



Substitute Refrigerants Under SNAP as of December 20, 2011

SNAP Information: <http://www.epa.gov/ozone/snap>

EPA has created the Significant New Alternatives Policy (SNAP) Program under section 612 of the Clean Air Act Amendments. SNAP evaluates alternatives to ozone-depleting substances. Substitutes are reviewed on the basis of ozone depletion potential, global warming potential, toxicity, flammability, and exposure potential as described in the March 18, 1994, final SNAP rule (59 FR 13044). Lists of acceptable and unacceptable substitutes will be updated periodically in the Federal Register. The following SNAP notices and subsequent final rules are included in this list: August 26, 1994 (59 FR 44240), January 13, 1995 (60 FR 3318), June 13, 1995 (60 FR 31092), July 28, 1995 (60 FR 38729), February 8, 1996 (61 FR 4736), May 22, 1996 (61 FR 25585), September 5, 1996 (61 FR 47012), October 16, 1996 (61 FR 54030), March 10, 1997 (62 FR 10700), June 3, 1997 (62 FR 30275), February 24, 1998 (63 FR 9151), May 22, 1998 (63 FR 28251), January 26, 1999 (64 FR 3861), March 3, 1999 (64 FR 10374), April 28, 1999 (64 FR 22982), June 8, 1999 (64 FR 30410), December 6, 1999 (64 FR 68039), April 11, 2000 (65 FR 19327), June 19, 2000 (65 FR 37900), December 18, 2000 (65 FR 78977), May 23, 2001 (66 FR 28379), March 22, 2002 (67 FR 13272), December 20, 2002 (67 FR 77927), August 21, 2003 (68 FR 50533), and October 1, 2004 (69 FR 58903), March 29, 2006 (71 FR 15589), September 28, 2006 (71 FR 55884), October 4, 2007 (72 FR 56628), June 12, 2008 (73 FR 33304), January 2, 2009 (74 FR 21), September 30, 2009 (74 FR 50129), June 16, 2010 (75 FR 34017), March 29, 2011 (76 FR 17488), October 4, 2011 (76 FR 61269), and December 20, 2011 (76 FR 78832).

Acceptable Substitutes for Class I (CFCs) Substances in Air Conditioning under the Significant New Alternatives Policy (SNAP) Program as of December 20, 2011

Substitutes (Name Used in Federal Register)	Trade Name	CFC-11 Centrifugal Chillers	CFC-12, CFC-114, R-500 Centrifugal Chillers	CFC-12, R-500 Reciprocating and Screw Chillers	CFC-12 Motor Vehicle AC ¹	CFC-12 Industrial Process AC	CFC-114 Industrial Process AC	CFC-12, R-500 Residential Dehumidifiers
HCFC-123	123	R, N	N					
HCFC-22	22	N	N	N	R, N ¹ (buses only)		N (only <115F)	R, N
HCFC-124	124		R, N (CFC-114 only)				R, N	
HFC-134a	134a	N	R, N	R, N	R, N ¹		N (only <125F)	R, N
HFC-152a	152a				N ³ (no R)			
HFC-227ea		N	N	N				
HFC-236fa			R, N (CFC-114 only)					
HFC-245fa	Genetron® 245fa	R,N	R,N (CFC-114 only)				R,N	
R-401A, R-401B	MP-39, MP-66			R, N			R, N	R, N
R-406A	GHG		R, N (R-500 only)		R, N ^{1,2}			R

Key: R = Retrofit Uses, N = New Uses

¹These refrigerants are actually "acceptable subject to use conditions." The conditions include 1)the use of unique fittings, 2)the use of descriptive labels, and 3) a prohibition against topping off one refrigerant with another. Details may be found in EPA's fact sheet titled "Choosing and Using Alternative Refrigerants for Motor Vehicle Air Conditioning."

² In addition to the use conditions listed under (¹), these refrigerants must be used with barrier hoses.

³See use conditions in Appendix B to Subpart G, 40 CFR Part 82 and 73 FR 33303 (June 12, 2008 final rule).



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**Acceptable Substitutes for Class I (CFCs) Substances in Air Conditioning under the
Significant New Alternatives Policy (SNAP) Program as of December 20, 2011 (continued)**

Substitutes (Name Used in Federal Register)	Trade Name	CFC-11 Centrifugal Chillers	CFC-12, CFC-114, R-500 Centrifugal Chillers	CFC-12, R-500 Reciprocating and Screw Chillers	CFC-12 Motor Vehicle AC¹	CFC-12 Industrial Process AC	CFC-114 Industrial Process AC	CFC-12, R-500 Residential Dehumidifiers
R-409A (HCFC Blend Gamma)	409A							R
R-411A, R-411B	411A, 411B			R, N				
FRIGC (HCFC Blend Beta)	FRIGC FR-12, 416A		R, N (CFC-12, R-500 only)	R, N	R, N ¹			R, N
Free Zone (HCFC Blend Delta)	Freezone / RB-276		R, N (CFC-12, R-500 only)	R, N	R, N ¹			R, N
Hot Shot (HCFC Blend Omicron)	Hot Shot, KarKool, 414B		R, N (CFC-12, R-500 only)	R, N	R, N ^{1,2}	R,N	R,N	R, N
GHG-X4 (HCFC Blend Xi)	GHG-X4, Autofrost, McCool Chill-it, 414A		R, N (CFC-12, R-500 only)	R, N	R, N ^{1,2}			R, N
GHG-X5	GHG-X5		R, N (CFC-12, R-500 only)	R, N	R, N ^{1,2}			R, N
GHG-HP (HCFC Blend Lambda)	GHG-HP				R, N ^{1,2}			R, N
Freeze 12	Freeze 12		R, N (CFC-12, R-500 only)	R, N	R, N ¹			R, N
411C	G2018C		R, N (CFC-12, R-500 only)	R, N				
THR-02	THR-02		N (CFC-12 only)	N (CFC-12 only)		R, N		
Ikon A, Ikon-12 (Blend Zeta)	Ikon A, Ikon-12		R, N (CFC-12 only)		R, N ¹	R, N		
Ikon B	Ikon B		R, N (CFC-12 only)	N (CFC-12 only)		R, N		R, N (CFC-12 only)
FOR12A, FOR12B	FOR12A, FOR12B		R, N (CFC-12 only)	R, N (CFC-12 only)		R, N		
SP34E	SP34E			R, N (CFC-12 only)	R, N ¹			
HCFC-22/HCFC-142b			R, N (CFC-12 only)	R, N (CFC-12 only)				R, N (CFC-12 only)
R-420A	Choice R-420A		R, N (CFC-12, R-500 only)	R, N	R ^{1,2}	R,N		R, N
ISCEON 39TC	ISCEON 39TC		R, N (CFC-12 only)			R,N		
RS-24 (2002 formulation)						R,N		R, N (CFC-12 only)
R-407C	SUVA 407C, KLEA 407C			R, N (R-502)		R, N (R- 502)		R, N (R-502)

Key: R = Retrofit Uses, N = New Uses

¹These refrigerants are actually "acceptable subject to use conditions." The conditions include 1) the use of unique fittings, 2) the use of descriptive labels, and 3) a prohibition against topping off one refrigerant with another. Details may be found in EPA's fact sheet titled "Choosing and Using Alternative Refrigerants for Motor Vehicle Air Conditioning."

²In addition to the use conditions listed under (¹), these refrigerants must be used with barrier hoses.



Acceptable Substitutes for Class I (CFCs) Substances in Air Conditioning under the Significant New Alternatives Policy (SNAP) Program as of December 20, 2011 (continued)

Substitutes (Name Used in Federal Register)	Trade Name	CFC-11 Centrifugal Chillers	CFC-12, CFC-114, R-500 Centrifugal Chillers	CFC-12, R-500 Reciprocating and Screw Chillers	CFC-12 Motor Vehicle AC ¹	CFC-12 Industrial Process AC	CFC-114 Industrial Process AC	CFC-12, R-500 Residential Dehumidifiers
R-422C	ICOR XLT1			R,N (R-502 only)		R, N (R-502)		R, N (R-502)
R-426A	RS-24 (new formulation)				R,N ¹	R,N		R,N
KDD6	KDD6			R, N		R,N		R, N
Hot Shot 2	Hot Shot 2	R	R	R (also R-502)				R
HFO-1234yf	HFO-1234yf, Opteon yf				N ⁴ (no R)			
Ammonia Vapor Compression		N	N					
Evaporative Cooling		N	N	N	N			
Desiccant Cooling		N	N	N				
Ammonia / Water Absorption		N	N					
Water / Lithium Bromide Absorption		N	N					
Small Auxiliary Power Units in Tractor Trailers					R, N			

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⁴See use conditions in Appendix B to Subpart G, 40 CFR Part 82 and 76 FR 17488 (March 29, 2011 final rule).



Acceptable Substitutes for Class I (CFCs) Substances in Commercial Refrigeration under the Significant New Alternatives Policy (SNAP) Program as of December 20, 2011

Substitutes (Name Used in Federal Register)	Trade Name	ODS Being Replaced	Cold Storage Warehouses	Ref. Transport	Retail Food Ref.	Ice Machines	Vending Machines	Water Coolers	Non-Mechanical Heat Transfer	Very Low Temp. Ref.
HCFC-22	22	12, 502	R, N	R, N	R, N	N	R, N	N		
HFC-23	23	12, 13, 13B1, 503								R, N
HFC-134a	134a	12	R, N	R, N	R, N	N	R, N	R, N		
HFC-227ea		12	N		N					
HFC-236fa		114							R, N	
HFC-245fa	Genetron® 245fa	11, 113, 114							R,N (11, 113)	,N (11, 114)
HFE-4310mee		all CFCs							R, N	
C6 perfluoroketone	Novec 649	113							R, N	
R-401A, R-401B	MP39, MP66	12	R, N	R, N	R, N	R, N	R, N	R, N		
R-402A, R-402B	HP80, HP81	502	R, N	R, N	R, N	R, N				
R-404A	HP62, 404A	502	R, N	R, N	R, N	R, N	R, N			
R-406A	GHG	12, 500	R	R	R	R	R	R		
R-407A, R-407B	Klea 407A, 407B	502	R, N	R, N	R, N	R, N				
R-408A (HCFC Blend Epsilon)	408A	502	R	R	R	R				
R-409A (HCFC Blend Gamma)	409A	12		R	R	R	R	R		
R-411A, R-411B	411A, 411B	12, 500, 502	R, N	R, N	R, N	R, N	R, N	R, N		
R-428A	RS-52	502	R,N	R,N	R,N	R,N				
R-507 (R-507A)	AZ-50	502, 13B	R, N	R, N	R, N	R, N	R, N			R (13B only)
R-508A (PFC Blend Alpha)	KLEA 5R3	13, 13B1, 503								R, N
R-508B	SUVA 95	13, 13B1, 503								R, N
FRIGC (HCFC Blend Beta)	FRIGC FR-12, 416A	12, 500	R, N	R, N	R, N	R, N	R, N	R, N		
Free Zone (HCFC Blend Delta)	Free Zone / RB-276	12	R, N	R, N	R, N	R, N	R, N	R, N		
Hot Shot (HCFC Blend Omicron)	Hot Shot, KarKool, 414B	12, 500	R, N	R, N	R, N	R, N	R, N	R, N		

Key: R = Retrofit Uses, N = New Uses



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Acceptable Substitutes for Class I (CFCs) Substances in Commercial Refrigeration under the Significant New Alternatives Policy (SNAP) Program as of December 20, 2011 (continued)

Substitutes (Name Used in the Federal Register)	Trade Name	ODS Being Replaced	Cold Storage Ware-houses	Ref. Transport	Retail Food Ref.	Ice Machines	Vending Machines	Water Coolers	Non-Mechanical Heat Transfer	Very Low Temp. Ref.
GHG-X4 (HCFC Blend Xi)	GHG-X4, Autofrost, McCool Chill-it, 414A	12, 500	R, N	R, N	R, N	R, N	R, N	R, N		
GHG-X5	GHG-X5	12, 500	R, N	R, N	R, N	R, N	R, N	R, N		
(HCFC Blend Lambda)	GHG-HP	12	R, N	R, N	R, N	R, N	R, N	R, N		
FREEZE 12	FREEZE 12	12	R, N	R, N	R, N	R, N	R, N	R, N		
411C	G2018C	12, 500, 502	R, N	R, N	R, N	R, N	R, N	R, N		
HCFC-22/HCFC-142b		12	R, N	R, N	R, N	R, N	R, N	R, N		
R-420A	Choice R-420A	12, 500	R, N		R,N	R,N	R,N	R,N		
R-421B	Choice R-421B	12, 502	R, N	R, N	R, N	R, N				
R-422C	ICOR XLT1	502			R,N				R,N	R,N
R-426A	RS-24 (new formulation)	12	R, N	R, N	R, N	R, N	R, N	R, N		
Ammonia Vapor Compression		all	N		N	N				
Galden Fluids		11, 12, 113, 114, 115							R	
Evaporative/Desiccant Cooling		all	N							
Stirling Cycle		all		N						
Direct Nitrogen Expansion		all		N						
Pressure Stepdown		all	N							
CO ₂ (R-744)		11, 12, 13, 113, 114, 115, 13B1, 503	N		N				R, N	R, N
Cryogenic System Using Recaptured Liquid CO ₂ or Liquid Nitrogen	Cryo-Mechanical	12, 500		N						
Propane (R-290)		12, 502			N ¹ (stand-alone units)					
Self-chilling cans using CO ₂		12, 502	R, N	R, N	R, N		R, N			
Volatile Methyl Siloxanes, Water, Mineral Oil		11, 12, 113, 114, 115							R, N	

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¹ See use conditions in Appendix R to Subpart G, 40 CFR Part 82 and 76 FR 78832 (December 20, 2011 final rule). Decision is for new stand-alone refrigerators and freezers only.



Acceptable Substitutes for Class I (CFCs) Substances in Commercial Refrigeration under the Significant New Alternatives Policy (SNAP) Program as of December 20, 2011 (continued)

Substitutes (Name Used in Federal Register)	Trade Name	ODS Being Replaced	Cold Storage Warehouses	Ref. Transport	Retail Food Ref.	Ice Machines	Vending Machines	Water Coolers	Non-Mechanical Heat Transfer	Very Low Temp. Ref.
C ₃ F ₈ , C ₄ F ₁₀ , C ₂ F ₁₂ , C ₂ F ₁₁ NO, C ₆ F ₁₄ , C ₆ F ₁₃ NO, C ₇ F ₁₆ , C ₇ F ₁₅ NO, C ₈ F ₁₈ , C ₈ F ₁₆ O, and C ₉ F ₂₁ N									R, N ²	
NARM-502		13,13B1,503								R, N
THR-02	THR-02	12	R, N	R, N	R, N	R, N	R, N	R, N		
THR-04	THR-04	502	R, N	R, N	R, N	R, N	R, N	R, N		
HFE-7100 (HFE-449s1), HFE-7200 (HFE-569sf2)		11, 12, 113, 114, 115							R, N	
HFE-7100 (HFE-449s1), HFE-7200 (HFE-569sf2) as a secondary heat transfer fluid in not-in-kind systems		12, 502, 13, 13B1, 503			N (12, 502)					N (13, 13B1, 503)
Ikon A, Ikon-12 (Blend Zeta)	Ikon A, Ikon-12	12	R, N	R, N	R, N	R, N	R, N	R, N		
Ikon B	Ikon B	12	R, N	R, N	R, N	R, N	R, N	R, N		
FOR12A, FOR12B	FOR12A, FOR12B	12	R, N	R, N	R, N	N	R, N	R, N		
SP34E	SP34E	12	R, N	R, N	R, N		R, N	R, N		
HFC-134a/HBr (92/8)		12, 502		N						
HFC-134a/HBr (92/8) as the primary heat transfer fluid in secondary-loop equipment		12, 502	N		N					
PFC-330ST, PFC-550HC, PFC-660HC, PFC-1100HC, PFC-1100LT, PGC-100, PGC-150, PFC-331ST, PFC-551HC, PFC-661HC, PFC-1101HC, PGC-151	PFC-330ST, PFC-550HC, PFC-660HC, PFC-1100HC, PFC-1100LT, PGC-100, PGC-150, PFC-331ST, PFC-551HC, PFC-661HC, PFC-1101HC, PGC-151	13, 113, 114, blends thereof								R, N
PFC-1102HC, PFC-662HC, PFC-552HC and FLC-15	PFC-1102HC, PFC-662HC, PFC-552HC and FLC-15	13, 113, 114, blends thereof								N
Hydrofluoroether 7000	HFE-7000	CFC-11, CFC-113							R, N	
ISCEON 39TC	ISCEON 39TC	12	R, N							

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² Acceptable only where no other alternatives are technically feasible due to safety or performance requirements



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**Acceptable Substitutes for Class I (CFCs) Substances in Commercial Refrigeration under the
 Significant New Alternatives Policy (SNAP) Program as of December 20, 2011 (continued)**

Substitutes (Name Used in Federal Register)	Trade Name	ODS Being Replaced	Cold Storage Ware- houses	Ref. Transport	Retail Food Ref.	Ice Machines	Vending Machines	Water Coolers	Non-Mecha- nical Heat Transfer	Very Low Temp. Ref.
RS-24 (2002 formulation)		12	R,N	R,N	R,N	R,N	R,N	R,N		
NU-22 [R-125/134a/600 (46.6/50.0/3.4)]	NU-22	502	R,N	R,N	R,N	R,N	R,N	R,N		
ISCEON 89	ISCEON 89	R-13B1								R,N
Hot Shot 2	Hot Shot 2	12, 500, 502	R	R	R	R	R			
R-407C	SUVA 407C, KLEA 407C	502	R,N	R,N	R,N	R,N	R,N	R,N	R,N	
R-407D		12		R,N						
KDD6	KDD6	12	R, N	R, N	R, N	R, N	R, N	R, N	R, N	
HFO-1234ze	HFO-1234ze	113							R, N	

Key: R = Retrofit Uses, N = New Uses



Acceptable Substitutes for Class I (CFCs) Substances in Non-Commercial Refrigeration under the Significant New Alternatives Policy (SNAP) Program as of December 20, 2011

Substitutes (Name Used in Federal Register)	Trade Name	ODS Being Replaced	Industrial Process Refrigeration	Ice Skating Rinks	Household Refrigerators	Household Freezers
HCFC-123	123	11	R, N			
HCFC-22	22	12, 502	R, N	R, N	R, N	R, N
HFC-23		13, 13B1, 503	R, N			
HFC-134a	134a	12	R, N		R, N	R, N
HFC-152a		12			N	N
HFC-227ea		12	N			
HFC-236fa		114	R,N			
HFC-245fa	Genetron® 245fa	114	R,N			
R-401A, R-401B	MP-39, MP-66	12	R, N	R	R, N	R, N
R-402A, R-402B	HP-80, HP-81	502	R, N			R, N
R-403B	Isceon 69-L	13, 13B1, 503	R, N ¹			
R-404A	HP-62, 404A	502	R, N			R, N
R-406A	GHG	12, 500	R		R	R
R-407A, R-407B	Klea 407A, 407B	502	R, N	R, N		
R-408A (HCFC Blend Epsilon)	408A	502	R			
R-409A (HCFC Blend Gamma)	409A	12			R	R
R-411A, R-411B	411A, 411B	12, 500, 502	R, N			
R-428A	RS-52	502		R,N	R,N	R,N
R-507	AZ-50	502	R, N			
R-508A (PFC Blend Alpha)	KLEA 5R3	13, 13B1, 503	R, N			
R-508B	Suva 95	13, 13B1, 503	R, N			
FRIGC (HCFC Blend Beta)	FRIGC FR-12, 416A	12, 500	R, N		R, N	R, N
Free Zone (HCFC Blend Delta)	Free Zone / RB-276	12	R, N	R, N	R, N	R, N
Hot Shot (HCFC Blend Omicron)	Hot Shot, KarKool, 414B	12, 500	R, N	R, N	R, N	R, N

Key: R = Retrofit Uses, N = New Uses

¹ Prohibited for other end-uses. See the list of unacceptable refrigerants below.



Acceptable Substitutes for Class I (CFCs) Substances in Non-Commercial Refrigeration under the Significant New Alternatives Policy (SNAP) Program as of December 20, 2011 (continued)

Substitutes (Name Used in Federal Register)	Trade Name	ODS Being Replaced	Industrial Process Refrigeration	Ice Skating Rinks	Household Refrigerators	Household Freezers
GHG-X4 (HCFC Blend Xi)	GHG-X4, Autofrost, McCool Chill-it, 414A	12, 500	R, N	R, N	R, N	R, N
GHG-X5	GHG-X5	12, 500	R, N		R, N	R, N
R-420A	Choice R-420A	12, 500	R, N	R, N	R, N	R, N
(HCFC Blend Lambda)	GHG-HP	12	R, N		R, N	R, N
FREEZE 12	FREEZE 12	12	R, N	R, N	R, N	R, N
411C	G2018C	12, 500, 502	R, N	R, N		
NARM-502	NARM-502	13, 503	R, N			
THR-01	THR-01	12			N	N
THR-02	THR-02	12	R, N		N	N
THR-04	THR-04	502	R, N	R, N	R, N	
HCFC-22/HCFC-142b		12	R, N		R, N	R, N
Ikon A, Ikon-12 (Blend Zeta)	Ikon A, Ikon-12	12	R, N		N	N
Ikon B	Ikon B	12	R, N		N	N
FOR12A, FOR12B	FOR12A, FOR12B	12	R, N		R, N	R, N
SP34E	SP34E	12			R, N	R, N
HFE-7100, HFE-7200 as a secondary heat transfer fluid in not-in-kind systems		11, 12, 114, 115, 502	R, N			
HFC-134a/HBr (92/8)		12, 502	N			
Hydrofluoroether-7000	HFE-7000	11,113	R,N			
ISCEON 39TC	ISCEON 39TC	12	R,N			
RS-24 (2002 formulation)		12	R,N	R,N	R,N	R,N
R-407C	SUVA 407C, KLEA 407C	502	R, N	R, N	R, N	R, N
R-421B	Choice R-421B	12, 502	R, N	R, N	R, N	R, N

Key: R = Retrofit Uses, N = New Uses



Acceptable Substitutes for Class I (CFCs) Substances in Non-Commercial Refrigeration under the Significant New Alternatives Policy (SNAP) Program as of December 20, 2011 (continued)

Substitutes (Name Used in Federal Register)	Trade Name	ODS Being Replaced	Industrial Process Refrigeration	Ice Skating Rinks	Household Refrigerators	Household Freezers
R-422C	ICOR XLT1	502	R,N			
R-426A	RS-24 (new formulation)	12	R,N	R,N	R,N	R,N
R-441A	HCR-188C	12			N ²	N ²
Hot Shot 2	Hot Shot 2	11, 12, 13B1, 113, 114, 500, 502	R	R (12, 500, 502 only)		
KDD6	KDD6	12	R, N	R, N	R,N	R,N
CO ₂		13, 13B1, 503	R, N			
Ammonia Vapor Compression		12, 502	R, N	R, N		
Ammonia Absorption		12			N	N
Isobutane (R-600a)		12			N ²	N ²
Propane (R-290), Propylene (R-1270), Butane (R-600)		12	R, N			
HC Blend A, B	HC-12a, OZ-12	all	R, N ¹			
Self-chilling cans using CO ₂		12, 502			R, N	
Evaporative/Desiccant Cooling		all	N			

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² See use conditions in Appendix R to Subpart G, 40 CFR Part 82 and 76 FR 78832 (December 20, 2011 final rule).



**Unacceptable Substitute Refrigerants
 Significant New Alternatives Policy (SNAP) Program as of December 20, 2011**

Substitutes (Name Used in Federal Register)	Trade Name	ODS Being Replaced	End-Uses where Unacceptable	Reason
All flammable refrigerants, including OZ-12 (Hydrocarbon Blend A) and HC-12a (Hydrocarbon Blend B), except for HFC-152a in new MVAC equipment		CFC-12	Motor Vehicle Air Conditioning, retrofit and new	lack of adequate risk assessment that characterizes incremental flammability risk
OZ-12 (Hydrocarbon Blend A) and HC-12a (Hydrocarbon Blend B)	OZ-12, HC-12a	CFC-12	All end-uses other than Industrial Process Refrigeration, retrofit and new	lack of adequate risk assessment that characterizes incremental flammability risk
R-141b		CFC-11	Centrifugal Chillers, new	high ODP, other substitutes with lower overall risk have been identified
R-176¹		CFC-12	All end-uses, retrofit and new	contains CFC-12
R-403B		R-502	All end-uses other than Industrial Process Refrigeration, retrofit and new	contains a perfluorocarbon that exhibits extremely high GWP and very long lifetime
R-405A		CFC-12	All end-uses, retrofit and new	contains a perfluorocarbon that exhibits extremely high GWP and very long lifetime
MT-31		all CFCs and HCFCs	All end-uses, retrofit and new	a chemical contained in this blend presents an unacceptable toxicity risk
Hexafluoropropylene (HFP) and all HFP-containing blends		all CFCs and HCFCs	All end-uses, retrofit and new	presents an unacceptable toxicity risk
Self-Chilling Cans using HFC-134a or HFC-152a		CFC-12, HCFC-22, R-502	Household Refrigeration, Transport Refrigeration, Vending Machines, Cold Storage Warehouses and Retail Food Refrigeration; retrofit and new	unacceptably high greenhouse gas emissions from direct release of refrigerant to the atmosphere
NARM-22		HCFC-22	All end-uses, retrofit and new	contains HCFC-22

¹R-176 contains CFC-12, HCFC-22, and HCFC-142b. It is a different product from RB-276, typically sold under the name "Freezone."



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Substitutes (Name Used in Federal Register)	Trade Name	Household and Light Commercial AC	Commercial Comfort AC	Industrial Process Refriger- ation	Industrial Process AC	Bus and Passenger Train AC	Cold Storage Warehouse Systems	Ice Skating Rinks	Refriger- ated Transport	Retail Food Refriger- ation	Ice Machines	Very Low Temp Refriger- ation	Household Refriger- ators and Freezers	Other Refriger- ated Appliances
R-407A	KLEA 60	R,N					R,N	R, N	R,N	R,N	R, N			
R-410A	AZ-20	N	N	N	N	N	N	N	N	N	N	N	N	N
R-410B	Suva 9100	N	N	N	N		N	N	N	N	N		N	N
R-404A	HP62	R,N	R,N	R, N	R,N		R,N	R,N	R,N	R,N	R,N	R,N	R, N	R,N
R-407C	Suva 407C, KLEA 407C	R, N	R, N	R, N	R, N	R, N	R, N	R, N	R, N	R, N	R, N	R,N	R, N	R, N
R-421A	Choice R421A	R,N	R,N	R,N	R,N		R,N	R,N	R,N	R,N	R,N		R,N	R, N
R-421B	Choice R421B			R,N			R,N	R,N	R,N	R,N	R,N		R, N	R, N (Water coolers)
R-422B	ICOR XAC1	R, N	R, N	R, N	R, N	R,N	R, N	R, N	R, N	R, N	R, N	R,N	R, N	R, N
R-422C	ICOR XLT1	R, N	R, N	R, N	R, N		R, N	R, N	R, N	R, N	R, N	R,N	R, N	R, N
R-422D	ISCEON MO29	R,N	R,N	R,N	R,N	R,N	R,N	R,N	R,N	R,N	R,N		R,N	R, N
R-424A	RS-44 (new formulation)	R,N	R,N	R,N	R,N	R, N	R,N	R,N	R,N	R,N	R,N		R,N	R, N (Residential Dehumidi- fiers)
R-428A	RS-52			N			R,N	R,N	R,N	R,N	R,N		R,N	-
R-134a	HFC-134a	N	R, N	R, N	R, N	R, N	R, N	R, N	R, N	R, N	N		R, N	R, N
R-245fa	Genetron- 245fa		R, N ¹									N (141b)		
R-507A	AZ-50	R, N	R, N	R, N	R, N		R, N	-	R, N	R, N	R, N		R, N	R, N
R-417A	Isceon 59, NU-22	R, N	R, N	R, N	R, N	R, N	R, N	R, N	R, N	R, N	R, N		R, N	R, N
R-427A	Forane 427A	R	R		R	R				R			R	-
R-125/134a/600a (28.1/70.0/1.9)		R, N	R, N	R, N	R, N	R, N			R, N					
Hydrofluoroether- 7000	HFE-7000			R, N								R, N		
RS-44 (2003 formulation)		R, N	R, N	R, N	R, N		R, N	R, N	R, N	R, N	R, N		R, N	R, N (Residential Dehumidi- fiers)



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R-434A	RS-45	R,N	R,N	R,N	R,N	R, N	R,N	R,N	R,N	R,N	R,N		R,N	R, N (Residential Dehumidi- fiers, Water Coolers)
R- 125/290/134a/600a (55.0/1.0/42.5/1.5)	ICOR AT-22	R, N	R, N	R, N	R, N		R, N	R, N	R, N	R, N	R, N	R,N	R, N	R, N
ISCEON 79, R-422A	ISCEON 79			R, N			R, N	R, N	R, N	R, N	R, N		R, N	-
R-438A (KDD5)	ISCEON® MO99	R,N	R,N	R,N	R,N	R,N	R,N	R,N	R,N	R,N	R,N		R,N	R, N
Self-chilling cans using recycled CO ₂		-	-	-	-		R, N	-	R, N	R, N	-		R, N	-
Ammonia		N ²	N ³	N ⁴	N ⁴		N ⁴	N ⁴	-	N ⁵	N ⁴		N ²	-
R-744 (Carbon dioxide, CO ₂)				R, N			N			N		N		
Evaporative Cooling		N	N	N	N	N	N	-	-	-	-	-		-
Desiccant Cooling		N	N	N	N		N	-	-	-	-	-		-
Water/Lithium bromide		-	N	-	-		-	-	-	-	-	-		-
THR-03	THR-03	N ⁶	N	R, N	N		N	N	R, N	N	N		N	-
HFE-7100 (HFE- 449s1), HFE-7200 (HFE-569sf2) for secondary heat transfer in NIK systems				N						N		N		
HFC-227ea			N	N			N							
R-423A	ISCEON 39TC		R,N ⁷	R, N	R, N		R, N	R, N						



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Substitutes (Name Used in Federal Register)	Trade Name	Household and Light Commercial AC	Commercial Comfort AC	Industrial Process Refriger- ation	Industrial Process AC	Bus and Passenger Train AC	Cold Storage Warehouse Systems	Ice Skating Rinks	Refriger- ated Transport	Retail Food Refriger- ation	Ice Machines	Very Low Temp Refriger- ation	Household Refriger- ators and Freezers	Other Refriger- ated Appliances
R-426A	RS-24 (new formulation)				R, N	R, N	R, N	R, N	R, N	R, N	R, N		R, N	R, N
R-437A		R, N											R, N	R, N (Residential Dehumidi- fiers)
R-441A	HCR-188C												N ⁸	
SP34E	SP34E		R, N ⁹			R, N	R, N		R, N	R, N			N	N (Vending machines, water coolers)
Stirling cycle			N	N		N	N		N		N		N	N (Vending machines)
RS-24 (2002 formulation)				R, N	R, N	R, N	R, N	R, N	R, N	R, N	R, N		R, N	R, N
HC Blend A	OZ-12			R, N										
HC Blend B	Original formulation of HC-12a			R, N										
Nitrogen direct gas expansion				N					N					
Pressure stepdown							N							
R-290 (Propane)				R, N						N ⁸				
R-407B				R, N			R, N	R, N	R, N	R, N	R, N			
R-407D									R, N					
R-407F	Genetron Performax LT	R,N		R,N	R,N	R,N	R,N	R,N	R,N	R,N	R,N		R,N	R,N
R-600 (Butane)				R, N										
R-600a (Isobutane)													N ⁸	
R-1270 (Propane)				R, N										
Cryogenic system using recaptured liquid CO2 or liquid nitrogen									N					
Hot Shot 2	Hot Shot 2	R	R	R			R	R	R	R	R			R (dehumidi- fiers, vending machines)

Key: R = Retrofit Uses, N = New Uses, (-) = Not submitted for review against this end use or not practical to use the substitute refrigerant in this end use.

1. Only approved for centrifugal chillers; 2. Absorption systems; 3. Absorption chillers or vapor compression with secondary loop; 4. Vapor compression or absorption systems; 5. Vapor compression with a secondary loop;

6. Only approved for window air conditioning units; 7. Only approved for centrifugal chillers; 8. See used conditions in Appendix R to Subpart G, 40 CFR Part 82 and 76 FR 78832 (December 20, 2011 final rule) 9. Only approved for reciprocating and screw chillers.



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Description of Class II End Uses		
End Use	Air Conditioning and Refrigeration Systems or Applications	Ozone Depleting Substance
Household and Light Commercial Air Conditioning	Heat pumps, central air conditioning, direct-expansion commercial air conditioners, packaged terminal air conditioners, room air conditioners, and split system air conditioners	HCFC-22
Commercial Comfort Air Conditioning	Reciprocating, centrifugal and screw chillers	HCFC-22, CFC-12, R-500, and CFC-11
Industrial Process Refrigeration	Refrigeration applications within the chemical, pharmaceutical and petrochemical industries, the oil and gas industry, the metallurgical industry, civil engineering, sports and leisure facilities, and food processing.	HCFC-22, CFC-12, R-500, and R-502
Industrial Process Air Conditioning	Air conditioning systems that perform a critical mission in a high-temperature industrial environment, such as cooling a control cab on a crane in a foundry or protecting a computer room in a steel mill.	HCFC-22, CFC-12, and CFC-114
Cold Storage Warehouse Systems	Public and private facilities used to store meat, produce, dairy products, frozen food, and other perishable goods.	HCFC-22, R-502 and CFC-12
Bus and Passenger Train Air Conditioning	Motor vehicle air conditioning systems for buses and passenger trains.	HCFC-22
Ice Skating Rinks	Ice Skating Rinks	HCFC-22, CFC-12, and R-502
Refrigerated Transport	Refrigeration systems in trucks, trailers, railcars, ships, internodal containers, on board ships, and air conditioning systems in buses and passenger trains.	CFC-12, R-500 and R-502
Retail Food Refrigeration	Stand alone refrigeration cases found in small markets, convenience stores, restaurants and other food establishments, large systems found in supermarkets, and HCFC-22 systems found in a wide variety of retail and service establishments.	HCFC-22, CFC-12, and R-502
Ice Machines	Small, medium, and large ice makers used by a number of entities including restaurants and hotels.	CFC-12
Household Refrigerators and Freezers	Refrigerators and freezers	CFC-12 and R-502
Other Refrigerated Appliances	Vending machines, residential dehumidifiers, and water coolers	CFC-12 and R-502

1. Substitution through retrofit is only applicable to HCFC-22 systems.

Refrigerant blends that contain Class II Ozone Depleting Substances include, but are not limited to, R-401A, R-401B, R-402A, R-402B, R-403B, R-406A, R-408A, R-409A, R-411A, R-411B, R-411C, R-414A, R-414B, and R-416A.



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Alternative Refrigerant Manufacturers																		
Refrigerant	3M	Arkema	Com-star	Dupont	Green-cool	Honey-well	ICI	ICO R	IKON	CFC Refi-max	Peoples Welding Supply	Refrigerant Solutions LTD	RMS of Georgia	Rhodia Ltd.	Sol-power	Technical Chemical	Techno Chem Co., Ltd. ¹	Tsinghua University of Beijing ²
THR-02, THR-03																		THR-02, THR-03
Isceon 59/NU-22				Isceon 59				NU-22						Isceon 59				
Isceon 79				Isceon 79										Isceon 79				
Isceon 89				Isceon 89										Isceon 89				
FOR12A, FOR12B																		FOR12A, FOR12B
SP34E															SP34E			
Hot Shot 2								Hot Shot 2										

1 and Inha University

2 and the Beijing Inoue Qinghua Refrigeration Technology Company LTD