The most often heard contractor phrase:

No one else makes me do that, so why do I have to ...

Stairs have many potential violations – this Newsletter is Part 2 of two parts.

The August Newsletter contained Part 1 of Stair Violations – this September Newsletter contains Part 2.

Violation 4 : Handrail does not meet requirements: no handrail installed/only one handrail installed; handrail too high/low; handrail does not extend lowest riser-to-highest riser; handrail not returned; clearance between handrail and wall insufficient; projection from wall too great
Code Section : 2014 (5th Edition): FBC-R R311.7.8 Handrails, R311.7.8.1 Height, R311.7.8.2 Continuity, and FBC-B
Comments : Contractor to correct handrail deficiencies to meet requirements

Violation 5 : Guard rail does not meet requirements: guard rail is missing; top rail not high enough; openings too large; in-fill loose/does not withstand load without deforming; top rail loose/does not withstand load
Code Section : 2014 (5th Edition): FBC-R R312.1.1 Where required, R312.1.2 Height, R312.1.3 Opening limitations, and FBC-B
Comments : Contractor to correct guard deficiencies to meet requirements

<u>Violation 4 : Handrail does not meet requirements: no handrail installed/only one handrail installed; handrail too high/low; handrail does not extend lowest riser-to-highest riser; handrail not returned; clearance between handrail and wall insufficient; projection from wall too great</u>

- No handrail installed at a stair which has four or more risers.
- Handrail is not within the permitted heights above the line of the nosings.
  - Handrail height is measured vertically above the line of the nosings
  - Minimum handrail height is 34 inches to the gripping surface (top of handrail)
  - Maximum handrail height is 38 inches to the gripping surface (top of handrail)
- Handrail does not extend to above the bottom riser and/or does not extend to above the top riser.
- Handrail is not returned to the wall or terminated at newell posts or safety terminals.
- Handrail does not have at least 1-1/2 inches clearance from the wall and/or projects too far from the wall.
- Handrail is not continuous for the flight of stairs as handrail meets an obstruction or is interrupted in the flight.
- Handrails not installed on both sides of the stairway – FBC-Building (FBC-Residential does not have this requirement).
- Handrail extensions not installed or not properly installed – FBC-Building (FBC-Residential does not have this requirement).
  - Radius handrail extensions are almost always improperly made – the handrail part is required to have a minimum clearance to the wall of 1-1/2 inches, thus the handrail portion of the handrail and return stops where the radius reduces the clearance to less than 1-1/2 inches. The typical radius return at the top measures 12 inches from the top riser to the outside end of the return … the handrail extension itself is required to be 12 inches at the top … only after there are 12 inches of handrail with 1-1/2 inches clearance does the return start.
  - Extensions beyond the bottom riser have similar configuration issues as the handrail extension is required to continue to slope for a minimum distance of one tread depth (one tread depth is a minimum of 11 inches), when the tread depth is greater than 11 inches, the minimum extension is the depth on one tread – lower extensions frequently are only approximately 9 inches to 10 inches measured horizontally (the extension distance is measured horizontally the same way tread depth is measured). Radius returns at the bottom handrail extensions typically have the same issues as radius returns at the top handrail extensions.

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From the 2014 (5th Edition) Florida Building Code, Residential

- *CHAPTER 3 BUILDING PLANNING*
  - *SECTION R311 MEANS OF EGRESS*
    - *R311.7 Stairways.*
      - *R311.7.8 Handrails.*

        Handrails shall be provided on at least one side of each continuous run of treads or flight with four or more risers.

        R311.7.8.1 Height.

        Handrail height, measured vertically from the sloped plane adjoining the tread nosing, or finish surface of ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

        Exceptions:

        1. *The use of a volute, turnout or starting easing shall be allowed over the lowest tread.*
        2. *When handrail fittings or bendings are used to provide continuous transition between flights, transitions at winder treads, the transition from handrail to guardrail, or used at the start of a flight, the handrail height at the fittings or bendings shall be permitted to exceed the maximum height.*

        R311.7.8.2 Continuity.

        Handrails for stairways shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned or shall terminate in newel posts or safety terminals. Handrails adjacent to a wall shall have a space of not less than 1 1/2 inch (38 mm) between the wall and the handrails.

        Exceptions:

        1. *Handrails shall be permitted to be interrupted by a newel post at the turn.*
        2. *The use of a volute, turnout, starting easing or starting newel shall be allowed over the lowest tread.*

From the 2014 (5th Edition) Florida Building Code, Building

- *CHAPTER 10 MEANS OF EGRESS*
  - *SECTION 1009 STAIRWAYS*
    - *1009.15 Handrails.*

      Stairways shall have handrails on each side and shall comply with Section 1012. Where glass is used to provide the handrail, the handrail shall also comply with Section 2407.

      Exceptions:

      1. *Handrails for aisle stairs provided in accordance with Section 1028.13.*
      2. *Stairways within dwelling units and spiral stairways are permitted to have a handrail on one side only.*
      3. *Decks, patios and walkways that have a single change in elevation where the landing depth on each side of the change of elevation is greater than what is required for a landing do not require handrails.*
      4. *In Group R-3 occupancies, a change in elevation consisting of a single riser at an entrance or egress door does not require handrails.*
      5. *Changes in room elevations of three or fewer risers within dwelling units and sleeping units in Groups R-2 and R-3 do not require handrails.*
  - *SECTION 1012 HANDRAILS*
    - *1012.1 Where required.*

      Handrails for stairways and ramps shall be adequate in strength and attachment in accordance with Section 1607.8. Handrails required for stairways by Section 1009.15 shall comply with Sections 1012.2 through 1012.9. Handrails required for ramps by Section 1010.9 shall comply with Sections 1012.2 through 1012.8.

    - *1012.2 Height.*

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Handrail height, measured above stair tread nosings, or finish surface of ramp slope, shall be uniform, not less than 34 inches (864 mm) and not more than 38 inches (965 mm). Handrail height of alternating tread devices and ship ladders, measured above tread nosings, shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

Exceptions:

1. *When handrail fittings or bendings are used to provide continuous transition between flights, the fittings or bendings shall be permitted to exceed the maximum height.*
2. *In Group R-3 occupancies; within dwelling units in Group R-2 occupancies; and in Group U occupancies that are associated with a Group R-3 occupancy or associated with individual dwelling units in Group R-2 occupancies; when handrail fittings or bendings are used to provide continuous transition between flights, transition at winder treads, transition from handrail to guard, or when used at the start of a flight, the handrail height at the fittings or bendings shall be permitted to exceed the maximum height.*

1012.3 Handrail graspability.

All required handrails shall comply with Section 1012.3.1 or shall provide equivalent graspability.

Exceptions:

1. *In Group R-3 occupancies; within dwelling units in Group R-2 occupancies; and in Group U occupancies that are accessory to a Group R-3 occupancy or accessory to individual dwelling units in Group R-2 occupancies; handrails shall be Type I in accordance with Section 1012.3.1, Type II in accordance with Section 1012.3.2 or shall provide equivalent graspability.*
2. *Accessible handrails shall meet the requirements of the Florida Building Code, Accessibility.*

1012.3.1 Type I.

Handrails with a circular cross section shall have an outside diameter of at least 1 1/4 inches (32 mm) and not greater than 2 inches (51 mm). Where the handrail is not circular, it shall have a perimeter dimension of at least 4 inches (102 mm) and not greater than 6 1/4 inches (160 mm) with a maximum cross-sectional dimension of 2 1/4 inches (57 mm) and minimum cross-sectional dimension of 1 inch (25 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).

1012.3.2 Type II.

Handrails with a perimeter greater than 6 1/4 inches (160 mm) shall provide a graspable finger recess area on both sides of the profile. The finger recess shall begin within a distance of 3/4 inch (19 mm) measured vertically from the tallest portion of the profile and achieve a depth of at least 5/16 inch (8 mm) within 7/8 inch (22 mm) below the widest portion of the profile. This required depth shall continue for at least 3/8 inch (10 mm) to a level that is not less than 1 3/4 inches (45 mm) below the tallest portion of the profile. The minimum width of the handrail above the recess shall be 1 1/4 inches (32 mm) to a maximum of 2 3/4 inches (70 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).

1012.4 Continuity.

Handrail gripping surfaces shall be continuous, without interruption by newel posts or other obstructions.

Exceptions:

1. *Handrails within dwelling units are permitted to be interrupted by a newel post at a turn or landing.*
2. *Within a dwelling unit, the use of a volute, turnout, starting easing or starting newel is allowed over the lowest tread.*
3. *Handrail brackets or balusters attached to the bottom surface of the handrail that do not project horizontally beyond the sides of the handrail within 1 1/2 inches (38 mm) of the bottom of the handrail shall not be considered obstructions. For each 1/2 inch (12.7 mm) of additional handrail perimeter dimension above 4 inches (102 mm), the vertical clearance dimension of 1 1/2 inches (38 mm) shall be permitted to be reduced by 1/8 inch (3 mm).*

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4. Where handrails are provided along walking surfaces with slopes not steeper than 1:20, the bottoms of the handrail gripping surfaces shall be permitted to be obstructed along their entire length where they are integral to crash rails or bumper guards.

1012.5 Fittings.

Handrails shall not rotate within their fittings.

1012.6 Handrail extensions.

Handrails shall return to a wall, guard or the walking surface or shall be continuous to the handrail of an adjacent stair flight or ramp run. Where handrails are not continuous between flights, the handrails shall extend horizontally at least 12 inches (305 mm) beyond the top riser and continue to slope for the depth of one tread beyond the bottom riser. At ramps where handrails are not continuous between runs, the handrails shall extend horizontally above the landing 12 inches (305 mm) minimum beyond the top and bottom of ramp runs. The extensions of handrails shall be in the same direction of the stair flights at stairways and the ramp runs at ramps.

Exceptions:

1. Handrails within a dwelling unit that is not required to be accessible need extend only from the top riser to the bottom riser.

2. Aisle handrails in rooms or spaces used for assembly purposes in accordance with Section 1028.13.

3. Handrails for alternating tread devices and ship ladders are permitted to terminate at a location vertically above the top and bottom risers. Handrails for alternating tread devices and ship ladders are not required to be continuous between flights or to extend beyond the top or bottom risers.

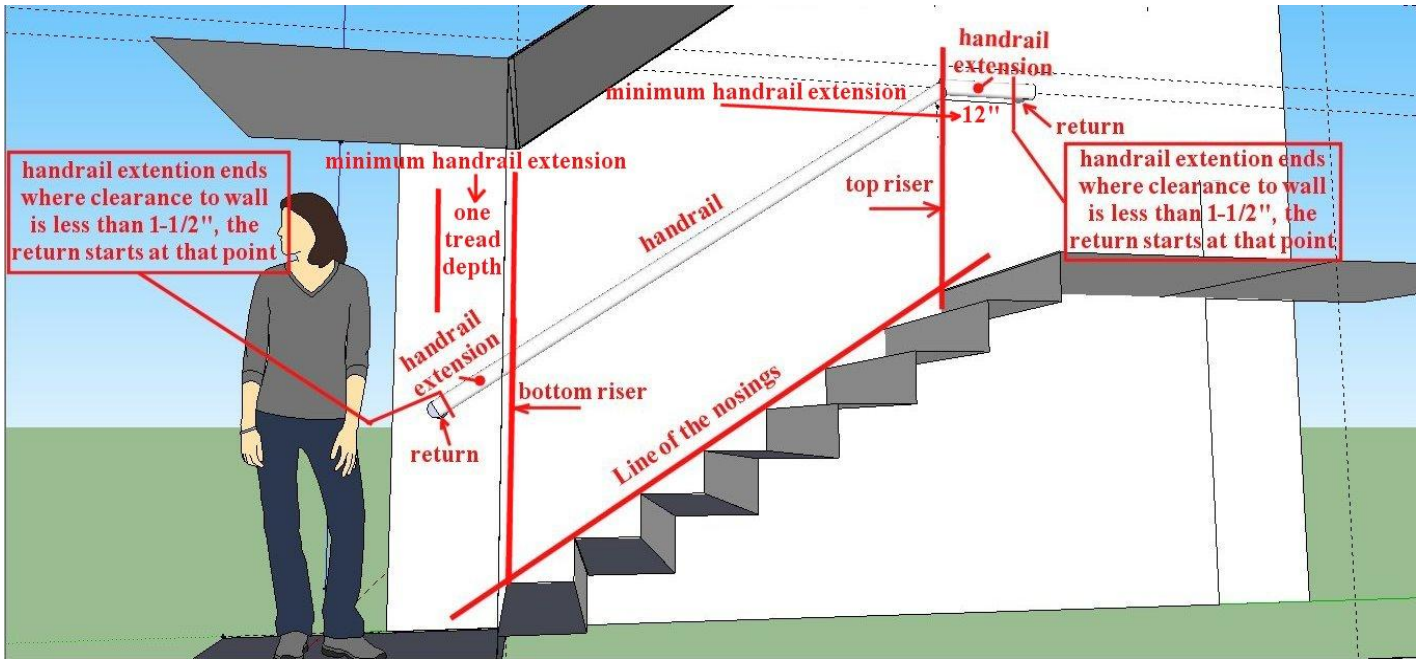
4. Accessible handrail extensions shall be in accordance with the Florida Building Code, Accessibility.

1012.7 Clearance.

Clear space between a handrail and a wall or other surface shall be a minimum of 1 1/2 inches (38 mm). A handrail and a wall or other surface adjacent to the handrail shall be free of any sharp or abrasive elements.

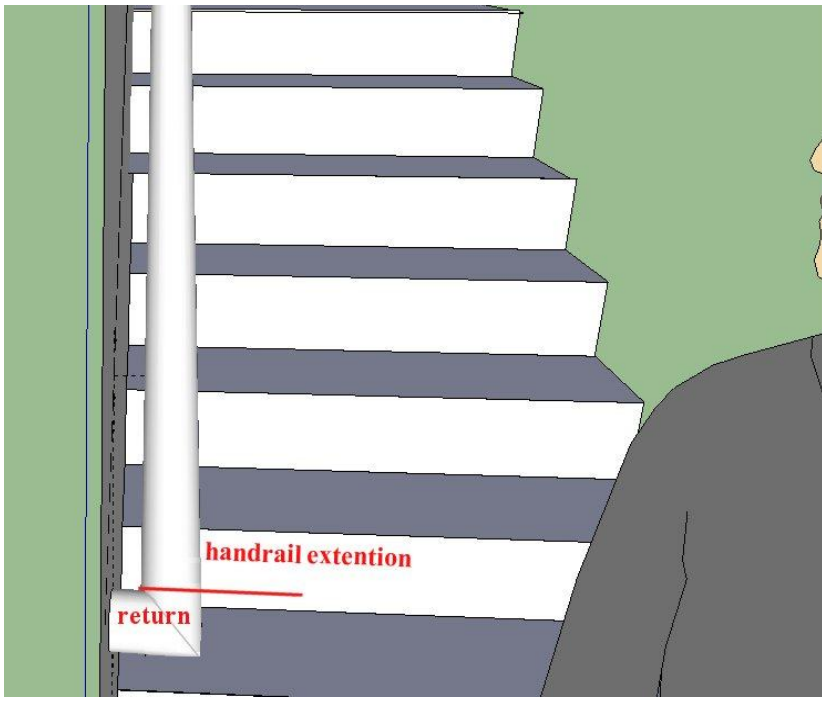
1012.8 Projections.

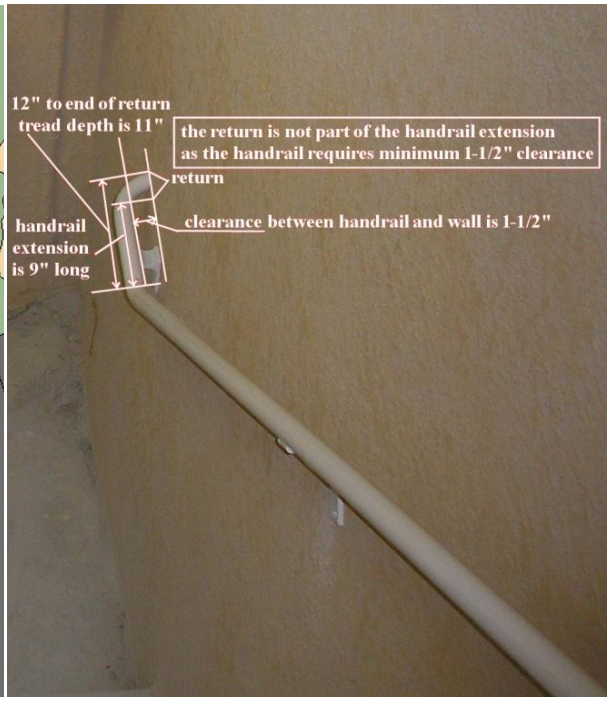
On ramps, the clear width between handrails shall be 36 inches (914 mm) minimum. Projections into the required width of stairways and ramps at each side shall not exceed 4 1/2 inches (114 mm) at or below the handrail height. Projections into the required width shall not be limited above the minimum headroom height required in Section 1009.5. Projections due to intermediate handrails shall not constitute a reduction in the egress width.



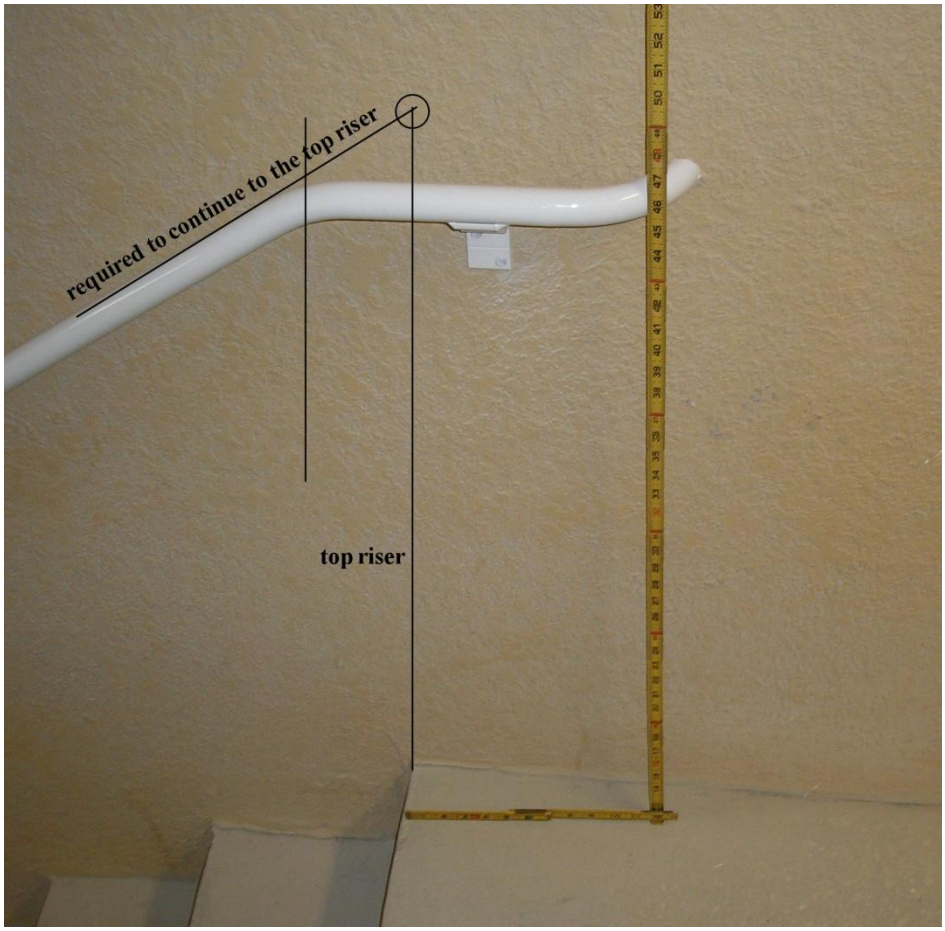
The most often heard contractor phrase:

No one else makes me do that, so why do I have to ...





Handrail returns start where the handrails end.
Handrails end when the clearance to the wall becomes less than 1-1/2".



Handrail should extend from above the nosing of the bottom riser to above the nosing of the top riser.

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If the stairway is not wide enough … find a way to make it wider … recess the handrail.

6-1/4" bottom riser height
7-1/4" adjacent riser height

7-1/2" bottom riser height
7" adjacent riser height

Which is worse:

riser height variation which exceeds 1"
<u>or</u>
risers which exceed 7" riser height?

Contractor can't make up their mind which is worse in the previous photo, or which they should do?

Do both in the same flight of stairs:

exceed 3/8" variation
<u>and</u>
exceed 7" maximum riser height.

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Violation 5 : Guard rail does not meet requirements: guard rail is missing; top rail not high enough; openings too large; in-fill loose/does not withstand load without deforming; top rail loose/does not withstand load

(NOTE: Only guards for stairs and balconies are addressed here, not guards required at other areas.)

- No guard rail is installed at edge of walking surface – a guard rail is required when the floor/grade below is more than 30 inches lower anywhere within 36 inches horizontally of walking surface edge.
  - Before the 2010 Edition of the Florida Building Code, one would measure vertically down from the edge of the higher walking surface and, if the height was 30 inches or less, that was good enough to meet code – forget that the grade could be sloping down to a river, lake, highway or anywhere else … measure straight down and that was all which was required.
  - Beginning with the 2010 Edition of the Florida Building Code, the 30 inch down measure also includes a 'fall zone', or should I refer to it as a 'landing zone' as the 'fall zone' is that 30 inch drop before you go kerplunk when you hit the ground. That 'landing zone' below the higher walking surface is required to be minimum 36 inches wide, so now, while we measure down from the edge as we did before, we now also have to measure out horizontally to 36 inches … if anywhere in that 36 inch 'landing zone' is greater than 30 inches down from the edge – a guard rail is required … and that grade is likely required to be sloped as required for minimum grade: 6 inches in the first 10 feet, which would be approximately 1-3/4 inches (≈1-13/16 inches) in 3 feet, that 2 inch drop in 3 feet needs to be considered when planning for a 30 inch height down from the walking surface.
- Guard rail is not high enough
  - Minimum height to top of guard rail is 36 inches – FBC-Residential
  - Minimum height to top of guard rail is 42 inches – FBC-Building
- Guard rail openings are too large – openings allow a 4 inch sphere to pass through.
  - Many contractors apparently think that the openings are allowed to be 4 inches, which is incorrect – the openings shall not permit a 4 inch sphere to pass through.
  - The openings must be sufficiently less than 4 inches to not allow a 4 inch sphere to pass through when the guard infill flexes. Guard rails shall not allow a 4 inch sphere to pass through.
    The guard infill is required to resist a load of 50 pound per square foot.
- Guard rail openings are triangular area at stair tread/stair riser/bottom of guard rail area too large – openings allow a 6-inch sphere to pass through.
  - When the stair guard infill has individual balusters which go from the top rail down into the treads, this triangular opening aspect is not an issue as there is no triangular opening.
  - When the stair guard infill has a top rail and a bottom rail, and has the balusters going between the top and bottom rails, the bottom rail leaves a triangular shaped opening below it.
  - The triangular shaped opening has the tread as the base of the triangle, the riser as the height of the triangle, the guard bottom rail becomes the hypotenuse of that right triangle (the triangle is almost a right triangle, depends on if the riser is vertical or slightly sloped).
  - This triangular opening must be small enough to resist the passage of a 6 inch sphere. The typical cause of the triangular opening being too large is that the bottom rail of the guard is too high above the line of the nosings.

From the 2014 (5th Edition) Florida Building Code, Residential

- *CHAPTER 3 BUILDING PLANNING*
  SECTION R312 GUARDS AND WINDOW FALL PROTECTION
  R312.1.1 Where required.
  Guards shall be located along open-sided walking surfaces, including stairs, ramps and landings, that are located more than 30 inches (762 mm) measured vertically to the floor or grade below at any point within

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36 inches (914 mm) horizontally to the edge of the open side. Insect screening shall not be considered as a guard.

R312.1.2 Height.

Required guards at open-sided walking surfaces, including stairs, porches, balconies or landings, shall be not less than 36 inches (914 mm) high measured vertically above the adjacent walking surface, adjacent fixed seating or the line connecting the leading edges of the treads.

Exceptions:

1. *Guards on the open sides of stairs shall have a height not less than 34 inches (864 mm) measured vertically from a line connecting the leading edges of the treads.*
2. *Where the top of the guard also serves as a handrail on the open sides of stairs, the top of the guard shall not be less than 34 inches (864 mm) and not more than 38 inches (965 mm) measured vertically from a line connecting the leading edges of the treads.*

R312.1.3 Opening limitations.

Required guards shall not have openings from the walking surface to the required guard height which allow passage of a sphere 4 inches (102 mm) in diameter.

Exceptions:

1. *The triangular openings at the open side of stair, formed by the riser, tread and bottom rail of a guard, shall not allow passage of a sphere 6 inches (153 mm) in diameter.*
2. *Guards on the open side of stairs shall not have openings which allow passage of a sphere 4 3/8 inches (111 mm) in diameter.*

From the 2014 (5th Edition) Florida Building Code, Building

- *CHAPTER 10 MEANS OF EGRESS*

SECTION 1013 GUARDS

1013.2 Where required.

Guards shall be located along open-sided walking surfaces, including mezzanines, equipment platforms, stairs, ramps and landings that are located more than 30 inches (762 mm) measured vertically to the floor or grade below at any point within 36 inches (914 mm) horizontally to the edge of the open side. Guards shall be adequate in strength and attachment in accordance with Section 1607.8.

Exception: Guards are not required for the following locations:

1. *On the loading side of loading docks or piers.*
2. *On the audience side of stages and raised platforms, including steps leading up to the stage and raised platforms.*
3. *On raised stage and platform floor areas, such as runways, ramps and side stages used for entertainment or presentations.*
4. *At vertical openings in the performance area of stages and platforms.*
5. *At elevated walking surfaces appurtenant to stages and platforms for access to and utilization of special lighting or equipment.*
6. *Along vehicle service pits not accessible to the public.*
7. *In assembly seating where guards in accordance with Section 1028.14 are permitted and provided.*

1013.3 Height.

Required guards shall not be less than 42 inches (1067 mm) high, measured vertically as follows:

1. *From the adjacent walking surfaces;*
2. *On stairs, from the line connecting the leading edges of the tread nosings; and*
3. *On ramps, from the ramp surface at the guard.*

Exceptions:

1. *For occupancies in Group R-3 not more than three stories above grade in height and within individual dwelling units in occupancies in Group R-2 not more than three stories above grade in height with separate means of egress, required guards shall not be less than 36 inches (914 mm) in height measured vertically above the adjacent walking surfaces or adjacent fixed seating.*

The most often heard contractor phrase:

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2. For occupancies in Group R-3, and within individual dwelling units in occupancies in Group R-2, guards on the open sides of stairs shall have a height not less than 34 inches (864 mm) measured vertically from a line connecting the leading edges of the treads.

3. For occupancies in Group R-3, and within individual dwelling units in occupancies in Group R-2, where the top of the guard also serves as a handrail on the open sides of stairs, the top of the guard shall not be less than 34 inches (864 mm) and not more than 38 inches (965 mm) measured vertically from a line connecting the leading edges of the treads.

4. The guard height in assembly seating areas shall comply with Section 1028.14.

5. Along alternating tread devices and ship ladders, guards whose top rail also serves as a handrail, shall have height not less than 30 inches (762 mm) and not more than 34 inches (864 mm), measured vertically from the leading edge of the device tread nosing.

1013.4 Opening limitations.

Required guards shall not have openings which allow passage of a sphere 4 inches (102 mm) in diameter from the walking surface to the required guard height.

Exceptions:

1. From a height of 36 inches (914 mm) to 42 inches (1067 mm), guards shall not have openings which allow passage of a sphere 4 3/8 inches (111 mm) in diameter.

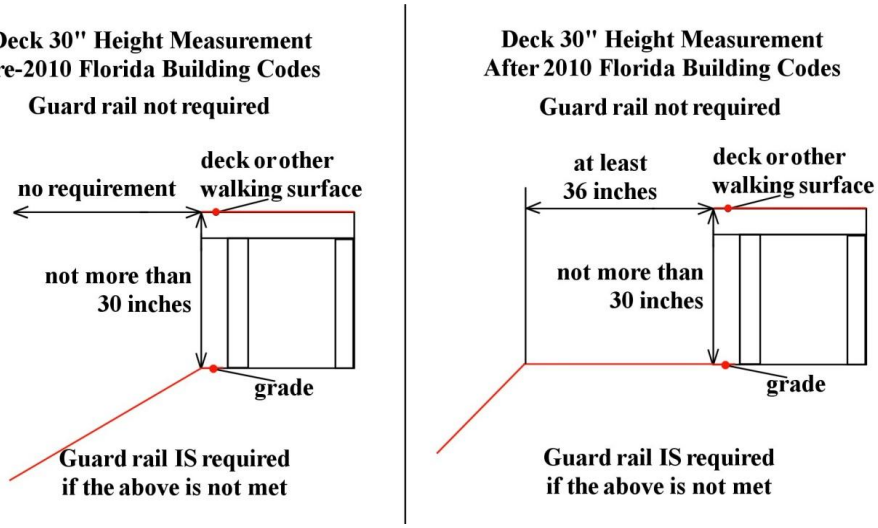
2. The triangular openings at the open sides of a stair, formed by the riser, tread and bottom rail shall not allow passage of a sphere 6 inches (152 mm) in diameter.

3. At elevated walking surfaces for access to and use of electrical, mechanical or plumbing systems or equipment, guards shall not have openings which allow passage of a sphere 21 inches (533 mm) in diameter.

4. In areas that are not open to the public within occupancies in Group I-3, F, H or S, and for alternating tread devices and ship ladders, guards shall not have openings which allow passage of a sphere 21 inches (533 mm) in diameter.

5. In assembly seating areas, guards at the end of aisles where they terminate at a fascia of boxes, balconies and galleries shall not have openings which allow passage of a sphere 4 inches in diameter (102 mm) up to a height of 26 inches (660 mm). From a height of 26 inches (660 mm) to 42 inches (1067 mm) above the adjacent walking surfaces, guards shall not have openings which allow passage of a sphere 8 inches (203 mm) in diameter.

6. Within individual dwelling units and sleeping units in Group R-2 and R-3 occupancies, guards on the open sides of stairs shall not have openings which allow passage of a sphere 4 3/8 (111 mm) inches in diameter.



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No one else makes me do that, so why do I have to ...

This is showing a 4 inch test sphere in guard infill openings which far exceeds the allowed opening size of "*shall not have openings which allow passage of a sphere 4 inches (102 mm) in diameter*".

This is showing a 6 inch test sphere in the triangular openings below a guard bottom rail, the triangular opening far exceeds the allowed opening size of "*shall not allow passage of a sphere 6 inches (152 mm) in diameter*".

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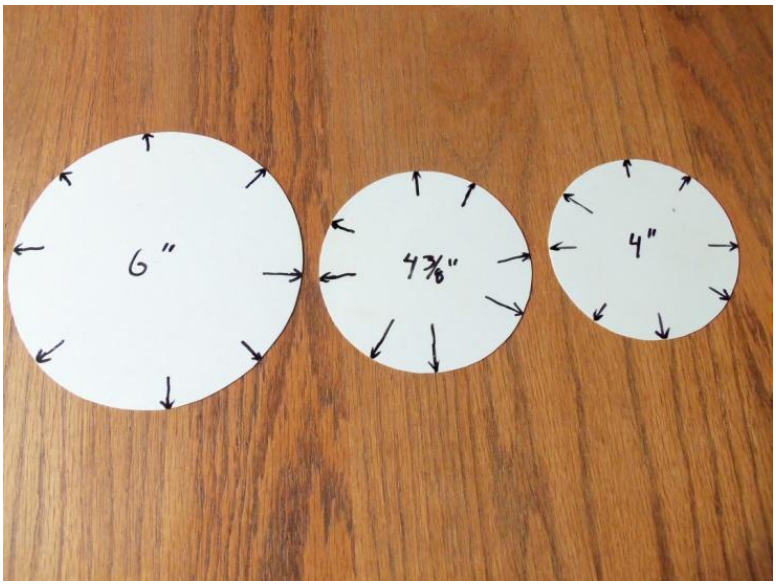

Carrying spheres around for inspections is a bit awkward – a solution is plastic circles: they are thin and easy to keep in a clipboard, yet the plastic circles can serve almost the same purpose as spheres by turning the circle on its side, vertical, at any angle, or even hold the circle up to the openings. The plastic circles can be used to show if the openings are small enough to resist a sphere from passing through the openings … while spheres are better and more accurate but less convenient to carry – these plastic circles are a convenient option and will resolve most disputes.

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Please, if you have any items, issues or tips you would like to share with other building officials / inspectors / plan reviewers, send the items, issues or tips to jerry@jerrypeck.com for inclusion in future newsletters.

All contributors will be acknowledged and given credit for their contributions … please help others by sharing the items, issues, and tips you have found in the field or during plan reviews.

I look forward to all contributions.

Respectfully submitted,

Jerry Peck
Editor/Publisher
Inspectors' Field Comments Newsletter©
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