TABLE 7	ESCAPE & RESCUE: MIN HEIGHT & WIDTH REQUIREMENTS TO MEET REQD 5.7-SQ.-FT. OPENING SIZE (SQ. INCHES)																												
Width	20	20½	21	21½	22	22½	23	23½	24	24½	25	25½	26	26½	27	27½	28	28½	29	29½	30	30½	31	31½	32	32½	33	33½	34
Height	41	40	39½	38½	37½	36½	35½	35	34½	33½	33	32½	32	31	30½	30	29½	29	28½	28	27½	27	26½	26½	26	25½	25	24½	24

TABLE 8	ESCAPE & RESCUE: 5.0-SQ.-FT. OPENING: GRADE-FLOOR OPENINGS ONLY (SQ. INCHES)																			
Width	20	20½	21	21½	22	22½	23	23½	24	24½	25	25½	26	26½	27	27½	28	28½	29	29½	30
Height	36	35	34½	33½	33	32	31½	31	30	29½	29	28½	28	27½	27	26½	26	25½	25	24½	24

EMERGENCY ESCAPE & RESCUE OPENINGS

Required Locations & Egress Paths — 21 IRC

- ☐ Reqd for every sleeping room, basements, & habitable attics EXC F29 — 310.1
  - • Storm shelters & mechanical equipment basements ≤ 200 sq. ft. — 310.1X1
  - • In sprinklered dwellings w/ basement sleeping rooms: either 1 EERO + a means of egress path, or 2 means of egress paths (stairs) — 310.1X2
- ☐ Open to public way or yard or court or min 36 in. width path to same — 310.1[29]
- ☐ Path under decks min 36 in. clear height & width to yard or court — 310.2.4[29]
- ☐ Additions req opening in each sleeping room — 310.6
- ☐ Existing basements undergoing alterations or repairs exempt EXC — 310.7
  - • New basement sleeping rooms req escape & rescue openings — 310.7

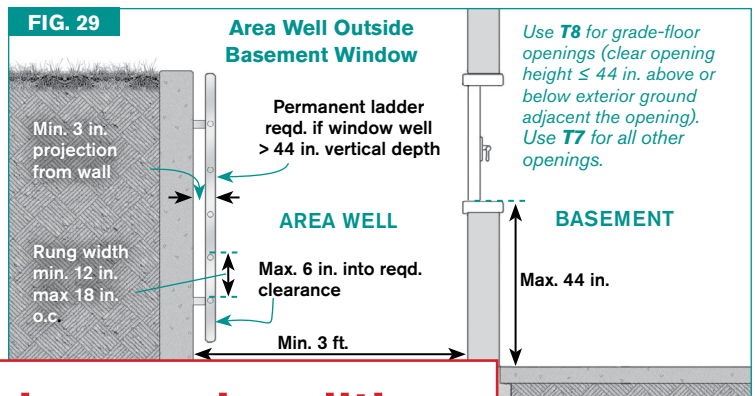
Operation & Dimensions of Openings

- ☐ Opening operati
- ☐ Security bars mu
  special knowled
- ☐ Window fall prev
- ☐ Min net clear are
  - • 5.0 sq. ft. OK
  - • 4.0 sq. ft. OK
- ☐ Bottom of clear opening max 44 in. AFF T2 — 310.2.3
- ☐ Min net clear height 24 in., min net clear width 20 in. T7,8 — 310.2.2
- ☐ Replacement windows exempt from height & size reqs if replacement is MFR's largest size that will fit into existing frame or rough opening — 310.5

29. Added width req
30. New rule on max height of hardware to unlatch window fall-prevention devices.
31. New allowance for smaller openings for additions and basement alterations.
32. Height now measured to actual opening, not simply the window sill.

Changes from the previous code edition are highlighted in the text and explained at the bottom of the page.

FIG. 29



21 IRC

- ll — 310.4
- ensions F29 — 310.4.1
- depth F29 — 310.4.2
- t ladder or stair — 310.4.2
- space F29 — 310.4.1X
- ☐ Ladder or steps min width 12 in. — 310.4.2.1&2
- ☐ Ladder rungs 12–18 in. O.C., min 3 in. projection from wall F29 — 310.4.2.1
- ☐ Steps min tread depth 5 in. max riser height 18 in. — 310.4.2.2[33]
- ☐ Covers or bulkheads over wells min 9 sq. ft. & operable from inside — 310.4.4
- ☐ Area wells req drainage system unless well-draining Group 1 soils — 310.4.3

33. Rise and run of area well stairs was not specified in previous code.

Headers

21 IRC

- ☐ Header spans per **T35,36** _____ 602.7
- ☐ Min number of full-height studs **F60** adjacent to headers per **T37** ____ 602.7.5
- ☐ Single member headers min 2×material, face nail 12 in. o.c. top & bottom w/ 10d nails **F60** _____ 602.7.1
- ☐ Headers not reqd f member OK for spa

Rim Board Header

- ☐ Rim board headers (header above top plates w/ cripple studs below top plate to top of opening) spans per **T36** _____ 602.7.2
- ☐ Number of full height studs each end of rim board headers must be at least the number of studs displaced by ½ the header span _____ 602.7.2
- ☐ Joists hangers reqd all joists above rim board header span _____ F602.7.2

336 Illustrations and 192 Tables

FIG. 60 Headers

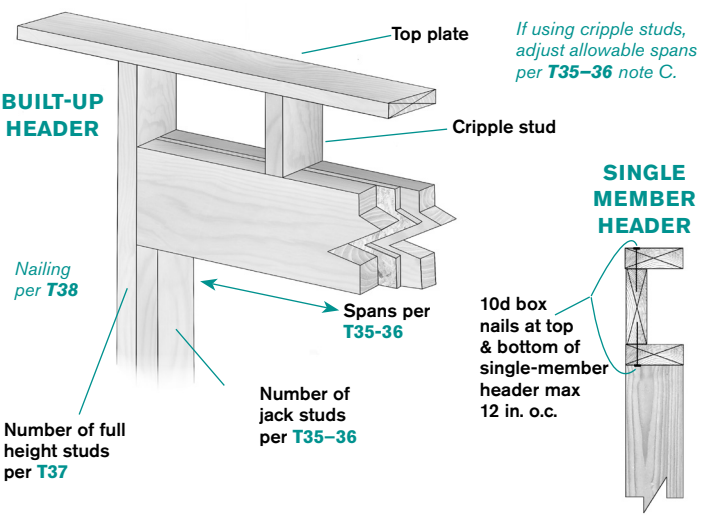
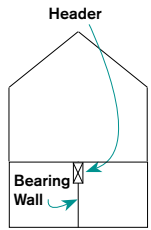
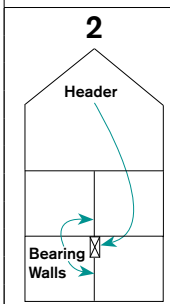


TABLE 35 ALLOWABLE GIRDER & HEADER SPANS FOR INTERIOR BEARING WALLS[A] ◆ T602.7(2)

No. of floors supported	Size	Building Width[B] 12 ft. NJ[D]	24 ft. Span[C]	24 ft. NJ[D]	36 ft. Span[C]	36 ft. NJ[D]
				1	2–4	1
				1	3–6	1
1	2–2×8	7–9	1	5–5	1	4–5	2
	2–2×10	9–2	1	6–6	2	5–3	2
	2–2×12	10–9	1	7–7	2	6–3	2
	3–2×8	9–8	1	6–10	1	5–7	1
	3–2×10	11–5	1	8–1	1	6–7	2
	3–2×12	13–6	1	9–6	2	7–9	2
	4–2×8	11–2	1	7–11	1	6–5	1
	4–2×10	13–3	1	9–4	1	7–8	1
	4–2×12	15–7	1	11–0	1	9–0	2
2	2–2×4	2–7	1	1–11	1	1–7	1
	2–2×6	3–11	1	2–11	2	2–5	2
	2–2×8	5–0	1	3–8	2	3–1	2
	2–2×10	5–11	2	4–4	2	3–7	2
	2–2×12	6–11	2	5–2	2	4–3	3
	3–2×8	6–3	1	4–7	2	3–10	2
	3–2×10	7–5	1	5–6	2	4–6	2
	3–2×12	8–8	2	6–5	2	5–4	2
	4–2×8	7–2	1	5–4	1	4–5	2
	4–2×10	8–6	1	6–4	2	5–3	2
	4–2×12	10–1	1	7–5	2	6–2	2





A. Based on No. 2 grade Douglas fir-larch, hem-fir, Southern pine, and spruce-pine-fir.
B. Building width is measured perpendicular to ridge. For building widths between those shown, spans listed in table are permitted to be interpolated.
C. Where top of header not laterally braced (e.g., cripple studs bearing on header as in **F60**), spans for 2 × 8, 2 × 10, or 2 × 12 to be multiplied by 0.70.
D. Number of jack studs reqd to support each end. If NJ=1, headers are permitted to be supported by an approved framing anchor to the full-height wall stud.

Showers	21 IRC	21 UPC
☐ Min. area 900 sq. in. (UPC: 1,024 sq. in.) **F67** EXC	2708.1	408.6
• Fold-down seats protruding into space must allow the min. 900 sq. in. area w/ seat in folded-up positiion	2708	/a
☐ Must be able to encompass 30 in. diameter circle from from top of threshold to point 70 in. above drain outlet EXC	2708.1	408.6
• Shower heads, valves, grab bars & soap dishes allowed to protrude into reqd min. space	2708.	408.6
• 25 in. cross section OK if area ≥1300 sq. in.	2708.1X2	/a
• Area & dimensions not reqd if min. 30 in. × 60 in. enclosure	n/a	408.6.2
☐ Shower walls nonabsorbent to min. 72 in. above drain	307.2	local
☐ If threshold provided, height min. 1 in. below top of shower recepto membrane & min. 2 in. max. 9 in. above top of drain **F68**	2709.1	408.
☐ If no threshold, adjacent floor considered a wet location	local	408.
☐ Door min. 22-in.-wide c		
☐ Door must open outwa		
☐ Finished floor slope mir		
☐ Secure shower valve, h		
☐ Shower head cannot di		
☐ Listed anti-scald/pressı		
☐ Min. 2 in. drain outlet (IR		

Shower Pan & Liner		
☐ Site-built liner materials		
☐ Slope underlayment ¼ in./ft. to weep holes **F68**	2709.3	408.7
• Liner min. 2 in. above dam or threshold (UPC: 3 in.) **F68**	2709.2	408.7
☐ Pan liner plastic AMI or 3 layers hot mop type 15 felt	2709.2	408.7
☐ Special attention to hot mop corner installation; extend 4 in. all directions from corner	2709.2.3	408.7
☐ PVC & CPE sheet lining cemented AMI	2709.2.1&2	408.7.1&2
☐ Weep holes at drain reqd & must remain clear **F68**	2709.4	408.7
☐ No fasteners in liner <1 in. above finished threshold	2709. 3	408.7
☐ Roll over top of rough threshold (no penetrations through top) & fasten to outside edge **F68**	2709.3	408.7
☐ Water-tight connection between liner and drain flange	2709.4	408.7

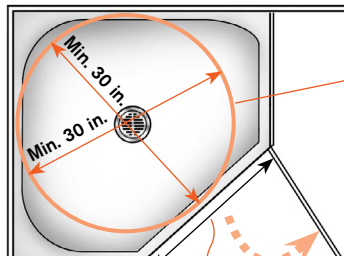
Testing	21 IRC	21 UPC
☐ Pan leak test min. 2 in. water measured at threshold, min. 15 minutes (UPC: water level ≥ rough threshold height)	2503.6	408.7.5
☐ Pan leak test reqs plug (balloon) in pipe below flange	2503.6	408.7.5

FIG. 67

Shower Receptor

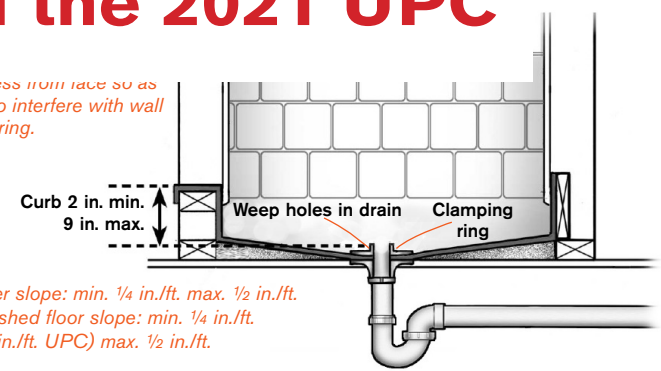
Overall net area
***IRC**: 900 sq. in.*
***UPC:** 1024 sq. in*

Soap dishes, grab bars, shower heads



The Plumbing section references the 2021 IRC and the 2021 UPC

Recess from face so as not to interfere with wall covering.

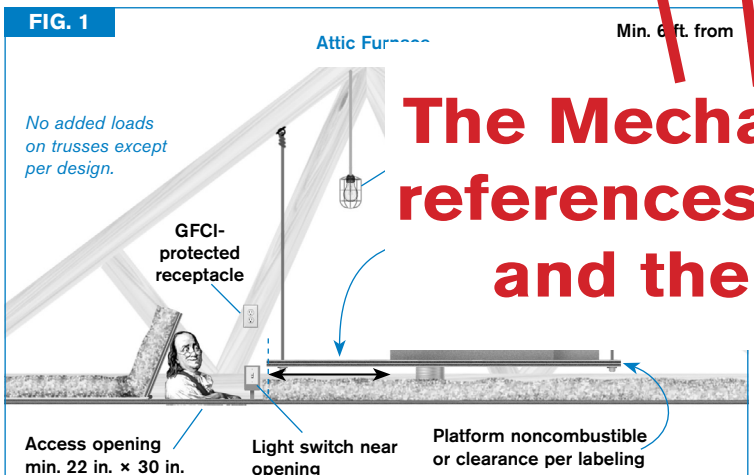


Liner slope: min. ¼ in./ft. max. ½ in./ft.
Finished floor slope: min. ¼ in./ft. (⅛ in./ft. UPC) max. ½ in./ft.

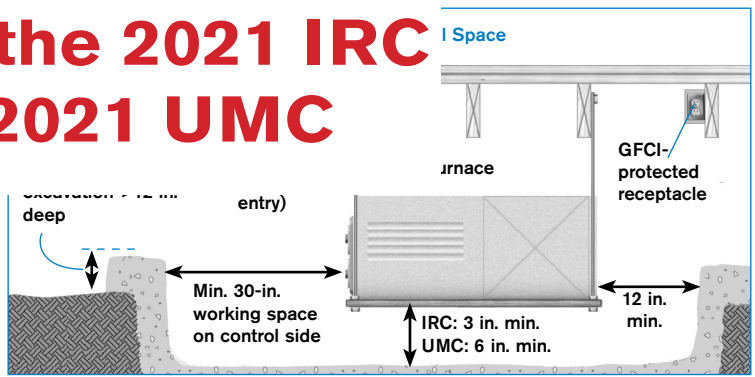
Appliances in Attics F1	21 IRC	21 UMC
☐ Appliance must fit through access opening	1305.1.2	304.4
☐ Opening & passageway min 22 in. wide × 30 in. high	1305.1.2	304.4
☐ Max 20 ft. from access opening to appliance EXC	1305.1.2	304.4.1
• If passageway ≥6 ft. high 50 ft. length (UMC: no limit)	1305.1.2X2	304.4.1
☐ Solid floor min 24 in. wide to equipment	1305.1.2	304.4.2
☐ Min 30-in. × 30-in. platform at service area EXC	1305.1.2	304.4.3
• Not reqd if equipment can be serviced from opening	1305.1.2X1	304.4.3X
• UMC: max 1 ft. setback if serviced from opening	n/a	304.4.3X
☐ Floor under furnace noncombustible construction EXC	2449.4	904.3
• Not reqd if appliance L&L for combustible floor	2449.4	904.3X
• Not reqd if floor protected in approved manner	2449.4	904.3X

Appliances Below Floors	21 IRC	21 UMC
☐ Access opening min size 22 in. × 30 in.	1305.1.3	304.4
☐ Appliance must fit through opening	1305.1.3	304.4
☐ Passageway min 22 in. wide (UMC: min 24 in.)	1305.1.3	304.4.2
☐ Passageway max 20 ft. long EXC	1305.1.3	304.4.1
• Passageway ≥6 ft. high OK for unlimited length	1305.1.3X2	304.4.1
☐ Min 30-in. × 30-in. level space on service side F2	1305.1.3	304.4.3
☐ Support on concrete slab min 3 in. above adjoining ground or suspend from floor AMI & min 6 in. above ground F2	1305.1.3.1	904.3.1
☐ Excavations min 3 in. (UMC: 6 in.) below appliance, 12 in. on sides, 30 in. on control side F2	1305.1.3.2	305.2
☐ If excavation >12 in. below adjacent grade, line w/ concrete extending 4 in. above adjacent grade F2	1305.1.3	305.2
☐ Luminaire & receptacle outlet near appliance F2	1305.1.3.3	304.4.4
e	1305.1.3.3	304.4.4
F2	1305.1.3.3	n/a
CI protection	3902.4	NEC 210.8

FIG. 1



The 30 in. deep working platform in front of the control side can be omitted if the furnace can be serviced from the opening. In the UMC, the max setback from the opening for this exception is 12 in.



The Mechanical section references the 2021 IRC and the 2021 UMC

FREESTANDING FIREPLACE STOVES (SOLID FUEL)

The IRC (section 1414.1) requires fireplace stoves to be listed, labeled & tested in accord with UL 737, which in turn references the current edition of NFPA 211. UMC section 902.10 refers to NFPA 211 for solid-fuel burning appliances. The rules for clearance, protection, & clearance reductions are virtually identical among the IRC, UMC, and NFPA 211.

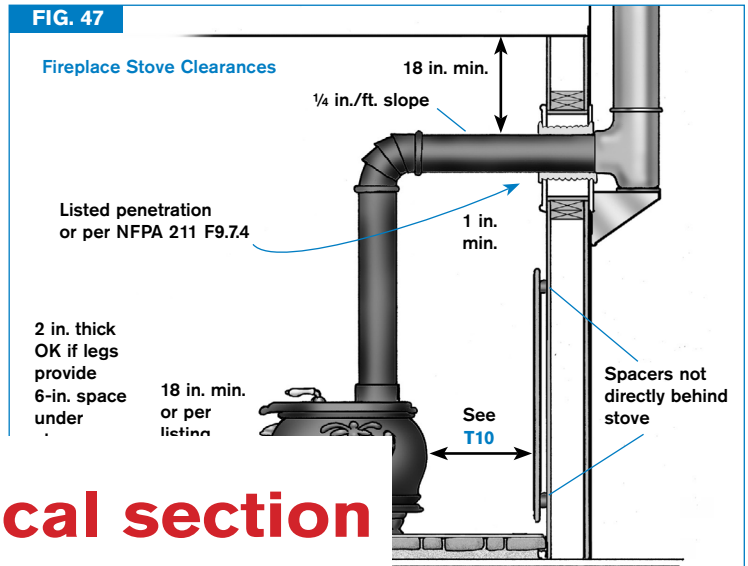
Fireplace Stoves & Solid-Fuel Room Heaters — NFPA 211

- ☐ Equipment must be listed & installed per L&L or be approved by AHJ ___ 13.1
- ☐ Unlisted equipment must be approved & installed AMI ___ 13.1.1
- ☐ No unlisted equipment in mobile homes ___ 13.1.2
- ☐ Not in alcove or enclosed space <512 cu. ft. unless listed for same ___ 13.2.2
- ☐ Not OK in garages or where flammable vapors or liquids present ___ 13.2.3&4
- ☐ Listed appliances OK on combustible floors if per L&L & AMI ___ 13.5.1.1
- ☐ Noncombustible floor material 18 in. beyond stove on all sides EXC ___ 13.5.1.4
  - • L&L floor protection assemblies OK AMI ___ 13.5.1.5
- ☐ Unlisted appliance floor protecti[illegible]
  - • If legs provide ≥6 in. of ventila
    2 in. thick masonry covered w/
  - • If legs provide ≥2 in. to <6 in.
    hollow masonry + metal, cores
- ☐ If legs provide <2 in. clearance,
- ☐ Fuel storage (firewood) min 36
- ☐ 36-in. side, top & front clearanc
  - • Listed appliance clearance to
  - • Reduced clearances OK per

Connectors

- ☐ Must be accessible for inspection, cleaning & replacement ___ 9.7.10
- ☐ Single wall min 18-in. clearance to combustibles EXC F47 ___ T9.5.1.1
  - • Lesser clearance w/ approved clearance-reduction system T10 ___ 9.5.1.2.1
- ☐ Not to pass through wall EXC ___ 9.7.4
  - • Listed pass-through system ___ 9.7.4
  - • Pass-through system constructed per NFPA 211 figure 9.7.4 ___ 9.7.4
- ☐ Maintain min ¼ in./ft. rise from appliance collar to chimney ___ 9.7.6

FIG. 47



l to the safe long-term operation of all
n allow heat transfer to adjacent com-
wood and lowers its ignition tempera-
result in a fire.

The Mechanical section also references NFPA and ASHRAE codes

onry Fireplaces — NFPA 211

- ☐ Connector must extend to flue liner—not just to firebox ___ 13.4.5.1
- ☐ If connector enters direct through chimney wall above smoke chamber, noncombustible seal reqd below entry ___ 13.4.5.1
- ☐ No dilution of combustion products in flue w/ habitable space air ___ 13.4.5.1
- ☐ Flue not less than size of appliance collar ___ 13.4.5.1
- ☐ Flue diameter max 2× appliance collar if chimney walls exposed to exterior below roof, 3× if no part exposed below roof ___ 13.4.5.1
- ☐ Installation must allow for chimney inspection & cleaning ___ 13.4.5.1

GROUNDING ELECTRODES

Proper grounding & bonding of electrical systems is essential for safety. These two different but related subjects are commonly misunderstood, even by veteran electricians. Connecting the system to earth helps to limit the voltage imposed by lightning, line surges, or accidental contact with higher voltage lines. It stabilizes a system and reduces electrical "noise" on communications systems. Grounding electrodes are the metallic components within the earth to which we connect electrical systems, including one of the current-carrying conductors of the system. Common grounding electrodes in residential construction are metal underground water piping, ground rods, and concrete-encased electrodes. Other types include ground rings, metal plates, metal well casings, listed grounding electrode systems, underground tanks, and the steel frame of a building connected to earth as shown below. Gas piping is not an acceptable grounding electrode.

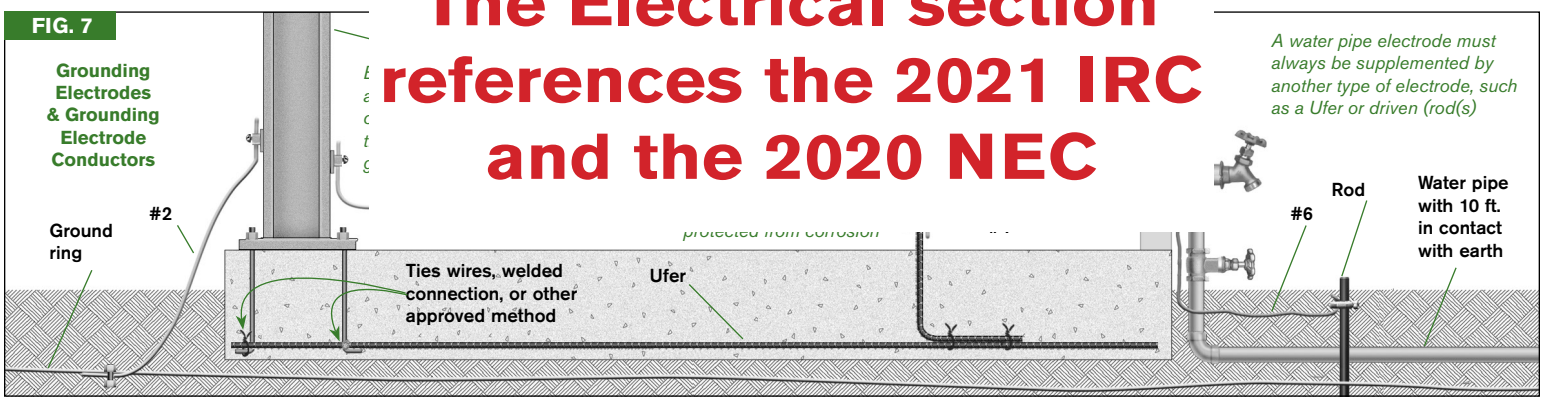
Grounding Electrode System (GES) F5	21 IRC	20 NEC
☐ Use all electrodes that are available on premises EXC	3608.1	250.50
• Concrete-encased electrode of existing building need not be included if not accessible w/o disturbing concrete	36081.X	250.50X
☐ Bond all electrodes together to form the GES	3608.1	250.50
☐ Metal underground gas piping syste electrodes & pool or spa shell bondi permitted as grounding electrodes		

Water Pipe Electrodes	21 IRC	20 NEC
☐ Use metal water pipe if ≥10 ft. in contact w/ soil F5	3608.1.1	250.52A1
☐ Bond around water meters, filters, pressure regulators & similar equipment	3608.1.1.2	250.53D1
☐ Water pipe cannot be the sole electrode – it must be supplemented by another type of electrode	3608.1.1.2	250.53D2
☐ Metal well casing electrodes req bonding around insulating joints or pipes	3608.1.1	250.52A8

Rod & Plate Electrodes	21 IRC	20 NEC
☐ Copper-clad rods min. ⅝ in. diameter unless listed	3608.1.4	250.52A5b
☐ Rods min. 8 ft. in contact w/ soil F5	3608.1.4.1	250.53A4
☐ Drive rods vertical & fully below grade EXC	3608.1.4.1	250.53A4
• If bedrock encountered, rod may be buried horizontally 2½ ft. deep or driven at max. 45° angle from vertical	3608.1.4.1	250.53A4
• Rod end & clamps above ground req protection against physical damage	3608.1.4.1	250.53A4
☐ Ferrous plates min. ¼ in. thick,	3608.1.5	250.52A7
of earth	3608.1.5	250.53A5

The Electrical section references the 2021 IRC and the 2020 NEC

FIG. 7

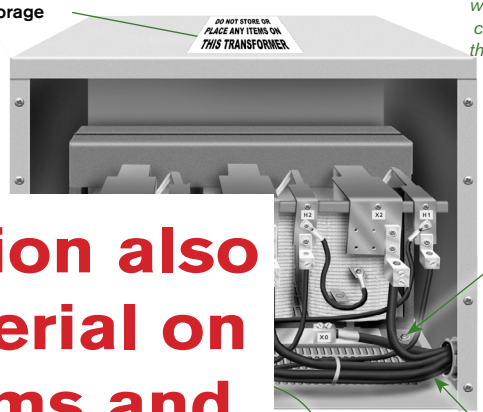


Grounding & Bonding **20 NEC**

- ☐ Provide terminal bar for grounding & bonding **F90** EXC _____ 450.10A
- ☐ Terminal bar may not block ventilation openings **F90** _____ 450.10A
- ☐ Size primary conductor EGCs per **T16** _____ 250.122
- ☐ Size grounded conductor of secondary & SBJ per **T52** _____ 250.28D1
- ☐ Size SSBJ per **T52** _____ 250.30A2
- ☐ Size GEC per **T52** _____ 250.30A5
- ☐ GEC to connect to same GES as building _____ 250.30A4
- ☐ Multiple separately derived systems may use common GEC _____ 250.30A6
- ☐ Common GEC can be 3/0 Cu or 250kcmil AL wire, metal water pipe ≤ 5 ft. of entry into building, or
- ☐ Bond SDS to metal pip

FIG. 90

Delta-Wye Transformer



The Electrical section also has extensive material on commercial systems and photovoltaics, which are not in the IRC

TABLE 52 MIN JUM

Largest Ungrounded C Area for Parallel Condu

Cu			
≤ 2			
1 or 1/0			
2/0 or 3/0			
4/0–350kcmil			
> 350–600kcmil			
> 600–1100kcmil	> 900–1750kcmil	2/0	4/0
> 1100kcmil	> 1750kcmil	Notes C & D	

A. The scope includes main bonding jumpers, system bonding jumpers & supply-side bonding jumpers.
B. Services w/ multiple service disconnect enclosures or separately derived systems w/ multiple sets of secondary conductors may size the bonding jumper based on areas of conductors in each set.
C. Min. 12½% of area of largest supply conductors or equivalent area for parallel conductors; need not be larger than largest ungrounded conductor or set of ungrounded conductors.
D. If ungrounded conductors & bonding jumper of different materials, base bonding jumper size on size of equivalent ungrounded conductors of same material as bonding jumper.

20 NEC

- ☐ [illegible]ral) conductor reqd to connect to supply & derived circuits EXC _____ 210.9 & 215.11
  - • OK w/o grounded (neutral) conductor for 208V:240V or 240V:208V (open delta configurations) _____ 210.9X1 & 215.11X1
- ☐ Each ungrounded input conductor reqs OCPD _____ 450.4A
- ☐ OCPD ≤ 125% of max. rated full-load current of autotransformer EXC 450.4A
  - • If 125% & ≥ 9A & between standard sizes, next higher size allowed 450.4A
- ☐ OCPD not to be in series w/ between shunt winding terminals _____ 450.4A