

**New Materials, Methods, and
Techniques of Construction**

Prepared for



Course # 36151
&
Course # 28067



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May 11, 2023

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Schedule

- 1:30 – 3:00 - Building, Plumbing & Mechanical**
- 3:00 – 3:15 - BREAK**
- 3:15 – ? - Electrical**

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Acknowledgments & References

Including material extracted from

Significant Changes to the International Residential Code 2021 Edition,
Stephen A. Van Note & Sandra Hyde, P.E., & Paul D. Armstrong, P.E., C.B.O.

Deck Construction based on the 2021 IRC, by Glenn Mathewson

A Complete Guide to the 2020 NEC Changes by Ryan Jackson

A Complete Guide to the 2023 NEC Changes by Ryan Jackson

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We Need You!

- To ask questions – enter them in “chat”
- To return from breaks on time
- To stay muted until unmuted by moderator
- No war stories!



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21st Century Codes & Standards

What has changed in the last 25 years?

- ☐ Codes are prescriptive & easier to understand
- ☐ Legacy codes were based on passive fire protection
- ☐ Fire protection codes are now active rather than passive
- ☐ Framing is lighter, connections are stronger
- ☐ Houses are tighter
- ☐ Major energy code changes, Green Building
- ☐ New technologies

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Different Types of Inspectors

- **Code enforcement inspector:** Typically looking at unpermitted work. Usually requires compliance with current code for such work. May issue citations and fines.
- **Jurisdictional building inspector:** Inspecting permitted work during the course of construction. May issue correction notices.
- **Home inspector:** Inspecting for safety and habitability using criteria that a “reasonably prudent home inspector” would apply. This can include issues based upon standards such as past, current, or future codes. Home inspectors look at the condition of aging components. They present their findings in a written report.

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Life Cycle of a Project

- ☐ Permit application & plan submittal
- ☐ Plan review
- ☐ Permit issuance
- ☐ Inspections
- ☐ Completion
- ☐ C of O issued

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Real Life

- ☐ Start project
- ☐ Get turned in to Code Enforcement by angry neighbor
- ☐ Lie to building department about what is new vs. existing
- ☐ Draw plans on scratch paper
- ☐ Complain that building department is not homeowner-friendly
- ☐ Eventually have permit issued as “owner builder” without insurance
- ☐ Begin war of attrition with inspectors
- ☐ Eventually get signed off
- ☐ Tell home inspector that everything was approved
- ☐ Tell buyer that home inspector is wrong about everything

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Home Inspectors and Codes

From the introduction to the *International Residential Code*:

The purpose of this code is to establish minimum requirements to provide a reasonable level of safety, health and general welfare through affordability, structural strength, means of egress, stability, sanitation, light and ventilation, energy conservation and safety to life and property from fire and other hazards and to provide a reasonable level of safety to fire fighters and emergency responders during emergency operations.

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Virginia Residential Code Amendments

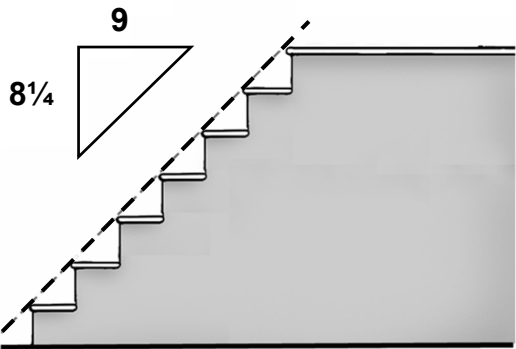
- ☐ Accessory structures up to 256 sq. ft. without permits
- ☐ Screens required at doors and windows
- ☐ Landings 8¼ in. below top of threshold, stair risers 8¼ in. treads 9 in.
- ☐ Child fall protection not required if > 18 in. above finished floor
- ☐ Fire extinguisher required if building not sprinklered
- ☐ Prescriptive bracing for floor plans of skewed rectangles
- ☐ Drip edge not required for asphalt shingles
- ☐ Uses IRC Energy Code
- ☐ Replacement appliances require chimney inspection
- ☐ Fire protection of floors not required

<https://codes.iccsafe.org/content/VRC2018P2>

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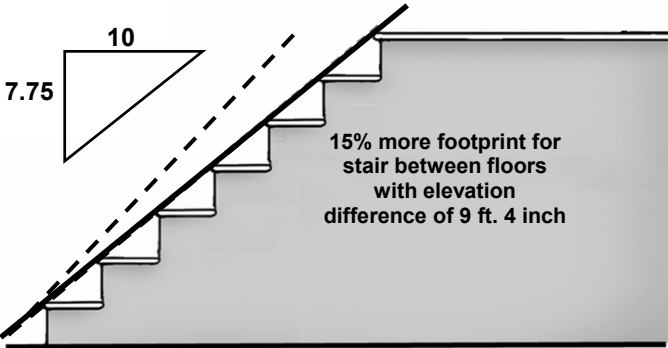
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Virginia Residential Stairs

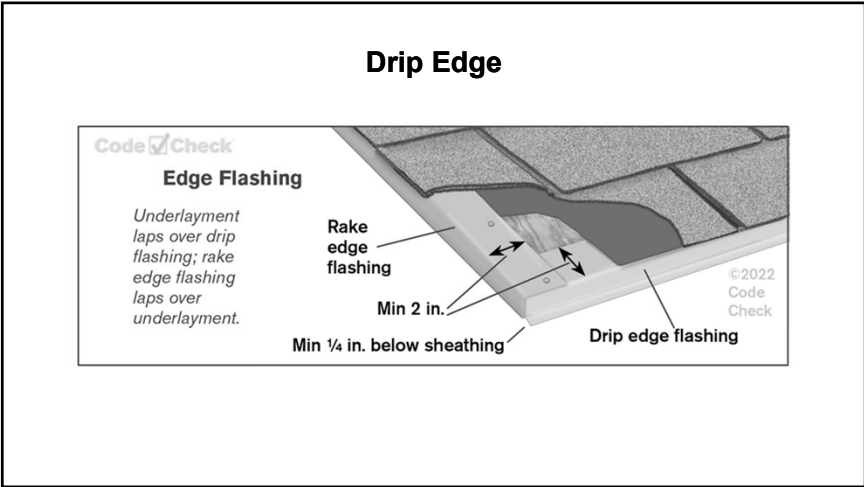


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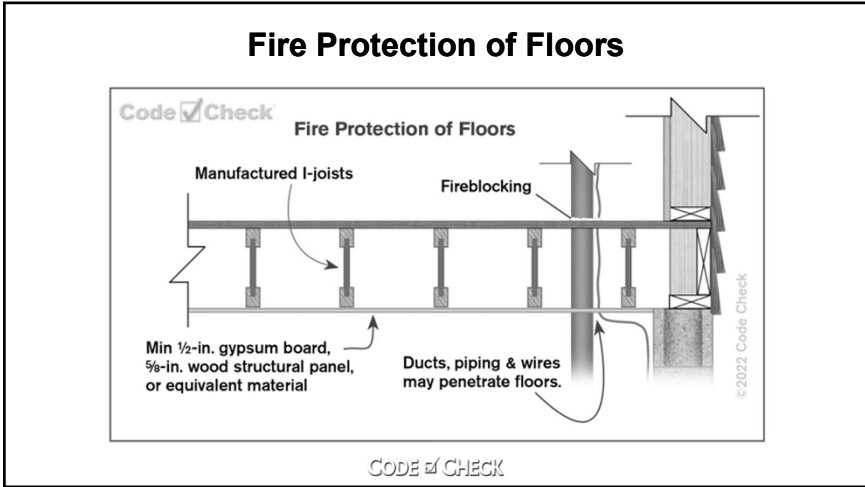
IRC Stairs



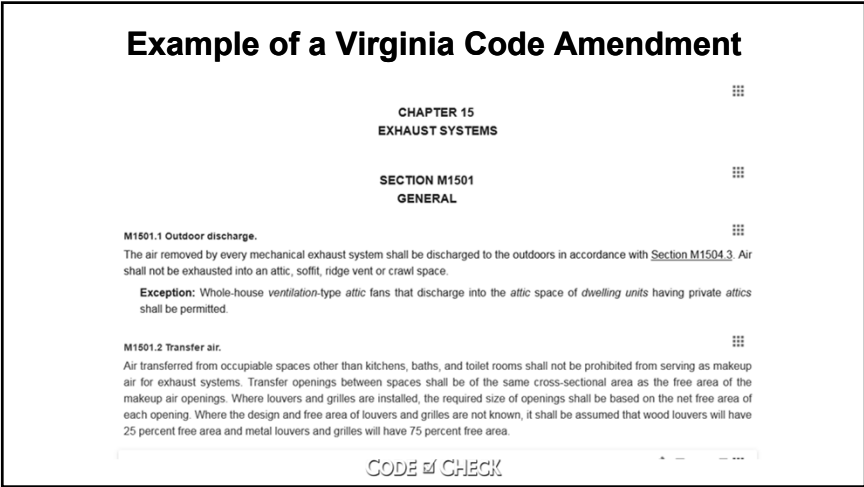
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Example of a Virginia Amendment

M1602.2 Return air openings.
Return air openings for heating, ventilation and air-conditioning systems shall comply with all of the following:

1. Openings shall not be located less than 10 feet (3048 mm) measured in any direction from an open combustion chamber or draft hood of another appliance located in the same room or space.
2. The amount of return air taken from any room or space shall not be greater than the flow rate of supply air delivered to such room or space.
3. Return and transfer openings shall be sized in accordance with the appliance or equipment manufacturer's installation instructions, Manual D or the design of the registered design professional.
4. Return air shall not be taken from a closet, bathroom, toilet room, kitchen, garage, mechanical room, boiler room, furnace room or unconditioned attic.

Exceptions:

1. Taking return air from a kitchen is not prohibited where such return air openings serve the kitchen only, and are located not less than 10 feet (3048 mm) from the cooking appliances.
2. Dedicated forced-air systems serving only the garage shall not be prohibited from obtaining return air from the garage.

5. For other than dedicated HVAC systems, return air shall not be taken from indoor swimming pool enclosures and associated deck areas except where the air in such spaces is dehumidified.

6. Taking return air from an unconditioned crawl space shall not be accomplished through a direct connection to the return side of a forced-air furnace. Transfer openings in the crawl space enclosure shall not be prohibited.

7. Return air from one dwelling unit shall not be discharged into another dwelling unit.

Exception: The return air within a two-family dwelling constructed without fire separations in accordance with Exception 3 of Section R302.3 shall be permitted to discharge into either dwelling unit.

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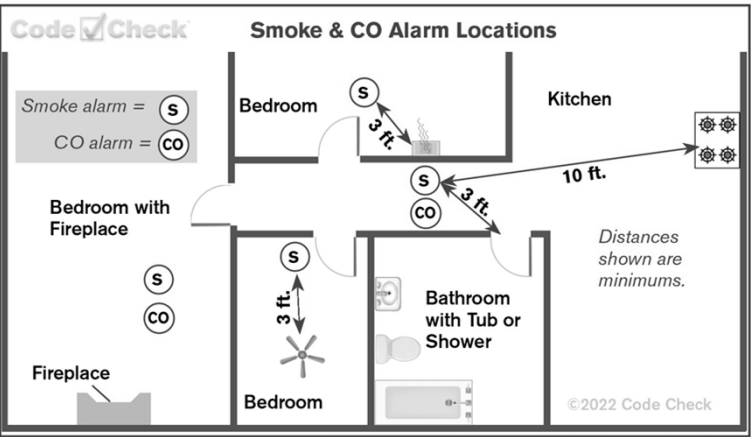
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Smoke & CO Alarms

A small change in the codes (beginning with the 2015 IRC) says that smoke alarms must also comply with NFPA 72...

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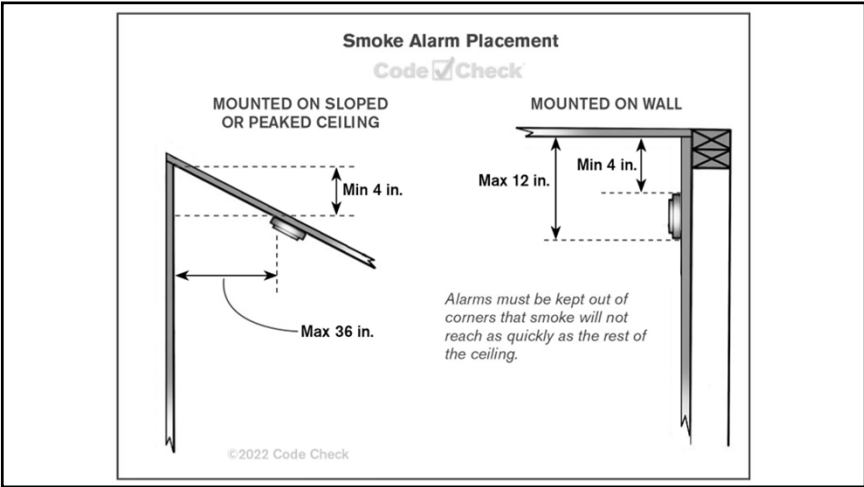
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Nuisance Sources of Alarm Activation

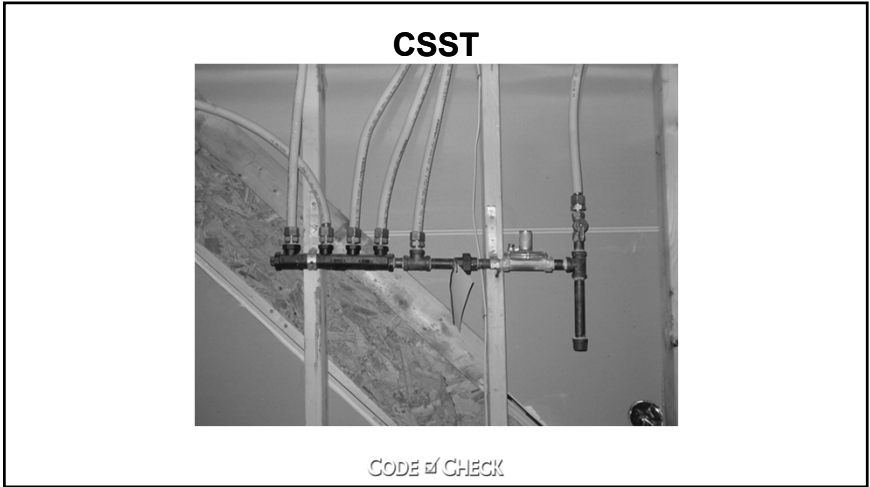
- Horizontal Distances from Cooking Appliances 22 NFPA 72**
- ☐ Prior to 1/1/23, if 10 ft. – 20 ft., either photoelectric, or hush button, or listed per UL 217 8th or newer edition or UL 268 7th edition for resistance to common nuisance sources from cooking **F18 D** 29.11.3.4(4)(a)
 - ☐ After 1/1/23, if 10 ft. – 20 ft., above listing mandatory **F18 D** 29.11.3.4(4)(b)
 - ☐ If < 10 ft. would prohibit placement of reqd alarms, radial distance of 6 ft. OK prior to 1/1/23 w/ photoelectric, or if listed as above. After 1/1/23, listing is mandatory **F18 E** 29.11.3.4(5)²³

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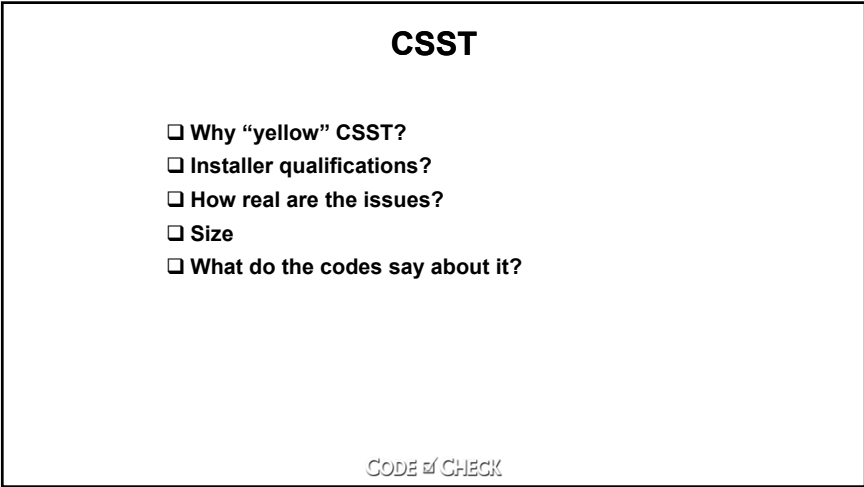
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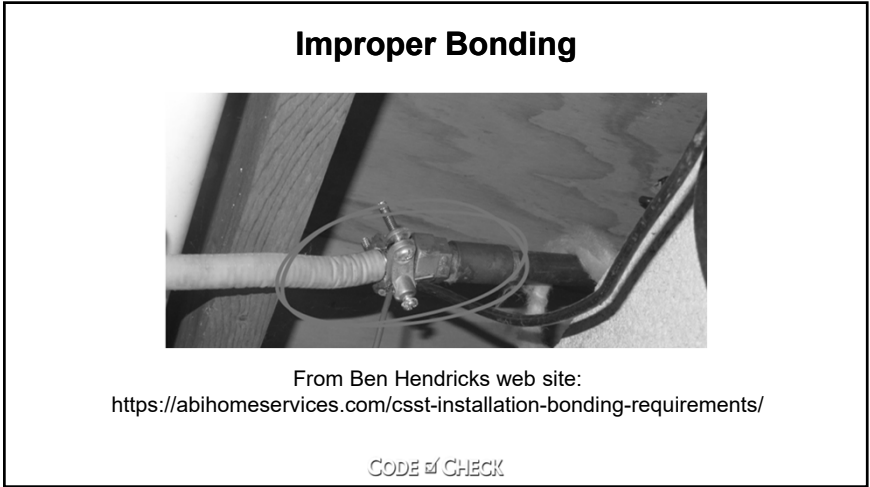
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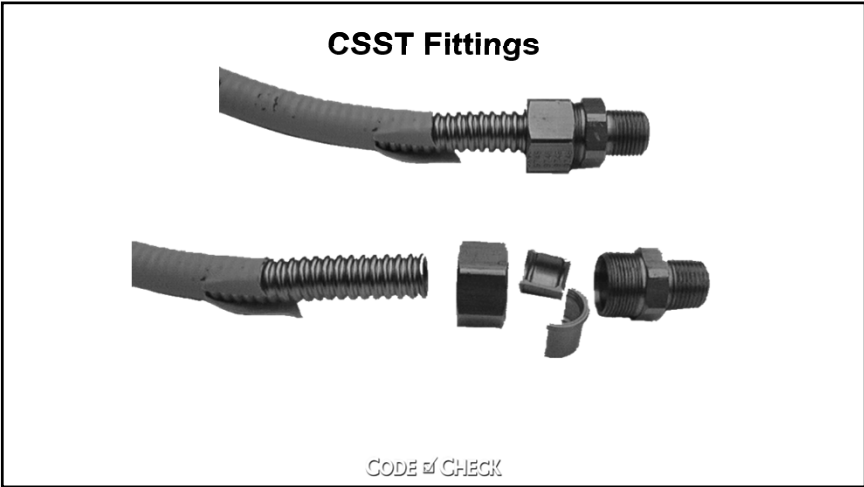
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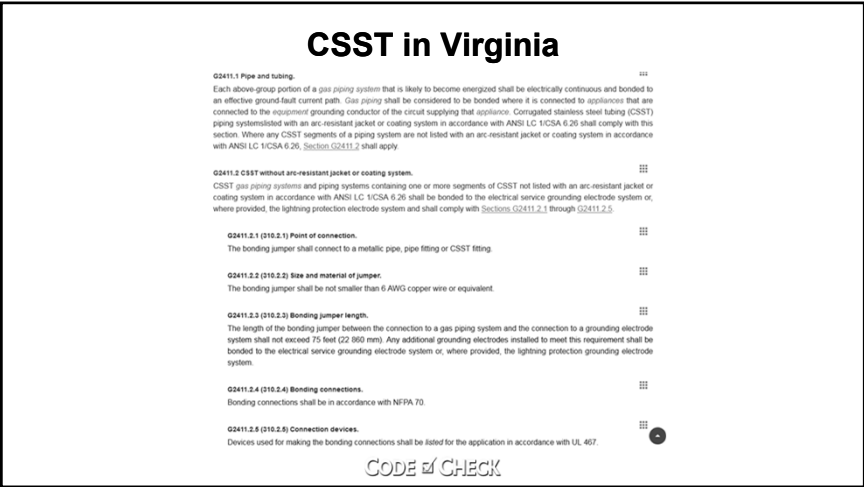
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Arc-Resistant Jacketed CSST

CHAPTER 24 FUEL GAS

G2411.3 (310.3) Arc-resistant CSST.

This section applies to corrugated stainless steel tubing (CSST) that is listed with an arc-resistant jacket or coating system in accordance with ANSI LC1/CSA 6.26. The CSST shall be electrically continuous and bonded to an effective ground-fault current path. Where any CSST component of a piping system does not have an arc-resistant jacket or coating system, the bonding requirements of Section G2411.2 shall apply. Arc-resistant-jacketed CSST shall be considered to be bonded where it is connected to an appliance that is connected to the appliance grounding conductor of the circuit that supplies that appliance.

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This slide has everything the NEC says about CSST:

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Decks: Permit Exceptions in IRC


- ❑ ≤ 200 sq. ft.
- ❑ not serving required exit door
- ❑ not attached
- ❑ ≤ 30 in. above grade at any point within 3 ft.



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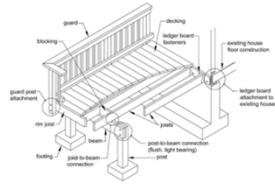
DCA 6

Design for Code Acceptance



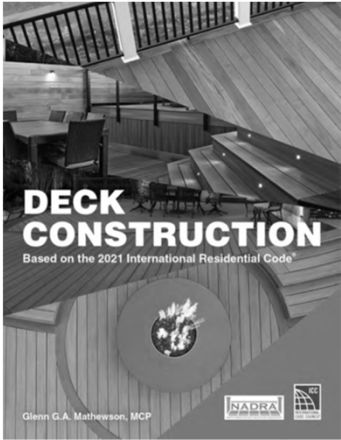
Prescriptive Residential Wood Deck Construction Guide

Based on the 2018 International Residential Code



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Available at

deckcodes.com

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Decks – IRC Updates

- ❑ Updated table for deck post footings
- ❑ Updated and expanded table for deck post height
- ❑ Updated and expanded table for max deck beam span
- ❑ Updated and expanded table for max joist span
- ❑ New calculation for “effective joist span”
- ❑ Table for joist spacing now factors single versus multiple span
- ❑ New section on guards

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Decks, Balconies & Elevated Walking Surfaces

- ❑ Previous code (IRC) assumed a 40 psf live load.
- ❑ IRC & DCA-6 tables for beams, joists, and decking were based on 40 psf.
- ❑ The 2022 IRC includes tables for 50, 60, & 70 psf snow load.

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Ledger Bolt Spacing

TABLE 40 DECK LEDGER CONNECTIONS TO BAND JOIST • T507.9.1.3(1)										
Load	Joist Span (ft.)	On-center Fastener Spacing (in.)								
		Connection Details								
40 psf live load	1/2-in. lag screw w/ 1/2-in. max. sheathing ^A F88 ①	30	23	18	15	13	11	10		
		36	36	34	29	24	21	19		
		36	36	29	24	21	18	16		
50 psf ground snow load	1/2-in. lag screw w/ 1/2-in. max. sheathing ^A F88 ①	29	22	17	14	12	11	9		
		36	36	33	27	23	20	18		
		36	35	28	23	20	17	15		
60 psf ground snow load	1/2-in. lag screw w/ 1/2-in. max. sheathing ^A F88 ①	25	18	15	12	10	9	8		
		36	35	28	23	20	17	15		
		36	30	24	20	17	15	13		
70 psf ground snow load	1/2-in. lag screw w/ 1/2-in. max. sheathing ^A F88 ①	22	16	13	11	9	8	7		
		36	31	25	20	17	15	13		
		35	26	21	17	15	13	11		

A. WSP sheathing or solid-sawn lumber.
B. WSP SFB, GB, lumber, joist. Up to 1/2-in. or stacked washers permitted w/ WSP or lumber.

A. WSP sheathing or solid-sawn lumber.
B. WSP SFB, GB, lumber, foam. Up to 10-in. of stacked washers permitted w/ WSP or lumber.

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Decks, Balconies & Elevated Walking Surfaces

- 507.2.1 Wood must be pressure treated or naturally durable.
Field cut notches, ends, & holes must be field treated.
- 507.2.3 Fasteners connectors G185, stainless, etc.
- 507.2.3 Flashings corrosion-resistant
- Wood decking min 1 1/4 in. (net dimension – not nominal)
- All Wood must be preservative treated (PT) or naturally durable (NDW)
- Fasteners and Connectors must be corrosion-resistant
- Plastic/composite deck systems per their ICC Evaluation Report

(No changes here)

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Posts

- Previous code: simple table for maximum post heights.
- 2021 IRC: Height depends upon Tributary Area.
- Tables have expanded to include ground snow loads.
- No post ever more than 14 ft.



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Staggered Bolts in 2 Rows



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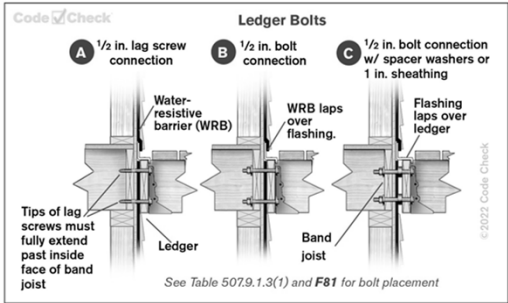
How Not to Attach Ledgers & Beams



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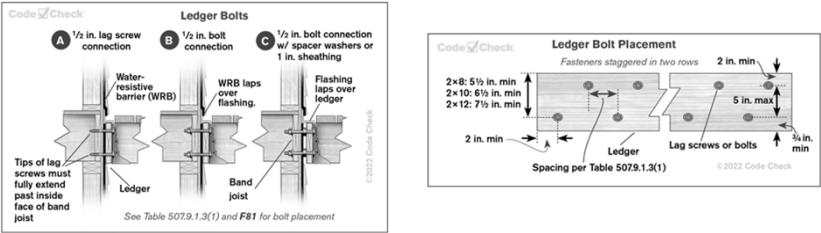
Deck Ledgers



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Deck Ledgers



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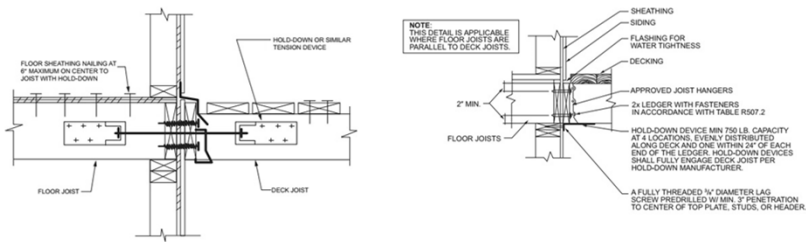
**If ledger connection not verifiable,
independent support required**



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Deck Lateral Connections



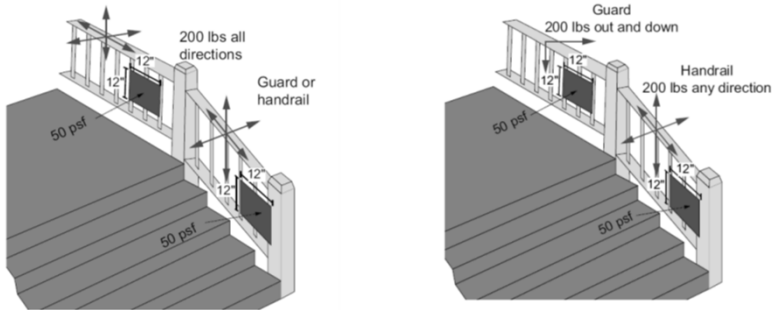
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Guards

2018 IRC

2021 IRC



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Deck Guards (new IRC section)

R507.10.1 Support of guards. Where guards are supported on deck framing, guard loads shall be transferred to the deck framing with a continuous load path to the deck joists.

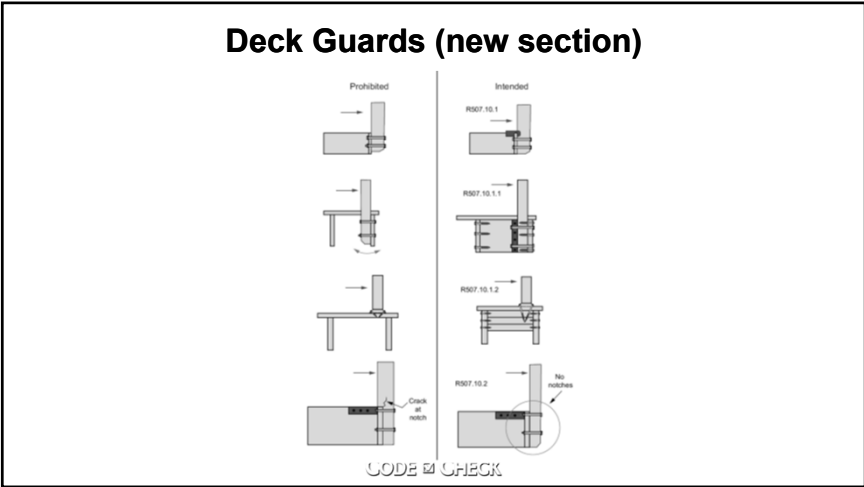
R507.10.1.1 Guards supported by side of deck framing. Where guards are connected to the interior or exterior side of a deck joist or beam, the joist or beam shall be connected to the adjacent joists to prevent rotation of the joist or beam. Connections relying only on fasteners in end grain withdrawal are not permitted.

R507.10.1.2 Guards supported on top of deck framing. Where guards are mounted on top of the decking, the guards shall be connected to the deck framing or blocking and installed in accordance with manufacturer's instructions to transfer the guard loads to the adjacent joists.

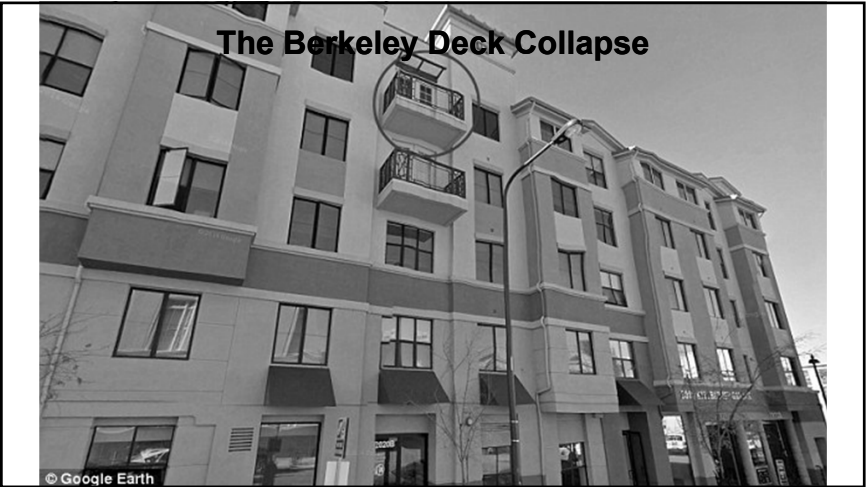
R507.10.2 Wood posts at deck guards. Where 4-inch by 4-inch (102 mm by 102 mm) wood posts support guard loads applied to the top of the guard, such posts shall not be notched at the connection to the supporting structure.

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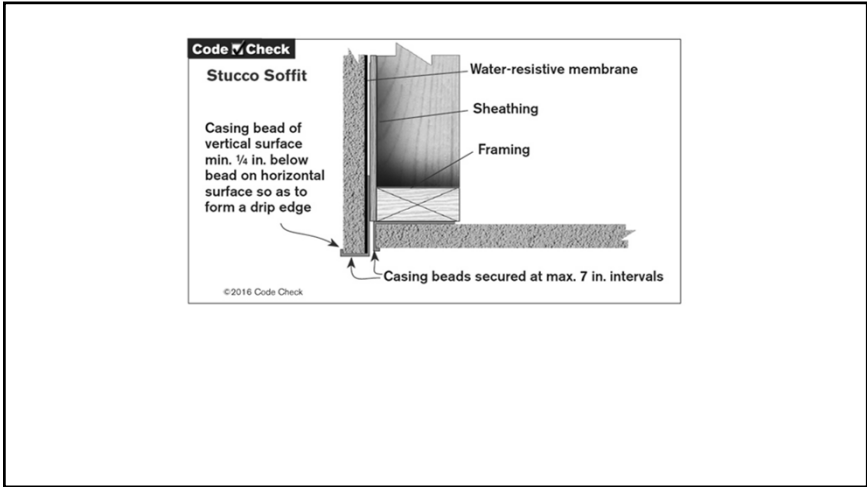
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Foundation Waterproofing – 2021 IRC

6 mil poly no longer allowed as a dampproofing or waterproofing material.

Two-ply hot-mopped felts.
Fifty-five-pound (25 kg) roll roofing.
Forty-mil (1 mm) polymer-modified asphalt.
Sixty-mil (1.5 mm) flexible polymer cement.




Graphic from Significant Changes in the 2021 IRC

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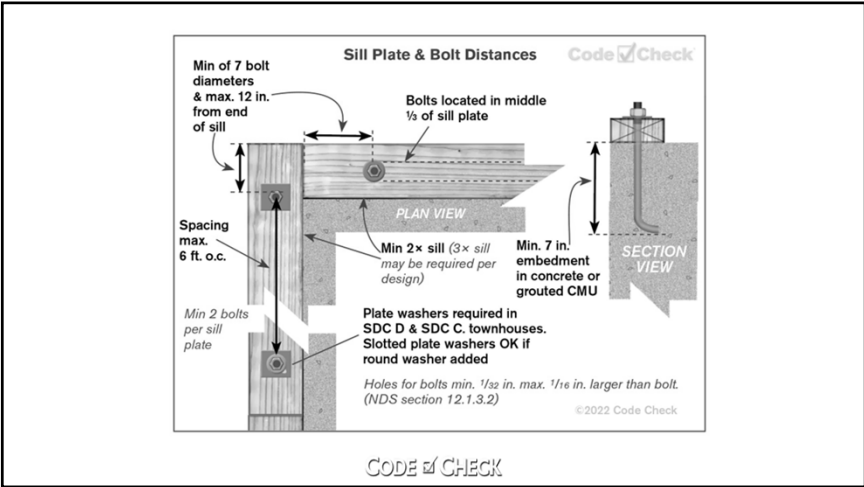
Cripple Walls – 2021 IRC change

☒ 602.9 Exterior cripple walls < 14 in. shall be continuously sheathed on one side ... or shall be constructed with solid blocking.

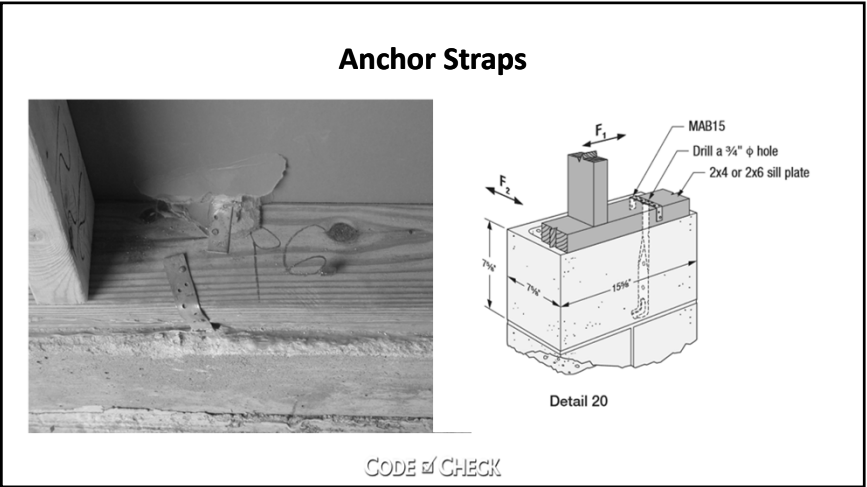


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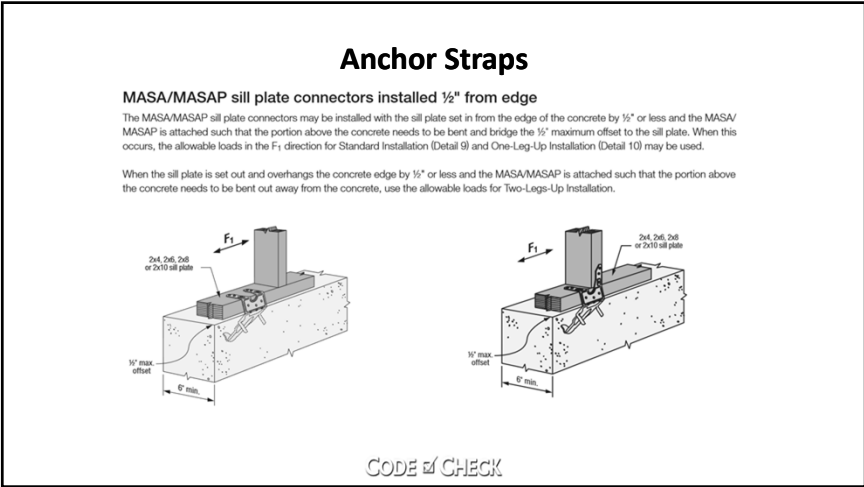
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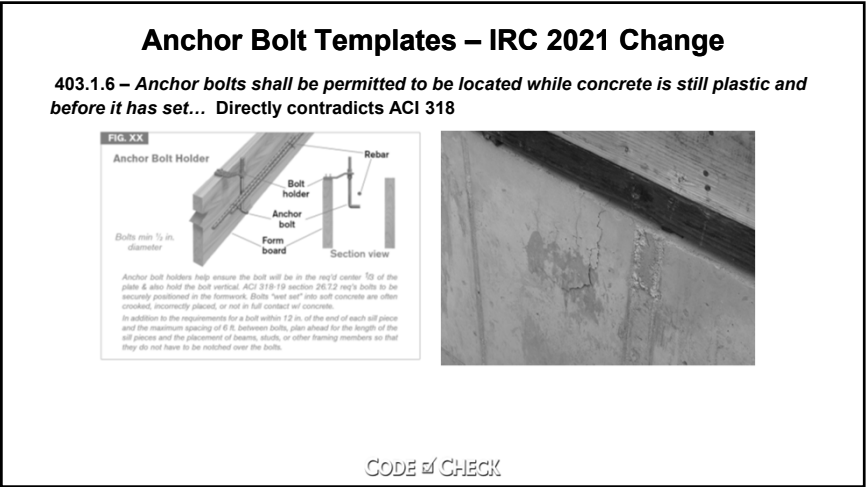
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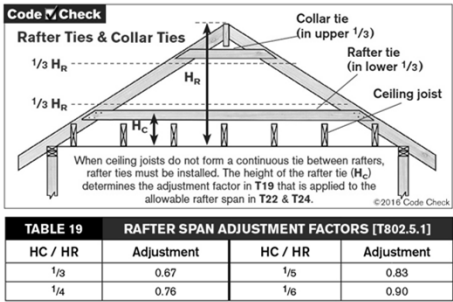


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Roof Rafters – 2021 IRC Change

When a roof does not have the ceiling or rafter ties otherwise required by this code, the ridge shall be designed as a beam.

2018 IRC:
Rafter ties on every rafter

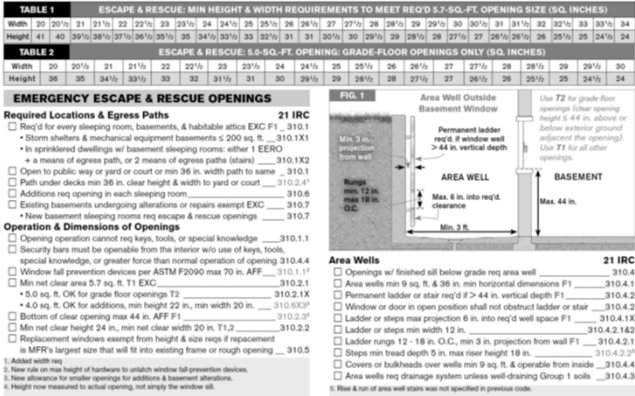


2021 IRC:
Rafter tie spacing max 24 in. o.c.

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Escape & Rescue Openings – 5 New IRC Rules



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Escape & Rescue Openings

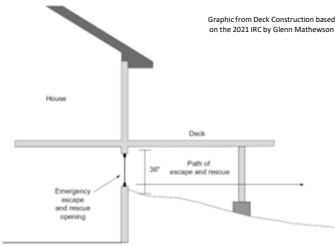
- 1. Path under deck must be 36 in. wide to yard or court
- 2. Window fall prevention devices per ASTM F2090 max 70 in. AFF
- 3. 4.0 sq. ft. OK for replacements, min height 22 in., min width 20 in.
- 4. Bottom of clear opening max 44 in. AFF **F1**
- 5. Steps min tread depth 5 in. max riser height 18 in.

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Escape & Rescue under a deck or cantilever

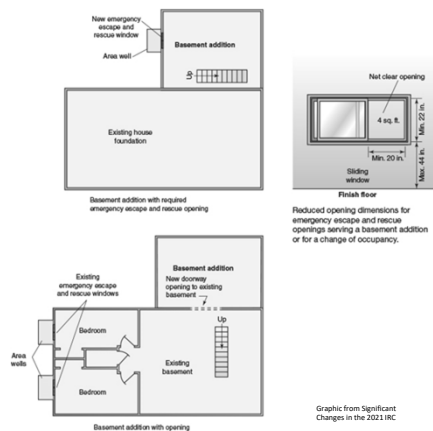
3 ft. high opening must also be a minimum of 36 in. wide to a yard or court.



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4. Replacement Windows, Additions



Graphic from Significant Changes in the 2021 IRC

5. Steps Instead of a Ladder



Min tread depth 5 in. Max riser height 18 in.

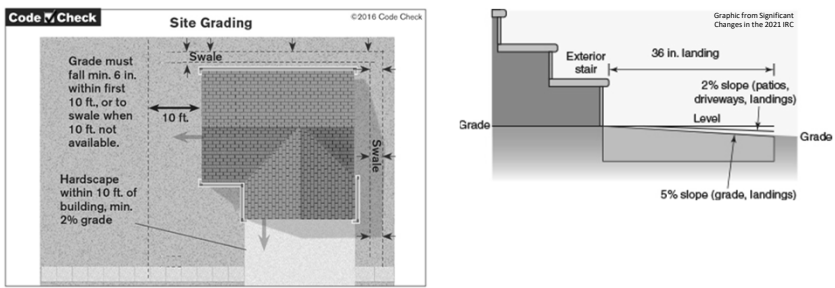
Graphic from original proposal submitted to ICC for 2021 IRC revisions

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Landings



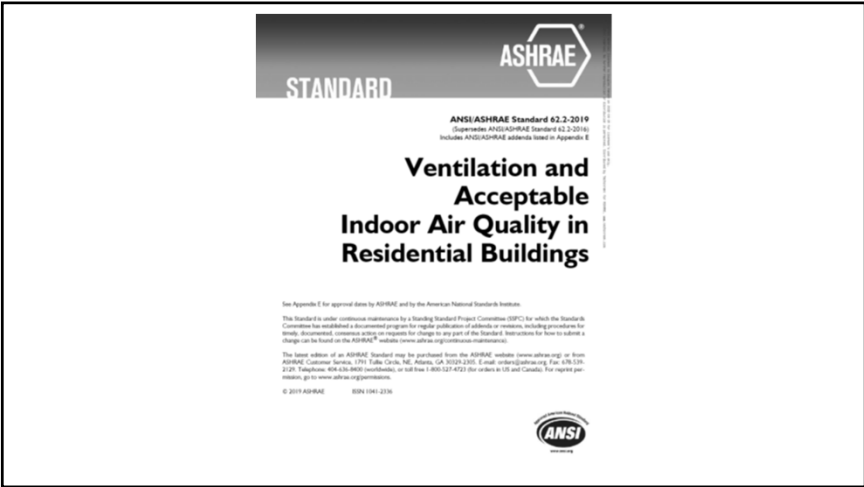
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Bathroom Ventilation

- 303.3 Bathrooms, toilet rooms, & similar req ventilation.
- Openable windows were once considered acceptable – now OK only for toilet rooms.
- Does a windowless toilet room require a fan?
(yes, per R303.3 & its exception, no per ASHRAE 62.2.)
- Window operation is not a substitute in rooms containing a tub, shower, or tub/shower combination
- Minimum local exhaust rates 50 cfm intermittent 20 cfm continuous
- Exhaust air from the space shall be directly to outdoors

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ASHRAE 62.2 Requirements

- Continuous fan max 1 sone, Intermittent 3 soness
- Whole house ventilation system req'd per ASHRAE 62.2
 - ☐ Mechanical exhaust, supply, or combination system req'd_____ 4.1
 - ☐ Min ventilation rate must comply w/ T39_____ 4.1
 - ☐ Local exhaust fans can count to req'd whole-house continuous ventilation__ 4.2
 - ☐ Min ventilation rates from T39 averaged over min 3 hr. period_____ 4.5.1
 - ☐ Measured infiltration rate can be used as credit to req'd ventilation_____ 4.1.2
 - ☐ Whole building or continuous ventilation fans max 1.0 sone EXC_____ 7.2.1
- Table on duct length no longer in ASHRAE 62.2 or CEC

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TABLE 39 MIN. VENTILATION RATES IN CFM ♦ ASHRAE 62.2 T4.1A					
Floor Area (sq. ft.)	Number of Bedrooms				
	1	2	3	4	5
<500	30	38	45	53	60
501–1000	45	53	60	68	75
1001–1500	60	68	75	83	90
1501–2000	75	83	90	98	105
2001–2500	90	98	105	113	120
2501–3000	105	113	120	128	135
3001–3500	120	128	135	143	150
3501–4000	135	143	150	158	165
4001–4500	150	158	165	173	180
4501–5000	165	173	180	188	195

Multiple continuously operating exhaust fans adding up to a min of the required amount is acceptable. Assumes 2 occupants up to 1 BR, plus 1 additional occupant per BR. Add 7.5 cfm per additional occupant.

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Questions?

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