Fall Prevention Specifications – Stairs, Stair Rails, Guardrails

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Introduction

The program is providing the following OSHA specifications in detail due to the inspection findings of over 20 transfer stations that indicated this issue required significant attention.

Most of these structures were constructed before Massachusetts became an OSHA-compliant state, thus they were not initially subject to OSHA standards.

It is important to note the following:

1. Grandfathering Based on Installation Date: Structures that do not meet current specifications might still comply with regulations if they were installed before certain standards were updated. It's essential to verify the date of installation to determine if these structures are "grandfathered" under older regulations.
2. Consulting the Building Code for Additional Guidance: The OSHA Standards may not cover all scenarios, such as specific measurements or requirements for certain steps, entrances, or railings. For these details, referring to the applicable building codes (e.g., International Building Code) may provide guidance. Examples include:
    - Height of a single step.
    - Access to structures with minimal steps.
    - Railing requirements for stairways with fewer than four risers.
3. MIIA and/or OSHA may require a railing in a location with less than a 4 feet drop if there is a serious risk. If you have questions regarding the risk level of a situation not covered by DLS/OSHA requirements, contact:
    1. Your MIIA Risk Manager
    2. DLS:
        - *DLS Workplace Safety and Health Program* at (508) 616-0461, ext. 9488, or email safepublicworkplacemailbox@mass.gov. Someone answers the phone and emails every day, and they usually respond within the day.
        - *DLS Consultation Program* at (508) 616-0461 (Option 2).

OSHA Definitions – Stair, Stair Rail, and Guardrail Systems

- **Balusters -** the vertical bars that attach to a handrail on a staircase**.**
- **Guardrail system** - a barrier erected along an unprotected or exposed side, edge, or other area of a walking-working surface to prevent employees from falling to a lower level.
- **Handrail** - a rail used to provide employees with a handhold for support.
- **Hoist area** - any elevated access opening to a walking-working surface through which equipment or materials are loaded or received.
- **Opening** - a gap or open space in a wall, partition, vertical walking-working surface, or similar surface that is at least 30 inches (76 cm) high and at least 18 inches (46 cm) wide, through which an employee can fall to a lower level.
- **Platform** - a walking-working surface that is elevated above the surrounding area.
- **Lower level** - a surface or area to which an employee could fall. Such surfaces or areas include, but are not limited to, ground levels, floors, roofs, ramps, runways, excavations, pits, tanks, materials, water, equipment, and similar surfaces and structures, or portions thereof.
- **Toeboard** - a low protective barrier that is designed to prevent materials, tools, and equipment from falling to a lower level, and protect employees from falling.
- **Open riser** - the gap or space between treads of stairways that do not have upright or inclined members (risers).
- **Ramp** - an inclined walking-working surface used to access another level.
- **Riser** - the upright (vertical) or inclined member of a stair that is located at the back of a stair tread or platform and connects close to the front edge of the next higher tread, platform, or landing.
- **Stair rail or stair rail system** - a barrier erected along the exposed or open side of stairways to prevent employees from falling to a lower level.
- **Stairway (stairs)** - risers and treads that connect one level with another, and includes any landings and platforms in between those levels. Stairways include standard, spiral, alternating tread-type, and ship stairs.
- **Standard stairs** - a fixed or permanently installed stairway.
- **Unprotected sides and edges** - any side or edge of a walking-working surface (except at entrances and other points of access) where there is no wall, guardrail system, or stair rail system to protect an employee from falling to a lower level.
- **Walking-working surface** - any horizontal or vertical surface on or through which an employee walks, works, or gains access to a work area or workplace location.

Stair Systems

Required if there are four or more risers.

Overview

- There are three standard parts of a stair rail system - top rail, mid-rail, and support posts. Depending on the circumstances, more protection can be added using screens, mesh, or balusters.
- OSHA specifies the material type, size, height, spacing, location, and strength of the rails.
- MIIA may identify additional risks to be addressed with stairs of less than four risers.

Component	Criteria	Citation
Stair Rail Components		
Rail	Thickness - At least ¼ inch thick	
Top Railing and Handrailing	Smooth – cannot cut skin or snag clothing	1910.29(f)(3)
	No Hazard - The ends of handrails and stair rail systems do not present any projection hazards.	1910.29(f)(6)
	Strength - Capable of withstanding a force of at least 200 pounds applied in any downward or outward direction within 2 inches of any point along the top edge of rail.	1910.29(f)(7)
	Finger Clearance - The minimum clearance between handrails and any other object is 2.25 inches.	
	Top Rail as a Handrail - The top rail of a stair rail system may serve as a handrail only when: • The height is at least 36 inches and not more than 38 inches as measured at the edge of the stair tread to the top of the top rail (see Figure D-13 below); and • The top rail of the stair rail system meets the other handrail requirements.	1910.29(f)(1)(iii) 1910.29(f)(1)(iii)(A) 1910.29(f)(1)(iii)(B)

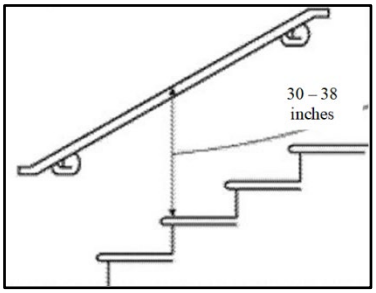
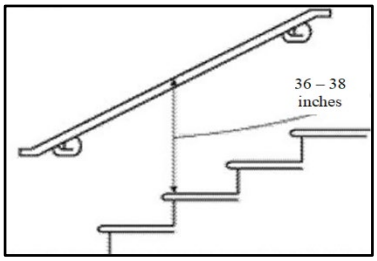
Component	Criteria	Citation
Top Rail (height)	Height - Handrails are not less than 30 inches and not more than 38 inches from the leading edge of the stair tread to the top surface of the handrail.  *Figure D-12-Handrail Measurement*	1910.29(f)(1)(i)
	Height - Stair rail systems minimum height installed: • **before** 1/17/17 is not less than 30 inches • **on or after** 1/17/17 is not less than 42 inches	1910.29(f)(1)(ii)(A) 1910.29(f)(1)(ii)(B)
	Is at least 36 inches, not more than 38 inches.  *Figure D-13 - Combination Handrail and Stair Rail*	1910.29(f)(1)(iii)(A)
Stair Rail Components		
Mid Rail	Evenly spaced	
	No more than 19 inches apart	
Vertical Rails	No more than 19 inches apart	1910.29(f)(4)
Posts	No more than 8 feet apart on center	
# Stairway Handrails	Each flight of stairs having at least 3 treads and at least 4 risers have stair rail systems and handrails as follows:	1910.28(b)(11)(ii)

Table D-2 - Stairway Handrail Requirements				
Stair Width	**Enclosed**	**One Open side**	**Two Open Sides**	**With earth built up on both sides**
Less than 44 inches	At least one handrail.	One stair rail system with handrail on open side.	One stair rail system each open side.	
44 inches to 88 inches	One handrail on each enclosed side.	One Stair rail system with handrail on open side and one handrail on enclosed side.	One stair rail system with handrail on each open side.	
Greater than 88 inches	One handrail on each enclosed side and one intermediate handrail located in the middle of the stair.	One stair rail system with handrail on open side, one handrail on enclosed side, and one intermediate handrail located in the middle of the stair.	One stair rail system with handrail on each open side and one intermediate handrail located in the middle of the stair.	
Exterior stairs less than 44 inches				One handrail on least one side.
Note to table: The width of the stair must be clear of all obstructions except handrails.				

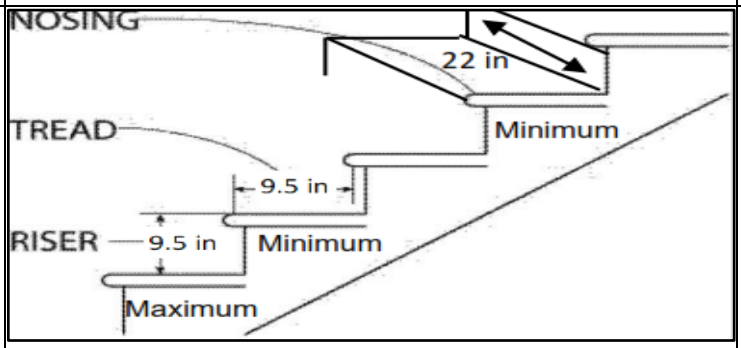
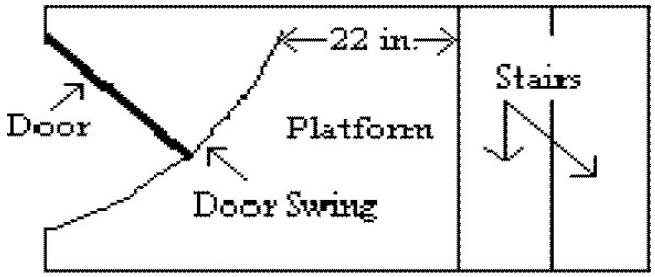
Hand and Stair Rail Summary

Handrails should:

- Be 30 - 38 inches in height
- Have a finger clearance of 2.25 inches
- Be smooth surfaced and easy to grab
- Be able to withstand 200 pounds of force
- Not end with the handrail sticking out as a projection hazard

Stair Rail systems should:

- Be 42 inches in height, unless:
  - The top rail is the handrail, then its 36 - 38 inches
  - It was installed before 2017, then it is 30 inches
- Have no gaps of 19 inches or more
- Be able to withstand 200 pounds of force
- Not end with the handrail sticking out as a projection hazard

Component	Criteria	Citation
Stair Components		
Risers	Evenly spaced	1910.25(b)(3)
	Maximum height 9.5 inches	1910.25(c)(2)
Tread (depth)	Evenly spaced	1910.25(b)(3)
	Minimum depth 9.5 inches	1910.25(c)(3)
	Vertical clearance - above any stair tread to any overhead obstruction is at least 6 feet, 8 inches	1910.25(b)(2)
Width (nosing)	Minimum width 22 inches	1910.25(c)(4)
	 ***Figure D-8 – Dimensions of Standard Stairs***	
Landings and Platforms	At least the width of the stair and at least 30 inches in depth, as measured in the direction of travel	1910.25(b)(4)
	When a door or a gate opens directly on a stairway, a platform is provided, and the swing of the door or gate does not reduce the platform's usable depth to: • Less than 20 inches installed before 1/1/17 • Less than 22 inches installed on or after 1/17/17  ***Figure D7 – Door or Gate Opening on Stairway***	1910.25(b)(5), 1910.25(b)(5)(i) and 1910.25(b)(5)(ii)

Guard Rail Systems

Required when there is a drop of four or more feet from a walking - working surface to the ground or machinery below.

Overview

- There are three standard parts of a rail system - top rail, mid-rail, and support posts. Depending on the circumstances, additional protection can be added using screens, mesh, or balusters (vertical members).
- OSHA specifies the material type, size, height, spacing, location, and strength of the rails.

  Important note for sites where vehicles drive right to the edge of the compactor opening on a tip floor - the specifications below for guardrails will not stop a vehicle, which can end up in the compactor. Consult the OSHA standard 1910.29 to determine requirements, and consult with a manufacturer or fabricator to obtain and install an adequate railing. Contact the Massachusetts Dept of Labor Standards, WSHP, if you need assistance.
- MIIA may identify additional risks to be addressed by drop-offs less than four feet.

Component	Criteria	Citation
Railings	Thickness - At least ¼ inch thick in diameter	1910.29(b)(9)
	Materials - Steel banding and plastic banding are not used for top rails or mid-rails.	1910.29(b)(1)
	Hazard Prevention - The ends of the rails shall not overhang the terminal posts except where the overhang does not constitute a projection hazard.	1910.29(b)(7)
Top Rail	Height - Must be 42 inches, plus or minus 3 inches, above the walking-working surface. The top edge height may exceed 45 inches, as long as the guardrail system meets all other criteria.	1910.29(b)(3)
	Strength - Must withstand a 200-pound force in a downward and outward direction.	1910.29(b)(3)
	Hazard Prevention - Smooth to protect from injury and from snagging clothing.	1910.29(b)(5)
Mid Rail - Infill panels[1]	Location - If there is not a wall or parapet at least 21 inches high, then mid rails must be installed halfway between the top edge of the guardrail and the walking-working surface.	1910.29(b)(2) 1910.29(b)(2)(i)

[1] **Mid Rail -** Infill panels (e.g., screens, mesh), intermediate vertical members, solid panels, or other equivalents can be considered "mid rails".

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Component	Criteria	Citation
Mid Rail, continued	Spacing - Evenly spaced no more than 19 inches apart.	1910.29(b)(2)(iv)
	Spacing - Other equivalent intermediate members (e.g., additional mid-rails and panels) are installed so that the openings are not more than 19 inches wide.	1910.29(b)(2)(iv)
	Placement - Screens/Mesh must extend from the walking surface to the top-rail and along the entire opening between vertical rails.	1910.29(b)(2)(ii)
	Strength - They must be capable of withstanding a force of at least 150 pounds applied in any downward or outward direction at any point along the intermediate member.	1910.29(b)(5)
Vertical Rails	Spacing - no? more than 19 inches apart.	1910.29(b)(2)(iii)
Toeboards – are required when employees below could be exposed to falling objects	Placement - Erected along the exposed edge of the overhead walking-working surface for a length sufficient to protect employees below.	1910.29(k)(1)(i)
	Composition - Are solid or do not have any opening that exceeds 1 inch at its greatest dimension.	1910.29(k)(1)(iv)
	Height - Must be at least 3½ inches in height from top edge to floor level.	1910.29(k)(1)(ii)
	Spacing - Have no gap greater than 1/4 inch between the toeboard and the walking-working surface.	1910.29(k)(1)(iii)
	Strength - Can withstand a force of 50 pounds applied in any direction.	1910.29(k)(1)(vi)
Posts	Spacing - No more than 8 feet apart on center	

Note: OSHA may require a guardrail for less than a 4 foot drop if there are hazards below.

Illustrations of OSHA Guardrail Requirements

P O S T	**Top Rail** - between 39” - 42” high from the upper surface of top rail to the floor, platform, or ramp level	**P O S T**
	No more than 19 inches space between rails	
	Mid-Rail - ½ way between top rail and the floor, platform, or ramp level	
	No more than 19 inches space between rails	
	Toeboard – if needed, must be a minimum of 3.5 tall	

Post distance – no more than 8 feet

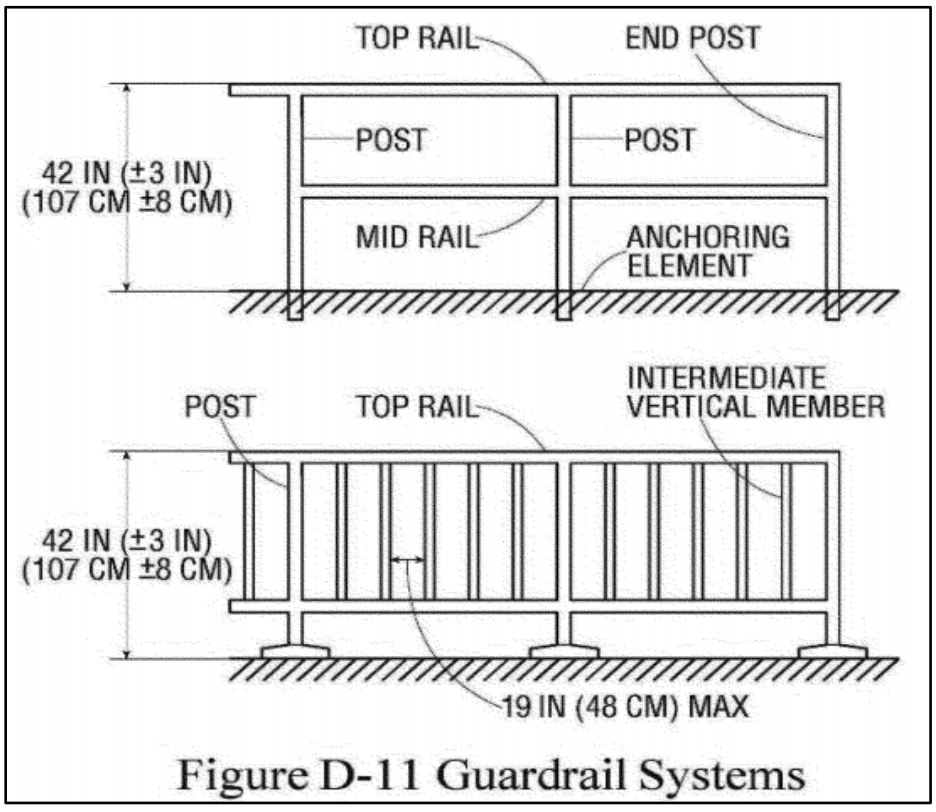

Figure D-11 Guardrail Systems

OSHA - https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.29

Summary Guardrail Requirements

Height and Dimensions

- Top rail is 42-inch high, give or take 3 inches. The height may exceed 45 inches, if the guardrail system meets all other criteria.
- Mid-rails are located between the surface and the top rail, unless there is a 21-inch wall.
- No gaps greater than 19 inches in between the mid-rail, top rail and walking surface.
- Posts maximum spacing is 8 feet apart.

Strength

- Top rails need to withstand 200 pounds of force, without bending below 39 inches.
- Mid-rails need to withstand 150 pounds of force.

Size and Composition

- Railing must be a minimum of 1/4 inch thickness or diameter.
- Cannot use steel banding or plastic banding.

Safety Precautions

- No projection, laceration, or puncture hazards on the top rail and clothing should not snag on it.
- Install a toeboard if employees working below the guardrail are at risk of objects falling on them.