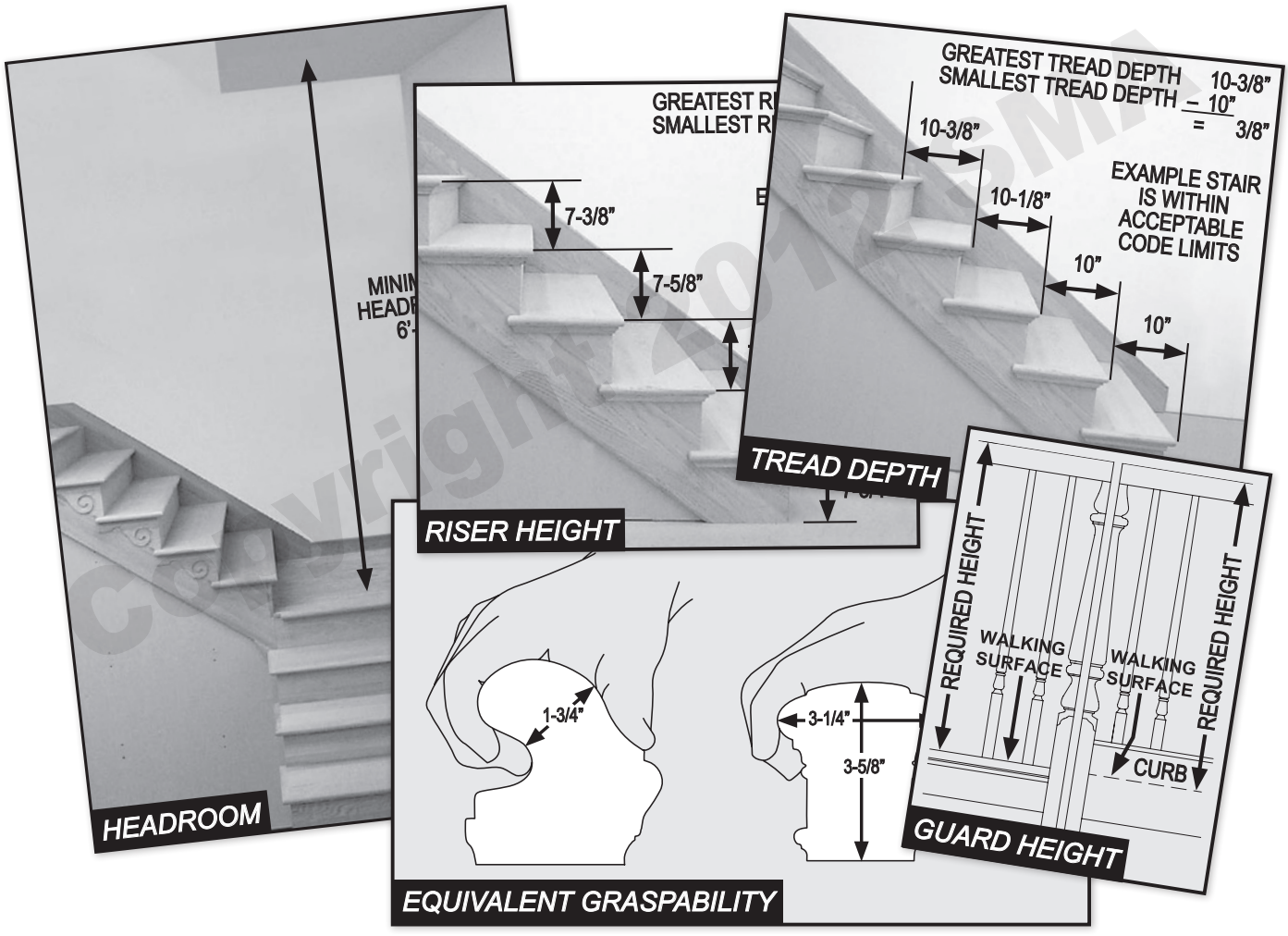
Visual Interpretation of the

STAIR BUILDING CODE

2012 International Residential Code



www.stairways.org

About this Document

The Stairbuilders and Manufacturers Association publishes visual interpretations of Building Codes to be accurate pictorial material void of editorial comment to aid in the understanding of the written code text. We provide this document as a learning tool to aid designers, builders, homeowners, building officials, stair builders, and others in the shelter industry to accurately and consistently interpret the building code related to stairways.

The SMA has participated in the model code development process since 1988. We support the International Code Council's (ICC) development process through our membership and are recognized and respected for our responsible efforts at code reform and interpretation in addition to our trade and industry experience that we bring to the table. This experience and reputation is an asset to our continued efforts to provide safe stairways and reduce stairway accidents while allowing freedom of design, and aesthetic properties of preference.

In addition to our experience in the code development process we provide technical writing and graphics assistance related to the IRC and IBC Code Commentaries as published by the ICC for each edition.

The SMA wishes to thank the ICC for their permission to print portions of the IRC and in full recognition of our responsibility to educate and inform we invite your feedback and comments.

To the User

If you find this document to be of significant value, then you will find it equally beneficial to associate with a member of the Stairbuilders Manufacturers Association (SMA). The members of the SMA have taken on the task of influencing the development of responsible and functional building codes. They are the very individuals effectively communicating consistent interpretation of each stair code. A resulting product of their effort is this Visual Interpretation. SMA members know their craft of Stair Design and Construction and they know Building Codes. You are encouraged to contact a member of the SMA before you begin your next stairway project. Our Members proudly display the "SMA Member" logo.

The Stair Industry
Dedicated to Safety & Quality

Consider Membership

If your work is related to stairs and you can prescribe to the ethics and quality standards of the SMA you may qualify for membership.

To learn more about the SMA go to our website www.stairways.org, and contact us or call toll free 877-500-5759.

SECTION R311.7 STAIRWAYS

R311.7.1 Width.
Stairways shall not be less than 36 inches (914 mm) in clear width at all points above the permitted *handrail* height and below the required headroom height. **PHOTO 1**. *Handrails* shall not project more than 4.5 inches (114 mm) on either side of the *stairway* **PHOTO 2** and the minimum clear width of the *stairway* at and below the *handrail* height, including treads and landings, shall not be less than 31½ inches (787 mm) where a *handrail* is installed on one side and 27 inches (698 mm) where *handrails* are provided on both sides **PHOTO 3**.

Exception: The width of spiral *stairways* shall be in accordance with Section R311.7.10.1. See **PHOTO 40 (page 15)**.

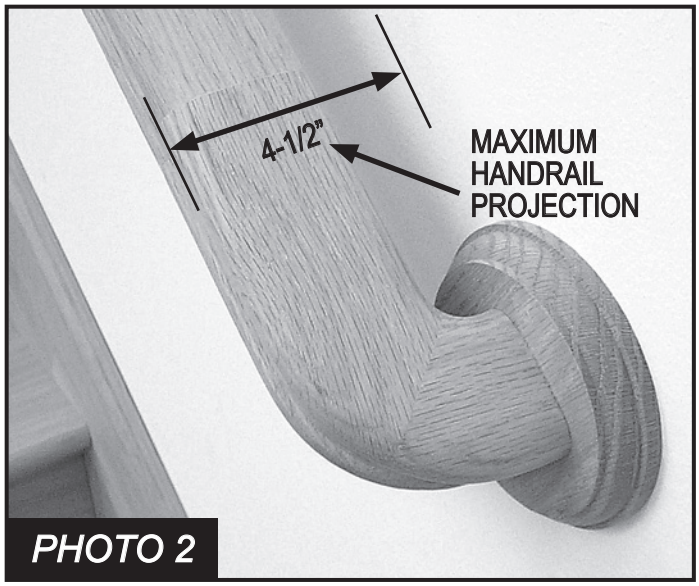


PHOTO 2

PHOTO 1

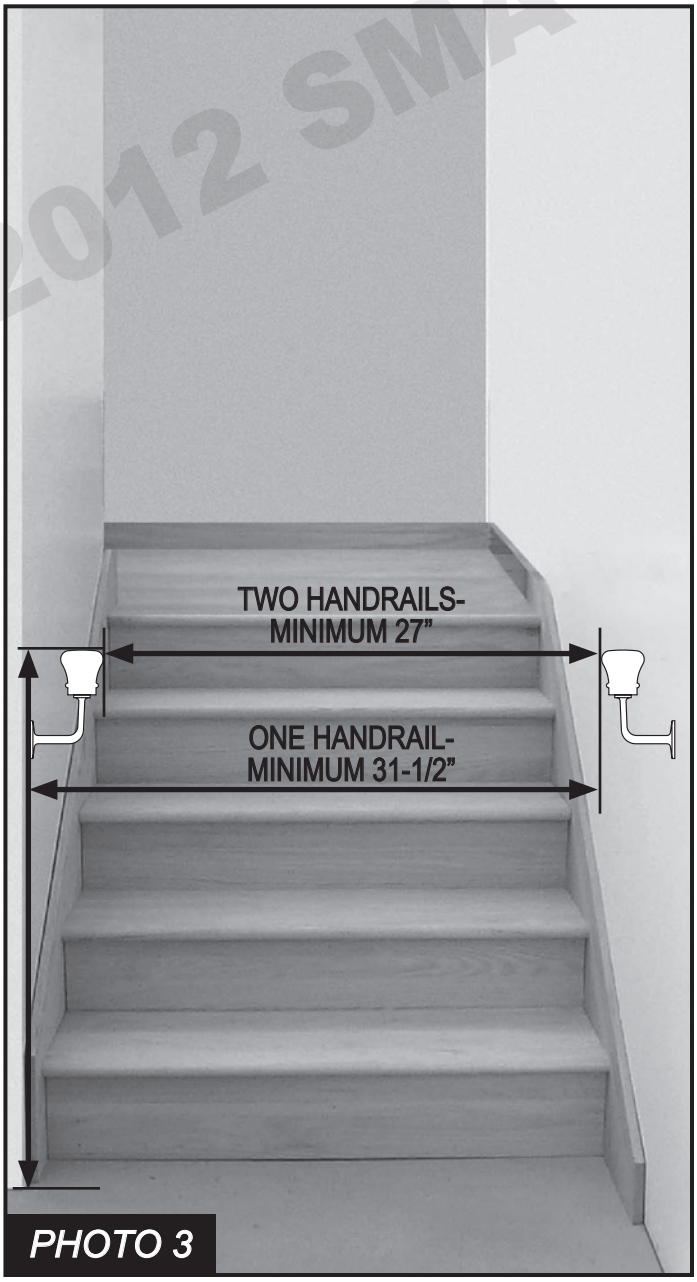


PHOTO 3

R311.7.2 Headroom.
The minimum headroom in all parts of the *stairway* shall not be less than 6 feet 8 inches (2032 mm) measured vertically from the sloped line adjoining the tread *nosing* **PHOTO 4** or from the floor surface of the landing or platform on that portion of the *stairway*. **PHOTO 5**.

Exception: Where the *nosings* of treads at the side of a flight extend under the edge of a floor opening through which the stair passes, the floor opening shall be allowed to project horizontally into the required headroom a maximum of 4¾ inches (121 mm). **PHOTO 6**

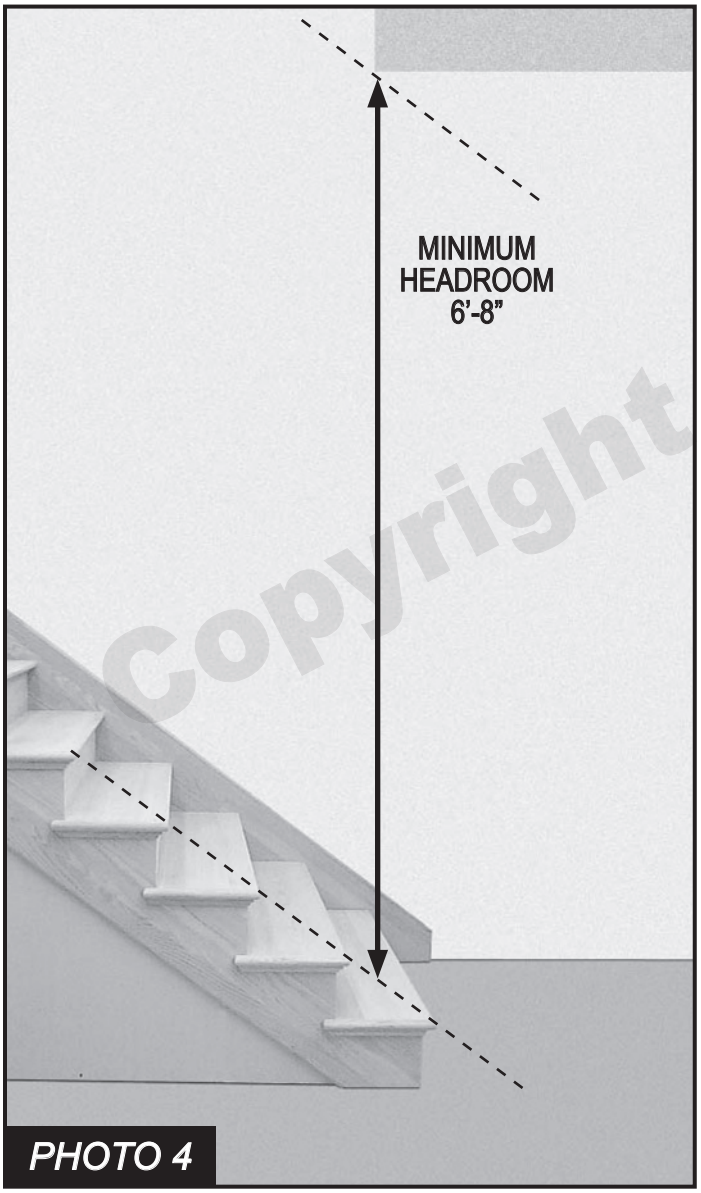


PHOTO 4

PHOTO 5

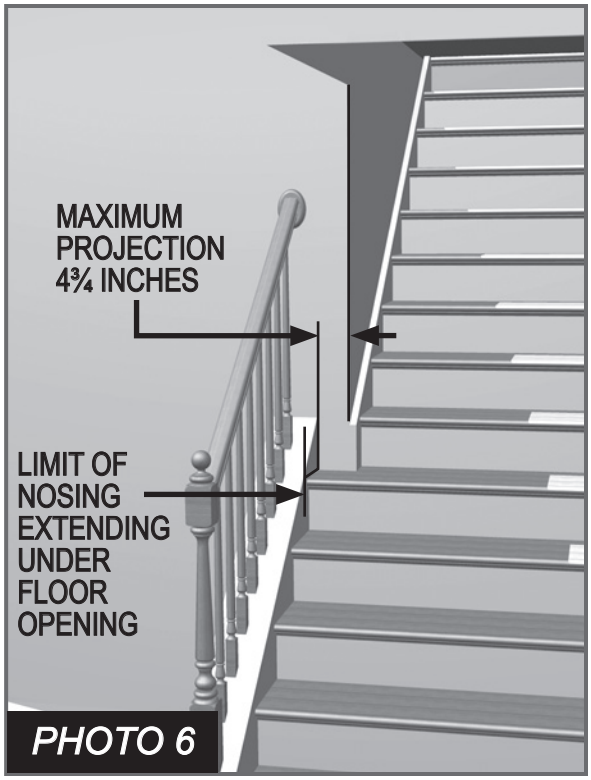
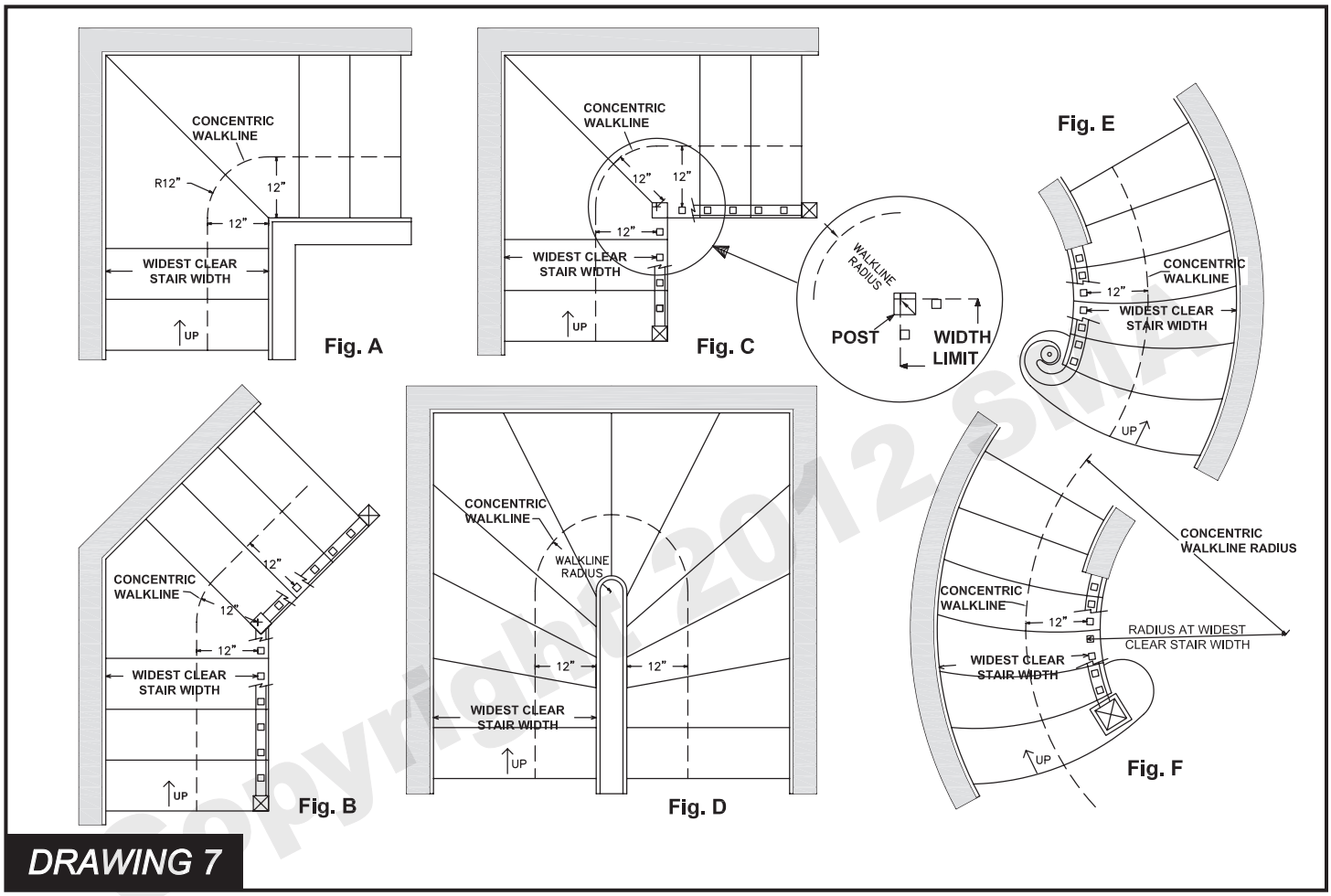


PHOTO 6

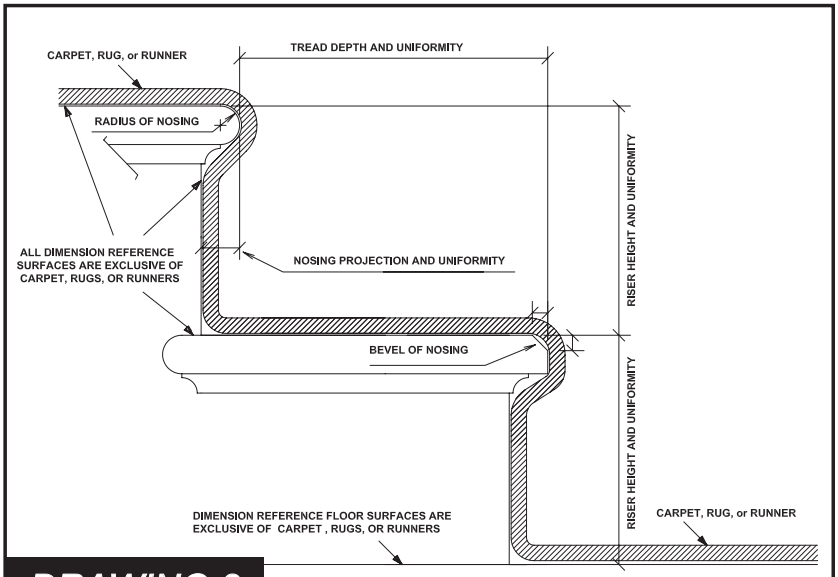
R311.7.3 Vertical rise.
A flight of stairs shall not have a vertical rise larger than 12 feet (3658 mm) between floor levels or landings.

R311.7.4 Walkline.
The walkline across *winder* treads shall be concentric to the curved direction of travel through the turn and located 12 inches (305 mm) from the side where the *winders* are narrower. The 12-inch (305 mm) dimension shall be measured from the widest point of the clear *stair* width at the walking surface of the *winder*. **DRAWING 7 figures A-F**. If *winders* are adjacent within the *flight*, **DRAWING 9 (p. 6)** the point of the widest clear *stair* width of the adjacent *winders* shall be used. **DRAWING 7 figures E-F**.



DRAWING 7

R311.7.5 Stair treads and risers.
Stair treads and risers shall meet the requirements of this section. For the purposes of this section all dimensions and dimensioned surfaces shall be exclusive of carpets, rugs or runners. **DRAWING 8**.

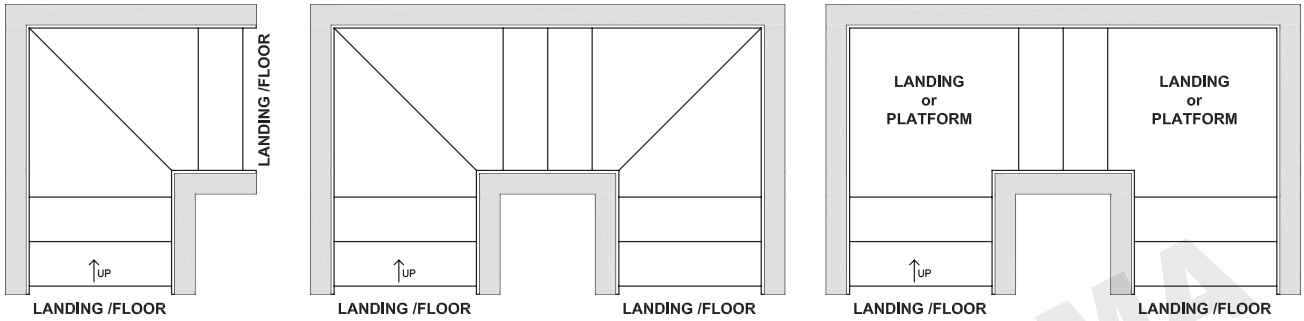


DRAWING 8

R311.7.5.1 Risers.
The maximum riser height shall be 7¾ inches (196 mm). The riser shall be measured vertically between leading edges of the adjacent treads. **PHOTO 10**. The greatest riser height within any *flight* **DRAWING 9** of *stairs* shall not exceed the smallest by more than ⅜ inch (9.5 mm). **PHOTO 11**. Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. **PHOTO 12**. Open risers are permitted provided that the opening between treads does not permit the passage of a 4-inch diameter (102 mm) sphere. **PHOTO 13**. **See Exception to the right.**

ICC DEFINITION - from Chapter 2 IRC and IBC

Flight - a continuous run of rectangular treads or winders or any combination thereof from one landing to another



DRAWING 9

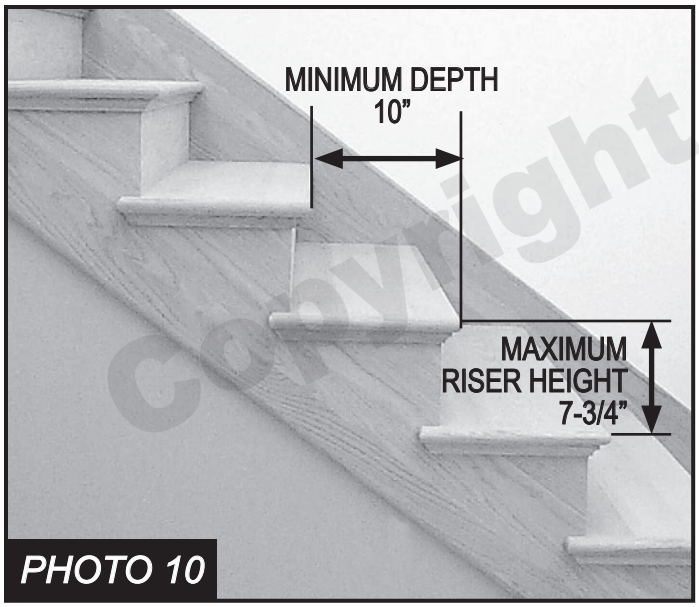


PHOTO 10

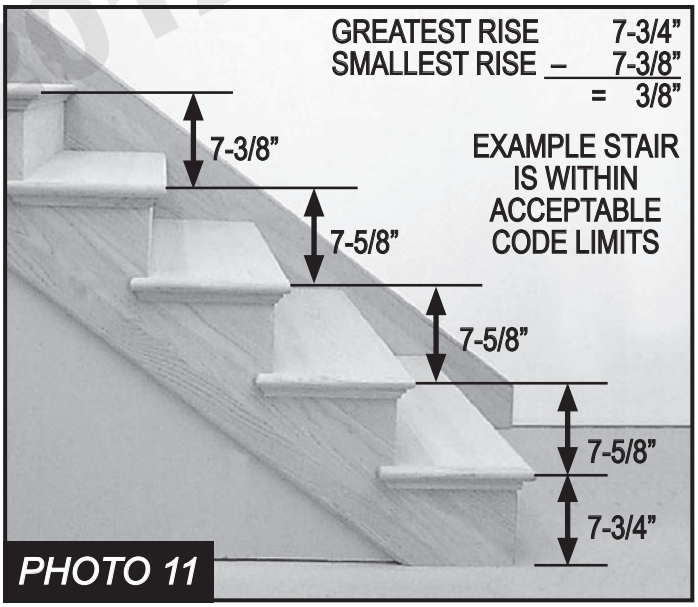


PHOTO 11

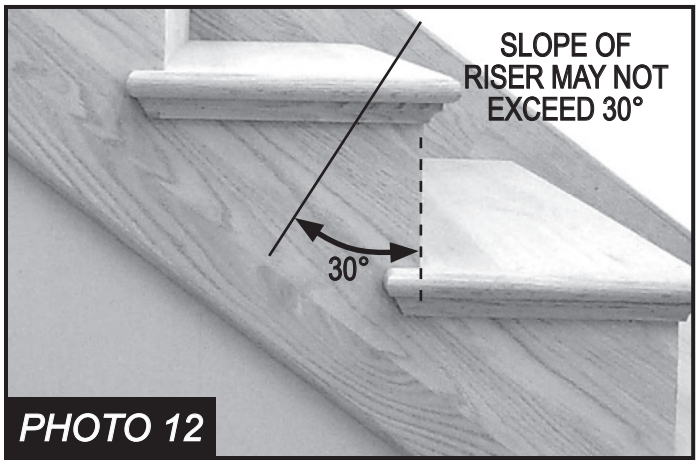


PHOTO 12

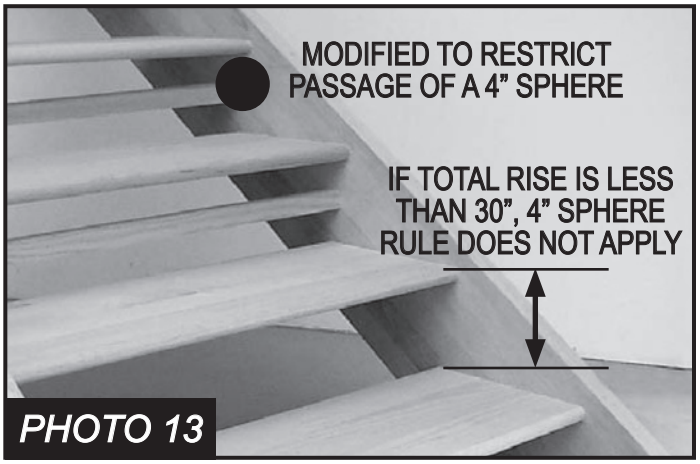


PHOTO 13

R311.7.5.1 Risers. (continued)
Exception: The opening between adjacent treads is not limited on stairs with a total rise of 30 inches (762 mm) or less. **PHOTO 13**

R311.7.5.2 Treads.
The minimum tread depth shall be 10 inches (254 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. **PHOTO 14**. The greatest tread depth within any flight **DRAWING 9** of stairs shall not exceed the smallest by more than ⅜ inch (9.5 mm). **PHOTO 14**.

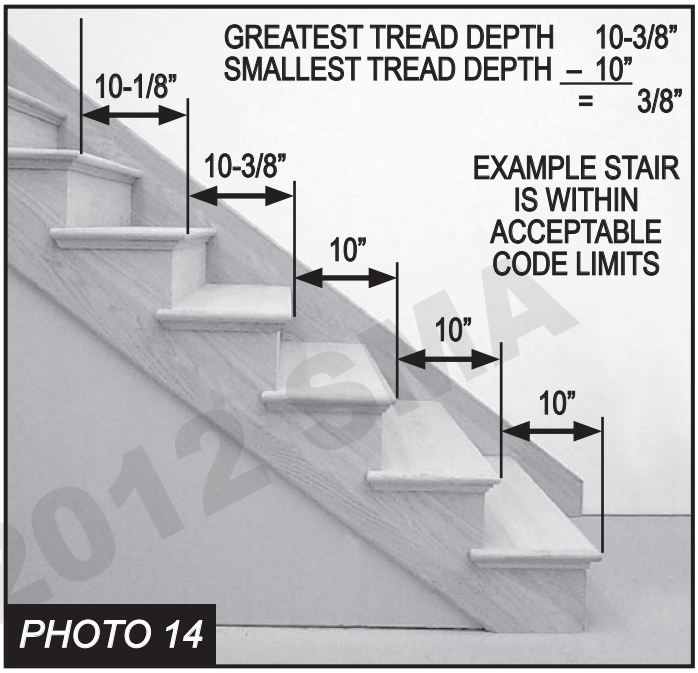
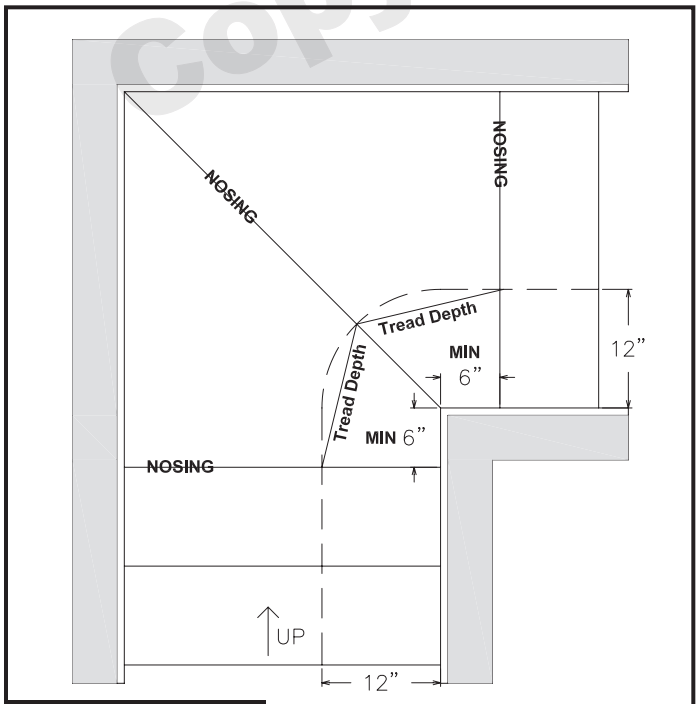
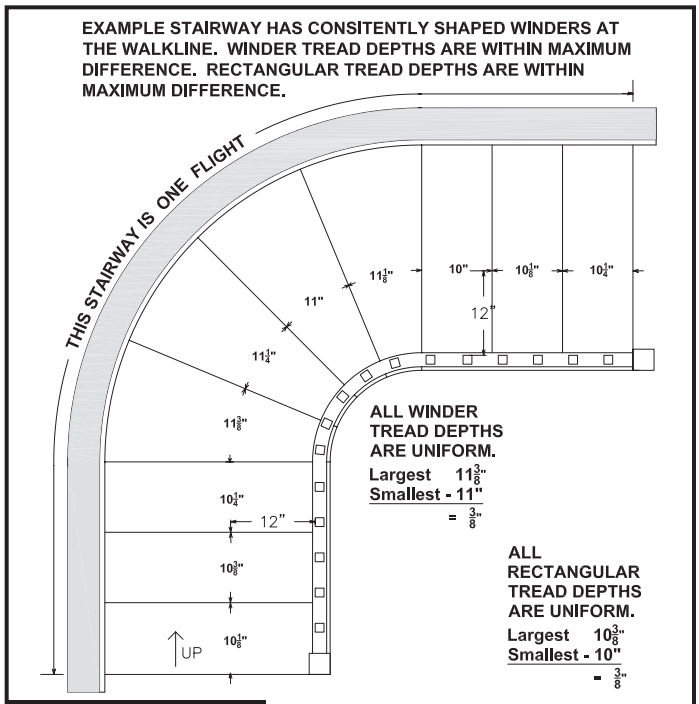


PHOTO 14

R311.7.5.2.1 Winder Treads.
Winder treads shall have a minimum tread depth of 10 inches (254 mm) measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline. Winder treads shall have a minimum tread depth of 6 inches (152 mm) at any point within the clear width of the stair. **DRAWING 15** Within any flight of stairs, **DRAWING 9** the largest winder tread depth at the walkline shall not exceed the smallest winder tread by more than 3/8 inch (9.5 mm). **DRAWING 16.** Consistently shaped winders at the walkline shall be allowed within the same flight of stairs as rectangular treads and do not have to be within 3/8 inch (9.5 mm) of the rectangular tread depth. **DRAWING 16**



DRAWING 15



DRAWING 16

ICC DEFINITION - from Chapter 2 IRC and IBC

Winder - A tread with non-parallel edges

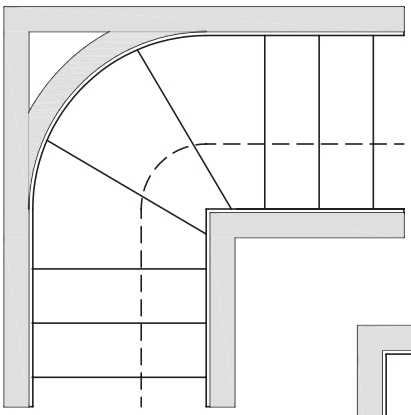


fig. A

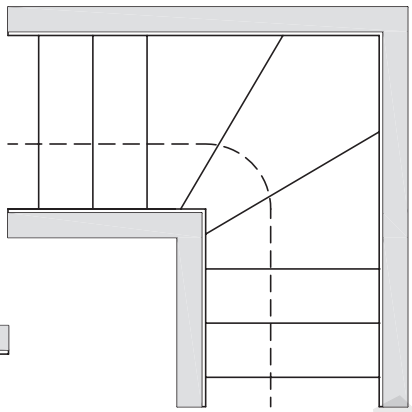


fig. B

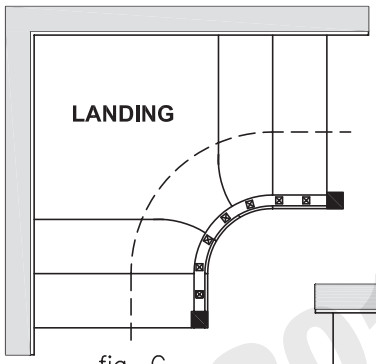


fig. C

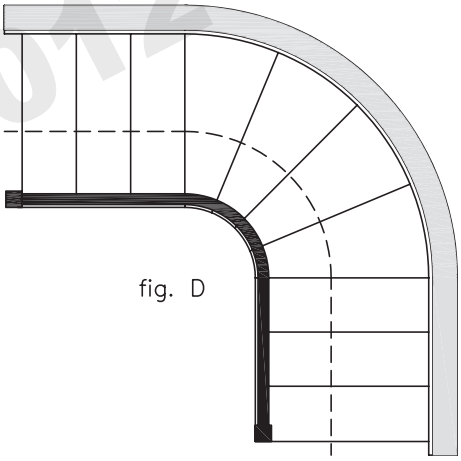


fig. D

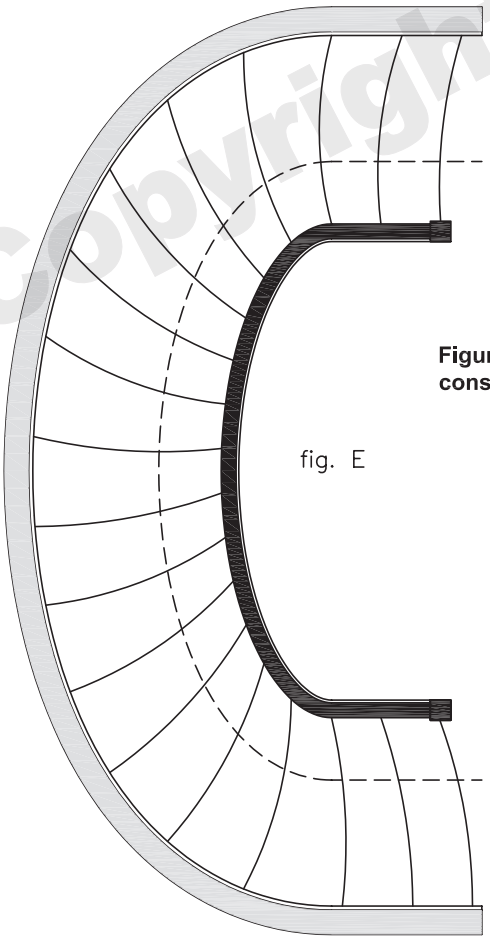


fig. E

Figures A-F illustrate common stairway designs with consistently shaped winder treads at the walkline.

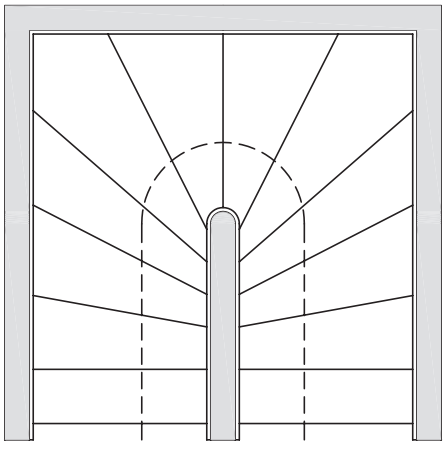


fig. F

R311.7.5.3 Nosings.
The radius of curvature at the nosing shall be no greater than $^{9}/_{16}$ inch (14 mm). **PHOTO 17**. A nosing not less than ¾ inch (19 mm) but not more than 1¼ inches (32 mm) shall be provided on stairways with solid risers. **PHOTO 18**. The greatest nosing projection shall not exceed the smallest nosing projection by more than ⅜ inch (9.5 mm) between two stories, including the nosing at the level of floors and landings. **PHOTO 19**. Beveling of nosings shall not exceed ½ inch (12.7 mm). **PHOTO 20**.

Exceptions: A nosing is not required where the tread depth is a minimum of 11 inches (279 mm).

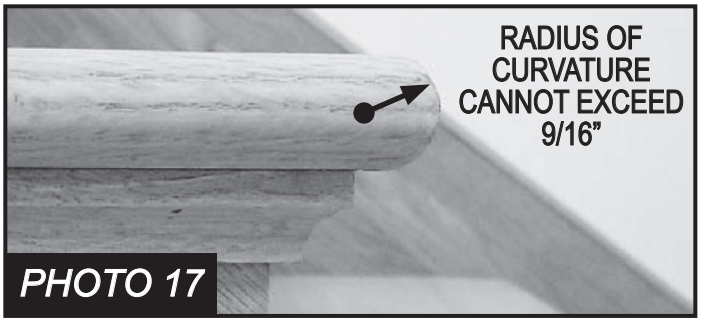


PHOTO 17

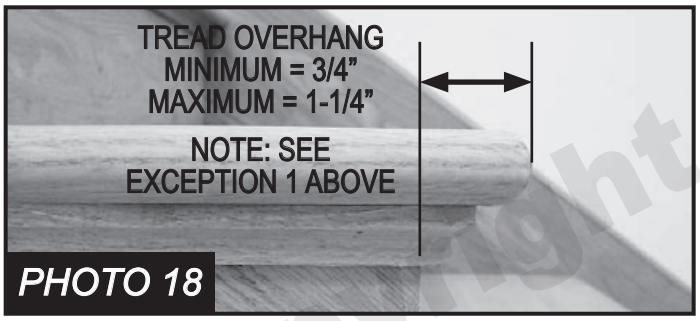


PHOTO 18

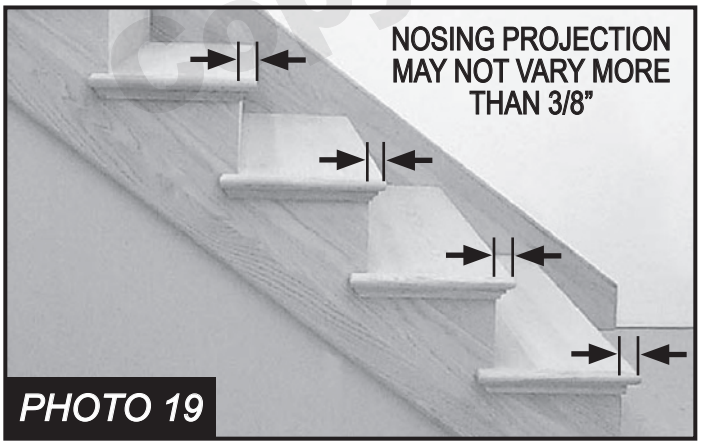


PHOTO 19

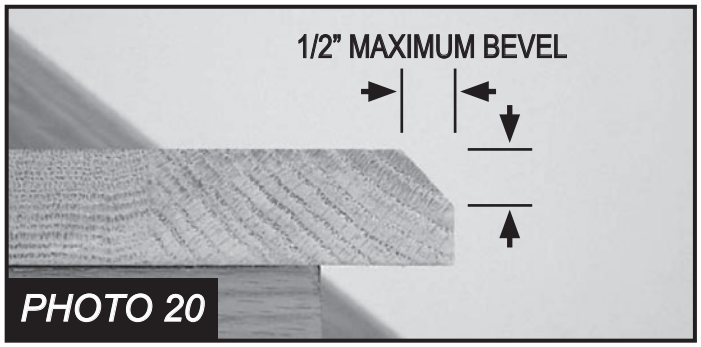
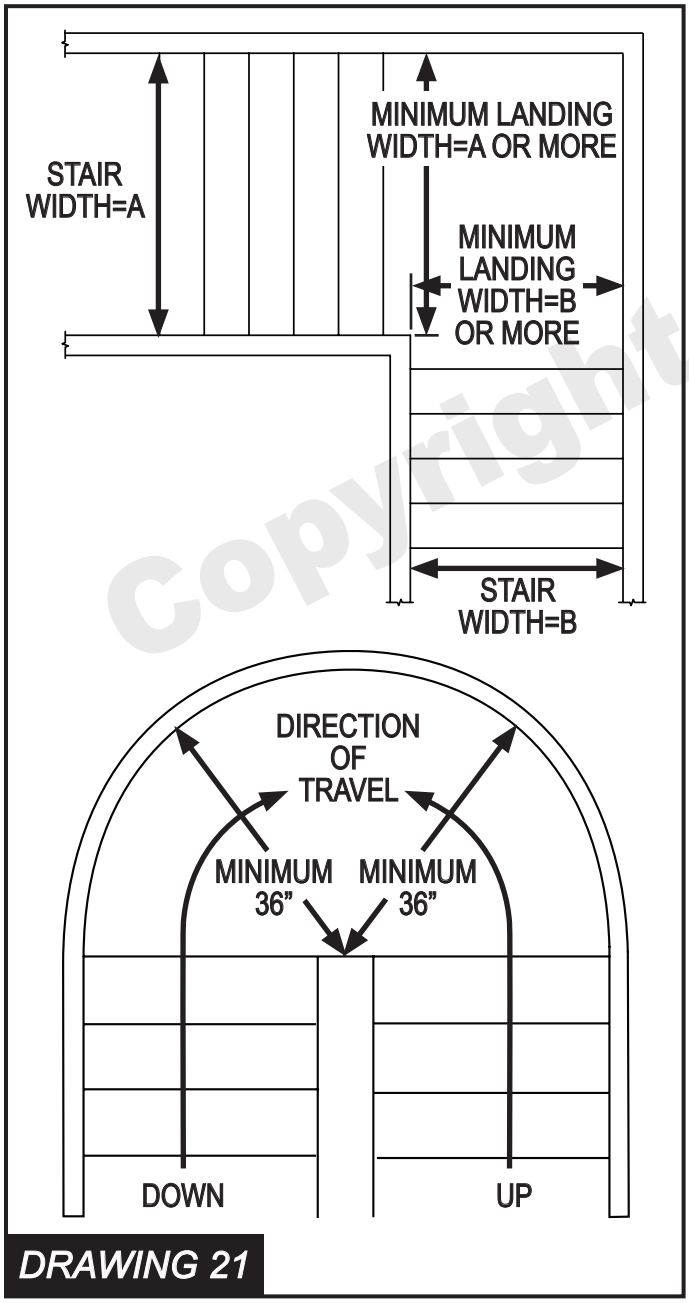


PHOTO 20

R311.7.5.4 Exterior wood/plastic composite stair treads.
Wood/plastic composite stair treads shall comply with the provisions of Section R507.3.

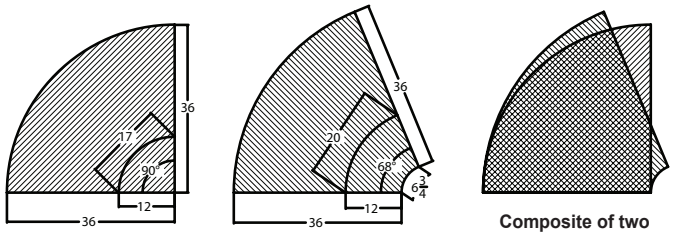
R311.7.6 Landings for stairways.
There shall be a floor or landing at the top and bottom of each stairway. The minimum width perpendicular to the direction of travel shall be no less than the width of the flight served. **DRAWING 21.** Landings of shapes other than square or rectangular shall be permitted provided the depth at the walk line and the total area is not less than that of a quarter circle with a radius equal to the required landing width. **DRAWING 22.** Where the stairway has a straight run, the minimum depth in the direction of the travel shall be not less than 36 inches (914 mm).

Exception: A floor or landing is not required at the top of an interior flight of stairs, including stairs in an enclosed garage, provided a door does not swing over the stairs.



DRAWING 21

Space Required to Safely Turn a Stairway at Connecting Flights is Regulated by Depth at the Walkline and Area



DRAWING 22

R311.7.7 Stairway walking surface.
The walking surface of treads and landings of *stairways* shall be sloped no steeper than one unit vertical in 48 inches horizontal (2-percent slope). **PHOTO 23**.

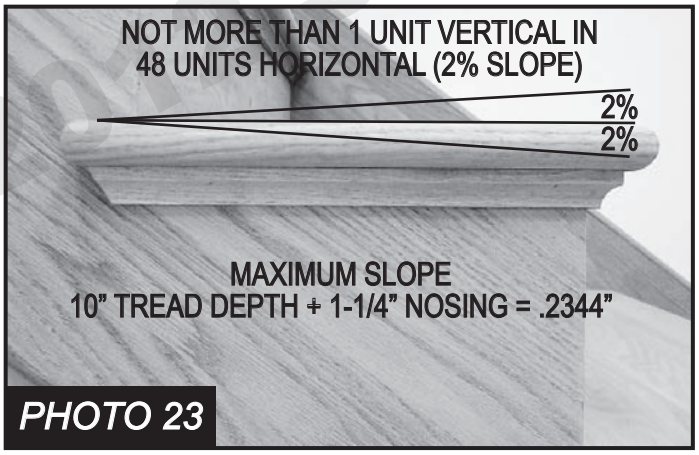
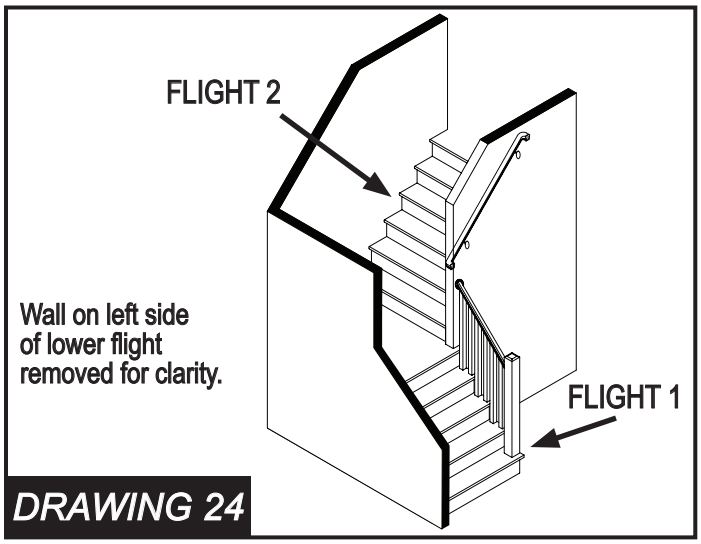


PHOTO 23

R311.7.8 Handrails.
Handrails shall be provided on at least one side of each continuous run of treads or *flight* **DRAWING 9 (p. 6)** with four or more risers. **DRAWING 24**.



DRAWING 24

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). **PHOTO 25**.

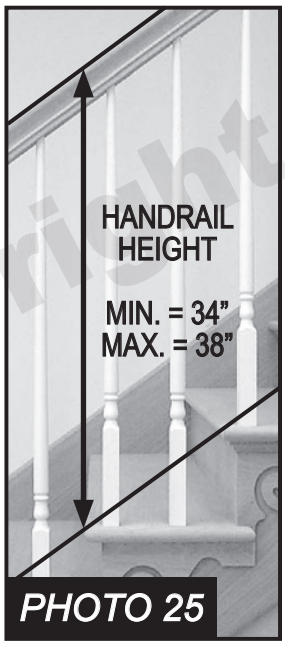


PHOTO 25

Exceptions:
1. The use of a volute, turnout or starting easing shall be allowed over the lowest tread. **PHOTO 26**

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. **DRAWING 27**

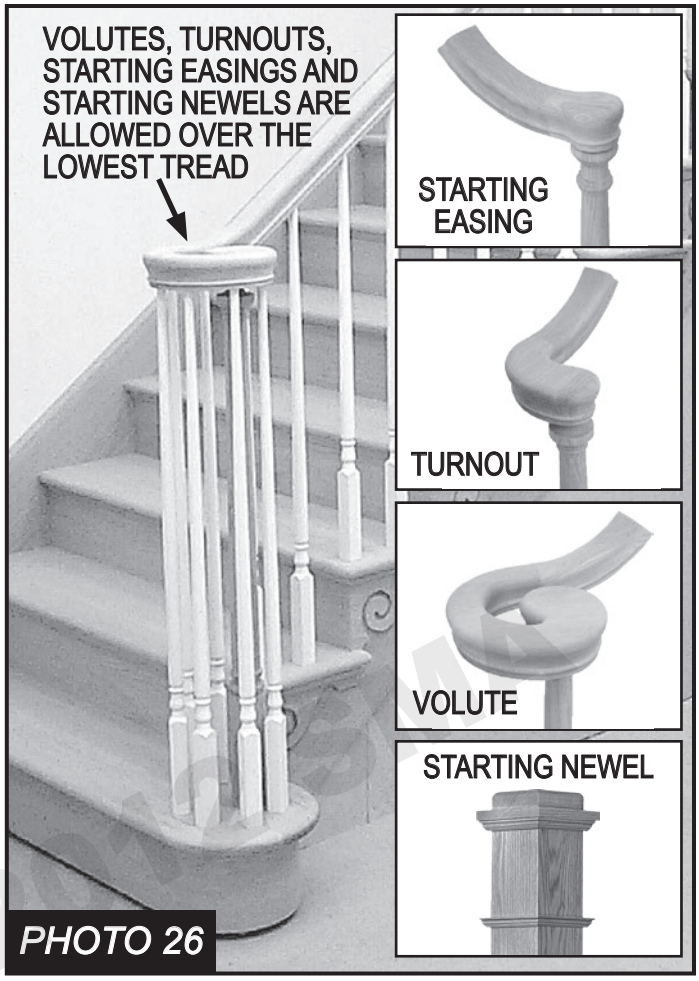
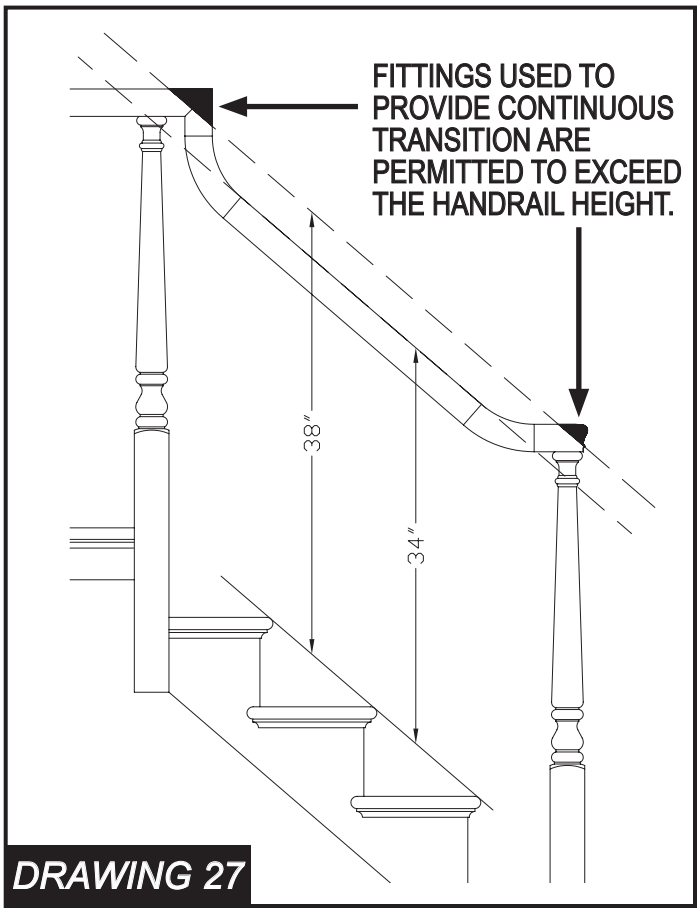


PHOTO 26

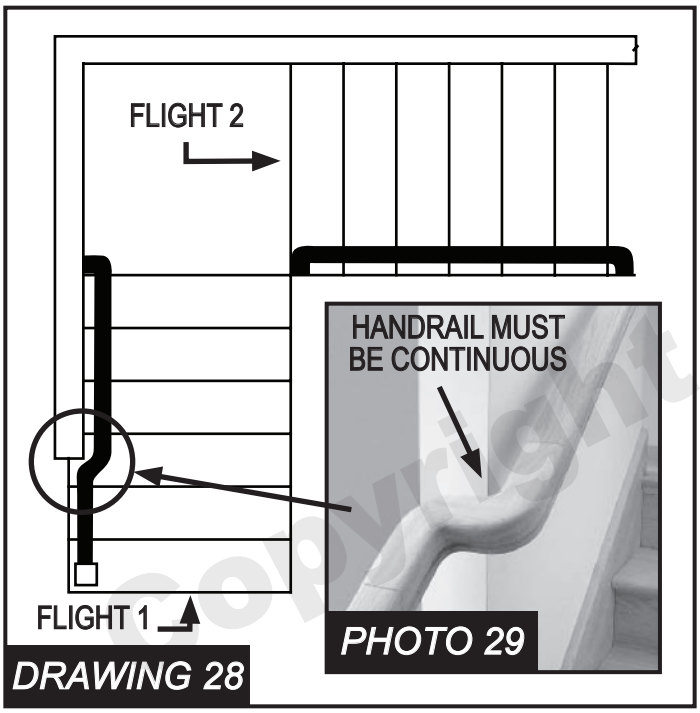


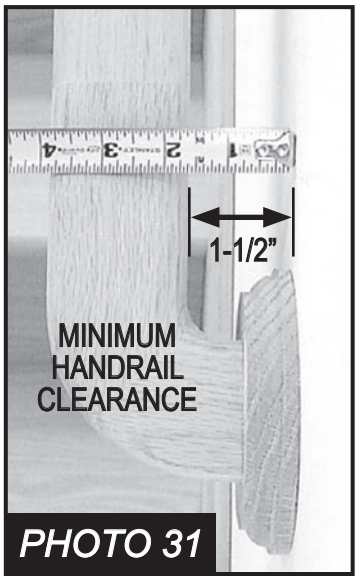
DRAWING 27

R311.7.8.2 Continuity.
Handrails for stairways shall be continuous for the full length of the *flight*, **DRAWING 27 (p. 11)** from a point directly above the top riser of the *flight* to a point directly above the lowest riser of the *flight*. **DRAWING 28** and **PHOTO 29** *Handrail* ends shall be returned **PHOTO 30** or shall terminate in newel posts or safety terminals. *Handrails* adjacent to a wall shall have a space of not less than 1½ inch (38 mm) between the wall and the *handrails*. **PHOTO 31**

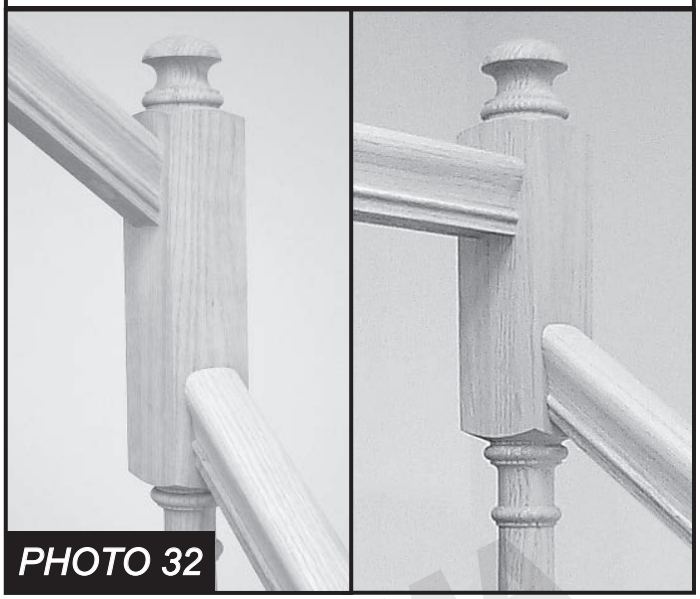
Exceptions: 1. *Handrails* shall be permitted to be interrupted by a newel post at the turn. **PHOTO 32**

2. The use of a volute, turnout, starting easing or starting newel shall be allowed over the lowest tread. **PHOTO 26 (p. 11)**

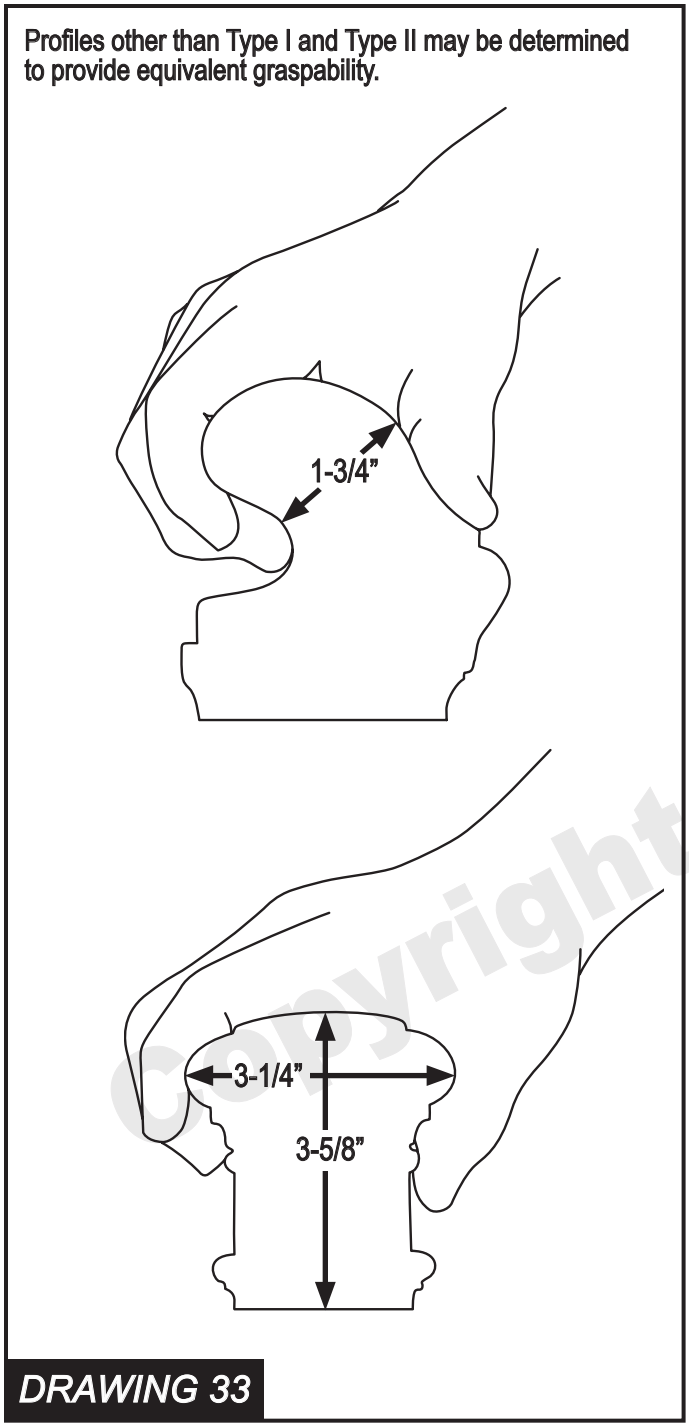




HANDRAIL MAY BE INTERRUPTED BY A NEWEL



R311.7.8.3 Grip-size.
All required *handrails* shall be of one of the following types or provide equivalent graspability. **DRAWING 33**.



DRAWING 33

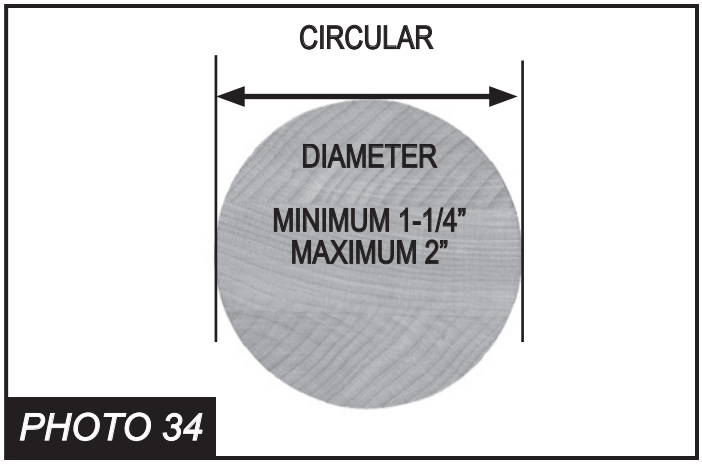


PHOTO 34

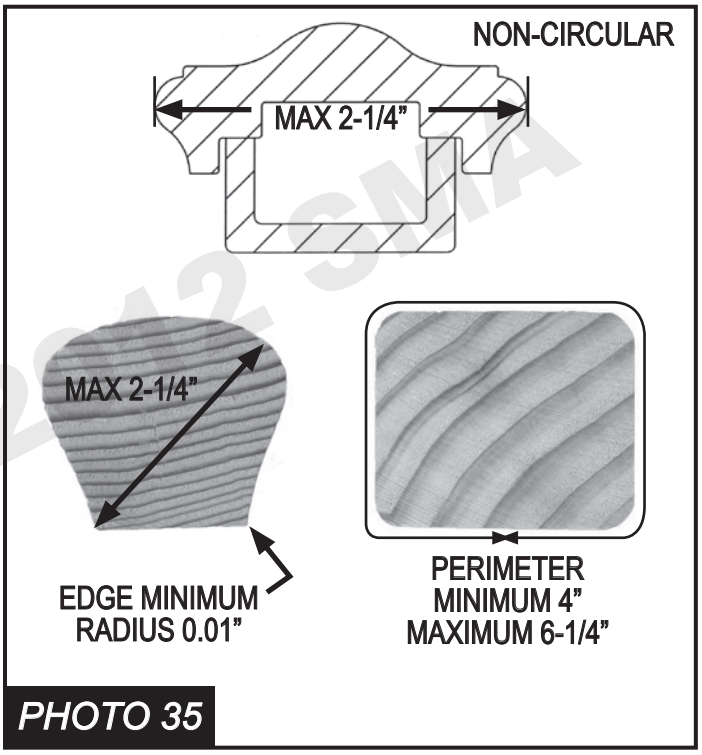
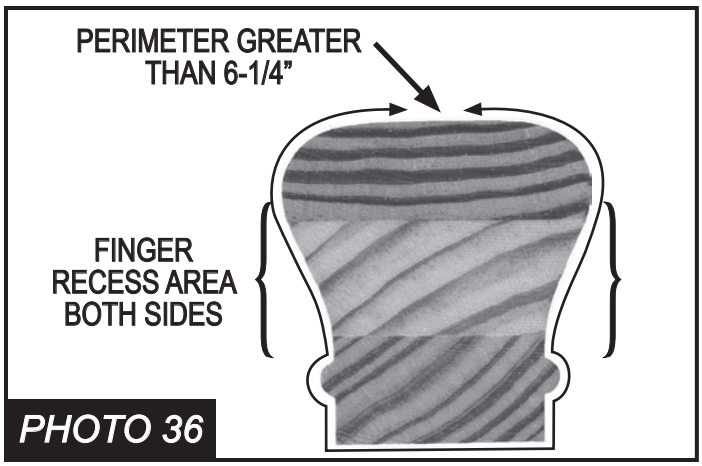


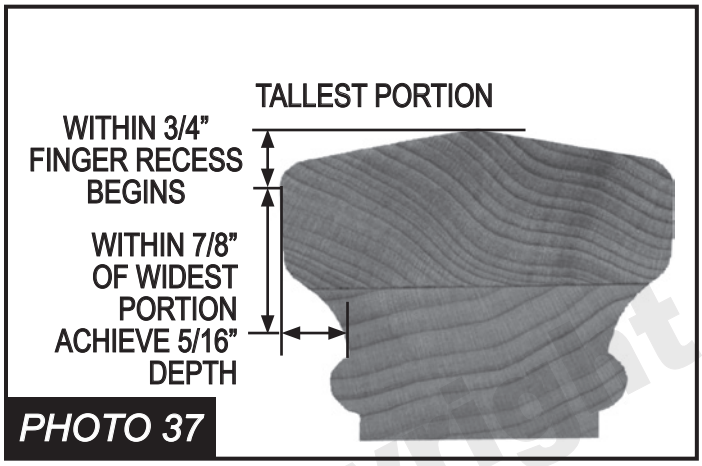
PHOTO 35

1. Type I. *Handrails* with a circular cross section shall have an outside diameter of at least 1¼ inches (32 mm) and not greater than 2 inches (51 mm). **PHOTO 34**. If the *handrail* is not circular, it shall have a perimeter dimension of at least 4 inches (102 mm) and not greater than 6¼ inches (160 mm) with a maximum cross section of dimension of 2¼ inches (57 mm). Edges shall have a minimum radius of 0.01 inches (0.25 mm) **PHOTO 35**.

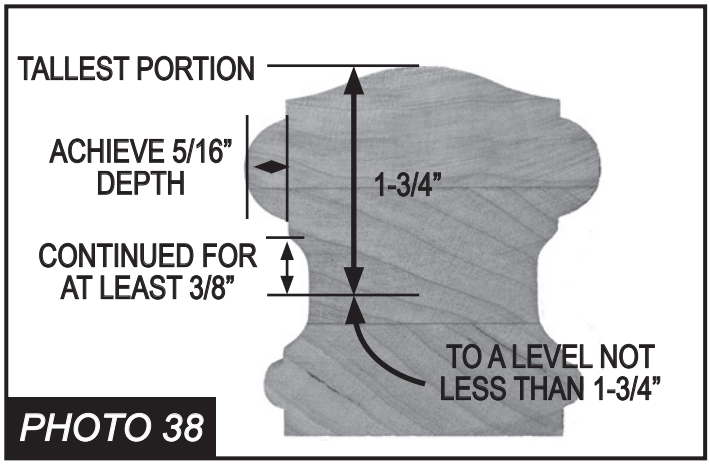
2. Type II. *Handrails* with a perimeter greater than 6¼ inches (160mm) shall have a graspable finger recess area on both sides of the profile. The finger recess shall begin within a distance of ¾ inch (19 mm) measured vertically from the tallest portion of the profile and achieve a depth of at least $^{5}/_{16}$ inch (8 mm) within ⅞ inch (22 mm) below the widest portion of the profile. This required depth shall continue for at least ⅜ inch (10 mm) to a level that is not less than 1¾ inches (45 mm) below the tallest portion of the profile. The minimum width of the handrail above the recess shall be 1¼ inches (32 mm) to a maximum of 2¾ inches (70 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm). **SEE ILLUSTRATIONS NEXT PAGE**



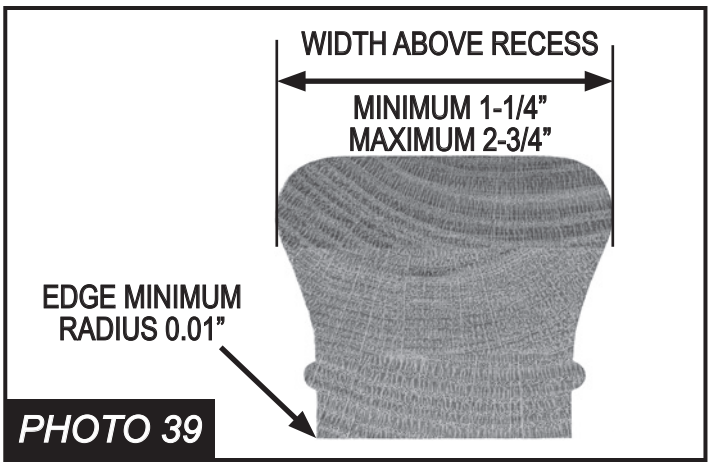
Handrails with a perimeter greater than 6¼ inches (160 mm) shall have a graspable finger recess area on both sides of the profile. **PHOTO 36**.



The finger recess shall begin within a distance of ¾ 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 ⅞ inch (22 mm) below the widest portion of the profile. **PHOTO 37**.



This required depth shall continue for at least ⅜ inch (10 mm) to a level that is not less than 1¾ inches (45 mm) below the tallest portion of the profile. **PHOTO 38**.



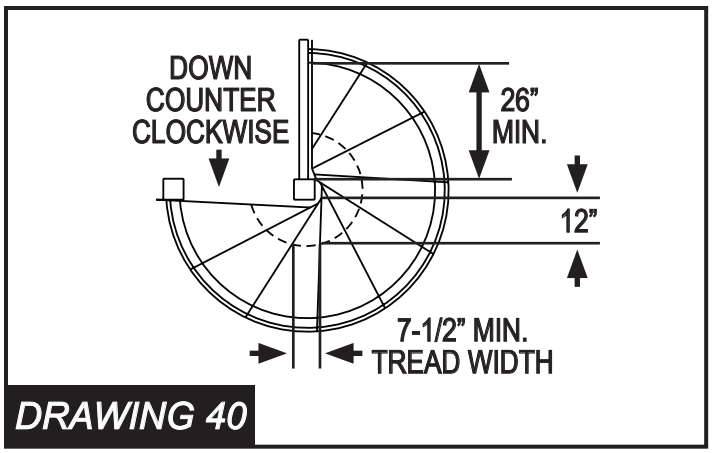
The minimum width of the handrail above the recess shall be 1¼ inches (32 mm) to a maximum of 2¾ inches (70 mm). **PHOTO 39**. Edges shall have a minimum radius of 0.01 inch (0.25 mm). **PHOTO 39**.

R311.7.8.4 Exterior wood/plastic composite handrails. Wood/plastic composite *handrails* shall comply with the provisions of Section R507.3.

R311.7.9 Illumination.
All *stairs* shall be provided with illumination in accordance with Section R303.6.

R311.7.10 Special stairways. Spiral *stairways* and bulkhead enclosure *stairways* shall comply with all requirements of Section R311.7 except as specified below.

R311.7.10.1 Spiral stairways. Spiral *stairways* are permitted, provided the minimum clear width at and below the *handrail* shall be 26 inches (660 mm) **DRAWING 40** & **PHOTO 41** with each tread having a 7½-inch (190 mm) minimum tread depth at 12 inches (914 mm) from the narrower edge. All treads shall be identical, **DRAWING 40** and the rise shall be no more than 9½ inches (241 mm). A minimum headroom of 6 feet 6 inches (1982 mm) shall be provided. **PHOTO 40**



DRAWING 40

R311.7.10.2 Bulkhead enclosure stairways. *Stairways* serving bulkhead enclosures, not part of the required building egress, providing access from the outside *grade* level to the *basement* shall be exempt from the requirements of Sections R311.3 and R311.7 where the maximum height from the *basement* finished floor level to *grade* adjacent to the *stairway* does not exceed 8 feet (2438 mm) and the *grade* level opening to the *stairway* is covered by a bulkhead enclosure with hinged doors or other *approved* means.

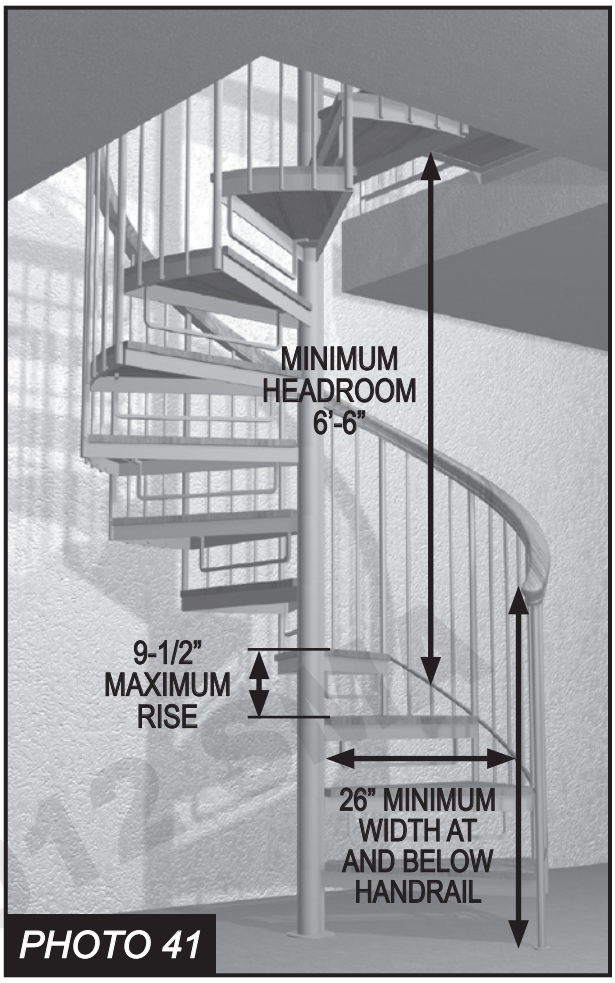
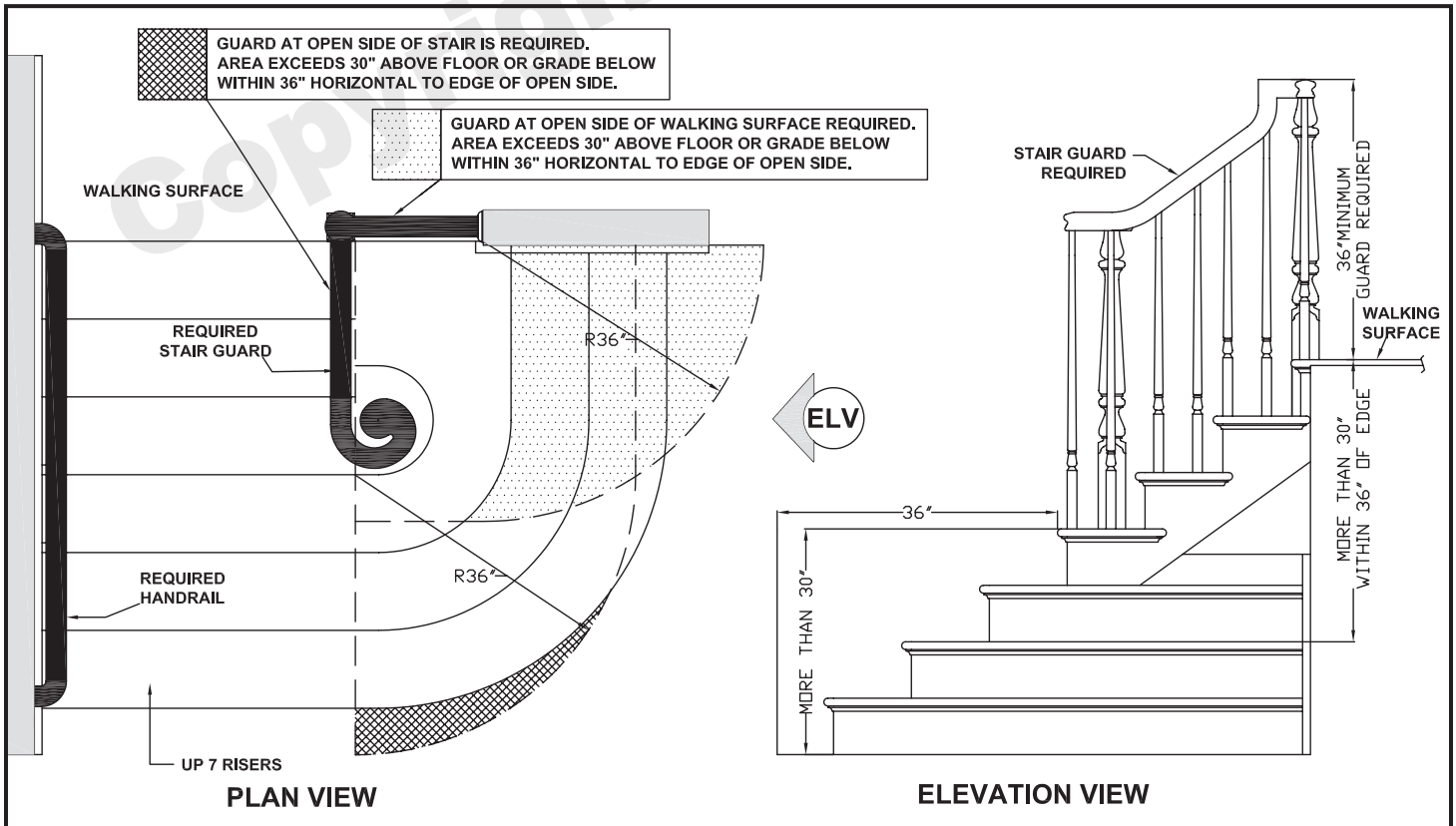


PHOTO 41



DRAWING 42

SECTION R312
GUARDSAND WINDOW FALL PROTECTION

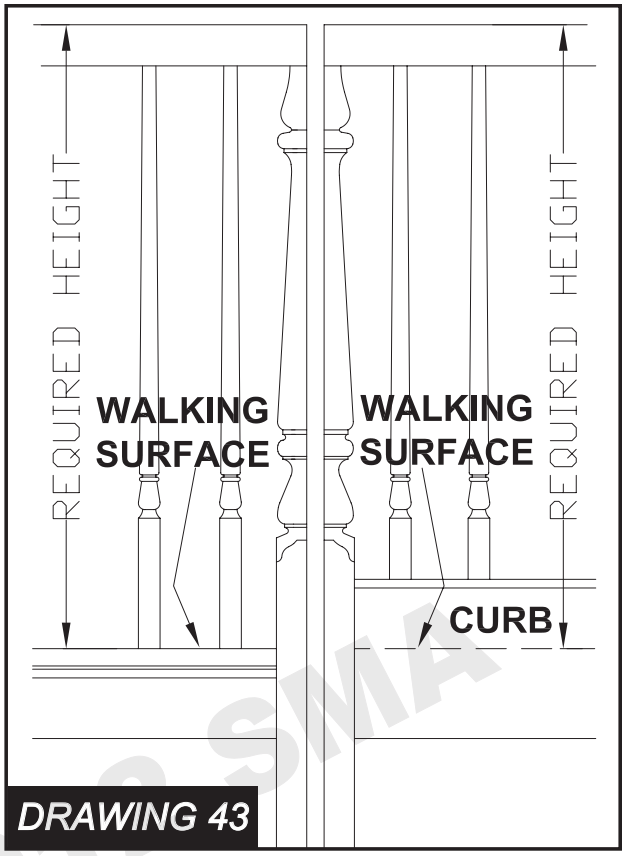
R312.1 Guards. Guards shall be provided in accordance with Sections R312.1.1 through R312.1.4.

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 36 inches (914 mm) horizontally to the edge of the open side. **DRAWING 42 (P. 15)** Insect screening shall not be considered as a *guard*.

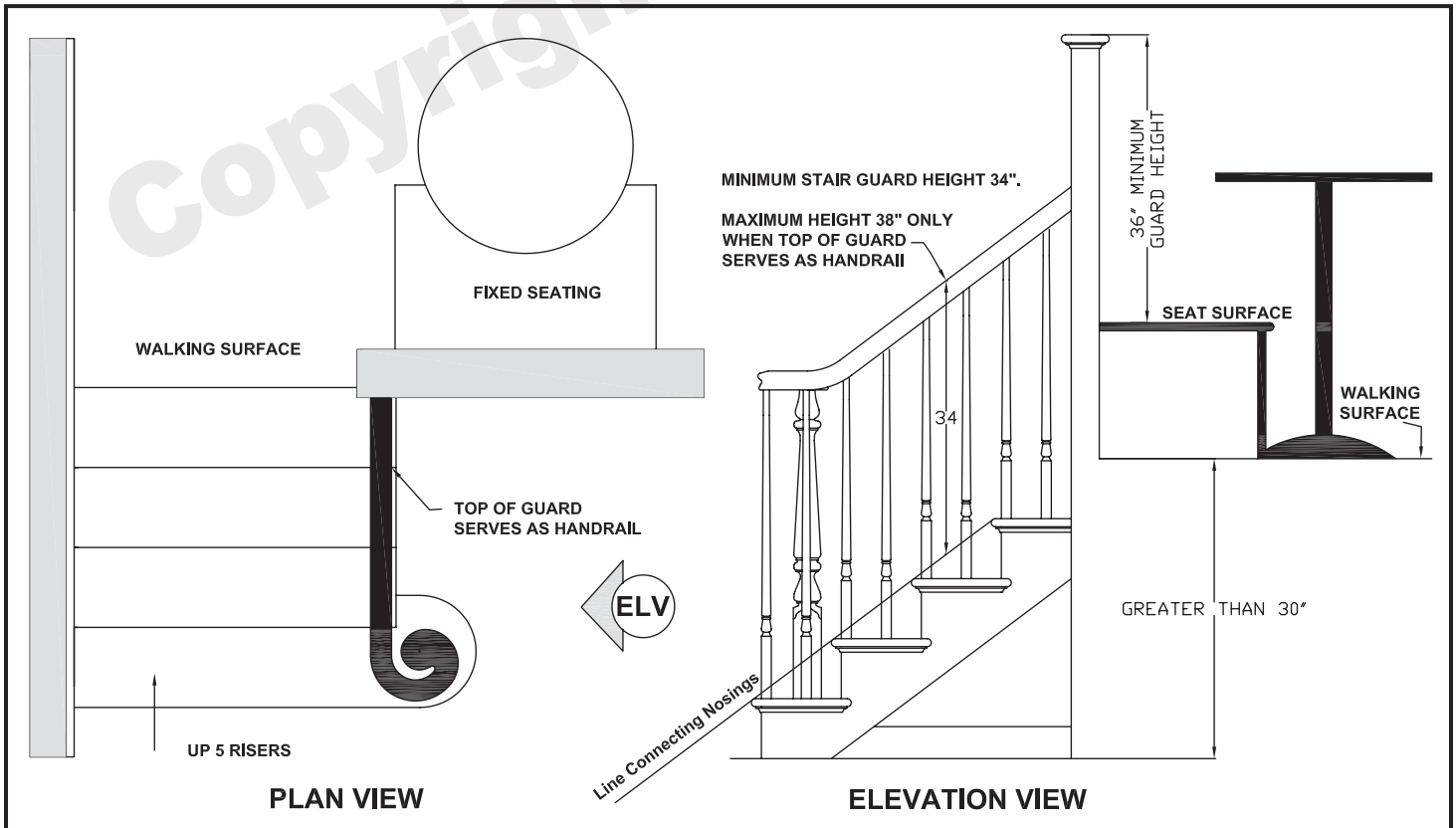
R312.1.2 Height. Required *guards* at open-sided walking surfaces, including *stairs*, porches, balconies or landings, shall be not less than 36 inches (914 mm) high measured vertically above the adjacent walking surface, **DRAWING 43** adjacent fixed seating or the line connecting the leading edges of the treads. **DRAWING 44**

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. **DRAWING 44**.

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 not 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. **DRAWING 44**



DRAWING 43



DRAWING 44

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. **PHOTO 45**.

Exception: 1. The triangular openings at the open side of a 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. **PHOTO 46**.

2. *Guards* on the open sides of stairs shall not have openings which allow passage of a sphere 4⅜ inches (111 mm) in diameter. **PHOTO 46**.

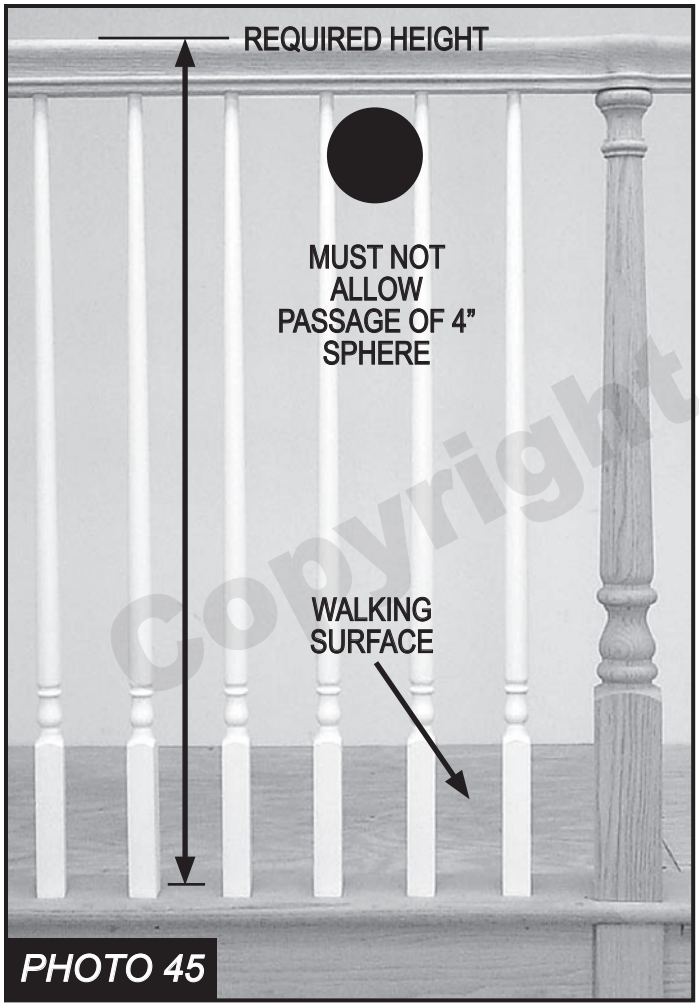


PHOTO 45

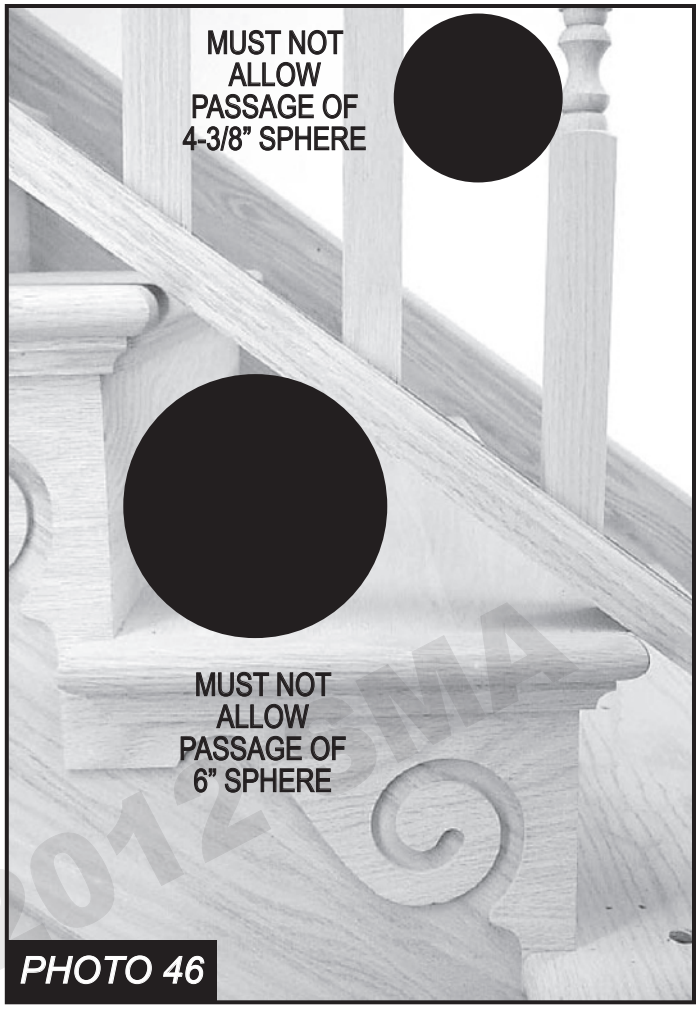


PHOTO 46

R312.1.4 Exterior woodplastic composite guards.
Woodplastic composite *guards* shall comply with the provisions of Section R317.4.

CHAPTER 2

DEFINITIONS

R201.3 Terms Defined in other codes. Where terms are not defined in this code such terms shall have meanings ascribed to them as in other code publications of the International Code Council.

Note: In order to assure a complete understanding in accordance with above we have listed all the stair related definitions from both the IRC and the IBC (International Building Code). These defined terms appear in italics within the document.

IRC - Section R202 Definitions

FLIGHT. A continuous run of rectangular treads or winders or combination thereof from one landing to another.

GUARD. A building component or a system of building components located near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to a lower level.

HANDRAIL. A horizontal or sloping rail intended for grasping by the hand for guidance or support.

NOSING. The leading edge of treads of stairs and of landings at the top of stairway flights.

STAIRWAY. One or more flights of stairs, either interior or exterior, with the necessary landings and platforms connecting them to form a continuous and uninterrupted passage from one level to another within or attached to a building, porch or deck.

WINDER. A tread with nonparallel edges.

IBC - Section 1002 Definitions

1002.1 Definitions. The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

ALTERNATING TREAD DEVICE. A device that has a series of steps between 50 and 70 degrees (0.87 and 1.22 rad) from horizontal, usually attached to a center support rail in an alternating manner so that the user does not have both feet on the same level at the same time.

FLIGHT. A continuous run of rectangular treads, winders or combination thereof from one landing to another.

GUARD. A building component or a system of building components located at or near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to a lower level.

HANDRAIL. A horizontal or sloping rail intended for grasping by the hand for guidance or support.

NOSING. The leading edge of treads of stairs and of landings at the top of stairway flights.

SCISSOR STAIR. Two interlocking stairways providing two separate paths of egress located within one stairwell enclosure.

STAIR. A change in elevation, consisting of one or more risers.

STAIRWAY. One or more flights of stairs, either exterior or interior, with the necessary landings and platforms connecting them, to form a continuous and uninterrupted passage from one level to another.

STAIRWAY, EXTERIOR. A stairway that is open on at least one side, except for required structural columns, beams, handrails and guards. The adjoining open areas shall be either yards, courts or public ways. The other sides of the exterior stairway need not be open.

STAIRWAY, INTERIOR. A stairway not meeting the definition of an exterior stairway.

STAIRWAY, SPIRAL. A stairway having a closed circular form in its plan view with uniform section-shaped treads attached to and radiating from a minimum-diameter supporting column.

WINDER. A tread with nonparallel edges.

NOTES:

cut on line and laminate for handy field/desk reference tool

FULL SCALE TYPE II RAIL TEST

INSTRUCTIONS:

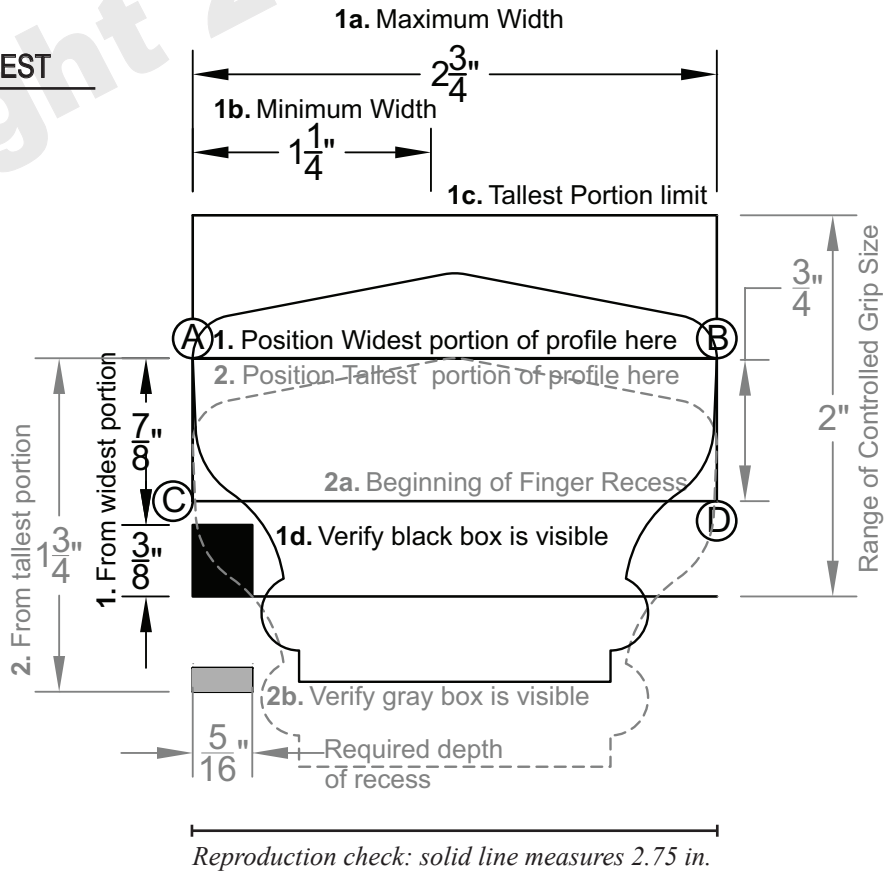
1. Position the widest portion on A-B line and left edge touching line A-C. Keep horizontal axis of rail parallel to line A-B. With the rail in position:

- **1a.** verify < maximum width
- **1b.** verify > minimum width
- **1c.** verify tallest portion is at or below the limit line
- **1d**. verify black box is visible

2. Slide rail down and position tallest portion of rail section touching line A-B and left edge touching line A-C. Keep horizontal axis of rail parallel to line A-B.

- **2a.** verify beginning of recess is at or above line C-D
- **2b.** verify gray box is visible

NOTE: Type II rails have a perimeter greater than 6-1/4 inches and a finger recess on each side. If profile is asymmetrical both sides must pass.



Reproduction check: solid line measures 2.75 in.

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The SMA is a broad based industry association founded in 1988. Our members include stair builders, stair parts manufacturers, installers, millwork distributors, dealers and interested building products professionals. We are an industry organization run by industry people. Our primary focus is to serve the Stair Industry.

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