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**COMMITTEE OF EXPERTS ON THE TRANSPORT OF
DANGEROUS GOODS AND ON THE GLOBALLY
HARMONIZED SYSTEM OF CLASSIFICATION
AND LABELLING OF CHEMICALS**

Sub-Committee of Experts on the
Transport of Dangerous Goods

Thirtieth session
Geneva, 4-12 (a.m.) December 2006
Item 2(a) of the provisional agenda

**PROPOSALS OF AMENDMENTS TO THE RECOMMENDATIONS
ON THE TRANSPORT OF DANGEROUS GOODS**

Model Regulations on the Transport of Dangerous Goods

P200 Filling Ratio Amendments

Transmitted by the expert from the United States of America

Background

1. Based on a proposal by the United States of America (ST/SG/AC.10/C.3/2006/41), the Sub-Committee at its twenty-ninth session agreed to amend the filling ratio values for certain gases in P200. The result of this amendment was to increase the filling ratio value for six gases, and to reconsider the value for Germane based on the technical information submitted to the experts. The technical justification for this amendment was based on an independent study performed by the U.S. National Institute of Standards and Technology (NIST). This study was designed to verify that the listed P200 filling ratio values provided an adequate level of safety. The NIST study has been reviewed by members of the gases working group at previous Sub-Committee sessions. During the 25th session of the Sub-Committee, the report of the gases working group (UN/SCETDG/25/INF.98) identified that experts from Germany and the US agreed to collaborate on proposed changes to the filling ratios listed in P200 based on the NIST calculations. The same NIST study indicated higher filling ratio values for several additional gases but it was agreed that the values should be further reviewed. Subsequently, experts from GE.06-

Germany (BAM and PRB), the US DOT, industry and NIST met in July 2005 and reviewed each liquefied gas separately for the purpose of refining the filling ratio data that is currently included in the NIST final report.

During the Sub-Committee's 29th session, representatives from Germany (BAM), EIGA and the United States agreed to propose to amend the filling ratios of all the liquefied gases of P200 with the final values that were calculated and confirmed by NIST with an uncertainty of less than 1%. In support of this proposal the following documents are provided as Annexes to this paper (reproduced in informal document UN/SCETDG/30/INF.4).

Annex 1: NIST Final Report: *Calculation and Verification of Filling Ratios for Liquefied Gases*

Annex 2: New Filling Conditions according to *NIST Report DTRS 56-02-X-0049 November 2002*. This document is a supplement to the original NIST Final Report that provides revised values based on the experts review during the July 2005 meeting.

A separate informal proposal will be submitted considering related changes to the filling densities used in Portable Tank Instruction T50.

Proposal

2. Amend the P200 filling ratio values as identified in Table 1 below.

Table 1 – Amended filling ratios for P200

UN No	Name	T_c (°C)	P_{test} (bar)		Filling ratio	Percentage Difference UN vs. NIST	Proposed minimum Ptest (bar) gauge	Uncertainty	Checked by
			UN, gauge	UN	Amended Filling Ratio Value	See Note	class	NIST	
1982	Tetrafluoromethane (R14)	-45.64	200	0.62	0.71	14.5	No Change	1	Confirmed
2451	Nitrogen trifluoride	-39.15	200	0.5	0.63	26.0	No Change	1	Confirmed
2451	Nitrogen trifluoride	-39.15	300	0.75	0.82	9.3	No Change	1	Confirmed
1962	Ethylene	9.2	225	0.34	0.34	0.0	No Change	1	Confirmed
1962	Ethylene	9.2	300	0.37	0.38	2.7	No Change	1	Confirmed
2036	Xenon	16.584	130	1.24	1.28	3.2	No Change	1	Confirmed
2599	R503	18.595	31	0.11	0.12	9.1	No Change	1	Confirmed
2193	Hexafluoroethane (R116)	19.88	200	1.1	1.13	2.7	No Change	1	Confirmed
1984	Trifluoromethane (R23)	26.143	190	0.87	0.88	1.1	No Change	1	Confirmed
1984	Trifluoromethane (R23)	26.143	250	0.95	0.96	1.1	No Change	1	Confirmed
1022	Chlorotrifluoromethane (R13)	28.85	120	0.9	0.90	0.0	No Change	1	Confirmed
1022	Chlorotrifluoromethane (R13)	28.85	190	1.04	1.04	0.0	No Change	1	Confirmed
1022	Chlorotrifluoromethane (R13)	28.85	250	1.1	1.11	0.9	No Change	1	Confirmed
1013	Carbon dioxide	30.978	190	0.66	0.68	3.0	No Change	1	Confirmed
1013	Carbon dioxide	30.978	250	0.75	0.76	1.3	No Change	1	Confirmed
1035	Ethane	32.18	95	0.25	0.25	0.0	No Change	1	Confirmed
1035	Ethane	32.18	120	0.29	0.30	3.4	No Change	1	Confirmed
1035	Ethane	32.18	300	0.39	0.40	2.6	No Change	1	Confirmed
1080	Sulphur hexafluoride	45.583	70	1.04	1.06	1.9	No Change	1	Confirmed
1080	Sulphur hexafluoride	45.583	140	1.33	1.34	0.8	No Change	1	Confirmed
1080	Sulphur hexafluoride	45.583	160	1.37	1.38	0.7	No Change	1	Confirmed
2454	Methyl fluoride (R41)	44.13	300	0.36	0.63	75.0	No Change	1	Confirmed

UN No	Name	T_c (°C)	P_{test} (bar)	Filling ratio		Percentage Difference UN vs. NIST See Note	Proposed minimum Ptest (bar) gauge	Uncertainty class	Checked by NIST
					Amended Filling Ratio Value				
			UN, gauge	UN					
3220	Pentafluoroethane (R125)	66.015	36	0.72	0.87	20.8	35	1	Confirmed
3339	R407B	74.284	38	0.93	0.93	0.0	33	1	Confirmed
3338	R407A	81.864	36	0.94	0.94	0.0	32	1	Confirmed
3340	R407C	86.021	35	0.95	0.95	0.0	30	1	Confirmed
1077	Propylene	92.42	30	0.43	0.43	0.0	27	1	Confirmed
1018	Chlorodifluoromethane (R22)	96.145	29	1.03	1.03	0.0	27	1	Confirmed
1978	Propane	96.675	25	0.42	0.43	2.4	23	1	Confirmed
1053	Hydrogen sulphide	100.45	55	0.67	0.67	0.0	48	1	Confirmed
3296	Heptafluoropropane (R227ea)	101.65	15	1.2	1.21	0.8	13	1	Confirmed
3159	1,1,1,2-Tetrafluoroethane (R134a)	101.06	22	1.04	1.05	1.0	18	1	Confirmed
1028	Dichlorodifluoromethane (R12)	111.97	18	1.15	1.15	0.0	16	1	Confirmed
1030	1,1-Difluoroethane (R152a)	113.26	18	0.79	0.79	0.0	16	1	Confirmed
1021	1-Chloro-1,2,2,2-tetrafluoroethane (R124)	122.28	12	1.2	1.2	0.0	11	1	Confirmed
1027	Cyclopropane	125.15	20	0.53	0.55	3.8	18	1	Confirmed
1005	Ammonia, anhydrous	132.25	33	0.53	0.54	1.9	29	1	Confirmed
1969	Isobutane	134.67	10	0.49	0.49	0.0	10 (9)	1	Confirmed
2517	1-Chloro-1,1-difluoroethane (R142b)	137.11	10	0.99	0.99	0.0	10 (9)	1	Confirmed
1958	1,2-Dichloro-1,1,2,2-tetrafluoroethane (R114)	145.68	10	1.3	1.3	0.0	10 (6)	1	Confirmed
1011	Butane	151.98	10	0.51	0.52	2.0	10 (7)	1	Confirmed
1079	Sulphur dioxide	157.49	14	1.23	1.23	0.0	12	1	Confirmed
2204	Carbonyl Sulphide	105.65	26	0.84	0.87	3.6	30	1	Confirmed
2044	2,2-Dimethylpropane	160.65	10	0.53	0.53	0.0	10 (5)	1	Confirmed