NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

TECHNICAL NOTE

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DESIGN CHARTS FOR FLAT COMPRESSION PANELS HAVING LONGITUDINAL EXTRUDED Y-SECTION STIFFENERS AND COMPARISON WITH PANELS HAVING FORMED Z-SECTION STIFFENERS

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Washington
August 1947

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SUMMARY

Design charts are presented for 24S-T (bare sheet) and 75S-T (Alclad sheet) aluminum-alloy flat compression panels with longitudinal extruded Y-section stiffeners. In addition, comparisons are made among panels designed from these charts and 24S-T aluminum-alloy panels having formed Z-section stiffeners designed from available design charts. The comparisons indicate that, if the ratio of intensity of loading to sheet thickness is relatively high, the charts presented may be used to design a Y-stiffened panel in either 24S-T or 75S-T material which is lighter in weight than a 24S-T Z-stiffened panel designed from the available charts to meet the same conditions. The amount of weight saving depends upon the specific design conditions and is greatest for the 75S-T Y-stiffened panels. The comparisons also indicate that the 24S-T Y-stiffener will have a height somewhat greater than the comparable 24S-T Z-stiffener or 75S-T Y-stiffener; the height of the 24S-T Z-stiffener generally is the smallest. In addition, the comparisons indicate that the average spacing of rivet lines is generally somewhat less for the 24S-T Y-stiffened panels than for the 24S-T Z-stiffened panels or for the 75S-T Y-stiffened panels; the average spacing generally is greatest for the 24S-T Z-stiffened panels. If the ratio of intensity of loading to sheet thickness is relatively low, however, the comparative designs indicate that a 24S-T Z-stiffened panel designed from the available charts will be slightly lighter in weight than a Y-stiffened panel of either 24S-T or 75S-T material. If the present design charts are extended to lower values of the ratio of stiffener thickness to sheet thickness to cover the region of heavy sheet thickness more thoroughly (where the ratio of intensity of loading to sheet thickness is relatively low), a Y-stiffened-panel design in this region will probably compare more favorably with a Z-stiffened-panel design than the charts presented indicate. If no sheet thickness is specified so that the design may have optimum proportions, it is concluded that both the 24S-T and 75S-T Y-stiffened panels will be lighter than the 24S-T Z-stiffened panels throughout the range of design conditions investigated.

INTRODUCTION

The problem of the design of wing compression panels of minimum weight is one that has confronted aircraft structural engineers since the advent of stressed-skin construction. Although the final solution of this problem has not yet been achieved, progress has been made toward its solution as the cumulative result of numerous theoretical and experimental studies to determine "optimum proportions" and "efficient" stiffener shapes.

Recently two such studies (references 1 and 2) have established a type of plot which appears particularly useful in connection with the design of wing compression panels of minimum weight. Reference 1 presented a theoretical comparison of the efficiencies of various stiffener shapes by plotting the average stress at failure - an inverse measure of the weight - against a parameter containing the main design conditions, the load per chordwise inch of panel, and the effective length of panel. Reference 2 used the same type of plot to provide design charts for Z-stiffened panels based on extensive test data from which the optimum proportions can be determined for a particular design.

Study of references 1 and 2 reveals that if panels with longitudinal stiffeners are to have high structural efficiency a stiffener shape is required which has both high-column strength and local-buckling strength. Because a stiffener in the shape of a Y appeared more nearly to meet this requirement than the Z-section or hat-section stiffeners of references 2 and 3, an investigation was made in the Langley structures research laboratory of the National Advisory Committee for Aeronautics to determine the compressive strength of panels having Y-section stiffeners. Both 24S-T (bare sheet) and 75S-T (Alclad sheet) aluminum-alloy panels were tested in this investigation. The results of these tests are presented herein in the form of design charts similar to the design charts for panels with Z-section stiffeners of reference 2.

In order to show the relative structural efficiencies of Y-section and Z-section stiffeners, comparisons are also presented of panels of both types designed to have the minimum weight required to meet a large range of loading conditions.

SYMBOLS

The symbols used to represent the various dimensions of the panels are shown in figure 1. In addition, the following symbols are used:

$\bar{\sigma}_f$	average stress at failing load, ksi
σ_{cr}	stress for local buckling of the sheet, ksi
σ_{cy}	compressive yield stress, ksi
P_i	compressive load per inch of panel width, kips per inch
c	coefficient of end fixity as used in Euler column formula
A_i	cross-sectional area per inch of panel width, or equivalent thickness of panel, inches
$\bar{\epsilon}_f$	shortening per unit length at failing load
ρ	radius of gyration, inches
I_i	moment of inertia per inch of panel width, cubic inches

TEST SPECIMENS AND PROCEDURE

The test specimens were constructed with six stiffeners and five bays as shown in figure 1. Three sizes of stiffeners were used that corresponded to values of b_W/t_W of 20, 25, and 30 with the nominal value of t_W held constant at 0.064 inch (see fig. 2) and various values of t_W/t_S were obtained by varying the sheet thickness. The stiffeners were riveted to the sheets with A17S-T flathead rivets (AN442AD) on all panels.

Values of the with-grain compressive yield stress for the material used for the sheets (bare sheets were used for the 24S-T panels and Alclad sheets for the 75S-T panels) and for the extrusions are given in table 1. The values of compressive yield stress for the extrusions represent the average values for specimens cut from the three webs and the outstanding flange of the Y-section extrusions at the locations shown in figure 3. Values of the compressive yield stress for the material used to construct the Z-stiffened panels of reference 2 are also given in table 1 for comparison.

The test procedure was essentially the same as that used in other panel tests in the Langley structures research laboratory. (See references 2 and 3.) The panels were tested flat-ended without side support (because their transverse stiffness was small) in a hydraulic testing machine having an accuracy of one-half of 1 percent of the load (See fig. 4.) The stress for local buckling of the sheet was determined by the "strain-reversal method." A discussion of this and other methods of experimentally determining the stress for local buckling is given in reference 4. For panels having a greater width of sheet under the Y's than between the Y's, strain gages were mounted inside the stiffeners, as indicated in figure 5. The ends of the panels were ground flat and parallel, and the method of alinement in the testing machine was such as to insure uniform bearing on the ends of the specimens. An end fixity coefficient of 3.75 has been indicated for such panel tests in this machine, and this value was therefore used in reducing the test data.

Proportions of the specimens and test data - including values of the ratios of rivet diameter to sheet thickness d/t_S and pitch to sheet thickness p/t_S, average stress at failing load $\bar{\sigma}_f$, and unit shortening at failing load $\bar{\epsilon}_f$ - are given in tables 2 to 4. The unit shortening was measured as the average of the strains indicated by four, $6\frac{1}{2}$-inch gage length, resistance-type wire strain gages mounted on the quarter points of the second and fifth stiffeners, as may be seen in figure 4.

Figure 6 shows a 24S-T aluminum-alloy Y-stiffened panel and its 75S-T counterpart after failure. There tended to be a greater shattering of the 75S-T panels than of the 24S-T panels.

DESIGN CHARTS

Design charts for panels with extruded Y-section stiffeners are presented in figures 7 to 11 for 24S-T and in figures 12 to 16 for 75S-T aluminum alloy. These charts were prepared from the test data of tables 2 to 4 in a manner similar to that described in the appendix of reference 2 for Z-stiffened panels. The use of design charts of this type is described fully in reference 2, and a procedure similar to that given in reference 2 for designing a panel for maximum structural efficiency (minimum weight) by use of the charts is included in appendix A of the present paper. This design procedure makes it possible to achieve the balance for given values of P_1, $L/\sqrt{c}$, and t_S between the proportions which will produce the highest average stress at failure and the proportions which will make the area such that the failing stress is just reached at the design load.

A comparison of the curves of the design charts and the test data from which the curves were derived indicates that the stresses given by the curves of the design charts for both the Y-stiffened panels of the present paper and the Z-stiffened panels of reference 2 are on the whole very slightly less than the stresses given by the test data. For both stiffener types, however, there are regions on the design charts in which the curves are interpolated or extrapolated far from the test data, and in these regions the accuracy of the charts is probably less than that indicated by the comparisons of curves and data. The region of the Y-stiffened-panel charts for which there is the least test data is that for $\frac{t_W}{t_S} = 0.40$ at wide stiffener spacings. (See figs. 7 and 12.) Slightly greater caution should be exercised in the use of the charts in this region than elsewhere in the design charts. The region of the Z-stiffened-panel charts for which there is the least test data is that for $\frac{t_W}{t_S} = 1.00$ at close stiffener spacings. In this region, additional unpublished test data have indicated that the curves may be as much as 5 or 6 percent too high.

GENERALIZED COMPARISON OF Y-STIFFENED PANELS AND Z-STIFFENED PANELS

Without restrictions on the sheet thickness.- If there are no restrictions on the sheet thickness that may be used, Y-stiffened and Z-stiffened panels may be compared by envelope curves faired over the curves of their design charts. Such a comparison of envelope curves is shown in figure 17. Because the average stresses at failing load for the envelope curves for the Y-stiffened panels of both 24S-T and 75S-T material are above those for the Z-stiffened panels, the Y-stiffened panels of optimum proportions are evidently lighter in weight than the Z-stiffened panels of optimum proportions throughout the range covered by the present design charts.

With restrictions on sheet thickness.- The sheet thickness needed to achieve the stresses of the envelope curves of figure 17 are fixed for any given intensity of loading by the proportions required by the envelope curves. In the design of wing compression panels, however, the sheet thickness is often fixed by other considerations such as torsional stiffness of the wing. Accordingly, curves which show the effect of a variation in sheet thickness should provide a more useful evaluation of the relative structural efficiencies of Y-stiffened and Z-stiffened panels than do the envelopes of figure 17; therefore, figures 18 to 20 were prepared. In these figures, the average stresses at failure $\bar{\sigma}_f$ carried by Y-stiffened and Z-stiffened-panel designs, selected for minimum weight according to the procedure given in appendix A, are plotted against the parameter $\frac{P_i}{t_S}$ for a series of values of $\frac{P_i}{L/\sqrt{c}}$. A discussion of this type of plot is given in appendix B.

The chief importance of figures 18 to 20 is that the figures indicate directly the average stress at failure $\bar{\sigma}_f$ carried by the minimum-weight designs of Y-stiffened or Z-stiffened panels which can be achieved within the large range of proportions covered by the design charts for given values of P_i, $L/\sqrt{c}$, and t_S. The effect of a change in any one of the variables $\bar{\sigma}_f$, P_i, $L/\sqrt{c}$, and t_S on any of the others, therefore, may be studied from these figures. For example, consider the effect of a change in t_S on the value of $\bar{\sigma}_f$. The relative flatness of the curves at the higher values of P_i/t_S indicates that the sheet thickness can be varied over a rather large range with very little change in the value of $\bar{\sigma}_f$ which can be achieved.

A comparison of figures 18 to 20 brings out the following facts:

(1) Minimum-weight designs of both 24S-T and 75S-T Y-stiffened panels are lighter in weight (carry higher stresses) than minimum-weight designs of 24S-T Z-stiffened panels in the region of high values of P_i/t_S (thin sheet); but the Z-stiffened designs are of slightly lighter weight in the region of low values of P_i/t_S (thick sheet). No sharply defined boundary exists between these two regions. Instead, there is a range of values of P_i/t_S, which varies with $\frac{P_i}{L/\sqrt{c}}$, for which the curves of figures 18 to 20 coincide.

(2) The actual amount by which the Y-stiffened-panel design is lighter than the Z-stiffened panel (or vice versa) varies somewhat

erratically as the design conditions $\frac{P_i}{L/\sqrt{c}}$ and $\frac{P_i}{t_S}$ are varied because of the cusped nature of the curves.

(3) The value of $\frac{t_W}{t_S}$, which produces the minimum-weight design for given values of $\frac{P_i}{L/\sqrt{c}}$ and $\frac{P_i}{t_S}$, is smallest for the 75S-T Y-stiffened panels and largest for the 24S-T Z-stiffened panels.

COMPARISON OF MINIMUM-WEIGHT DESIGNS OF Y-STIFFENED PANELS AND Z-STIFFENED PANELS

Although figures 18 to 20 show in a general way the relative structural efficiencies of Y- and Z-stiffened panels, probably the best way to evaluate two types of panel construction is to compare panels of each type designed to meet the same conditions. A comparison of this nature permits consideration of each of the many factors which influence the choice of the most desirable construction for a given situation, such as the number of rivet lines, the space required for the stiffeners, and the distance from the outside surface of the sheet to the axis of the center of gravity of the panel. A series of comparative designs of Y- and Z-stiffened panels, therefore, was made in a manner similar to that used in making the designs from which figures 18 to 20 were prepared. Four values of P_i, namely, 2.0, 3.0, 5.0, and 8.0 kips per inch and also four values of L, namely, 10, 20, 30, and 40 inches were used for the comparative designs. The end fixity coefficient c was assumed equal to 1 in all cases.

In making the comparative designs, obtainment of extruded Y-stiffeners in the thicknesses required by the designs was assumed possible. A minimum thickness in which these shapes can be successfully extruded exists, however, and this minimum thickness is probably above the thickness required for many of the designs for which P_i is equal to or less than 3.0 kips per inch. The reasons for retaining these designs are (1) they may be scaled up for higher intensities of loading for which the minimum thickness that can be extruded is no longer a limitation, and (2) to emphasize the fact that if the intensity of loading is low, the Y-stiffener will not be satisfactory simply because it cannot be obtained.

Numerical values of the properties of the comparative designs for all values of t_W/t_S covered by the design charts are given in tables 5 to 8. The values for the particular ratio of t_W/t_S for which minimum weight is achieved are enclosed in parentheses. In order to show graphically the general variation of the proportions of these designs as the panel length and the sheet thickness are varied, figures 21 and 22 have been prepared. These figures present cross-sectional views, drawn to scale, of some of the minimum-weight designs of Y-stiffened and Z-stiffened panels for $P_i = 5.0$ kips per inch (table 7).

The comparative designs were made according to the procedure given in appendix A except that all values of t_W/t_S given by the design charts were investigated for each design. Because the design charts cover only a limited range of proportions, the comparisons between the designs are in some cases affected by the limited range of proportions covered by the charts. With this qualification, comparisons of the minimum-weight designs of tables 5 to 8 and figures 21 and 22 show that:

(1) At relatively high values of P_i/t_S, which are associated with thin sheets, the average stresses at failure $\bar{\sigma}_f$ for both the 24S-T and the 75S-T Y-stiffened panels are greater than those for the 24S-T Z-stiffened panels, and these stresses indicate that less weight is required for the Y-stiffened than for the Z-stiffened panels, the least weight being required for the 75S-T Y-stiffened panels. On the other hand, at relatiavely low values of P_i/t_S, which are associated with thick sheets, the average stresses at failure $\bar{\sigma}_f$ for both the 24S-T and 75S-T Y-stiffened panels are slightly less than those for the 24S-T Z-stiffened panels, and these stresses indicate that the Z-stiffened panel is slightly lighter in weight. The magnitude of the difference in weight between the two types of panel varies with the values of P_i/t_S and $\frac{P_i}{L/\sqrt{c}}$.

(2) The height of the stiffeners H is generally somewhat greater and, hence, consumes more space inside the wing for the 24S-T Y-stiffened panels than for the 24S-T Z-stiffened panels or for the 75S-T Y-stiffened panels; the height of the 24S-T Z-stiffened panel generally is the smallest.

(3) The average spacing of rivet lines S is generally somewhat less and, hence, requires more rivets for the 24S-T Y-stiffened panels than for the 24S-T Z-stiffened panels or for the 75S-T Y-stiffened panels; the average spacing generally is greatest for the 24S-T Z-stiffened panels.

(4) Only if the values of both P_i/t_S and $\frac{P_i}{L/\sqrt{c}}$ are relatively high does the value of the stress for local buckling of the sheet σ_{cr} tend to be higher for the 24S-T or 75S-T Y-stiffened panels than for the 24S-T Z-stiffened panels.

(5) The distance from the outside surface of the sheet to the axis of the center of gravity of the panel $\bar{h}$, which tends to reduce the effectiveness of the panel to resist bending of the wing, is generally greater for the 24S-T Y-stiffened panels than for the 24S-T Z-stiffened panels or for the 75S-T Y-stiffened panels; the distance $\bar{h}$ generally tends to be smallest for the 24S-T Z-stiffened panels at low values of P_i/t_S (thick sheet) and smallest for the 75S-T Y-stiffened panels at high values of P_i/t_S (thin sheet). (The magnitude of the reduction in effectiveness of the panel to resist bending of the wing depends on the thickness of the wing. The thinner the wing, the greater the reduction.)

(6) The value of the radius of gyration ρ is generally greater (and also the value of $\rho^2 A_i = I_i$ is generally greater) for the 24S-T Y-stiffened panel than for the 24S-T Z-stiffened panel or for the 75S-T Y-stiffened panel; generally, ρ tends to be smallest for the 24S-T Z-stiffened panels at low values of P_i/t_S (thick sheet) and smallest for the 75S-T Y-stiffened panels at high values of P_i/t_S (thin sheet). (The greater the value of $\rho^2 A_i$, the greater the effectiveness of the panel to resist local air loads.)

EFFECT OF SMALL DIFFERENCES IN TEST SPECIMENS ON THE COMPARISONS OF 24S-T Y-STIFFENED AND Z-STIFFENED PANELS

Only small differences occurred between the test specimens for the 24S-T Y-stiffened and Z-stiffened panels. Differences occurred in material properties, diameter and pitch of rivets, and range of proportions of the elements of the panels actually tested and hence the proportions covered by the resulting design charts.

The effect of these differences on the comparisons of 24S-T Y-stiffened and Z-stiffened panels are discussed in the following sections.

Effect of material properties. - If the material properties of the Y-stiffened panels and the Z-stiffened panels had been identical, would the comparisons have been more or less favorable to the Y-stiffened panels? Table 1 indicates that the average compressive yield stress of the material used for the Z-stiffened panels and that of the material used for the sheets of the 24S-T Y-stiffened panels were identical but that the average compressive yield stress of the extruded Y-stiffeners as measured was between 3 and 4 percent less than that of the Z-stiffeners before forming. Because forming tends to raise the compressive yield stress (see reference 5), the average properties of the formed Z-stiffeners were probably more than 3 percent above those for the extruded Y-stiffeners. Accordingly, it may be inferred that if the Y-stiffeners and the Z-stiffeners had had identical properties - as might have been obtained if extruded Z-stiffeners had been used, for example - the 24S-T Y-stiffened panels tested would have increased in strength relative to the Z-stiffened panels, and the comparisons would have been more favorable to the Y-stiffened panels.

<u>Effect of riveting</u>.- If the riveting of the Y-stiffened panels and the Z-stiffened panels had been identical, would the comparisons have been more or less favorable to the Y-stiffened panels? A comparison of rivet proportions listed in tables 2 to 4 with those of reference 2 indicates that the Y-stiffened panels were more strongly riveted than the Z-stiffened panels. Reference 6 shows that the strength of short panels having close stiffener spacing increased with an increase in the diameter of the rivets and also increased with a decrease in the pitch of the rivets. Subsequent tests have indicated that as the length of the panel is increased the size and pitch of rivets have progressively less effect on the strength of the panel until the panel strength may actually decrease with an increase in the strength of riveting. If the Y-stiffened panels and Z-stiffened panels had had identical riveting, therefore, the comparative designs would probably have come out less favorable to the Y-stiffened panel in the case of the short panels $\left(\text{high values of } \frac{P_i}{L/\sqrt{c}}\right)$ and possibly very slightly more favorable to the Y-stiffened panel in the case of the long panels $\left(\text{low values of } \frac{P_i}{L/\sqrt{c}}\right)$.

<u>Effect of panel proportions</u>.- If proportions of Y-stiffened panels or Z-stiffened panels different from those tested and, hence, those covered by the resulting design charts had been considered, would the comparisons have been more or less favorable to the Y-stiffened panels? It can be seen by inspection of tables 5 to 8 that:

(1) The lightest weight 24S-T Y-stiffened-panel design for a given set of design conditions often requires a stiffener which is 2 sheet gages thinner than that for the comparable Z-stiffened-

panel design. (This agrees with the fact that the value of t_W/t_S for minimum weight is smaller for the Y-stiffened panel than for the Z-stiffened panel. See figs. 18 to 20.) Also, the present charts do not cover a large enough range of proportions to permit a Y-stiffener more than 1 gage thinner than a Z-stiffener in the region of heavy sheet thickness. If the design charts were extended to cover lower values of the ratio t_W/t_S so that a Y-stiffened-panel design could always be made which had a stiffener 2 gages thinner than the stiffener for the best Z-stiffened-panel design, then the Y-stiffened-panel design would probably be less inferior to the Z-stiffened-panel design in the region of heavy sheet thickness. Similarly, if the charts were extended in the other direction so that in all cases a Z-stiffened-panel design with a Z-stiffener 2 sheet gages thicker than the comparable Y-stiffened-panel design could be made, possibly the Y-stiffened panel would be less superior to the Z-stiffened panel in the region of very light sheet thickness.

(2) The lightest weight Y-stiffened-panel designs - in far more cases than for the Z-stiffened-panel designs - are obtained at the maximum or minimum values of b_W/t_W given by the design charts. Extending the range of proportions covered to higher and lower values of b_W/t_W would be likely, therefore, to result in lighter weight designs of Y-stiffened panels in more cases than in lighter designs of Z-stiffened panels.

Because a very extensive test program was run to establish optimum proportions for the Z-stiffener $\left(\frac{b_F}{b_W} = 0.3 \text{ to } 0.5\right)$, and no such program has been run to establish optimum proportions for the Y-stiffener, the proportions of the Y-stiffener possibly could be improved and, hence, the comparative designs made more favorable to the Y-stiffened panel for all sheet thicknesses. Among the changes in proportions of the Y-stiffened panels which might result in overall improvements in their structural efficiencies are: (1) a change in the angle included between the legs of the Y-stiffeners in order to effect a better balance between the width of sheet under the Y-stiffeners and between adjacent Y-stiffeners, (2) a change in relative proportions of the outstanding "T" part of the Y-stiffeners, and (3) a reduction in the width of attachment flanges of the Y-stiffeners, particularly for $\frac{t_W}{t_S} = 1.00$.

GENERAL TRENDS INDICATED BY MINIMUM-WEIGHT DESIGNS

In addition to the comparisons of Y-stiffened and Z-stiffened panels afforded by the designs of tables 5 to 8 and figures 21 and 22, there are several general trends indicated by the designs and by figures 18 to 20 which apply to both types of construction. These general trends are in some cases affected by the limited range of proportions covered by the present design charts. These trends as well as the comparisons between the two types of construction, are also strictly for minimum-weight designs. With the foregoing qualifications, the comparative designs show that:

For given values of P_i and $L/\sqrt{c}$

(1) The weight of panel generally increases ($\bar{\sigma}_f$ decreases) with an increase in sheet thickness, but the lightest panel is often obtained not at the thinnest sheet gage at which a design can be achieved but with the sheet 1 or 2 gages thicker than the minimum.

(2) The stress for local buckling of the sheet σ_{cr} and also the ratio $\sigma_{cr}/\bar{\sigma}_f$ generally decreases with an increase in sheet thickness, but the maximum value of the stress for local buckling of the sheet is often obtained not at the thinnest sheet gage at which a design can be achieved but with the sheet 1 or 2 gages thicker than the minimum.

(3) The average spacing of rivet lines S increases (requiring fewer rivets) with an increase in sheet thickness.

(4) The distance from the outside surface of the sheet to the axis of the center of gravity of the panel $\bar{h}$, which tends to decrease the effectiveness of the panel to resist bending of the wing, generally decreases with an increase in sheet thickness.

And for given values of P_i and t_S

(1) The weight of panel increases ($\bar{\sigma}_f$ decreases) with an increase in the value of $L/\sqrt{c}$.

(2) The stress for local buckling of the sheet σ_{cr}, but not necessarily the ratio $\sigma_{cr}/\bar{\sigma}_f$, generally decreases with an increase in the value of $L/\sqrt{c}$, except at the heavy sheet thicknesses.

(3) The height of the stiffeners H increases with an increase in the value of $L/\sqrt{c}$.

(4) The average spacing of rivet lines S generally increases (again requiring fewer rivets) with an increase in the value of $L/\sqrt{c}$, except at the heavy sheet thicknesses.

(5) The distance from the outside surface of the sheet to the axis of the center of gravity of the panel $\bar{h}$, which tends to decrease the effectiveness of the panel to resist bending of the wing, generally increases with an increase in the value of $L/\sqrt{c}$.

(6) The radius of gyration ρ increases (not necessarily increasing the effectiveness of the panel to resist local air loads) with an increase in the value of $L/\sqrt{c}$.

CONCLUDING REMARKS

In this paper, charts have been presented from which 24S-T (bare sheet) and 75S-T (Alclad sheet) aluminum-alloy flat compression panels having longitudinal extruded Y-section stiffeners may be designed to have the minimum weight required to carry a given intensity of loading at a given effective length of panel with a given sheet thickness. Comparisons have been made of panels designed from these charts and similar designs of Z-stiffened panels, in order to bring out the differences in characteristics of 24S-T and 75S-T and of Y- and Z-stiffened-panel designs. In the case of actual wing compression panels, however, there are often additional factors to be considered which have been neglected for the comparisons, such as the effects of local air loads, the distance from the neutral axis of the wing to the center of gravity of the cross section of the panel, the sheet curvature, the edge support, and the shear combined with the compression, or the effects on the design procedure of specifying stiffener height or spacing in addition to sheet thickness. The labor involved in the introduction of so many additional variables into the comparisons, however, is obviously prohibitive. In fact some of the variables cannot be introduced because the necessary research has not been done. Because in any particular design some such additional factor may be important, the choice of a type of construction in most cases is best made by evaluating the characteristics of panels of several types designed to meet all the requirements of the actual application. The design charts of the present paper (figs. 7 to 17) together with the tables of section properties (tables 9 to 13) may be used as an aid in such an evaluation of the characteristics of a 24S-T or 75S-T Y-stiffened panel.

Langley Memorial Aeronautical Laboratory
National Advisory Committee for Aeronautics
Langley Field, Va., April 30, 1947

APPENDIX A

METHOD OF DESIGNING A Y-STIFFENED PANEL FOR MINIMUM WEIGHT

The following procedure, which is similar to that given in reference 2 for Z-stiffened panels, permits the selection of the minimum-weight Y-stiffened panel for given values of the design conditions P_i, $L/\sqrt{c}$, and t_S. In this procedure, the conditions P_i, $L/\sqrt{c}$, and t_S are first combined to determine the values of the parameters $\frac{P_i}{L/\sqrt{c}}$ and $\frac{P_i}{t_S}$. Next, from figures 18 or 20 the value of t_W/t_S is found for which the minimum-weight design will be achieved. Then a study is made of all the curves of the design chart for that ratio of t_W/t_S at the given value of $\frac{P_i}{L/\sqrt{c}}$. From this study, a plot is made of the variation of the stress at failure with stiffener spacing for panels having all the proportions covered by the chart. Because the chart gives $\bar{\sigma}_f$ in terms of relative proportions (dimension ratios), the absolute size is established for each set of panel proportions by computing the sheet thickness required to make the design load P_i divided by the area A_i equal to the failing stress $\bar{\sigma}_f$. The variation of these sheet thicknesses, calculated as $\frac{P_i}{\bar{\sigma}_f \frac{A_i}{t_S}}$ is then plotted against stiffener spacing. This second plot makes the establishment of stiffener spacings associated with the design value of the sheet thickness for each of the panel proportions possible. Reference to the first plot permits the determination of the stresses corresponding to these proportions and the selection of the proportions (usually by interpolation) which give the highest stress (minimum weight) at the given sheet thickness.

As an example of this procedure, the values and quantities for the 24S-T design shown in figure 23 for $P_i = 5.0$ kips per inch, $L = 20$ inches, $c = 1$, and $t_S = 0.102$ inch are given in table 14 and are employed in the following steps:

(1) Compute $\frac{P_i}{L/\sqrt{c}}$ and $\frac{P_i}{t_S}$.

(2) From figures 18 or 20 (in the example, fig. 18 for 24S-T is used) determine the value or values of t_W/t_S which should be investigated to find the minimum-weight design at the values of $\frac{P_i}{L/\sqrt{c}}$ and $\frac{P_i}{t_S}$ determined in step (1) $\left(\text{in the example, } \frac{t_W}{t_S} = 0.40\right)$.

(3) From the curves for the particular value of t_W/t_S determined in step (2) (in the example, fig. 7), pick off for each value of b_W/t_W and b_S/t_S the value of $\bar{\sigma}_f$ corresponding to the value of $\frac{P_i}{L/\sqrt{c}}$ given by step (1).

(4) Pick from tables 9 to 13 (in the example, table 9) the values of A_i/t_S corresponding to the ratios used in step (3).

(5) Compute the sheet thickness that would be required to make the design load P_i divided by the area A_i equal to the failing stress $\bar{\sigma}_f$ in each case, thus $t_S = \frac{P_i}{\bar{\sigma}_f \frac{A_i}{t_S}}$.

(6) Plot the values of $\frac{P_i}{\bar{\sigma}_f \frac{A_i}{t_S}}$ and $\bar{\sigma}_f$ against b_S/t_S for each value of b_W/t_W and mark the values of $\bar{\sigma}_f$ at the value of b_S/t_S for which $\frac{P_i}{\bar{\sigma}_f \frac{A_i}{t_S}}$ equals the design value of t_S (in the example, 0.102 in.). The plots of this step for the example under consideration are given as the two lower plots in figure 23. For ease in interpolating to find the value of b_W/t_W for the design, a curve of b_W/t_W against b_S/t_S is also conveniently established by plotting the consecutive values of b_W/t_W (18, 21, 24, and so forth) at the values of b_S/t_S for which $\frac{P_i}{\bar{\sigma}_f \frac{A_i}{t_S}}$ equals the design value of t_S (the upper plot in fig. 23).

(7) After step (6) has been completed for all the values of b_W/t_W, draw curves of stress and of b_W/t_W against b_S/t_S through the points determined in step (5) (heavy curves in fig. 23).

(8) Each of the curves drawn in step (7) represents a series of designs, all of which have the required value of t_S (in the example, 0.102 in.). The maximum point on the curve of $\bar{\sigma}_f$ against b_S/t_S indicates the design for minimum weight. Note this maximum value of $\bar{\sigma}_f$, the value of b_S/t_S at which it is reached, and the corresponding value of b_W/t_W which can be picked from the curve of b_W/t_W against b_S/t_S.

(9) Check computations by picking from tables 9 to 13 the value of A_i/t_S corresponding to the ratios selected for minimum weight in step (8). If computations and plots are correct,

$$P_i = \bar{\sigma}_f \frac{A_i}{t_S} t_S$$

(10) Compute the following panel dimensions from the proportions determined by this design procedure with the aid of tables 9 to 13:

$$t_W = \frac{t_W}{t_S} t_S \qquad t_L = \frac{t_L}{t_W} t_W$$

$$b_S = \frac{b_S}{t_S} t_S \qquad b_L = \frac{b_L}{b_W} b_W$$

$$b_W = \frac{b_W}{t_W} t_W \qquad t_F = \frac{t_F}{t_W} t_W$$

$$b_A = \frac{b_A}{t_W} t_W \qquad b_F = \frac{b_F}{b_W} b_W$$

$$b_Y = \frac{b_Y}{b_W} b_W \qquad r = \frac{r}{t_W} t_W$$

$$H = \left(1.79 \frac{b_W}{t_W} + 1.6\right) t_W \qquad S = 0.5 \frac{b_S}{t_S} t_S + \left(0.52 \frac{b_W}{t_W} + 2.3\right) t_W$$

$$\bar{h} = \frac{\bar{h}}{t_S} t_S \qquad \rho = \frac{\rho}{t_S} t_S$$

(11) Compute the diameter and pitch of rivets from the proportions listed in tables 9 to 13, as

$$d = \frac{d}{t_S} t_S$$

$$p = \frac{p}{t_S} t_S$$

(12) Find σ_{cr} by interpolation between the short horizontal lines in figures 7 to 16.

If the values of $\frac{P_i}{L/\sqrt{c}}$ and $\frac{P_i}{t_S}$ computed in step (1) are such that the point on figure 18 or 20 corresponding to these values is near a boundary between two values of t_W/t_S, it is advisable to follow the design procedure of steps (1) to (12) for both values of t_W/t_S.

APPENDIX B

DESIGN CHART FOR DETERMINING THE STRUCTURAL EFFICIENCY

If a chart is to be drawn which will provide a direct measure of the structural efficiency of a wing compression panel, that chart must contain in its parameters all the design conditions which apply to the panel. In references 1 and 2 the parameter $\frac{P_i}{L/\sqrt{c}}$, which contains the design conditions of compressive load and effective length of panel, was used for charts that measure directly the structural efficiency when those are the design conditions.

The trend toward higher speeds and thinner wings and the accompanying requirement of high torsional stiffness, however, tends to establish a minimum acceptable sheet thickness for the panel. It therefore appears desirable to include the sheet thickness t_S within the parameters used for preparing charts indicative of the structural efficiency of panels.

A suitable parameter incorporating the sheet thickness appears to be P_i/t_S. This parameter, which represents the load divided by the area of sheet alone, denotes the upper limit of stress that can be carried by a panel for a given sheet thickness because any stiffeners added to the sheet must increase the panel area and reduce the stress below that determined as P_i/t_S. This upper limit is shown in figures 18 to 20 as the dashed line. Besides indicating the upper limit of stress, this line also represents the stress that would be carried by a panel having a value of $\frac{t_W}{t_S} = 0$ (pure shell construction), but only if such a panel could actually carry the indicated stress without failing.

As the value of t_W/t_S for the panel is increased from zero, the stress carried will decrease from that equal to the value of P_i/t_S. The actual magnitude of the highest stress that can be achieved for each value of t_W/t_S given by the design charts can be determined by assuming values of $\frac{P_i}{L/\sqrt{c}}$ and $\frac{P_i}{t_S}$ and by examining all the individual curves of the design charts in a manner similar to the minimum-weight-design procedure at the assumed values of t_W/t_S, $\frac{P_i}{L/\sqrt{c}}$, and $\frac{P_i}{t_S}$. (Values of $\bar{\sigma}_f \frac{A_i}{t_S}$, which are equal to $\frac{P_i}{t_S}$, instead of $\frac{P_i}{\bar{\sigma}_f \frac{A_i}{t_S}}$ are computed in step (5) and plotted in step (6) of the procedure. See appendix A. Also designs are made for a series of values of P_i/t_S, corresponding to a series of design values of t_S, from each plot of step (6).)

The foregoing procedure was used to establish the curves given in figures 18 to 20, which indicate the stresses attainable by minimum-weight designs as P_i/t_S is varied for chosen values of $\frac{P_i}{L/\sqrt{c}}$. The stress for any point on one of these curves is therefore a direct measure of the structural efficiency of the best design that can be made to meet the given design conditions P_i, $L/\sqrt{c}$, and t_S.

Because the design charts are drawn for definite values of t_W/t_S, the curves of figures 18 to 20 contain cusps which correspond to the intersection of the curves resulting from the use of the design charts for consecutive values of t_W/t_S. Light lines have been drawn in figures 18 to 20 connecting these cusps, thus dividing the figures into regions in which the indicated values of t_W/t_S produce the minimum-weight designs. As previously noted, the region for $\frac{t_W}{t_S} = 0$ is the dashed line, for which $\bar{\sigma}_f = \frac{P_i}{t_S}$.

For given values of P_i, $L/\sqrt{c}$, and t_S, the value of t_W/t_S that will produce the lightest weight Y-stiffened or Z-stiffened panel may be determined directly from figures 18 to 20. Since very slight variations in $\bar{\sigma}_f$ near the cusps of the curves could cause an appreciable shift in the location of the cusps in many cases, the light lines should be considered as only approximate boundaries. If the point corresponding to a particular design being considered lies near a boundary between two values of t_W/t_S, it might be wise to investigate both values of t_W/t_S in making that design.

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TABLE 1

VALUES OF THE COMPRESSIVE YIELD STRESS FOR THE MATERIALS USED FOR CONSTRUCTING THE Z-STIFFENED PANELS AND THE Y-STIFFENED PANELS

	σ_{cy} (ksi)	Sheet (bare)	**Stiffeners (bare sheet before forming)**
24S-T Z-stiffened panels (from reference 2)	**Maximum**	46.5	46.5
	Average	44.0	44.0
	Minimum	41.0	41.0
24S-T Y-stiffened panels	σ_{cy} (ksi)	Sheet (bare)	Stiffeners (extrusions)
	Maximum	47.3	48.0
	Average	44.0	42.3
	Minimum	42.4	38.4
75S-T Y-stiffened panels	σ_{cy} (ksi)	Sheet (Alclad)	Stiffeners (extrusions)
	Maximum	69.7	86.5
	Average	67.3	78.2
	Minimum	64.7	67.6

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TABLE 2

TEST DATA AND PROPORTIONS OF SPECIMENS HAVING $\frac{t_W}{t_S} = 0.40$

[Nominal proportions are given in parentheses]

(a) 24S-T SHEET AND STIFFENERS

Proportions of test specimens														Test data			
t_W (in.)	$\frac{t_W}{t_S}$	$\frac{b_S}{t_S}$	$\frac{b_W}{t_W}$	$\frac{b_A}{t_W}$	$\frac{b_W}{b_Y}$	$\frac{t_W}{t_L}$	$\frac{b_W}{b_L}$	$\frac{t_W}{t_F}$	$\frac{b_W}{b_F}$	$\frac{r}{t_W}$	$\frac{d}{t_S}$	$\frac{p}{t_S}$	$\frac{L}{b_W}$ (a)	σ_{cr} (ksi)	$\bar{\sigma}_f$ (ksi)	$\frac{P_1}{L/\sqrt{c}}$ $\left(\frac{\text{kips/in.}}{\text{in.}}\right)$	$\bar{\epsilon}_f$
(0.064)	(0.40)	(25)	(20)	(9.3)	(0.96)	(0.94)	(1.07)	(0.47)	(1.44)	(1)	(1.54)	(4.6)					
0.064	0.399	25.0	20.0	9.30		0.921		0.487					12.5		42.7	1.222	672×10^{-5}
.066	.409	25.3	19.5	9.05		.988		.486					24.9	40.7	41.3	.592	589
.067	.406	24.3	19.1	8.85		.946		.503					43.8		35.0	.292	362
.065	.397	24.6	19.7	9.14		.931		.488					74.8		20.8	.101	218
			(25)														
.066	.396	23.9	24.1	8.96		.936		.488					12.9	40.7	43.0	1.028	584
.068	.416	24.6	23.7	8.79		.947		.497					25.8	39.2	41.9	.496	573
.065	.390	24.1	24.8	8.79		.930		.461					45.0		34.9	.239	328
.065	.407	25.1	24.5	9.11		.906		.486					77.3		24.3	.095	232
			(30)														
.066	.409	25.0	29.1	9.01		.953		.471					13.2	41.8	43.3	.855	541
.066	.407	24.8	29.1	9.00		.971		.472					26.3		41.1	.407	507
.066	.405	24.5	29.1	9.03		.971		.469					46.1		34.7	.199	367
.064	.394	24.5	30.0	9.30		.945		.457					79.1		23.8	.078	225
		(35)	(20)														
.067	.416	35.1	19.1	8.85		.936		.501					11.7	33.3	36.9	1.055	727
.066	.411	35.0	19.3	8.96		.994		.491					23.5	34.0	35.6	.504	391
.066	.416	35.2	19.3	8.99		.947		.496					41.2	33.4	34.7	.279	346
.066	.409	34.4	19.2	8.93		.937		.501					70.7		20.7	.099	196
			(25)														
.066	.401	33.9	24.2	8.99		.923		.490					12.3	32.7	36.0	.838	552
.067	.406	34.2	24.0	8.89		.945		.492					24.6	33.8	35.7	.410	521
.066	.403	34.4	24.4	9.05		.904		.484					42.9	32.9	34.8	.230	331
.067	.410	35.0	24.0	8.92		.939		.490					73.6		21.4	.082	201
			(30)														
.063	.378	34.1	30.6	9.49		.953		.455					12.6	30.3	36.2	.696	516
.062	.373	34.1	30.9	9.57		.947		.454					25.2	34.4	36.3	.354	394
.063	.378	33.7	30.5	9.46		.949		.460					44.1	33.9	34.5	.193	325
.064	.393	34.6	30.0	9.30		.973		.468					75.7		21.1	.068	204
		(50)	(20)														
.067	.410	49.3	19.1	8.87		.932		.497					10.8	19.1	32.0	.933	1148
.067	.409	49.5	19.2	8.91		1.010		.493					21.8	19.9	29.2	.424	591
.066	.400	48.9	19.3	8.97		.946		.497					37.3	20.1	29.0	.242	
.066	.407	49.7	19.6	9.04		.940		.490					65.5	21.2	22.6	.109	211
			(25)														
.067	.408	49.2	24.0	8.91		.942		.491					11.4	19.5	31.4	.726	713
.067	.410	49.2	23.9	8.87		.938		.490					23.0	19.8	31.5	.359	627
.066	.403	49.7	24.4	9.05		.925		.487					40.1	20.2	29.2	.190	325
.067	.421	50.8	23.9	8.88		.970		.496					68.7	20.0	20.5	.077	192
			(30)														
.062	.393	51.0	30.7	9.52		.934		.457					11.9	16.7	30.6	.567	565
.061	.379	50.5	31.6	9.79		.905		.440					23.8	19.1	30.4	.285	426
.064	.405	50.7	29.9	9.25		.976		.469					41.6	20.3	29.5	.158	320
.065	.409	50.5	29.4	9.11		.985		.475					71.3	19.8	22.5	.070	214

[a] Lengths are for the actual test specimens for which c = 3.75 approximately.

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TABLE 2.- Concluded

TEST DATA AND PROPORTIONS OF SPECIMENS HAVING $\frac{t_W}{t_S} = 0.40$ – Concluded

(b) ALCLAD 75S-T SHEET AND 75S-T STIFFENERS

Proportions of test specimens														Test data			
t_W	$\frac{t_W}{t_S}$	$\frac{b_S}{t_S}$	$\frac{b_W}{t_W}$	$\frac{b_A}{t_W}$	$\frac{b_W}{b_Y}$	$\frac{t_W}{t_L}$	$\frac{b_W}{b_L}$	$\frac{t_W}{t_F}$	$\frac{b_W}{b_F}$	$\frac{r}{t_W}$	$\frac{d}{t_S}$	$\frac{p}{t_S}$	$\frac{L}{b_W}$ (a)	σ_{cr} (ksi)	$\bar{\sigma}_f$ (ksi)	$\frac{P_1}{L/\sqrt{c}}$ (kips/in./in.)	$\bar{\epsilon}_f$
(0.064)	(0.40)	(25)	(20)	(9.3)	(0.96)	(0.94)	(1.07)	(0.47)	(1.44)	(1)	(1.54)	(4.6)					
0.060	0.380	25.6	21.4	9.96		0.884		0.442					12.4	49.8	57.6	1.630	640×10^{-5}
.067	.422	25.3	19.2	8.92		.967		.493					24.9	51.5	58.1	.834	602
.064	.411	25.8	20.0	9.27		.955		.481					43.7	----	55.0	.443	526
.060	.370	24.7	21.3	9.90		.832		.431					75.0	----	25.9	.125	261
.064	0.402	25.2	(25) 25.1	9.31		.988		.464					12.8	51.9	57.9	1.351	589
.063	.395	25.2	25.3	9.40		.986		.470					25.6	55.0	58.2	.675	565
.066	.418	25.4	24.1	8.96		.938		.486					45.0	----	52.9	.352	535
.062	0.404	(35) 37.1	(20) 20.6	9.58		.887		.440					11.7	30.7	52.3	1.468	535
.062	.389	35.5	20.7	9.63		.870		.439					23.5	30.5	50.9	.720	697
.064	.402	35.3	20.0	9.30		.955		.478					41.2	33.9	45.8	.369	582
.064	.402	35.4	20.1	9.34		.951		.479					70.8	----	24.7	.115	243
.064	.398	35.2	(25) 25.1	9.31		.957		.461					12.2	28.3	48.4	1.102	615
.066	.411	35.2	24.3	9.03		.929		.488					24.5	33.4	47.7	.543	640
.064	.404	35.3	25.0	9.28		.896		.464					42.8	35.7	49.1	.319	620
.066	.416	35.8	24.4	9.04		.937		.468					73.6	----	27.1	.102	265
.066	.422	35.9	(30) 28.9	8.95		.921		.477					12.6	30.8	47.4	.906	567
.063	.394	35.4	30.5	9.46		.937		.453					25.2	33.0	47.1	.449	520
.067	.429	36.0	28.8	8.91		.929		.471					44.2	34.5			
.066	.422	35.7	28.9	8.96		.931		.477					75.8				
.065	.418	(50) 52.2	(20) 19.7	9.17		.940		.489					10.1	17.7	43.9	1.320	690
.064	.410	51.6	19.9	9.25		.925		.485					21.8	16.8	42.3	.594	740
.066	.421	51.6	19.4	9.03		.939		.491					38.1	17.1	40.2	.324	569
.061	.393	51.9	21.0	9.74		.860		.441					65.4	17.5	23.8	.111	258
.065	.411	51.1	(25) 24.7	9.17		.967		.481					11.4	15.8	42.0	.944	539
.066	.417	51.4	24.4	9.07		.919		.482					22.8	16.6	43.6	.491	590
.065	.416	51.3	24.5	9.08		.949		.469					40.0	17.2	41.6	.266	583
.065	.415	51.3	24.5	9.08		.941		.485					68.7	17.9	22.9	.085	264

[a] Lengths are for the actual test specimens for which c = 3.75 approximately.

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TABLE 3

TEST DATA AND PROPORTIONS OF SPECIMENS HAVING $\frac{t_W}{t_S} = 0.63$

[Nominal proportions are given in parentheses]

(a) 24S-T SHEET AND STIFFENERS

Proportions of test specimens														Test data			
t_W (in.)	$\frac{t_W}{t_S}$	$\frac{b_S}{t_S}$	$\frac{b_W}{t_W}$	$\frac{b_A}{t_W}$	$\frac{b_W}{b_Y}$	$\frac{t_W}{t_L}$	$\frac{b_W}{b_L}$	$\frac{t_W}{t_F}$	$\frac{b_W}{b_F}$	$\frac{r}{t_W}$	$\frac{d}{t_S}$	$\frac{p}{t_S}$	$\frac{L}{b_W}$ (a)	σ_{cr} (ksi)	$\bar{\sigma}_f$ (ksi)	$\frac{P_i}{L/\sqrt{c}}$ $\left(\frac{\text{kips/in.}}{\text{in.}}\right)$	$\bar{\epsilon}_f$
(0.064)	(0.63)	(25)	(20)	(9.3)	(0.96)	(0.94)	(1.07)	(0.47)	(1.44)	(1)	(1.84)	(6.1)					
0.067	0.687	25.2	19.0	8.83		.948		.498					14.0	42.6	45.1	1.013	715×10^{-5}
.067	.662	24.5	19.1	8.88		.946		.499					28.0	41.3	42.6	.484	610
.067	.690	25.6	19.1	8.85		.949		.499					48.8		33.8	.216	515
.066	.687	26.0	19.3	8.95		.931		.494					83.9		21.2	.079	213
.067	.661	24.7	(25) 23.8	8.83		.927		.500					14.2	39.2	41.5	.788	540
.066	.625	23.1	24.3	9.01		.950		.469					28.4		40.6	.398	513
.066	.647	24.6	24.2	8.99		.961		.487					49.8		34.5	.187	329
.066	.674	25.3	24.1	8.93		.915		.482					85.8		23.9	.074	226
.066	.665	25.4	(30) 29.1	9.03		.972		.473					14.3		41.0	.663	472
.065	.661	25.1	29.3	9.08		.978		.468					28.7	40.0	40.7	.331	481
.065	.657	25.4	29.6	9.18		.931		.473					50.3		35.3	.163	360
.066	.665	25.2	29.0	8.97		.959		.476					86.1		22.3	.062	220
.067	.685	(35) 35.6	(20) 19.0	8.84		.952		.501					11.1	35.6	40.6	1.018	652
.067	.654	34.5	19.1	8.87		.937		.501					27.1	35.9	38.4	.406	571
.065	.664	36.2	19.6	9.08		.933		.484					47.7		33.1	.194	333
.067	.681	35.9	19.1	8.89		.936		.499					81.8		22.4	.077	220
.067	.635	33.0	(25) 23.8	8.83		.935		.494					13.9	33.3	37.4	.670	518
.066	.638	34.1	24.2	8.97		.944		.487					27.9	36.0	37.7	.332	483
.067	.654	34.2	24.0	8.92		.951		.492					48.8		34.7	.173	319
.064	.647	35.6	25.1	9.33		.887		.463					83.3		25.1	.072	237
.064	0.627	34.3	(30) 29.7	9.20		.982		.471					14.1	33.7	36.8	.551	530
.065	.607	33.1	29.5	9.14		.953		.473					28.3	35.4	37.0	.284	458
.066	.640	34.3	29.0	8.97		.961		.480					49.5		33.9	.148	345
.064	.649	36.0	29.8	9.24		.936		.461					84.5		22.6	.056	225
.061	.591	(50) 48.3	(20) 20.9	9.69		.896		.465					12.8	21.5	34.6	.688	794
.067	.631	47.7	19.1	8.89		1.010		.496					26.3	22.2	32.5	.319	568
.068	.632	47.6	18.9	8.79		.956		.504					45.9	26.0	30.2	.171	329
.067	.637	48.0	19.1	8.87		.934		.503					78.8		22.5	.074	216
.068	.657	49.3	(25) 23.7	8.80		.930		.498					13.5	20.3	34.8	.563	644
.066	.649	49.4	24.1	8.93		.934		.490					27.0	23.1	34.1	.270	465
.066	.644	49.2	24.2	8.97		.944		.486					47.3	23.1	30.8	.139	323
.066	.650	49.6	24.2	8.97		.962		.487					81.0		22.0	.059	211
.061	.574	47.3	(30) 31.3	9.67		.919		.449					13.8	20.2	33.6	.466	505
.062	.583	47.6	30.9	9.57		.944		.453					27.5	23.4	32.9	.230	517
.064	.649	51.1	29.8	9.24		.977		.471					48.1	20.3	31.1	.119	350
.061	.618	51.8	31.5	9.75		.917		.443					82.7	21.4	22.0	.049	208
.062	.624	(75) 76.3	(20) 20.6	9.57		.899		.471					11.9	10.0	30.0	.559	762
.066	.673	77.4	19.4	9.00		1.010		.493					24.6	9.5	28.7	.256	499
.066	.663	76.4	19.2	.92		.938		.502					43.1	10.9	26.5	.137	343
.066	.664	76.5	19.4	9.01		.933		.498					74.0	10.1	20.2	.062	225
.068	.666	74.9	(25) 23.6	8.75		.933		.497					12.8	9.2	30.1	.452	646
.067	.662	75.0	23.8	8.85		.937		.495					25.6	8.3	30.6	.229	496
.067	.668	75.5	23.9	8.87		.957		.493					44.9	10.8	27.2	.116	347
.067	.667	76.0	24.0	8.91		.941		.487					76.8	10.4	19.2	.048	215
.067	.654	74.4	(30) 28.7	8.89		.956		.480					13.1	9.5	30.6	.393	514
.065	.643	75.4	29.6	9.18		.967		.474					26.3	9.9	30.3	.190	500
.066	.668	77.4	29.2	9.05		.979		.478					46.0	9.3	27.9	.100	370
.063	.643	77.7	30.4	9.43		.950		.461					79.1	10.4	19.8	.041	208

[a] Lengths are for the actual test specimens for which c = 3.75 approximately.

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TABLE 3.- Concluded

TEST DATA AND PROPORTIONS OF SPECIMENS HAVING $\frac{t_W}{t_S} = 0.63$ - Concluded

(b) ALCLAD 75S-T SHEET AND 75S-T STIFFENERS

Proportions of test specimens														Test data			
t_W	$\frac{t_W}{t_S}$	$\frac{b_S}{t_S}$	$\frac{b_W}{t_W}$	$\frac{b_A}{t_W}$	$\frac{b_W}{b_Y}$	$\frac{t_W}{t_L}$	$\frac{b_W}{b_L}$	$\frac{t_W}{t_F}$	$\frac{b_W}{b_F}$	$\frac{r}{t_W}$	$\frac{d}{t_S}$	$\frac{p}{t_S}$	$\frac{L}{b_W}$ (a)	σ_{cr} (ksi)	$\bar{\sigma}_f$ (ksi)	$\frac{P_i}{L/\sqrt{c}}$ $\left(\frac{\text{kips/in.}}{\text{in.}}\right)$	$\bar{\epsilon}_f$
(0.064)	(0.63)	(25)	(20)	(9.3)	(0.96)	(0.94)	(1.07)	(0.47)	(1.44)	(1)	(1.84)	(6.1)					
0.066	0.633	23.9	19.2	8.93		0.965		0.494					14.0	58.2	63.3	1.458	619 × 10^{-5}
.067	.643	23.8	19.1	8.85		.937		.512					27.9	60.5	63.2	.726	620
.066	.641	24.4	19.4	9.03		.948		.490					48.9	----	57.9	.376	562
.062	.605	24.3	20.5	9.52		.881		.446					84.0	----	25.4	.097	256
			(25)														
.064	.621	24.5	25.1	9.32		.981		.475					14.2	----	57.9	1.104	563
.066	.657	25.2	24.1	8.96		.935		.493					28.4	56.3	58.9	.553	573
.064	.615	24.3	25.2	9.35		.971		.461					49.8	----	54.6	.294	524
		(35)	(20)														
.062	.596	33.8	20.5	9.53		.866		.456					13.6	35.9	54.7	1.197	669
.064	.616	33.9	20.0	9.26		.917		.481					27.3	43.7	57.5	.607	646
.068	.656	34.2	18.9	8.79		.960		.486					47.6	37.5	52.2	.315	555
.064	.614	33.7	19.9	9.22		.928		.488					81.8	----	23.6	.084	255
			(25)														
.064	.623	34.6	24.8	9.21		.976		.479					13.9	38.1	55.1	.953	590
.065	.646	35.0	24.7	9.15		.997		.471					27.8	36.3	53.5	.462	602
.065	.640	34.9	24.5	9.10		.934		.487					48.8	38.9	49.3	.244	519
			(30)														
.065	.662	35.7	29.3	9.08		.906		.472					14.1	32.3	48.6	.736	533
.066	.654	34.6	29.0	8.97		.904		.473					28.2	35.1	49.9	.378	548
.064	.632	34.6	29.8	9.24		.903		.465					49.3	35.2	47.1	.204	489
		(50)	(20)														
.065	.616	48.0	19.7	9.14		.938		.484					13.0	20.4	51.0	1.019	648
.063	.593	47.5	20.3	9.43		.867		.446					26.2	20.9	50.9	.509	689
.063	.603	48.8	20.5	9.50		.868		.444					45.9	21.9	46.3	.260	587
.061	.583	48.2	21.0	9.74		.836		.437					78.7	22.7	23.7	.078	237
			(25)														
.065	.623	48.8	24.7	9.18		.939		.481					13.5	19.9	50.0	.802	652
.067	.632	47.7	24.0	8.91		.933		.478					27.0	20.8	51.2	.423	617
.066	.628	48.3	24.2	8.98		.936		.476					47.3	21.6	46.6	.219	572
.064	.610	48.1	25.0	9.28		.938		.464					81.0	21.9	23.7	.065	234
			(30)														
.066	.638	48.6	29.0	8.99		.938		.476					13.8	19.5	45.6	.641	566
.067	.666	50.4	28.8	8.91		.937		.490					27.5	19.5	46.6	.325	561
.066	.654	49.9	28.9	8.96		.925		.479					48.2	19.7	44.3	.176	531
.063	.624	49.9	30.3	9.40		.898		.463					82.6	21.9	23.6	.055	256
		(75)	(20)														
.061	.579	72.4	21.0	9.77		.909		.435					12.2	10.0	43.5	.824	739
.066	.629	72.9	19.4	9.01		.956		.494					24.6	8.7	43.6	.413	686
.065	.619	72.7	19.7	9.17		.938		.483					43.1	9.9	40.2	.217	576
.063	.602	72.6	20.3	9.41		.868		.450					74.0	9.9	22.2	.070	279
			(25)														
.066	.635	74.0	24.4	9.04		.922		.487					12.8	7.7	43.8	.665	634
.065	.650	76.2	24.6	9.12		.904		.472					25.6	7.9	42.2	.313	593
.065	.641	75.7	24.8	9.20		.946		.478					44.8	9.5	40.5	.172	585
.066	.642	73.7	24.1	8.95		.924		.485					76.8	8.4	22.6	.058	276
			(30)														
.067	.663	75.4	28.7	8.89		.929		.480					13.2	7.4	39.7	.509	560
.064	.637	75.8	30.0	9.30		.921		.459					26.4	8.9	39.6	.252	532
.066	.656	75.6	29.1	9.01		.906		.474					46.0	8.7	39.5	.144	559
.066	.659	75.7	29.0	8.97		.927		.476					79.0	10.6	22.1	.047	280

[a] Lengths are for the actual test specimens for which c = 3.75 approximately.

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TABLE 4

TEST DATA AND PROPORTIONS OF SPECIMENS HAVING $\frac{t_W}{t_S} = 1.00$

[Nominal proportions are given in parentheses]

(a) 24S-T SHEET AND STIFFENERS

Proportions of test specimens														Test data			
t_W (in.)	$\frac{t_W}{t_S}$	$\frac{b_S}{t_S}$	$\frac{b_W}{t_W}$	$\frac{b_A}{t_W}$	$\frac{b_W}{b_Y}$	$\frac{t_W}{t_L}$	$\frac{b_W}{b_L}$	$\frac{t_W}{t_F}$	$\frac{b_W}{b_F}$	$\frac{r}{t_W}$	$\frac{d}{t_S}$	$\frac{p}{t_S}$	$\frac{L}{b_W}$ (a)	σ_{cr} (ksi)	$\bar{\sigma}_f$ (ksi)	$\frac{P_1}{L/\sqrt{c}}$ $\left(\frac{\text{kips/in.}}{\text{in.}}\right)$	$\bar{\epsilon}_f$
(0.064)	(1.00)	(25)	(20)	(9.3)	(0.96)	(0.94)	(1.07)	(0.47)	(1.44)	(1)	(2.44)	(7.8)					
0.067	1.035	23.4	19.0	8.83		0.939		.500					13.9		42.4	.966	567×10^{-5}
.063	.981	23.4	20.2	9.37		.916		.482					29.5		41.2	.433	497
.068	1.080	24.8	18.9	9.49		.944		.504					50.9		33.9	.206	342
.069	1.099	25.1	18.6	8.63		1.006		.508					87.6		21.2	.073	209
			(25)														
.068	1.045	22.9	23.7	8.79		.942		.496					14.7	35.6	39.1	.713	590
.067	1.028	23.0	23.9	8.87		.938		.494					29.3		38.8	.352	490
.066	1.059	22.9	24.1	8.95		.935		.490					51.3		35.4	.183	336
.067	1.065	23.4	24.0	8.91		.930		.499					87.9		23.4	.070	227
		(35)	(20)														
.067	1.039	32.3	19.1	8.89		.949		.499					13.5	38.5	41.1	.843	505
.068	1.027	32.3	18.9	8.77		.942		.506					28.9		39.9	.384	455
.063	.946	34.9	20.2	9.37		.903		.474					50.7		35.1	.189	355
.067	1.075	32.9	19.0	8.84		1.006		.497					87.1		21.4	.065	245
			(25)														
.067	1.028	33.1	24.0	8.89		.941		.492					14.6	37.9	39.1	.639	612
.067	1.047	32.6	23.9	8.88		.953		.494					29.2		38.5	.312	447
.067	1.059	33.5	24.0	8.89		.940		.488					51.1		34.7	.158	349
.066	1.064	33.7	24.1	8.95		.925		.496					87.5		24.3	.064	235
			(30)														
.064	0.971	35.2	29.9	9.25		.958		.467					14.7	33.3	37.6	.536	440
.066	1.003	35.1	29.2	9.05		.988		.477					29.3	32.8	36.1	.257	385
.063	.972	35.6	30.3	9.37		.935		.461					51.3	33.2	33.9	.138	357
.064	1.021	35.6	30.0	9.28		.930		.459					88.0		22.7	.053	218
		(50)	(20)														
.067	1.052	46.8	19.1	8.85		.940		.501					14.4	25.7	38.7	.646	613
.063	.960	49.8	20.3	9.44		.897		.473					28.6	28.1	37.1	.308	521
.065	1.030	48.7	19.8	9.18		.934		.480					50.1	27.6	32.2	.151	359
.067	1.032	47.0	19.1	8.87		.938		.499					86.0		21.3	.059	215
			(25)														
.067	1.032	47.0	24.0	8.89		.933		.487					14.5	25.5	37.0	.532	630
.063	1.023	46.7	23.7	8.79		.931		.498					28.9	27.8	36.3	.261	649
.065	1.020	48.6	24.3	9.01		.939		.483					50.7	27.2	32.3	.130	312
.066	1.025	47.9	24.4	9.05		.945		.486					86.9		22.3	.052	227
			(30)														
.068	1.061	46.3	28.2	8.74		.952		.488					14.5	23.2	35.3	.448	363
.067	1.039	46.6	28.6	8.85		.974		.484					29.2	24.4	34.7	.221	450
.065	1.008	48.2	29.3	9.08		.960		.475					50.7	27.8	31.9	.115	325
.063	1.002	50.0	30.4	9.43		.957		.463					87.6		21.9	.044	205
		(75)	(20)														
.068	1.023	69.6	18.9	8.77		.938		.505					13.8	10.0	34.2	.513	625
.067	1.026	71.1	19.1	8.85		.941		.503					26.5	12.9	34.5	.268	505
.064	1.002	73.9	20.0	9.28		.914		.478					48.9	12.5	29.2	.121	343
.066	1.023	72.0	19.2	8.93		.927		.503					84.0	13.5	19.5	.048	207
			(25)														
.068	1.010	70.5	23.7	8.80		.932		.494					14.3	11.5	34.2	.430	520
.067	1.020	70.7	23.9	8.88		.984		.492					28.4	11.9	33.0	.206	490
.067	1.040	72.0	23.9	8.88		.956		.490					49.8	12.2	29.6	.104	337
.067	1.042	71.6	24.0	8.89		.990		.488					85.5	12.8	20.0	.041	210
			(30)														
.063	.972	74.8	30.3	9.40		.921		.462					14.4	10.5	31.7	.340	496
.064	.980	73.8	29.7	9.21		.979		.470					28.6	13.1	32.8	.178	381
.066	1.002	72.1	29.2	9.04		.963		.477					50.5	12.6	29.5	.092	323
.062	.986	76.6	30.8	9.53		.947		.454					86.5	11.8	20.5	.036	209

[a] Lengths are for the actual test specimens for which c = 3.75 approximately.

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TABLE 4. – Concluded

TEST DATA AND PROPORTIONS OF SPECIMENS HAVING $\frac{t_W}{t_S} = 1.00$ – Concluded

(b) ALCLAD 75S-T SHEET AND 75S-T STIFFENERS

Proportions of test specimens														Test data			
t_W	$\frac{t_W}{t_S}$	$\frac{b_S}{t_S}$	$\frac{b_W}{t_W}$	$\frac{b_A}{t_W}$	$\frac{b_W}{b_Y}$	$\frac{t_W}{t_L}$	$\frac{b_W}{b_L}$	$\frac{t_W}{t_F}$	$\frac{b_W}{b_F}$	$\frac{r}{t_W}$	$\frac{d}{t_S}$	$\frac{p}{t_S}$	$\frac{L}{b_W}$ (a)	σ_{cr} (ksi)	$\bar{\sigma}_f$ (ksi)	$\frac{P_1}{L/\sqrt{c}}$ $\left(\frac{\text{kips/in.}}{\text{in.}}\right)$	$\bar{\varepsilon}_f$
(0.064)	(1.00)	(25)	(20)	(9.3)	(0.96)	(0.94)	(1.07)	(0.47)	(1.44)	(1)	(2.44)	(7.8)					
0.064	1.003	24.5	20.0	9.31		0.876		0.452					14.6	60.8	64.0	1.350	615×10^{-5}
.063	1.002	24.8	20.3	9.43		.933		.475					29.2	61.1	61.6	.638	593
.064	1.019	24.9	19.9	9.24		.927		.484					50.9	56.2	58.0	.345	551
.065	1.027	24.2	19.7	9.14		.939		.491					87.6	----	25.3	.087	237
.065	.949	24.0	(25) 24.6	9.14		.902		.479					14.7	48.9	57.4	1.048	583
.064	.973	23.6	24.9	9.24		.921		.471					29.4	42.4	58.7	.533	600
.065	.991	24.2	24.7	9.18		.907		.477					51.3	----	52.9	.269	524
.062	.955	(35) 34.3	(20) 20.8	9.66		.833		.467					14.5	47.7	58.3	1.095	650
.064	.997	34.5	20.0	9.30		.896		.455					29.0	48.7	56.6	.534	547
.065	1.006	34.2	19.8	9.18		.945		.481					50.7	45.6	52.3	.278	497
.064	.998	34.1	20.1	9.35		.946		.461					87.1	----	25.9	.081	249
.064	1.013	34.8	(25) 25.0	9.27		.912		.478					14.6	42.4	54.8	.877	592
.065	.989	33.7	24.8	9.21		.936		.477					29.2	44.7	53.9	.429	542
.066	1.027	35.1	24.4	9.07		.928		.483					51.1	47.4	49.4	.223	522
.065	1.008	33.6	(30) 29.3	9.08		.901		.471					14.7	33.3	48.3	.690	560
.065	1.011	34.4	29.4	9.10		.903		.468					29.3	27.5	48.3	.343	520
.065	1.019	34.5	29.6	9.15		.896		.468					51.3	26.2	44.7	.179	457
.061	.944	(50) 48.8	(20) 21.0	9.74		.852		.429					14.3	23.3	55.6	.925	704
.062	.967	49.1	20.6	9.58		.858		.453					28.6	25.3	57.0	.475	541
.062	.963	48.9	20.5	9.52		.927		.466					50.2	23.7	50.1	.235	524
.062	.946	48.5	20.7	9.61		.858		.452					86.0	21.6	24.8	.069	255
.065	.951	45.9	(25) 24.5	9.08		.910		.483					14.5	25.7	53.1	.769	666
.065	.986	48.3	24.7	9.18		.956		.485					29.2	24.3	50.6	.356	551
.063	.952	47.4	25.2	9.37		.922		.470					50.7	24.8	48.5	.197	511
.064	.949	47.5	25.2	9.35		.968		.461					87.0	23.3	24.8	.058	250
.065	1.014	50.2	(30) 29.7	9.21		.896		.482					14.6	23.8	47.1	.586	517
.064	1.022	50.3	29.9	9.25		.908		.462					29.1	21.9	45.9	.286	503
.065	1.002	49.1	29.7	9.21		.901		.463					50.6	21.9	44.3	.161	465
.063	.989	49.8	30.5	9.46		.904		.454					87.4	23.3	24.9	.051	260
.062	.960	(75) 74.2	(20) 20.7	9.63		.848		.437					14.0	9.2	49.3	.717	638
.061	.953	74.6	21.1	9.82		.833		.427					28.0	11.9	49.6	.360	593
.067	1.059	75.2	19.1	8.88		.964		.499					48.9	11.1	46.9	.194	581
.062	.967	74.6	20.8	9.64		.866		.436					84.1	13.4	22.9	.055	236
.064	.933	70.4	(25) 25.1	9.32		.974		.471					14.3	11.7	47.7	.590	839
.064	1.002	74.5	25.0	9.28		.910		.472					28.5	10.4	47.2	.289	558
.064	.961	71.6	25.1	9.32		.967		.460					49.8	11.7	43.8	.155	543
.064	.973	71.7	24.9	9.25		.946		.461					84.2	12.0	23.2	.049	260
.067	1.026	73.3	(20) 28.8	8.93		.921		.479					14.4	11.1	43.5	.477	545
.064	1.005	73.9	29.8	9.22		.887		.462					28.8	10.7	42.6	.232	539
.066	1.022	74.3	29.2	9.04		.907		.472					50.4	11.8	43.4	.133	489
.060	.926	73.0	31.8	9.83		.878		.442					86.5	11.6	22.9	.041	258

[a] Lengths are for the actual test specimens for which c = 3.75 approximately.

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TABLE 5.- COMPARATIVE DESIGNS OF Y- AND Z-STIFFENED PANELS [P_1 = 2.0 kips/inch; c = 1; minimum-weight designs in parentheses]

	$\frac{t_W}{t_S}$	Panel	L = 10 in. t_S, in. 0.013	0.016	0.020	0.025	0.032	0.040	0.051	0.064	0.081	L = 20 in. t_S, in. 0.020	0.025	0.032	0.040	0.051	0.064	0.081	0.102	0.125
$\bar{\sigma}_f$ (ksi)	0.40	Y 75S-T					(42.6)	(37.0)	(30.8)	(25.5)	(20.9)				30.0	(28.3)	(23.9)	(19.8)	(16.4)	
		Y 24S-T						(33.6)	(29.5)	(25.0)	(20.7)					(27.2)	(23.4)	(19.6)	(16.4)	
	.51	Z 24S-T							(29.4)	(25.2)	(21.1)						(23.3)	(19.9)	(16.7)	(14.2)
		Y 75S-T				(44.9)	40.1	35.2	30.0					31.0	31.2	26.9	22.8	19.4		
		Y 24S-T					(35.0)	32.1	28.0	23.8					(29.0)	26.1	22.6	19.2		
	.63	Z 24S-T						(32.4)	28.4	24.5						(25.0)	22.9	19.9	16.4	
		Y 75S-T			(46.4)	44.0	40.2							(33.2)	(31.2)	26.9				
		Y 24S-T				(36.6)	34.2	31.0	27.5					(30.2)	29.2	25.7				
	.79	Z 24S-T					(33.5)	31.2	27.4	24.1					(27.0)	24.9	21.8			
		Y 75S-T		46.9	45.8	43.3							34.9	33.3	29.9					
		Y 24S-T			(36.4)	35.6	32.8	30.2					(30.7)	29.7	27.6					
	1.00	Z 24S-T			(33.4)	(33.9)	32.7	30.2	26.6					(28.5)	26.6	24.4				
		Y 75S-T	(46.8)	(47.1)	45.3							(36.2)	(35.6)	32.2						
		Y 24S-T		(35.7)	36.0	34.4	32.3					(31.1)	30.6	29.3						
σ_{cr} (ksi)	.40	Y 75S-T					(31.1)	(20.2)	(17.2)	(10.8)	(7.6)				30.0	(14.8)	(11.2)	(11.1)	(8.4)	
		Y 24S-T						(33.0)	(21.9)	(16.0)	(8.9)					(24.4)	(13.7)	(11.0)	(9.4)	
	.51	Z 24S-T							(29.4)	(25.2)	(9.7)						(23.3)	(12.7)	(10.6)	(8.1)
		Y 75S-T				(35.0)	23.0	21.0	9.2					31.0	16.6	10.5	8.6	7.2		
		Y 24S-T					(34.8)	25.9	15.3	9.0					(28.5)	14.9	11.9	8.9		
	.63	Z 24S-T						(32.4)	28.3	16.0						(25.0)	15.3	7.8	8.2	
		Y 75S-T			(43.0)	23.1	12.0							(18.8)	(7.5)	7.5				
		Y 24S-T				(36.6)	29.2	19.6	9.9					(30.2)	11.8	8.1				
	.79	Z 24S-T					(33.0)	31.2	18.3	9.9					(27.0)	19.1	10.1			
		Y 75S-T		42.2	27.0	14.0							21.5	9.2	8.0					
		Y 24S-T			(36.4)	31.6	20.1	11.0					(30.7)	16.8	8.7					
	1.00	Z 24S-T			(33.4)	(33.9)	32.0	19.5	11.4					(28.5)	24.0	12.2				
		Y 75S-T	(46.8)	(26.0)	14.1							(18.5)	(9.3)	8.7						
		Y 24S-T		(35.7)	35.5	20.9	9.4					(30.1)	20.4	8.8						
H (in.)	.40	Y 75S-T					(.70)	(.74)	(.68)	(.85)	(1.08)				.97	(1.21)	(1.34)	(1.24)	(1.35)	
		Y 24S-T						(.86)	(.85)	(.85)	(1.08)					(1.21)	(1.38)	(1.43)	(1.35)	
	.51	Z 24S-T							(.70)	(.67)	(1.08)						(1.09)	(1.36)	(1.33)	(1.34)
		Y 75S-T				(.71)	.74	.68	.85					.97	1.21	1.44	1.43	1.35		
		Y 24S-T					(.89)	.91	.98	1.14					(1.21)	1.40	1.43	1.35		
	.63	Z 24S-T						(.68)	.67	.84						(.99)	1.24	1.44	1.34	
		Y 75S-T			(.65)	.76	.83							(1.21)	(1.47)	1.25				
		Y 24S-T				(.89)	.89	.92	1.08					(1.21)	1.52	1.53				
	.79	Z 24S-T					(.70)	.67	.84	1.07					(.99)	1.15	1.58			
		Y 75S-T		.64	.73	.82							1.21	1.33	1.24					
		Y 24S-T			(.83)	.89	.98	1.08					(1.21)	1.45	1.60					
	1.00	Z 24S-T			(.66)	(.69)	.67	.84	1.07					(.94)	1.04	1.33				
		Y 75S-T	(.60)	(.69)	.78							(1.21)	(1.25)	1.09						
		Y 24S-T		(.80)	.80	.96	1.08					(1.21)	1.31	1.49						
S (in.)	.40	Y 75S-T					(.81)	(1.16)	(1.50)	(2.32)	(3.56)				.80	(1.76)	(2.40)	(2.93)	(4.19)	
		Y 24S-T						(.98)	(1.48)	(2.08)	(3.37)					(1.54)	(2.37)	(3.15)	(4.14)	
	.51	Z 24S-T							(1.79)	(2.42)	(5.39)						(2.59)	(4.62)	(6.31)	(8.89)
		Y 75S-T				(.63)	.97	1.20	2.13					.68	1.43	2.22	2.90	3.86		
		Y 24S-T					(.82)	1.19	1.86	2.86					(1.19)	2.02	2.72	3.66		
	.63	Z 24S-T						(1.28)	1.91	3.29						(1.74)	3.43	6.08	7.46	
		Y 75S-T			(.51)	.83	1.37							(1.20)	(2.16)	2.56				
		Y 24S-T				(.66)	.97	1.39	2.30					(1.00)	1.88	2.65				
	.79	Z 24S-T					(1.01)	1.40	2.52	4.46					(1.42)	2.50	4.39			
		Y 75S-T		.42	.69	1.09							1.01	1.70	2.10					
		Y 24S-T			(.53)	.79	1.24	1.90					(.83)	1.46	2.18					
	1.00	Z 24S-T			(.50)	(.78)	1.16	2.02	3.50					(1.22)	1.82	3.34				
		Y 75S-T	(.38)	(.61)	.95							(.95)	(1.43)	1.72						
		Y 24S-T		(.45)	.66	1.04	1.70					(.76)	1.14	1.84						
$\bar{h}$ (in.)	.40	Y 75S-T					(.135)	(.124)	(.100)	(.111)	(.126)				.232	(.214)	(.210)	(.169)	(.165)	
		Y 24S-T						(.180)	(.139)	(.119)	(.130)					(.232)	(.222)	(.198)	(.166)	
	.51	Z 24S-T							(.120)	(.099)	(.125)						(.185)	(.188)	(.158)	(.142)
		Y 75S-T				(.176)	.158	.125	.130					.286	.272	.282	.234	.194		
		Y 24S-T					(.228)	.195	.176	.168					(.302)	.287	.241	.197		
	.63	Z 24S-T						(.146)	.118	.123						(.219)	.210	.189	.160	
		Y 75S-T			(.186)	.188	.167							(.324)	(.318)	.222				
		Y 24S-T				(.262)	.228	.196	.190					(.352)	.360	.299				
	.79	Z 24S-T					(.190)	.149	.155	.159					(.266)	.251	.293			
		Y 75S-T		.211	.212	.202							.375	.347	.267					
		Y 24S-T			(.284)	.267	.254	.229					(.407)	.424	.388					
	1.00	Z 24S-T			(.254)	(.227)	.181	.191	.206					(.294)	.281	.296				
		Y 75S-T	(.221)	(.224)	.225							(.422)	(.371)	.271						
		Y 24S-T		(.308)	.269	.288	.273					(.454)	.438	.429						
ρ (in.)	.40	Y 75S-T					(.227)	(.224)	(.189)	(.220)	(.263)				.346	(.388)	(.405)	(.335)	(.336)	
		Y 24S-T						(.285)	(.255)	(.229)	(.265)					(.402)	(.425)	(.397)	(.337)	
	.51	Z 24S-T							(.216)	(.180)	(.264)						(.338)	(.381)	(.325)	(.282)
		Y 75S-T				(.254)	.255	.214	.248					.375	.430	.491	.441	.383		
		Y 24S-T					(.330)	.315	.315	.326					(.446)	.488	.448	.385		
	.63	Z 24S-T						(.232)	.202	.230						(.344)	.386	.389	.325	
		Y 75S-T			(.240)	.272	.279							(.452)	(.515)	.396				
		Y 24S-T				(.335)	.327	.311	.337					(.462)	.544	.511				
	.79	Z 24S-T					(.262)	.227	.265	.304					(.368)	.400	.514			
		Y 75S-T		.244	.274	.293							.462	.497	.422					
		Y 24S-T			(.324)	.338	.358	.364					(.469)	.558	.573					
	1.00	Z 24S-T			(.260)	(.270)	.247	.292	.347					(.366)	.387	.464				
		Y 75S-T	(.238)	(.266)	.295							(.476)	(.477)	.393						
		Y 24S-T		(.318)	.310	.363	.389					(.480)	.513	.566						
$\frac{b_W}{t_W}$	.40	Y 75S-T					(29.0)	(24.8)	(18.0)	(18.0)	(18.0)				33.0	(33.0)	(29.0)	(20.7)	(18.0)	
		Y 24S-T						(29.0)	(22.7)	(18.0)	(18.0)					(33.0)	(30.0)	(24.0)	(18.0)	
	.51	Z 24S-T							(27.0)	(20.0)	(26.0)						(33.0)	(33.0)	(25.0)	(20.0)
		Y 75S-T				(29.5)	24.8	18.0	18.0					33.0	33.0	31.2	24.0	18.0		
		Y 24S-T					(30.0)	24.5	21.0	19.0					(33.0)	30.4	24.0	18.0		
	.63	Z 24S-T						(26.2)	20.0	20.0						(30.0)	30.0	27.3	20.0	
		Y 75S-T			(27.0)	25.7	22.2							(33.0)	(32.0)	20.9				
		Y 24S-T				(30.0)	24.0	19.6	18.0					(33.0)	33.0	25.8				
	.79	Z 24S-T					(27.0)	20.0	20.0	20.0					(30.0)	27.8	30.0			
		Y 75S-T		26.6	24.6	22.0							33.0	28.9	20.7					
		Y 24S-T			(28.0)	24.0	21.0	18.0					(33.0)	31.5	27.0					
	1.00	Z 24S-T			(32.0)	(26.5)	20.0	20.0	20.0					(28.5)	25.0	25.0				
		Y 75S-T	(25.0)	(23.0)	21.0							(33.0)	(27.0)	18.2						
		Y 24S-T		(27.0)	21.5	20.5	18.0					(33.0)	28.4	25.2						
$\frac{b_S}{t_S}$	.40	Y 75S-T					(36.0)	(46.0)	(49.6)	(63.3)	(78.6)				24.5	(53.5)	(61.5)	(62.0)	(73.0)	
		Y 24S-T						(35.0)	(47.0)	(55.7)	(74.0)					(45.3)	(60.0)	(66.1)	(72.0)	
	.51	Z 24S-T							(35.0)	(37.8)	(66.5)						(40.5)	(57.0)	(61.9)	(71.1)
		Y 75S-T				(32.0)	45.0	48.4	72.1					23.0	52.0	69.0	76.0	83.9		
		Y 24S-T					(33.0)	44.5	60.0	77.0					(40.1)	61.5	70.1	78.7		
	.63	Z 24S-T						(32.0)	37.4	51.4						(34.2)	53.6	75.0	73.1	
		Y 75S-T			(28.8)	46.5	68.0							(50.7)	(84.0)	84.0				
		Y 24S-T				(30.0)	41.8	54.0	75.6					(38.2)	69.6	84.0				
	.79	Z 24S-T					(31.5)	35.0	49.5	69.8					(35.6)	49.0	68.6			
		Y 75S-T		26.7	45.0	65.0							49.6	79.0	84.0					
		Y 24S-T			(26.0)	39.8	57.0	76.0					(34.8)	62.0	82.8					
	1.00	Z 24S-T			(25.0)	(31.0)	36.3	50.6	68.7					(38.0)	45.4	65.4				
		Y 75S-T	(28.2)	(47.5)	68.2							(56.4)	(81.5)	84.0						
		Y 24S-T		(23.0)	39.0	57.0	83.0					(37.0)	57.0	84.0						

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TABLE 5.- COMPARATIVE DESIGNS OF Y- AND Z-STIFFENED PANELS - Concluded

	t_W/t_S	Panel	L = 30 in.									L = 40 in.								
			t_S, in.									t_S, in.								
			0.025	0.032	0.040	0.051	0.064	0.081	0.102	0.125	0.156	0.032	0.040	0.051	0.064	0.081	0.102	0.125	0.156	0.188
$\bar{\sigma}_f$ (ksi)	0.40	Y 75S-T				23.3	(22.5)	(18.9)	(15.8)	(13.3)					19.5	(18.2)	(15.3)	(13.0)	(10.8)	
		Y 24S-T					(22.2)	(18.8)	(15.8)	(13.4)					19.6	(18.1)	(15.2)	(13.0)	(10.8)	
	.51	Z 24S-T					20.9	(19.1)	(16.3)	(13.7)	(11.3)					17.2	(16.0)	(13.5)	(11.2)	(9.4)
		Y 75S-T				24.8	21.6	18.3						20.1	(20.4)	17.5	14.7			
		Y 24S-T				24.3	21.4	18.2						20.1	(20.3)	17.5	14.7			
	.63	Z 24S-T				(23.0)	(21.8)	19.0	15.6	13.4					(19.7)	(17.9)	15.6	12.3		
		Y 75S-T			26.5	(24.5)	21.4							(22.2)	20.1	17.1				
		Y 24S-T			(26.4)	(24.6)	21.2							(23.1)	20.2	17.2				
	.79	Z 24S-T			22.4	22.2	20.6	18.4						(21.0)	19.1	17.6	14.2			
		Y 75S-T		28.1	(26.9)	23.3							(24.0)	21.8	18.9					
		Y 24S-T		26.6	25.9	22.8							(23.8)	21.6	18.8					
	1.00	Z 24S-T		(23.0)	(23.3)	22.3	19.7						(21.2)	19.9	19.4	17.0				
		Y 75S-T	(29.8)	(28.1)	24.8							(25.0)	23.0	20.1						
		Y 24S-T	(27.1)	(27.0)	24.3							(24.3)	22.7	18.8						
σ_{cr} (ksi)	.40	Y 75S-T				23.3	(14.5)	(10.8)	(10.2)	(8.5)					19.5	(11.8)	(10.5)	(8.6)	(7.5)	
		Y 24S-T					(19.6)	(13.2)	(11.1)	(9.4)					19.6	(14.8)	(12.0)	(10.4)	(8.3)	
	.51	Z 24S-T					20.9	(16.1)	(10.3)	(10.2)	(8.0)					15.6	(11.0)	(8.3)	(7.5)	(8.2)
		Y 75S-T				16.2	10.4	9.0						20.1	(11.8)	8.5	7.1			
		Y 24S-T				20.3	11.5	9.3						20.1	(14.6)	9.2	8.0			
	.63	Z 24S-T				(23.0)	(16.7)	9.0	7.8	8.3					(19.7)	(9.5)	8.1	12.3		
		Y 75S-T			19.0	(7.7)	7.5							(13.2)	7.5	7.5				
		Y 24S-T			(21.6)	(8.1)	8.1							(11.2)	8.1	8.1				
	.79	Z 24S-T			22.4	22.2	13.6	8.2						(20.0)	16.2	8.4	14.2			
		Y 75S-T		18.1	(8.0)	8.0							(13.1)	8.0	8.0					
		Y 24S-T		26.1	10.9	8.4							(16.1)	8.4	8.4					
	1.00	Z 24S-T		(23.0)	(23.3)	13.2	14.8						(21.2)	19.9	8.9	10.0				
		Y 75S-T	(16.7)	(8.7)	8.7							(11.8)	8.7	8.7						
		Y 24S-T	(26.4)	(11.4)	8.8							(15.8)	8.8	14.7						
H (in.)	.40	Y 75S-T				1.21	(1.52)	(1.69)	(1.68)	(1.72)					1.52	(1.94)	(2.00)	(2.20)	(2.16)	
		Y 24S-T					(1.52)	(1.70)	(1.68)	(1.72)					1.52	(1.94)	(2.00)	(2.10)	(2.16)	
	.51	Z 24S-T					1.31	(1.42)	(1.58)	(1.66)	(1.70)					2.04	(1.84)	(1.98)	(2.11)	(2.14)
		Y 75S-T				1.52	1.77	1.64						1.52	(1.94)	2.15	2.21			
		Y 24S-T				1.52	1.77	1.74						1.52	(1.94)	2.12	2.15			
	.63	Z 24S-T				(1.31)	(1.40)	1.73	1.89	1.70					(1.64)	(2.09)	1.98	1.70		
		Y 75S-T			1.52	(1.86)	1.62							(1.94)	2.18	1.98				
		Y 24S-T			(1.52)	(1.86)	1.68							(1.94)	2.07	1.94				
	.79	Z 24S-T			1.15	1.44	1.58	1.66						(1.64)	1.79	1.98	1.70			
		Y 75S-T		1.52	(1.78)	1.58							(1.94)	1.98	1.91					
		Y 24S-T		1.52	1.81	1.72							(1.94)	2.03	1.96					
	1.00	Z 24S-T		(1.31)	(1.24)	1.58	1.34						(1.48)	1.55	1.92	1.70				
		Y 75S-T	(1.52)	(1.62)	1.54							(1.94)	1.93	1.77						
		Y 24S-T	(1.52)	(1.69)	1.60							(1.94)	1.99	1.72						
B (in.)	.40	Y 75S-T				.99	(2.20)	(3.10)	(3.93)	(5.12)					1.41	(3.04)	(3.97)	(5.24)	(6.77)	
		Y 24S-T					(2.08)	(3.03)	(3.93)	(5.10)					1.44	(2.97)	(3.93)	(4.99)	(6.77)	
	.51	Z 24S-T					2.12	(4.05)	(6.60)	(8.14)	(11.1)					3.84	(6.22)	(8.81)	(11.6)	(13.3)
		Y 75S-T				1.85	2.84	3.53						1.15	(2.60)	3.82	5.01			
		Y 24S-T				1.76	2.78	3.64						1.15	(2.59)	3.77	4.90			
	.63	Z 24S-T				(1.84)	(3.20)	5.59	7.65	9.05					(2.70)	(5.35)	7.52	5.69		
		Y 75S-T			1.49	(2.72)	3.24							(2.22)	3.40	4.07				
		Y 24S-T			(1.47)	(2.74)	3.25							(2.45)	3.37	3.98				
	.79	Z 24S-T			1.12	2.30	3.68	6.08						(2.27)	3.40	6.05	5.73			
		Y 75S-T		1.37	(2.26)	2.68							(1.96)	2.79	3.33					
		Y 24S-T		1.22	2.13	2.72							(1.90)	2.81	3.36					
	1.00	Z 24S-T		(1.15)	(1.64)	3.16	3.69						(1.64)	2.47	4.80	5.84				
		Y 75S-T	(1.24)	(1.92)	2.20							(1.82)	2.32	2.75						
		Y 24S-T	(1.08)	(1.82)	2.22							(1.69)	2.33	2.35						
$\bar{h}$ (in.)	.40	Y 75S-T				.298	(.267)	(.257)	(.232)	(.203)					.351	(.322)	(.293)	(.280)	(.246)	
		Y 24S-T					(.276)	(.263)	(.232)	(.204)					.346	(.326)	(.295)	(.273)	(.246)	
	.51	Z 24S-T					.276	(.217)	(.193)	(.191)	(.178)					.391	(.248)	(.229)	(.228)	(.220)
		Y 75S-T				.342	.331	.276						.441	(.404)	.386	.340			
		Y 24S-T				.352	.336	.287						.441	(.405)	.381	.332			
	.63	Z 24S-T				(.326)	(.264)	.262	.253	.202					(.373)	(.362)	.282	.264		
		Y 75S-T			.406	(.399)	.294							(.478)	.454	.350				
		Y 24S-T			(.407)	(.398)	.309							(.452)	.419	.341				
	.79	Z 24S-T			.371	.372	.327	.264						(.455)	.414	.350	.289			
		Y 75S-T		.464	(.450)	.349							(.549)	.485	.406					
		Y 24S-T		.488	.474	.397							(.559)	.505	.424					
	1.00	Z 24S-T		(.486)	(.384)	.400	.284						(.498)	.453	.430	.318				
		Y 75S-T	(.518)	(.479)	.408							(.633)	.562	.449						
		Y 24S-T	(.548)	(.522)	.432							(.651)	.583	.462						
ρ (in.)	.40	Y 75S-T				.442	(.486)	(.501)	(.465)	(.411)					.543	(.603)	(.583)	(.574)	(.504)	
		Y 24S-T					(.494)	(.510)	(.465)	(.412)					.540	(.606)	(.584)	(.551)	(.504)	
	.51	Z 24S-T					.453	(.422)	(.408)	(.396)	(.355)					.687	(.511)	(.491)	(.474)	(.440)
		Y 75S-T				.546	.587	.504						.592	(.670)	.704	.661			
		Y 24S-T				.551	.590	.541						.592	(.670)	.694	.640			
	.63	Z 24S-T				(.481)	(.460)	.513	.519	.407					(.585)	(.666)	.565	.477		
		Y 75S-T			.566	(.645)	.520							(.705)	.750	.625				
		Y 24S-T			(.567)	(.646)	.544							(.692)	.703	.610				
	.79	Z 24S-T			.449	.535	.537	.498						(.625)	.637	.632	.514			
		Y 75S-T		.587	(.648)	.549							(.725)	.720	.647					
		Y 24S-T		.593	.664	.611							(.729)	.744	.668					
	1.00	Z 24S-T		(.527)	(.482)	.581	.454						(.586)	.602	.675	.546				
		Y 75S-T	(.594)	(.619)	.566							(.754)	.735	.639						
		Y 24S-T	(.598)	(.651)	.594							(.758)	.759	.632						
$\frac{b_W}{t_W}$	.40	Y 75S-T				33.0	(33.0)	(28.6)	(22.6)	(18.0)					33.0	(33.0)	(27.0)	(23.2)	(18.0)	
		Y 24S-T					(33.0)	(28.8)	(22.6)	(18.0)					33.0	(33.0)	(27.0)	(22.2)	(18.0)	
	.51	Z 24S-T					40.0	(34.5)	(30.0)	(25.0)	(20.0)					50.0	(35.0)	(30.0)	(25.0)	(20.0)
		Y 75S-T				33.0	30.0	22.0						33.0	(33.0)	29.1	23.3			
		Y 24S-T				33.0	30.0	23.4						33.0	(33.0)	28.7	22.7			
	.63	Z 24S-T				(40.0)	(34.0)	33.0	28.5	20.0					(40.0)	(40.0)	30.0	20.0		
		Y 75S-T			33.0	(31.5)	21.7							(33.0)	29.5	20.8				
		Y 24S-T			(33.0)	(31.6)	22.5							(33.0)	28.0	20.4				
	.79	Z 24S-T			35.0	35.0	30.0	24.9						(40.0)	34.0	30.0	20.0			
		Y 75S-T		33.0	(30.2)	21.1							(33.0)	26.7	20.0					
		Y 24S-T		33.0	30.6	23.1							(33.0)	27.5	20.6					
	1.00	Z 24S-T		(40.0)	(30.0)	30.0	20.0						(36.0)	30.0	29.0	20.0				
		Y 75S-T	(33.0)	(27.4)	20.6							(33.0)	26.1	18.5						
		Y 24S-T	(33.0)	(28.6)	21.5							(33.0)	26.9	18.0						
$\frac{b_S}{t_S}$	.40	Y 75S-T				24.0	(54.0)	(63.0)	(66.0)	(72.3)					28.9	(59.5)	(65.0)	(72.0)	(77.2)	
		Y 24S-T					(50.3)	(61.0)	(66.0)	(72.0)					29.7	(57.9)	(64.1)	(68.5)	(77.2)	
	.51	Z 24S-T					33.2	(50.0)	(64.7)	(65.1)	(71.2)					47.4	(61.0)	(70.5)	(74.3)	(70.7)
		Y 75S-T				54.0	70.7	73.5						26.0	(61.8)	77.0	84.0			
		Y 24S-T				50.4	68.8	75.5						26.0	(61.5)	76.0	82.0			
	.63	Z 24S-T				(36.0)	(50.0)	69.0	75.0	72.4					(42.2)	(66.1)	73.7	45.5		
		Y 75S-T			50.5	(83.0)	84.0							(62.6)	84.0	84.0				
		Y 24S-T			(50.0)	(84.0)	84.0							(71.5)	84.0	84.0				
	.79	Z 24S-T			28.0	45.0	57.4	75.0						(44.6)	53.0	74.7	56.1			
		Y 75S-T		56.0	(84.0)	84.0							(67.0)	84.0	84.0					
		Y 24S-T		46.7	77.0	84.0							(63.5)	84.0	84.0					
	1.00	Z 24S-T		(35.8)	(40.9)	62.0	57.7						(41.0)	48.4	75.0	72.0				
		Y 75S-T	(61.2)	(84.0)	84.0							(74.5)	84.0	84.0						
		Y 24S-T	(46.8)	(77.5)	84.0							(66.5)	84.0	68.7						

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TABLE 6 .- COMPARATIVE DESIGNS OF Y- AND Z-STIFFENED PANELS [P_1 = 3.0 kips/inch; c = 1; minimum-weight designs in parentheses]

	$\frac{t_W}{t_S}$	Panel	L = 10 in.									L = 20 in.								
			t_S, in.									t_S, in.								
			0.020	0.025	0.032	0.040	0.051	0.064	0.081	0.102	0.125	0.025	0.032	0.040	0.051	0.064	0.081	0.102	0.125	0.156
$\bar{\sigma}_f$ (ksi)	0.40	Y 75S-T				(49.5)	(43.1)	(36.8)	(30.2)	(25.0)					(39.4)	(34.1)	(28.4)	(23.9)	(20.0)	
		Y 24S-T					(38.0)	(33.9)	(29.1)	(24.4)	(20.3)					(31.4)	(27.6)	(23.4)	(19.9)	
	.51	Z 24S-T						(33.5)	(29.8)	(24.9)	(21.2)						(28.0)	(23.6)	(20.2)	(16.9)
		Y 75S-T			(52.2)	47.5	41.3	35.5						(40.4)	36.8	32.2	27.5			
		Y 24S-T				(39.4)	36.1	32.0	27.7						(33.0)	30.0	26.3	22.5		
	.63	Z 24S-T					35.1	33.2	28.2	24.3						(30.5)	26.6	23.1	19.9	
		Y 75S-T		(54.5)	51.4	46.9	41.0						41.3	40.0	37.3	33.2				
		Y 24S-T			(40.9)	38.1	34.4	30.9						(34.5)	32.4	29.3	25.9			
	.79	Z 24S-T				36.5	(35.6)	31.4	27.2						(32.3)	29.0	25.8	22.8		
		Y 75S-T		53.2	49.6	45.3						41.0	41.3	39.9	36.2					
		Y 24S-T			38.7	36.2	33.3						(34.1)	33.3	30.9	28.4				
	1.00	Z 24S-T			(37.3)	(36.9)	33.3	29.8						(32.0)	30.3	28.3	25.6			
		Y 75S-T	(54.4)	52.4	47.5							(42.0)	(41.5)	38.8						
		Y 24S-T		(39.0)	37.4	35.2						(33.4)	34.0	32.6	30.2					
σ_{cr} (ksi)	.40	Y 75S-T				(42.5)	(26.0)	(18.5)	(10.9)	(7.7)					(27.0)	(16.5)	(16.9)	(13.2)	(8.7)	
		Y 24S-T					(38.0)	(31.4)	(19.8)	(10.5)	(7.2)					(28.5)	(20.1)	(18.4)	(10.1)	
	.51	Z 24S-T						(33.5)	(24.3)	(15.9)	(9.4)						(28.0)	(17.9)	(17.5)	(9.6)
		Y 75S-T			(52.2)	36.0	17.8	10.7						(32.5)	20.1	11.7	10.5			
		Y 24S-T				(39.4)	34.1	26.4	13.1						(33.0)	22.7	20.1	9.9		
	.63	Z 24S-T					35.1	32.0	21.0	10.0						(30.5)	20.0	11.0	9.7	
		Y 75S-T		(53.7)	37.0	17.2	9.1						32.7	20.2	10.0	7.5				
		Y 24S-T			(40.5)	36.8	26.7	14.5						(34.5)	22.3	13.7	9.1			
	.79	Z 24S-T				36.5	(34.1)	23.5	13.8						(32.3)	24.0	19.0	8.2		
		Y 75S-T		48.1	21.5	10.4						33.2	23.4	12.5	8.0					
		Y 24S-T			36.8	34.2	16.1						(34.1)	26.8	15.0	10.4				
	1.00	Z 24S-T			(37.0)	(36.9)	25.4	15.8						(31.9)	29.0	19.6	8.9			
		Y 75S-T	(48.0)	22.7	9.9							(26.1)	(12.6)	8.7						
		Y 24S-T		(39.0)	34.0	16.2						(33.4)	30.8	15.5	10.0					
H (in.)	.40	Y 75S-T				(.77)	(.82)	(.85)	(1.08)	(1.35)					(1.22)	(1.33)	(1.25)	(1.35)	(1.72)	
		Y 24S-T					(1.00)	(.98)	(1.08)	(1.35)	(1.72)					(1.52)	(1.52)	(1.35)	(1.72)	
	.51	Z 24S-T						(.87)	(.88)	(1.07)	(1.34)						(1.04)	(1.40)	(1.34)	(1.70)
		Y 75S-T			(.64)	.76	.85	1.08						(1.22)	1.33	1.54	1.48			
		Y 24S-T				(1.01)	1.05	1.08	1.35						(1.52)	1.60	1.35	1.72		
	.63	Z 24S-T					.83	.84	1.07	1.34						(1.18)	1.43	1.72	1.70	
		Y 75S-T		(.72)	.77	.91	1.08						1.22	1.43	1.57	1.40				
		Y 24S-T			(1.00)	1.07	1.20	1.35						(1.52)	1.67	1.79	1.72			
	.79	Z 24S-T				.85	(.84)	1.07	1.34						(1.13)	1.32	1.34	1.72		
		Y 75S-T		.72	.85	1.08						1.17	1.38	1.53	1.38					
		Y 24S-T			1.08	1.08	1.35						(1.52)	1.66	1.83	1.72				
	1.00	Z 24S-T			(.83)	(.84)	1.07	1.34						(1.24)	1.20	1.34	1.78			
		Y 75S-T	(.68)	.85	1.08							(1.32)	(1.43)	1.35						
		Y 24S-T		(.69)	1.08	1.35						(1.28)	1.46	1.73	1.72					
s (in.)	.40	Y 75S-T				(.82)	(1.31)	(1.84)	(2.91)	(4.34)					(1.36)	(2.02)	(2.44)	(3.44)	(5.08)	
		Y 24S-T					(1.04)	(1.51)	(2.40)	(3.95)	(5.78)					(1.74)	(2.51)	(3.12)	(4.95)	
	.51	Z 24S-T						(1.73)	(3.24)	(5.16)	(8.46)						(2.83)	(4.89)	(6.09)	(10.5)
		Y 75S-T			(.60)	.99	1.61	2.58						(1.01)	1.68	2.46	3.30			
		Y 24S-T				(.82)	1.24	1.80	3.13						(1.39)	2.07	2.56	4.33		
	.63	Z 24S-T					1.28	2.19	3.70	6.73						(2.24)	3.73	6.37	8.55	
		Y 75S-T		(.53)	.85	1.40	2.33						.85	1.44	2.36	3.17				
		Y 24S-T			(.70)	1.00	1.57	2.48						(1.14)	1.81	2.68	3.79			
	.79	Z 24S-T				1.00	(1.66)	2.78	4.71						(1.75)	2.69	3.98	7.65		
		Y 75S-T		.67	1.11	1.90						.67	1.21	1.90	2.62					
		Y 24S-T			.86	1.16	2.07						(.96)	1.46	2.30	3.09				
	1.00	Z 24S-T			(.84)	(1.29)	2.21	3.68						(1.41)	1.98	3.24	6.08			
		Y 75S-T	(.59)	.97	1.67							(.98)	(1.63)	2.15						
		Y 24S-T		(.69)	1.06	1.74						(.71)	1.18	1.90	2.68					
$\bar{h}$ (in.)	.40	Y 75S-T				(.163)	(.142)	(.128)	(.142)	(.162)					(.250)	(.235)	(.193)	(.186)	(.204)	
		Y 24S-T					(.219)	(.177)	(.159)	(.171)	(.190)					(.310)	(.252)	(.197)	(.208)	
	.51	Z 24S-T						(.158)	(.128)	(.136)	(.145)						(.173)	(.196)	(.172)	(.183)
		Y 75S-T			(.167)	.166	.154	.167						(.329)	.315	.292	.238			
		Y 24S-T				(.279)	.245	.207	.216						(.399)	.343	.245	.258		
	.63	Z 24S-T					.200	.155	.167	.169						(.252)	.253	.248	.208	
		Y 75S-T		(.212)	.196	.192	.189						.381	.379	.331	.237				
		Y 24S-T			(.314)	.295	.276	.261						(.462)	.426	.384	.296			
	.79	Z 24S-T				.250	(.195)	.211	.223						(.296)	.296	.247	.246		
		Y 75S-T		.209	.215	.229						.419	.430	.387	.288					
		Y 24S-T			.346	.293	.317						(.538)	.496	.475	.363				
	1.00	Z 24S-T			(.284)	(.240)	.265	.285						(.409)	.333	.306	.330			
		Y 75S-T	(.222)	.245	.274							(.461)	(.422)	.339						
		Y 24S-T		(.344)	.333	.373						(.492)	.478	.519	.437					
ρ (in.)	.40	Y 75S-T				(.262)	(.253)	(.238)	(.280)	(.331)					(.415)	(.425)	(.363)	(.360)	(.414)	
		Y 24S-T					(.348)	(.309)	(.299)	(.343)	(.394)					(.518)	(.461)	(.372)	(.416)	
	.51	Z 24S-T						(.248)	(.237)	(.259)	(.288)						(.311)	(.384)	(.323)	(.363)
		Y 75S-T			(.236)	.261	.269	.315						(.458)	.500	.510	.447			
		Y 24S-T				(.384)	.378	.349	.403						(.576)	.556	.429	.484		
	.63	Z 24S-T					.278	.260	.304	.337						(.404)	.448	.487	.415	
		Y 75S-T		(.268)	.281	.304	.336						.471	.534	.538	.427				
		Y 24S-T			(.387)	.399	.418	.439						(.583)	.615	.615	.528			
	.79	Z 24S-T				.326	(.291)	.345	.402						(.418)	.459	.422	.478		
		Y 75S-T		.267	.306	.362						.459	.540	.556	.467					
		Y 24S-T			.422	.393	.476						(.603)	.629	.674	.578				
	1.00	Z 24S-T			(.327)	(.315)	.383	.454						(.488)	.447	.467	.574			
		Y 75S-T	(.262)	.316	.390							(.519)	(.542)	.485						
		Y 24S-T		(.383)	.412	.496						(.509)	.569	.661	.621					
$\frac{b_W}{t_W}$	.40	Y 75S-T				(26.1)	(21.9)	(18.0)	(18.0)	(18.0)					(33.0)	(28.9)	(21.0)	(18.0)	(18.0)	
		Y 24S-T					(27.0)	(21.0)	(18.0)	(18.0)	(18.0)					(33.0)	(25.6)	(18.0)	(18.0)	
	.51	Z 24S-T						(23.5)	(21.0)	(20.0)	(20.0)						(25.0)	(26.5)	(20.0)	(20.0)
		Y 75S-T			(21.5)	20.2	18.0	18.0						(33.0)	30.0	26.0	19.7			
		Y 24S-T				(27.4)	22.5	18.0	18.0						(33.0)	27.0	18.0	18.0		
	.63	Z 24S-T					25.0	20.0	20.0	20.0						(28.5)	27.0	26.0	20.0	
		Y 75S-T		(24.0)	20.7	19.3	18.0						33.0	31.1	26.4	18.6				
		Y 24S-T			(27.0)	23.0	20.0	18.0						(33.0)	28.3	24.0	18.0			
	.79	Z 24S-T				25.6	(20.0)	20.0	20.0						(27.3)	25.0	20.0	20.2		
		Y 75S-T		19.2	18.0	18.0						31.9	30.0	25.8	18.4					
		Y 24S-T			23.3	18.0	18.0						(33.0)	28.0	24.6	18.0				
	1.00	Z 24S-T			(25.0)	(20.0)	20.0	20.0						(30.0)	22.5	20.0	21.0			
		Y 75S-T	(18.2)	18.0	18.0							(28.5)	(24.0)	18.0						
		Y 24S-T		(21.0)	18.0	18.0						(27.7)	24.5	23.3	18.0					
$\frac{b_S}{t_S}$	.40	Y 75S-T				(28.5)	(40.5)	(48.5)	(62.6)	(75.9)					(38.0)	(49.5)	(50.0)	(58.2)	(71.7)	
		Y 24S-T					(27.8)	(36.8)	(49.9)	(68.3)	(82.9)					(39.1)	(49.5)	(51.9)	(69.6)	
	.51	Z 24S-T						(27.0)	(40.0)	(50.6)	(67.7)						(35.0)	(48.0)	(48.7)	(67.1)
		Y 75S-T			(23.6)	35.5	51.7	68.9						(30.9)	48.4	61.0	69.0			
		Y 24S-T				(24.4)	35.0	44.5	65.8						(35.4)	48.3	51.5	73.2		
	.63	Z 24S-T					25.0	34.2	45.7	66.0						(35.0)	46.0	62.5	68.4	
		Y 75S-T		(23.0)	37.0	54.5	76.7						28.8	49.0	72.5	84.0				
		Y 24S-T			(23.0)	32.0	45.5	63.0						(32.5)	49.5	65.3	78.9			
	.79	Z 24S-T				25.0	(32.6)	43.5	58.1						(34.2)	42.1	49.1	75.0		
		Y 75S-T		33.5	51.5	76.4						23.0	47.4	70.0	84.0					
		Y 24S-T			31.5	39.6	62.7						(29.3)	46.0	66.5	78.0				
	1.00	Z 24S-T			(26.4)	(32.2)	43.3	57.4						(35.2)	38.8	50.6	75.0			
		Y 75S-T	(35.0)	54.1	81.4							(44.3)	(72.0)	84.0						
		Y 24S-T		(28.5)	43.0	65.5						(23.0)	43.5	66.0	81.5					

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TABLE 6.- COMPARATIVE DESIGNS OF Y- AND Z-STIFFENED PANELS - Concluded

	$\frac{t_W}{t_S}$	Panel	L = 30 in.									
			t_S, in.									
			0.025	0.032	0.040	0.051	0.064	0.081	0.102	0.125	0.156	0.188
$\bar{\sigma}_f$ (ksi)	0.40	Y 75S-T					(30.6)	(27.2)	(22.8)	(19.2)	(16.1)	
		Y 24S-T					27.5	(26.4)	(22.4)	(19.1)	(16.1)	
	.51	Z 24S-T						23.5	(22.5)	(19.4)	(16.3)	(14.0)
		Y 75S-T				31.7	30.1	25.6	22.1			
		Y 24S-T					(28.5)	25.2	21.6	18.7		
	.63	Z 24S-T					24.1	(25.1)	22.1	19.0		
		Y 75S-T			32.3	(32.7)	30.4	26.2				
		Y 24S-T				(30.4)	28.3	25.0				
	.79	Z 24S-T				23.0	(26.8)	24.3	21.3			
		Y 75S-T		32.9	34.8	32.5	28.7					
		Y 24S-T			(30.6)	29.4	26.8					
	1.00	Z 24S-T			(24.8)	(28.2)	26.0	23.9				
		Y 75S-T	(33.5)	(36.3)	(35.0)							
		Y 24S-T		(31.0)	30.3	28.3						
σ_{cr} (ksi)	.40	Y 75S-T					(29.9)	(14.8)	(11.6)	(10.5)	(8.0)	
		Y 24S-T					27.5	(18.6)	(13.7)	(10.5)	(9.0)	
	.51	Z 24S-T						23.5	(20.3)	(16.1)	(10.9)	(9.2)
		Y 75S-T				31.7	14.2	10.1	9.0			
		Y 24S-T					(22.2)	13.6	9.2	7.8		
	.63	Z 24S-T					24.1	(24.2)	12.5	11.2		
		Y 75S-T			32.3	(14.7)	7.5	7.5				
		Y 24S-T				(23.7)	10.1	8.1				
	.79	Z 24S-T				23.0	(26.2)	18.8	10.2			
		Y 75S-T		30.1	15.3	8.0	8.0					
		Y 24S-T			(28.2)	14.6	8.4					
	1.00	Z 24S-T			(24.8)	(27.2)	20.0	9.5				
		Y 75S-T	(27.1)	(16.1)	(8.7)							
		Y 24S-T		(30.7)	16.0	8.8						
H (in.)	.40	Y 75S-T					(1.52)	(1.77)	(1.91)	(2.02)	(2.16)	
		Y 24S-T					1.52	(1.94)	(2.05)	(2.28)	(2.16)	
	.51	Z 24S-T						1.45	(1.73)	(1.82)	(2.11)	(2.14)
		Y 75S-T				1.52	1.94	2.06	1.88			
		Y 24S-T					(1.94)	2.15	2.28	2.16		
	.63	Z 24S-T					1.52	(1.58)	1.98	2.10		
		Y 75S-T			1.52	(1.94)	2.05	1.81				
		Y 24S-T				(1.94)	2.43	2.15				
	.79	Z 24S-T				1.64	(1.58)	1.66	2.11			
		Y 75S-T		1.52	1.94	2.05	1.80					
		Y 24S-T			(1.94)	2.19	2.31					
	1.00	Z 24S-T			(1.31)	(1.50)	1.66	2.11				
		Y 75S-T	(1.52)	(1.82)	(1.83)							
		Y 24S-T		(1.74)	2.11	2.16						
S (in.)	.40	Y 75S-T					(1.62)	(2.72)	(3.69)	(4.75)	(6.56)	
		Y 24S-T					1.22	(2.68)	(3.73)	(5.01)	(6.49)	
	.51	Z 24S-T						2.09	(4.59)	(6.25)	(9.66)	(12.9)
		Y 75S-T				1.26	2.46	3.47	4.41			
		Y 24S-T					(2.17)	3.30	4.60	5.92		
	.63	Z 24S-T					1.60	(3.30)	6.02	7.79		
		Y 75S-T			1.02	(2.12)	3.36	4.02				
		Y 24S-T				(1.82)	3.19	4.12				
	.79	Z 24S-T				1.28	(2.56)	3.97	6.93			
		Y 75S-T		.91	1.85	2.81	3.31					
		Y 24S-T			(1.46)	2.42	3.46					
	1.00	Z 24S-T			(1.00)	(2.08)	3.20	4.20				
		Y 75S-T	(.82)	(1.60)	(2.29)							
		Y 24S-T		(1.21)	1.98	2.86						
$\bar{h}$ (in.)	.40	Y 75S-T					(.324)	(.300)	(.288)	(.265)	(.250)	
		Y 24S-T					.379	(.348)	(.318)	(.301)	(.252)	
	.51	Z 24S-T						.330	(.276)	(.251)	(.246)	(.224)
		Y 75S-T				.422	.417	.382	.289			
		Y 24S-T					(.449)	.422	.375	.296		
	.63	Z 24S-T					.438	(.315)	.316	.296		
		Y 75S-T			.486	(.490)	.415	.306				
		Y 24S-T				(.531)	.557	.394				
	.79	Z 24S-T				.587	(.399)	.342	.357			
		Y 75S-T		.548	.564	.510	.373					
		Y 24S-T			(.626)	.608	.537					
	1.00	Z 24S-T			(.529)	(.453)	.425	.450				
		Y 75S-T	(.593)	(.604)	(.519)							
		Y 24S-T		(.631)	.677	.594						
ρ (in.)	.40	Y 75S-T					(.529)	(.554)	(.560)	(.530)	(.509)	
		Y 24S-T					.557	(.624)	(.614)	(.609)	(.511)	
	.51	Z 24S-T						.514	(.521)	(.494)	(.521)	(.445)
		Y 75S-T				.584	.678	.678	.552			
		Y 24S-T					(.697)	.730	.704	.585		
	.63	Z 24S-T					.582	(.526)	.598	.579		
		Y 75S-T			.591	(.710)	.697	.549				
		Y 24S-T				(.726)	.864	.691				
	.79	Z 24S-T				.661	(.576)	.560	.651			
		Y 75S-T		.604	.730	.750	.601					
		Y 24S-T			(.748)	.829	.815					
	1.00	Z 24S-T			(.538)	(.578)	.607	.724				
		Y 75S-T	(.601)	(.710)	(.689)							
		Y 24S-T		(.691)	.822	.805						
$\frac{b_W}{t_W}$	.40	Y 75S-T					(33.0)	(30.0)	(25.7)	(21.3)	(18.0)	
		Y 24S-T					33.0	(33.0)	(27.7)	(24.0)	(18.0)	
	.51	Z 24S-T						35.2	(33.0)	(27.5)	(25.0)	(20.0)
		Y 75S-T				33.0	33.0	27.8	19.7			
		Y 24S-T					(33.0)	29.1	24.0	18.0		
	.63	Z 24S-T					36.9	(30.0)	30.0	25.0		
		Y 75S-T			33.0	(33.0)	27.7	18.9				
		Y 24S-T				(33.0)	33.0	22.6				
	.79	Z 24S-T				40.0	(30.0)	25.0	25.0			
		Y 75S-T		33.0	33.0	27.7	18.8					
		Y 24S-T			(33.0)	29.6	24.4					
	1.00	Z 24S-T			(32.4)	(28.4)	25.0	25.0				
		Y 75S-T	(33.0)	(30.8)	(24.6)							
		Y 24S-T		(29.5)	28.6	22.7						
$\frac{b_S}{t_S}$	.40	Y 75S-T					(35.4)	(53.0)	(60.0)	(65.0)	(74.6)	
		Y 24S-T					23.0	(50.7)	(60.0)	(68.1)	(73.5)	
	.51	Z 24S-T						25.8	(45.0)	(50.0)	(61.9)	(68.4)
		Y 75S-T				30.3	57.4	69.0	74.0			
		Y 24S-T					(48.4)	64.0	75.4	82.7		
	.63	Z 24S-T					25.0	(40.8)	59.0	62.3		
		Y 75S-T			26.3	(58.8)	84.0	84.0				
		Y 24S-T				(46.8)	75.2	84.0				
	.79	Z 24S-T				25.0	(40.0)	49.0	67.9			
		Y 75S-T		26.0	61.1	84.0	84.0					
		Y 24S-T			(41.7)	67.0	84.0					
	1.00	Z 24S-T			(25.0)	(40.8)	49.9	73.2				
		Y 75S-T	(26.7)	(63.0)	(84.0)							
		Y 24S-T		(40.2)	66.5	84.0						

	$\frac{t_W}{t_S}$	Panel	L = 40 in.								
			t_S, in.								
			0.032	0.040	0.051	0.064	0.081	0.102	0.125	0.156	0.188
$\bar{\sigma}_f$ (ksi)	0.40	Y 75S-T					(25.4)	(22.0)	(18.7)	(15.7)	(13.5)
		Y 24S-T					(24.3)	(21.7)	(18.6)	(15.7)	(13.6)
	.51	Z 24S-T						(21.8)	(19.1)	(15.9)	(13.3)
		Y 75S-T				27.0	24.5	21.0	18.2		
		Y 24S-T				25.3	24.2	20.9	18.1		
	.63	Z 24S-T					(24.2)	21.2	18.7	15.4	
		Y 75S-T			27.7	(27.5)	24.5				
		Y 24S-T			26.1	(27.3)	24.2	20.8			
	.79	Z 24S-T				24.2	23.3	20.6	17.7		
		Y 75S-T		28.5	(29.8)	26.8					
		Y 24S-T		25.9	(27.6)	25.8	22.5				
	1.00	Z 24S-T			(24.3)	(24.3)	22.7	20.2			
		Y 75S-T	(30.2)	(31.2)	28.1						
		Y 24S-T	(27.8)	(28.2)	26.9	23.9					
σ_{cr} (ksi)	.40	Y 75S-T					(22.1)	(13.1)	(10.4)	(11.8)	(7.5)
		Y 24S-T					(24.3)	(13.8)	(12.1)	(13.3)	(8.1)
	.51	Z 24S-T						(21.8)	(14.9)	(15.2)	(13.3)
		Y 75S-T				26.0	11.4	9.1	8.3		
		Y 24S-T				25.3	14.3	10.3	8.9		
	.63	Z 24S-T					(24.2)	15.5	9.3	13.8	
		Y 75S-T			27.7	(11.0)	(7.5)				
		Y 24S-T			26.1	(12.4)	8.1	8.1			
	.79	Z 24S-T				24.2	22.1	10.9	13.1		
		Y 75S-T		28.5	(10.2)	8.0					
		Y 24S-T		25.9	(16.1)	8.7	8.4				
	1.00	Z 24S-T			(24.3)	(21.7)	11.8	9.5			
		Y 75S-T	(24.1)	(10.5)	8.7						
		Y 24S-T	(27.8)	(20.8)	8.8	8.8					
H (in.)	.40	Y 75S-T					(1.94)	(2.21)	(2.51)	(2.16)	(2.74)
		Y 24S-T					(1.94)	(2.43)	(2.55)	(2.16)	(2.74)
	.51	Z 24S-T						(1.72)	(2.11)	(2.11)	(2.14)
		Y 75S-T				1.94	2.31	2.43	2.39		
		Y 24S-T				1.94	2.43	2.55	2.51		
	.63	Z 24S-T					(1.68)	2.05	2.51	2.14	
		Y 75S-T			1.94	(2.43)	2.41				
		Y 24S-T			1.94	(2.43)	2.58	2.31			
	.79	Z 24S-T				1.89	1.78	1.75	2.14		
		Y 75S-T		1.94	(2.43)	2.33					
		Y 24S-T		1.94	(2.43)	2.67	2.38				
	1.00	Z 24S-T			(1.73)	(1.89)	2.19	2.14			
		Y 75S-T	(1.94)	(2.43)	2.20						
		Y 24S-T	(1.94)	(2.21)	2.45	2.29					
S (in.)	.40	Y 75S-T					(2.33)	(3.63)	(4.88)	(5.50)	(8.26)
		Y 24S-T					(2.07)	(3.82)	(4.82)	(5.50)	(8.32)
	.51	Z 24S-T						(4.08)	(6.56)	(8.10)	(8.86)
		Y 75S-T				1.88	3.30	4.53	5.69		
		Y 24S-T				1.63	3.30	4.50	5.69		
	.63	Z 24S-T					(3.16)	5.31	8.52	8.87	
		Y 75S-T			1.51	(3.03)	4.15				
		Y 24S-T			1.36	(2.97)	4.22	5.07			
	.79	Z 24S-T				2.43	3.73	6.74	7.40		
		Y 75S-T		1.29	(2.72)	3.46					
		Y 24S-T		1.12	(2.38)	3.53	4.21				
	1.00	Z 24S-T			(1.84)	(3.07)	5.42	7.42			
		Y 75S-T	(1.28)	(2.36)	2.87						
		Y 24S-T	(1.16)	(1.86)	2.95	3.47					
$\bar{h}$ (in.)	.40	Y 75S-T					(.380)	(.363)	(.354)	(.278)	(.295)
		Y 24S-T					(.408)	(.405)	(.365)	(.278)	(.294)
	.51	Z 24S-T						(.294)	(.300)	(.273)	(.273)
		Y 75S-T				.485	.471	.419	.351		
		Y 24S-T				.523	.510	.453	.379		
	.63	Z 24S-T					(.356)	.360	.363	.290	
		Y 75S-T			.580	(.574)	.467				
		Y 24S-T			.608	(.580)	.514	.395			
	.79	Z 24S-T				.537	.394	.431	.351		
		Y 75S-T		.656	(.671)	.543					
		Y 24S-T		.691	(.715)	.662	.508				
	1.00	Z 24S-T			(.591)	(.514)	.491	.397			
		Y 75S-T	(.719)	(.779)	.608						
		Y 24S-T	(.742)	(.748)	.710	.588					
ρ (in.)	.40	Y 75S-T					(.647)	(.685)	(.701)	(.544)	(.606)
		Y 24S-T					(.666)	(.759)	(.718)	(.544)	(.605)
	.51	Z 24S-T						(.536)	(.593)	(.546)	(.513)
		Y 75S-T				.714	.797	.772	.680		
		Y 24S-T				.732	.848	.821	.725		
	.63	Z 24S-T					(.575)	.648	.714	.555	
		Y 75S-T			.743	(.872)	.800				
		Y 24S-T			.750	(.876)	.867	.707			
	.79	Z 24S-T				.717	.618	.757	.630		
		Y 75S-T		.751	(.914)	.823					
		Y 24S-T		.756	(.929)	.965	.808				
	1.00	Z 24S-T			(.687)	(.701)	.769	.686			
		Y 75S-T	(.766)	(.940)	.820						
		Y 24S-T	(.769)	(.868)	.932	.830					
$\frac{b_W}{t_W}$	.40	Y 75S-T					(33.0)	(30.0)	(26.6)	(18.0)	(18.0)
		Y 24S-T					(33.0)	(33.0)	(27.0)	(18.0)	(18.0)
	.51	Z 24S-T						(32.8)	(32.0)	(25.0)	(20.0)
		Y 75S-T				33.0	31.3	25.7	20.0		
		Y 24S-T				33.0	33.0	27.0	21.0		
	.63	Z 24S-T					(32.0)	31.0	30.0	20.0	
		Y 75S-T			33.0	(33.0)	25.5				
		Y 24S-T			33.0	(33.0)	27.3	19.2			
	.79	Z 24S-T				36.0	26.8	28.0	20.0		
		Y 75S-T		33.0	(33.0)	24.6					
		Y 24S-T		33.0	(33.0)	28.3	19.8				
	1.00	Z 24S-T			(33.0)	(28.0)	26.0	20.0			
		Y 75S-T	(33.0)	(33.0)	23.1						
		Y 24S-T	(33.0)	(30.0)	25.9	19.1					
$\frac{b_S}{t_S}$	.40	Y 75S-T					(42.1)	(57.2)	(65.0)	(60.9)	(77.8)
		Y 24S-T					(35.7)	(59.6)	(63.8)	(60.9)	(78.4)
	.51	Z 24S-T						(40.0)	(52.5)	(51.9)	(47.1)
		Y 75S-T				39.4	63.0	73.0	78.0		
		Y 24S-T				31.5	62.1	71.8	77.3		
	.63	Z 24S-T					(39.0)	52.0	68.1	56.9	
		Y 75S-T			34.7	(70.2)	84.0				
		Y 24S-T			28.7	(68.4)	84.0	84.0			
	.79	Z 24S-T				38.0	46.0	66.0	59.1		
		Y 75S-T		33.4	(76.2)	84.0					
		Y 24S-T		24.6	(62.7)	83.0	84.0				
	1.00	Z 24S-T			(36.0)	(48.0)	67.0	72.7			
		Y 75S-T	(41.2)	(78.9)	84.0						
		Y 24S-T	(32.3)	(56.8)	84.0	84.0					

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TABLE 7.- COMPARATIVE DESIGNS OF Y- AND Z-STIFFENED PANELS [P_1 = 5.0 kips/inch; c = 1; minimum-weight designs in parentheses]

	$\frac{t_W}{t_S}$	Panel	L = 10 in.										L = 20 in.								
			t_S, in.										t_S, in.								
			0.032	0.040	0.051	0.064	0.081	0.102	0.125	0.156	0.188	0.204	0.040	0.051	0.064	0.081	0.102	0.125	0.156	0.188	0.204
$\bar{\sigma}_f$ (ksi)	0.40	Y 75S-T				(54.1)	(46.6)	(38.9)	(33.1)	(27.2)					(48.0)	(43.3)	(37.3)	(31.9)	(26.7)	(22.4)	
		Y 24S-T					(40.8)	(36.1)	(31.4)	(26.5)	(22.7)					(37.5)	(34.2)	(30.4)	(25.9)	(22.3)	(20.8)
	.51	Z 24S-T						(36.1)	(31.6)	(26.7)	(23.2)	(21.5)					31.6	(30.4)	(26.1)	(22.8)	(21.1)
		Y 75S-T			(57.3)	51.5	44.5	37.7							46.8	41.7	36.0	31.1			
		Y 24S-T				(42.5)	38.5	33.9	29.8	25.2					(39.2)	36.1	32.4	28.9	24.8		
	.63	Z 24S-T					(38.5)	34.3	30.1	25.8							(32.8)	29.6	25.3	22.2	
		Y 75S-T		(60.1)	55.3	49.6	43.2							(49.8)	46.1	41.3					
		Y 24S-T				40.8	36.4	32.2	28.5						37.4	34.6	31.4	28.0			
	.79	Z 24S-T				37.8	36.9	32.5	28.6	24.7					34.8	(34.5)	31.9	28.2	24.7		
		Y 75S-T		57.3	52.4	46.9							(51.2)	48.4	45.0						
		Y 24S-T			(41.2)	37.7	34.8							(38.0)	36.1	33.6	30.4				
	1.00	Z 24S-T			(40.2)	(38.1)	34.2	30.5	27.1					(34.9)	(35.5)	33.6	30.4	27.0			
		Y 75S-T	(58.5)	54.4	49.2								50.5	47.5							
		Y 24S-T		(41.2)	39.7	36.3							(38.1)	37.0	35.1						
σ_{cr} (ksi)	.40	Y 75S-T				(50.1)	(27.5)	(15.2)	(10.4)	(7.3)					(42.0)	(30.0)	(21.1)	(15.0)	(10.2)	(7.4)	
		Y 24S-T					(40.8)	(32.5)	(20.4)	(11.3)	(7.6)					(37.5)	(31.5)	(23.7)	(14.3)	(9.3)	(8.1)
	.51	Z 24S-T						(35.5)	(30.6)	(18.4)	(10.6)	(9.5)					30.2	(29.6)	(22.1)	(13.5)	(11.1)
		Y 75S-T			(55.5)	31.0	15.2	8.7							35.7	24.0	12.2	8.1			
		Y 24S-T				(42.0)	36.9	24.7	14.1	7.5					(39.2)	35.8	26.7	17.9	9.1		
	.63	Z 24S-T					(38.1)	34.1	22.8	13.1							(31.3)	24.8	15.2	8.1	
		Y 75S-T		(58.6)	38.2	17.5	9.7							(41.1)	19.9	12.2					
		Y 24S-T				40.7	30.0	14.7	8.1						37.4	28.7	17.7	9.5			
	.79	Z 24S-T				36.0	35.7	24.1	16.1	9.5					34.7	(33.6)	26.4	17.4	9.0		
		Y 75S-T		44.5	20.0	10.4							(51.2)	24.0	13.1						
		Y 24S-T			(41.1)	34.2	16.6							(38.0)	31.6	21.3	8.5				
	1.00	Z 24S-T			(38.5)	(37.3)	26.9	17.8	11.0					(34.1)	(34.0)	28.1	18.1	10.8			
		Y 75S-T	(42.0)	21.0	10.5								26.2	13.1							
		Y 24S-T		(37.1)	31.5	16.7							(38.1)	34.0	19.7						
H (in.)	.40	Y 75S-T				(.84)	(1.08)	(1.35)	(1.72)	(2.16)					(1.36)	(1.49)	(1.49)	(1.72)	(2.16)	(2.74)	
		Y 24S-T					(1.26)	(1.35)	(1.72)	(2.16)	(2.74)					(1.81)	(1.90)	(1.95)	(2.16)	(2.74)	(2.74)
	.51	Z 24S-T						(1.07)	(1.34)	(1.70)	(2.14)	(2.14)					1.63	(1.66)	(1.86)	(2.14)	(2.14)
		Y 75S-T			(.84)	1.08	1.35	1.72							1.46	1.47	1.72	2.16			
		Y 24S-T				(1.31)	1.35	1.72	2.16	2.74					(1.85)	1.89	1.99	2.16	2.74		
	.63	Z 24S-T					(1.17)	1.34	1.70	2.14							(1.66)	1.70	2.14	2.63	
		Y 75S-T		(.88)	1.08	1.35	1.72							(1.43)	1.64	1.72					
		Y 24S-T				1.35	1.72	2.16	2.74						1.90	2.11	2.16	2.74			
	.79	Z 24S-T				1.38	1.34	1.70	2.14	2.63					1.61	(1.66)	1.70	2.14	2.63		
		Y 75S-T		1.08	1.35	1.72							(1.32)	1.53	1.72						
		Y 24S-T			(1.35)	1.72	2.16							(1.88)	2.05	2.16	2.74				
	1.00	Z 24S-T			(1.17)	(1.34)	1.70	2.14	2.63					(1.58)	(1.66)	1.70	2.14	2.63			
		Y 75S-T	(1.08)	1.35	1.72								1.49	1.72							
		Y 24S-T		(1.43)	1.72	2.16							(1.72)	1.94	2.16						
S (in.)	.40	Y 75S-T				(1.15)	(1.96)	(3.22)	(4.73)	(7.07)					(1.23)	(2.01)	(2.80)	(3.98)	(5.96)	(8.41)	
		Y 24S-T					(1.43)	(2.28)	(3.65)	(5.89)	(8.65)					(1.71)	(2.50)	(3.47)	(5.33)	(7.78)	(8.91)
	.51	Z 24S-T						(2.65)	(4.34)	(7.38)	(11.7)	(14.1)					2.55	(4.44)	(6.79)	(10.3)	(12.4)
		Y 75S-T			(.93)	1.59	2.75	4.37							1.59	2.28	3.67	5.56			
		Y 24S-T				(1.18)	1.75	2.96	4.69	7.50					(1.34)	1.96	2.92	4.25	6.95		
	.63	Z 24S-T					(2.03)	3.38	5.38	9.10							(3.49)	5.03	8.36	13.6	
		Y 75S-T		(.76)	1.13	2.21	3.69							(1.33)	2.15	3.28					
		Y 24S-T				1.39	2.31	3.93	6.18						1.59	2.45	3.62	5.78			
	.79	Z 24S-T				1.60	2.57	4.30	6.78	11.2					1.60	(2.66)	4.07	6.44	11.3		
		Y 75S-T		1.07	1.84	3.05							(1.03)	1.72	2.74						
		Y 24S-T			(1.16)	1.87	3.20							(1.33)	2.01	3.01	5.22				
	1.00	Z 24S-T			(1.28)	(2.02)	3.35	5.54	8.71					(1.34)	(2.15)	3.21	5.47	8.62			
		Y 75S-T	(.96)	1.54	2.60								1.49	2.38							
		Y 24S-T		(1.05)	1.73	2.78							(1.11)	1.76	2.66						
$\bar{h}$ (in.)	.40	Y 75S-T				(.168)	(.180)	(.193)	(.214)	(.240)					(.323)	(.280)	(.240)	(.236)	(.265)	(.291)	
		Y 24S-T					(.264)	(.236)	(.249)	(.265)	(.287)					(.425)	(.366)	(.305)	(.286)	(.305)	(.319)
	.51	Z 24S-T						(.195)	(.206)	(.220)	(.235)	(.232)					.358	(.271)	(.258)	(.250)	(.248)
		Y 75S-T			(.209)	.222	.238	.256							.346	.295	.286	.308			
		Y 24S-T				(.346)	.303	.323	.342	.366					(.537)	.468	.407	.363	.384		
	.63	Z 24S-T					(.266)	.252	.273	.287							(.337)	.283	.302	.309	
		Y 75S-T		(.249)	.261	.280	.301							(.391)	.378	.322					
		Y 24S-T				.358	.392	.417	.442						.553	.515	.436	.461			
	.79	Z 24S-T				.409	.315	.341	.370	.384					.513	(.425)	.352	.381	.383		
		Y 75S-T		.304	.337	.365							(.412)	.420	.388						
		Y 24S-T			(.411)	.471	.508							(.626)	.589	.527	.560				
	1.00	Z 24S-T			(.387)	(.387)	.431	.470	.500					(.583)	(.514)	.440	.473	.504			
		Y 75S-T	(.347)	.394	.443								.463	.460							
		Y 24S-T		(.488)	.526	.597							(.628)	.628	.613						
ρ (in.)	.40	Y 75S-T				(.274)	(.318)	(.368)	(.424)	(.495)					(.493)	(.484)	(.439)	(.450)	(.527)	(.602)	
		Y 24S-T					(.420)	(.410)	(.463)	(.530)	(.595)					(.643)	(.626)	(.556)	(.550)	(.618)	(.651)
	.51	Z 24S-T						(.324)	(.367)	(.414)	(.463)	(.460)					.565	(.487)	(.485)	(.484)	(.485)
		Y 75S-T			(.305)	.360	.420	.493							.523	.490	.520	.598			
		Y 24S-T				(.486)	.470	.550	.629	.726					(.710)	.696	.670	.647	.745		
	.63	Z 24S-T					(.402)	.419	.485	.551							(.551)	.494	.567	.621	
		Y 75S-T		(.323)	.381	.451	.534							(.532)	.577	.549					
		Y 24S-T				.488	.592	.701	.807						.728	.755	.711	.821			
	.79	Z 24S-T				.521	.466	.553	.646	.734					.625	(.607)	.561	.655	.733		
		Y 75S-T		.396	.486	.579							(.501)	.570	.591						
		Y 24S-T			(.510)	.628	.755							(.737)	.767	.765	.910				
	1.00	Z 24S-T			(.456)	(.503)	.613	.734	.851					(.634)	(.642)	.617	.736	.853			
		Y 75S-T	(.413)	.506	.623								.570	.630							
		Y 24S-T		(.550)	.649	.795							(.677)	.748	.801						
$\frac{b_W}{t_W}$	.40	Y 75S-T				(18.0)	(18.0)	(18.0)	(18.0)	(18.0)					(29.6)	(25.1)	(19.9)	(18.0)	(18.0)	(18.0)	
		Y 24S-T					(21.0)	(18.0)	(18.0)	(18.0)	(18.0)					(30.6)	(25.7)	(20.5)	(18.0)	(18.0)	(18.0)
	.51	Z 24S-T						(20.0)	(20.0)	(20.0)	(20.0)	(20.0)					31.0	(25.0)	(22.0)	(20.0)	(20.0)
		Y 75S-T			(18.0)	18.0	18.0	18.0							24.5	19.6	18.0	18.0			
		Y 24S-T				(22.0)	18.0	18.0	18.0	18.0					(31.3)	25.5	21.0	18.0	18.0		
	.63	Z 24S-T					(22.0)	20.0	20.0	20.0							(25.0)	20.0	20.0	20.0	
		Y 75S-T		(18.7)	18.0	18.0	18.0							(24.0)	21.9	18.0					
		Y 24S-T				18.0	18.0	18.0	18.0						25.7	22.2	18.0	18.0			
	.79	Z 24S-T				26.0	20.0	20.0	20.0	20.0					30.5	(25.0)	20.0	20.0	20.0		
		Y 75S-T		18.0	18.0	18.0							(22.1)	20.5	18.0						
		Y 24S-T			(18.0)	18.0	18.0							(25.3)	21.6	18.0	18.0				
	1.00	Z 24S-T			(22.0)	(20.0)	20.0	20.0	20.0					(30.0)	(25.0)	20.0	20.0	20.0			
		Y 75S-T	(18.0)	18.0	18.0								20.0	18.0							
		Y 24S-T		(19.0)	18.0	18.0							(23.1)	20.4	18.0						
$\frac{b_S}{t_S}$	.40	Y 75S-T				(26.8)	(39.2)	(54.0)	(66.1)	(81.1)					(24.6)	(37.5)	(45.0)	(54.1)	(66.9)	(79.4)	
		Y 24S-T					(25.0)	(35.5)	(48.9)	(65.9)	(81.9)					(24.1)	(36.6)	(45.0)	(58.7)	(72.7)	(78.1)
	.51	Z 24S-T						(26.0)	(34.7)	(47.3)	(62.0)	(68.9)					25.0	(35.5)	(43.5)	(55.0)	(60.5)
		Y 75S-T			(24.9)	38.0	54.4	76.3							34.6	44.0	60.2	77.0			
		Y 24S-T				(23.0)	31.6	46.3	63.0	84.0					(23.0)	33.0	44.0	56.1	76.9		
	.63	Z 24S-T					(25.0)	33.1	43.0	58.3							(34.2)	40.2	53.6	72.4	
		Y 75S-T		(23.0)	36.8	54.4	76.3							(33.4)	50.0	66.2					
		Y 24S-T				28.9	42.3	62.2	83.6						30.0	43.0	56.4	77.3			
	.79	Z 24S-T				25.0	31.7	42.2	54.2	72.0					25.0	(32.8)	39.9	51.5	72.2		
		Y 75S-T		34.8	53.6	76.9							(29.4)	47.0	66.8						
		Y 24S-T			(27.0)	39.6	61.8							(28.0)	41.0	55.7	83.6				
	1.00	Z 24S-T			(25.0)	(31.5)	41.3	54.3	69.7					(26.2)	(33.6)	39.6	53.6	69.0			
		Y 75S-T	(36.7)	53.4	78.5								49.0	70.7							
		Y 24S-T		(28.0)	44.6	63.5							(25.4)	42.0	58.4						

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TABLE 7.- COMPARATIVE DESIGNS OF Y- AND Z-STIFFENED PANELS - Concluded

			L = 30 in.								
			t_S, in.								
	$\frac{t_W}{t_S}$	Panel	0.040	0.051	0.064	0.081	0.102	0.125	0.156	0.188	0.204
$\bar{\sigma}_f$ (ksi)	0.40	Y 75S-T				(41.0)	(35.7)	(30.6)	(25.7)	(22.2)	(20.6)
		Y 24S-T					(32.5)	(29.2)	(25.2)	(22.0)	(20.5)
	.51	Z 24S-T						(29.3)	(25.3)	(22.0)	(20.8)
		Y 75S-T			(42.4)	38.5	33.7	29.5			
		Y 24S-T				(34.1)	31.2	27.8	24.1		
	.63	Z 24S-T					(31.2)	28.0	24.6	21.6	20.5
		Y 75S-T		(43.6)	41.7	38.6	34.7				
		Y 24S-T			(35.6)	33.2	30.2	27.2			
	.79	Z 24S-T				(32.3)	30.1	27.5	23.8		
		Y 75S-T	42.3	42.8	41.1	38.2					
		Y 24S-T		(35.0)	34.1	31.8	29.3				
	1.00	Z 24S-T			(32.6)	31.1	29.4	26.6			
		Y 75S-T	(44.1)	43.0							
		Y 24S-T		35.0	33.4	31.3					
σ_{cr} (ksi)	.40	Y 75S-T				(27.0)	(18.5)	(18.8)	(11.8)	(10.8)	(8.3)
		Y 24S-T					(30.8)	(21.8)	(16.9)	(12.0)	(10.1)
	.51	Z 24S-T						(29.3)	(22.8)	(20.0)	(15.9)
		Y 75S-T			(32.5)	21.0	12.8	12.0			
		Y 24S-T				(34.1)	23.2	17.9	11.9		
	.63	Z 24S-T					(31.1)	26.0	19.8	13.1	9.1
		Y 75S-T		(38.7)	21.9	11.2	7.5				
		Y 24S-T			(35.6)	26.0	16.7	11.4			
	.79	Z 24S-T				(32.3)	25.3	21.7	12.2		
		Y 75S-T	31.5	27.0	13.8	9.7					
		Y 24S-T		(35.0)	31.9	16.7	11.1				
	1.00	Z 24S-T			(32.6)	27.3	20.1	12.5			
		Y 75S-T	(29.0)	15.0							
		Y 24S-T		32.5	17.3	9.7					
H (in.)	.40	Y 75S-T				(1.94)	(2.02)	(1.92)	(2.41)	(2.74)	(2.74)
		Y 24S-T					(2.42)	(2.51)	(2.48)	(2.74)	(2.74)
	.51	Z 24S-T						(1.86)	(2.11)	(2.14)	(2.14)
		Y 75S-T			(1.94)	2.17	2.40	2.16			
		Y 24S-T				(2.42)	2.59	2.62	2.74		
	.63	Z 24S-T					(1.98)	2.11	2.14	2.63	2.63
		Y 75S-T		(1.77)	2.17	2.43	2.25				
		Y 24S-T			(2.42)	2.58	2.68	2.74			
	.79	Z 24S-T				(1.89)	2.11	2.14	2.63		
		Y 75S-T	1.94	2.08	2.28	2.16					
		Y 24S-T		(2.21)	2.39	2.86	2.74				
	1.00	Z 24S-T			(1.87)	2.11	2.14	2.63			
		Y 75S-T	(2.01)	2.23							
		Y 24S-T		2.28	2.73	2.83					
s (in.)	.40	Y 75S-T				(2.14)	(3.06)	(3.59)	(5.50)	(7.29)	(8.41)
		Y 24S-T					(2.69)	(3.76)	(5.05)	(6.95)	(8.11)
	.51	Z 24S-T						(4.25)	(6.56)	(8.56)	(10.3)
		Y 75S-T			(1.64)	2.61	3.80	4.56			
		Y 24S-T				(2.15)	3.25	4.38	6.24		
	.63	Z 24S-T					(3.52)	4.89	7.27	11.2	14.6
		Y 75S-T		(1.25)	2.21	3.64	5.04				
		Y 24S-T			(1.78)	2.67	3.91	5.34			
	.79	Z 24S-T				(2.59)	4.19	5.89	9.50		
		Y 75S-T	1.08	1.81	2.86	4.07					
		Y 24S-T		(1.36)	2.07	3.46	4.76				
	1.00	Z 24S-T			(2.04)	3.32	5.04	8.15			
		Y 75S-T	(1.56)	2.48							
		Y 24S-T		1.80	2.90	4.38					
$\bar{h}$ (in.)	.40	Y 75S-T				(.399)	(.355)	(.290)	(.320)	(.318)	(.331)
		Y 24S-T					(.504)	(.419)	(.347)	(.326)	(.335)
	.51	Z 24S-T						(.325)	(.309)	(.278)	(.272)
		Y 75S-T			(.522)	.493	.456	.348			
		Y 24S-T				(.629)	.568	.476	.415		
	.63	Z 24S-T					(.436)	.393	.326	.346	.320
		Y 75S-T		(.551)	.573	.516	.383				
		Y 24S-T			(.745)	.666	.583	.484			
	.79	Z 24S-T				(.521)	.480	.402	.426		
		Y 75S-T	.698	.639	.588	.449					
		Y 24S-T		(.785)	.718	.749	.590				
	1.00	Z 24S-T			(.627)	.599	.493	.523			
		Y 75S-T	(.690)	.672							
		Y 24S-T		.774	.829	.716					
ρ (in.)	.40	Y 75S-T				(.660)	(.642)	(.535)	(.629)	(.634)	(.669)
		Y 24S-T					(.831)	(.760)	(.664)	(.645)	(.680)
	.51	Z 24S-T						(.572)	(.580)	(.519)	(.520)
		Y 75S-T			(.730)	.778	.792	.638			
		Y 24S-T				(.920)	.914	.831	.776		
	.63	Z 24S-T					(.688)	.664	.592	.666	.647
		Y 75S-T		(.687)	.807	.838	.689				
		Y 24S-T			(.936)	.955	.927	.84			
	.79	Z 24S-T				(.709)	.736	.670	.773		
		Y 75S-T	.756	.803	.833	.725					
		Y 24S-T		(.881)	.902	1.05	.926				
	1.00	Z 24S-T			(.736)	.795	.749	.864			
		Y 75S-T	(.784)	.852							
		Y 24S-T		.888	1.04	1.02					
$\frac{b_W}{t_W}$	.40	Y 75S-T				(33.0)	(27.4)	(20.1)	(20.1)	(18.0)	(18.0)
		Y 24S-T					(33.0)	(26.6)	(20.5)	(18.0)	(18.0)
	.51	Z 24S-T						(28.0)	(25.0)	(20.0)	(20.0)
		Y 75S-T			(33.0)	29.4	25.3	18.0			
		Y 24S-T				(33.0)	27.6	22.0	18.0		
	.63	Z 24S-T					(30.0)	25.0	20.0	20.0	20.0
		Y 75S-T		(30.0)	29.4	25.8	18.8				
		Y 24S-T			(33.0)	27.3	22.6	18.0			
	.79	Z 24S-T				(28.5)	25.0	20.0	20.0		
		Y 75S-T	33.0	28.0	24.2	18.0					
		Y 24S-T		(30.0)	25.1	24.0	18.0				
	1.00	Z 24S-T			(28.2)	25.0	20.0	20.2			
		Y 75S-T	(27.0)	23.6							
		Y 24S-T		24.0	22.9	18.6					
$\frac{b_S}{t_S}$	.40	Y 75S-T				(37.5)	(47.0)	(47.0)	(60.0)	(67.6)	(73.2)
		Y 24S-T					(37.4)	(47.0)	(54.0)	(63.9)	(70.2)
	.51	Z 24S-T						(34.0)	(42.1)	(45.5)	(50.4)
		Y 75S-T			(31.7)	47.0	59.0	61.0			
		Y 24S-T				(33.8)	47.0	56.0	67.9		
	.63	Z 24S-T					(34.5)	39.1	46.6	59.5	71.4
		Y 75S-T		(26.3)	47.0	70.0	84.0				
		Y 24S-T			(31.2)	45.0	59.0	70.2			
	.79	Z 24S-T				(32.0)	41.0	47.1	60.8		
		Y 75S-T	23.0	44.5	65.5	82.0					
		Y 24S-T		(25.0)	40.0	62.0	74.8				
	1.00	Z 24S-T			(32.0)	40.9	49.4	65.2			
		Y 75S-T	(45.1)	68.0							
		Y 24S-T		40.8	62.0	84.0					

			L = 40 in.									
			t_S, in.									
	$\frac{t_W}{t_S}$	Panel	0.040	0.051	0.064	0.081	0.102	0.125	0.156	0.188	0.204	0.250
$\bar{\sigma}_f$ (ksi)	0.40	Y 75S-T					(34.0)	(29.7)	(24.9)	(21.4)	(20.2)	(17.1)
		Y 24S-T					(30.4)	(28.4)	(24.5)	(21.3)	(20.0)	(16.8)
	.51	Z 24S-T							(24.7)	(21.4)	(20.5)	(17.3)
		Y 75S-T				36.0	32.2	28.0	24.3			
		Y 24S-T				31.4	29.9	27.0	23.6	20.8		
	.63	Z 24S-T					24.3	(27.3)	23.8	21.2	19.8	
		Y 75S-T			37.3	(35.8)	32.9					
		Y 24S-T			(32.8)	(31.8)	29.4	26.6				
	.79	Z 24S-T				28.0	(28.2)	26.1	22.9			
		Y 75S-T		38.3	(38.1)	35.2						
		Y 24S-T			32.4	30.8	28.2					
	1.00	Z 24S-T			(28.6)	(29.7)	27.5	25.6				
		Y 75S-T	(38.4)	(39.2)	37.6							
		Y 24S-T		(33.0)	31.9	30.1						
σ_{cr} (ksi)	.40	Y 75S-T					(19.0)	(14.1)	(13.0)	(12.9)	(10.2)	(7.4)
		Y 24S-T					(30.4)	(19.4)	(15.7)	(12.6)	(12.7)	(8.1)
	.51	Z 24S-T							(23.2)	(17.3)	(12.9)	(13.2)
		Y 75S-T				25.6	14.8	10.5	10.3			
		Y 24S-T				31.4	22.0	14.7	15.5	8.4		
	.63	Z 24S-T					23.6	(24.5)	15.1	9.5	13.2	
		Y 75S-T			37.3	(12.8)	7.5					
		Y 24S-T			(32.8)	(23.9)	14.0	8.8				
	.79	Z 24S-T				28.0	(26.2)	19.7	15.8			
		Y 75S-T		27.1	(13.8)	9.5						
		Y 24S-T			29.8	17.0	10.9					
	1.00	Z 24S-T			(28.6)	(27.6)	17.2	13.3				
		Y 75S-T	(30.0)	(15.5)	8.7							
		Y 24S-T		(32.0)	17.1	9.8						
H (in.)	.40	Y 75S-T					(2.42)	(2.76)	(2.86)	(2.74)	(2.74)	(3.45)
		Y 24S-T					(2.42)	(3.09)	(3.02)	(3.18)	(2.74)	(3.45)
	.51	Z 24S-T							(2.27)	(2.78)	(2.79)	(2.63)
		Y 75S-T				2.42	2.74	3.06	2.74			
		Y 24S-T				2.42	3.09	3.30	2.74	3.45		
	.63	Z 24S-T					2.64	(2.39)	2.88	3.50	2.63	
		Y 75S-T			2.42	(2.93)	2.84					
		Y 24S-T			(2.42)	(3.09)	3.41	3.61				
	.79	Z 24S-T				1.98	(2.45)	2.65	2.63			
		Y 75S-T		2.42	(2.80)	2.79						
		Y 24S-T			2.77	3.18	3.28					
	1.00	Z 24S-T			(1.98)	(2.31)	2.65	2.63				
		Y 75S-T	(2.23)	(2.58)	2.68							
		Y 24S-T		(2.54)	3.05	3.31						
s (in.)	.40	Y 75S-T					(3.17)	(4.27)	(5.50)	(6.46)	(7.53)	(11.1)
		Y 24S-T					(2.21)	(4.13)	(5.37)	(6.93)	(7.26)	(10.9)
	.51	Z 24S-T							(6.40)	(9.21)	(11.6)	(14.1)
		Y 75S-T				2.42	3.80	5.27	6.28			
		Y 24S-T				1.82	3.49	4.90	5.60	8.60		
	.63	Z 24S-T					2.55	(5.07)	8.26	12.8	11.8	
		Y 75S-T			1.95	(3.48)	5.23					
		Y 24S-T			(1.55)	(2.89)	4.56	6.24				
	.79	Z 24S-T				2.04	(4.08)	6.08	8.45			
		Y 75S-T		1.70	(2.97)	4.21						
		Y 24S-T			2.17	3.53	5.03					
	1.00	Z 24S-T			(1.75)	(3.28)	5.22	7.34				
		Y 75S-T	(1.40)	(2.43)	(3.59)							
		Y 24S-T		(1.84)	3.03	4.51						
$\bar{h}$ (in.)	.40	Y 75S-T					(.456)	(.444)	(.407)	(.340)	(.353)	(.390)
		Y 24S-T					(.565)	(.540)	(.452)	(.402)	(.357)	(.396)
	.51	Z 24S-T							(.349)	(.374)	(.353)	(.315)
		Y 75S-T				.608	.565	.541	.409			
		Y 24S-T				.705	.706	.638	.438	.457		
	.63	Z 24S-T					.791	(.466)	.466	.480	.361	
		Y 75S-T			.718	(.710)	.537					
		Y 24S-T			(.793)	(.843)	.776	.676				
	.79	Z 24S-T				.625	(.612)	.546	.456			
		Y 75S-T		.824	(.786)	.655						
		Y 24S-T			.889	.881	.762					
	1.00	Z 24S-T			(.719)	(.690)	.673	.552				
		Y 75S-T	(.834)	(.837)	.732							
		Y 24S-T		(.903)	.970	.897						
ρ (in.)	.40	Y 75S-T					(.799)	(.826)	(.793)	(.662)	(.698)	(.800)
		Y 24S-T					(.866)	(.967)	(.849)	(.794)	(.701)	(.805)
	.51	Z 24S-T							(.701)	(.726)	(.719)	(.611)
		Y 75S-T				.901	.944	.975	.769			
		Y 24S-T				.941	1.10	1.09	.798	.894		
	.63	Z 24S-T					1.03	(.763)	.857	.951	.698	
		Y 75S-T			.930	(1.06)	.931					
		Y 24S-T			(.947)	(1.16)	1.21	1.17				
	.79	Z 24S-T				.772	(.891)	.881	.799			
		Y 75S-T		.955	(1.06)	.993						
		Y 24S-T			1.07	1.20	1.16					
	1.00	Z 24S-T			(.792)	(.886)	.968	.886				
		Y 75S-T	(.887)	(1.01)	.995							
		Y 24S-T		(1.01)	1.19	1.23						
$\frac{b_W}{t_W}$	.40	Y 75S-T					(33.0)	(29.3)	(24.0)	(18.0)	(18.0)	(18.0)
		Y 24S-T					(33.0)	(33.0)	(25.5)	(21.0)	(18.0)	(18.0)
	.51	Z 24S-T							(27.0)	(26.2)	(26.4)	(20.0)
		Y 75S-T				33.0	29.2	26.0	18.0			
		Y 24S-T				33.0	33.0	28.1	18.0	18.0		
	.63	Z 24S-T					40.2	(28.5)	27.3	27.0	20.0	
		Y 75S-T			33.0	(31.4)	23.9					
		Y 24S-T			(33.0)	(33.0)	29.0	24.0				
	.79	Z 24S-T				30.0	(29.3)	25.0	20.0			
		Y 75S-T		33.0	(30.0)	23.5						
		Y 24S-T			29.5	27.0	21.8					
	1.00	Z 24S-T			(30.0)	(27.5)	25.0	20.0				
		Y 75S-T	(30.3)	(27.5)	22.4							
		Y 24S-T		(27.0)	25.9	21.9						
$\frac{b_S}{t_S}$	.40	Y 75S-T					(46.8)	(54.0)	(58.4)	(58.7)	(64.5)	(79.3)
		Y 24S-T					(28.1)	(50.2)	(56.0)	(62.2)	(62.0)	(77.9)
	.51	Z 24S-T							(41.0)	(49.0)	(57.0)	(56.3)
		Y 75S-T				40.5	57.0	68.0	68.4			
		Y 24S-T				25.7	48.9	61.0	59.7	78.9		
	.63	Z 24S-T					25.0	(40.6)	53.0	68.0	57.9	
		Y 75S-T			36.4	(62.5)	84.0					
		Y 24S-T			(24.0)	(46.7)	67.5	80.5				
	.79	Z 24S-T				25.2	(40.0)	48.6	54.2			
		Y 75S-T		36.0	(64.1)	81.0						
		Y 24S-T			39.5	61.1	77.0					
	1.00	Z 24S-T			(27.3)	(40.5)	51.2	56.7				
		Y 75S-T	(33.6)	(62.0)	84.0							
		Y 24S-T		(39.2)	63.0	84.0						

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TABLE 8.- COMPARATIVE DESIGNS OF Y- AND Z-STIFFENED PANELS [P_1 = 8.0 kips/inch; c = 1; minimum-weight designs in parentheses]

	t_W/t_S	Panel	L = 10 in.										L = 20 in.								
			t_S, in.										t_S, in.								
			0.040	0.051	0.064	0.081	0.102	0.125	0.156	0.188	0.204	0.250	0.051	0.064	0.081	0.102	0.125	0.156	0.188	0.204	0.250
$\bar{\sigma}_f$ (ksi)	0.40	Y 75S-T					(55.3)	(48.5)	(41.2)	(35.3)	(32.8)	(26.5)				(52.7)	(46.9)	(40.1)	(34.4)	(32.4)	(26.8)
		Y 24S-T						(43.2)	(37.6)	(32.9)	(30.9)	(26.5)					(40.9)	(36.5)	(32.6)	(30.8)	(26.3)
	.51	Z 24S-T							(37.1)	(32.9)	(31.1)	(26.7)						(35.5)	(32.7)	(31.1)	(26.7)
		Y 75S-T				(58.2)	52.1	46.1	39.2						(56.3)	50.7	45.1	38.6			
		Y 24S-T					(44.4)	40.1	34.9	31.1	29.4					(41.5)	38.5	34.5	30.7	29.1	25.1
	.63	Z 24S-T							35.3	31.4	29.8	25.8					37.0	35.3	31.4	29.8	25.8
		Y 75S-T			(60.6)	55.7	49.9	44.2						(58.6)	54.9	49.3	43.9				
		Y 24S-T					41.7	37.5	33.2	29.7						39.9	36.7	33.2	29.6		
	.79	Z 24S-T					37.0	(37.6)	33.4	29.8	28.3	24.7				36.5	(37.5)	33.4	29.8	28.3	24.7
		Y 75S-T		(60.8)	57.9	52.9	47.3							56.8	52.3	47.1					
		Y 24S-T				(42.7)	38.8	35.2	31.5						(40.6)	37.8	35.2	31.5			
	1.00	Z 24S-T				(40.5)	(38.2)	34.9	31.2	28.2	26.8				(39.1)	(38.1)	34.8	31.2	28.2	26.7	
		Y 75S-T	(60.4)	58.9	54.6	49.6							(57.8)	54.2	49.3						
		Y 24S-T			(42.6)	40.0	36.4	33.1						(40.2)	39.1	36.2	33.0				
σ_{cr} (ksi)	.40	Y 75S-T					(43.4)	(26.8)	(14.9)	(10.4)	(9.5)	(6.1)				(52.7)	(34.0)	(19.2)	(12.1)	(11.0)	(7.6)
		Y 24S-T						(41.4)	(33.1)	(24.2)	(18.8)	(10.4)					(40.9)	(37.0)	(25.4)	(20.4)	(11.7)
	.51	Z 24S-T							(36.3)	(32.4)	(29.1)	(18.4)						(35.1)	(32.7)	(29.6)	(18.6)
		Y 75S-T				(54.0)	28.0	15.6	9.0						(56.3)	36.0	18.9	10.6			
		Y 24S-T					(42.4)	36.3	26.2	16.6	13.1					(41.5)	38.1	28.5	17.6	14.0	7.6
	.63	Z 24S-T							34.9	25.1	20.9	13.0					35.5	34.9	25.2	21.4	13.1
		Y 75S-T			(59.0)	38.0	17.3	9.8						(57.2)	40.1	18.1	10.0				
		Y 24S-T					38.4	30.3	16.8	9.7						39.9	33.3	17.3	10.0		
	.79	Z 24S-T					34.7	(36.0)	26.2	18.0	15.2	9.3				36.5	(36.1)	26.3	17.9	15.1	9.2
		Y 75S-T		(58.6)	43.7	21.1	10.3							48.4	21.5	11.1					
		Y 24S-T				(40.3)	31.6	17.5	9.1						(39.8)	33.9	19.5	9.1			
	1.00	Z 24S-T				(40.0)	(38.0)	29.0	18.8	12.4	10.8				(38.5)	(37.8)	28.1	19.2	12.7	10.6	
		Y 75S-T	(57.5)	42.2	21.6	10.8							(47.5)	22.2	11.1						
		Y 24S-T			(40.9)	31.2	16.6	9.9						(40.2)	34.0	17.2	9.9				
H (in.)	.40	Y 75S-T					(1.35)	(1.72)	(2.16)	(2.74)	(2.74)	(4.40)				(1.35)	(1.72)	(2.16)	(2.74)	(2.74)	(3.45)
		Y 24S-T						(1.72)	(2.16)	(2.74)	(2.74)	(3.45)					(2.37)	(2.16)	(2.74)	(2.74)	(3.45)
	.51	Z 24S-T							(1.72)	(2.14)	(2.14)	(2.63)						(2.11)	(2.14)	(2.14)	(2.63)
		Y 75S-T				(1.35)	1.72	2.16	2.74						(2.69)	1.72	2.16	2.74			
		Y 24S-T					(1.78)	2.16	2.74	3.45	3.45					(2.36)	2.41	2.43	3.45	3.45	4.28
	.63	Z 24S-T							2.14	2.63	2.63	3.28					2.27	2.14	2.63	2.63	3.28
		Y 75S-T			(1.36)	1.72	2.16	2.74						(1.54)	1.72	2.16	2.74				
		Y 24S-T					2.16	2.74	3.45	4.22						2.40	2.74	3.45	4.22		
	.79	Z 24S-T					2.31	(2.14)	2.63	3.28	3.28	4.28				2.37	(2.14)	2.63	3.28	3.28	3.95
		Y 75S-T		(1.49)	1.72	2.16	2.74							1.72	2.16	2.74					
		Y 24S-T				(2.16)	2.74	3.45	4.22						(2.45)	2.74	3.45	4.22			
	1.00	Z 24S-T				(1.86)	(2.14)	2.63	3.28	3.95	4.28				(2.07)	(2.14)	2.63	3.28	3.95	4.28	
		Y 75S-T	(1.57)	1.72	2.16	2.74							(1.72)	2.16	2.74						
		Y 24S-T			(2.16)	2.74	3.45	4.22						(2.42)	2.74	3.45	4.22				
S (in.)	.40	Y 75S-T					(1.96)	(3.14)	(5.02)	(7.11)	(8.17)	(12.0)				(1.68)	(2.74)	(4.49)	(6.56)	(7.46)	(10.8)
		Y 24S-T						(2.12)	(3.46)	(5.22)	(6.18)	(9.51)					(2.33)	(3.09)	(4.99)	(5.93)	(9.32)
	.51	Z 24S-T							(3.90)	(6.00)	(7.29)	(11.9)						(3.90)	(5.86)	(7.29)	(11.9)
		Y 75S-T				(1.52)	2.65	4.20	6.63						(1.40)	2.42	3.86	6.24			
		Y 24S-T					(1.79)	2.76	4.47	6.68	7.85					(1.95)	2.71	4.17	6.47	7.69	11.9
	.63	Z 24S-T							4.87	7.46	9.02	14.6					3.13	4.84	7.50	9.05	14.6
		Y 75S-T			(1.21)	2.09	3.54	5.59						(1.26)	2.02	3.47	5.47				
		Y 24S-T					2.32	3.57	5.76	8.66						2.27	3.34	5.67	8.55		
	.79	Z 24S-T					2.55	(3.80)	6.24	9.41	11.4	18.1				2.55	(3.80)	6.21	9.42	11.3	18.1
		Y 75S-T		(1.09)	1.74	2.92	4.86							1.67	2.83	4.75					
		Y 24S-T				(1.94)	3.15	4.93	7.76						(1.88)	2.97	4.79	7.75			
	1.00	Z 24S-T				(2.03)	(3.20)	4.95	8.04	12.2	14.5				(2.03)	(3.24)	4.96	8.05	12.2	14.6	
		Y 75S-T	(.99)	1.54	2.48	4.08							(1.50)	2.47	4.06						
		Y 24S-T			(1.67)	2.77	4.44	6.68						(1.71)	2.66	4.39	6.68				
$\bar{h}$ (in.)	.40	Y 75S-T					(.258)	(.268)	(.293)	(.322)	(.336)	(.514)				(.280)	(.294)	(.313)	(.338)	(.355)	(.394)
		Y 24S-T						(.341)	(.366)	(.388)	(.394)	(.430)					(.518)	(.389)	(.398)	(.407)	(.435)
	.51	Z 24S-T							(.316)	(.338)	(.327)	(.344)						(.420)	(.342)	(.327)	(.344)
		Y 75S-T				(.328)	.345	.365	.395						(.346)	.364	.384	.410			
		Y 24S-T					(.447)	.466	.501	.534	.546					(.643)	.552	.529	.544	.554	.590
	.63	Z 24S-T							.411	.439	.422	.445					.563	.413	.437	.421	.445
		Y 75S-T			(.386)	.414	.444	.464						(.450)	.421	.449	.477				
		Y 24S-T					.552	.609	.659	.698						.645	.630	.666	.701		
	.79	Z 24S-T					.703	(.511)	.543	.592	.566	.621				.729	(.511)	.545	.592	.567	.586
		Y 75S-T		(.477)	.483	.535	.582							.492	.544	.590					
		Y 24S-T				(.644)	.729	.792	.872						(.768)	.749	.805	.870			
	1.00	Z 24S-T				(.616)	(.619)	.682	.742	.786	.807				(.717)	(.616)	.681	.741	.784	.804	
		Y 75S-T	(.569)	.551	.628	.707							(.557)	.629	.709						
		Y 24S-T			(.727)	.834	.949	1.06						(.849)	.847	.953	1.06				
ρ (in.)	.40	Y 75S-T					(.428)	(.484)	(.560)	(.640)	(.677)	(1.10)				(.446)	(.506)	(.582)	(.659)	(.700)	(.807)
		Y 24S-T						(.544)	(.631)	(.711)	(.748)	(.846)					(.796)	(.651)	(.722)	(.756)	(.858)
	.51	Z 24S-T							(.502)	(.582)	(.586)	(.650)						(.680)	(.588)	(.586)	(.650)
		Y 75S-T				(.483)	.567	.650	.757						(.498)	.580	.665	.770			
		Y 24S-T					(.642)	.722	.849	.965	1.02					(.889)	.829	.865	.975	1.03	1.17
	.63	Z 24S-T							.623	.758	.763	.860					.806	.666	.758	.763	.863
		Y 75S-T			(.506)	.605	.718	.829						(.582)	.609	.721	.833				
		Y 24S-T					.777	.918	1.09	1.24						.876	.929	1.09	1.24		
	.79	Z 24S-T					.886	(.738)	.861	1.00	1.01	1.19				.908	(.738)	.864	1.00	1.01	1.14
		Y 75S-T		(.567)	.633	.771	.923							.635	.774	.927					
		Y 24S-T				(.809)	.989	1.17	1.40						(.936)	.999	1.18	1.40			
	1.00	Z 24S-T				(.724)	(.804)	.955	1.14	1.30	1.38				(.817)	(.803)	.954	1.14	1.30	1.38	
		Y 75S-T	(.615)	.658	.808	.996							(.659)	.808	.992						
		Y 24S-T			(.835)	1.03	1.27	1.52						(.947)	1.03	1.27	1.52				
$\frac{b_W}{t_W}$	.40	Y 75S-T					(18.0)	(18.0)	(18.0)	(18.0)	(18.0)	(23.2)				(18.0)	(18.0)	(18.0)	(18.0)	(18.0)	(18.0)
		Y 24S-T						(18.0)	(18.0)	(18.0)	(18.0)	(18.0)					(25.0)	(18.0)	(18.0)	(18.0)	(18.0)
	.51	Z 24S-T							(20.2)	(20.0)	(20.0)	(20.0)						(25.1)	(20.0)	(20.0)	(20.0)
		Y 75S-T				(18.0)	18.0	18.0	18.0						(18.2)	18.0	18.0	18.0			
		Y 24S-T					(18.6)	18.0	18.0	18.0	18.0					(24.9)	20.1	18.0	18.0	18.0	18.0
	.63	Z 24S-T							20.0	20.0	20.0	20.0					27.0	20.0	20.0	20.0	20.0
		Y 75S-T			(18.2)	18.0	18.0	18.0						(20.6)	18.0	18.0	18.0				
		Y 24S-T					18.0	18.0	18.0	18.0						19.9	18.0	18.0	18.0		
	.79	Z 24S-T					27.5	(20.0)	20.0	20.0	20.0	20.0				28.2	(20.0)	20.0	20.0	20.0	20.0
		Y 75S-T		(19.6)	18.0	18.0	18.0							18.0	18.0	18.0					
		Y 24S-T				(18.0)	18.0	18.0	18.0						(20.5)	18.0	18.0	18.0			
	1.00	Z 24S-T				(22.0)	(20.0)	20.0	20.0	20.0	20.0				(24.6)	(20.0)	20.0	20.0	20.0	20.0	
		Y 75S-T	(21.0)	18.0	18.0	18.0							(18.0)	18.0	18.0						
		Y 24S-T			(18.0)	18.0	18.0	18.0						(20.3)	18.0	18.0	18.0				
$\frac{b_S}{t_S}$	.40	Y 75S-T					(29.2)	(40.7)	(54.8)	(65.5)	(70.8)	(84.0)				(23.8)	(34.3)	(48.0)	(59.6)	(63.8)	(77.1)
		Y 24S-T						(24.3)	(34.7)	(45.4)	(51.2)	(66.5)					(24.8)	(30.0)	(43.0)	(48.8)	(65.0)
	.51	Z 24S-T							(25.0)	(31.9)	(35.7)	(47.5)						(25.0)	(31.2)	(35.7)	(47.4)
		Y 75S-T				(25.9)	40.3	55.2	72.9						(23.0)	35.7	49.8	67.9			
		Y 24S-T					(23.0)	32.1	45.2	58.4	65.3					(23.0)	30.2	41.3	56.1	63.6	83.3
	.63	Z 24S-T							31.2	39.7	44.2	58.4					25.0	31.0	39.9	44.3	58.4
		Y 75S-T			(23.0)	36.8	54.8	74.2						(23.0)	35.1	53.3	72.4				
		Y 24S-T					30.8	41.9	58.5	76.4						28.5	38.2	57.4	75.3		
	.79	Z 24S-T					25.0	(30.4)	40.0	50.1	55.7	72.2				25.0	(30.4)	39.8	50.1	55.5	72.1
		Y 75S-T		(23.0)	35.7	53.6	76.7							33.5	51.4	74.5					
		Y 24S-T				(29.3)	43.1	59.8	80.8						(28.0)	39.6	57.5	80.6			
	1.00	Z 24S-T				(25.0)	31.4	39.6	51.5	64.6	70.9				(25.0)	(31.7)	39.7	51.6	64.9	71.3	
		Y 75S-T	(23.0)	37.1	54.1	77.4							(35.5)	53.9	76.9						
		Y 24S-T			(28.8)	45.0	63.6	83.5						(27.5)	42.3	62.6	83.5				

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TABLE 8.- COMPARATIVE DESIGNS OF Y- AND Z-STIFFENED PANELS - Concluded

	$\frac{t_W}{t_S}$	Panel	L = 30 in.									L = 40 in.									
			t_S, in.									t_S, in.									
			0.051	0.064	0.081	0.102	0.125	0.156	0.188	0.204	0.250	0.051	0.064	0.081	0.102	0.125	0.156	0.188	0.204	0.250	0.375
$\bar{\sigma}_f$ (ksi)	0.40	Y 75S-T				(49.0)	(44.5)	(38.8)	(33.7)	(31.5)	(26.6)					(42.9)	(37.7)	(32.9)	(30.8)	(26.0)	
		Y 24S-T					(38.5)	(35.3)	(31.7)	(30.1)	(26.0)						(34.0)	(31.0)	(29.4)	(25.5)	(18.2)
	.51	Z 24S-T							(32.0)	(30.6)	(26.2)							(30.7)	(29.7)	(25.3)	(19.0)
		Y 75S-T				47.4	42.8	37.6	32.7	30.7					(44.7)	40.6	35.8	31.7	30.0		
		Y 24S-T				(39.4)	36.8	33.4	30.2	28.6	24.8					(35.3)	32.5	29.5	28.1	24.4	
	.63	Z 24S-T						(34.4	31.2	29.5	25.4						(32.3)	30.2	28.5	24.9	
		Y 75S-T			(51.0)	46.8	42.6							(46.4)	44.2	40.6					
		Y 24S-T				38.0	35.5	32.5	29.1	27.8					(36.6)	34.4	31.4	28.6	27.2		
	.79	Z 24S-T				35.3	(35.6)	33.1	29.4	28.0	24.6					(33.4)	31.6	29.0	27.4	24.2	
		Y 75S-T		(52.3)	49.2	45.5							46.9	45.7	43.0						
		Y 24S-T			(38.2)	36.5	34.2	31.0						(36.4)	35.0	33.1	30.4				
	1.00	Z 24S-T			(35.7)	(36.3)	34.2	31.1	28.2	26.8				(33.4)	(33.8)	32.8	30.5	27.8	26.6		
		Y 75S-T	(52.7)	51.6	48.1							(46.6)	(47.0)	45.3							
		Y 24S-T		(38.4)	37.3	35.3	33.0						(35.9)	35.8	34.2	32.4					
σ_{cr} (ksi)	.40	Y 75S-T				(42.0)	(33.5)	(26.5)	(16.4)	(14.0)	(9.9)					(31.6)	(20.5)	(21.2)	(17.5)	(11.4)	
		Y 24S-T					(38.5)	(34.2)	(28.9)	(23.0)	(14.6)						(33.9)	(25.9)	(22.7)	(17.5)	(7.1)
	.51	Z 24S-T							(32.0)	(30.6)	(22.2)							(30.7)	(29.7)	(25.3)	(7.3)
		Y 75S-T				37.1	28.0	14.3	8.9	7.7					(34.5)	25.3	16.2	11.2	9.2		
		Y 24S-T				(39.4)	36.1	28.1	20.6	16.4	8.8					(33.9)	27.7	19.2	10.5		
	.63	Z 24S-T						(34.4)	27.6	23.8	14.8						(32.3)	28.0	28.1	16.9	
		Y 75S-T			(44.7)	20.7	12.6							(41.0)	18.9	13.0					
		Y 24S-T				38.0	32.0	20.2	11.2	9.2					(36.6)	28.9	16.9	12.7	9.9		
	.79	Z 24S-T				34.3	(35.6)	28.1	20.0	16.2	10.1					(33.4)	29.4	22.6	18.3	10.3	
		Y 75S-T		(52.0)	26.4	13.2							42.9	27.5	13.3						
		Y 24S-T			(38.2)	36.5	22.2	10.3						(36.4)	31.5	21.6	11.6				
	1.00	Z 24S-T			(35.6)	(36.3)	29.9	19.2	12.7	11.1				(33.4)	(33.8)	32.8	20.7	13.1	11.2		
		Y 75S-T	(52.5)	27.0	12.0							(46.6)	(25.8)	15.9							
		Y 24S-T		(38.4)	34.9	19.5	9.9						(35.9)	33.3	18.1	10.8					
H (in.)	.40	Y 75S-T				(2.16)	(2.27)	(2.16)	(2.74)	(2.74)	(3.45)					(2.71)	(3.03)	(2.74)	(2.74)	(3.45)	
		Y 24S-T					(2.84)	(3.00)	(3.01)	(2.96)	(3.45)						(3.51)	(3.61)	(3.39)	(3.45)	(5.27)
	.51	Z 24S-T							(2.35)	(2.30)	(2.63)							(2.80)	(2.75)	(2.63)	(4.14)
		Y 75S-T				2.18	2.16	2.74	3.45	3.45					(2.70)	2.85	3.25	3.45	3.46		
		Y 24S-T				(2.81)	3.11	3.17	3.45	3.45	4.22					(3.94)	3.74	4.07	3.45	4.22	
	.63	Z 24S-T						(2.26)	2.63	2.63	3.28						(2.82)	2.94	2.63	3.28	
		Y 75S-T			(2.09)	2.45	2.74							(2.60)	3.17	3.22					
		Y 24S-T				2.95	3.18	3.45	4.22	4.22					(3.38)	3.84	4.29	4.22	4.22		
	.79	Z 24S-T				2.51	(2.40)	2.63	3.28	3.28	4.28					(2.80)	2.94	3.28	3.28	4.28	
		Y 75S-T		(1.94)	2.27	2.74							2.44	2.89	3.18						
		Y 24S-T			(2.94)	3.17	3.45	4.22						(3.35)	3.61	4.00	4.22				
	1.00	Z 24S-T			(2.35)	(2.35)	2.63	3.28	3.95	4.28				(2.59)	(2.63)	2.63	3.28	3.95	4.28		
		Y 75S-T	(1.94)	2.16	2.74							(2.38)	(2.85)	3.05							
		Y 24S-T		(2.67)	2.99	3.45	4.22						(2.99)	3.45	4.00	4.22					
S (in.)	.40	Y 75S-T				(2.00)	(2.91)	(3.89)	(5.82)	(6.73)	(9.78)					(3.07)	(4.59)	(5.09)	(6.01)	(8.93)	
		Y 24S-T					(2.39)	(3.61)	(4.83)	(5.69)	(8.81)						(3.80)	(5.21)	(5.87)	(5.87)	(17.4)
	.51	Z 24S-T							(5.74)	(6.94)	(10.9)							(5.74)	(7.25)	(8.88)	(28.1)
		Y 75S-T				2.46	3.29	5.53	8.13	9.55					(2.60)	3.58	5.39	7.27	8.55		
		Y 24S-T				(2.08)	3.03	4.32	6.00	7.20	11.2					(3.37)	4.60	6.36	6.63	10.4	
	.63	Z 24S-T						(4.68)	7.14	8.55	13.6						(4.79)	7.05	7.61	12.4	
		Y 75S-T			(2.02)	3.36	5.04							(2.07)	3.65	5.03					
		Y 24S-T				2.50	3.51	5.34	8.12	9.71					(2.69)	3.89	5.97	7.74	9.21		
	.79	Z 24S-T				2.55	(3.72)	6.01	9.05	10.9	17.9					(3.75)	5.85	8.50	10.1	17.1	
		Y 75S-T		(1.62)	2.65	4.41							(1.66)	2.81	4.42						
		Y 24S-T			(2.11)	3.14	4.53	7.58						(2.16)	3.28	4.78	7.20				
	1.00	Z 24S-T			(2.03)	(3.16)	4.80	7.98	12.1	14.4				(2.03)	(3.13)	4.35	7.65	11.7	14.1		
		Y 75S-T	(1.43)	2.27	3.90							(1.43)	(2.46)	3.80							
		Y 24S-T		(1.73)	2.70	4.20	6.67						(1.72)	2.84	4.45	6.42					
$\bar{H}$ (in.)	.40	Y 75S-T				(.495)	(.422)	(.340)	(.363)	(.376)	(.418)					(.534)	(.501)	(.393)	(.403)	(.440)	
		Y 24S-T					(.658)	(.572)	(.461)	(.453)	(.448)						(.709)	(.582)	(.548)	(.478)	(.568)
	.51	Z 24S-T							(.392)	(.368)	(.362)							(.504)	(.459)	(.403)	(.432)
		Y 75S-T				.507	.422	.438	.472	.485					(.692)	.607	.579	.508	.520		
		Y 24S-T				(.811)	.762	.636	.571	.577	.610					(1.00)	.792	.710	.606	.638	
	.63	Z 24S-T						(.455)	.449	.435	.464						(.623)	.533	.464	.489	
		Y 75S-T			(.561)	.553	.500							(.772)	.780	.651					
		Y 24S-T				.838	.765	.687	.724	.735					(1.05)	.972	.906	.750	.760		
	.79	Z 24S-T				.793	(.612)	.555	.606	.581	.625					(.768)	.666	.628	.605	.643	
		Y 75S-T		(.597)	.607	.614							.821	.845	.770						
		Y 24S-T			(.971)	.906	.829	.882						(1.14)	1.08	1.01	.912				
	1.00	Z 24S-T			(.857)	(.714)	.692	.744	.790	.809				(.982)	(.848)	.725	.762	.804	.818		
		Y 75S-T	(.676)	.650	.722							(.885)	(.945)	.870							
		Y 24S-T		(.970)	.952	.973	1.06						(1.12)	1.16	1.18	1.08					
ρ (in.)	.40	Y 75S-T				(.763)	(.716)	(.609)	(.687)	(.726)	(.838)					(.890)	(.910)	(.717)	(.754)	(.866)	
		Y 24S-T					(.990)	(.959)	(.825)	(.836)	(.875)						(1.16)	(1.04)	(1.01)	(.911)	(1.18)
	.51	Z 24S-T							(.672)	(.656)	(.673)							(.852)	(.826)	(.724)	(.877)
		Y 75S-T				.774	.695	.797	.908	.959					(1.01)	.970	1.01	.942	.993		
		Y 24S-T				(1.07)	1.12	1.04	.996	1.05	1.19					(1.42)	1.26	1.23	1.06	1.21	
	.63	Z 24S-T						(.723)	.767	.775	.882						(.957)	.896	.777	.908	
		Y 75S-T			(.771)	.852	.851							(.999)	1.16	1.06					
		Y 24S-T				1.11	1.11	1.10	1.26	1.33					(1.34)	1.33	1.43	1.28	1.35		
	.79	Z 24S-T				.975	(.854)	.870	1.01	1.02	1.19					(1.03)	1.01	1.03	1.04	1.20	
		Y 75S-T		(.738)	.833	.940							.954	1.10	1.13						
		Y 24S-T			(1.15)	1.19	1.19	1.41						(1.31)	1.37	1.42	1.42				
	1.00	Z 24S-T			(.937)	(.897)	.959	1.14	1.31	1.38				(1.04)	(1.03)	.973	1.15	1.31	1.39		
		Y 75S-T	(.761)	.815	.997							(.940)	(1.11)	1.16							
		Y 24S-T		(1.05)	1.14	1.28	1.51						(1.18)	1.34	1.51	1.52					
$\frac{b_W}{t_W}$	.40	Y 75S-T				(29.0)	(24.0)	(18.0)	(18.0)	(18.0)	(18.0)					(28.9)	(25.6)	(18.0)	(18.0)	(18.0)	
		Y 24S-T					(30.2)	(25.3)	(19.8)	(19.3)	(18.0)						(30.0)	(24.2)	(22.5)	(18.0)	(18.0)
	.51	Z 24S-T							(22.0)	(21.5)	(20.0)							(26.5)	(26.0)	(20.0)	(21.0)
		Y 75S-T				22.9	18.0	18.0	18.0	18.0					(29.0)	24.0	21.5	18.0	18.0		
		Y 24S-T				(30.0)	26.3	21.0	18.0	18.0	18.0					(33.0)	25.0	21.5	18.0	18.0	
	.63	Z 24S-T						(21.2)	20.0	20.0	20.0						(26.7)	22.5	20.0	20.0	
		Y 75S-T			(22.0)	20.5	18.0							(27.8)	27.0	21.5					
		Y 24S-T				24.8	21.0	18.0	18.0	18.0					(29.6)	25.7	22.7	18.0	18.0		
	.79	Z 24S-T				30.0	(22.5)	20.0	20.0	20.0	20.0					(26.5)	22.5	20.0	20.0	20.0	
		Y 75S-T		(20.5)	19.0	18.0							26.0	24.4	21.0						
		Y 24S-T			(24.8)	21.0	18.0	18.0						(28.2)	24.0	21.0	18.0				
	1.00	Z 24S-T			(28.0)	(22.0)	20.0	20.0	20.0	20.0				(31.0)	(25.0)	20.0	20.0	20.0	20.0		
		Y 75S-T	(20.5)	18.0	18.0							(25.1)	(24.0)	20.3							
		Y 24S-T		(22.5)	19.6	18.0	18.0						(25.1)	22.9	21.0	18.0					
$\frac{b_S}{t_S}$	.40	Y 75S-T				(25.6)	(34.5)	(40.3)	(51.8)	(56.7)	(68.6)					(35.0)	(46.0)	(44.1)	(49.6)	(61.9)	
		Y 24S-T					(23.4)	(33.5)	(40.5)	(46.0)	(60.1)						(34.0)	(42.6)	(46.4)	(53.4)	(83.4)
	.51	Z 24S-T							(30.5)	(34.0)	(43.4)							(30.5)	(35.5)	(35.5)	(75.0)
		Y 75S-T				34.0	40.6	58.7	73.9	81.9					(33.6)	42.1	55.0	64.6	72.1		
		Y 24S-T				(23.0)	32.0	41.7	51.1	58.8	78.0					(33.9)	43.0	53.0	53.3	71.7	
	.63	Z 24S-T						(30.0)	38.0	41.9	54.3						(30.7)	37.5	37.3	49.6	
		Y 75S-T			(32.5)	49.5	65.5							(30.0)	51.0	63.0					
		Y 24S-T				30.0	39.0	53.2	70.8	80.9					(30.5)	42.0	58.0	66.7	76.0		
	.79	Z 24S-T				25.0	(29.8)	38.5	48.1	53.3	71.4					(30.0)	37.5	45.2	49.7	68.3	
		Y 75S-T		(30.0)	46.0	68.0							26.6	45.6	65.6						
		Y 24S-T			(28.0)	40.5	53.4	78.4						(26.5)	40.8	54.9	73.5				
	1.00	Z 24S-T			(25.0)	(31.0)	38.4	51.1	64.1	70.5				(25.0)	(30.7)	34.8	49.0	62.2	69.1		
		Y 75S-T	(30.2)	47.6	72.9							(25.4)	(47.2)	68.0							
		Y 24S-T		(26.0)	41.5	59.0	83.4						(23.0)	41.5	60.8	79.3					

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TABLE 9.- Y-PANEL PROPERTIES $\left[\frac{t_W}{t_S} = 0.40;\ \frac{b_A}{t_W} = 9.3;\ \frac{b_Y}{b_W} = 1.04;\ \frac{t_L}{t_W} = 1.06;\ \frac{b_L}{b_W} = 0.94;\ \frac{t_F}{t_W} = 2.13;\ \frac{b_F}{b_W} = 0.69;\ \frac{r}{t_W} = 1;\ \frac{d}{t_S} = 1.5;\ \frac{p}{t_S} = 4.6\right]$

$\frac{b_S}{t_S}$ \ $\frac{b_W}{t_W}$		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
23	$\frac{A_1}{t_S}$	1.496	1.512	1.527	1.542	1.557	1.571	1.585	1.598	1.612	1.624	1.637	1.649	1.661	1.673	1.685	1.696
24		1.481	1.497	1.512	1.526	1.541	1.555	1.568	1.582	1.595	1.608	1.620	1.632	1.644	1.656	1.667	1.678
25		1.467	1.482	1.497	1.512	1.526	1.539	1.553	1.566	1.579	1.591	1.604	1.616	1.628	1.639	1.650	1.662
26		1.454	1.469	1.483	1.497	1.511	1.525	1.538	1.551	1.564	1.576	1.588	1.600	1.612	1.623	1.635	1.646
27		1.441	1.456	1.470	1.484	1.498	1.511	1.524	1.537	1.550	1.562	1.574	1.586	1.597	1.608	1.619	1.630
28		1.429	1.444	1.458	1.472	1.485	1.498	1.511	1.524	1.536	1.548	1.560	1.572	1.583	1.594	1.605	1.616
29		1.418	1.432	1.446	1.460	1.473	1.486	1.498	1.511	1.523	1.535	1.547	1.558	1.569	1.580	1.591	1.602
30		1.407	1.421	1.435	1.448	1.461	1.474	1.486	1.499	1.511	1.522	1.534	1.545	1.556	1.567	1.578	1.589
31		1.397	1.411	1.424	1.437	1.450	1.463	1.475	1.487	1.499	1.510	1.522	1.533	1.544	1.555	1.565	1.576
32		1.388	1.401	1.414	1.427	1.440	1.452	1.464	1.476	1.488	1.499	1.510	1.521	1.532	1.543	1.553	1.564
33		1.378	1.391	1.404	1.417	1.430	1.442	1.454	1.465	1.477	1.488	1.499	1.510	1.521	1.531	1.542	1.552
34		1.370	1.382	1.395	1.408	1.420	1.432	1.444	1.455	1.467	1.478	1.489	1.500	1.510	1.521	1.531	1.541
35		1.361	1.374	1.386	1.399	1.411	1.423	1.434	1.446	1.457	1.468	1.479	1.489	1.500	1.510	1.520	1.530
36		1.353	1.366	1.378	1.390	1.402	1.414	1.425	1.436	1.447	1.458	1.469	1.479	1.490	1.500	1.510	1.520
37		1.346	1.358	1.370	1.382	1.394	1.405	1.416	1.427	1.438	1.449	1.460	1.470	1.480	1.490	1.500	1.510
38		1.338	1.350	1.362	1.374	1.385	1.397	1.400	1.419	1.430	1.440	1.451	1.461	1.471	1.481	1.491	1.500
39		1.331	1.343	1.355	1.366	1.378	1.389	1.392	1.411	1.421	1.432	1.442	1.452	1.462	1.472	1.482	1.491
40		1.324	1.336	1.348	1.359	1.370	1.381	1.389	1.403	1.413	1.424	1.434	1.444	1.454	1.463	1.473	1.482
42		1.312	1.323	1.334	1.345	1.356	1.367	1.378	1.388	1.398	1.408	1.418	1.428	1.437	1.447	1.456	1.465
44		1.300	1.311	1.322	1.333	1.343	1.354	1.364	1.374	1.384	1.394	1.403	1.413	1.422	1.432	1.441	1.450
46		1.289	1.300	1.310	1.321	1.331	1.341	1.351	1.361	1.371	1.380	1.390	1.399	1.408	1.417	1.426	1.435
48		1.279	1.289	1.300	1.310	1.320	1.330	1.339	1.349	1.359	1.368	1.377	1.386	1.395	1.404	1.413	1.421
50		1.270	1.280	1.289	1.300	1.309	1.319	1.328	1.338	1.347	1.356	1.365	1.374	1.383	1.391	1.400	1.408
52		1.261	1.271	1.280	1.290	1.299	1.309	1.318	1.327	1.336	1.345	1.354	1.363	1.371	1.380	1.388	1.396
54		1.252	1.261	1.272	1.281	1.290	1.299	1.308	1.317	1.326	1.335	1.343	1.352	1.360	1.369	1.377	1.385
56		1.245	1.254	1.263	1.272	1.282	1.290	1.299	1.308	1.317	1.325	1.334	1.342	1.350	1.358	1.366	1.374
58		1.237	1.247	1.256	1.265	1.273	1.282	1.291	1.299	1.308	1.316	1.324	1.332	1.340	1.348	1.356	1.364
60		1.231	1.239	1.248	1.257	1.266	1.274	1.283	1.291	1.299	1.307	1.315	1.323	1.331	1.339	1.347	1.354
63		1.221	1.230	1.238	1.246	1.255	1.263	1.271	1.279	1.287	1.295	1.303	1.311	1.318	1.326	1.333	1.341
66		1.212	1.220	1.229	1.237	1.245	1.253	1.261	1.269	1.276	1.284	1.291	1.299	1.306	1.314	1.321	1.328
69		1.204	1.212	1.220	1.228	1.236	1.243	1.251	1.259	1.266	1.273	1.281	1.288	1.295	1.302	1.309	1.316
72		1.196	1.204	1.212	1.220	1.227	1.235	1.242	1.249	1.257	1.264	1.271	1.278	1.285	1.292	1.299	1.306
75		1.189	1.197	1.204	1.212	1.219	1.226	1.234	1.241	1.248	1.255	1.262	1.269	1.275	1.282	1.289	1.295
78		1.183	1.190	1.197	1.205	1.212	1.219	1.226	1.233	1.240	1.246	1.253	1.260	1.266	1.273	1.279	1.286
81		1.177	1.184	1.191	1.198	1.205	1.212	1.218	1.225	1.232	1.238	1.245	1.252	1.258	1.264	1.271	1.277
84		1.171	1.178	1.185	1.192	1.198	1.205	1.212	1.218	1.225	1.231	1.237	1.244	1.250	1.256	1.262	1.269
23	$\frac{\bar{h}}{t_S}$	2.788	2.979	3.172	3.369	3.571	3.773	3.979	4.185	4.398	4.607	4.823	5.038	5.256	5.477	5.700	5.922
24		2.741	2.931	3.122	3.314	3.514	3.715	3.914	4.122	4.330	4.541	4.752	4.965	5.181	5.401	5.619	5.839
25		2.697	2.881	3.071	3.264	3.459	3.654	3.856	4.059	4.265	4.470	4.683	4.895	5.110	5.323	5.539	5.763
26		2.655	2.838	3.022	3.210	3.403	3.600	3.797	3.998	4.203	4.406	4.613	4.824	5.037	5.249	5.468	5.686
27		2.612	2.793	2.976	3.162	3.354	3.545	3.741	3.940	4.143	4.346	4.551	4.760	4.971	5.178	5.391	5.607
28		2.572	2.751	2.932	3.118	3.304	3.494	3.688	3.886	4.083	4.284	4.488	4.695	4.901	5.110	5.322	5.537
29		2.534	2.709	2.888	3.072	3.257	3.445	3.634	3.830	4.026	4.225	4.428	4.629	4.834	5.041	5.252	5.465
30		2.496	2.669	2.847	3.026	3.209	3.396	3.583	3.778	3.972	4.166	4.367	4.567	4.770	4.977	5.186	5.398
31		2.461	2.633	2.805	2.983	3.164	3.350	3.535	3.725	3.918	4.110	4.310	4.509	4.711	4.916	5.118	5.329
32		2.429	2.596	2.767	2.943	3.123	3.303	3.487	3.675	3.867	4.058	4.252	4.449	4.650	4.854	5.055	5.265
33		2.393	2.558	2.728	2.902	3.081	3.260	3.443	3.625	3.816	4.005	4.198	4.394	4.594	4.791	4.996	5.199
34		2.364	2.524	2.692	2.865	3.039	3.217	3.398	3.579	3.768	3.957	4.148	4.343	4.536	4.738	4.937	5.139
35		2.330	2.493	2.656	2.828	3.000	3.177	3.353	3.537	3.720	3.907	4.098	4.286	4.484	4.678	4.876	5.077
36		2.300	2.462	2.624	2.790	2.961	3.136	3.311	3.490	3.672	3.857	4.047	4.234	4.430	4.624	4.821	5.020
37		2.274	2.430	2.591	2.756	2.926	3.096	3.269	3.446	3.627	3.812	4.000	4.186	4.376	4.568	4.764	4.963
38		2.243	2.398	2.558	2.722	2.886	3.059	3.193	3.407	3.587	3.766	3.953	4.138	4.326	4.518	4.713	4.904
39		2.216	2.370	2.528	2.687	2.855	3.022	3.154	3.368	3.542	3.724	3.905	4.089	4.276	4.467	4.660	4.851
40		2.189	2.341	2.499	2.656	2.818	2.984	3.140	3.328	3.501	3.682	3.862	4.045	4.231	4.415	4.608	4.797
42		2.141	2.287	2.438	2.594	2.754	2.917	3.086	3.252	3.423	3.597	3.775	3.956	4.134	4.322	4.506	4.694
44		2.092	2.237	2.386	2.539	2.692	2.854	3.015	3.180	3.349	3.521	3.691	3.870	4.046	4.232	4.415	4.601
46		2.047	2.190	2.332	2.484	2.635	2.790	2.949	3.112	3.278	3.443	3.617	3.788	3.963	4.141	4.321	4.505
48		2.005	2.141	2.287	2.432	2.581	2.734	2.886	3.047	3.212	3.375	3.541	3.711	3.884	4.060	4.239	4.415
50		1.967	2.102	2.236	2.384	2.526	2.678	2.828	2.987	3.145	3.306	3.470	3.638	3.809	3.977	4.155	4.329
52		1.928	2.061	2.194	2.335	2.476	2.626	2.774	2.926	3.082	3.241	3.404	3.571	3.734	3.907	4.076	4.248
54		1.889	2.015	2.156	2.291	2.430	2.573	2.719	2.870	3.024	3.182	3.337	3.502	3.663	3.835	4.002	4.173
56		1.858	1.983	2.112	2.245	2.388	2.524	2.669	2.819	2.971	3.122	3.281	3.438	3.598	3.761	3.927	4.096
58		1.822	1.950	2.078	2.210	2.341	2.481	2.624	2.766	2.918	3.066	3.218	3.374	3.532	3.694	3.858	4.026
60		1.795	1.912	2.038	2.169	2.303	2.437	2.579	2.719	2.863	3.010	3.161	3.315	3.472	3.632	3.795	3.954
63		1.749	1.869	1.988	2.112	2.244	2.375	2.510	2.648	2.789	2.935	3.083	3.235	3.383	3.541	3.696	3.860
66		1.707	1.820	1.943	2.064	2.189	2.318	2.451	2.587	2.721	2.864	3.004	3.154	3.300	3.456	3.608	3.763
69		1.669	1.780	1.896	2.016	2.139	2.260	2.391	2.525	2.657	2.792	2.937	3.078	3.222	3.369	3.520	3.673
72		1.630	1.740	1.854	1.972	2.088	2.213	2.336	2.463	2.599	2.732	2.868	3.008	3.150	3.296	3.444	3.596
75		1.597	1.705	1.812	1.928	2.042	2.160	2.287	2.412	2.540	2.672	2.806	2.944	3.077	3.221	3.368	3.510
78		1.567	1.669	1.774	1.889	2.001	2.118	2.237	2.361	2.487	2.610	2.743	2.879	3.011	3.153	3.290	3.438
81		1.538	1.638	1.741	1.849	1.948	2.075	2.187	2.308	2.433	2.555	2.686	2.820	2.951	3.084	3.227	3.366
84		1.507	1.606	1.708	1.815	1.918	2.032	2.149	2.262	2.386	2.505	2.628	2.761	2.890	3.021	3.156	3.301
23	$\frac{\rho}{t_S}$	4.393	4.684	4.974	5.266	5.560	5.846	6.133	6.427	6.725	7.003	7.299	7.585	7.879	8.158	8.444	8.708
24		4.361	4.650	4.940	5.232	5.524	5.809	6.094	6.390	6.686	6.966	7.247	7.545	7.840	8.118	8.402	8.667
25		4.329	4.616	4.905	5.197	5.488	5.771	6.058	6.352	6.647	6.925	7.221	7.506	7.801	8.077	8.361	8.628
26		4.297	4.584	4.871	5.160	5.451	5.736	6.021	6.314	6.609	6.887	7.181	7.466	7.760	8.037	8.323	8.588
27		4.266	4.552	4.838	5.127	5.418	5.700	5.984	6.278	6.573	6.851	7.144	7.429	7.721	7.997	8.281	8.546
28		4.235	4.521	4.807	5.094	5.383	5.665	5.949	6.243	6.535	6.813	7.106	7.391	7.682	7.959	8.243	8.508
29		4.206	4.489	4.775	5.063	5.350	5.632	5.913	6.206	6.498	6.776	7.069	7.351	7.643	7.919	8.203	8.468
30		4.175	4.458	4.744	5.029	5.316	5.598	5.878	6.171	6.463	6.738	7.031	7.313	7.604	7.881	8.165	8.430
31		4.147	4.429	4.712	4.996	5.283	5.565	5.846	6.135	6.427	6.702	6.995	7.277	7.568	7.844	8.125	8.391
32		4.121	4.400	4.684	4.966	5.253	5.531	5.812	6.101	6.392	6.667	6.957	7.239	7.530	7.806	8.087	8.353
33		4.090	4.369	4.651	4.935	5.221	5.500	5.780	6.066	6.357	6.632	6.921	7.203	7.494	7.767	8.051	8.314
34		4.066	4.341	4.622	4.906	5.189	5.467	5.747	6.033	6.324	6.598	6.888	7.170	7.457	7.734	8.014	8.278
35		4.037	4.315	4.593	4.876	5.159	5.437	5.713	6.000	6.290	6.564	6.853	7.132	7.422	7.696	7.976	8.240
36		4.011	4.288	4.566	4.845	5.128	5.406	5.682	5.966	6.254	6.529	6.818	7.096	7.387	7.660	7.941	8.204
37		3.987	4.261	4.538	4.817	5.100	5.374	5.650	5.933	6.222	6.296	6.785	7.063	7.350	7.623	7.904	8.167
38		3.959	4.233	4.509	4.789	5.066	5.344	5.620	5.903	6.192	6.462	6.751	7.029	7.316	7.589	7.870	8.130
39		3.934	4.208	4.484	4.759	5.041	5.314	5.589	5.873	6.157	6.432	6.717	6.994	7.281	7.554	7.835	8.095
40		3.909	4.182	4.458	4.733	5.010	5.284	5.557	5.843	6.126	6.400	6.685	6.963	7.249	7.519	7.799	8.059
42		3.864	4.132	4.404	4.678	4.955	5.228	5.501	5.783	6.065	6.335	6.619	6.897	7.179	7.452	7.729	7.989
44		3.817	4.084	4.355	4.629	4.901	5.174	5.444	5.724	6.005	6.275	6.555	6.832	7.114	7.387	7.663	7.924
46		3.772	4.039	4.304	4.577	4.849	5.117	5.387	5.666	5.947	6.212	6.496	6.769	7.050	7.319	7.595	7.856
48		3.729	3.991	4.260	4.529	4.800	5.067	5.332	5.611	5.891	6.156	6.437	6.708	6.988	7.257	7.533	7.789
50		3.689	3.950	4.210	4.482	4.748	5.015	5.279	5.558	5.833	6.098	6.376	6.648	6.929	7.193	7.469	7.725
52		3.648	3.908	4.167	4.434	4.699	4.966	5.230	5.503	5.778	6.042	6.320	6.592	6.868	7.136	7.407	7.663
54		3.605	3.860	4.128	4.390	4.654	4.915	5.179	5.451	5.726	5.990	6.262	6.534	6.809	7.078	7.348	7.604
56		3.571	3.825	4.083	4.343	4.612	4.868	5.131	5.403	5.677	5.935	6.213	6.479	6.753	7.017	7.287	7.543
58		3.531	3.789	4.046	4.306	4.564	4.824	5.087	5.353	5.627	5.885	6.156	6.423	6.696	6.959	7.219	7.485
60		3.499	3.747	4.003	4.262	4.525	4.779	5.042	5.307	5.575	5.833	6.104	6.369	6.643	6.906	7.176	7.426
63		3.446	3.697	3.947	4.204	4.462	4.715	4.971	5.236	5.503	5.760	6.032	6.296	6.563	6.826	7.089	7.345
66		3.395	3.640	3.895	4.147	4.401	4.655	4.910	5.174	5.434	5.691	5.954	6.219	6.485	6.748	7.011	7.261
69		3.348	3.592	3.840	4.091	4.346	4.591	4.846	5.109	5.353	5.618	5.888	6.146	6.412	6.667	6.930	7.179
72		3.300	3.543	3.790	4.040	4.287	4.539	4.786	5.042	5.307	5.557	5.819	6.077	6.342	6.597	6.859	7.109
75		3.256	3.498	3.738	3.987	4.234	4.478	4.731	4.986	5.244	5.493	5.754	6.012	6.269	6.524	6.786	7.028
78		3.218	3.452	3.691	3.940	4.185	4.428	4.674	4.929	5.186	5.427	5.688	5.944	6.201	6.456	6.710	6.959
81		3.178	3.411	3.649	3.890	4.138	4.377	4.616	4.869	5.126	5.366	5.626	5.883	6.139	6.385	6.647	6.888
84		3.137	3.369	3.606	3.847	4.083	4.325	4.570	4.815	5.071	5.311	5.563	5.819	6.074	6.321	6.573	6.823

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

TABLE 10 - Y-PANEL PROPERTIES $\left[\frac{t_W}{t_S} = 0.51;\ \frac{b_A}{t_W} = 9.3;\ \frac{b_Y}{b_W} = 1.04;\ \frac{t_L}{t_W} = 1.06;\ \frac{b_L}{b_W} = 0.94;\ \frac{t_F}{t_W} = 2.13;\ \frac{b_F}{b_W} = 0.69;\ \frac{r}{t_W} = 1;\ \frac{d}{t_S} = 2.0;\ \frac{p}{t_S} = 6.0\right]$

$\frac{b_S}{t_S}$ \ $\frac{b_W}{t_W}$		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
23	$\frac{A_1}{t_S}$	1.749	1.770	1.792	1.812	1.832	1.852	1.871	1.889	1.907	1.924	1.941	1.958	1.974	1.989	2.004	2.019
24		1.728	1.749	1.770	1.790	1.810	1.829	1.848	1.866	1.884	1.901	1.918	1.934	1.950	1.966	1.981	1.996
25		1.708	1.729	1.750	1.770	1.789	1.808	1.827	1.845	1.862	1.880	1.896	1.912	1.928	1.944	1.959	1.974
26		1.689	1.710	1.730	1.750	1.769	1.788	1.807	1.824	1.842	1.859	1.875	1.891	1.907	1.923	1.938	1.952
27		1.671	1.692	1.712	1.731	1.750	1.769	1.787	1.805	1.822	1.839	1.855	1.871	1.887	1.902	1.917	1.932
28		1.654	1.674	1.694	1.714	1.732	1.751	1.769	1.786	1.803	1.820	1.836	1.852	1.868	1.883	1.898	1.912
29		1.638	1.658	1.678	1.697	1.715	1.734	1.751	1.769	1.785	1.802	1.818	1.834	1.849	1.864	1.879	1.893
30		1.623	1.642	1.662	1.681	1.699	1.717	1.734	1.752	1.768	1.785	1.801	1.816	1.832	1.847	1.861	1.875
31		1.608	1.628	1.647	1.665	1.683	1.701	1.718	1.735	1.752	1.768	1.784	1.799	1.815	1.829	1.844	1.858
32		1.594	1.613	1.632	1.650	1.668	1.686	1.703	1.720	1.736	1.752	1.768	1.783	1.798	1.813	1.827	1.841
33		1.581	1.600	1.618	1.636	1.654	1.671	1.688	1.705	1.721	1.737	1.752	1.768	1.783	1.797	1.811	1.826
34		1.568	1.587	1.605	1.623	1.640	1.657	1.674	1.691	1.707	1.722	1.738	1.753	1.767	1.782	1.796	1.810
35		1.556	1.574	1.592	1.610	1.627	1.644	1.661	1.677	1.693	1.708	1.723	1.738	1.753	1.767	1.781	1.795
36		1.544	1.562	1.580	1.598	1.615	1.631	1.648	1.664	1.679	1.695	1.710	1.725	1.739	1.753	1.767	1.781
37		1.533	1.551	1.569	1.586	1.602	1.619	1.635	1.651	1.666	1.682	1.697	1.711	1.726	1.740	1.753	1.767
38		1.522	1.540	1.557	1.574	1.591	1.607	1.623	1.639	1.654	1.669	1.684	1.698	1.713	1.727	1.740	1.754
39		1.512	1.529	1.546	1.563	1.580	1.596	1.611	1.627	1.642	1.657	1.672	1.686	1.700	1.714	1.727	1.741
40		1.502	1.519	1.536	1.553	1.569	1.585	1.600	1.616	1.631	1.645	1.660	1.674	1.688	1.702	1.715	1.728
42		1.483	1.500	1.516	1.533	1.548	1.564	1.579	1.594	1.609	1.623	1.637	1.651	1.665	1.679	1.692	1.705
44		1.466	1.482	1.498	1.514	1.529	1.545	1.559	1.574	1.589	1.603	1.617	1.630	1.644	1.657	1.670	1.683
46		1.450	1.466	1.481	1.497	1.512	1.526	1.541	1.555	1.569	1.583	1.597	1.610	1.623	1.636	1.649	1.662
48		1.435	1.450	1.465	1.480	1.495	1.510	1.524	1.538	1.552	1.565	1.579	1.592	1.605	1.617	1.630	1.642
50		1.420	1.436	1.451	1.465	1.480	1.494	1.508	1.521	1.535	1.548	1.561	1.574	1.587	1.599	1.612	1.624
52		1.407	1.422	1.437	1.450	1.465	1.479	1.492	1.506	1.519	1.532	1.545	1.558	1.570	1.582	1.594	1.606
54		1.394	1.409	1.423	1.437	1.451	1.465	1.478	1.491	1.504	1.517	1.530	1.542	1.554	1.566	1.578	1.590
56		1.383	1.397	1.411	1.425	1.438	1.452	1.465	1.478	1.490	1.503	1.515	1.527	1.539	1.551	1.563	1.574
58		1.372	1.386	1.399	1.413	1.426	1.439	1.452	1.464	1.477	1.489	1.501	1.513	1.525	1.537	1.548	1.559
60		1.362	1.375	1.388	1.402	1.414	1.427	1.440	1.452	1.464	1.476	1.488	1.500	1.511	1.523	1.534	1.545
63		1.347	1.360	1.373	1.386	1.398	1.411	1.423	1.435	1.447	1.459	1.470	1.481	1.493	1.504	1.515	1.525
66		1.334	1.346	1.359	1.371	1.383	1.395	1.407	1.419	1.430	1.442	1.453	1.464	1.475	1.486	1.496	1.507
69		1.321	1.334	1.346	1.358	1.369	1.381	1.393	1.404	1.415	1.426	1.437	1.448	1.459	1.469	1.480	1.490
72		1.310	1.322	1.333	1.345	1.356	1.368	1.379	1.390	1.401	1.412	1.422	1.433	1.443	1.454	1.464	1.474
75		1.299	1.311	1.322	1.333	1.344	1.355	1.366	1.377	1.388	1.398	1.409	1.419	1.429	1.439	1.449	1.459
78		1.289	1.300	1.311	1.322	1.333	1.344	1.354	1.365	1.375	1.386	1.396	1.406	1.416	1.425	1.435	1.445
81		1.280	1.291	1.301	1.312	1.323	1.333	1.343	1.354	1.364	1.374	1.383	1.393	1.403	1.413	1.422	1.431
84		1.271	1.281	1.292	1.302	1.313	1.323	1.333	1.343	1.353	1.362	1.372	1.382	1.391	1.400	1.410	1.419
23	$\frac{\bar{h}}{t_S}$	4.209	4.502	4.803	5.103	5.409	5.719	6.031	6.344	6.661	6.979	7.300	7.626	7.951	8.275	8.603	8.934
24		4.149	4.439	4.735	5.035	5.337	5.642	5.952	6.263	6.578	6.894	7.214	7.533	7.857	8.183	8.509	8.838
25		4.091	4.378	4.672	4.968	5.267	5.570	5.878	6.187	6.497	6.815	7.129	7.447	7.768	8.093	8.417	8.796
26		4.034	4.319	4.608	4.902	5.198	5.500	5.806	6.110	6.422	6.734	7.046	7.362	7.682	8.005	8.328	8.650
27		3.978	4.262	4.549	4.838	5.132	5.432	5.733	6.038	6.344	6.655	6.965	7.280	7.598	7.916	8.237	8.561
28		3.925	4.204	4.488	4.779	5.068	5.366	5.665	5.965	6.269	6.578	6.887	7.200	7.517	7.833	8.152	8.470
29		3.874	4.151	4.433	4.719	5.006	5.302	5.596	5.898	6.197	6.504	6.811	7.123	7.434	7.748	8.066	8.383
30		3.825	4.096	4.378	4.661	4.947	5.237	5.529	5.830	6.127	6.433	6.739	7.044	7.358	7.671	7.983	8.298
31		3.775	4.048	4.324	4.602	4.886	5.175	5.465	5.760	6.060	6.360	6.664	6.968	7.281	7.587	7.903	8.216
32		3.728	3.996	4.270	4.546	4.828	5.116	5.405	5.698	5.992	6.291	6.593	6.896	7.202	7.512	7.821	8.133
33		3.683	3.949	4.218	4.493	4.774	5.056	5.343	5.635	5.927	6.224	6.521	6.826	7.131	7.435	7.743	8.059
34		3.638	3.902	4.170	4.443	4.718	4.998	5.284	5.574	5.865	6.156	6.456	6.756	7.055	7.362	7.668	7.978
35		3.595	3.854	4.120	4.392	4.665	4.944	5.228	5.513	5.803	6.092	6.386	6.684	6.986	7.287	7.592	7.901
36		3.552	3.810	4.074	4.344	4.616	4.889	5.172	5.455	5.739	6.032	6.324	6.621	6.917	7.217	7.520	7.828
37		3.512	3.768	4.030	4.295	4.561	4.837	5.114	5.396	5.679	5.970	6.261	6.552	6.852	7.150	7.447	7.753
38		3.471	3.725	3.983	4.246	4.515	4.785	5.061	5.341	5.622	5.908	6.198	6.487	6.785	7.082	7.378	7.683
39		3.433	3.682	3.938	4.200	4.467	4.736	5.006	5.285	5.565	5.849	6.138	6.426	6.718	7.014	7.308	7.612
40		3.395	3.643	3.897	4.157	4.419	4.687	4.955	5.233	5.512	5.790	6.077	6.364	6.655	6.949	7.243	7.540
42		3.321	3.566	3.813	4.071	4.326	4.591	4.857	5.127	5.403	5.678	5.958	6.243	6.531	6.824	7.115	7.409
44		3.253	3.492	3.736	3.987	4.239	4.502	4.760	5.028	5.302	5.575	5.852	6.129	6.415	6.700	6.989	7.281
46		3.188	3.424	3.662	3.910	4.160	4.410	4.671	4.932	5.198	5.468	5.744	6.018	6.296	6.579	6.865	7.156
48		3.126	3.355	3.590	3.831	4.078	4.332	4.585	4.844	5.107	5.370	5.644	5.916	6.192	6.466	6.751	7.033
50		3.062	3.293	3.526	3.760	4.005	4.251	4.502	4.753	5.015	5.276	5.541	5.811	6.085	6.358	6.640	6.920
52		3.006	3.230	3.460	3.688	3.930	4.174	4.418	4.672	4.926	5.185	5.448	5.716	5.982	6.253	6.527	6.805
54		2.948	3.170	3.394	3.623	3.859	4.101	4.342	4.589	4.841	5.098	5.359	5.619	5.883	6.152	6.424	6.700
56		2.899	3.114	3.335	3.563	3.792	4.031	4.271	4.516	4.760	5.015	5.268	5.526	5.788	6.055	6.326	6.594
58		2.848	3.062	3.276	3.502	3.729	3.961	4.198	4.436	4.683	4.930	5.182	5.438	5.698	5.963	6.225	6.491
60		2.802	3.009	3.221	3.445	3.664	3.895	4.130	4.365	4.606	4.850	5.100	5.354	5.607	5.870	6.130	6.394
63		2.731	2.935	3.145	3.360	3.577	3.804	4.032	4.264	4.502	4.744	4.985	5.230	5.486	5.740	5.998	6.252
66		2.669	2.864	3.072	3.279	3.493	3.712	3.937	4.166	4.395	4.635	4.873	5.116	5.363	5.614	5.862	6.122
69		2.605	2.803	3.002	3.208	3.413	3.630	3.852	4.073	4.299	4.530	4.766	5.006	5.250	5.492	5.745	5.995
72		2.550	2.740	2.932	3.134	3.337	3.552	3.765	3.984	4.208	4.436	4.663	4.901	5.136	5.382	5.626	5.873
75		2.494	2.682	2.871	3.066	3.266	3.472	3.683	3.900	4.121	4.341	4.572	4.800	5.033	5.270	5.511	5.757
78		2.442	2.623	2.809	3.002	3.200	3.403	3.606	3.820	4.033	4.257	4.479	4.705	4.936	5.163	5.403	5.646
81		2.395	2.573	2.752	2.942	3.138	3.334	3.534	3.746	3.957	4.172	4.384	4.609	4.837	5.070	5.300	5.533
84		2.347	2.518	2.700	2.882	3.076	3.270	3.468	3.671	3.880	4.085	4.303	4.525	4.744	4.967	5.203	5.434
23	$\frac{\rho}{t_S}$	6.055	6.435	6.822	7.210	7.594	7.976	8.361	8.739	9.128	9.492	9.878	10.25	10.64	10.99	11.36	11.70
24		6.024	6.410	6.789	7.177	7.562	7.942	8.327	8.705	9.094	9.458	9.845	10.22	10.60	10.96	11.33	11.67
25		5.993	6.372	6.758	7.146	7.529	7.909	8.295	8.673	9.060	9.426	9.809	10.18	10.57	10.93	11.30	11.64
26		5.963	6.342	6.725	7.113	7.496	7.876	8.262	8.639	9.028	9.392	9.777	10.15	10.53	10.89	11.26	11.60
27		5.932	6.311	6.695	7.081	7.464	7.844	8.228	8.607	8.994	9.359	9.744	10.12	10.50	10.86	11.23	11.57
28		5.902	6.279	6.663	7.051	7.432	7.812	8.196	8.573	8.960	9.325	9.710	10.08	10.47	10.83	11.20	11.54
29		5.873	6.250	6.633	7.019	7.400	7.781	8.163	8.542	8.927	9.292	9.678	10.05	10.43	10.79	11.16	11.50
30		5.844	6.219	6.602	6.988	7.370	7.748	8.130	8.509	8.895	9.260	9.645	10.02	10.40	10.76	11.13	11.47
31		5.814	6.191	6.573	6.953	7.337	7.716	8.098	8.475	8.863	9.226	9.612	9.982	10.37	10.73	11.10	11.44
32		5.786	6.160	6.541	6.925	7.306	7.685	8.067	8.444	8.829	9.193	9.579	9.949	10.33	10.69	11.06	11.40
33		5.758	6.132	6.511	6.895	7.276	7.652	8.035	8.412	8.797	9.161	9.544	9.917	10.30	10.66	11.03	11.37
34		5.729	6.104	6.482	6.866	7.245	7.621	8.003	8.381	8.766	9.128	9.513	9.884	10.27	10.63	10.99	11.34
35		5.719	6.074	6.453	6.836	7.215	7.591	7.977	8.348	8.734	9.096	9.479	9.850	10.23	10.59	10.96	11.30
36		5.674	6.045	6.424	6.807	7.186	7.560	7.942	8.317	8.700	9.065	9.448	9.819	10.20	10.56	10.93	11.27
37		5.647	6.019	6.397	6.778	7.154	7.530	7.910	8.285	8.668	9.033	9.416	9.785	10.17	10.53	10.90	11.24
38		5.619	5.991	6.367	6.747	7.126	7.500	7.880	8.255	8.638	9.000	9.384	9.752	10.14	10.50	10.86	11.21
39		5.594	5.963	6.338	6.719	7.097	7.471	7.848	8.223	8.606	8.969	9.352	9.721	10.01	10.46	10.83	11.17
40		5.567	5.936	6.311	6.692	7.067	7.441	7.818	8.194	8.578	8.936	9.320	9.689	10.01	10.43	10.80	11.14
42		5.515	5.883	6.254	6.636	7.008	7.382	7.759	8.132	8.514	8.875	9.255	9.625	10.01	10.37	10.73	11.08
44		5.465	5.831	6.198	6.580	6.952	7.326	7.700	8.072	8.455	8.815	9.196	9.563	9.944	10.30	10.67	11.01
46		5.417	5.782	6.150	6.527	6.899	7.266	7.643	8.013	8.392	8.753	9.152	9.500	9.879	10.24	10.61	10.95
48		5.369	5.730	6.098	6.471	6.890	7.214	7.587	7.957	8.336	8.694	9.075	9.441	9.820	10.18	10.54	10.89
50		5.319	5.683	6.051	6.418	6.792	7.159	7.532	7.898	8.277	8.635	9.013	9.379	9.758	10.11	10.49	10.82
52		5.274	5.634	6.001	6.367	6.738	7.105	7.474	7.844	8.220	8.577	8.955	9.322	9.697	10.05	10.42	10.76
54		5.226	5.587	5.950	6.318	6.686	7.053	7.422	7.787	8.163	8.521	8.898	9.262	9.637	9.993	10.36	10.70
56		5.185	5.541	5.904	6.272	6.636	7.002	7.371	7.736	8.108	8.466	8.839	9.203	9.578	9.934	10.30	10.64
58		5.142	5.498	5.856	6.224	6.587	6.949	7.318	7.679	8.055	8.409	8.782	9.146	9.521	9.877	10.24	10.58
60		5.102	5.453	5.811	6.178	6.537	6.899	7.267	7.629	7.999	8.354	8.727	9.090	9.461	9.818	10.18	10.52
63		5.044	5.389	5.746	6.109	6.467	6.829	7.193	7.553	7.924	8.278	8.647	9.006	9.381	9.734	10.10	10.43
66		4.981	5.326	5.683	6.041	6.398	6.755	7.118	7.479	7.845	8.199	8.567	8.926	9.297	9.650	10.01	10.35
69		4.921	5.270	5.622	5.979	6.331	6.683	7.050	7.406	7.771	8.120	8.488	8.847	9.218	9.566	9.929	10.27
72		4.868	5.212	5.558	5.914	6.265	6.621	6.979	7.334	7.699	8.048	8.411	8.770	9.135	9.489	9.846	10.18
75		4.813	5.156	5.501	5.851	6.202	6.553	6.910	7.265	7.629	7.973	8.341	8.694	9.059	9.408	9.765	10.10
78		4.761	5.098	5.442	5.792	6.140	6.492	6.843	7.198	7.556	7.906	8.268	8.621	8.986	9.329	9.686	10.02
81		4.713	5.049	5.387	5.736	6.086	6.429	6.780	7.134	7.492	7.836	8.192	8.545	8.909	9.258	9.610	9.942
84		4.662	4.992	5.335	5.678	6.021	6.370	6.720	7.068	7.426	7.763	8.125	8.478	8.836	9.179	9.536	9.868

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TABLE 11.- Y-PANEL PROPERTIES $\left[\frac{t_W}{t_S} = 0.63;\ \frac{b_A}{t_W} = 9.3;\ \frac{b_Y}{b_W} = 1.04;\ \frac{t_L}{t_W} = 1.06;\ \frac{b_L}{b_W} = 0.94;\ \frac{t_F}{t_W} = 2.13;\ \frac{b_F}{b_W} = 0.69;\ \frac{r}{t_W} = 1;\ \frac{d}{t_S} = 1.8;\ \frac{p}{t_S} = 6.1\right]$

$\frac{b_S}{t_S}$ \ $\frac{b_W}{t_W}$		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
23	$\frac{A_1}{t_S}$	2.059	2.080	2.115	2.142	2.167	2.192	2.216	2.240	2.263	2.285	2.306	2.327	2.347	2.366	2.385	2.404
24		2.031	2.059	2.087	2.113	2.139	2.164	2.188	2.211	2.234	2.255	2.277	2.297	2.318	2.337	2.357	2.375
25		2.005	2.033	2.060	2.086	2.112	2.136	2.160	2.184	2.206	2.228	2.249	2.270	2.290	2.309	2.328	2.347
26		1.980	2.008	2.035	2.061	2.086	2.110	2.134	2.157	2.180	2.201	2.222	2.243	2.263	2.282	2.301	2.320
27		1.956	1.984	2.010	2.036	2.061	2.085	2.109	2.132	2.154	2.176	2.197	2.217	2.238	2.257	2.276	2.294
28		1.934	1.961	1.987	2.013	2.038	2.062	2.085	2.108	2.130	2.151	2.172	2.193	2.213	2.232	2.251	2.269
29		1.912	1.939	1.965	1.990	2.015	2.039	2.062	2.085	2.107	2.128	2.149	2.169	2.189	2.208	2.227	2.245
30		1.892	1.918	1.944	1.969	1.993	2.017	2.040	2.062	2.084	2.106	2.126	2.146	2.166	2.185	2.205	2.222
31		1.872	1.898	1.924	1.948	1.973	1.996	2.019	2.041	2.063	2.084	2.104	2.125	2.144	2.163	2.182	2.200
32		1.853	1.879	1.904	1.929	1.953	1.976	1.999	2.021	2.042	2.063	2.084	2.104	2.123	2.142	2.161	2.179
33		1.835	1.861	1.886	1.910	1.934	1.957	1.979	2.001	2.022	2.043	2.064	2.083	2.110	2.122	2.140	2.158
34		1.818	1.843	1.868	1.892	1.915	1.938	1.960	1.982	2.003	2.024	2.044	2.064	2.083	2.102	2.120	2.138
35		1.801	1.826	1.851	1.874	1.898	1.920	1.942	1.964	1.985	2.005	2.025	2.045	2.064	2.083	2.101	2.120
36		1.785	1.810	1.834	1.858	1.881	1.903	1.925	1.946	1.967	1.988	2.007	2.027	2.046	2.064	2.083	2.100
37		1.770	1.794	1.818	1.842	1.864	1.887	1.908	1.929	1.950	1.970	1.990	2.009	2.028	2.047	2.065	2.082
38		1.755	1.779	1.803	1.826	1.849	1.871	1.892	1.913	1.934	1.954	1.973	1.992	2.011	2.029	2.047	2.065
39		1.741	1.765	1.788	1.811	1.834	1.855	1.877	1.897	1.918	1.938	1.957	1.976	1.995	2.013	2.031	2.048
40		1.727	1.751	1.774	1.797	1.819	1.840	1.861	1.882	1.902	1.922	1.941	1.959	1.979	1.997	2.014	2.032
42		1.702	1.725	1.747	1.769	1.791	1.812	1.833	1.853	1.873	1.892	1.911	1.930	1.948	1.966	1.983	2.001
44		1.678	1.700	1.722	1.744	1.765	1.786	1.806	1.826	1.845	1.865	1.883	1.902	1.919	1.937	1.954	1.971
46		1.655	1.677	1.699	1.720	1.741	1.761	1.781	1.801	1.820	1.838	1.857	1.875	1.892	1.910	1.927	1.944
48		1.634	1.656	1.677	1.698	1.718	1.738	1.757	1.777	1.795	1.814	1.832	1.850	1.867	1.884	1.901	1.917
50		1.614	1.635	1.656	1.677	1.696	1.716	1.735	1.754	1.772	1.791	1.808	1.826	1.843	1.860	1.876	1.893
52		1.596	1.616	1.637	1.657	1.676	1.695	1.714	1.733	1.751	1.769	1.786	1.803	1.820	1.837	1.853	1.869
54		1.578	1.599	1.619	1.638	1.657	1.676	1.695	1.713	1.731	1.748	1.765	1.782	1.799	1.815	1.831	1.847
56		1.562	1.582	1.601	1.620	1.639	1.657	1.676	1.694	1.711	1.728	1.745	1.762	1.778	1.794	1.810	1.826
58		1.546	1.566	1.585	1.604	1.622	1.640	1.658	1.676	1.693	1.710	1.726	1.743	1.759	1.775	1.790	1.806
60		1.532	1.551	1.569	1.588	1.606	1.624	1.641	1.658	1.675	1.692	1.708	1.725	1.740	1.756	1.772	1.787
63		1.511	1.529	1.548	1.566	1.583	1.601	1.618	1.634	1.651	1.667	1.683	1.699	1.714	1.730	1.745	1.759
66		1.492	1.510	1.528	1.545	1.562	1.579	1.597	1.612	1.628	1.644	1.659	1.675	1.690	1.705	1.720	1.734
69		1.474	1.491	1.509	1.526	1.543	1.559	1.575	1.591	1.607	1.622	1.637	1.653	1.667	1.682	1.696	1.711
72		1.458	1.475	1.491	1.508	1.524	1.540	1.556	1.572	1.587	1.602	1.617	1.632	1.646	1.660	1.674	1.688
75		1.442	1.459	1.475	1.491	1.507	1.523	1.538	1.553	1.568	1.583	1.598	1.612	1.626	1.640	1.654	1.668
78		1.428	1.444	1.460	1.476	1.491	1.506	1.521	1.536	1.551	1.565	1.579	1.594	1.607	1.621	1.635	1.648
81		1.415	1.430	1.446	1.461	1.476	1.491	1.506	1.520	1.534	1.548	1.562	1.576	1.590	1.603	1.616	1.629
84		1.402	1.417	1.432	1.447	1.462	1.476	1.491	1.505	1.519	1.535	1.546	1.560	1.573	1.586	1.599	1.612
23	$\frac{\bar{h}}{t_S}$	5.943	6.339	6.778	7.202	7.627	8.057	8.489	8.927	9.366	9.806	10.25	10.69	11.14	11.58	12.03	12.49
24		5.872	6.284	6.702	7.122	7.547	7.975	8.405	8.837	9.274	9.710	10.15	10.59	11.04	11.48	11.94	12.38
25		5.805	6.214	6.628	7.045	7.468	7.891	8.319	8.752	9.184	9.621	10.06	10.50	10.94	11.38	11.83	12.28
26		5.738	6.145	6.557	6.972	7.390	7.811	8.237	8.665	9.098	9.529	9.965	10.41	10.85	11.29	11.73	12.18
27		5.672	6.027	6.484	6.897	7.313	7.732	8.156	8.582	9.010	9.443	9.877	10.31	10.75	11.19	11.64	12.08
28		5.611	6.011	6.415	6.826	7.240	7.657	8.076	8.501	8.927	9.355	9.787	10.22	10.66	11.10	11.54	11.98
29		5.600	5.946	6.348	6.754	7.166	7.581	7.999	8.421	8.846	9.272	9.708	10.13	10.57	11.00	11.44	11.88
30		5.489	5.882	6.283	6.687	7.094	7.507	7.922	8.340	8.763	9.190	9.615	10.05	10.48	10.91	11.35	11.79
31		5.430	5.768	6.219	6.618	7.026	7.434	7.848	8.264	8.685	9.107	9.531	9.962	10.39	10.82	11.26	11.70
32		5.372	5.761	6.154	6.554	6.958	7.364	7.776	8.190	8.606	9.027	9.452	9.878	10.31	10.74	11.17	11.61
33		5.316	5.703	6.094	6.489	6.891	7.296	7.702	8.115	8.529	8.948	9.372	9.793	10.25	10.65	11.08	11.51
34		5.262	5.644	6.033	6.427	6.823	7.226	7.631	8.042	8.454	8.872	9.290	9.714	10.14	10.57	10.99	11.43
35		5.207	5.587	5.975	6.363	6.761	7.159	7.562	7.972	8.382	8.794	9.212	9.633	10.06	10.48	10.91	11.34
36		5.154	5.533	5.915	6.305	6.698	7.094	7.496	7.900	8.309	8.724	9.135	9.556	9.976	10.40	10.83	11.25
37		5.104	5.477	5.858	6.246	6.634	7.032	7.429	7.831	8.239	8.648	9.062	9.477	9.896	10.32	10.74	11.17
38		5.053	5.424	5.804	6.187	6.577	6.969	7.364	7.765	8.171	8.579	8.987	9.401	9.819	10.24	10.66	11.09
39		5.004	5.374	5.748	6.130	6.518	6.905	7.303	7.698	8.103	8.509	8.916	9.328	9.745	10.16	10.58	11.00
40		4.955	5.323	5.696	6.076	6.458	6.844	7.236	7.634	8.033	8.438	8.844	9.250	9.670	10.09	10.50	10.92
42		4.865	5.226	5.592	5.965	6.345	6.727	7.116	7.507	7.904	8.302	8.704	9.112	9.521	9.933	10.35	10.77
44		4.776	5.130	5.493	5.863	6.236	6.616	6.998	7.386	7.775	8.175	8.571	8.976	9.377	9.787	10.20	10.61
46		4.688	5.040	5.399	5.762	6.133	6.505	6.885	7.270	7.657	8.045	8.443	8.841	9.239	9.647	10.06	10.47
48		4.606	4.955	5.307	5.668	6.031	6.401	6.773	7.156	7.535	7.925	8.316	8.712	9.108	9.508	9.914	10.32
50		4.526	4.867	5.217	5.575	5.931	6.298	6.668	7.044	7.420	7.808	8.191	8.585	8.978	9.377	9.774	10.18
52		4.452	4.787	5.134	5.484	5.838	6.198	6.565	6.938	7.313	7.693	8.074	8.460	8.851	9.248	9.643	10.04
54		4.376	4.713	5.053	5.396	5.747	6.105	6.470	6.836	7.208	7.581	7.959	8.343	8.732	9.121	9.514	9.912
56		4.308	4.637	4.970	5.311	5.659	6.010	6.372	6.736	7.101	7.471	7.848	8.229	8.611	8.997	9.388	9.784
58		4.237	4.564	4.895	5.234	5.575	5.923	6.278	6.640	7.002	7.371	7.739	8.119	8.498	8.883	9.266	9.660
60		4.175	4.495	4.818	5.155	5.494	5.840	6.187	6.541	6.901	7.268	7.634	8.012	8.383	8.765	9.153	9.539
63		4.079	4.391	4.716	5.043	5.374	5.717	6.061	6.406	6.763	7.121	7.484	7.853	8.221	8.601	8.979	9.356
66		3.990	4.298	4.615	4.934	5.261	5.596	5.943	6.279	6.627	6.982	7.336	7.703	8.068	8.438	8.814	9.188
69		3.903	4.203	4.517	4.833	5.157	5.483	5.815	6.154	6.500	6.846	7.197	7.561	7.917	8.284	8.651	9.029
72		3.824	4.121	4.421	4.735	5.050	5.373	5.702	6.039	6.375	6.718	7.067	7.421	7.775	8.133	8.497	8.865
75		3.744	4.038	4.335	4.640	4.952	5.272	5.593	5.920	6.254	6.594	6.940	7.285	7.636	7.992	8.353	8.719
78		3.672	3.958	4.252	4.554	4.858	5.169	5.487	5.812	6.143	6.474	6.811	7.160	7.501	7.855	8.214	8.570
81		3.604	3.881	4.173	4.466	4.768	5.076	5.392	5.707	6.030	6.358	6.692	7.032	7.378	7.722	8.071	8.425
84		3.534	3.809	4.092	4.383	4.682	4.981	5.294	5.608	5.927	6.253	6.578	6.916	7.252	7.593	7.940	8.292
23	$\frac{\rho}{t_S}$	7.833	8.194	8.808	9.292	9.776	10.23	10.71	11.20	11.68	12.13	12.61	13.07	13.55	13.99	14.45	14.86
24		7.806	8.174	8.781	9.265	9.750	10.20	10.69	11.17	11.66	12.11	12.59	13.05	13.52	13.97	14.42	14.84
25		7.780	8.149	8.755	9.239	9.724	10.17	10.66	11.15	11.63	12.08	12.56	13.02	13.50	13.94	14.40	14.81
26		7.754	8.124	8.726	9.213	9.697	10.15	10.63	11.12	11.60	12.05	12.53	12.99	13.47	13.92	14.37	14.79
27		7.724	8.100	8.701	9.185	9.670	10.12	10.61	11.09	11.58	12.03	12.51	12.97	13.45	13.89	14.35	14.76
28		7.702	8.073	8.674	9.159	9.644	10.10	10.58	11.07	11.55	12.00	12.48	12.94	13.42	13.87	14.32	14.74
29		7.675	8.047	8.648	9.131	9.616	10.07	10.55	11.04	11.52	11.98	12.46	12.92	13.40	13.84	14.30	14.71
30		7.649	8.022	8.621	9.105	9.589	10.04	10.53	11.01	11.50	11.95	12.43	12.89	13.37	13.81	14.27	14.69
31		7.623	7.996	8.595	9.078	9.563	10.02	10.50	10.98	11.47	11.92	12.40	12.87	13.34	13.79	14.25	14.67
32		7.597	7.971	8.567	9.052	9.536	9.988	10.47	10.96	11.44	11.90	12.38	12.84	13.32	13.76	14.22	14.64
33		7.571	7.946	8.542	9.025	9.509	9.962	10.45	10.93	11.42	11.87	12.35	12.81	13.30	13.74	14.20	14.61
34		7.545	7.920	8.515	8.998	9.481	9.934	10.42	10.90	11.39	11.84	12.32	12.79	13.26	13.71	14.17	14.59
35		7.519	7.895	8.489	8.970	9.455	9.907	10.39	10.88	11.36	11.81	12.30	12.76	13.24	13.68	14.15	14.56
36		7.493	7.870	8.462	8.945	9.428	9.880	10.37	10.85	11.33	11.79	12.27	12.73	13.21	13.66	14.12	14.54
37		7.468	7.844	8.435	8.919	9.400	9.854	10.34	10.82	11.31	11.76	12.24	12.70	13.18	13.63	14.09	14.51
38		7.442	7.819	8.409	8.891	9.374	9.828	10.31	10.80	11.28	11.73	12.21	12.68	13.16	13.60	14.06	14.48
39		7.417	7.795	8.383	8.865	9.348	9.800	10.29	10.77	11.25	11.71	12.19	12.65	13.13	13.58	14.04	14.46
40		7.392	7.770	8.354	8.839	9.321	9.773	10.26	10.74	11.23	11.68	12.16	12.62	13.10	13.55	14.01	14.43
42		7.343	7.721	8.305	8.785	9.268	9.720	10.20	10.69	11.17	11.62	12.11	12.57	13.05	13.50	13.96	14.38
44		7.294	7.672	8.254	8.735	9.215	9.668	10.15	10.63	11.12	11.57	12.05	12.52	12.99	13.44	13.90	14.33
46		7.245	7.623	8.204	8.683	9.164	9.615	10.10	10.58	11.06	11.52	11.99	12.46	12.94	13.39	13.85	14.27
48		7.197	7.577	8.154	8.633	9.111	9.563	10.04	10.53	11.01	11.46	11.94	12.41	12.89	13.33	13.79	14.22
50		7.149	7.528	8.104	8.583	9.059	9.511	9.991	10.47	10.95	11.41	11.89	12.35	12.83	13.28	13.74	14.17
52		7.104	7.481	8.056	8.532	9.009	9.459	9.939	10.42	10.90	11.36	11.84	12.30	12.78	13.23	13.69	14.11
54		7.056	7.437	8.009	8.482	8.958	9.409	9.890	10.37	10.85	11.30	11.78	12.24	12.72	13.17	13.63	14.06
56		7.012	7.391	7.959	8.433	8.909	9.357	9.838	10.32	10.80	11.25	11.73	12.19	12.67	13.12	13.58	14.04
58		6.966	7.346	7.913	8.386	8.860	9.309	9.786	10.27	10.75	11.20	11.68	12.14	12.62	13.06	13.52	13.95
60		6.925	7.302	7.865	8.338	8.812	9.261	9.736	10.21	10.69	11.15	11.62	12.09	12.56	13.01	13.47	13.90
63		6.859	7.235	7.798	8.269	8.739	9.189	9.664	10.14	10.62	11.07	11.55	12.01	12.48	12.93	13.39	13.82
66		6.796	7.173	7.732	8.199	8.669	9.116	9.594	10.07	10.54	10.99	11.47	11.93	12.40	12.85	13.31	13.74
69		6.733	7.108	7.665	8.132	8.602	9.045	9.517	9.991	10.47	10.92	11.39	11.85	12.32	12.77	13.25	13.66
72		6.674	7.050	7.598	8.065	8.531	8.975	9.446	9.921	10.40	10.84	11.32	11.77	12.25	12.69	13.15	13.58
75		6.613	6.989	7.536	7.998	8.464	8.909	9.376	9.847	10.32	10.77	11.24	11.70	12.17	12.62	13.08	13.51
78		6.558	6.930	7.475	7.937	8.399	8.839	9.307	9.777	10.25	10.70	11.17	11.63	12.10	12.54	13.00	13.43
81		6.503	6.872	7.415	7.873	8.335	8.775	9.243	9.709	10.18	10.62	11.09	11.55	12.02	12.47	12.92	13.35
84		6.446	6.816	7.354	7.811	8.272	8.709	9.176	9.642	10.11	10.56	11.02	11.48	11.95	12.39	12.85	13.28

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TABLE 12.—Y-PANEL PROPERTIES $\left[\frac{t_W}{t_S} = 0.79;\ \frac{b_A}{t_W} = 9.3;\ \frac{b_Y}{b_W} = 1.04;\ \frac{t_L}{t_W} = 1.06;\ \frac{b_L}{b_W} = 0.94;\ \frac{t_F}{t_W} = 2.13;\ \frac{b_F}{b_W} = 0.69;\ \frac{r}{t_W} = 1;\ \frac{d}{t_S} = 2.3;\ \frac{p}{t_S} = 7.7\right]$

$\frac{b_S}{t_S}$ \ $\frac{b_W}{t_W}$		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
23	$\frac{A_1}{t_S}$	2.517	2.554	2.590	2.624	2.657	2.689	2.720	2.749	2.778	2.806	2.832	2.858	2.883	2.907	2.931	2.953
24		2.481	2.518	2.555	2.588	2.621	2.652	2.683	2.713	2.741	2.769	2.796	2.822	2.847	2.871	2.895	2.917
25		2.446	2.483	2.519	2.552	2.585	2.617	2.648	2.677	2.706	2.734	2.761	2.787	2.812	2.836	2.860	2.883
26		2.414	2.450	2.485	2.519	2.552	2.584	2.614	2.644	2.672	2.700	2.727	2.753	2.778	2.803	2.826	2.849
27		2.382	2.418	2.453	2.487	2.520	2.551	2.582	2.611	2.640	2.668	2.694	2.720	2.746	2.770	2.794	2.817
28		2.352	2.388	2.423	2.456	2.489	2.520	2.551	2.580	2.609	2.636	2.663	2.689	2.714	2.739	2.763	2.786
29		2.323	2.359	2.394	2.427	2.459	2.490	2.521	2.550	2.579	2.606	2.633	2.659	2.684	2.709	2.733	2.756
30		2.296	2.331	2.366	2.399	2.431	2.462	2.492	2.521	2.550	2.577	2.604	2.630	2.655	2.680	2.704	2.727
31		2.269	2.304	2.339	2.371	2.403	2.434	2.464	2.494	2.522	2.549	2.576	2.602	2.627	2.651	2.675	2.698
32		2.244	2.279	2.313	2.345	2.377	2.408	2.438	2.467	2.495	2.522	2.549	2.575	2.600	2.624	2.648	2.671
33		2.219	2.254	2.288	2.320	2.352	2.382	2.412	2.441	2.469	2.496	2.523	2.548	2.573	2.598	2.622	2.645
34		2.196	2.230	2.264	2.296	2.327	2.358	2.387	2.416	2.444	2.471	2.497	2.523	2.548	2.572	2.596	2.619
35		2.173	2.207	2.241	2.272	2.304	2.334	2.363	2.392	2.420	2.447	2.473	2.498	2.523	2.548	2.571	2.594
36		2.152	2.185	2.218	2.250	2.281	2.311	2.340	2.368	2.396	2.423	2.449	2.475	2.499	2.524	2.547	2.570
37		2.131	2.164	2.197	2.228	2.259	2.289	2.318	2.346	2.373	2.400	2.426	2.451	2.476	2.500	2.524	2.547
38		2.110	2.144	2.176	2.208	2.238	2.267	2.296	2.324	2.351	2.378	2.404	2.429	2.454	2.478	2.501	2.524
39		2.091	2.124	2.156	2.187	2.233	2.246	2.275	2.303	2.330	2.357	2.382	2.408	2.432	2.456	2.479	2.502
40		2.072	2.105	2.136	2.167	2.197	2.226	2.255	2.283	2.310	2.336	2.362	2.387	2.411	2.435	2.458	2.481
42		2.036	2.068	2.100	2.130	2.159	2.188	2.216	2.244	2.270	2.296	2.322	2.346	2.371	2.394	2.417	2.440
44		2.003	2.034	2.065	2.095	2.124	2.152	2.180	2.207	2.233	2.259	2.284	2.308	2.332	2.356	2.379	2.401
46		1.971	2.002	2.032	2.062	2.090	2.118	2.145	2.172	2.198	2.223	2.248	2.275	2.296	2.319	2.342	2.364
48		1.942	1.972	2.002	2.031	2.059	2.086	2.113	2.139	2.165	2.190	2.215	2.239	2.262	2.285	2.308	2.329
50		1.914	1.944	1.973	2.001	2.029	2.056	2.083	2.108	2.134	2.159	2.183	2.206	2.230	2.252	2.275	2.296
52		1.888	1.917	1.946	1.974	2.001	2.028	2.054	2.079	2.104	2.129	2.153	2.176	2.199	2.221	2.243	2.265
54		1.864	1.892	1.920	1.948	1.974	2.001	2.026	2.051	2.076	2.100	2.124	2.147	2.170	2.192	2.214	2.235
56		1.840	1.868	1.896	1.923	1.949	1.975	2.000	2.025	2.049	2.073	2.096	2.119	2.142	2.164	2.185	2.206
58		1.818	1.846	1.873	1.899	1.925	1.951	1.975	2.000	2.024	2.047	2.070	2.093	2.114	2.137	2.158	2.179
60		1.797	1.824	1.851	1.877	1.902	1.927	1.952	1.976	2.000	2.023	2.045	2.067	2.090	2.111	2.132	2.153
63		1.767	1.794	1.820	1.845	1.870	1.895	1.919	1.942	1.965	1.988	2.010	2.032	2.054	2.075	2.095	2.116
66		1.740	1.766	1.791	1.816	1.840	1.864	1.888	1.911	1.933	1.956	1.977	1.999	2.020	2.041	2.061	2.081
69		1.715	1.740	1.764	1.789	1.812	1.836	1.859	1.881	1.903	1.925	1.947	1.968	1.988	2.009	2.029	2.048
72		1.691	1.715	1.739	1.763	1.786	1.809	1.832	1.854	1.875	1.897	1.918	1.938	1.959	1.979	1.998	2.017
75		1.668	1.692	1.716	1.739	1.762	1.784	1.806	1.828	1.849	1.870	1.890	1.911	1.931	1.950	1.970	1.988
78		1.648	1.671	1.694	1.716	1.739	1.761	1.782	1.803	1.824	1.845	1.865	1.885	1.904	1.924	1.943	1.961
81		1.628	1.651	1.673	1.695	1.717	1.738	1.760	1.780	1.801	1.821	1.841	1.860	1.879	1.898	1.917	1.935
84		1.609	1.632	1.654	1.675	1.697	1.718	1.738	1.759	1.779	1.798	1.818	1.837	1.856	1.875	1.893	1.911
23	$\frac{\bar{b}}{t_S}$	8.442	9.003	9.590	10.18	10.77	11.37	11.97	12.56	13.17	13.77	14.38	14.99	15.60	16.21	16.83	17.44
24		8.346	8.925	9.507	10.10	10.69	11.28	11.87	12.47	13.07	13.68	14.28	14.89	15.50	16.11	16.65	17.33
25		8.270	8.847	9.428	10.01	10.60	11.19	11.78	12.38	12.98	13.58	14.18	14.79	15.40	16.00	16.62	17.22
26		8.199	8.771	9.348	9.930	10.52	11.11	11.70	12.29	12.88	13.49	14.09	14.69	15.30	15.90	16.51	17.12
27		8.126	8.695	9.270	9.850	10.43	11.02	11.61	12.20	12.80	13.39	13.99	14.59	15.20	15.80	16.41	17.02
28		8.056	8.623	9.195	9.770	10.35	10.94	11.52	12.11	12.71	13.30	13.90	14.50	15.10	15.71	16.31	16.92
29		7.986	8.551	9.121	9.694	10.27	10.85	11.44	12.03	12.62	13.21	13.81	14.41	15.00	15.61	16.21	16.82
30		7.919	8.480	9.048	9.619	10.19	10.77	11.36	11.94	12.53	13.12	13.72	14.31	14.91	15.51	16.12	16.72
31		7.851	8.409	8.976	9.542	10.12	10.69	11.27	11.86	12.45	13.03	13.63	14.22	14.82	15.41	16.02	16.62
32		7.787	8.343	8.905	9.469	10.04	10.62	11.19	11.78	12.36	12.95	13.54	14.13	14.73	15.32	15.92	16.52
33		7.721	8.275	8.835	9.397	9.966	10.54	11.11	11.69	12.28	12.86	13.45	14.04	14.63	15.23	15.83	16.43
34		7.659	8.208	8.766	9.327	9.891	10.46	11.04	11.61	12.19	12.78	13.36	13.95	14.54	15.14	15.73	16.33
35		7.595	8.143	8.699	9.255	9.821	10.39	10.96	11.53	12.11	12.70	13.28	13.86	14.45	15.05	15.64	16.24
36		7.536	8.079	8.631	9.187	9.749	10.31	10.88	11.45	12.03	12.61	13.19	13.78	14.37	14.96	15.55	16.14
37		7.476	8.017	8.567	9.119	9.678	10.24	10.81	11.38	11.95	12.53	13.11	13.69	14.28	14.87	15.46	16.06
38		7.415	7.957	8.502	9.055	9.610	10.17	10.73	11.30	11.87	12.45	13.03	13.61	14.20	14.78	15.37	15.96
39		7.358	7.895	8.439	8.987	9.593	10.10	10.66	11.22	11.79	12.37	12.94	13.53	14.11	14.70	15.28	15.87
40		7.300	7.836	8.374	8.921	9.472	10.03	10.59	11.15	11.72	12.30	12.87	13.45	14.03	14.61	15.20	15.79
42		7.188	7.717	8.256	8.796	9.341	9.893	10.45	11.01	11.57	12.14	12.72	13.29	13.87	14.45	15.03	15.61
44		7.082	7.604	8.136	8.673	9.215	9.761	10.31	10.87	11.43	11.99	12.56	13.13	13.70	14.28	14.86	15.44
46		6.975	7.494	8.020	8.554	9.089	9.632	10.18	10.73	11.29	11.84	12.41	12.99	13.55	14.12	14.70	15.28
48		6.876	7.388	7.910	8.438	8.970	9.506	10.05	10.60	11.15	11.71	12.27	12.83	13.40	13.97	14.54	15.11
50		6.777	7.286	7.802	8.322	8.852	9.385	9.926	10.47	11.02	11.57	12.13	12.68	13.25	13.81	14.39	14.96
52		6.682	7.185	7.698	8.216	8.738	9.269	9.803	10.34	10.89	11.44	11.99	12.54	13.10	13.66	14.23	14.80
54		6.592	7.089	7.594	8.110	8.626	9.154	9.681	10.22	10.76	11.30	11.85	12.41	12.96	13.52	14.09	14.65
56		6.500	6.994	7.497	8.005	8.519	9.040	9.565	10.10	10.63	11.18	11.72	12.27	12.83	13.38	13.94	14.50
58		6.414	6.904	7.401	7.903	8.413	8.932	9.450	9.981	10.51	11.05	11.59	12.14	12.69	13.24	13.80	14.36
60		6.329	6.813	7.307	7.806	8.310	8.822	9.342	9.866	10.40	10.93	11.46	12.00	12.56	13.10	13.66	14.22
63		6.205	6.685	7.171	7.662	8.162	8.670	9.183	9.698	10.22	10.75	11.28	11.82	12.36	12.91	13.45	14.01
66		6.090	6.562	7.039	7.526	8.018	8.518	9.027	9.540	10.05	10.58	11.10	11.64	12.17	12.71	13.26	13.80
69		5.980	6.443	6.913	7.396	7.880	8.377	8.878	9.381	9.898	10.41	10.94	11.46	11.99	12.53	13.07	13.61
72		5.871	6.326	6.792	7.267	7.747	8.236	8.734	9.289	9.737	10.25	10.77	11.29	11.82	12.35	12.88	13.41
75		5.764	6.215	6.678	7.145	7.622	8.102	8.591	9.089	9.589	10.10	10.60	11.12	11.65	12.17	12.80	13.23
78		5.668	6.112	6.566	7.024	7.498	7.976	8.456	8.945	9.442	9.946	10.45	10.96	11.48	12.00	12.53	13.05
81		5.570	6.010	6.456	6.912	7.377	7.846	8.329	8.809	9.303	9.799	10.30	10.80	11.31	11.83	12.35	12.88
84		5.475	5.912	6.354	6.801	7.264	7.730	8.199	8.682	9.167	9.654	10.15	10.65	11.16	11.67	12.19	12.71
23	$\frac{\rho}{t_S}$	10.15	10.76	11.37	11.98	12.59	13.17	13.75	14.36	14.97	15.53	16.13	16.70	17.30	17.85	18.41	18.91
24		10.15	10.74	11.35	11.96	12.57	13.15	13.74	14.35	14.95	15.51	16.11	16.69	17.28	17.84	18.40	18.90
25		10.11	10.72	11.33	11.94	12.55	13.13	13.72	14.32	14.94	15.50	16.10	16.67	17.27	17.82	18.38	18.89
26		10.09	10.70	11.31	11.92	12.53	13.12	13.70	14.31	14.92	15.48	16.08	16.66	17.25	17.81	18.37	18.88
27		10.07	10.68	11.29	11.90	12.51	13.10	13.68	14.29	14.90	15.46	16.07	16.64	17.24	17.80	18.35	18.86
28		10.05	10.66	11.27	11.88	12.49	13.08	13.67	14.28	14.88	15.44	16.05	16.62	17.22	17.78	18.34	18.85
29		10.03	10.64	11.25	11.86	12.47	13.06	13.65	14.26	14.87	15.43	16.03	16.61	17.20	17.76	18.32	18.83
30		10.01	10.62	11.23	11.84	12.45	13.04	13.63	14.24	14.85	15.41	16.01	16.59	17.19	17.75	18.31	18.82
31		9.991	10.60	11.21	11.82	12.43	13.02	13.61	14.22	14.83	15.39	16.00	16.57	17.17	17.73	18.29	18.81
32		9.970	10.58	11.19	11.80	12.41	13.00	13.59	14.20	14.81	15.37	15.98	16.56	17.15	17.72	18.28	18.79
33		9.949	10.56	11.17	11.78	12.39	12.98	13.57	14.18	14.79	15.36	15.96	16.54	17.14	17.70	18.26	18.78
34		9.929	10.54	11.15	11.76	12.37	12.96	13.55	14.16	14.77	15.34	15.94	16.52	17.12	17.68	18.24	18.76
35		9.907	10.52	11.13	11.74	12.35	12.94	13.53	14.14	14.75	15.32	15.92	16.50	17.10	17.66	18.23	18.74
36		9.887	10.50	11.11	11.72	12.33	12.92	13.51	14.12	14.73	15.30	15.90	16.48	17.08	17.65	18.21	18.73
37		9.866	10.48	11.09	11.70	12.31	12.90	13.49	14.10	14.71	15.28	15.88	16.46	17.07	17.63	18.19	18.71
38		9.844	10.46	11.07	11.68	12.29	12.88	13.47	14.08	14.69	15.26	15.87	16.45	17.05	17.61	18.17	18.69
39		9.824	10.44	11.05	11.66	12.29	12.86	13.45	14.06	14.67	15.24	15.85	16.43	17.03	17.59	18.16	18.68
40		9.802	10.41	11.03	11.64	12.25	12.84	13.43	14.04	14.65	15.22	15.83	16.41	17.01	17.57	18.14	18.66
42		9.760	10.37	10.98	11.60	12.21	12.80	13.39	14.00	14.61	15.18	15.79	16.37	16.97	17.54	18.10	18.62
44		9.718	10.33	10.94	11.55	12.17	12.76	13.35	13.96	14.57	15.14	15.75	16.33	16.93	17.50	18.06	18.59
46		9.675	10.29	10.90	11.51	12.12	12.71	13.30	13.92	14.53	15.10	15.71	16.29	16.89	17.46	18.03	18.55
48		9.633	10.24	10.86	11.47	12.08	12.67	13.26	13.87	14.49	15.06	15.67	16.25	16.85	17.42	17.99	18.51
50		9.591	10.20	10.81	11.42	12.04	12.63	13.22	13.83	14.45	15.02	15.62	16.21	16.81	17.38	17.95	18.47
52		9.549	10.16	10.77	11.38	11.99	12.59	13.18	13.78	14.41	14.97	15.58	16.16	16.77	17.34	17.91	18.43
54		9.508	10.12	10.73	11.34	11.95	12.54	13.13	13.75	14.36	14.93	15.54	16.12	16.73	17.30	17.87	18.39
56		9.466	10.05	10.68	11.30	11.91	12.50	13.09	13.70	14.32	14.89	15.50	16.08	16.69	17.26	17.83	18.35
58		9.424	10.03	10.64	11.25	11.86	12.46	13.05	13.66	14.27	14.84	15.45	16.04	16.64	17.21	17.78	18.31
60		9.383	9.990	10.60	11.21	11.82	12.41	13.00	13.62	14.23	14.80	15.41	15.99	16.60	17.17	17.74	18.27
63		9.321	9.928	10.54	11.14	11.76	12.35	12.94	13.55	14.16	14.74	15.35	15.93	16.54	17.11	17.68	18.21
66		9.261	9.867	10.47	11.08	11.69	12.28	12.88	13.49	14.10	14.67	15.28	15.87	16.47	17.04	17.62	18.15
69		9.202	9.806	10.41	11.02	11.63	12.22	12.81	13.42	14.03	14.61	15.22	15.80	16.41	16.98	17.55	18.08
72		9.143	9.744	10.35	10.96	11.56	12.15	12.75	13.36	13.97	14.54	15.15	15.73	16.34	16.92	17.49	18.02
75		9.082	9.684	10.29	10.89	11.50	12.09	12.68	13.30	13.90	14.48	15.08	15.67	16.28	16.85	17.42	17.96
78		9.027	9.626	10.23	10.83	11.44	12.03	12.62	13.23	13.84	14.41	15.02	15.61	16.21	16.79	17.36	17.89
81		8.969	9.568	10.17	10.77	11.38	11.96	12.56	13.16	13.78	14.35	14.96	15.54	16.14	16.72	17.29	17.83
84		8.911	9.510	10.11	10.71	11.32	11.91	12.49	13.10	13.71	14.28	14.89	15.48	16.08	16.65	17.23	17.77

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TABLE 13.- Y-PANEL PROPERTIES $\left[\frac{t_W}{t_S} = 1.00;\ \frac{b_A}{t_W} = 9.3;\ \frac{b_Y}{b_W} = 1.04;\ \frac{t_L}{t_W} = 1.06;\ \frac{b_L}{b_W} = 0.94;\ \frac{t_F}{t_W} = 2.13;\ \frac{b_F}{b_W} = 0.69;\ \frac{r}{t_W} = 1;\ \frac{d}{t_S} = 2.4;\ \frac{p}{t_S} = 7.8\right]$

$\frac{b_S}{t_S}$ \ $\frac{b_W}{t_W}$		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
23	$\frac{A_1}{t_S}$	3.177	3.225	3.270	3.313	3.355	3.395	3.433	3.470	3.505	3.539	3.572	3.604	3.634	3.663	3.692	3.719
24		3.131	3.178	3.223	3.267	3.309	3.349	3.387	3.424	3.460	3.494	3.527	3.559	3.590	3.619	3.648	3.676
25		3.086	3.133	3.179	3.222	3.264	3.304	3.343	3.380	3.416	3.450	3.483	3.516	3.547	3.576	3.605	3.633
26		3.043	3.090	3.136	3.179	3.221	3.261	3.300	3.338	3.373	3.408	3.441	3.474	3.505	3.535	3.564	3.592
27		3.002	3.049	3.095	3.138	3.180	3.220	3.259	3.296	3.333	3.367	3.401	3.433	3.465	3.495	3.524	3.553
28		2.963	3.010	3.055	3.098	3.140	3.181	3.219	3.257	3.293	3.328	3.362	3.394	3.426	3.456	3.486	3.514
29		2.925	2.972	3.017	3.060	3.102	3.142	3.181	3.219	3.255	3.290	3.324	3.356	3.388	3.418	3.448	3.477
30		2.888	2.935	2.980	3.023	3.065	3.105	3.144	3.182	3.218	3.253	3.287	3.320	3.351	3.382	3.412	3.441
31		2.853	2.900	2.944	2.988	3.029	3.070	3.108	3.146	3.182	3.217	3.251	3.284	3.316	3.347	3.376	3.405
32		2.819	2.865	2.910	2.953	2.995	3.035	3.074	3.111	3.148	3.183	3.217	3.249	3.281	3.312	3.342	3.371
33		2.786	2.833	2.877	2.920	2.962	3.002	3.040	3.078	3.114	3.149	3.183	3.216	3.248	3.279	3.309	3.338
34		2.755	2.801	2.845	2.888	2.929	2.969	3.008	3.045	3.081	3.117	3.150	3.183	3.215	3.246	3.276	3.306
35		2.725	2.770	2.814	2.857	2.898	2.938	2.977	3.014	3.050	3.085	3.119	3.152	3.184	3.215	3.245	3.274
36		2.695	2.741	2.785	2.827	2.868	2.908	2.946	2.983	3.019	3.054	3.088	3.121	3.153	3.184	3.214	3.244
37		2.667	2.712	2.756	2.798	2.839	2.878	2.917	2.954	2.990	3.025	3.058	3.091	3.123	3.154	3.184	3.214
38		2.639	2.684	2.728	2.770	2.810	2.850	2.888	2.925	2.961	2.996	3.030	3.062	3.094	3.125	3.155	3.185
39		2.613	2.657	2.701	2.742	2.783	2.822	2.860	2.897	2.933	2.968	3.001	3.034	3.066	3.097	3.127	3.156
40		2.587	2.631	2.674	2.716	2.756	2.795	2.833	2.870	2.906	2.940	2.974	3.007	3.039	3.070	3.100	3.129
42		2.538	2.582	2.624	2.665	2.705	2.744	2.782	2.818	2.854	2.888	2.921	2.954	2.986	3.017	3.047	3.076
44		2.492	2.535	2.577	2.618	2.657	2.695	2.733	2.769	2.804	2.838	2.872	2.904	2.936	2.966	2.996	3.026
46		2.448	2.491	2.532	2.573	2.612	2.650	2.686	2.722	2.757	2.791	2.824	2.857	2.888	2.919	2.948	2.977
48		2.408	2.450	2.490	2.530	2.569	2.606	2.643	2.678	2.713	2.747	2.779	2.811	2.843	2.873	2.903	2.932
50		2.369	2.410	2.451	2.490	2.528	2.565	2.601	2.636	2.671	2.704	2.737	2.768	2.799	2.830	2.859	2.888
52		2.332	2.373	2.413	2.451	2.489	2.526	2.562	2.596	2.630	2.663	2.696	2.727	2.758	2.788	2.817	2.846
54		2.297	2.338	2.377	2.415	2.452	2.489	2.524	2.558	2.592	2.625	2.657	2.688	2.719	2.748	2.778	2.806
56		2.264	2.304	2.343	2.380	2.417	2.453	2.488	2.522	2.555	2.588	2.620	2.651	2.681	2.711	2.739	2.768
58		2.233	2.272	2.310	2.348	2.384	2.419	2.454	2.488	2.520	2.553	2.584	2.615	2.645	2.674	2.703	2.731
60		2.203	2.242	2.279	2.316	2.352	2.387	2.421	2.454	2.487	2.519	2.550	2.581	2.610	2.639	2.668	2.696
63		2.161	2.199	2.236	2.272	2.307	2.341	2.375	2.408	2.440	2.471	2.502	2.532	2.561	2.590	2.618	2.646
66		2.122	2.159	2.195	2.230	2.265	2.298	2.331	2.364	2.395	2.426	2.456	2.486	2.515	2.543	2.571	2.598
69		2.085	2.121	2.157	2.191	2.225	2.258	2.291	2.322	2.353	2.384	2.413	2.443	2.471	2.499	2.527	2.554
72		2.051	2.086	2.121	2.155	2.188	2.220	2.252	2.283	2.314	2.344	2.373	2.402	2.430	2.458	2.485	2.511
75		2.019	2.053	2.087	2.120	2.153	2.185	2.216	2.247	2.277	2.306	2.335	2.363	2.391	2.418	2.445	2.471
78		1.988	2.022	2.055	2.088	2.120	2.151	2.182	2.212	2.242	2.271	2.299	2.327	2.354	2.381	2.408	2.433
81		1.960	1.993	2.026	2.057	2.089	2.120	2.150	2.179	2.208	2.237	2.265	2.292	2.319	2.346	2.372	2.397
84		1.933	1.965	1.997	2.029	2.059	2.090	2.119	2.148	2.177	2.205	2.232	2.259	2.286	2.312	2.338	2.363
23	$\frac{\bar{h}}{t_S}$	11.81	12.61	13.42	14.23	15.04	15.85	16.67	17.49	18.31	19.13	19.96	20.79	21.61	22.44	23.27	24.10
24		11.73	12.53	13.34	14.14	14.95	15.77	16.58	17.40	18.22	19.04	19.86	20.69	21.52	22.34	23.17	24.00
25		11.66	12.45	13.26	14.06	14.87	15.68	16.49	17.31	18.13	18.95	19.77	20.59	21.42	22.24	23.07	23.90
26		11.58	12.38	13.18	13.98	14.78	15.59	16.40	17.21	18.03	18.85	19.67	20.50	21.32	22.14	22.97	23.80
27		11.51	12.30	13.10	13.90	14.70	15.51	16.32	17.13	17.94	18.76	19.58	20.40	21.22	22.05	22.87	23.70
28		11.44	12.22	13.02	13.82	14.62	15.42	16.23	17.04	17.85	18.67	19.49	20.31	21.13	21.95	22.77	23.60
29		11.36	12.15	12.94	13.74	14.54	15.34	16.14	16.95	17.77	18.58	19.40	20.21	21.03	21.85	22.68	23.50
30		11.29	12.08	12.87	13.66	14.46	15.26	16.06	16.87	17.68	18.49	19.30	20.12	20.94	21.76	22.58	23.40
31		11.22	12.00	12.79	13.58	14.38	15.18	15.98	16.78	17.59	18.40	19.21	20.03	20.85	21.66	22.48	23.30
32		11.15	11.93	12.71	13.50	14.30	15.09	15.90	16.70	17.51	18.31	19.13	19.94	20.75	21.57	22.39	23.21
33		11.08	11.86	12.64	13.43	14.22	15.02	15.81	16.62	17.42	18.23	19.04	19.85	20.66	21.48	22.29	23.11
34		11.01	11.79	12.57	13.35	14.14	14.93	15.73	16.53	17.33	18.14	18.95	19.76	20.57	21.38	22.20	23.02
35		10.95	11.72	12.50	13.28	14.07	14.86	15.65	16.45	17.25	18.05	18.86	19.67	20.48	21.29	22.11	22.92
36		10.88	11.65	12.43	13.21	13.99	14.78	15.57	16.37	17.17	17.97	18.77	19.58	20.39	21.20	22.02	22.83
37		10.82	11.58	12.36	13.13	13.92	14.70	15.50	16.29	17.09	17.89	18.69	19.49	20.30	21.11	21.92	22.74
38		10.75	11.52	12.29	13.06	13.84	14.63	15.42	16.21	17.01	17.80	18.61	19.41	20.22	21.02	21.83	22.65
39		10.69	11.45	12.22	12.99	13.77	14.55	15.34	16.13	16.92	17.72	18.52	19.32	20.13	20.94	21.75	22.56
40		10.63	11.38	12.15	12.92	13.70	14.48	15.26	16.05	16.85	17.64	18.44	19.24	20.04	20.85	21.66	22.47
42		10.50	11.26	12.02	12.78	13.56	14.33	15.12	15.90	16.69	17.48	18.27	19.07	19.87	20.68	21.48	22.29
44		10.38	11.13	11.89	12.65	13.42	14.19	14.97	15.75	16.53	17.32	18.12	18.91	19.71	20.51	21.31	22.12
46		10.26	11.01	11.76	12.52	13.28	14.05	14.82	15.60	16.38	17.17	17.96	18.75	19.54	20.34	21.14	21.94
48		10.15	10.89	11.64	12.39	13.15	13.91	14.68	15.46	16.24	17.02	17.80	18.59	19.38	20.18	20.97	21.77
50		10.04	10.77	11.52	12.27	13.02	13.78	14.55	15.31	16.09	16.87	17.65	18.43	19.22	20.02	20.81	21.61
52		9.928	10.66	11.40	12.14	12.89	13.65	14.41	15.18	15.95	16.72	17.50	18.28	19.07	19.86	20.65	21.44
54		9.820	10.55	11.28	12.02	12.77	13.52	14.28	15.04	15.81	16.58	17.35	18.13	18.92	19.70	20.49	21.28
56		9.715	10.44	11.17	11.90	12.64	13.39	14.15	14.91	15.67	16.44	17.21	17.99	18.76	19.55	20.33	21.12
58		9.614	10.33	11.05	11.79	12.53	13.27	14.02	14.78	15.53	16.30	17.07	17.84	18.62	19.39	20.18	20.96
60		9.513	10.23	10.94	11.67	12.41	13.15	13.89	14.64	15.40	16.16	16.93	17.70	18.47	19.25	20.03	20.81
63		9.367	10.07	10.79	11.51	12.24	12.97	13.71	14.46	15.21	15.96	16.72	17.49	18.26	19.03	19.80	20.58
66		9.227	9.925	10.63	11.35	12.07	12.79	13.53	14.27	15.02	15.77	16.52	17.28	18.05	18.81	19.59	20.36
69		9.089	9.779	10.48	11.19	11.90	12.63	13.36	14.09	14.83	15.58	16.33	17.08	17.84	18.60	19.37	20.14
72		8.958	9.640	10.34	11.04	11.75	12.46	13.19	13.91	14.65	15.39	16.14	16.89	17.64	18.40	19.17	19.93
75		8.830	9.505	10.19	10.89	11.59	12.30	13.02	13.75	14.48	15.21	15.95	16.70	17.45	18.20	18.96	19.72
78		8.703	9.374	10.05	10.75	11.44	12.15	12.86	13.58	14.31	15.04	15.77	16.51	17.26	18.01	18.76	19.52
81		8.584	9.248	9.924	10.60	11.30	12.00	12.71	13.42	14.13	14.86	15.59	16.33	17.07	17.82	18.57	19.32
84		8.466	9.122	9.791	10.47	11.15	11.85	12.55	13.26	13.97	14.69	15.42	16.15	16.89	17.63	18.37	19.12
23	$\frac{\rho}{t_S}$	13.08	13.85	14.61	15.38	16.14	16.87	17.60	18.37	19.13	19.83	20.58	21.30	22.04	22.72	23.43	24.05
24		13.07	13.84	14.60	15.37	16.13	16.87	17.60	18.36	19.12	19.82	20.58	21.29	22.04	22.72	23.42	24.05
25		13.06	13.82	14.59	15.36	16.12	16.86	17.59	18.35	19.12	19.81	20.57	21.28	22.03	22.71	23.42	24.04
26		13.04	13.81	14.58	15.35	16.11	16.85	17.58	18.35	19.11	19.81	20.56	21.28	22.03	22.71	23.42	24.04
27		13.03	13.80	14.57	15.34	16.10	16.84	17.57	18.34	19.10	19.80	20.56	21.27	22.02	22.70	23.41	24.04
28		13.02	13.79	14.56	15.33	16.09	16.83	17.56	18.33	19.09	19.79	20.55	21.27	22.02	22.70	23.41	24.03
29		13.01	13.78	14.55	15.31	16.08	16.82	17.55	18.32	19.08	19.78	20.54	21.26	22.01	22.69	23.40	24.03
30		12.99	13.76	14.53	15.30	15.07	17.81	17.54	18.31	19.08	19.78	20.53	21.25	22.00	22.69	23.40	24.03
31		12.98	13.75	14.52	15.29	16.06	16.80	17.53	18.30	19.07	19.77	20.53	21.24	22.00	22.68	23.39	24.02
32		12.97	13.74	14.51	15.28	16.05	16.79	17.52	18.29	19.06	19.76	20.52	21.24	21.99	22.67	23.39	24.02
33		12.95	13.72	14.50	15.27	16.04	16.77	17.51	18.28	19.05	19.75	20.51	21.23	21.98	22.67	23.38	24.01
34		12.94	13.71	14.48	15.25	16.02	16.76	17.50	18.27	19.04	19.74	20.50	21.22	21.97	22.66	23.37	24.00
35		12.92	13.70	14.47	15.24	16.01	16.75	17.49	18.26	19.03	19.73	20.49	21.21	21.96	22.65	23.36	24.00
36		12.91	13.68	14.46	15.23	16.00	16.74	17.48	18.25	19.02	19.72	20.48	21.20	21.96	22.64	23.36	23.99
37		12.90	13.67	14.44	15.21	15.99	16.73	17.47	18.24	19.00	19.71	20.47	21.19	21.95	22.64	23.35	23.99
38		12.88	13.65	14.43	15.21	15.97	16.71	17.45	18.22	18.99	19.70	20.46	21.18	21.94	22.63	23.34	23.98
39		12.87	13.64	14.41	15.19	15.96	16.70	17.44	18.21	18.98	19.69	20.45	21.17	21.93	22.62	23.33	23.97
40		12.85	13.63	14.40	15.17	15.95	16.69	17.43	18.20	18.97	19.67	20.44	21.16	21.92	22.61	23.33	23.96
42		12.82	13.60	14.37	15.14	15.92	16.66	17.40	18.17	18.95	19.65	20.42	21.14	21.90	22.59	23.31	23.95
44		12.79	13.57	14.34	15.12	15.89	16.63	17.38	18.15	18.92	19.63	20.39	21.12	21.88	22.57	23.29	23.93
46		12.76	13.54	14.31	15.09	15.86	16.61	17.35	18.12	18.90	19.61	20.37	21.10	21.86	22.55	23.27	23.91
48		12.73	13.50	14.28	15.06	15.83	16.58	17.32	18.10	18.87	19.58	20.35	21.08	21.83	22.53	23.25	23.89
50		12.70	13.47	14.25	15.03	15.80	16.55	17.29	18.07	18.84	19.55	20.32	21.05	21.81	22.51	23.23	23.87
52		12.68	13.44	14.22	14.99	15.77	16.52	17.26	18.04	18.81	19.53	20.29	21.02	21.78	22.48	23.20	23.85
54		12.63	13.41	14.19	14.96	15.74	16.49	17.23	18.01	18.79	19.50	20.27	21.00	21.76	22.46	23.18	23.83
56		12.60	13.38	14.15	14.93	15.71	16.46	17.20	17.98	18.76	19.47	20.24	20.97	21.73	22.43	23.16	23.81
58		12.56	13.34	14.12	14.90	15.68	16.43	17.17	17.95	18.73	19.44	20.21	20.95	21.71	22.41	23.13	23.78
60		12.53	13.31	14.09	14.87	15.65	16.40	17.14	17.92	18.70	19.41	20.18	20.92	21.68	22.38	23.11	23.76
63		12.48	13.26	14.04	14.82	15.60	16.35	17.10	17.87	18.65	19.37	20.14	20.88	21.64	22.34	23.07	23.72
66		12.43	13.21	13.99	14.77	15.55	16.30	17.05	17.83	18.61	19.33	20.10	20.83	21.60	22.30	23.03	23.69
69		12.38	13.16	13.94	14.72	15.50	16.25	17.00	17.78	18.56	19.28	20.05	20.79	21.55	22.26	22.99	23.65
72		12.33	13.11	13.89	14.67	15.45	16.20	16.95	17.73	18.51	19.23	20.00	20.74	21.51	22.22	22.95	23.60
75		12.28	13.06	13.83	14.62	15.40	16.15	16.90	17.68	18.46	19.18	19.96	20.70	21.46	22.17	22.90	23.56
78		12.23	13.01	13.79	14.57	15.35	16.10	16.85	17.63	18.41	19.14	19.91	20.65	21.42	22.13	22.86	23.52
81		12.18	12.96	13.74	14.52	15.30	16.05	16.80	17.58	18.36	19.09	19.86	20.60	21.37	22.08	22.81	23.48
84		12.13	12.91	13.69	14.47	15.24	16.00	16.75	17.53	18.31	19.04	19.81	20.55	21.32	22.03	22.77	23.43

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

TABLE 14

VALUES AND COMPUTATIONS FOR OBTAINING DESIGN FOR MAXIMUM STRUCTURAL EFFICIENCY

[P_1 = 5.0 kips/in.; L = 20 in.; c = 1; t_S = 0.102 in.; $\frac{t_W}{t_S}$ = 0.40]

[a]Step (1)		Step (3)			Step (4)	Step (5)	Step (8)			Step (9)		Step (10)			Step(12)
$\frac{P_1}{L/\sqrt{c}}$ (ksi)	$\frac{P_1}{t_S}$ (ksi)	$\frac{b_W}{t_W}$	$\frac{b_S}{t_S}$	$\bar{\sigma}_f$ (ksi)	$\frac{A_1}{t_S}$	$\frac{P_1}{\bar{\sigma}_f \frac{A_1}{t_S}}$ (in.)	$\frac{b_S}{t_S}$	$\frac{b_W}{t_W}$	$\bar{\sigma}_f$ (ksi)	$\frac{A_1}{t_S}$	P_1 (kips/in.)	t_W (in.)	b_S (in.)	b_W (in.)	σ_{cr} (ksi)
							For t_S = 0.102 in.								
0.25	49	18	23	31.2	1.496	0.1071	36.6	25.7	34.2	1.439	5.02	0.040	3.732	1.028	31.5
			26	31.5	1.454	.1090									
			30	31.6	1.407	.1123									
			35	31.2	1.361	.1177									
			42	29.8	1.312	.1278									
			50	27.8	1.270	.1415									
			60	25.7	1.231	.1580									
			72	22.5	1.196	.1860									
			84	19.2	1.171	.2222									
		21	23	33.3	1.542	.0973									
			26	33.6	1.497	.0995									
			30	33.5	1.448	.1029									
			35	32.9	1.399	.1086									
			42	31.5	1.345	.1179									
			50	29.4	1.300	.1318									
			60	26.7	1.257	.1489									
			72	23.4	1.220	.1750									
			84	19.7	1.192	.2127									
		24	23	35.1	1.585	.0899									
			26	35.4	1.538	.0919									
			30	35.0	1.486	.0962									
			35	34.1	1.434	.1022									
			42	32.3	1.378	.1123									
			50	30.1	1.328	.1250									
			60	27.2	1.283	.1432									
			72	24.0	1.242	.1677									
			84	20.0	1.212	.2063									
		27	23	36.5	1.624	.0843									
			26	36.5	1.576	.0870									
			30	35.9	1.522	.0915									
			35	34.8	1.468	.0978									
			42	32.8	1.408	.1082									
			50	30.2	1.356	.1221									
			60	27.4	1.307	.1397									
			72	24.0	1.264	.1647									
			84	20.2	1.231	.2010									
		30	23	37.7	1.661	.0798									
			26	37.2	1.612	.0834									
			30	36.4	1.556	.0881									
			35	35.0	1.500	.0952									
			42	32.6	1.437	.1067									
			50	30.2	1.383	.1195									
			60	27.1	1.331	.1385									
			72	23.7	1.285	.1642									
			84	20.2	1.250	.1980									
		33	23	39.0	1.696	.0756									
			26	37.3	1.646	.0814									
			30	36.2	1.589	.0870									
			35	34.7	1.530	.0941									
			42	32.2	1.465	.1060									
			50	29.8	1.408	.1191									
			60	26.7	1.354	.1381									
			72	23.4	1.306	.1636									
			84	20.3	1.269	.1942									

[a]See appendix A for discussion of steps.

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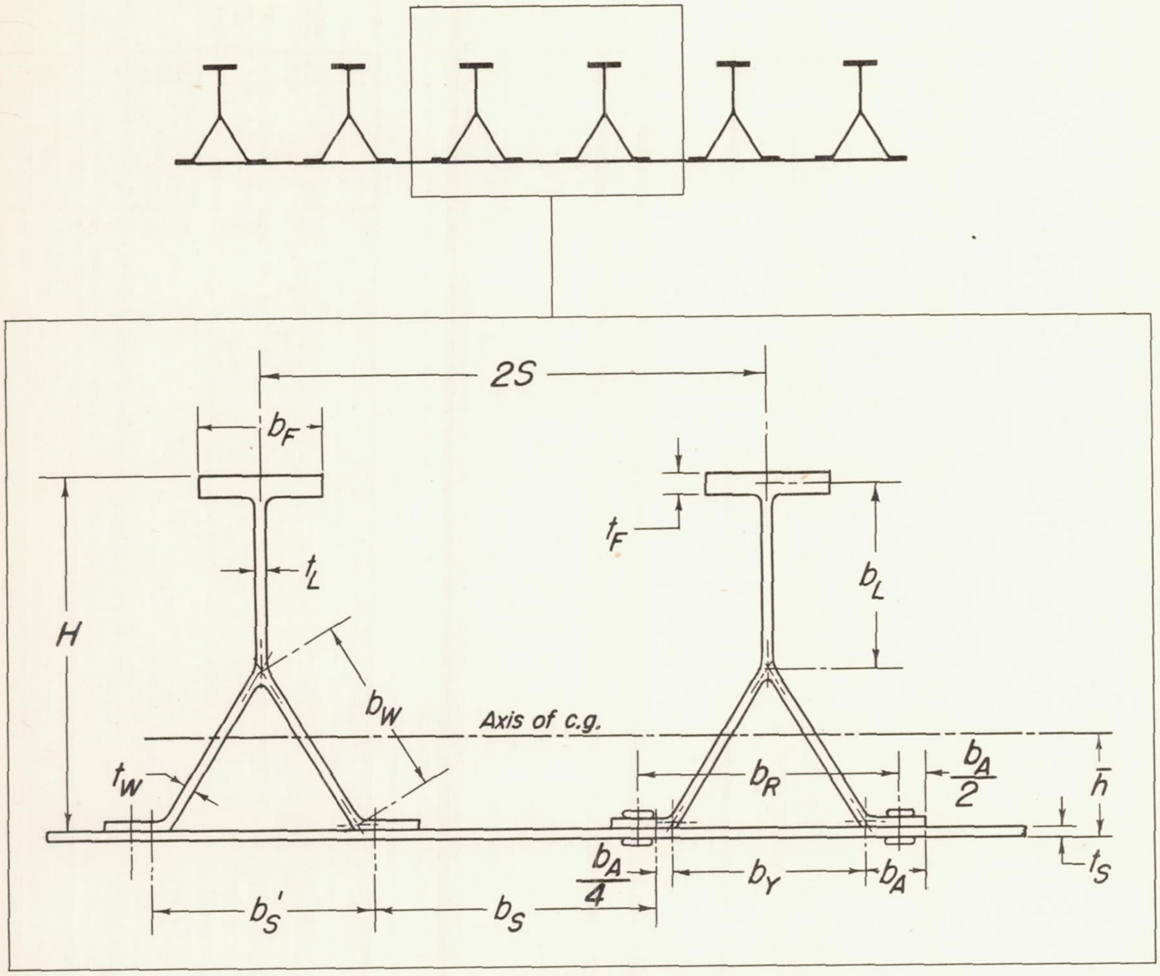

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r = All fillet radii
d = Rivet diameter
p = Rivet pitch
L = Length of panel

Figure 1.- Symbols for panel dimensions.

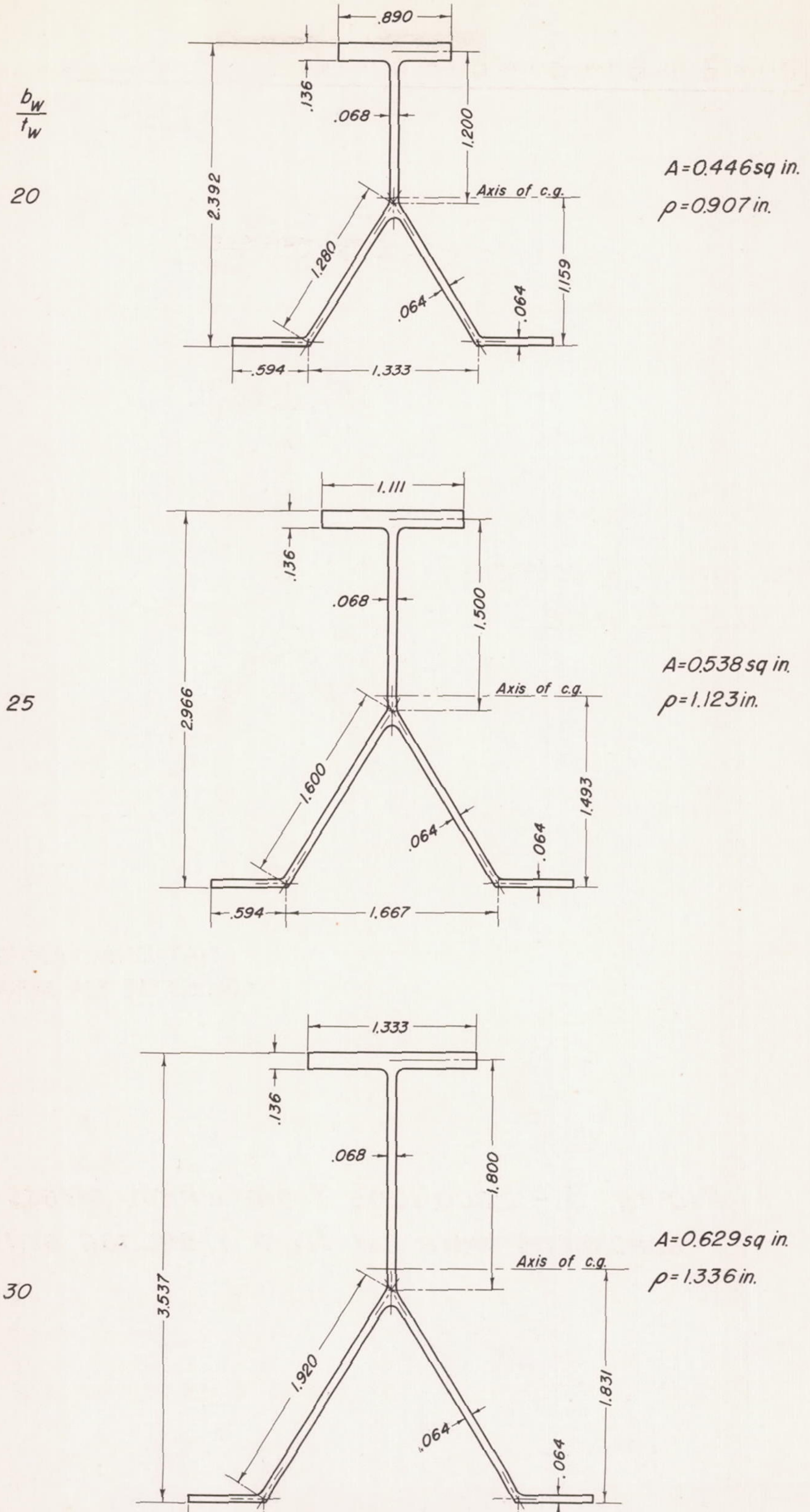

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Figure 2.- Dimensions of extrusions used for test specimens.

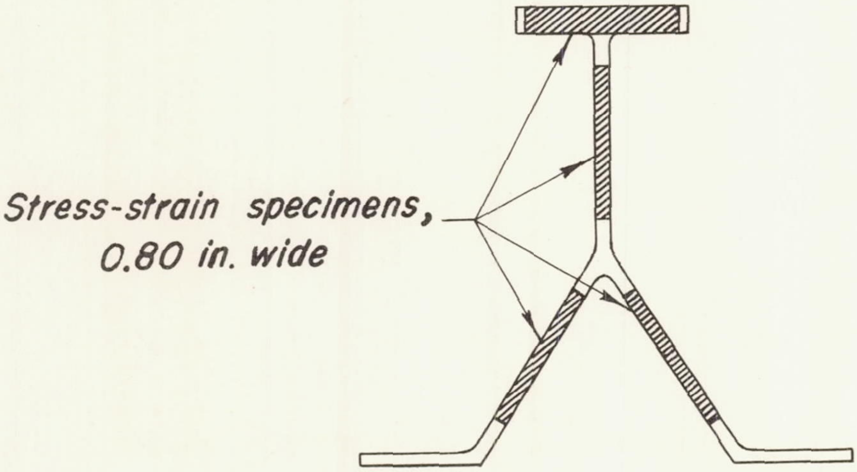

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Figure 3.- Locations from which stress-strain specimens were cut from Y-section extrusions.

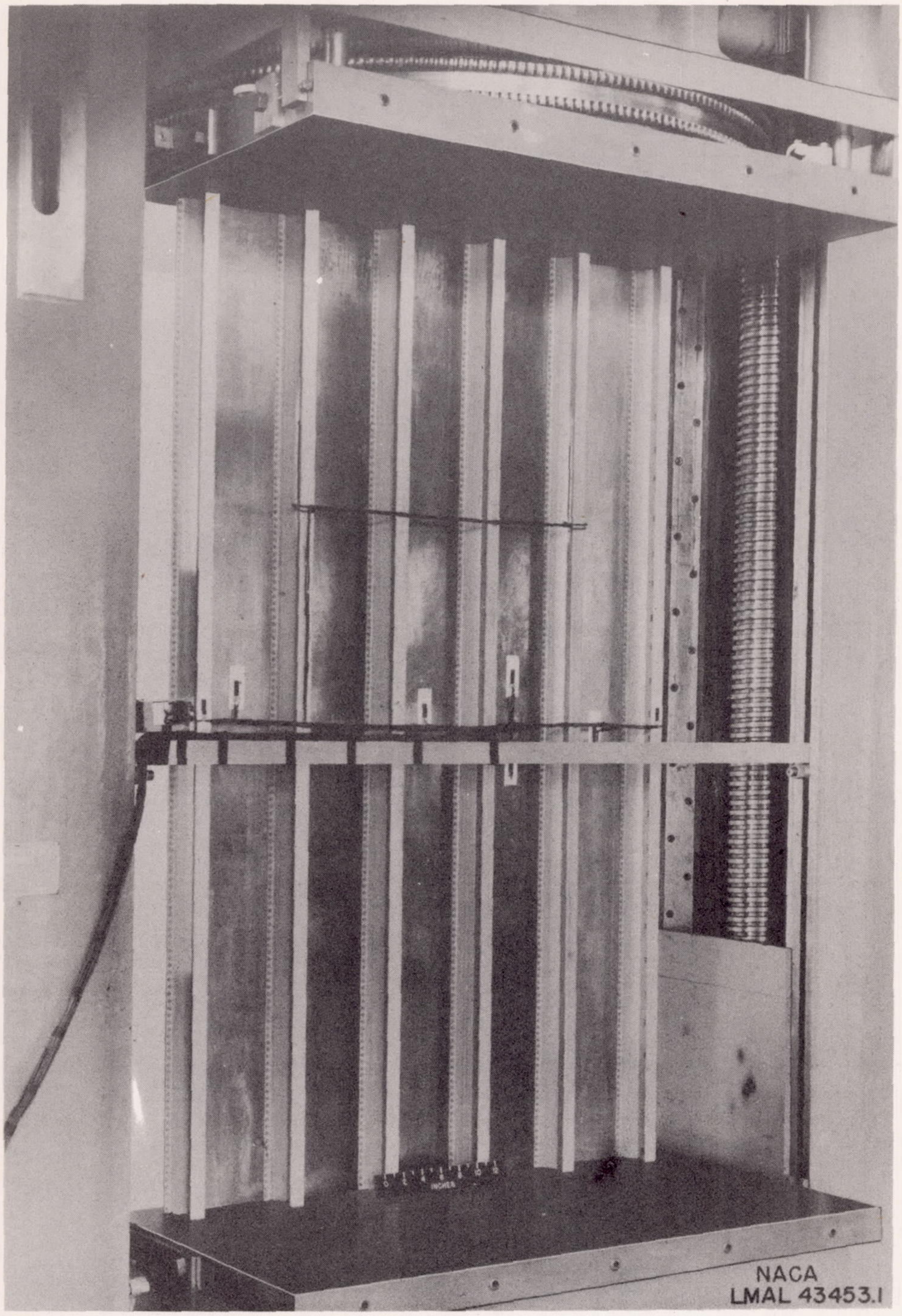

Figure 4.- Test specimen in testing machine.

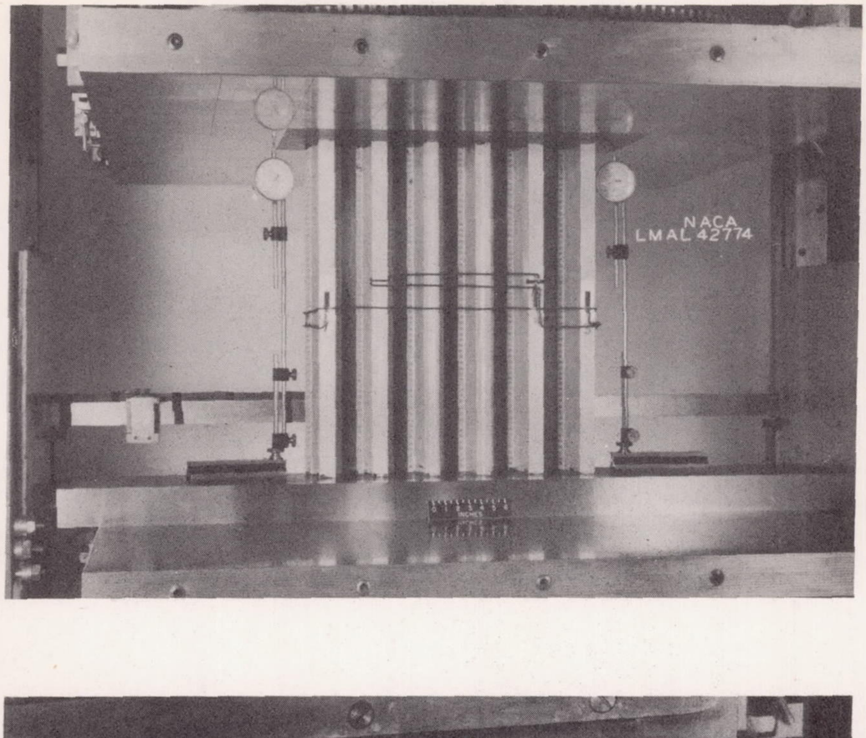

Figure 5.- Test specimen in testing machine with special bearing block to permit gage wires to be introduced inside stiffeners.

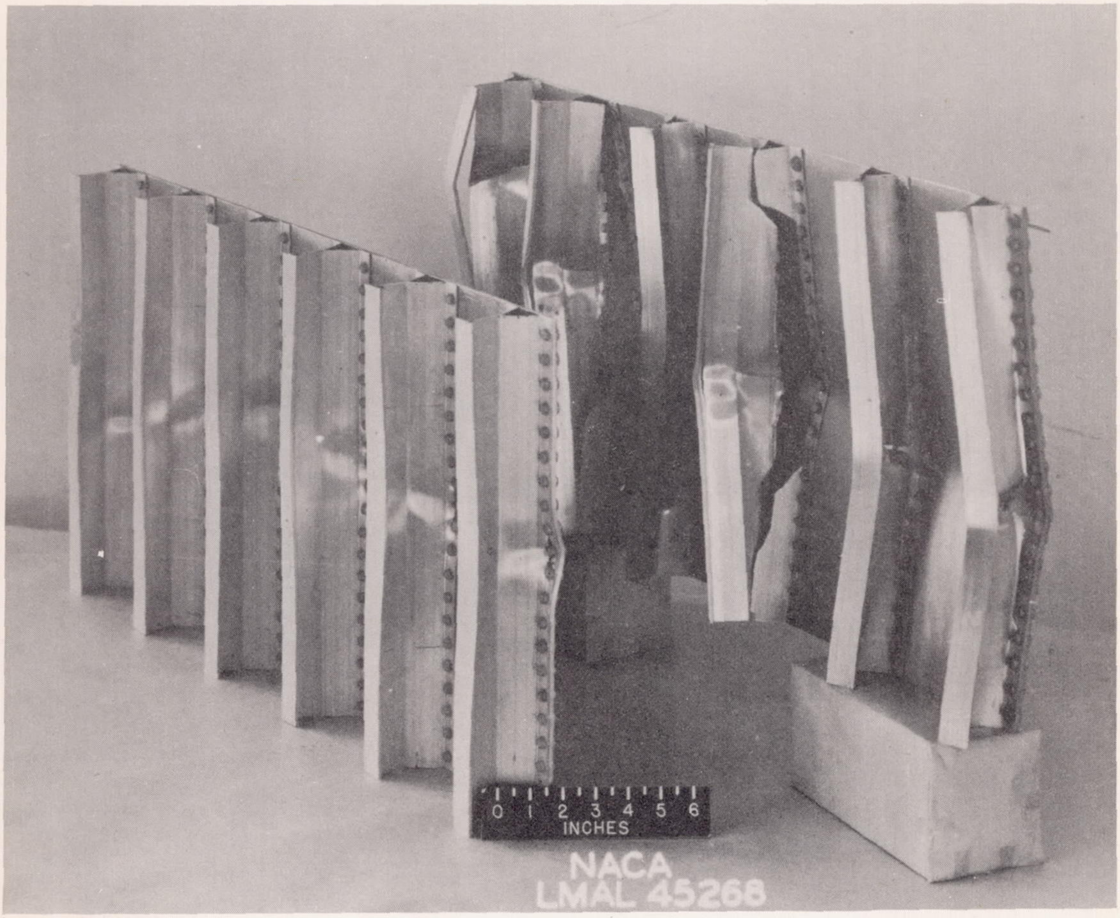

Figure 6.- A 24S-T aluminum-alloy Y-stiffened panel (on the left) and its 75S-T counterpart after failure.

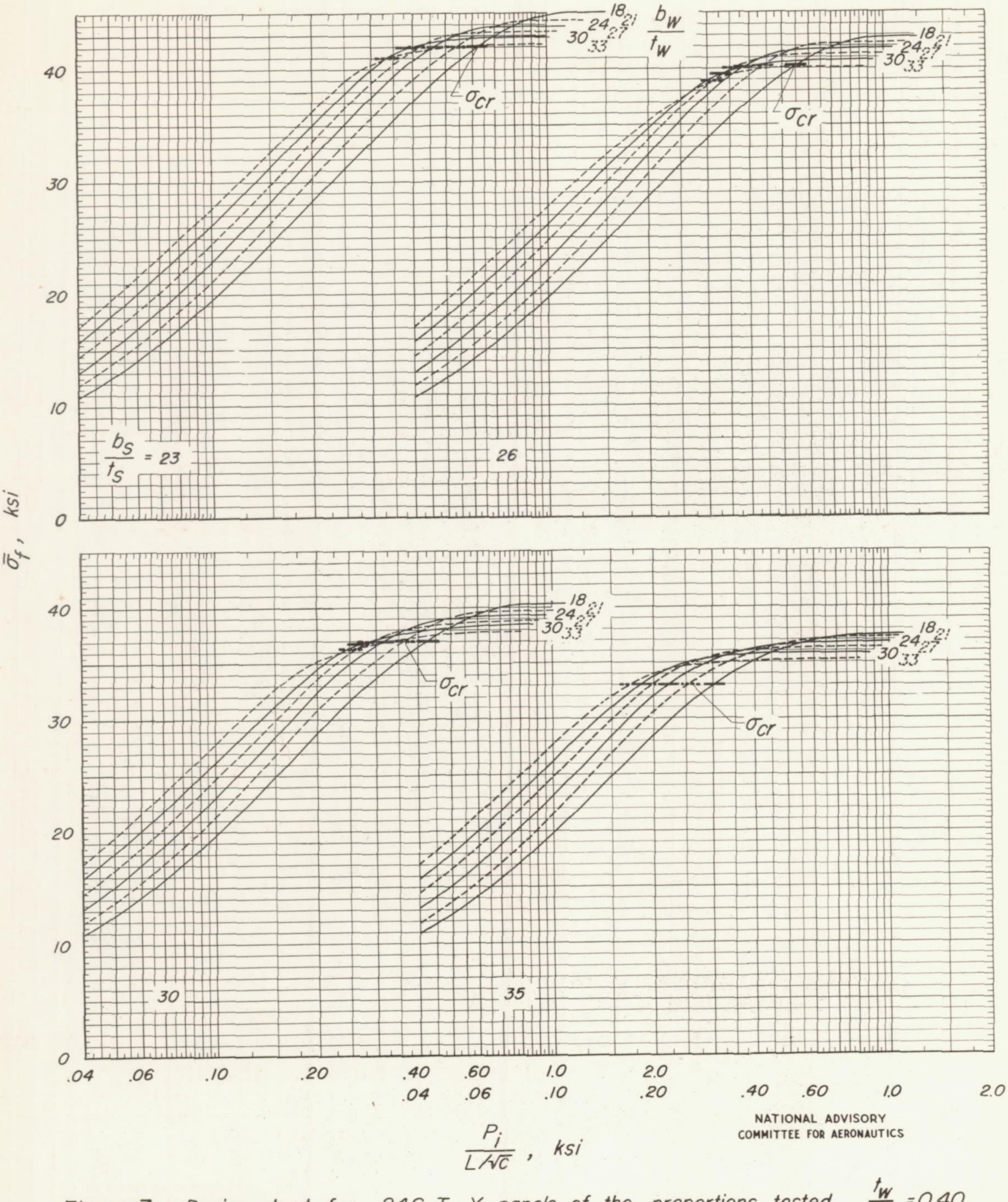

Figure 7.- Design chart for 24S-T Y-panels of the proportions tested. $\frac{t_W}{t_S} = 0.40$.

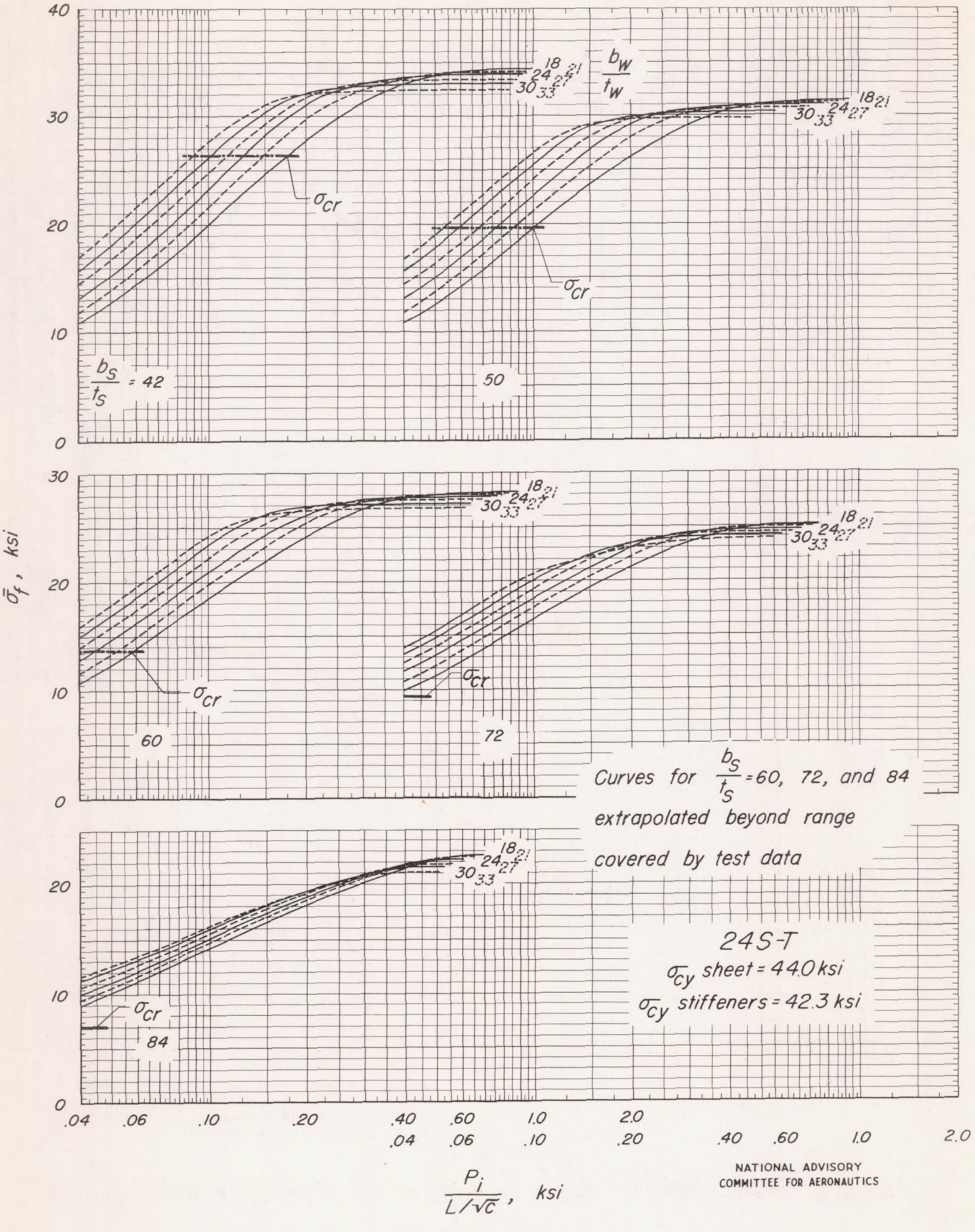

Figure 7.- Concluded.

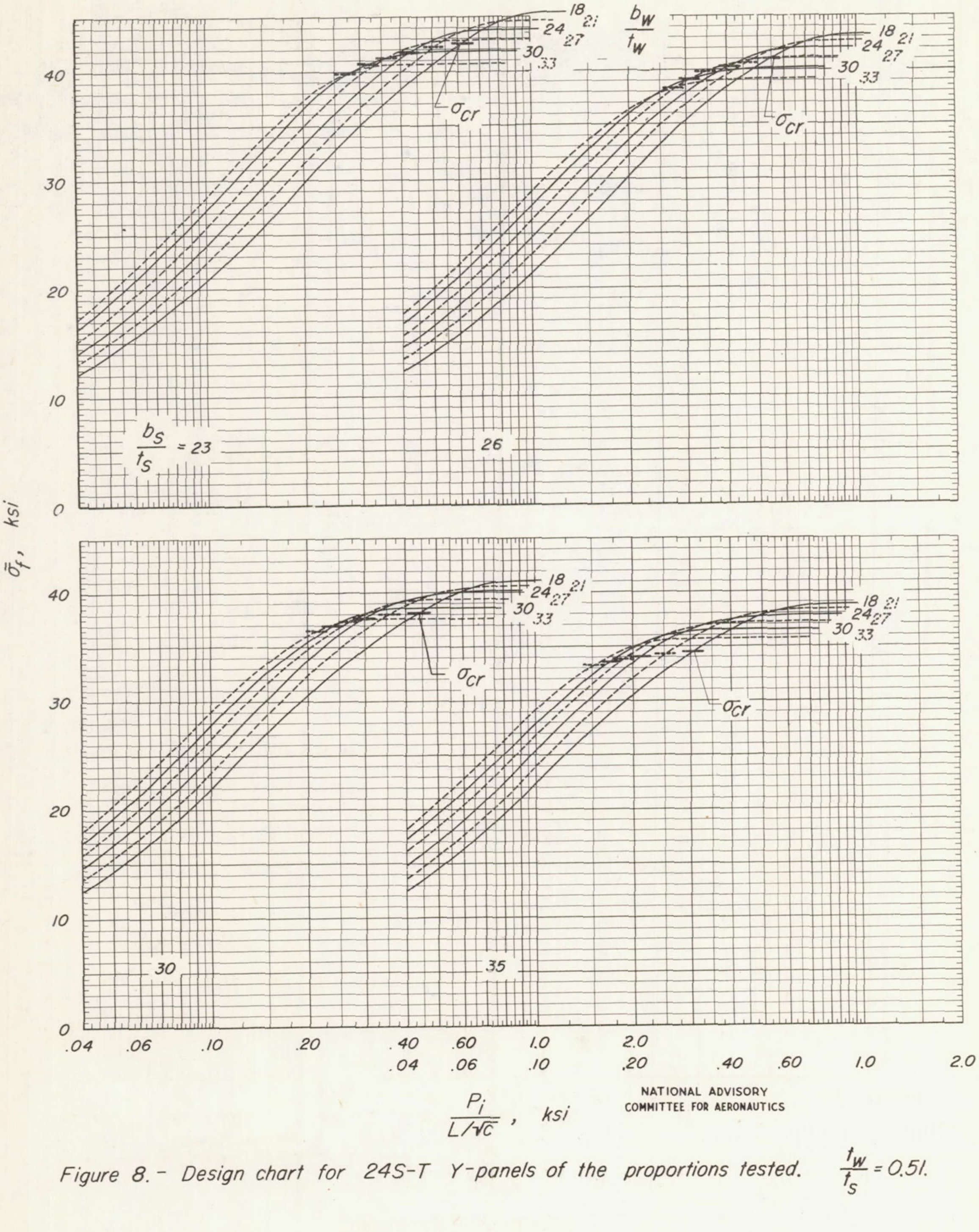

Figure 8.- Design chart for 24S-T Y-panels of the proportions tested. $\frac{t_w}{t_s} = 0.51$.

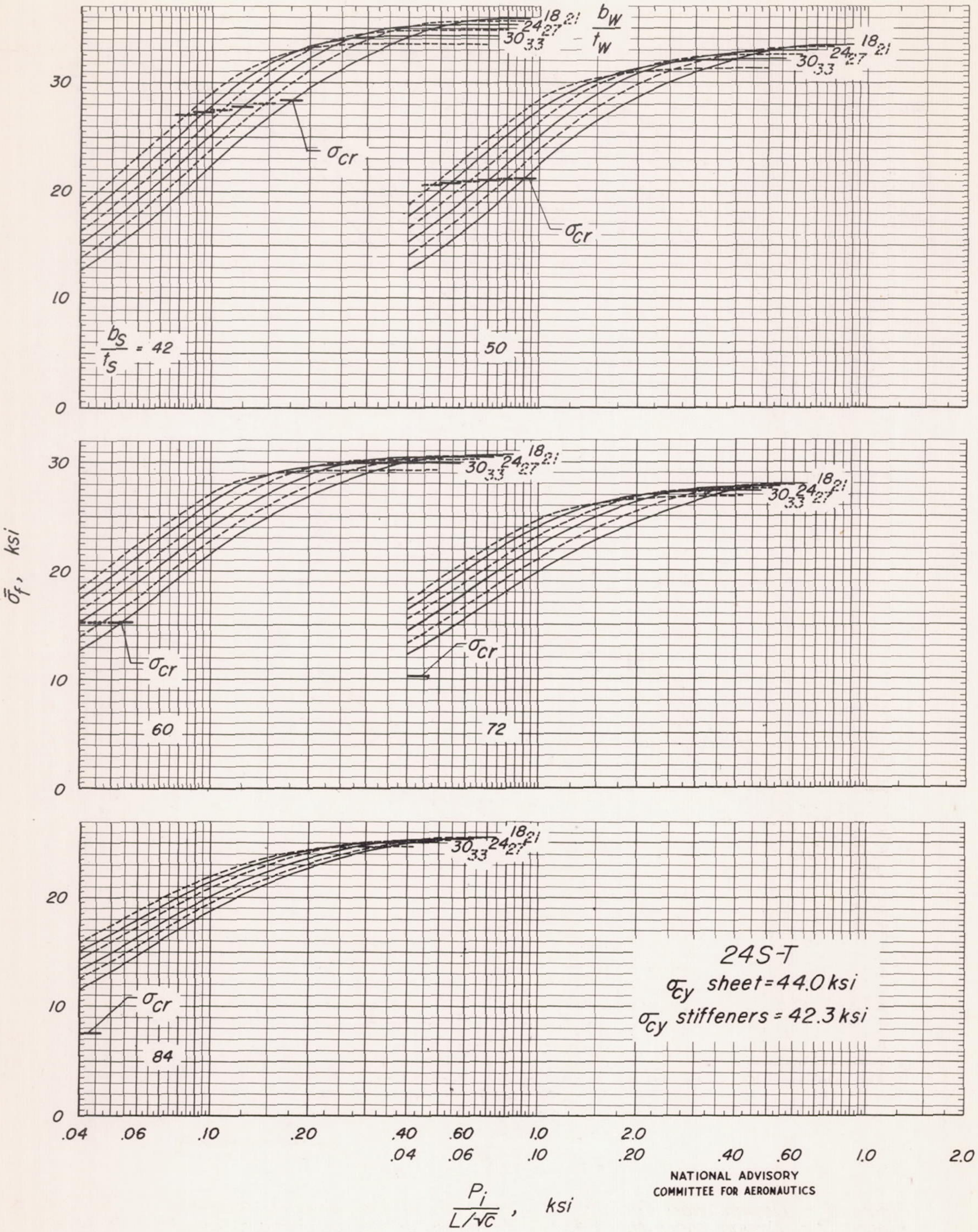

Figure 8. - Concluded.

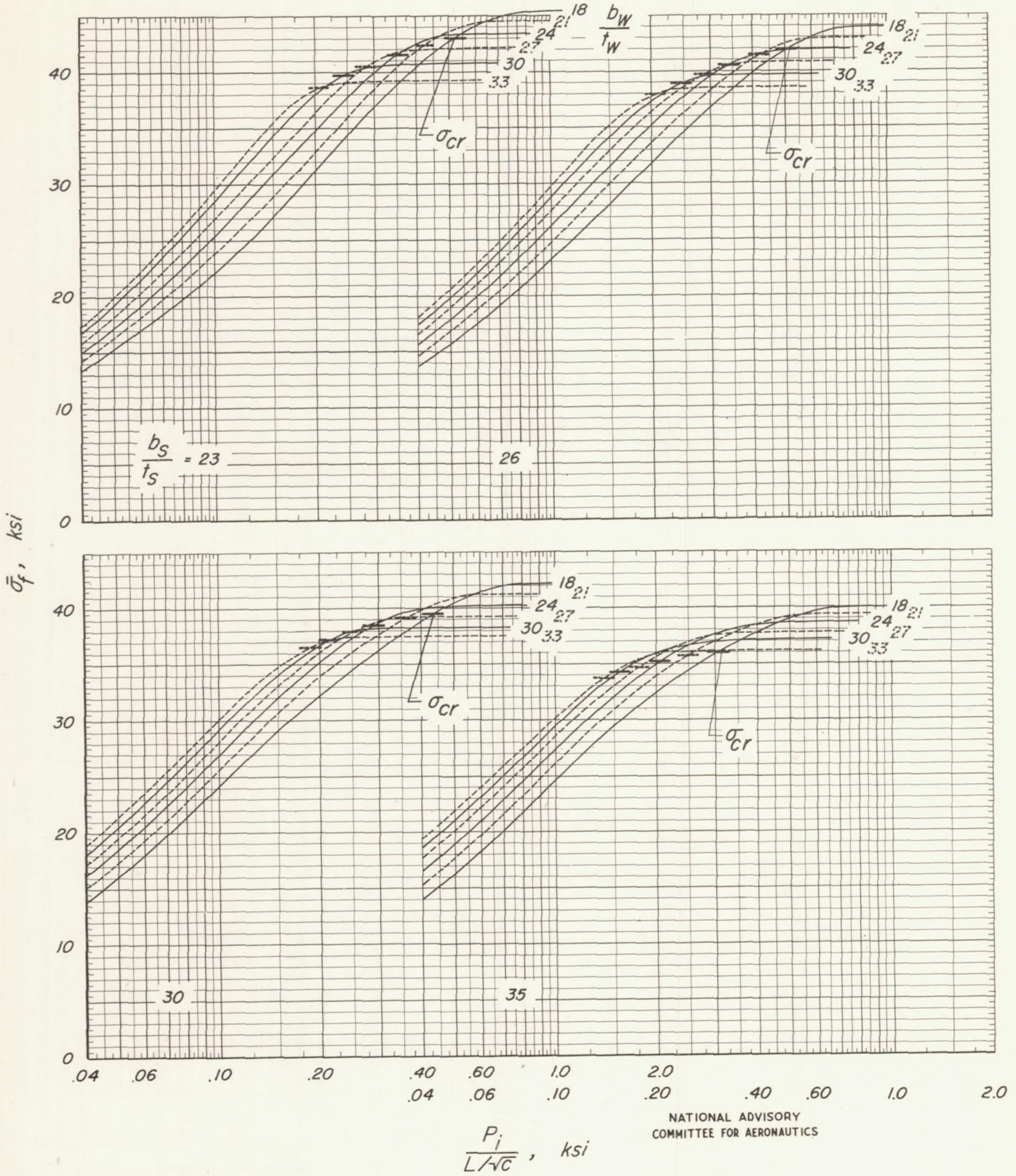

Figure 9.- Design chart for 24S-T Y-panels of the proportions tested. $\frac{t_W}{t_S} = 0.63$.

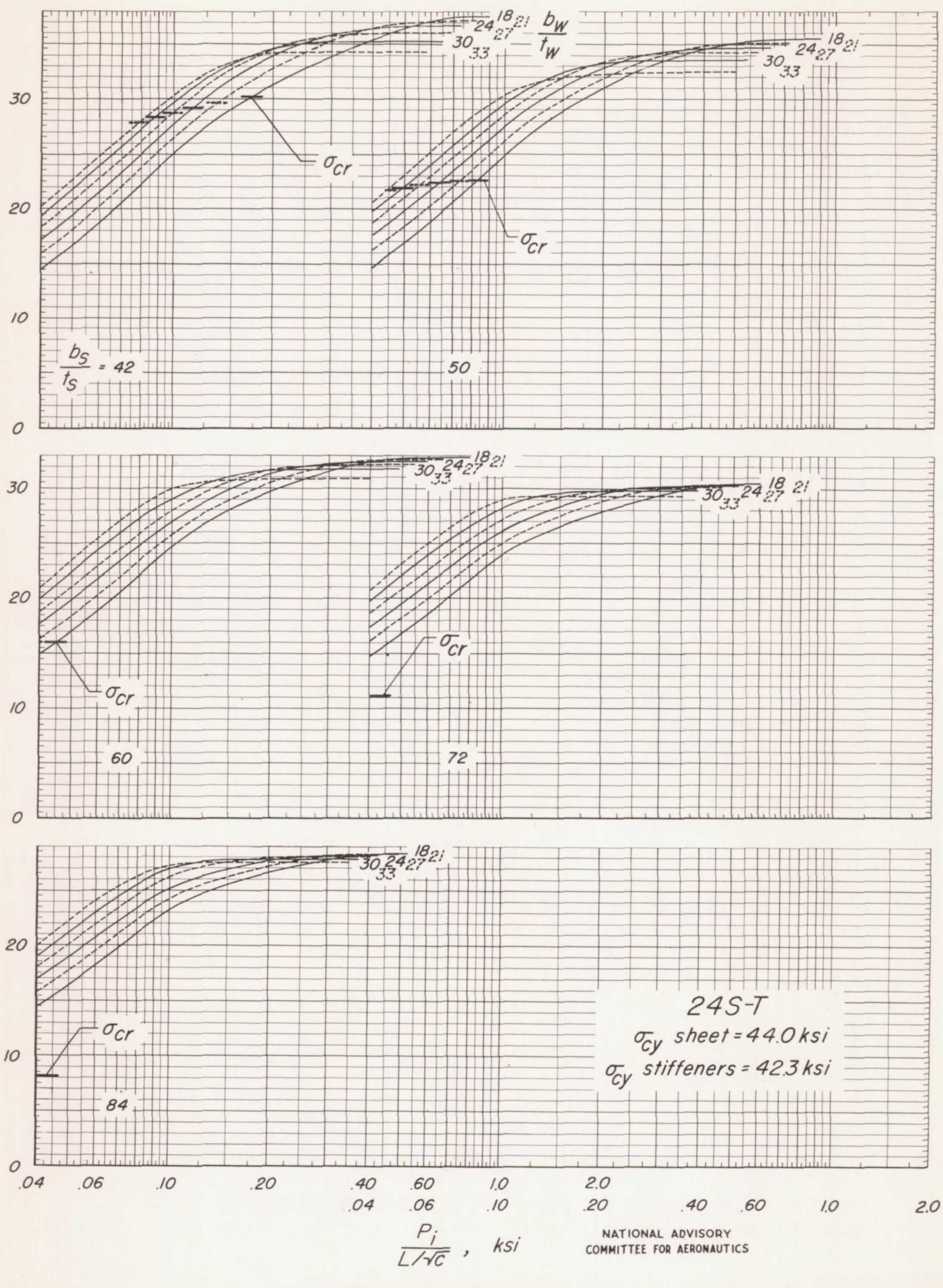

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Figure 9.- Concluded.

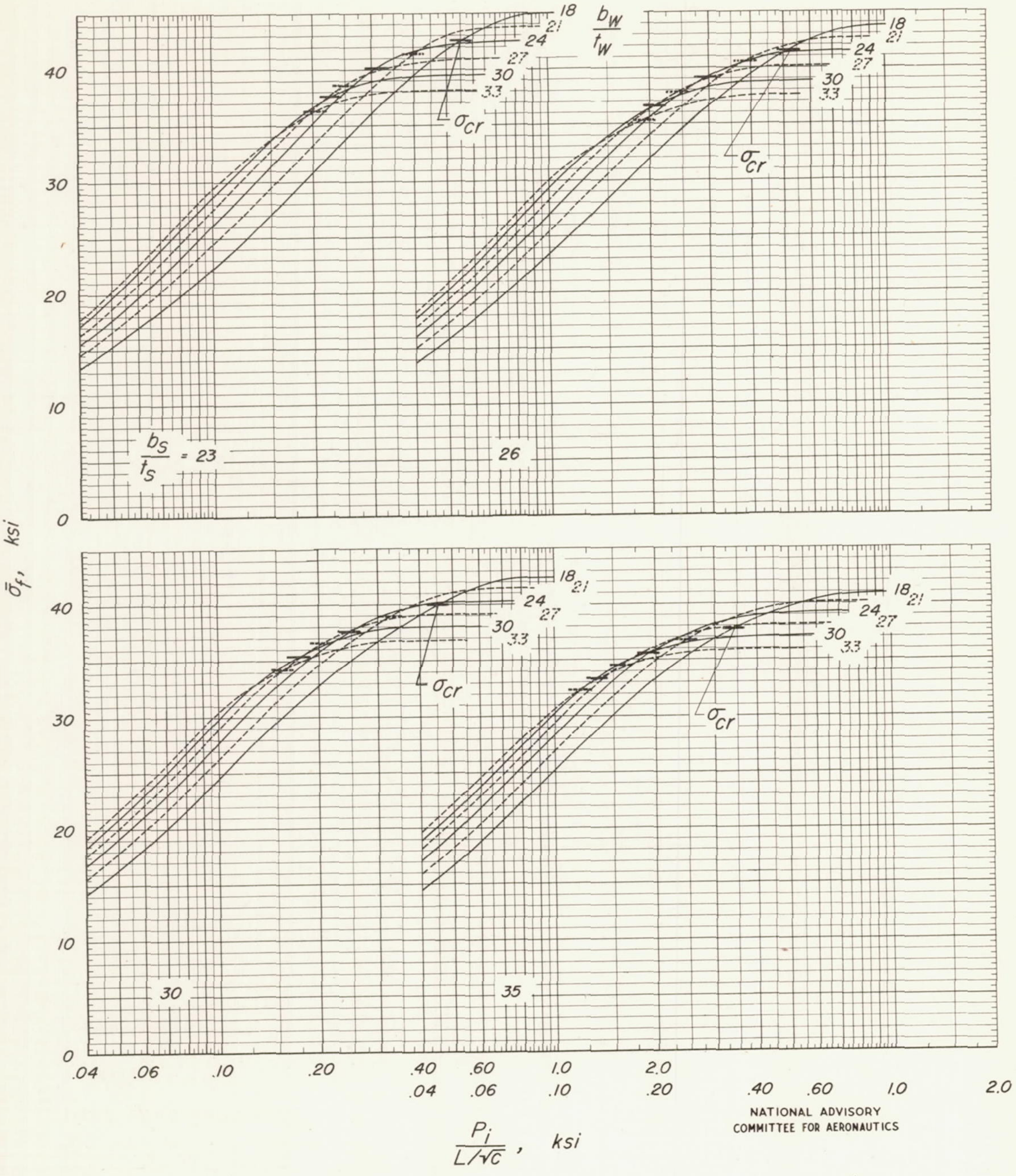

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Figure 10.- Design chart for 24S-T Y-panels of the proportions tested. $\frac{t_w}{t_s} = 0.79$.

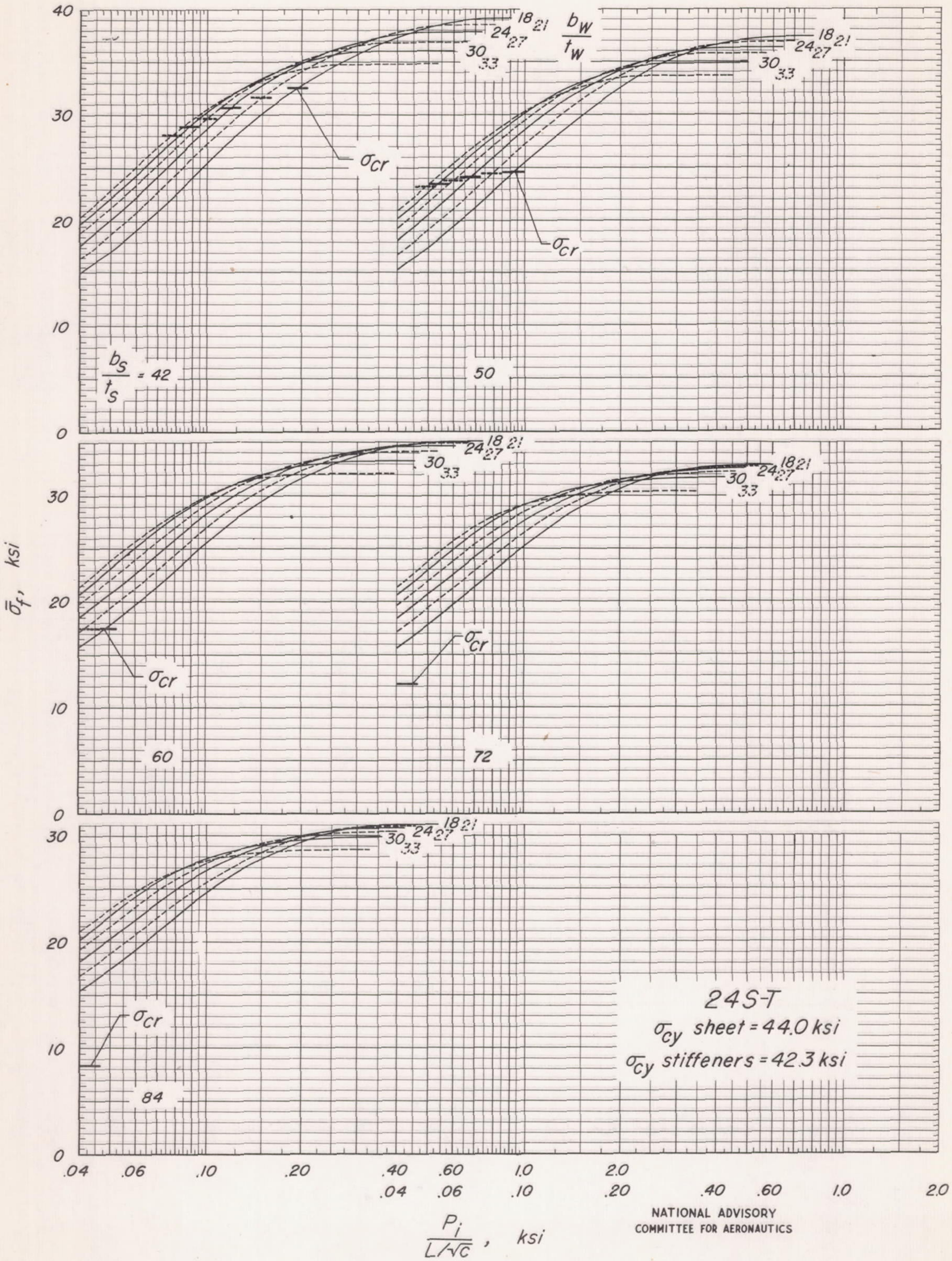

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Figure 10.- Concluded.

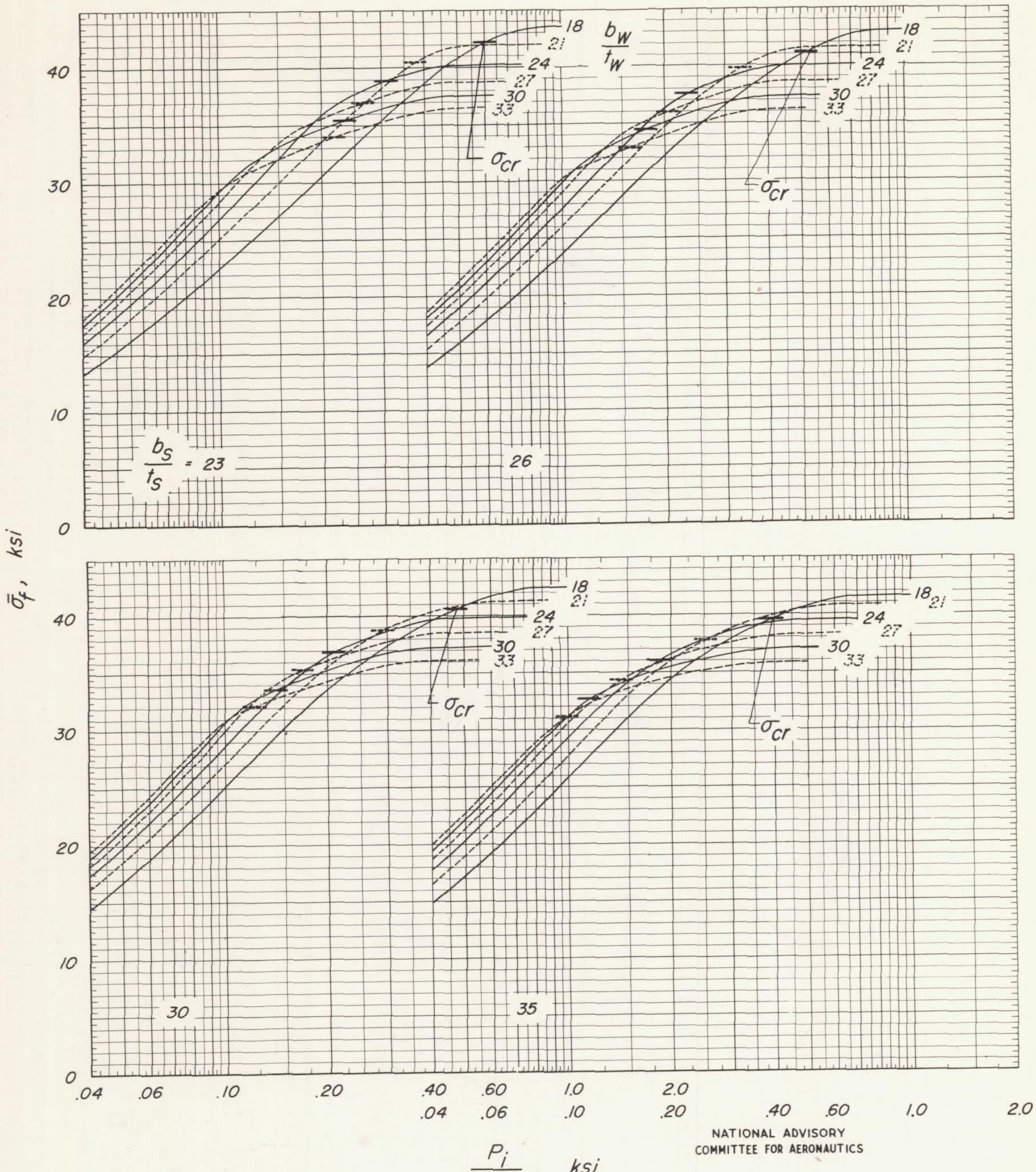

Figure 11.- Design chart for 24S-T Y-panels of the proportions tested. $\frac{t_w}{t_s} = 1.00$.

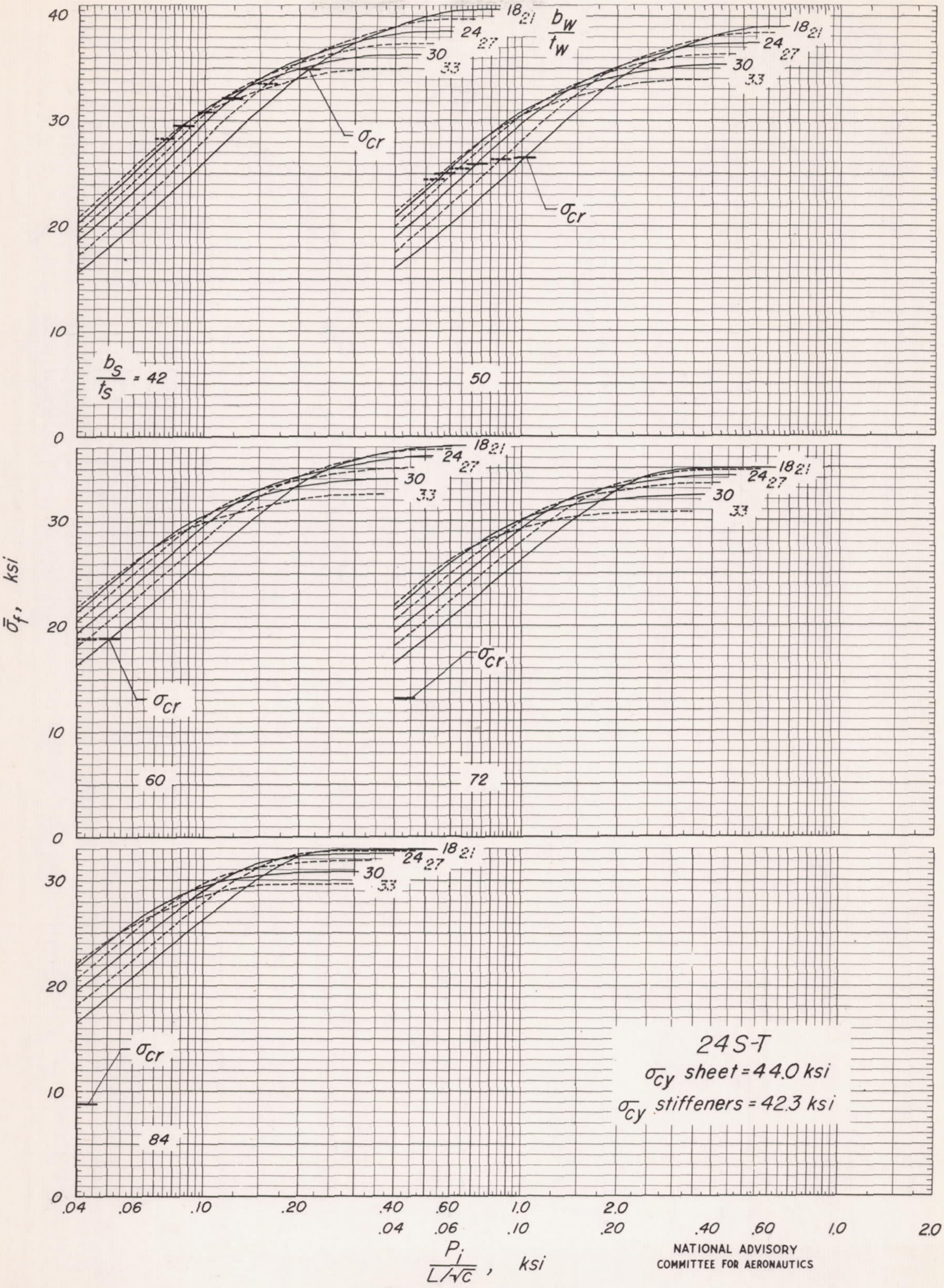

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Figure 11.- Concluded.

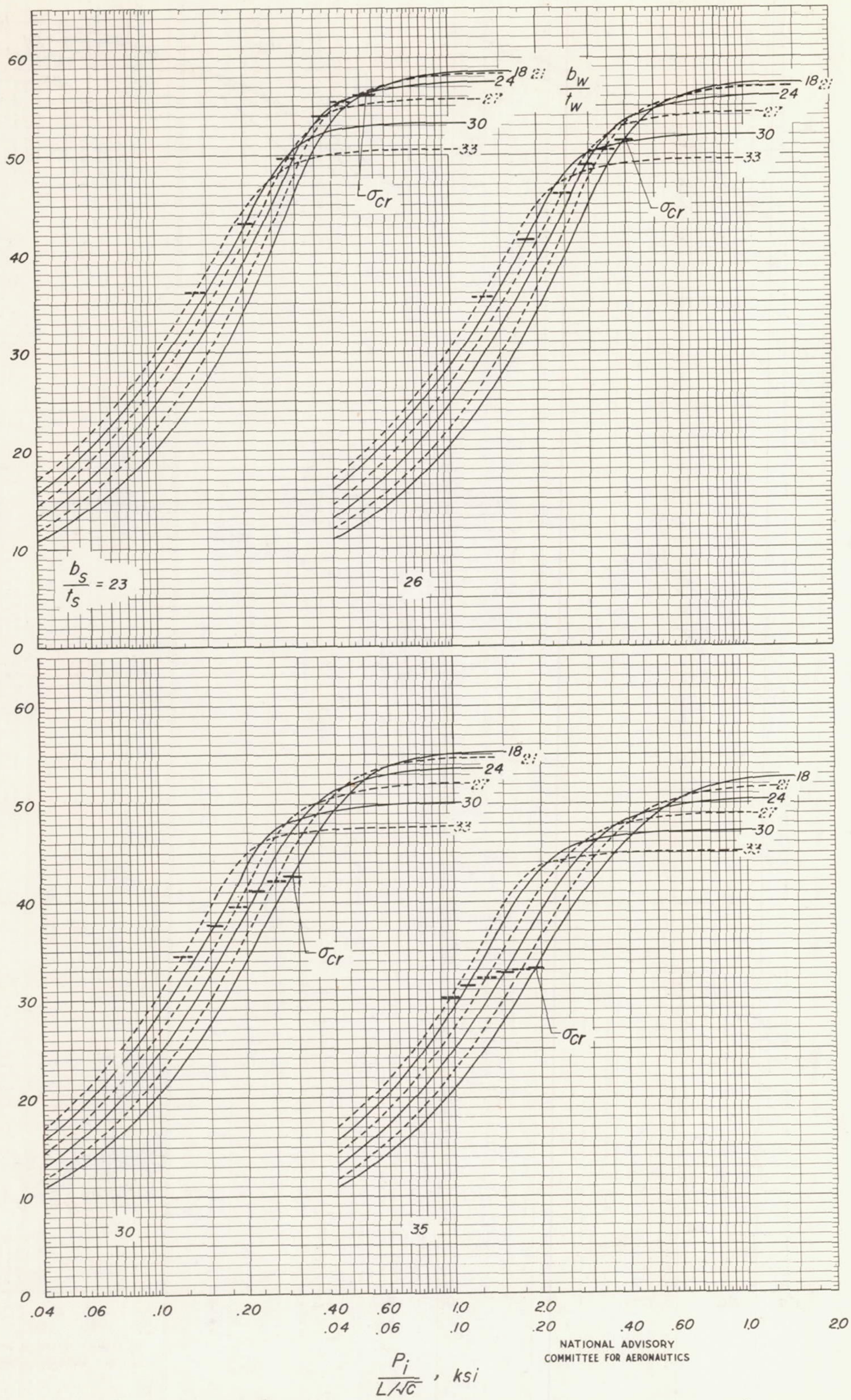

Figure 12.- Design chart for 75S-T Y-panels of the proportions tested. $\frac{t_w}{t_s} = 0.40$.

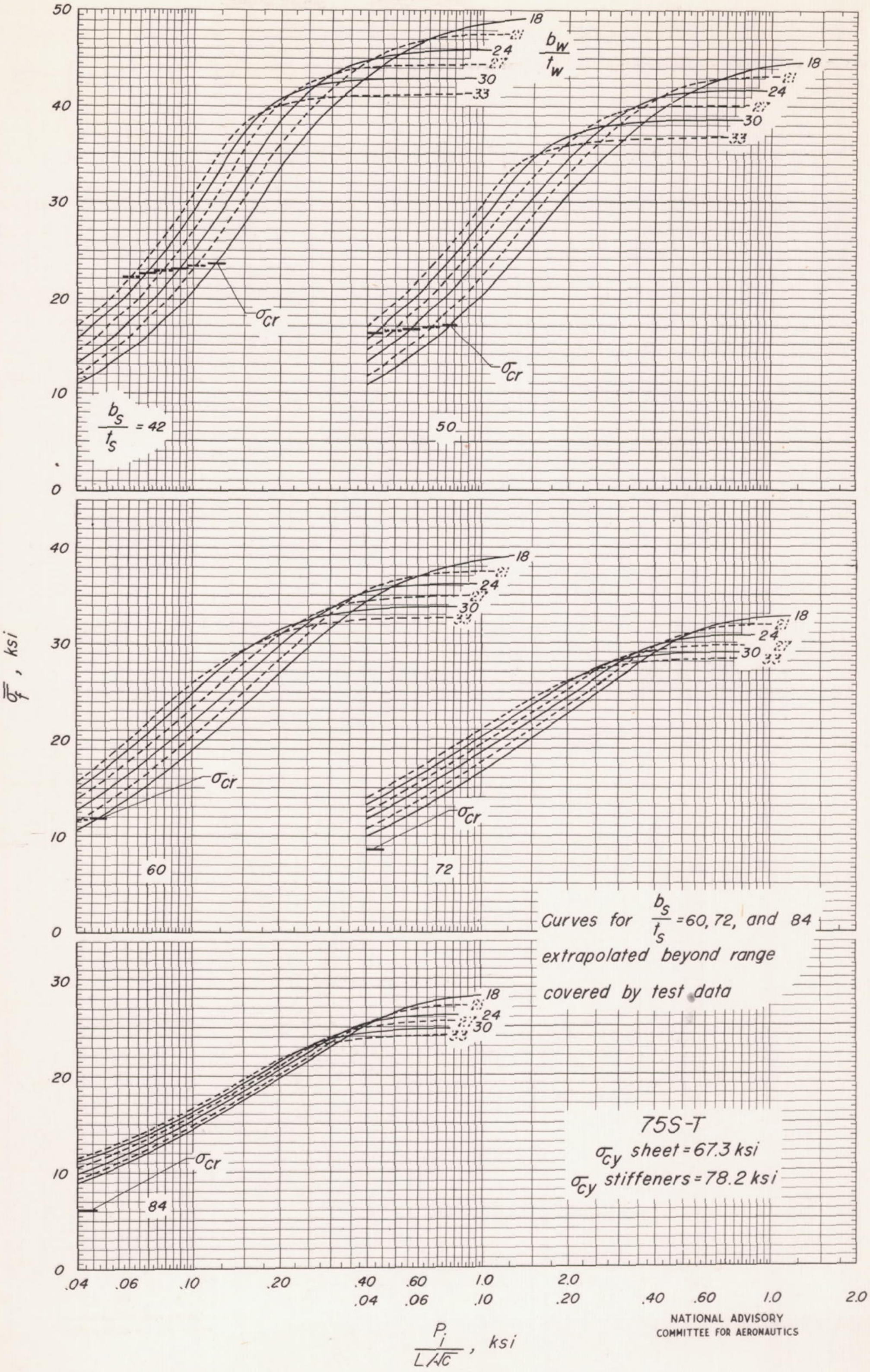

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Figure 12.-Concluded.

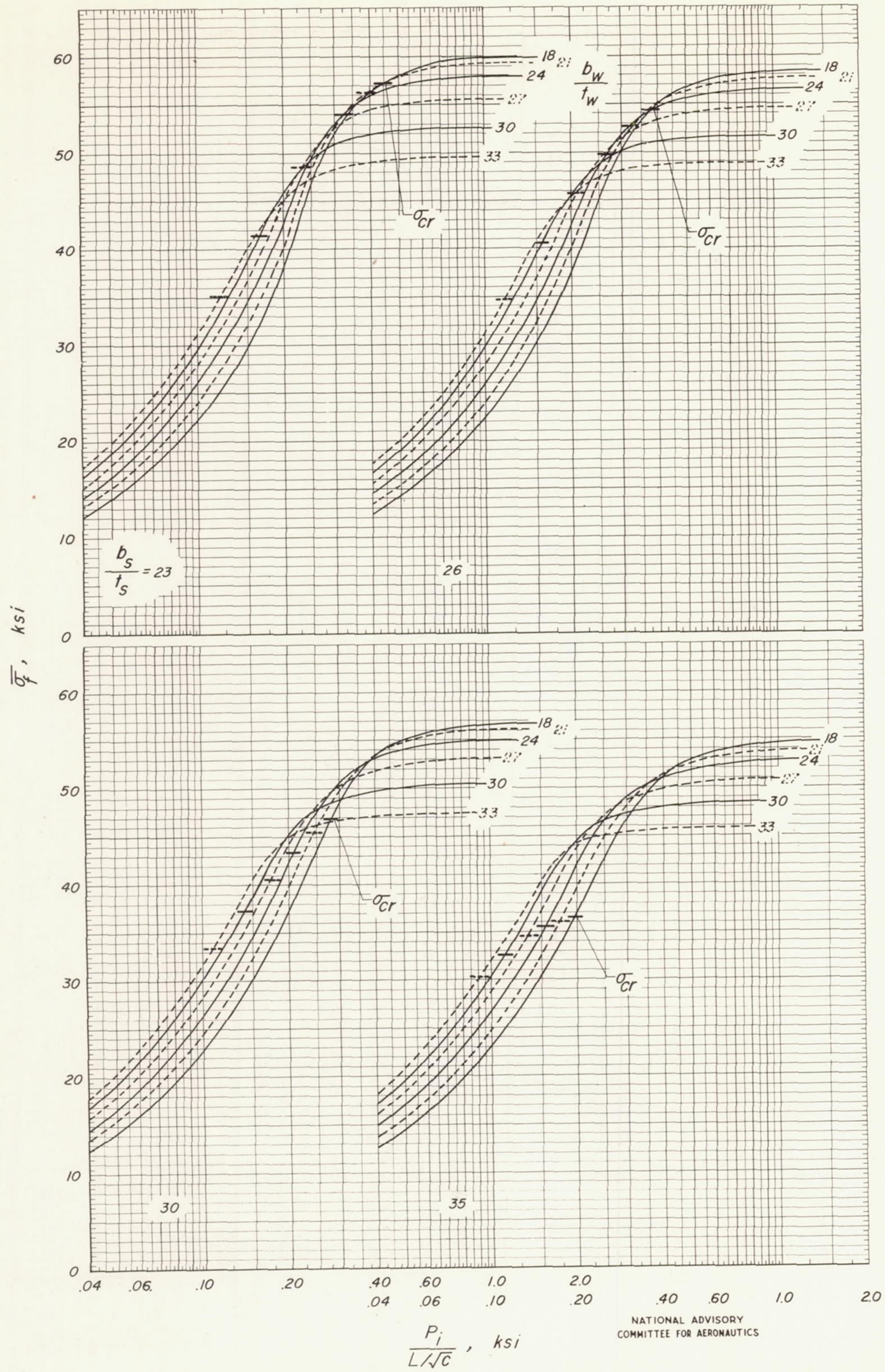

Figure 13.- Design chart for 75S-T Y-panels of the proportions tested. $\frac{t_w}{t_s} = 0.51$.

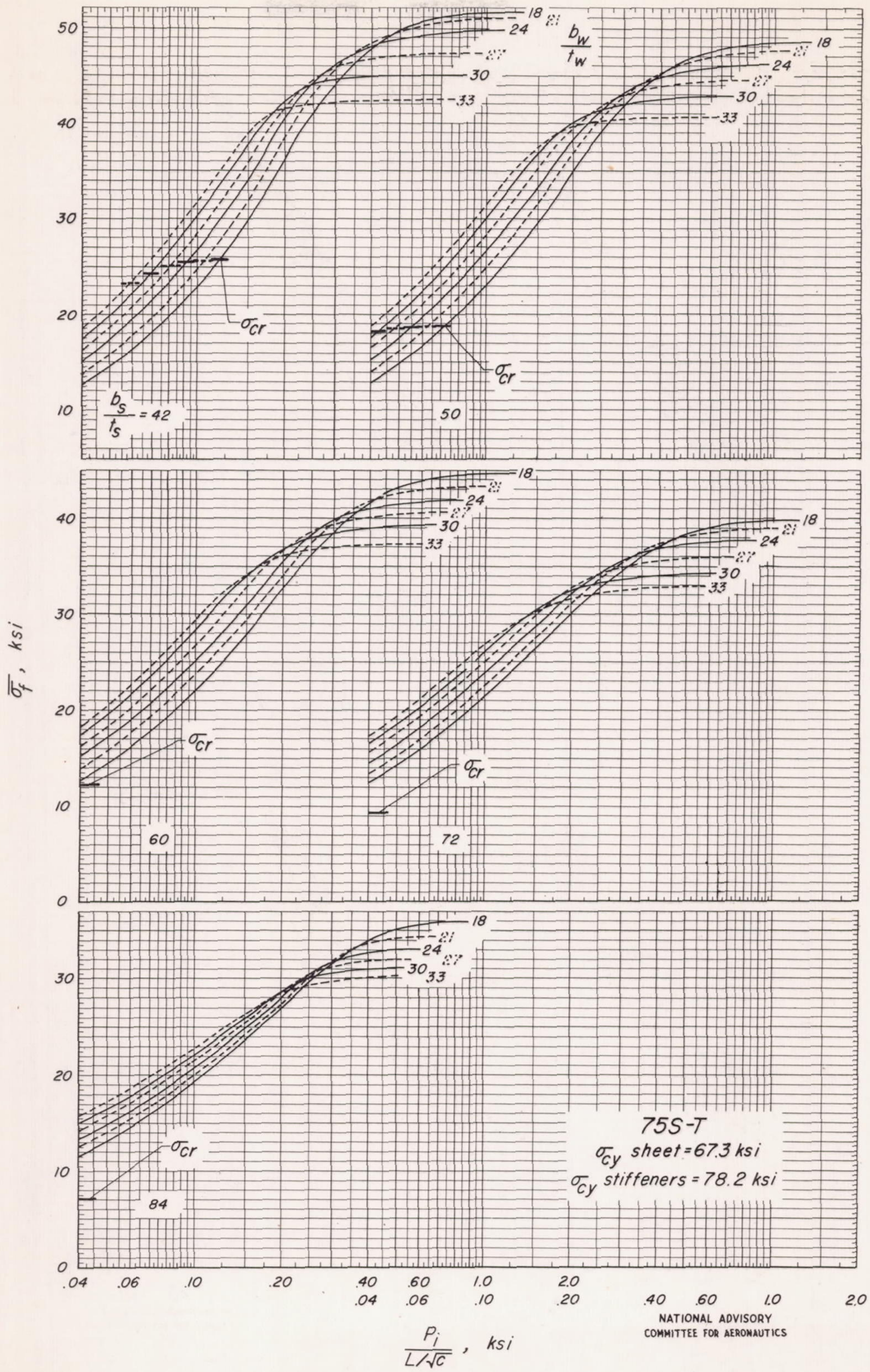

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Figure 13.– Concluded.

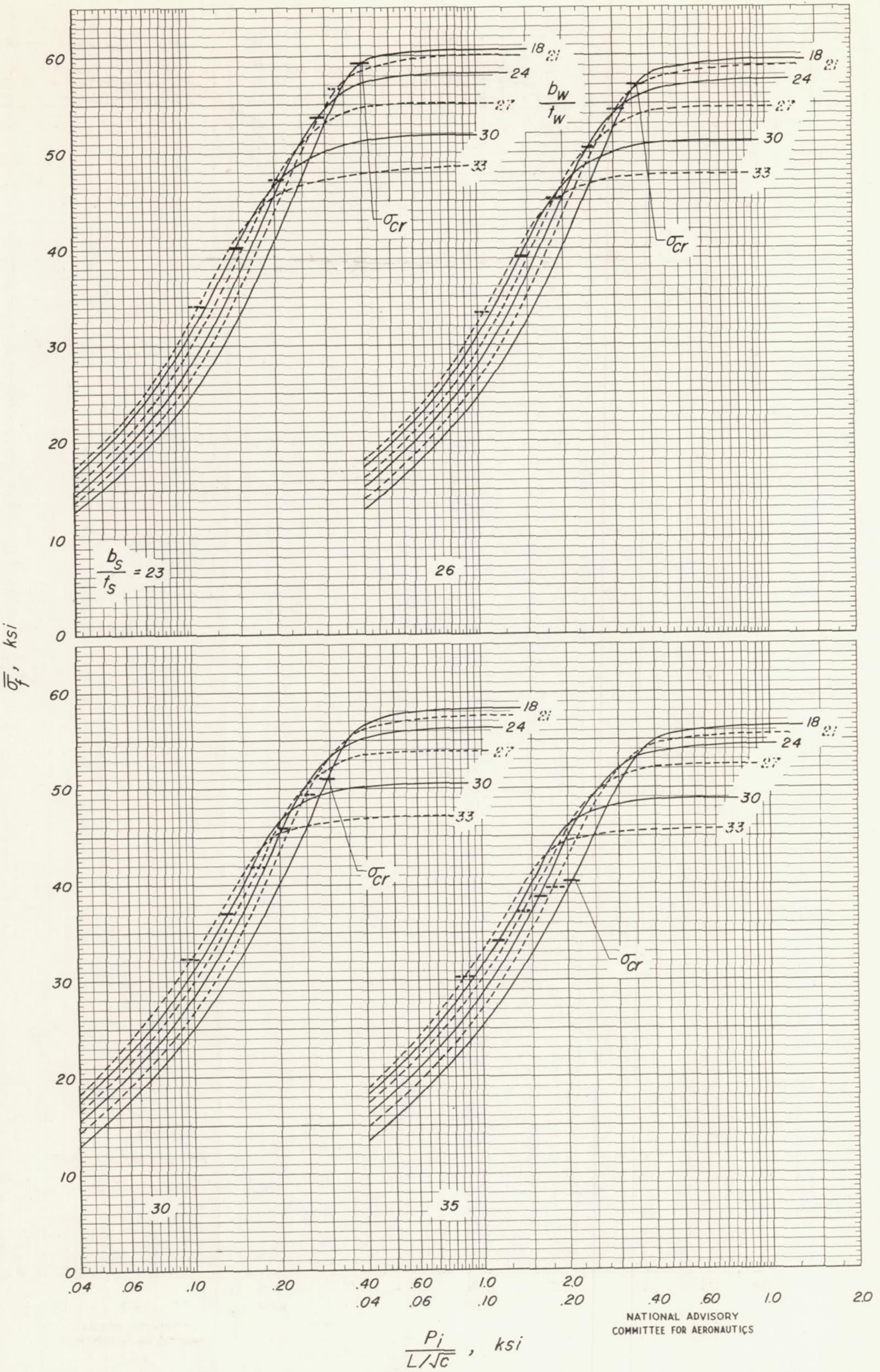

Figure 14.- Design chart for 75S-T Y-panels of the proportions tested. $\frac{t_w}{t_s} = 0.63$.

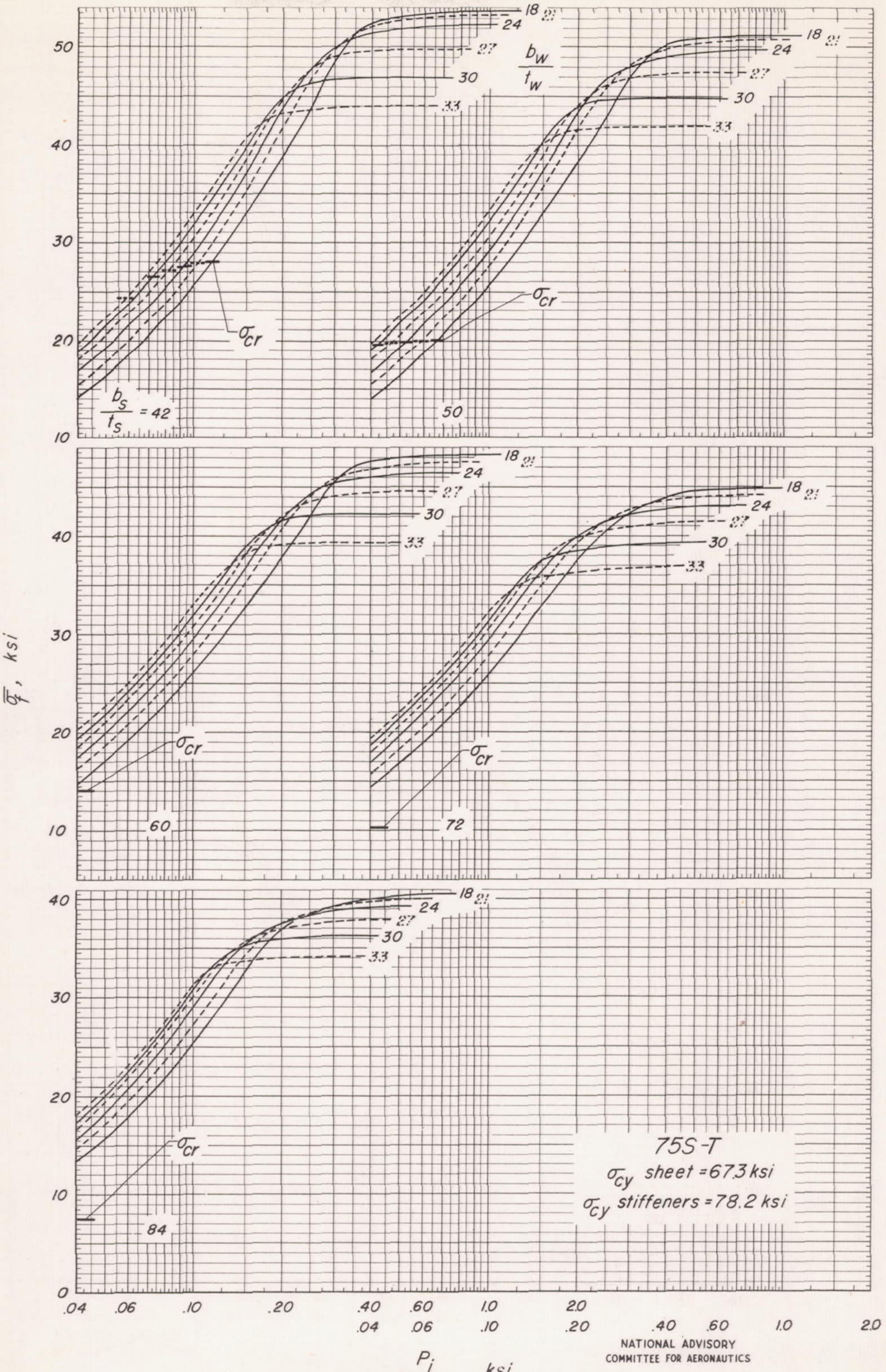

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Figure 14.-Concluded.

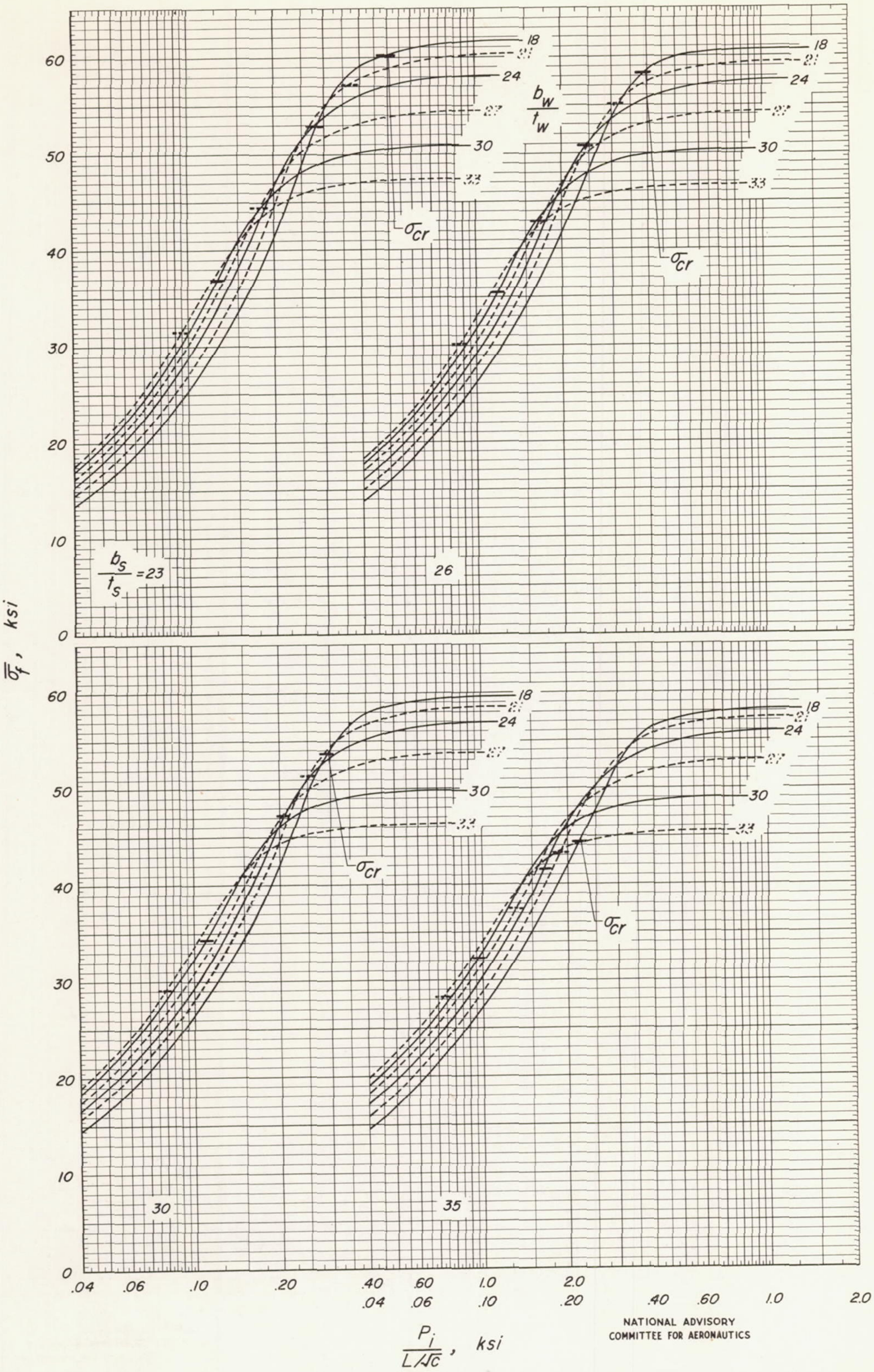

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Figure 15.—Design chart for 75S-T Y-panels of the proportions tested. $\frac{t_w}{t_s} = 0.79$.

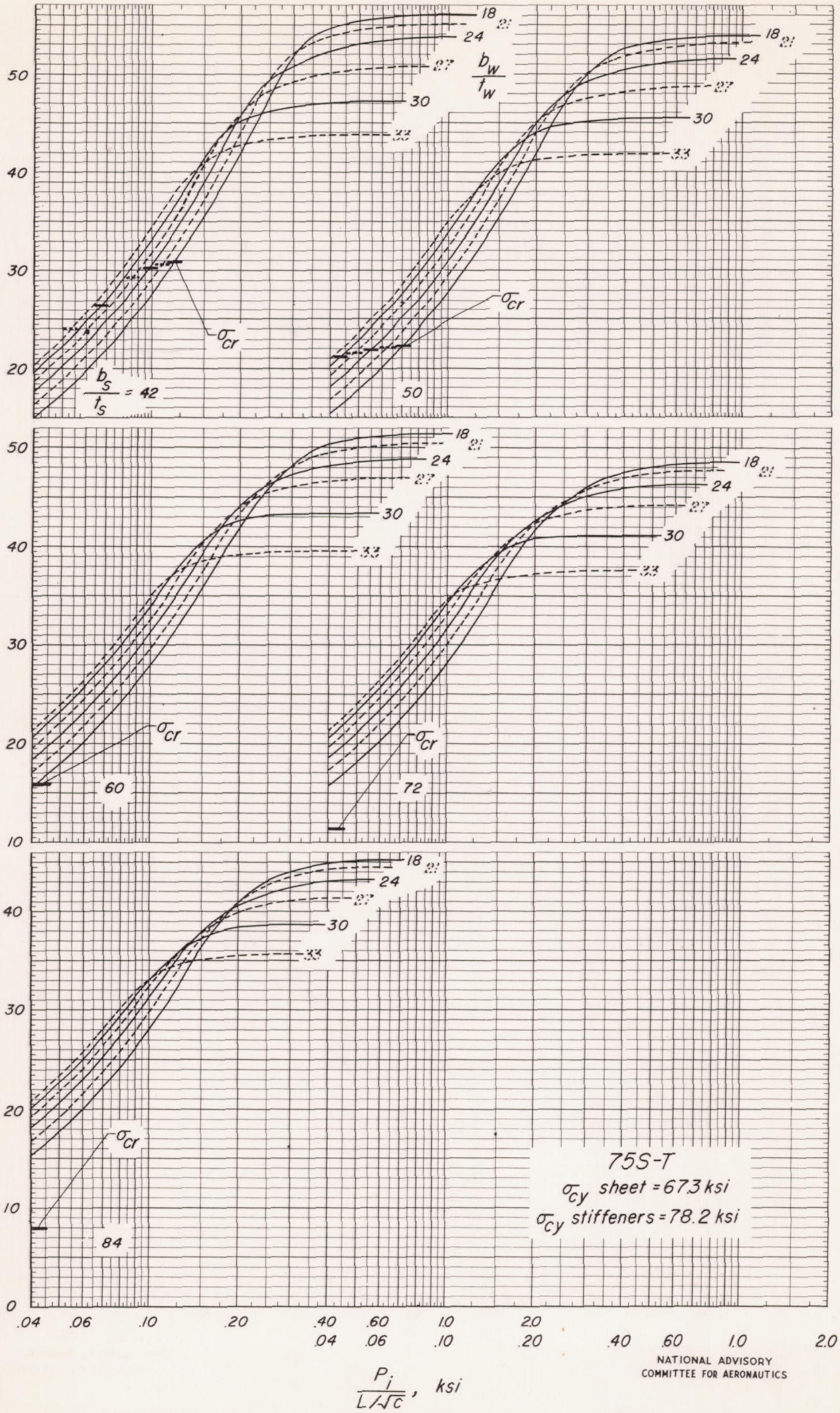

Figure 15.– Concluded.

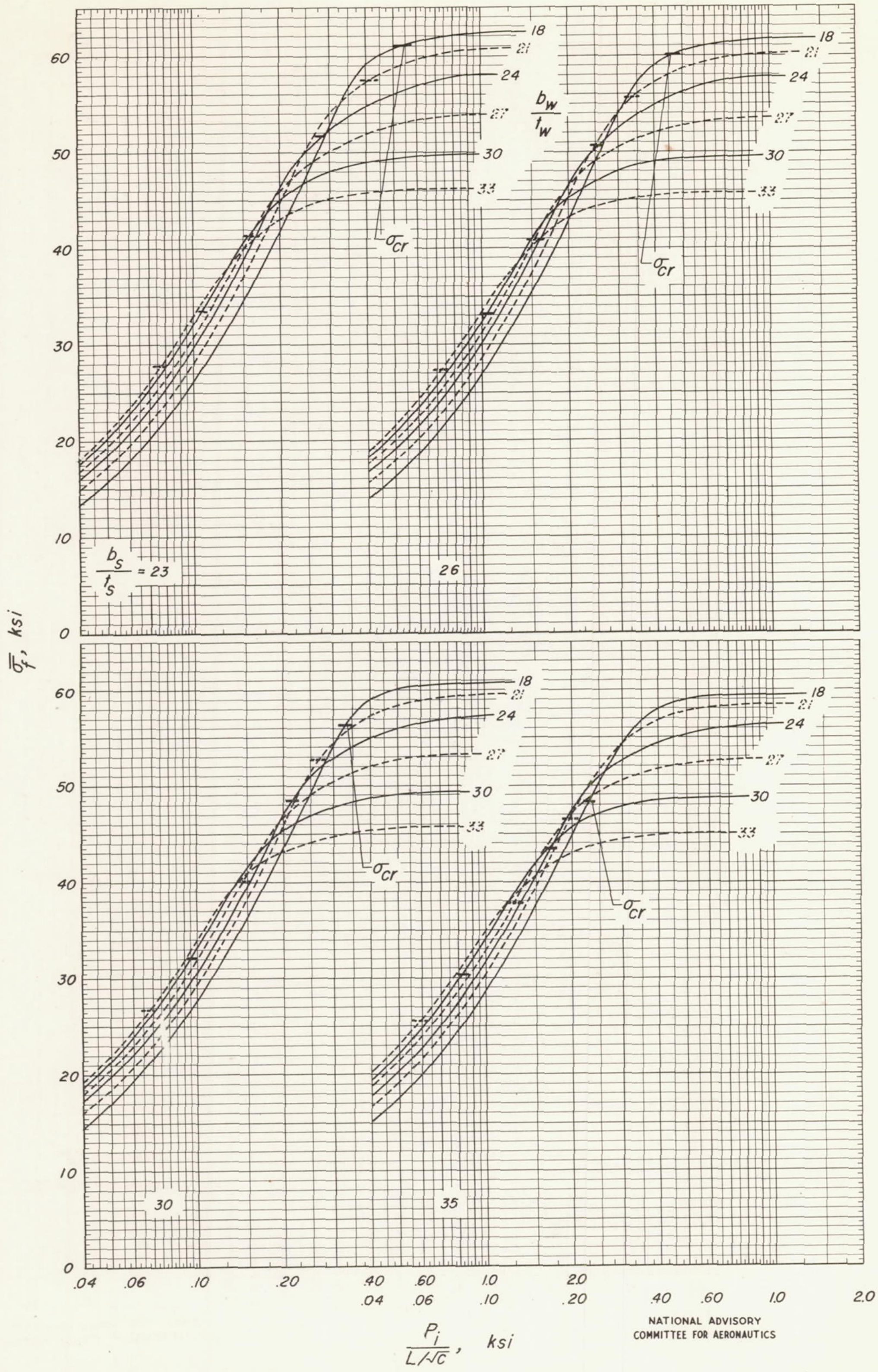

Figure 16.—Design chart for 75S-T Y-panels of the proportions tested, $\frac{t_w}{t_s} = 1.00$.

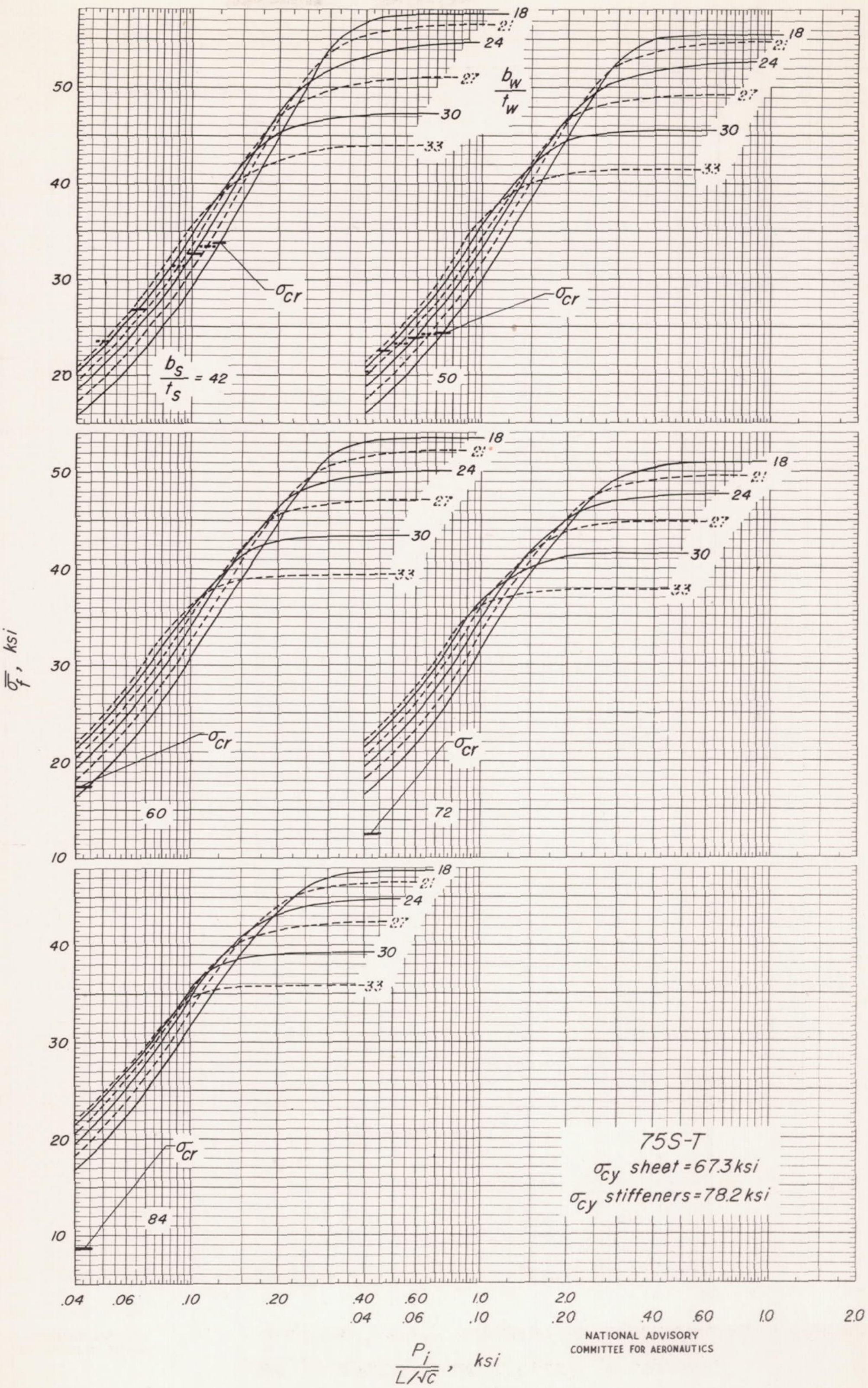

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Figure 16.- Concluded.

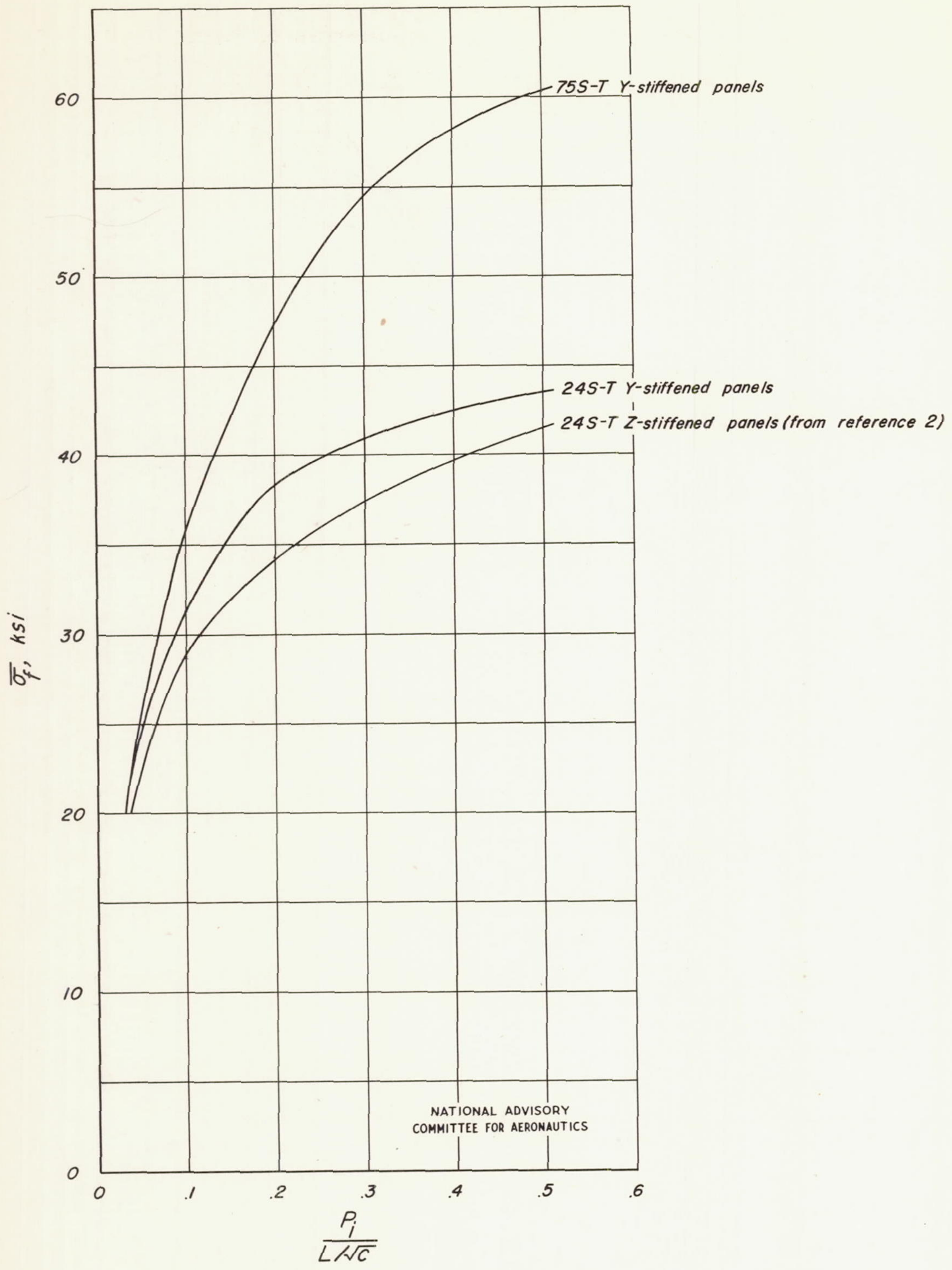

Figure 17.-Comparison of envelope curves for 24S-T Z-stiffened panels (from reference 2) and for 24S-T and 75S-T Y-stiffened panels.

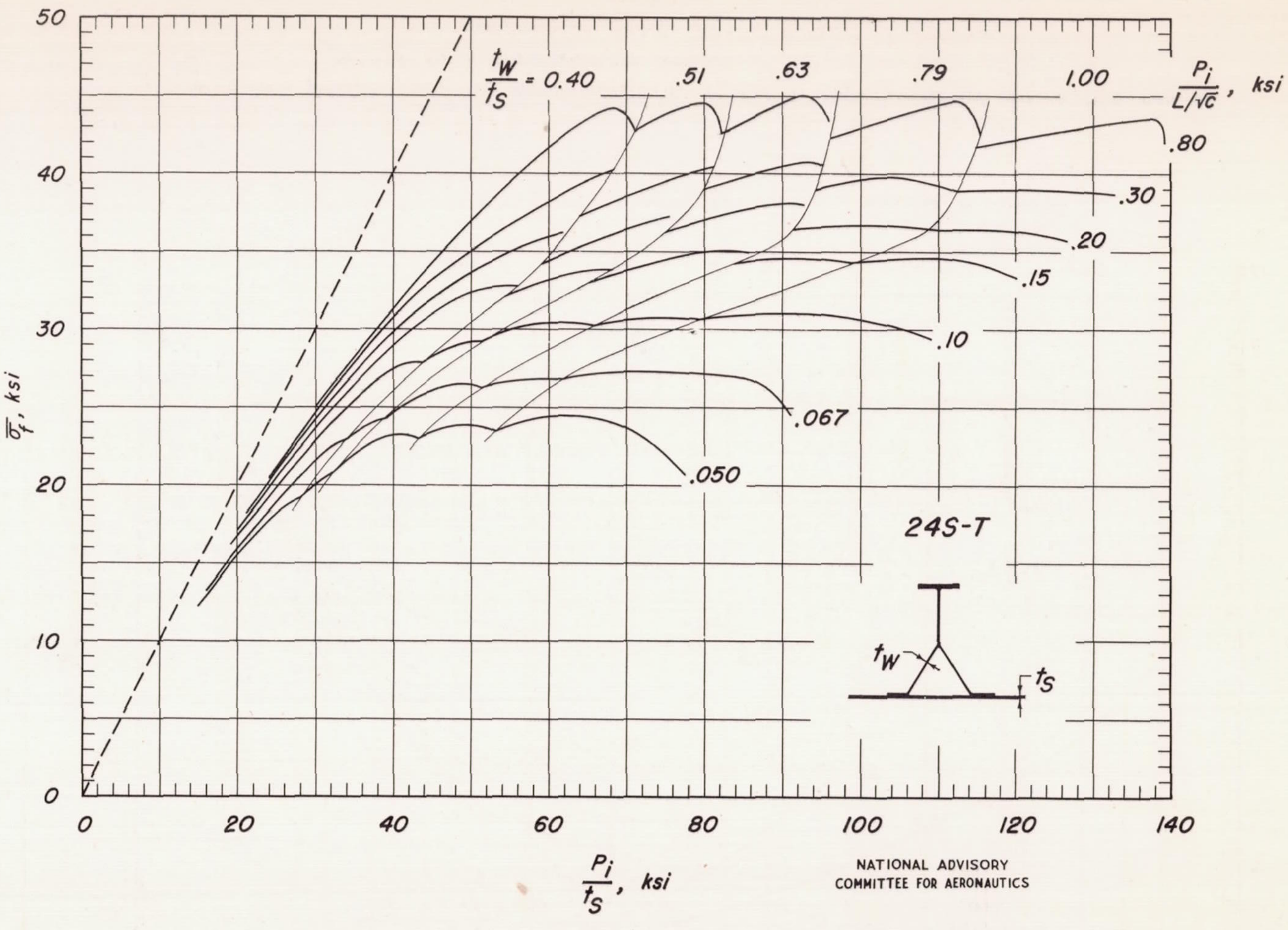

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Figure 18.- Design chart for the determination of the average stress at failure that can be carried by minimum-weight designs of 24S-T aluminum-alloy flat compression panels having extruded Y-section stiffeners.

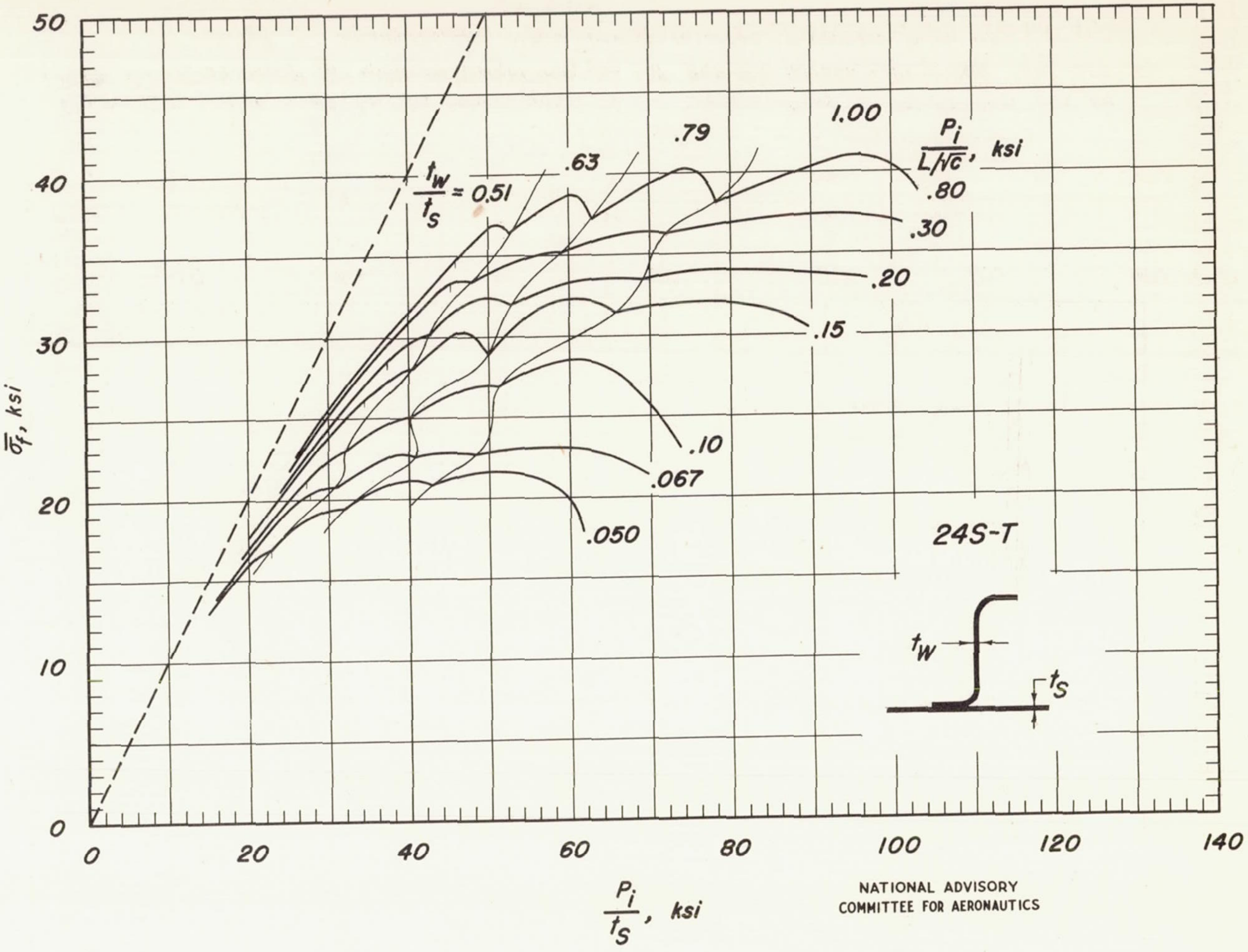


Figure 19.- Design chart for the determination of the average stress at failure that can be carried by minimum-weight designs of 24S-T aluminum-alloy flat compression panels having formed Z-section stiffeners.

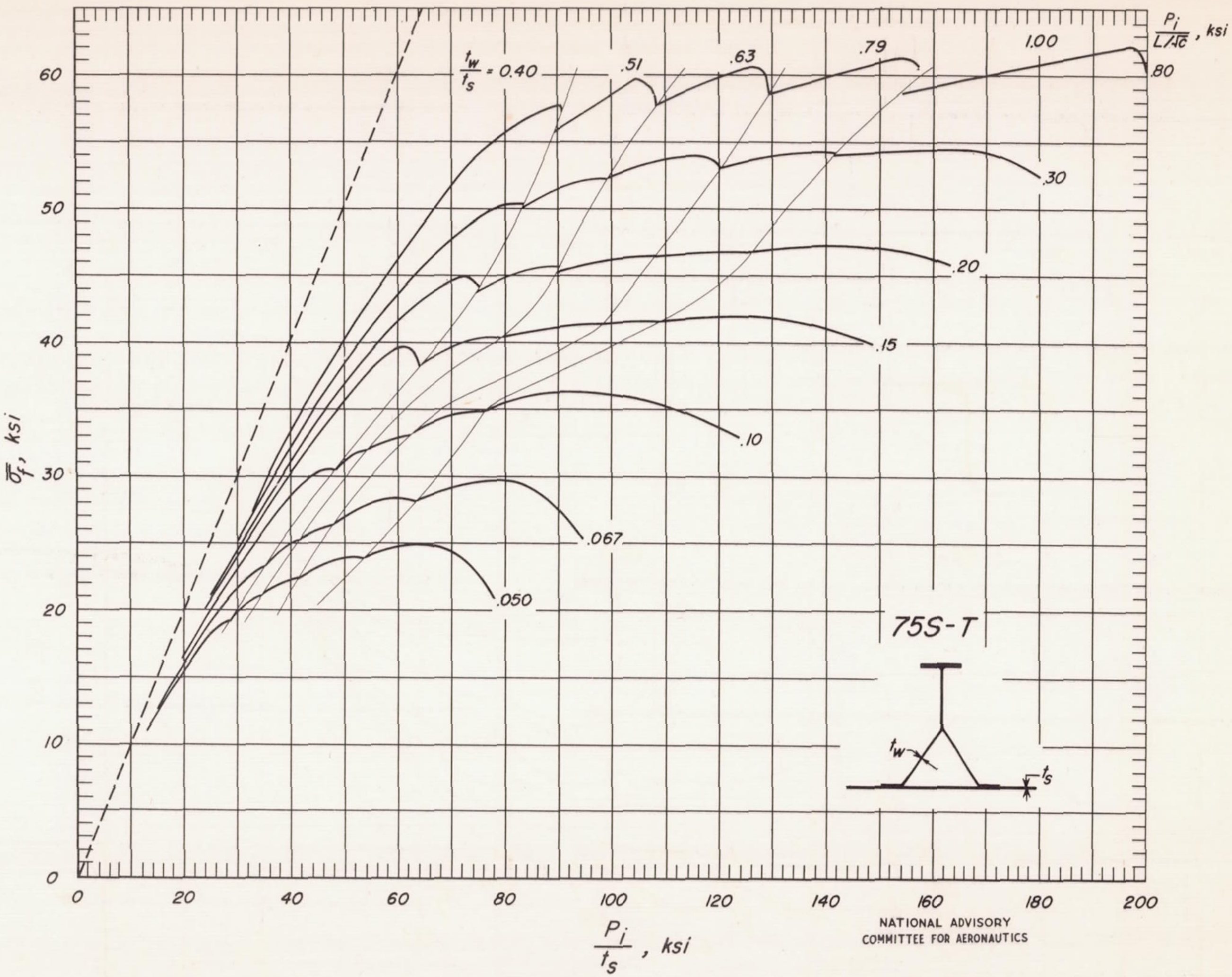
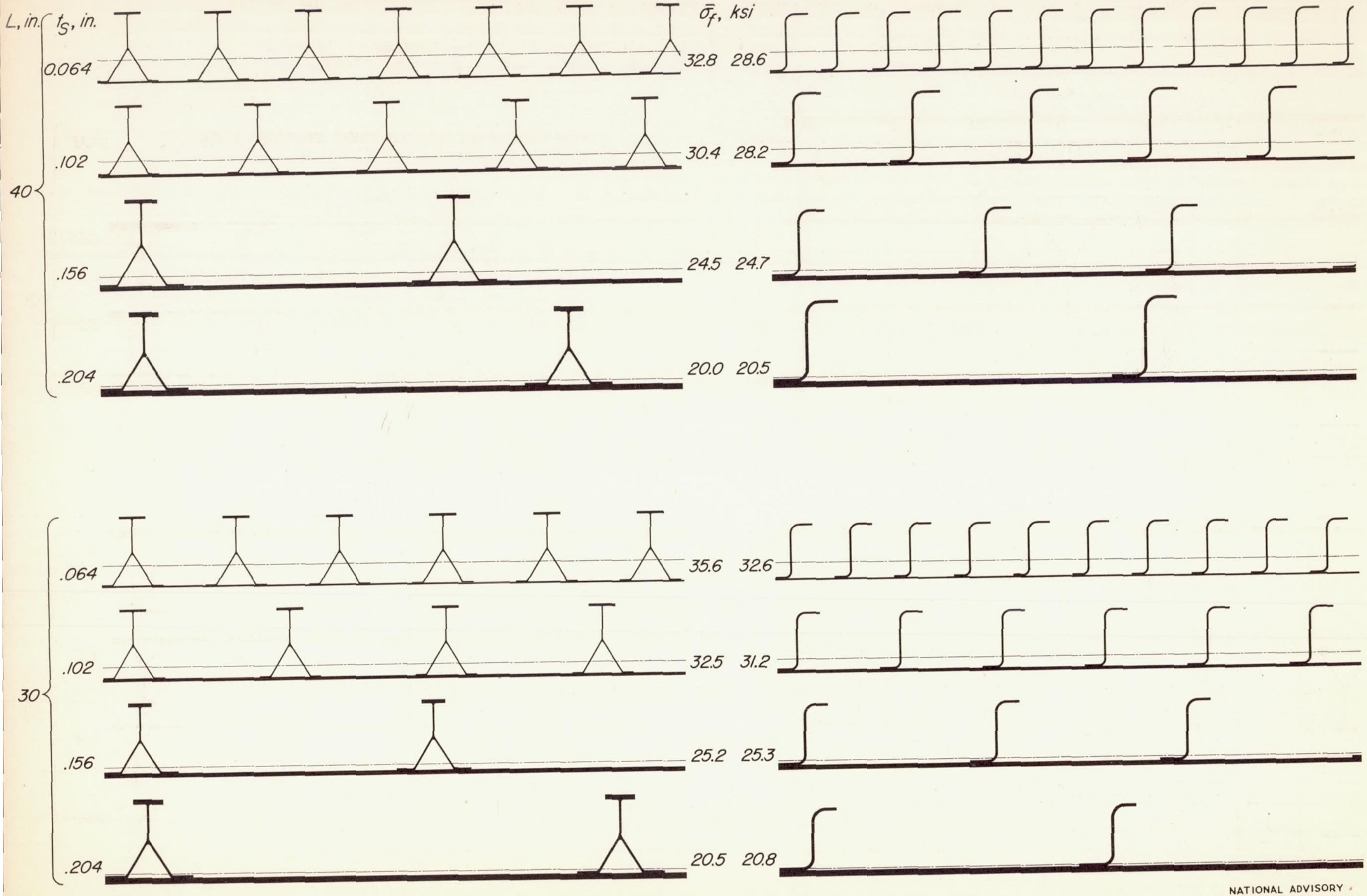


Figure 20.- Design chart for the determination of the average stress at failure that can be carried by minimum-weight designs of flat compression panels having Alclad 75S-T aluminum-alloy sheet and extruded 75S-T Y-section stiffeners.

Fig. 21



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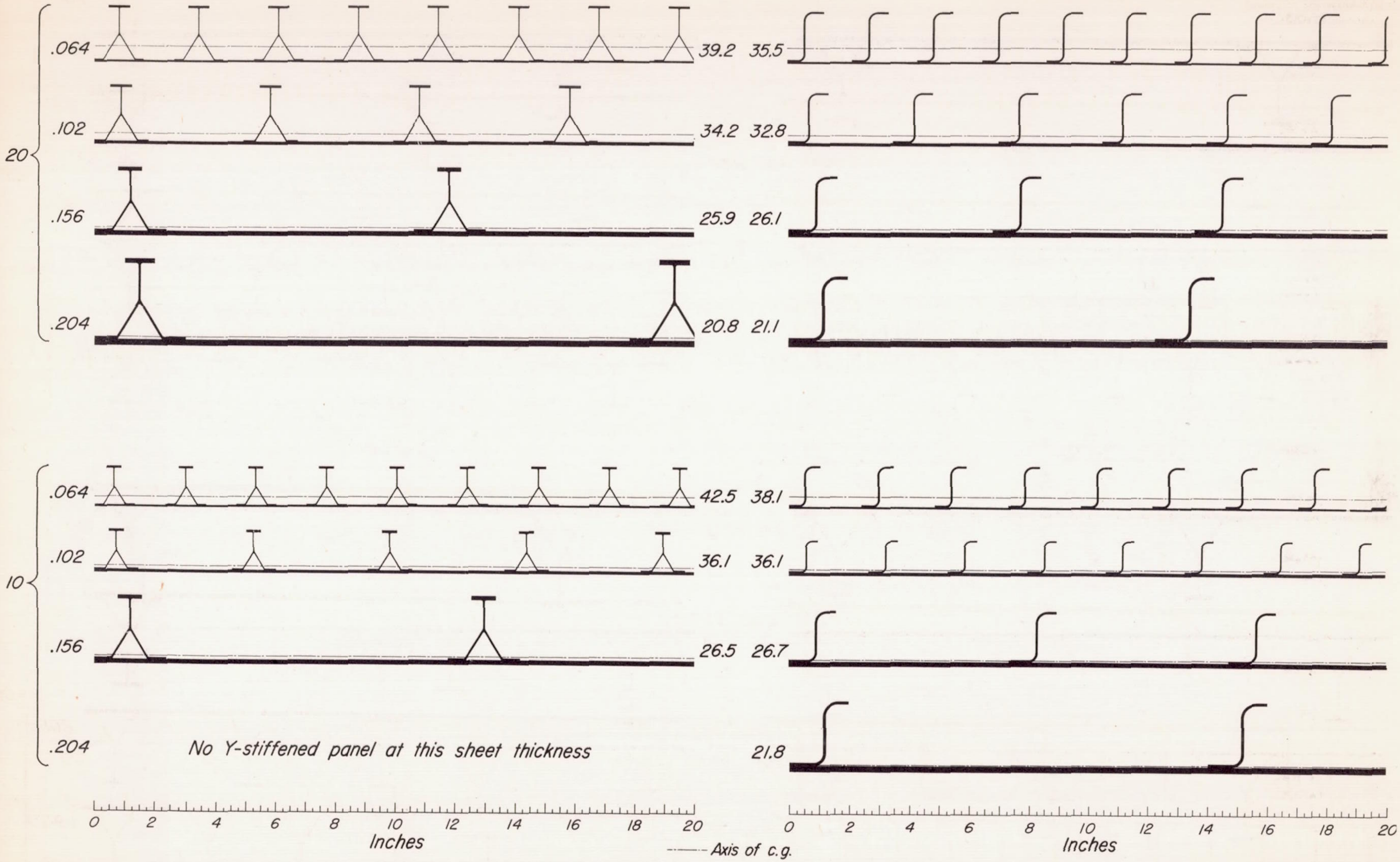

Figure 21.- Comparative minimum-weight designs of Y- and Z-stiffened panels. $P_i = 5.0$ kips per inch; $c = 1$.

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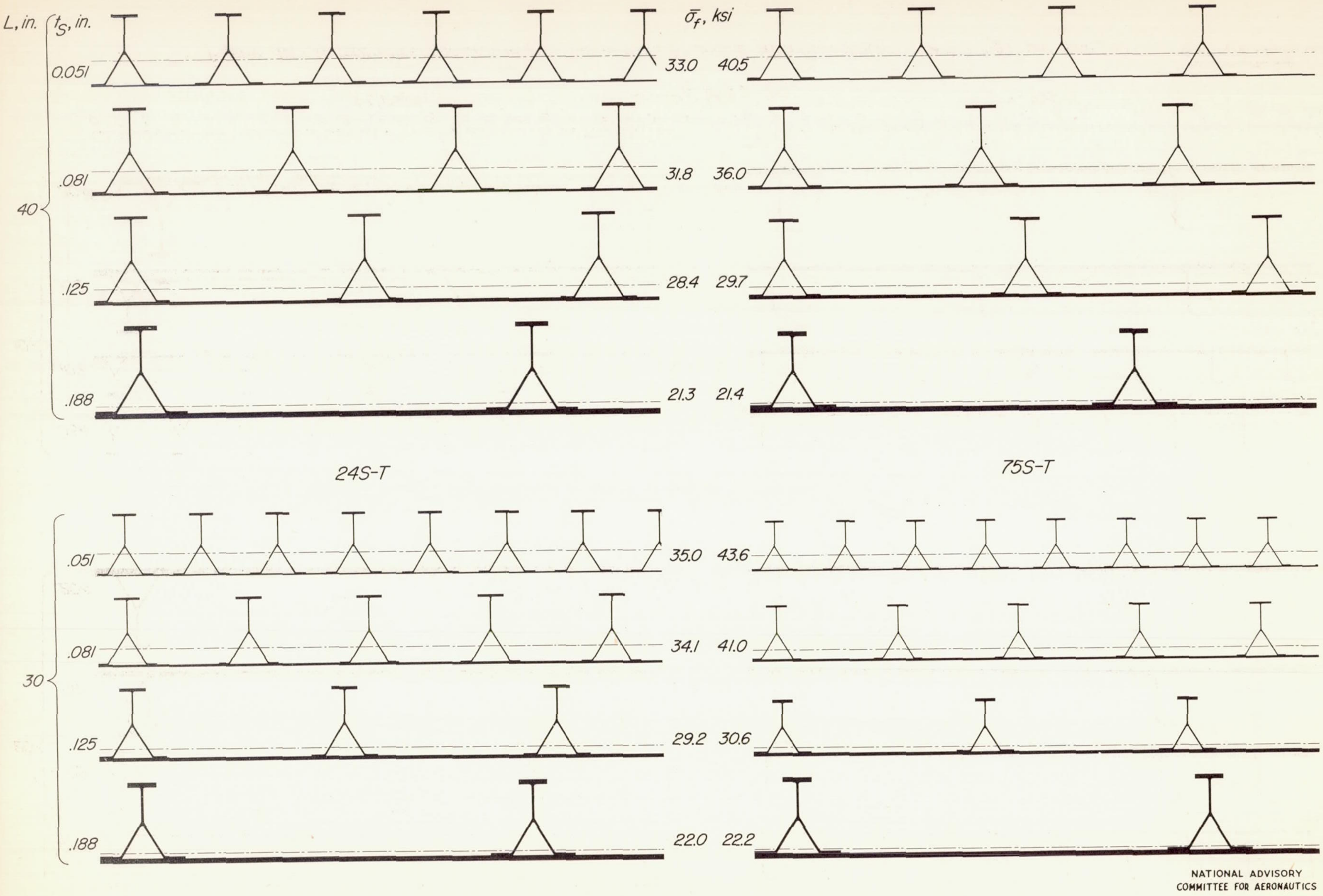
Fig. 22


L, in.
t_S, in.
$\bar{\sigma}_f$, ksi
40
0.051
33.0
40.5
.081
31.8
36.0
.125
28.4
29.7
.188
21.3
21.4
24S-T
75S-T
30
.051
35.0
43.6
.081
34.1
41.0
.125
29.2
30.6
.188
22.0
22.2
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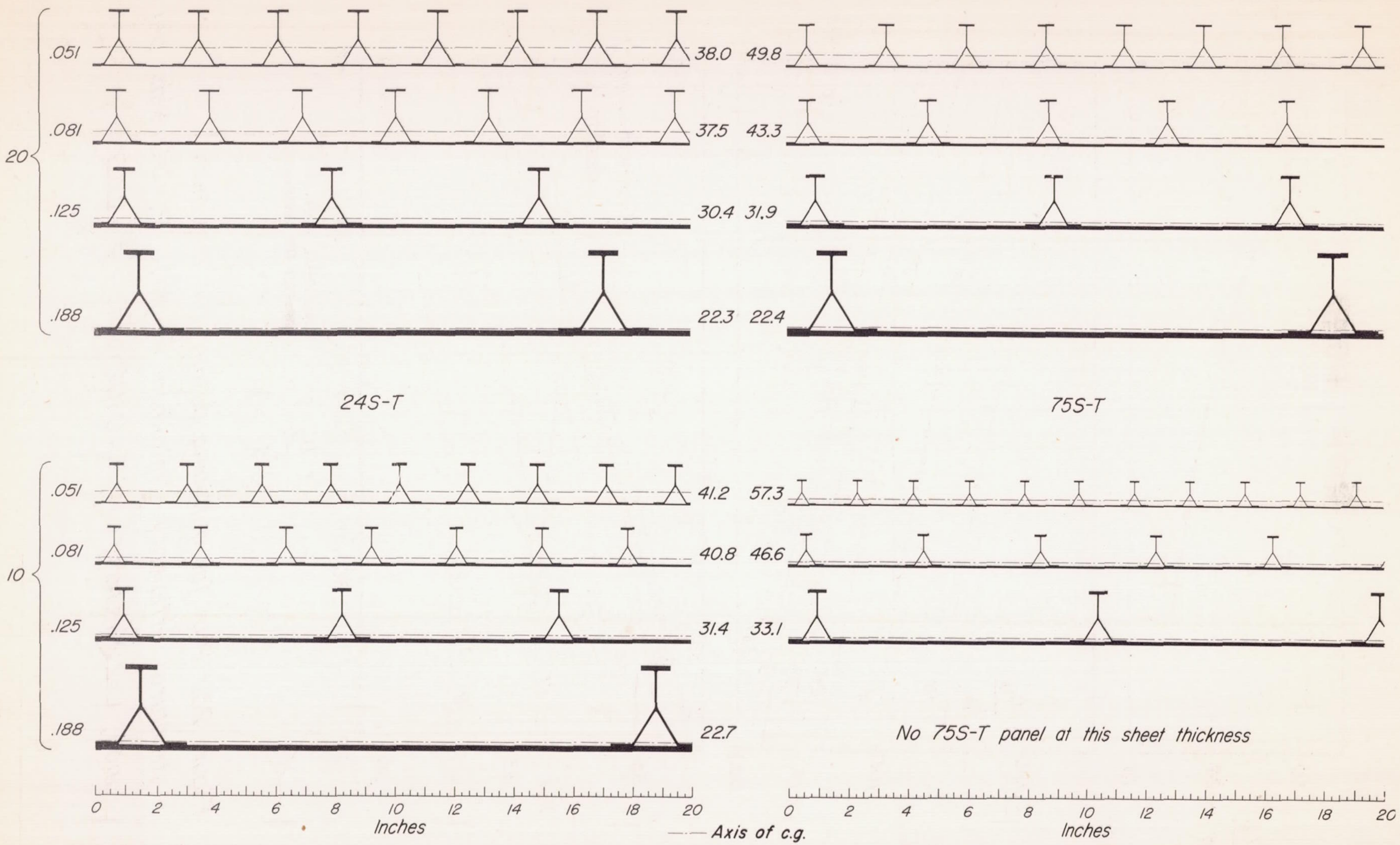

Figure 22.– Comparative minimum-weight designs of 24S-T and 75S-T Y-stiffened panels. $P_i = 5.0$ kips per inch; $c = 1$.

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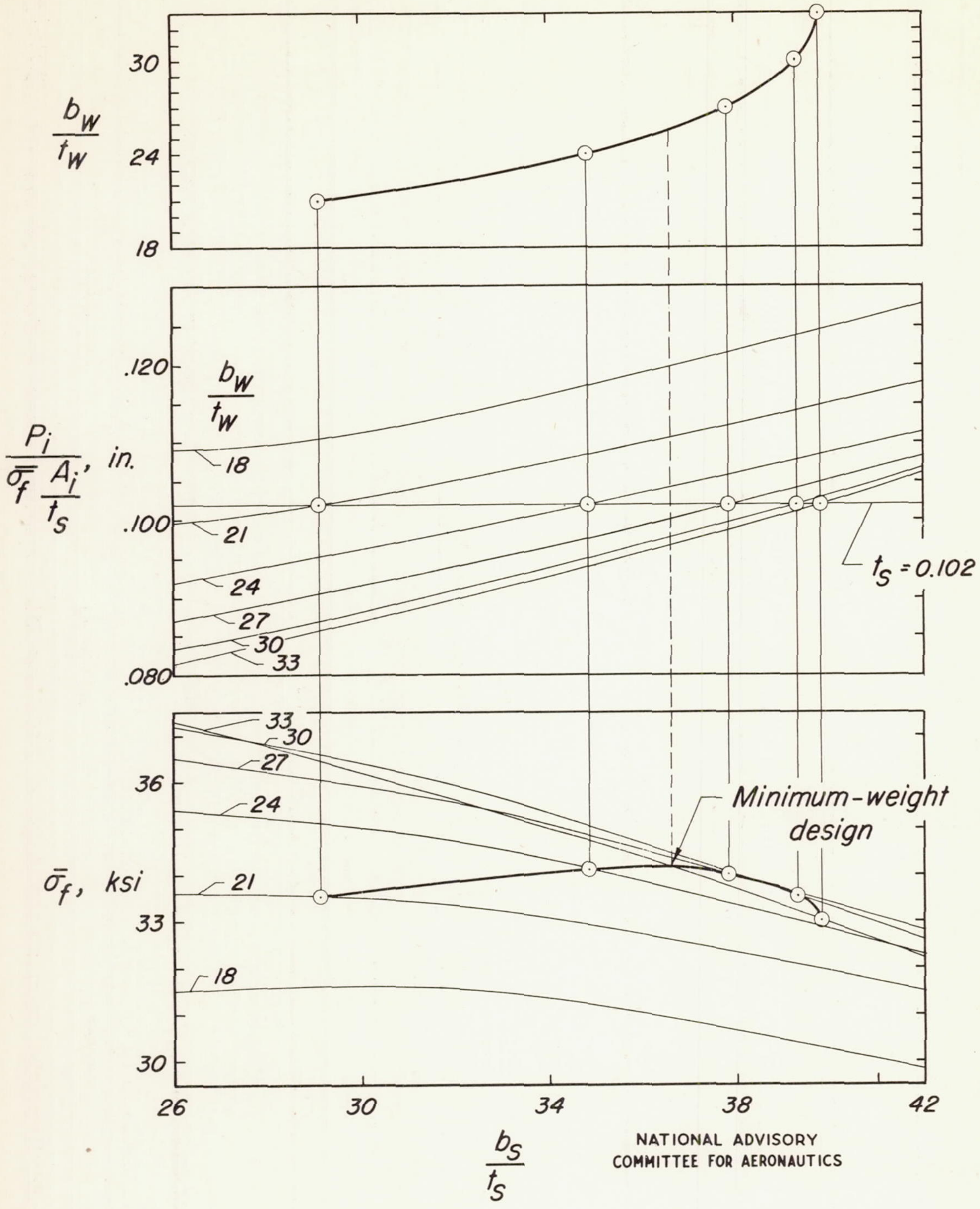

Figure 23.- Plot for obtaining design for maximum structural efficiency (minimum weight). $P_i = 5.0$ kips per inch; $L = 20$ inches; $c = 1$; $t_s = 0.102$ inch; $\frac{t_w}{t_s} = 0.40$.