Section 4
FALL PROTECTION

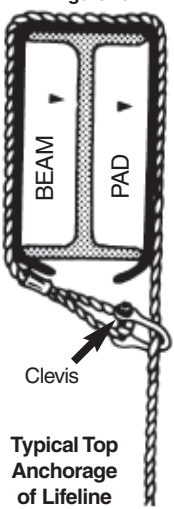
General Requirements

Fall protection is required when a worker is exposed to a fall hazard (working more than 6 ft (1.8 m) above a lower level and an opening more than 12 in. (305 mm).

There are three ways of controlling fall hazards. Elimination of the fall hazard should be the first consideration. The second consideration is a guard rail system, and the third is a personal fall arrest system.

4.1 Personal Fall-Arrest System

Figure 4a



Typical Top Anchorage of Lifeline

Figure 4b (next page) shows the attachment of the body harness and shock-absorbing lanyard to the lifeline while working in the hoistway/wellway, and an example of typical top anchorage of the lifeline is shown in Figure 4a.

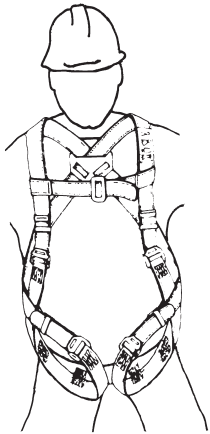
(a) Only company-approved lifelines, shock-absorbing lanyards and body harnesses shall be used.

(b) All fall protection components shall be compatible.

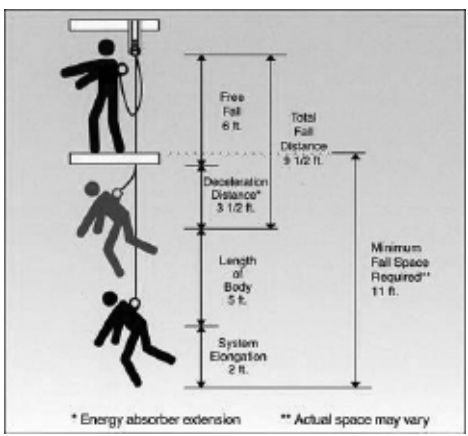
(c) Lifelines shall be protected against being cut or abraded. Only synthetic or wire rope shall be used for lifelines.

(d) Lifelines shall be installed before working in the hoistway/wellway and shall run the full length of the hoist way/wellway and be so arranged to

Figure 4b



Full-Body Harness



permit tying off before entering the hoistway/wellway. Prior to use the personal fall-arrest system shall be approved by a **Competent Person**.

(e) Only one worker is permitted on a vertical lifeline, and that lifeline shall have a breaking strength greater than 5000 lbs (2268 kg) after it has been attached to the anchorage point.

(f) Shock-absorbing lanyards shall be anchored to the lifeline and shall be above shoulder height so that any fall shall not exceed 6 ft (1.8 m). When determining fall heights be sure to use proper fall clearance distances (refer to figure 4b). Lanyards shall be connected to a vertical lifeline by means of a rope grab; the lanyard shall not be attached directly to the lifeline.

(g) Lifelines, harnesses and shock-absorbing lanyards subjected to impact loading shall be immediately removed from service. They shall be eliminated and destroyed for employee safeguarding.

(h) Tying to the hoist line is prohibited. Proper rope grab shall be used.

(i) Fall protection shall be used on top of a completed elevator car where there is a fall hazard and the car is secured from movement.

(j) On a completed car secured from movement, tie off when exposed to a fall hazard. Do not position yourself where there is fall hazard.

(k) Replace personal fall protection equipment at intervals recommended by the manufacturer.

(l) Before using a body harness, shock-absorbing lanyard and lifeline, inspect them carefully each time for signs of wear or damage.

4.1.1 Inspection and Maintenance Checklist

To maintain service life and high performance, personal fall arrest systems shall be inspected before each use. Replace the personal fall arrest system if any defective conditions are found.

- ❑ *Webbing*. Grasp the webbing with your hands 6 in. (150 mm) to 8 in. (200 mm) apart. Bend the webbing in an inverted "U". The resulting surface tension makes damaged fibers or cuts easier to see. Follow this procedure the entire length of the webbing, inspecting both sides of each strap. Watch for frayed edges, broken fibers, pulled stitches, cuts, burns and chemical damage.
- ❑ *D-Rings/Back Pads*. Check D-rings for distortion, cracks, breaks, and rough or sharp edges. The D-ring should pivot freely. D-ring back pads should also be inspected for damage.
- ❑ *Attachment of Buckles*. Attachments of buckles and D-rings should be given special attention. Note any unusual wear frayed or cut fibers or distortion the buckles or D-rings.
- ❑ *Tongue/Grommets*. The tongue receives heavy wear from repeated buckling and unbuckling. Inspect for loose, distorted or broken grommets. Webbing shall not have additional punched holes.
- ❑ *Tongue Buckle*. Buckle tongues shall be free of distortion in shape and motion. They should overlap the buckle frame and move freely back and forth in their socket. The roller shall turn freely on the frame. Check for distortion or sharp edges.
- ❑ *Friction and Mating Buckles*. Inspect the buckle for distortion. The outer bars and center bars must be straight. Pay special attention to corners and attachment points of the center bar.

Visual Indications of Damage to Webbing and Rope. The following indications refer to nylon and polyester webbing:

- ❑ *Heat*. In excessive heat, webbing becomes brittle and has a shriveled brownish appearance. Fibers will break when flexed. Harnesses made of these materials should not be used at temperatures above 180 degrees Fahrenheit.
- ❑ *Chemical*. Changes in color usually appearing as a brownish smear or smudge. Transverse cracks appear when bent over a mandrel. Loss of elasticity.
- ❑ *Molten Metal or Flame*. Webbing strands fuse together. Hard shiny spots appear. Hard and brittle feel.
- ❑ *Paint and Solvents*. Paint that penetrates and dries restricts movement of fibers. Drying agents and solvents in some paints cause chemical damage.

4.2 Guardrail Systems

General

OSHA compliant guardrail systems for car tops, open hoistways or escalator wellways shall have a top rail 42 in. ±3 in. (1067 mm ±76 mm) high, with a mid-rail 21 in. (533 mm) high at centerline and toeboards. 3-1/2 in. (90 mm) high, with no greater than 8 ft (2.4 m) between uprights and shall be capable of sustaining a force equal to 200 lbf (890 N) at the toprail, 150 lbf (667 N) at the midrail, and 50 lbf (222 N) at the toeboard. When 200 lbf (890 N) is applied, the top rail shall not deflect lower than 39 in. (991 mm) (See Figures c, d and e)

(a) OSHA compliant removable guardrail systems with toeboards shall be installed at elevator hoistways or escalator wellways typically by the General Contractor, after either rough or finished floors are in place.

(b) Signs shall be installed warning against removal. It is also recommended that a sign indicate “Caution: Workers in Hoistway.”

(c) After hoistways are enclosed, and before permanent doors are installed, openings shall be protected by removable guardrail systems (including toeboards).

(d) If it is necessary to remove the guardrails, be sure to replace them before leaving the area.

(e) Wire-rope guardrail systems are not recommended for guarding hoistways. Where used, post spacing shall not be greater than 8 ft (2.4 m) and they shall not deflect to a height less than 39 in. above the walking/ working level when a force of 200 lbf (890 N) is applied. Warning flags shall be attached every 6 ft (1.8 m), toeboards shall be provided and they must be easily removable for access to the hoistway at the terminal landings.

(f) If guardrails are not properly maintained in place, notify your Superintendent/Manager and the General Contractor's Superintendent immediately.

(g) On new installation, modernization, or major repair jobs where the general public is present, solid barricades at least 8 ft (2.4 m) high shall be used to fully enclose the work areas, open hoistways and escalator wellways. They shall be properly secured to avoid unauthorized access.

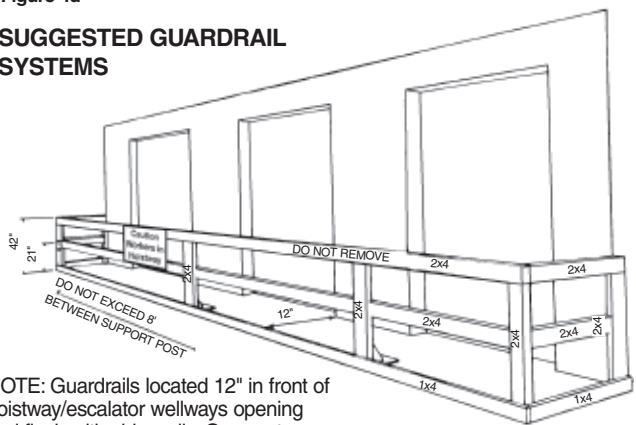
(h) When a guardrail is removed to perform a job, a personal fall-arrest system must be utilized when a fall hazard is present.

NOTE: The methods shown in Figures 4d and 4e are recommended as a means of providing maximum protection and flexibility during construction. Do not use during modernization or major repair jobs where the general public is present – use only solid barricades.

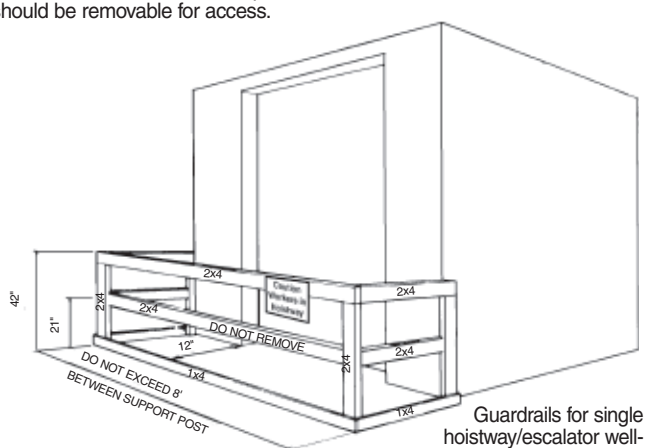
Figure 4c
Osha compliant cartop guardrail system

Figure 4d

SUGGESTED GUARDRAIL SYSTEMS



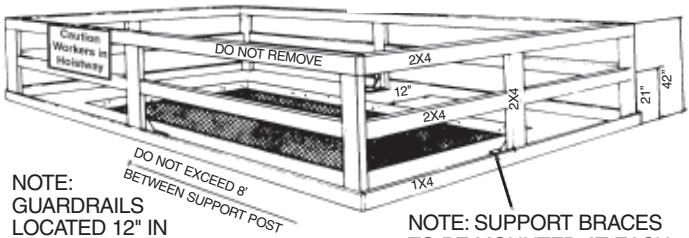
NOTE: Guardrails located 12" in front of hoistway/escalator wellways opening and flush with side walls. One part should be removable for access.



Guardrails for single hoistway/escalator wellways opening located 12" from opening

Figure 4e

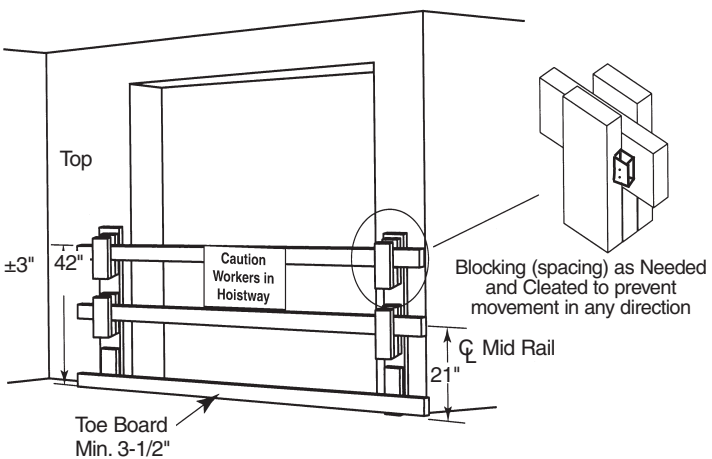
SUGGESTED GUARDRAIL SYSTEMS



NOTE: GUARDRAILS LOCATED 12" IN FRONT OF HOISTWAY/ ESCALATOR WELLWAY OPENING

NOTE: SUPPORT BRACES TO BE MOUNTED AT EACH SUPPORT POST

SHADED AREA ABOVE REPRESENTS CLEAR HOISTWAY/ESCALATOR WELLWAY OPENING

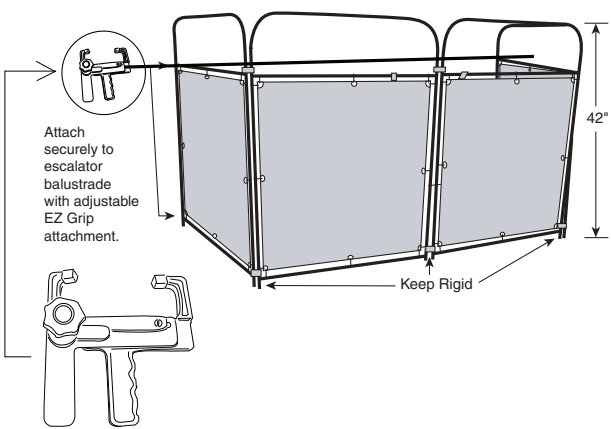


Removable Guardrails:
Space out from walls to permit Entrance Frame Installation.

4.3 Escalator/Moving Walk Barricades

(a) Barricades shall be positioned to completely surround the escalator/moving walk from public access.
(b) Barricades shall be positioned to surround, from public access, floor opening created when equipment access plate(s) are removed.
(c) Barricades shall be a minimum of 42 in. (1067 mm) high.
(d) Barricades shall be securely attached to the balustrades, handrails and/or floor.
(e) All sections shall be connected.
(f) A system shall be in place to keep the barricade rigid.
(g) See figure 4f.

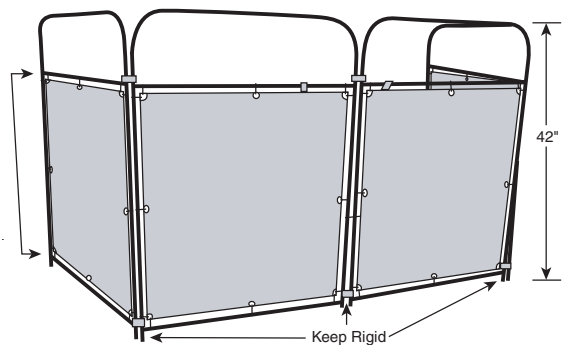
Figure 4f



4.4 Elevator Maintenance Barricades

(a) Barricade shall be positioned to restrict public access to the hoistway where doors are open greater than 5 in. (125 mm).
(b) Barricade shall be a minimum of 42 in. (1067 mm) high.
(c) Barricade shall cover entire entrance area.
(d) All sections shall be connected.
(e) A system shall be in place to keep the barricade rigid.
(f) See Figure 4g.

Figure 4g



Barricade