

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

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**PROPOSALS OF AMENDMENTS TO THE MODEL REGULATIONS
ON THE TRANSPORT OF DANGEROUS GOODS**

Analysis of new organic peroxide entries proposed in ST/SG/AC.10/C.3/2006/12

Transmitted by the expert from the United Kingdom

The Sub-Committee may recall that at the last Session, the expert from the United Kingdom expressed his reservations about some of the data that ICCA presented in their paper in support of new entries for the organic peroxides table in 2.5.3.2.4 of the Model Regulations. He undertook to provide further details. Here, a summary of the classification of organic peroxides is given by way of background, followed by a review of the data itself.

Résumé of the classification of organic peroxides

- (1) Test Series A examines detonation. One of the five tests must be performed (a cavitated version of the test is required if transport in IBCs or tanks is envisaged). If a (+) result is obtained, the package test of Series B (Test B.1) must be performed--to determine whether or not the peroxide is TYPE A.
- (2) Test Series C examines deflagration. Both test C.1 and test C.2 must be performed, unless the result of either test is "Yes, rapidly" as the overall result is based on a combination of the two individual results. If the overall result "Yes, rapidly" is obtained, the package test of Series D (Test D.1) must be performed to determine whether or not the peroxide is TYPE A. The combination of results (from C.1 & C.2) is as follows: a "Yes, rapidly" result in either C.1 or C.2 gives an overall result of "Yes, rapidly"; otherwise, the result from Test C.2 takes precedence over that from test C.1, and is used for the classification.
- (3) Test Series E examines thermal explosion (heating under confinement). Two of the three tests must be performed (the recommended test is E.2 Dutch Pressure Vessel, Test E1 Koenen being preferred for the second test), the overall result being the more severe of the two. If the overall result is "violent" then one of the package tests of Series G must be performed to determine whether the OP is TYPE B or TYPE C.
- (4) Test Series F examines explosive power, and is used to determine if an organic peroxide can be considered for (a) transport in IBCs and tanks, or (b) exemption from transport regulation as an organic peroxide.

(a) If, having found that a substance neither propagates a detonation (including the cavitated detonation test if the substance is a liquid) nor a deflagration, and gives a result for Test Series E no more severe than "low", it may be considered for transport in an IBC or tank providing the result from one of the five tests in Test Series F. is no more severe than "Low". For the two Series F tests mentioned in ST/SG/AC.10/C.3/2006/12 a low result is:

Test F.3 (Trauzl test) $10 < \text{expansion rate cm}^3 < 25$

Test F.4 (Modified Trauzl test) $3 < \text{expansion rate cm}^3 < 12$

(b) If, having found that a substance neither propagates a detonation (including the cavitated detonation test if the substance is a liquid) nor a deflagration, and gives a result for Test Series E of "no", and has a SADT (50kg pack) of no lower than 60°C, it may be considered for exemption from the provisions governing the transport of OPs providing the result from one of the five tests as above in Test Series F is no more severe than "No". For the two Series F tests mentioned in ST/SG/AC.10/C.3/2006/12 a No result is:

Test F.3: Trauzl test $< 10 \text{ cm}^3$

Test F.4: Modified Trauzl test $< 3 \text{ cm}^3$

Review of entries in ST/SG/AC.10/C.3/2006/12

Note: In ICCA's ST/SG/AC.10/C.3/2006/12, the entries for Table 2.1 of necessity appear in a different order from those in the Table of test results that featured in the paper as an Annex. The UK's comments only relate to the *entries to be added to this Table 2.1*. For ease of reference, the expert from the UK reproduces here the relevant part of Table 2.1, with the addition of a column "#1", "#9" etc. corresponding to each entry's position in the list. This is felt to be clearer than referring to "first entry", "ninth entry" etc. in our table. It is, of course, without prejudice to the appearance of the eventual list in 2.5.3.2.4 of the Model Regulations. This table should be looked at in conjunction with ICCA's Annex Table, referred to here as "the Annex Table".

The analysis below takes the new entries proposed in ST/SG/AC.10/C.3/2006/12 one by one. It presents, in each case, the suggested re-classification (if any); followed by an explanation of how that conclusion was reached. The entries #3, #4, #8, and #12, however, are not considered further, as the expert from the UK agrees with ICCA's conclusions on these.

	ORGANIC PEROXIDE	Concentration (%)	Diluent type A (%)	Diluent type B 1 (%)	Inert solid (%)	Water	Packing Method	Control temperature (°C)	Emergency temperature (°C)	Number (Generic entry)	Subsidiary risks and remarks	Number (Generic entry)	Subsidiary risks and remarks
	ADD:												
#1	tert-AMYL PEROXYNEODECANOATE	≤47	≥ 53				OP8	0	+10	3119		3119	
#2	tert-BUTYL PEROXY 3,5,5-TRIMETHYLHEXANOATE	≤42			≥48		OP7			3106		3106	
#3	CUMYL PEROXYNEODECANOATE	≤ 87	≥ 13				OP7	-10	0	3115		3115	
#4	2,2-DI-(tert-AMYLPEROXY)BUTANE	≤ 57	≥ 43				OP7			3105		3105	
#5	1,1-DI-(tert-BUTYLPEROXY)CYCLOHEXANE	≤ 72		≥ 28			OP5			3103	30)	3103	30)
#6	1,1-DI-(tert-BUTYLPEROXY)CYCLOHEXANE + tert-BUTYLPEROXY-2-ETHYLHEXANOATE	≤43+ ≤16	≥ 41				OP 7			3105		3105	
#7	1,1-DI-(tert-BUTYLPEROXY)-3,3,5-TRIMETHYLCYCLOHEXANE	≤ 90		≥ 10			OP5			3103	30)	3103	30)
#8	DI-2,4-DICHLOROBENZOYL PEROXIDE	≤ 52 as a paste					OP8	+20	+25	3118		3118	
#9	3-HYDROXY-1,1-DIMETHYLBUTYL PEROXYNEODECANOATE	≤77	≥ 23				OP 7	-5	+5	3115		3115	
#10	3-HYDROXY-1,1-DIMETHYLBUTYLPEROXYNEODECANOATE	≤52 as a stable dispersion in water					OP 8	-5	+5	3119		3119	
#11	3-HYDROXY-1,1-DIMETHYLBUTYL PEROXYNEODECANOATE	≤52	≥ 48				OP 8	-5	+5	3117		3117	
#12	METHYL ISOPROPYL KETONE PEROXIDE(S)	See remark 31)	≥ 70				OP8			3109	31)	3109	31)
#13	3,3,5,7,7-PENTAMETHYL-1,2,4-TRIOXEPANE	≤100					OP8			3107		3107	

#1 tert-AMYL PEROXYNEODECANOATE, for which the data is in the Annex Table as entry No. 15

The conclusion for classification is appropriate.
However, in the F.4 test, 7ml is "Low", not "No".

#2 tert-BUTYL PEROXY 3,5,5-TRIMETHYLHEXANOATE, for which the data is in the Annex Table as entry No. 22

The data is sufficient for a TYPE F classification, ie UN3110.
This is because the results of Test Series A is "No"; of Series C is "No" (C.2 "No" takes precedence over C.1 "Yes, slowly"); of Series E is "Low" ("Low" from E.2 takes precedence over "No" from E.1); of Series F is "No".

Note: As the thermal stability data is only for a 400 ml Dewar, a TYPE F classification is limited to packages: as the SADT is 55°C, it is possible that at IBC level and above a temperature control classification would apply.

#5 1,1-DI-(tert-BUTYLPEROXY)CYCLOHEXANE, for which the data is in the Annex Table as entry No. 7

The data is insufficient to make a classification.

This is because the Test Series C data is incomplete: it lacks a result for test C.1. In addition, the "violent" result from Test Series E test E.1 dictates that a test from Test Series G be performed: however, no results are presented for this.

Note: The packing method is that for TYPE B (which implies a test may have been performed in "TYPE B" packaging and the result was "no explosion", hence the substance would be TYPE C.

#6 1,1-DI-(tert-BUTYLPEROXY) CYCLOHEXANE + tert-BUTYLPEROXY-2-ETHYLHEXANOATE, for which the data is in the Annex Table as entry No. 20

The conclusion for classification is appropriate.

However, the "Modified Trauzl" entry is incorrectly suffixed with "F.3". For an F.4 test, 7ml is "Low".

#7 1,1-DI-(tert-BUTYLPEROXY)-3,3,5-TRIMETHYLCYCLOHEXANE, for which the data is in the Annex Table as entry No. 8

The data is insufficient to make a classification.

This is because the "violent" result from the Test Series E tests dictates that a test from Test Series G be performed: however, no results are presented for this.

Note: The packing method is that for TYPE B (which implies a test may have been performed in "TYPE B" packaging and the result was "no explosion", hence the substance would be TYPE C.

#9 3-HYDROXY-1,1-DIMETHYL BUTYLPEROXYNEODECANOATE [77% diluent type A], for which the data is in the Annex Table as entry No. 17

The conclusion for classification is appropriate.

However, in the F.4 test, 9ml is "Low", not "No".

#10 3-HYDROXY-1,1-DIMETHYL BUTYLPEROXYNEODECANOATE [dispersion], for which the data is in the Annex Table as entry No. 18

The conclusion for classification is appropriate.

However, the "Modified Trauzl" entry is incorrectly suffixed with "F.3". For a F.4 test, 7ml is "Low".

#11 3-HYDROXY-1,1-DIMETHYL BUTYLPEROXYNEODECANOATE [52% diluent type A], for which the data is in the Annex Table as entry No. 19

The conclusion for classification is probably appropriate.

However, if the Test Series A test was carried out as a cavitation test, there is sufficient data for a TYPE F (UN3119) assignment.

However, the "Modified Trauzl" entry is incorrectly suffixed with "F.3". For a F.4 test, 7ml is "Low".

#13 3,3,5,7,7-PENTAMETHYL-1,2,4-TRIOXEPANE, technically pure, for which the data is in the Annex Table as entry No. 13

The data may warrant a TYPE F classification (ie UN3109) if the data presented for Test Series A is for the cavitated state. The data should be clarified, as the column heading indicates test A.1 but the entry itself indicates test A.6.
