


Certified Building Official Examination Review



© 2024 Shums Coda Associates 1

1

Instructor




Bill Clayton, CBO
In the construction industry since 1973

Designer/ builder 16 years
Combo Inspector 30+ years
Plans Examiner 25+ years
Served on IEBC committee 9 years
IBC General comm 3 years
8+ years CBO
8+ years as Consultant and Instructor for CCC/Shums Coda Associates
Author of ICC Resource book "Firestopping, Joint Systems & Dampers" 2024

© 2024 Shums Coda Associates 2

2

What are we going to do?



- Discuss the Building Codes and Standards Module portion of the ICC Certified Building Official Examination
- Provide students with suggestions on how best to take the test.
- Review applicable codes
- Review potential questions in the test

© 2024 Shums Coda Associates 3

3

Overview of Examination

- 80 multiple choice questions
- Open Book
- 2 hour limit
 - 1 minute 30 seconds per question



© 2024 Shums Coda Associates

4

4

Applicable Codes

- International Building Code-2021
- International Residential Code-2021
- International Mechanical Code-2021
- International Fire Code-2021
- International Plumbing Code- 2021
- International Energy Conservation Code-2021
- ANSI/ICC A117.1-09 Accessible and Usable Buildings and Facilities
- 2020 National Electrical Code (ok to bring 2020 or 2017 edition)
- 2018 Special Inspection Manual (Ok to bring 2018 or 2012 edition)

© 2024 Shums Coda Associates

5

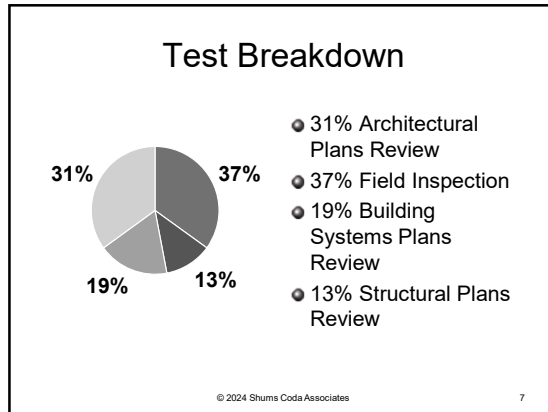
5

- The Certified Building Official is responsible for the development, administration, interpretation, application, and enforcement of the codes adopted by their jurisdiction. They will be able to manage their department's budget and the certification and training of inspection staff. They will have an understanding of laws and regulations pertaining to human resources. They will have a thorough knowledge of customer service, develop and maintain effective relationships with all client groups, and be able to effectively communicate with contractors, homeowners, subordinates, superiors, news media, elected officials, and civic organizations.
- The Certified Building Official shall be responsible for development and implementation of programs that provide for the review and inspections of all occupancies for, but not limited to, fire and life safety, interior finish, occupancy type, height and area limitations, construction type, and general fire safety, in accordance with Codes and Standards adopted by their respective jurisdictions. The Certified Building Official shall also develop and implement programs for plan review, permitting and enforcement to ensure compliance with adopted Codes and Standards.

© 2024 Shums Coda Associates

6

6



7

Preparing for the Test

- Knowing the subject matter is the best antidote for test anxiety.
- Specific area for studying that includes a desk or table and all required materials.
- Study area should be:
 - Quiet
 - Well-Lit
 - Well-Ventilated
 - Comfortable
 - Not Too Comfortable
 - Free of Distractions

© 2024 Shums Coda Associates 8

8

Preparing for the Test

- Set aside an adequate amount of time to truly concentrate
- Think positively and tell yourself you will pass the exam
- Focus on the long term goal that certification will allow you to achieve

© 2024 Shums Coda Associates 9

9

Preparing for the Test



- Preparation for a multiple-choice exam requires regular review and practice on a daily and weekly basis.
- The time you invest will result in greater confidence locating, understanding and applying the code.
- Once you are confident about the subject matter, here are some hints that may help you become a wiser test-taker.

© 2024 Shums Coda Associates

10

10

HINT #1 Work Quickly

- Read each question through just once. Go with the first answer that occurs to you. If you have second thoughts, mark the number and come back to it later, if you have time. It is important that you finish the exam and not spend too much time on any one question.
- It is a good idea to plan a time strategy for taking the test. Determine how many questions you must answer in the given time. Allocate a certain amount of time per question (perhaps 1 to 1 1/2 minutes) and use a watch to maintain this pace throughout the exam.

© 2024 Shums Coda Associates

11

11

Taking the test

- Take the time to go thru the practice test to make sure you are comfortable with the process...
- If you have questions about the process---ask before you start
- Do this even if you are an experienced test taker

© 2024 Shums Coda Associates

12

12

HINT #2
Watch for Key Words

- In multiple-choice questions you are given a partial statement which test writers call the "stem." The rest of the question completes the statement which test writers call "answer choices." Only one answer choice is correct.
- **Stem:**
The minimum height of a guard at a loft overlooking the lower story within a dwelling unit in a Group R-2, 5-story apartment building Occupancy is:
- **Answer choices:** (only one is correct)
 - (A) 34 inches
 - (B) 36 inches
 - (C) 38 inches
 - (D) 42 inches

© 2024 Shums Coda Associates 13

13

Watch for Key Words

- A "key" word or phrase is a word or group of words which are **IMPORTANT** to the meaning of the stem. Pay attention to key words by reading the stem slowly.
- **Some key words are:**
 - except
 - not
 - more than
 - less than
 - maximum
 - Minimum
 - within
 - which of the following
 - all of the following
 - which is true/which is false
 - Also, sometimes key words will be underlined, capitalized or boldfaced.

© 2024 Shums Coda Associates 14

14

Watch for Key Words

- **Key Word Example**
 - All of the following statements are **true** about an automatic fire detection system
EXCEPT

© 2024 Shums Coda Associates 15

15

HINT #3 Eliminate Answers

- Multiple-choice questions have four answer choices; that means you have 25% chance to choose the right answer.
- By reviewing and ruling out two of the possible choices, your odds improve to one to two or a 50/50 chance of answering correctly.



© 2024 Shums Coda Associates

16

16

Eliminate Answers

- Immediately discard any obvious incorrect choices and move quickly to the next possibility.
- If an answer choice is partly wrong, it is all wrong. Move to the next possibility.
- If an answer choice seems correct but has nothing to do with the stem of the question, discard it. Move to the next possibility, and so on.
- Sometimes two answer choices say exactly the opposite thing. In such a case, the correct answer is usually one or the other.
- Many times, two of the answer choices are similar. Often only one or two words differ. Again, the correct answer is usually one or the other.

© 2024 Shums Coda Associates

17

17

Eliminate Answers

- When a soils report is not provided, the maximum slope of permanent fill for site work is _____.
 - A. 25 percent (1:4)
 - B. 33 percent (1:3)
 - C. 50 percent (1:2)
 - D. 66 percent (1:1.5)

© 2024 Shums Coda Associates

18

18

HINT #4 Follow Your Hunches

- Research shows that when you have a hunch and change an answer, your hunch usually proves to be right. Follow your hunches systematically.
- Do not go over any answers until you have finished the test. Then, use all the remaining time to review your answer selections.
- First, go back and review the directions. Make sure you followed them exactly.
- Next, check that you have entered the answer choice you intended to select.
- Then, read over the questions and answers that you selected for further thought (as suggested in Hint #1).
- Finally, if you have time, go over all your other answers. Carefully correct errors.

© 2024 Shums Coda Associates

19

19

RELAX!

- When thinking about or taking an exam, does your...
 - mind become agitated?
 - heart beat accelerate?
 - breathing become shallow?
 - body sweat?
 - stomach feel queasy?
- Most test takers can identify with some, if not all, of the above conditions. How do you get control of these internal responses? One way is train your mind and body to relax.



© 2024 Shums Coda Associates

20

20

RELAX!

- Mind and Body Relaxation Exercise
- A periodic relaxation break during the exam is well worth the feelings of relaxation and rejuvenation that you'll feel. The following exercise can be done in about 30 seconds.
- Take a comfortable deep breath and then let the air out slowly and quietly. As you breathe out, say "RELAX" to yourself, and feel the tension flowing out of your body.

© 2024 Shums Coda Associates

21

21

RELAX! ZEN....Woosaw

- While relaxing during the deep breath, let your arms and hands dangle at your sides. Feel the warmth from the blood flow into your hands. Imagine the tension flowing out through your fingertips.
- Tighten and relax your fingers several times to induce blood flow.
- Change your body position slightly allowing more blood flow to your lower body.
- Stretch your arms, legs and back.
- Take another deep breath, say "RELAX" as you exhale, and return to work.

© 2024 Shums Coda Associates

22

22

The Answers Often.....

- Are in the exceptions
 - Are in the footnotes
 - Are in the tables
- Always**
- Must be the best answer available
 - "No trick questions"

© 2024 Shums Coda Associates

23

23

Resources

BC Building Codes and Standards

FREE QUIZ

This free quiz contains 10 questions from our premium (BC) Building Codes and Standards Practice Exam, which one of the three exam modules required for those looking to become a Certified Building Official (CBO).

Take Quiz

- ICC Practice tests
- ICC Workbooks
- Fellow candidates

© 2024 Shums Coda Associates

24

24

Practice exam

BC BUILDING CODES AND STANDARDS Practice Exam

\$44.99

Includes 2 Practice Exams, 80 Questions Each

For 2021 Click Here

For 2019 Click Here

© 2024 Shums Coda Associates

25

25

IBC Format

- Chapter 1
 - Administration
- Chapter 2
 - Definitions
- Chapters 3-6
 - Building Classification
- Chapters 7-9
 - Fire Protection
- Chapter 10
 - Means of Egress
- Chapter 11
 - Accessibility
- Chapters 12-15
 - Building Environment
- Chapters 16-23
 - Structural & Materials
- Chapters 24-31
 - Miscellaneous Requirements
- Chapters 32-33
 - Public Protection
- Chapter 35
 - Referenced Standards
- Appendix Chapters

© 2024 Shums Coda Associates

26

26

Classifying the Building

- Occupancy Classification
 - A Assembly
 - B Business
 - E Educational
 - F Factory/Industrial
 - H Hazardous
 - I Institutional
 - M Mercantile
 - R Residential
 - S Storage
 - U Utility/Misc.



© 2024 Shums Coda Associates

27

27

High-Hazard Group H 307

- Group H-1
 - Contain materials that pose a detonation hazard
- Group H-2 Structures
 - Contain materials that present a deflagration hazard or a hazard from accelerated burning
- Group H-3 Structures
 - Contain materials that readily support combustion or present a physical hazard
- Group H-4 Structures
 - Contain materials that are health hazards
- Group H-5 Structures
 - Semiconductor fabrication facilities and comparable research and development areas

28

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE ^b		
			Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas (cubic feet at NTP)
Combustible liquid ^{c,1}	II IIA IIIB	H-2 or H-3 H-2 or H-3 N/A	N/A	120 ^{d,1} 330 ^{d,1} 13,200 ^{e,1}	N/A
Combustible fiber	Loose Baled	H-3	(100) (1,000)	N/A	N/A
Consumer fireworks (Class C, Common)	1.4G	H-3	125 ^{d,e,1}	N/A	N/A
Cryogenics flammable	N/A	H-2	N/A	45 ^d	N/A
Cryogenics oxidizing	N/A	H-3	N/A	45 ^d	N/A
Explosives	Division 1.1	H-1	1 ^{e,2}	(1) ^{e,2}	N/A
	Division 1.2	H-1	1 ^{e,2}	(1) ^{e,2}	N/A
	Division 1.3	H-1 or 2	5 ^{e,2}	(5) ^{e,2}	N/A
	Division 1.4	H-3	50 ^{e,2}	(50) ^{e,2}	N/A
	Division 1.4G	H-3	125 ^{d,e,1}	N/A	N/A
	Division 1.5 Division 1.6	H-1 H-1	1 ^{e,2} 1 ^{e,2}	(1) ^{e,2} N/A	N/A N/A
Flammable gas	Gaseous liquefied	H-2 N/A	N/A N/A	N/A 30 ^{d,e}	1,000 ^{d,e} N/A
Flammable liquid ^d	IA IB and IIC	H-2 H-3	N/A N/A	30 ^{d,e} 120 ^{d,e}	N/A

29

Construction Classification FRR Table 601

TABLE 601 FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV		TYPE V		
	A	B	A	B	A	B	A	B	HT	A	B
Primary structural frame ^f (see Section 202)	3 ^h	2 ^h	0 ^h	0 ^h	0 ^h	0 ^h	0 ^h	0 ^h	0 ^h	HT	0 ^h
Bearing walls											
Exterior ^{g,1}	3	2	1	0	2	2	3	2	2	2	1
Interior	3 ^h	2 ^h	1	0	1	0	3	2	2	1/HT ^g	1
Nonbearing walls and partitions											
Exterior											
Nonbearing walls and partitions											
Interior ^g	0	0	0	0	0	0	0	0	0	See Section 204.11.2	0
Floor construction and associated secondary structural members (see Section 202)	2	2	1	0	1	0	2	2	2	HT	1
Roof construction and associated secondary structural members (see Section 202)	1 ^{1/2}	1 ^{1/2}	1 ^{1/2}	0 ^h	1 ^{1/2}	0	1 ^{1/2}	1	1	HT	1 ^{1/2}

30

Building Element 202



© 2024 Shums Coda Associates

31

- A fundamental component of building construction, listed in Table 601, which may or may not be of fire-resistance-rated construction and is constructed of materials based on the building type of construction

31

Primary Frame Definition 202



© 2024 Shums Coda Associates

32

- The primary structural frame shall include all of the following structural members:
 1. The columns;
 2. Structural members having direct connections to the columns, including girders, beams, trusses and spandrels;
 3. Members of the floor construction and roof construction having direct connections to the columns;
 4. Members that are essential to the vertical stability of the primary structural frame under gravity loading.

32

Secondary Frame Definition 202



© 2024 Shums Coda Associates

33

- The following structural members shall be considered secondary members and not part of the primary structural frame:
 1. Structural members not having direct connections to the columns;
 2. Members of the floor construction and roof construction not having direct connections to the columns; and
 3. Bracing members that are not designated as part of the *primary structural frame* or bearing wall.

33

Combustible Materials Permitted 603

- Combustible materials shall be permitted in buildings of Type I or II construction in the following applications and in accordance with Sections 603.1.1 through 603.1.3:
 - Thermal/Acoustical insulation
 - Foam Plastics Ch. 26
 - Roof Coverings
 - Show windows over 15 feet
 - Partitions dividing stores, offices, etc.
 - Platforms Sec. 410
 - Blocking
 - Exterior wall coverings, balconies
 - ETC. Etc. Etc.....
- 27 separate conditions listed.
- Fire-retardant-treated lumber
 - Nonbearing partitions > 2hour fire rating
 - Nonbearing exterior walls
 - Limited Roof Construction

**Exterior Walls Fire Rating
Table 705.5**

**TABLE 705.5
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE^{a, g}**

FIRE SEPARATION DISTANCE - X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H ^b	OCCUPANCY GROUP F-1, M, S-1 ^f		OCCUPANCY GROUP A, B, E, F-2, I, R, S-2, U ^h	
			0	1	0	1
X < 0 ^b	All	3	2	1		
0 ≤ X < 10	IA, IVA	3	2	1		
	Others	2	1	1		
	IA, IB, IVA, IVB	2	1	1	1 ^e	
10 ≤ X < 30	IB, VB	1	0	0		
	Others	1	1	1	1 ^e	
X ≥ 30	All	0	0	0		

For SI: 1 foot = 304.8 mm.

- Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.
- See Section 705.1.1 for party walls.
- Cover parking garages complying with Section 605 shall not be required to have a fire-resistance rating.
- The fire-resistance rating of an exterior wall is determined based upon the fire separation distance of the exterior wall and the story in which the wall is located.
- For special requirements for Group H occupancies, see Section 415.6.
- For special requirements for Group S aircraft hangars, see Section 413.3.1.
- Where Table 705.5 permits nonbearing exterior walls with unlimited area of unprotected openings, the required fire-resistance rating for the exterior walls is 0 hours.
- For a building containing only a Group U occupancy private garage or carport, the exterior wall shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet (1523 mm) or greater.
- For a Group R-3 building of Type II-B or Type V-B construction, the exterior wall shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet (1523 mm) or greater.

Height Limitations 504.3

TABLE 504.3 ALLOWABLE BUILDING HEIGHT IN FEET ABOVE GRADE PLANE^a

OCCUPANCY CLASSIFICATION	See Footnotes	TYPE OF CONSTRUCTION												
		Type I		Type II		Type III		Type IV		Type V				
		A	B	A	B	A	B	A	B	C	HT	A	B	
A, B, E, F, M, S, U	NS ^b	UL	160	65	55	65	55	65	65	65	65	65	65	40
	S	UL	180	85	75	85	75	270	180	85	85	70	60	60
H-1, H-2, H-3, H-5	NS ^{b, c}	UL	160	65	55	65	55	120	90	65	65	65	50	40
	S	UL	180	85	75	85	75	140	100	85	85	70	60	60
H-4	NS ^{b, c}	UL	160	65	55	65	55	65	65	65	65	65	50	40
	S	UL	180	85	75	85	75	140	100	85	85	70	60	60
I-1 Condition 1, 1.1	NS ^{b, c}	UL	160	65	55	65	55	65	65	65	65	65	50	40
	S	UL	180	85	75	85	75	180	120	85	85	70	60	60
I-1 Condition 2, 1.2	NS ^{b, c, f}	UL	160	65	55	65	55	65	65	65	65	65	50	40
	S	UL	180	85	75	85	75	180	120	85	85	70	60	60
I-4	NS ^{b, c}	UL	160	65	55	65	55	65	65	65	65	65	50	40
	S	UL	180	85	75	85	75	180	120	85	85	70	60	60
R ^b	NS ^b	UL	160	65	65	65	65	65	65	65	65	65	50	40
	S13D	60	60	60	60	60	60	60	60	60	60	60	50	40
	S13R	60	60	60	60	60	60	60	60	60	60	60	50	40
S	UL	180	85	75	85	75	270	180	85	85	70	60	60	

Height limitations 504.4

TABLE 504.4 ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE^{a, b}

Table with columns for OCCUPANCY CLASSIFICATION, SEE FOOTNOTES, and TYPE OF CONSTRUCTION (Type I, II, III, IV, V) with sub-columns A, B, C, HT, and A, B. Rows include A-1, A-2, A-3, A-4, A-5, B, E, F-1, F-2, and H-1.

© 2024 Shums Coda Associates

Table 506.2 Allowable Areas

TABLE 506.2 ALLOWABLE AREA FACTOR (A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z) (IN SQUARE FEET)^{a, b}

Table with columns for OCCUPANCY CLASSIFICATION, SEE FOOTNOTES, and TYPE OF CONSTRUCTION (Type I, II, III, IV, V) with sub-columns A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z. Rows include A-1, A-2, A-3, A-4, A-5, and B.

© 2024 Shums Coda Associates

Frontage increase 506.3

506.3 Frontage Increase.

Every building shall adjoin or have access to a public way to receive an area factor increase based on frontage. Area factor increase shall be determined in accordance with Sections 506.3.1 through 506.3.3.

Premium Code Insights: Code Change Details Hearing Videos Study Topics

506.3.1 Minimum percentage of perimeter.

To qualify for an area factor increase based on frontage, a building shall have not less than 25 percent of its perimeter on a public way or open space. Such open space shall be either on the same lot or dedicated for public use and shall be accessed from a street or approved fire lane.

Premium Code Insights: Code Change Details Hearing Videos

506.3.2 Minimum frontage distance.

To qualify for an area factor increase based on frontage, the public way or open space adjacent to the building perimeter shall have a minimum distance (95' or 20 feet (6096 mm)) measured at right angles from the building face to any of the following:

- 1. The closest interior lot line.
2. The entire width of a street, alley or public way.
3. The exterior face of an adjacent building on the same property.

The frontage increase shall be based on the smallest public way or open space that is 20 feet (6096 mm) or greater, and the percentage of building perimeter having a minimum 20 feet (6096 mm) public way or open space.

© 2024 Shums Coda Associates

Horizontal lines for handwritten notes on page 37.

Horizontal lines for handwritten notes on page 38.

Horizontal lines for handwritten notes on page 39.

- Given:
 - Restaurant
 - Type V-B Construction
 - One-Story
 - Fully sprinkled NFPA 13
 - 40' Street
 - Sides with at least 20' frontage= 275'
 - Total perimeter = 350'
 - $275/350=.79$
 - Smallest yard with at least 20' = 21'
 - 50% increase based on a NS building

© 2024 Shums Coda Associates 40

40

FSD for Frontage

- Measure from face of building to:
 - The closest interior lot line
 - The entire width of a street, alley or public way
 - The exterior face of an adjacent building on the same property

© 2024 Shums Coda Associates 41

41

AMOUNT OF INCREASE

506.3.3 Amount of Increase. ☰
 The area factor increase based on frontage shall be determined in accordance with Table 506.3.3.

Premium Code Insights Code Change Details Hearing Video

TABLE 506.3.3 FRONTAGE INCREASE FACTOR² ☰

PERCENTAGE OF BUILDING PERIMETER	OPEN SPACE (ft)		
	0 to less than 20	20 to less than 25	25 to less than 30 or greater
0 to less than 25	0	0	0
25 to less than 50	0	0.17	0.21
50 to less than 75	0	0.33	0.42
75 to 100	0	0.50	0.63

© 2024 Shums Coda Associates 42

42

Applying the increase

- Equation 5-1: $\Lambda_a = \Lambda_t + (NS \times I_f)$
- $NS = 6,000 \times 50\% = 3000$
- $\Lambda_a = 22,000 + 3000 = 25,000$ total allowable area per floor.
- $7500 < 25,000$ therefore allowable area is OK

© 2024 Shums Coda Associates

43

43

Area Determination 506.4.1

- The total allowable building area of a single occupancy building with more than one story above grade plane shall be determined by multiplying the allowable building area per story (Λ_a), as determined in Section 506.2, by the number of stories above grade plane as listed below:
 1. For buildings with two stories above grade plane, multiply by 2;
 2. For buildings with three or more stories above grade plane, multiply by 3; and
 3. No story shall exceed the allowable building area per story (Λ_a), as determined in Section 506.2, for the occupancies on that story.
 4. Multiply by 4, where the building is equipped with an NFPA 13R sprinkler

© 2024 Shums Coda Associates

44

44

506.3.3.1 Section 507 buildings

- Where a building meets the requirements of Section 507, as applicable, except for compliance with the minimum 60-foot public way or yard requirement, the area factor increase based on frontage shall be determined in accordance with Table 506.3.3.1.

**TABLE 506.3.3.1
SECTION 507 BUILDINGS***

PERCENTAGE OF BUILDING PERIMETER	OPEN SPACE (ft ²)					
	30 to less than 35	35 to less than 40	40 to less than 45	45 to less than 50	50 to less than 55	55 to less than 60
0 to less than 25	0	0	0	0	0	0
25 to less than 50	0.29	0.33	0.38	0.42	0.46	0.50
50 to less than 75	0.58	0.67	0.75	0.83	0.92	1.00
75 to 100	0.88	1.00	1.13	1.25	1.38	1.50

© 2021 Shums Coda Associates

45

45

**TABLE 508.3.3.1
SECTION 507 BUILDINGS***

PERCENTAGE OF BUILDING PERIMETER	OPEN SPACE (feet)					
	30 to less than 35	35 to less than 40	40 to less than 45	45 to less than 50	50 to less than 55	55 to less than 60
0 to less than 25	0	0	0	0	0	0
25 to less than 50	0.29	0.33	0.38	0.42	0.46	0.50
50 to less than 75	0.58	0.67	0.75	0.83	0.92	1.00
75 to 100	0.88	1.00	1.13	1.25	1.38	1.50

Perimeter with > 20' yard = 911'
 Total Perimeter = 1,018'
 911/1,018 = 90%
 Smallest Yard = 53' 1"

90% Building Perimeter
 Yard Dimension = 53' 1"
 Frontage Increase = 138%

© 2021 Shums Coda Associates

46

Mixed Use and Occupancy 508

- Where a building contains more than one occupancy group, the building or portion thereof shall comply with the applicable provisions of Section 508.2, 508.3 or 508.4, or a combination of these sections.
 - 508.2 Accessory Occupancies
 - 508.3 Nonseparated Occupancies
 - 508.4 Separated Occupancies
 - (Buildings separated by Fire Walls)

© 2024 Shums Coda Associates

47

Mixed Use and Occupancy 508

- Where a building or portion thereof contains two or more occupancies or uses, the building or portion thereof shall comply with applicable provisions of this section.

© 2024 Shums Coda Associates

48

Mixed Use and Occupancy 508

■ Exceptions

1. Occupancies separated in accordance with section 510
2. Where required by Table 415.36.5 areas of Group H-1, H-2 and H-3 occupancies shall be located in a detached building or structure.



49

© 2024 Shums Coda Associates

49

Accessory Occupancies 508.2



50

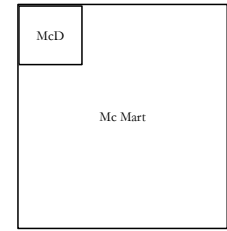
© 2024 Shums Coda Associates

50

- Accessory occupancies are those occupancies that are ancillary to the main occupancy of the building or portion thereof.
- 508.2.1 Accessory occupancies shall be individually classified for Use and Occupancy classification in accordance with 302.1

Area Limitations 508.2.1

- Aggregate accessory occupancies shall not occupy more than 10 percent of the building area of the story in which they are located
- Cannot not exceed the tabular values in 506 for the non-sprinkled values for each separate accessory occupancy



51

© 2024 Shums Coda Associates

51

Accessory Occupancies

- Not required to be separated from the main occupancy (except for H per 508.4 and I-1, R-1, R-2, R-3 dwelling units per section 420).
- Aggregate area of accessory occupancies cannot exceed 10% of the floor upon which they are located.

© 2024 Shums Coda Associates

52

52

Nonseparated Occupancies

508.3

- Nonseparated occupancies shall be individually classified in accordance with Section 302.1.



53

© 2024 Shums Coda Associates

53

Nonseparated Occupancies

508.3

- The requirements of this code shall apply to each portion of the building based on the occupancy classification of that space except that the most restrictive applicable provisions of Section 403 (high rise) and Chapter 9 shall apply to the building or portion thereof in which the nonseparated occupancies are located.
- High Rise Building Provisions if applicable
- Automatic Sprinklers
- Fire Alarms
- Most restrictive height and area of chapter 5 shall apply to the non-separated area

54

© 2024 Shums Coda Associates

54

Nonseparated Occupancy Example

One-story
Office, Warehouse
Parking Garage
Type IIB Construction
Fully Sprinklered
80,000 sq. ft.
40' yards all around

- Occupancy Classifications
 - Office = Group B
 - Warehouse = S-1
 - Auto Storage = S-2
- Tabular Areas/Max. Ht.
 - Group B = 92,000/3
 - Group S-1 = 70,000/4
 - Group S-2 = 104,000/4
- Most Restrictive = Group S-1
- Area calculation based on S-1
 - $A_s = 70,000 + 52,500 =$
 - $A_s = 122,500\text{sq. ft.}$
 - Apply chapter 9 requirements to the entire building for non-separated use

© 2024 Shums Coda Associates

55

Separated Occupancies 508.4

- Separated occupancies shall be individually classified in accordance with Section 302.1.
- Each separated space shall comply with this code based on the occupancy classification of that portion of the building.

Apartments R-2
10,500 sq. ft.

One-story
Mixed Use
Type VB Const.
Fully Sprinklered

Offices- B
8,500 sq. ft.

Parking
Garage- S-2
14,500 sq. ft.

© 2024 Shums Coda Associates

56

Allowable Building Area 508.4.2

- In each story, the building area shall be such that the sum of the ratios of the actual building area of each separated occupancy divided by the allowable building area of each separated occupancy shall not exceed 1.

Apartments
10,500 sq. ft.

One-story
Mixed Use
Type VB Const.
Fully Sprinklered

Offices
8,500 sq. ft.

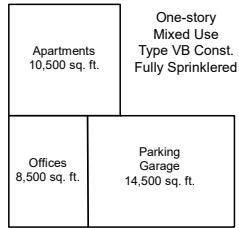
Parking
Garage
14,500 sq. ft.

© 2024 Shums Coda Associates

57

Separated Occupancy Example

Occ.	Actual Area	A ₂	Ratio
R-2	10,500	28,000	0.38
B	8,500	36,000	0.24
S-2	14,500	54,000	0.27
Total	33,500		0.89 < 1



© 2024 Shums Coda Associates

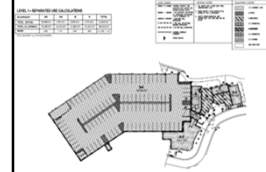
Table 508.4 Occupancy Separation

TABLE 508.4 REQUIRED SEPARATION OF OCCUPANCIES (HOURS)

OCCUPANCY	A, E		I-1, I-3, I-4		I-2	R ¹	F-2, S-2 ¹ , U		H ¹ , F-1, M, S-1		H-5	H-2		H-3, H-4		H-5				
	S	NS	S	NS			S	NS	S	NS		S	NS	S	NS		S	NS		
A, E	N	N	1	2	2	NP	1	2	N	1	1	2	NP	NP	3	2	2	2	NP	
I-1, I-3, I-4	1	2	N	N	2	NP	1	NP	1	2	1	2	NP	NP	3	NP	2	NP	2	NP
I-2	2	NP	2	NP	N	N	2	NP	2	NP	2	NP	NP	NP	3	NP	2	NP	2	NP
R ¹	1	2	1	NP	2	NP	N	N	1 ¹	2 ¹	1	2	NP	NP	3	NP	2	NP	2	NP
F-2, S-2 ¹ , U	N	1	1	2	2	NP	1	2	N	N	1	2	NP	NP	3	4	2	3	2	NP
H ¹ , F-1, M, S-1	1	2	1	2	2	NP	1	2	1	2	N	N	NP	NP	2	3	1	2	1	NP
H-1	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
H-2	3	4	3	NP	3	NP	3	NP	3	4	2	3	NP	NP	3	NP	1	NP	1	NP
H-3, H-4	2	3	2	NP	2	NP	2	NP	2	3	1	2	NP	NP	1	NP	1 ¹	NP	1	NP
H-5	2	NP	2	NP	2	NP	2	NP	1	NP	NP	NP	1	NP	1	NP	1	NP	N	NP

© 2021 Shums Coda Associates

Allowable Height 508.4.3

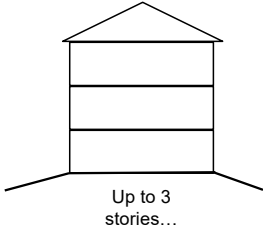


- Each separated occupancy shall comply with the building height limitations based on the type of construction of the building in accordance with Section 503.1.
- Exception: Special provisions permitted by Section 510.

© 2024 Shums Coda Associates

More Than One Story Above Grade Plane -

- The maximum number of stories shall not exceed the limits specified in table 504.4
- No individual occupancy shall exceed the limitations in 504
- The total building height in stories shall comply with that for the main use and type of construction

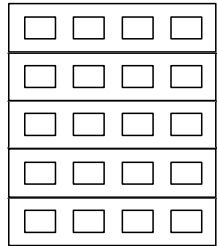


Up to 3 stories...

61 © 2024 Shums Coda Associates

61

Multi-Story Mixed Occupancies Example



- Given
 - 5 story building as shown
 - 35,000 sq. ft. per story
 - Type IIA Construction
 - NFPA 13 Sprinklers
 - No yard increase
- Solution
 - Aa (M) = 64,500
 - Aa (B) = 112,500 sq. ft.
 - Aa (R-2) = 72,000 sq. ft.

62 © 2024 Shums Coda Associates

62

Multi-Story Mixed Occupancies

Each floor is less than 1 and the total building is less than 3 therefore OK

Story	Occ.	Actual Area	A _a	Ratio
1	M	35,000	64,500	0.54
2	B	35,000	112,500	0.31
3	R-2	35,000	72,000	0.49
4	R-2	35,000	72,000	0.49
5	R-2	35,000	72,000	0.49
Totals		175,000		2.32

63 © 2024 Shums Coda Associates

63

Separation of Incidental Occupancies - 509

- The incidental occupancies listed in Table 509 shall be separated from the remainder of the building or equipped with an automatic fire-extinguishing system, or both, in accordance with Table 509.
- Exception: Incidental occupancies within and serving a dwelling unit are not required to comply with this section.



64

© 2024 Shums Coda Associates

64

Table 509 Incidental uses

ROOM OR AREA	SEPARATION AND/OR PROTECTION
Painter room where any piece of equipment is over 400,000 Btu per hour input	1 hour or provide automatic sprinkler system
Rooms with fixtures where the largest piece of equipment is over 12 psi and 10 horsepower	1 hour or provide automatic sprinkler system
Refrigerant machinery room	1 hour or provide automatic sprinkler system
Hydrogen fuel gas rooms, not classified as Group H	1 hour in Group R, F, M, S and U occupancies; 2 hours in Group A, E, and P occupancies
Decompressor rooms	2 hours and provide automatic sprinkler system
Paint shops, not classified as Group H, located in occupancies other than Group F	2 hours, or 1 hour and provide automatic sprinkler system
In Group I occupancies, laboratories and vocational shops not classified as Group H	1 hour or provide automatic sprinkler system
In Group I-2 occupancies, laboratories not classified as Group H	1 hour and provide automatic sprinkler system
In ambulatory care facilities, laboratories not classified as Group H	1 hour or provide automatic sprinkler system
Laundry rooms over 100 square feet	1 hour or provide automatic sprinkler system
In Group I-2, laundry rooms over 100 square feet	1 hour
Group I-3 units and Group I-2 patient rooms equipped with padded surfaces	1 hour
In Group I-2, physical plant maintenance shops	1 hour
In ambulatory care facilities or Group I-2 occupancies, waste and linen collection rooms with contents that have an aggregate volume of 10 cubic feet or greater	1 hour
In other than ambulatory care facilities and Group I-2 occupancies, waste and linen collection rooms over 100 square feet	1 hour or provide automatic sprinkler system
In ambulatory care facilities or Group I-2 occupancies, storage rooms greater than 100 square feet	1 hour
Electrical installations and transformers	See Sections 110.26 through 110.32 and Sections 450.4 through 450.43 of NFPA 70 for protection and separation requirements.

65

© 2021 Shums Coda Associates

65

Special Detailed Requirements Based On Use And Occupancy Chapter 4 — 28 categories



© 2024 Shums Coda Associates

66

66

Covered Mall Buildings

402

- Provision apply to Covered mall buildings not exceeding three floor levels at any point nor more than three stories above grade plane.
- Exception:
 - Foyers and lobbies of Groups B, R-1 and R-2
 - Where buildings totally comply with other applicable provisions of this code.



© 2024 Shums Coda Associates

67

67

High-Rise Buildings

403

- High-rise buildings shall comply with Sections 403.2 through 403.6.
- High Rise Definition:
 - A building with an occupied floor located more than 75 feet above the lowest level of fire department vehicle access.



© 2024 Shums Coda Associates

68

68

Atriums

404

- In other than Group H occupancies, and where permitted by Section 712.1.6, the provisions of Sections 404.1 through 404.9 shall apply to buildings or structures containing vertical openings defined as "Atriums."



© 2024 Shums Coda Associates

69

69

Motor-Vehicle-Related Occupancies

406



- Private garages/carports
- Parking structures
- Open parking garages
- Enclosed parking garages
- Motor vehicle service stations
- Repair garages

© 2024 Shums Coda Associates

70

70

Group I-2 Occupancies

407

- Corridor walls
 - Smoke Partitions
- Smoke Barriers
 - Min. two compartments
 - 22,500 max floor area
- Sprinklers required
- Automatic fire detection required
 - Corridors of nursing homes, detoxification facilities and spaces permitted to open to corridors by 407.2



© 2024 Shums Coda Associates

71

71

Stages and Platforms

410

- Applies to all stages
 - > 50' high - separated from rest of building by two-hour fire walls
 - < 50' high - separated from dressing rooms and accessory spaces by one-hour wall.
- Platforms
 - Fire-retardant wood permitted in certain conditions




© 2024 Shums Coda Associates

72

72

Hazardous Materials 414




- Control areas increased
- Includes requirements for grinding rooms
- LPG distribution facilities
- Dry cleaning plants
- Gas rooms
- Gas detection in gas cabinets, enclosures and gas rooms

© 2024 Shums Coda Associates 73

73

Fire-Resistance Rating of Structural Members – 704.1

- The fire-resistance ratings of structural members and assemblies shall comply with this section and the requirements for the type of construction as specified in Table 601. The fire-resistance ratings shall not be less than the ratings required for the fire-resistance-rated assemblies supported by the structural members.
 - Exception: Fire barriers, fire partitions, smoke barriers and horizontal assemblies as provided in Sections 707.5, 708.4, 709.4 and 711.2, respectively.



© 2024 Shums Coda Associates 74

74

Projections 705.2

- Projections shall not extend any closer to the line used to determine the fire separation distance than shown in Table 705.2.
 - Exception: Buildings on the same lot and considered as portions of one building in accordance with Section 705.3 are not required to comply with this section.

TABLE 705.2 MINIMUM DISTANCE OF PROJECTION ☰


FIRE SEPARATION DISTANCE (FSD) (ft/ft)	MINIMUM DISTANCE FROM LINE USED TO DETERMINE FSD
0 to less than 2	Projections not permitted
2 to less than 3	24 inches
3 to less than 5	Two-thirds of FSD
5 or greater	40 inches

© 2024 Shums Coda Associates 75

75

Projections 705.2.1 & 705.2.2

- **Type I & II**
 - **noncombustible materials or combustible materials as allowed by 705.2.3.1 and 705.2.4**
- **Type III, IV, V**
 - **Any approved materials**
 - **Projection protection shall be by:**



© 2024 Shums Coda Associates 76

76

Projection protection

705.2.3 Projection protection.

Projections extending to within 5 feet (1524 mm) of the line used to determine the *fire separation distance* shall be one of the following:

1. Noncombustible materials.
2. Combustible materials of not less than 1-hour fire-resistance-rated construction.
3. Heavy timber construction complying with Section 2304.11.
4. Fire-retardant-treated wood.
5. As permitted by Section 705.2.3.1.

Exception: Type VB construction shall be allowed for combustible projections in Group R-3 and U occupancies with a fire separation distance greater than or equal to 5 feet (1524 mm).

© 2024 Shums Coda Associates 77

77

Opening Limitations 705.8

TABLE 705.8
MAXIMUM AREA OF EXTERIOR WALL OPENINGS BASED ON FIRE SEPARATION DISTANCE AND DEGREE OF OPENING PROTECTION


FIRE SEPARATION DISTANCE (ft+)	DEGREE OF OPENING PROTECTION	ALLOWABLE AREA*
0 to less than 3 ^{ft+}	Unprotected, Nonspresktered (UP, NS)	Not Permitted ^g
	Protected (P)	Not Permitted ^g
3 to less than 6 ^{ft+}	Unprotected, Nonspresktered (UP, NS)	Not Permitted
	Unprotected, Spresktered (UP, S)	15%
6 to less than 10 ^{ft+}	Protected (P)	15%
	Unprotected, Nonspresktered (UP, NS)	10% ^h
10 to less than 15 ^{ft+}	Unprotected, Spresktered (UP, S)	25%
	Protected (P)	25%
15 to less than 20 ^{ft+}	Unprotected, Nonspresktered (UP, NS)	15% ^h
	Protected (P)	45%
20 to less than 25 ^{ft+}	Unprotected, Spresktered (UP, S)	45%
	Protected (P)	25%
25 to less than 30 ^{ft+}	Unprotected, Nonspresktered (UP, NS)	25%
	Protected (P)	75%
30 or greater	Unprotected, Spresktered (UP, S)	75%
	Protected (P)	25%
30 or greater	Unprotected, Nonspresktered (UP, NS)	No Limit
	Protected (P)	No Limit
30 or greater	Unprotected, Spresktered (UP, S)	No Limit
	Protected (P)	No Limit

*As a percentage of the gross area of the exterior wall. ^gNot permitted for Type I, II, III, IV, V, and VI construction. ^hAs a percentage of the gross area of the exterior wall.

78

Parapets at Exterior Walls 705.11

- Parapets shall be provided on exterior walls of buildings.
- Exceptions!

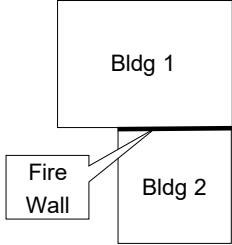


© 2024 Shums Coda Associates 79

79

Fire Walls 706

- Each portion of a building separated by one or more fire walls that comply with the provisions of this section shall be considered a separate building



© 2024 Shums Coda Associates 80

80

Fire Resistance Rating Table 706.4

TABLE 706.4
FIRE WALL FIRE-RESISTANCE RATINGS


GROUP	FIRE-RESISTANCE RATING (hours)
A, B, E, H-4, I, R-1, R-2, U	3 ^a
F-1, H-3 ^b , H-5, M, S-1	3
H-1, H-2	4 ^b
F-2, S-2, R-3, R-4	2

a. In Type II or V construction, walls shall be permitted to have a 2-hour fire-resistance rating.
b. For Group H-1, H-2 or H-3 buildings, also see Sections 415.4 and 415.5.

© 2024 Shums Coda Associates 81

81

Continuity 706.5 – 706.6




- Horizontal Continuity
- Vertical Continuity
– Several Exceptions

© 2024 Shums Coda Associates 82

82

Fire Barriers 707



- Shaft Enclosures
- Exit enclosures 1023
- Exit passageways 1024
- Horizontal exits 1026
- Atrium Separations 404.6
- Incidental use areas 509.4.1
- Control Areas 414.2.1
- Separation of mixed occupancies 508.4.4
- Single-occupancy fire areas 707.3.10

© 2024 Shums Coda Associates 83

83

SINGLE-OCCUPANCY FIRE AREAS 707.3.10

707.3.10 Fire areas. ¶

The fire barriers, fire walls, horizontal assemblies or combinations thereof separating a single occupancy into different fire areas shall have a fire-resistance rating of not less than that indicated in Table 707.3.10. The fire barriers, fire walls, horizontal assemblies or combinations thereof separating fire areas of mixed occupancies shall have a fire-resistance rating of not less than the highest value indicated in Table 707.3.10 for the occupancies under consideration.

TABLE 707.3.10 ¶
FIRE-RESISTANCE-RATING REQUIREMENTS FOR FIRE BARRIERS, FIRE WALLS OR HORIZONTAL ASSEMBLIES BETWEEN FIRE AREAS

OCCUPANCY GROUP	FIRE-RESISTANCE RATING (hours)
H-1, H-2	4
F-1, H-3, S-1	3
A, B, E, F-2, H-4, H-5, I, M, R, S-2	2
U	1

© 2024 Shums Coda Associates 84

84

Fire Partitions 708



- Dwelling separations
- Sleeping unit separations
- Tenant separations in mall buildings
- Corridor walls
- Elevator lobby separations

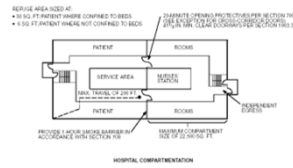
© 2024 Shums Coda Associates

85

85

Smoke Barriers 709

- 1-hour fire-resistance rated
- Continuous from outside wall to outside wall and slab to underside of floor/roof deck above
- Supporting structure the same
- 20 minute opening protectives (716)



© 2024 Shums Coda Associates

86

86

Smoke Partitions 710

- Glass atrium separation
- I-2 corridor walls
- Elevator lobbies in sprinklered buildings




© 2024 Shums Coda Associates

87

87

Floor & Roof Assemblies 711.3


- Type of Construction
- Type of Separation
- I-1, R-1, R-2
 - One-hour fire-resistive
 - Separation is per table 508.4



© 2024 Shums Coda Associates 88

88

Vertical Openings 712




- The provisions of this section shall apply to the vertical opening applications listed in Sections 712.1.1 through 712.1.18.

© 2024 Shums Coda Associates 89

89

Shafts Fire-Resistance Rating 713.4

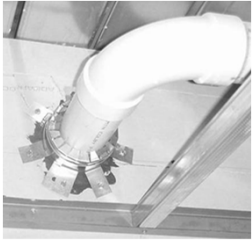


- Four stories or more
 - two-hour
- Less than four stories
 - one-hour
- Includes basements, but not mezzanines
- Not less than the floor assembly penetrated, but need not exceed 2 hours

© 2024 Shums Coda Associates 90

90

Penetrations 714.



- Penetrations: Membrane or Through
 - fire walls
 - fire barriers
 - smoke barrier walls need F and L rating
 - fire partitions
 - Horizontal assemblies need F and T rating
- F rating same as wall fire rating

© 2024 Shums Coda Associates

91

91

Fire-Resistant Joint System 715

- Joints in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies
- Protected by an approved fire-resistant joint system designed to resist the passage of fire for a time period not less than the required fire-resistance rating of the wall, floor or roof in or between which it is installed.



© 2024 Shums Coda Associates

92

92

Opening protection 716

TABLE 716.1(1) OPENING FIRE PROTECTION ASSEMBLIES, RATINGS AND MARKINGS

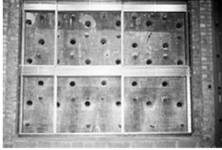
TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours)	DOOR VISION PANEL SIZE ¹	FIRE-RATED GLAZING MARKING DOOR VISION PANEL ²	MINIMUM SMOKE/LEAKAGE ASSEMBLY RATING (hours)		FIRE-RATED GLAZING MARKING SMOKE/LEAKAGE PANEL		
					Fire protection	Restrictions	Fire protection	Fire resistance	
Fire walls and fire barriers	4	3	6	None	Not Permitted	4	Not Permitted	10-240	
	3	2 ³	None	None	Not Permitted	3	Not Permitted	10-180	
Roofs and floor/ceiling assemblies (other than walls)	2	1 ³	100 sq. in. ⁴	100 sq. in. + C=100	Not Permitted	2	Not Permitted	10-120	
	1 ³	0 ³	100 sq. in.	100 sq. in. + C=100	Not Permitted	1 ³	Not Permitted	10-60	
Double fire walls (other than fire partitions)	4	3	3	None	C=100-180	Not Permitted	3	Not Permitted	10-180
	3	2	1 ³	100 sq. in.	3 100 sq. in. + C=100 1 100 sq. in. + C=100-180	Not Permitted	2	Not Permitted	10-120
	2	1	1	100 sq. in.	3 100 sq. in. + C=100 1 100 sq. in. + C=100-180	Not Permitted	1	Not Permitted	10-60

© 2024 Shums Coda Associates

93

93

Dampers Where Required 717.5




- Fire Walls
 - Fire damper
- Fire Barriers
 - Fire damper*
- Shaft Enclosures
 - Fire/smoke damper*
- Fire Partitions
 - Fire damper*
- Corridors
 - Smoke damper*
- Smoke Barriers
 - Smoke damper*
- Horizontal Assemblies
 - Shaft enclosure*

*contains exceptions

© 2024 Shums Coda Associates 94

94

Concealed Spaces 718



- Combustible concealed locations
 - Fireblocking
 - Draftstopping in floors
 - Draftstopping in attics

© 2024 Shums Coda Associates 95

95

Prescriptive Fire Resistance 721

- The provisions of this section contain prescriptive details of fire-resistance-rated building elements, components or assemblies.
- The materials of construction listed in Table 721.1(1), Table 721.1(2), and Table 721.1(3) shall be assumed to have the fire-resistance ratings prescribed therein.
- Where materials that change the capacity for heat dissipation are incorporated into a fire-resistance-rated assembly, fire test results or other substantiating data shall be made available to show that the required fire-resistance rating time period is not reduced.

© 2024 Shums Coda Associates 96

96

Table 721.1(2)

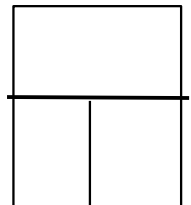
RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS ***						
13. Noncombustible studs—interior partition with gypsum wallboard each side	13-1.1	0.015" (No. 25 carbon sheet steel gage) channel-shaped studs 24" on center with one full-length layer of 7/8" Type X gypsum wallboard [†] applied vertically attached with 1" long No. 6 drywall screws to each stud. Screws are 8" on center around the perimeter and 12" on center on the intermediate stud. The wallboard may be applied horizontally when attached to 3/4" studs and the horizontal joints are staggered with those on the opposite side. Screws for the horizontal application shall be 8" on center at vertical edges and 12" on center at intermediate studs.	—	—	—	2 1/4
	13-1.2	0.015" (No. 25 carbon sheet steel gage) channel-shaped studs 25" on center with two full-length layers of 7/8" Type X gypsum wallboard [†] applied vertically each side. First layer attached with 1" long No. 6 drywall screws, 8" on center around the perimeter and 12" on center on the intermediate stud. Second layer applied with vertical joints offset one stud space from first layer using 1 1/2" long No. 6 drywall screws spaced 9" on center along vertical joints, 12" on center at intermediate studs and 24" on center along top and bottom runners.	—	—	3 1/4	—
	13-1.3	0.055" (No. 16 carbon sheet steel gage) approved suitable metal studs [†] 24" on center with full-length 7/8" Type X gypsum wallboard [†] applied vertically and nailed 7" on center with 6d cement-coated common nails. Approved metal fastener grips used with nails at vertical butt joints along studs.	—	—	—	4 1/4

Calculated Fire Resistance 722

- The provisions of this section contain procedures by which the fire resistance of specific materials or combinations of materials is established by calculations.
- These procedures apply only to the information contained in this section and shall not be otherwise used.
- Concrete, concrete masonry, and clay masonry
 - ACI 216.1/TMS 0216.1.
- Steel Assemblies
 - Chapter 5 of ASCE/SFPE 29

Fire Area

- The aggregate floor area enclosed and bounded by fire walls, fire barriers, exterior walls or horizontal assemblies of a building.
- Areas of the building not provided with surrounding walls shall be included in the fire area if such areas are included within the horizontal projection of the roof or floor next above.



97

98

99

Group A-2 Sprinklers 903.2.1.2



- One of the following
 - Fire area exceeds 5,000 sq. ft.
 - Fire area with occupant load 100 or more
 - Fire area on floor other than exit discharge

© 2024 Shums Coda Associates

100

100

Stories Without Openings 903.2.11.1



- Throughout every story or basement of all buildings where the floor area exceeds 1,500 square feet and where there is not provided at least one of the following types of exterior wall openings:
 - Openings below grade that lead directly to ground level by stair or ramp located every 50 linear feet of exterior wall on at least one side
 - Openings above adjoining ground totaling at least 20 sq. ft. in each 50 linear feet of exterior wall in a story on at least one side

© 2024 Shums Coda Associates

101

101

Standpipe Systems 905



- Types of Standpipes
 - Automatic dry
 - Automatic wet
 - Manual dry
 - Manual wet
 - Semiautomatic dry


© 2024 Shums Coda Associates

102

102

Fire Alarm & Detection Systems 907

- An approved automatic fire detection system shall be installed in accordance with the provisions of this code and NFPA 72.
- The automatic fire detectors shall be smoke detectors, except that an approved alternative type of detector shall be installed in spaces such as boiler rooms where, during normal operation, products of combustion are present in sufficient quantity to actuate a smoke detector.

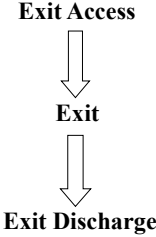


© 2024 Shums Coda Associates 103

103

Means of Egress


- A continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building or structure to a public way.



© 2024 Shums Coda Associates 104

104

Floor Area per Occupant Table 1004.5




FRACTION OF SPACE	OCCUPANT LOAD FACTOR
Accessory storage areas, mechanical equipment room	300 gross
Agricultural building	300 gross
Animal storage	300 gross
Apartment	300 gross
Ballroom	15 gross
Bar	300 gross
Bedroom	300 gross
Closet	100 gross
Common area	15 gross
Assembly	15 gross
Control room (audio, video, etc.)	15 gross
Coffee shop and museum	20 net
Assembly with fixed seats	94 (2004, 2015)
Assembly without fixed seats	7 net
Courtyard (open-roofed) and porch	5 net
Stairway	5 net
Unencumbered (stairs and chutes)	15 net
Quarry (open-roofed) 2 persons for each 100 sq. ft. of floor, and for additional areas	7 net
Business office	100 gross
Construction business use areas	94 (2004, 2015)

© 2024 Shums Coda Associates 105

105

Fixed Seating
1004.6




- The occupant load shall be determined by the number of fixed seats installed therein.
- Seating w/o dividing arms
 - 18" per occupant
- Seating booths
 - 24" per occupant

© 2024 Shums Coda Associates 106

106

Means of Egress Sizing
1005.3


- The required capacity, in inches, of the means of egress for any room, area, space or story shall not be less than that determined in accordance with Sections 1005.3.1 and 1005.3.2



© 2024 Shums Coda Associates 107

107

Stairways
1005.3.1




- The capacity, in inches, of means of egress stairways shall be calculated by multiplying the occupant load served by such stairway by 0.3 inch per occupant.
- Where stairways serve more than one story, only the occupant load of each story considered individually shall be used in calculating the required capacity of the stairways serving that story.

© 2024 Shums Coda Associates 108

108

Other egress components
1005.3.2

- The capacity, in inches, of means of egress components other than stairways shall be calculated by multiplying the occupant load served by such component by 0.2 inch per occupant.




© 2024 Shums Coda Associates

109

1005.3
Exceptions

- 0.2" for stairs
- 0.15" for other egress components
- Other than H & I-2
- NFPA 13 or 13R Sprinkler systems installed throughout
- Emergency voice/alarm communication system installed throughout



© 2024 Shums Coda Associates

110

Exit Access Doorways Required 1006.2.1

- Occupant load exceeds values in Table 1006.2.1
- Common path of travel exceeds limitations in 1006.2.1
 - H-1, H-2, H-3 - 25 Feet

TABLE 1006.2.1 SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY

OCCUPANCY	MAXIMUM OCCUPANT LOAD OF SPACE	MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (ft=)		
		Without Sprinkler System (ft=)		With Sprinkler System (ft=)
		Occupant Load		
		OL ≤ 50	OL > 50	
A7, E, M	49	75	75	25*
B	49	100	75	100*
F	49	75	75	100*
H-1, H-2, H-3	5	NP	NP	25*
H-4, H-5	10	NP	NP	25*
I-1, I-2, I-4	10	NP	NP	25*
I-3	10	NP	NP	100*
R-1	10	NP	NP	25*
R-2	20	NP	NP	100*
R-3*	20	NP	NP	100**
R-4*	20	NP	NP	100**
S*	20	100	75	100*
U	49	100	75	25*

© 2024 Shums Coda Associates

111

Common Path of Egress Travel 202

□ That portion of exit access which the occupants are required to traverse before two separate and distinct paths of egress travel to two exits are available.

© 2024 Shums Coda Associates

112

Common Path of egress travel 1006.2.1

TABLE 1006.2.1 SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY

OCCUPANCY	MAXIMUM OCCUPANT LOAD OF SPACE	MAXIMUM COMMON PATH OF EGRESS TRAVEL DISTANCE (ft/m)		
		Occupant Load		
		Without Sprinkler System (ft/m)	With Sprinkler System (ft/m)	
A ¹ , E, M	49	75	75	75 ^a
B	49	100	75	100 ^a
F	49	75	75	100 ^a
H1.1, H2, H3	3	NP	NP	25 ^b
H4, H5	10	NP	NP	75 ^b
I-1, I2 ^c , I4	10	NP	NP	75 ^b
I3	10	NP	NP	100 ^b
R-1	10	NP	NP	75 ^b
R-2	20	NP	NP	125 ^b
R-3 ^d	20	NP	NP	125 ^b
R-4 ^e	20	NP	NP	125 ^b
S ^f	29	100	75	100 ^b
U	49	100	75	75 ^b

© 2024 Shums Coda Associates

113

Two exits or exit access doorways 1007.1.1

□ Two exits

- A distance apart equal to not less than 1/2 the longest diagonal
- Exception 1:
- Exception 2
 - sprinklered building 1/3 diagonal

© 2024 Shums Coda Associates

114

Exit Access Travel Distance
 Table 1017.2 measured from most remote point to entrance of exit along natural and unobstructed path
 Unenclosed stairways & ramps included

TABLE 1017.2 EXIT ACCESS TRAVEL DISTANCE*


OCCUPANCY	WITHOUT SPRINKLER SYSTEM (feet)	WITH SPRINKLER SYSTEM (feet)
A, E, F-1, M, R, S-1	200 ^a	250 ^a
I-1	Not Permitted	250 ^a
B	200	300 ^a
F-2, S-2, U	300	400 ^a
H-1	Not Permitted	75 ^a
H-2	Not Permitted	100 ^a
H-3	Not Permitted	150 ^a
H-4	Not Permitted	175 ^a
H-5	Not Permitted	200 ^a
I-2, I-3	Not Permitted	200 ^a
I-4	150	200 ^a

© 2024 Shums Coda Associates

115

Exits from stories & occupied roofs 1006.3

- The means of egress system serving any story or occupied roof shall be provided with the number of separate and distinct exits or access to exits based on the aggregate occupant load served in accordance with this section



© 2024 Shums Coda Associates

116

Exits from stories 1006.3.3

TABLE 1006.3.3 MINIMUM NUMBER OF EXITS OR ACCESS TO EXITS PER STORY

OCCUPANT LOAD PER STORY	MINIMUM NUMBER OF EXITS OR ACCESS TO EXITS FROM STORY
1-500	2
501-1,000	3
More than 1,000	4

© 2024 Shums Coda Associates

117

of Exits per story 1006.3.4

The occupant load or number of dwelling units exceeds one of the values in Table 1006.3.4(1) or 1006.3.4(2) or the exit access travel distance exceeds tables 1006.3.4 (1) or (2).

TABLE 1006.3.4(1) STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR R-2 OCCUPANCIES

STORY	OCCUPANCY	MAXIMUM NUMBER OF DWELLING UNITS	MAXIMUM EXIT ACCESS TRAVEL DISTANCE
Basement, first, second or third story above grade plane	R-2 ^{a,b}	4 dwelling units	125 feet
Fourth story above grade plane and higher	NP ^c	NA	NA

For R-1, foot = 304.8 mm.
NP = Not Permitted.
NA = Not Applicable.
^a Buildings classified as Group R-2 equipped throughout with an automatic sprinkler system in accordance with Section 1003.3.1.1 or 1003.1.2 and provided with emergency escape and rescue storage in accordance with 1003.01.3021.
^b This table is used for R-2 occupancies consisting of dwelling units. For R-2 occupancies consisting of sleeping units, see Table 1006.3.4(2).

TABLE 1006.3.4(2) STORIES WITH ONE EXIT OR ACCESS TO ONE EXIT FOR OTHER OCCUPANCIES

STORY	OCCUPANCY	MAXIMUM OCCUPANT LOAD PER STORY	MAXIMUM EXIT ACCESS TRAVEL DISTANCE (feet)
First story above or below grade plane	A, B, E, F, M, U	49	75
	H-2, H-3	3	25
	H-4, H-5, I, R-1, R-2 ^a	10	75
Second story above grade plane	2 ^a	29	75
	G ^b	29	75
Third story above grade plane and higher	B, F, M, S ^d	NA	NA
	NP	NA	NA


^a For R-2 occupancies consisting of sleeping units, see Table 1006.3.4(1).
^b For R-2 occupancies consisting of sleeping units, see Table 1006.3.4(1).
^c For R-2 occupancies consisting of sleeping units, see Table 1006.3.4(1).
^d For R-2 occupancies consisting of sleeping units, see Table 1006.3.4(1).

118 © 2014 Colorado Code Consulting, LLC

118

Accessible Means of Egress 1009

- Accessible spaces shall be provided with not less than one accessible means of egress.
- Where more than one means of egress is required from any accessible space, each accessible portion of the space shall be served by not less than two accessible means of egress.



© 2024 Shums Coda Associates

119

119

Continuity and Components 1009.2

- Continuous to public way
- consist of one or more components:
 1. Accessible routes complying with Section 1104
 2. Interior exit stairways complying with Sections 1009.3 and 1023
 3. Exit access stairways complying with Sections 1009.3 and 1019.3 or 1019.4
 4. Exterior exit stairways complying with Sections 1009.3 and 1022 and serving levels other than the level of exit discharge
 5. Elevators complying with Section 1009.4
 6. Platform lifts complying with Section 1009.5
 7. Horizontal exits complying with Section 1009.6
 8. Ramps complying with Section 1012
 9. Areas of refuge complying with Section 1009.6
 10. Exterior areas for assisted rescue complying with Section 1009.7, serving exits at the level of exit discharge

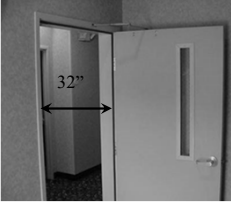
© 2024 Shums Coda Associates

120

120

Doors 1010

- Width sufficient for the occupant load
- Provide a clear width of not less than 32 inches.
- Maximum width of leaf 48"
- Minimum 80" height
- Swing in direction of egress travel \geq 50 occupants or a Group H occupancy
- Must have floor or landing on each side of a door at the same elevation




© 2024 Shums Coda Associates 121

121

Panic & Hardware 1010.2.9

- Group H
- Required in Group A or E having an occupant load of 50 or more and any occupancy of any Group H
- Electrical rooms with equipment rated 1,200 amperes or more and over 6 feet wide that contain overcurrent devices, switching devices or control devices with exit or exit access doors
- 4 exceptions




© 2024 Shums Coda Associates 122

122

Exit access stairways & ramps 1019


- Number of stories connected by exit access stairways shall include basement but not mezzanines.
- Serving floor levels within a single story are not required to be enclosed



© 2024 Shums Coda Associates 123

123

Stairway Width/Headroom 1011.2

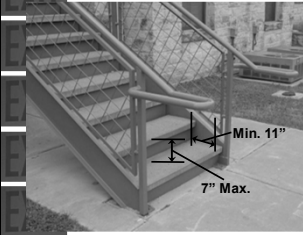


- Width as determined by Section 1005.1
- Minimum 44"
 - Exceptions
- Minimum headroom clearance of 80 inches

© 2024 Shums Coda Associates 124

124

Stair Treads & Risers 1011.5.2




- Stair riser heights shall be 7 inches maximum and 4 inches minimum.
 - Measured vertically between leading edges of adjacent tread
- Stair tread depths shall be 11 inches minimum.
 - Measured horizontally between vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge

© 2024 Shums Coda Associates 125

125

Stairway Landings 1011.6




- There shall be a floor or landing at the top and bottom of each stairway
 - width not less than stairway served
 - length same as width of stairway
 - straight run 48" max.
 - Doors shall not reduce width more than 1/2 required width
 - Door shall not project more than 7" when fully open

© 2024 Shums Coda Associates 126

126

Ramps
1012

- Means of Egress
 - 1:12 (8%)
- Other Ramps
 - 1:8 (12.5%)
- Cross Slope
 - 1:48 (2%)
- Maximum rise for any ramp run shall be 30 inches
- Landing requirements
- Edge protection




© 2024 Shums Coda Associates 127

127

Handrails
1014

- 34 inches to 38 inches
- Measured above stair tread nosings, or finish surface of ramp slope
- Graspability Requirements
- Continuity Requirements




© 2024 Shums Coda Associates 128

128

Handrail Extensions
1014.6

- 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 beyond the top riser and continue to slope for the depth of one tread beyond the bottom riser.




© 2024 Shums Coda Associates 129

129

Handrail Extensions
1014.6

- At ramps where handrails are not continuous between flights,
- the handrail shall extend horizontally 12 inches minimum beyond the top and bottom ramp runs
- Must be in same direction as the ramp runs or flight of stairs




© 2024 Shums Coda Associates 130

130

Intermediate Handrails
1014.9

- Intermediate handrails are required so that all portions of the stairway width **required** for egress capacity are within 30 inches of a handrail.
- On monumental stairs, handrails shall be located along the most direct path of egress travel.





© 2024 Shums Coda Associates 131

131

Means of Egress Illumination -1008

- Illumination shall be provided in the MOE in accordance with section 1008.2. Emergency power shall be provided in accordance with 1008.3.



1008.3.1 General.
In the event of power supply failure in rooms and spaces that require two or more exits or access to exits, an emergency electrical system shall automatically illuminate all of the following areas:

1. Aisles;
2. Corridors;
3. Exit access stairways and ramps.

© 2024 Shums Coda Associates 132

132

Exit Signs Required
Exceptions - 1013.1

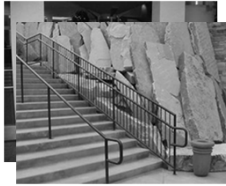
- Rooms or areas which require only one exit or exit access.
- Main exterior exit doors or gates which obviously and clearly are identifiable as exits
- Group U and individual sleeping units or dwelling units in Group R-1, R-2 or R-3
- Sleeping areas in occupancies in Group I-3
- Groups A-4 and A-5 on the seating side of vomitories or openings into seating areas where exit signs are provided in the concourse that are readily apparent from the vomitories. Egress lighting is provided to identify each vomitory or opening within the seating area in an emergency.

© 2024 Shums Coda Associates 133

133

Guards
1015

- Open sided walking surfaces more than 30 inches above floor or grade below
Measured out 36" horizontally
- Glass guards must comply with 2407
- 42 inches above tread, ramp or walking surface
 - Exceptions
- Opening limitations
 - Exceptions



© 2024 Shums Coda Associates 134

134

Guards: Where required 1015.2

1015.2 Where required.

Guards shall be located along open-sided walking surfaces, including mezzanines, equipment platforms, aisles, 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 1607.9.


Exceptions: 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 stairs 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 areas at cross aisles in accordance with Section 1030.17.2.
8. On the loading side of station platforms on fixed guideway transit or passenger rail systems.

© 2024 Shums Coda Associates 135

135

Mechanical Equipment Guards 1015.6



- Guard required where appliances, equipment, fans, roof hatch openings or other components within 10 feet of roof edge
- Prevent passage of a 21 inch sphere
- Extend 30 inches beyond each end of such equipment

© 2024 Shums Coda Associates 136

136

Corridor Construction 1020

- Corridors shall be fire-resistance rated in accordance with Table 1020.2
- The corridor walls required to be fire-resistance-rated shall comply with Section 708 for fire partitions.

TABLE 1020.2 CORRIDOR FIRE-RESISTANCE RATING

OCCUPANCY	OCCUPANT LOAD SERVED BY CORRIDOR	REQUIRED FIRE-RESISTANCE RATING (hours)	
		Without sprinkler system	With sprinkler system
H-1, H-2, H-3	AS	Not Permitted	c
H-4, H-5	Greater than 30	Not Permitted	c
A, B, E, F, M, S, U	Greater than 30	1	0
R	Greater than 10	Not Permitted	0.5(1)F
I-2*	AS	Not Permitted	0
I-1, I-3	AS	Not Permitted	b, c
I-4	AS	1	0

a. For requirements for occupancies in Group I-3, see Section 607.2 and 607.3.
 b. For a reduction in the fire-resistance rating for occupancies in Group I-3, see Section 608.3.
 c. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 where allowed.
 d. Group I-3 and I-4 buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.3. See Section 903.2.8 for occupancies where automatic sprinkler systems are permitted in accordance with Section 903.1.4.

© 2024 Shums Coda Associates 138

137

Corridor Width 1020.3




TABLE 1020.3 MINIMUM CORRIDOR WIDTH


OCCUPANCY	MINIMUM WIDTH (inches)
Any facility not listed in this table	44
Access to and utilization of mechanical, plumbing or electrical systems or equipment	24
With an occupant load of less than 50	36
Within a dwelling unit	36
In Group E with a corridor having an occupant load of 100 or more	72
In corridors and areas serving stretcher traffic in ambulatory care facilities	72
Group I-2 in areas where required for bed movement	96

© 2024 Shums Coda Associates 138

138

Interior Exit Stairways 1027


- Interior exit stairways and ramps shall be enclosed
 - 4+ stories - 2 hr. fire rated
 - < 4 stories - 1 hr. fire rated
- all floor levels used to compute stories, including basements
 - excluding mezzanines
- Means of Egress only



139 © 2024 Shums Coda Associates

139

Smokeproof Enclosure or Pressurized Stairway - 1023.12



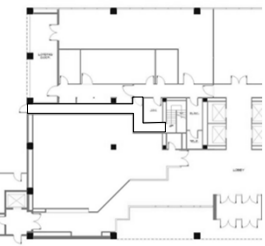
- Required in high-rise and underground buildings
- Must exit into public way, exit passageway, or yard accessing public way
- May access through vestibule or exterior balcony
- Constructed in accordance with Section 909.20

140 © 2024 Shums Coda Associates

140

Exit Passageway 1024

- Width per Section 1005.1, minimum 44 inches
 - Occupant load <50 - 36"
- Walls, floors & ceilings 1-hour fire-resistance rated, and not less than exit enclosure rating
- Openings & penetrations restricted

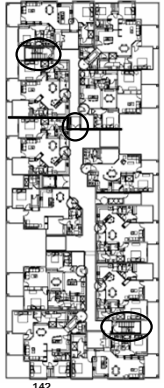


141 © 2024 Shums Coda Associates

141

Horizontal Exit
1026

- Shall not serve as only exit
- not more than 1/2 of exits or width shall be horizontal exits
- exceptions
- Separated by fire wall or 2 hr. fire barrier
 - Fire barrier shall extend through all levels or 2 hr. floors




142 associates

142

Exterior Exit Ramps & Stairways
1027

- Not permitted to be used in I-2
- Limited to 6 stories above grade plane or buildings not classified as a high rise.




© 2024 Shums Coda Associates
143

143

Exit Discharge
1028.1

- Exits shall discharge directly to the exterior of the building.
- The exit discharge shall be at grade or shall provide direct access to grade.
- The exit discharge shall not re-enter a building.




© 2024 Shums Coda Associates
144

144

**Assembly
1030**

- Foyers & lobbies
- Smoke protected seating
- Travel distance
- Aisles required
- Assembly guards




© 2024 Shums Coda Associates

145

**Emergency Escape and Rescue
1031**

- In addition to the means of egress required by this chapter, provisions shall be made for emergency escape and rescue openings in Group R-2 occupancies with only one exit or access to one exit as permitted by tables 1006.3.4(1) or (2)




© 2024 Shums Coda Associates

146

**Emergency Escape & Rescue
Openings - 1029**


- 5.7 square feet net clear opening
 - grade floor openings may be 5 square feet
- > 24 inches height
- > 20 inches wide
- 44" to bottom of opening
- Operational from inside w/o key or tools
- Window well requirements



© 2024 Shums Coda Associates

147

Accessible Routes 1104




- **Site arrival points**
 - Accessible routes within the site shall be provided from public transportation stops, accessible parking and accessible passenger loading zones, and public streets or sidewalks to the accessible building entrance served.

© 2024 Shums Coda Associates 148

148

Accessible Entrances Required 1105.1

- At least 60 percent but not less than one entrance to each building and structure, and each separate tenant space within the building or structure, shall comply with the accessible route provisions of Chapter 11.
 - Exceptions:
 - Not required to areas not required to be accessible
 - Loading & service entrances



© 2024 Shums Coda Associates 149

149

Public entrance with Power door 1105

TABLE 1105.1.1 PUBLIC ENTRANCE WITH POWER-OPERATED DOOR^a

OCCUPANCY	BUILDING OCCUPANT LOAD GREATER THAN
A-1, A-2, A-3, A-4	300
B, M, R-1	500

a. In mixed-use facilities where the total sum of the building occupant load is greater than those listed, the most restrictive building occupant load shall apply.

© 2024 Shums Coda Associates 150

150

Parking & Passenger Loading Facilities – 1106.1

- Where parking is provided, accessible parking spaces shall be provided in compliance with Table 1106.2 except as required by Sections 1106.3.

TABLE 1106.2 ACCESSIBLE PARKING SPACES

TOTAL PARKING SPACES PROVIDED IN PARKING FACILITIES	REQUIRED MINIMUM NUMBER OF ACCESSIBLE SPACES
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1,000	2% of total
1,001 and over	20, plus one for each 100, or fraction thereof, over 1,000

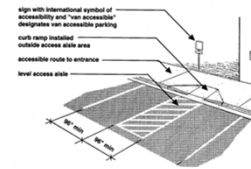
© 2024 Shums Coda Associates

151

151

Van Spaces 1106.6

- For every six or fraction of six accessible parking spaces, at least one shall be a van-accessible parking space.



© 2024 Shums Coda Associates

152

152

Parking ,meters and pay stations

1106.8 Parking meters and pay stations.

Where parking meters and pay stations serve accessible parking spaces, such parking meters and pay stations shall be accessible.

ICC A117.1 Section 502.10 includes technical provisions for parking meters and pay stations where they are associated with the accessible parking space. As an accessible element, pay stations associated with accessible parking spaces must be on an accessible route from the accessible parking space. Parking meters are expected to be at the front of the parking space. While access directly from access aisle is preferred, technically an accessible route to the parking meter does not have to be directly from the access aisle.

© 2024 Shums Coda Associates

153

153

EV charging stations

1107.1 General.

Electrical vehicle charging stations shall comply with Section 1107.2. Fuel-dispensing systems shall comply with Section 1107.3.

◆ This section contains separate criteria for accessible vehicle spaces at electric vehicle charging stations and for fuel dispensers (gas pumps) at filling stations and similar places.

1107.2 Electrical vehicle charging stations.


Electrical vehicle charging stations shall comply with Sections 1107.2.1 and 1107.2.2.

Exception: Electrical vehicle charging stations provided to serve Group R-2, R-3 and R-4 occupancies are not required to comply with this section.

154

154

Dining Areas 1109.2.9



- In dining areas, the total floor area allotted for seating and tables shall be accessible.
 - Exception:** In buildings without elevators, an accessible route to a mezzanine seating area is not required, provided that the mezzanine contains less than 25 percent of the total area and the same services are provided in the accessible area.

155

155

Group R-1 Units 1108.6.1.1

TABLE 1108.6.1.1 ACCESSIBLE DWELLING UNITS AND SLEEPING UNITS

TOTAL NUMBER OF UNITS PROVIDED	MINIMUM REQUIRED NUMBER OF ACCESSIBLE UNITS WITHOUT ROLL-IN SHOWERS	MINIMUM REQUIRED NUMBER OF ACCESSIBLE UNITS WITH ROLL-IN SHOWERS	TOTAL NUMBER OF REQUIRED ACCESSIBLE UNITS
1 to 25	1	0	1
26 to 50	2	0	2
51 to 75	3	1	4
76 to 100	4	1	5
101 to 150	5	2	7
151 to 200	6	2	8
201 to 300	7	3	10
301 to 400	8	4	12
401 to 500	9	4	13
501 to 1,000	2% of total	1% of total	3% of total
Over 1,000	20, plus 1 for each 100, or fraction thereof, over 1,000	10 plus 1 for each 100, or fraction thereof, over 1,000	30 plus 2 for each 100, or fraction thereof, over 1,000

156

156

Accessible Spaces 1108.3

- Rooms and spaces available for the use of the residents of accessible sleeping accommodations shall be accessible.
- Accessible spaces shall include toilet and bathing rooms, kitchen, living and dining areas, and any exterior spaces, including patios, terraces and balconies.



© 2024 Shums Coda Associates

157

157

Group R-2 1108.6.2

- >20 units in a building—
2% min to be Type A units
- ≥Four dwelling units in single structure
 - Every unit – Type B



© 2024 Shums Coda Associates

158

158

Toilet & Bathing Facilities 1110.2

- Each toilet room and bathing room shall be accessible.
- Where a floor level is not required to be connected by an accessible route, the only toilet rooms or bathing facilities provided within the facility shall not be located on the inaccessible floor.
- At least one of each type of fixture, element, control or dispenser in each accessible toilet room and bathing facility shall be accessible.
 - Exceptions




© 2024 Shums Coda Associates

159

159

Sinks
1110.2.5




- Where sinks are provided, at least 5% but not less than one, provided in accessible spaces shall comply with ICC/ANSI A117.1.
- **Exceptions:**
 - Mop or service sinks
 - Sinks designated for use by children in day care and primary school occupancies.

© 2024 Shums Coda Associates 160

160

Attic Spaces
1202.2




- Enclosed attics and enclosed rafter spaces
 - Minimum 1" air space between insulation and sheathing
 - 1/150 of ventilated area
 - Exceptions!

© 2024 Shums Coda Associates 161

161

Under-Floor Ventilation
1202.4



- The space between the bottom of the floor joists and the earth under any building except spaces occupied by a basement or cellar shall be provided with ventilation openings through foundation walls or exterior walls. Such openings shall be placed so as to provide cross-ventilation of the under-floor space.

© 2024 Shums Coda Associates 162

162

Minimum Ceiling Heights 1208.2



- Occupiable spaces, habitable spaces and corridors shall have a ceiling height of not less than 7 feet 6 inches.
- Bathrooms, toilet rooms, kitchens, storage rooms and laundry rooms shall be permitted to have a ceiling height of not less than 7 feet.

© 2024 Shums Coda Associates

163

163

Access to Unoccupied Spaces 1209



- Crawl Spaces
 - 18" X 24"
- Attic Spaces
 - 20" X 30" to any attic with clear height of 30"
 - 30" clear headroom shall be provided at access opening
- Mechanical Appliances
 - International Mechanical Code

© 2024 Shums Coda Associates

164

164

Toilet and Bathroom Surrounding Materials 1210



- In other than dwelling units, toilet and bathing room floors shall have a smooth, hard, nonabsorbent surface that extends upward onto the walls at least 4 inches.
- Walls within 2 feet of urinals and water closets shall have a smooth, hard, nonabsorbent surface, to a height of 4 feet above the floor, and except for structural elements, the materials used in such walls shall be of a type that is not adversely affected by moisture.
- Showers 72 inches above the drain inlet

© 2024 Shums Coda Associates

165

165

Roof coverings Fire Classification 1505.1

- The minimum roof coverings installed on buildings shall comply with Table 1505.1 based on the type of construction of the building.

**TABLE 1505.1a,b
MINIMUM ROOF COVERING CLASSIFICATION
FOR TYPES OF CONSTRUCTION**

IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB
B	B	B	C ^c	B	C ^c	B	B	C ^c

© 2024 Shums Coda Associates

166 277

166

Structural Design Chapter 16

**TABLE 1607.1
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_p, AND MINIMUM CONCENTRATED LIVE LOADS**

OCCUPANCY OR USE		UNIFORM (psf)	CONCENTRATED (pounds)	ALSO SEE SECTION
1.	Apartments (see residential)	—	—	—
2.	Access floor systems	Office use	50	2,000
	Computer use	100	2,000	—
3.	Atriums and drill rooms	150 ^a	—	—
	Fixed seats (fastened to floor)	60 ^a	—	—
	Follow spot, projections and control rooms	50	—	—
	Lobbies	100 ^a	—	—
	Movable seats	100 ^a	—	—
4.	Stage floors	150 ^a	—	—
	Platforms (assembly)	100 ^a	—	—
	Bleachers, folding and telescopic seating and grandstands	100 ^a (See Section 1607.15)	—	—
	Stadiums and arenas with fixed seats (fastened to the floor)	60 ^a (See Section 1607.15)	—	—
	Other assembly areas	100 ^a	—	—
5.	Balconies and decks	1.5 times the live load for the area served, not required to exceed 100	—	—

167

Special Inspections 1704

- Inspection of fabricators
- Steel Construction
 - Table 1704.3
- Concrete Construction
 - Table 1704.4
- Masonry Construction
- Wood Construction
 - Fabricated materials
- Soils
- Driven Deep Foundations
- Cast-in-Place Deep Foundations
- Helical Pile Foundations
- Vertical Masonry Foundation Elements
- Sprayed fire-resistant materials
- Mastic and Intumescent Coatings
- EIFS
- Special Cases
- Smoke Control Systems

© 2024 Shums Coda Associates

168

168

Special Inspections

- New requirements for Group R fire areas with an occupant load of >250. #rdf party inspection required for fire stopping, joint systems, and perimeter fire containment
- New requirements for Construction Type IV A, B, C and Sealing of mass timber
- Table 1705.5.3

© 2024 Shums Coda Associates

169

169

Concrete Chapter 19

- Copyright © by the American Concrete Institute and reproduced with their consent. All rights reserved.
- Structural concrete shall be designed and constructed in accordance with ACI 318 as amended in Section 1905 of this code



© 2024 Shums Coda Associates

170

170

Aluminum Chapter 20

- Aluminum used for structural purposes in buildings and structures shall comply with AAASM 35 and Parts 1-A and 1-B of the Aluminum Design Manual. The nominal loads shall be the minimum design loads required by Chapter 16.




© 2024 Shums Coda Associates

171

171

Masonry
Chapter 21

- Masonry shall comply with the provisions of TMS 402, TMS 403 or TMS 404 as well as applicable requirements of this chapter.
- Masonry veneer shall comply with chapter 14




© 2024 Shums Coda Associates 172

172

Steel
Chapter 22

- The design, fabrication and erection of structural steel for buildings and structures shall be in accordance with AISC 360




© 2024 Shums Coda Associates 173

173

Wood
Chapter 23

- The design of structural elements or systems, constructed partially or wholly of wood or wood-based products, shall be based on one of the following methods.
 - Allowable Stress Design
 - Load & Resistance Factor Design
 - Conventional Light-Frame Construction
 - Heavy timber must be in compliance with 2304.11



© 2024 Shums Coda Associates 174

174

Glazing Hazardous Locations 2406.4.2

- Within 24-inch arc of door in closed position
- Exceptions:
- Intervening wall or other permanent barrier between the door and the glazing.
 - Where access through the door is to a closet or storage area 3 feet or less in depth.
 - Glazing in walls perpendicular to the plane of the door in a closed position, other than the wall towards which the door swings when opened, in dwelling units



© 2024 Shums Coda Associates

175

175

Glazing Hazardous Locations 2406.4.3,

- Glazing where the bottom exposed edge of the glazing is less than 60 inches above the plane of the adjacent walking surface of stairways, landings between flights of stairs, and ramps shall be considered a hazardous location.
- Exception!



© 2024 Shums Coda Associates

176

176

Plastics chapter 26

- Exterior walls and architectural trim
- Foam plastic insulation
- Spray applied foam plastics
- Surface burning
- Thermal barriers
- Roofing
- Attics and crawl spaces
- Garage doors
- Etc.

© 2024 Shums Coda Associates

177

177

Elevators & conveying systems

- Emergency communication
- Lobbies
- Hoistways
- Ambulance stretcher
- Common enclosure with a stairway prohibited
- Standby power
- Fire fighter emergency operation

© 2024 Shums Coda Associates

178

178

Special Construction Chapter 31



- Membrane Structures 3102
- Temporary Structures 3103
- Pedestrian Walkways & Tunnels 3104
- Awnings & Canopies 3105
- Marquees 3106
- Signs 3107
- Radio & Television Towers 3108

© 2024 Shums Coda Associates

179

179

International Residential Code




© 2024 Shums Coda Associates

180

180

Definitions R202

- **Townhouse**
 - A single-family dwelling unit constructed in a group of three or more attached units in which each unit extends from foundation to roof and with a yard or public way on at least two sides.



3+ units

© 2024 Shums Coda Associates 181

181

Table R301.5 Live Load

- Places 3 attic criteria in the table
- Balconies same as deck live load

TABLE R301.5 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

USE	UNIFORM LOAD (psf)	CONCENTRATED LOAD (lb)
Uninhabitable attics without storage ^a	10	—
Uninhabitable attics with limited storage ^{b, c}	20	—
Inhabitable attics and attics served with fixed stairs	30	—
Balconies (exterior) and decks ^d	40	—
Fire escapes	40	—
Guards	—	200 ^{e, f}
Guard in-fill components ^g	—	50 ^h
Handrail ⁱ	—	200 ^j
Passenger vehicle garages ^k	50 ^k	2,000 ^l
Areas other than sleeping areas	40	—
Sleeping areas	30	—
Stairs	40 ^m	300 ⁿ

© 2024 Shums Coda Associates 182

182

R302.1 Exterior Walls

FIRE-RESISTANT CONSTRUCTION

R302.1 Exterior walls.

Construction, projections, openings and penetrations of exterior walls of dwellings and accessory buildings shall comply with [Table R302.1\(1\)](#) or dwellings equipped throughout with an automatic sprinkler system installed in accordance with [Section F2301](#) shall comply with [Table R302.1\(2\)](#).

Exceptions:

1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the fire separation distance.
2. Walls of individual dwelling units and their accessory structures located on the same lot.
3. Detached tool sheds and storage sheds, playhouses and similar structures exempted from permits are not required to provide wall protection based on location on the lot. Projections beyond the exterior wall shall not extend over the lot line.
4. Detached garages accessory to a dwelling located within 2 feet (610 mm) of a lot line are permitted to have roof eave projections not exceeding 4 inches (102 mm).
5. Foundation vents installed in compliance with this code are permitted.

© 2024 Shums Coda Associates 183

183

Location on Lot - R302

EXTERIOR WALL ELEMENT	FIRE RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E 119 or UL 263 with exposure from both sides
	Not fire-resistance rated	0 hours
Projections	Fire-resistance rated	1 hour on the underside
	Not fire-resistance rated	0 hours
	Not allowed	N/A
Openings in walls	25% maximum of wall area	0 hours
	Ultimated	0 hours
	Comply with Section R302.4	5 feet
Penetrations	All	Comply with Section R302.4
		None required

© 2024 Shums Coda Associates

184

184

Location on Lot - R302

EXTERIOR WALL ELEMENT	FIRE RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E 119 or UL 263 with exposure from the outside
	Not fire-resistance rated	0 hours
Projections	Fire-resistance rated	1 hour on the underside
	Not fire-resistance rated	0 hours
	Not allowed	N/A
Openings in walls	Ultimated	0 hours
	Comply with Section R302.4	5 feet
Penetrations	All	Comply with Section R302.4
		None required

For SI: 1 foot = 304.8 mm.
N/A = Not Applicable.
a. For residential subdivisions where all dwellings are equipped throughout with an automatic sprinkler system installed in accordance with Section 7200.4, the fire separation distance for un-rated exterior walls and rated projections shall be reduced to 0 feet, and un-limited unprotected openings and penetrations shall be permitted, where the adjoining lot provides an open setback yard that is 6 feet or more in width on the opposite side of the property line.

© 2024 Shums Coda Associates

185

185

Townhouse Separation R302.2

- Townhouses shall be considered separate buildings & separated per Section R302.1
- 2 one-hour walls
 - Exception: Common 1-hour wall
 - cannot contain any plumbing or mechanical equipment, ducts, or vents in the cavity



Forget about local amendments!!!!

© 2024 Shums Coda Associates

186

186

Parapet R302.2.4

- Where roof surfaces adjacent to the wall or walls are at the same elevation, the parapet shall extend not less than 30 inches above the roof surfaces.
 - Exceptions



© 2024 Shums Coda Associates

187

187

1- & 2- Family Dwelling Unit Separation R302.3

- Two-family dwellings
 - One-hour fire-resistive wall and/or floor assembly
 - ASTM E119
 - Supporting construction same protection



© 2024 Shums Coda Associates

188

188

Garages & Carports R302.5

- No openings into sleeping room
- Other openings
 - solid wood door 1 3/8"
 - honeycomb core steel door 1 3/8"
 - 20-minute fire-rated
- Ducts
 - 26 gauge or other approved material



© 2024 Shums Coda Associates

189

189

Separation Required R302.6

TABLE R302.6
DWELLING/GARAGE SEPARATION

SEPARATION	MATERIAL
From the residence and attics	Not less than 1/2-inch gypsum board or equivalent applied to the garage side
From all habitable rooms above the garage	Not less than 5/8-inch Type X gypsum board or equivalent
Structure(s) supporting floor/ceiling assemblies used for separation required by this section	Not less than 1/2-inch gypsum board or equivalent
Garages located less than 3 feet from a dwelling unit on the same lot	Not less than 1/2-inch gypsum board or equivalent applied to the interior side of exterior walls that are within this area



© 2024 Shums Coda Associates

190

190

Light, Ventilation & Heating R303

- **Habitable Rooms**
 - Aggregate glazing area of 8 percent of floor area of room
 - Natural ventilation via openings to the outdoor air shall be 4 percent of the floor area.



© 2024 Shums Coda Associates

191

191

Bathrooms R303.3

- 3 square feet of glazing with 1/2 of window openable
- **Exception:**
 - Artificial light & mechanical ventilation permitted
 - 50 cfm intermittent
 - 20 cfm continuous
 - exhausted outside



© 2024 Shums Coda Associates

192

192

Minimum Room Areas R304

- habitable rooms minimum 70 square feet
- Minimum 7 feet horizontal dimension
 - Exception for kitchens

© 2024 Shums Coda Associates 193

193

Ceiling Height R305

- Habitable space, hallways, bathrooms, toilet rooms, laundry rooms and portions of basements containing these spaces shall have a ceiling height of not less than 7 feet
 - Exceptions for basements w/o habitable space, sloped ceilings & bathrooms

© 2024 Shums Coda Associates 194

194

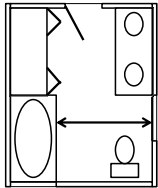
Glazing

- glazing installed in hazardous locations shall be provided with a manufacturer's designation specifying:
 - who applied the designation,
 - the type of glass
 - The safety glazing standard
 - Must be visible in the final installation.
 - Acid etched, sandblasted, ceramic-fired, laser etched, embossed, or be of a type which once applied cannot be removed without being destroyed.
 - A label shall be permitted in lieu of the manufacturer's designation.
- Hazardous Locations

© 2024 Shums Coda Associates 195

195

Glazing and Wet Surfaces



- Glazing in walls, enclosures, or fences containing OR FACING:
- Bathtubs
- Showers
- Whirlpools, saunas, steam rooms, indoor and outdoor pools
- Shall be safety glazing if less than 60" AFF

© 2024 Shums Coda Associates

196

196

Flood Hazard Areas

- Garage floors shall be:
 - Elevated to or above the design flood elevation
 - Located below design flood elevation
 - at or above grade on all sides
 - used solely for parking, building access, or storage



© 2024 Shums Coda Associates

197

197

Emergency Escape & Rescue Openings R310



- Basements and every sleeping room shall have at least one openable emergency escape and rescue opening. Such opening shall open directly
- Such opening shall open directly into a public street, public alley, yard or court.
 - Except Basements used only to house mechanical equipment and not exceeding total floor area of 200 square feet.

© 2024 Shums Coda Associates

198

198

R311.1 Means of Egress

- The means of egress shall provide a continuous and unobstructed path of vertical and horizontal egress travel from all portions of the dwelling to the exterior of the dwelling at the required egress door without requiring travel through a garage.



© 2024 Shums Coda Associates

199

199

Door Type and Size R311.2

- The required exit door shall be a side-hinged door not less than 3 feet in width and 6 feet 8 inches in height.
- Other doors shall not be required to comply with these minimum dimensions.



© 2024 Shums Coda Associates

200

200

Landings at Doors R311.3

- There shall be a landing or floor on each side of each exterior door.
- The width of each landing shall not be less than the door served.
- Every landing shall have a minimum dimension of 36 inches measured in the direction of travel. Exterior landings shall be permitted to have a slope not to exceed 1/4 unit vertical in 12 units horizontal (2-percent).




© 2024 Shums Coda Associates

201

201

Floor Elevations At The Required Egress Doors - R311.3.1

- Landings or floors at the required egress door shall not be more than 1½ inches lower than the top of the threshold.
- Exception: The exterior landing or floor shall not be more than 7¾ inches below the top of the threshold provided the door does not swing over the landing or floor.




© 2024 Shums Coda Associates 202

202

Floor Elevations At The Required Egress Doors - R311.3.1

- When exterior landings or floors serving the required egress door are not at grade, they shall be provided with access to grade by means of a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7.



© 2024 Shums Coda Associates 203

203

Floor elevations for other exterior doors - R311.3.2

- Doors other than the required egress door shall be provided with landings or floors not more than 7¾ inches below the top of the threshold. ←
- Exception: A landing is not required where a stairway of two or fewer risers is located on the exterior side of the door, provided the door does not swing over the stairway.

© 2024 Shums Coda Associates 204

204

Stairway Width R311.7.1



- 36 inches minimum width
 - above handrail
 - below headroom height
 - handrails permitted to project 4 1/2 inches on either side
- 31.5 inches minimum width
 - below one handrail
- 27 inches minimum width
 - below two handrails

© 2024 Shums Coda Associates

205

205

Treads & Risers R311.7.5.1

- Maximum rise 7 3/4"
- Minimum tread 10"
- Winders
 - 10" at 12" from narrower side
 - Minimum tread depth 6"
- 3/8" tolerance for treads and risers
- Stairway profile requirements
- Opening requirements



© 2024 Shums Coda Associates

206

206

Handrails R311.7.8



- At least one side of each continuous run of treads or flight with four or more risers
- 34" - 38" above tread
- Continuous full length of stairs from top riser to bottom riser in the same flight
 - newel posts permitted
- Ends returned or terminate at newel post or safety rail
 - use of volute, turnout or starting easing allowed at lowest tread
- 1.5 inch space at wall

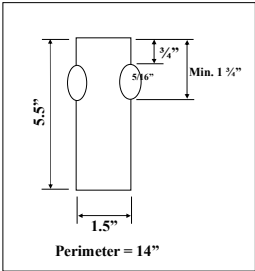
© 2024 Shums Coda Associates

207

207

Handrail Grip Size R311.7.8.5

- Type I
 - Circular cross section
 - outside diameter $1\frac{1}{4}$ inches to than 2 inches.
 - Non-circular cross section
 - perimeter dimension of at least 4 inches to $6\frac{1}{4}$ inches
 - maximum cross section of $2\frac{1}{4}$ inches.
- Type II




Perimeter = 14"

© 2024 Shums Coda Associates 208

208

Ramps R311.8

- Maximum slope 1:12
 - Except when technically infeasible - 1:8
- 3' X 3' landing required
 - Top & bottom
 - Where doors open onto ramps
 - Change of Direction
- Handrails required
 - One side of ramps steeper than 1:12
 - 34" - 38" height
 - Grip size per R311.5.6.3
 - Continuous full length of ramp




© 2024 Shums Coda Associates 209

209

Guards Required R312.1

- Guards shall be located along open-sided walking surfaces, including stairs, ramps and landings, that are located more than 30 inches measured vertically to the floor or grade below at any point within 36 inches horizontally to the edge of the open side.



© 2024 Shums Coda Associates 210

210

Height R312.2

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



© 2024 Shums Coda Associates

211

211

Guard Opening Limitations R312.1.3

- Required guards shall have intermediate rails or ornamental closures that do not allow passage of a sphere 4 inches in diameter.

– Exceptions:

- 6 inch sphere permitted at riser/tread triangle
- 4 3/8" on sides of stair treads



© 2024 Shums Coda Associates

212

212

Window Sills R312.2

- In dwelling units, where the opening of an operable window is located more than 72 inches above the finished grade or surface below, the lowest part of the clear opening of the window shall be a minimum of 24 inches above the finished floor of the room in which the window is located.
- Glazing between the floor and 24 inches shall be fixed or have openings through which a 4-inch-diameter sphere cannot pass.



– Exceptions:

- 4-inch-diameter sphere
- Provide fall protection device

© 2024 Shums Coda Associates

213

213

Automatic Fire Sprinkler Systems R313


- Affects NEW:
- One Family
- Two Family
- Townhouses
 - Exception: Additions and alterations to existing nonsprinkled structures



© 2024 Shums Coda Associates 214

214

Townhouse R313.1




P2904 or 13D is the required sprinkler standard

© 2024 Shums Coda Associates 215

215

One and Two Family Dwellings R313.2

- NFPA 13D
- P2904




© 2024 Shums Coda Associates 216

216

Smoke Alarms R314

- Smoke alarms required:
 - Each sleeping room
 - Outside of each separate sleeping area
 - Each additional story including basements but not including crawl spaces and uninhabitable attics




© 2024 Shums Coda Associates 217

217

R315 Carbon Monoxide Detectors

- Carbon Monoxide Detectors Required IF:
 - Attached Garage
 - and/or Fuel Fired Equipment
- Located outside of each sleeping area in immediate vicinity of bedrooms.
- No provisions for interconnection or hardwiring of the devices
 - Follow Mfr's Instructions
- Retroactive if ANY permit is required.
- Need to coordinate with any state preemption statutes




© 2024 Shums Coda Associates 218

218

Protection Against Decay R317.1

- Approved species of wood or treated lumber required if:
 - Joists <18" to ground
 - Beams <12" to ground
 - Wood framing members resting on concrete/masonry exterior walls within 8" of exposed ground
 - Girders entering masonry or concrete <1/2" air space
 - Siding, sheathing, framing within 6" of ground & 2" above concrete
 - Members supporting moisture permeable floors
 - Furring strips on concrete without vapor barrier



© 2024 Shums Coda Associates 219

219

R319.1 Address Numbers

- Plainly legible and visible from the street or road fronting the property.
- 4" Height
- ½" Stroke
- Contrasting background



© 2024 Shums Coda Associates

220

220

Flood Resistant Construction R322.1



© 2024 Shums Coda Associates

221

221

- Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1) shall be designed and constructed in accordance with the provisions contained in this section.
 - Exception: Buildings within floodways shall be designed and constructed as stipulated in the *International Building Code*.

Structural Systems R322.1.2



© 2024 Shums Coda Associates

222

222

- Shall be designed, connected and anchored to resist flotation, collapse or permanent lateral movement due to structural loads and stresses from flooding equal to the design flood elevation.

Elevation Requirements R322.2.1

1. Buildings and structures in flood hazard areas not designated as Coastal A Zones shall have the lowest floors elevated to or above the design flood elevation.
2. Buildings and structures in flood hazard areas designated as Coastal A Zones shall have the lowest floors elevated to or above the base flood elevation plus 1 foot, or to the design flood elevation, whichever is higher.
3. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including basement) elevated at least as high above the highest adjacent grade as the depth number specified in feet on the FIRM, or at least 2 feet if a depth number is not specified.
4. Basement floors that are below grade on all sides shall be elevated to or above the design flood elevation.

Exception: Enclosed areas below the design flood elevation, including basements whose floors are not below grade on all sides, shall meet the requirements of Section R322.2.2.

© 2024 Shums Coda Associates

223

223

Drainage R401.3

- Drain away from foundation
- Grade shall fall 6" within first 10'

Exception: Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, drains or swales shall be constructed to ensure drainage away from the structure. Impervious surfaces within 10 feet of the building foundation shall be sloped a minimum of 2 percent away from the building.



© 2024 Shums Coda Associates

224

224

Materials R402.2

- Concrete

– Minimum compressive strength per table R402.2

TYPE OR LOCATION OF CONCRETE CONSTRUCTION	MINIMUM SPECIFIED COMPRESSIVE STRENGTH* (f'c)		
	Weathering Potential ^b		
	Negligible	Moderate	Severe
Basement walls, foundations and other concrete not exposed to the weather	2,500	2,500	2,500 ^c
Basement slabs and interior slabs on grade, except garage floor slabs	2,500	2,500	2,500 ^c
Basement walls, foundation walls, exterior walls and other vertical concrete work exposed to the weather	2,500	3,000 ^d	3,000 ^d
Porches, carport slabs and steps exposed to the weather, and garage floor slabs	2,500	3,000 ^{d,e}	3,500 ^{d,e}

© 2024 Shums Coda Associates

225

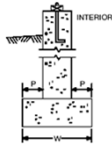
225

Minimum Footing Size R403.1.1

TABLE R403.1
MINIMUM WIDTH OF CONCRETE,
PRECAST OR MASONRY FOOTINGS
(inches)^a

	LOAD-BEARING VALUE OF SOIL (psi)			
	1,500	2,000	3,000	>4,000
Conventional light-frame construction				
1-story	12	12	12	12
2-story	15	12	12	12
3-story	23	17	12	12
4-inch brick veneer over light frame or 8-inch hollow concrete masonry				
1-story	12	12	12	12
2-story	21	16	12	12
3-story	32	24	16	12
8-inch solid or fully grouted masonry				
1-story	16	12	12	12
2-story	29	21	14	12
3-story	42	32	21	16

- Table R403.1 and Figure R403.1(1)
- At least 6-inches thick



BASEMENT OR CRAWL SPACE WITH CONCRETE WALL AND SPREAD FOOTING

© 2024 Shums Coda Associates

226

226

Foundations With Stemwalls R403.1.3.1

- Foundations with stem walls shall have installed a minimum of one No. 4 bar within 12 inches of the top of the wall and one No. 4 bar located 3 inches to 4 inches from the bottom of the footing.

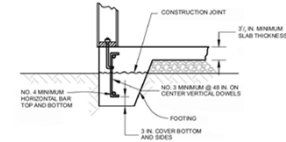
© 2024 Shums Coda Associates

227

227

Turned-Down Footings R403.1.3.3

- Slabs-on-ground with turned down footings shall have a minimum of one No. 4 bar at the top and bottom of the footing.
 - Slabs monolithically with footing requires one #5 or 2 #4 located in middle 1/3 of footing depth



© 2024 Shums Coda Associates

228

228

Minimum Depth R403.1.4

- Must extend at least 12 inches below undisturbed ground
- Frost Protection
 - Table 301.2
 - frost protected shallow foundations
 - ASCE 32
 - Erected on solid rock



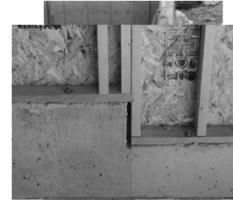
© 2024 Shums Coda Associates

229

229

Foundation Anchorage R403.1.6

- Braced Walls Panels supported on continuous foundation shall be anchored to foundation.
 - Spaced a maximum of 6 feet O.C.
 - Minimum two bolts per plate section
 - Located within 12" or less than 7 bolt diameters from the ends of each plate section.
 - Bolts shall be at least 1/2" in diameter and shall extend a minimum of 7" into masonry or concrete.



© 2024 Shums Coda Associates

230

230

Under floor Ventilation R408

- 1/150 square feet
- One ventilating opening shall be within 3 feet of each corner of the building.
- 1/1500 with Class I vapor retarder



© 2024 Shums Coda Associates

231

231

Unvented Crawl Space R408.3

- Ventilation openings in under-floor spaces specified in Sections R408.1 and R408.2 shall not be required where:
- 1. Exposed earth is covered with a continuous Class I vapor retarder. Joints overlap by 6 inches and shall be sealed or taped. The edges extend at least 6 inches up the stem wall and shall be attached and sealed to the stem wall; and
- 2. One of the following is provided for the under-floor space:
 - 2.1. Continuously operated mechanical exhaust ventilation at a rate equal to 1 cfm for each 50 ft² of crawlspace floor area, including an air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.8;
 - 2.2. Conditioned air supply sized to deliver at a rate equal to 1 cfm for each 50 ft² of under-floor area, including a return air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.8;

© 2024 Shums Coda Associates

232

232

Crawlspace Access R408.4



- Minimum opening
 - 18" X 24" in floor
 - 16" X 24" in perimeter wall
 - 16" X 24" areaway required if access is below grade
- Mechanical equipment access

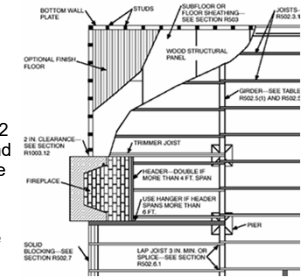
© 2024 Shums Coda Associates

233

233

Design and Construction R502.2

- Floors shall be designed and constructed in accordance with the provisions of this chapter, Figure R502.2 and Sections R319 and R320 or in accordance with AF&PA/NDS.
- Figures are part of the code!



© 2024 Shums Coda Associates

234

234

Joist Span Tables Table R502.3.1(2)

**TABLE R502.3.1(2)
JOIST SPACING FOR COMMON MEMBER SPECIES (Residential living areas, live loads=40 psf, L₁=30')**

DEAD LOAD = 10 psf
DEAD LOAD = 20 psf

JOIST SPACING (inches)	SPECIES AND GRADE	Maximum floor joist spans							
		2x6	2x8	2x10	2x12	2x8	2x10	2x12	
16	Douglas fir-larch	10-4	13-7	17-4	21-1	10-4	13-7	17-4	21-0
16	Douglas fir-larch	9-11	12-1	16-5	19-1	9-8	12-4	15-0	17-5
16	Douglas fir-larch	8-3	10-7	14-1	17-5	8-3	10-7	14-1	17-5
16	Douglas fir-larch	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4
16	Member	10-9	12-10	16-5	19-1	9-9	12-10	15-5	19-1
16	Member	8-1	10-8	14-6	18-2	9-6	12-0	14-8	17-0
16	Member	7-4	9-4	11-7	13-7	8-1	10-4	12-0	14-1
16	Member	10-2	12-4	17-0	20-9	10-2	13-4	17-0	20-9
16	Member	9-11	13-1	16-9	20-4	9-11	13-1	16-4	19-6
16	Member	8-1	10-9	14-1	18-0	8-1	10-9	14-1	17-2
16	Member	7-4	9-4	11-6	13-6	7-4	9-4	11-1	13-2
16	Member	9-6	12-7	16-0	19-6	9-6	12-7	16-0	19-6
16	Member	8-4	11-3	14-5	17-10	8-4	11-6	14-1	16-3
16	Member	7-4	10-3	13-5	16-10	7-4	10-3	13-1	15-3
16	Member	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4

© 2024 Shums Coda Associates 235

235

Floor Cantilevers R502.3.3

Roof & Floor – Table 502.3.3(1)
Exterior Balconies – Table 502.3.3(2)

**TABLE R502.3.3(1)
CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING LIGHT-FRAME EXTERIOR BEARING WALL AND ROOF ONLY^{a, b, c, d, e}**

**TABLE R502.3.3(2)
CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING EXTERIOR BALCONY^{a, b, c, f}**

Member Size	Spacing	Maximum Cantilever Span (psf Force at Backspan Support in Lin. ft) ^d		
		30 psf	50 psf	70 psf
2 x 8	12"	42" (139)	39" (156)	34" (165)
2 x 8	16"	36" (151)	34" (171)	29" (180)
2 x 10	12"	61" (164)	57" (189)	49" (201)
2 x 10	16"	53" (180)	49" (208)	42" (220)
2 x 10	24"	43" (212)	40" (241)	34" (255)
2 x 12	16"	72" (228)	67" (260)	57" (268)
2 x 12	24"	58" (279)	54" (319)	47" (330)
2 x 12 @ 8"	16"	48" (169)	45" (184)	40" (233)
2 x 12 @ 8"	18"	45" (169)	42" (206)	36" (230)
2 x 12 @ 8"	20"	42" (169)	39" (230)	34" (230)
2 x 12 @ 8"	18"	40" (169)	36" (230)	30" (379)

© 2024 Shums Coda Associates 236

236

Girder Spans Table R502.5

**TABLE R502.5(1)
GIRDER SPANS^a AND HEADER SPANS^b FOR EXTERIOR BEARING WALLS**
(Maximum spans for Douglas fir-larch, hem-fir, southern pine and spruce-pine-fir and required number of jack studs)

GROUND SNOW LOAD (psf)^c

GIRDER HEADERS	BAND SUPPORTING	SIZE	Building width (feet)											
			20				30				50			
			Span	N ^d	Span	N ^d	Span	N ^d	Span	N ^d	Span	N ^d	Span	N ^d
2x8	3-0	1	3-2	1	2-10	1	3-2	1	2-9	1	2-0	1		
2x8	5-0	1	4-8	1	4-2	1	4-8	1	4-1	1	3-8	2		
2x8	6-0	1	5-11	2	5-4	2	5-11	2	5-0	2	4-7	2		
2x10	8-5	2	7-5	2	6-6	2	7-5	2	6-3	2	5-7	2		
2x10	8-5	2	8-5	2	7-6	2	8-5	2	7-3	2	6-6	2		
2x10	8-4	1	7-5	1	6-8	1	7-5	1	6-5	2	5-9	2		
3x10	10-0	1	9-2	2	8-2	2	9-1	2	7-8	2	7-0	2		
3x12	12-2	2	10-5	2	9-5	2	10-7	2	9-2	2	8-2	2		
4x8	9-2	1	8-4	1	7-8	1	8-4	1	7-5	1	6-8	1		
4x10	11-8	1	10-6	1	9-5	2	10-6	1	9-1	2	8-2	2		
4x12	14-1	1	12-2	2	10-11	2	12-2	2	10-7	2	9-5	2		

Exterior header for 7'6" opening supporting roof/ceiling

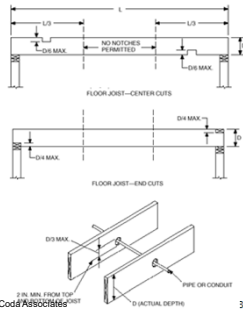
© 2024 Shums Coda Associates 237

237



Drilling & Notching R502.8

- Sawn Lumber - Notches
 - Top & bottom
 - <1/6 depth of joist
 - No longer than 1/3 depth
 - Ends
 - <1/4 joist depth
 - Cannot be located in middle third of span
- Holes
 - Diameter must be <1/3 the depth of the joist
 - Cannot be located within 2" of top or bottom of joist or to any other hole or notch



238

Table R503.2.1

TABLE R503.2.1(1)
ALLOWABLE SPANS AND LOADS FOR WOOD STRUCTURAL PANELS FOR ROOF AND SUBFLOOR SHEATHING AND COMBINATION SUBFLOOR UNDERLAYMENT^{a,c}

SPAN RATING	MINIMUM NOMINAL PANEL THICKNESS (in)	MAXIMUM SPAN (feet) ^b		LOAD (pounds per square foot, at maximum span)		MAXIMUM SPAN (feet) (subfloor)
		With edge support	Without edge support	Total load	Live load	
12/0	5/16	12	12	40	30	0
16/0	5/16	16	16	40	30	0
20/0	5/16	20	20	40	30	0
24/0	5/8	24	20 ^d	40	30	0
24/16	5/16	24	24	50	40	16
32/16	1 1/32, 1/2	32	28	40	30	16 ^e
40/30	1 1/32, 5/8	40	32	40	30	20 ^f
48/24	1 1/32, 3/4	48	36	45	35	24
60/32	3/4	60	48	45	35	32
Underlayment, C-C plugged, single floor ^a		Roof ^f		Combination subfloor underlayment ^a		
16 o.c.	1 1/32, 5/8	24	24	50	40	16 ^g
20 o.c.	1 1/32, 5/8	32	32	40	30	20 ^h
24 o.c.	1 1/32, 3/4	48	36	35	25	24
32 o.c.	3/4	48	40	50	40	32
48 o.c.	1 1/32, 1 1/8	60	48	50	40	48

© 2024 Shums Coda Associates

239

239

Concrete Floors R506

- Minimum 3.5" thick
- Fill shall be compacted
 - Fill depths not to exceed:
 - 24" clean sand or gravel
 - 8" earth
- 4" base course required for slabs below grade
 - except when slab is installed on well-drained or sand-gravel mixture soils



© 2024 Shums Coda Associates

240

240

Wood Wall Framing Table R602.3(5)

TABLE R602.3(5)
SIZE, HEIGHT AND SPACING OF WOOD STUDS*


STUD SIZE (inches)	BEARING WALLS					NONBEARING WALLS	
	Laterally unsupported stud height ¹ (feet)	Maximum spacing when supporting a roof-ceiling assembly or a habitable attic assembly, only (inches)	Maximum spacing when supporting one floor, plus a roof-ceiling assembly or a habitable attic assembly (inches)	Maximum spacing when supporting two floors, plus a roof-ceiling assembly or a habitable attic assembly (inches)	Maximum spacing when supporting one floor height ² (feet)	Laterally unsupported stud height ¹ (feet)	Maximum spacing (inches)
2 x 2 ³	---	---	---	---	---	10	16
2 x 4	10	24 ⁴	16 ⁵	---	24	14	24
3 x 4	10	24	24	16	24	14	24
2 x 5	10	24	24	---	24	16	24
2 x 6	10	24	24	16	24	20	24

© 2024 Shums Coda Associates

241

Exterior Walls R602.3.2

- Double Top Plate Required
 - Overlapped at corners and intersections of bearing walls
 - End joints of plates offset 24"
- Single top plate
 - Permitted if tied at joints with 3"x6" steel plate each side
- Bottom plate
 - Nominal 2" thick with width same as stud




© 2024 Shums Coda Associates

242

Interior Walls R602.4 & R602.5

- Load bearing walls same as exterior walls
- Nonbearing
 - 2X3 24"
 - 2X4 16" OC flat when not part of braced wall lines
 - Single top plate




© 2024 Shums Coda Associates

243

Notching R602.6

- Notching
 - Exterior & bearing
 - cannot exceed 25% of stud width
 - Non-bearing
 - up to 40% of stud width
- Drilling
 - Max. 40% of stud
 - Min. 5/8" from edge
 - Stud shoes permitted

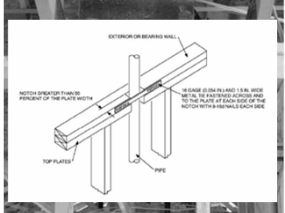


© 2024 Shums Coda Associates 244

244

Drilling/Notching of Top Plate R602.6.1

- Top plate cut by more than 50 %
 - Galvanized metal tie
 - Minimum 0.054 inch thick (16 gage)
 - 1 1/2 inches wide
 - Fastened to each plate with not less than eight 10d nails at each side or equivalent




© 2024 Shums Coda Associates 245

245

R602.10 Wall Bracing

- Buildings shall be braced in accordance with this section or, when applicable, Section R602.12. Where a building, or portion thereof, does not comply with one or more of the bracing requirements in this section, those portions shall be designed and constructed in accordance with Section R301.1.



© 2024 Shums Coda Associates 246

246

Wall Bracing Overview

- Intermittent bracing
- Continuous sheathing
- Engineered design



© 2024 Shums Coda Associates

247

247

TABLE E802.4
BRACING METHODS

METHODS, MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA*	
			Fasteners	Spacing
LFB Let-in bracing	1 x 4 wood or approved metal straps at 45° to 60° angles for maximum 16" stud spacing		Wood: 2-8d common nails or 3-8d (2 1/2" long x 0.113" dia.) nails	Wood: per stud end top and bottom plates
			Metal strap: per manufacturer	Metal: per manufacturer
DWB Diagonal wood boards	1/2" (1" nominal) for maximum 24" stud spacing		2-8d (2 1/2" long x 0.113" dia.) nails or 2 - 1 1/2" long staples	Per stud
WSP Wood structural panel (See Section 1804)	1/4"		Exterior sheathing per Table E802.3(1)	6" edges 12" field
			Interior sheathing per Table E802.3(2) or E802.3(2)	Varies by fastener

© 2024 Shums Coda Associates

248

248

TABLE R602.10.1.2(1)^{a, b, c, d}
BRACING REQUIREMENTS BASED ON WIND SPEED
(as a function of braced wall line spacing)

Basic Wind Speed (mph)	Story Location	Braced Wall Line Spacing (feet)	MINIMUM TOTAL LENGTH (feet) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
			Method LFB ^a	Method GB (double sided) ^b	Methods DWB, WSP, SPS, PCP, HPS ^c	Continuous Sheathing
≤ 85 (mph)		10	3.5	3.5	2.0	1.5
		20	6.0	6.0	3.5	3.0
		30	8.5	8.5	5.0	4.5
		40	11.5	11.5	6.5	5.5
		50	14.0	14.0	8.0	7.0
		60	16.5	16.5	9.5	8.0
		10	6.5	6.5	3.5	3.0
		20	11.5	11.5	6.5	5.5
		30	16.5	16.5	9.5	8.0
		40	21.5	21.5	12.5	10.5
		50	26.5	26.5	15.0	13.0
		60	31.5	31.5	18.0	15.5
		10	NP	9.0	5.5	4.5
		20	NP	17.0	10.0	8.5
		30	NP	24.5	14.0	12.0
		40	NP	32.0	18.0	15.5
		50	NP	39.0	22.5	19.0
		60	NP	46.5	26.5	22.5

© 2024 Shums Coda Associates

249

ADJUSTMENT BASED ON	STORY SUPPORTING	CONDITION	ADJUSTMENT FACTOR (BASED ON TABLE R602.10.1.1)	APPLICABLE METHODS
Diaphragm category	One story structure	B	1.00	All methods
	Two story structure	C	1.00	
	Three story structure	D	1.00	
	Four story structure	E	1.00	
Roof deck to edge height	Roof only	E1 10 feet	0.75	All methods
	Roof + 1 storey	10 feet	1.00	
		20 feet	1.00	
		30 feet	1.00	
Wall height adjustment	Any story	0 feet	1.00	All methods
		10 feet	1.00	
		20 feet	1.00	
		30 feet	1.00	
Number of braced walls (see also Section 602)	Any story	1	1.00	All methods
		2	1.00	
		3	1.00	
		4	1.00	
Additional 80% point load shear bracing	Top story only	Provided 80% point load shear bracing on each level and not on the diaphragm or framing below	0.60	DWS, WSP, UFB, FES, PFC, BFC
Decking on braced beam (see also Section 602)	Any story	Decking does not rest on braced wall panels	1.40	DWS, WSP, UFB, FES, PFC, BFC, CS-WSP, CS-G, CS-UB
Diaphragm bracing	Any story	Diaphragm is not rigidly braced and all horizontal loads are resisted by diaphragm	0.1	CB

250

R602.10 Wall Bracing

■ Sep. table for seismic

Seismic Design Category (SDC)	Story Location	MINIMUM TOTAL LENGTH (ft) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
		Method UBR	Method WSP, UFB, FES, PFC, BFC	Method WSP	Diaphragm Shearwall
SDC A and B and Reduced Overlays to C	Exempt from Seismic Requirements (See Table R602.10.1.1.1 for Seismic Requirements)	10	2.5	1.6	1.4
		20	5.0	3.2	2.7
		30	7.5	4.8	4.1
		40	10.0	6.4	5.4
		50	12.5	8.0	6.8
		NP	4.5	3.0	2.6
	SDC C	10	NP	6.0	5.1
		20	NP	11.5	9.7
		30	NP	18.0	12.0
		40	NP	22.5	15.0
		50	NP	27.0	18.0
		NP	6.0	4.5	3.8
SDC D	10	NP	12.0	9.0	
	20	NP	18.0	13.5	
	30	NP	24.0	18.0	
SDC E	10	NP	30.0	21.0	
	20	NP	36.0	25.2	

251

ADJUSTMENT BASED ON	STORY SUPPORTING	CONDITION	ADJUSTMENT FACTOR (BASED ON TABLE R602.10.1.1)	APPLICABLE METHODS
Story height (Diaphragm, UBR, B)	Any story	≤ 10 feet	1.0	All methods
Braced wall line spacing (Diaphragm, B, SDC C)	Any story	> 10 feet and ≤ 12 feet	1.2	
		> 15 feet and ≤ 50 feet	1.43	
Braced wall line spacing (in SDC D _s , D ₁ , D ₂)	Any story	> 25 feet and ≤ 30 feet	1.2	
		> 30 feet and ≤ 50 feet	1.4	
Wall dead load	Any story	> 8 pcf and ≤ 15 pcf	1.8	All methods
		> 15 pcf	0.85	
Transferring dead load to wall supporting	Roof only or roof plus one or two stories	≤ 15 pcf	1.0	All methods
		> 15 pcf and ≤ 25 pcf	1.1	
Walls with stone or masonry veneer (see also Section 602.10.1)	Roof only	≤ 10 feet	1.0	All masonry and concrete methods
		> 10 feet and ≤ 20 feet	1.5	
		> 20 feet	1.5	
Walls with stone or masonry veneer, attached roof and two levels (see also Section 602.10.1)	Any story	See Table R602.10.6.5		BV-WSP
Isolate gypsum board (Finish or equivalent)	Any story	Omitted from inside face of braced wall panels	1.5	DWS, WSP, UFB, FES, PFC, BFC, CS-WSP, CS-G, CS-UB

252

R802.11 – Roof Uplift Resistance

- However...
- "Uplift forces shall be permitted as determined as specified by Table R802.11, if applicable, or as determined by accepted engineering practice"
- table with 85-110 mph covered at Exposure B and C

© 2024 Shums Coda Associates

262

262

Roof Ventilation R806



- Ventilation required
 - attic spaces
 - rafter spaces
- Min. area= 1:300
 - 50-80% of vents in upper portion
 - Remainder at eave or cornice
- 1" minimum clearance

© 2024 Shums Coda Associates

263

263

Attic Access R807



- Combustible ceiling or roof construction
 - areas that exceed 30 square feet
 - 30" vertical height
- 22"X30" opening
 - hallway or readily accessible location
 - 30" min. headroom
 - M1305.1.3 mechanical access

© 2024 Shums Coda Associates

264

264

Roof Drainage R903.4



- Unless roof drains over roof edge, roof drains and scuppers required
 - Sized per IPC
 - Overflow 2" above roof drain inlet
 - Scuppers 3 times roof drain, 2" above inlet
 - Overflow not allowed to be connected to roof drain lines

© 2024 Shums Coda Associates

265

265

Roof Coverings R905

- Asphalt Shingles
- Clay & concrete tiles
- Metal roof shingles
- Mineral-surfaced roll roofing
- Slate shingles
- Wood shingles/shakes
- Built-up roofs
- Modified Bitumen
- Single-ply roofing
- Sprayed foam roofing
- Liquid-applied coatings



© 2024 Shums Coda Associates

266

266

Masonry Fireplaces R1001.1



- Masonry fireplaces shall be constructed in accordance with this section and the applicable provisions of Chapters 3 and 4.

© 2024 Shums Coda Associates

267

267

Exterior Air Supply R1006.1



- Exterior air required for factory-built or masonry fireplaces unless room is mechanically ventilated so indoor pressure is neutral or positive
 - Factory built fireplaces follow manufacturers listing
 - Masonry fireplaces may use listed combustion air ducts installed per listing

© 2024 Shums Coda Associates

268

268

ENERGY EFFICIENCY CHAPTER 11

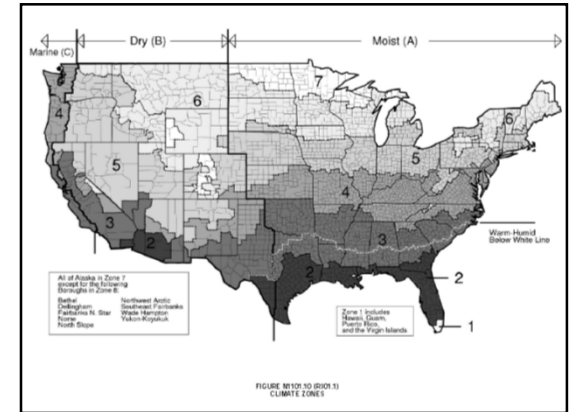
- The text of the following Sections N1101.2 through N1105 is extracted from the International Energy Conservation Code—Residential Provisions and has been editorially revised to conform to the scope and application of this code.
- The section numbers appearing in parenthesis after each section number are the section numbers of the corresponding text in the International Energy Conservation Code—Residential Provisions.



© 2024 Shums Coda Associates

269

269



270

IRC Part V Mechanical



© 2024 Shums Coda Associates

274

M1305.1.3.1

- ◆ Consolidated for everything!
 - 3" minimum above grade
 - Concrete or approved equivalent.



© 2024 Shums Coda Associates

275

275

Condensate Disposal M1411.3

- ◆ Approved place of disposal
- ◆ Secondary Drain
 - where damage to building is possible
 - 3/4" piping
 - ◆ auxiliary drain pan
 - ◆ separated overflow drain
 - ◆ auxiliary drain pan with automatic shutoff



© 2024 Shums Coda Associates

276

276

Clothes Dryer Exhaust M1502

- ◆ Minimum diameter as recommended by manufacturer & outlet
- ◆ Maximum length
 - 25 feet from dryer to outlet
 - Reduced per Table M1502.4.6.1
 - Manufacturer's instructions



© 2024 Shums Coda Associates

277

277

Local exhaust rates M1505.4.4

- ◆ Local exhaust systems shall be designed to have the capacity to exhaust the minimum air flow rate determined in accordance with Table M1505.4.4.

TABLE M1505.4.4 MINIMUM REQUIRED LOCAL EXHAUST RATES FOR ONE- AND TWO-FAMILY DWELLINGS

AREA TO BE EXHAUSTED	EXHAUST RATES*
Kitchens	100 cfm intermittent or 25 cfm continuous
Bathrooms-Toilet Rooms	Mechanical exhaust capacity of 50 cfm intermittent or 20 cfm continuous

© 2024 Shums Coda Associates

278

278

Duct Insulation Materials M1601.3

- ◆ Flame-spread 25 or less & smoke-developed index not greater than 50
- ◆ Shall not flame, glow, smolder or smoke ASTM E84
- ◆ External duct insulation and flex-duct must be identified



© 2024 Shums Coda Associates

279

279

Floor Heating Systems M2103

- ◆ Piping
 - Standard-weight steel pipe, copper tubing, CPVC, PEX-AL-PEX or polybutylene with a minimum rating of 100 psi at 180°F
- ◆ Thermal barrier required
- ◆ Joints
 - Steel Pipe - welded
 - Copper tubing - brazed
 - PB - heat-fused PB fitting
 - CPVC - solvent cement
- ◆ 100 psi test, 30 minutes



© 2024 Shums Coda Associates

280

280

Prohibited Locations G2406.2

- ◆ Fuel-fired appliances shall not be located in any of the following rooms or spaces:
 - Sleeping rooms.
 - Bathrooms.
 - Toilet rooms.
 - Storage or;
 - Surgical rooms



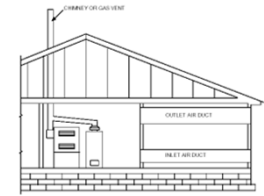
© 2024 Shums Coda Associates

281

281

Two-Permanent-Opening Method G2407.6.1

- ◆ 12" from top, 12" from bottom
- ◆ Must communicate with outdoors
 - Crawl spaces, attic spaces ok
- ◆ Vertical ducts
 - 1 sq. in. per 4000 Btu of total input
- ◆ Horizontal ducts
 - 1 sq. in. per 2000 Btu of total input



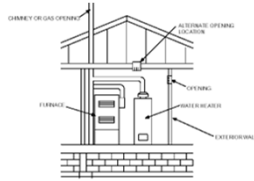
© 2024 Shums Coda Associates

282

282

One-Permanent-Opening Method G2407.6.2

- ◆ 12" from top of enclosure
- ◆ 1" clearance from sides & back, 6" from front of appliance
- ◆ Must communicate with outdoors
 - Crawl spaces, attic spaces ok
- ◆ 1 sq. in. per 3,000 Btu total input and not less than sum of areas of all vent connectors in the space



© 2024 Shums Coda Associates

283

283

Elevation of Ignition Source G2408.2

- ◆ Equipment and appliances having an ignition source shall be elevated such that the source of ignition is not less than 18 inches above the floor in hazardous locations and private garages.
- ◆ For the purpose of this section, rooms or spaces that are not part of the living space of a dwelling unit and that communicate directly with a private garage through openings shall be considered to be part of the private garage.



© 2024 Shums Coda Associates

284

284

Private Garages G2408.3

- ◆ Appliances located in private garages shall be installed with a minimum clearance of 6 feet above the floor.
 - Exception:
Shall not apply where the appliances are protected from motor vehicle impact and installed in accordance with Section G2408.2



© 2024 Shums Coda Associates

285

285

Pipe Sizing G2413

TABLE G2413.4-1 SCHEDULE 40 STEEL PIPE		TABLE G2413.4-2 SCHEDULE 40S STEEL PIPE	
Outside Diameter, in.	Wall Thickness, in.	Outside Diameter, in.	Wall Thickness, in.
1/2	0.109	1/2	0.083
3/4	0.133	3/4	0.106
1	0.147	1	0.119
1 1/4	0.189	1 1/4	0.153
1 1/2	0.203	1 1/2	0.167
2	0.250	2	0.203
2 1/2	0.283	2 1/2	0.236
3	0.307	3	0.250
3 1/2	0.331	3 1/2	0.274
4	0.354	4	0.288
4 1/2	0.378	4 1/2	0.312
5	0.402	5	0.326
5 1/2	0.426	5 1/2	0.350
6	0.450	6	0.364
6 1/2	0.474	6 1/2	0.388
7	0.498	7	0.402
7 1/2	0.522	7 1/2	0.426
8	0.546	8	0.440
8 1/2	0.570	8 1/2	0.464
9	0.594	9	0.478
9 1/2	0.618	9 1/2	0.502
10	0.642	10	0.516
10 1/2	0.666	10 1/2	0.540
11	0.690	11	0.554
11 1/2	0.714	11 1/2	0.578
12	0.738	12	0.592
12 1/2	0.762	12 1/2	0.616
13	0.786	13	0.630
13 1/2	0.810	13 1/2	0.654
14	0.834	14	0.668
14 1/2	0.858	14 1/2	0.692
15	0.882	15	0.706
15 1/2	0.906	15 1/2	0.730
16	0.930	16	0.744
16 1/2	0.954	16 1/2	0.768
17	0.978	17	0.782
17 1/2	1.002	17 1/2	0.806
18	1.026	18	0.820
18 1/2	1.050	18 1/2	0.844
19	1.074	19	0.858
19 1/2	1.098	19 1/2	0.882
20	1.122	20	0.896
20 1/2	1.146	20 1/2	0.920
21	1.170	21	0.934
21 1/2	1.194	21 1/2	0.958
22	1.218	22	0.972
22 1/2	1.242	22 1/2	0.996
23	1.266	23	1.010
23 1/2	1.290	23 1/2	1.034
24	1.314	24	1.048
24 1/2	1.338	24 1/2	1.072
25	1.362	25	1.086
25 1/2	1.386	25 1/2	1.110
26	1.410	26	1.124
26 1/2	1.434	26 1/2	1.148
27	1.458	27	1.162
27 1/2	1.482	27 1/2	1.186
28	1.506	28	1.200
28 1/2	1.530	28 1/2	1.224
29	1.554	29	1.238
29 1/2	1.578	29 1/2	1.262
30	1.602	30	1.276
30 1/2	1.626	30 1/2	1.300
31	1.650	31	1.314
31 1/2	1.674	31 1/2	1.338
32	1.698	32	1.352
32 1/2	1.722	32 1/2	1.376
33	1.746	33	1.390
33 1/2	1.770	33 1/2	1.414
34	1.794	34	1.428
34 1/2	1.818	34 1/2	1.452
35	1.842	35	1.466
35 1/2	1.866	35 1/2	1.490
36	1.890	36	1.504
36 1/2	1.914	36 1/2	1.528
37	1.938	37	1.542
37 1/2	1.962	37 1/2	1.566
38	1.986	38	1.580
38 1/2	2.010	38 1/2	1.604
39	2.034	39	1.618
39 1/2	2.058	39 1/2	1.642
40	2.082	40	1.656
40 1/2	2.106	40 1/2	1.680
41	2.130	41	1.694
41 1/2	2.154	41 1/2	1.718
42	2.178	42	1.732
42 1/2	2.202	42 1/2	1.756
43	2.226	43	1.770
43 1/2	2.250	43 1/2	1.794
44	2.274	44	1.808
44 1/2	2.298	44 1/2	1.832
45	2.322	45	1.846
45 1/2	2.346	45 1/2	1.870
46	2.370	46	1.884
46 1/2	2.394	46 1/2	1.908
47	2.418	47	1.922
47 1/2	2.442	47 1/2	1.946
48	2.466	48	1.960
48 1/2	2.490	48 1/2	1.984
49	2.514	49	1.998
49 1/2	2.538	49 1/2	2.022
50	2.562	50	2.036

- ◆ Sized in accordance with Section G2413.4
 - Sizing tables
 - ◆ Longest length method
 - ◆ Branch length method
 - ◆ Hybrid pressure
 - Equations 24-3 & 24-4
- ◆ Listed piping system's sizing tables
- ◆ Other approved engineered methods

© 2024 Shums Coda Associates 286

286

G2420.5 Appliance Shutoff Valve

- G2420.5.1 - Same Room
 - ◆ Shutoff within 6', upstream of union, within the same room
- G2420.5.2 - Vented Decorative Appliances
 - ◆ May be installed in a room remote from appliance, 6' pipe length limit
- G2420.5.3 - Manifold piping configuration
 - ◆ shutoff valve located at manifold if ≤ 50 feet from appliance

© 2024 Shum & Zuda Associates 287

287

Gas Vent Termination G2427.6.5

ROOF PITCH	MINIMUM HEIGHT	IN
1/4 on 12	1.0	0.50
1/2 on 12	1.25	0.56
3/4 on 12	1.5	0.63
1 on 12	1.75	0.69
1 1/4 on 12	2.25	0.89
1 1/2 on 12	2.5	0.98
2 on 12	3.25	1.25
2 1/2 on 12	4.0	1.52
3 on 12	5.0	1.93
3 1/2 on 12	6.0	2.40
4 on 12	7.0	2.81
4 1/2 on 12	8.0	3.22
5 on 12	9.0	3.63
5 1/2 on 12	10.0	4.04

© 2024 Shums Coda Associates 288

288

Minimum Fixture Clearances Figure R307.1

© 2024 Shums Coda Associates 292

292

Lawn Irrigation P2902.5.3

- The potable water supply to lawn irrigation systems shall be protected against backflow by an atmospheric-type vacuum breaker, a pressure-type vacuum breaker or a reduced pressure principle backflow preventer. A valve shall not be installed downstream from an atmospheric vacuum breaker.

© 2024 Shums Coda Associates 293

293

Thermal Expansion Control P2903.4

- A means for controlling increased pressure caused by thermal expansion shall be installed where required in accordance with Sections P2903.4.1 and P2903.4.2.
 - Pressure-reducing valve.
 - P2903.4.2 Backflow prevention device or check valve.

© 2024 Shums Coda Associates 294

294

Size of Water-service Mains, Branch Mains And Risers - P2903.7



- ◆ The minimum size water service pipe shall be ¾ inch.
- ◆ The size of water service mains, branch mains and risers shall be determined according to water supply demand (gpm), available water pressure (psi) and friction loss caused by the water meter and developed length of pipe (feet), including equivalent length of fittings.
- ◆ The size of each water distribution system shall be determined according to design methods conforming to acceptable engineering practice, such as those methods in Appendix P and shall be approved by the code official.

© 2024 Shums Coda Associates 295

295

Drain Pipe Sizing P3005.4

TABLE P3005.4.1
MAXIMUM FIXTURE UNITS ALLOWED TO BE CONNECTED TO BRANCHED AND STACKS

NOMINAL PIPE SIZE (INCHES)	ANY HORIZONTAL FIXTURE BRANCH	ANY ONE VERTICAL STACK OR DRAIN
1½"	—	—
1½"	3	4
2"	6	10
2½"	12	20
3	20	48
4	100	240

TABLE P3005.4.2
MAXIMUM NUMBER OF FIXTURE UNITS ALLOWED TO BE CONNECTED TO THE BUILDING DRAIN

DIAMETER OF PIPE (INCHES)	SLOPE PER FOOT		
	¼ inch	⅜ inch	½ inch
1½"	—	None	None
2"	—	21	27
2½"	—	24	31
3	36	42	50
4	180	216	250

© 2024 Shums Coda Associates 296

- ◆ Drain pipes shall be sized according to drainage fixture unit (d.f.u.) loads. The size of the drainage piping shall not be reduced in size in the direction of flow.

296

IRC Part VIII Electrical

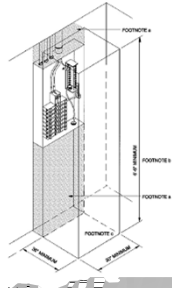


© 2024 Shums Coda Associates 297

297

Working Space And Clearances E3405.1

- ◆ Sufficient access and working space shall be provided and maintained around all electrical equipment to permit ready and safe operation and maintenance of such equipment in accordance with this section and Figure E3305.1.



© 2024 Shums Coda Associates

298

298

Electrical Services E3601

- ◆ One- and two-family dwellings shall be supplied by only one service.
- ◆ Service conductors supplying a building or other structure shall not pass through the interior of another building or other structure.



© 2024 Shums Coda Associates

299

299

Service Disconnect Location E3601.6.2

- ◆ The service disconnecting means shall be installed at a readily accessible location either outside of a building or inside nearest the point of entrance of the service conductors.
- ◆ Service disconnecting means shall not be installed in bathrooms.
- ◆ Each occupant shall have access to the disconnect serving the dwelling unit in which they reside.



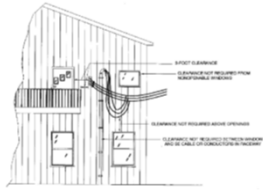
© 2024 Shums Coda Associates

300

300

Clearances on buildings E3604.1

- ◆ Open conductors and multi-conductor cables without an overall outer jacket shall have a clearance of not less than 3 feet from the sides of doors, porches, decks, stairs, ladders, fire escapes and balconies, and from the sides and bottom of windows that open. See Figure E3604.1.



© 2024 Shums Coda Associates

301

301

Vertical clearance from grade E3604.2.2

1. For service-drop cables supported on and cabled together with a grounded bare messenger wire, the minimum vertical clearance shall be 10 feet at the electric service entrance to buildings, at the lowest point of the drip loop of the building electric entrance, and above areas or sidewalks accessed by pedestrians only. Such clearance shall be measured from final grade or other accessible surfaces.
2. Twelve feet -over residential property and driveways.
3. Eighteen feet -over public streets, alleys, roads or parking areas subject to truck traffic.

© 2024 Shums Coda Associates

302

302

Grounding Electrode System E3608.1

- ◆ Metal Underground Water Pipe
- ◆ Concrete-Encased Electrode
- ◆ Ground Rings
- ◆ Rod & Pipe Electrodes
- ◆ Plate Electrodes
- ◆ Other Listed Electrodes

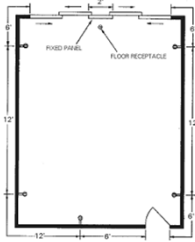


© 2024 Shums Coda Associates

303

303

General Purpose Receptacle Distribution - E3901.2



- ◆ In every kitchen, family room, dining room, living room, parlor, library, den, sun room, bedroom, recreation room, or similar room or area of dwelling units, receptacle outlets shall be installed in accordance with the general provisions specified in Sections E3801.2.1 through E3801.2.3

© 2024 Shums Coda Associates

304

304

GFCI Protection E3902



- ◆ All 125-volt, single-phase, 15- and 20-ampere receptacles
 - Bathrooms
 - Garages
 - Outdoor receptacles
 - Crawl spaces
 - Unfinished basements
 - Kitchens
 - Laundry, Utility and Bar Sinks

© 2024 Shums Coda Associates

305

305

Arc-fault circuit-interrupter protection E3902.11



Arc Fault Circuit Interrupter Breaker

- ◆ Ground-fault circuit-interrupter protection shall be provided for outlets supplied by branch circuits rated 150 volts or less to ground that supply dishwashers in dwelling unit locations.

© 2024 Shums Coda Associates

306

306

Habitable Rooms E3903.2

- ◆ At least one wall switch-controlled lighting outlet shall be installed in every habitable room and bathroom.



© 2024 Shums Coda Associates

307

307

Additional Locations E3903.3

- ◆ At least one wall-switch-controlled lighting outlet shall be installed in hallways, stairways, attached garages, and detached garages with electric power.
- ◆ At least one wall-switch-controlled lighting outlet shall be installed to provide illumination on the exterior side of each outdoor egress door having grade level access, including outdoor egress doors for attached garages and detached garages with electric power.
- ◆ A vehicle door in a garage shall not be considered as an outdoor egress door.
- ◆ Where one or more lighting outlets are installed for interior stairways, there shall be a wall switch at each floor level and landing level that includes an entryway to control the lighting outlets where the stairway between floor levels has six or more risers.

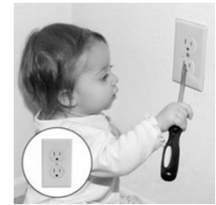
© 2024 Shums Coda Associates

308

308

E4002.14 Tamper-resistant Receptacles

- ◆ 125-volt
- ◆ 15- and 20-amp receptacles
- ◆ Must be tamper resistant




© 2024 Shums Coda Associates

309

309

Questions?


End of day one



© 2024 Shums Coda Associates 310

310

ICC A117.1 2017 Accessible and Usable Buildings and Facilities



© 2024 Shums Coda Associates 311

311

ICC/ A117.1 Format

- ▶ Chapter 1
 - Application & Administration
 - Definitions
- ▶ Chapter 2
 - Scoping
- ▶ Chapter 3
 - Building Blocks
- ▶ Chapter 4
 - Accessible Route
- ▶ Chapter 5
 - General Site & Building Elements
- ▶ Chapter 6
 - Plumbing Elements & Facilities
- ▶ Chapter 7
 - Communication Elements & Features
- ▶ Chapter 8
 - Special Rooms & Spaces
- ▶ Chapter 9
 - Built-in Furnishings & Equipment
- ▶ Chapter 10
 - Recreational Facilities
- ▶ Chapter 11
 - Dwelling and sleeping units

© 2024 Shums Coda Associates 312

312

A117.1 – Accessible Route 403 Walking Surfaces

- ▶ Section 303 – Changes in Level
 - 303.2 Vertical Max. ¼ inch
 - 303.3 – Beveled

▶ if ¼" to ½" change, 1:2 bevel OK

Fig. 303.2 Vertical Changes in Level

Fig. 303.3 Beveled Changes in Level

© 2024 Shums Coda Associates 313

313

ANSI A117.1 – Accessible Route 404 Doors and Doorways

- ▶ Clear Width - 404.2.2
 - 32" minimum clear opening
 - >24" alcove, then 36" minimum

(a) Hinged Door

(b) Sliding Door

(c) Folding Door

Fig. 404.2.3 Clear Width of Doorways

© 2024 Shums Coda Associates 314

314

ANSI A117.1 – Accessible Route 404 Doors and Doorways

- ▶ 404.2.3 - Maneuvering Clearances at Doors
- ▶ Table 404.2.3.2- Swinging Doors

TYPE OF USE		MINIMUM MANEUVERING CLEARANCES	
Approach Direction	Door or Gate Side	Perpendicular to Doorway	Parallel to Doorway (beyond latch unless noted)
From front	Push	60 inches (1525 mm)	18 inches (457 mm)
From front	Pull	52 inches (1320 mm) ¹	0 inches (0 mm) ²
From hinge side	Push	60 inches (1525 mm)	36 inches (915 mm)
From hinge side	Pull	54 inches (1370 mm)	42 inches (1065 mm)
From latch side	Push	42 inches (1065 mm) ¹	22 inches (560 mm) ⁴
From latch side	Pull	48 inches (1220 mm) ²	24 inches (610 mm)
From latch side	Push	42 inches (1065 mm) ²	24 inches (610 mm)

¹ Add 6 inches (150 mm) if closer and latch provided.
² Add 6 inches (150 mm) if closer provided.
³ Add 12 inches (305 mm) beyond latch if closer and latch provided.
⁴ Beyond hinge side.
⁵ In existing buildings and facilities, the dimension perpendicular to the door or gate for the front direction on the push side shall be 48 inches (1220 mm) minimum.

315

ANSI A117.1 – Accessible Route 404 Doors and Doorways

▶ Table 404.2.3.3 – Sliding and Folding Doors

TABLE 404.2.3.3 —MANEUVERING CLEARANCES AT SLIDING AND FOLDING DOORS


Approach Direction	MINIMUM MANEUVERING CLEARANCES	
	Perpendicular to Doorway	Parallel to Doorway (beyond stop or latch side unless noted)
From front	52 inches (1320 mm) ¹	0 inches (0 mm)
From nonlatch side	42 inches (1065 mm)	22 inches (560 mm) ¹
From latch side	42 inches (1065 mm)	24 inches (610 mm)

¹ Beyond pocket or hinge side.

© 2024 Shums Coda Associates 316

316

A117.1 – Accessible Route 405 Ramps



▶ Section 405 – Ramps

▶ If the slope is > 1:20,
It is a RAMP!!

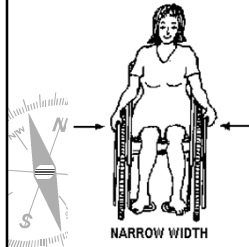
▶ Slope
1:12 Maximum Slope
Limited Exception for existing sites

▶ Cross Slope
1:48 Maximum

© 2024 Shums Coda Associates 317

317

A117.1 – Accessible Route 405 Ramps



▶ Clear Width

- 36 inches minimum
- Limited Exception for within employee work areas

▶ Rise

- 30 inches Max.

▶ Landings

- Required at the Top and Bottom of each run.

© 2024 Shums Coda Associates 318

318

Slide 318

DO9

The ANSI Standard previously stated that the measurement was "between the handrails".

DELL OWNER, 1/20/2004

A117.1 – Accessible Route 405 Ramps

- ▶ Landings – 405.7
 - Slope = 1:48 Maximum
 - Width = Wide as Ramp Run
 - Length = 60" Minimum

© 2024 Shums Coda Associates 319

319

A117.1 – Accessible Route 405 Ramps

- ▶ Landings
 - 405.7.4 Change in Direction
60" x 60" Minimum
- ▶ Doorways
Maneuvering clearances may overlap
- ▶ Handrails
If Rise > 6 inches, then they are required

© 2024 Shums Coda Associates 320

320

A117.1 – Accessible Route 405 Ramps

- ▶ 405.9 – Edge Protection
 - Extend 12" minimum each side OR
 - Provide Curb or Barrier (4" dia.)
(see Exceptions)

© 2024 Shums Coda Associates 321

321

A117.1 – Accessible Route 406 Curb Ramps

- ▶ Sides of Curb Ramps - 406.2.3
 - Required if pedestrians must walk across the ramp.
 - Flare slope = 1:10 Maximum
 - Minimum 36" landing at top of curb ramp

322

322

A117.1 – Accessible Route 407 Elevators

- ▶ 407 – Elevators
 - Regulates:
 - Call Buttons
 - Hall Signals
 - Tactile Characters
 - Doors
 - Car Call Delays
 - Car Dimensions
 - Operating Controls
 - Elevator Landings
 - Signals
 - Signs

323

323

502 – Parking Spaces

- ▶ IBC Table 1106.2 regulates the number of accessible parking spaces
- ▶ 502.2 – Vehicle Spaces
 - 96" wide min. with an adjacent 60" access aisle
 - 132" for Van Accessible with 60" access aisle or 96" + 96"

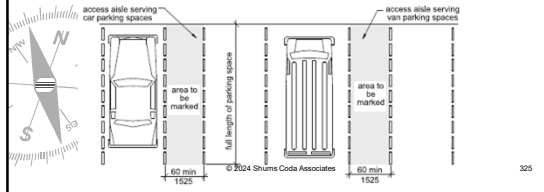
324

324

502 – Parking Spaces

► 502.4 – Access Aisle

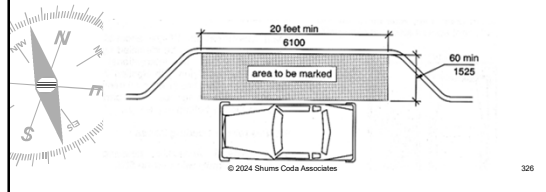
- Width = 60"
- Length = As long as the space served.
- Marking = Such to discourage parking in them.



325

503 – Passenger Loading Zones

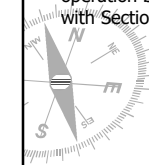
- 60 inches Wide
- 20 feet Long
- Marked to discourage parking



326

502.11 Vehicle Charging Stations

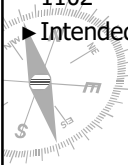
- 502.11 Electrical vehicle charging stations.
- An electrical vehicle charging station serving a parking space shall comply with Section 502.11.
- 502.11.1 Operable parts.
- Operable parts on the charging station intended for operation by the user, including card readers, shall comply with Section 309.



327

1102 ACCESSIBLE UNITS

- ▶ Scoping is in IBC section 1108.
- ▶ Technical details are in ICC A117.1 section 1102
- ▶ Intended to be fully accessible units



© 2024 Shums Coda Associates 328

328

A117.1 – 1103 Type A 1103.9 Operable Parts

- ▶ Shall comply w/309
 - Light Controls
 - Receptacles
 - Environmental
 - Appliance
 - Window Hardware
 - Plumbing Fixture
 - Security or Intercom

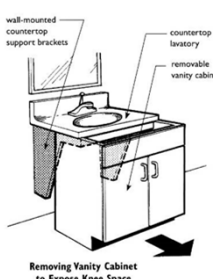


© 2024 Shums Coda Associates 329

329

A117.1 – 1103 Type A 1003.11 - Toilet and Bathing Facilities

- ▶ 1103.11.2.2 Lavatories
 - ▶ Shall comply w/ 606
 - ▶ Exception- Cabinetry may be added that:
 - Can be removed without removal of the lavatory
 - Finish floor extends under cabinet
 - Walls behind & surrounding cabinet required to be finished
- ▶ 1003.11.2.3 Mirrors
 - If above lavatory, shall be 40" max. AFF

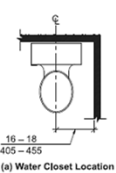


© 2024 Shums Coda Associates 330

330

A117.1 – 1103 Type A
1103.11 - Toilet and Bathing Facilities

- ▶ 1003.11.2.4.1 Water Closets
- ▶ Shall be positioned with a wall at the rear and one side.
- ▶ 16-18" from side wall

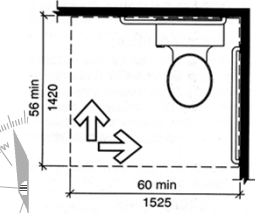


(a) Water Closet Location

© 2024 Shums Coda Associates 331

331

A117.1 – 1103 Type A
1003.11 - Toilet and Bathing Facilities



(c) Parallel and Forward Approach

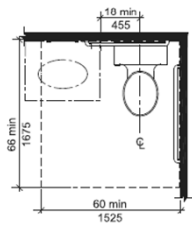
- ▶ Clearance
 - 56"x60"
 - Nothing may encroach except grab bars, paper dispensers, coat hooks, shelves, accessible routes, clear floor space of other fixtures and wheelchair turning space.

© 2024 Shums Coda Associates 332

332

A117.1 – 1103 Type A
1003.11 - Toilet and Bathing Facilities

- ▶ EXCEPTION: A lavatory shall be permitted on the rear wall 18 inches minimum from the centerline of the water closet
- ▶ where the clearance at the water closet is 66 inches minimum measured perpendicular from the rear wall.




(c) Clearance with Lavatory (Overlap Exception)

© 2024 Shums Coda Associates 333

333

A117.1 – 1103 Type A
1103.11 - Toilet and Bathing Facilities




- ▶ 1103.11.2.5.1 Bathtubs
- ▶ Shall comply w/ 607
- ▶ Exceptions:
 - Grab bars are not required if backing is provided
 - Counter tops and cabinetry shall be permitted at the control end of the clearance, provided such counter tops and cabinetry can be removed and the floor finish extends under such cabinetry.
 - Seat is not required but backing for a future seat is in accordance with 608.3

© 2024 Shums Coda Associates 334

334

A117.1 – 1103 Type A
1103.11 - Toilet and Bathing Facilities



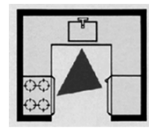
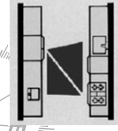
- ▶ 1103.11.2.5.2 Showers
- ▶ Shall comply w/608
- ▶ Exceptions:
 - Shower seat not req'd for transfer showers (reinforcement is req'd)
 - Grab bars not req'd (if reinforcement is provided in the walls)
 - Counter tops and cabinetry shall be permitted at the control end of the clearance, provided such counter tops and cabinetry can be removed and the floor finish extends under such cabinetry.

© 2024 Shums Coda Associates 335

335

A117.1 – 1103 Type A
1103.12 - Kitchens

1103.12.1 Clearances



Galley – 40" min.

U-Shaped – 60" min.
3 contiguous sides

© 2024 Shums Coda Associates 336

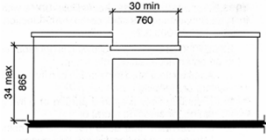
336

A117.1 – 1103 Type A 1103.12 - Kitchens

1103.12.3 Work Surface:

- ▶ One req'd min.
- ▶ 30" wide
- ▶ Clear space underneath
- ▶ 34" max. height

Exception: spaces that do not have a cooktop or conventional range

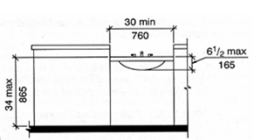


- No sharp or abrasive surfaces under the work counter.
- A removable cabinet may be used if:
 - Top is stationary
 - floor finish extends under walls behind and surrounding cabinetry are finished.

© 2024 Shums Coda Associates 337

337

A117.1 – 1103 Type A 1103.12 - Kitchens




- ▶ 1103.12.4 Kitchen Sink
- ▶ 30" min. width
- ▶ Clear floor space with knee & toe clearance underneath req'd
- ▶ 34" max. height to the sink rim or counter.
- ▶ Exceptions

© 2024 Shums Coda Associates 338

338

A117.1 – 1104 Type B 1104.2 – Primary Entrance



- ▶ Primary entrance
- ▶ Shall be accessible
- ▶ Shall be on an accessible route
- ▶ Shall not be to a bedroom

© 2024 Shums Coda Associates 339

339

A117.1 – 1104 Type B
1104.11 – Toilet & Bathing Fixtures

- ▶ Clear floor space is required at accessible fixtures
- ▶ Doors shall not swing into the clear space unless 30"x48" space provided outside swing



© 2024 Shums Coda Associates 340

340

A117.1 – 1104 Type B
1104.11 – Toilet & Bathing Fixtures

- ▶ Grab bar reinforcement req'd for future installation:
- ▶ Water closets
- ▶ Bathtubs
- ▶ Showers (including seats)
- ▶ 7 Exceptions: Not Required in powder rooms

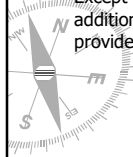


© 2024 Shums Coda Associates 341

341

A117.1 – 1104 Type B
1104.11.3 – Bathroom Fixtures

- ▶ Option A
- ▶ Each fixture provided must provide the required clearances.
 - Except 1/2 bath when additional fixtures provided on that level
- ▶ Option B
- ▶ Only one of each fixture bathroom must comply. Must be in a single bathroom
- ▶ Lavatory shall be 34" max. AFF (clearance centered)
- ▶ May not encroach into the clearance in front of the bathtub

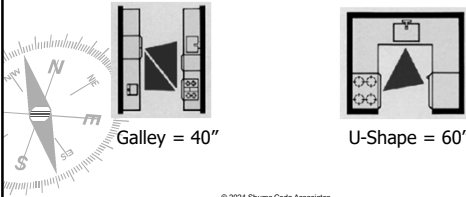


© 2024 Shums Coda Associates 342

342

**A117.1 – 1104 Type B
1104.12 - Kitchens**

Clearances

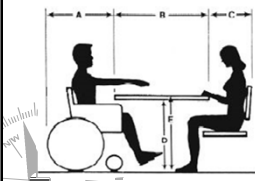


Galley = 40"
U-Shape = 60"

© 2024 Shums Coda Associates 343

343

**A117.1 --902 - Seating at Tables,
Counters, & Work Surfaces**

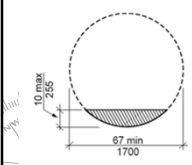


- ▶ 902.2 – Requires clear floor per 306.
- ▶ 902.4 – Requires top height = 28" – 34"
- ▶ 902.5 Children's Use has different dimensions

© 2024 Shums Coda Associates 344

344

**A117.1
Section 603 – Toilet and Bathing Rooms**



- ▶ 603.2 Clearances:
- ▶ Wheelchair turning space provided per Section 304
- ▶ Section 304.3.2
 - Permits T-Shaped turning space
- ▶ 304.4 – Doors
 - Doors may swing into turning spaces (usually), but shall not swing into the required clear floor space of any fixture.

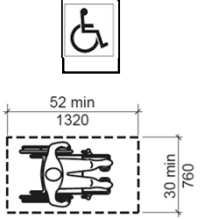
Overlap of knee and toe clearance

© 2024 Shums Coda Associates 345

345

A117.1
Section 305 – Clear Floor Space

- ▶ 30" x 52"
- ▶ Slope = 1:48 max.
- ▶ May include knee and toe space per 306
- ▶ One side on accessible route
- ▶ 305.7 Alcoves
 - Require additional clearances



© 2024 Shums Coda Associates 346

346

A117.1
Section 306 – Knee and Toe Clearance

306.2 - Toe Clearance

1. Located between floor and 9"
2. Max. Depth = 25"
3. Min. Depth = 17" if toe depth is required for a fixture
4. Min. 30" width

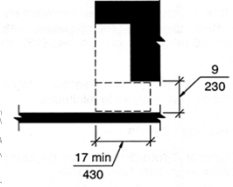


Fig. 306.2
Toe Clearance

© 2024 Shums Coda Associates 347

347

A117.1
Section 306 – Knee and Toe Clearance

306.3 Knee Clearance

1. Located between 9" and 27"
2. Max. Depth = 25"
3. Min. Depth = 11" at 9" high and 8" at 27" high
4. Min. 30" width

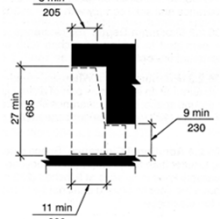


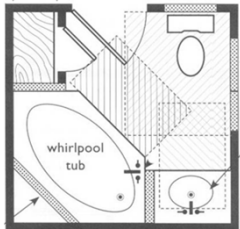
Fig. 306.3
Knee Clearance

© 2024 Shums Coda Associates 348

348

A117.1
Section 603 – Toilet and Bathing Rooms

- ▶ 603.2.2 Overlap
 - Clear floor spaces may overlap
- ▶ Doors shall NOT swing into required clear floor space
 - Unless single occupant with clear space outside swing

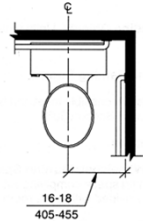


© 2024 Shums Coda Associates 349

349

A117.1
604 – Water Closets & Toilet Compartments

- ▶ 604.2 Location
- ▶ Shall have a wall on the rear and on the side.
- ▶ 16-18" from centerline to side wall

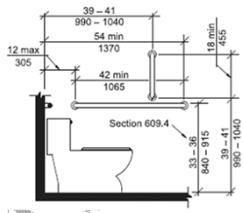


© 2024 Shums Coda Associates 350

350

A117.1
604 – Water Closets & Toilet Compartments

- ▶ 604.5 Grab bars – side wall
- ▶ Start 12" max. from back wall
- ▶ Extend 54" min. from back wall
- ▶ Vertical bar 18 inches minimum in length shall be mounted with the bottom of the bar located between 39 inches and 41 inches above the floor, and with the center line of the bar located between 39 inches and 41 inches from the rear wall.



© 2024 Shums Coda Associates 351

351

A117.1
604 – Water Closets & Toilet Compartments

- ▶ 604.5.2 Grab bars – rear wall
- ▶ 36" minimum
- ▶ 6" maximum from the side wall
- ▶ Extend 42" minimum from side wall
- ▶ Exceptions:

Note: For children's dimensions see Fig. 609.4.2

© 2024 Shums Coda Associates 352

352

A117.1
604 – Water Closets & Toilet Compartments

© 2024 Shums Coda Associates 353

353

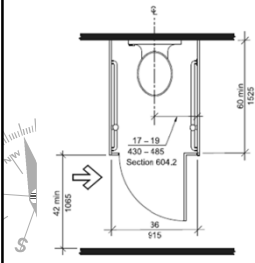
A117.1
604 – Water Closets & Toilet Compartments

- ▶ 604.9.3 Doors
- ▶ Door approach per 404 EXCEPT:
 - If latch side approach,
 - 4" max. hinge offset
 - Self closing

© 2024 Shums Coda Associates 354

354

A117.1
604 – Water Closets & Toilet Compartments




▶ **604.10 Ambulatory Compartments**

- 60" deep minimum
- 36" wide
- Doors shall not swing inside
- Grab bar req.d on each side wall

© 2024 Shums Coda Associates 355

355

A117.1 – 605 Urinals




▶ **605 – Urinals**

- ▶ Rim = 17" AFF max.
- ▶ 13.5" MIN FROM REAR WALL TO FRONT LIP
- ▶ Clear floor space shall be provided
- ▶ Flush = Automatic or per Sec. 309

© 2024 Shums Coda Associates 356

356

A117.1
607 - Bathtubs

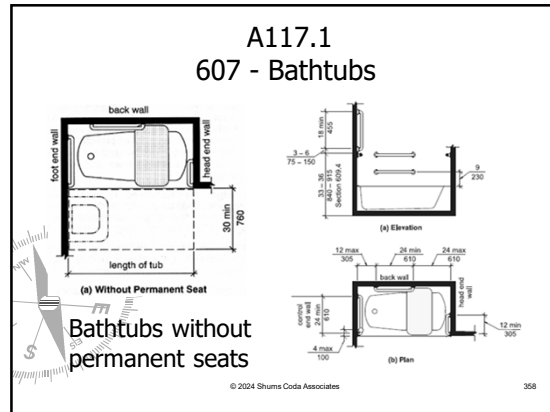


▶ 30" wide by length of tub clearance req.d

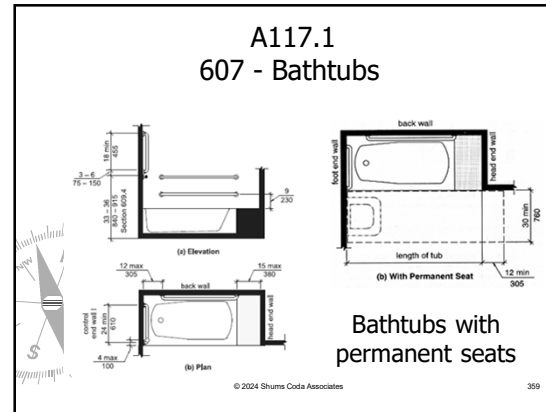
▶ Permanent Seat shall be provided at head wall or a removable in tub seat shall be provided.

© 2024 Shums Coda Associates 357

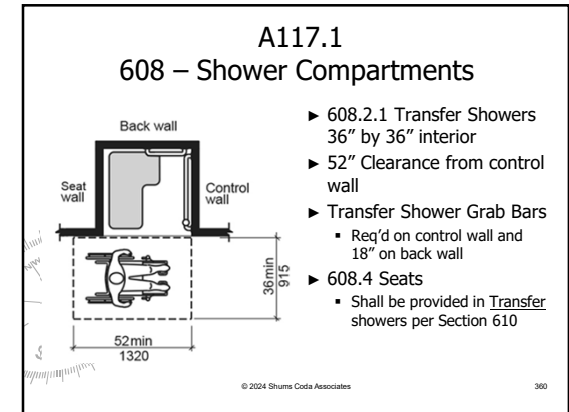
357



358

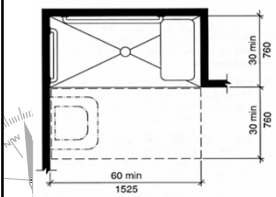


359



360

A117.1
608 – Shower Compartments



▶ 608.2.2 Roll-in Shower
▶ 30" wide by 60" long minimum
▶ 30" by 60" Clearance
▶ Roll-in Shower Grab Bars

- Provided on all 3 walls
- Except with seat: Bars shall not extend over the seat

Fig. 608.2.2
Standard Roll-In-Type Shower Compartment

© 2024 Shums Coda Associates 361

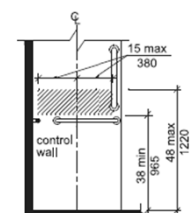
361

A117.1
608 – Shower Compartments

▶ 608.4 Controls

- Thermal control to 120 degrees max.
- Higher than grab bar 48" max. AFF

Transfer stall:
Side wall opposite seat
38" – 48" AFF



© 2024 Shums Coda Associates 362

362

A117.1
602 – Drinking Fountains



▶ 602.6 Water Flow

- ▶ Shall flow 4" high
- ▶ Angle = 30 deg. max. up to 3"
- ▶ 15 deg. max. between 3" & 5"



© 2024 Shums Coda Associates 363

363

A117.1 407 - Elevators

- ▶ 407.2.1 Call Buttons shall be 15-48" AFF
- ▶ 407.2.3 visible and audible signals req'd.
- ▶ Visible signal shall be 72" min. AFF
 - 2.5" min. ht.

364

364

A117.1 - 407 - Elevators

- ▶ 407.4.1
 - Provides requirements for minimum car dimensions.

365

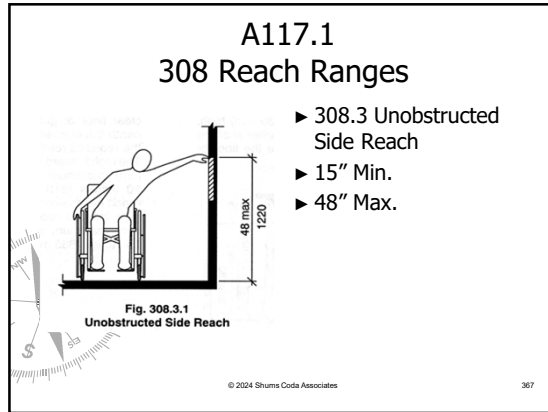
365

A117.1 308 Reach Ranges

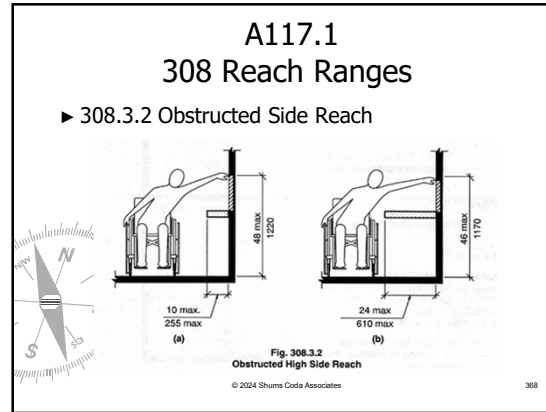
- 308.2.2 Obstructed Forward Reach
Clear Space Req'd underneath

366

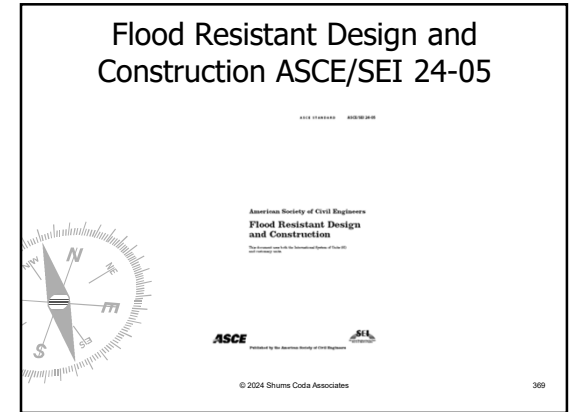
366



367



368



369

FRDS Format

- ▶ Chapter 1
 - General
- ▶ Chapter 2
 - Basic Requirements (not in coastal areas)
- ▶ Chapter 3
 - High Risk Flood Hazard Areas
- ▶ Chapter 4
 - Coastal Areas
- ▶ Chapter 5
 - Materials
- ▶ Chapter 6
 - Dry & Wet Floodproofing
- ▶ Chapter 7
 - Utilities
- ▶ Chapter 8
 - Building Access
- ▶ Chapter 9
 - Miscellaneous Construction
- ▶ Chapter 10
 - References

© 2014 Shums Coda Associates 370

370

Definitions 1.2

- ▶ Base Flood Elevation (BFE)
 - Elevation of flooding having a 1% chance of being equaled or exceeded in any given year
- ▶ Design Flood Elevation (DFE)
 - Elevation of the design flood based on the communities FIRM
- ▶ Flood Insurance Rate Map (FIRM)
 - Official community flood map from FEMA
- ▶ Floodplain
 - Any land area, including water course, susceptible to partial or complete inundation by water from any source

© 2014 Shums Coda Associates 371

371

Classification of Structures Table 1.1

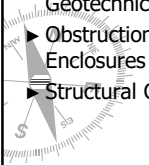
OCCUPANCY CATEGORY	NATURE OF OCCUPANCY
IV	Buildings and other structures designated as essential facilities, including but not limited to: <ul style="list-style-type: none"> ▪ Hospitals and other health care facilities having surgery or emergency treatment facilities. ▪ Fire, rescue and police stations and emergency vehicle garages. ▪ Designated earthquake, hurricane or other emergency shelters. ▪ Designated emergency preparedness, communication, and operation centers and other facilities required for emergency response. ▪ Power-generating stations and other public utility facilities required as emergency backup facilities for Occupancy Category IV structures. ▪ Structures containing highly toxic materials as defined by Section 307 where the quantity of the material exceeds the maximum allowable quantities of Table 307.1 (2). ▪ Aviation control towers, air traffic control centers and emergency aircraft hangars. ▪ Buildings and other structures having critical national defense functions. ▪ Water treatment facilities required to maintain water resource for fire suppression. view regulations to be disseminated to the public, if released.

© 2014 Shums Coda Associates 372

372

Basic Design 1.5

- ▶ Elevation Of The Structure Relative To DFE
- ▶ Foundations And Geotechnical Factors
- ▶ Obstructions Or Enclosures Below DFE
- ▶ Structural Connections

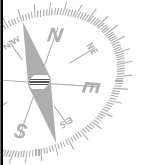


© 2024 Shums Coda Associates 373

373

Basic Design 1.5

- ▶ Use Of Flood-Damage-Resistant Materials
- ▶ Floodproofing
- ▶ Utilities
- ▶ Means Of Egress
- ▶ Adverse Impacts To Other Structures And Property



© 2024 Shums Coda Associates 374

374

International Mechanical Code



2021 International Mechanical Code (IMC)

© 2024 Shums Coda Associates 375

375

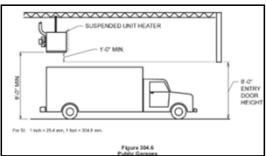
IMC Format

- Chapter 1
 - Administration
- Chapter 2
 - Definitions
- Chapter 3
 - General Regulations
- Chapter 4
 - Ventilation
- Chapter 5
 - Exhaust Systems
- Chapter 6
 - Duct Systems
- Chapter 7
 - Combustion Air
- Chapter 8
 - Chimneys & Vents
- Chapter 9
 - Specific Appliances, Fireplaces
- Chapter 10
 - Boilers, Water Heaters
- Chapter 11
 - Refrigeration
- Chapter 12-14
 - Hydronics, Fuel Oil, Solar
- Chapter 15
 - Referenced Standards

© 2024 Shums Coda Associates 376

376

Public garages 304.6




□ Appliances located in public garages, motor fueling-dispensing facilities, repair garages or other areas frequented by motor vehicles, shall be installed a minimum of 8 feet above the floor. Where motor vehicles are capable of passing under an appliance, the appliance shall be installed at the clearances required by the appliance manufacturer and not less than 1 foot higher than the tallest vehicle garage door opening.

© 2024 Shums Coda Associates 377

377

Clearances from grade IMC 304.10, IFGC 305.7



□ Equipment and appliances installed at grade level shall be supported on a level concrete slab or other approved material extending not less than 3 inches above adjoining grade or shall be suspended not less than 6 inches above adjoining grade. Such support shall be in accordance with the manufacturer's installation instructions.

© 2024 Shums Coda Associates 378

378

Equipment and appliances on roofs or elevated structures – IMC & IFGC 306.5

Where equipment requiring access and appliances are installed on roofs or elevated structures at a height exceeding 16 feet, such access shall be provided by a permanent approved means of access, the extent of which shall be from grade or floor level to the equipment and appliances' level service space. Such access shall not require climbing over obstructions greater than 30 inches high or walking on roofs having a slope greater than four units vertical in 12 units horizontal. Where access involves climbing over parapet walls, the height shall be measured to the top of the parapet wall.

Figure 306.5
Access height above grade

379 © 2024 Shums Coda Associates

379

401.4 Intake Opening location

- Outside air exhaust and intake openings
 - Minimum of 10 feet from lot lines or buildings on the same lot.

380 © 2024 Shums Coda Associates

380

401.4 Intake openings

- Mechanical and gravity outside air intake openings
 - Minimum of 10 feet from any hazardous or noxious contaminant such as vents, chimneys, plumbing vents, streets, alleys, parking lots and loading docks, except as otherwise specified as specified in Item 3 of 501.2.1

381 © 2024 Shums Coda Associates

381


401.4
Intake Opening Location

- Intake openings shall be located not less than 3 feet below contaminant sources where such sources are located within 10 feet of the opening.
- Intake openings on structures in flood hazard areas shall be at or above the design flood level.

© 2024 Shums Coda Associates 382

382

402.1
Natural ventilation




- Natural ventilation of an occupied space shall be through windows, doors, louvers or other openings to the outdoors.
 - 4% of room area

© 2024 Shums Coda Associates 383

383

403
Mechanical Ventilation



- Mechanical ventilation shall be provided by a method of supply air and return or exhaust air.
 - Supply air shall be approximately equal to the return and exhaust air.
 - Negative or positive pressure.
- Designed to deliver the required rate of supply air to the occupied zone within an occupied space.

© 2024 Shums Coda Associates 384

384

403.3 Ventilation

TABLE 403.3.1.1 MINIMUM VENTILATION RATES


OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT ² *	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, P ₀ CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, P _a CFM/FT ² *	EXHAUST AIRFLOW RATE CFM/FT ² *
Correctional facilities				
Booking/waiting	50	7.5	0.06	—
Cells				
without plumbing fixtures	25	5	0.12	—
with plumbing fixtures [†]	25	5	0.12	1.0
Day room	30	5	0.06	—
Dining halls (see "Food and beverage service")	—	—	—	—
Guard stations	15	5	0.06	—
Dry cleaners, laundries				
Coin-operated dry cleaner	20	15	—	—
Coin-operated laundries	20	7.5	0.12	—
Commercial dry cleaner	30	30	—	—
Commercial laundry	10	5	0.12	—

* 2014 Shums Coda Associates 385

385

404 Enclosed Parking Garages

- System not required to operate continuously where arranged to operate automatically upon detection of a concentration of carbon monoxide of 25 ppm by automatic detection devices.
- Automatic operation of the system shall not reduce the ventilation rate below 0.05 cfm per square foot of the floor area and the system shall be capable of producing a ventilation rate of 0.75 cfm per square foot.
- Connecting accessory offices, waiting rooms, ticket booths and similar uses shall be maintained at a positive pressure



© 2024 Shums Coda Associates 386

386


502 Required Exhaust Systems

- Aircraft fueling and defueling
- Battery-charging areas
- Stationary lead-acid battery systems
- Valve-regulated lead-acid batteries
- Dry cleaning plants
- Application of flammable finishes
- Hazardous materials
- Hazardous production materials (HPM)
- Motion picture projectors
- Organic coating processes
- Public garages
- Motor vehicle operation
- Repair garages
- Tire rebuilding or recapping
- Specific rooms
 - bathrooms, locker rooms, smoking lounges and toilet rooms

© 2024 Shums Coda Associates 387

387

502.14 Motor Vehicle Operation




Sliding Balancer Track

- In addition to Section 403, areas in which stationary motor vehicles are operated shall be provided with a source capture system that connects directly to the motor vehicle exhaust systems.
 - Exceptions:
 1. electrically powered vehicle repair.
 2. one- and two-family dwellings.
 3. service areas where engines are operated inside the building only for the duration necessary to move the motor vehicles in and out of the building.

© 2024 Shums Coda Associates 388

388

502.15 Repair Garages




- Where Class I liquids or LP-gas are stored or used within a building having a basement or pit wherein flammable vapors could accumulate, the basement or pit shall be provided with ventilation designed to prevent the accumulation of flammable vapors therein.

© 2024 Shums Coda Associates 389

389

Section 504 Clothes Dryer Exhaust




- Clothes dryers shall be exhausted in accordance with the manufacturer's instructions.
- Shall be independent of all other systems and shall convey the moisture and any products of combustion to the outside of the building.
 - Exception: This section shall not apply to listed and labeled condensing (ductless) clothes dryers.

© 2024 Shums Coda Associates 390

390

504.5
Makeup air




- Installations exhausting more than 200 cfm shall be provided with makeup air.
- Closet installation - an opening having an area of not less than 100 square inches shall be provided in the closet enclosure or makeup air shall be provided by other approved means.

© 2024 Shums Coda Associates 391

391

504.6
Domestic Clothes Dryer Ducts



- Exhaust ducts shall be constructed of metal and shall have a smooth interior finish.
- Minimum nominal size of 4 inches in diameter.
- Entire system shall be supported and secured in place.
- The male end of the duct at overlapped duct joints shall extend in the direction of airflow.

© 2024 Shums Coda Associates 392

392

504.9.4.1
Maximum length


- The maximum length of the exhaust duct shall be 35 feet from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are used, the maximum length of the exhaust duct shall be reduced in accordance with Table 504.6.4.1.

TABLE 504.6.4.1 DRYER EXHAUST DUCT FITTING EQUIVALENT LENGTH	
DRYER EXHAUST DUCT FITTING TYPE	EQUIVALENT LENGTH
4" radius mitered 45-degree elbow	2 feet 6 inches
4" radius mitered 90-degree elbow	5 feet
6" radius smooth 45-degree elbow	1 foot
6" radius smooth 90-degree elbow	1 foot 9 inches
8" radius smooth 45-degree elbow	1 foot
8" radius smooth 90-degree elbow	1 foot 7 inches
10" radius smooth 45-degree elbow	9 inches
10" radius smooth 90-degree elbow	1 foot 6 inches

© 2024 Shums Coda Associates 393

393

504.10
Commercial Clothes Dryers




- Exhaust ducts serving Type 2 clothes dryers shall comply with the appliance manufacturer's installation instructions.
- Exhaust fan motors shall be located outside of the airstream.
- In multiple installations, the fan shall operate continuously or be interlocked to operate when any individual unit is operating.
- Ducts shall have a minimum clearance of 6 inches to combustible materials.
- Transition ducts limited to single lengths not to exceed 8 feet in length and shall be listed and labeled for the application.
- Transition ducts shall not be concealed within construction.

© 2024 Shums Coda Associates 394

394

507.2
Commercial Kitchen Hoods




- Type I hoods.
 - cooking appliances produce grease or smoke, such as occurs with griddles, fryers, broilers, ovens, ranges and wok ranges.
- Type II hoods
 - where cooking or dishwashing appliances produce heat or steam and do not produce grease or smoke, such as steamers, kettles, pasta cookers and dishwashing machines.

© 2024 Shums Coda Associates 395

395

506.3.1.1
Grease Duct Materials




- Type I hoods shall be constructed of steel not less than 0.0575 inch (No. 16 Gage) in thickness or stainless steel not less than 0.0450 inch (No. 18 Gage) in thickness.

© 2024 Shums Coda Associates 396

396

**506.3.1.2
Makeup Air Ducts**

- Make up air ducts connecting to or within 18 inches of a Type I hood shall be constructed and installed in accordance with Sections 603.1, 603.4, 603.5, 603.11 and 603.14.
- Duct insulation installed within 18 inches of a Type I hood shall be noncombustible or shall be listed for the application.




© 2024 Shums Coda Associates 397

397

**506.3.2.1
Duct Joint Types**

- Duct joints shall be butt joints, welded flange joints with a maximum flange depth of 1/2 inch or overlapping duct joints of either the telescoping or bell type.
- Overlapping joints shall be installed to prevent ledges and obstructions from collecting grease or interfering with gravity drainage to the intended collection point.
- The difference between the inside cross-sectional dimensions of overlapping sections of duct shall not exceed 1/4 inch.
- The length of overlap for overlapping duct joints shall not exceed 2 inches.




© 2024 Shums Coda Associates 398

398

**506.3.4
Air Velocity**


- Grease duct systems serving a Type I hood shall be designed and installed to provide an air velocity within the duct system of not less than 500 feet per minute



© 2024 Shums Coda Associates 399

399

506.3.6
Duct Clearances



- Where enclosures are not required, grease duct systems and exhaust equipment serving a Type I hood shall have a clearance to combustible construction of not less than 18 inches, and shall have a clearance to noncombustible construction and gypsum wallboard attached to noncombustible structures of not less than 3 inches

© 2024 Shums Coda Associates 400

400

506.3.10
Duct Enclosure


- A grease duct serving a Type I hood that penetrates a ceiling, wall or floor shall be enclosed from the point of penetration to the outlet terminal.
- A duct shall penetrate exterior walls only at locations where unprotected openings are permitted by the International Building Code.
- The duct enclosure shall serve a single grease duct and shall not contain other ducts, piping or wiring systems.
- Duct enclosures shall be either field-applied or factory-built.
- Duct enclosures shall have a fire-resistance rating not less than that of the floor assembly penetrated, but need not exceed 2 hours.
- Duct enclosures shall be as prescribed by Section 506.3.10.1, 506.3.10.2 or 506.3.10.3.

© 2024 Shums Coda Associates 401

401

506.3.13
Kitchen Exhaust Termination

- 40 inches above the roof surface.
- Permitted to terminate through exterior walls where the smoke, grease, gases, vapors, and odors in the discharge from such terminations do not create a public nuisance or a fire hazard.
- Shall not be located where protected openings are required by the International Building Code.
- Other exterior openings shall not be located within 3 feet of such terminations.




© 2024 Shums Coda Associates 402

402

506.3.12.3
Kitchen Exhaust Termination

- Not less than 10 feet horizontally from parts of the same or contiguous buildings, adjacent property lines and air intake openings into any building
- Not less than 10 feet above the adjoining grade level.
- Exhaust outlets shall be located not less than 10 feet horizontally from or not less than 3 feet above air intake openings into any building.




© 2024 Shums Coda Associates 403

403

507.3 &
Hood Materials

- Type I hoods
 - steel not less than 0.0466 inch (No. 18 MSG) in thickness, or stainless steel not less than 0.0335 (No. 20 MSG) inch in thickness.
- Type II hoods
 - steel not less than 0.0296 inch (No. 22 Gage) in thickness, stainless steel not less than 0.0220 inch (No. 24 Gage) in thickness, copper sheets weighing not less than 24 ounces per square foot, or of other approved material and gage.




© 2024 Shums Coda Associates 404

404

507.2.6
Clearances for Type I hood

- A Type I hood shall be installed with a clearance to combustibles of not less than 18 inches.
 - Exception: Clearance shall not be required from gypsum wallboard or 1/2-inch or thicker cementitious wallboard attached to noncombustible structures provided that a smooth, cleanable, nonabsorbent and noncombustible material is installed between the hood and the gypsum or cementitious wallboard over an area extending not less than 18 inches in all directions from the hood.

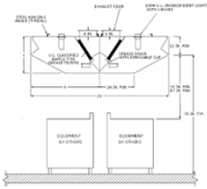


© 2024 Shums Coda Associates 405

405

507.4.1 Canopy Size And Location

□ The inside lower edge of canopy-type commercial cooking hoods shall overhang or extend a horizontal distance of not less than 6 inches beyond the edge of the cooking surface, on all open sides. The vertical distance between the front lower lip of the hood and the cooking surface shall not exceed 4 feet.




© 2024 Shums Coda Associates 406

406

602.2.1 Air Plenums

□ Materials

- Noncombustible
- Flame spread index of not more than 25 and a smoke-developed index of not more than 50
 - Wiring
 - Fire Sprinkler Piping
 - Pneumatic tubing
 - Electrical equipment
 - Foam plastic insulation




© 2024 Shums Coda Associates 407

407

603.10 Duct Support

□ Per SMACNA

□ Per manufacturer's instructions.



© 2024 Shums Coda Associates 408

408

**917.1
Cooking Appliances**

- Cooking appliances that are designed for permanent installation, including ranges, ovens, stoves, broilers, grills, fryers, griddles and barbecues, shall be listed, labeled and installed in accordance with the manufacturer's installation instructions.
- Commercial electric cooking appliances shall be listed and labeled in accordance with UL 197.
- Household electric ranges shall be listed and labeled in accordance with UL 858.
- Microwave cooking appliances shall be listed and labeled in accordance with UL 923.
- Oil-burning stoves shall be listed and labeled in accordance with UL 896. Solid-fuel-fired ovens shall be listed and labeled in accordance with UL 2162.

© 2024 Shums Coda Associates 409

409

**917.2
Prohibited Location.**




- Cooking appliances designed, tested, listed and labeled for use in commercial occupancies shall not be installed within dwelling units or within any area where domestic cooking operations occur.

© 2024 Shums Coda Associates 410

410

**Chapter 11
Refrigeration**

- Governs the design, installation, construction and repair of refrigeration systems that vaporize and liquefy a fluid during the refrigerating cycle.
- Permanently installed refrigerant storage systems and other components shall be considered as part of the refrigeration system to which they are attached.



© 2024 Shums Coda Associates 411

411

1102
System Requirements

- The system classification, allowable refrigerants, maximum quantity, enclosure requirements, location limitations, and field pressure test requirements shall be determined as follows:
 - 1. Determine the refrigeration system's classification - Section 1103.3.
 - 2. Determine the refrigerant classification - Section 1103.1.
 - 3. Determine the maximum allowable quantity of refrigerant - Section 1104
 - 4. Determine the system enclosure requirements - Section 1104.
 - 5. Installation shall be subject to the limitations of Chapter 3.
 - 6. Nonfactory-tested, field-erected equipment and appliances shall be pressure tested - Section 1108.

© 2024 Shums Coda Associates 412

412

1104.2
Machinery Room


- Except as provided in Sections 1104.2.1 and 1104.2.2, all components containing the refrigerant shall be located either outdoors or in a machinery room where the quantity of refrigerant in an independent circuit of a system exceeds the amounts shown in Table 1103.1.
- Shall also apply when the amount for any blend component exceeds that indicated in Table 1103.1 for that component.
- Shall also apply when the combined amount of the blend components exceeds a limit of 69,100 parts per million (ppm) by volume.
 - Exception:
 - 1. Machinery rooms are not required for listed equipment and appliances containing not more than 6.6 pounds of refrigerant, regardless of the refrigerant's safety classification, where installed in accordance with the equipment's or appliance's listing and the equipment or appliance manufacturer's installation instructions.

© 2024 Shums Coda Associates 413

413

1105 - Machinery Room, General Requirements

- Must be designed and constructed in accordance with the International Building Code and this section.
- Ducts and air handlers in the machinery room that operate at a lower pressure than the room shall be sealed to prevent any refrigerant leakage from entering the airstream.
- Refrigerant detectors in machinery rooms shall be provided as required by the International Fire Code.
- Periodic tests of the mechanical ventilating system shall be performed in accordance with manufacturer's specifications and as required by the code official.



© 2024 Shums Coda Associates 414

414


1105.5 Fuel-burning appliances.

- Open flames that use combustion air from the machinery room shall not be installed in a machinery room.
 - Exception:
 1. Matches, lighters, halide leak detectors and similar devices.
 2. Where the refrigerant is carbon dioxide or water.
 3. Appliances where combustion air is ducted from outside the machinery room and sealed in such a manner as to prevent any refrigerant leakage from entering the combustion chamber, or where a refrigerant vapor detector is employed to automatically shut off the combustion process in the event of refrigerant leakage.

© 2024 Shums Coda Associates 415

415

1106.6 Emergency Signs And Labels

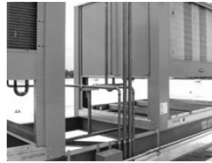


- Refrigeration units and systems shall be provided with approved emergency signs, charts, and labels in accordance with the International Fire Code.

© 2024 Shums Coda Associates 416

416

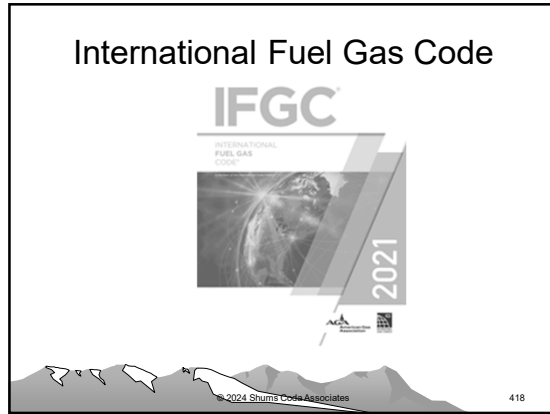
1107 Refrigerant Piping



- Piping/Tubing
 - Steel
 - Copper or Brass Pipe
 - Copper Tube
 - Copper Tubing Joints

© 2024 Shums Coda Associates 417

417



418

IFGC Format

• Chapter 1 – Administration	• Chapter 5 – Chimneys & Vents
• Chapter 2 – Definitions	• Chapter 6 – Specific Appliances
• Chapter 3 – General Regulations	• Chapter 7 – Gaseous Hydrogen Systems
• Chapter 4 – Gas Piping Installation	• Chapter 8 – Referenced Standards

419

303.3 Prohibited locations

- Fuel burning appliances shall not be located in or obtain combustion air from:
 - Sleeping rooms
 - Bathrooms
 - Toilet rooms
 - Storage closets
 - Surgical rooms
 - Exceptions allowed

420

304 Combustion Air

- Indoor Air
 - Minimum required volume shall be 50 cubic feet per 1,000 Btu/h of appliance input rating.
- Outdoor Air
 - Two-permanent-openings method
 - One-permanent-opening method



421

304.10 Louvers and grills



- Minimum ¼-inch screen mesh
- If free open area is not known, can assume 75% for metal louvers and 25% for wood louvers
- Motorized louvers must be interlocked with equipment served.



422

305.3 Elevation of ignition source

- 18-inch elevation above floor of garage to ignition source.
 - Applies to public, private, repair and parking garages, motor fuel dispensing facilities and other hazardous locations.
 - Appliances listed as flammable vapor resistant (VFR) are exempt.



423

305.4 Public garages 305.5 Private garages

- Appliances installed in public garages must be elevated 8-feet above the floor.
- 6-feet above the floor for residential garages.
 - Height of garage door would be a factor to consider.
 - Protection from vehicle damage in lieu of elevation (see Section 312 of the IFC – 36" high and able to resist force of 12,000 pounds at 36")
 - NFPA 30A applies to installation in repair garages



424

404.4 Piping in concealed locations

- The following are not allowed to be concealed:
 - Unions
 - Tubing fittings (does not include CSST)
 - Right and left couplings
 - Compression couplings
 - Swing joints



425

404.12 Minimum burial depth

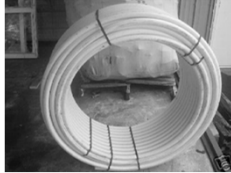
- Underground piping to be minimum of 12-inches below grade
 - Not dependant on working pressure
 - Individual lines to outside lights, grills or other appliances may be a minimum 8-inches below grade
 - Only allowed where not subject to physical damage
 - Code official approval required



426

404.17 Plastic pipe

- May only be installed underground outside of the structure
 - May terminate above ground outside building where installed in approved riser
 - May terminate inside building with wall head adapter when piping inserted in material approved for inside location
- Minimum 18 AWG tracer wire with terminations accessible – insulation must be approved for burial.



© 2024 Shuma Code Associates

427

427

406.4 Testing of gas piping

- Test pressure to be minimum 1-½ times working pressure – not less than 3-psi
- Duration of test – 10 minutes for systems less than 10 cubic feet
 - ½ hour for each additional 500 cubic feet or fraction thereof
- Single-family dwellings will fall within the 10-cubic feet (approximately 1,600 feet of 1-inch pipe)



© 2024 Shuma Code Associates

428

428

409.5 Equipment shutoff valve

- Required for all appliances
- Must be accessible within same room
 - Could be behind range or dryer, or in control compartment of gas fireplace
- To be located within 6-feet of appliance
- Must be upstream of union, appliance connector

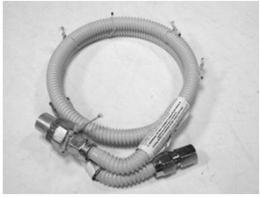


© 2024 Shuma Code Associates

429

429

411.1.3 Appliance connectors




- Maximum length 6-feet
- Shall not be concealed within or extend through walls, floors, ceilings, partitions or appliance housing
 - Exception allowed for fireplace inserts with factory equipped grommets, sleeves or other means of protection

© 2024 Shum's Code Associates 430

430

International Plumbing Code



© 2024 Shum's Code Associates 431

431

IPC Format

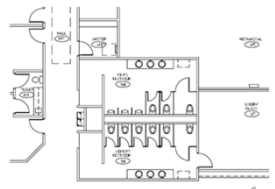
- Chapter 1
 - Administration
- Chapter 2
 - Definitions
- Chapter 3
 - General Regulations
- Chapter 4
 - Fixtures
- Chapter 5
 - Water Heaters
- Chapter 6
 - Water Supply and Distribution
- Chapter 7
 - Sanitary Drainage
- Chapter 8
 - Indirect/Special Wastes
- Chapter 9
 - Vents
- Chapter 10
 - Traps, Interceptors
- Chapter 11
 - Storm Drainage
- Chapter 12
 - Special Piping
- Chapter 13
 - Referenced Standards

© 2024 Shum's Code Associates 432

432

Number of Fixtures 403

- Plumbing fixtures shall be provided for the type of occupancy and in the minimum number shown in Table 403.1.



© 2024 Shuma Code Associates 433

433

2	Business	Buildings for the transaction of business, professional services, other services involving merchandise, office buildings, banks, ambulatory care, light industrial and similar uses	1 per 25 for the first 50 and 1 per 50 for the remainder exceeding 50	1 per 40 for the first 80 and 1 per 80 for the remainder exceeding 80	—	1 per 100	1 service sink
---	----------	---	---	---	---	-----------	----------------

15000 s.f. office floor plate
Occupant load = 100
50 male, 50 female
2 Water Closets each
2 Lavatories each
1 drinking fountain 1-service sink

© 2024 Shuma Code Associates 434

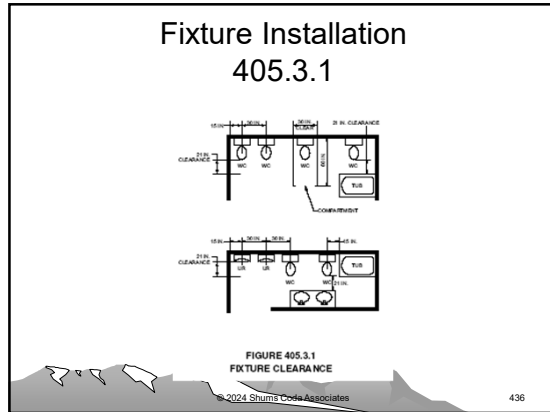
434

Separate Facilities 403.2

- Where plumbing fixtures are required, separate facilities shall be provided for each sex.
- Exceptions:
 - Separate employee facilities shall not be required in occupancies in which 15 or less people are employed.
 - Structures or tenant spaces with a total occupant load, including both employees and customers, of 15 or less.
 - Mercantile occupancies in which the maximum occupant load is 100
 - Not required where single sex toilet facilities are provided 403.1.2
 - Not required where toilet facilities and lavs are provided for use by both sexes per 405.3.4

© 2024 Shuma Code Associates 435

435



436

Waste Piping Materials 702

- Cast Iron
- Copper DWV
- ABS
- PVC

© 2024 Shum's Code Associates

437

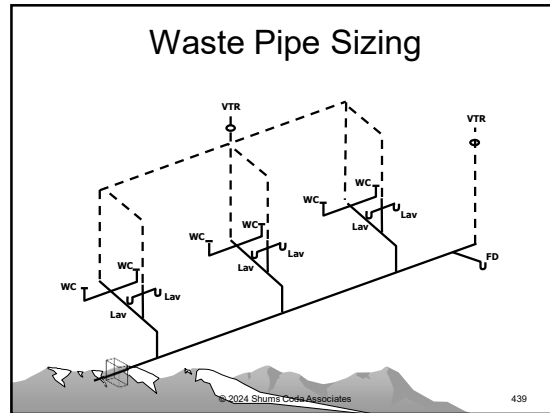
Fixture Units 709.1

TABLE 709.1
DRAINAGE FIXTURE UNITS FOR FIXTURES AND GROUPS

FIXTURE TYPE	DRAINAGE FIXTURE UNIT VALUE AS LOAD FACTOR	MINIMUM SIZE OF TRAP (Inches)
Floor drain	Note b	2
Kitchen sink, domestic	2	1½
Kitchen sink, domestic with food waste grinder and/or dishwasher	2	1½
Laundry tray (1 or 2 compartments)	2	1½
Lavatory	1	1¼
Shower (based on the total flow rate through showerheads and body sprays)		
Flow rate:		
5.7 gpm or less	2	1½
Greater than 5.7 gpm to 12.3 gpm	3	2
Greater than 12.3 gpm to 25.9 gpm	5	3
Greater than 25.9 gpm to 55.6 gpm	6	4
Service sink	2	1½
Sink	2	1½
Urinal	4	Note d
Urinal, 1 gallon per flush or less	2 ^a	Note d
Urinal, recirculator supplied	½	Note d
Wash sink (circular or multiple) each set of faucets	2	1½
Water closet, flushometer tank, public or private	4 ^a	Note d
Water closet, private (1.6 gpf)	3 ^a	Note d
Water closet, private (flushing greater than 1.6 gpf)	4 ^a	Note d
Water closet, public (1.6 gpf)	4 ^a	Note d
Water closet, public (flushing greater than 1.6 gpf)	4 ^a	Note d

© 2024 Shum's Code Associates

438



439

Building Drains/Sewers Table 710.1 (1)

TABLE 710.1(1)
BUILDING DRAINS AND SEWERS
MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS CONNECTED TO ANY PORTION OF THE BUILDING DRAIN OR THE BUILDING SEWER, INCLUDING BRANCHES OF THE BUILDING DRAIN*

DIAMETER OF PIPE (inches)	Slope per foot			
	1/8 inch	1/4 inch	1/2 inch	3/4 inch
1 1/4	—	—	1	1
1 1/2	—	—	3	3
2	—	—	21	26
2 1/2	—	—	24	31
3	—	36	42	50
4	—	180	216	250
5	—	390	489	575
6	—	700	840	1,000
8	1,400	1,600	1,920	2,300
10	2,500	2,900	3,500	4,200
12	3,900	4,600	5,600	6,700
15	7,000	8,300	10,000	12,000

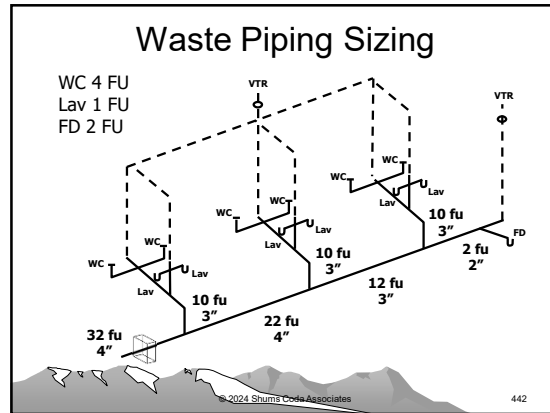
440

Horizontal Fixtures & Stacks Table 710.1(2)

TABLE 710.1(2)
HORIZONTAL FIXTURE BRANCHES AND STACKS*
MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS (DFU)

DIAMETER OF PIPE (inches)	Stacks*			
	Total for horizontal branch	Total discharge into one branch interval	Total for stack of three branch intervals or less	Total for stack greater than three branch intervals
1 1/2	3	2	4	5
2	6	6	10	24
2 1/2	12	9	20	42
3	20	20	48	72
4	160	90	240	500
5	360	200	540	1,100
6	620	350	960	1,900
8	1,400	600	2,300	3,600
10	2,500	1,000	3,800	5,600
12	2,900	1,500	6,000	8,400
15	7,000	Note c	Note c	Note c

441



442

Installation 704.1

- Horizontal drainage piping shall be installed in uniform alignment at uniform slopes. The minimum slope of a horizontal drainage pipe shall be in accordance with Table 704.1.

SIZE (inches)	MINIMUM SLOPE (inch per foot)
3/4 or less	1/4
3/4 to 6	1/8
8 or larger	1/16

443

443

Cleanouts 708

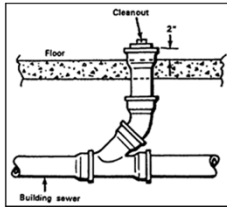
- All horizontal drains shall be provided with cleanouts located not more than 100 feet apart.

444

444

Cleanouts 708

- Building sewers
 - located not more than 100 feet apart measured from the upstream entrance of the cleanout.
- Building sewers 8 inches and larger
 - manholes located not more than 200 feet from the junction of the building drain and building sewer.
 - each change in direction and at intervals of not more than 400 feet apart.



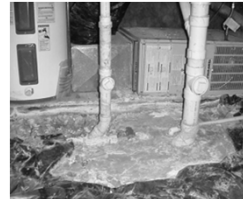
© 2024 Shuma Code Associates

445

445

Cleanouts 708

- Cleanouts shall be installed at each change of direction of the building drain or horizontal waste or soil lines greater than 45 degrees. Where more than one change of direction occurs in a run of piping, only one cleanout shall be required for each 40 feet of developed length of the drainage piping.
- A cleanout shall be provided at the base of each waste or soil stack.



© 2024 Shuma Code Associates

446

446

Cleanouts 708

- Near the junction of the building drain and the building sewer.
 - inside or outside the building wall
 - brought up to the finished ground level or to the basement floor level.
 - two-way cleanout is allowed
 - not required if the cleanout on a 3-inch or larger diameter soil stack is located within a developed length of 10 feet of the building drain and building sewer connection.



© 2024 Shuma Code Associates

447

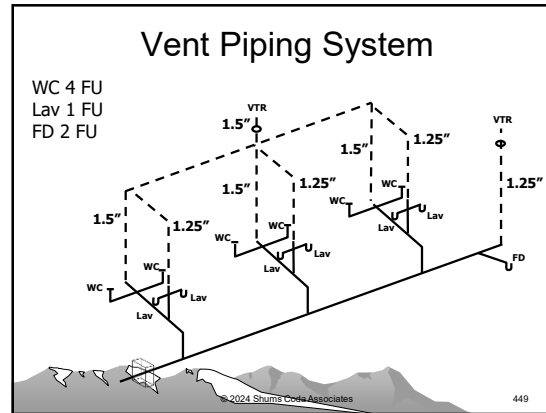
447

Vent Piping Sizing 916

TABLE 917.2 SINGLE STACK SIZE

STACK SIZE (inches)	MAXIMUM CONNECTED DRAINAGE FIXTURE UNITS		
	Stacks less than 75 feet in height	Stacks 75 feet to less than 160 feet in height	Stacks 160 feet and greater in height
3	24	NP	NP
4	225	24	NP
5	480	225	24
6	1,015	480	225
8	2,320	1,015	480
10	4,500	2,320	1,015
12	8,100	4,500	2,320
15	13,600	8,100	4,500

448



449


Water Service 603.1

- The water service pipe shall be sized to supply water to the structure in the quantities and at the pressures required in this code. The minimum diameter of water service pipe shall be 3/4 inch.

450

Separation Of Water Service And Building Sewer – 603.2

- Water service pipe and the building sewer shall be separated by 5 feet of undisturbed or compacted earth.




© 2024 Shuma Code Associates 451

451

Separation Of Water Service And Building Sewer - 603.2

- The required separation distance shall not apply where the bottom of the water service pipe within 5 feet of the sewer is a minimum of 12 inches above the top of the highest point of the sewer and the pipe materials conform to Section 703.1.

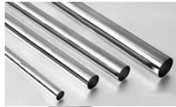



© 2024 Shuma Code Associates 452

452

Materials 605

- Table 605.4
 - Copper
 - PB
 - PEX
 - Brass



© 2024 Shuma Code Associates 453

453

Water Piping Sizing 604.5

- The minimum size water service pipe shall be 3/4 inch.
- The size of water service mains, branch mains and risers shall be determined according to:
 - water supply demand (gpm)
 - available water pressure (psi)
 - friction loss due to the water meter and developed length of pipe (feet), including equivalent length of fittings.



© 2024 Shuma Code Associates

454

454

Location Of Full-open Valves 606.1

1. On the building water service pipe from the public water supply near the curb.
2. On the water distribution supply pipe at the entrance into the structure.
3. On the discharge side of every water meter.
4. On the base of every water riser pipe in occupancies other than multiple-family residential occupancies that are two stories or less in height and in one- and two-family residential occupancies.
5. On the top of every water down-feed pipe in occupancies other than one- and two-family residential occupancies.
6. On the entrance to every water supply pipe to a dwelling unit, except where supplying a single fixture equipped with individual stops.
7. On the water supply pipe to a gravity or pressurized water tank.
8. On the water supply pipe to every water heater.



© 2024 Shuma Code Associates

455

455

Location Of Shutoff Valves 606.2

- Shutoff valves shall be installed in the following locations:
 1. On the fixture supply to each plumbing fixture other than bathtubs and showers in one- and two-family residential occupancies, and other than in individual guestrooms that are provided with unit shutoff valves in hotels, motels, boarding houses and similar occupancies.
 2. On the water supply pipe to each sillcock.
 3. On the water supply pipe to each appliance or mechanical equipment.




© 2024 Shuma Code Associates

456

456

Thermal Expansion Control 607.3

- A means of controlling increased pressure caused by thermal expansion shall be provided where required in accordance with Sections 607.3.1 and 607.3.2.
- Pressure-reducing valve.
 - For water service system sizes up to and including 2 inches (51 mm), a device for controlling pressure shall be installed where, because of thermal expansion, the pressure on the downstream side of a pressure-reducing valve exceeds the pressure-reducing valve setting.




© 2024 Shuma Code Associates 457

457

Thermal Expansion Control 607.3

- Backflow prevention device or check valve.
 - Where a backflow prevention device, check valve or other device is installed on a water supply system utilizing storage water heating equipment such that thermal expansion causes an increase in pressure, a device for controlling pressure shall be installed.




© 2024 Shuma Code Associates 458

458

Backflow Prevention 608.14

- Beverage dispensers.
 - backflow preventer conforming to ASSE 1022 or by an air gap.
- Potable supply to the boiler.
 - intermediate atmospheric vent complying
- Conditioning chemicals.
 - air gap or a reduced pressure principle backflow preventer.
- Heat exchangers.
 - toxic transfer fluid
 - double-wall construction
 - nontoxic transfer fluid
 - single-wall construction.



© 2024 Shuma Code Associates 459

459

Interceptors And Separators 1003

- Interceptors and separators shall be provided to prevent the discharge of oil, grease, sand and other substances harmful or hazardous to the building drainage system, the public sewer, or sewage treatment plant or processes.



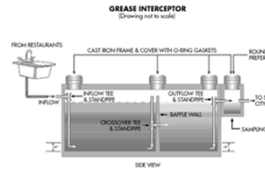
© 2024 Shuma Code Associates

460

460

Grease Traps And Grease Interceptors Required - 1003.3.1

- A grease trap or grease interceptor shall be required to receive the drainage from fixtures and equipment with grease-laden waste located in food preparation areas, such as in restaurants, hotel kitchens, hospitals, school kitchens, bars, factory cafeterias, or restaurants and clubs.



© 2024 Shuma Code Associates

461

461

Oil Separators Required 1003.4

- At repair garages, carwashing facilities with engine or undercarriage cleaning capability and at factories where oily and flammable liquid wastes are produced, separators shall be installed into which all oil-bearing, grease-bearing or flammable wastes shall be discharged before emptying in the building drainage system or other point of disposal.




© 2024 Shuma Code Associates

462

462

Roof Drain Systems Sizing 1106

- The size of the vertical conductors and leaders, building storm drains, building storm sewers, and any horizontal branches of such drains or sewers shall be based on the 100-year hourly rainfall rate indicated in Figure 1106.1 or on other rainfall rates determined from approved local weather data.



463

Roof Drain Systems Sizing 1106

- Vertical conductors and leaders shall be sized for the maximum projected roof area, in accordance with Table 1106.2.

TABLE 1106.2(1)
SIZE OF CIRCULAR VERTICAL CONDUCTORS AND LEADERS

DIAMETER OF LEADER (inches) ^a	HORIZONTALLY PROJECTED ROOF AREA (square feet)											
	Rainfall rate (inches per hour)											
	1	2	3	4	5	6	7	8	9	10	11	12
2	2,880	1,440	960	720	575	480	410	360	320	290	260	240
3	8,800	4,400	2,930	2,200	1,700	1,470	1,260	1,100	980	880	800	730
4	18,400	9,200	6,130	4,600	3,680	3,070	2,630	2,300	2,045	1,840	1,675	1,530
5	34,600	17,300	11,530	8,650	6,920	5,765	4,945	4,325	3,845	3,460	3,145	2,880
6	54,000	27,000	17,995	13,500	10,800	9,000	7,715	6,750	6,000	5,400	4,910	4,500
8	116,000	58,000	38,660	29,000	23,200	19,315	16,570	14,500	12,890	11,600	10,545	9,600

464

Roof Drain Systems Sizing 1106



TABLE 1106.2 STORM DRAIN PIPE SIZING

PIPE SIZE (inches)	VERTICAL DRAIN	CAPACITY (gpm)			
		SLOPE OF HORIZONTAL DRAIN			
		1/16 inch per foot	1/8 inch per foot	1/4 inch per foot	1/2 inch per foot
2	34	15	22	31	44
3	67	30	55	79	111
4	160	81	115	163	231
5	311	117	165	234	331
6	535	243	344	487	689
8	1,117	505	714	1,010	1,429
10	2,050	927	1,311	1,855	2,623
12	3,272	1,480	2,093	2,960	4,187
15	5,543	2,508	3,546	5,016	7,093

465

Sizing Of Secondary Drains 1108.3


- Secondary (emergency) roof drain systems shall be sized in accordance with Section 1101.7




© 2024 Shums Coda Associates 466

466

Sizing Of Secondary Drains 1107.3



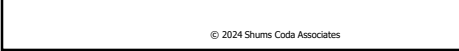

- Scuppers shall be sized to prevent the depth of ponding water from exceeding that for which the roof was designed as determined by Section 1101.7.
- Scuppers shall not have an opening dimension of less than 4 inches. The flow through the primary system shall not be considered when sizing the secondary roof drain system.



© 2024 Shums Coda Associates 467

467

International Fire Code



© 2024 Shums Coda Associates 468

468

IFC Format

- Chapter 1
 - Administration
- Chapter 2
 - Definitions
- Chapter 3
 - General Requirements
- Chapter 4
 - Emergency Planning and Preparedness
- Chapter 5
 - Fire Service Features
- Chapter 6
 - Building Services and Systems
- Chapters 7-10
 - Same as IBC
- Chapter 11
 - Construction Requirements for Existing Buildings
- Chapters 20-36
 - Special Occupancies & Operations
- Chapter 40 Storage of Distilled spirits
- Chapters 50-67
 - Hazardous Materials
- Chapter 80
 - Referenced Standards
- Chapters 13-19, & 68-79 Reserved

© 2024 Shums Coda Associates 469

469

Permits required 105.1.1

- Permits required by this code shall be obtained from the fire code official.
- Permit fees, if any, shall be paid prior to issuance of the permit.
- Issued permits shall be kept on the premises designated therein at all times and shall be readily available for inspection by the fire code official .

© 2024 Shums Coda Associates 470

470

Types of permits 105.1.2

<p>1. Operational permit. An operational permit allows the applicant to conduct an operation or a business for which a permit is required by Section 105.6 for either:</p> <ul style="list-style-type: none">1.1. A prescribed period.1.2. Until renewed or revoked.	<p>2. Construction permit. A construction permit allows the applicant to install or modify systems and equipment for which a permit is required by Section 105.7.</p>
---	---

© 2024 Shums Coda Associates 471

471

Operational Permits (Partial list)

- Amusement Buildings
- Carnivals/Fairs
- Compressed Gases
- Covered Mall Buildings
- Cryogenic Fluids
- Cutting & Welding
- Hazard Materials
- High-Piled Storage
- Hot Work Operations
- Lumber Yards
- Open Burning
- Organic Coatings
- Places of Assembly
- Pyrotechnic Special Effects Materials
- Spraying or Dipping Operations

© 2024 Shums Coda Associates

472

472

Required Construction Permits (Partial list)

- Automatic Fire-Extinguishing Systems
- Battery Systems
- Compressed Gasses
- Fire Alarm and Detection Systems
- Fire Pumps
- Flammable and Combustible Materials
- Hazardous Materials
- LP-Gas
- Private Fire Hydrants
- Spraying and Dipping Operations
- Standpipe Systems
- Temporary Membrane Structures and Tents

© 2024 Shums Coda Associates

473

473

Open Burning 307

- Permit Required
- Location
 - 50 feet from structure
 - (exceptions)
- Attendance
 - Constantly attended
 - Fire Extinguisher required

© 2024 Shums Coda Associates

474

474

Open-flame cooking devices

308.1.4



- Charcoal burners and other open-flame cooking devices shall not be operated on combustible balconies or within 10 feet of combustible construction.
- Exceptions:
 1. One- and two-family dwellings .
 2. Where buildings, balconies and decks are protected by an automatic sprinkler system .
 3. LP-gas cooking devices having LP-gas container with a water capacity not greater than 2½ pounds [nominal 1 pound LP-gas capacity].

© 2024 Shums Coda Associates

475

475

Indoor Display of Vehicles

314.4

Liquid- or gas-fueled vehicles, boats or other motorcraft shall not be located indoors except as follows:

1. Batteries are disconnected.
2. Fuel in fuel tanks does not exceed one-quarter tank or 5 gallons (19 L) (whichever is least).
3. Fuel tanks and fill openings are closed and sealed to prevent tampering.
4. Vehicles, boats or other motorcraft equipment are not fueled or defueled within the building.

© 2024 Shums Coda Associates

476

476

FIRE SAFETY AND EVACUATION PLANS

404



1. Group A, other than Group A occupancies used exclusively for purposes of religious worship that have an occupant load less than 2,000.
2. Group B buildings having an occupant load of 500 or more persons or more than 100 persons above or below the lowest level of exit discharge .
3. Group E .
4. Group F buildings having an occupant load of 500 or more persons or more than 100 persons above or below the lowest level of exit discharge .
5. Group H .
6. Group I .
7. Group R-1 .
8. Group R-2 college and university buildings.
9. Group R-4 .
10. High-rise buildings.
11. Group M buildings having an occupant load of 500 or more persons or more than 100 persons above or below the lowest level of exit discharge .
12. Covered malls exceeding 50,000 square feet in aggregate floor area.
13. Underground buildings.
14. Buildings with an atrium and having an occupancy in Group A, E or M.

© 2024 Shums Coda Associates

477

477

Emergency Evacuation Drills 405.2

- Required emergency evacuation drills shall be held at the intervals specified in Table 405.2 or more frequently where necessary to familiarize all occupants with the drill procedure.

TABLE 405.2
FIRE AND EVACUATION DRILL
FREQUENCY AND PARTICIPATION

GROUP OR OCCUPANCY	FREQUENCY	PARTICIPATION
Group A	Quarterly	Employees
Group B ^a	Annually	Employees
Group E	Monthly ^a	All occupants
Group F	Annually	Employees
Group I	Quarterly on each shift	Employees ^a
Group R-1	Quarterly on each shift	Employees
Group R-2 ^d	Four annually	All occupants
Group R-4	Quarterly on each shift	Employees ^a
High-rise buildings	Annually	Employees

a. The frequency shall be allowed to be modified in accordance with Section 405.3.2.
 b. Fire and evacuation drills in residential care assisted living facilities shall include complete evacuations of the premises in accordance with Section 408.10.5. Where occupants receive habilitation or rehabilitation training, fire prevention and fire safety practice shall be included as part of the training program.
 c. Group E buildings having an occupant load of 500 or more persons or more than 100 persons above or below the lowest level of exit discharge.
 d. Applicable to Group R-2 college and university buildings in accordance with Section 408.3.

478

Ch. 5 Fire Service Features



- Approved fire apparatus access roads shall be provided for every facility, building or portion of a building hereafter constructed or moved into or within the jurisdiction.
- The fire apparatus access road shall comply with the requirements of this section and shall extend to within 150 feet of all portions of the facility and all portions of the exterior walls of the first story of the building as measured by an approved route around the exterior of the building or facility.

- Exceptions

479

Access Road Specifications 503.2

- Unobstructed width of not less than 20 feet, exclusive of shoulders
- Unobstructed vertical clearance of not less than 13 feet 6 inches
- Fire Code Official may increase dimensions
- Designed and maintained to support the imposed loads of fire apparatus and shall be surfaced so as to provide all-weather driving capabilities.
- Turning Radius
- Dead Ends limited more than 150 ft. require turnaround

480

Premise Identification 505

- New and existing buildings
- placed in a position that is plainly legible and visible from the street or road fronting the property.
- numbers shall contrast with their background.
- Arabic numbers or alphabetical letters.
- minimum of 4 inches high with a minimum stroke width of 0.5 inch.
- Private road and the building cannot be viewed from the public way, a monument, pole or other sign or means shall be used to identify the structure.

© 2024 Shums Coda Associates

481

481

Water Supply 507.5

- Fire hydrants within 400' of all portions of building
 - 600 feet if the building is sprinklered
 - 600 feet if R-3 or U occupancy



© 2024 Shums Coda Associates

482

482

Emergency and standby power systems 604

- Emergency and standby power systems required by this code or the International Building Code shall be installed in accordance with this code, NFPA 110 and NFPA 111.
- Existing installations shall be maintained in accordance with the original approval.



© 2024 Shums Coda Associates

483

483

Fire Resistance-Rated Construction 703.1

- The required fire-resistance rating of fire-resistance-rated construction (including walls, firestops, shaft enclosures, partitions, smoke barriers, floors, fire-resistive coatings and sprayed fire-resistive materials applied to structural members and fire-resistant joint systems) shall be maintained.
- Such elements shall be visually inspected by the owner annually and properly repaired, restored or replaced when damaged, altered, breached or penetrated.

© 2024 Shums Coda Associates

484

484

Chapters 8-10

- Identical to IBC except for provisions regarding maintenance of building



© 2024 Shums Coda Associates

485

485

Ch. 10 Means Of Egress

- §1032 covers maintenance of egress systems



© 2024 Shums Coda Associates

486

486

Dry Cleaning Chapter 21

- Dry cleaning plants and their operations shall comply with the requirements of this chapter.

© 2024 Shums Coda Associates

487

487

Combustible Dust-producing Operations - Chapter 22

- The equipment, processes and operations involving dust explosion hazards shall comply with the provisions of this chapter.

© 2024 Shums Coda Associates

488

488

Ch. 33 Fire Safety During Construction And Demolition

- §3311 Stairs must be constructed when the building reaches 50' or 4 stories
- §3312 Water supply must be available as soon as combustible material arrives on site



© 2024 Shums Coda Associates

489

489

Ch. 24 Flammable Finishes



© 2024 Shums Coda Associates

490

- Floor surfacing or finishing >350 sq. ft.
- Application of dual-component coatings by brush or roller >1 gallon

490

Ch. 24 Flammable Finishes



© 2024 Shums Coda Associates

491

- 2404.5.2 Protection of sprinklers in spray areas
- 2409.3 Resin applications operations conducted only in sprinklered areas

491

Fruit and Crop Ripening Chapter 25

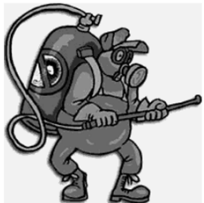
- Ripening processes where ethylene gas is introduced into a room to promote the ripening of fruits, vegetables and other crops shall comply with this chapter.
 - Exception: Mixtures of ethylene and one or more inert gases in concentrations which prevent the gas from reaching greater than 25 percent of the lower explosive limit (LEL) when released to the atmosphere.

© 2024 Shums Coda Associates

492

492

Ch. 26 Fumigation And Thermal Insecticidal Fogging



- 2603.2 Electricity shut down during process

© 2024 Shums Coda Associates

493

493

Ch. 28 Lumber Yards And Woodworking Facilities

- 2804.3 Outdoor storage areas shall be provided with either a hydrant and hose system, or portable extinguishing equipment acceptable to code official



© 2024 Shums Coda Associates

494

494

Ch. 23 Service Stations And Repair Garages



- Automotive Service Station
- Repair Garage
- Fleet Vehicle Service Station

© 2024 Shums Coda Associates

495

495

Ch. 32 High-piled Combustible Storage

- Storage of combustible materials in closely packed piles or combustible materials on pallets, in racks or on shelves where the top of storage is greater than 12 feet in height.
- When required by the fire code official, high-piled combustible storage also includes certain high-hazard commodities, such as rubber tires, Group A plastics, flammable liquids, idle pallets and similar commodities, where the top of storage is greater than 6 feet in height.



© 2024 Shums Coda Associates

496

496

Ch. 34 Tire Rebuilding And Waste Tire Storage

- Indoor and outdoor storage
- Tire buffing and tire recapping rooms separated by 1-hour fire barrier
- §3406.1 Fire access roads to all new and existing facilities



© 2024 Shums Coda Associates

497

497

Ch. 34 Tire Rebuilding And Waste Tire Storage

- §3405 Outdoor storage piles $\leq 5,000$ sq. ft.
 - 50' from property lines or buildings
 - 50,000 cubic feet with 40' separations
 - Aggregate areas $> 150,000$ cubic feet separated by 75'




© 2024 Shums Coda Associates

498

498

Ch. 35 Welding And Other Hot Work



- Hot Work Program Permit
 - Responsible person
 - Maintain reports
- Fire Safety Precautions
 - Separation from combustibles
 - Fire watch
 - Pre-hot work check

© 2024 Shums Coda Associates 499

499

Physical hazards 5001.2.2.1

1. Explosives and blasting agents.
2. Combustible liquids .
3. Flammable solids, liquids and gases.
4. Organic peroxide solids or liquids.
5. Oxidizer, solids or liquids.
6. Oxidizing gases.
7. Pyrophoric solids, liquids or gases.
8. Unstable (reactive) solids, liquids or gases.
9. Water-reactive materials solids or liquids.
10. Cryogenic fluids .

© 2024 Shums Coda Associates 500

500

Health hazards 5001.2.2.2

1. Highly toxic and toxic materials.
2. Corrosive materials.

© 2024 Shums Coda Associates 501

501

Ch. 51 Aerosols

- The inside storage of Level 2 and 3 aerosol products shall comply with Sections 5104.2 through 5104.7 and NFPA 30B. Level 1 aerosol products shall be considered equivalent to a Class III commodity and shall comply with the requirements for palletized or rack storage in NFPA 13.



© 2024 Shums Coda Associates

502

502

Ch. 53 Compressed Gases

- §5307.2 Ventilation of indoor storage and use areas for:
 - Asphyxiant
 - Irritant
 - Radioactive
- Must be operational when area is occupied



© 2024 Shums Coda Associates

503

503

Ch. 55 Cryogenic Fluids

- §5503.4.2 Identify stationary and portable containers with name of product
- §5504.3.1.1 Storage of flammable cryogens prohibited in areas of the jurisdiction where such storage is prohibited



© 2024 Shums Coda Associates

504

504

Ch. 56 Explosives And Fireworks



- §5604.5 Indoor magazines
 - Located within 10 feet of an exit door
 - Maximum of 50 pounds
 - Limit of two magazines per building
 - Magazines must be separated by 10'

© 2024 Shums Coda Associates

505

505

Ch. 56 Explosives And Fireworks

- Table 5604.5.2(1) Table of Distances
- Mass Detonating Explosive
- Net Explosive Weight
- §5606.4 – storage of black and smokeless powder in residences



© 2024 Shums Coda Associates

506

506

Ch. 56 Explosives And Fireworks



- §5608 Display of fireworks and use of pyrotechnic special effect materials
 - NFPA 1123 *Fireworks Display*
 - NFPA 1126 *Use of Pyrotechnics Before a Proximate Audience*


© 2024 Shums Coda Associates

507

507

Ch. 57 Flammable And Combustible Liquids

- §5703.4 Class III-B liquids exempt from spill control and secondary containment
- §5705.3.7.5.3 requires spill control for open-use systems




© 2024 Shums Coda Associates 508

508

Ch. 60 Highly Toxic And Toxic Materials

- §6005 Ozone gas-generators
- Ozone gas-generator rooms do not need a treatment system
- Gas detection and automatic shut-down of the generating equipment




© 2024 Shums Coda Associates 509

509

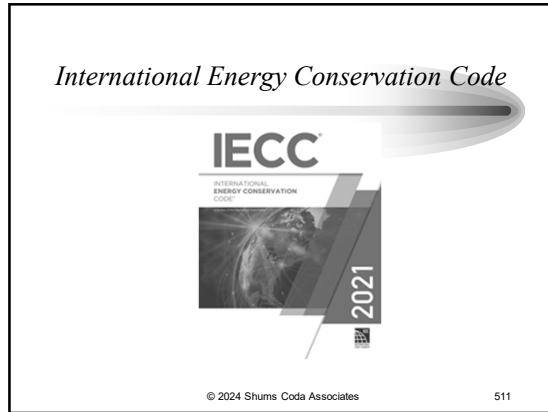
Ch. 61 Liquefied Petroleum Gases

- §6109.12 Cylinder exchange program is addressed
- 20' from any exit access doors, exits or stairways
- 5' to 20' from dispensing (depending upon quantities)
- 10' from combustible materials
- Distance to building per Table 3809.12

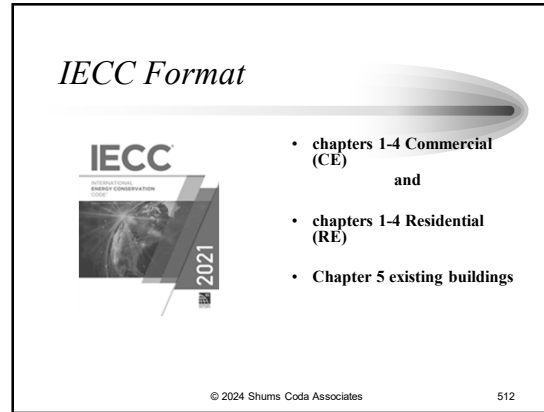


© 2024 Shums Coda Associates 510

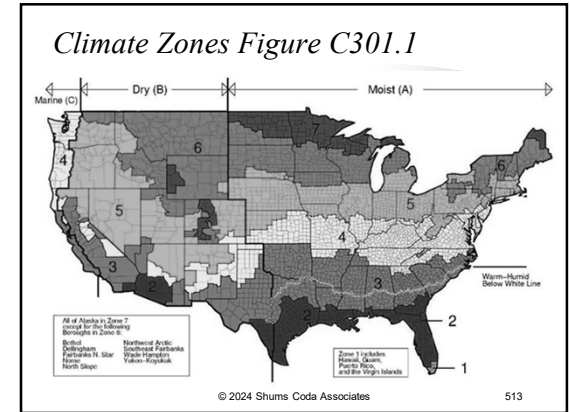
510



511



512



513

Residential VS Commercial

Definition of Residential per IECC is different than that found in the IRC and IBC:

RESIDENTIAL BUILDING. For this code, includes one and two family buildings and townhouses and Group R-3 buildings, as well as R-2 and R-4 buildings three stories or less in height above grade.



COMMERCIAL BUILDING. For this code, all buildings that are not included in the definition of "Residential buildings."

© 2024 Shums Coda Associates

514

514

Which path did they choose?

- Prescriptive- Requirements by component- By The Book.
- U/A Trade Off- ComCheck,
- Performance- Engineered Calculations Method
- ASHRAE 90.1- The whole building is designed to this standard, no mixing and matching



© 2024 Shums Coda Associates

515

515

OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHOD*

CLIMATE ZONE	1 AND 1		2		3		4 EXCEPT MARINE		5 AND MARINE 4	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs										
Insulation	R-20a	R-25a	R-25a	R-25a	R-25a	R-25a	R-30a	R-30a	R-30a	R-30a
entry above roof deck										
Metal buildings ¹	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS
Alc and other	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49
Walls, above grade										
Metal ²	R-5.70 ²	R-5.70 ²	R-5.70 ²	R-7.5a	R-7.5a	R-8.5a	R-8.5a	R-11.4a	R-11.4a	R-13.3a
Metal building	R-13 + R-4.5a	R-13 + R-4.5a	R-13 + R-4.5a	R-13 + R-7.5a	R-13 + R-7.5a	R-13 + R-7.5a	R-13 + R-7.5a	R-13 + R-7.5a	R-13 + R-7.5a	R-13 + R-7.5a

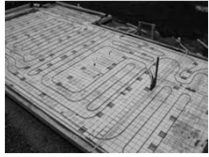
© 2024 Shums Coda Associates

516

516

C402.2.6 Insulation of radiant heating systems

- Radiant panels, and associated U-bends and headers, designed for sensible heating of an indoor space through heat transfer from the thermally effective panel surfaces to the occupants or indoor space by thermal radiation and natural convection and the bottom surfaces of floor structures incorporating radiant heating shall be insulated with a minimum R3.5.



IMC Conflict-1209.5.1 Slab-on-grade installation. Radiant piping utilized in slab-on-grade applications shall be provided with insulating materials installed beneath the piping having a minimum R-value of 5.



© 2024 Shums Coda Associates

517

517

Opaque Doors C402.4.5.2



Doors having < 50% glass area

- Swinging doors
- ✓ Meet U-factor requirement
 - ✓ Roll up doors
 - ✓ See 402.4.5.2

518

518

Fenestration (Prescriptive) C402.4

- Vertical fenestration area (not including opaque doors and opaque spandrel panels) shall not exceed 30% of the gross above-grade wall area.
- Skylights shall not exceed 6% of the gross roof area.



© 2024 Shums Coda Associates

519

519

Default U-Factors
Tables C303.1.3(1) and (2)

TABLE C303.1.3(1)
DEFAULT GLAZED FENESTRATION U-FACTOR

FRAME TYPE	DOUBLE PANE		SKYLIGHT	
	SINGLE PANE	DOUBLE PANE	Single	Double
Metal	1.20	0.80	2.00	1.30
Metal with Thermal Break	1.10	0.65	1.90	1.10
Nonmetal or Metal Clad	0.95	0.55	1.75	1.05
Glazed Block	0.60			

TABLE C303.1.3(2)
DEFAULT DOOR U-FACTORS

DOOR TYPE	U-FACTOR
Uninsulated Metal	1.20
Insulated Metal	0.60
Wood	0.50
Insulated, nonmetal edge, max 45% glazing, any glazing double pane	0.35

© 2024 Shums Coda Associates 520

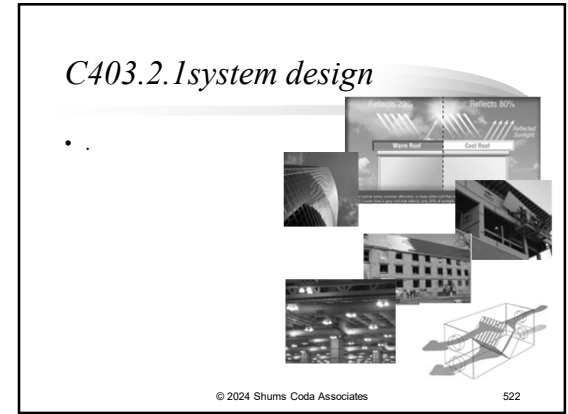
520

C402.4.1 Air Barriers

- Continuous air barrier shall be provided throughout the building thermal envelope.
- Air barriers shall be permitted to be located on the inside or outside of the building envelope, located within the assemblies composing the envelope, or any combination thereof.
- Air barriers not required in climate zones 1-3.
- **Air barrier construction:**
 - Shall be continuous for all assemblies that are the thermal envelope of the building and across the joints and assemblies
 - Air barrier joints and seams shall be sealed, including sealing transitions in places and changes in materials.
 - Air barrier penetrations shall be sealed


© 2024 Shums Coda Associates 521

521



522

C403.5 Economizers




© 2024 Shums Coda Associates 523

523

C405 Mandatory Lighting Controls

- The description of lighting systems and controls has changed to include electrical energy consumption.
- In addition to the requirements for interior lighting controls, manual lighting controls have been added
- The exceptions have been expanded upon for when you don't have to provide light reduction controls



© 2024 Shums Coda Associates 524

524

Insulation and Fenestration Requirements

TABLE R402.1.2 MAXIMUM ASSEMBLY U-FACTORS* AND FENESTRATION REQUIREMENTS

CLIMATE ZONE	FENESTRATION U-FACTOR*	SKYLIGHT U-FACTOR*	GLAZED FENESTRATION SHGC ^{1,2}	CEILING U-FACTOR*	WOOD FRAME WALL U-FACTOR*	MASS WALL U-FACTOR*	FLOOR U-FACTOR*	BASEMENT WALL U-FACTOR*	CRAWL SPACE WALL U-FACTOR*
0	0.50	0.75	0.25	0.035	0.084	0.107	0.064	0.360	0.477
1	0.50	0.75	0.25	0.035	0.084	0.107	0.064	0.360	0.477
2	0.40	0.65	0.25	0.026	0.084	0.105	0.064	0.360	0.477
3	0.30	0.55	0.25	0.026	0.060	0.098	0.047	0.091 ¹	0.136
4 except Marine	0.30	0.55	0.40	0.024	0.045	0.098	0.047	0.059	0.065
5 and	0.30	0.55	0.40	0.024	0.045	0.098	0.047	0.059	0.065

© 2024 Shums Coda Associates 525

525

R402.4 Air Leakage

TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION*		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	Air barrier or barrier shall be installed in the building envelope. Seams in joints in the air barrier shall be tested. The air barrier in any irregular ceiling or wall shall be tested with the finished ceiling or wall in place. The barrier shall be tested.	An operable door shall not be used as a sealing element. The insulation in any irregular ceiling shall be tested with the air barrier.
Exceptions	Access openings, such as door frames, shall be tested in accordance with Section R402.4.1.2. The location of the foundation and all other shall be tested.	
Note	The location of the top plate and the top of exterior walls shall be tested.	Cracks within masonry and masonry of frame walls shall be repaired to comply with the code with a repair having a thermal resistance equal to that of the base wall. Cracks through or around window or door frames shall be repaired in accordance with and continue approved with the design.

- R402.4.1 Building thermal envelope. The building thermal envelope shall comply with Sections R402.4.1.1 and R402.4.1.2.
- TESTING is not an option anymore.
- R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate...

526

R403.4 Service hot water systems

- R403.5.2 Hot water pipe insulation (Prescriptive):
- All remaining piping shall be insulated to at least R-3 or meet the run length requirements of Table R403.4.2



527


Whole House Mechanical Ventilation R403.6.2 (Mandatory)

- Ventilation
 - Building to have ventilation meeting IRC or IMC or with other approved means
 - Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating
- Whole-house mechanical ventilation system fans to meet efficacy in Table R403.6.2
 - Exception
 - When fans are integral to tested and listed HVAC equipment, powered by electronically commutated motor

528

*Electrical Power and Lighting
R404 (Mandatory)*

- All light fixtures to be high-efficacy lamps



© 2024 Shums Coda Associates 529

529

2020 National Electrical Code

© 2024 Shums Coda Associates 530

530

NEC Format


- Chapter 1
 - Definitions
 - Requirements for Electrical Installations
- Chapter 2
 - Wiring and Protection
- Chapter 3
 - Wiring Methods and Materials
- Chapter 4
 - Equipment for General Use
- Chapter 5
 - Special Occupancies
- Chapter 6
 - Special Equipment
- Chapter 7
 - Special Conditions
- Chapter 8
 - Communications Systems
- Chapter 9
 - Tables

© 2024 Shums Coda Associates 531

531

Definitions
Article 100

- Accessible vs Readily Accessible
 - Equipment
 - Wiring methods
 - Available access vs. quick access



© 2024 Shums Coda Associates 532

532

Definitions

- Service
- Feeder
- Outlet
- Receptacle
- Luminaire

© 2024 Shums Coda Associates 533

533

Requirements for Electrical Installations – Article 110

- Part I
 - General Installation
- Part II
 - 600 Volts, Nominal, or less
- Part III
 - Over 600 Volts, Nominal
- Part IV
 - Tunnel Installations over 600 volts, nominal
- Part V
 - Manholes & Other Electric Enclosures Intended for Personnel Entry, All Voltages

© 2024 Shums Coda Associates 534

534

Table 110.26(A)(1) Working Spaces

Nominal Voltage to Ground	Minimum Clear Distance		
	Condition 1	Condition 2	Condition 3
0 - 150	3 feet	3 feet	3 feet
151 - 600	3 feet	3 ½ feet	4 feet

- Note: Where the conditions are as follows:
 - Condition 1 — Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating materials. Insulated wire or insulated busbars operating at not over 300 volts to ground shall not be considered live parts.
 - Condition 2 — Exposed live parts on one side and grounded parts on the other side. Concrete, brick, or tile walls shall be considered as grounded.
 - Condition 3 — Exposed live parts on both sides of the work space (not guarded as provided in Condition 1) with the operator between.

© 2024 Shums Coda Associates 535

535

Entrance to Working Space
110.26 (C)



- 0-1200 Amperes
 - One entrance
- > 1200 Amperes
 - 24" X 6'6" doors at each end of working space
 - Open in the direction of egress
 - Panic bars, pressure plate

© 2024 Shums Coda Associates 536

536

Use and Identification of Grounded Conductors - Chapter 2

- Identification of terminals
- Grounded conductors in premises wiring systems
- Identification of grounded conductors

© 2024 Shums Coda Associates 537

537

Branch Circuits Article 210

- Ratings
- Identification of Branch Circuits
- GFCI Protection
- AFCI Protection
- Required Outlets

© 2024 Shums Coda Associates 538

538

GFCI Protection for Personnel 210.8

- Dwelling Units
 - Bathrooms
 - Garages
 - Outdoors
 - Crawl Spaces
 - Unfinished Basements
 - Kitchens
 - Laundry, Utility, and Wet Bar Sinks
- Other than dwelling units
 - Bathrooms
 - Commercial and institutional kitchens
 - Rooftops
 - Outdoors in public spaces
 - Outdoor receptacles for equipment service

© 2024 Shums Coda Associates 539

539

Required Outlets 210.50 – 210.70

- Receptacle Outlets
 - Dwelling Unit
 - Show Windows
 - HVAC Service Outlet
- Lighting Outlets
 - Dwelling Units
 - Storage or Equipment Spaces
 - Guest Rooms or Guest Suites
 - Attic & Underfloor spaces containing equipment

© 2024 Shums Coda Associates 540

540


Feeders
Article 215

- Minimum Rating & Size
- Ground Fault Protection of Equipment
- Identification for Feeders

© 2024 Shums Coda Associates 541

541

Number of Services
Article 230




- One Service per building
 - Exceptions:
 - Special Conditions
 - Special Occupancies
 - Capacity Requirements
 - Different Characteristics
 - Permanent Identification

© 2024 Shums Coda Associates 542

542

Service Conductors Considered
Outside of Building – Article 230.6

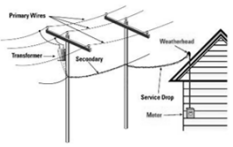
- Installed under 2” of concrete under building
- Encased in 2” of concrete in building
- Installed in an electrical vault
- Installed in conduit & 18” of earth beneath a building or structure



© 2024 Shums Coda Associates 543

543

Overhead Service Clearances 230.24



- 8' above roof surface
- 10' above sidewalks
- 12' over residential, driveways & areas w/o truck traffic < 300 volts
- 15' > 300 volts
- 18' public streets, alleys, etc.

© 2024 Shums Coda Associates

544

544

Overcurrent Protection Article 240

- Location
- Enclosures
- Disconnecting and Guarding
- Fuses
- Industrial Installations
- Over 600 Volts

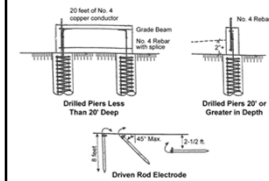


© 2024 Shums Coda Associates

545

545

Grounding & Bonding Article 250



- System Grounding
- Grounding Electrode System & Electrode Conductor
- Bonding
- Equipment Grounding

© 2024 Shums Coda Associates

546

546

Grounding Electrodes
250.52

- Metal Underground Water Pipe
 - Minimum 10 feet length in contact with earth
- Metal Frame of building or structure
 - Minimum 10 feet
- Plate Electrode
- Concrete-Encased
 - 2” concrete
 - Bottom of foundation
 - 20’ in length
 - #4 rebar or 4 AWG bare copper
- Ground Ring
 - 8’ Rod

© 2024 Shums Coda Associates 547

547


Wiring Methods
Article 300

- Conductors
- Protection against physical damage
- Minimum cover requirements

© 2024 Shums Coda Associates 548

548

Conductor Applications & Insulations – Table 310.13



- Trade Name
- Type Letter
 - RHW, THHN, THW, etc.
- Application Provisions
- Insulation
- Outer Covering

© 2024 Shums Coda Associates 549

549

Armored Cable: Type AC
Article 320

- Uses permitted
 - Exposed & concealed work
 - Cable trays
 - Dry locations
 - Embedded in plaster finish on brick or masonry (dry locations)
 - Air voids of masonry block



© 2024 Shums Coda Associates

550

550

Metal-Clad Cable: Type MC
Article 330

- Services, feeders and branch circuits
- Power, lighting, control & signal circuits
- Indoors or outdoors
- Direct buried where identified
- Cable trays where identified
- Any raceway
- Aerial cable on messenger
- Hazardous locations
- Dry locations in masonry
- Wet locations w/conditions

© 2024 Shums Coda Associates

551

551

Nonmetallic-Sheathed Cable – NM
Article 334


- One- & two-family dwellings
- Multifamily dwellings of Types III, IV & V Construction
- Other structures of Types III, IV & V except 334.12
- Cable trays of Types III, IV & V
- 334.12
- Dropped/suspended ceilings
- Service Entrance Cable
- Commercial garages
- Theaters
- Storage battery rooms
- Elevators & hoistways
- Embedded in concrete

© 2024 Shums Coda Associates

552

552

*Underground Feeder & Branch
Circuit: UF – Article 340*



- Underground direct burial
- Wet, dry or corrosive locations

© 2024 Shums Coda Associates 553

553


*Rigid Metal Conduit
Article 344*

- All conditions and occupancies
- Corrosion resistance
- Cinder Fill
- Wet Locations

© 2024 Shums Coda Associates 554

554

*Electric Metal Tubing: EMT
Article 358*




- Exposed and Concealed
- Corrosion Protection
- Wet Location

© 2024 Shums Coda Associates 555

555

Equipment for General Use
Chapter 4



- Flexible Cords & Cables
- Fixture Wires
- Switches
- Receptacles
- Switchboards & Panelboards
- Luminaires
- Appliances

© 2024 Shums Coda Associates 556

556


Transformers
Article 450

- Indoors
 - < 112 ½ KVA 12' from combustibles
 - > 112 ½ KVA one-hour enclosures
 - > 35,000 volts installed in vault
- Outdoors
 - Weatherproof enclosure
 - > 112 ½ KVA 12" clearance from combustibles

© 2024 Shums Coda Associates 557

557

Hazardous Locations
Article 500



- Class I Locations
 - Division 1
 - Division 2
- Class II Locations
 - Division 1
 - Division 2
- Class III Locations
 - Division 1
 - Division 2

© 2024 Shums Coda Associates 558

558

Special Equipment
Chapter 6

- Signs & Outline Lighting
- Office Furnishings
- Cranes & Hoists
- Elevators, etc.
- Vehicle charging
- Welders
- Swimming pools



© 2024 Shums Coda Associates

559

559

Special Conditions
Article 700

- Emergency Systems
- Standby Systems
- Signaling Circuits
- Fire Alarm Systems
- Optical Fiber



© 2024 Shums Coda Associates

560

560

Communications Circuits
Chapter 800

- Radio & Television Equipment
- CATV
- Network-Powered Broadband Communication Systems



© 2024 Shums Coda Associates

561

561

Colorado Code Consulting, LLC

- **Bill Clayton**
 - **4610 S Ulster, Suite 150**
 - **Ph. 303-400-6564**
 - **Fax 303-693-0630**
- **www.shumscoda.com**
- **Bill.clayton@shumscoda.com**

© 2024 Shums Coda Associates 562

562



© 2024 Shums Coda Associates 563

563
