NON-LOAD-BEARING STORAGE PARTITIONS

Closets in homes are undergoing considerable change in design due primarily to:

1. Need for increased storage space as attics and basements are eliminated and houses become more compact.

2. Growth in popularity of roof-truss construction and other framing methods which relieve the interior partitions of houses from carrying any of the weight of the roof. Such construction makes it possible to use lightweight studless walls as partitions.

3. Recognition of the fact that in most homes (even those not utilizing trusses or other clear-span methods of framing) the walls which enclose closets seldom are needed for support of the roof or the floor above. To construct these walls as load-bearing stud walls is a construction extravagance.

Non-load-bearing storage partitions are being used more and more to divide the house into rooms. These storage partitions usually consist of open or enclosed units—12, 16, or 24 inches deep—having shelves, rods or drawers. By placing these units side-by-side or back-to-back, storage compartments can be arranged to face into one or two rooms.

Such ceiling-height partitions can be most economically constructed of thin studless panels built on the job from stock building materials.*

Studless Panels

Specifically, partitions of thin-wall studless panels have the following advantages over stud-wall partitions when used for closets:

- They reduce wall thickness and, hence, conserve floor space. This means that either the storage capacity of the closet itself or the size of the room can be increased.

- They offer economical construction since they save material. Thin-wall studless panels are engineered for the purpose that they serve—enclosure walls rather than load-bearing walls.

Job-Built Storage Partitions

Because storage partitions built on the job have single walls, they can be constructed more economically than prefabricated cabinet-type units now available. Job-built units utilize the floor, the ceiling, and the exterior walls of the house, while most cabinet-type units result in a double thickness at the floor and ceiling, and also at the side and back walls when the units are not freestanding.

* Research by the Small Homes Council under a grant given to the University of Illinois by the Lumber Dealers Research Council.
IMPROVED STORAGE DESIGN*

Thin-wall closets and storage units are particularly efficient and economical when they are designed to offer:

- **Accessibility for all items stored.** Storage units should be shallow—just deep enough to accommodate the type of article to be stored. Shallow closets make it possible to get items without moving one article to reach another.
  
  Shelves should be within reach of people of average height so that articles can be easily stored and removed.
  
  A closet with a full-front opening is more accessible than a door-in-a-wall closet since the jamb and the head of the door in the latter block access to storage space near the sides and ceiling.

- **Efficient use of space.** Much waste space can be eliminated if storage units are designed with relation to the size of the articles to be stored. Practically all items in a home can be stored efficiently in units of three depths—12, 16, and 24 inches.

- **Flexibility in use.** Adjustable shelves and drawers make it possible to adapt closets for efficient storage of many types and quantities of articles. Storage space can thus be adjusted to meet the changing needs of individual members of a family, and also the needs of the various families who may occupy the house.
  
  Units of one depth can be used for storage of several types of articles. For example, a storage unit 16 inches deep can be adapted for storage of business papers, musical instruments, work and play clothes, sports equipment, cleaning equipment and supplies, and bathroom supplies.

- **Economical construction through use of modular dimensions.** Sizing the storage units and their compartments to dimensions that are modular (divisible by 4 inches) simplifies the layout and allows the use of sheet materials and doors which are also based on the 4-inch module. Use of modular dimensions and building materials reduces the amount of cutting and fitting of materials and, hence, cost.

The storage partitions shown in this circular take advantage of the above principles of improved storage design. The partitions are most economical to construct when ceilings are 8 feet (nominal) high.

* See Small Homes Council circular, C5.1 — "Household Storage Units."
THIN-WALL STUDLESS PANELS

Use of studless construction for storage partitions is possible because:

1. Thin-wall studless panels have been developed which withstand impact and other load tests as well as — or better than — stud walls.

2. A box-type framework can be utilized to give added stiffness to thin-wall panels when used in storage partitions. That is, the fixed shelf, the back panel, and the divider panel (also called “end panel” when it forms the end of the unit) are designed to support one another. These three pieces are nailed to the house and become a part of it.

Back Panels: Panels, 4 feet wide, are used for economy in constructing the back wall of thin-wall storage units. This width is most economical since 1) this is the width of standard sheet materials, such as hardboard and gypsum board; and 2) thin-wall panel construction permits storage units or compartments up to 4 feet in width without intermediate bracing of the back panel.

To determine the most satisfactory panel for the back wall, the Small Homes Council built and tested 22 different types of studless panels made from stock materials. All panels were selected to be competitive in cost with conventional stud walls.

A thin-wall panel of ½-inch untempered hardboard cemented to ⅜-inch gypsum board with linoleum paste was selected as the most satisfactory from the standpoint of strength, ease of installation, cost, and weight. In the impact tests, it proved to be the toughest. It costs several cents less per square foot than a stud wall finished with ½-inch gypsum board. The weight of a 4' x 8' panel — 80 pounds — is light enough for easy installation.

Panels of ½-inch plywood are also satisfactory but, unless a plywood with a textured surface is used, the joint between panels should be concealed with trim.

Panels made of two sheets of ½-inch gypsum board cemented together also withstand impact and load tests. In handling, however, corners of such panels are apt to be broken. Handling is further complicated because the panels weigh 100 pounds. If gypsum board is to be used, nail the first sheet in place and cement the second sheet to it.

Other panels can be used if their strength is proved under impact, uniform, and concentrated load tests. Among materials which might be used are ¾-inch tongue-and-groove boards applied vertically, hardwood panels with a glued-up lumber core, and sandwich panels, such as panels with cement-asbestos-board facing and fiberboard core.

Divider or End Panels: Closet units are separated into compartments by divider panels. These panels can also form the end of the closet. In addition to being strong and stiff enough to support the back wall, the divider panels must be suitable for fastening to the adjoining floor, ceiling, back panel, and shelves. It must be possible to nail into the edges of divider panels without splitting them.

Divider panels can be made of ¾-inch boards (not wider than 6 inches) glued at the edges to form a panel. Among other types of divider panels are plywood panels with a glued-up lumber core, and framed panels with ½-inch hardboard facing and a ¾- or 1½-inch wood frame.

Fixed Shelf: To obtain the added stiffness which box-type framing offers, a fixed shelf should be fastened to both the back panel and the divider (or end) panels. The distance between the fixed shelf and the floor or the ceiling should not be more than 6 feet.

This shelf should be made of ¾-inch board. For units 12 inches deep, a 1” x 12” board is recommended; for deeper units, boards can be glued together at the edges so that the shelf is in one piece.

CONSTRUCTION OF PARTITIONS

Storage partitions may extend the full width or length of a room, or they can be shorter and enclosed on one side with an end-wall panel.

Detailed instructions on how to build thin-wall panels and storage partitions are given in the Small Homes Council instruction sheet, “How to Build the Small Homes Council’s Storage Partition.”*

**Limitations:** Storage partitions made of thin-wall studless panels should not be used as plumbing walls or for that part of interior walls supporting a door frame. The thickness and the stiffness of stud walls are necessary in such cases. Storage units can be built against such stud-wall partitions or against exterior walls (page 8).

While items to be stored influence the design, and the minimum depth and width of a storage unit, economical considerations and structural limitations of building materials are also factors in the design and size of the units.

Since %-inch boards (the most economical shelf material) cannot span more than 48 inches under normal loads, it is desirable to limit compartments within storage partitions to this width.

Width of compartments is further limited to 24 inches when %-inch divider panels are used in storage partitions with two or more adjoining back panels. Such construction requires a divider panel on each side of the joints of the back panels. These divider panels should not be more than 24 inches apart. (If divider panels with a 1½-inch nailing edge are used, a single divider panel can be placed at each joint of the back panels. These divider panels can be spaced up to 48 inches apart.)

Adjustable Shelves and Trays

Many storage units require shelves in addition to the fixed shelf. These should be adjustable so that the storage unit can be readily adapted to changing needs. Such shelves can be supported by pilaster shelf standards consisting of metal strips fastened to the wall. These standards have a series of slots, %-inch on center, and are designed to hold a removable metal shelf-support. Special supports which fit into the same standards will hold adjustable clothes rods.

Pull-out trays for linens and pull-out drawers can be supported on wood strips nailed to the side of the cabinet or they can be placed on adjustable shelves. A center guide on the shelf and a groove strip on the bottom of the drawer will prevent the trays from twisting and sticking when they are pulled out and pushed in. A number of different types of open boxes made of metal, plastic, and wood are now on the market and are usable as drawers.

**Loads on Shelves:** Adjustable shelves supported on the ends only must be of the proper thickness to avoid excessive bending under load. Although it is not always possible to predict how much load will be placed on a shelf, it can generally be designed for either normal or heavy loads. Shelves for clothing, dishes, toys, and similar items should be designed for normal loads (approximately 16 pounds or less per square foot of shelf); shelves for books, magazines, or phonograph records should be designed for heavy loads (approximately 64 pounds per square foot).

The table below shows the recommended maximum spans for end-supported shelves made of Douglas fir plywood, white pine boards, or other materials of similar stiffness.

<table>
<thead>
<tr>
<th>MAXIMUM NET SPANS FOR ADJUSTABLE SHELVES†</th>
<th>Shelf Material</th>
<th>Normal Loads</th>
<th>Heavy Loads</th>
</tr>
</thead>
<tbody>
<tr>
<td>½&quot; Plywood (with face grain parallel to span)</td>
<td>26&quot;</td>
<td>16&quot;</td>
<td></td>
</tr>
<tr>
<td>¾&quot; Plywood (with face grain parallel to span)</td>
<td>46&quot;</td>
<td>29&quot;</td>
<td></td>
</tr>
<tr>
<td>¾&quot; Solid wood (nominal 1-inch board)</td>
<td>48&quot;</td>
<td>30&quot;</td>
<td></td>
</tr>
<tr>
<td>1½&quot; Solid wood (nominal 1½-inch board)</td>
<td>66&quot;</td>
<td>42&quot;</td>
<td></td>
</tr>
</tbody>
</table>

† The spans given are from edge of shelf support to edge of shelf support. The length of the shelf may exceed these spans by the amount that the shelf overlaps the two supports.

* Available for 25 cents from Small Homes Council.

University of Illinois Small Homes Council Circular C5.11
DOORS FOR FULL-FRONT CLOSETS

A full-front closet opening is an essential feature of improved storage design. Such an opening allows easier access to the full width and height of the storage unit than that in the old-type door-in-a-wall closet.

A full-access closet can be designed with an open front, or with folding, sliding or hinged doors. Whether or not the storage unit is to have a door depends on the items to be stored in that unit. The door is usually omitted on book, magazine and toy units.

Each of the different types of doors has its advantages and disadvantages. Factors which influence choice include cost, ease of operation, ventilation, and required clearances (both inside and outside the closet).

The factory-made closet door is more economical than a job-built one of comparable quality.

Sliding Doors

Sliding doors open without projecting into the room and, as a result, do not interfere with passageways in front of storage units. These doors, however, have a disadvantage in that part of the full-front opening is always blocked by stacked doors.

Although the crack around the edge of sliding doors allows more air movement than the hinged door, this air movement is ordinarily not objectionable except in the case of closets used for out-of-season storage.

Sliding doors are available in stock sizes in heights of 6'-8” and 8'-0” (the latter is normal ceiling height) and in several widths ranging from 2 to 4 feet. Two, three or four doors can be installed as fronts on storage units up to 12 feet wide. Because all sizes of doors are not available as stock items, it is important to establish in the early planning stages the dimensions of the storage unit so that they coincide with stock door sizes.

Installation of sliding doors requires skill to make sure that the track is level and that the doors are adjusted to avoid sticking. Usually two or four doors on a double track, either ceiling or floor, are used. Doors which are hung from a ceiling track with self-lubricating rollers open and close the easiest. In a floor-track installation, doors are apt to stick and come out of the track accidentally if small items fall into the track grooves.

Warpage may also cause the doors to stick. It is therefore important to use non-warping doors. The minimum thickness recommended for wood panel or wood-veneer flush doors is 1/8 inches. Thinner doors made of sheet material should be reinforced or should be built from some of the newer types of non-warping materials.
Hinged Doors

Hinged doors can be fully opened so that the entire width of the closet is accessible at one time. This is the only type of door on which closet accessories, such as tie and shoe racks, can be mounted.

Free space must be provided in front of storage units to allow for the swing of hinged doors. The clearance required varies with the width of the door.

Hinged doors operate very easily if properly fitted. Fitting of the doors (except pre-hung doors) and installation of hardware require a skilled carpenter.

Hinged doors may be full-height, extending from the floor to the ceiling, or they may be in two sections—a small door above a larger door. The latter is used mostly in expensive, custom-built work and is not available as a moderate-priced factory-made unit.

As yet, 1½" doors are not available as a stock item in 8-foot heights. Ceiling-height doors, ½" to ¾" thick, can be made from plywood or from panels of pressed wood chips if stiffened with a framework approximately three inches deep.

Folding Doors (Accordion-Type)

With folding doors, almost the entire width of a closet can be accessible at one time.

Folding doors operate on a ceiling track. When open, they project into the room only a few inches; hence, there is no problem of clearance in front of the closet. Since folding doors also extend a few inches inside the storage unit when they are opened, it is necessary to provide a space of 4 to 6 inches for the thickness of the doors when folded.

Operation is easy if the doors are pushed gently at the proper heights. Because small children find it awkward to reach up and push at the right place, handles on the door are suggested.

Clearances of one to two inches at the top and bottom of folding doors allow free air movement. Folding doors of fabric are sufficiently tight for all uses except sealed storage. Woven-wood splint doors are not dust-proof; however, the free movement of air which they allow is desirable in areas where mildew in closets is common.

Folding doors are delivered as a packaged item ready for installation. Stock-sized doors are available in heights of 6'-8" and 8'-0". Other heights are available on special order. Widths of stock-sized doors range from 2 to 6 feet. Due to the take-up in the folds, a closet of any width up to 12 feet can be enclosed with a stock-sized folding door or a pair of doors.

This is the easiest type of closet front to install. The ceiling track is cut to length and fastened; the guides or rollers on the top of the folding door are inserted; and the door is fastened to the side wall.
WAYS TO INCREASE STORAGE SPACE IN HOUSES

Homeowners can often install storage units in rooms, which have sufficient floor area, without a major remodeling job.

Room-End Storage
Space along existing walls particularly can be utilized for storage units by merely installing shelves or rods and, where desired, a closet front. For example, folding or sliding doors can sometimes be installed along one end of a room to enclose storage space.

A single 1" x 12" shelf for a clothes closet can be held in place by 1" x 2" wood cleats nailed to the end walls of the closet. If the span for the shelf exceeds those recommended in the chart (see page 5), a back-wall cleat should be installed to reinforce the shelf. The cleat permits the span for a 1" x 12" shelf to be doubled under normal loads. If longer shelves are used, a divider panel made from the same material as the shelf can be installed to support the shelf at the middle of the span.

A closet narrower than room width can be formed by using the walls of the room as the back and the side, and folding doors as the front and the end of the closet. The free end of the shelf can be supported by a shelf bracket fastened to the back wall, and the rod can be hung under the shelf.

Book Shelves
Book shelves or other open-front shelf units can be supported on projecting adjustable shelf brackets. These brackets, which are designed for heavy loads, such as books, will support shelves up to 12 inches deep. (See table on page 5 for recommended spacing between brackets.) To install such a unit, fasten the shelf standards to the wall with screws or toggle bolts, cut the shelves to length, and set them in place on the brackets.

Perforated Panel
A perforated hardboard panel can be adapted for household storage by the use of hooks or pegs. The panel should be mounted on a wall by fastening it to strips spaced 16 inches on center. Leave at least 1/4" space behind the panel so shelf supports and other hardware can be inserted.

Many different types of bent wire and stamped steel hardware are designed for use with these perforated panels. Cold-drawn steel wire, such as .070-inch galvanized clothesline wire, can be bent to make simple "S" hook fasteners, or a series of loops can be made to hold heavy items, such as carpentry tools. Golf tees inserted in the panel will support lightweight items — i.e., clothing, kitchen utensils and pictures.