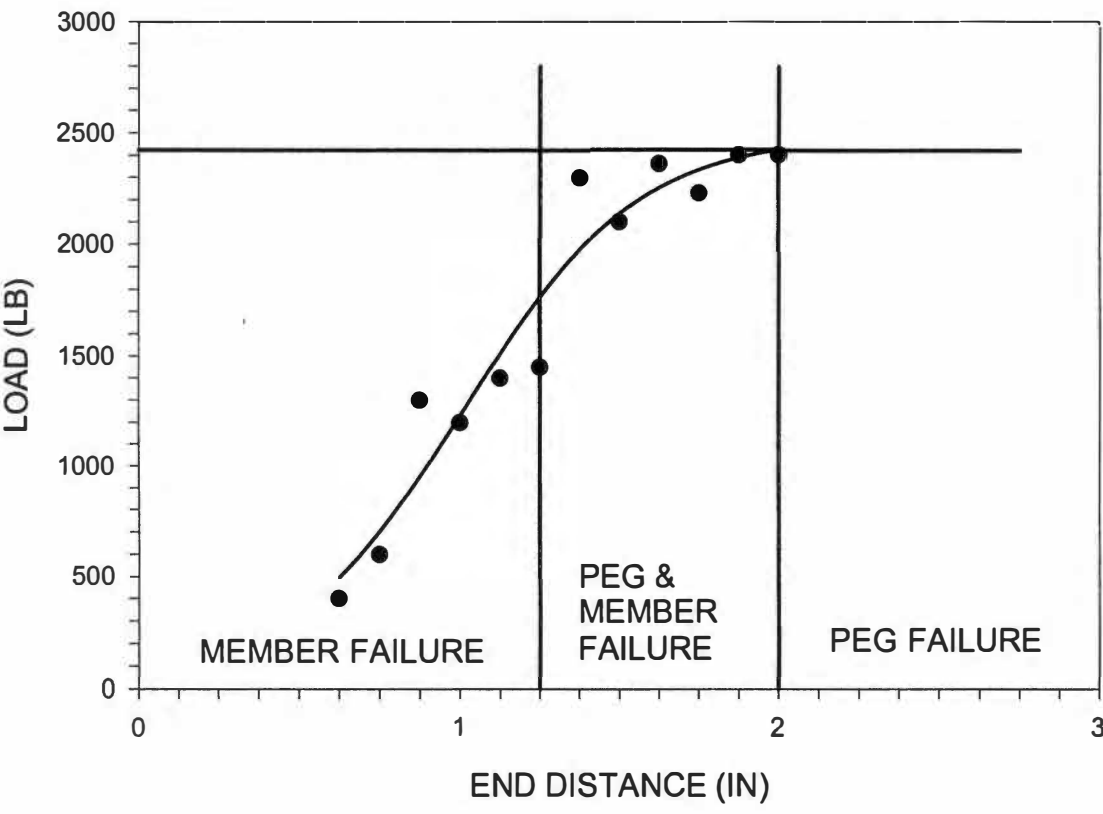
LOAD(lb)	DEFLECT(in)
0	0.000
100	0.026
200	0.035
300	0.044
400	0.052
500	0.060
600	0.064
700	0.070
800	0.075
900	0.080
1000	0.086
1100	0.092
1200	0.097
1300	0.103
1400	0.109
1500	0.114
1600	0.120
1700	0.125
1800	0.130
1900	0.136
2000	0.142
2100	0.148
2200	0.154
2300	0.160
2400	0.167
2500	0.175
2600	0.183
2700	0.192
2800	0.220



LOAD(lb)	DEFLECT(in)	LOAD(lb)	DEFLECT(in)
2900	0.298	3300	0.397
3000	0.326		
3100	0.350		
3200	0.370		

APPENDIX J – END TEST-SOUTHERN PINE-1” RED OAK PEGS

END TEST-SOUTHERN PINE-1" RED OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

PEG NO. 1RO-0.625

KIND OF TEST END DISTANCE TEST

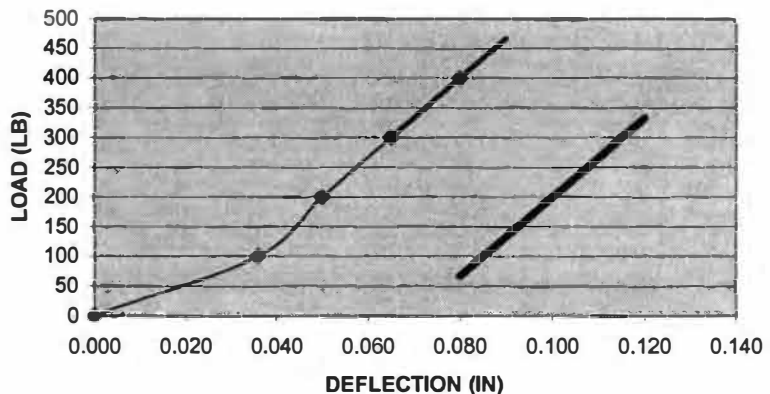
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.30 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 11.5%
 *KIND OF FAILURE relish
 DATA

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.036
200	0.050
300	0.065
400	0.080



*LOAD @ FAILURE 400 LBS
 *34 %R.H.
0.625"
 *SPECIES OF PEG
RED OAK
 *DIA. 1 "
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 7
 *SAP 10%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

PEG NO. 1RO-0.75

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.36 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 11.5%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 600 LBS
 *34 %R.H.

0.75"

*SPECIES OF PEG
RED OAK

*DIA. 1"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD
PERP

*WEIGHT 0.12 LBS

*RINGS PER INCH 3

*SAP 10%

*SUMMERWOOD 20%

*SEASONING GREEN

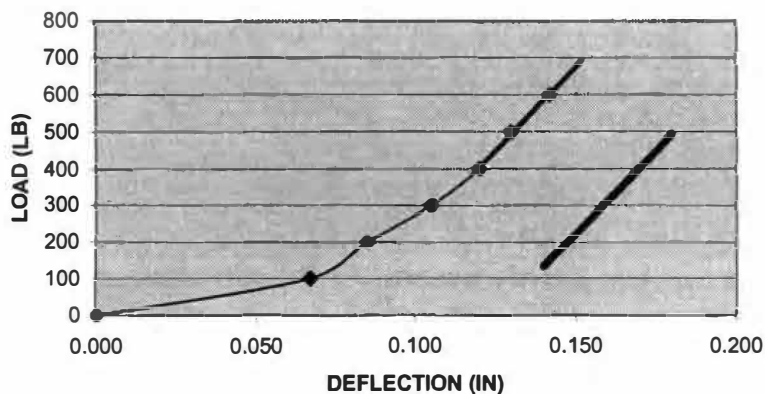
*MOISTURE DRY

*KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.067
200	0.085
300	0.105
400	0.120
500	0.130
600	0.142



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

PEG NO. 1RO-0.875

KIND OF TEST END DISTANCE TEST

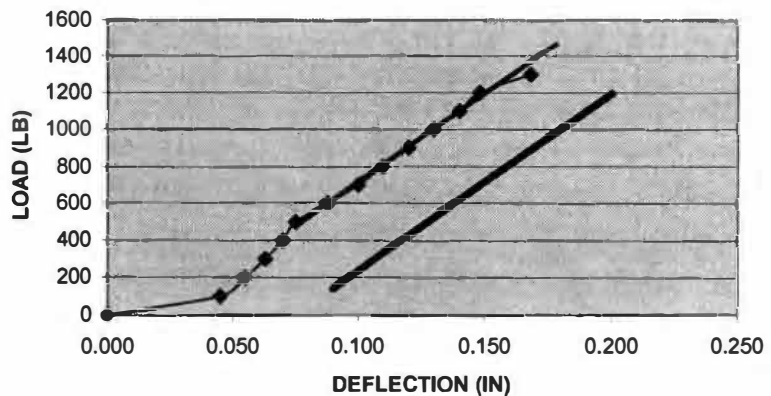
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.36 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 11.5%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 1300 LBS
 *34 %R.H.
 *0.875"
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.11 LBS
 *RINGS PER INCH 8
 *SAP 20%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE:

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.045
200	0.055
300	0.063
400	0.070
500	0.075
600	0.088
700	0.100
800	0.110
900	0.120
1000	0.130
1100	0.140
1200	0.148
1300	0.168



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

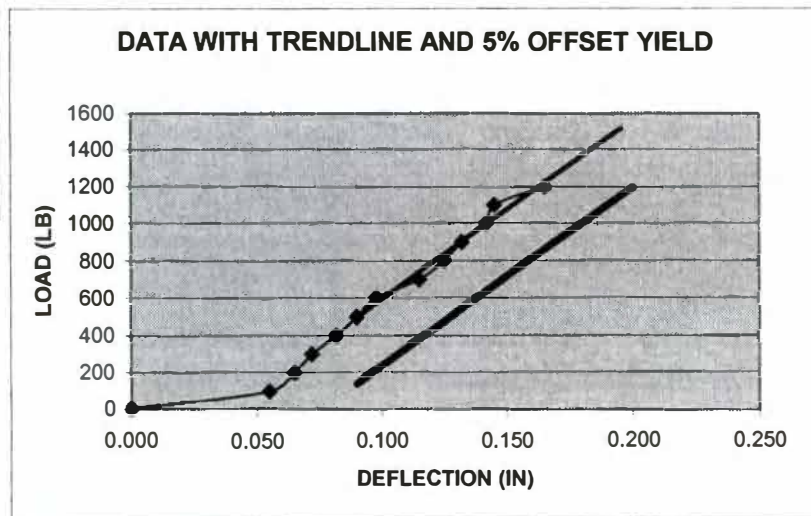
PEG NO. 1RO-1.00

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.35 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 11.5%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 1200 LBS
 *34 %R.H.
 *1.00"
 *SPECIES OF PEG
 *RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
 *PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 10
 *SAP 35%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.055
200	0.065
300	0.072
400	0.082
500	0.090
600	0.098
700	0.115
800	0.125
900	0.132
1000	0.142
1100	0.145
1200	0.165



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

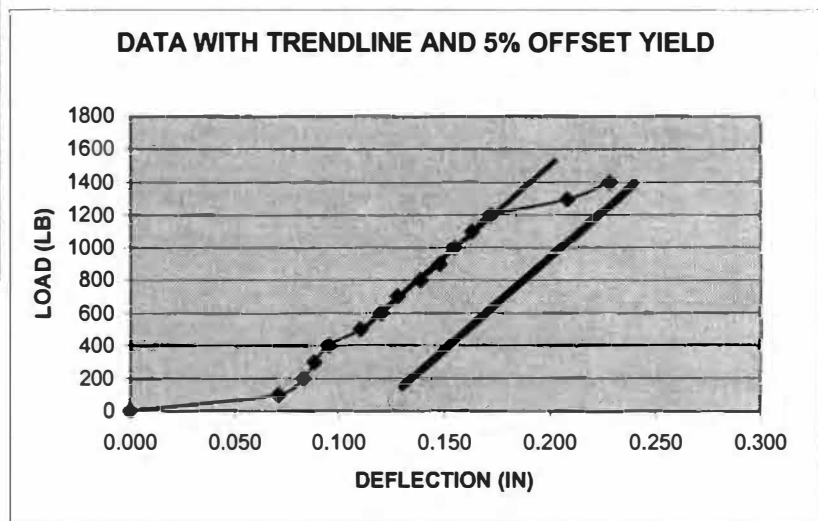
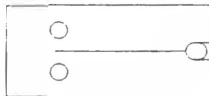
PEG NO. 1RO-1.125

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 70.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.38 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 12.0%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 1400 LBS
 *34 %R.H.
 *1.125"
 *SPECIES OF PEG
RED OAK
 *DIA. 1 "
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 9
 *SAP 20%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.071
200	0.083
300	0.088
400	0.095
500	0.110
600	0.120
700	0.128
800	0.139
900	0.148
1000	0.155
1100	0.163
1200	0.172
1300	0.208
1400	0.228



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

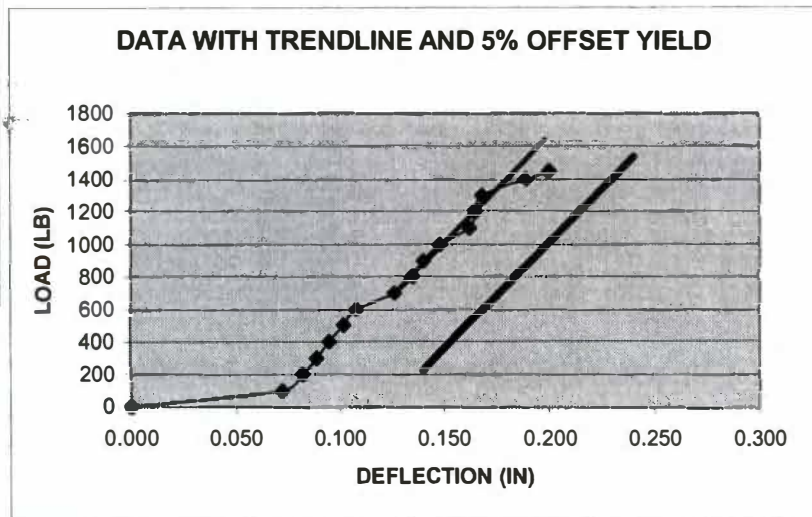
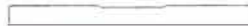
PEG NO. 1RO-1.25

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 70.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.37 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 12.5%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 1450 LBS
 *34 %R.H.
 *1.25"
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 8
 *SAP 20%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: crushed
slightly

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.072
200	0.082
300	0.089
400	0.095
500	0.102
600	0.108
700	0.126
800	0.135
900	0.140
1000	0.148
1100	0.162
1200	0.165
1300	0.168
1400	0.189
1450	0.200



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

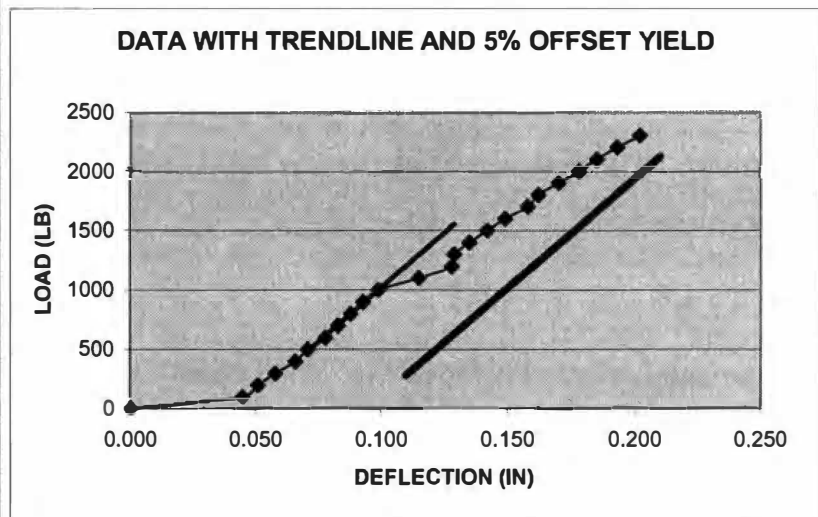
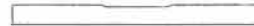
PEG NO. 1RO-1.375

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 70.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.39 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 12.5%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 2300 LBS
 *34 %R.H.
 *1.375"
 *SPECIES OF PEG RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.11 LBS
 *RINGS PER INCH 4
 *SAP 80%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: crushed
slightly

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.045
200	0.051
300	0.058
400	0.066
500	0.071
600	0.078
700	0.083
800	0.088
900	0.093
1000	0.099
1100	0.115
1200	0.128
1300	0.129
1400	0.135
1500	0.142
1600	0.149
1700	0.158
1800	0.162
1900	0.170
2000	0.178
2100	0.185
2200	0.193
2300	0.202



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

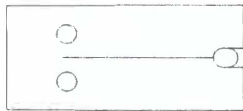
PEG NO. 1RO-1.5

KIND OF TEST END DISTANCE TEST

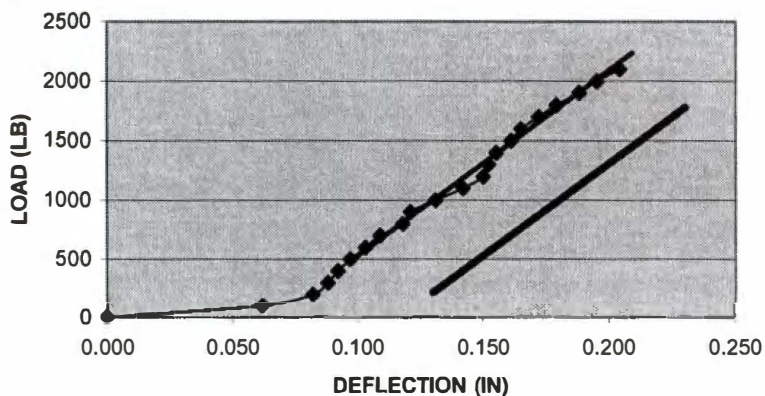
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 70.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.44 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 12.5%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 2100 LBS
 *33 %R.H.
 *1.5"
 *SPECIES OF PEG RED OAK
 *DIA. 1 "
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 10
 *SAP 25%
 *SUMMERWOOD 65%
 *SEASONING GREEN
 *MOISTURE 5.0%
 *KIND OF FAILURE: crushed
slightly

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.062
200	0.082
300	0.088
400	0.092
500	0.097
600	0.103
700	0.109
800	0.118
900	0.121
1000	0.131
1100	0.142
1200	0.150
1300	0.152
1400	0.155
1500	0.161
1600	0.165
1700	0.172
1800	0.179
1900	0.188
2000	0.195
2100	0.204



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

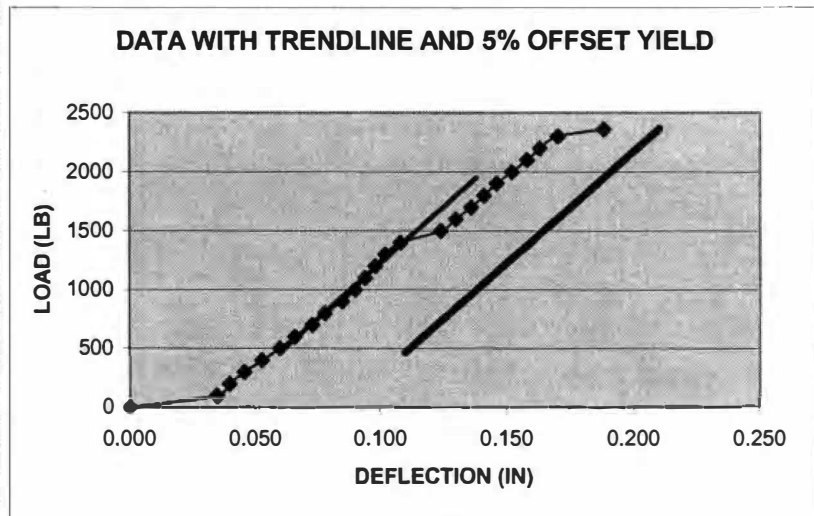
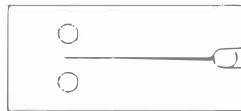
PEG NO. 1RO-1.625

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 70.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.46 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 12.5%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 2360 LBS
 *33 %R.H.
 *1.625"
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 7
 *SAP 10%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 5.0%
 *KIND OF FAILURE: crushed
slightly

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.035
200	0.040
300	0.046
400	0.053
500	0.060
600	0.066
700	0.073
800	0.078
900	0.085
1000	0.090
1100	0.094
1200	0.098
1300	0.102
1400	0.108
1500	0.124
1600	0.130
1700	0.136
1800	0.141
1900	0.146
2000	0.152
2100	0.158
2200	0.163
2300	0.170
2360	0.188



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

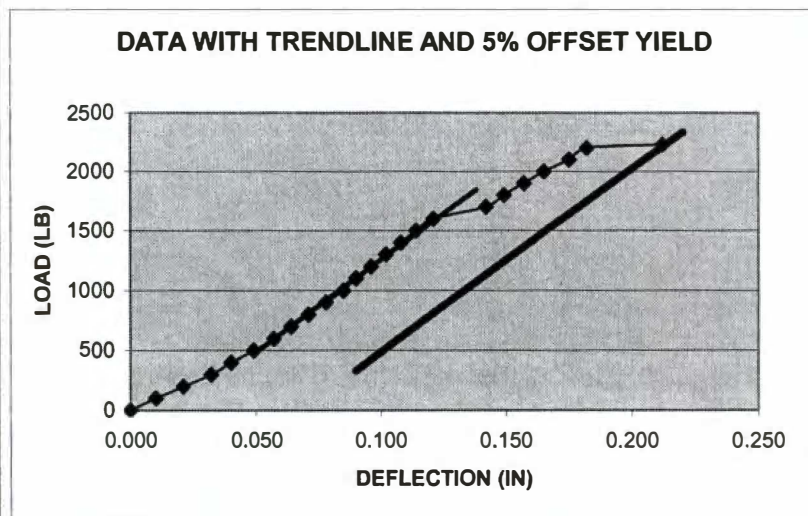
PEG NO. 1RO-1.75

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 70.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.40 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 12.5%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 2230 LBS
 *33 %R.H.
 *1.75"
 *SPECIES OF PEG RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.11 LBS
 *RINGS PER INCH 12
 *SAP 80%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 5.0%
 *KIND OF FAILURE: crushed
slightly

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.010
200	0.021
300	0.032
400	0.040
500	0.049
600	0.057
700	0.064
800	0.071
900	0.078
1000	0.085
1100	0.090
1200	0.096
1300	0.102
1400	0.108
1500	0.114
1600	0.121
1700	0.142
1800	0.149
1900	0.157
2000	0.165
2100	0.175
2200	0.182
2230	0.212



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

PEG NO. 1RO-1.875

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 70.3 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.44 LBS

*RINGS PER INCH 7

*SAP 75%

*SUMMERWOOD 20%

*SEASONING GREEN

*MOISTURE 13.5%

*KIND OF FAILURE relish
cracked

*LOAD @ FAILURE 2400 LBS

33 %R.H.

1.875"

*SPECIES OF PEG

RED OAK

*DIA. 1"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.12 LBS

*RINGS PER INCH 8

*SAP 30%

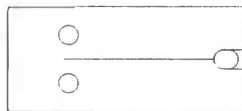
*SUMMERWOOD 50%

*SEASONING GREEN

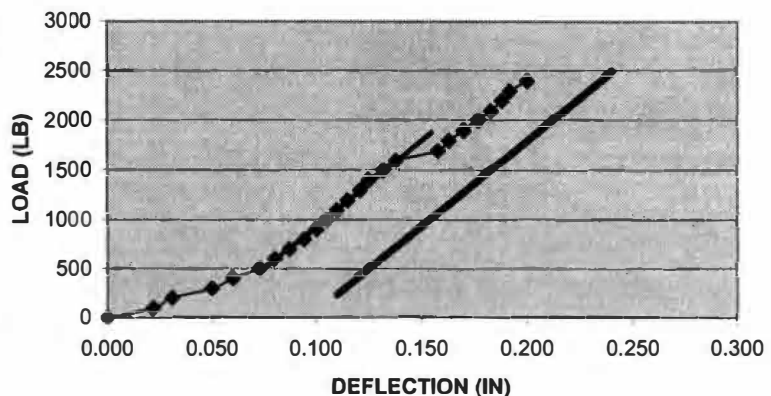
*MOISTURE 5.0%

*KIND OF FAILURE: crushed
slightly

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.022
200	0.031
300	0.050
400	0.060
500	0.073
600	0.080
700	0.087
800	0.094
900	0.100
1000	0.105
1100	0.110
1200	0.115
1300	0.121
1400	0.125
1500	0.132
1600	0.138
1700	0.158
1800	0.163
1900	0.170
2000	0.177
2100	0.183
2200	0.188
2300	0.192
2400	0.200



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

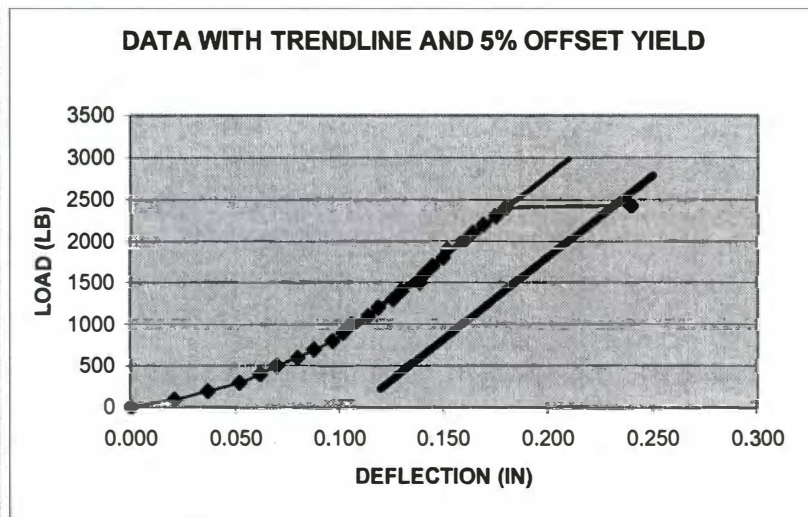
PEG NO. 1RO-2.00

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 70.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 3/4"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.41 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 13.5%
 *KIND OF FAILURE
 DATA

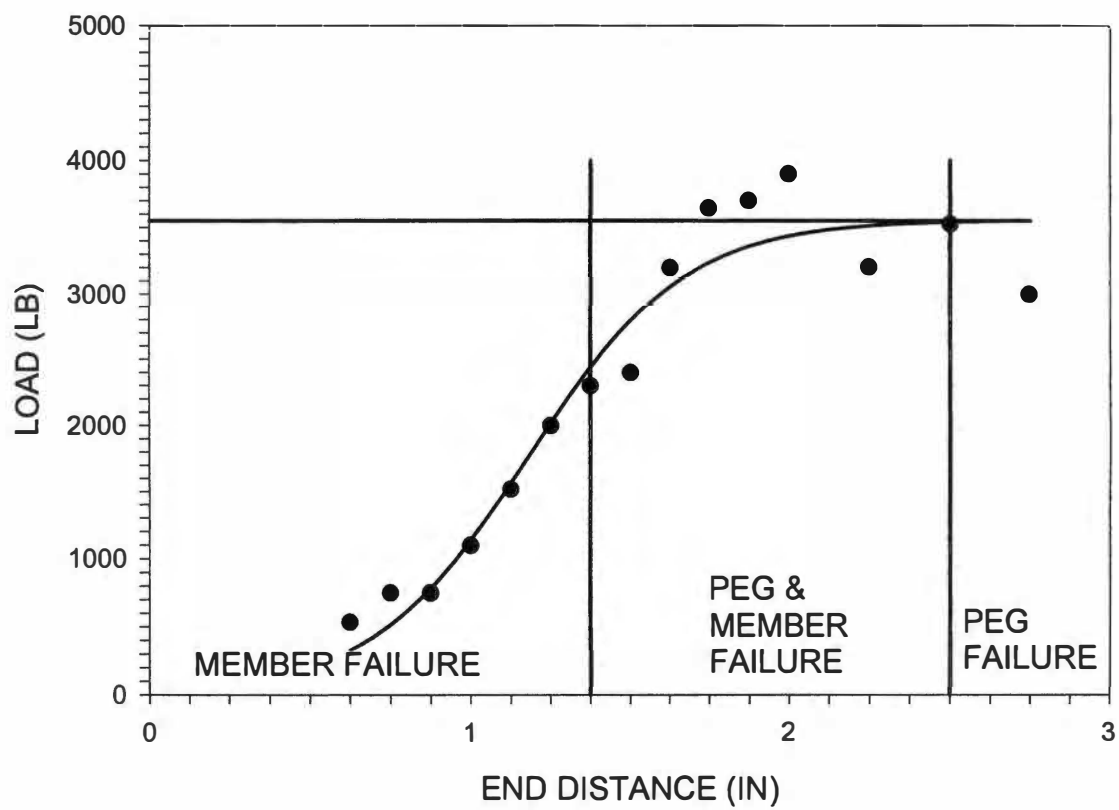
*LOAD @ FAILURE 2400 LBS
 *33 %R.H.
 *2.00"
 *SPECIES OF PEG
RED OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 9
 *SAP 30%
 *SUMMERWOOD 85%
 *SEASONING GREEN
 *MOISTURE 5.0%
 *KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.021
200	0.037
300	0.052
400	0.062
500	0.070
600	0.080
700	0.088
800	0.097
900	0.102
1000	0.106
1100	0.114
1200	0.119
1300	0.126
1400	0.130
1500	0.139
1600	0.141
1700	0.145
1800	0.150
1900	0.152
2000	0.160
2100	0.164
2200	0.169
2300	0.175
2400	0.180
2430	0.240



APPENDIX K – END TEST-DOUGLAS FIR-1” WHITE OAK PEGS

END TEST-DOUGLAS FIR-1" WHITE OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

PEG NO. 1 WO -0.625

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 74.3 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.44 LBS

*RINGS PER INCH 5

*SAP 25%

*SUMMERWOOD 20%

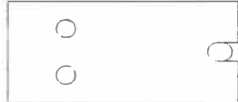
*SEASONING GREEN

*MOISTURE 9%

*KIND OF FAILURE relish

DATA

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.013
200	0.025
300	0.034
400	0.042
500	0.048
535	0.058



*LOAD @ FAILURE 535

75.3%R.H.

0.625 in

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.14 LBS

*RINGS PER INCH 11

*SAP 10%

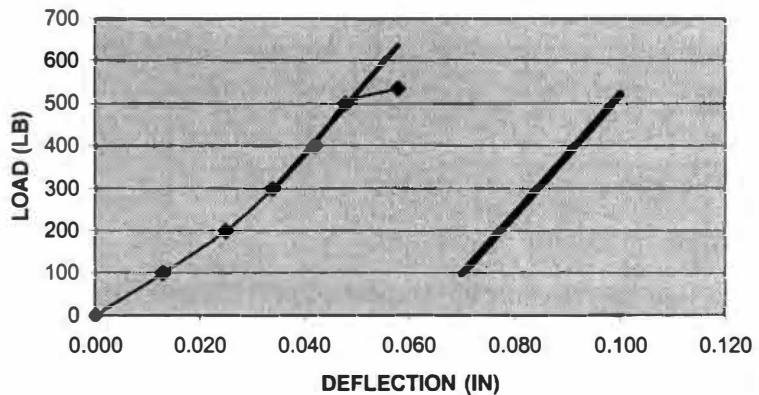
*SUMMERWOOD 20%

*SEASONING GREEN

*MOISTURE 3.5%

*KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

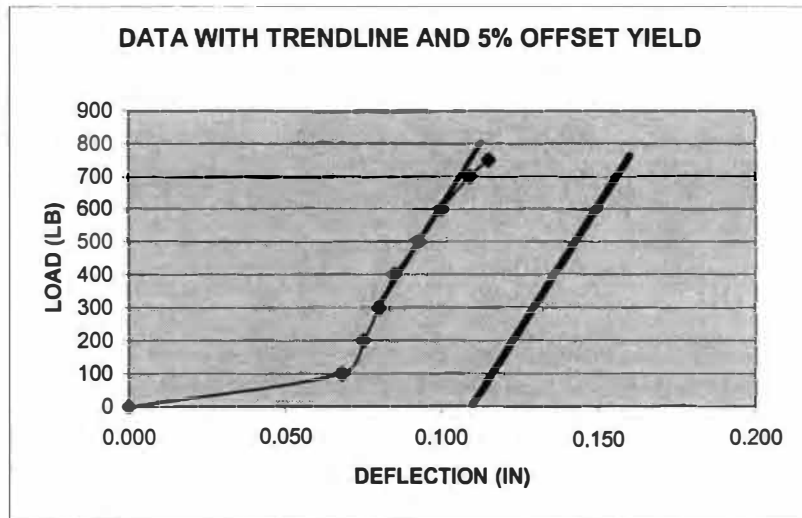
DATE: 24-Sep-03 PIECE NO 15DF PEG NO. 1 WO -0.75

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.42 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 750
75.1%R.H.
0.75 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6 1/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.11 LBS
 *RINGS PER INCH 5
 *SAP 75%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 3.5%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.068
200	0.075
300	0.080
400	0.085
500	0.093
600	0.100
700	0.109
750	0.115



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 15DF

PEG NO. 1 WO -0.875

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 74.2 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.43 LBS

*RINGS PER INCH 5

*SAP 25%

*SUMMERWOOD 20%

*SEASONING GREEN

*MOISTURE 10%

*KIND OF FAILURE relish

DATA

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.013
200	0.023
300	0.029
400	0.036
500	0.042
600	0.047
700	0.058
750	0.062



*LOAD @ FAILURE 750

74.9%R.H.

0.875 in

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.12 LBS

*RINGS PER INCH 10

*SAP 40%

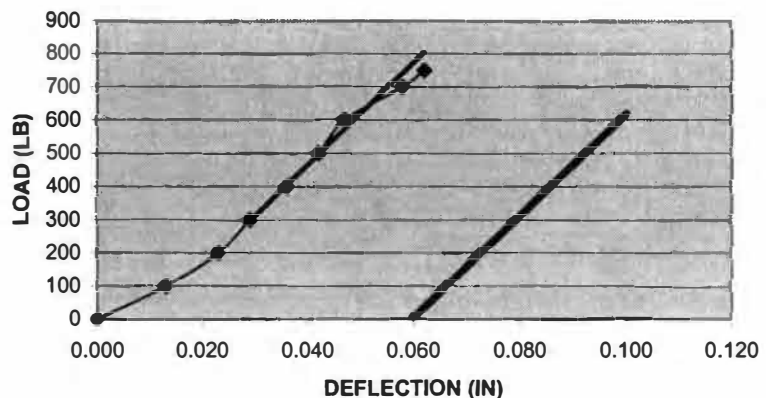
*SUMMERWOOD 10%

*SEASONING GREEN

*MOISTURE 5.0%

*KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03 PIECE NO 15DF PEG NO. 1 WO -1.00

KIND OF TEST END DISTANCE TEST

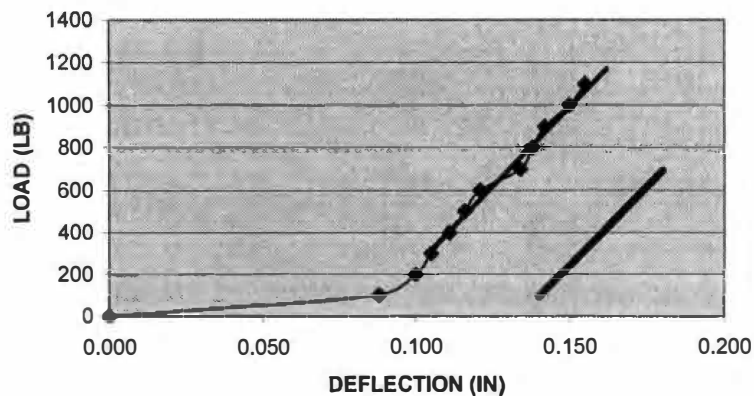
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.44 LBS
 *RINGS PER INCH 5
 *SAP 25%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 9%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 1100
74.9%R.H.
1.00 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 14
 *SAP 30%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 5.0%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.088
200	0.100
300	0.105
400	0.111
500	0.116
600	0.121
700	0.134
800	0.138
900	0.142
1000	0.150
1100	0.155



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 16DF

PEG NO. 1 WO -1.125

KIND OF TEST END DISTANCE TEST

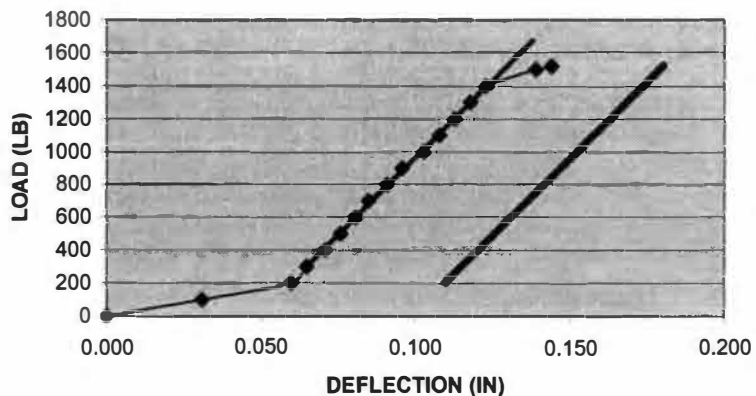
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.63 LBS
 *RINGS PER INCH 7
 *SAP 1%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 8%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 1520
75%R.H.
1.125 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 11
 *SAP 25%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 5.0%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.031
200	0.060
300	0.065
400	0.071
500	0.076
600	0.081
700	0.085
800	0.091
900	0.096
1000	0.103
1100	0.108
1200	0.113
1300	0.118
1400	0.123
1500	0.139
1520	0.144



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

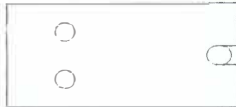
DATE: 24-Sep-03 PIECE NO 16DF PEG NO. 1 WO -1.25

KIND OF TEST END DISTANCE TEST

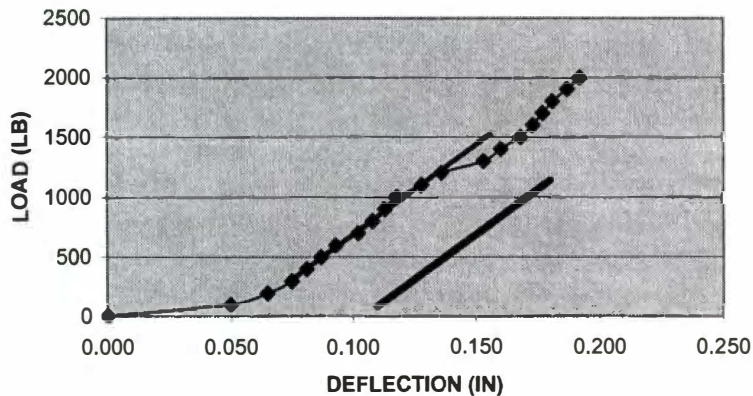
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.68 LBS
 *RINGS PER INCH 7
 *SAP 1%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 2000
75%R.H.
1.25 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.15 LBS
 *RINGS PER INCH 12
 *SAP 30%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 3.5%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.050
200	0.065
300	0.075
400	0.081
500	0.087
600	0.093
700	0.102
800	0.108
900	0.113
1000	0.118
1100	0.128
1200	0.136
1300	0.153
1400	0.160
1500	0.168
1600	0.173
1700	0.177
1800	0.181
1900	0.187
2000	0.192



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 16DF

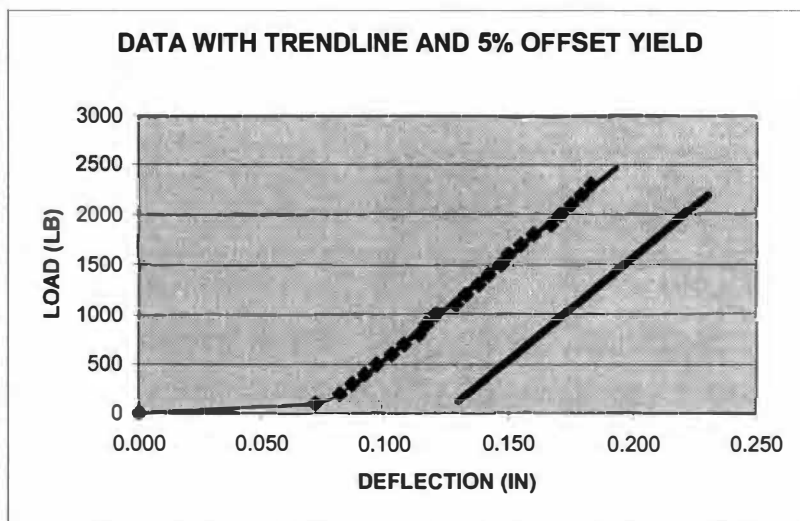
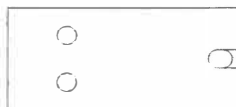
PEG NO. 1 WO -1.375

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 74.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.66 LBS
 *RINGS PER INCH 7
 *SAP 1%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 2300
74.7%R.H.
1.375 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.14 LBS
 *RINGS PER INCH 14
 *SAP 15%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 3.5%
 *KIND OF FAILURE: crushed
slightly

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.072
200	0.082
300	0.087
400	0.092
500	0.097
600	0.103
700	0.108
800	0.114
900	0.117
1000	0.121
1100	0.129
1200	0.133
1300	0.138
1400	0.142
1500	0.147
1600	0.150
1700	0.155
1800	0.160
1900	0.167
2000	0.171
2100	0.175
2200	0.179
2300	0.183



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

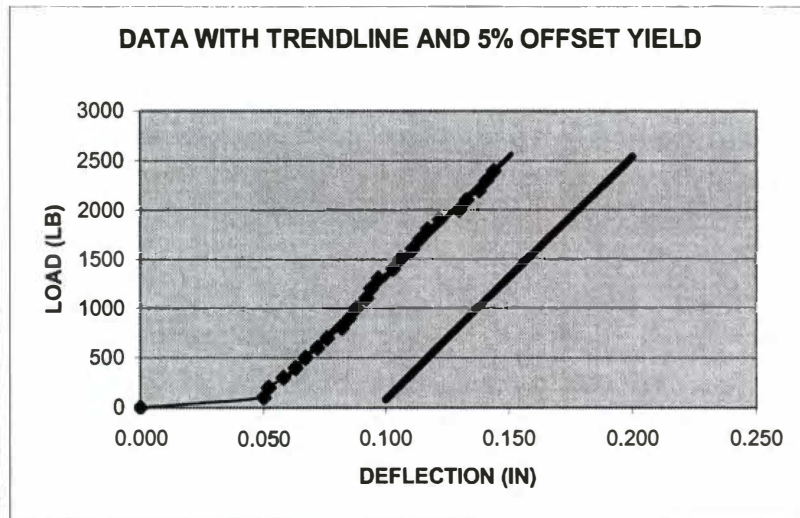
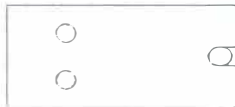
DATE: 24-Sep-03 PIECE NO 16DF PEG NO. 1 WO -1.5

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.70 LBS
 *RINGS PER INCH 7
 *SAP 1%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 2400
74.7%R.H.
1.5 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.14 LBS
 *RINGS PER INCH 12
 *SAP 5%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 3.5%
 *KIND OF FAILURE: crushed
slightly

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.050
200	0.052
300	0.058
400	0.063
500	0.067
600	0.072
700	0.076
800	0.082
900	0.085
1000	0.088
1100	0.092
1200	0.094
1300	0.097
1400	0.103
1500	0.106
1600	0.111
1700	0.114
1800	0.117
1900	0.122
2000	0.130
2100	0.133
2200	0.138
2300	0.141
2400	0.144



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 16DF

PEG NO. 1 WO -1.625

KIND OF TEST END DISTANCE TEST

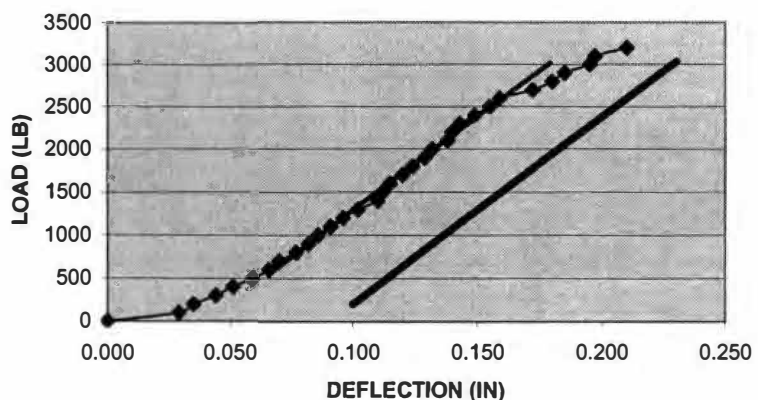
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 73.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.70 LBS
 *RINGS PER INCH 7
 *SAP 1%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 3200
74.7%R.H.
1.625 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.11 LBS
 *RINGS PER INCH 4
 *SAP 40%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 5.0%
 *KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.029
200	0.035
300	0.044
400	0.051
500	0.059
600	0.066
700	0.070
800	0.077
900	0.082
1000	0.086
1100	0.091
1200	0.096
1300	0.102
1400	0.110
1500	0.112
1600	0.115
1700	0.120
1800	0.124
1900	0.129
2000	0.132
2100	0.138
2200	0.140
2300	0.143
2400	0.149
2500	0.155
2600	0.159
2700	0.172
2800	0.180



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	DEFLECT(in)
2900	0.185
3000	0.195
3100	0.197
3200	0.210

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03 PIECE NO 16DF PEG NO. 1 WO -1.75

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 73.7 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.72 LBS

*RINGS PER INCH 7

*SAP 1%

*SUMMERWOOD 40%

*SEASONING GREEN

*MOISTURE 10%

*KIND OF FAILURE cracked

DATA

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.057
200	0.067
300	0.071
400	0.077
500	0.082
600	0.088
700	0.091
800	0.097
900	0.102
1000	0.107
1100	0.113
1200	0.116
1300	0.120
1400	0.123
1500	0.127
1600	0.132
1700	0.135
1800	0.138
1900	0.142
2000	0.147
2100	0.151
2200	0.154
2300	0.158
2400	0.161
2500	0.164
2600	0.167
2700	0.173
2800	0.176



*LOAD @ FAILURE 3645

74.6%R.H.

1.75 in

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.15 LBS

*RINGS PER INCH 10

*SAP 10%

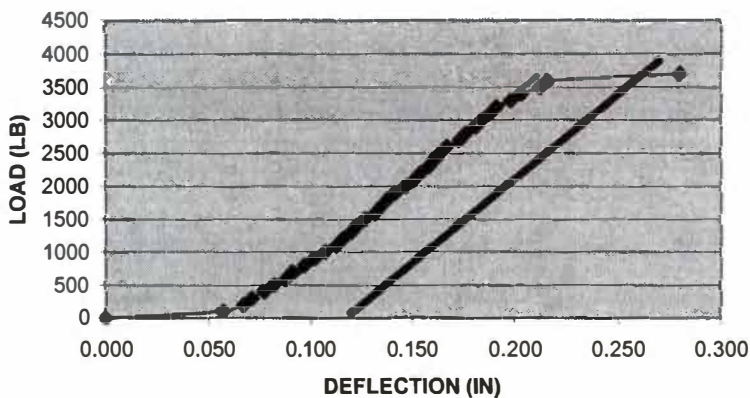
*SUMMERWOOD 15%

*SEASONING GREEN

*MOISTURE 5.0%

*KIND OF FAILURE: crushed

DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	DEFLECT(in)	LOAD(lb)	DEFLECT(in)	LOAD(lb)	DEFLECT(in)
2900	0.181	3300	0.198	3700	0.280
3000	0.184	3400	0.203		
3100	0.188	3500	0.212		
3200	0.191	3600	0.216		

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03

PIECE NO 16DF

PEG NO. 1 WO -1.875

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 73.5 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.79 LBS

*RINGS PER INCH 7

*SAP 1%

*SUMMERWOOD 40%

*SEASONING GREEN

*MOISTURE 11%

*KIND OF FAILURE relish

DATA

*LOAD @ FAILURE 3700

74.5%R.H.

1.875 in

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.14 LBS

*RINGS PER INCH 12

*SAP 5%

*SUMMERWOOD 15%

*SEASONING GREEN

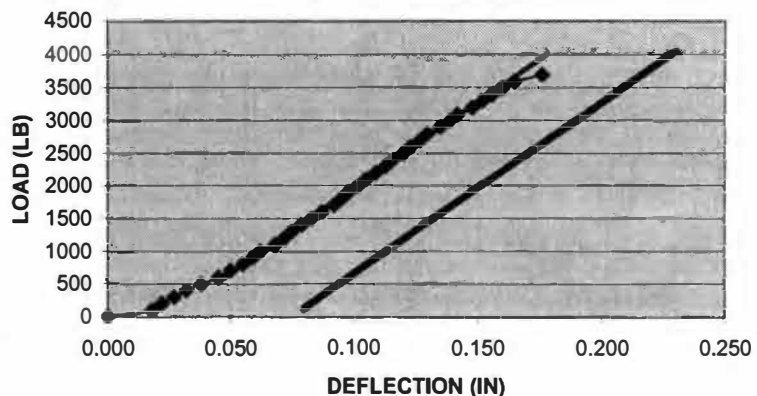
*MOISTURE 5.0%

*KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.018
200	0.022
300	0.027
400	0.032
500	0.038
600	0.045
700	0.050
800	0.055
900	0.059
1000	0.062
1100	0.068
1200	0.072
1300	0.075
1400	0.079
1500	0.083
1600	0.087
1700	0.092
1800	0.095
1900	0.098
2000	0.102
2100	0.105
2200	0.109
2300	0.113
2400	0.116
2500	0.120
2600	0.123
2700	0.127
2800	0.130



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	DEFLECT(in)	LOAD(lb)	DEFLECT(in)	LOAD(lb)	DEFLECT(in)
2900	0.135	3300	0.152	3700	0.176
3000	0.139	3400	0.156		
3100	0.142	3500	0.160		
3200	0.148	3600	0.165		

DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Sep-03 PIECE NO 16DF PEG NO. 1 WO -2.00

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 74.3 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.84 LBS

*RINGS PER INCH 7

*SAP 1%

*SUMMERWOOD 40%

*SEASONING GREEN

*MOISTURE 11%

*KIND OF FAILURE elongated hole

DATA

*LOAD @ FAILURE 3900

*75.5%R.H.

2.00 in

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 5 15/16"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.13 LBS

*RINGS PER INCH 10

*SAP 20%

*SUMMERWOOD 10%

*SEASONING GREEN

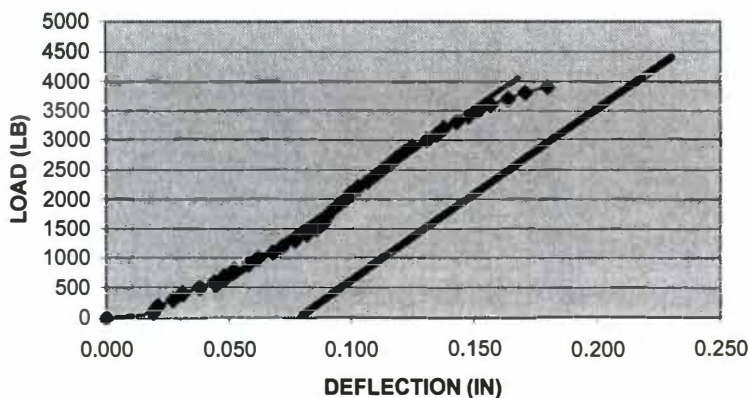
*MOISTURE 3.5%

*KIND OF FAILURE: crushed
bent

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.019
200	0.021
300	0.027
400	0.031
500	0.038
600	0.044
700	0.048
800	0.052
900	0.058
1000	0.062
1100	0.068
1200	0.072
1300	0.077
1400	0.082
1500	0.086
1600	0.089
1700	0.090
1800	0.092
1900	0.095
2000	0.098
2100	0.100
2200	0.103
2300	0.107
2400	0.110
2500	0.113
2600	0.116
2700	0.119
2800	0.122



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	DEFLECT(in)	LOAD(lb)	DEFLECT(in)	LOAD(lb)	DEFLECT(in)
2900	0.125	3300	0.143	3700	0.164
3000	0.131	3400	0.148	3800	0.171
3100	0.135	3500	0.152	3900	0.180
3200	0.138	3600	0.157		

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO 19DF

PEG NO. 1 WO -2.25

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 78.6 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 11 3/4"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 2.00 LBS

*RINGS PER INCH 19

*SAP 25%

*SUMMERWOOD 50%

*SEASONING GREEN

*MOISTURE 11%

*KIND OF FAILURE cracked
DATA relish

*LOAD @ FAILURE 3200

11%R.H.

2.25 in

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.14 LBS

*RINGS PER INCH 17

*SAP 75%

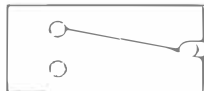
*SUMMERWOOD 80%

*SEASONING GREEN

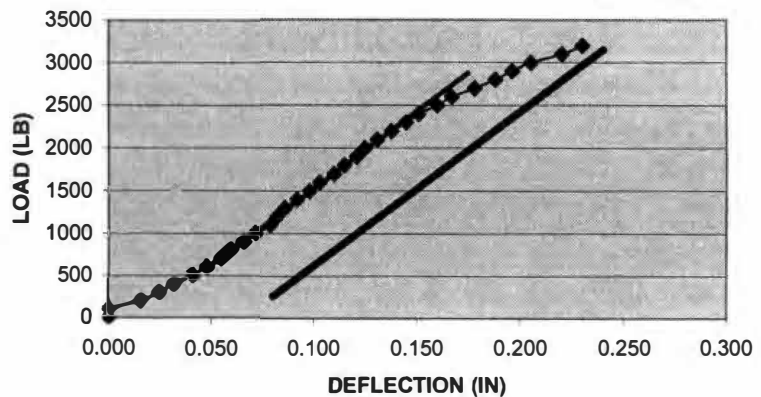
*MOISTURE 9.0%

*KIND OF FAILURE: crushed
bent

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.000
200	0.016
300	0.025
400	0.032
500	0.041
600	0.048
700	0.055
800	0.060
900	0.066
1000	0.072
1100	0.079
1200	0.082
1300	0.086
1400	0.092
1500	0.098
1600	0.103
1700	0.110
1800	0.115
1900	0.121
2000	0.125
2100	0.131
2200	0.138
2300	0.145
2400	0.151
2500	0.160
2600	0.167
2700	0.178
2800	0.188



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	DEFLECT(in)
2900	0.196
3000	0.205
3100	0.220
3200	0.230

DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

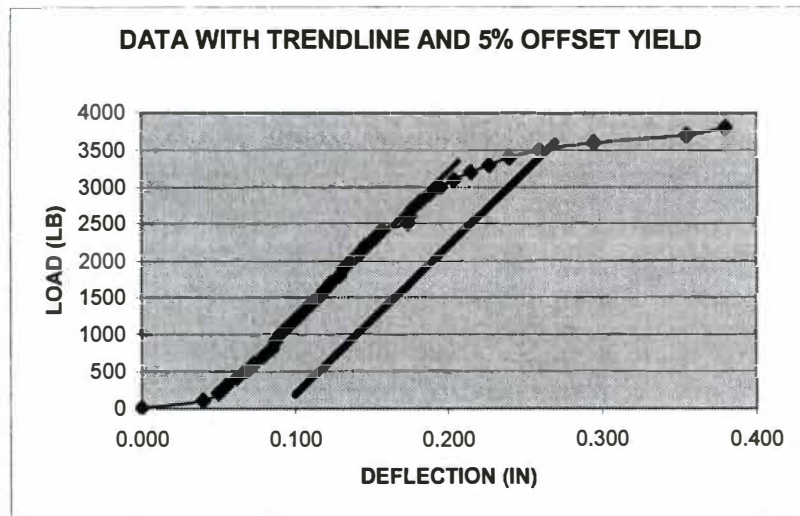
DATE: 24-Feb-04 PIECE NO 19DF PEG NO. 1 WO -2.5

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 2.22 LBS
 *RINGS PER INCH 19
 *SAP 25%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE elongated hole
 DATA cracked

*LOAD @ FAILURE 3525
11%R.H.
2.5 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 17
 *SAP 70%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 10.0%
 *KIND OF FAILURE: crushed
bent
cracked

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.040
200	0.050
300	0.055
400	0.062
500	0.068
600	0.073
700	0.079
800	0.085
900	0.087
1000	0.090
1100	0.095
1200	0.100
1300	0.105
1400	0.110
1500	0.115
1600	0.119
1700	0.123
1800	0.129
1900	0.132
2000	0.137
2100	0.142
2200	0.146
2300	0.152
2400	0.157
2500	0.174
2600	0.175
2700	0.177
2800	0.182



LOAD(lb)	DEFLECT(in)	LOAD(lb)	DEFLECT(in)	LOAD(lb)	DEFLECT(in)
2900	0.188	3300	0.227	3700	0.355
3000	0.195	3400	0.240	3800	0.380
3100	0.204	3500	0.260		
3200	0.215	3600	0.295		

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO 19DF

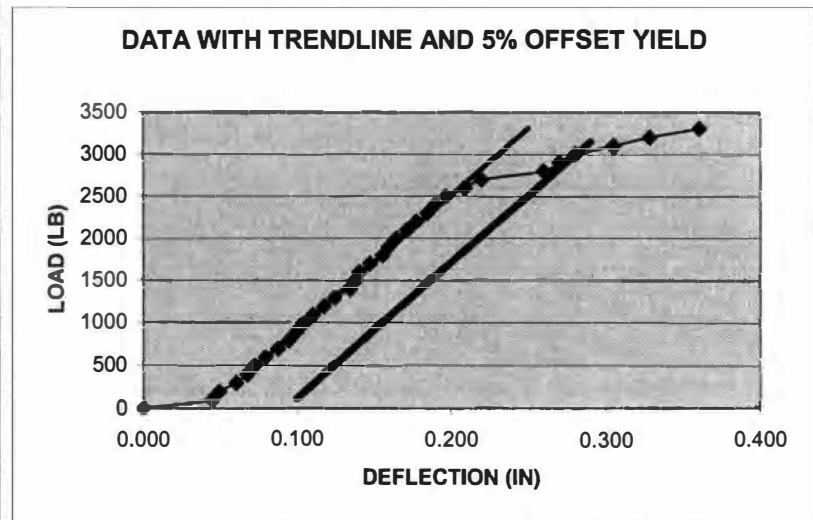
PEG NO. 1 WO -2.75

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 79 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 2.23 LBS
 *RINGS PER INCH 19
 *SAP 25%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 12%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 3000
11%R.H.
2.75 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 14
 *SAP 90%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 8.0%
 *KIND OF FAILURE: crushed
bent
shear

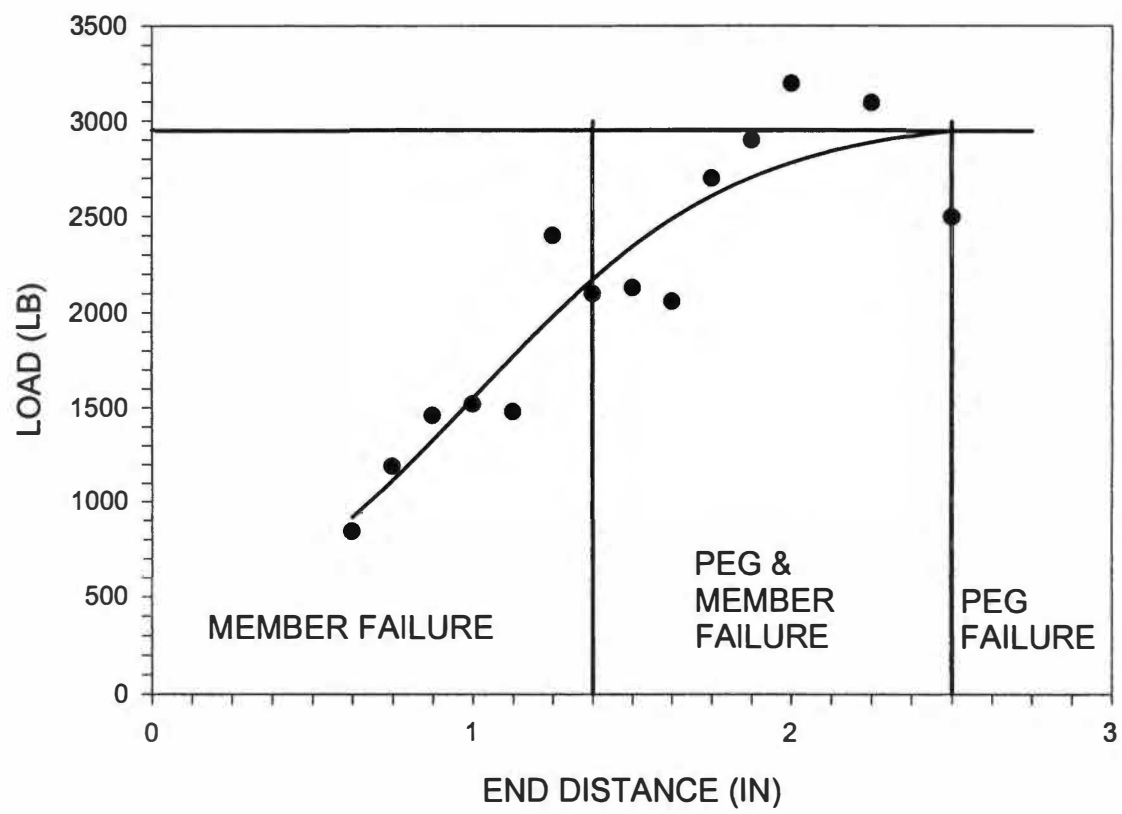
LOAD(lb)	DEFLECT(in)
0	0.000
100	0.045
200	0.050
300	0.061
400	0.068
500	0.073
600	0.080
700	0.088
800	0.095
900	0.100
1000	0.105
1100	0.111
1200	0.118
1300	0.125
1400	0.135
1500	0.138
1600	0.141
1700	0.148
1800	0.156
1900	0.160
2000	0.165
2100	0.172
2200	0.178
2300	0.185
2400	0.190
2500	0.197
2600	0.209
2700	0.220
2800	0.260



LOAD(lb)	DEFLECT(in)	LOAD(lb)	DEFLECT(in)
2900	0.270	3300	0.360
3000	0.280		
3100	0.305		
3200	0.328		

APPENDIX L – END TEST-SOUTHERN PINE-1” WHITE OAK PEGS

END TEST-SOUTHERN PINE-1" WHITE OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

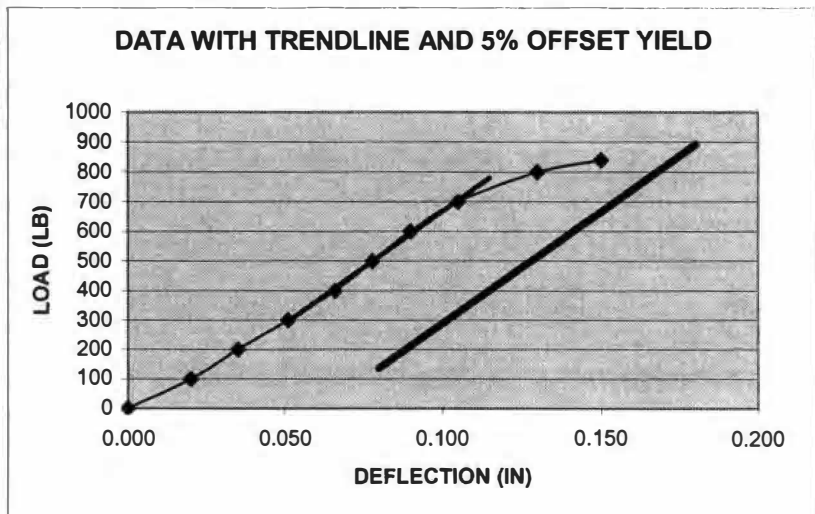
PEG NO. 1WO-0.625

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.51 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 14.5%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 840 LBS
35 %R.H.
0.625"
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1 "
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.14 LBS
 *RINGS PER INCH 14
 *SAP 10%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.020
200	0.035
300	0.051
400	0.066
500	0.078
600	0.090
700	0.105
800	0.130
840	0.150



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

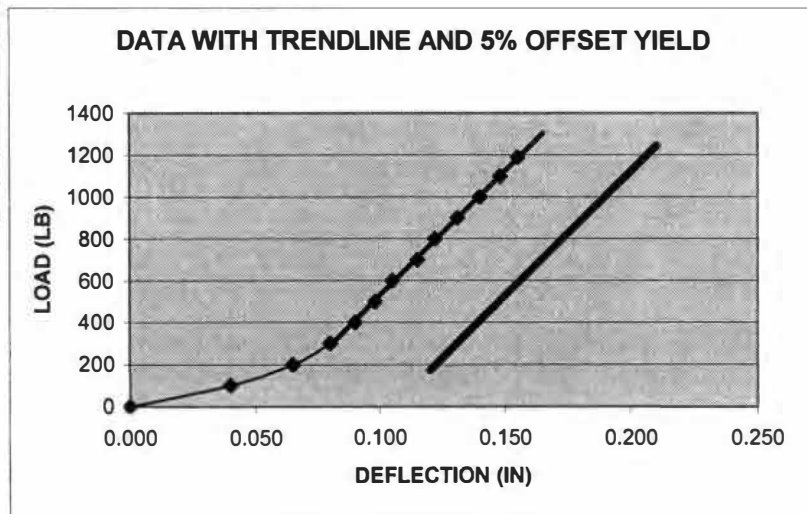
PEG NO. 1WO-0.75

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 67.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.51 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 13.0%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 1190 LBS
 *35 %R.H.
 *0.75"
 *SPECIES OF PEG WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
 *PERP
 *WEIGHT 0.11 LBS
 *RINGS PER INCH 4
 *SAP 70%
 *SUMMERWOOD 25%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.040
200	0.065
300	0.080
400	0.090
500	0.098
600	0.105
700	0.115
800	0.122
900	0.131
1000	0.140
1100	0.148
1190	0.155



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

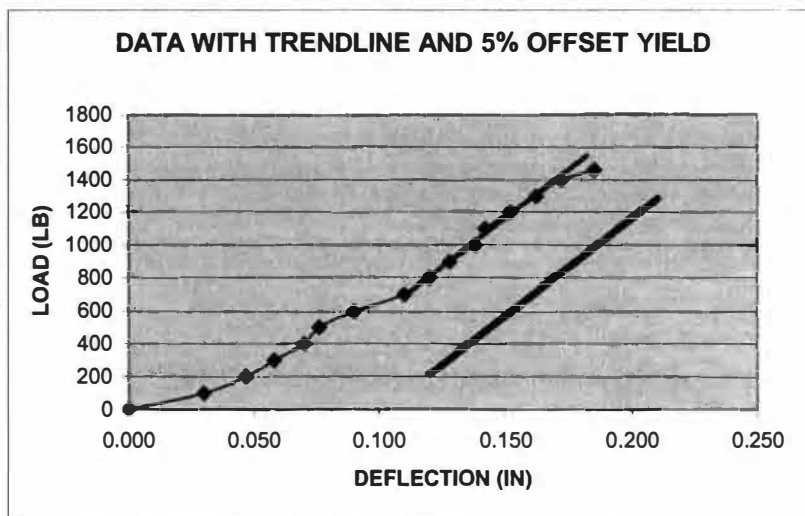
PEG NO. 1WO-0.875

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.152 LBS
 *RINGS PER INCH 7
 *SAP 75%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 14.5%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 1460 LBS
35 %R.H.
0.875"
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.12 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE DRY
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.030
200	0.047
300	0.058
400	0.070
500	0.076
600	0.090
700	0.110
800	0.120
900	0.128
1000	0.138
1100	0.142
1200	0.152
1300	0.162
1400	0.172
1460	0.185



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 18SP

PEG NO. 1WO-1.00

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 68.1 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.48 LBS

*RINGS PER INCH 7

*SAP 75%

*SUMMERWOOD 20%

*SEASONING GREEN

*MOISTURE 14.5%

*KIND OF FAILURE relish

DATA

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.032
200	0.050
300	0.059
400	0.067
500	0.075
600	0.089
700	0.096
800	0.105
900	0.111
1000	0.118
1100	0.126
1200	0.135
1300	0.141
1400	0.153
1500	0.170
1520	0.178



*LOAD @ FAILURE 1520 LBS

35 %R.H.

1.00"

*SPECIES OF PEG

WHITE OAK

*DIA. 1 "

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.14 LBS

*RINGS PER INCH 11

*SAP 75%

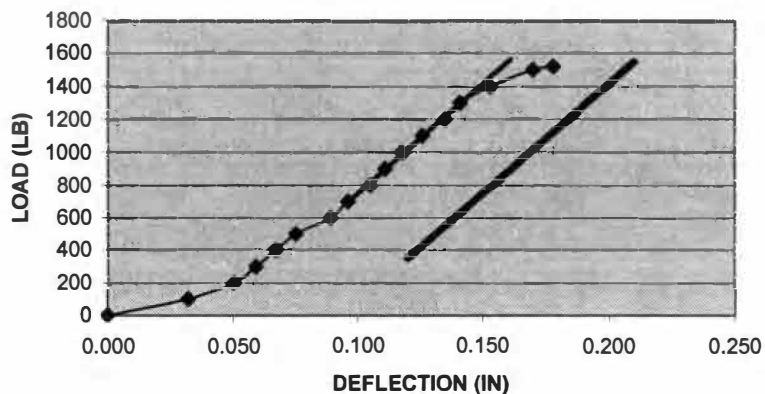
*SUMMERWOOD 50%

*SEASONING GREEN

*MOISTURE 4.5%

*KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 19SP

PEG NO. 1WO-1.125

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 70.5 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 9 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.34 LBS

*RINGS PER INCH 5

*SAP 80%

*SUMMERWOOD 10%

*SEASONING GREEN

*MOISTURE 10.5%

*KIND OF FAILURE relish

DATA

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.039
200	0.088
300	0.098
400	0.103
500	0.107
600	0.128
700	0.137
800	0.147
900	0.154
1000	0.161
1100	0.167
1200	0.174
1300	0.187
1400	0.194
1480	0.201



*LOAD @ FAILURE 1480 LBS

33 %R.H.

1.125"

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.14 LBS

*RINGS PER INCH 12

*SAP 2%

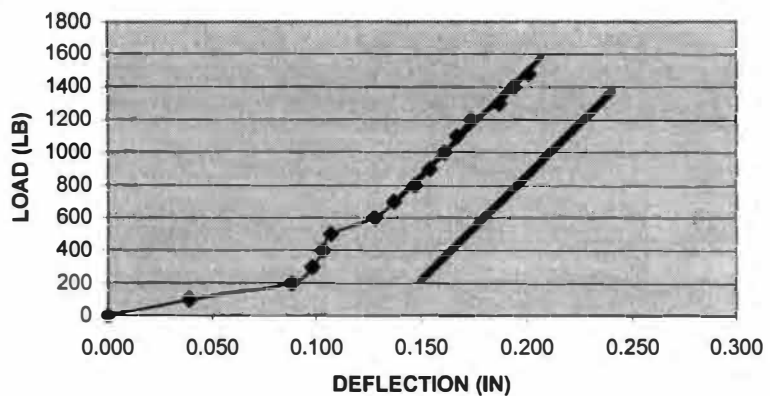
*SUMMERWOOD 90%

*SEASONING GREEN

*MOISTURE 4.5%

*KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 19SP

PEG NO. 1WO-1.25

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 70.8 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 9 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.39 LBS

*RINGS PER INCH 5

*SAP 80%

*SUMMERWOOD 10%

*SEASONING GREEN

*MOISTURE 9.5%

*KIND OF FAILURE relish
DATA cracked

*LOAD @ FAILURE 2400 LBS

33 %R.H.

1.25"

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.13 LBS

*RINGS PER INCH 12

*SAP 35%

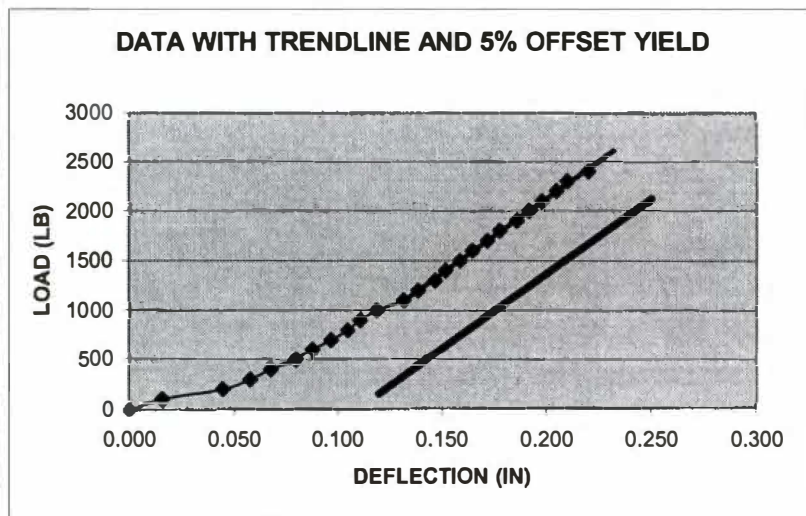
*SUMMERWOOD 80%

*SEASONING GREEN

*MOISTURE 4.5%

*KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.016
200	0.045
300	0.058
400	0.068
500	0.080
600	0.088
700	0.097
800	0.105
900	0.111
1000	0.119
1100	0.132
1200	0.139
1300	0.147
1400	0.152
1500	0.159
1600	0.165
1700	0.172
1800	0.178
1900	0.186
2000	0.192
2100	0.198
2200	0.205
2300	0.210
2400	0.220



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 19SP

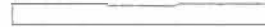
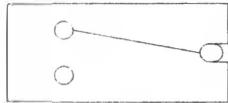
PEG NO. 1WO-1.375

KIND OF TEST END DISTANCE TEST

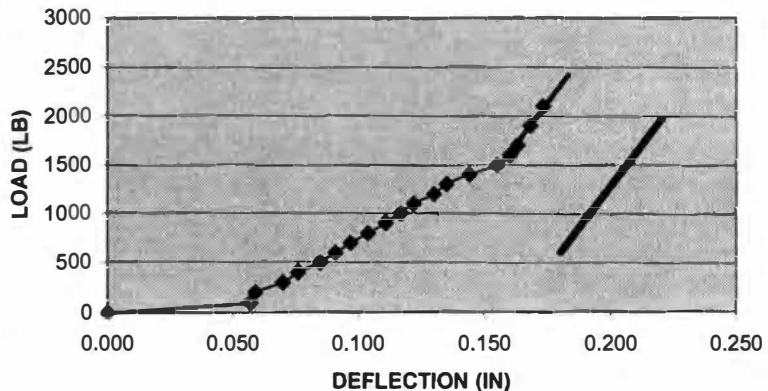
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 70.7 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE 1.375"
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.45 LBS
 *RINGS PER INCH 5
 *SAP 80%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 9.5%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 2100 LBS
 *33 %R.H. 1.375"
 *SPECIES OF PEG WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.14 LBS
 *RINGS PER INCH 12
 *SAP 35%
 *SUMMERWOOD 85%
 *SEASONING GREEN
 *MOISTURE 4.5%
 *KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.057
200	0.059
300	0.070
400	0.076
500	0.085
600	0.091
700	0.097
800	0.104
900	0.111
1000	0.117
1100	0.122
1200	0.130
1300	0.135
1400	0.144
1500	0.155
1600	0.160
1700	0.163
1900	0.168
2100	0.173



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 19SP

PEG NO. 1WO-1.5

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 70.8 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 9 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.40 LBS

*RINGS PER INCH 5

*SAP 80%

*SUMMERWOOD 10%

*SEASONING GREEN

*MOISTURE 10.5%

*KIND OF FAILURE relish

DATA

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.014
200	0.019
300	0.030
400	0.046
500	0.056
600	0.065
700	0.073
800	0.080
900	0.086
1000	0.094
1100	0.099
1200	0.106
1300	0.122
1400	0.128
1500	0.133
1600	0.138
1700	0.142
1800	0.150
1900	0.155
2000	0.161
2100	0.170
2130	0.185



*LOAD @ FAILURE 2130 LBS

33 %R.H.

1.5"

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.14 LBS

*RINGS PER INCH 12

*SAP 1%

*SUMMERWOOD 85%

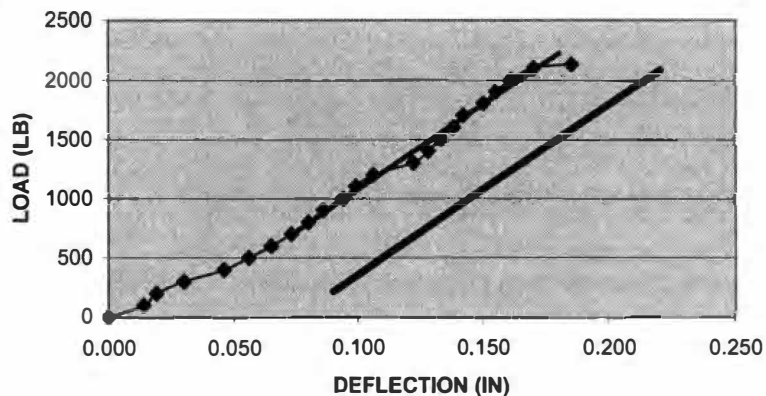
*SEASONING GREEN

*MOISTURE 4.5%

*KIND OF FAILURE: crushed

slightly

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 19SP

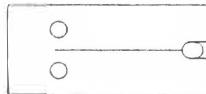
PEG NO. 1WO-1.625

KIND OF TEST END DISTANCE TEST

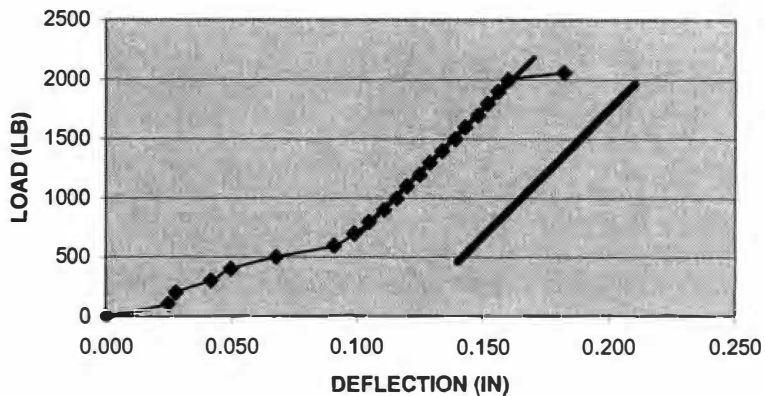
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 71 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.40 LBS
 *RINGS PER INCH 5
 *SAP 80%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 10.5%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 2060 LBS
33 %R.H.
1.625"
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.15 LBS
 *RINGS PER INCH 10
 *SAP 5%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE 4.5%
 *KIND OF FAILURE: cushed
slightly

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.025
200	0.028
300	0.042
400	0.050
500	0.068
600	0.091
700	0.099
800	0.105
900	0.111
1000	0.116
1100	0.120
1200	0.125
1300	0.129
1400	0.134
1500	0.139
1600	0.143
1700	0.148
1800	0.152
1900	0.156
2000	0.160
2060	0.182



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 19SP

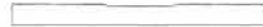
PEG NO. 1WO-1.75

KIND OF TEST END DISTANCE TEST

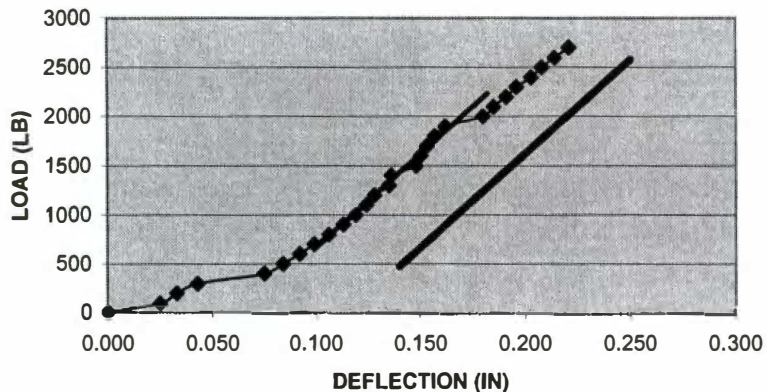
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 71 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.45 LBS
 *RINGS PER INCH 5
 *SAP 80%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 11.5%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 2700 LBS
33 %R.H.
1.75"
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.14 LBS
 *RINGS PER INCH 12
 *SAP 20%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 4.5%
 *KIND OF FAILURE: cushed
slightly

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.025
200	0.033
300	0.043
400	0.075
500	0.084
600	0.092
700	0.099
800	0.106
900	0.113
1000	0.119
1100	0.124
1200	0.128
1300	0.135
1400	0.136
1500	0.148
1600	0.150
1700	0.153
1800	0.157
1900	0.162
2000	0.180
2100	0.185
2200	0.191
2300	0.196
2400	0.203
2500	0.208
2600	0.214
2700	0.221



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 23-Oct-03

PIECE NO. 19SP

PEG NO. 1WO-1.875

KIND OF TEST END DISTANCE TEST

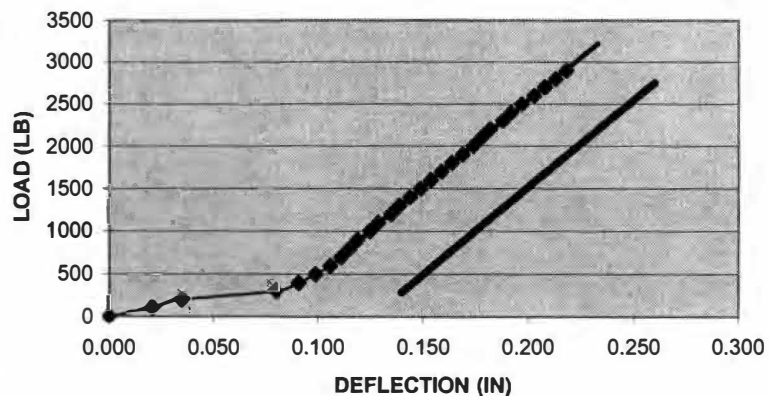
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 71 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.43 LBS
 *RINGS PER INCH 5
 *SAP 80%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 11.5%
 *KIND OF FAILURE elongated hole
 DATA

*LOAD @ FAILURE 2900 LBS
 33 %R.H.
 1.875"
 *SPECIES OF PEG
 WHITE OAK
 *DIA. 1"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
 PERP
 *WEIGHT 0.13 LBS
 *RINGS PER INCH 11
 *SAP 70%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 4.5%
 *KIND OF FAILURE: crushed
cracked

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.021
200	0.035
300	0.080
400	0.091
500	0.099
600	0.106
700	0.111
800	0.115
900	0.119
1000	0.125
1100	0.129
1200	0.135
1300	0.139
1400	0.144
1500	0.149
1600	0.154
1700	0.159
1800	0.164
1900	0.169
2000	0.174
2100	0.178
2200	0.182
2300	0.188
2400	0.192
2500	0.197
2600	0.203
2700	0.208
2800	0.213



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	DEFLECT(in)
2900	0.218

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO. 18SP

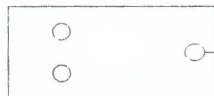
PEG NO. 1WO-2.00

KIND OF TEST END DISTANCE TEST

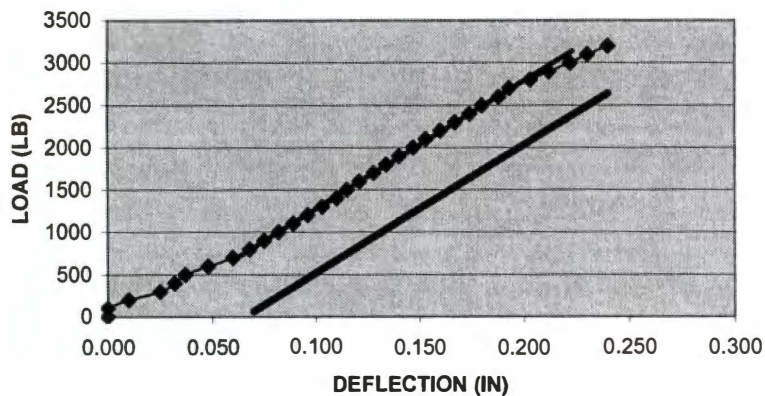
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.69 LBS
 *RINGS PER INCH 4
 *SAP 80%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 12.0%
 *KIND OF FAILURE cracked
 DATA

*LOAD @ FAILURE 3200 LBS
 *11%R.H.
 *2.00"
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.14 LBS
 *RINGS PER INCH 9
 *SAP 35%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE 10.0%
 *KIND OF FAILURE: crushed
cracked

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.000
200	0.010
300	0.025
400	0.032
500	0.037
600	0.048
700	0.060
800	0.068
900	0.075
1000	0.082
1100	0.089
1200	0.096
1300	0.103
1400	0.110
1500	0.115
1600	0.121
1700	0.128
1800	0.134
1900	0.140
2000	0.147
2100	0.153
2200	0.160
2300	0.167
2400	0.174
2500	0.180
2600	0.188
2700	0.193
2800	0.203



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	DEFLECT(in)
2900	0.212
3000	0.222
3100	0.2300
3200	0.240

DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO. 18SP

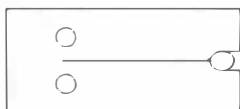
PEG NO. 1WO-2.25

KIND OF TEST END DISTANCE TEST

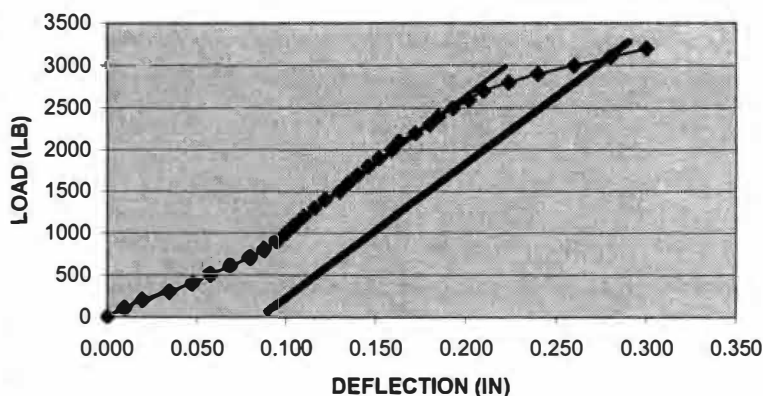
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 78.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 12"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.74 LBS
 *RINGS PER INCH 4
 *SAP 80%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 14.0%
 *KIND OF FAILURE cracked
 DATA relish

*LOAD @ FAILURE 3100 LBS
11% R.H.
2.25"
 *SPECIES OF PEG
WHITE OAK
 *DIA. 1 "
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.14 LBS
 *RINGS PER INCH 19
 *SAP 25%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 10.0%
 *KIND OF FAILURE: crushed
bent
shear

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.010
200	0.020
300	0.035
400	0.048
500	0.058
600	0.069
700	0.080
800	0.088
900	0.095
1000	0.100
1100	0.105
1200	0.110
1300	0.116
1400	0.122
1500	0.130
1600	0.135
1700	0.140
1800	0.146
1900	0.152
2000	0.159
2100	0.163
2200	0.172
2300	0.180
2400	0.185
2500	0.193
2600	0.202
2700	0.210
2800	0.224



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	DEFLECT(in)
2900	0.240
3000	0.26
3100	0.2800
3200	0.300

DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Feb-04

PIECE NO. 18SP

PEG NO. 1WO-2.5

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 78.8 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE 2.5"

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 12"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.75 LBS

*RINGS PER INCH 4

*SAP 80%

*SUMMERWOOD 20%

*SEASONING GREEN

*MOISTURE 16.0%

*KIND OF FAILURE
DATA

*LOAD @ FAILURE 2500 LBS
11%R.H.

2.5"

*SPECIES OF PEG

WHITE OAK

*DIA. 1"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD
PERP

*WEIGHT 0.14 LBS

*RINGS PER INCH 11

*SAP 20%

*SUMMERWOOD 10%

*SEASONING GREEN

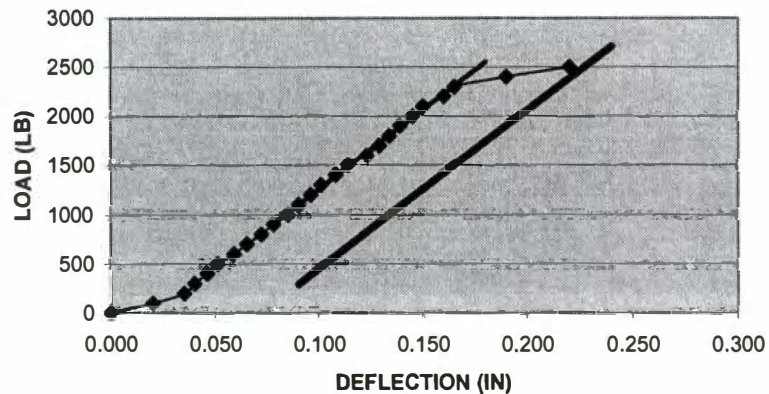
*MOISTURE 11.0%

*KIND OF FAILURE: shear

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.020
200	0.035
300	0.040
400	0.046
500	0.051
600	0.059
700	0.065
800	0.072
900	0.078
1000	0.085
1100	0.090
1200	0.096
1300	0.101
1400	0.108
1500	0.114
1600	0.123
1700	0.129
1800	0.134
1900	0.139
2000	0.145
2100	0.150
2200	0.160
2300	0.165
2400	0.190
2500	0.220

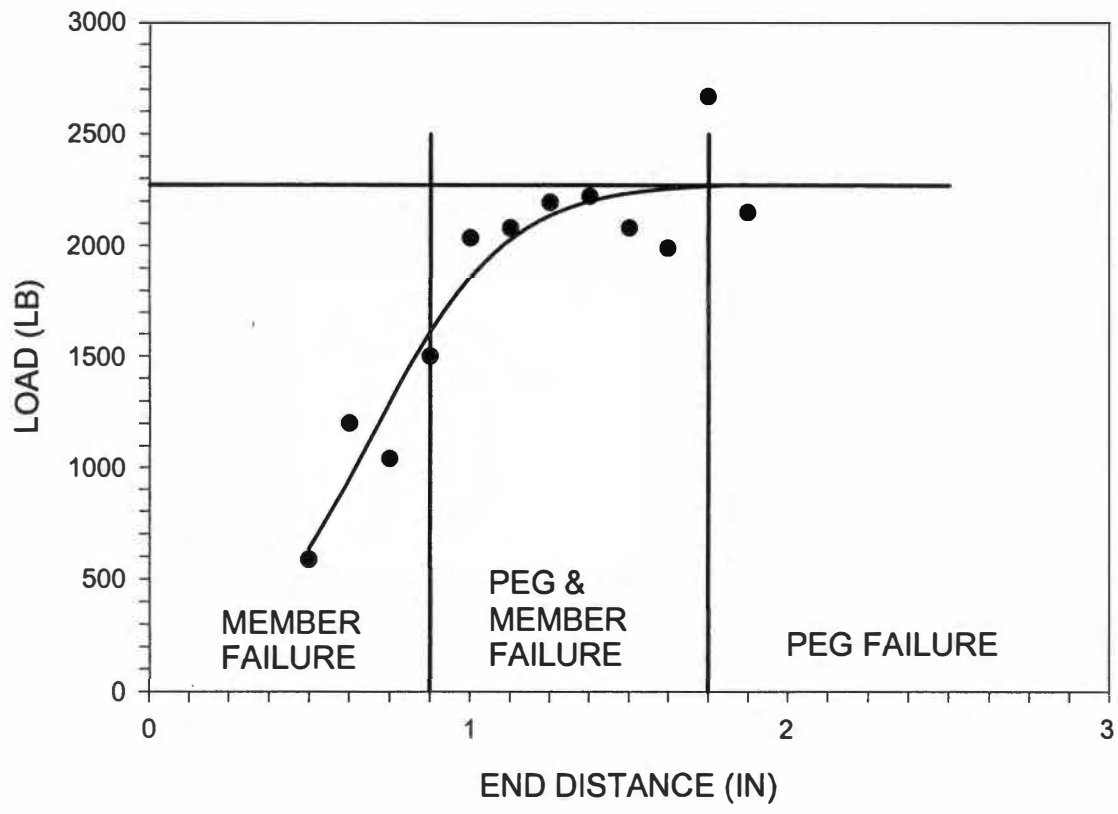


DATA WITH TRENDLINE AND 5% OFFSET YIELD



APPENDIX M – END TEST-DOUGLAS FIR-3/4” RED OAK PEGS

END TEST-DOUGLAS FIR-3/4" RED OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Oct-03

PIECE NO. 16DF

PEG NO. 3/4 RO -0.5

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 67.8 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.91 LBS

*RINGS PER INCH 10

*SAP 40%

*SUMMERWOOD 40%

*SEASONING GREEN

*MOISTURE 11%

*KIND OF FAILURE relish
DATA

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.028
200	0.058
300	0.066
400	0.076
500	0.084
600	0.140
700	0.158
800	0.193
900	0.227



*LOAD @ FAILURE 589 LBS

35%R.H.

.5 in

*SPECIES OF PEG

RED OAK

*DIA. 3/4"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.06 LBS

*RINGS PER INCH 12

*SAP 35%

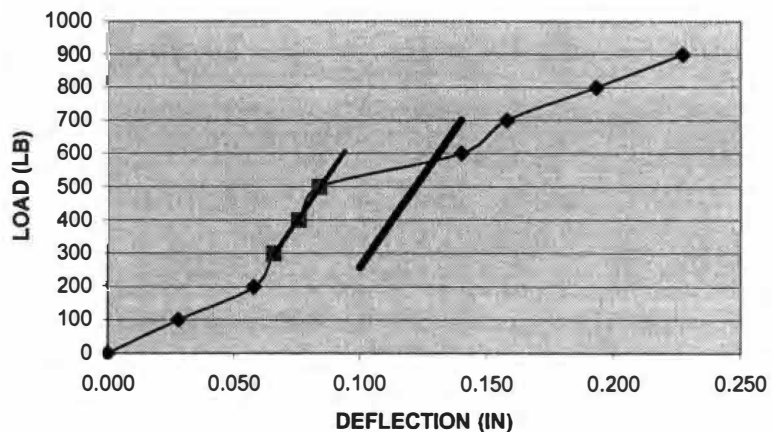
*SUMMERWOOD 10%

*SEASONING GREEN

*MOISTURE 5%

*KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Oct-03

PIECE NO. 16DF

PEG NO. 3/4 RO -0.625

KIND OF TEST END DISTANCE TEST

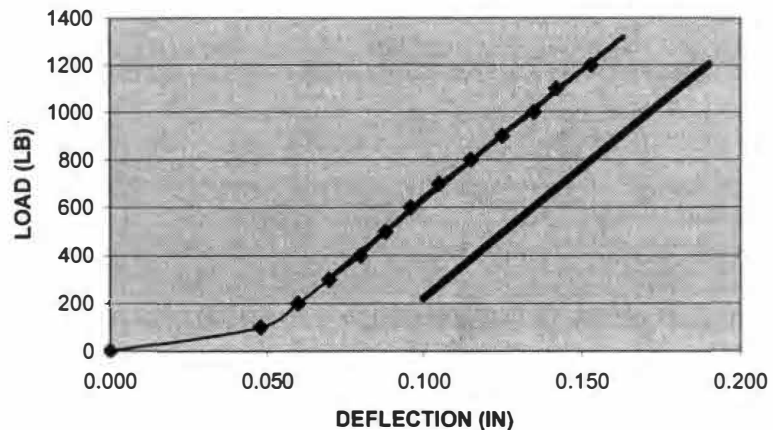
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.86 LBS
 *RINGS PER INCH 10
 *SAP 40%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 1200 LBS
 *34%R.H.
 *.0625 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.06 LBS
 *RINGS PER INCH 6
 *SAP 40%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 5%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.048
200	0.060
300	0.070
400	0.080
500	0.088
600	0.096
700	0.105
800	0.115
900	0.125
1000	0.135
1100	0.142
1200	0.153



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Oct-03

PIECE NO. 16DF

PEG NO. 3/4 RO -0.75

KIND OF TEST END DISTANCE TEST

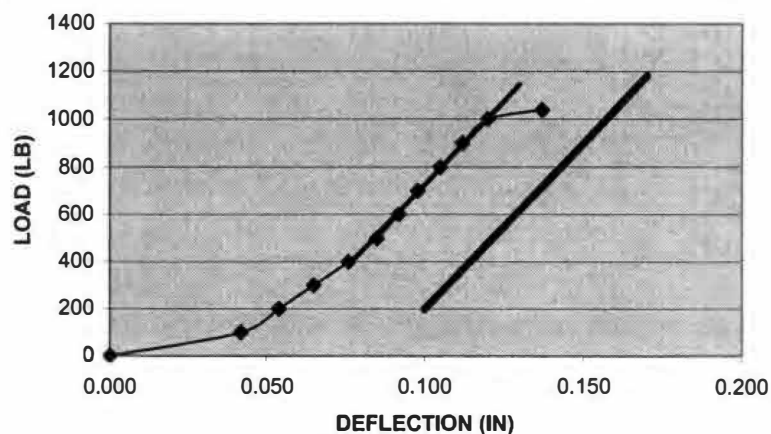
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.84 LBS
 *RINGS PER INCH 10
 *SAP 40%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 1040 LBS
33%R.H.
.075 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 6
 *SAP 30%
 *SUMMERWOOD 5%
 *SEASONING GREEN
 *MOISTURE 5%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.042
200	0.054
300	0.065
400	0.076
500	0.085
600	0.092
700	0.098
800	0.105
900	0.112
1000	0.120
1040	0.137



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Oct-03

PIECE NO. 16DF

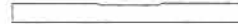
PEG NO. 3/4 RO -0.875

KIND OF TEST END DISTANCE TEST

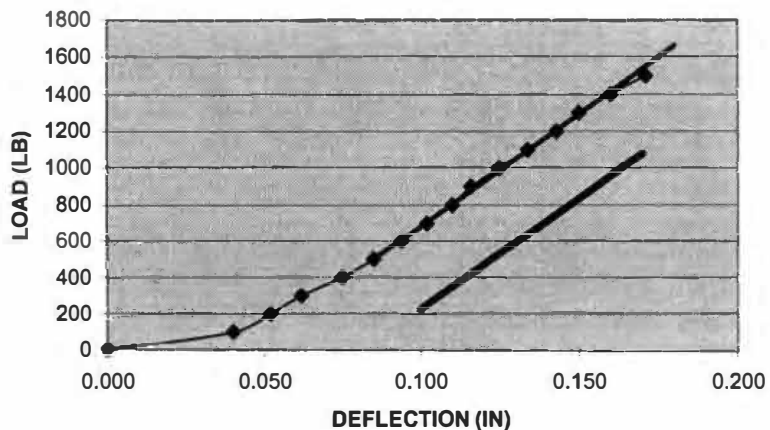
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.9 LBS
 *RINGS PER INCH 10
 *SAP 40%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 1500 LBS
 *33%R.H.
 *.0875 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 6
 *SAP 30%
 *SUMMERWOOD 5%
 *SEASONING GREEN
 *MOISTURE 5%
 *KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.040
200	0.052
300	0.062
400	0.075
500	0.085
600	0.094
700	0.102
800	0.110
900	0.116
1000	0.125
1100	0.134
1200	0.143
1300	0.150
1400	0.160
1500	0.171



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Oct-03

PIECE NO. 16DF

PEG NO. 3/4 RO -1.00

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 69.1 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.9 LBS

*RINGS PER INCH 10

*SAP 40%

*SUMMERWOOD 40%

*SEASONING GREEN

*MOISTURE 10.5%

*KIND OF FAILURE relish

DATA

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.028
200	0.038
300	0.048
400	0.056
500	0.064
600	0.072
700	0.080
800	0.088
900	0.094
1000	0.102
1100	0.108
1200	0.115
1300	0.121
1400	0.129
1500	0.136
1600	0.143
1700	0.150
1800	0.157
1900	0.166
2000	0.181
2035	0.190



*LOAD @ FAILURE 2035 LBS

33%R.H.

1.00 in

*SPECIES OF PEG

RED OAK

*DIA. 3/4"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.07 LBS

*RINGS PER INCH 12

*SAP 30%

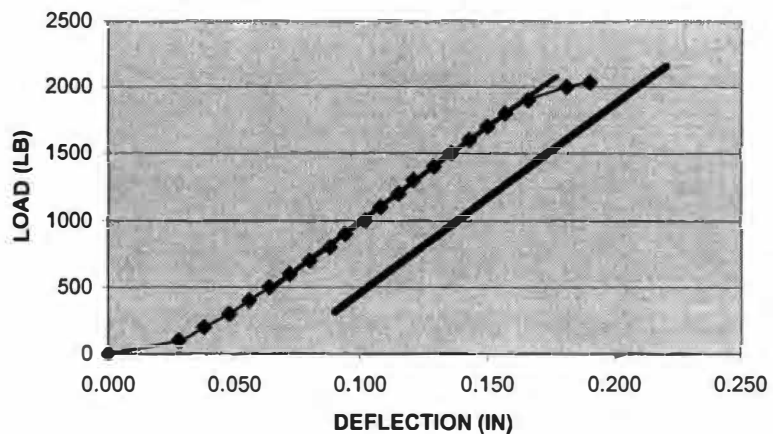
*SUMMERWOOD 15%

*SEASONING GREEN

*MOISTURE 7%

*KIND OF FAILURE: crushed

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Oct-03

PIECE NO. 16DF

PEG NO. 3/4 RO -1.125

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 69.1 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.93 LBS

*RINGS PER INCH 10

*SAP 40%

*SUMMERWOOD 40%

*SEASONING GREEN

*MOISTURE 11.0%

*KIND OF FAILURE relish
DATA

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.092
200	0.101
300	0.110
400	0.118
500	0.125
600	0.132
700	0.138
800	0.144
900	0.152
1000	0.157
1100	0.164
1200	0.172
1300	0.178
1400	0.185
1500	0.192
1600	0.198
1700	0.205
1800	0.214
1900	0.225
2000	0.240
2080	0.253



*LOAD @ FAILURE 2080 LBS

33%R.H.

1.125 in

*SPECIES OF PEG

RED OAK

*DIA. 3/4"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.07 LBS

*RINGS PER INCH 16

*SAP 35%

*SUMMERWOOD 20%

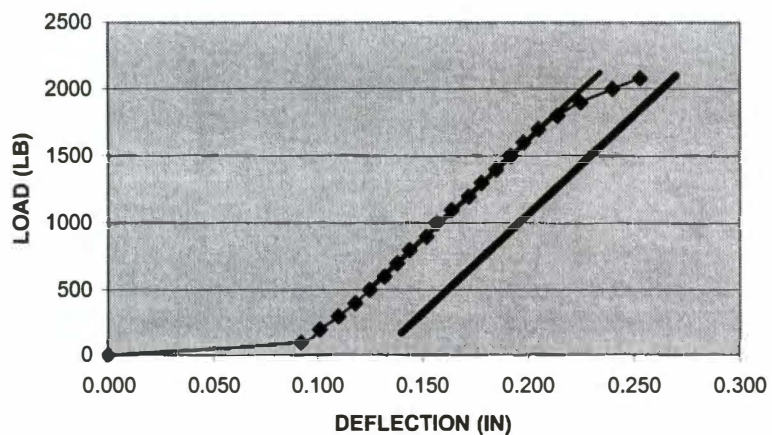
*SEASONING GREEN

*MOISTURE 7%

*KIND OF FAILURE: crushed
bent



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Oct-03

PIECE NO. 16DF

PEG NO. 3/4 RO -1.25

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 69.1 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.95 LBS

*RINGS PER INCH 10

*SAP 40%

*SUMMERWOOD 40%

*SEASONING GREEN

*MOISTURE 11.0%

*KIND OF FAILURE relish

*LOAD @ FAILURE 2195 LBS

33%R.H.

1.25 in

*SPECIES OF PEG

RED OAK

*DIA. 3/4"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.07 LBS

*RINGS PER INCH 12

*SAP 25%

*SUMMERWOOD 10%

*SEASONING GREEN

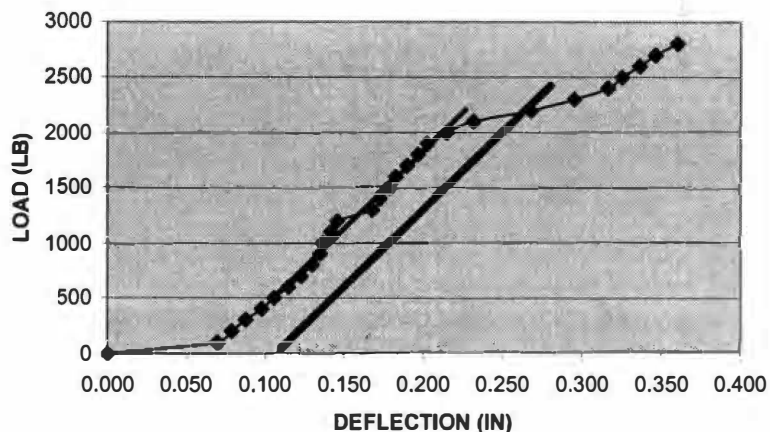
*MOISTURE 6.5%

*KIND OF FAILURE: crushed
bent

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.070
200	0.079
300	0.088
400	0.098
500	0.106
600	0.115
700	0.123
800	0.130
900	0.135
1000	0.137
1100	0.142
1200	0.146
1300	0.168
1400	0.173
1500	0.179
1600	0.183
1700	0.190
1800	0.197
1900	0.203
2000	0.215
2100	0.232
2200	0.268
2300	0.295
2400	0.316
2500	0.325
2600	0.336
2700	0.346
2800	0.360



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 24-Oct-03

PIECE NO. 16DF

PEG NO. 3/4 RO -1.375

KIND OF TEST END DISTANCE TEST

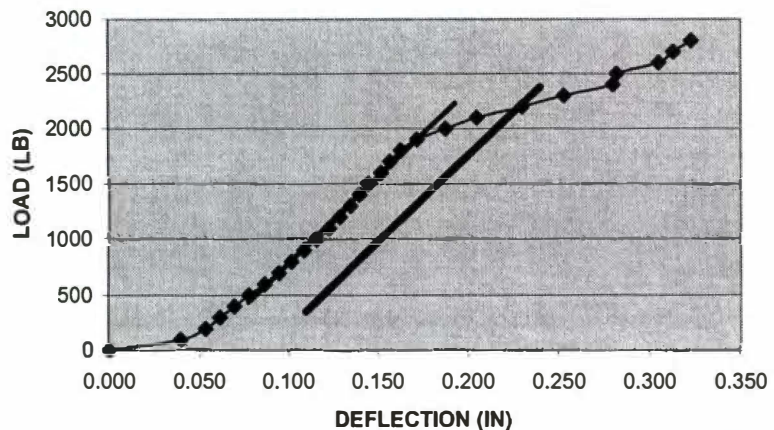
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.94 LBS
 *RINGS PER INCH 10
 *SAP 40%
 *SUMMERWOOD 40%
 *SEASONING GREEN
 *MOISTURE 10.0%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 2222 LBS
33%R.H.
1.375 in
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 8
 *SAP 35%
 *SUMMERWOOD 1%
 *SEASONING GREEN
 *MOISTURE 6.5%
 *KIND OF FAILURE: crushed
bent

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.040
200	0.054
300	0.062
400	0.070
500	0.078
600	0.087
700	0.095
800	0.102
900	0.109
1000	0.116
1100	0.123
1200	0.129
1300	0.135
1400	0.140
1500	0.145
1600	0.152
1700	0.157
1800	0.163
1900	0.172
2000	0.188
2100	0.205
2200	0.230
2300	0.253
2400	0.280
2500	0.282
2600	0.305
2700	0.313
2800	0.323



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

PEG NO. 3/4 RO -1.5

KIND OF TEST END DISTANCE TEST

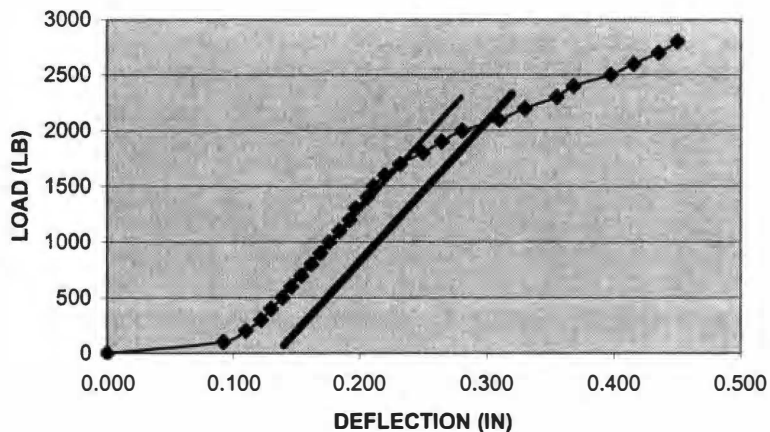
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 67.7 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.83 LBS
 *RINGS PER INCH 6
 *SAP 40%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 11.0%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 2080 LBS
 *38%R.H.
 *1.5 in
 *SPECIES OF PEG RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.06 LBS
 *RINGS PER INCH 8
 *SAP 25%
 *SUMMERWOOD 50%
 *SEASONING GREEN
 *MOISTURE dry
 *KIND OF FAILURE: crushed
bent
cracked

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.092
200	0.110
300	0.122
400	0.130
500	0.139
600	0.146
700	0.154
800	0.162
900	0.169
1000	0.176
1100	0.184
1200	0.192
1300	0.197
1400	0.206
1500	0.211
1600	0.220
1700	0.232
1800	0.250
1900	0.265
2000	0.281
2100	0.310
2200	0.330
2300	0.355
2400	0.368
2500	0.397
2600	0.415
2700	0.435
2800	0.450



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

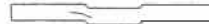
DATE: 27-Oct-03 PIECE NO. 17DF PEG NO. 3/4 RO -1.625

KIND OF TEST END DISTANCE TEST

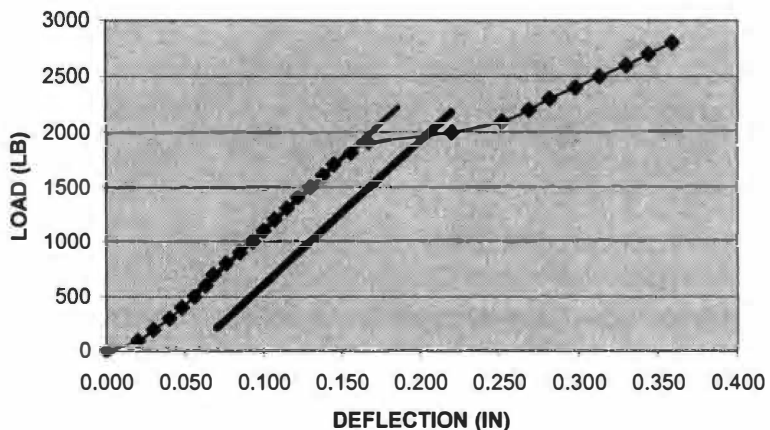
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 67.7 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.81 LBS
 *RINGS PER INCH 6
 *SAP 40%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 10.0%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 1990 LBS
 *38%R.H.
 *1.625 in
 *SPECIES OF PEG RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.06 LBS
 *RINGS PER INCH 6
 *SAP 20%
 *SUMMERWOOD 65%
 *SEASONING GREEN
 *MOISTURE dry
 *KIND OF FAILURE: crushed
bent
cracked

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.020
200	0.030
300	0.040
400	0.048
500	0.056
600	0.063
700	0.068
800	0.076
900	0.085
1000	0.093
1100	0.100
1200	0.107
1300	0.115
1400	0.122
1500	0.130
1600	0.138
1700	0.145
1800	0.156
1900	0.167
2000	0.220
2100	0.252
2200	0.269
2300	0.282
2400	0.298
2500	0.313
2600	0.330
2700	0.344
2800	0.359



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

PEG NO. 3/4 RO -1.75

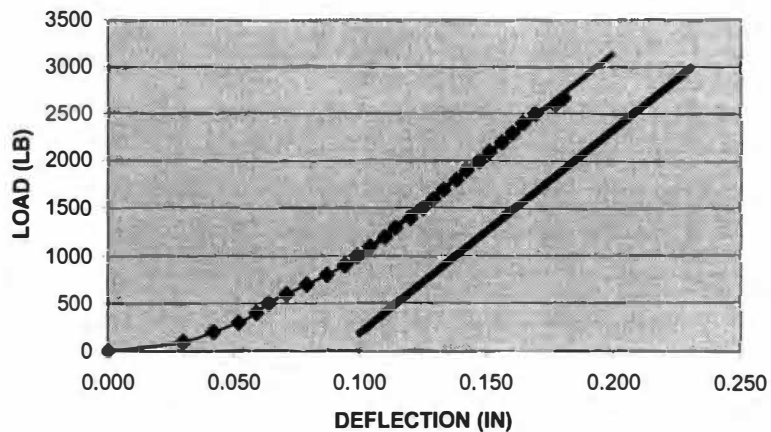
KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 67.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.81 LBS
 *RINGS PER INCH 6
 *SAP 40%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 10.5%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 2670 LBS
39%R.H.
1.75 in
 *SPECIES OF PEG RED OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 3
 *SAP 30%
 *SUMMERWOOD 90%
 *SEASONING GREEN
 *MOISTURE dry
 *KIND OF FAILURE: crushed bent

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.030
200	0.042
300	0.052
400	0.059
500	0.064
600	0.071
700	0.079
800	0.087
900	0.094
1000	0.099
1100	0.104
1200	0.110
1300	0.114
1400	0.120
1500	0.125
1600	0.129
1700	0.133
1800	0.138
1900	0.142
2000	0.147
2100	0.151
2200	0.156
2300	0.160
2400	0.164
2500	0.169
2600	0.177
2670	0.180

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

PEG NO. 3/4 RO -1.875

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 67.6 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 7 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.78 LBS

*RINGS PER INCH 6

*SAP 40%

*SUMMERWOOD 45%

*SEASONING GREEN

*MOISTURE 10.0%

*KIND OF FAILURE did not fail

*LOAD @ FAILURE 2150 LBS

39%R.H.

1.875 in

*SPECIES OF PEG

RED OAK

*DIA. 3/4"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.07 LBS

*RINGS PER INCH 6

*SAP 20%

*SUMMERWOOD 40%

*SEASONING GREEN

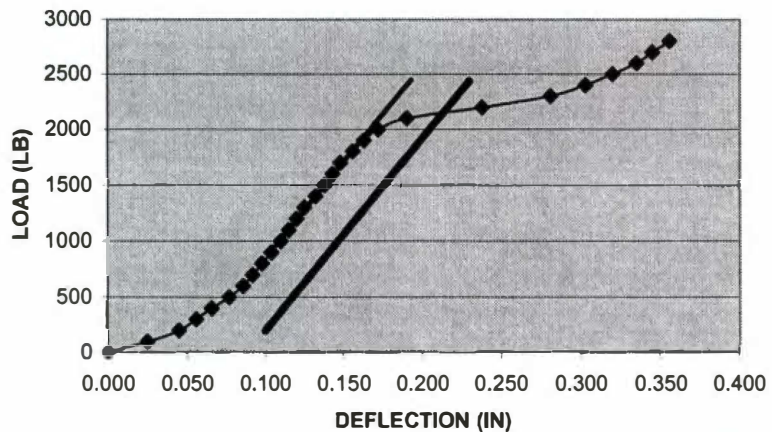
*MOISTURE dry

*KIND OF FAILURE: shear

LOAD(ib)	DEFLECT(in)
0	0.000
100	0.025
200	0.045
300	0.056
400	0.066
500	0.077
600	0.086
700	0.092
800	0.098
900	0.104
1000	0.110
1100	0.115
1200	0.120
1300	0.125
1400	0.132
1500	0.138
1600	0.143
1700	0.148
1800	0.156
1900	0.163
2000	0.172
2100	0.190
2200	0.238
2300	0.281
2400	0.303
2500	0.320
2600	0.335
2700	0.345
2800	0.356

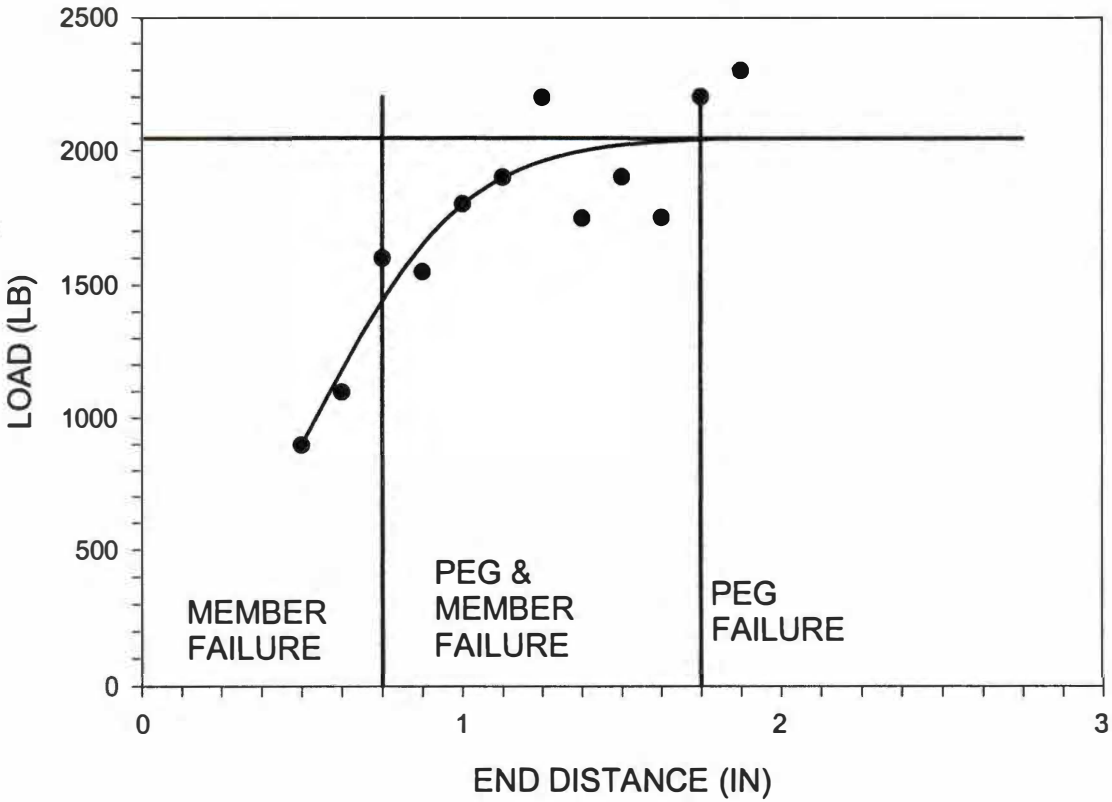


DATA WITH TRENDLINE AND 5% OFFSET YIELD



APPENDIX N – END TEST-SOUTHERN PINE-3/4” RED OAK PEGS

END TEST-SOUTHERN PINE-3/4" RED OAK



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 19SP

PEG NO. 3/4RO-0.5

KIND OF TEST END DISTANCE TEST

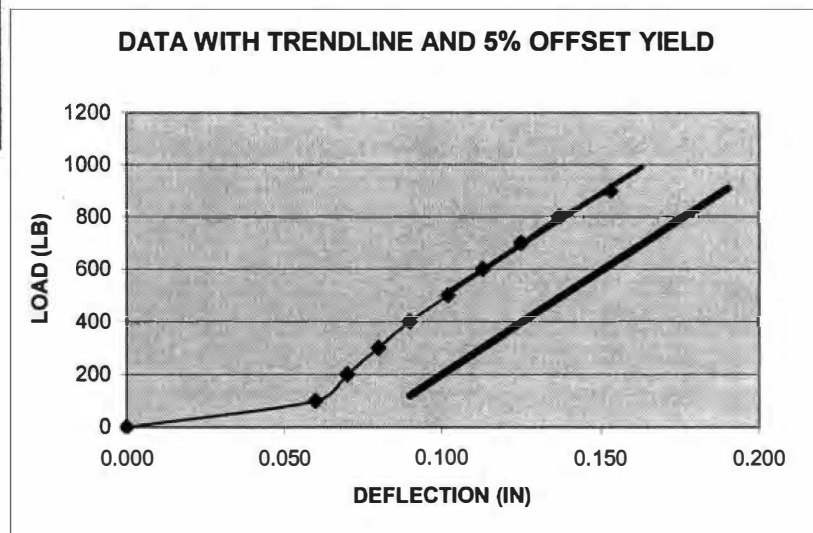
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.56 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 11.5%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 900 LBS
35 %R.H.

*SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP

*WEIGHT 0.065 LBS
 *RINGS PER INCH 2
 *SAP 35%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.060
200	0.070
300	0.080
400	0.090
500	0.102
600	0.113
700	0.125
800	0.137
900	0.153



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 19SP

PEG NO. 3/4RO- 0.625

KIND OF TEST END DISTANCE TEST

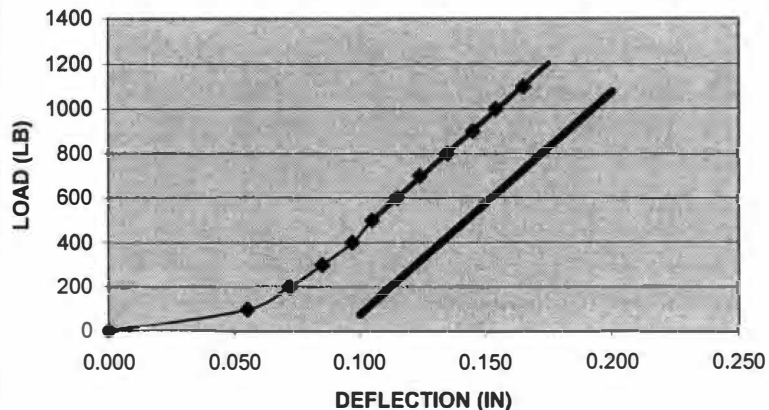
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.58 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 11.0%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 1100 LBS
35 %R.H.
0.625
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 8
 *SAP 40%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.055
200	0.072
300	0.085
400	0.097
500	0.105
600	0.115
700	0.124
800	0.135
900	0.145
1000	0.154
1100	0.165



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 19SP

PEG NO. 3/4RO- 0.75

KIND OF TEST END DISTANCE TEST

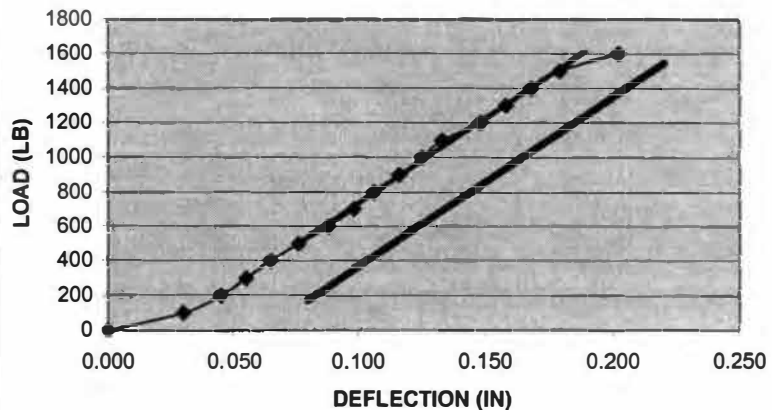
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.58 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 11.0%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 1600 LBS
 *35 %R.H.
 *0.75
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.06 LBS
 *RINGS PER INCH 8
 *SAP 35%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: crushed
bent

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.030
200	0.045
300	0.055
400	0.065
500	0.076
600	0.088
700	0.098
800	0.106
900	0.116
1000	0.125
1100	0.133
1200	0.148
1300	0.158
1400	0.168
1500	0.179
1600	0.202



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 19SP

PEG NO. 3/4RO- 0.875

KIND OF TEST END DISTANCE TEST

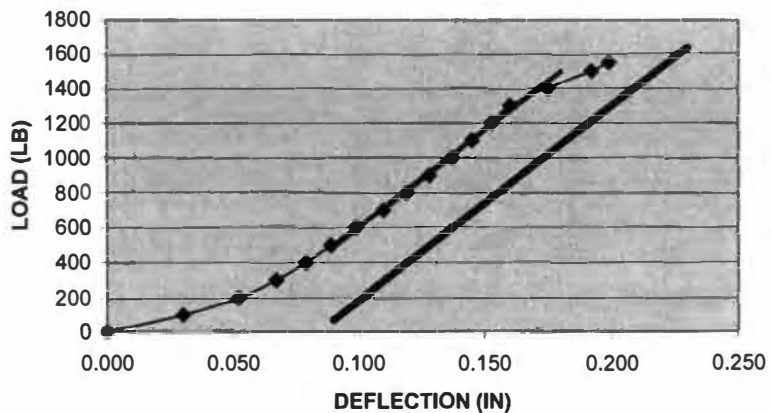
*MACHINE: Universal Testing Machine
 *SPEED ON MACH 0.04 IN PER MIN. 1
 *TESTED AT 68.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 3/4"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.58 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 12.5%
 *KIND OF FAILURE elongated hole
 DATA cracked

*LOAD @ FAILURE 1550 LBS
35 %R.H.
0.875
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 8
 *SAP 25%
 *SUMMERWOOD 85%
 *SEASONING GREEN
 *MOISTURE 5.5%
 *KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.030
200	0.052
300	0.067
400	0.079
500	0.089
600	0.099
700	0.110
800	0.119
900	0.128
1000	0.137
1100	0.145
1200	0.153
1300	0.160
1400	0.175
1500	0.192
1550	0.199



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 19SP

PEG NO. 3/4RO-1.00

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 68.8 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.71 LBS

*RINGS PER INCH 6

*SAP 75%

*SUMMERWOOD 10%

*SEASONING GREEN

*MOISTURE 12.5%

*KIND OF FAILURE elongated hole

DATA

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.020
200	0.033
300	0.044
400	0.053
500	0.062
600	0.070
700	0.077
800	0.083
900	0.091
1000	0.098
1100	0.103
1200	0.110
1300	0.118
1400	0.124
1500	0.131
1600	0.138
1700	0.144
1800	0.153



*LOAD @ FAILURE 1800 LBS

35 %R.H.

1.000

*SPECIES OF PEG

RED OAK

*DIA. 3/4"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.07 LBS

*RINGS PER INCH 12

*SAP 65%

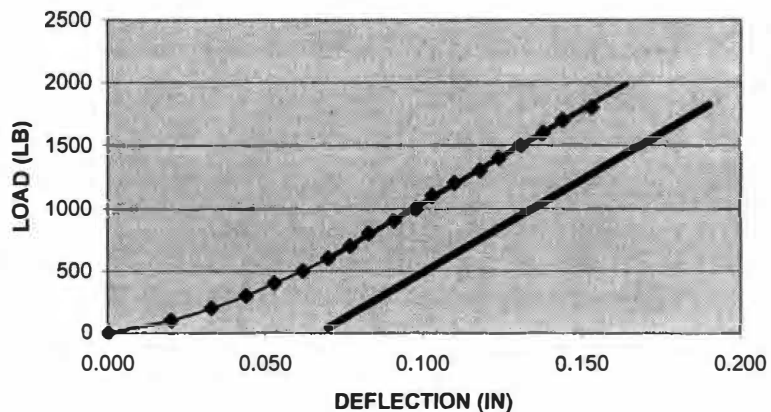
*SUMMERWOOD 75%

*SEASONING GREEN

*MOISTURE 5.5%

*KIND OF FAILURE: crushed

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 19SP

PEG NO. 3/4RO-1.125

KIND OF TEST END DISTANCE TEST

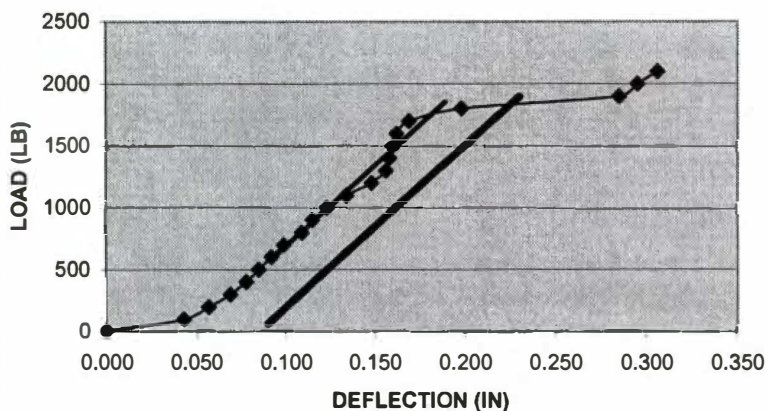
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.63 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 13.0%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 1898 LBS
 *35 %R.H.
 *1.125"
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 3/4"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.065 LBS
 *RINGS PER INCH 4
 *SAP 5%
 *SUMMERWOOD 5%
 *SEASONING GREEN
 *MOISTURE 6.5%
 *KIND OF FAILURE: crushed
cracked

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.043
200	0.057
300	0.069
400	0.078
500	0.085
600	0.092
700	0.099
800	0.109
900	0.115
1000	0.123
1100	0.134
1200	0.148
1300	0.156
1400	0.158
1500	0.160
1600	0.162
1700	0.169
1800	0.198
1900	0.285
2000	0.295
2100	0.306



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 19SP

PEG NO. 3/4RO-1.25

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 69.1 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 9 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.71 LBS

*RINGS PER INCH 6

*SAP 75%

*SUMMERWOOD 10%

*SEASONING GREEN

*MOISTURE 14.5%

*KIND OF FAILURE elongated hole

DATA

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.023
200	0.037
300	0.045
400	0.054
500	0.060
600	0.066
700	0.076
800	0.084
900	0.092
1000	0.098
1100	0.103
1200	0.109
1300	0.114
1400	0.120
1500	0.127
1600	0.139
1700	0.159
1800	0.168
1900	0.182
2000	0.192
2100	0.204
2200	0.215
2300	0.232
2400	0.248
2500	0.261
2600	0.285
2700	0.325



*LOAD @ FAILURE 2200 LBS

35 %R.H.

1.25"

*SPECIES OF PEG

RED OAK

*DIA. 3/4"

*LENGTH 5 7/8"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.08 LBS

*RINGS PER INCH 4

*SAP 25%

*SUMMERWOOD 15%

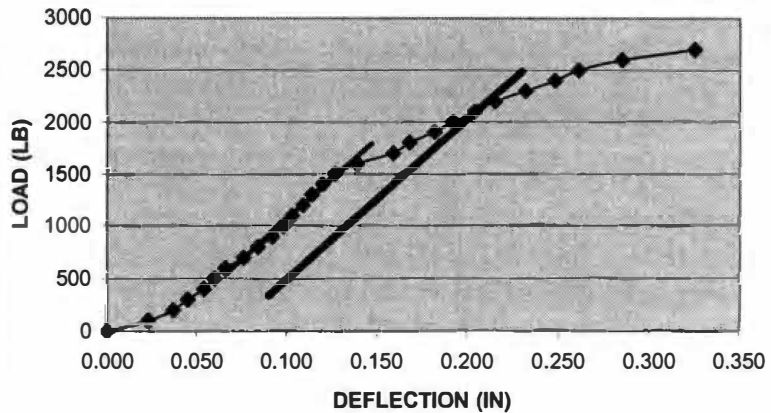
*SEASONING GREEN

*MOISTURE 6.5%

*KIND OF FAILURE: crushed

cracked
bent

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 19SP

PEG NO. 3/4RO-1.375

KIND OF TEST END DISTANCE TEST

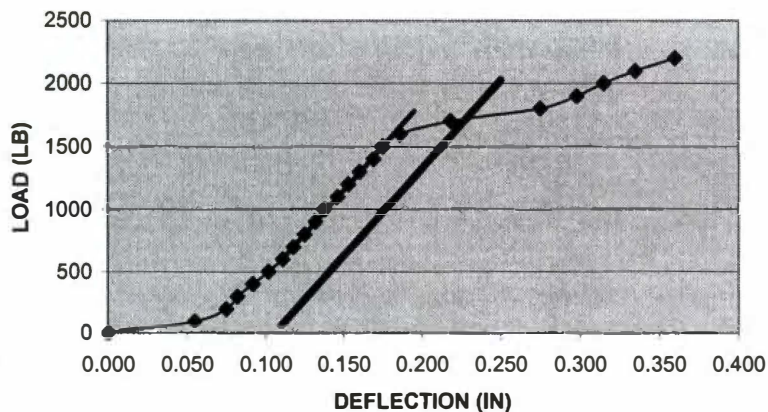
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.73 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 14.5%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 1746 LBS
 *35 %R.H.
1.375"
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.06 LBS
 *RINGS PER INCH 8
 *SAP 35%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE 6.5%
 *KIND OF FAILURE: crushed
cracked
bent

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.055
200	0.075
300	0.082
400	0.092
500	0.102
600	0.111
700	0.118
800	0.125
900	0.132
1000	0.138
1100	0.146
1200	0.153
1300	0.160
1400	0.169
1500	0.175
1600	0.186
1700	0.218
1800	0.275
1900	0.298
2000	0.315
2100	0.335
2200	0.360



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

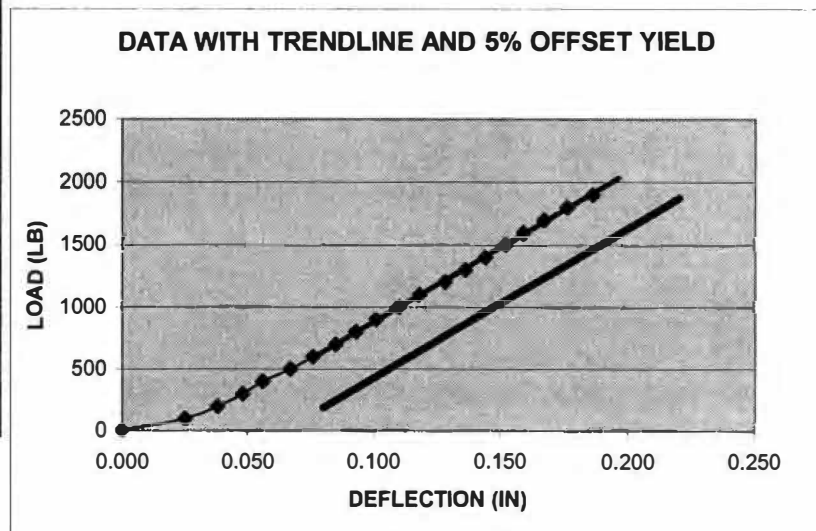
PEG NO. 3I4RO-1.5

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.3 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.37 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 10.5%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 1900 LBS
 *35 %R.H.
 *1.5"
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 6
 *SAP 35%
 *SUMMERWOOD 30%
 *SEASONING GREEN
 *MOISTURE 6.5%
 *KIND OF FAILURE: crushed
cracked
bent

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.025
200	0.038
300	0.048
400	0.056
500	0.067
600	0.076
700	0.085
800	0.093
900	0.101
1000	0.110
1100	0.118
1200	0.128
1300	0.136
1400	0.144
1500	0.152
1600	0.159
1700	0.167
1800	0.176
1900	0.186



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

PEG NO. 3/4RO-1.625

KIND OF TEST END DISTANCE TEST

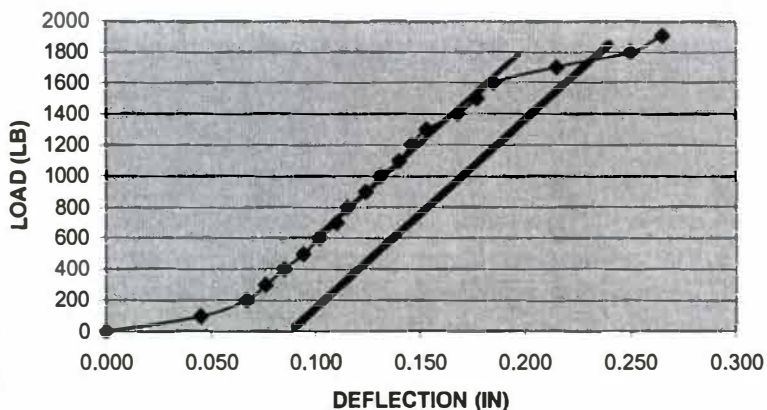
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.4 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.32 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 8.0%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 1750 LBS
 *35 %R.H.
 *1.625"
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 6
 *SAP 20%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 6.5%
 *KIND OF FAILURE: crushed
cracked
bent

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.045
200	0.067
300	0.076
400	0.085
500	0.094
600	0.102
700	0.110
800	0.115
900	0.124
1000	0.131
1100	0.140
1200	0.146
1300	0.153
1400	0.168
1500	0.177
1600	0.185
1700	0.215
1800	0.250
1900	0.265



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

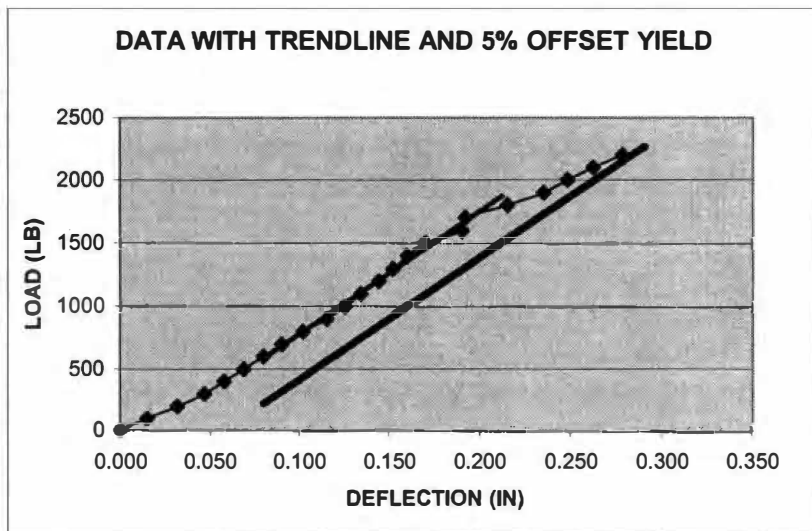
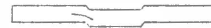
PEG NO. 3/4RO-1.75

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.35 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 11.5%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 2200 LBS
35 %R.H.
1.75"
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 12
 *SAP 35%
 *SUMMERWOOD 60%
 *SEASONING GREEN
 *MOISTURE 6.5%
 *KIND OF FAILURE: crushed
cracked
bent

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.015
200	0.032
300	0.047
400	0.058
500	0.069
600	0.080
700	0.090
800	0.102
900	0.115
1000	0.125
1100	0.134
1200	0.144
1300	0.152
1400	0.160
1500	0.170
1600	0.190
1700	0.192
1800	0.215
1900	0.235
2000	0.248
2100	0.262
2200	0.278



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

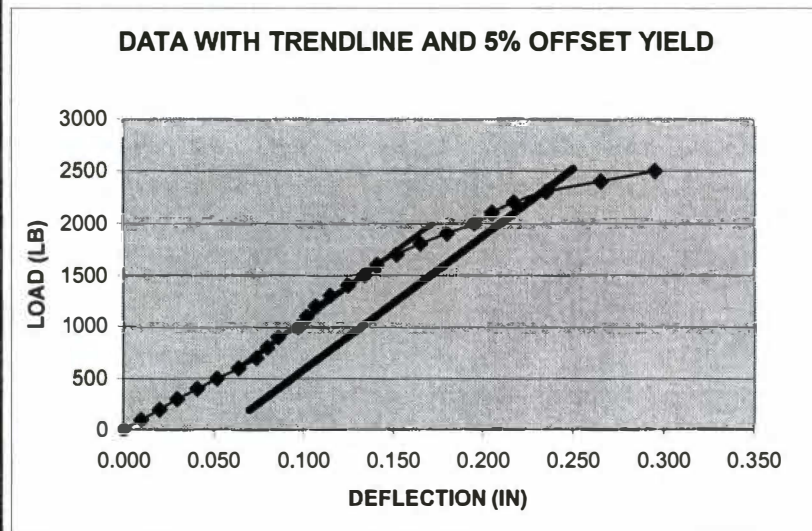
PEG NO. 3/4RO-1.875

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.5 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.30 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 10.5%
 *KIND OF FAILURE did not fail

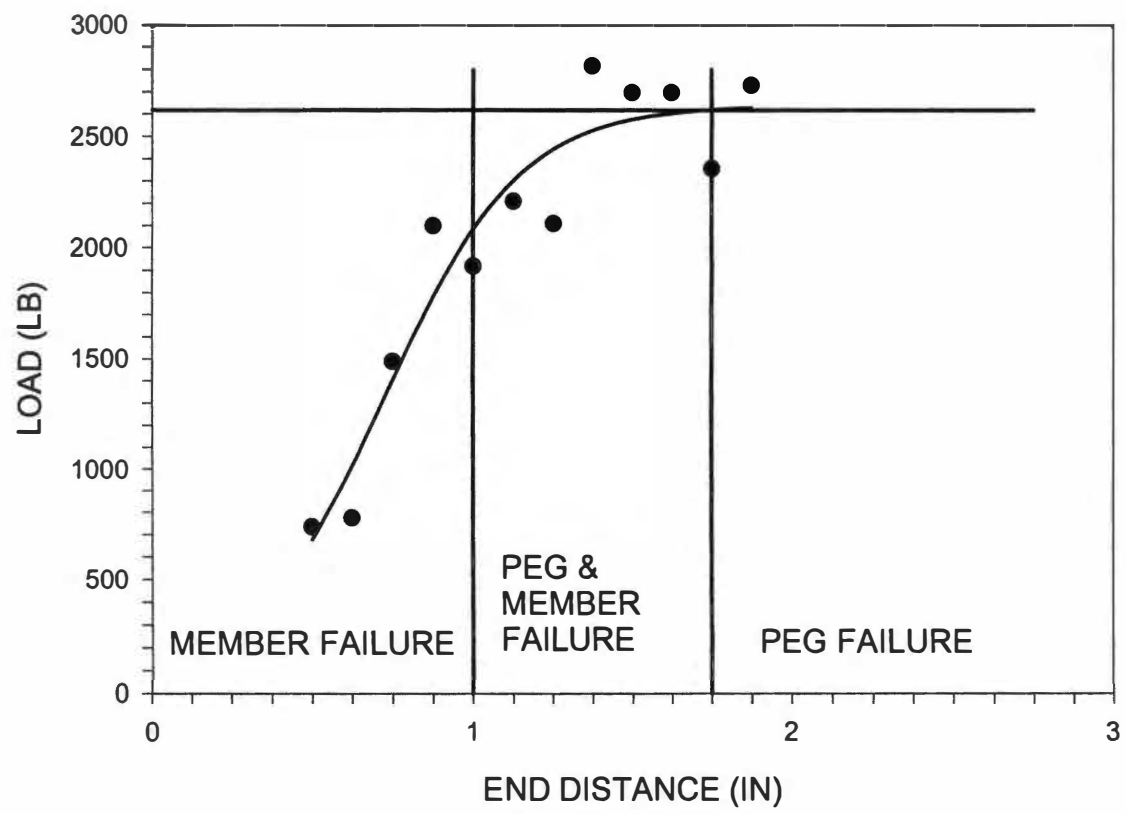
*LOAD @ FAILURE 2300 LBS
 *35 %R.H.
 *1.875"
 *SPECIES OF PEG
RED OAK
 *DIA. 3/4"
 *LENGTH 5 7/8"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.07 LBS
 *RINGS PER INCH 6
 *SAP 20%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 6.5%
 *KIND OF FAILURE: crushed
cracked
bent

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.010
200	0.020
300	0.030
400	0.041
500	0.052
600	0.064
700	0.074
800	0.080
900	0.086
1000	0.097
1100	0.102
1200	0.107
1300	0.115
1400	0.125
1500	0.134
1600	0.141
1700	0.152
1800	0.165
1900	0.180
2000	0.195
2100	0.205
2200	0.217
2300	0.235
2400	0.265
2500	0.295



APPENDIX O – END TEST-DOUGLAS FIR-3/4” WHITE OAK PEGS

END TEST-DOUGLAS FIR-3/4" WHITE OAK PEGS



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

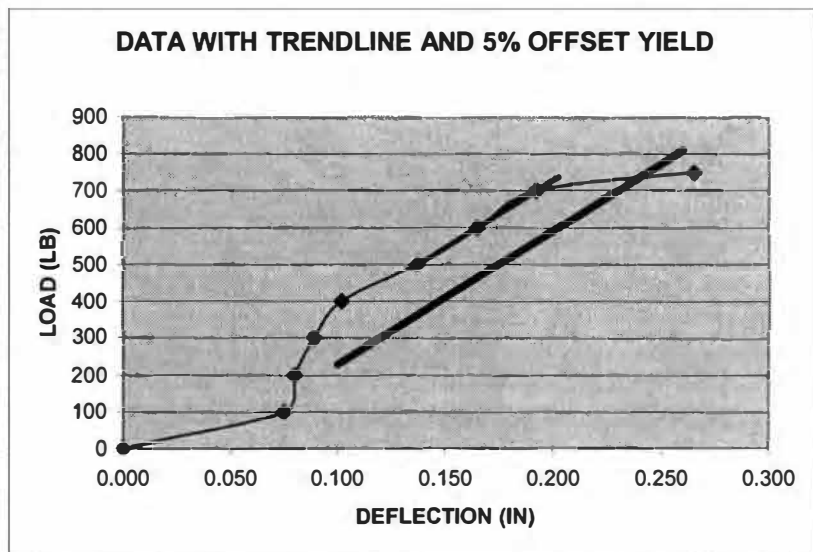
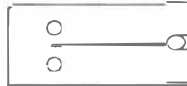
PEG NO. 3/4 WO -0.5

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68.2 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.75 LBS
 *RINGS PER INCH 6
 *SAP 40%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 738 LBS
 *39%R.H.
 *.05 in
 *SPECIES OF PEG WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 14
 *SAP 1%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.075
200	0.080
300	0.089
400	0.102
500	0.137
600	0.165
700	0.192
750	0.265



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

PEG NO. 3/4 WO -0.625

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 68.3 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 9 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.76 LBS

*RINGS PER INCH 6

*SAP 40%

*SUMMERWOOD 45%

*SEASONING GREEN

*MOISTURE 10%

*KIND OF FAILURE relish

*LOAD @ FAILURE 779 LBS

39%R.H.

.625 in

*SPECIES OF PEG

WHITE OAK

*DIA. 3/4"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD
PERP

*WEIGHT 0.06 LBS

*RINGS PER INCH 2

*SAP 85%

*SUMMERWOOD 95%

*SEASONING GREEN

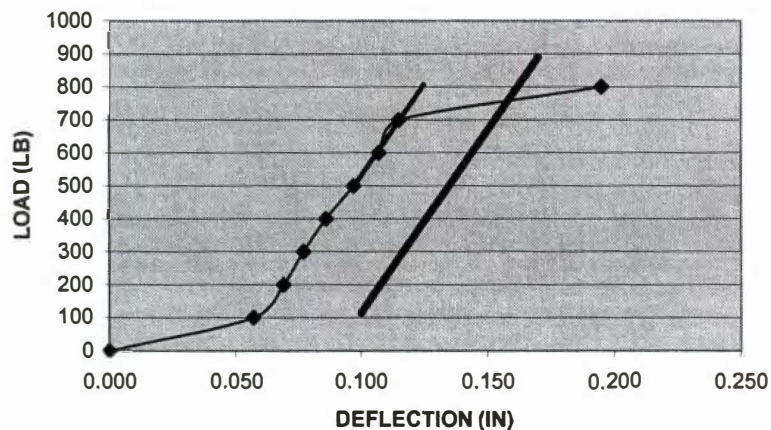
*MOISTURE 7%

*KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.057
200	0.069
300	0.077
400	0.086
500	0.097
600	0.107
700	0.115
800	0.195



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

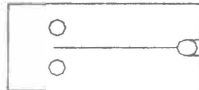
PEG NO. 3/4 WO -0.75

KIND OF TEST END DISTANCE TEST

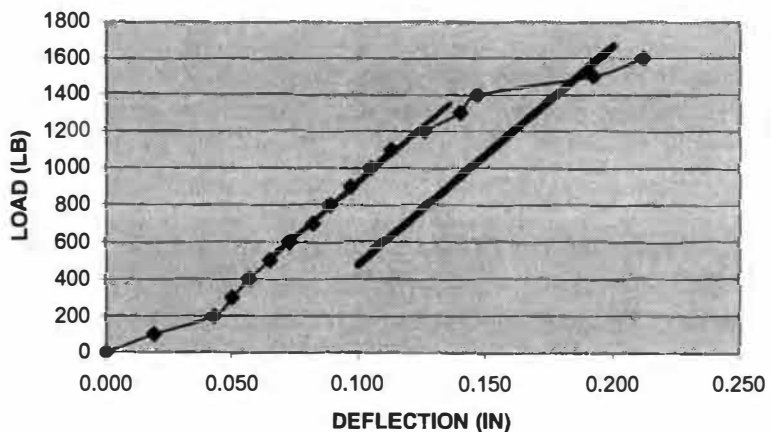
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68.7 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.73 LBS
 *RINGS PER INCH 6
 *SAP 40%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 1490 LBS
39%R.H.
.75 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 20
 *SAP 10%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.019
200	0.043
300	0.050
400	0.057
500	0.065
600	0.073
700	0.082
800	0.089
900	0.097
1000	0.105
1100	0.113
1200	0.126
1300	0.140
1400	0.147
1500	0.192
1600	0.212



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

PEG NO. 3/4 WO -0.875

KIND OF TEST END DISTANCE TEST

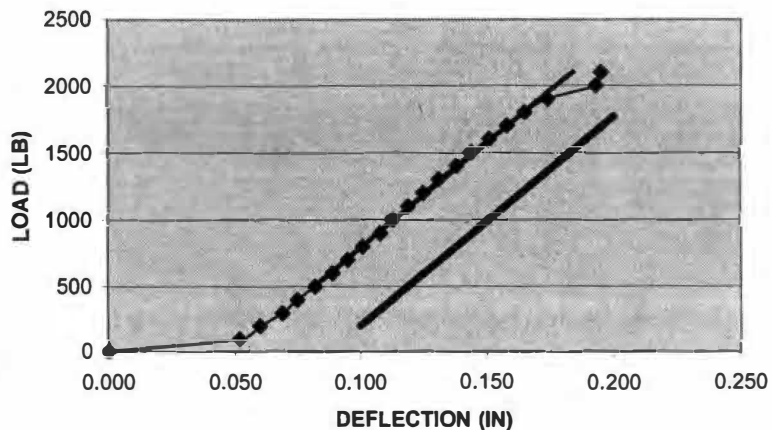
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68.7 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.71 LBS
 *RINGS PER INCH 6
 *SAP 40%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 2100 LBS
38%R.H.
.875 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 20
 *SAP 25%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.052
200	0.060
300	0.069
400	0.075
500	0.082
600	0.089
700	0.095
800	0.101
900	0.108
1000	0.113
1100	0.119
1200	0.125
1300	0.131
1400	0.138
1500	0.144
1600	0.151
1700	0.158
1800	0.165
1900	0.174
2000	0.193
2100	0.195



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

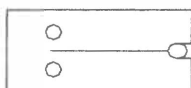
PEG NO. 3/4 WO 1.00

KIND OF TEST END DISTANCE TEST

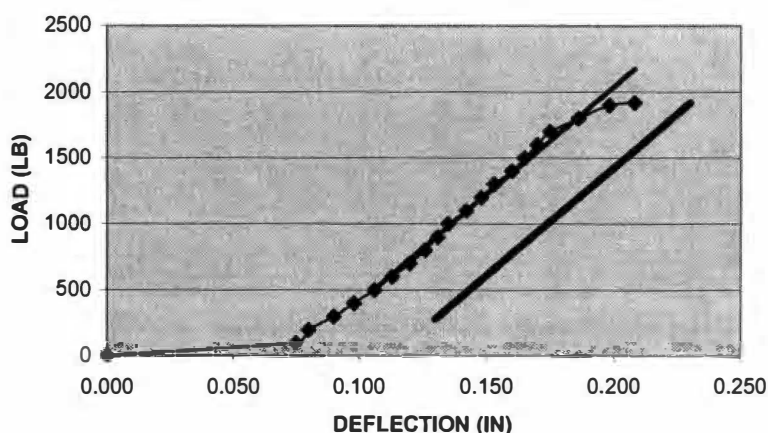
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.68 LBS
 *RINGS PER INCH 6
 *SAP 40%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 9%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 1920 LBS
38%R.H.
1.00 in
 *SPECIES OF PEG WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD PERP
 *WEIGHT 0.095 LBS
 *RINGS PER INCH 12
 *SAP 1%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.075
200	0.080
300	0.090
400	0.098
500	0.106
600	0.113
700	0.120
800	0.126
900	0.131
1000	0.135
1100	0.142
1200	0.148
1300	0.153
1400	0.160
1500	0.165
1600	0.170
1700	0.175
1800	0.186
1900	0.198
1920	0.208



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

PEG NO. 3/4 WO 1.125

KIND OF TEST END DISTANCE TEST

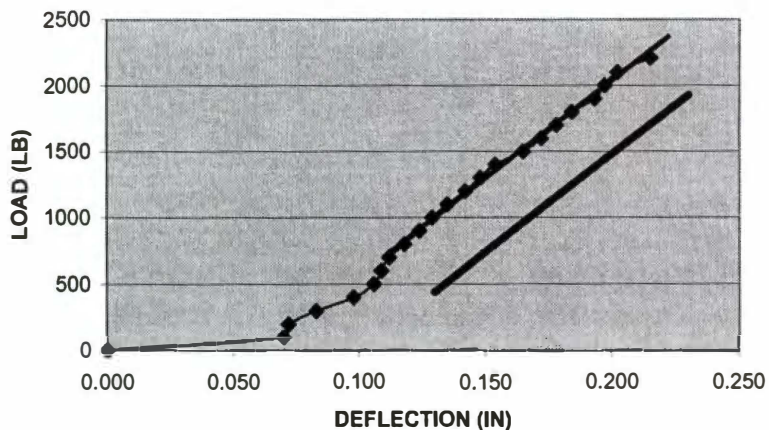
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68.8 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.69 LBS
 *RINGS PER INCH 6
 *SAP 40%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE relish
 DATA cracked

*LOAD @ FAILURE 2210 LBS
37%R.H.
1.125 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 16
 *SAP 15%
 *SUMMERWOOD 20%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.070
200	0.072
300	0.083
400	0.098
500	0.106
600	0.109
700	0.112
800	0.118
900	0.124
1000	0.129
1100	0.135
1200	0.142
1300	0.148
1400	0.154
1500	0.165
1600	0.172
1700	0.178
1800	0.184
1900	0.193
2000	0.197
2100	0.202
2210	0.215



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: **27-Oct-03**

PIECE NO. **17DF**

PEG NO. **3/4 WO 1.25**

KIND OF TEST END DISTANCE TEST

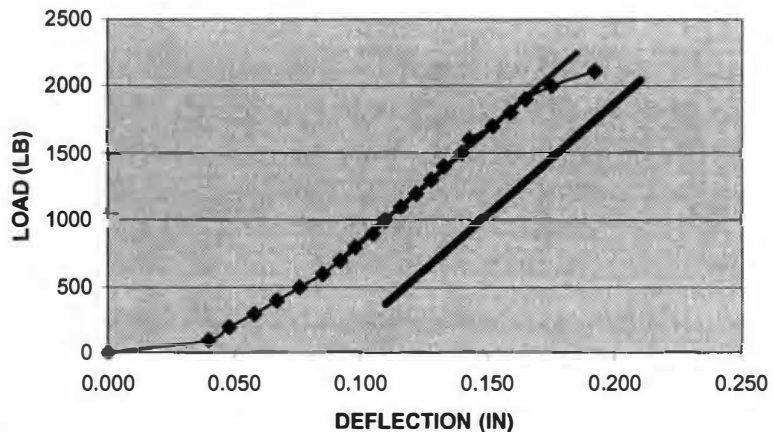
*MACHINE: **Universal Testing Machine**
 *SPEED ON MACH. **0.04 IN PER MIN. 1**
 *TESTED AT **68.6 degrees** TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS **DOUGLAS FIR**
 *LENGTH **9 7/8"**
 *HEIGHT **5.5"**
 *WIDTH **1.5"**
 *ANGLE OF GRAIN TO LOADING: **PARALLEL**
 *WEIGHT **1.67 LBS**
 *RINGS PER INCH **6**
 *SAP **40%**
 *SUMMERWOOD **45%**
 *SEASONING **GREEN**
 *MOISTURE **10%**
 *KIND OF FAILURE **elognated hole**
 DATA

*LOAD @ FAILURE **2110 LBS**
 *36%R.H.
 *1.25 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. **3/4"**
 *LENGTH **6.5"**
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT **0.08 LBS**
 *RINGS PER INCH **14**
 *SAP **40%**
 *SUMMERWOOD **15%**
 *SEASONING **GREEN**
 *MOISTURE **7%**
 *KIND OF FAILURE: **crushed**
bent

LOAD(lb)	DEFLECTY(in)
0	0.000
100	0.040
200	0.048
300	0.058
400	0.067
500	0.076
600	0.085
700	0.092
800	0.098
900	0.105
1000	0.110
1100	0.116
1200	0.122
1300	0.128
1400	0.133
1500	0.140
1600	0.143
1700	0.152
1800	0.159
1900	0.165
2000	0.175
2110	0.192



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

PEG NO. 3/4 WO 1.375

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 68.6 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 9 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.66 LBS

*RINGS PER INCH 6

*SAP 40%

*SUMMERWOOD 45%

*SEASONING GREEN

*MOISTURE 11%

*KIND OF FAILURE relish
DATA cracked

*LOAD @ FAILURE 2820 LBS

36%R.H.

1.375 in

*SPECIES OF PEG

WHITE OAK

*DIA. 3/4"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD
PERP

*WEIGHT 0.09 LBS

*RINGS PER INCH 12

*SAP 5%

*SUMMERWOOD 15%

*SEASONING GREEN

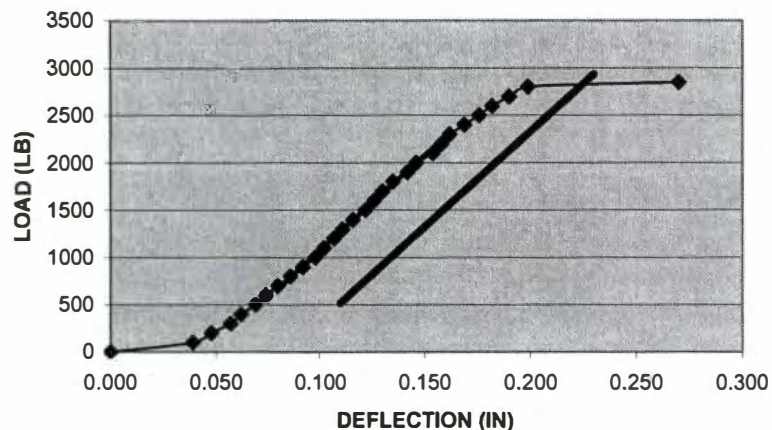
*MOISTURE 7%

*KIND OF FAILURE: crushed
bent

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.039
200	0.048
300	0.057
400	0.062
500	0.069
600	0.074
700	0.080
800	0.086
900	0.092
1000	0.098
1100	0.102
1200	0.107
1300	0.111
1400	0.116
1500	0.122
1600	0.126
1700	0.130
1800	0.135
1900	0.142
2000	0.146
2100	0.154
2200	0.158
2300	0.162
2400	0.169
2500	0.176
2600	0.182
2700	0.190
2800	0.199



DATA WITH TRENDLINE AND 5% OFFSET YIELD



LOAD(lb)	DEFLECT(in)
2850	0.270

DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

PEG NO. 3/4 WO 1.5

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 68.6 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS DOUGLAS FIR

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.66 LBS

*RINGS PER INCH 6

*SAP 40%

*SUMMERWOOD 45%

*SEASONING GREEN

*MOISTURE 9%

*KIND OF FAILURE elongated hole
DATA

*LOAD @ FAILURE 2700 LBS

36%R.H.

1.5 in

*SPECIES OF PEG

WHITE OAK

*DIA. 3/4"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.08 LBS

*RINGS PER INCH 12

*SAP 10%

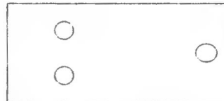
*SUMMERWOOD 25%

*SEASONING GREEN

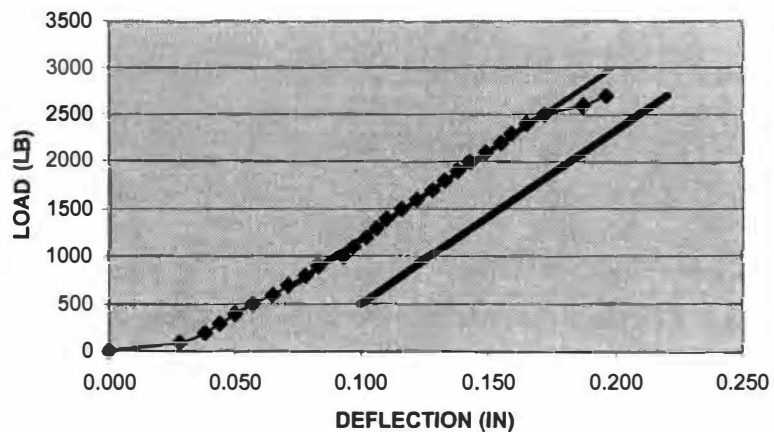
*MOISTURE 7%

*KIND OF FAILURE: crushed bent

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.028
200	0.038
300	0.044
400	0.050
500	0.057
600	0.065
700	0.071
800	0.078
900	0.083
1000	0.093
1100	0.097
1200	0.102
1300	0.106
1400	0.110
1500	0.116
1600	0.122
1700	0.128
1800	0.133
1900	0.138
2000	0.143
2100	0.149
2200	0.155
2300	0.159
2400	0.165
2500	0.172
2600	0.187
2700	0.196



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

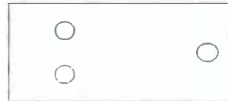
PEG NO. 3/4 WO 1.625

KIND OF TEST END DISTANCE TEST

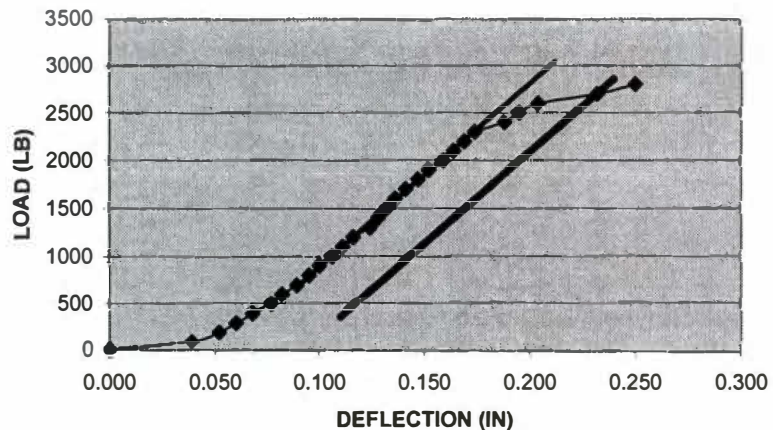
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.66 LBS
 *RINGS PER INCH 6
 *SAP 40%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE elongated hole
 DATA

*LOAD @ FAILURE 2700 LBS
36%R.H.
1.625 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.09 LBS
 *RINGS PER INCH 14
 *SAP 15%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: crushed
bent
cracked

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.039
200	0.052
300	0.060
400	0.068
500	0.077
600	0.082
700	0.089
800	0.095
900	0.100
1000	0.106
1100	0.111
1200	0.116
1300	0.124
1400	0.128
1500	0.132
1600	0.136
1700	0.141
1800	0.147
1900	0.152
2000	0.159
2100	0.164
2200	0.169
2300	0.174
2400	0.188
2500	0.195
2600	0.204
2700	0.232
2800	0.250



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

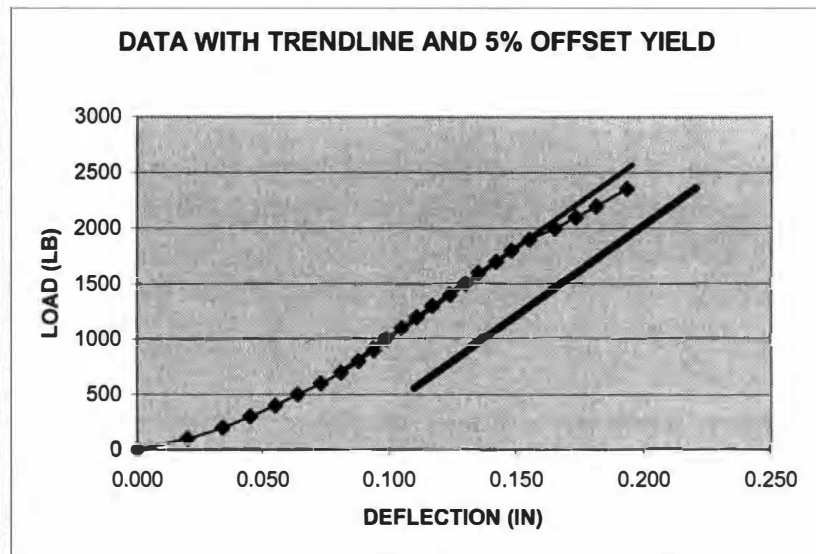
PEG NO. 3/4 WO 1.75

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.64 LBS
 *RINGS PER INCH 6
 *SAP 40%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 9%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 2357 LBS
 *36%R.H.
1.75 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.09 LBS
 *RINGS PER INCH 12
 *SAP 10%
 *SUMMERWOOD 35%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: crushed
cracked

LOAD(lb)	DEFLECT(in)
0	0.000
100	0.020
200	0.034
300	0.045
400	0.055
500	0.064
600	0.073
700	0.081
800	0.088
900	0.094
1000	0.099
1100	0.105
1200	0.111
1300	0.117
1400	0.124
1500	0.130
1600	0.135
1700	0.142
1800	0.148
1900	0.155
2000	0.165
2100	0.173
2200	0.181
2357	0.193



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 17DF

PEG NO. 3/4 WO 1.875

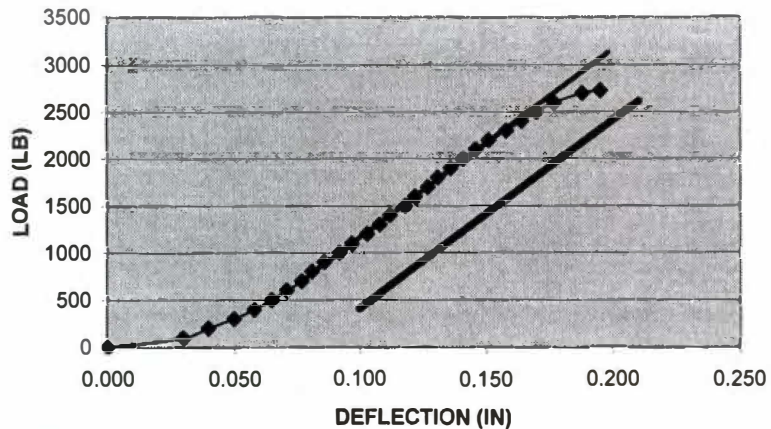
KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 68.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS DOUGLAS FIR
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.63 LBS
 *RINGS PER INCH 6
 *SAP 40%
 *SUMMERWOOD 45%
 *SEASONING GREEN
 *MOISTURE 10%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 2730 LBS
 *36%R.H.
1.875 in
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.09 LBS
 *RINGS PER INCH 6
 *SAP 20%
 *SUMMERWOOD 10%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: crushed
cracked

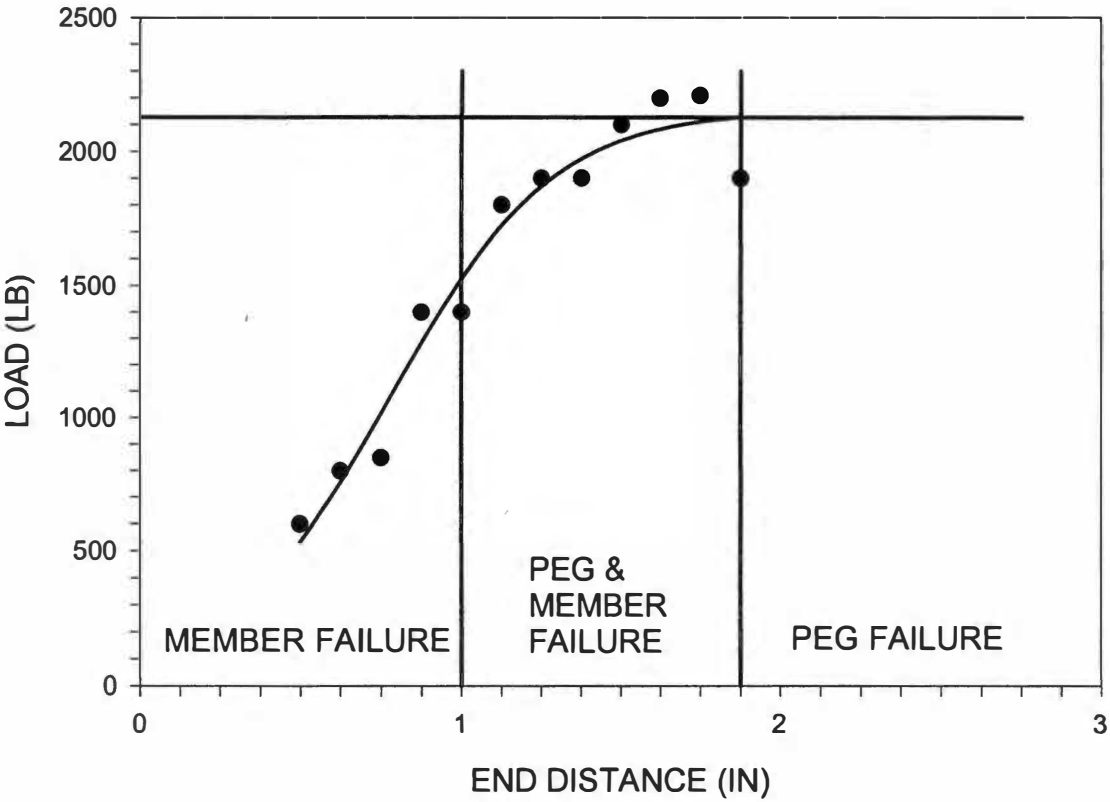
LOAD(lb)	DEFLECT(in)
0	0.000
100	0.030
200	0.040
300	0.050
400	0.058
500	0.065
600	0.071
700	0.077
800	0.081
900	0.086
1000	0.092
1100	0.097
1200	0.103
1300	0.108
1400	0.112
1500	0.118
1600	0.122
1700	0.127
1800	0.131
1900	0.136
2000	0.141
2100	0.146
2200	0.151
2300	0.158
2400	0.164
2500	0.170
2600	0.177
2700	0.188
2730	0.195

DATA WITH TRENDLINE AND 5% OFFSET YIELD



APPENDIX P – END TEST-SOUTHERN PINE-3/4” WHITE OAK PEGS

END TEST-SOUTHERN PINE-3/4" WHITE OAK



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

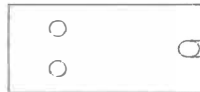
PEG NO. 3/4WO 0.5

KIND OF TEST END DISTANCE TEST

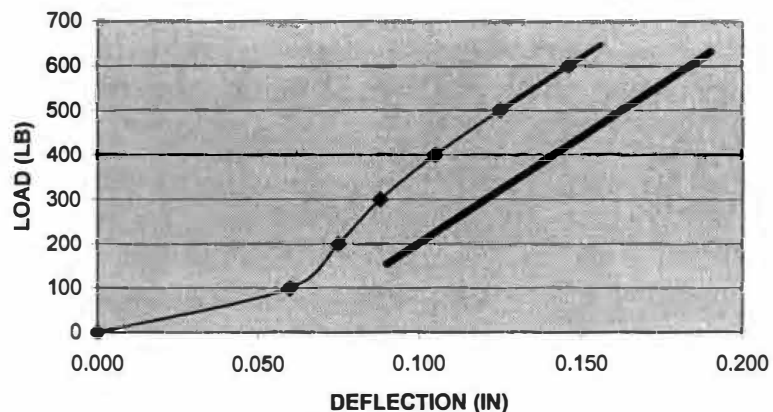
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.6 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.33 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 9%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 600 LBS
35 %R.H.
0.5
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 14
 *SAP 15%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.060
200	0.075
300	0.088
400	0.105
500	0.125
600	0.146



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

PEG NO. 3/4WO 0.625

KIND OF TEST END DISTANCE TEST

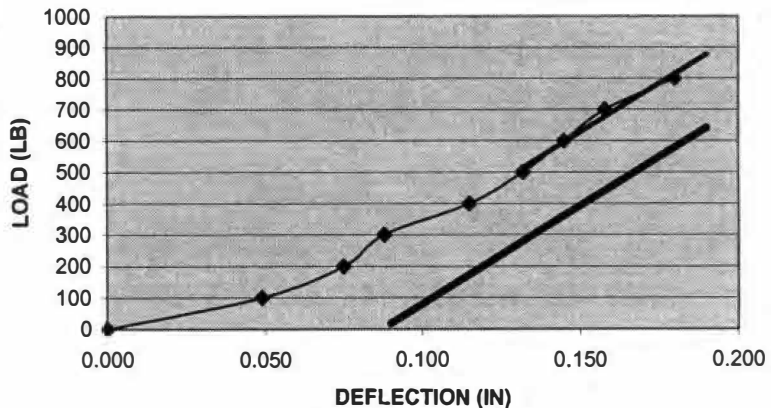
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.37 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 11%
 *KIND OF FAILURE relish
 DATA

*LOAD @ FAILURE 800 LBS
 *35 %R.H.
 *0.625
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.09 LBS
 *RINGS PER INCH 18
 *SAP 1%
 *SUMMERWOOD 85%
 *SEASONING GREEN
 *MOISTURE 7%
 *KIND OF FAILURE: did not fail

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.049
200	0.075
300	0.088
400	0.115
500	0.132
600	0.145
700	0.158
800	0.180



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

PEG NO. 3/4WO 0.75

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 69.7 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 9 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.31 LBS

*RINGS PER INCH 6

*SAP 75%

*SUMMERWOOD 15%

*SEASONING GREEN

*MOISTURE 10.5%

*KIND OF FAILURE relish

DATA

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.002
200	0.020
300	0.032
400	0.045
500	0.060
600	0.077
700	0.092
850	0.120



*LOAD @ FAILURE 850 LBS

35 %R.H.

0.75

*SPECIES OF PEG

WHITE OAK

*DIA. 3/4"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.08 LBS

*RINGS PER INCH 16

*SAP 80%

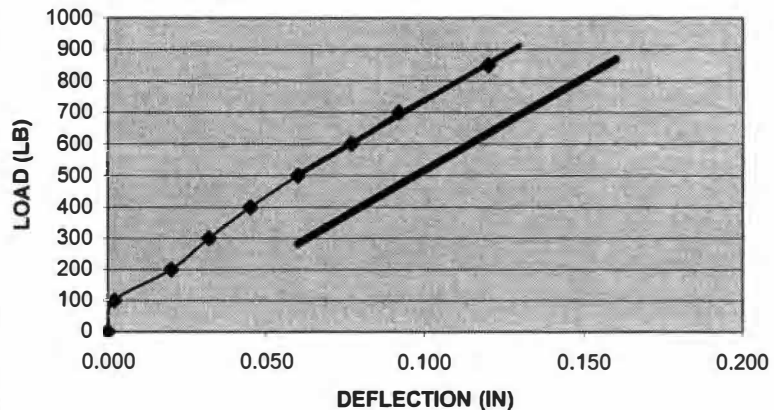
*SUMMERWOOD 20%

*SEASONING GREEN

*MOISTURE 7.0%

*KIND OF FAILURE: did not fail

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

PEG NO. 3/4WO 1.00

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 69.9 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 9 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.38 LBS

*RINGS PER INCH 6

*SAP 75%

*SUMMERWOOD 15%

*SEASONING GREEN

*MOISTURE 11.5%

*KIND OF FAILURE relish

DATA

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.038
200	0.050
300	0.060
400	0.070
500	0.080
600	0.089
700	0.094
800	0.098
900	0.105
1000	0.113
1100	0.118
1200	0.123
1300	0.150
1400	0.163



*LOAD @ FAILURE 1400 LBS
35 %R.H.

1

*SPECIES OF PEG

WHITE OAK

*DIA. 3/4"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.08 LBS

*RINGS PER INCH 8

*SAP 5%

*SUMMERWOOD 80%

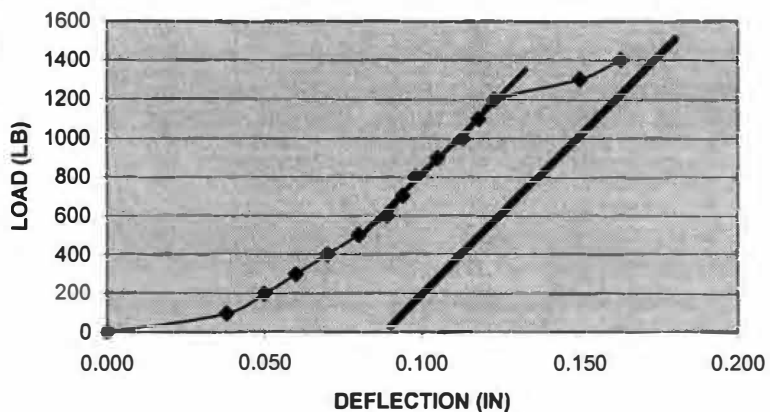
*SEASONING GREEN

*MOISTURE 7.0%

*KIND OF FAILURE: crushed
slightly



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

PEG NO. 3/4WO 1.125

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 70 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 9 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.4 LBS

*RINGS PER INCH 6

*SAP 75%

*SUMMERWOOD 15%

*SEASONING GREEN

*MOISTURE 10.5%

*KIND OF FAILURE relish

DATA

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.064
200	0.080
300	0.093
400	0.105
500	0.113
600	0.120
700	0.128
800	0.134
900	0.140
1000	0.145
1100	0.152
1200	0.160
1300	0.165
1400	0.172
1500	0.178
1600	0.184
1700	0.198
1800	0.205



*LOAD @ FAILURE 1800 LBS

35 %R.H.

1.125"

*SPECIES OF PEG

WHITE OAK

*DIA. 3/4"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.09 LBS

*RINGS PER INCH 12

*SAP 20%

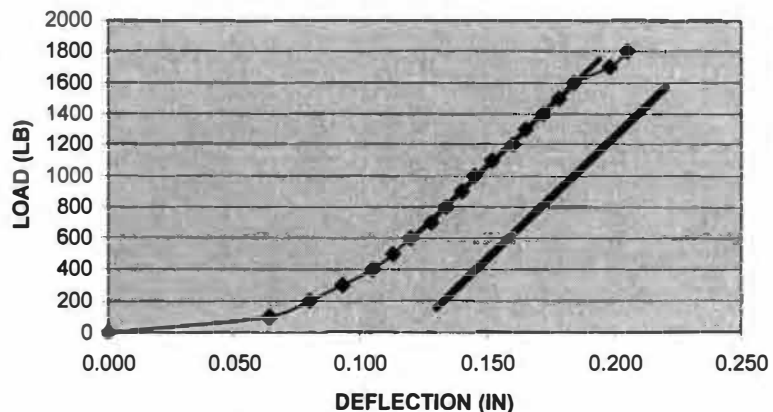
*SUMMERWOOD 85%

*SEASONING GREEN

*MOISTURE 7.0%

*KIND OF FAILURE: crushed
slightly

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

PEG NO. 3/4WO 1.25

KIND OF TEST END DISTANCE TEST

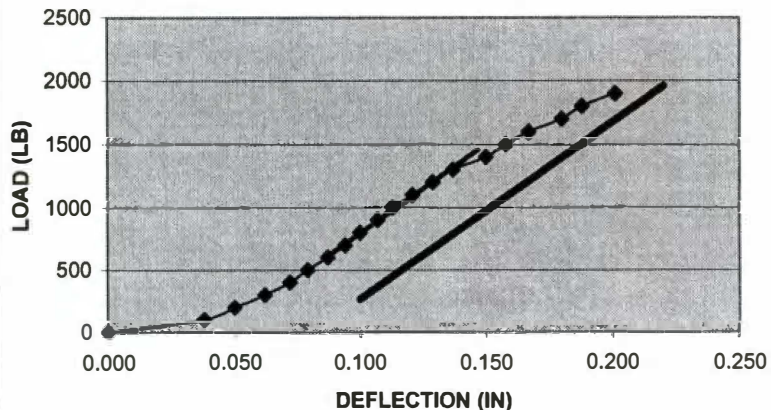
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 69.9 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.4 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 10.0%
 *KIND OF FAILURE relish

*LOAD @ FAILURE 1900 LBS
 *35 %R.H.
1.125"
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.09 LBS
 *RINGS PER INCH 10
 *SAP 40%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 6.0%
 *KIND OF FAILURE: crushed
slightly

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.038
200	0.050
300	0.062
400	0.072
500	0.079
600	0.087
700	0.094
800	0.100
900	0.107
1000	0.113
1100	0.121
1200	0.129
1300	0.137
1400	0.150
1500	0.158
1600	0.167
1700	0.180
1800	0.188
1900	0.201



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

PEG NO. 3/4WO 1.375

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 70 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 10"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.45 LBS

*RINGS PER INCH 6

*SAP 75%

*SUMMERWOOD 15%

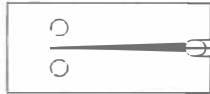
*SEASONING GREEN

*MOISTURE 10.0%

*KIND OF FAILURE relish

DATA

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.040
200	0.051
300	0.063
400	0.074
500	0.081
600	0.089
700	0.096
800	0.102
900	0.108
1000	0.116
1100	0.125
1200	0.130
1300	0.136
1400	0.144
1500	0.152
1600	0.158
1700	0.165
1800	0.173
1900	0.184



*LOAD @ FAILURE 1900 LBS

35 %R.H.

1.375"

*SPECIES OF PEG

WHITE OAK

*DIA. 3/4"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.08 LBS

*RINGS PER INCH 14

*SAP 40%

*SUMMERWOOD 85%

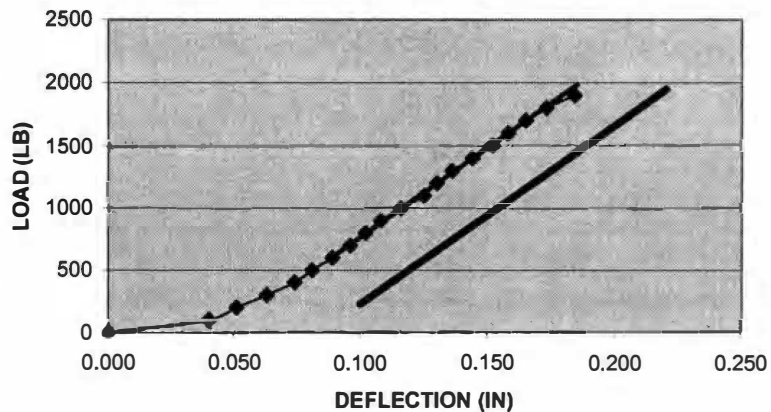
*SEASONING GREEN

*MOISTURE 6.0%

*KIND OF FAILURE: crushed

slightly

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

PEG NO. 3/4WO 1.5

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 70 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 9 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.42 LBS

*RINGS PER INCH 6

*SAP 75%

*SUMMERWOOD 15%

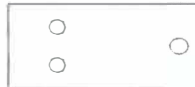
*SEASONING GREEN

*MOISTURE 10.5%

*KIND OF FAILURE elongated hole

DATA

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.043
200	0.056
300	0.065
400	0.075
500	0.082
600	0.093
700	0.101
800	0.108
900	0.115
1000	0.122
1100	0.131
1200	0.138
1300	0.144
1400	0.151
1500	0.159
1600	0.172
1700	0.179
1800	0.186
1900	0.197
2000	0.208
2100	0.220



*LOAD @ FAILURE 2100 LBS

35 %R.H.

1.5"

*SPECIES OF PEG

WHITE OAK

*DIA. 3/4"

*LENGTH 6"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.08 LBS

*RINGS PER INCH 14

*SAP 15%

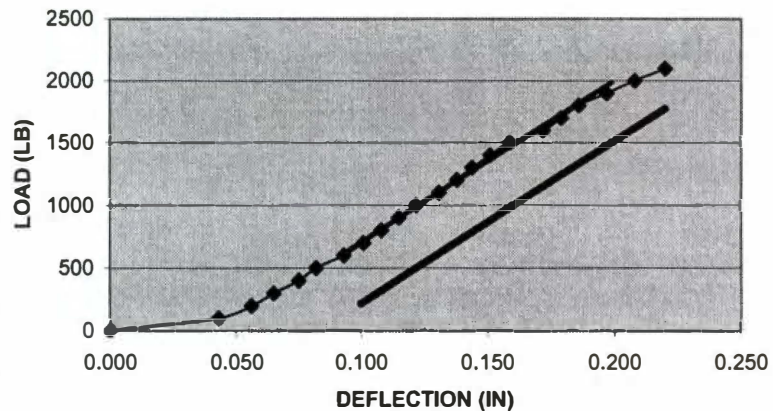
*SUMMERWOOD 80%

*SEASONING GREEN

*MOISTURE 6.0%

*KIND OF FAILURE: crushed
bent

DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

PEG NO. 3/4WO 1.625

KIND OF TEST END DISTANCE TEST

*MACHINE: Universal Testing Machine

*SPEED ON MACH. 0.04 IN PER MIN. 1

*TESTED AT 70 degrees TEMP

*DISTANCE OF CENTERLINE OF HOLE TO EDGE

*SPECIES OF MAIN MEMBERS SOUTHERN PINE

*LENGTH 9 7/8"

*HEIGHT 5.5"

*WIDTH 1.5"

*ANGLE OF GRAIN TO LOADING: PARALLEL

*WEIGHT 1.47 LBS

*RINGS PER INCH 6

*SAP 75%

*SUMMERWOOD 15%

*SEASONING GREEN

*MOISTURE 11.0%

*KIND OF FAILURE relish
DATA cracked

*LOAD @ FAILURE 2200 LBS

35 %R.H.

1.625"

*SPECIES OF PEG

WHITE OAK

*DIA. 3/4"

*LENGTH 6.5"

*ANGLE OF GRAIN TO LOAD

PERP

*WEIGHT 0.09 LBS

*RINGS PER INCH 14

*SAP 75%

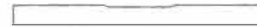
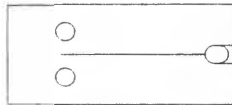
*SUMMERWOOD 70%

*SEASONING GREEN

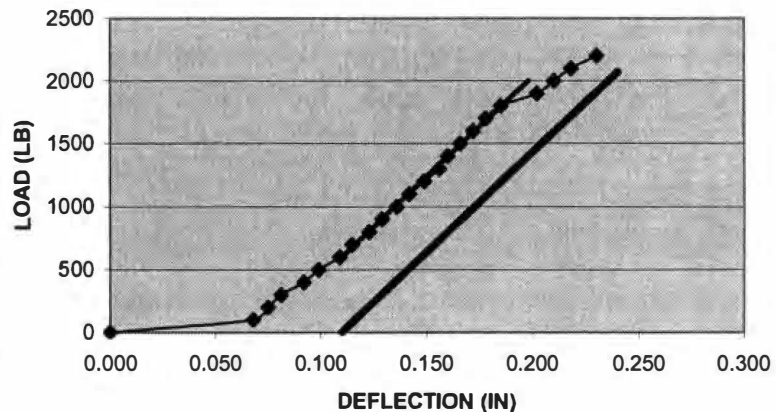
*MOISTURE 6.0%

*KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.068
200	0.075
300	0.081
400	0.092
500	0.099
600	0.109
700	0.115
800	0.123
900	0.129
1000	0.136
1100	0.142
1200	0.149
1300	0.156
1400	0.160
1500	0.166
1600	0.172
1700	0.178
1800	0.185
1900	0.202
2000	0.210
2100	0.218
2200	0.230



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

PEG NO. 3/4WO 1.75

KIND OF TEST END DISTANCE TEST

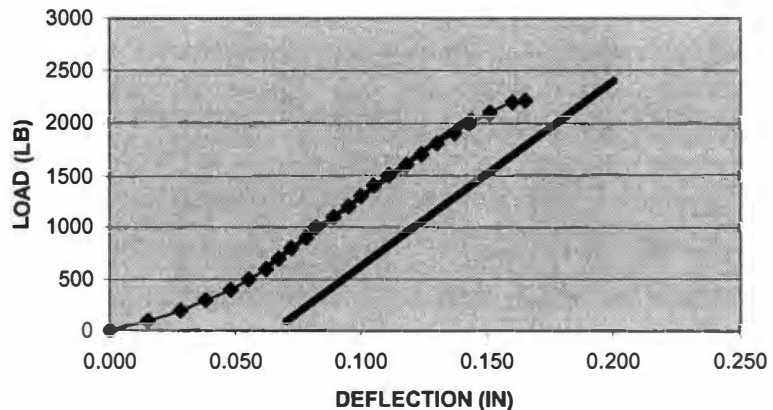
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 70.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 9 7/8"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.47 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 10.5%
 *KIND OF FAILURE elongated hole

*LOAD @ FAILURE 2210 LBS
 *35 %R.H.
 *1.75"
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 16
 *SAP 15%
 *SUMMERWOOD 80%
 *SEASONING GREEN
 *MOISTURE 6.0%
 *KIND OF FAILURE: crushed

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.015
200	0.028
300	0.038
400	0.048
500	0.055
600	0.062
700	0.067
800	0.072
900	0.078
1000	0.082
1100	0.089
1200	0.095
1300	0.100
1400	0.105
1500	0.111
1600	0.118
1700	0.124
1800	0.130
1900	0.137
2000	0.143
2100	0.151
2200	0.160
2210	0.165



DATA WITH TRENDLINE AND 5% OFFSET YIELD



DEPARTMENT OF CIVIL ENGINEERING

UNIVERSITY OF TENNESSEE KNOXVILLE

DATE: 27-Oct-03

PIECE NO. 20SP

PEG NO. 3/4WO 1.875

KIND OF TEST END DISTANCE TEST

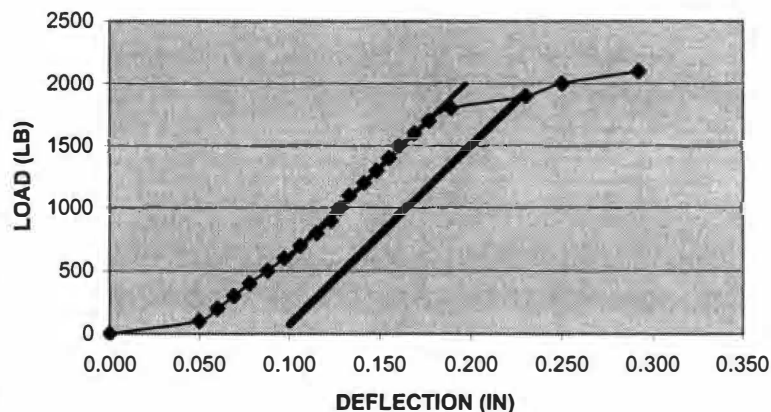
*MACHINE: Universal Testing Machine
 *SPEED ON MACH. 0.04 IN PER MIN. 1
 *TESTED AT 70.1 degrees TEMP
 *DISTANCE OF CENTERLINE OF HOLE TO EDGE
 *SPECIES OF MAIN MEMBERS SOUTHERN PINE
 *LENGTH 10"
 *HEIGHT 5.5"
 *WIDTH 1.5"
 *ANGLE OF GRAIN TO LOADING: PARALLEL
 *WEIGHT 1.42 LBS
 *RINGS PER INCH 6
 *SAP 75%
 *SUMMERWOOD 15%
 *SEASONING GREEN
 *MOISTURE 10.0%
 *KIND OF FAILURE did not fail

*LOAD @ FAILURE 1900 LBS
 *35 %R.H.
1.875"
 *SPECIES OF PEG
WHITE OAK
 *DIA. 3/4"
 *LENGTH 6"
 *ANGLE OF GRAIN TO LOAD
PERP
 *WEIGHT 0.08 LBS
 *RINGS PER INCH 14
 *SAP 25%
 *SUMMERWOOD 70%
 *SEASONING GREEN
 *MOISTURE 6.0%
 *KIND OF FAILURE: crushed
bent
cracked

LOAD(lb)	DEFLECT (in)
0	0.000
100	0.050
200	0.060
300	0.069
400	0.078
500	0.088
600	0.097
700	0.106
800	0.115
900	0.123
1000	0.128
1100	0.133
1200	0.141
1300	0.148
1400	0.155
1500	0.161
1600	0.169
1700	0.177
1800	0.189
1900	0.230
2000	0.250
2100	0.292



DATA WITH TRENDLINE AND 5% OFFSET YIELD



VITA

Sally Summers Nichols was born in Memphis, Tennessee. She graduated with a Bachelor of Architecture with high honors from the University of Tennessee. She is a licensed architect and a registered interior designer. While designing a large timber residence, she became interested in doing research in timber frame structures and enrolled in the graduate program at the Civil Engineering Department at the University of Tennessee. She is a member of Chi Epsilon, Phi Kappa Phi, and The American Institute of Architects. Currently, she is self-employed as an architect and interior designer.

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18/28/04

WFB

