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**PROPOSALS OF AMENDMENTS TO ANNEXES A AND B OF ADR**

**Chapter 5.3 of Annex A to ADR**

**Amendment of sub-section Section 5.3.2.2 of ADR:**  
**Specification for the orange-coloured plates**

**Submitted by the governments of Germany and Spain**

**SUMMARY**

<b>Executive Summary:</b>	The purpose of this proposal is to improve the visibility and durability and also the fire behaviour of orange-coloured plates.
<b>Action to be taken:</b>	Amendments to paragraphs 5.3.2.2.1 and 5.3.2.2.2 of ADR
<b>Related documents:</b>	See also proposal TRANS/WP.15/2000/8 of 28 February 2000, INF 17 of the 69th session of WP.15 and INF.13 of the 71th meeting of WP.15

**Introduction**

The ADR does not give any special description for the construction and the material for orange coloured plates with hazard identification number and the UN number. The experiences in the past have shown many irregularities.

The supervisory authorities and fire services have been confronted with considerable problems since the requirements of section 5.3.2.2 of ADR 2001 (corresponding to marginal 10 500 of ADR 1999) were introduced, because the current construction of the plates does not ensure that the identification numbers on these plates can always be recognized when checks are performed by the police on dangerous goods shipments or rescue teams deal with an accident involving a vehicle carrying dangerous goods. In addition, it is not always ensured that the vehicle driver applies the regulations correctly.

In case of an accident, the hazard identification number and the UN number are often not readable. Often the interchangeable numbers slide on top of each other, single numbers and coverplates fly away or the plates fall out of the fastenings. Moreover, by simple mistakes, the existing danger can be increased by showing false or incomplete numbers.

## Proposal

### New note to be inserted at the end of paragraph 5.3.2.2.1

**Note:** The colour of the fluorescent orange plates in conditions of normal use should have chromaticity co-ordinates lying within the area on the chromaticity diagram formed by the co-ordinates given in the following table (chromaticity co-ordinates of the corner points) (according to Fluorescence Working Group DIN FNF/FNL 25/ DIN 6171, Part 1):

Chromaticity co-ordinates (co-ordinates of the corner points)				
x	0.583	0.515	0.569	0.655
y	0.418	0.397	0.341	0.345

Fluorescent luminance factor:  $\beta_F > 0.18$ ,  
Luminance factor:  $\beta_T > 0.25$ .

The chromaticity and the luminance factors should be measured using 45°/0° geometry and illuminated with standard directional illuminant D65 (see DIN 5033 Part 7). The size of the receiver aperture should not exceed 2 x 5°. The test specimens should have a clean surface.

The minimum values of the specific co-efficient of reflex luminous intensity should conform to the values given in the table below:

Viewing angle Alpha [°]	Angle of illumination Beta [°]	Specific coefficient of reflex luminous intensity for fluorescent orange [cd * lx <sup>-1</sup> * m <sup>2</sup> ]
0.2	5	200
0.33	5	120
0.5	5	56
1.0	5	4.5

The existing note at the end of paragraph 5.3.2.2.1 should be deleted.

The third sentence of paragraph 5.3.2.2.2 should be replaced by the following text:

“The hazard identification number and the UN number shall be indelible and permanently recognizable in that, on account of their construction characteristics, they remain clearly legible in spite of external effects such as fire engulfment, chemical and mechanical stresses.

These conditions are fulfilled if

- a) the hazard identification number and the UN number are legible at daylight from a distance of 30 m. Clear legibility from a distance of 30 m is ensured if the digits are 100 mm high;
- b) the colour and the co-efficients of reflex luminous intensity are in conformity with the note of paragraph 5.3.2.2.1;
- c) the hazard identification number and the UN number remain legible after 30 minutes complete engulfment in a fire from fuel oil EN 590:1993 at a temperature of 900 °C;
- d) corrosion-resistant special steel or similar corrosion-resistant steel has been used as material;
- e) the resistance of the hazard identification number and the UN number is neither affected by chemical effects nor mechanical stress;
- f) the construction of the fastening of the orange-coloured plates is of the same material and resistance as the orange-coloured plates themselves.

For each type of orange-coloured plate the competent authority or a body designated by that authority shall issue a certificate attesting that the type meets the construction requirements of 5.3.2.2 .

#### Transitional measures

Add a new sub-section 1.6.1.5:

“1.6.1.5 The orange-coloured plates with identification numbers manufactured before 30 June 2005 in accordance with the requirements in force up to 31 December 2004, may continue to be used until 31 December 2005.

## Justification

Both supervisory authorities and fire services have been confronted with considerable problems since the requirements of sub-section 5.3.2.2 of ADR 2001 (corresponding to marginal 10 500 of ADR 1999) were introduced because the current construction of the plates does not ensure that the identification numbers on the plates can always be recognized when checks are performed by the police on dangerous goods shipments or rescue teams are dealing with an accident involving a vehicle carrying dangerous goods. Owing to the materials which are at present used in most cases for the manufacture of the plates, the identification numbers quickly become illegible in daily use as a result of wear, being hit by stones, cleaning, changing of digits, abrasion owing to the weather and handling and consequently no longer serve the purpose they are intended for. Therefore, it cannot be said in many cases at present that the identification numbers on orange-coloured plates are clearly visible.

The current paragraph 5.3.2.2.2 of ADR requiring that the identification numbers and letters remain legible after 15 minutes engulfment in fire does not, according to information from the fire services, conform to what actually occurs in practice, because legibility does not only depend on the duration of the fire but, in addition to the effects of the fire, also the effects of the heat and/or the formation of soot have to be taken into account (see INF 17 of CTIF for the 69th meeting in Geneva).

Appropriate tests carried out by the Federal Institute for Materials Research and Testing (BAM), Berlin, have shown that, owing to technical progress, the requirements indicated under a) to e) above are in keeping with practice and can be met by the technical means at present available.

In addition, a type approval or an check through an competent authority will be necessary, because it will be possible for the authorities to actually check whether the orange-coloured plates are in conformity with the requirements. Manufacturers will have to conform to the criteria established.

Examples of tests regarding the quality of orange-coloured plates are given in annex 1.

### Justification relating to the individual amendments proposed

#### *The new note referring to paragraph 5.3.2.2.1*

Owing to the fluorescence there is a high contrast to the environment during the day and consequently an increased level of conspicuousness as compared to standard colours (three times higher visibility by daylight in comparison with conventional film). At night, the values of the specific co-efficient of reflex luminous intensity are ten times higher than those of standard film.

Thus the visibility and recognizability will be clearly improved in bad weather conditions or in reduced daylight in winter or during many months with bad lighting conditions in the northern countries.

The results of the work done by Fluorescence Working Group DIN/FNL 25/ DIN 6171, Part 1 will in future be taken into consideration for the DIN standards.

*Amendment to the third sentence of paragraph 5.3.2.2.2*

Ad a)

Under medium lighting conditions, the figures must still be clearly legible for a normal-sighted observer from a distance of 30 metres. This is the case if the digits of the identification numbers are 100 mm high. In addition, 30 metres is the minimum distance which, in the opinion of the fire services and rescue teams, has to be kept for safety reasons.

Ad b)

The required orange-coloured fluorescent retroreflective film should conform to the requirements of the note of paragraph 5.3.2.2.1.

Ad c)

Fire tests carried out by the Professional Firemen's Institute in Münster/Westphalia and by the Federal Institute for Materials Research and Testing (BAM) have shown that the temperatures of fires involving hydrocarbons (e.g. diesel oil, motor spirit, heating oil are the dangerous goods transported most in terms of quantity) are  $> 1000\text{ }^{\circ}\text{C}$ . The proposed temperature of  $900\text{ }^{\circ}\text{C}$  is clearly below the maximum temperature that may be reached; it is thus adequate and is considered in line with practical requirements according to the independent institutes referred to above.

Ad d)

The advantage of the use of special steel or corrosion-resistant steel as proposed is that the orange-coloured plates will have an extended useful life compared with the existing plates.

Their warning function will be permanently preserved because colour, digits and the values of the specific co-efficient of reflex luminous intensity will no longer be affected by corrosion.

Ad e)

Measures should be devised to prevent that the numbers on the plates are no longer legible after a short time as a result of being hit by stones, cleaning, abrasion owing to the weather and frequent changing of digits.

Ad f)

The fastening of the orange-coloured plates needs to have the same resistance as the plates themselves to ensure that the rescue services find the plates where they expect them to be affixed.

## **Safety implications**

The proposal intends to improve safety for both, rescue services and the public.

## **Feasibility**

Concerning the feasibility no problems are seen. The materials and tests requested are available and the additional costs are mostly caught up by a longer lifetime of the plates and the fastenings.

## **Annex 1:**

Regarding the quality of the orange-coloured plates different tests exist. Following are some examples:

- Abrasion tests are given in IMO Resolution A.658 (16) of 19 October 1989 for testing the abrasion resistance of reflective film.

When tests are performed in accordance with the above, the values of the specific co-efficient of reflex luminous intensity measured after 1000 strokes have been applied to the surface of the film with a specified brush should not be less than 50 % of the values given in the above table.

- Some examples of methods for testing the abrasion resistance of digits are given below. Particular methods should be agreed upon that are appropriate to the practical requirements to be met by plates.

Various abrasion tests which may be applied as a basis for testing plates with identification numbers are as follows:

ASTM D 2197 (1986-00-00)

*Test Method for Adhesion of Organic Coatings by Scrape Adhesion*

American Society for Testing and Materials

This standard corresponds to ISO 1518.

ASTM D 3170 (1987-00-00)

*Test Method for Chipping Resistance of Coatings*

American Society for Testing and Materials

ISO 1518 (1992-04-00)

*Paints and Varnishes; Scratch Test*

ISO/TC 35 Paints and Varnishes

Basically corresponds to ASTM D 2197.

International correspondence

BS 3900 PART E2(1992/BSI)

DIN EN ISO 2409 (1994-10-00)

*Paints and Varnishes - Cross-cut Test*

DIN Deutsches Institut für Normung e.V.

ISO 1514 (1993-12-00)

*Paints and Varnishes; Standard Panels for Testing*

ISO International Organization for Standardization

DIN 58196-6 (1995-07-00)

*Optical Coatings – Part 6: Testing of the Adhesion with a Tape (Tape Test)*

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