

A STUDY OF THE DIMENSIONAL STABILITY OF A
PANEL WOOD-WASTE CORE MATERIAL

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requirements for the degree of Master of Wood Technology.

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James E. Bamborough

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INTRODUCTION

This study was conducted in an effort to obtain information on the dimensional stability of a panel core material made of wood waste. L. A. Patronsky, Associate Professor of Wood Technology at the University of Michigan, made an extensive study¹ of the properties of one such material, plaswood, a pressed core material of fine wood chips and fibers mixed with a urea resin. He found that, except for its lack of dimensional stability, it was well suited as a core material for furniture panels. Due to the differential in shrinking and swelling of the plaswood and the edge-bands, the structure of the core could be seen on the surface of the panel after being subjected to changes in relative humidity. This is a defect which will not pass in quality furniture. As a result of this study, the question was raised as to whether there is any relationship between the density of such a core material and its change in dimensions due to moisture content changes.

The Lane Company, Inc., manufacturers of cedar chests, are using a core material of chipped wood waste in the top panels of their cedar chests. This "chip-core" is similar to plaswood. Two of the major differences are the larger size of chips in chip-core and a different percentage resin content. From observing the method of manufacture of chip-core, it appeared that there would be considerable variation

1. A numbered list of references can be found in the bibliography.

in density throughout a single chip-core. (See description of manufacture on page 6). One of the aims of this study was to find what effect, if any, density variation of the chip-core had on its dimensional stability. If there is a definite relationship between density and dimension change, and if the dimension changes are significant it might be advisable for the manufacturer to adopt a method of manufacture that would yield a more uniformly dense chip-core.

The other objective was to find what dimension changes occurred in a panel subjected to different conditions of relative humidity.

The remainder of this thesis is devoted to explaining the procedure used in conducting tests, and setting forth and discussing the results.

EXPERIMENT INTRODUCTION

This study has been divided into two main phases - (1) Panel Dimensional Stability, and (2) Specific Gravity, Dimension Change Relationship.

Each of these phases will be discussed separately.

Panel Dimensional Stability

How are panels which are made with a core material of chip-core and lumber edge-bands affected by varying conditions of relative humidity? Can the dimensional stability of chip-core panels be improved by changes in the method of manufacture? These are some of the questions for which answers are sought in this study.

For making tests on dimensional stability, panels were subjected to different conditions of relative humidity. This was done by placing them in constant temperature and humidity rooms. The three constant temperature and humidity rooms used were set to obtain equilibrium moisture contents in wood of 5%, 8% and 13%. A high humidity chamber (90% - 100% relative humidity) was used to hasten increases in panel moisture content. The constant temperature and humidity rooms were set with conditions as follows.

<u>C.T.H. Room</u> <u>Set for e.m.c.</u>	<u>Relative Humidity</u> <u>%</u>	<u>Temperature</u> <u>degrees F</u>
5%	24	75
8%	42	75
13%	70	75

The change in thickness was observed at a number of scattered points on each panel. Since the core of these panels are made of chip-core with edge-bands of lumber, relative dimensional changes of the two materials are particularly important.

When the testing was first started, the intention was to let the panels equalize at each of the moisture contents previously decided upon and finally to make specific gravity determinations at a number of the points where the thickness had been checked to discover whether there was any relationship. It soon became evident that equalizing at each moisture content was impractical with the time allowed for completing the study. It takes considerable time for a panel to equalize in moisture content. Furthermore, as was later found, chip-core takes on moisture more slowly than lumber. For this reason the tests described under the next heading were decided upon.

The warping tendencies of the panels were also observed as conditions of relative humidity were changed.

Specific Gravity, Dimension Change Relationship

It is commonly known that in general the greater the specific gravity of a piece of wood, the greater is its shrinking and swelling with moisture content changes. Is there a similar relationship for chip-core? The tests in this section were made in an effort to find an answer to that question.

Dimension change tests were made on a number of specific gravity samples cut from the remaining panel and from several of the chip-cores. Such small samples ($3/4"$ x $3/4"$ x thickness of panel or chip-core) would reach equilibrium moisture content much more rapidly than would the quarter-panels. From the data obtained in these tests an effort was made to ascertain whether or not there existed any definite relationship between specific gravity and dimension change.

CHIP-CORE - METHOD OF MANUFACTURE *

The waste material used in chip-core is a mixture of kiln dried poplar, tupelo, gum, maple, oak, and some cedar lumbers; veneer waste from face veneers (walnut, mahogany, prima vera, etc.); and poplar and gum crossbanding. The chips do not go through a drying process, but the average moisture content of the mixture is around 8%. The waste, hogged through a Jeffery Hog and blown into a cyclone collector, is then screened through a 4 x 4 mesh screen and an 8 x 8 mesh screen. The chips that pass over the 4 x 4 screen are re-ground, and those that stay on the 8 x 8 screen are piped into the bin for use. Those chips passing through the 8 x 8 screen (mostly very fine dust) are used for fuel.

The chips are weighed into a tumbler and the resin mixture is sprayed in while the chips are being tumbled. Approximately 20% of the resin mixture, based on the weight of the chips, is used. The resin mixture is made up of 100 parts liquid urea resin (Uformite 430), 25 parts wheat flour, 15 parts water, and 8 parts catalyst. *

The treated chips are then weighed into pans, using approximately 28 pounds of treated chips for a pan 28 inches x 52 inches. Frames are used in the pans, and the height of the mass of chips is about 4 inches. Chips are tamped down to about 3 inches, the frames removed, and caul boards placed on before loading into the press.

* This description of the manufacturing process is taken from a letter received from Mr. M. O. Carr of the The Lane Company, Inc.

The desired rough thickness of the panel is between $\frac{7}{8}$ inch and 1 inch. A pressure of 185 pounds per square inch is used. $1\frac{3}{4}$ to 2 minutes time is required for the press to reach this pressure. The cure time is 16 minutes at 320°F plate temperature.

Upon removal from the press the panels are placed on stickers and allowed to condition for 4 days before sizing and planing. They are then sized to $11\frac{1}{2}$ inches x 46 inches, rimmed on Taylor clamps using hide glue, and planed to $11\frac{1}{16}$ inch. From this point on they are treated the same as lumber cores.

TESTING PROCEDURE

Panel Dimensional Stability

Four panels were used for thickness variation tests and observance of warping. Each panel was cut into four sections to facilitate handling. In Figure 1 on page 11 is a diagram showing how the panels were divided. On each quarter-panel were marked points at which the thickness was to be measured as the moisture content was changed. The location of the points was made in an effort to show how the different parts of the panel were affected by changing conditions of relative humidity. A number of points were marked near the lines where chip-core meets edge-bands. It is along these lines that a differential in shrinking and swelling properties of the two materials would be most likely to show. See Figure 2 on page 12 for a diagram showing how panels were marked for thickness variation tests.

A fifth panel was used throughout the tests for moisture content determinations. From this panel moisture content samples were cut. (See Moisture Content Determination on page 15 for an explanation of moisture content sampling and determination.) Since this moisture content panel underwent the same conditions as the four thickness variation panels, its moisture content should have been fairly representative. The original moisture content was found to be 5.33%. The thickness at all the points was then checked. The procedure from then on was to change the moisture content of the panels

to 8%, then 13%, back to 8%, and finally back to approximately 5.33%, checking thickness at each of the moisture content levels.

In order to determine approximately when the panels had reached a particular moisture content, the sample board technique, a method common in kiln drying, was used. By weighing 6 of the 16 quarter-panels periodically the change in moisture could be followed. (For explanation of this method see the section on Moisture Content Determination on page 15.)

In order to hasten the absorption of moisture the panels were placed in the 13%* room until they were calculated by weighing to be at 8% moisture content. They were then placed in the 8% room for several days before thickness testing.

In order to hasten the absorption of moisture to reach a moisture content of 13% the panels were placed in a high humidity chamber. The relative humidity in the chamber was maintained at from 90% to 100% relative humidity with a temperature of from 70°F to 80°F. A moisture content of 14.5% was obtained, however, instead of the intended 13%.

After testing thickness change the panels were put in the 5% room to speed the loss of moisture to 8%. They were placed in the 8% room when the moisture content was calculated to be about 8%. The thickness tests were made

* In the remainder of this study the constant temperature and humidity room set to obtain an equilibrium moisture content in wood of 13% will be designated at 13% room; likewise for the rooms set for 5% and 8% e.m.c.

and the quarter-panels put into the 5% room to obtain a moisture content of 5%.

Thickness Tests

In Figure 3 on page 13 is a diagram of the testing device used for checking thickness at the designated points on the panels. On page 14 is a photograph of a panel being checked for thickness by the device. It consists of a heavy metal base on one corner of which is a vertical $3/4$ " diameter steel rod. A horizontal arm is attached to the vertical rod. On one end of the horizontal arm is a dial gauge calibrated in thousandths of an inch. A bolt head is located directly below the gauge. The thickness of a panel can be measured at any point by moving the panel under the gauge. Two nuts along with the fixed bolt give three point suspension to the panel.

Precision gauge blocks were used to check the distance between the gauge and bolt head before and after each panel was checked.

Upon completion of testing thickness at each moisture content, samples were cut from the moisture content panel and moisture content determinations were made.

Figure 1

Chip-core Panel ($44\frac{3}{8}$ " X $20\frac{3}{4}$ " X $\frac{1}{16}$)

Cut Into Quarter Sections To Facilitate Testing.

Panel cut along the 3 lines marked "x"

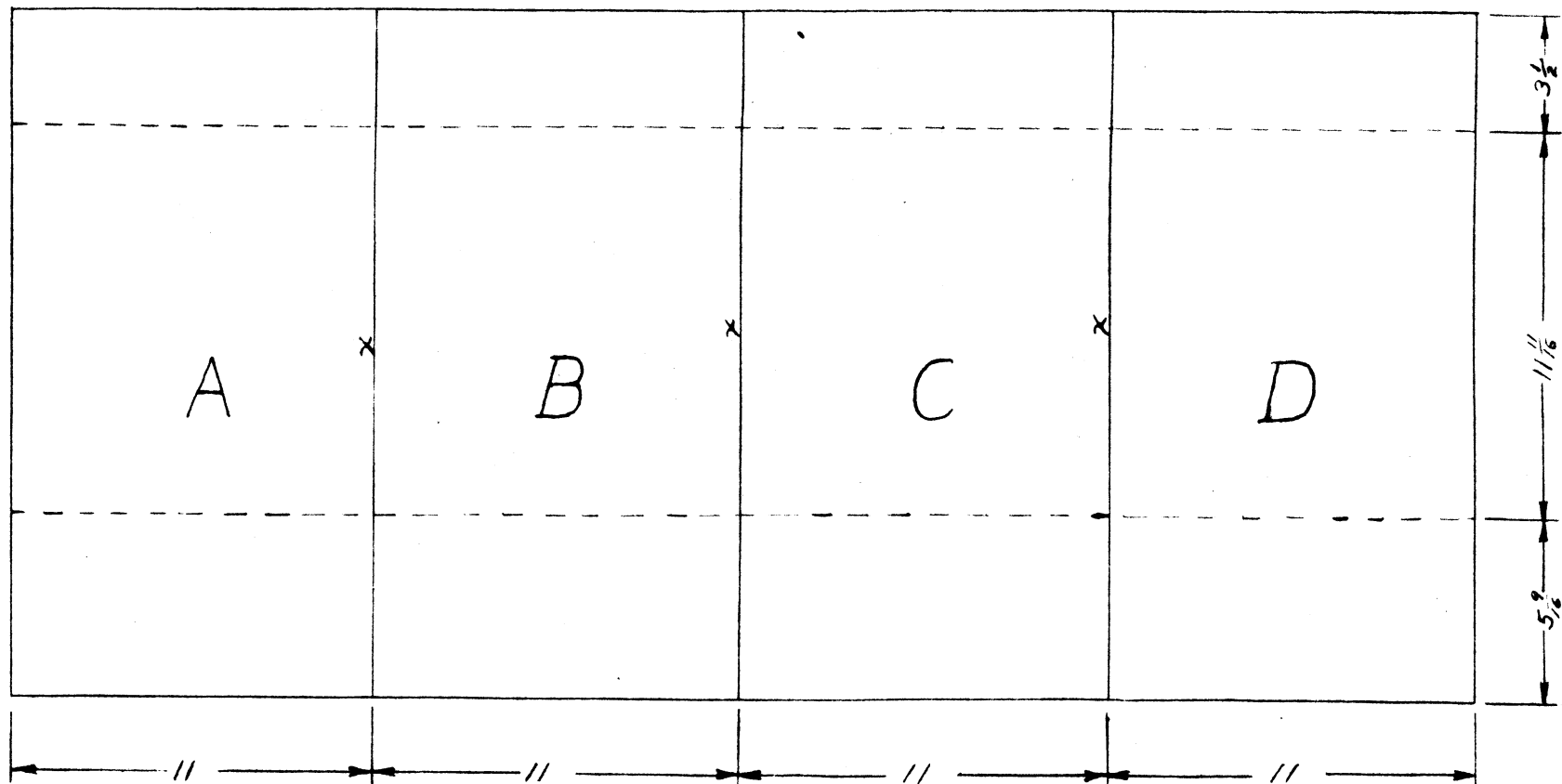


Figure 2

Quarter Section of Chip-core Panel

Location of Points for Thickness Variation Tests

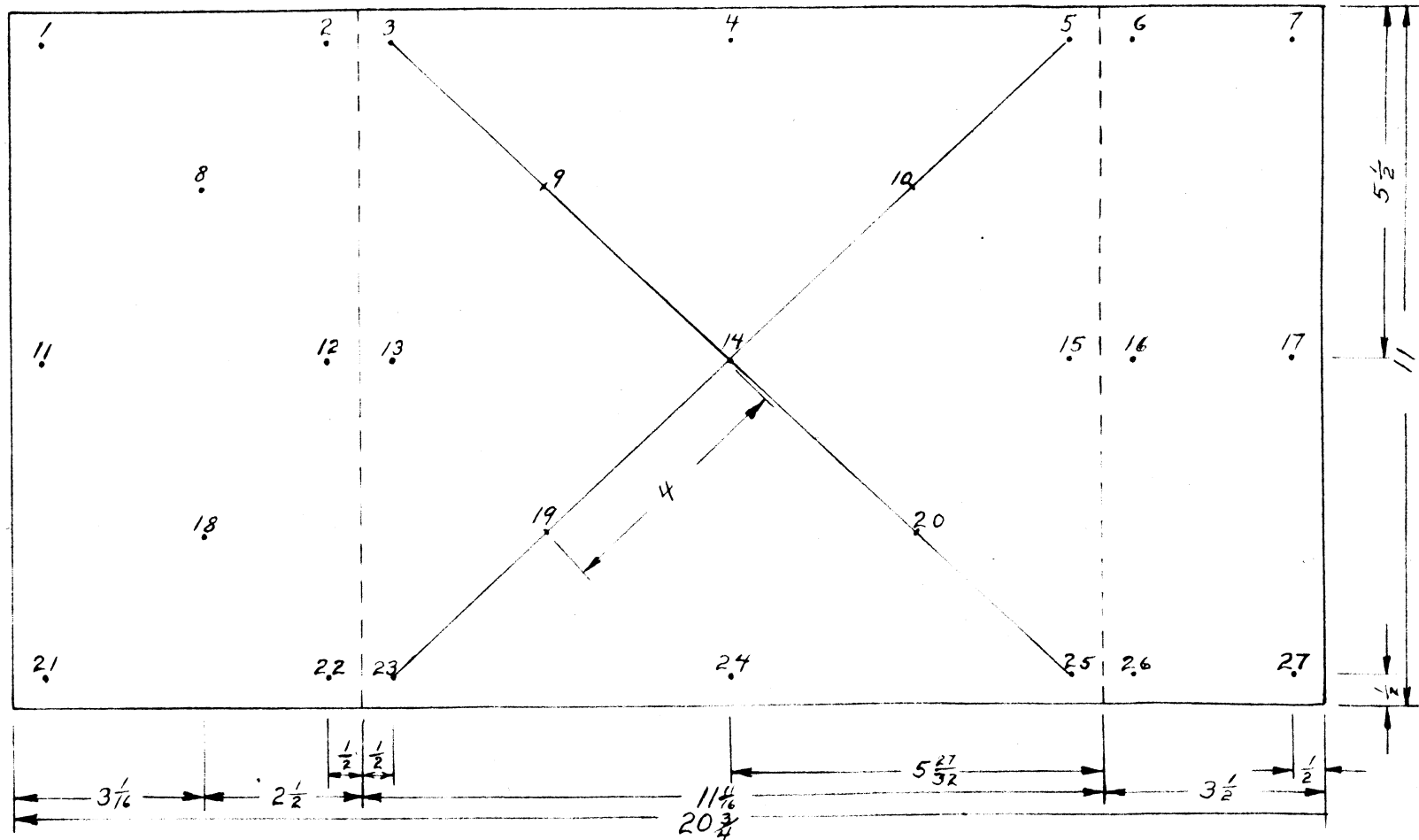
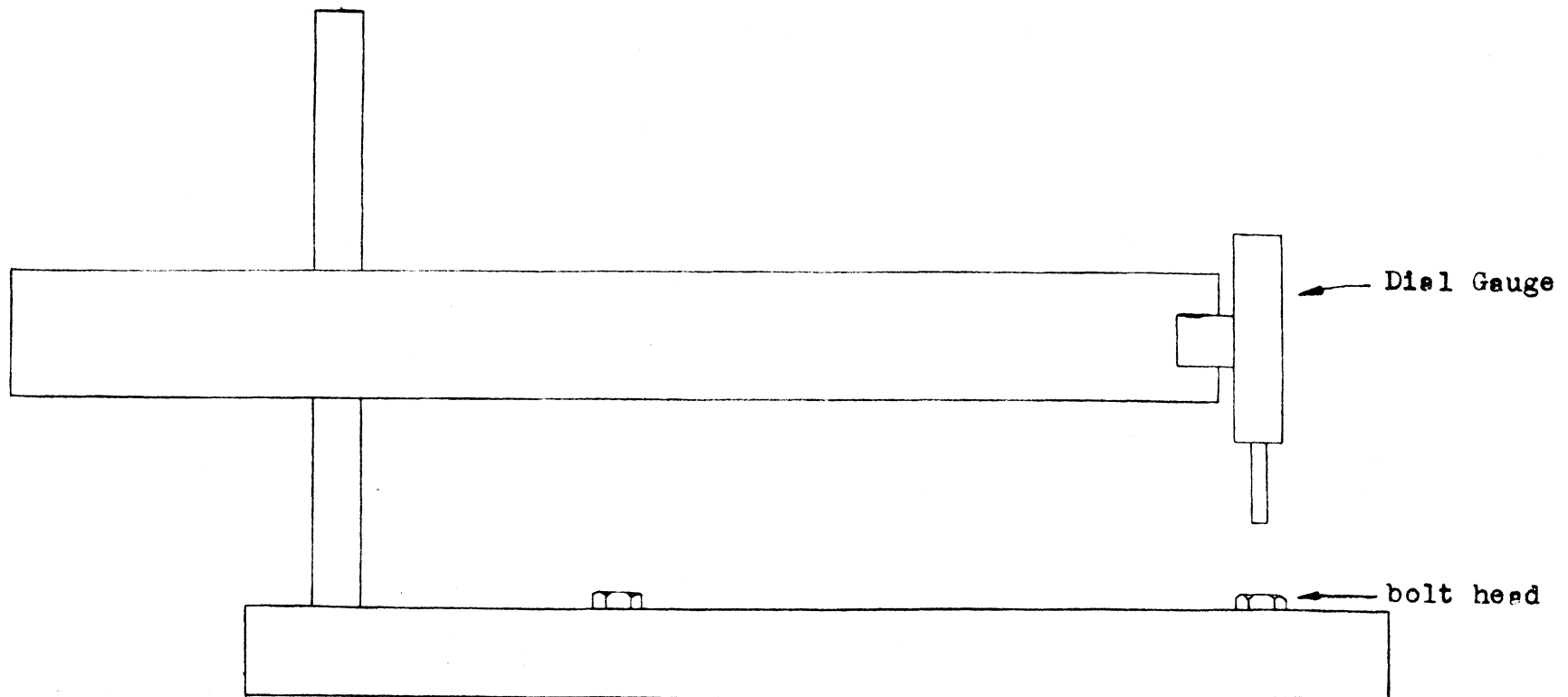


Figure 3

Diagram of Panel Thickness Testing Device





Moisture Content Sampling and Determination

Approximate moisture content of the panels was determined by weighing 6 of them and using the sample board method. The original moisture content, 5.33%, was determined by the oven dry method, using the formula:

$$\text{Percent Moisture Content} = \frac{\text{Original Weight} - \text{Oven dry Weight} \times 100}{\text{Oven Dry Weight}}$$

Then by weighing the panels the oven dry weight was calculated by the formula $\text{O.D. Weight} = \frac{\text{Weight at 5.33\% m.c.}}{100 + \% \text{ m.c. of the sample}}$

With the approximate oven dry weight the moisture content of the panels could be computed at any time during the conditioning by weighing and substituting that weight in the formula

$$\text{Percent Moisture Content} = \frac{\text{Original Weight} - \text{Oven dry Weight} \times 100}{\text{Oven-dry Weight}}$$

This method will give the approximate overall average moisture content of the panel, but tells nothing of moisture variation throughout. See the comparison of results of moisture content tests made by the two methods at one time. The moisture contents (in the column headings of the tables from page 44 to page 59) were derived by the oven dry method from 8 to 10 specimens cut from different locations in the moisture content panel. The moisture contents for the specimens were averaged, and the resulting average used as the moisture content at which thickness tests were made. Generally about one half the specimens were cut near the end of the panel and the other

one half from near the center. When the relative humidity was raised the moisture content samples near the ends showed higher moisture content than the samples near the center, as would be expected. Likewise when the relative humidity was being lowered the moisture content samples cut from the ends showed lower moisture content than those from the center.

Specific Gravity, Dimension Change Tests

Specimens were cut from five chip-cores and one panel for specific gravity and dimension change tests. 98 specimens were cut from one chip-core to give a thorough picture of the specific gravity variation throughout. Figure 4 on page 19 shows the numbering and location of those specimens. 28 samples were cut from each of 4 other chip-cores. In figure 5 on page 20 is shown the location and numbering of specimens for each of those cores. Fifty specimens were cut from the panel as shown in figure 6 page 21.

The chip-cores and panel were at a moisture content of approximately 5% when the specimens were cut. All the samples were placed in the 5% room for about 2 weeks to equalize. Then the 3 dimensions of each specimen were measured by means of a dial gauge. On pages 22 and 23 are photographs of the testing device with a specimen being measured. The apparatus is very similar to that described on page 10 used for measuring panel thickness. It is, however, much smaller. The gauge is calibrated in thousandths of an inch.

From the 3 dimensions the volume in cubic inches was computed and then converted into volume in cubic centimeters. The specimens were then weighed on the chemical balance to the nearest thousandths of a gram. From this data specific gravity was computed by the formula

$$\text{Specific Gravity} = \frac{\text{Weight (in grams)}}{\text{Volume (in cubic centimeters)}}$$

It should be kept in mind throughout this study that the specific gravity is based on a moisture content of 5.5%-6%.

The panel specimens and specimens from 4 of the 5 chip-cores were placed in the high humidity chamber (described on page 9) for several days and then were put in the 13% room for 2-3 weeks. They were again measured and their volume computed. The specimens from one chip-core were left in the high humidity chamber to obtain a moisture content in excess of 13%. Unfortunately they became wet from moisture condensation dripping off the chamber ceiling. They were discarded after noting that they swelled very unevenly.

An attempt was made to find a relationship between the specific gravity and dimension change data found in these tests.

The section on results gives the information found.

Figure 4

Chip-core Specific Gravity Test

Specimens approximately $3/4"$ X $3/4"$ were cut from the chip-core at the numbered points. The specimens were used to find if there is a correlation between specific gravity and swelling due to moisture content increase.

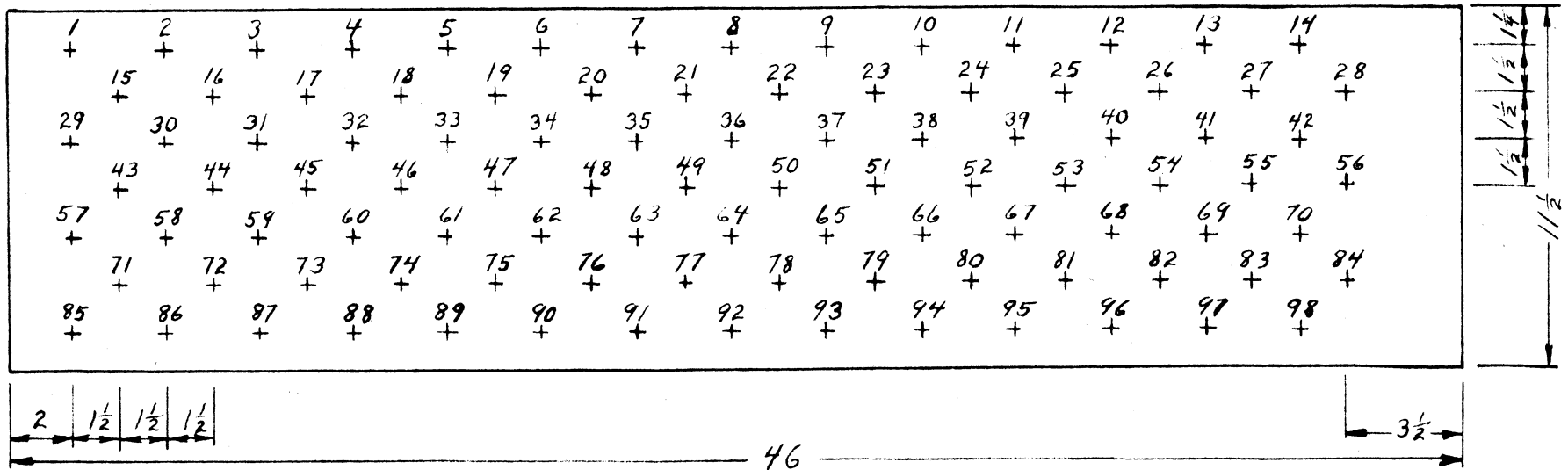
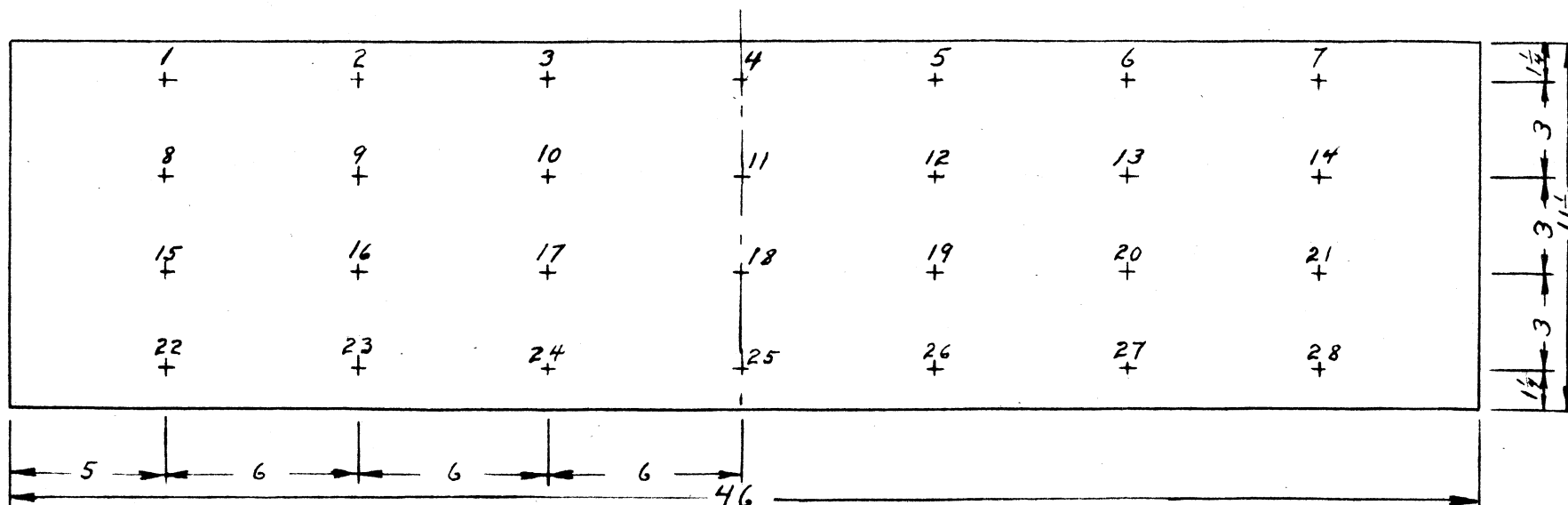


Figure 5

Chip-core Specific Gravity Test

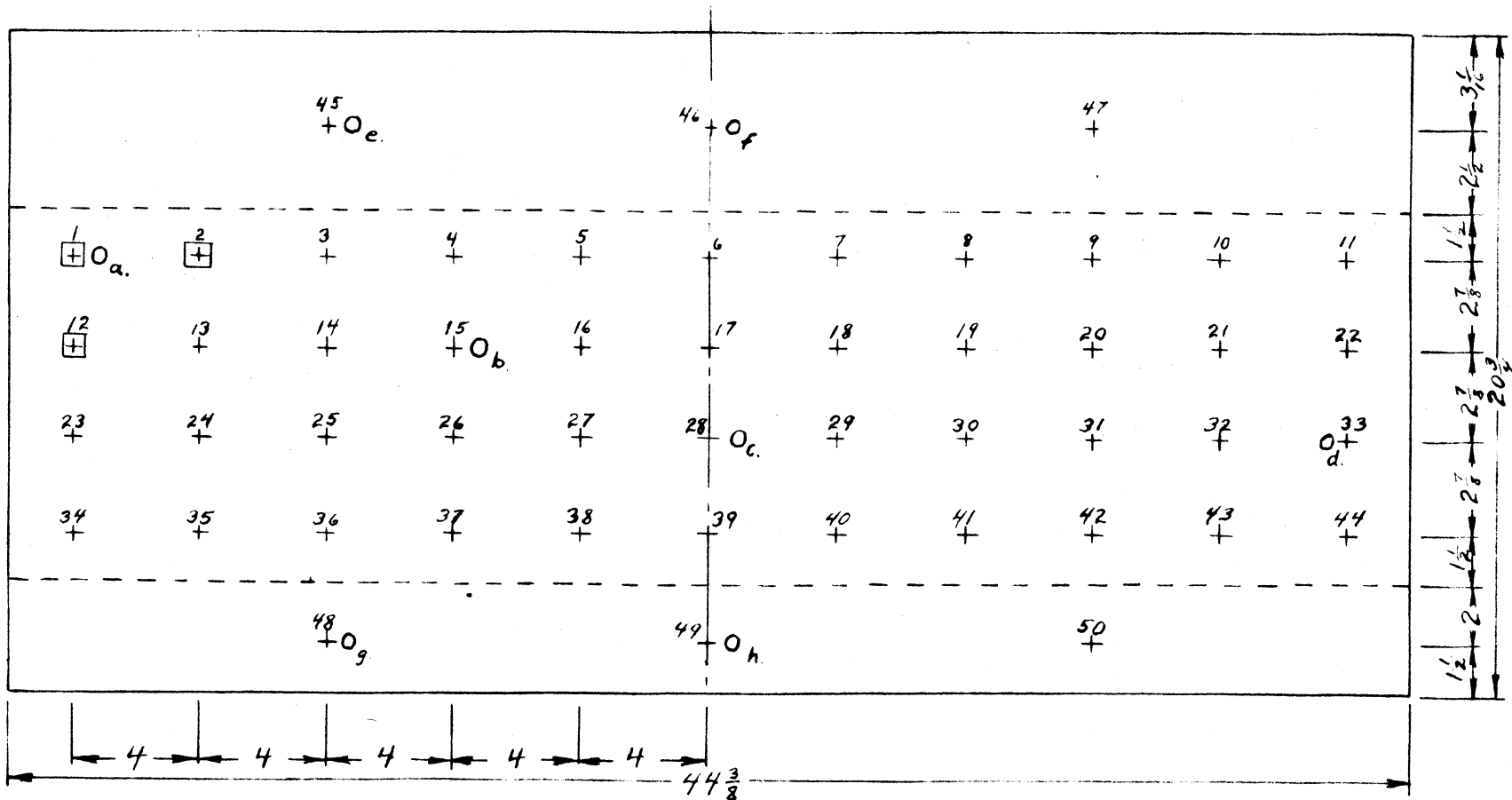
Specimens approximately $\frac{3}{4}$ " X $\frac{3}{4}$ " were cut from the chip-core at the numbered points. The specimens were used to find if there is a correlation between specific gravity and swelling due to moisture content increase.

Chip-cores A, B, and C were cut according to this pattern.



Chip-core Panel Specific Gravity Test

Lettered circles indicate original moisture content samples.







RESULTS

Panel Dimensional Stability

On pages 44 through 59 are tabulated the results of the thickness tests. The thicknesses were checked when the moisture contents of the panels were determined by the sample board method to be 5%, 8%, 13.8%, 8% and 5.6%. Moisture content determinations made by the oven-dry method indicated that the moisture contents of the panels were 5.33%, *8.11%, 14.5%, 8.86%, and 6.71%. It was obvious from these latter results that moisture content varied considerably throughout a panel. The moisture content determinations are tabulated on pages 60 through 64. The location of the samples cut from the moisture sample board are shown with the tabulated data on those pages.

The thickness changes of 4 of the 16 panels have been graphed on pages 27 to 30. Panels I-A, II-B, III-D, and IV-C were selected as representing a different location from each of the 4 original full-size panels. These bar graphs show the thickness changes only. The original thickness, as shown in the second column of the data tables on pages 44 to 59, varied at the different points about the panel. Therefore in order to clearly show the amount of change in thickness about the panel, the original thickness at each point was used as the base point for the graph. The amount of change that had occurred at each moisture content is shown by the level of the adjacent bars.

* The 3rd, 4th, and 5th columns of the data sheets on pages 44 through 59 should have been 8.11% m.c. instead of 8.32%.

Since the panels were not uniform in thickness originally, in some cases a little swelling tended to make them more nearly uniform. However, as the swelling increased the thickness became less and less uniform.

The panels when last tested for thickness change were at a moisture content of 6.71%. The plan called for a final moisture content equal to the original (5.33%). Due to limited time the final tests had to be made when the panels were down to only 6.71%. Even then the thicknesses averaged only about .005 inches greater than the original. If the final moisture content had been reduced to equal the original, the panels would probably have shrunk to the original thickness.

As stated earlier in this report, warping along the length of the quarter-panels rarely exceeded 1/8 inch. Part of this warping was due to the bulges at the chip-core, edge-band lines. A number of other factors might also have contributed to the warping.

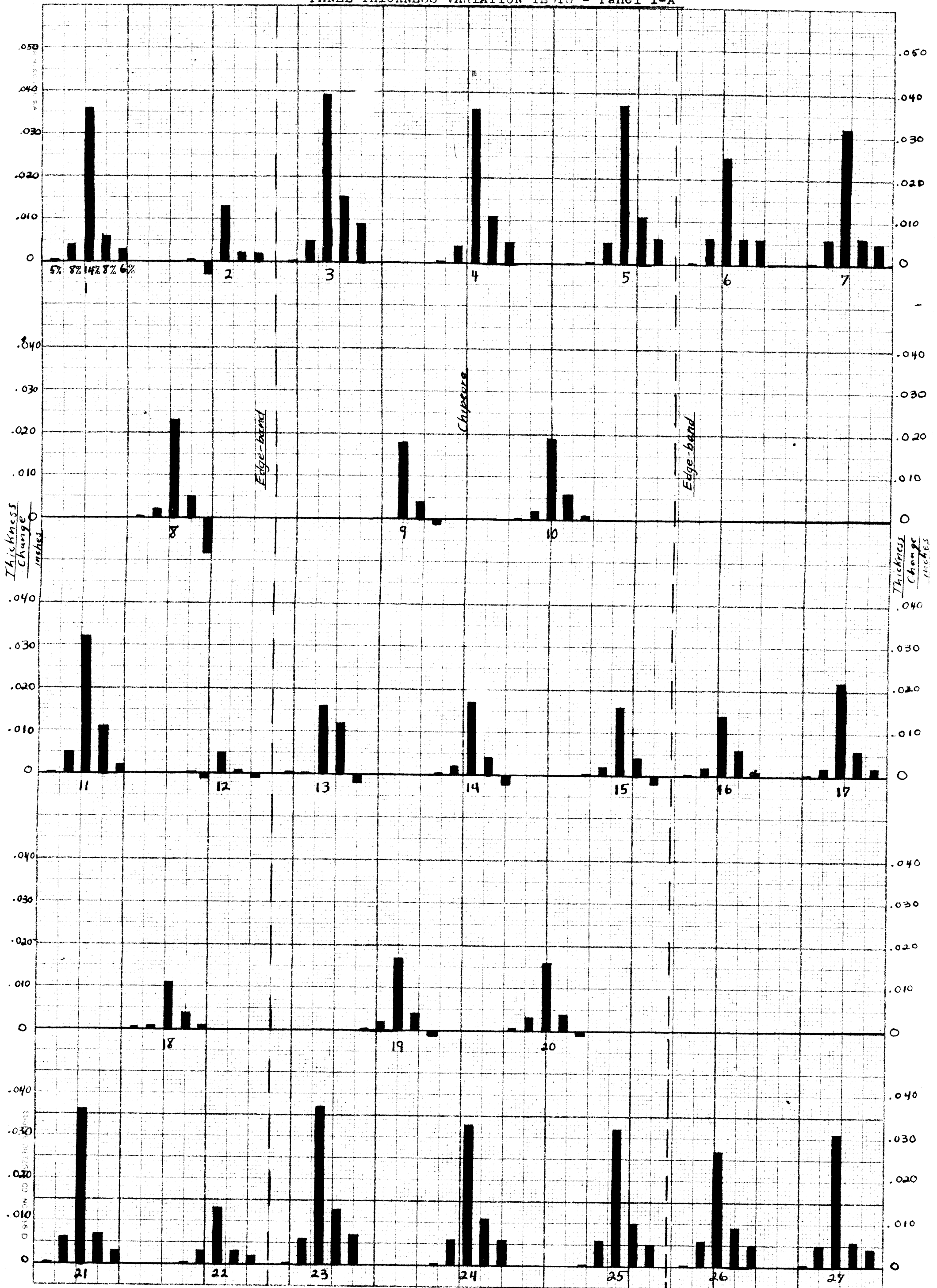
Specific Gravity, Dimension Change Relationship

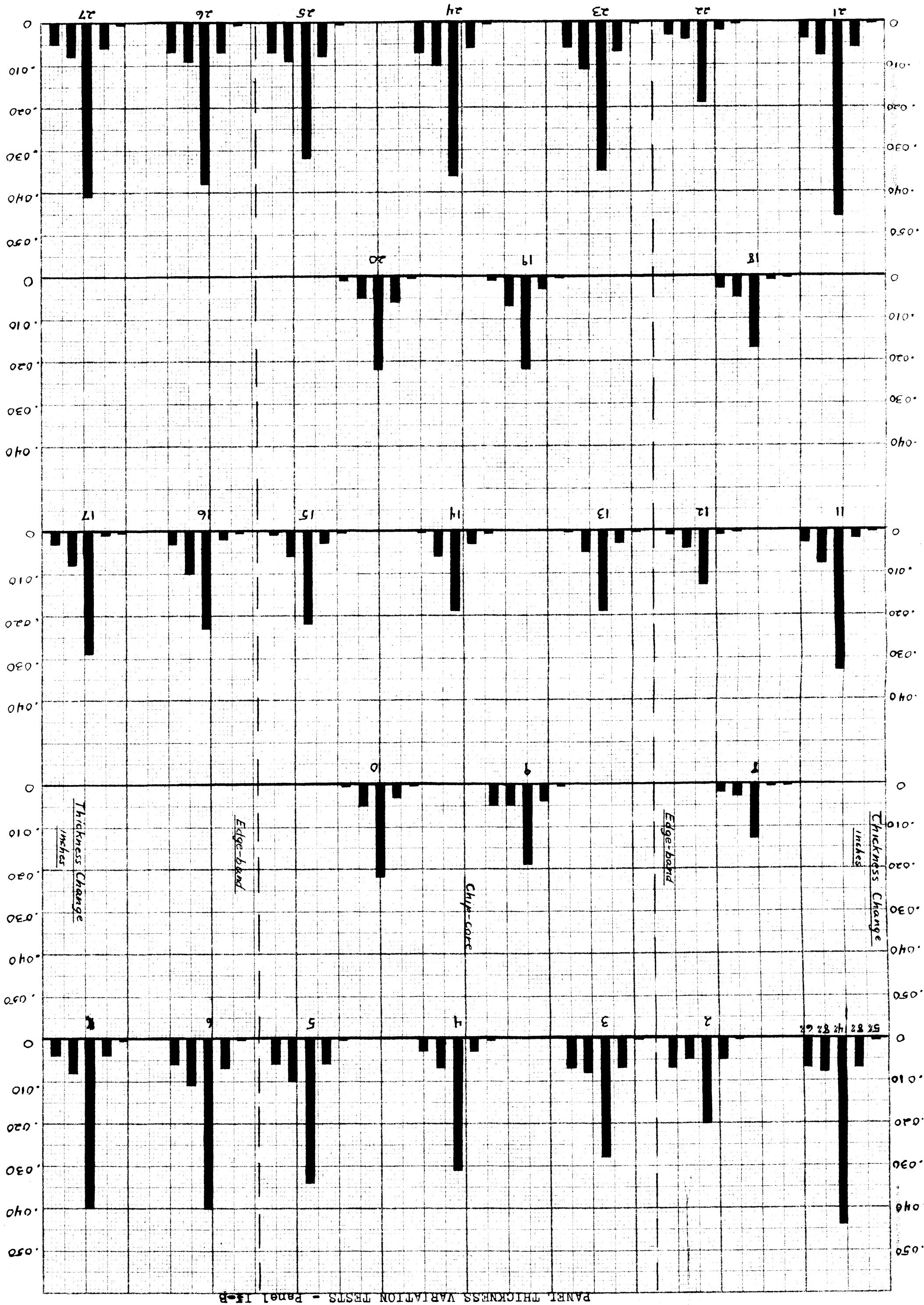
During the 2 weeks that the specific gravity specimens were in the 5% room the conditions of the room varied between 5% and 6% equilibrium moisture content. The result was that the moisture contents of the specimens when first tested were actually from 5.5% to 6.1%. They were then placed in the 13% room for several weeks. When tested for dimension change they were between 11.1% and 12.1%. This was due to the fact that considerable trouble had been encountered in trying to maintain the 13% room at 13% equilibrium moisture content. Most of the time during which the specimens were in the 13%

room conditions varied widely, both above and below 13% equilibrium moisture content. Thus the change in moisture content of the specimens was from 5% to 6%. Due to this change in moisture content there was an increase in thickness and in volume ranging on the average from 2.5% to 4%. The results of the tests are tabulated on pages 65 through 85 . It can be seen from the ^{pages 31-35} graphs that there is no relationship between the specific gravity and the percent swelling.

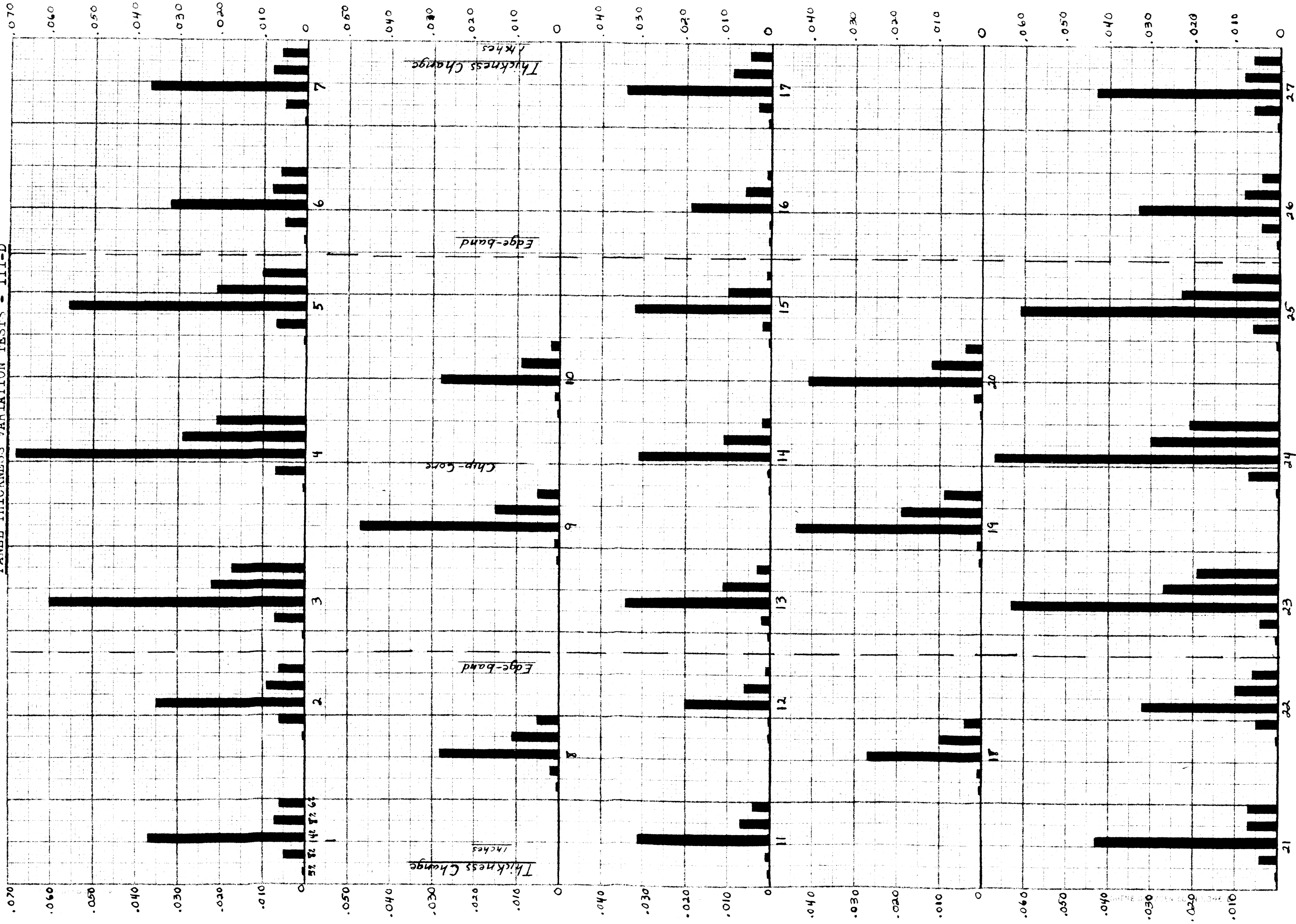
These results are discussed in the section - Discussion of Results, starting on page 36.

PANEL THICKNESS VARIATION TESTS - Panel I-A

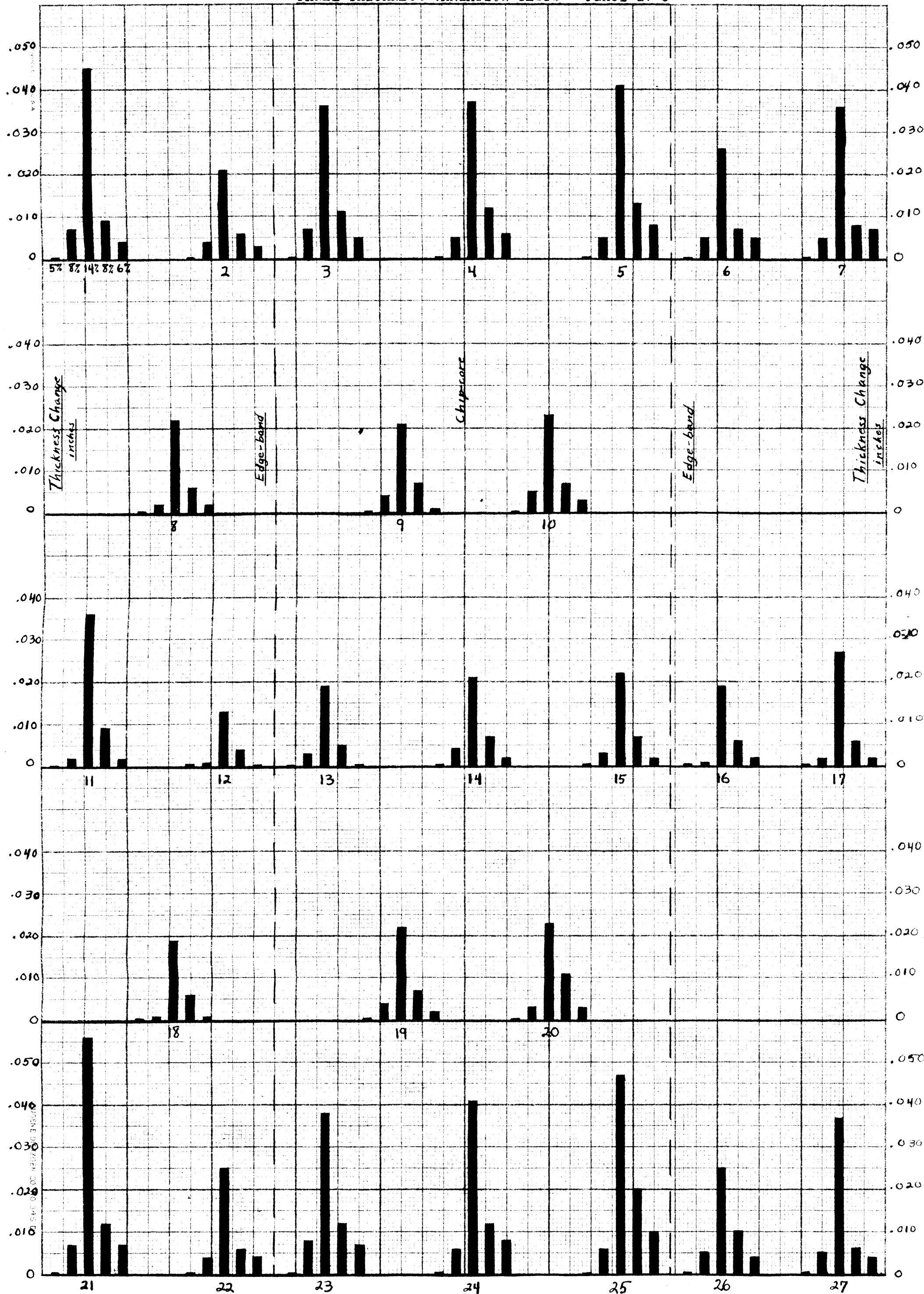




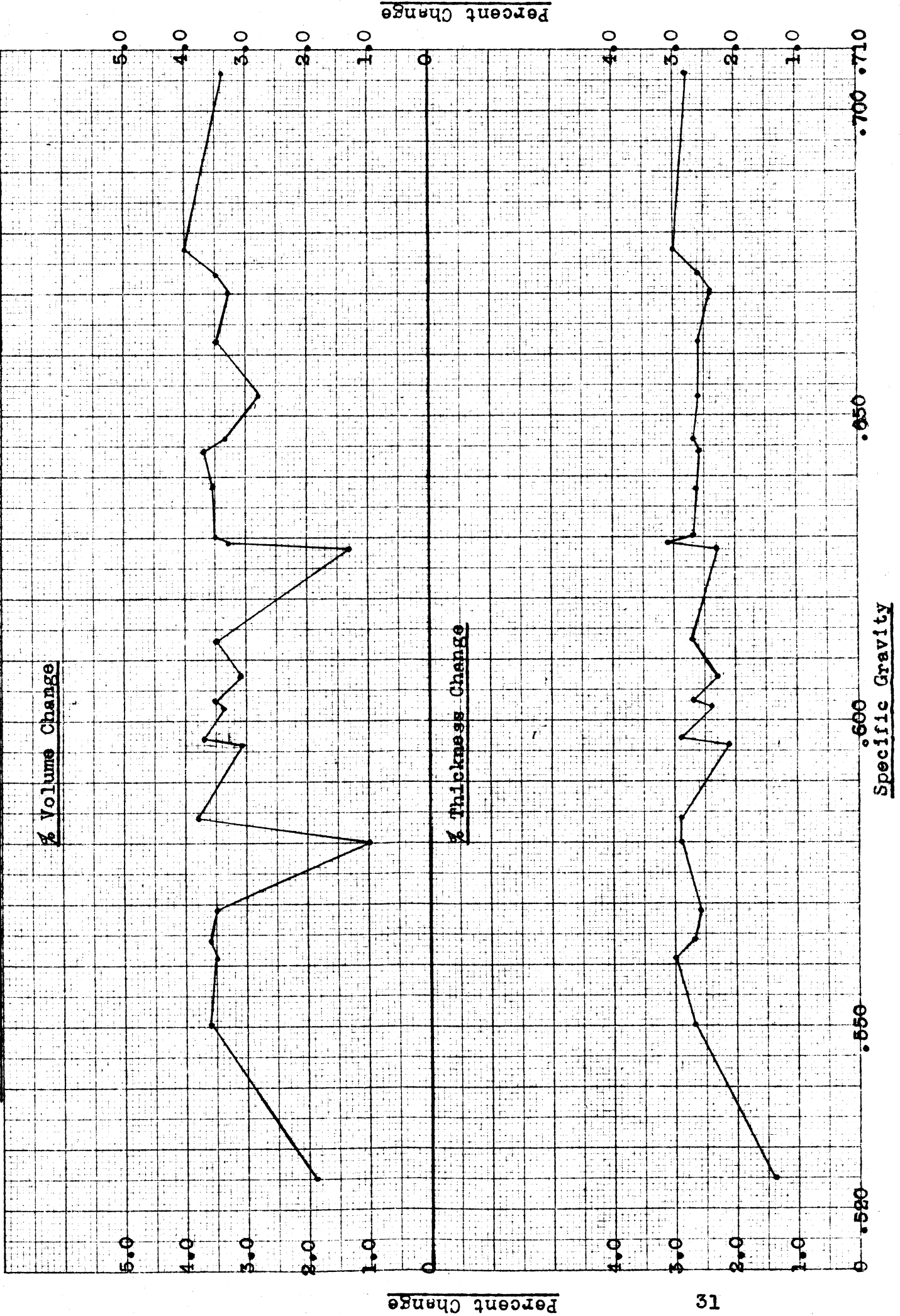
PANEL THICKNESS VARIATION TESTS - III-D



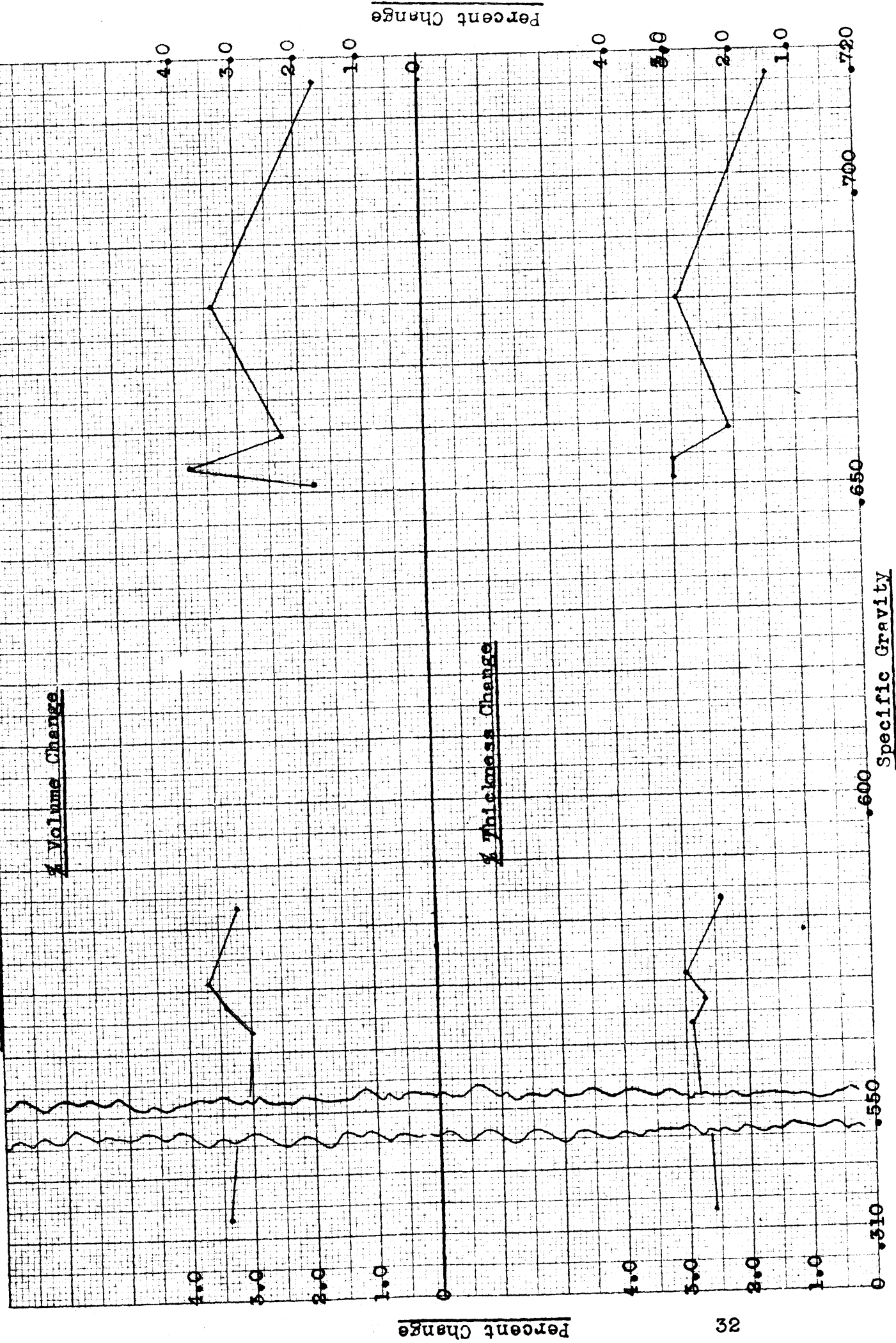
PANEL THICKNESS VARIATION TESTS - Panel IV-C



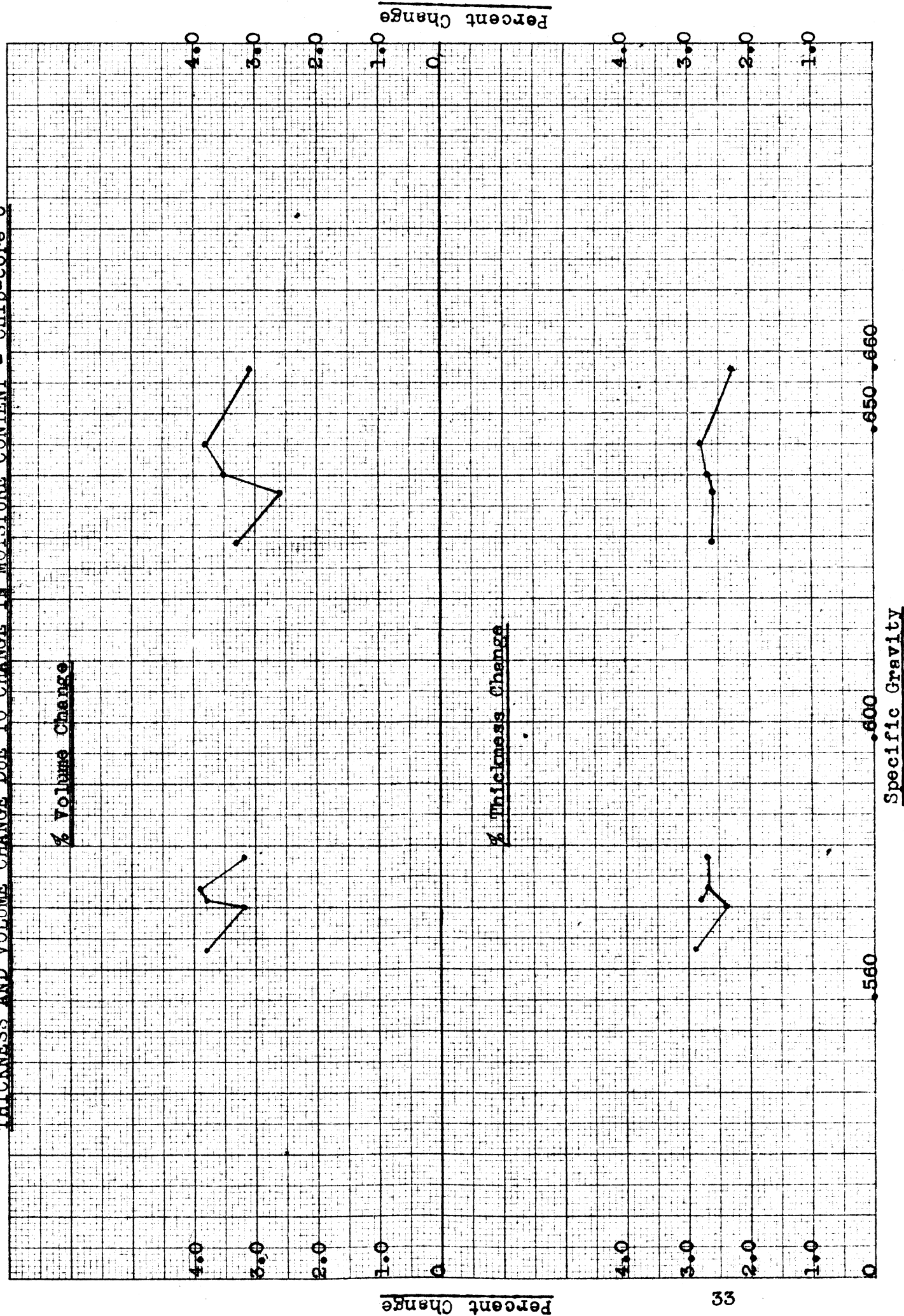
THICKNESS AND VOLUME CHANGE DUE TO CHANGE IN MOISTURE CONTENT - Chip-core A

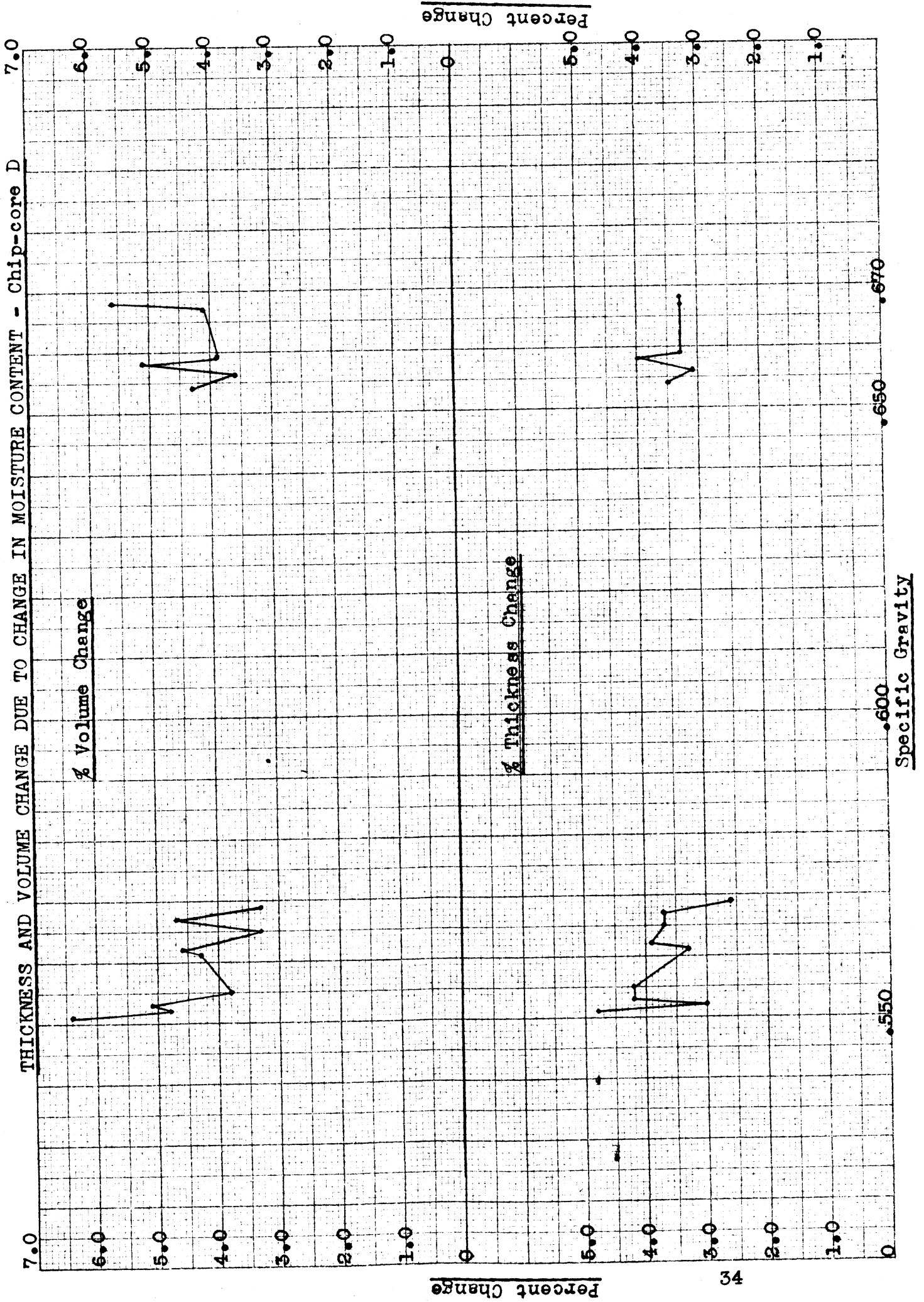


THICKNESS AND VOLUME CHANGE DUE TO CHANGE IN MOISTURE CONTENT of Chip-core B

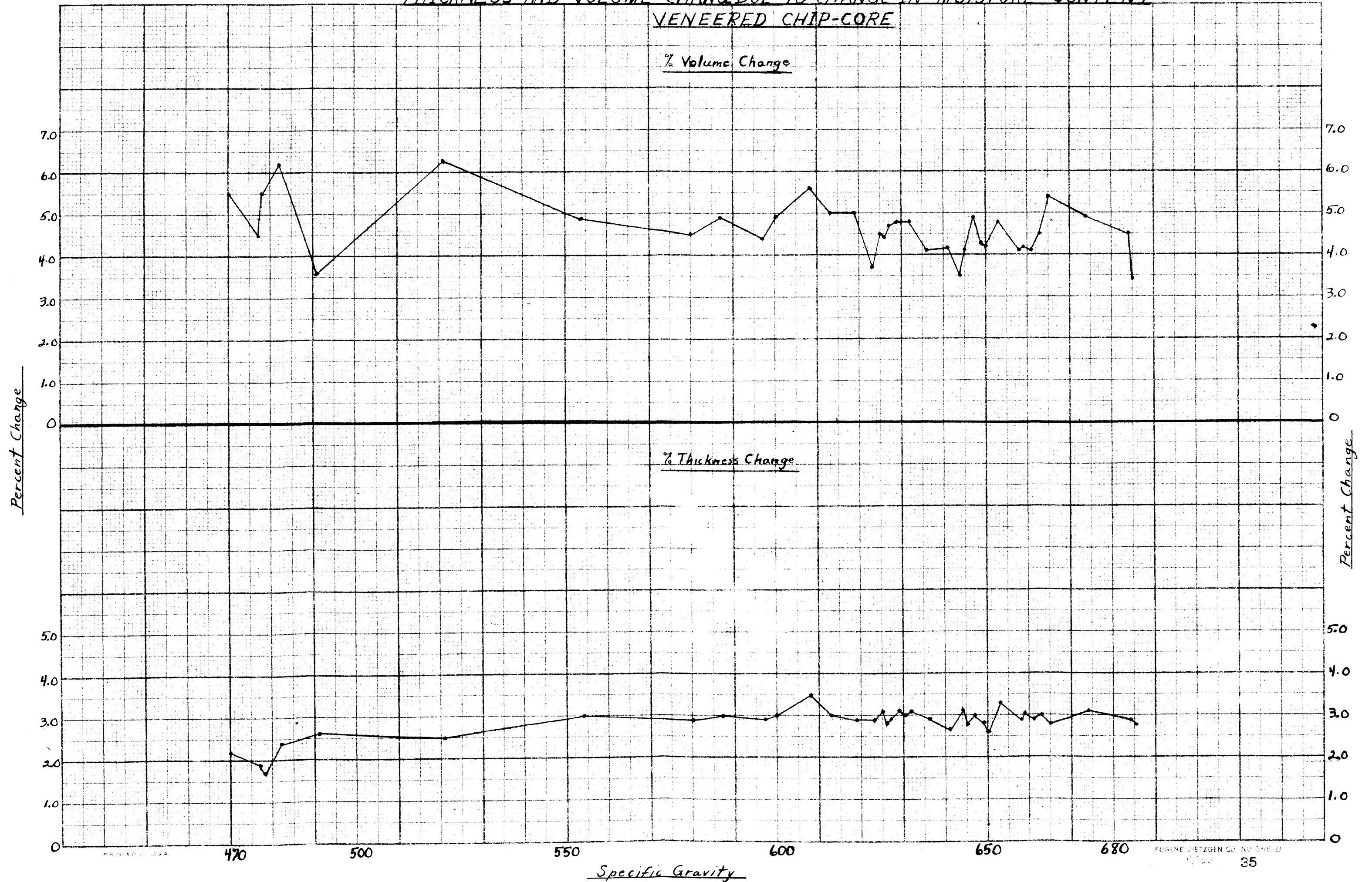


THICKNESS AND VOLUME CHANGE DUE TO CHANGE IN MOISTURE CONTENT - Chip-core C





THICKNESS AND VOLUME CHANGEDUE TO CHANGE IN MOISTURE CONTENT
VENEERED CHIP-CORE



DISCUSSION OF RESULTS

Panel Dimensional Stability

The results of raising and lowering relative humidity showed that the panels do not shrink and swell uniformly. This fact is clearly shown by the bar graphs on pages 27 to 30. Five bars representing the changes in thickness for each moisture content were drawn for each point tested on the panel. It should be noted that the panels swelled considerably along the edges where moisture is more readily absorbed. Also, there was a lot of swelling at the corners since there were 2 exposed edges by which moisture might enter. Probably the most important fact observed was that the thickness increase in the chip-core adjacent to the line of the joint with the edge-band was nearly twice the thickness increase of the edge-band next to the line. The result of course was a very noticeable bulge where the chip-core met the lumber edge band. Naturally this is objectionable in a panel. When the relative humidity was lowered this bulge disappeared, however. The panel shrunk back to within approximately .005 inch of its original thickness. The final moisture content was 6.71%. If it had been reduced to the original 5.33%, recovery would probably have been complete.

There are 2 reasons for the non-uniformity of swelling throughout the panel. First, the moisture content was not uniform in the panel when the thickness tests were made.

For instance when the overall moisture content determined by the sample board method was found to be 13.82% (average of 6 values ranging from 13.33% to 14.30%) the moisture content of samples cut from the moisture content sample board showed moisture content ranging from 11.57% to 18.35%. The specimens near the edges showed the higher moisture content values. The diagram on page 62 shows the location of those samples in the panel. It is also interesting to note that all the moisture content samples cut from the edge-band sections were higher than any moisture content sample cut from chip-core samples,

The question might logically be raised - "Why weren't the panels brought to equilibrium moisture content before checking thickness?" Due to the size of the panels it would have taken a long time to obtain equilibrium moisture content at each humidity. When wood is subjected to high relative humidity it will increase in moisture content very rapidly at first. But the closer the moisture content gets to the equilibrium moisture content corresponding to the humidity conditions, the more slowly it gains moisture. A study² made at the Wood Utilization Laboratory explains moisture content changes in detail.

When considering the finished product in actual use, conditions would not often be such that a change in relative humidity would last long enough for a panel to come

to equilibrium moisture content. So the changes in the panel resulting from the shorter period of exposure to high relative humidity actually will be more representative of the results in actual use. That is, the fact that the panels were not at equilibrium moisture content is probably more nearly the normal condition. During the winter, however, when houses are closed and heated the panels might come to an equilibrium moisture content.

The second cause for the non-uniformity of swelling throughout the panel is the difference in the 2 materials comprising the core. The shrinking and swelling properties of the chip-core are not the same as those of the lumber edge-bands. Thus swelling is not uniform throughout the panel. The swelling characteristic of chip-core is more thoroughly discussed in the next section.

The warping which occurred was partly due to the bulging at the joints of the edge-bands and chip-core. The average warping, measured along the 20-3/4 inch dimension, was approximately 1/8 inch.

Specific Gravity, Dimension Change Relationship

On pages 31 to 35 are graphs showing the relationship between specific gravity and swelling of chip-core when exposed to high relative humidity. Before this study was started it was suspected that the higher the specific gravity of the chip-core, the greater would be the swelling, as in general such is the case with wood. However, these results indicate that no such relationship exists. Higher specific gravity does not seem to result in greater swelling. The author believes that lack of such a relationship is due to one, or a combination of the following 2 factors.

Consider the differences between chip-core and wood. First, the structure of the 2 materials are different. Wood has a definite structural pattern. Chip-core shows no particular uniformity of structure except that generally the long dimension of the chips lie approximately parallel to the surface of the chip-core panel. Except for that limited orientation it is structurally a mixed mass of chips of a variety of species.

When wood cells swell, part of the swelling is outward.³ Thus, with the individual cells swelling outward, there is an increase in the surface dimensions of a piece of wood. There are many voids in chip-core. It seems probable that when the individual chips swell they will swell into the voids to some extent, since therein lies the path of least resistance. It might still seem that the higher specific

gravity material would swell more since there is more wood substance compressed into a unit of volume. This would be likely if the specific gravity were very high with the result being a much less porous substance. In the material tested there were very few specimens with a specific gravity over .7 figured on a moisture content of 5%. Thus it may very likely be that the swelling in the interior of a piece of chip-core is taken up for the most part by the voids, and that the increase in exterior dimensions is due primarily to the swelling of the chips comprising the outer shell. Part of that swelling may also be due to compression recovery. Within the range of specific gravity of the chip-core tested in this study there appears to be no relationship with dimensional changes. It may very possibly be, that above a certain specific gravity there is a direct relationship.

The other difference between wood and chip-core is that the chip-core contains a urea-formaldehyde resin. The urea resin probably partially accounts for the fact that chip-core absorbs moisture more slowly than does wood. Urea resin also contributes to the specific gravity of the chip-core. Thus chip-core of high specific gravity probably would not swell as much more than chip-core of low specific gravity as it would if the specific gravity was a function of the amount of wood substance only.

It is the opinion of 2 chemical engineering professors *

* Professors Brier and McCready of the College of Engineering of the University of Michigan.

that there probably is no chemical action between urea-formaldehyde and wood that would account for the fact that there is no direct specific gravity dimension change relationship in chip-core.

CONCLUSIONS

The results of this study were discussed in the section Discussion of Results. Discussion of some other aspects of chip-core and suggestions for possible future research are included in this section.

This study was made on unfinished chip-core panels. The panels as used in a cedar chest are finished with 2 coats of lacquer. Such finishing materials reduce the rapidity of moisture changes in wood. This means, of course, that it will take longer for moisture changes to occur in the panels as used in the finished cedar chests than in the unfinished panels tested in this study. The use of lacquer finished veneer and lumber bands on the ends of the chip-core also reduce the rate of moisture change. With such protection very high humidity for long periods would probably be required to cause any harmful effects. However if enough moisture does get in, the resulting bulges along the edges of the chip-core will very likely loosen the veneer and the edge strips.

In these tests the panels very nearly returned to their original thickness. If the final moisture content of the panels had been as low as the original moisture content, the original thickness probably would have been obtained. Alternate cycles of high and low relative humidity might eventually result in a permanent substantial increase in thickness. If the bulges that occurred at the edges of the chip-core at high relative humidity were to become

permanent the panel would be ruined. Thus cyclic tests on completely finished chip-core panels would yield some valuable information.

As stated in "Chip-core Manufacture" on page 6 the chip-core is a mixture of poplar, tupelo, gum, maple, oak, and some cedar lumbers; face veneer waste of walnut, mahogany, prima vera; and poplar and gum crossbanding. It would be interesting to find if the dimensional stability would differ by using one species only of wood chips.

Panels made with different resin contents might react differently to moisture content changes. However, results on the dimensional stability of plaswood obtained by L. A. Patronskey¹ showed that the dimensional stability of panels of different compositions was approximately the same. The plaswood compositions used were:

- (1) 16% urea resin content, density 35 lbs./ cu.ft.
- (2) 25% urea resin content, density 35 lbs./ cu.ft.
- (3) 25% urea resin content, density 40 lbs./ cu.ft.

Different results might be obtained with chip-core, though.

A more stable chip-core might be found by testing experimental panels made with different combinations of the variables of species, resin content, and chip-size; as well as different resins.

It seems likely that further experimentation along this line will result in the discovery of a more stable panel core material.

PANEL THICKNESS VARIATION TESTS - Panel I-A

Specimen No.	Thickness 5.33% mc. inches	Thickness Change 5.33%-8.32% inches	Thickness 8.32% mc. inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc. inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.819	.004	.823	.032	.855	.029	.826	.004	.822
2	.816	—	.813	.016	.829	.011	.818	.000	.818
3	.815	.005	.820	.034	.854	.024	.828	.004	.824
4	.825	.004	.829	.032	.861	.025	.836	.006	.830
5	.823	.005	.828	.032	.860	.026	.834	.005	.829
6	.825	.006	.831	.019	.850	.018	.832	.001	.831
7	.823	.006	.829	.026	.855	.026	.829	.001	.828
8	.825	.002	.827	.021	.848	.018	.830	.013	.817
9	*----		.831	.018	.849	.014	.835	.005	.830
10	.832	.002	.834	.017	.851	.013	.838	.005	.833
11	.827	.005	.829	.027	.856	.021	.835	.006	.829
12	.830	—	.829	.006	.835	.004	.831	.002	.829
13	.828	.000	.828	.016	.844	.012	.832	.006	.826
14	.831	.002	.833	.015	.848	.013	.835	.006	.829
15	.832	.002	.834	.014	.848	.012	.836	.006	.830
16	.833	.002	.835	.012	.847	.008	.839	.002	.834
17	.832	.002	.834	.020	.854	.016	.838	.004	.834
18	.830	.001	.831	.010	.841	.007	.834	.003	.831
19	.827	.002	.829	.015	.844	.013	.831	.005	.826
20	.831	.003	.834	.013	.847	.012	.835	.005	.830
21	.823	.006	.829	.030	.859	.029	.830	.004	.826
22	.827	.003	.830	.010	.840	.010	.830	.001	.829
23	.824	.006	.830	.031	.861	.024	.837	.004	.831
24	.825	.006	.831	.027	.858	.022	.836	.005	.831
25	.829	.006	.835	.026	.861	.022	.839	.005	.834
26	.831	.006	.837	.021	.858	.018	.840	.004	.836
27	.832	.005	.837	.026	.863	.025	.838	.002	.836

* Overlooked checking this point.

PANEL THICKNESS VARIATION TESTS - Panel I-B

Specimen No.	Thickness 5.33% mc. inches	Thickness Change 5.33%-8.32% inches	Thickness 8.32% mc. inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc. inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.822	.006	.828	.035	.863	.033	.830	.004	.826
2	.826	.003	.829	.013	.842	.011	.831	.001	.830
3	.823	.007	.830	.033	.863	.028	.835	.004	.831
4	.824	.007	.831	.027	.858	.024	.834	.005	.829
5	.826	.008	.834	.028	.862	.025	.837	.005	.832
6	.831	.004	.835	.023	.858	.020	.838	.004	.834
7	.833	.003	.836	.028	.864	.023	.841	.003	.838
8	.828	.001	.829	.013	.842	.005	.837	.006	.831
9	.827	.002	.829	.016	.845	.013	.832	.005	.827
10	.831	.002	.833	.016	.849	.013	.836	.006	.830
11	.826	.003	.829	.025	.854	.020	.834	.006	.828
12	.829	.000	.829	.006	.835	.005	.830	.001	.829
13	.827	.001	.828	.017	.845	.015	.830	.005	.825
14	.831	.000	.831	.015	.846	.012	.834	.006	.828
15	.831	.001	.832	.016	.848	.013	.835	.005	.830
16	.833	.000	.833	.014	.847	.008	.839	.005	.834
17	.832	.002	.834	.021	.855	.017	.838	.004	.834
18	.828	.001	.829	.013	.842	.009	.833	.003	.830
19	.827	.003	.830	.019	.849	.017	.832	.005	.827
20	.830	.003	.833	.017	.850	.014	.836	.006	.830
21	.815	.005	.820	.032	.852	.029	.823	.005	.818
22	.826	.003	.828	.009	.837	.008	.829	.001	.828
23	.822	.006	.828	.034	.862	.028	.834	.006	.828
24	.825	.006	.831	.035	.866	.027	.839	.006	.833
25	.827	.008	.835	.032	.867	.027	.840	.005	.835
26	.830	.007	.837	.022	.859	.019	.840	.003	.837
27	.829	.006	.835	.025	.860	.024	.836	.002	.834

PANEL THICKNESS VARIATION TESTS - Panel I-C

Specimen No.	Thickness 5.33% mc. inches	Thickness Change 5.33%-8.32% inches	Thickness 8.32% mc inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.816	.007	.823	.026	.851	.029	.822	.004	.818
2	.826	.003	.829	.010	.839	.011	.828	.001	.827
3	.830	.007	.837	.040	.877	.033	.844	.008	.837
4	.828	.006	.834	.035	.869	.029	.840	.005	.835
5	.831	.005	.836	.032	.868	.026	.842	.005	.837
6	.832	.004	.836	.020	.856	.017	.839	.003	.836
7	.831	.004	.835	.026	.861	.023	.838	.004	.834
8	.829	.002	.831	.015	.846	.012	.834	.005	.829
9	.825	.009	.834	.018	.852	.018	.834	.007	.827
10	.832	.002	.834	.018	.853	.015	.838	.005	.833
11	.825	.000	.825	.029	.854	.025	.829	.005	.824
12	.827	.001	.828	.007	.835	.006	.829	.003	.826
13	.823	.003	.826	.021	.847	.017	.830	.006	.824
14	.828	.003	.831	.019	.850	.016	.834	.005	.829
15	.830	.003	.833	.019	.852	.016	.836	.006	.830
16	.834	.001	.835	.014	.849	.010	.839	.005	.834
17	.835	.002	.837	.021	.858	.010	.840	.004	.836
18	.832	.001	.833	.014	.847	.011	.836	.004	.832
19	.824	.004	.828	.024	.852	.020	.832	.006	.826
20	.829	.004	.833	.019	.851	.016	.835	.005	.830
21	.824	.004	.828	.032	.860	.021	.829	.005	.824
22	.827	.005	.832	.015	.847	.013	.834	.003	.831
23	.820	.007	.827	.042	.869	.033	.836	.005	.831
24	.826	.006	.832	.038	.870	.030	.840	.004	.836
25	.828	.008	.836	.036	.872	.030	.842	.006	.836
26	.831	.006	.837	.020	.857	.019	.833	.004	.834
27	.832	.006	.838	.025	.863	.025	.838	.003	.835

PANEL THICKNESS VARIATION TESTS - Panel I-D

Specimen No.	Thickness 5.33% mc. inches	Thickness Change 5.33%-8.32% inches	Thickness 8.32% mc. inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc. inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.823	.007	.830	.037	.867	.033	.834	.003	.831
2	.827	.004	.831	.012	.843	.012	.831	.000	.831
3	.821	.007	.828	.032	.860	.027	.833	.004	.829
4	.826	.005	.831	.032	.863	.026	.837	.006	.833
5	.827	.008	.835	.032	.867	.026	.841	.004	.837
6	.830	.006	.836	.020	.856	.018	.838	.002	.836
7	.830	.006	.836	.030	.866	.027	.839	.002	.837
8	.828	.003	.831	.013	.844	.009	.935	.002	.833
9	.825	.004	.829	.019	.848	.016	.832	.005	.827
10	.829	.004	.833	.021	.854	.017	.837	.004	.833
11	.822	.003	.825	.027	.852	.022	.830	.004	.826
12	.827	.003	.830	.010	.840	.0063	.834	.003	.831
13	.824	.003	.827	.018	.845	.014	.831	.005	.826
14	.825	.004	.829	.019	.848	.015	.833	.005	.828
15	.828	.004	.832	.020	.852	.016	.836	.006	.830
16	.831	.002	.833	.015	.848	.009	.839	.005	.834
17	.830	.003	.833	.025	.858	.020	.838	.003	.835
18	.823	.001	.824	.013	.837	.006	.829	.006	.825
19	.822	.011	.833	.016	.849	.017	.832	.006	.826
20	.828	.004	.832	.022	.854	.015	.839	.005	.834
21	.805	.006	.811	.034	.845	.031	.814	.003	.811
22	.814	.004	.818	.013	.831	.011	.820	.002	.818
23	.813	.008	.821	.032	.853	.024	.829	.004	.823
24	.822	.006	.828	.040	.868	.027	.841	.006	.835
25	.824	.009	.833	.040	.873	.031	.842	.006	.836
26	.828	.006	.834	.018	.852	.014	.838	.003	.835
27	.828	.007	.836	.025	.861	.023	.838	.002	.836

PANEL THICKNESS VARIATION TESTS - Panel II-A

Specimen No.	Thickness 5.33% mc. inches		Thickness 8.32% mc. inches		Thickness 14.5% mc. inches		Thickness 14.5%-8.36% inches		Thickness 8.36% mc. inches		Thickness Change 8.36%-6.71% inches		Thickness 6.71% mc. inches	
	Thickness	Change	Thickness	Change	Thickness	Change	Thickness	Change	Thickness	Change	Thickness	Change	Thickness	Change
1	.824	.007	.831	.041	.872	.041	.835	.037	.835	.003	.832	.003	.832	.003
2	.822	.003	.825	.015	.840	.015	.827	.013	.827	.001	.826	.001	.826	.001
3	.819	.007	.826	.024	.850	.024	.829	.021	.829	.004	.825	.004	.825	.004
4	.825	.004	.829	.029	.858	.029	.832	.026	.832	.004	.828	.004	.828	.004
5	.814	.006	.820	.031	.851	.031	.825	.026	.825	.004	.821	.004	.821	.004
6	.814	.007	.821	.037	.858	.037	.828	.030	.828	.005	.823	.005	.823	.005
7	.823	.001	.824	.035	.859	.035	.828	.031	.828	.003	.825	.003	.825	.003
8	.832	.001	.833	.012	.845	.012	.836	.009	.836	.002	.834	.002	.834	.002
9	.832	.002	.834	.014	.848	.014	.834	.014	.834	.004	.830	.004	.830	.004
10	.827	.003	.830	.020	.850	.020	.833	.017	.833	.004	.829	.004	.829	.004
11	.832	.002	.834	.031	.865	.031	.842	.023	.842	.007	.835	.007	.835	.007
12	.834	.000	.834	.011	.845	.011	.838	.007	.838	.007	.835	.007	.835	.007
13	.832	.000	.832	.017	.849	.017	.835	.014	.835	.006	.829	.006	.829	.006
14	.830	.003	.833	.016	.849	.016	.834	.015	.834	.004	.830	.004	.830	.004
15	.828	.002	.830	.018	.848	.018	.833	.015	.833	.005	.828	.005	.828	.005
16	.832	-.001	.831	.020	.851	.020	.839	.012	.839	.005	.834	.005	.834	.005
17	.829	.001	.830	.029	.859	.029	.836	.017	.836	.003	.833	.003	.833	.003
18	.835	-.001	.834	.015	.849	.015	.839	.010	.839	.002	.837	.002	.837	.002
19	.832	.003	.835	.018	.853	.018	.838	.015	.838	.006	.832	.006	.832	.006
20	.833	.003	.836	.016	.852	.016	.838	.014	.838	.003	.835	.003	.835	.003
21	.827	.007	.834	.037	.871	.037	.837	.034	.837	.005	.832	.005	.832	.005
22	.831	.004	.835	.016	.851	.016	.836	.015	.836	.000	.836	.000	.836	.000
23	.825	.006	.831	.027	.858	.027	.834	.024	.834	.004	.830	.004	.830	.004
24	.829	.006	.835	.031	.866	.031	.840	.026	.840	.004	.836	.004	.836	.004
25	.829	.008	.837	.026	.863	.026	.839	.024	.839	.003	.836	.003	.836	.003
26	.832	.008	.840	.030	.870	.030	.842	.028	.842	.003	.839	.003	.839	.003
27	.830	.005	.835	.037	.872	.037	.839	.033	.839	.004	.835	.004	.835	.004

PANEL THICKNESS VARIATION TESTS - Panel II-B

Specimen No.	Thickness 5.33% mc. inches	Thickness Change 5.33%-8.32% inches	Thickness 8.32% mc. inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc. inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.830	.007	.837	.037	.874	.036	.838	.001	.837
2	.832	.005	.837	.015	.852	.015	.837	.002	.839
3	.827	.007	.834	.025	.855	.020	.835	.001	.834
4	.832	.003	.835	.028	.863	.024	.839	.004	.835
5	.831	.006	.837	.028	.865	.024	.841	.004	.837
6	.833	.007	.840	.033	.873	.039	.844	.005	.839
7	.830	.004	.834	.036	.870	.032	.838	.006	.834
8	.837	.000	.837	.013	.850	.010	.840	.001	.839
9	.833	.004	.837	.015	.852	.014	.838	.000	.838
10	.835	.003	.838	.019	.857	.017	.840	.005	.835
11	.832	.002	.834	.031	.865	.025	.840	.005	.835
12	.837	.001	.838	.012	.850	.009	.841	.003	.838
13	.832	.003	.835	.016	.851	.014	.837	.005	.832
14	.835	.003	.838	.016	.854	.013	.841	.006	.835
15	.835	.003	.838	.019	.857	.016	.841	.005	.836
16	.837	.002	.839	.021	.860	.013	.847	.007	.840
17	.834	.001	.835	.038	.863	.021	.842	.005	.837
18	.835	.001	.836	.016	.852	.012	.840	.002	.838
19	.835	.003	.838	.019	.857	.015	.842	.006	.836
20	.836	.006	.842	.016	.858	.017	.841	.004	.837
21	.827	.006	.833	.040	.873	.038	.835	.006	.831
22	.833	.002	.835	.017	.852	.015	.837	.001	.836
23	.827	.007	.834	.028	.862	.024	.838	.005	.833
24	.833	.006	.839	.040	.869	.026	.843	.003	.840
25	.830	.008	.838	.024	.862	.023	.839	.002	.837
26	.831	.007	.838	.031	.869	.029	.840	.002	.838
27	.829	.006	.835	.035	.870	.033	.837	.003	.834

PANEL THICKNESS VARIATION TESTS - Panel II-C

Specimen No.	Thickness 5.33%mc. inches	Thickness Change 5.33%-8.32% inches	Thickness 8.32% mc. inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc. inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.829	.006	.835	.032	.867	.030	.837	.003	.834
2	.832	.005	.837	.018	.855	.016	.839	.003	.836
3	.828	.008	.836	.036	.872	.028	.844	.008	.836
4	.832	.005	.837	.037	.874	.029	.845	.006	.839
5	.832	.005	.837	.036	.875	.032	.843	.005	.838
6	.831	.007	.838	.034	.872	.030	.842	.005	.837
7	.831	.003	.834	.036	.870	.022	.838	.004	.834
8	.835	.001	.836	.015	.851	.012	.839	.003	.836
9	.834	.003	.837	.025	.862	.019	.843	.007	.836
10	.832	.004	.836	.023	.859	.019	.840	.006	.834
11	.832	.001	.833	.033	.866	.024	.842	.006	.836
12	.835	.000	.835	.013	.848	.007	.841	.005	.836
13	.832	.000	.832	.023	.855	.016	.839	.007	.832
14	.832	.003	.835	.022	.857	.018	.839	.006	.833
15	.832	.004	.836	.021	.857	.018	.839	.006	.833
16	.835	.001	.836	.024	.860	.014	.846	.008	.838
17	.832	.000	.832	.032	.864	.025	.839	.005	.834
18	.833	.001	.834	.018	.852	.013	.839	.003	.836
19	.832	.001	.833	.027	.860	.021	.839	.007	.832
20	.831	.004	.835	.023	.858	.021	.837	.005	.832
21	.825	.006	.831	.045	.876	.041	.835	.002	.833
22	.828	.004	.832	.019	.851	.019	.833	.004	.831
23	.823	.005	.828	.035	.863	.028	.835	.004	.831
24	.825	.007	.832	.041	.873	.033	.840	.007	.833
25	.827	.007	.834	.039	.873	.034	.839	.005	.834
26	.830	.004	.834	.035	.869	.031	.838	.004	.834
27	.826	.005	.831	.039	.870	.039	.831	.002	.829

PANEL THICKNESS VARIATION TESTS - Panel II-D

Specimen No.	Thickness 5.33% mc.		Thickness 8.32% mc.		Thickness 14.5% mc.		Thickness 8.86% mc.		Thickness 6.71% mc.	
	Thickness inches	Change 5.33%-8.32% inches	Thickness inches	Change 8.32%-14.5% inches	Thickness inches	Change 14.5%-8.86% inches	Thickness inches	Change 8.86%-6.71% inches	Thickness inches	Change 6.71% inches
1	.825	.007	.832	.041	.873	.040	.833	.004		
2	.827	.005	.832	.015	.847	.016	.831	.000		
3	.822	.008	.830	.025	.855	.025	.830	.003		
4	.825	.008	.833	.030	.863	.026	.837	.005		
5	.825	.009	.834	.032	.866	.030	.836	.004		
6	.828	.007	.835	.032	.867	.030	.837	.004		
7	.825	.005	.830	.038	.868	.036	.832	.003		
8	.831	.000	.831	.018	.849	.013	.836	.004		
9	.830	.003	.833	.018	.851	.016	.835	.004		
10	.831	.003	.834	.023	.857	.020	.837	.005		
11	.829	.002	.831	.039	.870	.031	.839	.007		
12	.833	.000	.833	.012	.845	.009	.836	.003		
13	.829	.002	.831	.020	.851	.017	.834	.006		
14	.830	.004	.834	.021	.855	.018	.837	.006		
15	.829	.003	.832	.022	.854	.019	.835	.005		
16	.831	.001	.832	.025	.857	.017	.840	.006		
17	.827	.001	.828	.035	.863	.028	.835	.006		
18	.830	.000	.830	.021	.851	.015	.836	.006		
19	.828	.003	.831	.024	.855	.011	.834	.005		
20	.829	.003	.832	.023	.855	.014	.841	.010		
21	.822	.005	.827	.056	.883	.048	.835	.005		
22	.816	.003	.819	.024	.843	.019	.824	.002		
23	.817	.006	.823	.040	.863	.032	.831	.004		
24	.824	.007	.831	.035	.866	.029	.837	.007		
25	.826	.005	.831	.036	.867	.027	.840	.005		
26	.826	.006	.832	.033	.865	.025	.840	.007		
27	.826	.006	.832	.033	.865	.025	.840	.007		

PANEL THICKNESS VARIATION TESTS - Panel III-A

Specimen No.	Thickness 5.33% mc. inches	Thickness Change 5.33%-8.32% inches	Thickness 8.32% mc. inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc. inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.827	.006	.833	.035	.868	.033	.835	.002	.833
2	.818	.004	.822	.020	.842	.020	.822	-.001	.823
3	.826	.009	.835	.045	.880	.035	.845	.003	.842
4	.833	.008	.841	.051	.892	.035	.857	.007	.850
5	.859	.008	.867	.050	.917	.058	.875	.008	.867
6	.820	.007	.827	.032	.859	.031	.828	.003	.825
7	.811	.005	.816	.026	.842	.027	.815	.003	.812
8	.827	.005	.832	.016	.848	.014	.834	.003	.831
9	.827	.005	.832	.030	.862	.023	.839	.006	.833
10	.827	.004	.831	.031	.862	.024	.838	.006	.832
11	.826	.006	.827	.029	.856	.025	.831	.008	.829
12	.826	.003	.829	.014	.843	.008	.835	.006	.829
13	.824	.005	.829	.026	.855	.022	.833	.005	.828
14	.827	.004	.831	.024	.855	.019	.836	.006	.830
15	.825	.006	.831	.029	.860	.024	.836	.006	.830
16	.829	.003	.832	.024	.856	.018	.838	.005	.833
17	.826	.003	.829	.028	.857	.025	.832	.002	.830
18	.825	.003	.828	.022	.850	.017	.833	.004	.829
19	.826	.003	.829	.032	.861	.026	.835	.005	.830
20	.825	.005	.830	.025	.855	.021	.834	.005	.829
21	.826	.004	.830	.039	.869	.039	.830	.000	.830
22	.824	.006	.830	.033	.863	.030	.833	.003	.830
23	.850	.009	.859	*	.816	*	.870	.005	.865
24	.825	.008	.833	.028	.861	? .007	.854	.007	.847
25	.824	.008	.832	.054	.836	.039	.847	.004	.843
26	.826	.007	.833	.030	.863	.028	.835	.003	.832
27	.825	.005	.830	.039	.869	.037	.832	.000	.832

PANEL THICKNESS VARIATION TESTS - Panel III-B

Specimen No.	Thickness 5.35% mc. inches	Thickness Change 5.35%-8.32% inches	Thickness 8.32% mc. inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc. inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.824	.006	.830	.028	.858	.027	.831	.000	.831
2	.826	.005	.831	.016	.847	.015	.832	.001	.831
3	.823	.008	.831	.037	.863	.030	.838	.004	.834
4	.825	.006	.831	.033	.864	.026	.838	.003	.835
5	.823	.008	.831	.029	.860	.025	.835	.003	.832
6	.825	.007	.832	.022	.854	.021	.833	.002	.831
7	.826	.004	.830	.026	.853	.024	.832	.001	.831
8	.829	.003	.832	.016	.843	.011	.837	.004	.833
9	.828	.005	.833	.020	.853	.017	.836	.006	.830
10	.828	.004	.832	.016	.848	.014	.834	.003	.831
11	.824	.003	.827	.023	.850	.018	.832	.001	.831
12	.830	.003	.833	.012	.845	.008	.837	.004	.833
13	.825	.006	.831	.020	.851	.017	.834	.006	.828
14	.828	.004	.832	.017	.849	.013	.836	.006	.830
15	.826	.006	.832	.014	.846	.013	.833	.003	.830
16	.832	.003	.835	.012	.847	.010	.837	.002	.835
17	.828	.005	.833	.022	.853	.019	.836	.002	.834
18	.828	.004	.832	.017	.849	.010	.839	.006	.833
19	.827	.006	.833	.015	.848	.010	.838	.007	.831
20	.828	.004	.832	.019	.851	.010	.841	.011	.830
21	.820	.006	.826	.023	.851	.023	.828	.001	.827
22	.825	.005	.830	.020	.850	.017	.833	.003	.830
23	.821	.008	.829	.047	.876	.032	.844	.007	.837
24	.825	.009	.834	.059	.893	.039	.854	.006	.848
25	.827	.007	.834	.040	.874	.029	.845	.005	.840
26	.830	.004	.834	.013	.852	.017	.835	.002	.833
27	.825	.007	.832	.026	.858	.025	.833	.001	.832

PANEL THICKNESS VARIATION TESTS - Panel III-C

Specimen No.	Thickness 5.33% mc. inches	Thickness Change 5.33%-8;32% inches	Thickness 8.32% mc. inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc. inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.821	.005	.826	.026	.852	.025	.827	.000	.827
2	.826	.006	.831	.020	.851	.018	.833	.001	.832
3	.821	.009	.830	.059	.889	.043	.846	.005	.841
4	.825	.006	.831	.059	.890	.040	.850	.005	.845
5	.829	.006	.835	.047	.882	.034	.848	.005	.843
6	.827	.007	.834	.023	.857	.022	.835	.003	.832
7	.824	.007	.831	.030	.861	.029	.832	.001	.831
8	.832	.002	.834	.017	.851	.011	.840	.004	.836
9	.831	.003	.834	.029	.863	.022	.841	.005	.836
10	.833	.002	.835	.021	.856	.019	.837	.002	.835
11	*		.829	.021	.850	.018	.832	.002	.830
12	.832	.000	.832	.014	.846	.009	.837	.004	.833
13	.830	.002	.832	.021	.853	.017	.836	.006	.830
14	.833	.002	.835	.020	.855	.015	.840	.006	.834
15	.832	.003	.835	.017	.852	.014	.838	.005	.833
16	.836	.000	.836	.012	.848	.009	.839	.003	.836
17	.830	.003	.833	.025	.858	.021	.837	.003	.834
18	.830	.001	.833	.021	.854	.014	.840	.006	.834
19	.829	.003	.832	.027	.859	.020	.839	.006	.833
20	.832	.003	.835	.019	.854	.005	.849	.015	.834
21	.826	.005	.831	.029	.860	.027	.833	.001	.832
22	.825	.005	.830	.022	.852	.020	.832	.002	.830
23	.826	.003	.829	.039	.868	.028	.840	.004	.836
24	.827	.008	.835	.044	.879	.032	.847	.006	.841
25	.828	.007	.835	.035	.870	.029	.841	.005	.836
26	.828	.006	.834	.016	.850	.015	.835	.003	.832
27	.825	.006	.831	.030	.861	.030	.831	.001	.830

* overlooked checking this wt.

PANEL THICKNESS VARIATION TESTS - Panel III-D

Specimen No.	Thickness 5.33%mc. inches	Thickness Change 5.33%-8.32% inches	Thickness 8.32% mc. inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc. inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.825	.005	.830	.032	.862	.030	.832	.001	.831
2	.825	.006	.831	.029	.860	.026	.834	.003	.831
3	.824	.007	.831	.053	.884	.038	.846	.005	.841
4	.826	.007	.833	.061	.894	.039	.855	.008	.847
5	.826	.007	.833	.049	.882	.035	.847	.006	.841
6	.828	.005	.833	.027	.860	.024	.836	.002	.834
7	.825	.005	.830	.032	.862	.029	.833	.002	.831
8	.829	.002	.831	.026	.857	.017	.840	.006	.834
9	.831	.001	.832	.046	.878	.032	.846	.010	.836
10	.832	.001	.833	.027	.860	.019	.841	.007	.834
11	.826	.001	.827	.030	.857	.024	.833	.003	.830
12	.830	.000	.830	.020	.850	.014	.836	.005	.831
13	.829	.002	.831	.032	.863	.023	.840	.008	.832
14	.832	.000	.832	.031	.863	.020	.843	.009	.834
15	.831	.002	.833	.030	.863	.022	.841	.009	.832
16	.833	.000	.833	.019	.852	.014	.839	.005	.834
17	.829	.003	.832	.031	.863	.025	.838	.004	.834
18	.828	.001	.829	.026	.855	.017	.838	.006	.832
19	.830	.001	.831	.043	.874	.025	.849	.010	.839
20	.832	.002	.834	.039	.873	.029	.844	.008	.836
21	.822	.004	.826	.039	.865	.036	.829	.000	.829
22	.818	.005	.823	.027	.850	.022	.828	.004	.824
23	.822	.004	.826	.059	.885	.036	.849	.008	.841
24	.828	.007	.835	.060	.895	.037	.858	.009	.849
25	.828	.006	.834	.055	.889	.038	.851	.007	.844
26	.830	.004	.834	.029	.863	.025	.838	.004	.834
27	.828	.006	.834	.037	.871	.035	.836	.002	.834

PANEL THICKNESS VARIATION TESTS - Panel IV-A

Specimen No.	Thickness 5.33%mo. inches	Thickness Change 5.33%-8.32% inches	Thickness 8.32% mo. inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mo. inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mo. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mo. inches
1	.822	.007	.829	.039	.868	.035	.833	.005	.828
2	.828 (?)	.004	.832	.014	.846	.013	.833	.002	.831
3	.824	.007	.831	.030	.861	.025	.836	.005	.831
4	.823	.005	.828	.033	.861	.025	.836	.005	.831
5	.815	.004	.819	.035	.854	.027	.827	.005	.822
6	.817	.004	.821	.024	.845	.020	.825	.003	.822
7	.822	.003	.825	.027	.852	.025	.827	.002	.825
8	.831	.001	.832	.016	.848	.011	.837	.005	.832
9	.828	.004	.832	.015	.847	.013	.834	.004	.830
10	.825	.003	.828	.019	.847	.015	.832	.006	.826
11	.828	-.001	.827	.032	.859	.025	.834	.006	.828
12	.831	.001	.832	.010	.842	.007	.835	.006	.831
13	.827	.004	.831	.017	.848	.014	.834	.005	.829
14	.828	.003	.831	.015	.846	.012	.834	.005	.829
15	.825	.002	.827	.018	.845	.015	.830	.005	.825
16	.828	.000	.828	.016	.844	.010	.834	.004	.830
17	.828	.000	.828	.023	.851	.019	.832	.003	.829
18	.832	.001	.833	.028	.851	.012	.839	.005	.834
19	.826	.004	.830	.017	.847	.014	.833	.006	.827
20	.825	.004	.829	.017	.846	.011	.835	.009	.826
21	.822	.004	.826	.045	.871	.041	.830	.005	.825
22	.828	.004	.832	.018	.850	.017	.833	.002	.831
23	.824	.007	.831	.032	.863	.027	.836	.005	.831
24	.825	.005	.830	.033	.863	.025	.838	.005	.833
25	.820	.007	.827	.044	.871	.038	.833	.003	.830
26	.822	.005	.827	.033	.860	.030	.830	.002	.828
27	.826	.003	.829	.030	.859	.030	.829	.001	.828

PANEL THICKNESS VARIATION TESTS - Panel IV -B

Specimen	Thickness 5.33% mc. inches	Thickness Change 5.33%-8.32% inches	Thickness 8.32% mc.	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc.	Thickness Change 14.5%-8.86 inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.826	.000	.826	.036	.862	.035	.827	.005	.822
2	.830	.005	.835	.018	.853	.018	.835	.003	.832
3	.826	.008	.834	.027	.861	.025	.836	.005	.831
4	.825	.007	.832	.028	.860	.024	.836	.004	.832
5	.821	.009	.830	.032	.862	.029	.833	.005	.828
6	.825	.005	.830	.021	.851	.020	.831	.003	.828
7	.825	.005	.830	.024	.854	.024	.830	.002	.828
8	.834	.008	.836	.020	.856	.016	.840	.005	.835
9	.830	.003	.833	.015	.848	.013	.835	.005	.830
10	.827	.006	.833	.012	.845	.014	.831	.004	.827
11	.824	.003	.827	.032	.859	.026	.823	.007	.826
12	.834	.001	.835	.010	.845	.008	.837	.007	.834
13	.834	.001	.835	.016	.851	.014	.837	.005	.832
14	.831	.001	.832	.016	.848	.012	.836	.005	.831
15	.827	.000	.827	.018	.845	.015	.830	.004	.826
16	.828	.000	.828	.014	.842	.009	.833	.005	.828
17	.828	.001	.829	.021	.850	.019	.831	.001	.830
18	.837	.001	.838	.016	.854	.012	.842	.002	.838
19	.831	.001	.832	.019	.851	.015	.836	.005	.831
20	.827	.003	.830	.016	.846	.015	.831	.003	.828
21	.821	.007	.828	.042	.870	.039	.831	.006	.825
22	.831	.005	.836	.016	.852	.015	.837	.002	.835
23	.829	.006	.835	.027	.862	.024	.838	.005	.833
24	.825	.006	.831	.031	.862	.027	.835	.004	.831
25	.823	.007	.830	.030	.860	.028	.832	.001	.831
26	.825	.005	.830	.020	.850	.019	.831	.002	.829
27	.828	.000	.828	.031	.859	.032	.827	.001	.826

PANEL THICKNESS VARIATION TESTS - Panel IV-C

Specimen No.	Thickness 53% mc. inches	Thickness Change 5.33%-8.32% inches	Thickness 8.32% mc. inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc. inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.821	.007	.828	.038	.866	.036	.830	.005	.825
2	.832	.004	.836	.017	.853	.015	.838	.003	.835
3	.829	.007	.836	.029	.865	.025	.840	.006	.834
4	.826	.005	.831	.032	.863	.025	.838	.006	.832
5	.824	.005	.829	.036	.865	.028	.837	.005	.832
6	.825	.005	.830	.021	.851	.019	.832	.008	.830
7	.822	.005	.827	.031	.858	.028	.830	.001	.829
8	.836	.002	.838	.020	.858	.016	.842	.004	.838
9	.830	.004	.834	.017	.851	.014	.837	.006	.831
10	.827	.005	.832	.018	.850	.016	.834	.004	.830
11	.827	.002	.829	.034	.863	.027	.836	.007	.829
12	.834	.001	.835	.012	.847	.009	.838	.004	.834
13	.831	.003	.834	.016	.850	.014	.836	.005	.831
14	.827	.004	.831	.017	.848	.014	.834	.005	.829
15	.827	.003	.830	.019	.849	.015	.834	.005	.829
16	.829	.001	.830	.018	.848	.013	.835	.004	.831
17	.824	.002	.826	.025	.851	.021	.830	.004	.826
18	.834	.001	.835	.018	.853	.013	.840	.005	.835
19	.828	.004	.832	.018	.850	.015	.835	.005	.830
20	.828	.003	.831	.020	.851	.012	.839	.008	.831
21	.823	.007	.830	.049	.879	.044	.835	.005	.830
22	.830	.004	.834	.021	.855	.019	.836	.002	.834
23	.826	.008	.834	.030	.864	.026	.838	.005	.833
24	.823	.006	.829	.035	.864	.029	.835	.004	.831
25	.823	.006	.829	.041	.870	.027	.843	.010	.833
26	.825	.005	.830	.020	.850	.015	.835	.006	.829
27	.822	.005	.827	.032	.859	.031	.828	.002	.826

PANEL THICKNESS VARIATION TESTS - Panel IV-D

Specimen No.	Thickness 5.33% mc. inches	Thickness Change 5.33%-8.32% inches	Thickness 8.32% mc. inches	Thickness Change 8.32%-14.5% inches	Thickness 14.5% mc. inches	Thickness Change 14.5%-8.86% inches	Thickness 8.86% mc. inches	Thickness Change 8.86%-6.71% inches	Thickness 6.71% mc. inches
1	.823	.009	.832	.037	.869	.034	.835	.004	.831
2	.828	.007	.835	.018	.853	.017	.836	.003	.833
3	.826	.008	.834	.028	.862	.024	.838	.004	.834
4	.825	.004	.829	.030	.859	.024	.835	.005	.830
5	.820	.008	.828	.025	.863	.028	.835	.005	.830
6	.826	.005	.831	.018	.849	.017	.832	.008	.830
7	.823	.002	.825	.027	.852	.024	.828	.003	.825
8	.833	.005	.838	.016	.854	.010	.844	.006	.838
9	.827	.004	.831	.019	.850	.015	.835	.006	.829
10	.826	.005	.831	.021	.852	.017	.835	.006	.829
11	.827	.005	.832	.030	.862	.022	.840	.007	.833
12	.831	.003	.834	.012	.846	.009	.837	.007	.834
13	.827	.005	.832	.017	.849	.014	.835	.006	.829
14	.826	.003	.829	.018	.848	.014	.834	.006	.828
15	.825	.002	.827	.020	.847	.015	.832	.006	.826
16	.827	.000	.827	.016	.843	.010	.833	.004	.829
17	.819	.003	.822	.019	.841	.016	.825	.003	.822
18	.830	.004	.834	.015	.849	.010	.839	.004	.835
19	.826	.006	.832	.021	.853	.016	.837	.006	.831
20	.825	.005	.830	.021	.851	.016	.835	.006	.829
21	.811	.007	.818	.041	.859	.035	.824	.005	.819
22	.825	.007	.832	.019	.851	.017	.834	.003	.831
23	.823	.008	.831	.038	.869	.029	.840	.007	.833
24	.823	.006	.829	.038	.867	.027	.840	.006	.834
25	.814	.008	.822	.037	.859	.029	.830	.005	.825
26	.815	.006	.821	.023	.844	.018	.826	.003	.823
27	.813	.002	.815	.020	.835	.019	.816	.002	.814

MOISTURE CONTENT DETERMINATION - I

Specimen No.	Original Weight grams	Oven dry Weight grams	Moisture Content %
1	7.430	7.100	4.65
2	7.390	7.015	5.12
3	12.175	11.540	5.32
4	12.380	11.695	5.67
5	9.140	8.640	5.42
6	9.055	8.620	5.97
7	6.850	6.520	5.06
8	6.780	6.430	5.43

Average

5.33

Sample Location

		Chip-core
1	2	
3	4	
5	6	
7	8	

MOISTURE CONTENT DETERMINATION - II

Specimen No.	Original Weight grams	Oven dry Weight grams	Moisture Content %
1	5.090	4.700	3.30
2	7.620	7.050	3.10
3	7.710	7.120	3.30
4	7.130	6.590	3.20
5	6.820	6.320	7.92
6	5.090	4.710	8.07
7	7.810	7.230	8.02
8	7.810	7.220	8.17
9	6.900	6.390	8.15
10	6.730	6.240	7.86
Average			8.11

Sample Location

Chip-core		
	6	1
	7	2
	8	3
	9	4
	10	5

MOISTURE CONTENT DETERMINATION - III

Specimen No.	Original Weight grams	Oven dry- Weight grams	Moisture Content %
1	4.530	3.380	16.73
2	6.041	5.342	11.57
3	5.513	4.862	13.40
4	3.769	3.339	12.90
5	4.719	4.124	14.45
6	4.621	3.907	18.35
7	6.592	5.769	14.27
8	5.910	5.166	14.40
9	3.936	3.485	12.95
10	3.091	2.664	16.00
Average			14.50

Sample Location

Chip-core			
	1		6
	2		7
	3		8
	4		9
	5		10

MOISTURE CONTENT OF WOOD SPECIMENS - IV

Specimen No.	Original Weight grams	Oven dry Weight grams	Moisture Content %
1	2.190	2.024	8.20
2	4.318	3.993	8.13
3	3.179	2.932	8.43
4	4.588	4.228	8.50
5	4.467	4.122	8.38
6	2.598	2.381	9.12
7	3.981	3.666	8.60
8	5.192	4.739	9.56
9	4.829	4.393	9.92
10	3.555	3.240	9.72
Average			8.86

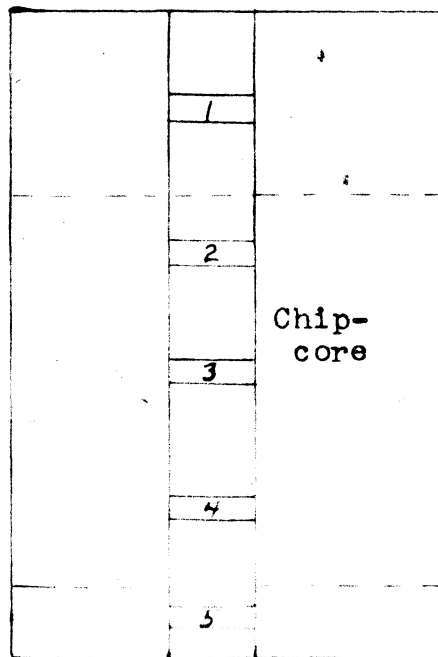
Sample Location

Chip- core			
	6		1
	7		2
	8		3
	9		4
	10		5

MOISTURE CONTENT DETERMINATION - V

Specimen	Orig. Wt.	O.D. Wt.	M.C.
1	5.614	5.243	6.61
2	6.061	5.659	6.62
3	7.323	6.834	6.74
4	6.202	5.775	6.88
5	3.536	3.298	6.73
Average			6.71

Sample Location

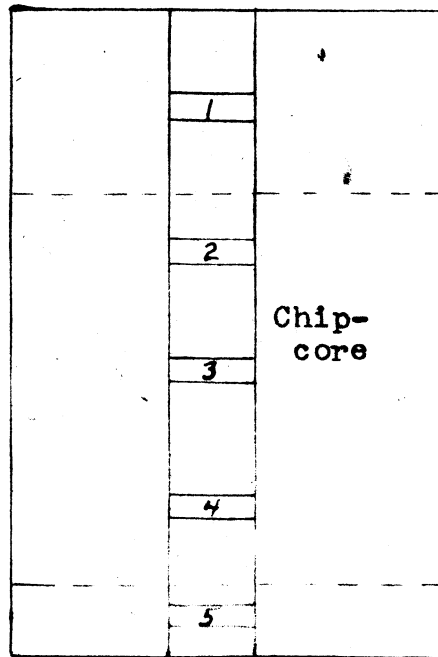


Panel	Calculated o.d.weight	Weight at test	Moisture content-%
I-A	1710	1803	5.33
I-B	1757	1856	5.63
I-C	1742	1840	5.62
I-D	1720	1819	5.76
III-B	1667	1764	5.82
III-C	1702	1799	5.70
Average			5.65

MOISTURE CONTENT DETERMINATION - V

<u>Specimen</u>	<u>Orig. Wt.</u>	<u>O.D. Wt.</u>	<u>M.C.</u>
1	5.614	5.243	6.61
2	6.061	5.659	6.62
3	7.328	6.834	6.74
4	6.202	5.775	6.88
5	3.536	3.298	6.73
Average			6.71

Sample Location



<u>Panel</u>	<u>Calculated o.d.weight</u>	<u>Weight at test</u>	<u>Moisture content-%</u>
I-A	1710	1803	5.38
I-B	1757	1856	5.63
I-C	1742	1840	5.62
I-D	1720	1819	5.76
III-B	1667	1764	5.82
III-C	1702	1799	5.70
Average			5.65

CHIP-CORE SPECIFIC GRAVITY TESTS

Chip-core A.

Equilibrium Moisture Content = 6.1%

Spec. No.	Weight grams	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.	Specific Gravity
1	4.017	.689	.743	.743	.380361	6.233	.644
2	4.247	.692	.745	.750	.386655	6.336	.670
3	4.121	.699	.763	.749	.399469	6.546	.629
4	4.266	.690	.753	.740	.384481	6.300	.677
5	4.523	.688	.758	.750	.391128	6.409	.706
6	4.319	.691	.754	.751	.391281	6.412	.673
7	3.755	.695	.748	.740	.384696	6.304	.596
8	3.751	.692	.728	.749	.377328	6.183	.607
9	4.019	.694	.745	.755	.390357	6.397	.628
10	4.074	.697	.746	.749	.389451	6.382	.638
11	4.215	.695	.744	.751	.388327	6.363	.662
12	4.117	.695	.749	.756	.393539	6.449	.638
13	4.174	.697	.759	.745	.394122	6.458	.646
14	4.028	.695	.750	.748	.389895	6.389	.630
15	3.609	.698	.722	.748	.376959	6.177	.584
16	4.099	.693	.744	.751	.387209	6.345	.646
17	3.783	.699	.738	.750	.386896	6.340	.597
18	4.142	.695	.747	.746	.386777	6.338	.653
19	3.893	.697	.750	.753	.393630	6.450	.603
20	3.915	.695	.745	.753	.389884	6.389	.613
21	3.755	.695	.754	.754	.395118	6.475	.580
22	3.438	.693	.740	.744	.381538	6.252	.550
23							
24	3.577	.692	.700	.748	.362331	5.937	.602
25	3.657	.706	.748	.749	.395537	6.482	.564
26	3.642	.702	.740	.752	.390648	6.401	.569
27	3.566	.696	.746	.747	.387854	6.356	.561
28	3.410	.705	.746	.753	.396025	6.490	.525

The above specimens were tested after 2 weeks in a constant temperature and humidity room, which was set for an equilibrium moisture content of approximately 6%.

At the time of testing, the moisture content of 2 specimens was found, using the oven-dry method. The results of these tests are tabulated below.

Specimen No.	Original Weight grams	Oven-dry Weight grams	Moisture Content %
a	3.931	3.925	6.14
b	3.898	3.890	6.12
Average			6.1

CHIP-CORE DIMENSION CHANGE TESTS

Chip-core A.

Moisture Content = 11-1%

Specimen No.	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.
1	.707	.748	.746	.394511	6.464
2	.709	.749	.752	.399342	6.544
3	.721	.761	.752	.412608	6.761
4	.711	.757	.743	.399902	6.553
5	.707	.760	.753	.404601	6.630
6	.709	.755	.757	.405218	6.640
7	.710	.751	.743	.396175	6.492
8	.708	.734	.749	.389234	6.378
9	.710	.747	.746	.395656	6.483
10	.715	.746	.752	.401109	6.572
11	.713	.748	.754	.402126	6.589
12	.714	.752	.756	.405917	6.651
13	.714	.761	.747	.405885	6.651
14	.714	.751	.753	.403769	6.616
15	.718	.726	.751	.391472	6.415
16	.714	.747	.753	.401769	6.583
17	.719	.741	.753	.401182	6.574
18	.713	.746	.748	.397859	6.519
19	.716	.753	.756	.407595	6.679
20	.714	.750	.754	.403767	6.616
21	.715	.747	.747	.398976	6.538
22	.712	.742	.748	.395171	6.475
23	----				
24	.709	.704	.751	.374851	6.142
25	.725	.750	.754	.409987	6.718
26	.720	.742	.757	.404419	6.627
27	.717	.746	.751	.401696	6.582
28	.715	.749	.754	.403793	6.616

The moisture content of the above specimens was raised by keeping them in a constant temperature and humidity room, which was set for 13% equilibrium moisture content.

At the time of testing, the moisture content of 4 specimens was found, using the oven-dry method. The results of these tests are tabulated below.

Specimen No.	Original Weight grams	Oven-dry Weight grams	Moisture Content %	
a	3.803	3.426	11.00%	
b	4.440	3.991	11.25%	
c	3.905	3.512	11.19%	
d	3.816	3.437	11.02%	Average = 11.1%

THICKNESS AND VOLUME CHANGE DUE TO CHANGE IN MOISTURE CONTENT

Chip-core A.

Moisture content change from 6.1% to 11.1%

Spec. No.	Sp.Gr. g/cc	Thickness 6% m.c. inches	Thickness 12.1% m.c. inches	Thickness Change inches	Thickness Change %	Volume 6% m.c. cu.cm.	Volume 12.1% m.c. cu.cm.	Volume Change cu.cm.	Volume Change %
5	.706	.688	.707	.019	2.8	6.409	6.630	.221	3.4
4	.677	.690	.711	.021	3.0	6.300	6.553	.253	4.0
6	.673	.691	.709	.018	2.6	6.412	6.640	.228	3.5
2	.670	.692	.709	.017	2.4	6.356	6.544	.208	3.3
11	.662	.695	.713	.018	2.6	6.363	6.589	.226	3.5
18	.653	.695	.713	.018	2.6	6.338	6.519	.181	2.8
13	.646	.697	.714	.017	2.4	6.458	6.651	.193	3.0
16	.646	.693	.714	.021	3.0	6.345	6.583	.238	3.7
1	.644	.689	.707	.018	2.6	6.233	6.464	.231	3.7
10	.638	.697	.715	.018	2.6	6.382	6.572	.190	3.0
12	.638	.695	.714	.019	2.7	6.449	6.651	.202	3.1
14	.630	.695	.714	.019	2.7	6.389	6.616	.227	3.5
3	.629	.699	.721	.022	3.1	6.546	6.761	.215	3.3
9	.628	.694	.710	.016	2.3	6.397	6.483	.086	1.3
20	.613	.695	.714	.019	2.7	6.389	6.616	.227	3.5
8	.607	.692	.708	.016	2.3	6.183	6.378	.195	3.1
19	.603	.697	.716	.019	2.7	6.450	6.679	.229	3.5
24	.602	.692	.709	.017	2.4	5.937	6.142	.205	3.4
17	.597	.699	.719	.020	2.9	6.340	6.574	.234	3.7
7	.596	.695	.710	.015	2.1	6.304	6.492	.198	3.1
15	.584	.698	.718	.020	2.9	6.177	6.415	.238	3.8
21	.580	.695	.715	.020	2.9	6.475	6.538	.063	1.0
26	.569	.702	.720	.018	2.6	6.401	6.627	.226	3.5
25	.564	.706	.725	.019	2.7	6.482	6.718	.236	3.6
27	.561	.696	.717	.021	3.0	6.356	6.582	.226	3.5
22	.550	.693	.712	.019	2.7	6.252	6.475	.223	3.6
28	.525	.705	.715	.010	1.4	6.490	6.616	.126	1.9

THICKNESS AND VOLUME CHANGE DUE TO CHANGE IN MOISTURE CONTENT

Chip-core A - (continued)

<u>Specimen</u>	<u>Sp. Gr.</u>	<u>Thickness Change %</u>	<u>Volume Change %</u>
5 (Highest Sp. Gr.)	.706	2.8	3.4
28 (Lowest Sp. Gr.)	.525	<u>1.4</u>	<u>1.9</u>
Difference	.181	1.4	1.5

CHIP-CORE SPECIFIC GRAVITY TESTS

Chip-core B

Equilibrium Moisture Content = 6%

Spec. No.	Weight grams	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.	Specific Gravity
1	3.588	.689	.745	.757	.388571	6.367	.563
2	3.744	.696	.749	.752	.392020	6.424	.583
3	3.631	.691	.746	.753	.388160	6.361	.571
4	4.102	.674	.748	.753	.379626	6.221	.659
5	3.652	.689	.759	.752	.393259	6.444	.567
6	3.733	.688	.755	.750	.389580	6.384	.592
7	3.796	.687	.756	.746	.387451	6.349	.598
8	3.828	.691	.745	.750	.386096	6.327	.605
9	3.764	.692	.733	.748	.379412	6.217	.605
10	3.868	.695	.745	.751	.388849	6.372	.607
11	4.521	.685	.746	.754	.385301	6.314	.716
12	3.849	.695	.756	.750	.394065	6.457	.596
13	3.947	.695	.756	.750	.394065	6.457	.611
14	4.034	.691	.760	.750	.393870	6.454	.625
15	3.772	.696	.745	.750	.388890	6.373	.592
16	3.825	.700	.750	.751	.394800	6.464	.591
17	2.029	.693	.758	.752	.395021	6.473	.313
18	3.915	.695	.754	.752	.394070	6.458	.606
19	4.347	.693	.751	.750	.390332	6.396	.680
20	4.181	.693	.752	.752	.391894	6.422	.651
21	3.908	.691	.747	.755	.389713	6.386	.612
22	3.795	.700	.748	.745	.390082	6.392	.594
23	4.109	.698	.735	.747	.383233	6.280	.654
24	4.116	.701	.751	.749	.394311	6.461	.637
25	3.709	.698	.742	.748	.387401	6.348	.584
26	3.741	.698	.742	.746	.386365	6.331	.591
27	3.927	.699	.745	.747	.378588	6.204	.633
28	3.802	.694	.737	.747	.382074	6.261	.607

The above specimens were tested after 2 weeks in a constant temperature and humidity room, which was set for an equilibrium moisture content of approximately 6%.

At the time of testing, the moisture content of 1 specimen was found, using the oven-dry method. The results of these tests are tabulated below.

Specimen No.	Original Weight grams	Oven-dry Weight grams	Moisture Content %
a	3.901	3.896	6.01

CHIP-CORE DIMENSION CHANGE TESTS

Chip-core B.

Moisture Content = 12.1%

Highest

Specimen No.	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.
11	.695	.748	.754	.391974	6.423
19	.713	.754	.751	.403739	6.616
4	.688	.750	.753	.388548	6.367
23	.719	.738	.750	.397966	6.521
20	.714	.748	.747	.398951	6.537

Lowest

17	.711	.760	.756	.408512	6.694
1	.709	.747	.756	.400394	6.561
5	.708	.761	.755	.406784	6.665
3	.712	.752	.752	.402638	6.598
2	.713	.752	.755	.404812	6.633

The moisture content of the above specimens was raised by keeping them in a constant temperature and humidity room, which was set for 13% equilibrium moisture content.

At the time of testing, the moisture content of 4 specimens was found, using the oven-dry method. The results of these tests are tabulated below.

Specimen No.	Original Weight grams	Oven-dry Weight grams	Moisture Content %
a	3.792	3.385	12.02
b	4.208	3.771	11.58
c	4.728	4.170	13.41
d	4.285	3.848	11.34
Average			12.1

THICKNESS AND VOLUME CHANGE DUE TO CHANGE IN MOISTURE CONTENT

Chip-core B.

Moisture content change from 6% to 12.1%

Specimens of Highest Specific Gravity									
Spec. No.	Sp.Gr. g/cc	Thickness 6% m.c. inches	Thickness 12.1% m.c. inches	Thickness Change inches	Thickness Change %	Volume 6% m.c. cu.cm.	Volume 12.1% m.c. cu.cm.	Volume Change cu.cm.	Volume Change %
11	.716	.685	.695	.010	1.4	6.314	6.423	.109	1.7
19	.680	.693	.713	.020	2.9	6.396	6.616	.220	3.4
4	.659	.674	.688	.014	2.1	6.221	6.367	.146	2.3
23	.654	.698	.719	.021	3.0	6.280	6.521	.241	3.8
20	.651	.693	.714	.021	3.0	6.422	6.537	.115	1.8
Average					2.8%				2.6%

Specimens of Lowest Specific Gravity									
Specimen No.	Sp.Gr. g/cc	Thickness 6% m.c. inches	Thickness 12.1% m.c. inches	Thickness Change inches	Thickness Change %	Volume 6% m.c. cu.cm.	Volume 12.1% m.c. cu.cm.	Volume Change cu.cm.	Volume Change %
17	.513	.693	.711	.018	2.6	6.473	6.694	.221	3.4
1	.563	.689	.709	.020	2.9	6.367	6.561	.194	3.0
5	.567	.689	.708	.019	2.7	6.444	6.665	.221	3.4
3	.571	.691	.712	.021	3.0	6.361	6.598	.237	3.7
2	.583	.696	.713	.017	2.4	6.424	6.633	.209	3.2
Average					2.72%				3.34%

At the time of testing, the moisture content of 4 specimens was found, using the oven-dry method, The results of these tests are tabulated below.

Specimen No.	Original Weight- grams	Oven-dry Weight- grams	Moisture Content - %
3	3.792	3.385	12.02
17	4.208	3.771	11.58
11	4.728	4.170	13.4
23	4.285	3.848	11.34
Average			12.085%

CHIP-CORE SPECIFIC GRAVITY TESTS

Chip-core C

Equilibrium Moisture Content = 5.5%

Spec. No.	Weight grams	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.	Specific Gravity
1	3.789	.703	.742	.753	.392784	6.436	.589
2	3.980	.706	.743	.749	.392893	6.438	.618
3	3.799	.706	.741	.749	.391836	6.421	.592
4	3.759	.703	.735	.750	.387528	6.350	.592
5	3.936	.705	.739	.745	.388141	6.360	.619
6	4.044	.699	.742	.747	.387437	6.348	.637
7	3.926	.698	.744	.748	.388445	6.365	.617
8	3.800	.705	.762	.747	.401295	6.576	.578
9	4.108	.704	.767	.750	.404976	6.636	.619
10	4.006	.701	.760	.748	.398504	6.530	.613
11	4.101	.702	.765	.752	.403846	6.617	.620
12	4.237	.704	.748	.747	.393364	6.446	.657
13	3.996	.699	.744	.745	.387441	6.349	.629
14	3.883	.698	.751	.748	.392100	6.425	.604
15	4.173	.701	.752	.749	.394836	6.470	.645
16	3.881	.701	.757	.748	.396931	6.504	.597
17	3.979	.701	.760	.745	.396906	6.504	.612
18	3.846	.702	.761	.741	.395858	6.486	.593
19	4.162	.699	.758	.749	.396851	6.503	.640
20	3.960	.699	.747	.748	.390570	6.400	.619
21	3.655	.702	.743	.750	.391189	6.410	.570
22	3.755	.702	.765	.745	.400087	6.556	.573
23	3.889	.699	.760	.748	.397367	6.511	.597
24	3.726	.698	.769	.752	.403645	6.617	.503
25	3.750	.700	.765	.748	.400554	6.563	.571
26	3.783	.698	.754	.751	.395245	6.476	.584
27	3.875	.695	.752	.752	.393025	6.440	.602
28	3.733	.697	.749	.391017		6.407	.583

The above specimens were tested after 2 weeks in a constant temperature and humidity room, which was set for an equilibrium moisture content of approximately 6%.

At the time of testing, the moisture content of 2 specimens was found, using the oven-dry method. The results of these tests are tabulated below.

Specimen No.	Original Weight grams	Oven-dry Weight grams	Moisture Content %
a	3.812	3.611	5.57
b	3.964	3.756	5.54
Average			5.5%

CHIP-CORE DIMENSION CHANGE TESTS

Chip-Core C

Moisture Content = 11.1%

Highest

Specimen No.	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.
12	.720	.750	.751	.405540	6.645
15	.721	.755	.753	.409899	6.717
19	.718	.760	.753	.410897	6.733
6	.717	.740	.749	.397404	6.512
13	.717	.746	.748	.400091	6.556

Lowest

24	.718	.772	.756	.419047	6.866
21	.719	.748	.751	.403896	6.618
25	.720	.763	.752	.415825	6.814
22	.721	.763	.751	.415849	6.814
8	.724	.764	.749	.414298	6.789

The moisture content of the above specimens was raised by keeping them in a constant temperature and humidity room, which was set for 13% equilibrium moisture content.

At the time of testing, the moisture content of 4 specimens was found, using the oven-dry method. The results of these tests are tabulated below.

Specimen No.	Original Weight grams	Oven-dry Weight grams	Moisture Content %
a	4.430	3.994	10.91
b	4.231	3.806	11.15
c	3.908	3.510	11.34
d	3.929	3.542	10.94
Average			11.1%

THICKNESS AND VOLUME CHANGE DUE TO CHANGE IN MOISTURE CONTENT

Chip-Core C

Moisture content change from 5.5% to 11.1%

Specimens of Highest Specific Gravity

Spec. No.	Sp. Gr. g/cc	Thickness 6% m.c. inches	Thickness 12.1% m.c. inches	Thickness Change inches	Thickness Change %	Volume 6% m.c. cu.cm.	Volume 12.1% m.c. cu.cm.	Volume Change cu.cm.	Volume Change %
12	.657	.704	.720	.016	2.3	6.446	6.645	.199	3.1
15	.645	.701	.721	.020	2.8	6.470	6.717	.247	3.8
19	.640	.699	.718	.019	2.7	6.503	6.733	.230	3.5
6	.637	.699	.717	.018	2.6	6.348	6.512	.164	2.6
13	.629	.699	.717	.018	2.6	6.349	6.556	.207	3.3
Average					13.0				16.3
					2.6%				3.26%

Specimens of Lowest Specific Gravity

24	.563	.698	.718	.020	2.9	6.617	6.866	.249	3.8
21	.570	.702	.719	.017	2.4	6.410	6.615	.208	3.2
25	.571	.700	.720	.020	2.8	6.563	6.814	.251	3.8
22	.573	.702	.721	.019	2.7	6.556	6.814	.258	3.9
8	.578	.705	.724	.019	2.7	6.576	6.789	.213	3.2
Average					13.5				17.9
					2.7%				3.58%

At the time of testing, the moisture content of 4 specimens was found, using the oven-dry method. The results of these tests are tabulated below,

Specimen No.	Original Weight grams	Oven-dry Weight grams	Moisture Content %
12	4.430	3.994	10.91
6	4.231	3.806	11.15
24	3.908	3.510	11.34
22	3.929	3.542	10.92
Average			11.08%

CHIP-CORE SPECIFIC GRAVITY TESTS

Chip-core D

Equilibrium Moisture Content = 6.0%

Spec. No.	Weight grams	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.	Specific Gravity
1	3.548	.692	.777	.729	.391971	6.423	.552
2	3.832	.692	.777	.742	.398961	6.538	.586
3	3.775	.694	.775	.736	.395857	6.487	.582
4	3.742	.694	.782	.748	.405945	6.652	.562
5	3.847	.695	.787	.747	.408582	6.695	.575
6	3.935	.693	.784	.727	.394987	6.473	.608
7	3.933	.696	.785	.750	.409770	6.715	.581
8	3.677	.698	.786	.719	.394463	6.464	.569
9	3.789	.696	.786	.745	.407556	6.679	.567
10	3.868	.699	.795	.751	.417334	6.839	.565
11	3.688	.696	.791	.717	.394734	6.468	.570
12	3.647	.696	.787	.724	.396572	6.499	.561
13	3.787	.694	.786	.763	.416204	6.820	.555
14	3.623	.693	.785	.740	.401025	6.571	.551
15	3.947	.694	.762	.746	.394505	6.465	.610
16	4.179	.692	.762	.739	.389677	6.386	.654
17	4.037	.692	.765	.734	.388564	6.367	.634
18	4.185	.693	.762	.750	.396049	6.490	.645
19	3.958	.694	.764	.725	.384406	6.299	.628
20	4.031	.694	.763	.745	.394493	6.464	.624
21	4.111	.695	.761	.764	.404075	6.621	.621
22	3.919	.695	.757	.767	.403530	6.613	.593
23	3.780	.695	.753	.738	.386221	6.329	.597
24	3.873	.695	.756	.750	.394065	6.457	.600
25	3.750	.695	.760	.738	.389811	6.388	.587
26	3.898	.693	.759	.752	.395542	6.482	.601
27	3.813	.694	.755	.723	.378830	6.208	.614
28	3.533	.694	.757	.742	.389815	6.388	.553
29	3.889	.695	.766	.746	.397148	6.508	.597
30	4.091	.694	.767	.734	.390706	6.402	.639
31	3.900	.693	.770	.736	.392736	6.436	.606
32	4.009	.695	.770	.745	.398686	6.533	.614
33	4.056	.694	.765	.753	.399775	6.551	.619
34	3.823	.696	.765	.733	.390278	6.395	.598
35	3.938	.696	.766	.738	.393451	6.447	.611
36	4.038	.696	.768	.730	.390205	6.394	.631
37	4.186	.697	.772	.749	.403024	6.604	.634
38	4.217	.694	.771	.749	.400770	6.567	.642
39	4.130	.696	.772	.738	.396536	6.498	.635
40	4.097	.692	.768	.731	.388494	6.366	.643
41	4.296	.693	.765	.760	.402910	6.602	.649
42	3.901	.694	.765	.742	.393935	6.455	.604
43	4.101	.692	.752	.742	.386124	6.327	.648
44	4.053	.693	.750	.742	.385654	6.320	.641
45	4.103	.692	.748	.737	.381482	6.251	.656

Chip-core D - continued

Spec. No.	Weight grams	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.	Specific Gravity
46	4.000	.692	.748	.740	.383035	6.277	.637
47	3.987	.693	.750	.729	.378897	6.209	.642
48	4.042	.693	.748	.743	.385144	6.311	.640
49	4.077	.693	.753	.752	.392415	6.430	.634
50	4.067	.694	.749	.771	.400770	6.567	.619
51	3.795	.695	.750	.737	.384161	6.295	.603
52	3.975	.695	.749	.739	.384690	6.304	.630
53	3.999	.695	.749	.738	.384169	6.295	.635
54	3.964	.696	.748	.745	.387852	6.357	.623
55	3.863	.694	.748	.732	.379989	6.227	.620
56	3.712	.693	.749	.749	.388773	6.371	.583
57	4.024	.692	.780	.745	.402121	6.589	.611
58	4.334	.691	.782	.752	.406852	6.658	.651
59	4.229	.691	.785	.737	.399774	6.551	.646
60	4.029	.693	.778	.749	.403307	6.609	.610
61	4.185	.692	.778	.745	.401090	6.573	.637
62	4.310	.692	.779	.739	.398371	6.528	.660
63	4.250	.693	.777	.738	.397394	6.512	.653
64	4.158	.694	.777	.737	.397418	6.512	.638
65	2.058	.693	.776	.742	.399023	6.539	.615
66	4.126	.693	.777	.746	.401691	6.582	.627
67	4.328	.692	.775	.738	.395789	6.486	.667
68	4.005	.693	.778	.735	.396278	6.494	.617
69	3.941	.693	.777	.756	.407076	6.671	.591
70	3.798	.696	.774	.740	.398640	6.532	.581
71	3.910	.693	.767	.747	.397053	6.506	.601
72	4.120	.692	.761	.741	.390220	6.394	.644
73	3.943	.690	.767	.729	.385808	6.322	.624
74	4.056	.690	.749	.741	.382956	6.275	.646
75	4.080	.694	.753	.740	.386710	6.337	.644
76	4.153	.692	.758	.743	.389730	6.386	.650
77	4.112	.693	.760	.748	.393956	6.456	.637
78	4.081	.694	.760	.740	.390305	6.396	.638
79	4.117	.695	.762	.742	.392955	6.439	.639
80	4.220	.696	.760	.729	.385611	6.319	.668
81	4.233	.694	.766	.738	.392323	6.429	.658
82	3.942	.695	.765	.742	.394502	6.465	.610
83	3.992	.695	.767	.735	.391802	6.420	.622
84	3.923	.696	.768	.744	.397688	6.517	.602
85	3.739	.694	.757	.757	.397696	6.517	.574
86	3.955	.692	.748	.745	.385623	6.319	.626
87	4.094	.696	.750	.741	.386802	6.338	.646
88	3.901	.693	.750	.745	.387213	6.345	.618
89	4.115	.691	.753	.745	.387640	6.352	.648
90	3.985	.693	.758	.743	.390293	6.396	.623

Chip-core D - continued

Spec. No.	Weight grams	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.	Specific Gravity
91	4.227	.692	.758	.745	.391303	6.412	.659
92	4.245	.694	.757	.738	.387714	6.353	.668
93	3.983	.694	.753	.744	.388301	6.371	.625
94	4.205	.694	.758	.744	.391382	6.413	.656
95	4.204	.694	.755	.746	.390881	6.405	.656
96	4.134	.696	.757	.738	.388831	6.372	.649
97	3.954	.696	.746	.746	.387335	6.347	.623
98	3.958	.696	.760	.743	.393017	6.440	.614

The above specimens were tested after 2 weeks in a constant temperature and humidity room, which was set for an equilibrium moisture content of approximately 6%.

At the time of testing, the moisture content of 3 specimens was found, using the oven-dry method. The results of these tests are tabulated below.

Specimen No.	Original Weight grams	Oven-dry Weight grams	Moisture Content %
a	3.764	3.756	6.0
b	3.917	3.912	6.03
c	3.686	3.680	5.95

CHIP-CORE DIMENSION CHANGE TESTS

Chip-core D.

Moisture Content = 11.2%

Specimen No.	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.
14	.726	.789	.745	.426746	6.993
1	.713	.781	.738	.410957	6.734
28	.723	.760	.746	.409912	6.717
13	.723	.791	.766	.438070	7.178
12	.719	.790	.728	.413511	6.776
4	.721	.785	.750	.424488	6.956
10	.725	.800	.754	.437320	7.166
9	.722	.790	.748	.426644	6.991
8	.716	.787	.723	.407404	6.676
80	.720	.765	.739	.407041	6.770
92	.716	.760	.742	.403766	6.616
67	.715	.776	.743	.412246	6.755
91	.715	.762	.746	.406443	6.660
81	.722	.769	.743	.412526	6.760
45	.714	.748	.740	.395213	6.476
94	.716	.760	.747	.406487	6.661
95	.715	.759	.745	.404300	6.625
16	.716	.765	.742	.406423	6.660

The moisture content of the above specimens was raised by keeping them in a constant temperature and humidity room, which was set for 13% equilibrium moisture content.

At the time of testing, the moisture content of 4 specimens was found, using the oven-dry method. The results of these tests are tabulated below.

Specimen No.	Original Weight grams	Oven-dry Weight grams	Moisture Content %
a	3.981	3.577	11.29
b	3.705	3.332	11.19
c	4.296	3.855	11.43
d	4.408	3.969	11.07
Average			11.2%

THICKNESS AND VOLUME CHANGE DUE TO CHANGE IN MOISTURE CONTENT

Chip-core D

Moisture content change from 6% to 11.2%

Specimens of Highest Specific Gravity

Spec. No.	Sp. Gr. g/cc	Thickness 6% m.c. inches	Thickness 12.1% m.c. inches	Thickness Change inches	Thickness Change percent	Volume Change cu.cm.	Volume 12.1% m.c. cu.cm.	Volume Change cu.cm.	Volume Change %
80	.668	.696	.720	.024	3.4	6.319	6.770	.451	7.1
82	.668	.694	.716	.022	3.2	6.353	6.616	.263	4.1
67	.667	.692	.715	.023	3.3	6.486	6.755	.269	4.1
91	.659	.692	.715	.023	3.3	6.412	6.660	.248	3.9
81	.658	.694	.722	.028	4.0	6.429	6.760	.331	5.1
45	.656	.692	.714	.022	3.2	6.251	6.476	.225	3.6
74	.656	.694	.716	.022	3.2	6.413	6.661	.248	3.9
75	.656	.694	.715	.021	3.0	6.405	6.625	.220	3.4
16	.654	.692	.716	.024	3.5	6.386	6.660	.274	4.3
Average					3.34%				4.39%

Specimens of Lowest Specific Gravity

Spec. No.	Sp. Gr. g/cc	Thickness 6% m.c. inches	Thickness 12.1% m.c. inches	Thickness Change inches	Thickness Change percent	Volume Change cu.cm.	Volume 12.1% m.c. cu.cm.	Volume Change cu.cm.	Volume Change %
14	.551	.693	.726	.033	4.8	6.571	6.993	.422	6.4
1	.552	.692	.713	.021	3.0	6.423	6.734	.311	4.8
28	.553	.694	.723	.029	4.2	6.388	6.717	.329	5.1
13	.555	.694	.723	.029	4.2	6.820	7.178	.258	3.8
12	.561	.696	.719	.023	3.3	6.499	6.776	.277	4.3
4	.562	.694	.721	.027	3.9	6.652	6.956	.304	4.6
10	.565	.699	.725	.026	3.7	6.839	7.166	.227	3.3
9	.567	.696	.722	.026	3.7	6.679	6.991	.312	4.7
8	.569	.698	.716	.018	2.6	6.464	6.676	.212	3.3
Average					3.71%				4.43%

Spec. No.	Thick.	Vol.
80 (Highest Sp. Gr)	3.4%	7.1%
14 (Lowest Sp. Gr)	4.8	6.4
Difference	-1.4%	.7%

VENEERED CHIP-CORE SPECIFIC GRAVITY TESTS

Veneered Chip-core

Equilibrium Moisture Content = 5.7%

Spec. No.	Weight grams	Thickness inches	Width inches	Length in.	Volume cu.in.	Volume cu.cm.	Specific Gravity
1	4.575	.826	.753	.748	.465239	7.624	.600
2	4.794	.826	.752	.747	.464000	7.603	.630
3	4.407	.826	.712	.739	.434614	7.122	.619
4	4.485	.827	.727	.743	.446713	7.320	.613
5	4.704	.826	.745	.745	.458450	7.513	.626
6	4.915	.825	.757	.745	.465271	7.624	.645
7	4.937	.824	.772	.744	.473279	7.756	.636
8	4.752	.823	.757	.745	.464143	7.606	.625
9	4.887	.823	.776	.745	.475792	7.797	.627
10	4.495	.826	.770	.743	.472562	7.744	.580
11	4.505	.828	.762	.742	.463154	7.672	.587
12	4.668	.824	.756	.752	.468453	7.676	.608
13	5.001	.828	.762	.747	.471309	7.723	.647
14	4.906	.828	.747	.745	.460794	7.551	.650
15	4.675	.829	.740	.739	.453346	7.429	.629
16	4.915	.829	.756	.742	.465029	7.620	.644
17	5.053	.828	.749	.750	.468129	7.622	.663
18	5.153	.827	.753	.752	.468293	7.674	.684
19	5.118	.824	.766	.751	.474019	7.768	.659
20	5.178	.823	.791	.757	.492801	8.075	.641
21	4.925	.825	.766	.752	.475226	7.787	.632
22	4.309	.826	.769	.747	.474489	7.775	.554
23	4.837	.828	.763	.750	.473823	7.764	.623
24	4.928	.831	.751	.748	.466812	7.650	.644
25	4.702	.829	.737	.732	.447232	7.329	.641
26	5.006	.831	.746	.745	.461844	7.568	.661
27	4.967	.828	.760	.742	.466760	7.649	.649
28	5.112	.826	.753	.744	.462751	7.583	.674
29	5.375	.827	.763	.759	.478929	7.848	.685
30	5.091	.823	.768	.746	.471519	7.727	.659
31	4.927	.826	.772	.746	.475703	7.795	.632
32	4.833	.828	.759	.748	.470082	7.703	.627
33	4.592	.828	.762	.744	.469416	7.692	.597
34	4.659	.827	.745	.746	.459005	7.522	.619
35	4.715	.830	.743	.745	.459434	7.529	.626
36	5.003	.830	.748	.739	.458800	7.518	.665
37	4.918	.830	.738	.741	.453892	7.437	.661
38	5.011	.829	.753	.741	.462559	7.580	.661
39	4.970	.830	.753	.746	.466242	7.640	.650
40	5.145	.827	.770	.744	.473771	7.764	.663

Veneered Chip-core - continued

Spec. No.	Weight grams	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.	Specific Gravity
41	5.107	.824	.774	.743	.473867	7.765	.658
42	5.109	.825	.773	.749	.477656	7.827	.653
43	4.791	.826	.756	.746	.465844	7.634	.627
44	4.473	.926	.764	.746	.470773	7.714	.580
45	3.658	.828	.766	.740	.469343	7.691	.477
46	3.612	.830	.760	.745	.469946	7.701	.470
47	3.658	.829	.756	.745	.466909	7.651	.478
48	3.721	.829	.760	.748	.471269	7.723	.482
49	4.021	.830	.760	.746	.470576	7.711	.521
50	3.744	.831	.735	.743	.464927	7.619	.491

The above specimens were tested after 2 weeks in a constant temperature and humidity room, which was set for an equilibrium moisture content of approximately 6%.

At the time of testing, the moisture content of 4 specimens was found, using the oven-dry method. The results of these tests are tabulated below.

Specimen No.	Original Weight grams	Oven-dry Weight grams	Moisture Content %
a	4.706	4.456	5.62
b	4.945	4.679	5.68
c	5.073	4.797	5.76
d	4.802	4.545	5.66
Average			5.7

CHIP-CORE DIMENSION CHANGE TESTS

Veneered Chip-core

Moisture Content = 11.9%

Specimen No.	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.
1	.851	.761	.754	.488298	8.001
2	.852	.758	.753	.486299	7.968
3	.851	.719	.744	.455230	7.459
4	.852	.737	.747	.469059	7.686
5	.850	.749	.751	.478124	7.835
6	.848	.763	.749	.484620	7.941
7	.847	.778	.748	.492906	8.077
8	.849	.762	.750	.485203	7.951
9	.847	.782	.751	.497427	8.151
10	.849	.778	.748	.494070	8.096
11	.853	.770	.748	.491293	8.050
12	.853	.764	.759	.494634	8.105
13	.853	.771	.752	.494562	8.104
14	.852	.754	.751	.482448	7.905
15	.855	.747	.744	.475181	7.786
16	.855	.761	.749	.487340	7.986
17	.854	.756	.756	.488091	7.998
18	.851	.760	.757	.489597	8.023
19	.852	.771	.754	.495296	8.116
20	.847	.798	.761	514364	8.428
21	.851	.772	.757	.497327	8.149
22	.852	.775	.754	.497866	8.158
23	.852	.768	.751	.491406	8.052
24	.855	.757	.752	.486720	7.975
25	.849	.744	.736	.464898	7.618
26	.855	.751	.750	.481578	7.891
27	.851	.765	.748	.486959	7.979
28	.852	.761	.749	.485630	7.958
29	.850	.768	.765	.499392	8.183
30	.845	.774	.749	.489868	8.027
31	.852	.779	.751	.498444	8.168
32	.854	.766	.753	.492585	8.071
33	.852	.769	.748	.490080	8.030
34	.850	.756	.752	.483235	7.918
35	.854	.749	.751	.480374	7.871
36	.853	.762	.744	.483589	7.924
37	.853	.742	.745	.471529	7.726

Veneered Chip-core - continued

Specimen No.	Thickness inches	Width inches	Length inches	Volume cu.in.	Volume cu.cm.
38	.853	.758	.745	.481697	7.893
39	.852	.759	.751	.485647	7.958
40	.851	.773	.750	.493367	8.084
41	.848	.779	.747	.493462	8.086
42	.852	.780	.753	.500413	8.200
43	.849	.762	.754	.487791	7.993
44	.852	.768	.752	.492060	8.063
45	.844	.779	.746	.490477	8.037
46	.842	.784	.751	.495756	8.123
47	.843	.778	.751	.492546	8.071
48	.849	.781	.755	.500617	8.203
49	.851	.781	.753	.500467	8.201
50	.853	.754	.749	.481728	7.894

The moisture content of the above specimens was raised by keeping them in a constant temperature and humidity room, which was set for 13% equilibrium moisture content.

At the time of testing, the moisture content of 6 specimens was found, using the oven-dry method. The results of these tests are tabulated below.

Specimen No.	Original Weight grams	Oven-dry Weight grams	Moisture Content %
A	5.152	4.584	12.40
B	5.216	4.651	12.13
C	5.085	4.545	11.88
D	5.051	4.503	12.18
E	5.343	4.768	12.05
F	5.178	4.612	10.93
		Average	11.9%

THICKNESS AND VOLUME CHANGE DUE TO CHANGE IN MOISTURE CONTENT

Veneered Chip-core

Moisture content change from 5.7% to 11.9%

Spec. No.	Sp.Gr. g.cc	Thickness 6%lm.c. inches	Thickness 12.1% mc. inches	Thickness Change inches	Thickness Change %	Volume 6% mc. cu.cm.	Volume 12.1%mc. cu.cm.	Volume Change cu.cm.	Volume Change %
29	.685	.827	.850	.023	2.8	7.848	8.182	.265	3.4
18	.684	.827	.851	.024	2.9	7.674	8.023	.349	4.5
28	.674	.826	.852	.026	3.1	7.583	7.958	.375	4.9
36	.665	.830	.853	.023	2.8	7.518	7.924	.406	5.4
17	.663	.828	.854	.026	3.1	7.622	7.998	.376	4.9
40	.663	.827	.851	.024	2.9	7.764	8.084	.320	4.1
26	.661	.831	.855	.024	2.9	7.568	7.891	.323	4.3
37	.771	.830	.853	.023	2.8	7.437	7.726	.289	3.9
38	.661	.829	.853	.024	2.9	7.580	7.893	.313	4.1
19	.659	.824	.852	.028	3.4	7.768	8.116	.348	4.5
30	.659	.823	.845	.022	2.7	7.727	8.027	.300	3.9
41	.658	.824	.848	.024	2.9	7.765	8.086	.321	4.1
42	.653	.825	.852	.027	3.3	7.827	8.200	.373	4.8
14	.650	.828	.852	.024	2.9	7.551	7.905	.354	4.7
39	.650	.830	.852	.022	2.6	7.640	7.958	.318	4.2
27	.649	.828	.851	.023	2.8	7.649	7.979	.330	4.3
13	.647	.828	.853	.025	3.0	7.723	8.104	.381	4.9
6	.645	.825	.848	.023	2.8	7.624	7.941	.317	4.1
16	.644	.829	.855	.026	3.1	7.620	7.886	.266	3.5
20	.641	.823	.847	.024	2.9	8.075	8.428	.353	4.4
25	.641	.829	.849	.020	2.4	7.329	7.618	.289	3.9
7	.636	.824	.847	.023	2.9	7.756	8.077	.321	4.1
21	.632	.825	.851	.026	3.1	7.787	8.149	.362	4.6
31	.632	.826	.852	.026	3.1	7.795	8.168	.373	4.8
2	.630	.826	.852	.026	3.0	7.603	7.968	.365	4.8
15	.629	.829	.855	.026	3.1	7.429	7.786	.357	4.8
9	.627	.823	.847	.024	2.9	7.797	8.151	.354	4.5
32	.627	.828	.854	.026	3.1	7.703	8.071	.368	4.8

THICKNESS AND VOLUME CHANGE DUE TO CHANGE IN MOISTURE CONTENT

Veneered Chip-core - continued

Spec. No.	Sp.Gr. g.cc	Thickness 6%lm.c. inches	Thickness 12.1% mc. inches	Thickness Change inches	Thickness Change %	Volume 6% mc. cu.cm.	Volume 12.1%mc. cu.cm.	Volume Change cu.cm.	Volume Change %
43	.627	.826	.849	.023	2.8	7.634	7.993	.359	4.7
5	.626	.826	.850	.024	2.8	7.513	7.835	.322	4.3
35	.626	.830	.854	.024	2.8	7.529	7.871	.342	4.5
8	.625	.823	.849	.026	3.1	7.606	7.951	.345	4.5
23	.623	.828	.852	.024	2.9	7.764	8.052	.288	3.7
3	.619	.826	.851	.025	3.0	7.122	7.459	.337	4.7
34	.619	.827	.850	.023	2.8	7.522	7.918	.396	5.3
4	.613	.827	.852	.025	3.0	7.320	7.686	.366	5.0
12	.608	.824	.853	.029	3.5	7.676	8.105	.429	5.6
1	.600	.826	.851	.025	3.0	7.624	8.001	.377	4.9
33	.597	.828	.852	.024	2.9	7.692	8.030	.338	4.4
11	.587	.828	.853	.025	3.0	7.672	8.050	.378	4.9
10	.580	.826	.849	.023	2.7	7.744	8.096	.352	4.5
44	.580	.826	.852	.026	3.1	7.714	8.063	.349	4.5
22	.554	.826	.852	.026	3.0	7.775	8.158	.383	4.9
49	.521	.830	.851	.021	2.5	7.711	8.201	.490	6.3
50	.491	.831	.853	.022	2.6	7.619	7.894	.275	3.6
48	.482	.829	.849	.020	2.4	7.723	8.203	.480	6.2
47	.478	.829	.843	.014	1.7	7.651	8.071	.420	5.5
45	.477	.828	.844	.016	1.9	7.691	8.037	.346	4.5
46	.470	.830	.842	.018	2.2	7.701	8.123	.422	5.5

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