Secure and Protect
Non-Structural Earthquake Hazard Mitigation in the Office and Home

Introduction

When the earthquake shaking starts, your first action should be to duck, cover, and hold. In other words, get under something sturdy, like a table or chair, and hold on. If this is not an option, move away from windows toward the interior of the room. However, when the shaking starts you won't be the only thing moving. Objects in and outside the building or home, such as light fixtures, lamps, computers, bookshelves, signs, chimneys, plus many others, will also be moving. They could be falling, toppling, sliding, rolling or even flying. These objects are considered the non-structural components of a building. Not only is there the potential for these objects to be damaged, but their movement can cause damage, injury or even loss of life. Often the most damage, injury and loss of life during an earthquake are the result of the movement of the non-structural components. Therefore, it is important to move quickly to protect yourself. Duck, cover, and hold looks easy on paper and even during practice, and practice almost makes perfect. However, when the shaking begins, it might not be as easy to protect yourself in a timely manner as you think.

Never fear. There is something that you can do. If objects are secured, either with bolts, velcro, straps, or other devices, then the urgency to duck, cover and hold is not as great, although still necessary. Damage, injury and loss of life from the earthquake would be greatly reduced if these objects were secured. In addition, evacuation, if necessary, will run smoother if there is less debris along the evacuation routes. Securing items is often inexpensive and easy to do. If securing is not an option, objects can be placed in a safer location, as long as its movement would not hinder evacuation. For example, heavy objects could be moved to lower shelves or a file cabinet could be moved away from a doorway.

Below you will find a checklist of objects typically found in offices and homes, complemented by diagrams illustrating how to secure them. The checklist is divided into different sections depending on the level of expertise required to inspect and secure the objects. Most people in an office and home would probably focus on the Equipment and Furnishings section.

By securing these objects and practicing the duck, cover and hold, you will go a long way in protecting yourself from the earthquake. Remember it is not if an earthquake will strike but when. Contact Mark Darienzo, Earthquake Program Coordinator, State Office of Emergency Management, at 503-378-2911 ext. 22237 or mdarien@oem.state.or.us for further information.

Earthquake Non-Structural Hazard Checklist

A. Inspections and securing of items, unless otherwise noted, can be made by office staff and homeowners.

1. ***** indicates that inspection should be made by qualified staff or contractor.

2. **A/E** indicates an architect or engineer should be consulted.

B. Key to diagrams illustrating solutions are in parentheses. Solution diagrams are located at the end of the checklist.

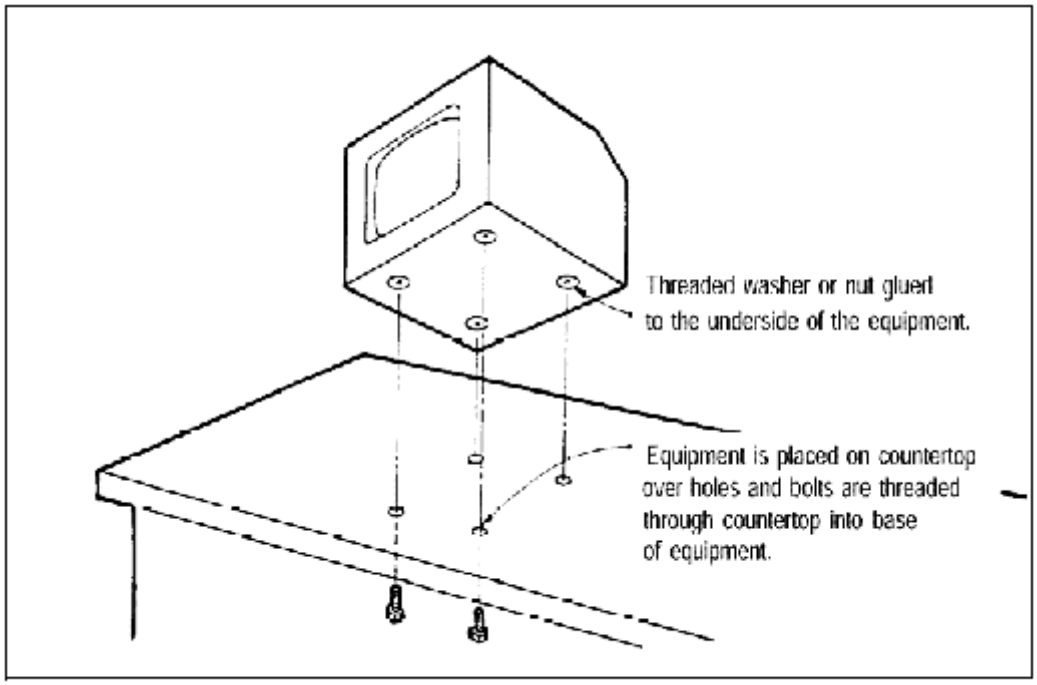
C. **Bold** indicates a life safety hazard

D. If items can not be secured, they should be moved to a location where movement would not cause injury or be a barrier to evacuation.

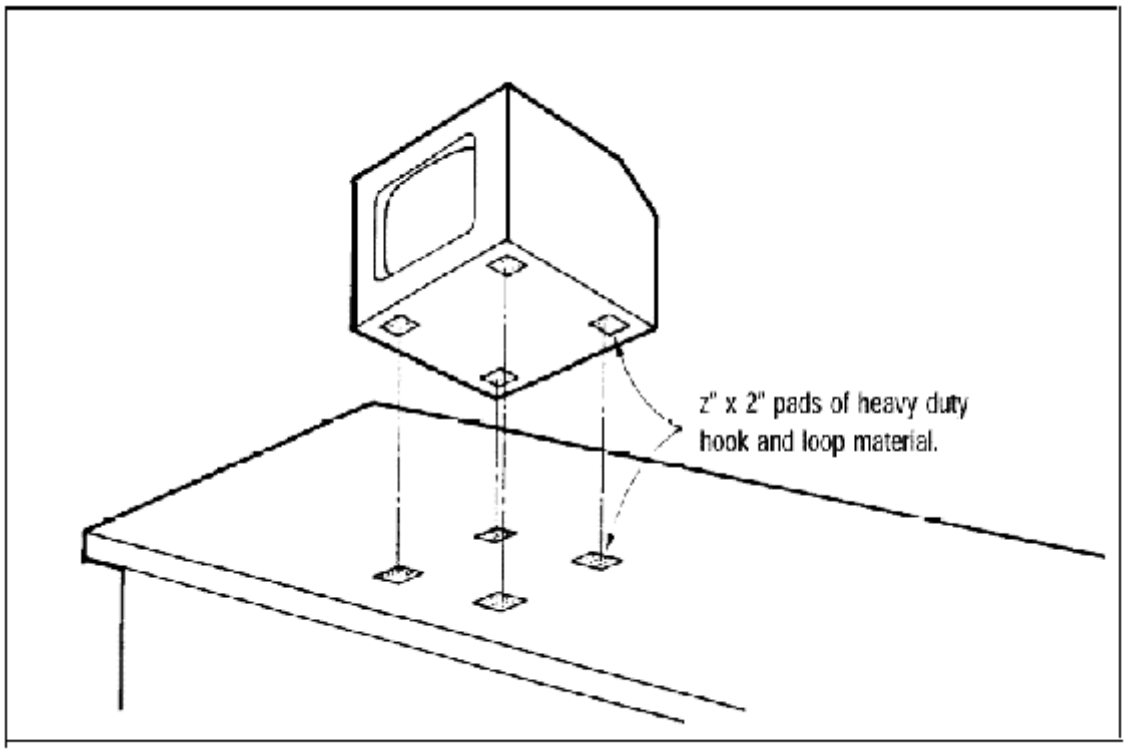
NOTE: **Attaching objects to walls may require permission of the building owner and may require an inspection by a qualified individual if the wall is not load bearing.**

Section EF (EQUIPMENT AND FURNISHINGS)			yes	no
1.	Are desk or table top computers, printers, etc. secured? (EF1 a or b)	**9**	**9**	
2.	**Are the tops of 4-5 drawer file cabinets secured to wall or to each other?** (EF2)		**9**	**9**
3.	Do file cabinet drawers have latches? (Provide latches)	**9**	**9**	
4.	Are large and heavy office machines restrained and located where they will not slide a few inches, fall off counters, or block exits? (EF3a or b)	**9**	**9**	
5.	Are wall-mounted objects over 5 lbs connected to structural framing? (EF4)	**9**	**9**	
6.	**Are tall cabinets and bookshelves attached to the wall or to each other?** (EF5)		**9**	**9**
7.	Are desks or tables located such that they will not slide and block exits? (Move them)	**9**	**9**	
8.	**Are tall storage racks cross-braced in both directions or, for racks significantly taller than wide, are there large anchor bolts connected to the concrete slab?** (EF6)		**9**	**9**
9.	Are heavy or sharp wall decorations securely mounted, with closed eye-hooks, for example? (EF4)		**9**	**9**
10.	Are valuable, fragile art objects or trophies protected against tipping over, breaking glass, or sliding off shelves or pedestals? (EF7)		**9**	**9**
11.	**Are refrigerators, ranges, candy/soda machines restrained by built in cabinetry or attachments to floor or wall?** (EF2)		**9**	**9**
12.	**Is floor-supported freestanding shop equipment secured against overturning or sliding?** (EF8)		**9**	**9**

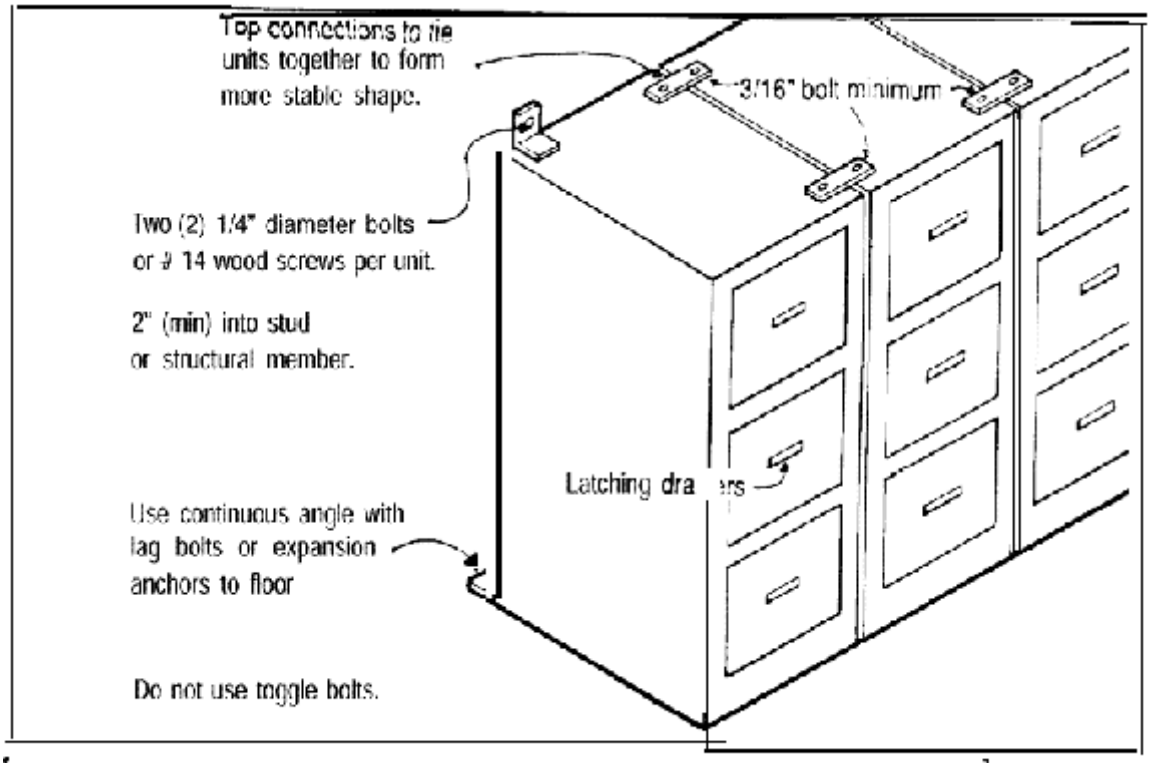
Section EF EQUIPMENT AND FURNISHINGS (cont.)	yes	no
13. Are fire extinguishers securely mounted? (EF9)	**9**	**9**
14. Are potted plants or heavy items on top of file cabinets or other high locations restrained? (EF10)	**9**	**9**
15. Are display cases protected against overturning or sliding off tables? (EF1)	**9**	**9**
16. Is freestanding equipment on wheels locked against rolling? (lock wheels)	**9**	**9**
17. **Have heavy objects been removed from the tops of shelves? (remove the objects)**	**9**	**9**



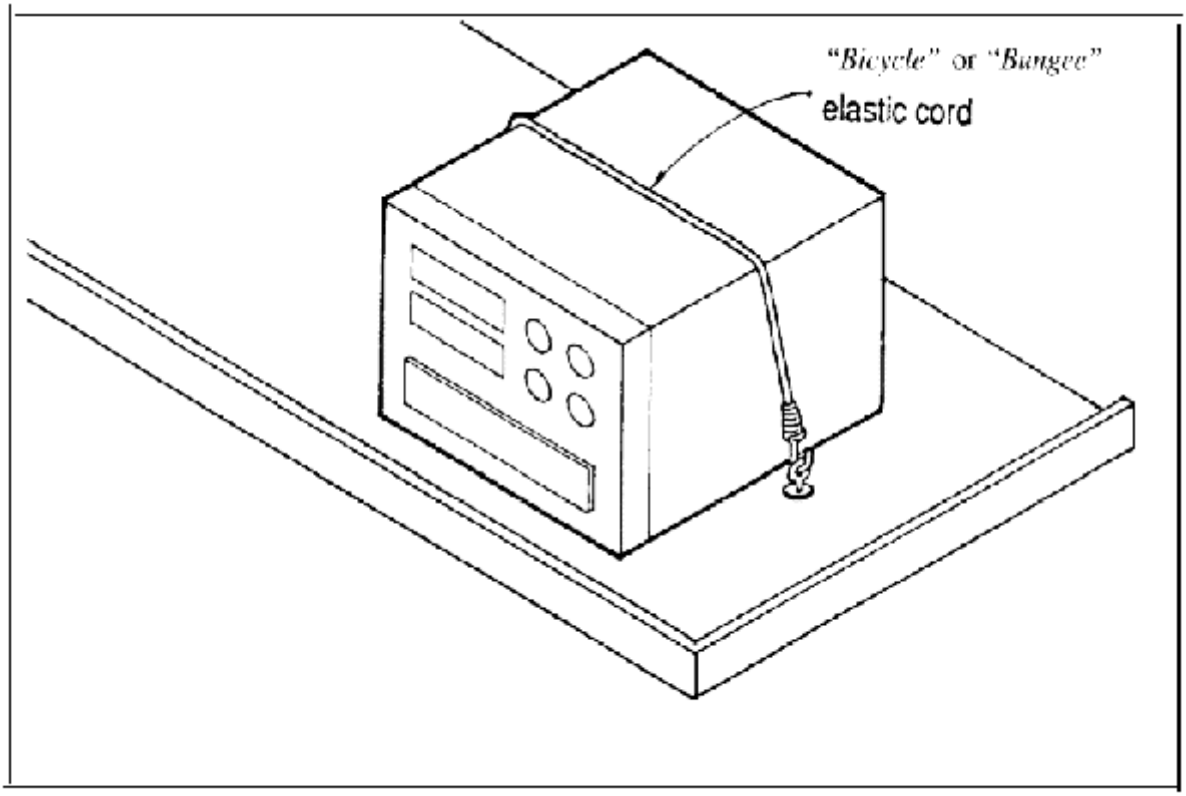
EF1 (a) - FIXED ATTACHMENT OF EQUIPMENT TO COUNTERTOP



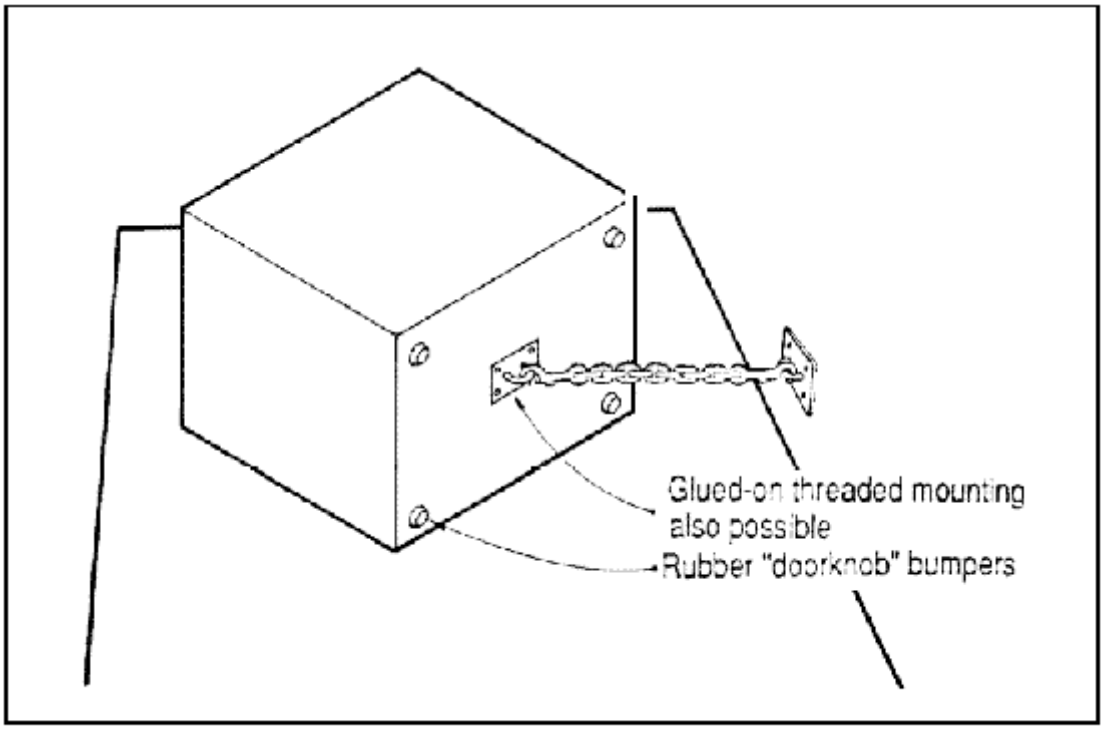
EF1(b) - REMOVABLE ATTACHMENT OF EQUIPMENT TO COUNTERTOP



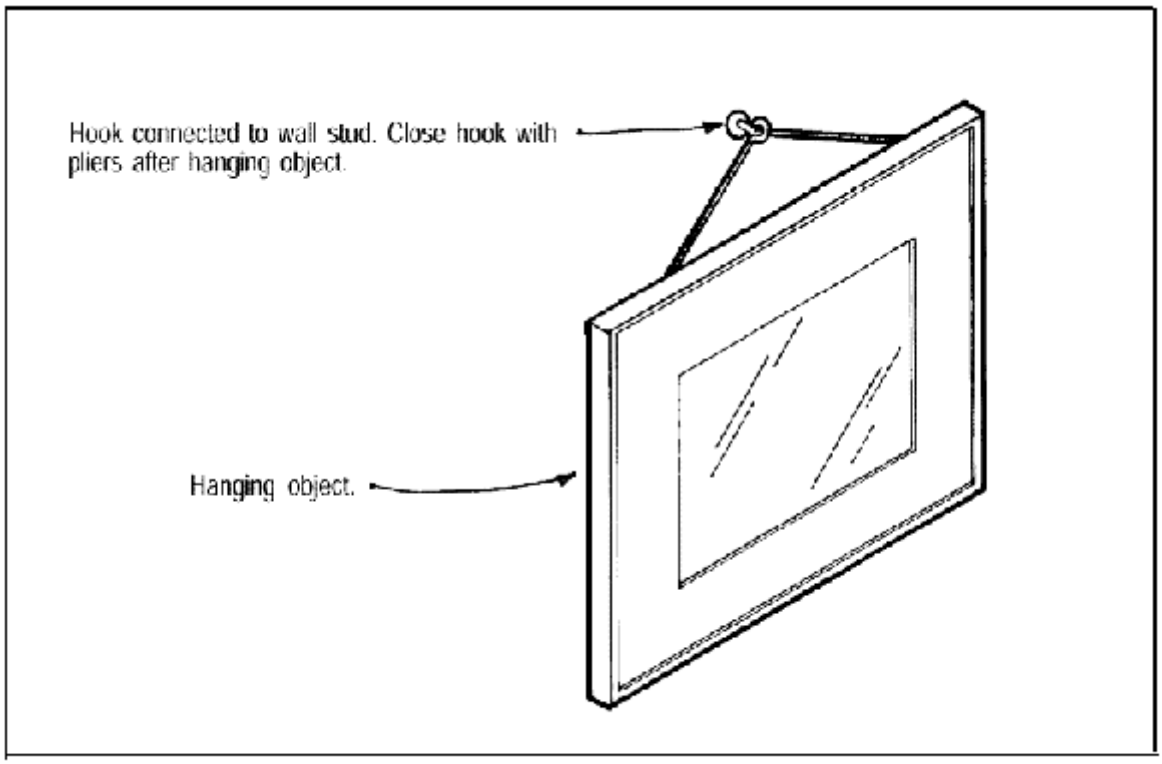
EF2 - CABINETS ATTACHED AT TOP, BOTTOM AND SIDES TO STRUCTURE



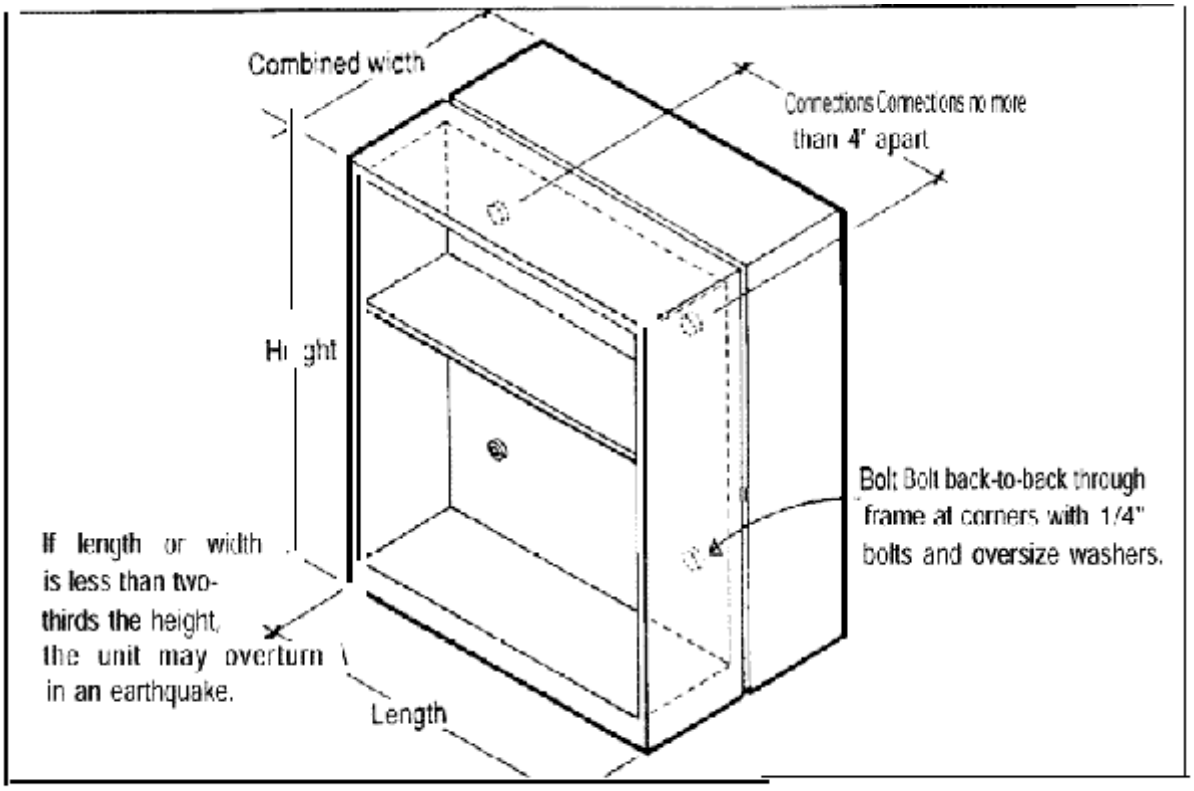
EF3(a) - TIE DOWN ATTACHMENT OF RADIO EQUIPMENT



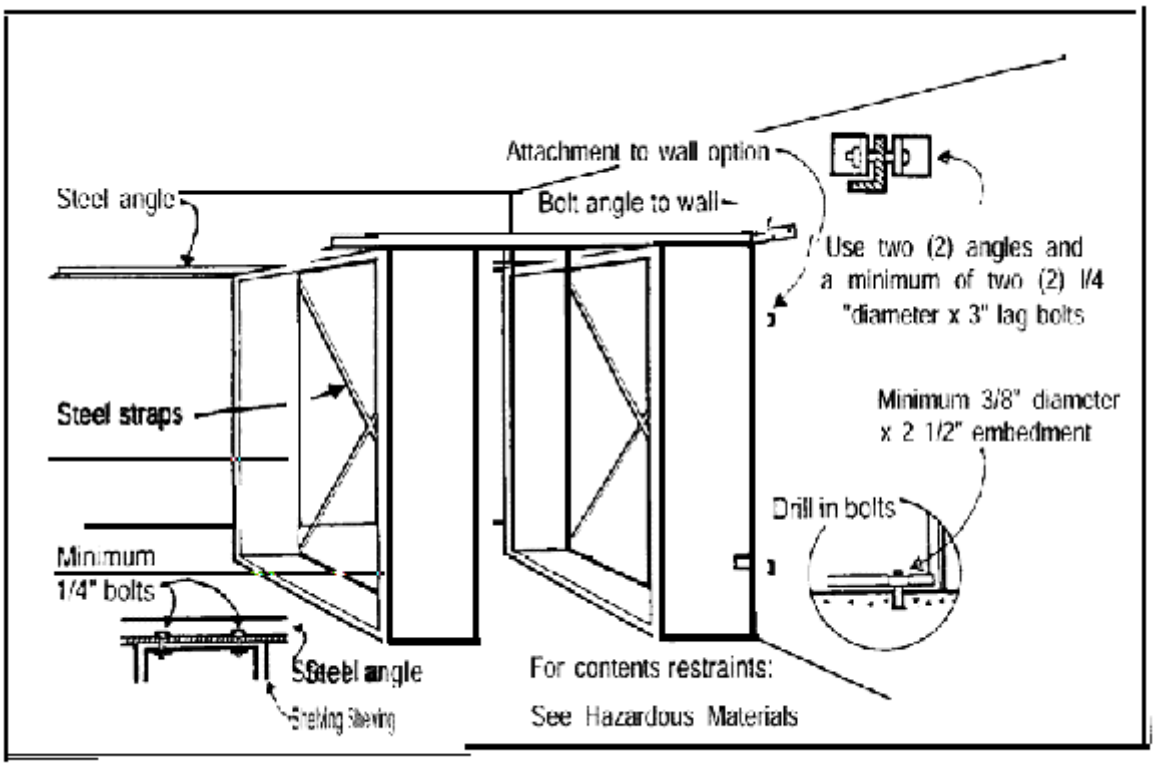
EF3(b) - DETACHABLE LEASH ATTACHMENT OF RADIO EQUIPMENT TO WALL



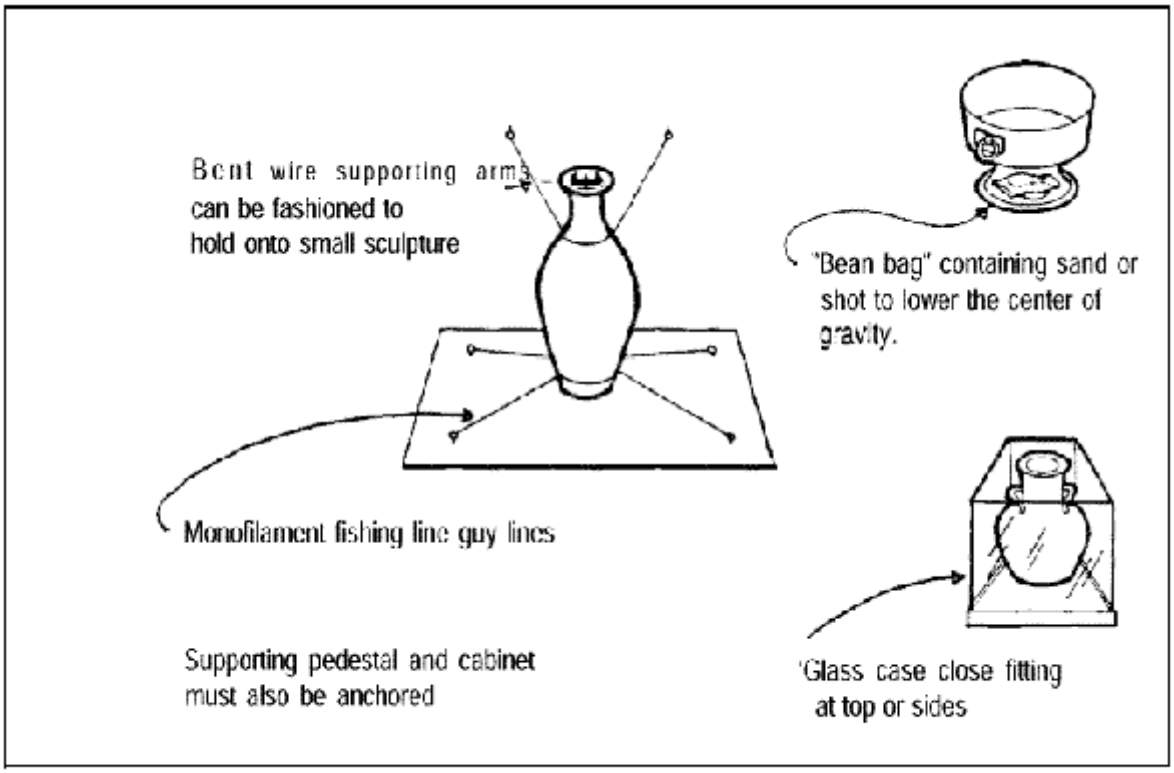
EF4 - ATTACHMENT OF SHELVES AND PICTURE FRAMES TO WALLS



EF5 - BACK-TO-BACK Attachment OF BOOKCASES TO PREVENT OVERTURNING



EF6 - BRACING OF LIBRARY SHELVING (STACKS)

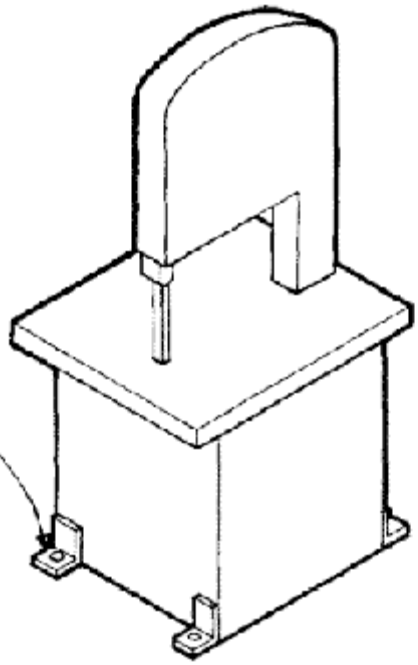


EF7 - BRACING OF FRAGILE DISPLAYS

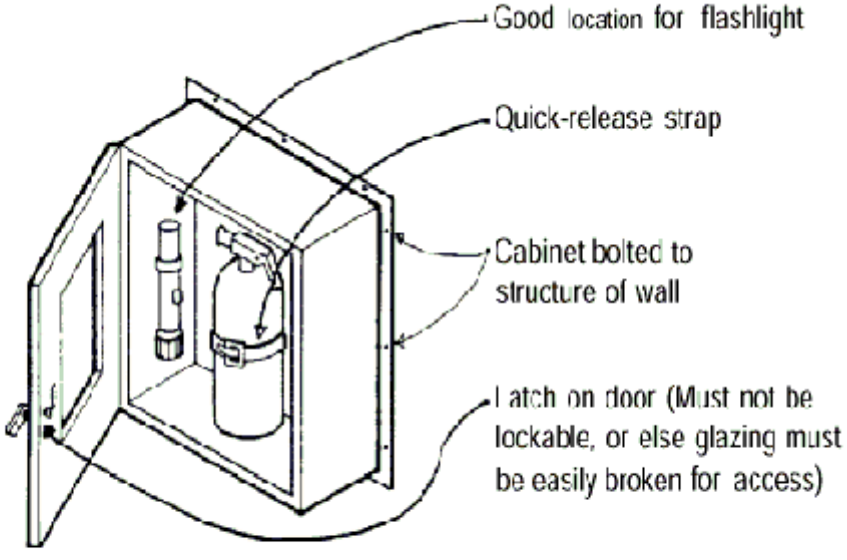
For objects under 1000 tbs.

For heavier equipment, seek an architect's or engineer's advice.

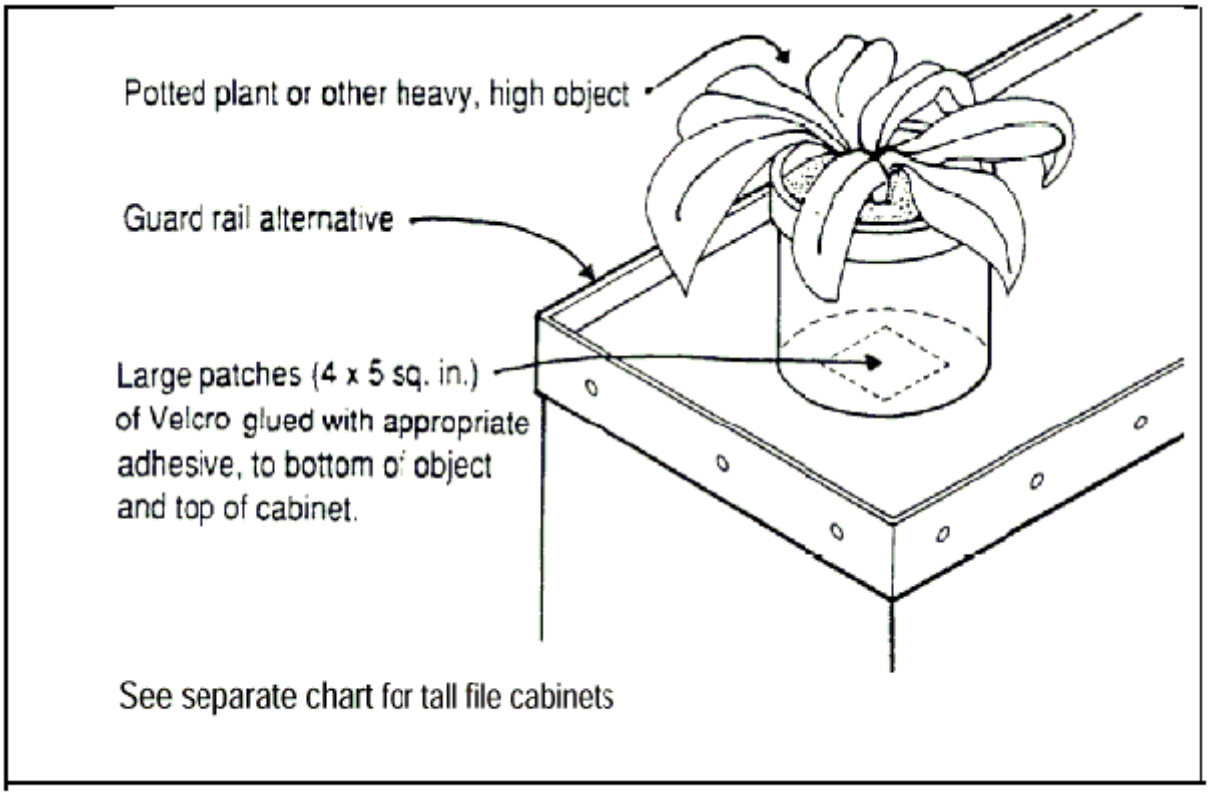
Minimum 1/2" wide x 3" embedment expansion anchors at each corner. Torque test to 30 foot- pounds.



EF8 - BOLTING OF SHOP EQUIPMENT TO FLOOR

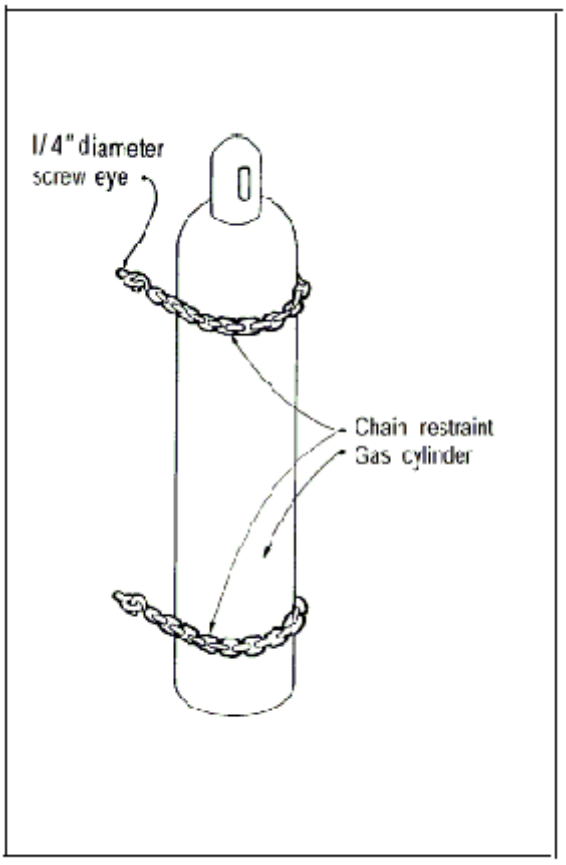


EF9 - ATTACHMENT OF FIRE EXTINGUISHER TO WALL

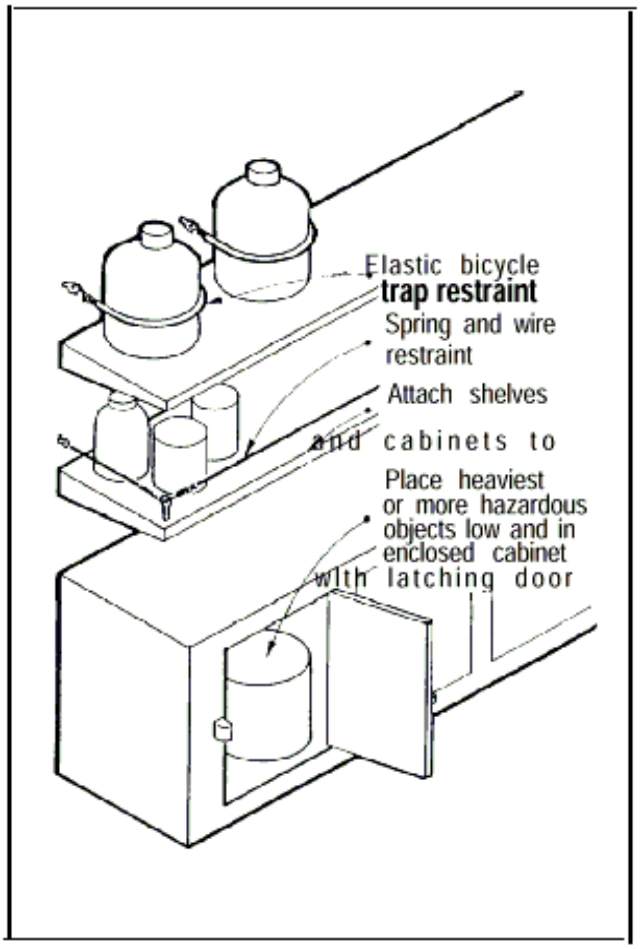


EF1O - GUARDRAILS TO CONTAIN FALLING OBJECTS

Section HM (HAZARDOUS MATERIALS)	yes	no
1. Are compressed gas cylinders secured top and bottom with a safety chain? (HM1)	9	9
2. Are laboratory chemicals on shelves restrained? (HM2)	9	9
3. Are containers of hazardous materials stored on braced storage rack or tall stacks? (provide secured storage)	9	9
4. *Are gas tank legs anchored to a concrete footing or slab? (HM3) [A/E]	9	9
5. *Do gas pipes have flexible connections? (provide flexible connections) [A/E]	9	9

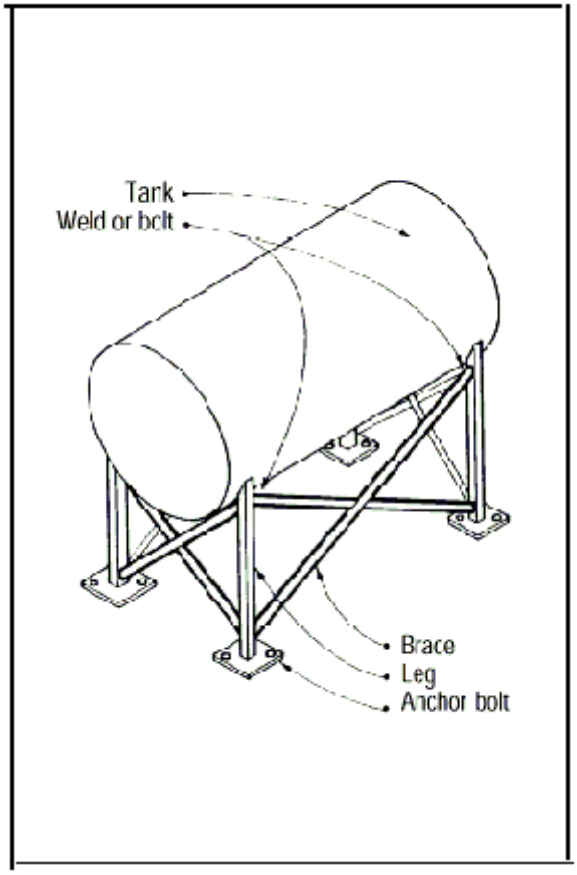


HM1-SAFETY CHAINS FOR BOTTLED HIGH PRESSURE GASES



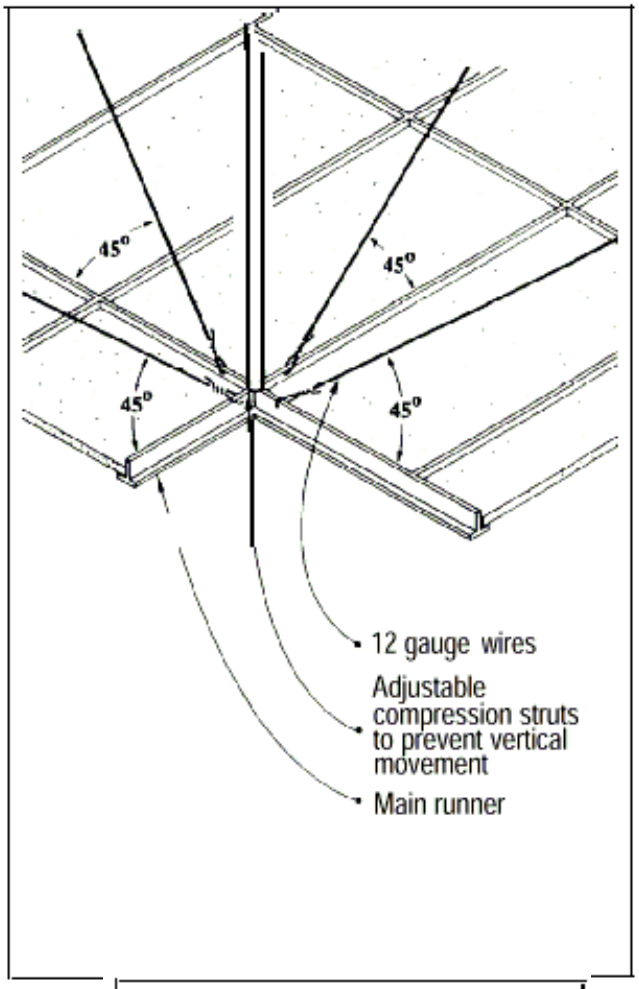
HM2-SAFETY RESTRAINTS FOR CHEMICAL STORAGE

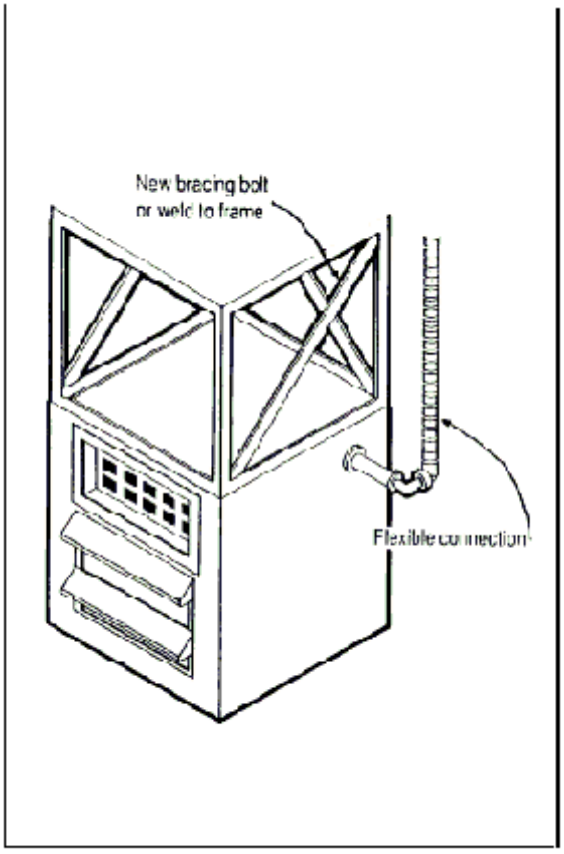
FM3 - SEISMIC BRACING FOR ELEVATED TANKS



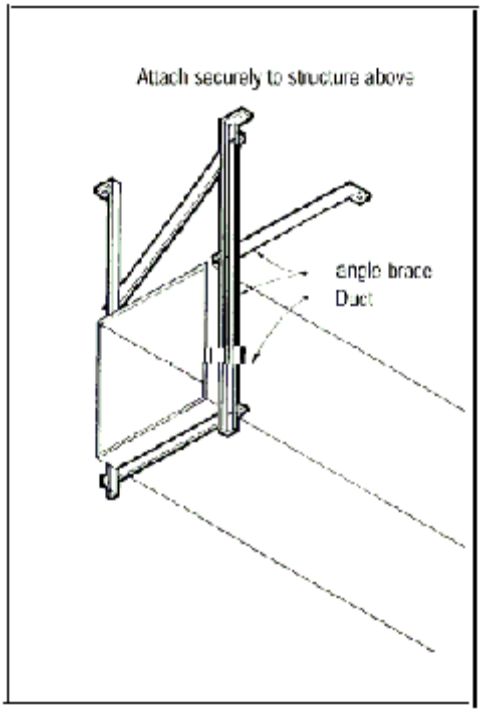
Section OE *(OVERHEAD ELEMENTS)	yes	no
1. Do pendant mounted light fixtures or chandeliers have safety cables? (OE4)	**9**	**9**
2. Will hanging light fixtures swing freely, not hitting each other if allowed to swing 45 degrees minimum? (Fix or remove)	**9**	**9**
3. Are sound system speakers or televisions in elevated locations anchored to structure? (secure them)	**9**	**9**
4. Do hanging plants, mobiles, or displays have closed eye-hooks, and can they swing freely 45 degrees? (Secure objects in safe locations)	**9**	**9**
5. Could chandeliers swing freely, not hitting each other, or windows, roof trusses, or walls? (immobilize or move chandeliers)	**9**	**9**
6. Are air distribution grills or diffusers mounted? (provide anchorage)	**9**	**9**
7. Do large metal air distribution ducts, especially those suspended a few feet, have diagonal bracing? (OE3)[A/E]	**9**	**9**
8. Does the suspended ceiling have diagonal bracing wires? (OE1) [A/E]	**9**	**9**
9. Are the fluorescent light fixtures merely resting on the hung ceiling grid without another support? (OE3) [A/E]	**9**	**9**
10. Are decorative ceiling panels or latticework securely attached? (OE1)	**9**	**9**
11. Will spotlights remain securely attached if shaken? (secure them)	**9**	**9**
12. Are suspended space heaters, especially gas fired, braced and/or have flexible gas connections? (OE2) [A/E]	**9**	**9**

0E1 -SEISMIC BRACING FOR SUSPENDED CEILINGS



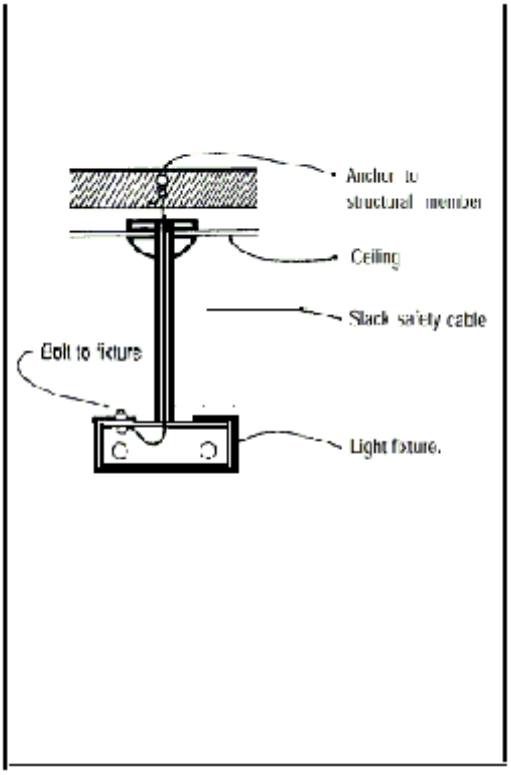


OE2- SEISMIC BRACING FOR SUSPENDED UNIT HEATERS



OE3 - SEISMIC BRACING FOR HVAC DUCT

OE4 - SAFETY WIRE FOR PENDANT LIGHT FIXTURE

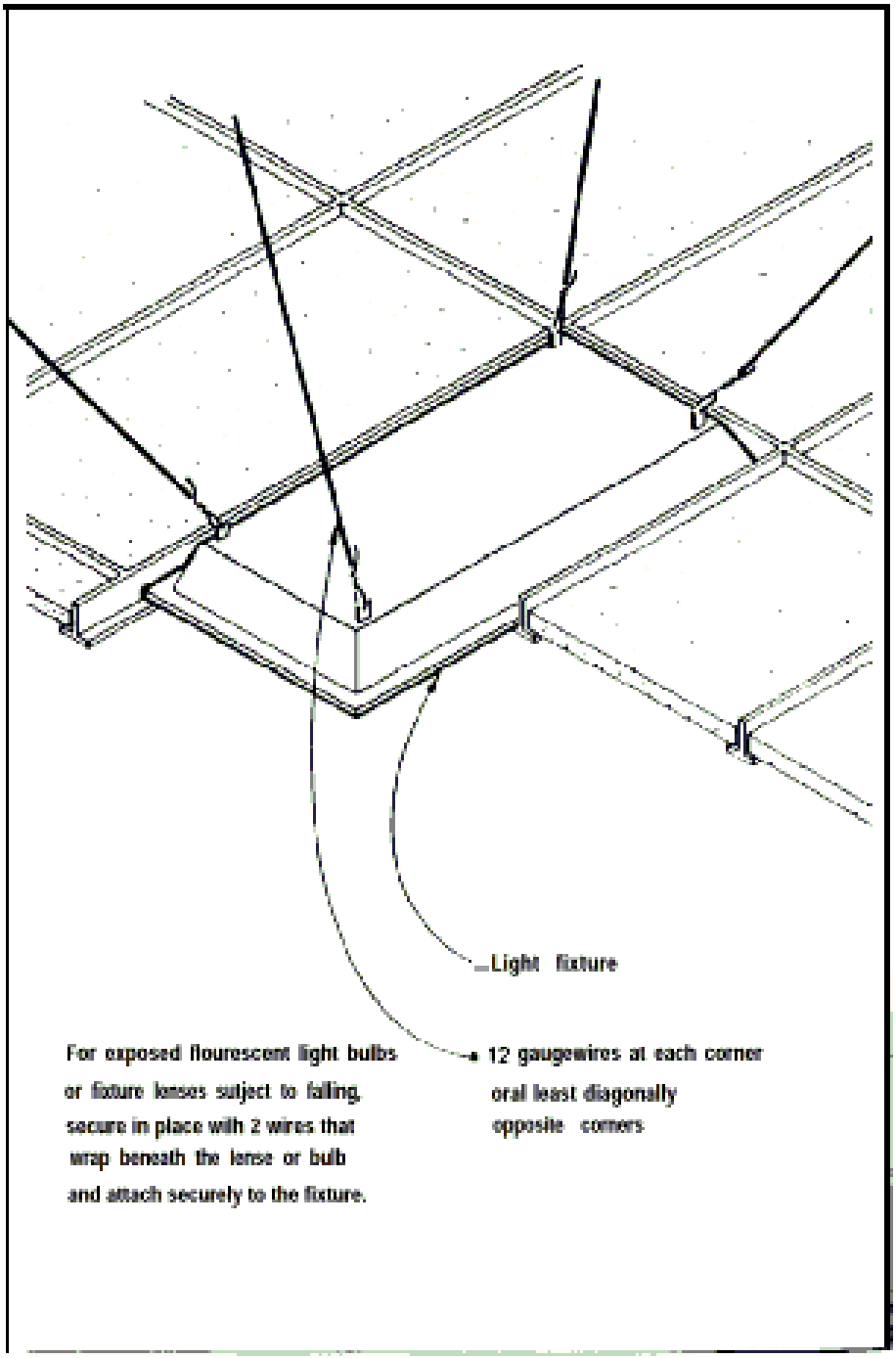


Section EE *(ELECTRICAL EQUIPMENT) yes no

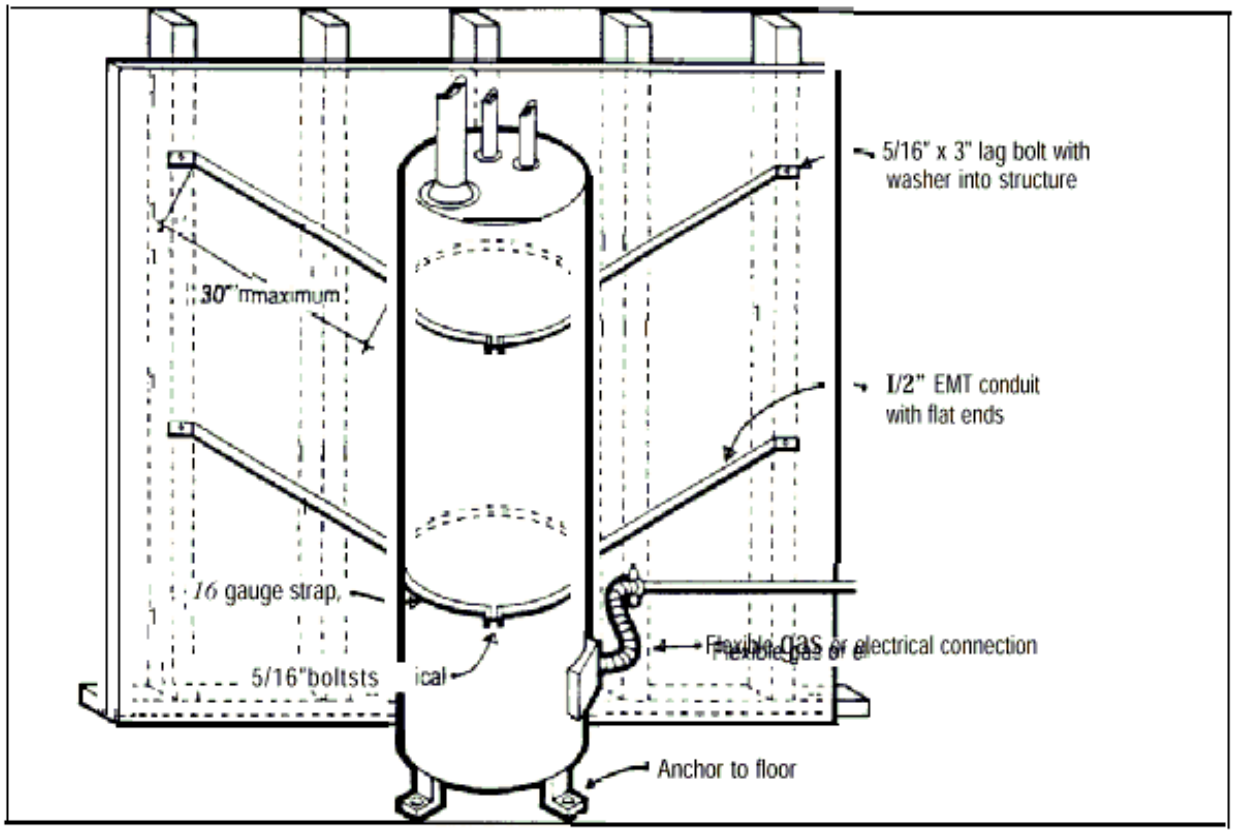
1. Are fluorescent light bulbs and lenses fastened securely? **9** **9**
(EE1)

2. Is essential communications equipment secured? **9** **9**
(secure it)

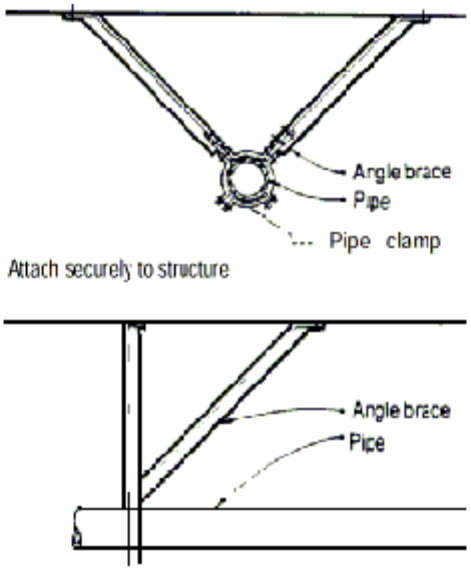
EEI - SEISMIC SAFETY WIRES FOR LIGHT FIXTURES



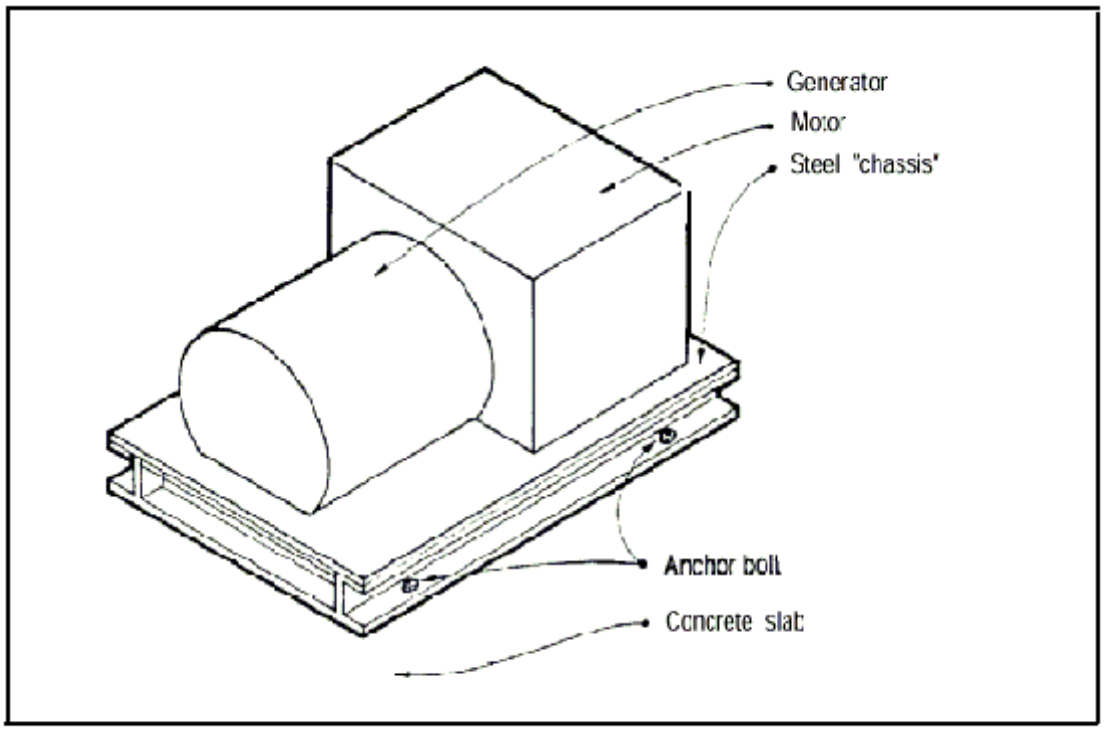
Section ME *(MECHANICAL EQUIPMENT)		yes	no
1.	Are the water heaters restrained? (ME1)	9	9
2.	Is the furnace or boiler restrained? (EF8) [A/E]	9	9
3.	Are large diameter pipes braces or do pipes that cross expansion joints have accommodation for movement? (ME2) [A/E]	9	9
4.	Are fans, chillers, pumps, or other heating-venting-air conditioning equipment-typically found in mechanical rooms-restrained or mounted correctly? (ME3 a or b) [A/E]	9	9
5.	Do the fire sprinkler risers have a v-brace to the wall, and do the large diameter sprinkler pipes have diagonal braces to the structure above? (ME2) [A/E]	9	9



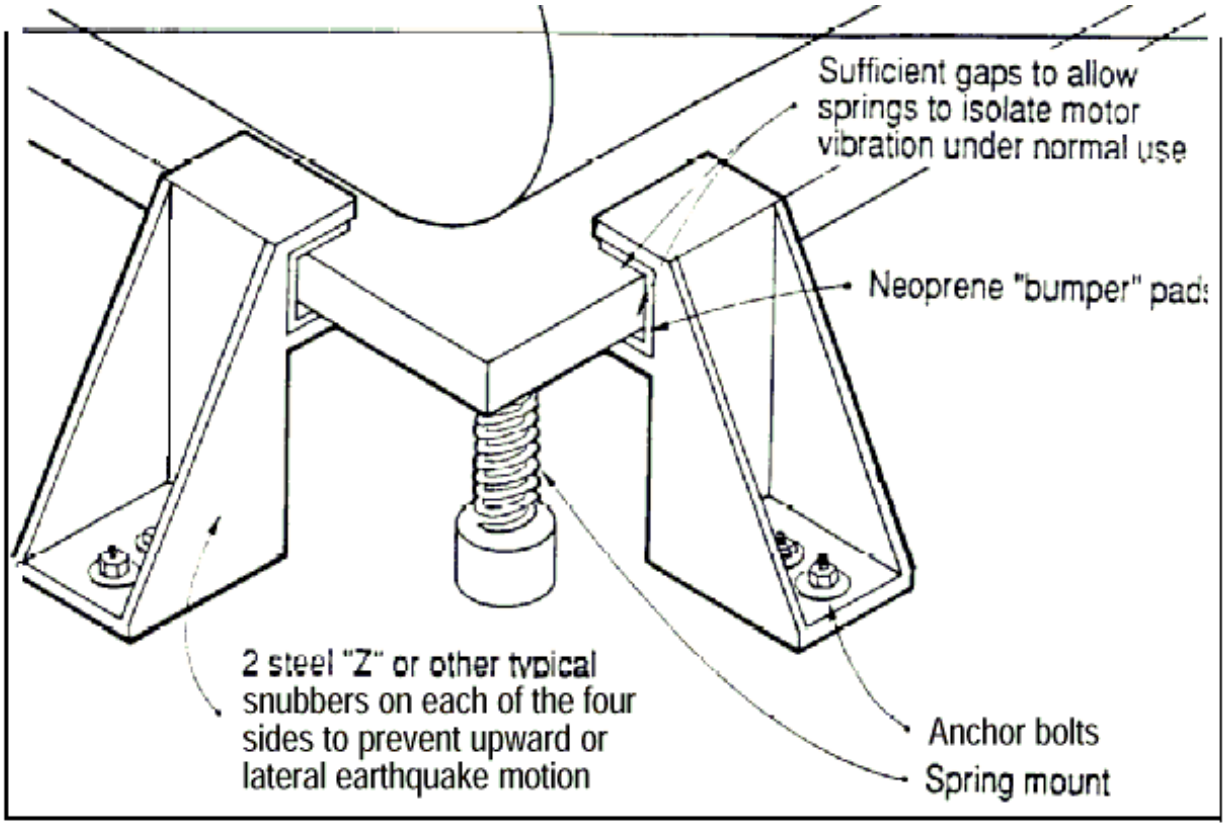
ME1 - **SEISMIC BRACE SYSTEM FOR HOTWATER HEATERS]**



ME2 - SEISMIC BRACING OF PIPING 1



ME3(b) - ANCHOR BOLT AND CHASSIS SYSTEM FOR MECHANICAL EQUIPMENT



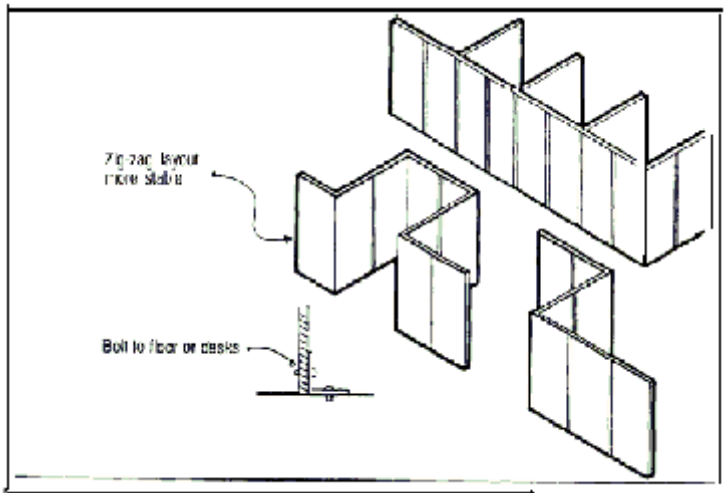
ME3(a)- SEISMIC SNUBBERS AND SPRING MOUNT FOR MECHANICAL EQUIPMENT

Section PA *(PARTITIONS) yes no

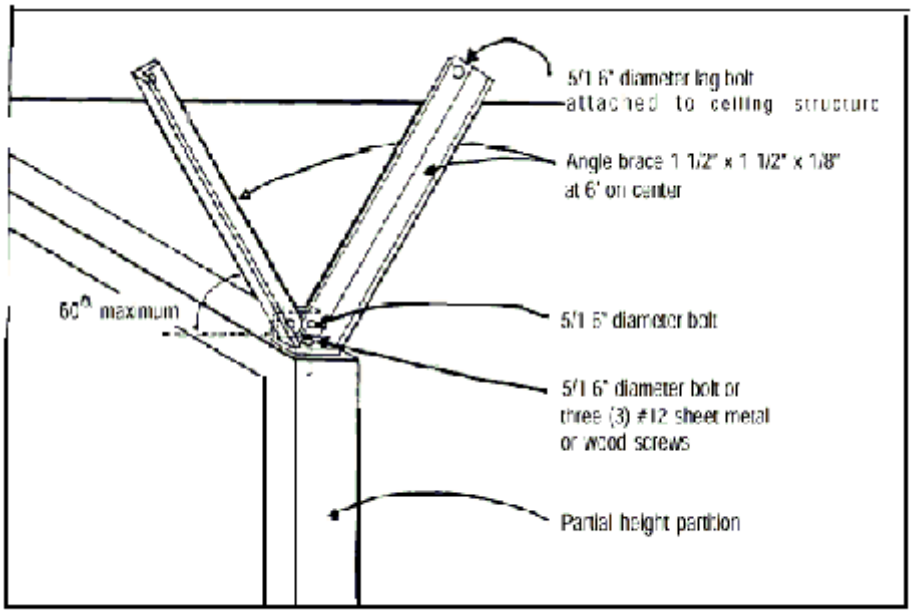
1. Are freestanding, movable, partial-height partitions-especially if supporting bookshelves-adequately braced? (PA1) **9** **9**

2. Are light-weight drywall partitions, that extend as high as the hung ceiling, braced or supported by the structure above, particularly if these partitions are used as lateral support for tall shelving or cabinets? (PA3) [A/E] **9** **9**

3. Are the clear panels in partitions made of plastic or safety glass? (Replace with shatter-proof materials or apply shatter-resistant film) **9** **9**



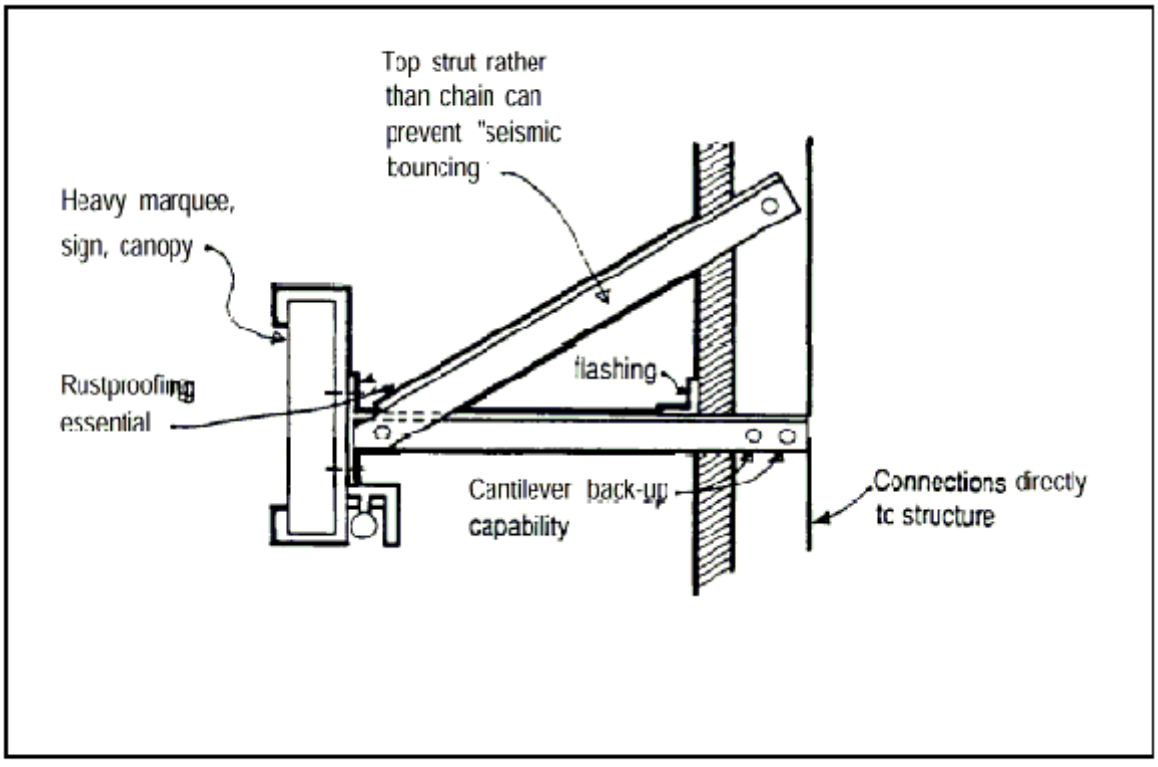
PA1 - INTERLOCKING ARRANGEMENT FOR SEISMIC STABILITY



PA2 - SEISMIC BRACING OF NON-STRUCTURAL PARTITIONS AND ROOM DIVIDERS

Section W *(WINDOWS)	yes	no
1. Are the large panes made of safety glass, and is it known if the mounting of the panes was designed by an architect/engineer to accommodate expected seismic distortion of the surrounding structure? (Apply shatter-resistant film)	**9**	**9**
2. Are transoms (glass panes over doors) safety glass? (Apply shatter-resistant film)	**9**	**9**

Section EE *(EXTERIORS)		yes	no
1.	Are decorations or appendages adequately attached? (E1) [A/E]	9	9
2.	Are statuary or decorative objects anchored? (E1) [A/E]	9	9
3.	Are tall backboards or fences supported by pressure-treated wood posts or galvanized metal posts? (Provide anchorage to ground)	9	9
4.	If large trees are leaning or in poor health are they supported? (Reinforce or remove)	9	9
5.	Are signs adequately secured, especially if heavy? (E1)	9	9



EI - BRACING OF CANTILEVERED MARQUEE OR SIGN