2021 Virginia Construction Code

CHAPTER 28 MECHANICAL SYSTEMS

SECTION 2801
GENERAL

2801.1 Scope.

Mechanical appliances, *equipment* and systems shall be constructed and installed in accordance with this chapter, the *International Mechanical Code* (IMC) and the *International Fuel Gas Code* (IFGC) Masonry chimneys, fireplaces and barbecues shall comply with the *International Mechanical Code* and Chapter 21 of this code.

Exception: This code shall not govern the *construction* of water heaters, boilers and pressure vessels to the extent which they are regulated by the Virginia Boiler and Pressure Vessel Regulations (16VAC25-50). However, the building official may require the *owner* of a structure to submit documentation to substantiate compliance with those regulations.

2801.1.1 Required heating in dwelling units.

Heating facilities shall be required in every dwelling unit or portion thereof which is to be rented, leased or let on terms, either expressed or implied, to furnish heat to the occupants thereof. The heating facilities shall be capable of maintaining the room temperature at 65°F (18°C) during the period from October 15 to May 1 during the hours between 6:30 a.m. and 10:30 p.m. of each day and not less than 60°F (16°C) during other hours when measured at a point 3 feet (914 mm) above the floor and 3 feet (914 mm) from the exterior walls. The capability of the heating system shall be based on the outside design temperature required for the *locality* by this code.

2801.1.2 Required heating in nonresidential structures.

Heating facilities shall be required in every enclosed occupied space in nonresidential structures. The heating facilities shall be capable of producing sufficient heat during the period from October 1 to May 15 to maintain a temperature of not less than 65°F (18°C) during all working hours. The required room temperature shall be measured at a point 3 feet (914 mm) above the floor and 3 feet (914 mm) from the exterior walls.

Processing, storage and operation areas that require cooling or special temperature conditions and areas in which persons are primarily engaged in vigorous physical activities are exempt from these requirements.

2801.1.3 Changes to the IMC.

The following changes shall be made to the IMC:

1. Add the following definitions to Section 202 of the IMC:

   REFRIGERANT DESIGNATION. The unique identifying alphanumeric value or refrigerant number assigned to an individual refrigerant and published in ASHRAE Standard 34.

2. Change Section 401.2 of the IMC to read:

   401.2 Ventilation required. Every occupied space shall be ventilated by natural means in accordance with Section 402 or by mechanical means in accordance with Section 403. Group R dwelling units shall be ventilated by mechanical means in accordance with Section 403. *Ambulatory care facilities* and Group I-2 occupancies shall be ventilated by mechanical means in accordance with Section 407.

3. Change Section 403.3.1.1 of the IMC to read:

   403.3.1.1 Outdoor airflow rate. Ventilation systems shall be designed to have the capacity to supply the minimum outdoor airflow rate determined in accordance with this section. In each occupiable space, the ventilation system shall be designed to deliver the required rate of outdoor airflow to the breathing zone. The occupant load utilized for design of the ventilation system shall not be less than the number determined from the estimated maximum occupant load rate indicated in Table 403.3.1.1. Ventilation rates for occupancies not represented in Table 403.3.1.1 shall be those for a listed occupancy classification that is most similar in terms of occupant density, activities and *building construction*; or shall be determined by an approved engineering analysis. The ventilation system shall be designed to supply the required rate of ventilation air continuously during the period the *building* is occupied, except as otherwise stated in other provisions of the code.

   With the exception of smoking lounges and other designated areas where smoking is permitted, the ventilation rates in Table 403.3.1.1 are based on the absence of smoking in occupiable spaces.

   Exception: The occupant load is not required to be determined based on the estimated maximum occupant load rate indicated in Table 403.3.1.1 where approved statistical data document the accuracy of an alternate anticipated occupant density.

4. Add the following rows to Table 403.3.1.1 of the IMC to read:

TABLE 403.3.1.1

MINIMUM VENTILATION RATES

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #1000 ft^2 [a]	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_p cfm/person	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_a cfm/ft^2 [a]	EXHAUST AIRFLOW RATE cfm/ft^2 [a]
Food and beverage service				
Bars or cocktail lounges designated as an area where smoking is permitted[b]	100	30	—	—
Cafeteria or fast food designated as an area where smoking is permitted[b]	100	20	—	—
Dining rooms designated as an area where smoking is permitted[b]	70	20	—	—
Public spaces				
Lounges designated as an area where smoking is permitted[b]	100	30	—	—
Medical facilities				
Medical procedure rooms[i]	20	15	—	—
Patient rooms[i]	10	25	—	—
Physical therapy rooms[i]	20	15	—	—

i. For spaces that are located in clinic, outpatient facilities as defined in Chapter 2 of the VCC.

5. Change Section 504.9.2 of the IMC to read:

504.9.2 Duct installation. Exhaust ducts shall be supported at 4-foot (1219 mm) intervals and secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Ducts shall not be joined with screws or similar fasteners that protrude into the inside of the duct.

Where dryer exhaust ducts are enclosed in wall or ceiling cavities, such cavities shall allow the installation of the duct without deformation.

6. Change Item 2 of Section 504.10 of the IMC to read:

2. Dampers shall be prohibited in the exhaust duct. Penetrations of the shaft and ductwork shall be protected in accordance with Section 607.5.5, Exception 1.

7. Change Exception 1 of Section 505.3 of the IMC to read:

1. In Group R buildings, where installed in accordance with the manufacturer's installation instructions and where mechanical or natural ventilation is otherwise provided in accordance with Chapter 4, listed and labeled ductless range hoods shall not be required to discharge to the outdoors.

8. Change Item 2 of Section 505.5, and Section 505.6 of the IMC to read:

2. Penetrations of the shaft and ductwork shall be protected in accordance with Section 607.5.5.

505.6 Other than Group R. In other than Group R occupancies, where electric domestic cooking appliances are utilized for domestic purposes, domestic range hoods shall be permitted for such appliances. Hoods and exhaust systems for such electric domestic cooking appliances shall be in accordance with Sections 505.2 and 505.4. In other than Group R occupancies, where fuel-fired domestic cooking appliances are utilized for domestic purposes, a Type I or Type II hood shall be provided as required for the type of appliances and processes in accordance with Section 507.1.

9. Change Section 510.6.1.1 of the IMC to read:

510.6.1.1 Shaft penetrations. Hazardous exhaust ducts that penetrate fire-resistance-rated shafts shall comply with Section 713.11 of the *International Building Code*.

10. Change Section 607.5.5 of the IMC to read:

607.5.5 Shaft enclosures. Shaft enclosures that are permitted to be penetrated by ducts and air transfer openings shall be protected with approved fire and smoke dampers installed in accordance with their listing.

Exceptions:

1. Fire and smoke dampers are not required where steel exhaust subducts extend at least 22 inches (559 mm) vertically in exhaust shafts, provided there is a continuous airflow upward to the outside.
2. Fire dampers are not required where penetrations are tested in accordance with ASTM E119 as part of the fire-resistance-rated assembly.
3. Fire and smoke dampers are not required where ducts are used as part of an approved smoke control system in accordance with Section 909 of the *International Building Code*.
4. Fire and smoke dampers are not required where the penetrations are in parking garage exhaust or supply shafts that are separated from other *building* shafts by not less than 2-hour fire-resistance-rated *construction*.
5. Smoke dampers are not required where the *building* is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 of the *International Building Code*.

11. Add Section 607.6.2.2 to the IMC to read:

607.6.2.2 Equipment shutdown. Where ceiling radiation dampers are listed as static dampers, the HVAC *equipment* shall be effectively shut down to stop the airflow prior to the damper closing using one of the following methods:

1. A duct detector installed in the return duct.
2. An area smoke detector interlocked with the HVAC *equipment*.
3. A listed heat sensor installed in the return duct.

12. Change Table 1101.2 of the IMC to read:

TABLE 1101.2
FACTORY-BUILT EQUIPMENT AND APPLIANCES

EQUIPMENT	STANDARDS
Air-conditioning *equipment* and heat pump *equipment*	UL 1995 or UL/CSA 60335-2-40
Packaged terminal air conditioners and heat pumps	UL 484 or UL/CSA 60335-2-40
Split-system air conditioners and heat pumps	UL 1995 or UL/CSA 60335-2-40
Dehumidifiers	UL 474 or UL/CSA 60335-2-40
Air/water cooled condensers	UL 1995 or UL/CSA 60335-2-40 or UL/CSA 60335-2-89
Refrigeration *equipment*	UL 1995 or UL/CSA 60335-2-89
Unit coolers	UL 412 or UL/CSA 60335-2-89
Commercial refrigerators, freezers, beverage coolers and walk-in coolers	UL 471 or UL/CSA 60335-2-89
Refrigerating units and walk-in coolers	UL 427 or UL 60335-2-89
Refrigeration condensing units	UL 1995 or UL/CSA 60335-2-89
Automatic commercial ice machines	UL 563 or UL/CSA 60335-2-89
Refrigerant-containing components and accessories	UL 207

13. Add Section 1101.2.1 to the IMC to read:

1101.2.1 Group A2L, A2, A3 and B1 high probability equipment. High probability *equipment* using Group A2L, A2, A3 or B1 refrigerant shall comply with UL 484, UL/CSA 60335-2-40, or UL/CSA 60335-2-89.

14. Change Sections 1101.7 and 1102.2.1 of the IMC to read:

1101.7 Changing refrigerant. Changes of refrigerant in an existing system to a refrigerant with a different refrigerant designation shall only be allowed where in accordance with the following:

1. The *owner* or the *owner's* authorized agent shall be notified prior to making a change of refrigerant, and the change of refrigerant shall not be made where the *owner* objects to the change.
2. The change in refrigerant shall be in accordance with one of the following.
   2.1. Written instructions of the original *equipment* manufacturer.
   2.2. An evaluation of the system by a *registered design professional* or by an approved agency that validates safety and suitability of the replacement refrigerant.
   2.3. Approved by the code official.
3. Where the replacement refrigerant is classified into the same safety group, requirements that were

applicable to the existing system shall continue to apply.

4. Where the replacement refrigerant is classified into a different safety group, the system shall comply with the requirements of this standard for a new installation, and the change of refrigerant shall require code official approval.

1102.2.1 Mixing. Refrigerants with different refrigerant designations shall only be mixed in a system in accordance with both of the following:

1. The addition of a second refrigerant is allowed by the*equipment* manufacturer and is in accordance with the manufacturer's written instructions.
2. The resulting mixture does not change the refrigerant safety group.

15. Change Table 1103.1 of the IMC to read:

TABLE 1103.1
REFRIGERANT CLASSIFICATION, AMOUNT AND OEL

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE						OEL[c]	DEGREES OF HAZARD[a]
				RCL			LFL				
				LB/MCf	ppm	g/m³	LB/MCf	ppm	g/m³	ppm	
R-11[c]	CCl_3F	trichlorofluoromethane	A1	0.39	1,100	6.1	—	—	—	1,000	2-0-0[b]
R-12[c]	CCl_2F_2	dichlorodifluoromethane	A1	5.6	18,000	90	—	—	—	1,000	2-0-0[b]
R-13[c]	$CClF_3$	chlorotrifluoromethane	A1	—	—	—	—	—	—	1,000	2-0-0[b]
R-13B1[c]	$CBrF_3$	bromotrifluoromethane	A1	—	—	—	—	—	—	1,000	2-0-0[b]
R-13I1	CF_3I	trifluoroiodomethane	A1	1.0	2,000	16	—	—	500	—	—
R-14	CF_4	tetrafluoromethane (carbon tetrafluoride)	A1	25	110,000	400	—	—	—	1,000	2-0-0[b]
R-22	$CHClF_2$	chlorodifluoromethane	A1	13	59,000	210	—	—	—	1,000	2-0-0[b]
R-23	CHF_3	trifluoromethane (fluoroform)	A1	7.3	41,000	120	—	—	—	1,000	2-0-0[b]
R-30	CH_2Cl_2	dichloromethane (methylene chloride)	B1	—	—	—	—	—	—	—	—
R-31	CH_2ClF	chlorofluoromethane	—	—	—	—	—	—	—	—	—
R-32	CH_2F_2	difluoromethane (methylene fluoride)	A2L	4.8	36,000	77	19.1	144,000	306	1,000	1-4-0
R-40	CH_3Cl	chloromethane (methyl chloride)	B2	—	—	—	—	—	—	—	—
R-41	CH_3F	fluoromethane (methyl fluoride)	—	—	—	—	—	—	—	—	—
R-50	CH_4	methane	A3	—	—	—	5	0,000	—	1,000	—
R-113[c]	CCl_2FCClF_2	1,1,2-trichloro-1,2,2-trifluoroethane	A1	1.2	2,600	20	—	—	—	1,000	2-0-0[b]
R-114[c]	$CClF_2CClF_2$	1,2-dichloro-1,1,2,2-tetrafluoroethane	A1	8.7	20,000	140	—	—	—	1,000	2-0-0[b]

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE								TOXICITY LEVEL OF HAZARD (F) DEGREES
				RCL			LFL			OEL		
				LB/MCf	ppm	g/m	LB/MCf	ppm	g/m	ppm		
R-115	$CClF_2CF_3$	chloropentafluoroethane	A1	47	120,000	760	—	—	—	1,000	—	
R-116	CF_3CF_3	hexafluoroethane	A1	34	97,000	550	—	—	—	1,000	1	1-0-0
R-123	$CHCl_2CF_3$	2,2-dichloro-1,1,1-trifluoroethane	B1	3.5	9,100	57	—	—	—	50	2	1-0-0[b]
R-124	$CHClFCF_3$	2-chloro-1,1,1,2-tetrafluoroethane	A1	3.5	10,000	56	—	—	—	1,000	2	1-0-0[b]
R-125	CHF_2CF_3	pentafluoroethane	A1	23	75,000	370	—	—	—	1,000	2	1-0-0[b]
R-134a	CH_2FCF_3	1,1,1,2-tetrafluoroethane	A1	13	50,000	210	—	—	—	1,000	2	1-0-0[b]
R-141b	CH_3CCl_2F	1,1-dichloro-1-fluoroethane	—	0.78	2,600	12	1	7.8	60,000	287	500	2-1-0
R-142b	CH_3CClF_2	1-chloro-1, 1-difluoroethane	A2	5.1	20,000	82	2	0.4	80,000	329	1,000	2-4-0
R-143a	CH_3CF_3	1,1,1-trifluoroethane	A2L	4.4	21,000	70	1	7.5	82,000	282	1,000	2-0-0[b]
R-152a	CH_3CHF_2	1,1-difluoroethane	A2	2.0	12,000	32	8.1	48,000	130	1,000	1	4-0
R-170	CH_3CH_3	ethane	A3	0.54	7,000	8.6	2.4	31,000	38	1,000	2	4-0
R-E170	CH_3OCH_3	Methoxymethane (dimethyl ether)	A3	1.0	8,500	16	4.0	34,000	64	1,000	—	
R-218	$CF_3CF_2CF_3$	octafluoropropane	A1	43	90,000	690	—	—	—	1,000	2	1-0-0[b]
R-227ea	CF_3CHFCF_3	1,1,1,2,3,3,3-heptafluoropropane	A1	36	84,000	580	—	—	—	1,000	—	
R-236fa	$CF_3CH_2CF_3$	1,1,1,3,3,3-hexafluoropropane	A1	21	55,000	340	—	—	—	1,000	2	1-0-0[b]
R-245fa	$CHF_2CH_2CF_3$	1,1,1,3,3-pentafluoropropane	B1	12	34,000	190	—	—	—	300	2	1-0-0[b]
R-290	$CH_3CH_2CH_3$	propane	A3	0.59	5,300	9.5	2.4	21,000	38	1,000	2	4-0
R-C318	$-(CF_2)_4-$	octafluorocyclobutane	A1	41	80,000	650	—	—	—	1,000	—	
R-400A[c]	zeotrope	R-12/114 (50.0/50.0)	A1	10	28,000	160	—	—	—	1,000	2	1-0-0[b]

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE								TOXICITY (F) DEGREES OF HAZARD
				RCL			LFL					
				LB/MCf	ppm	g/m	LB/MCf	ppm	g/m	ppm		
R-400B[c]	zeotrope	R-12/114 (60.0/40.0)	A1	11	30,000	170	—	—	—	1,000	—	
R-401A	zeotrope	R-22/152a/124 (53.0/13.0/34.0)	A1	6.6	27,000	110	—	—	—	1,000	2-0-0[b]	
R-401B	zeotrope	R-22/152a/124 (61.0/11.0/28.0)	A1	7.2	30,000	120	—	—	—	1,000	2-0-0[b]	
R-401C	zeotrope	R-22/152a/124 (33.0/15.0/52.0)	A1	5.2	20,000	84	—	—	—	1,000	2-0-0[b]	
R-402A	zeotrope	R-125/290/22 (60.0/2.0/38.0)	A1	17	66,000	270	—	—	—	1,000	2-0-0[b]	
R-402B	zeotrope	R-125/290/22 (38.0/2.0/60.0)	A1	15	63,000	240	—	—	—	1,000	2-0-0[b]	
R-403A	zeotrope	R-290/22/218 (5.0/75.0/20.0)	A2	7.6	33,000	120	—	—	—	1,000	2-0-0[b]	
R-403B	zeotrope	R-290/22/218 (5.0/56.0/39.0)	A1	18	68,000	290	—	—	—	1,000	2-0-0[b]	
R-404A	zeotrope	R-125/143a/134a (44.0/52.0/4.0)	A1	31	130,000	500	—	—	—	1,000	2-0-0[b]	
R-405A	zeotrope	R-22/152a/142b/C318 (45.0/7.0/5.5/42.5)	—	16	57,000	260	—	—	—	1,000	—	
R-406A	zeotrope	R-22/600a/142b (55.0/4.0/41.0)	A2	4.7	21,000	75	18.8	82,000	301.9	1,000	—	
R-407A	zeotrope	R-32/125/134a (20.0/40.0/40.0)	A1	19	83,000	300	—	—	—	1,000	2-0-0[b]	
R-407B	zeotrope	R-32/125/134a (10.0/70.0/20.0)	A1	21	79,000	330	—	—	—	1,000	2-0-0[b]	
R-407C	zeotrope	R-32/125/134a (23.0/25.0/52.0)	A1	18	81,000	290	—	—	—	1,000	2-0-0[b]	
R-407D	zeotrope	R-32/125/134a (15.0/15.0/70.0)	A1	16	68,000	250	—	—	—	1,000	2-0-0[b]	
R-407E	zeotrope	R-32/125/134a (25.0/15.0/60.0)	A1	17	80,000	280	—	—	—	1,000	2-0-0[b]	
R-407F	zeotrope	R-32/125/134a (30.0/30.0/40.0)	A1	20	95,000	320	—	—	—	1,000	—	
R-407G	zeotrope	R-32/125/134a (2.5/2.5/95.0)	A1	13	52,000	210	—	—	—	1,000	—	

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE								TOXICITY GROUP DEGREES OF HAZARD
				RCL			LFL			OEL		
				LB/MCf	ppm	g/m	LB/MCf	ppm	g/m	ppm		
R-407H	zeotrope	R-32/125/134a (32.5/15.0/52.5)	A1	19	92,000	300	—	—	—	1,000	—	
R-407I	zeotrope	R-32/125/134a(19.5/8.5/72.0)	A1	16	71,100	250	—	—	—	1,000	—	
R-408A	zeotrope	R-125/143a/22 (7.0/46.0/47.0)	A1	21	94,000	330	—	—	—	1,000	2	0-0[b]
R-409A	zeotrope	R-22/124/142b (60.0/25.0/15.0)	A1	7.1	29,000	110	—	—	—	1,000	2	0-0[b]
R-409B	zeotrope	R-22/124/142b (65.0/25.0/10.0)	A1	7.3	30,000	120	—	—	—	1,000	2	0-0[b]
R-410A	zeotrope	R-32/125 (50.0/50.0)	A1	26	140,000	420	—	—	—	1,000	2	0-0[b]
R-410B	zeotrope	R-32/125 (45.0/55.0)	A1	27	140,000	430	—	—	—	1,000	2	0-0[b]
R-411A	zeotrope	R-127/22/152a (1.5/87.5/11.0)	A2	2.9	14,000	46	11.6	55,000	185.96	970	—	
R-411B	zeotrope	R-1270/22/152a (3.0/94.0/3.0)	A1	2.8	13,000	45	14.8	70,000	238.93	940	—	
R-412A	zeotrope	R-22/218/142b (70.0/5.0/25.0)	A2	5.1	22,000	82	20.5	87,000	328.6	1,000	—	
R-413A	zeotrope	R-218/134a/600a (9.0/88.0/3.0)	A2	5.8	22,000	93	23.4	88,000	374.9	1,000	—	
R-414A	zeotrope	R-22/124/600a/142b (51.0/28.5/4.0/16.5)	A1	6.4	26,000	100	—	—	—	1,000	—	
R-414B	zeotrope	R-22/124/600a/142b (50.0/39.0/1.5/9.5)	A1	6.0	23,000	96	—	—	—	1,000	—	
R-415A	zeotrope	R-22/152a (82.0/18.0)	A2	2.9	14,000	47	—	—	—	1,000	—	
R-415B	zeotrope	R-22/152a (25.0/75.0)	A2	2.1	12,000	34	—	—	—	1,000	—	
R-416A	zeotrope	R-134a/124/600 (59.0/39.5/1.5)	A1	3.9	14,000	62	—	—	—	1,000	2	0-0[b]
R-417A	zeotrope	R-125/134a/600 (46.6/50.0/3.4)	A1	3.5	13,000	55	—	—	—	1,000	2	0-0[b]
R-417B	zeotrope	R-125/134a/600 (79.0/18.3/2.7)	A1	4.3	15,000	69	—	—	—	1,000	—	

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE								NFPA 704 DEGREES OF HAZARD
				RCL			LFL			OEL		
				LB/MCf	ppm	g/m	LB/MCf	ppm	g/m	ppm		
R-417C	zeotrope	R-125/134a/600 (19.5/78.8/1.7)	A1	5.4	21,000	87	—	—	—	1,000	—	
R-418A	zeotrope	R-290/22/152a (1.5/96.0/2.5)	A2	4.8	22,000	77	19.2	89,000	308.4	1,000	—	
R-419A	zeotrope	R-125/134a/E170 (77.0/19.0/4.0)	A2	4.2	15,000	67	16.7	60,000	268.6	1,000	—	
R-419B	zeotrope	R-125/134a/E170 (48.5/48.0/3.5)	A2	4.6	17,000	74	18.5	69,000	297.3	1,000	—	
R-420A	zeotrope	R-134a/142b (88.0/12.0)	A1	12	44,000	180	—	—	—	1,000	2-0-0[b]	
R-421A	zeotrope	R-125/134a (58.0/42.0)	A1	17	61,000	280	—	—	—	1,000	2-0-0[b]	
R-421B	zeotrope	R-125/134a (85.0/15.0)	A1	21	69,000	330	—	—	—	1,000	2-0-0[b]	
R-422A	zeotrope	R-125/134a/600a (85.1/11.5/3.4)	A1	18	63,000	290	—	—	—	1,000	2-0-0[b]	
R-422B	zeotrope	R-125/134a/600a (55.0/42.0/3.0)	A1	16	56,000	250	—	—	—	1,000	2-0-0[b]	
R-422C	zeotrope	R-125/134a/600a (82.0/15.0/3.0)	A1	18	62,000	290	—	—	—	1,000	2-0-0[b]	
R-422D	zeotrope	R-125/134a/600a (65.1/31.5/3.4)	A1	16	58,000	260	—	—	—	1,000	2-0-0[b]	
R-422E	zeotrope	R-125/134a/600a (58/39.3/2.7)	A1	16	57,000	260	—	—	—	1,000	—	
R-423A	zeotrope	R-134a/227ea (52.5/47.5)	A1	19	59,000	300	—	—	—	1,000	2-0-0[b]	
R-424A	zeotrope	R-125/134a/600a/600/601a (50.5/47.0/0.9/1.0/0.6)	A1	6.2	23,000	100	—	—	—	990	2-0-0[b]	
R-425A	zeotrope	R-32/134a/227ea (18.5/69.5/12.0)	A1	16	72,000	260	—	—	—	1,000	2-0-0[b]	
R-426A	zeotrope	R-125/134a/600a/601a (5.1/93.0/1.3/0.6)	A1	5.2	20,000	83	—	—	—	990	—	
R-427A	zeotrope	R-32/125/143a/134a (15.0/25.0/10.0/50.0)	A1	18	79,000	290	—	—	—	1,000	2-1-0	
R-428A	zeotrope	R-125/143a/290/600a (77.5/20.0/0.6/1.9)	A1	23	84,000	370	—	—	—	1,000	—	
R-429A	zeotrope	R-E170/152a/600a (60.0/10.0/30.0)	A3	0.81	6,300	13	3.2	25,000	83.8	1,000	—	

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE								DEGREES OF HAZARD
				RCL				LFL				OEL(F)
				LB/MCf	ppm	g/m		LB/MCf	ppm	g/m	ppm	
R-430A	zeotrope	R-152a/600a (76.0/24.0)	A3	1.3	8,000	21	5	2	32,000	44.0	1,000	—
R-431A	zeotrope	R-290/152a (71.0/29.0)	A3	0.68	5,500	11	2	7	22,000	38.6	1,000	—
R-432A	zeotrope	R-1270/E170 (80.0/20.0)	A3	0.13	1,200	2.1	2	4	22,000	39.2	550	—
R-433A	zeotrope	R-1270/290 (30.0/70.0)	A3	0.34	3,100	5.5	2	4	20,000	32.4	760	—
R-433B	zeotrope	R-1270/290 (5.0-95.0)	A3	0.39	3,500	6.3	2	0	18,000	32.1	950	—
R-433C	zeotrope	R-1270/290 (25.0-75.0)	A3	0.41	3,700	6.5	2	0	18,000	33.8	790	—
R-434A	zeotrope	R-125/143a/600a (63.2/18.0/16.0/2.8)	A1	20	73,000	320	—	—	—	—	1,000	—
R-435A	zeotrope	R-E170/152a (80.0/20.0)	A3	1.1	8,500	17	4	3	34,000	68.2	1,000	—
R-436A	zeotrope	R-290/600a (56.0/44.0)	A3	0.50	4,000	8.1	2	0	16,000	32.2	1,000	—
R-436B	zeotrope	R-290/600a (52.0/48.0)	A3	0.51	4,000	8.2	2	0	16,000	32.7	1,000	—
R-437A	zeotrope	R-125/134a/600/601 (19.5/78.5/1.4/0.6)	A1	5.1	19,000	82	—	—	—	—	990	—
R-438A	zeotrope	R-32/125/134a/600/601a (8.5/45.0/44.2/1.7/0.6)	A1	4.9	20,000	79	—	—	—	—	990	—
R-439A	zeotrope	R-32/125/600a (50.0/47.0/3.0)	A2	4.7	26,000	76	1	8.9	104,3000	303.3	1,000	—
R-440A	zeotrope	R-290/134a/152a (0.6/1.6/97.8)	A2	1.9	12,000	31	7	8	46,000	124.7	1,000	—
R-441A	zeotrope	R-170/290/600a/600 (3.1/54.8/6.0/36.1)	A3	0.39	3,200	6.3	2	0	16,000	31.7	1,000	—
R-442A	zeotrope	R-32/125/134a/152a/227ea (31.0/31.0/30.0/3.0/5.0)	A1	21	100,000	330	—	—	—	—	1,000	—
R-443A	zeotrope	R-1270/290/600a (55.0/40.0/5.0)	A3	0.19	1,700	3.1	2	2	20,000	35.6	640	—
R-444A	zeotrope	R-32/152a/1234ze(E) (12.0/5.0/83.0)	A2L	5.1	21,000	81	1	9.9	82,000	324.8	850	—
R-444B	zeotrope	R-32/152a/1234ze(E) (41.5/10.0/48.5)	A2L	4.3	23,000	69	1	7.3	93,000	227.93	930	—
R-445A	zeotrope	R-744/134a/1234ze(E) (6.0/9.0/85.0)	A2L	4.2	16,000	67	2	1.7	63,000	347.94	930	—

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE								TOXICITY (F) DEGREES OF HAZARD
				RCL			LFL					
				LB/MCf	ppm	g/m	LB/MCf	ppm	g/m	ppm		
R-446A	zeotrope	R-32/1234ze(E)/600 (68.0/29.0/3.0)	A2L	2.5	16,000	39	13.5	62,000	217.4	960	—	
R-447A	zeotrope	R-32/125/1234ze(E) (68.0/3.5/28.5)	A2L	2.6	16,000	42	18.9	65,000	303.5	960	—	
R-447B	zeotrope	R-32/125/1234ze(E) (68.0/8.0/24)	A2L	23	16,000	42	20.6	121,000	331.7	970	—	
R-448A	zeotrope	R-32/125/1234yf/134a/1234ze(E) (26.0/26.0/20.0/21.0/7.0)	A1	24	110,000	390	—	—	—	860	—	
R-449A	zeotrope	R-32/125/1234yf/134a (24.3/24.7/25.3/25.7)	A1	23	100,000	370	—	—	—	840	—	
R-449B	zeotrope	R-32/125/1234yf/134a (25.2/24.3/23.2/27.3)	A1	23	100,000	370	—	—	—	850	—	
R-449C	zeotrope	R-32/125/1234yf/134a (20.0/20.0/31.0/29.0)	A1	23	98,000	360	—	—	—	800	—	
R-450A	zeotrope	R-134a/1234ze(E) (42.0/58.0)	A1	20	72,000	320	—	—	—	880	—	
R-451A	zeotrope	R-1234yf/134a (89.8/10.2)	A2L	5.3	18,000	81	20.3	70,000	326.5	530	—	
R-451B	zeotrope	R-1234yf/134a (88.8/11.2)	A2L	5.3	18,000	81	20.3	70,000	326.5	530	—	
R-452A	zeotrope	R-32/125/1234yf (11.0/59.0/30.0)	A1	27	100,000	440	—	—	—	790	—	
R-452B	zeotrope	R-32/125/1234yf (67.0/7.0/26.0)	A2L	4.8	30,000	77	19.3	119,000	310.85	870	—	
R-452C	zeotrope	R-32/125/1234yf (12.5/61.0/26.5)	A1	27	100,000	430	—	—	—	810	—	
R-453A	zeotrope	R-32/125/134a/227ea/600/601a (20.0/20.0/53.8/5.0/0.6/0.6)	A1	7.8	34,000	120	—	—	—	1,000	—	
R-454A	zeotrope	R-32/1234yf (35.0/65.0)	A2L	3.2	16,000	52	18.3	63,000	293.69	900	—	
R-454B	zeotrope	R-32/1234yf (68.9/31.1)	A2L	3.1	19,000	49	22.0	77,000	352.86	850	—	
R-454C	zeotrope	R-32/1234yf (21.5/78.5)	A2L	4.4	19,000	71	18.0	62,000	289.65	620	—	
R-455A	zeotrope	R-744/32/1234yf (3.0/21.5/75.5)	A2L	4.9	22,000	79	26.9	118,400	432.61	650	—	
R-456A	zeotrope	R-32/134a/1234ze(E) (6.0/45.0/49.0)	A1	20	77,000	320	—	—	—	900	—	

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE								DEGREES OF HAZARD
				RCL				LFL				OEL(F)
				LB/MCf	ppm	g/m		LB/MCf	ppm	g/m	ppm	
R-457A	zeotrope	R-32/1234yf/152a (18.0/70.0/12.0)	A2L	3.4	15,000	54	1	13.5	60,000	216.3	650	—
R-457B	zeotrope	R-32/1234yf/152a (35.0/55.0/10.0)	A2L	3.7	19,000	59	1	14.9	76,000	239	730	—
R-458A	zeotrope	R-32/125/134a/227ea/236fa (20.5/4.0/61.4/13.5/0.6)	A1	18	76,000	280	—	—	—	—	1,000	—
R-459A	zeotrope	R-32/1234yf/1234ze(E) (68.0/26.0/6.0)	A2L	4.3	27,000	69	1	17.4	107,000	278.87	70	—
R-459B	zeotrope	R-32/1234yf/1234ze(E) (21.0/69.0/10.0)	A2L	30	25,000	92	2	3.3	99,000	373.65	40	—
R-460A	zeotrope	R-32/125/134a/1234ze(E) (12.0/52.0/14.0/22.0)	A1	24	92,000	380	—	—	—	—	950	—
R-460B	zeotrope	R-32/125/134a/1234ze(E) (28.0/25.0/20.0/27.0)	A1	25	120,000	400	—	—	—	—	950	—
R-460C	zeotrope	R-32/125/134a/1234ze(E) (2.5/52.5/46.0/49.0)	A1	20	73,000	310	—	—	—	—	900	—
R-461A	zeotrope	R-125/143a/134a/227ea/600a (55.0/5.0/32.0/5.0/3.0)	A1	17	61,000	270	—	—	—	—	1,000	—
R-462A	zeotrope	R-32/125/143a/134a/600 (9.0/42.0/2.0/44.0/3.0)	A2	3.9	16,000	62	1	6.6	105,000	265.8	1,000	—
R-463A	zeotrope	R-744/32/125/1234yf/134a (6.0/36.0/30.0/14.0/14.0)	A1	19	98,000	300	—	—	—	—	990	—
R-464A	zeotrope	R-32/125/1234ze(E)/227ea (27.0/27.0/40.0/6.0)	A1	27	120,000	430	—	—	—	—	930	—
R-465A	zeotrope	R-32/290/1234yf (21.0/7.9/71.1)	A2	2.5	12,000	40	1	0.0	98,000	160.69	660	—
R-466A	zeotrope	R-32/125/13I1 (49.0/11.5/39.5)	A1	6.2	30,000	99	—	—	—	—	860	—
R-467A	zeotrope	R-32/125/134a/600a (22.0/5.0/72.4/0.6)	A2L	6.7	31,000	110	—	—	—	—	1,000	—
R-468A	zeotrope	R-1132a/32/1234yf (3.5/21.5/75.0)	A2L	4.1	16,000	66	—	—	—	—	610	—
R-469A	zeotrope	R-744/32/125 (35.0/32.5/32.5)	A1	8	53,000	—	—	—	—	1,600	—	
R-470A	zeotrope	R-744/32/125/134a/1234ze(E)/227ea (10.0/17.0/19.0/7.0/44.0/3.0)	A1	17	77,000	270	—	—	—	—	1,100	—
R-470B	zeotrope	R-744/32/125/134a/1234ze(E)/227ea (10.0/11.5/11.5/3.0/57.0/7.0)	A1	16	72,000	270	—	—	—	—	1,100	—
R-471A	zeotrope	R-1234ze(E)/227ea/1336mzz(E) (78.7/4.3/17.0)	A1	9.7	31,000	160	—	—	—	—	710	—

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE								TOXICITY LEVEL (F)	DEGREES OF HAZARD
				RCL				LFL					
				LB/MCf	ppm	g/m		LB/MCf	ppm	g/m	ppm		
R-472A	zeotrope	R-744/32/134a (69.0/12.0/19.0)	A1	4.5	35,000	72	—	—	—	—	2,700	—	
R-500[d]	azeotrope	R-12/152a (73.8/26.2)	A1	7.4	29,000	120	—	—	—	—	1,000	2	0-0[b]
R-501[c]	azeotrope	R-22/12 (75.0/25.0)	A1	13	54,000	210	—	—	—	—	1,000	—	
R-502[d]	azeotrope	R-22/115 (48.8/51.2)	A1	21	73,000	330	—	—	—	—	1,000	2	0-0[b]
R-503[d]	azeotrope	R-23/13 (40.1/59.9)	—	—	—	—	—	—	—	—	1,000	2	0-0[b]
R-504[c]	azeotrope	R-32/115 (48.2/51.8)	—	28	140,000	450	—	—	—	—	1,000	—	
R-507A	azeotrope	R-125/143a (50.0/50.0)	A1	32	130,000	510	—	—	—	—	1,000	2	0-0[b]
R-508A	azeotrope	R-23/116 (39.0/61.0)	A1	14	55,000	220	—	—	—	—	1,000	2	0-0[b]
R-508B	azeotrope	R-23/116 (46.0/54.0)	A1	13	52,000	200	—	—	—	—	1,000	2	0-0[b]
R-509A	azeotrope	R-22/218 (44.0/56.0)	A1	24	75,000	380	—	—	—	—	1,000	2	0-0[b]
R-510A	azeotrope	R-E170/600a (88.0/12.0)	A3	0.87	7,300	14	3.5	29,000	56.1	1,000	—		
R-511A	azeotrope	R-290/E170 (95.0/5.0)	A3	0.59	5,300	9.5	2.4	21,000	38.0	1,000	—		
R-512A	azeotrope	R-134a/152a (5.0/95.0)	A2	1.9	11,000	31	7.7	45,000	123.9	1,000	—		
R-513A	azeotrope	R-1234yf/134a (56.0/44.0)	A1	20	72,000	320	—	—	—	650	—		
R-513B	azeotrope	R-1234yf/134a (58.5/41.5)	A1	21	74,000	330	—	—	—	640	—		
R-514A	azeotrope	R-1336mzz(S)/1130(E) (74.7/25.3)	B1	0.86	2,400	14	—	—	—	320	—		
R-515A	azeotrope	R-1234ze(E)/227ea (88.0/12.0)	A1	19	63,000	300	—	—	—	810	—		
R-515B	azeotrope	R-1234ze(E)/227ea (91.1/8.9)	A1	18	61,000	290	—	—	—	810	—		
R-516A	azeotrope	R-1234yf/134a/152a (77.5/8.5/14.0)	A2	3.2	13,000	52	13.1	50,000	210.51	590	—		
R-600	$CH_3CH_2CH_2CH_3$	butane	A3	0.15	1,000	2.4	3.0	20,000	48	1,000	1	4-0	

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE								HEALTH (F) DEGREES OF HAZARD[a]
				RCL			LFL			OEL		
				LB/MCf	ppm	g/m	LB/MCf	ppm	g/m	ppm		
R-600a	$CH(CH_3)_2CH_3$	2-methylpropane (isobutane)	A3	0.59	4,000	9.6	2.4	16,000	38	1,000		2-4-0
R-601	$CH_3CH_2CH_2CH_2CH_3$	pentane	A3	0.18	1,000	2.9	2.2	12,000	35	600		—
R-601a	$(CH_3)_2CHCH_2CH_3$	2-methylbutane (isopentane)	A3	0.18	1,000	2.9	2.4	13,000	38	600		—
R-610	$CH_3CH_2OCH_2CH_3$	ethoxyethane (ethyl ether)	—	—	—	—	—	—	—	400		—
R-611	$HCOOCH_3$	methyl formate	B2	—	—	—	—	—	—	100		—
R-717	NH_3	ammonia	B2L	0.014	320	0.22	7.2	167,000	116	25		3-3-0[c]
R-718	H_2O	water	A1	—	—	—	—	—	—	—		0-0-0
R-744	CO_2	carbon dioxide	A1	4.5	40,000	72	—	—	—	5,000		2-0-0[b]
R-1130(E)	$CHCl=CHCl$	trans-1,2-dichloroethene	B2	0.25	1,000	4	16	65,000	258	200		—
R-1132a	$CF_2=CH_2$	1,1-difluoroethylene	A2	2.0	13,000	33	8.1	50,000	131	500		—
R-1150	$CH_2=CH_2$	ethene (ethylene)	A3	—	—	—	2.2	31,000	36	200		1-4-2
R-1224yd(Z)	$CF_3CF=CHCl$	(Z)-1-chloro-2,3,3,3-tetrafluoroethylene	A1	23	60,000	370	—	—	—	1,000		—
R-1233zd(E)	$CF_3CH=CHCl$	trans-1-chloro-3,3,3-trifluoro-1-propene	A1	5.3	16,000	85	—	—	—	800		—
R-1234yf	$CF_3CF=CH_2$	2,3,3,3-tetrafluoro-1-propene	A2L	4.7	16,000	75	18.0	62,000	289	500		—
R-1234ze(E)	$CF_3CH=CHF$	trans-1,3,3,3-tetrafluoro-1 -propene	A2L	4.7	16,000	76	18.8	65,000	303	800		—
R-1270	$CH_3CH=CH_2$	Propene (propylene)	A3	0.1	1,000	1.7	—	—	—	500		1-4-1
R-1336mzz(E)	$CF_3CHCHCF_3$	trans-1,1,1,4,4,4-hexaflouro-2-butene	A1	3.0	7,200	48	—	—	—	400		—
R-1336mzz(Z)	$CF_3CHCHCF_3$	cis-1,1,1,4,4,4-hexaflouro-2-butene	A1	5.2	13,000	84	—	—	—	500		—

For SI: 1 pound = 0.454 kg, 1 cubic foot = 0.0283m^3.

a. Degrees of hazard are for health, fire, and reactivity, respectively, in accordance with NFPA 704.

b. Reduction to 1-0-0 is allowed if analysis satisfactory to the code official shows that the maximum concentration for a rupture or full loss of refrigerant charge would not exceed the IDLH, considering both the refrigerant quantity and room volume.

c. Class I ozone depleting substance; prohibited for new installations.

d. Occupational Exposure Limit based on the OSHA PEL, ACGIH TLV-TWA, the TERA WEEL or consistent value on a time-weighed average (TWA) basis (unless

noted C for ceiling) for an 8 hr/d and 40 hr/wk.

16. Change Section 1104.3.1 of the IMC to read:

1104.3.1 Air conditioning for human comfort. High probability systems used for human comfort shall use Group A1 or A2L refrigerant.

Exceptions:

1. Listed *equipment* for residential occupancies containing a maximum of 6.6 pounds (3 kg) of refrigerant.
2. Listed *equipment* for commercial occupancies containing a maximum of 22 pounds (10 kg) of refrigerant.
3. Industrial occupancies.

17. Change Section 1104.3.2 of the IMC to read:

1104.3.2 Group A3 and B3 refrigerants. Group A3 and B3 refrigerants shall not be used except where approved.

Exceptions: This section does not apply to:

1. Laboratories where the floor area per occupant is not less than 100 square feet (9.3 m^2).
2. Listed self-contained systems having a maximum of 0.331 pounds (150 g) of Group A3 refrigerant.
3. Self-contained systems listed per UL 60335-2-89 having a maximum of 1.1 pounds (500g) of Group A3 refrigerant.
4. Industrial occupancies.
5. *Equipment* listed for and used in residential occupancies containing a maximum of 6.6 pounds (3 kg) of Group A2 or B2 refrigerant.
6. *Equipment* listed for and used in commercial occupancies containing a maximum of 22 pounds (10 kg) of Group A2 or B2 refrigerant.

18. Delete Table 1104.3.2 of the IMC.

19. Delete the exception to Section 1106.3 of the IMC and change Section 1106.3 of the IMC to read:

1106.3 Class 2 and 3 refrigerants. Where refrigerants of Groups A2, A3, B2 and B3 are used, the *machinery room* shall conform to the Class I, Division 2, *hazardous location* classification requirements of NFPA 70.

20. Delete the exception to Section 1106.4 and change Section 1106.4 of the IMC to read:

1106.4 Group A2L and B2L refrigerant. Machinery rooms for Group A2L and B2L refrigerant shall comply with Section 1106.4.1 through Section 1106.4.3.

21. Change Section 1106.4.1 of the IMC to read:

1106.4.1 Elevated temperature. Open flameproducing devices or continuously operating hot surfaces over 1290°F (700°C) shall not be permanently installed in the room.

22. Change Section 1106.4.2 of the IMC to read:

1106.4.2 Refrigerant detector. In addition to the requirements of Section 1105.3, refrigerant detectors shall signal an alarm and activate the ventilation system in accordance with the response time specified in Table 1106.4.2.

23. Replace Table 1106.4.2 of the IMC with the following:

Table 1106.4.2
GROUP A2L and B2L DETECTOR ACTIVATION

ACTIVATION LEVEL	MAXIMUM RESPONSE TIME (seconds)	ASHRAE 15 VENTILATION LEVEL	ALARM RESET	ALARM TYPE
Less than or equal to the OEL in Table 1103.1	300	1	Automatic	Trouble
Less than or equal to the refrigerant concentration level in Table 1103.1	15	2	Manual	Emergency

24. Change Section 1106.4.3 of the IMC to read:

1106.4.3 Mechanical ventilation. The *machinery room* shall have a mechanical ventilation system complying with ASHRAE 15.

25. Add the following standards to the list of referenced standards in Chapter 15 of the IMC.

Standard Reference Number	Title
UL 484–2019	Standard for Room Air Conditioners

Standard Reference Number	Title
UL/CSA 60335–2–40– 2019	Household and Similar Electrical Appliances—Safety–Part 2–40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers
UL/CSA 60335–2–40–2021	Household and Similar Electrical Appliances—Safety–Part 2–89: Particular Requirements for Commercial Refrigerating Appliances and Ice Makers with an Incorporated or Remote Refrigerant Unit or Motor-Compressor

26. Delete the following standards from the list of referenced standards inChapter 15 of the IMC:

Standard Reference Number	Title
UL 484–2019	Standard for Room Air Conditioners
UL/CSA 60335–2–40–2017	Household and Similar Electrical Appliances—Safety—Part 2–40: Particular Requirements for Electrical Heat Pumps, Air–Conditioners and Dehumidifiers
UL/CSA 60335–2–89–2017	Household and Similar Electrical Appliances—Safety—Part 2–89: Particular Requirements for Commercial Refrigerating Appliances and Ice Makers with an Incorporated or Remote Refrigerant Unit or Motor-Compressor
UL 109– 97	Tube Fittings for Flammable and Combustible Fluids, Refrigeration Service and Marine Use
UL 207–2009	Refrigerant-containing Components and Accessories, Nonelectrical - with revisions through June 2014

2801.1.4 Changes to the IFGC.

The following changes shall be made to theIFGC:

1. Change Section 301.1 of the IFGC to read:

301.1 Scope. This code shall apply to the installation of fuel gas piping systems, fuel gas utilization*equipment*, and related accessories as follows:

1. Coverage of piping systems shall extend from the point of delivery to the connections with gas utilization *equipment*. (See "*Point of delivery.*")
2. Systems with an operating pressure of 125 psig (862 kPa gauge) or less. Piping systems for gas-air mixtures within the flammable range with an operating pressure of 10 psig (69 kPa gauge) or less. LP-Gas piping systems with an operating pressure of 20 psig (140 kPa gauge) or less.
3. Piping systems requirements shall include design, materials, components, fabrication, assembly, installation, testing and inspection.
4. Requirements for gas utilization *equipment* and related accessories shall include installation, combustion and ventilation air and venting.

This code shall not apply to the following:

1. Portable LP-gas *equipment* of all types that are not connected to a fixed fuel piping system.
2. Installation of farm *equipment* such as brooders, dehydrators, dryers, and irrigation*equipment*.
3. Raw material (feedstock) applications except for piping to special atmosphere generators.
4. Oxygen-fuel gas cutting and welding systems.
5. Industrial gas applications using gases such as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen, and nitrogen.
6. Petroleum refineries, pipeline compressor or pumping stations, loading terminals, compounding plants, refinery tank farms, and natural gas processing plants.
7. Integrated chemical plants or portions of such plants where flammable or combustible liquids or gases are produced by chemical reactions or used in chemical reactions.
8. LP-gas installations at utility gas plants.

9. Liquefied natural gas (LNG) installations.
10. Fuel gas piping in power and atomic energy plants.
11. Proprietary items of *equipment*, apparatus, or instruments such as gas generating sets, compressors, and calorimeters.
12. LP-gas *equipment* for vaporization, gas mixing, and gas manufacturing.
13. Temporary LP-gas piping for *buildings* under *construction* or renovation that is not to become part of the permanent piping system.
14. Installation of LP-gas systems for railroad switch heating.
15. Installation of LP-gas and compressed natural gas (CNG) systems on vehicles.
16. Except as provided in Section 401.1.1, gas piping, meters, gas pressure regulators, and other appurtenances used by the serving gas supplier in the distribution of gas, other than undiluted LP-gas.
17. *Building* design and *construction*, except as specified herein.

2. Change Section 301.3 of the IFGC to read:

301.3 Listed and labeled. Appliances regulated by this code shall be listed and labeled for the application in which they are used unless otherwise approved in accordance with Section 112. The approval of unlisted appliances in accordance with Section 112 shall be based on approved engineering evaluation.

3. Add Section 404.11.5 to the IFGC to read:

404.11.5 Coating application. Joints in gas piping systems shall not be coated prior to testing and approval.

4. Change Item 6 of Section 410.2 of the IFGC (Items 1 through 5 and Item 7 remain) to read:

6. Means shall be provided downstream of the MP regulator for the connection of a pressure measuring instrument and shall be positioned to allow connection of a pressure measuring instrument. Such means shall be permitted to be a dedicated test port on a regulator, gas control, or manifold, or a plugged tee fitting or plugged manifold port.

5. Change Section 614.9.2 of the IFGC to read:

614.9.2 Duct installation. Exhaust ducts shall be supported at 4-foot (1219 mm) intervals and secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Ducts shall not be joined with screws or similar fasteners that protrude into the inside of the duct.

Where dryer exhaust ducts are enclosed in wall or ceiling cavities, such cavities shall allow the installation of the duct without deformation.

6. Add the following standards to the list of referenced standards in Chapter 8 of the IFGC:

Standard Reference Number	Title
ANSI LC1/CSA 6.26-18	Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)

7. Delete the following standards from the list of referenced standards in Chapter 8 of the IFGC:

Standard Reference Number	Title
ANSI LC1/CSA 6.26-16	Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)