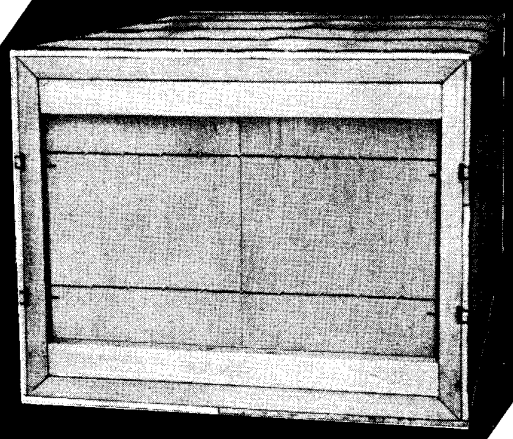
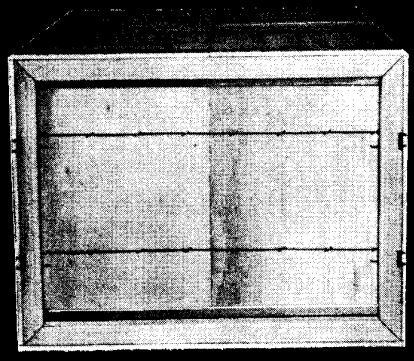
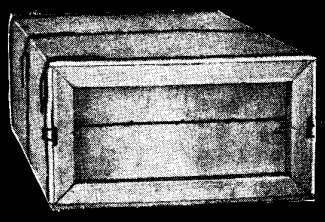
design facts

Volume 1 Number 8

Wirebound boxes and crates







ENDS
standard manufacturing limitations

SMC

Rockaway, New Jersey

What are the limitations of the stitching machine on which ends are to be made? For example, will the machine be able to stitch an end to the dimensions the designer specifies, with the number of wires, liners, or battens *where* he wants them? These *practical considerations* can be found in this issue of *Design Facts*.

Only the various styles of ends in *common* use are covered here. Ends smaller than those shown in the limitation sketches may be run in some cases by use of special equipment or setup.

The following machines can be used to manufacture linered or All-Bound ends:

BF-8E	End machine
BF-2	End machine
BF-4	End machine
BF-5E	End machine
RF-5	Rock Fastener machine
RF-12	Rock Fastener machine

The same machines can be used to manufacture Battened Ends (with additional equipment).

Also, Battened Ends without binding wires can be manufactured on a BF-5T machine.

Generally, the dimension limitations are common to all of the End machines listed. When a dimension limitation is restricted to only one or more of these End machines, it is indicated in the presentation.

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HOW TO USE THIS BOOK

EXAMPLE 1

The end on an All-Bound box having inside dimensions 26-1/2" x 18" x 11-3/4" is being designed. The nature of the contents (type of load) indicates that two edge liners, 1-1/4" wide, and two wires, are required. Liners are to be on the same side as wires. A BF-2 End machine is available for manufacturing the end.

Using this End machine, can two wires be stitched to this end?

Referring to page 5, we note that for two wires, the depth of end must be 9-1/8" or greater.

Therefore, for a box having 11-3/4" depth, (given above), two wires *can* be stitched to the end using the BF-2 machine.

EXAMPLE 2

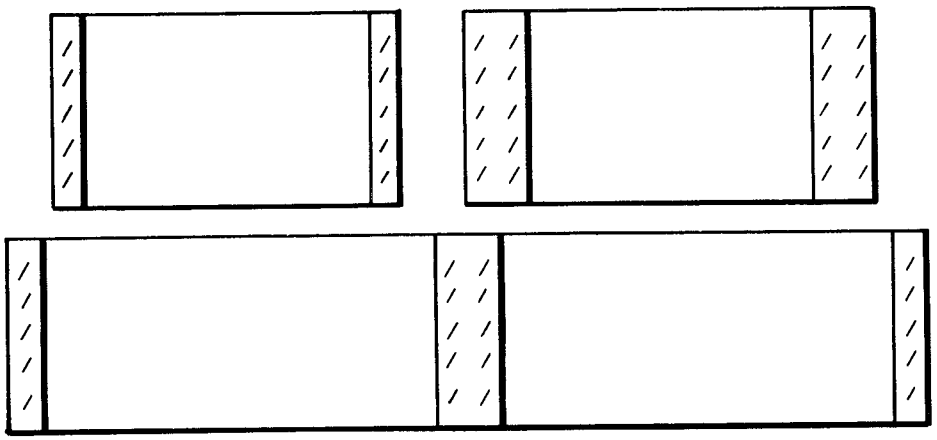
The end on a Rock Fastener type of box having inside dimensions of 26-1/2" x 18" x 11-3/4" is being designed. A primary source of information on design indicates that because of the nature of the contents, at least three battens (Type F) are required on each end. A BF-5E End machine with battened end equipment is available on which to stitch the end.

However, from a "practical" point of view, *can* these battens be attached by stitching them on this BF-5E End machine?

On page 4, the sketch indicates that the *minimum* distance between the outer edges of Type F battens is 13-7/8". By adding 1-3/4" (depth of two No. 13 cleats), the minimum width of box with Type F battens on the ends is 15-5/8".

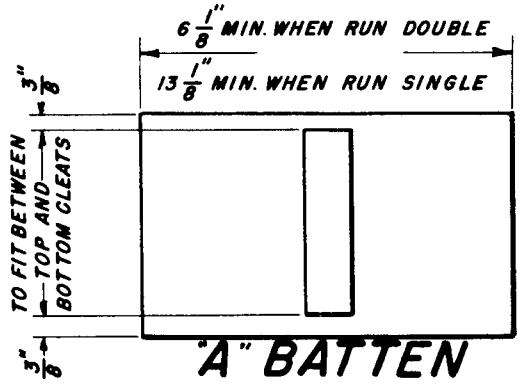
Therefore, for a box having 18" inside width, (given above), Type F battens *can* be stitched on the BF-5E End machine.

LINERED ENDS

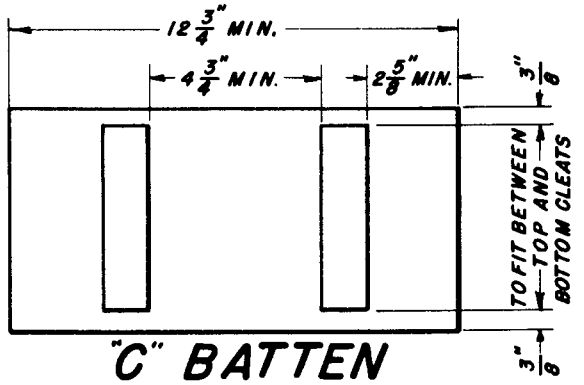


NO PRACTICAL MACHINE LIMITATIONS

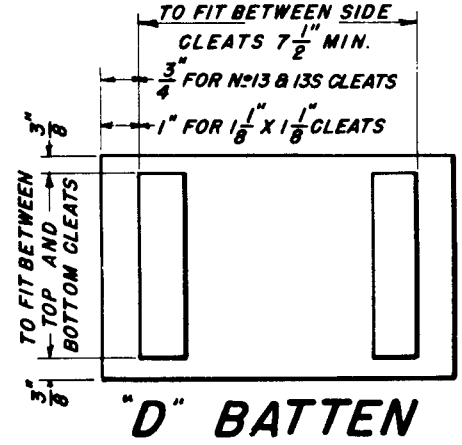
BATTENED ENDS



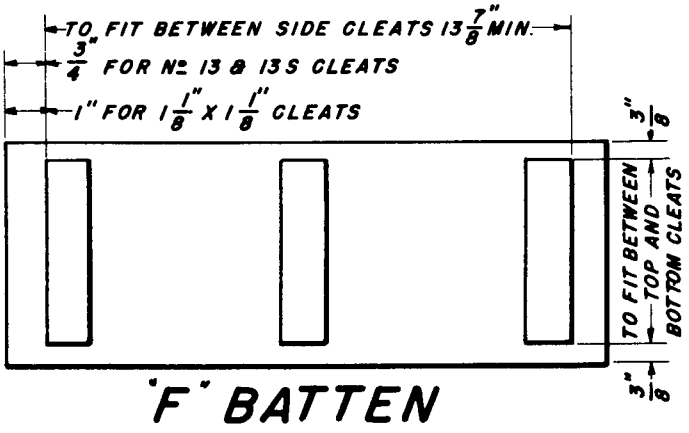
"A" BATTEN



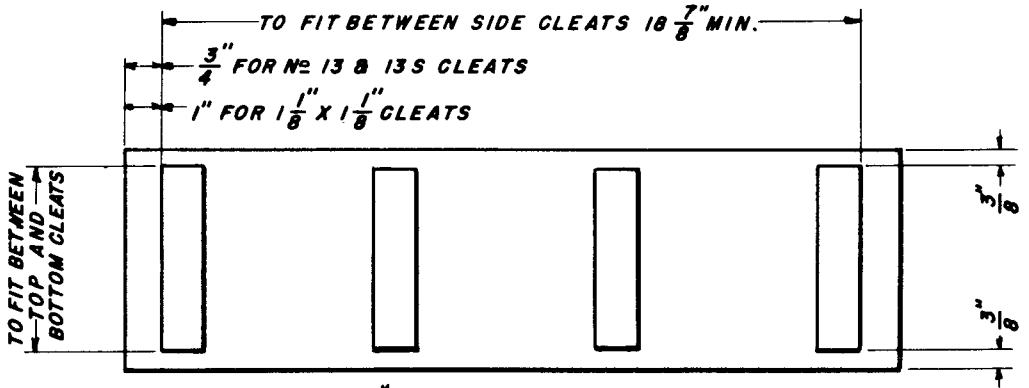
"C" BATTEN



"D" BATTEN



"F" BATTEN



"X" BATTEN

Notes

a.) Minimum dimensions apply only when ends are manufactured on a stitching machine.

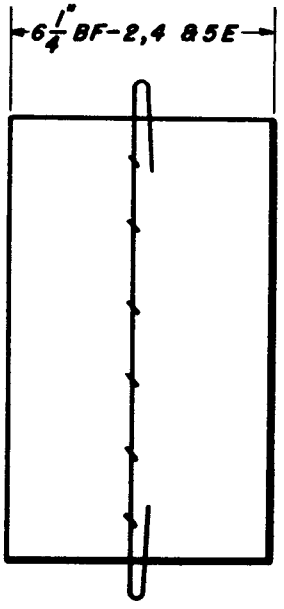
b.) All battens shown above are 1-3/8" wide.

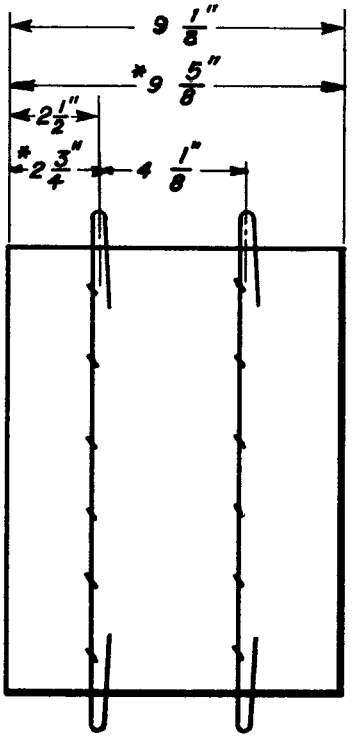
c.) End material may be solid or slatted.

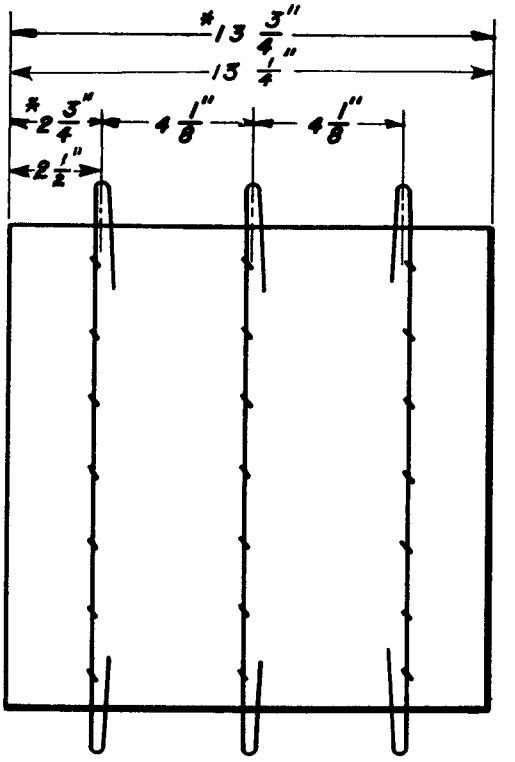
ALL-BOUND ENDS

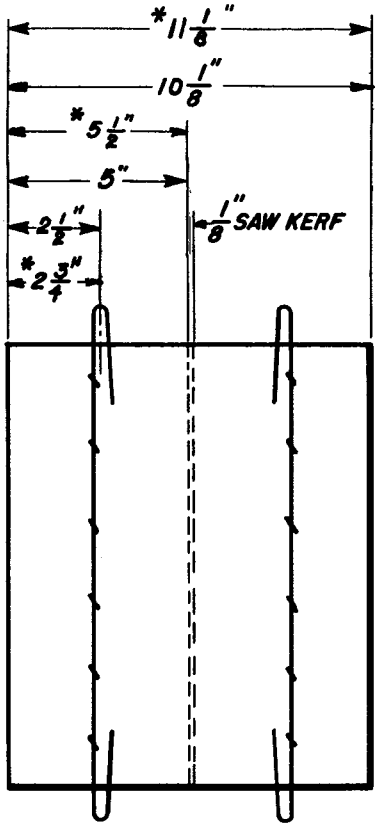
Plain Construction - Plywood

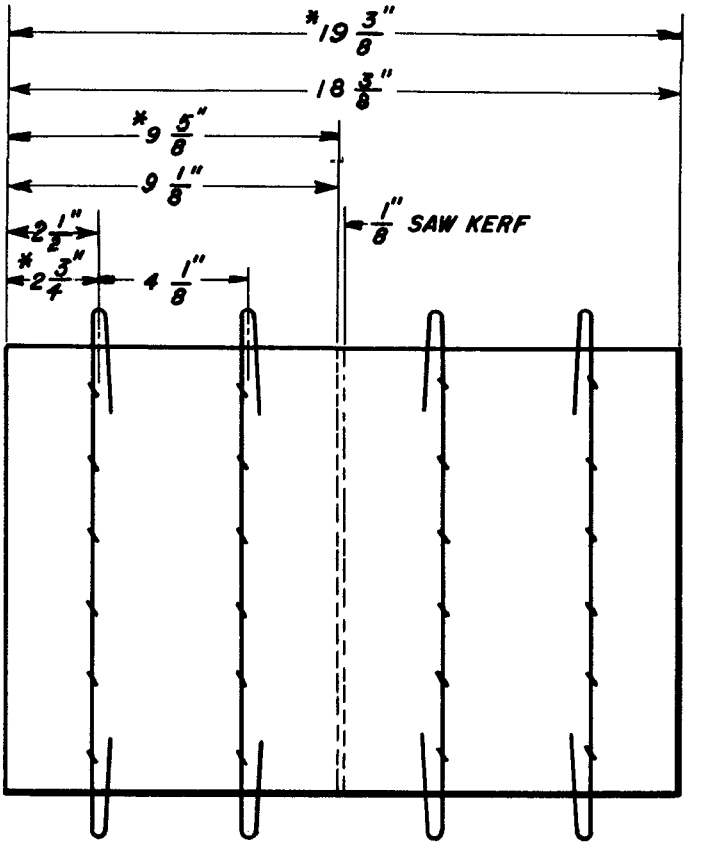
RUN SINGLE











Direction Ends Go Through Machines.

RUN DOUBLE

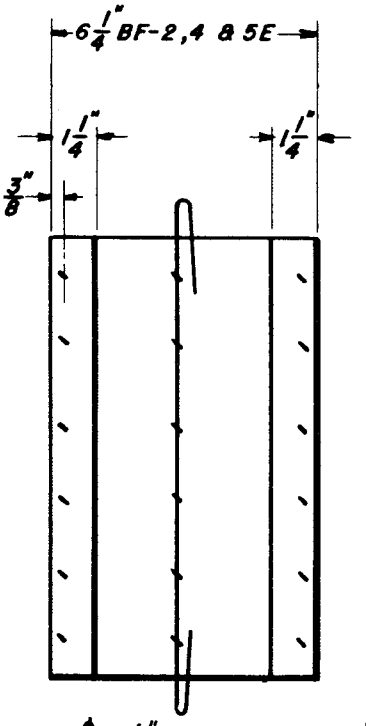
Notes

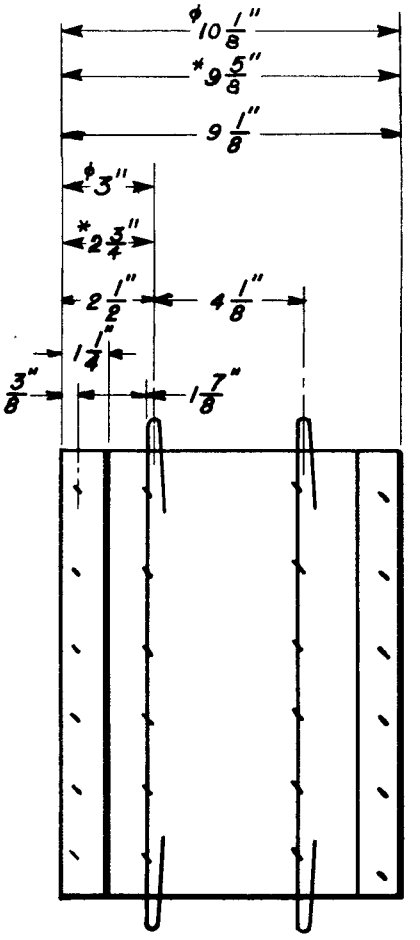
a.) Dimensions shown are minimums.

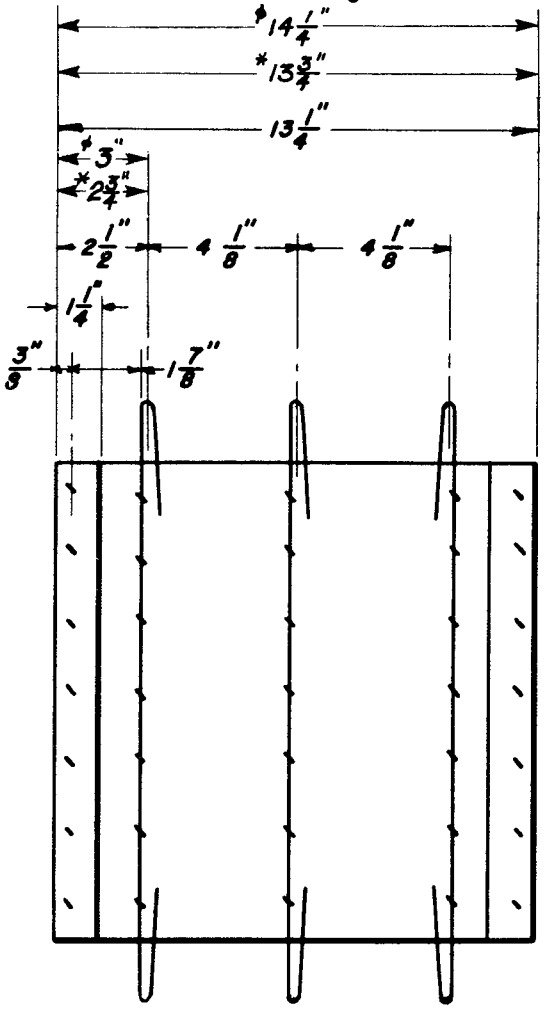
b.) Centers of Rock Fastener loops are symmetrical about center line of end.

*) With High Fin Spacers

ALL-BOUND ENDS







RUN SINGLE

Direction Ends Go Through Machines.

Notes

a.) Dimensions shown are minimums.

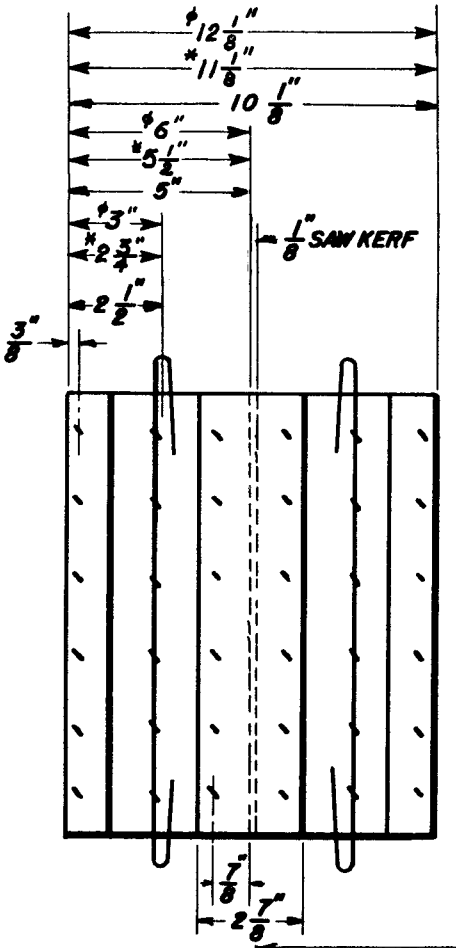
b.) Face material may be solid or slatted.

c.) Centers of Rock Fastener loops are symmetrical about center line of end.

✱) With High Fin Spacers — Solid

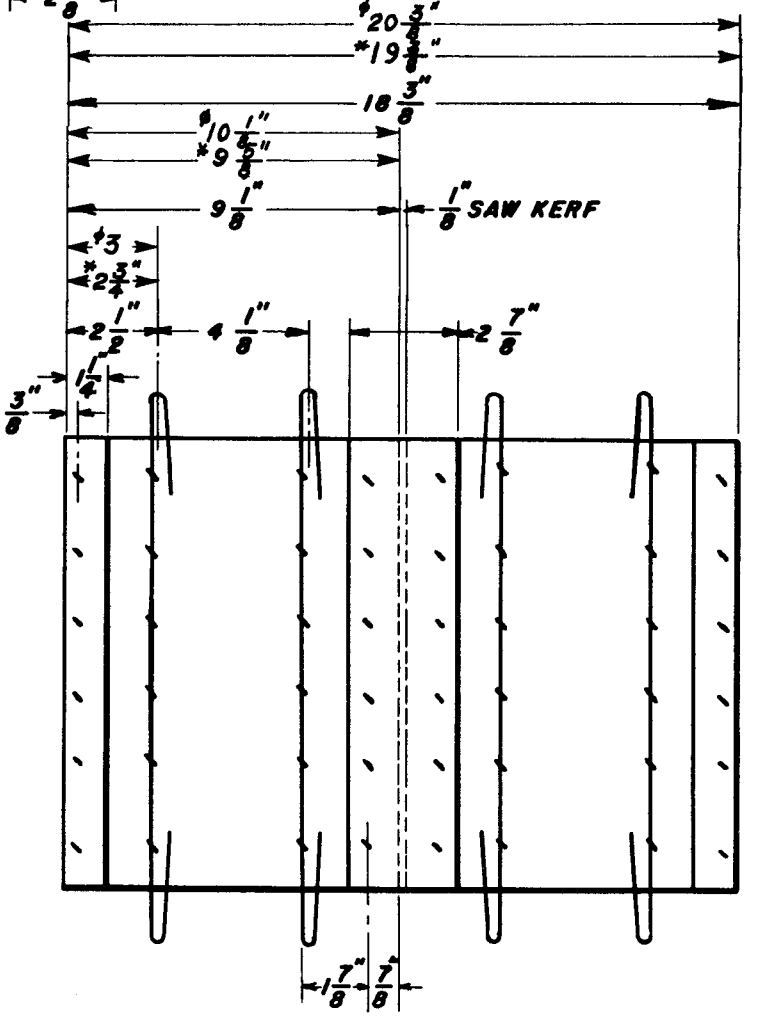
ϕ) Slatted End — High Fin Spacers

With Standard Liners on same side or opposite side as wires



RUN DOUBLE

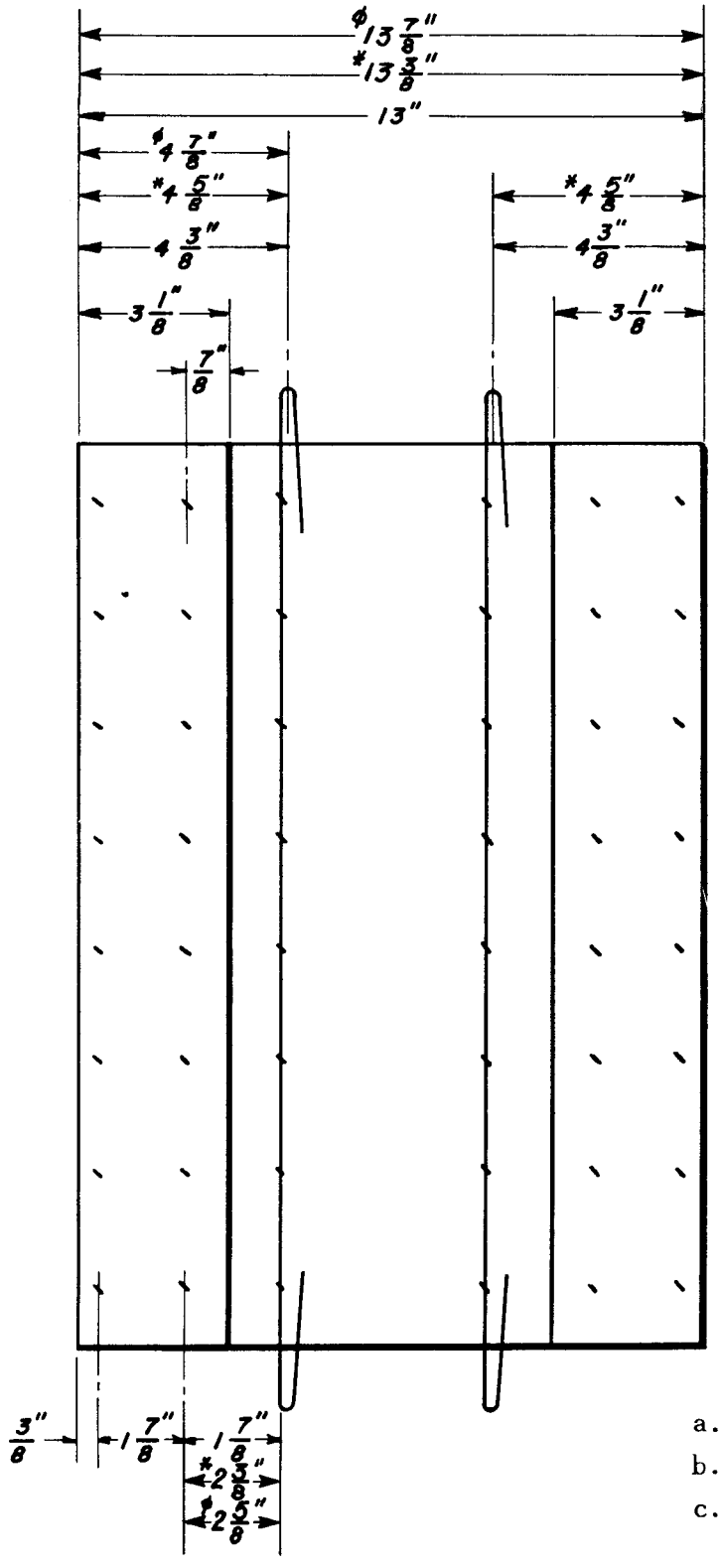
Direction Ends Go Through Machines.

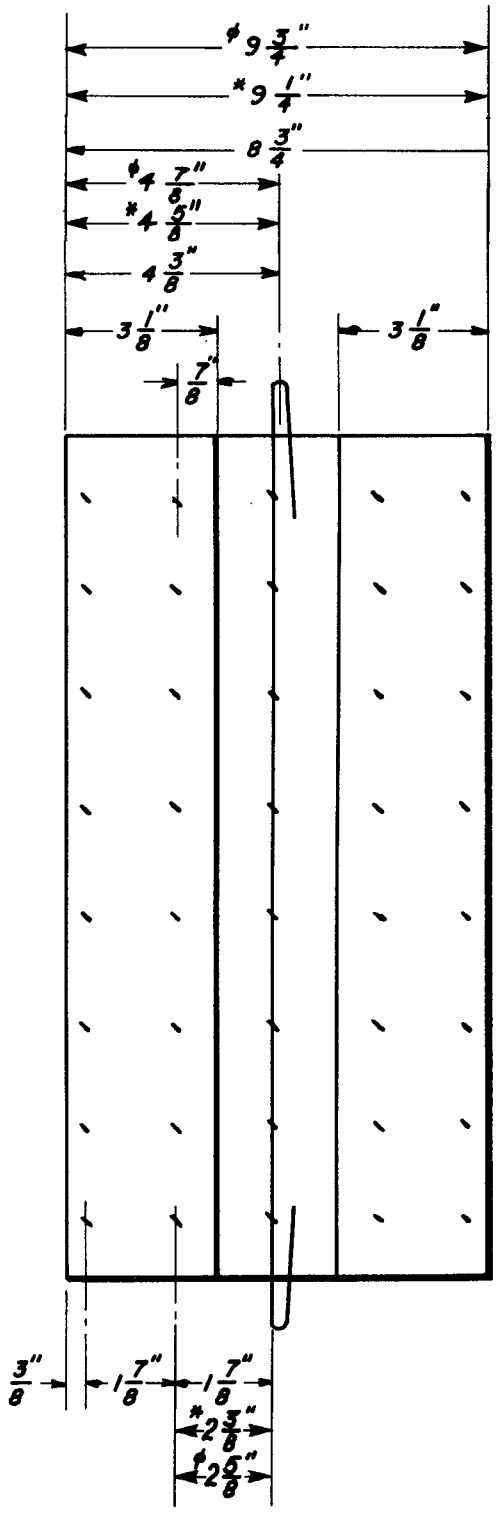


ALL-BOUND ENDS

Direction Ends Go Through Machines.

RUN SINGLE OR DOUBLE





Notes

a.) Dimensions shown are minimums.

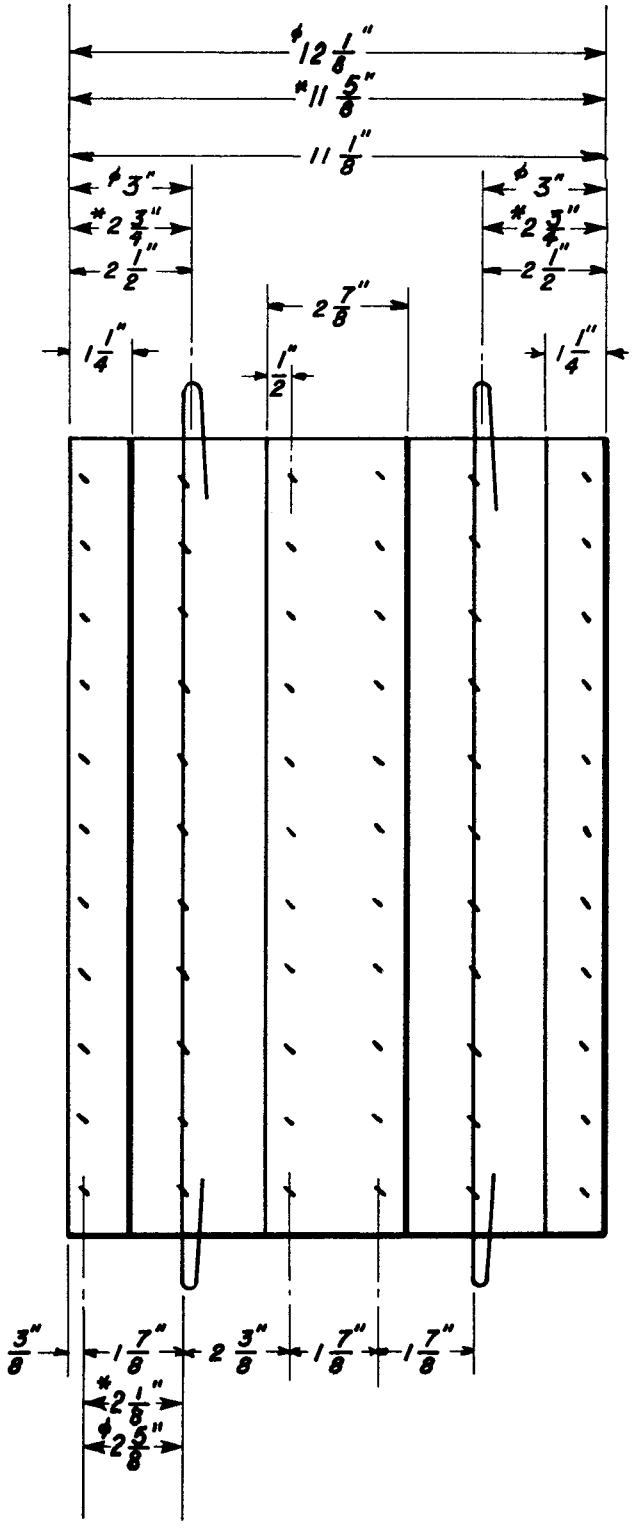
b.) Face material may be solid or slatted.

c.) Centers of Rock Fastener loops are symmetrical about center line of end.

✱) Solid End — High Fin Spacers

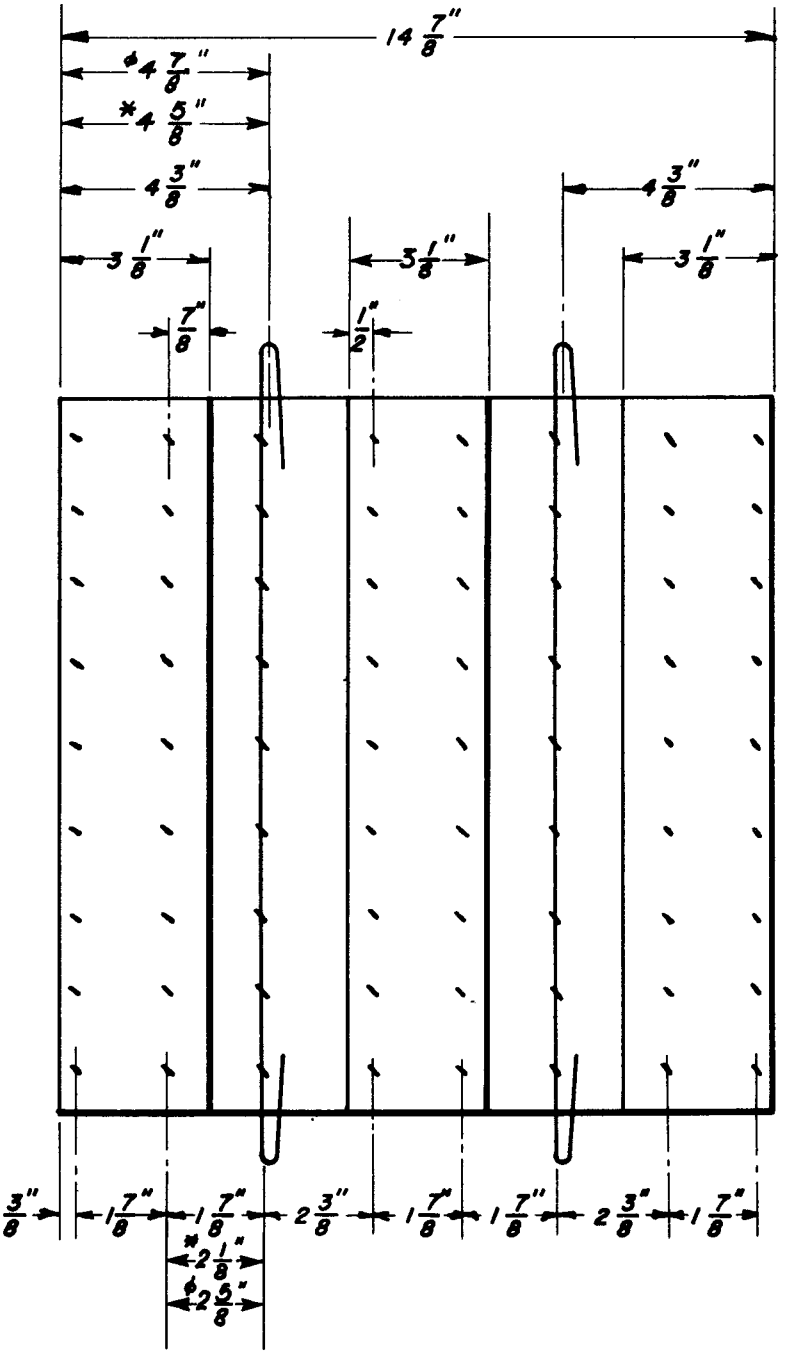
ϕ) Slatted End — High Fin Spacers

With Wide Liners on same side or opposite side as wires



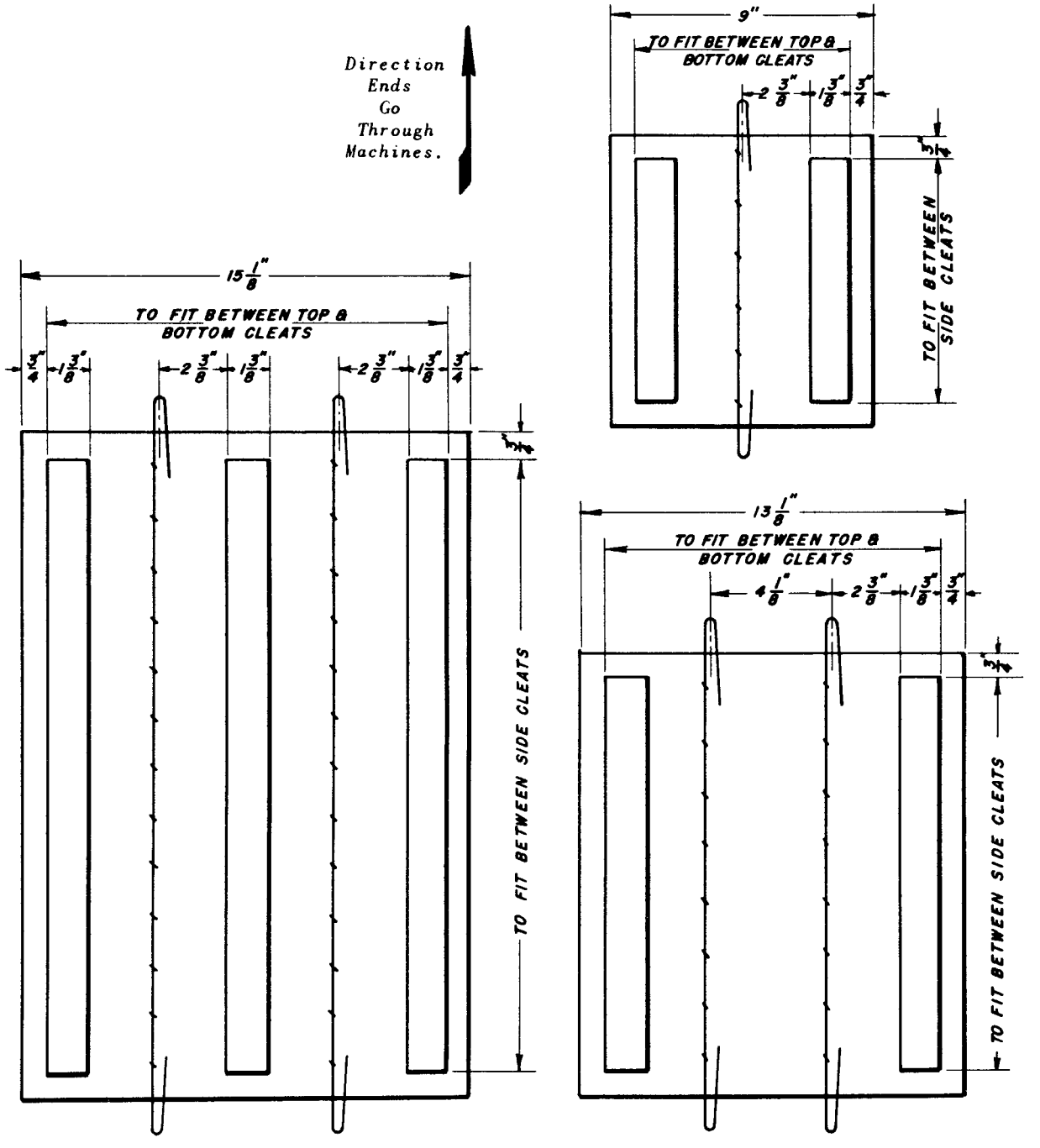
Direction Ends Go Through Machines.

RUN SINGLE ONLY



ALL-BOUND ENDS

With Battens on same side as wires



Notes

a.) Dimensions shown are minimums.

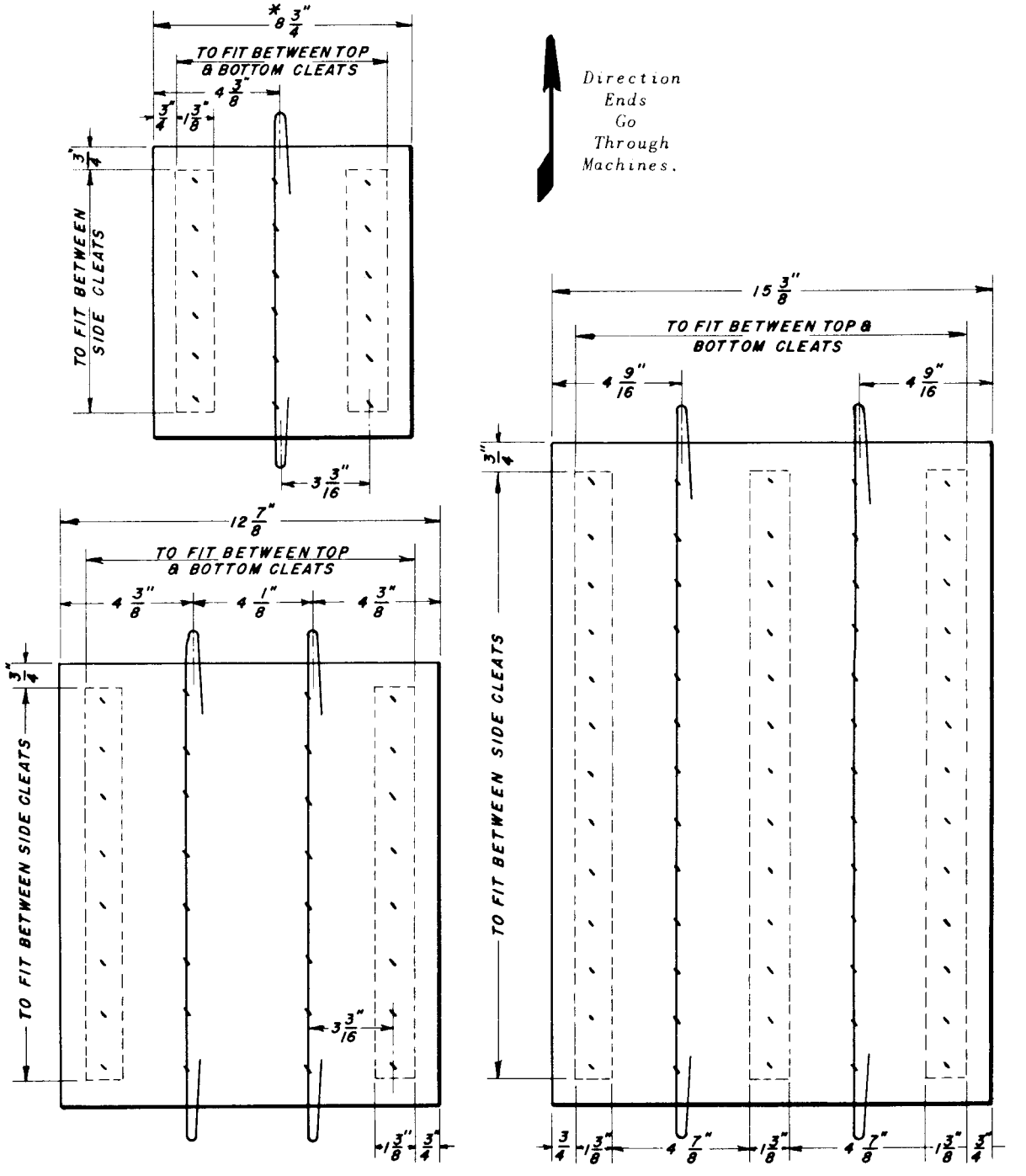
b.) Face material may be solid or slatted.

c.) Battens attached to same side as wires *before* stitching wires.

d.) Centers of Rock Fastener loops are symmetrical about center line of end.

ALL-BOUND ENDS

With Battens on side opposite to wires



Notes

a.) Dimensions shown are minimums.

b.) Minimum dimensions apply only when battens and wires are stitched to ends in same operation.

c.) Face material may be solid or slatted.

d.) Centers of Rock Fastener loops are symmetrical about center line of end.

FIGURING CUTTING SIZES OF MATERIALS

For Ends

The box designer normally writes the specifications from which boxes are manufactured. For simple boxes, it has been customary for the *shop* to figure cutting sizes from the box dimensions. Allowances for fits and tolerances were based on their experience.

As boxes and crates become more complicated, and new personnel come into the industry, it seems desirable to formulate general rules to guide the person who finally writes instructions to the shop in terms of cutting sizes for the various parts of the box.

Given a box dimension, the information contained on the following pages will enable a box designer to figure the cutting sizes of materials for ends on most wirebound boxes and crates.

There are special cases where the requirements of the problem call for special fits or clearances, but they may be considered exceptions to the general rule.

The direction of grain of liners and battens is normally perpendicular to the grain of end material. On All-Bound boxes, the direction of grain on end material must be parallel to the *depth* of the box. On boxes other than All-Bound, the direction of grain on end material is usually parallel to the *width* of the box.

Where "Tolerance" is used --

Tolerance -1/16" (minus 1/16") means the dimension should measure *from given size to 1/16" less*

Tolerance ±1/16" (plus or minus 1/16") means the dimension should measure *from 1/16" over to 1/16" under the given size.*

Tolerance +1/16" (plus 1/16") means the dimension should measure *from given size to 1/16" over*

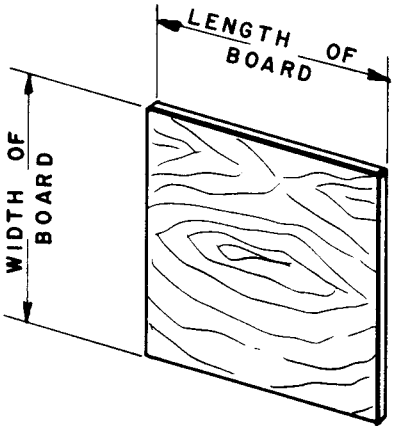
PLAIN ENDS

Plain ends should fit the box and should never be too large.

Stock should be as close to exact size as practicable with no oversize permitted.

Recommended cutting sizes are:

1. Length of board:
   Width of box minus 1/16"
   Tolerance -1/16"
2. Width of board:
   Depth of box minus 1/8"
   Tolerance -1/16"



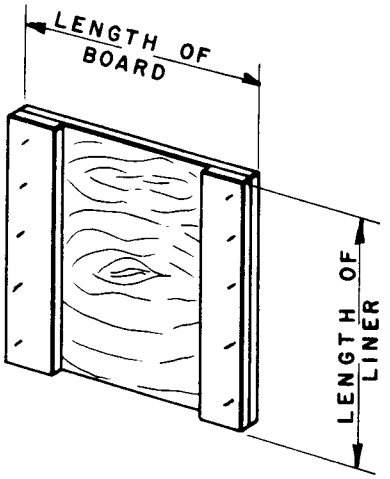
LINERED ENDS

Linered ends should fit the box and should never be too large.

To provide clearance in forms or machines, stock should be cut *slightly undersize;* form or machine setup should be as close to exact size as practicable with no oversize permitted.

Recommended cutting sizes are:

1. Length of Boards:
   Width of box minus 1/16"
   Tolerance -1/16"
2. Length of Liners and Total Width of Boards:
   Depth of box minus 1/8"
   Tolerance -1/16"



BATTENED ENDS

When the box is assembled, battens adjacent to a cleat should fit against that cleat. The ends of all battens should fit snugly against cleats or other battens. The boards of the end should not interfere with the boards of the blank. The ends of the boards should extend beyond the batten edges a distance equal to the cleat depth minus 1/16" to 1/8". This means that, with cleat depth of 7/8", the ends of boards should overhang the edge of battens by 13/16" to 3/4". For a cleat depth of 13/16", overhang would be 3/4" to 11/16". For simplification, we suggest a standard overhang of 3/4" on board length, for cleat depths of 13/16" and 7/8". For a cleat depth of 1-1/8", the overhang would be 1".

On board width, the requirements are different. The board splits easily with the grain and should extend a minimum over the batten ends. The minimum allowable depends on the commodity to be packed. If contents allow, the board overhang beyond batten ends should be 3/8".

From these requirements, for the usual type of battened ends with vertical battens fitting between cleats, the following cutting sizes are recommended:

1. Length of Batten

   Depth of box *minus* twice cleat depth *minus* 1/16"
   Tolerance +1/16"

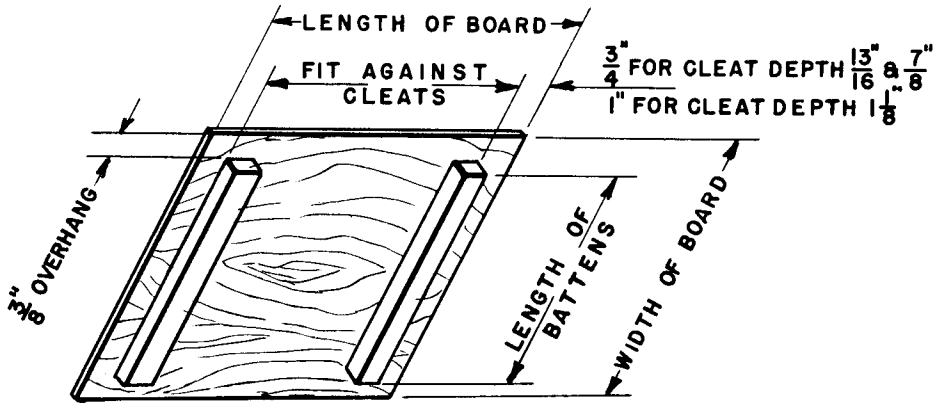
   Location: Set up the assembly operation to position battens exactly to fit cleats.

2. Length of Board

   Width of box *minus* 1/4" for cleats 7/8" to 1-1/8" deep
   " " " " 1/8" " " 13/16" deep
   Tolerance +1/16"

3. Width of Board (or Location of Slat)

   Depth of box *minus* 1-1/2" for cleats 1-1/8" deep
   " " " " 1" " " 7/8" "
   " " " " 7/8" " " 13/16" "
   Tolerance ±1/16"

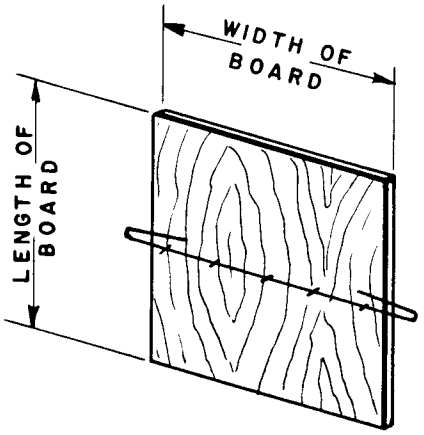


ALL-BOUND ENDS

All-Bound Ends should fit the box loosely since they are attached flexibly, not rigidly, to the box. The depth of the end should be equal to, or slightly less than, the depth of the box. The width of the end should always be less than the width of the box, to allow for some slack in the attachment of the end loops to the box cleats.

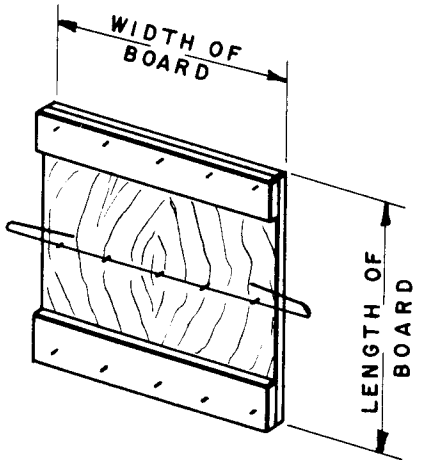
To manufacture ends for the above results, cutting sizes of parts should be specified as follows:

A. Plain- plywood



1. Length of board:
   depth of box minus 1/8"
   tolerance +1/16"
2. Width of board:
   wires on outside: width of box minus 1/8"
   tolerance -1/16"
   wires on inside: width of box minus 1/4"
   tolerance -1/16"

B. With Liners



1. Length of Boards (or Slats):
   Single ends: depth of box minus 1/8"
   Tolerance +1/16"
   Double ends: twice depth of box minus 1/8"
   Tolerance +1/16"
   (Based on 1/8" saw kerf)
2. Length of Liners, also Width of Board if solid:
   Wires on outside: width of box minus 1/8"
   Tolerance -1/16"
   Wires on inside: width of box minus 1/4"
   Tolerance -1/16"

C. With Battens

In addition to the general requirements for All-Bound Ends, the edges and ends of battens should fit snugly against the cleats when assembled in a box. The ends of the boards should extend beyond the edges of the battens a distance equal to the depth of cleat minus 1/8". For a number 13 cleat, the depth of cleat is 7/8" and the ends of the boards should overhang the edges of the battens by 3/4". The edges of the board should overhang the ends of the battens by 3/4".

To meet the above requirements, the following cutting sizes are recommended:

1. Length of batten:

   width of box minus twice cleat depth minus 1/16"
   tolerance +1/16"

   location: set up the assembly operation to position battens exactly to fit cleats.

2. Length of board:

   depth of box minus 1/4" (for No. 13 cleats)
   tolerance +1/16"

3. Width of board (or slat location):

   Wires on outside: Width of box minus 3/16"
   Tolerance -1/16"

   Wires on inside: Width of box minus 5/16"
   Tolerance -1/16"