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October 2024

BUREAU OF INDIAN STANDARDS

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DRAFT AMENDMENT NO. 1

TO

IS 15975 : 2020 GAS CYLINDERS — CONDITIONS FOR FILLING GAS CYLINDERS

(First Revision of IS 15975 *)*

ICS 23.020.30

Gas Cylinders Sectional Committee, MED 16	Last date for receipt of comments is **28 November 2024**

(*Page* 1, *clause* **3.2**) — Substitute the following for the existing clause:

'**3.2 Settled Pressure or Filling Pressure (p_f)** — The maximum permissible gauge pressure, converted to 15 °C, at which a gas cylinder for permanent gas or gas dissolved under pressure can be filled. In other words, pressure of the contents of the cylinders at 15 °C.'

(*Page* 1, *clause* **3.3**) — Substitute the following for the existing clause:

'**3.3 Filling Ratio (*C*)** — The ratio of the weight of a liquefiable gas introduced in the cylinder to the weight of the water the cylinders will hold at 15 °C.'

(*Page* 1, *clause* **3.5**) — Substitute the following for the existing clause:

'**3.5 Maximum Development Pressure (p_d)** — The internal pressure developed by the gas at the maximum attainable temperature of 65 °C.'

(*Page* 2, *clause* **3.8**) — Substitute the following for the existing clause:

'**3.8 Critical Temperature (t_c)** — Temperature above which a substance cannot exist in the liquid state.'

(*Page* 2, *clause* **4.2**) — Substitute the following for the existing clause:

'**4.2 Compressed Gases**

4.2.1 The maximum settled pressure shall be the lower of the following values:

a) Two-thirds of the test pressure or as per the specification of cylinders (*For example*: IS 7285 (3/5 of test pressure);
b) A pressure that does not exceed the cylinder test pressure when the cylinder content is raised to the reference temperature of 65 °C; and
c) The pressure given in Table 1.

4.2.2 The values for filling pressure at 15 °C, p_f and corresponding developed pressure at 65 °C, p_d are given in Table 7. The ratio $C = p_d/p_f$ is also given in this table.

NOTE — Values of intermittent pressures may be linearly interpolated.'

(*Page* 2, *clause* **4.3.4**) — Insert the following new sub-subclause at the end:

'**4.3.5** The liquid densities for low pressure liquefiable gases other than hydrocarbon gases are mentioned in Table 8.'

(*Page* 3, *clause* **4.6**) — Insert the following new clause at the end:

'**4.7 Low Pressure Liquefied Hydrocarbon Gases**

Among hydrocarbon gases mixtures of two or more gases of varying composition are more common than pure gases. These mixtures may contain several hydrocarbons and their composition may vary from time to time. The filling ratio to be used is generally obtained from the density at the maximum attainable temperature of 65 °C. Since it is not convenient to carry out the routine determination of the density at 65 °C, in practice density determination is made at some lower temperature. Table 9 gives the filling ratios for 65 °C when density determination is done at temperature other than 65 °C. The conversion table given is applicable to saturated hydrocarbon mixtures as also to hydrocarbon mixtures containing a maximum of 10 percent of unsaturated hydrocarbons. For gas mixtures containing more than 10 percent of unsaturated hydrocarbons, it is recommended that the filling ratios are calculated from the actual density determination at 65 °C.'

(*Page* 8, *Table* 2) — Insert the following at the end:

Sl No.	**UN No.**	**Gas Name**	**Chemical Formulae**	**Critical Temperature**	**Recommended Cylinder Test Pressure In MPa (g)**	**Filling Degree (Filling Ratio)**	**Substances and Preparation Directive Classification**	**Test Period (Years)**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ixxxv)	3082	Trichlorofluoromethane (R 11)	CCl_3F	198	1.76	0.90	-	5
Ixxxvi)	1075	Petroleum gas, Liquified		-42	2.45	0.80	-	10

(*Page* 12, *Table* 6) — Substitute the following for the existing table:

Sl No.	**UN No.**	**Gas Name**	**Chemical Formula**	**Boiling Point (°C)**	**Minimum Test Pressure In MPa (g)**	**Filling Degree (Filling Ratio)**	**Substances and Preparation Directive Classification**	**Test Period (Years)**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	3163	R 410 A (difluoromethane, pentafluroethane)	-	-48.5	6.37	0.81	-	5

ii)	3337	R 404 A (pentafluoroethane, 1,1,1- trifluoroethane, and 1,1,1,2- tetrafluoroetane zeotropic mixture with approximately 44 percent pentafluoroethane and 52 percent 1,1,1-trifluoroethane)	-	-46	2.94	0.82	-	5
iii)	3340	R 407 C (difluoromethane, pentafluoroethane, and 1,1,1,2-tetrafluoroethane zeotropic mixture with approximately 23 percent difluoromethane and 25 percent pentafluoroethane)	-	-43.6	2.94	0.95	-	5
iv)	2602	Refrigerant gas mixture, R 500	R-12 $CC1_2F_2$, CHF_2CH 73.8 % + R-152a 26.2 %, by mass	-33.6	2	0.94	F	5
v)	1973	Refrigerant gas mixture, R 502	R-22 $CHClF_2$, $CClF_2CF_3$ 48.8 % + R-115 51.2%, by mass	-45.3	3	0.97	Xi	5
vi)	3070	Refrigerant gas mixture (Ethylene oxide with dichlorodifluoro methane)	R-12 88 % + ethylene oxide 12 %, by mass	-	1	1.05	F+	5

(*Page* 12, *Table* 6) — Insert the following Table 7, Table 8 and Table 9 after Table 6:

Table 7 Developed Pressure at 65 ºC in kgf/cm^2 (Gauge), p_d, and Ratio *C*

(*Clause* 4.2.2)

Sl No.	Filling Pressure p_f (Gauge) at 15ºC, kgf/cm^2	Air		Argon T_c = -122 °C		Carbon Monoxide T_c = -140 °C		Helium T_c = -267.9 °C		Hydrogen T_c = -239.9 °C		Methane T_c = -82.1 °C		Neon T_c = -228.7 °C		Nitrogen T_c = -147 °C		Oxygen T_c = -118.4 °C	
		p_d	$C = \frac{p_d}{p_f}$	p_d	$C = \frac{p_d}{p_f}$	p_d	$C = \frac{p_d}{p_f}$	p_d	$C = \frac{p_d}{p_f}$	p_d	$C = \frac{p_d}{p_f}$	p_d	$C = \frac{p_d}{p_f}$	p_d	$C = \frac{p_d}{p_f}$	p_d	$C = \frac{p_d}{p_f}$	p_d	$C = \frac{p_d}{p_f}$
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
i)	35.16	41.98	1.195	41.77	1.189	42.05	1.196	40.72	1.158	41.21	1.171	42.62	1.213	41.42	1.177	41.98	1.195	41.98	1.194
ii)	70.32	84.88	1.207	85.02	1.209	85.16	1.211	82.70	1.176	82.63	1.175	88.04	1.252	82.84	1.178	84.81	1.206	85.16	1.211
iii)	105.49	128.83	1.222	129.18	1.225	129.25	1.225	123.91	1.175	124.05	1.176	136.29	1.292	124.40	1.180	128.69	1.220	129.47	1.227
iv)	139.24	171.80	1.234	172.64	1.240	172.43	1.238	163.43	1.174	163.78	1.176	185.79	1.334	164.35	1.180	171.52	1.232	172.78	1.241
v)	140.65	173.56	1.234	174.47	1.241	174.26	1.239	165.12	1.174	165.47	1.176	187.90	1.336	165.96	1.180	173.28	1.232	174.68	1.242
vi)	175.81	218.64	1.244	220.82	1.256	219.90	1.251	206.75	1.176	206.96	1.176	242.33	1.378	207.59	1.181	218.07	1.240	221.03	1.257
vii)	210.97	264.28	1.253	268.21	1.271	265.96	1.261	249.37	1.182	248.31	1.177	295.22	1.399	249.30	1.182	263.36	1.248	268.14	1.271
viii)	232.07	292.26	1.260	297.12	1.280	293.88	1.266	274.40	1.182	273.21	1.177	327.57	1.411	274.33	1.182	290.93	1.254	297.05	1.280
ix)	246.13	310.83	1.263	316.60	1.286	312.45	1.269	290.79	1.181	289.80	1.177	349.37	1.420	291.00	1.182	309.35	1.257	316.53	1.286
x)	281.23	357.74	1.272	365.26	1.298	358.72	1.275	331.93	1.180	332.84	1.183	401.97	1.429	333.12	1.184	355.41	1.264	365.96	1.301

Table 8 Liquid Densities for Low Pressure Liquefiable Gases other than Hydrocarbon Gases

(*Clause* 4.3.5)

Sl No.	Name of Gas	Liquid Density at 15 ºC (g/ml)
(1)	(2)	(3)
i)	Ammonia	0.617

Sl No.	Name of Gas	Liquid Density at 15 °C (g/ml)
(1)	(2)	(3)
ii)	Boron trichloride	1.344
iii)	Butadiene (vinylethylene, divinyl)	0.626
iv)	Butane (normal)	0.584
v)	Butene	-
vi)	Chlorine	1.424
vii)	Chlorine trifluoride	1.840
viii)	Cyanogen	-
ix)	Cyanogen chloride	1.179
x)	Cyclopropane	0.615
xi)	Dichlorodifluoromethane (R-12)	1.346
xii)	Dichloromonofluoromethane (R-21)	1.390
xiii)	1.2 Dichlorotetrafluoroethane (R-114)	1.486
xiv)	1.1 Difluoroethane (ethylidene fluoride) (R-152a)	0.924
xv)	Dimethylamine	0.661
xvi)	Dimethylether (methyl ether, methyl oxide)	0.676
xvii)	Ethylamine (aminoethane)	0.688
xviii)	Ethyl chloride (chloro-ethane)	0.900
xix)	Ethylene oxide	0.876
xx)	Hydrogen bromide (anhydrous)	-
xxi)	Hydrogen cyanide (anhydrous)	0.694
xxii)	Hydrogen fluoride (anhydrous)	0.978
xxiii)	Hydrogen sulphide	0.800
xxiv)	Methyl bromide	1.690
xxv)	Methyl chloride	0.927
xxvi)	Methylmercaptan (methanethiol)	-
xxvii)	Monochlorodifluoroethane (R-142b)	1.133
xxviii)	Monochlorodifluoromethane (R-22)	1.231
xxix)	Monochloromonobromodifluoromethane (R-12B1)	1.833

Sl No.	**Name of Gas**	**Liquid Density at 15 °C** (g/ml)
(1)	(2)	(3)
xxx)	Monochloropentafluoroethane (R-115)	1.334
xxxi)	Monochlorotetrafluoroethane (R-124)	-
xxxii)	Monochlorotrifluoroethane (R-133a)	1.352
xxxiii)	Monochlorotrifluoroethylene (R-1113)	-
xxxiv)	Nitrogen tetroxide (Nitrogen peroxide)	1.458
xxxv)	Nitrosyl chloride	1.312
xxxvi)	Octafluorocyclobutane (R-C318)	1.539
xxxvii)	Phosgene (carbonyl chloride)	1.385
xxxviii)	Propane	0.509
xxxix)	Propene	0.524
xl)	Refrigerant gas mixture R-500 (R-12 73.8% + R-152a 26.2%, by mass)	1.189
xli)	Refrigerant gas mixture R-502 (R-22 48.8% + R-115 51.2%, by mass)	1.285
xlii)	Refrigerant gas mixture (R-12 88% + ethylene oxide 12%, by mass)	1.294
xliii)	Sulphur dioxide	1.395
xliv)	Trichloromonofluromethane (R-11)	-
xlv)	Trimethylamine	0.639
xlvi)	Vinyl bromide	-
xlvii)	Vinyl chloride	0.920
xlviii)	Vinyl methyl ether (methyl vinyl oxide)	-
xlix)	Isobutane (2-methyl propane) (R-600a)	0.566
l)	Isobutylene	-
li)	Methylamine (aminomethane)	0.666

Table 9 Filling Ratios for Liquefied Hydrocarbon Gases Assumed Maximum Temperature 65 °C

(*Clause* 4.7)

Sl No.	Density (g/ml)	Temperature for Density Determination						
		0 °C	5 °C	10 °C	15 °C	20 °C	25 °C	30 °C
		Filling Ratios						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	0.500	0.358	0.368	0.378	0.388	0.400	0.409	0.418
ii)	0.505	0.364	0.375	0.384	0.396	0.406	0.415	0.423
iii)	0.510	0.371	0.382	0.392	0.402	0.413	0.421	0.430
iv)	0.515	0.378	0.389	0.400	0.409	0.418	0.427	0.436
v)	0.520	0.385	0.396	0.406	0.415	0.424	0.433	0.442
vi)	0.525	0.393	0.403	0.413	0.421	0.431	0.440	0.448
vii)	0.530	0.401	0.411	0.419	0.428	0.437	0.446	0.454
viii)	0.535	0.408	0.417	0.426	0.435	0.444	0.452	0.460
ix)	0.540	0.415	0.422	0.435	0.442	0.450	0.458	0.466
x)	0.545	0.421	0.430	0.440	0.448	0.456	0.465	0.471
xi)	0.550	0.429	0.437	0.447	0.454	0.463	0.470	0.477
xii)	0.555	0.436	0.447	0.452	0.462	0.468	0.475	0.484
xiii)	0.560	0.444	0.451	0.460	0.467	0.474	0.482	0.489
xiv)	0.565	0.449	0.458	0.466	0.475	0.481	0.488	0.494
xv)	0.570	0.456	0.465	0.471	0.480	0.487	0.493	0.500
xvi)	0.575	0.464	0.470	0.478	0.486	0.492	0.500	0.506
xvii)	0.580	0.470	0.477	0.485	0.491	0.500	0.506	0.513
xviii)	0.585	0.476	0.483	0.490	0.498	0.504	0.512	0.519
xix)	0.590	0.484	0.490	0.497	0.504	0.512	0.518	0.525
xx)	0.595	0.490	0.498	0.504	0.511	0.519	0.525	0.531
xxi)	0.600	0.495	0.503	0.511	0.518	0.525	0.531	0.597
xxii)	0.605	0.501	0.508	0.514	0.520	–	–	–
xxiii)	0.610	0.507	0.514	0.520	0.525	–	–	–
xxiv)	0.615	0.514	0.520	0.525	–	–	–	–

Sl No.	**Density** (g/ml)	**Temperature for Density Determination**						
		0 °C	5 °C	10 °C	15 °C	20 °C	25 °C	30 °C
		Filling Ratios						
xxv)	0.620	0.520	0.525	–	–	–	–	–
xxvi)	0.625	0.525	–	–	–	–	–	–