

### How to Assemble

Read all instructions prior to assembly.

1. Assemble end and interior frames as per OFFSET POST OPEN FRAMES ASSEMBLY INSTRUCTIONS.
2. Insert shelf clips at desired shelf locations.
3. Stand two frames upright. Move them into position and install a shelf into the top and bottom sets of shelf clips. Press down on each shelf corner to seat properly. Repeat this procedure for remaining intermediate shelves.
4. Bolt a pair of back braces together at the center to form an "X". Attach the back sway brace to the inside flanges of the rear offset posts with four nuts and bolts. Place the top holes of the brace even with or below top holes of side sway braces. Refer to "Shelving Brocing Considerations" for suggested placement of braces on multiple units.

To add additional units:

5. Same as above, except one interior frame will be complete on existing unit.

To end a row of units:

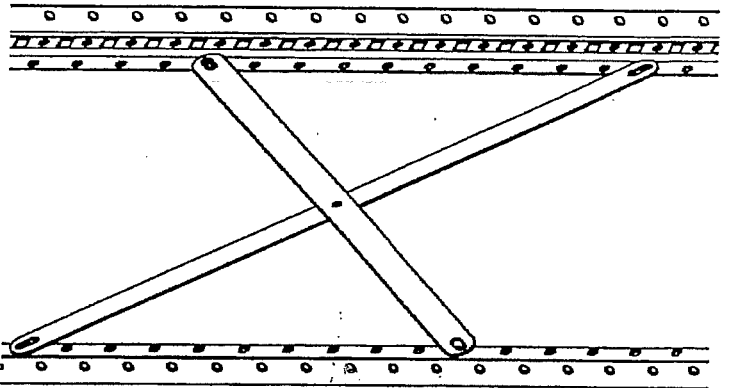
6. Use end frame assembly instead of interior frame assembly and procede with Step 5.

If a back-to-back row is desired:

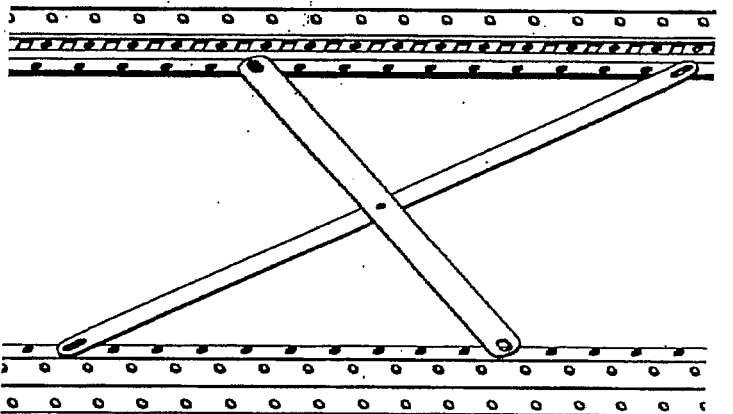
12. Assemble front row as above, then assemble the rear row as above, except no back brace is required. Tie rear row to existing row at back brace locations and at 2nd hole from top and 2nd hole from bottom of each post.

# Open Offset Post CLIP TYPE Assembly Instructions

End Frame



Interior Frame



How to Assemble End Frame

Read all instructions prior to assembly.

1. Place two offset posts on table or horses. Position posts parallel to each other and spaced apart to match depth of shelf.
  2. Bolt a pair of side braces together at the center to form an "X". Attach the side sway brace to the inside of the posts (use holes nearest edge of post). Sways should be positioned near midpoint of height of unit.
- Note: Heads of bolts should be on outside of frame.

How to Assemble Interior Frame

Read all instructions prior to assembly.

1. Bolt two sets of posts together at 2nd hole from top and 2nd hole from bottom. Place post assemblies on table or horses. Position post assemblies parallel to each other and spaced apart to match depth of shelf.
2. Bolt a pair of side braces together at the center to form an "X". Attach the side sway brace to the inside of the posts (use holes nearest edge of posts). Sways should be positioned near midpoint of height of unit.

# **Offset Post Open Frames Assembly Instructions**

# SHELVING BRACING CONSIDERATIONS

## FOREWORD AND INTRODUCTION

The Shelving Manufacturers Association, hereinafter referred to as SMA, is a product section of The Material Handling Institute, Inc. and is comprised of manufacturers engaged in the design, fabrication, sale and installation of industrial grade shelving. The Engineering Committee of the SMA has developed a "Specification for the Design, Testing, Utilization and Application of Industrial Grade Steel Shelving," which subsequently was adopted by The American National Standards Institute (designated as MH 28.1, 1982).

The intent of this document is to provide guidelines relative to the purpose, function and proper application of shelving bracing. This guide is primarily a user's guide outlining some of the characteristics pertaining to the bracing of industrial grade steel shelving. The SMA has developed this guide for the benefit of users including consultants and installers who are involved with the general design, use, installation, and application of industrial grade steel shelving. It is recommended that this document be used in conjunction with shelving that has been manufactured to ANSI MH 28.1, 1982, and installation instructions, drawings or manuals supplied by the manufacturer.

This guide is intended to be used only as reference and does not imply any warranty or responsibility by any of the member companies, the SMA or by The Material Handling Institute, Inc. Further, these following guidelines do not assure compliance with applicable federal, state, or local regulations and codes.

## COMMENTARY

The proper application of any product requires that it be fit for the intended use. The application of shelving requires the design of adequate bracing for structural stability. The considerations that follow are by no means all-inclusive, but represent some of the more common considerations when designing shelving. Therefore, these considerations must be taken into account when applying shelving.

This guideline is not intended to be a textbook but has been developed only to alert the user to the need for a formal approach to adequate bracing to prevent failure. The shelving manufacturer's staff engineers or consulting engineers should provide specifics for any condition.

## DEFINITION OF BRACING

Bracing, as related to shelving, is a physical member usually made of steel—flexible or rigid—whose function is to support, sustain, buttress, prop or bolster the structure surrounding it in an upright or plumb position.

# PURPOSE OF BRACING

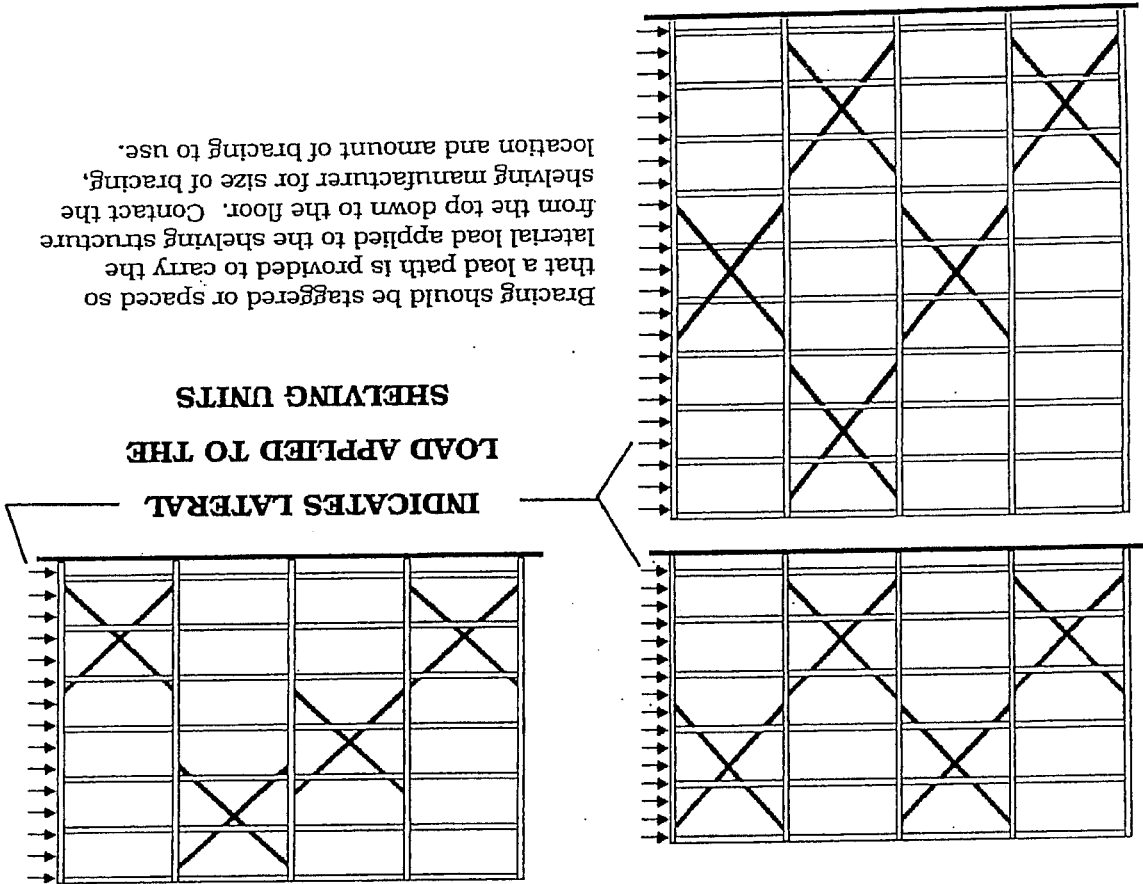
There are two primary reasons to adequately brace a shelving storage structure.

1. To provide stability and resistance against lateral (horizontal) forces induced by the following possible conditions.

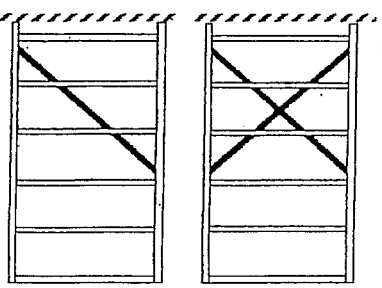
- A. Out of plumb: While the ANSI specifications restrict out of plumb to 1 inch in 10 feet, this small allowance will create a lateral force. (About 0.833% of the vertical dead load plus live load in each unit of shelving.) Out of plumb is usually caused by uneven floors and minor looseness or flexing of connections.
- B. Other external forces such as wind (if outdoors) and seismic forces; if a structure is to be designed to resist possible earthquake or wind forces, the lateral load may be of such magnitude that additional bracing is required.
- C. Impact by carts, jacks, vehicles: These vehicles impart load factors and forces that are difficult to define in quantitative terms. However their existence should be considered and provided for if the installation is adjacent to high-traffic areas. (The shelving itself being hand loaded.)

2. To provide for post stiffness.

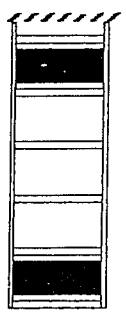
The ability of the shelving post to carry gravity loads is heavily affected by the "effective" unbraced length of a post. Bracing reduces side sway or movement of the shelving structure. It also can substantially reduce the effective unbraced length of the post, thereby allowing the post to carry more load. The type of bracing used in the shelving structure is critical in determining the effective unbraced post length. Analysis should be conducted for every unusual situation.



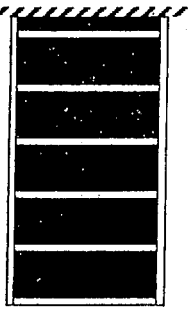
# TYPES OF BRACING AND EXAMPLES



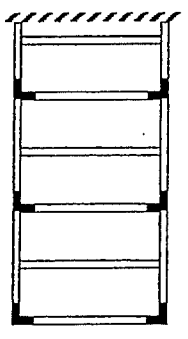
1. Cross bracing is generally used for open-type shelving (side and back sway braces). Usually one or two diagonal bars at various locations in the shelving structure, depending on conditions.



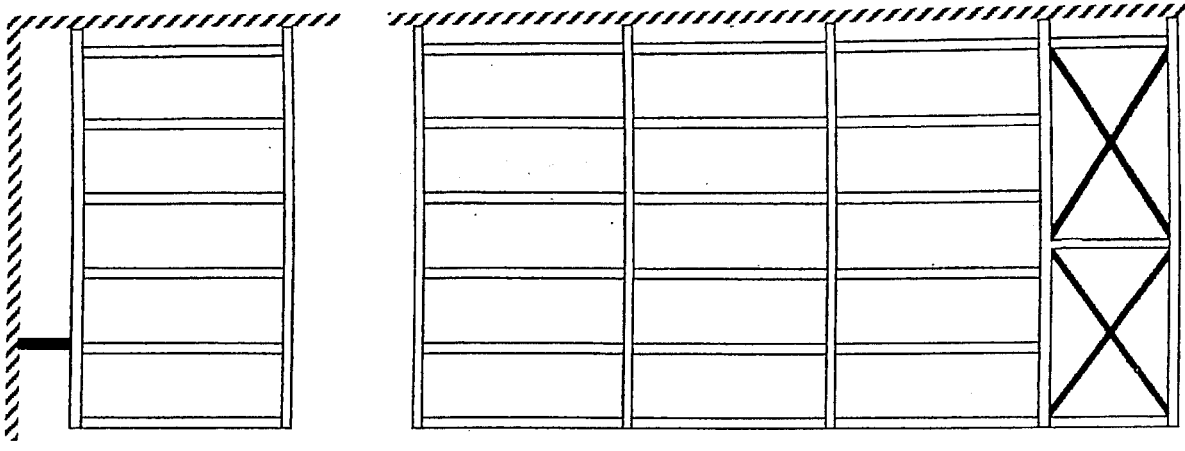
2. Partial panel (panel sway brace). Usually a light gauge narrow panel used to make an open upright assembly.



3. Full panel, also referred to as closed shelving (closed upright and back). Usually light gauge, running from bottom to top of shelving unit. Full panels should be attached to the columns at sufficiently close intervals to be effective as a bracing element.



4. Moment connection (corner angle brace, spreaders and beams). Usually a corner brace rigidly located at post to shelf position. Spacing of moment connections may vary depending on load conditions. Contact shelving manufacturer for recommendations.



5. Anchor to rigid structure "towers" or building (if building has been designed to take this load).

## BRACING RECOMMENDATIONS AND OTHER CONSIDERATIONS

1. When checking for adequacy of connection and members, the bolt, brace and post it attaches to should be analyzed to determine the weakest member.
2. Very special attention should be given to a "pass thru" (no sway bracing) situation, as this makes the design of adequate bracing a much more complex consideration. This is the moment connection type of bracing.
3. Bracing should be attached as close to the bottom of posts as possible.
4. To derive the best benefit from sway bracing, it should connect the posts as close to shell levels as possible.
5. Top ties are normally used where overturning of units is evident. The top tie provides horizontal stability by connecting single faced units to double faced units which normally corrects the overturning problem.
6. Cross aisle supports used in two level or multi-level shelving provides a labyrinth, which connects all shelving units together by the attachment of decking material in the aisles to form one large mass which helps to stiffen the installation.
7. Floor anchors are used to prevent movement or overturning due to seismic considerations.
8. Also, upright assembly anchoring should be used when the top loaded shelf is over 8' 3" (2.5m) high and the height to depth ratio of shelving exceeds four (4).