Code☑Check Plumbing & Mechanical® Sixth Edition

By DOUGLAS HANSEN, SKIP WALKER & REDWOOD KARDON
Illustrations by Paddy Morrissey, Kaia Mathewson & Douglas Hansen

 ISBN 978-1-64155-208-0

Updated to the 2021 International Residential Code, Uniform Plumbing Code & Uniform Mechanical Code

Code Check Plumbing & Mechanical 6th edition is an illustrated reference guide to code requirements and common violations in residential plumbing and mechanical systems. The main codes referenced in this book are the *2021 International Residential Code*, published by the International Code Council, the *2021 Uniform Plumbing Code*, and the *2021 Uniform Mechanical Code*. For most topics, these codes are in agreement. These are the most widely used codes throughout the United States. NFPA 54, the *National Fuel Gas Code*, is the basis for the fuel gas provisions of the IRC, UPC, and UMC. Other referenced codes used in the book are listed in Table 1 (T1) below.

Model codes are updated on a 3-year cycle. In most areas, the 2021 code cycle will remain in effect for 3 to 6 years after the cover date. Significant changes from the previous code editions are highlighted in the text so that this book can be used in areas still using older code editions. Minor changes and those that only affected numbering (not substance) are not highlighted.

Energy codes vary greatly from one area to another and may modify or overrule the requirements shown in this book. Before beginning any project, check with your local building department to determine the codes and editions that apply in your area. Some jurisdictions modify the model code[illegible] standards, many of which are maintained by the organ[illegible]

TABLE 1 CODES USED IN TH[illegible]

Organization	Edition	C[illegible]
ASHRAE	2019	ASHRAE 62.2 Ventilatio[illegible] Quality in Res[illegible]
ICC	2021	International Res[illegible]
ICC	2021	IPSDC—International Pr[illegible]
IAPMO	2021	Uniform Mecha[illegible]
IAPMO	2021	Uniform Plum[illegible]
NFPA	2020	NFPA 31 Standar[illegible] Oil-Burning Equipment
NFPA	2021	NFPA 54 National Fuel Gas Code
NFPA	2020	NFPA 58 Liquefied Petroleum Gas Code
NFPA	2020	NFPA 70 National Electrical Code
NFPA	2019	NFPA 211 Standard for Chimneys, Fireplaces, Vents, and Solid Fuel–Burning Appliances

TABLE 2 STANDARDS ORGANIZATIONS

Acronym	Name
ACCA	Air Conditioning Contractors of America
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating & Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (formerly American Society for Testing & Materials)
CSA	CSA Group (Canadian Standards Association)
IAPMO	International Association of Plumbing & Mechanical Officials
ICC	International Code Council
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
SMACNA	Sheet Metal & Air Conditioning Contractors' National Association
UL	UL (formerly Underwriters Laboratories)

The inside cover lists the codes and standards that are used in the book, along with examples of the shorthand conventions that are used.

KEY TO USING THIS BOOK

Large amounts of code information are condensed here by using several "shorthand" conventions. Many terms are abbreviated, as shown on the following page.

Each rule described in Code Check begins with a checkbox and ends with code citations. Where there are two columns of citations, the first one is from the IRC and the second one from the UPC or UMC, as noted at the top of the columns of code references. See this example from ***p. 4***:

Inspections	**21 IRC**	**21 UPC**
☐ All piping below slab tested before casting concrete	109.1.2	105.1

This section is saying that piping must be tested before being covered by concrete. The IRC code reference is 109.1.2 & the UPC reference 105.1.

References to figures and tables are preceded by an **F** or a **T** as in the following examples from ***p. 13***:

☐ Trap seal min. 2 in., max. 4 in. F21	3201.2	1005.1
☐ Size trap for fixture per T8	3201.7	1003.3

size is per Table 8.

on in a different color, and planation at the bottom of

	n/a	T703.2[2]

VC's on a 3 in. drain, as of that page:

& 3 on horizontal drain.

otion," as in this example

	n/a	904.2X

the IRC, and in the UPC

an exception follows in the next line, as in this example from ***p. 13***:

☐ Fixture tailpiece max. 24-in. vertical distance EXC F20	3201.6	1001.2
• CW standpipes 18–42 in. (UPC: 18–30 in.) F74	2706.1.2	804.1

This line says that the maximum height of a fixture tailpiece (the vertical distance between the fixture outlet and its trap) is 24 inches in both codes, with an exception for a clothes washer standpipe. Notice also that the maximum height of the standpipe is not the same in the two codes, and the UPC size is shown in parentheses.

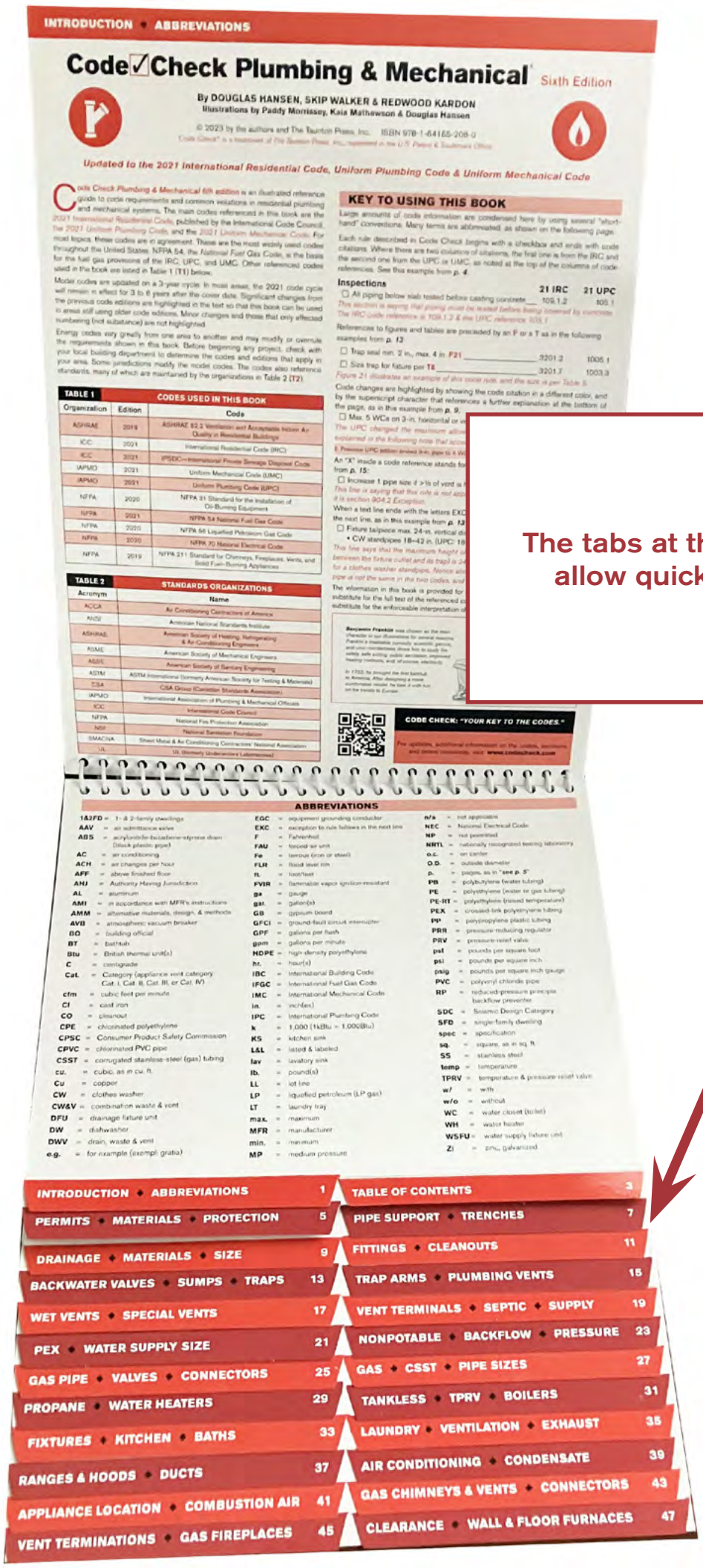
The information in this book is provided for informational purposes only and is not a substitute for the full text of the referenced codes. It should not be considered to be a substitute for the enforceable interpretation of the local building department.

Benjamin Franklin *was chosen as the main character in our illustrations for several reasons. Franklin's insatiable curiosity, scientific genius, and civic-mindedness drove him to study fire safety, safe exiting, public sanitation, improved heating methods, and, of course, electricity.*

In 1752, he brought the first bathtub to America. After designing a more comfortable model, he took it with him on his travels to Europe.

CODE CHECK: *"YOUR KEY TO THE CODES."*

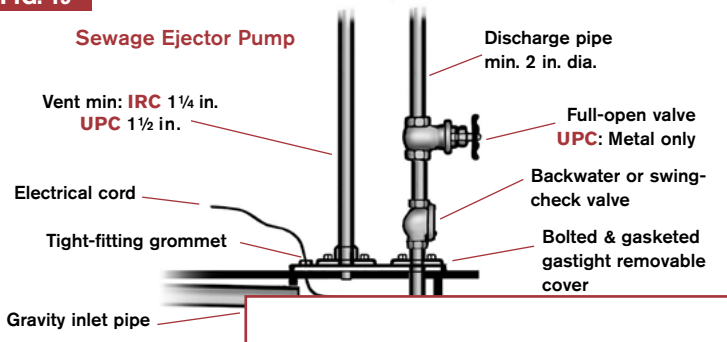
For updates, additional information on the codes, seminars, and online resources, visit: **www.codecheck.com**



The tabs at the bottom of every page allow quick access to each topic

Sump Pit & Pump	21 IRC	21 UPC
☐ Sewer ejector pumps must operate automatically	3007.4	710.9
☐ Sump min. 18 in. diameter 24 in. deep F19	3007.3.2	n/a
☐ Sump concrete, metal, or other approved materials (IRC: Also tile or plastic; UPC: Metal requires corrosion protection)	3007.3.2	710.8
☐ Min. pump capacity 21 gpm (UPC: 20 gpm)	3007.6	710.3 #1

FIG. 19



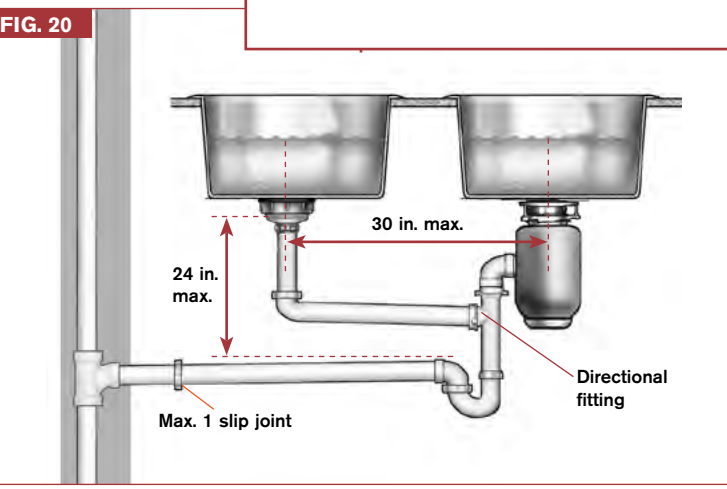
Max. height of starting level o sump must be ≥ 2 in. below gravity drain inlet.

When 2 commonly-used codes are referenced, the IRC code number is in the left column, and the UPC or UMC code number is on the right

TABLE 14 IRC MINI

Discharge Pipe Diamet
2 in.
2½ in.
3 in.

FIG. 20

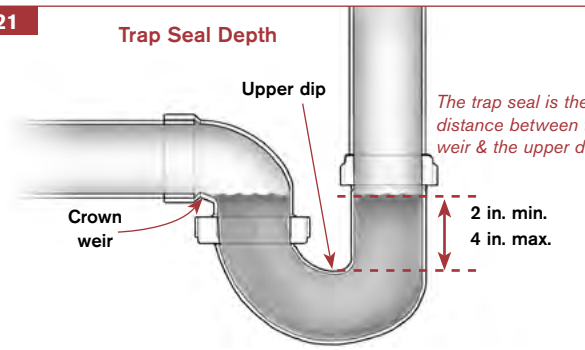


TRAPS, FIXTURE TAILPIECES & TRAP ARMS

Traps provide an air barrier between the contaminated atmosphere of the sewer and the indoor air we breathe. Without a proper trap seal, sewer gases, airborne bacteria, vermin, and other contaminants can enter the living area. If the seal is too shallow, the seal could be lost due to evaporation. If too deep, drainage could be blocked with sludge. Trap arms (fixture drains) must be vented, otherwise the negative pressure created by water moving down the pipe will cause water to be sucked out of the trap and the seal to be lost. Maintaining a proper trap seal is the underlying principle behind the code rules for drainage, traps, and venting.

Traps & Fixture Tailpieces	21 IRC	21 UPC
☐ Each fixture requires separate trap EXC	3201.6	1001.2
• Fixtures w/ integral traps (toilets)	3201.6X1	1001.2
• 2 or 3 like fixtures (sinks, laundry tubs, or lavs) in same room allowed on single trap at center fixture if fixture outlets ≤30 in. apart F20	3201.6X2	1001.2
• Laundry tray (sink) may drain to CW standpipe F75	3201.6X3	n/a
☐ Trap seal min. 2 in., max. 4 in. F21	3201.2	1005.1
☐ Set traps level & protect from freezing	3201.3	1005.1
bove trap weir F24	3201.3	1002.4
n traps, crown-vented traps, or traps w/ ions EXC F23	3105.3 & 3201.5	1004.1&2
nless partitions	3201.5(2)	1004.1
for special conditions	104.11	1004.1
	3201.7	1003.3
UPC: max. one size larger)	3201.7	1003.3
uble traps (in series)	3201.6	1004.1
os	3201.1	1003.1
ertical distance EXC F20	3201.6	1001.2
(UPC: 18–30 in.) F74	2706.1.2	804.1
otal developed length except d by continuous waste F20	n/a	1001.2
or continuous wastes from disposer (i.e., wyes, combos, or tees w/baffles) F20	2707.1	419.2
☐ Building traps prohibited (UPC: unless required by AHJ)	3201.4	1008.1

FIG. 21



Trap Arms	21 IRC	21 UPC
☐ Trap same size as trap arm	3201.7	1003.3
☐ No crown venting—min. length 2× trap arm diameter **F25**	3105.3	1002.2
☐ Length & slope per table EXC **T15**	3105.1	1002.2
• Trap arm length from WC unlimited (UPC: 6 ft.)	3105.1X	T1002.2
☐ Min. slope ¼ in./ft. (IRC ⅛ in./ft. OK for ≥3-in. pipe)	T3105.1	T1002.2
☐ Total fall of trap arm max. 1 pipe diameter **F24,T15**	3105.2	n/a
☐ Vent connection not below weir of trap (except WCs)	3105.2	1002.4
☐ Only 1 trap permitted on trap arm EXC		
• 2 trap arms on same level allowed double-wye fitting to common ver		
☐ Tubing traps require trap adapter **F**		
☐ Max. 1 slip joint allowed on outlet si		
☐ Horizontal direction changes in trap		
☐ CO required if direction change >4		
☐ Slip-joint connections required to be a		
☐ Access openings min. 12 in. × 12 in. **F**		

The print edition has 114 illustrations and 52 tables. These are referenced in the text along with the code number that applies to them.

FIG. 22

Trap Adapte

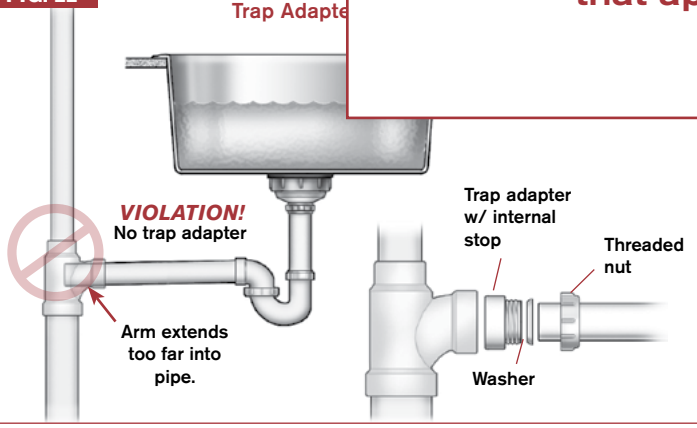


FIG. 23

S Trap

For water to drain in the vertical pipe downstream of the trap, it must have air to prevent a vacuum behind it. If that air comes from the fixture tailpiece, rather than from a vent, the water in the trap also gets siphoned into the drain pipe. That can leave the trap with no water seal to keep out sewer odors & vermin.

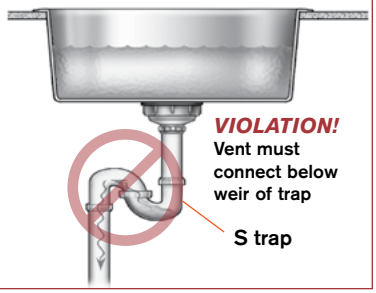
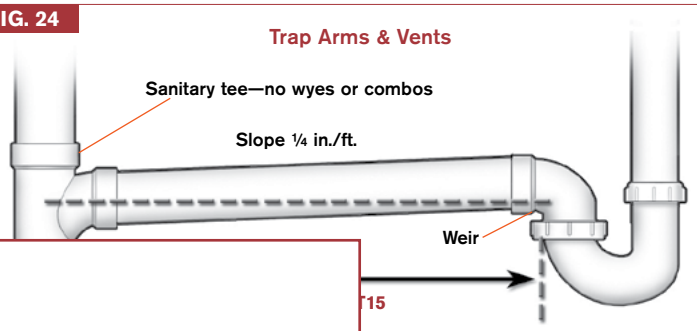


FIG. 24

Trap Arms & Vents



be admitted above the weir tted line in the figure. If the e trap weir would be above

DISTANCE TO VENT 5.1 & UPC T1002.2

		lax. Arm Length	UPC Max. Arm Length
		5 ft. (60 in.)	2½ ft. (30 in.)
1½ in.	3 in.	6 ft. (72 in.)	3½ ft. (42 in.)
2 in.	4 in.	8 ft. (96 in.)	5 ft. (60 in.)
3 in.[A]	6 in.	12 ft. (144 in.)	6 ft. (72in.)
4 in. or larger[A]	8 in.	16 ft. (192 in.)	10 ft. (120 in.)[B]

A. In the IRC, these arms can have ⅛-in./ft. slope. In the UPC, all arms must slope ¼ in./ft.
B. Max. developed length from a water closet to the vent is 6 ft. in the UPC & unlimited in the IRC.

FIG. 25