NORTH ATLANTIC TREATY ORGANIZATION
ORGANISATION DU TRAITE DE L'ATLANTIQUE NORD

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To : See MAS Distribution List No. 2

Subject : STANAG 2835 LAND (EDITION 2) - NATO ULTRAVIOLET REFLECTIVE (UVR) WHITE COLOUR FOR THE CAMOUFLAGE OF MILITARY EQUIPMENTS IN SNOW ENVIRONMENTS

References :
a. MAS(ARMY)(75)475 dated 8 December 1975
b. AC/225-D/1090 / AC/225(Panel VI)D/383 dated 4 September 1989

Enclosure : STANAG 2835 (Edition 2)

1. The enclosed NATO Standardization Agreement which has been ratified by nations as reflected in page iii is promulgated herewith.

2. The references listed above are to be destroyed in accordance with local document destruction procedures.

3. AAP-4 should be amended to reflect the latest status of the STANAG.

ACTION BY NATIONAL STAFFS

4. National staffs are requested to examine page iii of the STANAG and if they have not already done so, to advise the Defence Support Division, IS, through their national delegation as appropriate of their intention regarding its ratification and implementation.

G.B. FERRARI
Major-General, ITAF
Chairman, MAS

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STANAG No. 2835
(Edition 2)

NORTH ATLANTIC TREATY ORGANIZATION
(NATO)

MILITARY AGENCY FOR STANDARDIZATION
(MAS)

STANDARDIZATION AGREEMENT

SUBJECT : NATO ULTRAVIOLET REFLECTIVE (UVR) WHITE COLOUR FOR THE CAMOUFLAGE OF MILITARY EQUIPMENTS IN SNOW ENVIRONMENTS

Promulgated on 22 September 1995

G.B. FERRARI
Major-General, ITAF
Chairman, MAS

RECORD OF AMENDMENTS

No.	Reference/date of amendment	Date entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Chairman MAS under the authority vested in him by the NATO Military Committee.

2. No departure may be made from the agreement without consultation with the tasking authority. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.

3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

DEFINITIONS

4. Ratification is "The declaration by which a nation formally accepts the content of this Standardization Agreement".

5. Implementation is "The fulfilment by a nation of its obligations under this Standardization Agreement".

6. Reservation is "The stated qualification by a nation which describes that part of this Standardization Agreement which it cannot implement or can implement only with limitations".

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

7. Page iii gives the details of ratification and implementation of this agreement. If no details are shown it signifies that the nation has not yet notified the tasking authority of its intentions. Page iv (and subsequent) gives details of reservations and proprietary rights that have been stated.

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(Edition 2)

ARMY

NATO STANDARDIZATION AGREEMENT
(STANAG)

NATO ULTRAVIOLET REFLECTIVE (UVR) WHITE COLOUR FOR THE CAMOUFLAGE OF MILITARY EQUIPMENTS IN SNOW ENVIRONMENTS

Annex A. Standard specifications for NATO UVR white colour
Appendix A 1. Reference curve and limit curves
Colorimetric tolerances and characteristics

Annex B. Standard methods of inspection for NATO UVR white colour

Reference documents :

STANAG 2338 LAND - NATO infrared reflective (IRR) green colour for painting military equipment

STANAG 2836 LAND - Removable paints for camouflage

AIM

1 . The aim of this agreement is to standardize, for NATO Forces, the characteristics of a white colour reflecting in particular ultraviolet radiation (UV), to be known as NATO UVR white.

This colour will provide camouflage in the spectral regions extending from the near ultraviolet to near infrared and blend with the snow of the European theatre of operations.

AGREEMENT

2 . Participating nations agree to define the characteristics of a common camouflage colour called NATO UVR white and to use it for the camouflage of military equipment intended for use in snow environments.

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GENERAL

3 . The present agreement is in two parts :

a . Annex A, which gives the reference reflectance curve, nominal colorimetric characteristics and specular gloss of the NATO UVR white colour, as well as corresponding tolerances,

b . Annex B, which describes the standard methods of inspection for the aforementioned colour.

4 . A nation may use NATO UVR white colour when this colour is appropriate :

a . either for equipment in general,

b . or for military equipment manufactured in common by two or more signatory nations.

5 . Any signatory nation may use the NATO UVR white colour, notably for the following products and materials :

. removable paints (temporary),
. finishing paints (permanent),
. coated fabrics (tarpaulins, etc.),
. camouflage nets or screens,
. textiles,
. miscellaneous coatings and materials.

6 . Nations concerned, when arranging an international contract, will determine the specular gloss of any equipment requiring a camouflage white colour as well as the corresponding tolerances.

7 . However, as regards § 4.b, equipment received or manufactured before the date of implementation of the agreement by concerned nations does not have to be of the NATO UVR white colour.

IMPLEMENTATION OF THE AGREEMENT

8 . This STANAG shall be deemed to have been implemented when a nation has given instructions to its Forces to the effect that the colour of equipment used in snow environments must be in accordance with this STANAG.

ANNEX A to
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STANDARD SPECIFICATIONS FOR NATO UVR WHITE COLOUR

INTRODUCTION

1 . The following optical characteristics apply to opaque (1) samples, as delivered, after any conditioning appropriate to the nature of the material.

So as to ensure the durability of the optical characteristics mentioned below under conditions of normal use of equipment and materials it is recommended that indicative measurements are made on samples before and after ageing(s) (2).

Ageing test conditions *(including sample conditioning after test)* and optical tolerances associated with this test are to be defined by each nation depending on the nature of the product or material and its use.

REFLECTANCE CURVE

2 . The reflectance curve of equipment *(or material)* from 350 to 1 200 nanometres must lie within the tolerance zone between the upper and lower limit curves and be as close as possible to the reference curve (see reference curve and limit curves, Appendix A 1 to this annex).

However; it is desirable that this condition be also met in the spectral range from 320 to 350 nanometres (see dashed curves in Appendix A 1 to this annex).

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(1) In the case of non-opaque - but not translucid material - a complex test sample made of sufficient layers of material to make it opaque over the whole spectral range, must be prepared

(2) Natural ageing *(exposure to the elements)*, artificial ageing *(artificial radiation)*, various types of cleaning, washing sequences, etc.

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COLORIMETRIC CHARACTERISTICS (x, y et Y ; a*, b* et L*)

3 . The nominal colorimetric characteristics are as follows :

- illuminant D_{65} / CIE 1964 (10°) supplementary standard colorimetric observer

. chromaticity (1)	. chromaticity (1)
x_o = .315	a_o^* = .14
y_o = .332	b_o^* = .74
. luminance factor (1)	. CIE 1976 lightness (1)
Y_o = 87.4 %	L_o^* = 94.9

- illuminant C / CIE 1931 (2°) standard colorimetric observer

. chromaticity (1)	. chromaticity (1)
x_o = .312	a_o^* = .04
y_o = .318	b_o^* = .80
. luminance factor (1)	. CIE 1976 lightness (1)
Y_o = 87.4 %	L_o^* = 94.9

Note : The NATO UVR white colour must be ***non-fluorescent***

4 . The maximum acceptable tolerance (1) (ΔE_{max}) is as follows :

$$\Delta E_{max} = 4 \text{ CIELAB units}$$

5 . So as to avoid any dispute arising from dispersion in measurements obtained with the different apparatus used by the parties concerned, it is recommended that in the case of bilateral or multilateral programmes, a smaller tolerance (ΔE) than thone indicated in § 4, namely :

$$\Delta E = 2 \text{ CIELAB units}$$

be imposed on manufacturers.

In addition to the above colorimetric tolerance ΔE, concerned parties may if necessary impose other colorimetric tolerances, also expressed in CIELAB units, emphasizing chromaticity (ΔC) and CIE 1976 lightness (ΔL^*) differences. It will be remenbered that $\Delta E = (\Delta C^2 + \Delta L^{*2})^{1/2}$.

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(1) See CIE Publication N° 15.2 (1986) - "Colorimetry - Second edition - Technical Committee Reports of the International Commission on Illumination"

SPECULAR GLOSS (SPECULAR REFLECTION)

6 . The NATO UVR white colour must have the following degree of gloss (G_s), before correction for the contribution of the diffuse light :

a . in the case of **painted surfaces**, measured in accordance with ISO standard 2813 :

$G_s \leq 8$ gloss units for 60° geometry ;

b . in the case of **coated fabrics** (tarpaulins, etc.) and **camouflage nets**, measured in accordance with ISO standard 2813 :

$G_s \leq 8$ gloss units for 60° geometry ;

c . in the case of **camouflage screens** :

$G_s \leq 8$ gloss units for 60° geometry ;

d . in the case of **other products, coatings and materials** :

to be defined.

7 . In the case of bilateral or multilateral programmes, the concerned parties must specify the specular gloss of any equipment and also the corresponding tolerances (see General § 6) ; geometry will have to be specified, if different from that of § 6.

APPENDIX to
ANNEX A to
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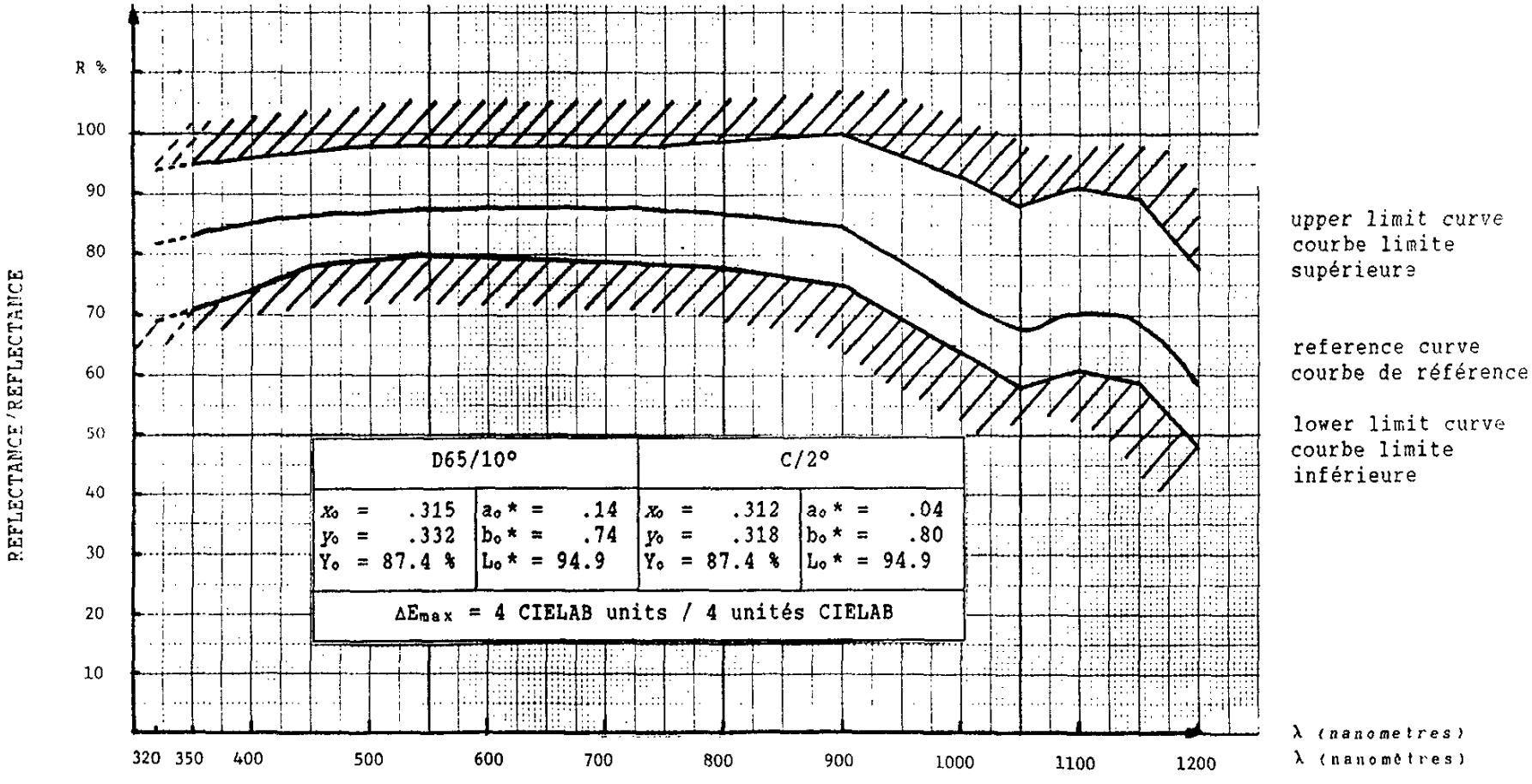
NATO UVR WHITE COLOUR - REFERENCE CURVE AND LIMIT CURVES/COLORIMETRIC TOLERANCES AND CHARACTERISTICS
COULEUR BLANC UV OTAN - COURBE DE REFERENCE ET COURBES LIMITES/CARACTERISTIQUES ET TOLERANCES COLORIMETRIQUES



D65/10°		C/2°	
x_o = .315	a_o^* = .14	x_o = .312	a_o^* = .04
y_o = .332	b_o^* = .74	y_o = .318	b_o^* = .80
Y_o = 87.4 %	L_o^* = 94.9	Y_o = 87.4 %	L_o^* = 94.9

ΔE_{max} = 4 CIELAB units / 4 unités CIELAB

ANNEX B to
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STANDARD METHODS OF INSPECTION FOR
NATO UVR WHITE COLOUR

REFLECTANCE CURVE

1 . Draw up the curve using a spectrophotometer fitted with an integrating sphere and under the following operating conditions :

- measurement geometry : *normal/diffuse* (ε°/d) or *diffuse/normal* (d/ε°) with ε° ≤ 8° *specular component excluded*
- reference standard : *barium sulphate or calibrated official white standard*
- spectral range : 320 *to* 1 200 *nanometres*

COLORIMETRIC CHARACTERISTICS (*x,y* et Y ; a*, b* et L*)

2 . Effect measurements using a spectrophotometer fitted with an integrating sphere and under the following operating conditions :

- measurement geometry : *normal/diffuse* (ε°/d) or *diffuse/normal* (d/ε°) with ε° ≤ 8° *specular component excluded*
- reference standard : *barium sulphate or calibrated official white standard*
- spectral range : 380 *to* 780 *nanometres*

3 . Effect colorimetric calculations by selecting

- illuminant D_{65} or C
- CIE 1964 (10°) supplementary standard colorimetric observer or CIE 1931 (2°) standard colorimetric observer
- measuring wavelength interval (Δλ) : 10 *nanometres*

SPECULAR GLOSS (SPECULAR REFLECTION)

4 . Measure the degree of gloss by means of a glossmeter under the following operating conditions :

- measurement geometry : 60°
- reference standard : *black Carrara glass or calibrated official black standard*

5 . Correct for the contribution of the diffuse light, if such correction has been decided upon.