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ORGANISATION DU TRAITE DE L'ATLANTIQUE NORD

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MAS/256-PCS/4381
8 July 1994

To : See MAS Distribution List No. 2

Subject : STANAG 4381 PCS (EDITION 1) - BLACKOUT LIGHTING SYSTEMS FOR TACTICAL LAND VEHICLES

Reference : AC/301-D/386 dated 20 January 1993

Enclosure : STANAG 4381 (Edition 1)

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

2. The reference listed above is to be destroyed in accordance with local document destruction procedures.

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

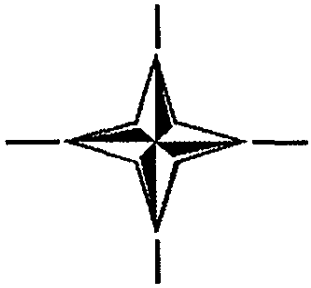
ACTION BY NATIONAL STAFFS

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

STANAG No. 4381
(Edition 1)

NORTH ATLANTIC TREATY ORGANIZATION
(NATO)



MILITARY AGENCY FOR STANDARDIZATION
(MAS)

STANDARDIZATION AGREEMENT
(STANAG)

SUBJECT: BLACKOUT LIGHTING SYSTEMS FOR TACTICAL LAND VEHICLES

Promulgated on 8 July 1994

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.

Agreed English/French texts

STANAG 4381
(Edition 1)

ARMY

NATO STANDARDIZATION AGREEMENT (STANAG)

BLACKOUT LIGHTING SYSTEMS FOR TACTICAL LAND VEHICLES

Annex: A. Reduced Lighting Design Parameters

Related Documents:
- STANAG 2154 M&T - Regulations for Military Motor Vehicle Movement by Road
- STANAG 4007 PCS - Electrical Connectors Between Tractors and Trailers
- MIL-STD-1179- Lamps, Reflectors and Associated Signalling Equipment for Military Vehicles

AIM

1. The aim of this Agreement is to provide guidance for member nations in the design and application of blackout lighting systems on tactical land vehicles.

AGREEMENT

2. Participating nations agree to adopt the Tactical land Vehicle Blackout Lighting Principles described in the following paragraphs. It is intended that this lighting will be incorporated into new fleets of tactical land vehicles taken into service by countries signing this agreement. Blackout Lighting is not mandatory for administrative or civilian pattern vehicles. This agreement does not apply to the interior lights in tracked or wheeled tactical land vehicles.

DEFINITIONS

3. The following terms and definitions are used for the purpose of this agreement:

(a) Blackout Conditions. When applied to lighting it means reduced lighting to comply with regulations governing vehicle movement under blackout conditions. When applied to rear lights, stoplights, front corner markers (or their equivalents), etc, it means special purpose lights or lamps, capable only of suitably reduced emissions, solely for use under blackout conditions.

(b) Blackout lamps. Blackout lamps are lamps designed to maintain vehicle/trailer blackout lighting security during blackout conditions by limiting horizontal and vertical illumination as well as providing ample light for safe vehicle operation. Blackout lamps may use light from either normal lamp filaments or infra-red secure emitters.

(c) Convoy lamp. A light used by certain nations to mark the rear of a vehicle when operating under blackout conditions by means of the reflection on a white surface of an emission from a cowled lamp. It may be used as an alternative to blackout rearlights.

(d) Convoy driving lamp. A single light in front of the vehicle, shaded to prevent detection from above and used to provide roadway illumination for the driver during blackout driving conditions.

(e) Blackout marker lamps. Blackout marker lamps are lamps used on tactical land vehicles to indicate their width. Width is indicated by using either front marker lamps or tail marker lamps.

(f) Infra-red secure lamps. Infra-red secure lamps use emitters which primarily emit radiation in the visible portion of the electromagnetic spectrum.

(g) Non infra-red secure lamps. Non infra-red secure lamps are lamps which emit radiation in both the visible and infra-red portion of the electromagnetic spectrum.

(h) Tactical land vehicle. A military vehicle, whether designed primarily for military use or adapted from a commercial vehicle, which has specialized military characteristics to fit it for use by forces in the field in direct connection with, or in support of, combat operations or the training of troops for such operations.

(j) Normal conditions. With regard to lighting and signalling this term implies operating under conditions of normality and not under blackout or tactical conditions.

(k) Curb Weight. The weight of the vehicle/trailer fully equipped and serviced for operation, including fuel, lubricants, coolant, vehicle tools and equipment, but without crew, personal equipment or payload. It is also known as net or tare weight.

DETAILS OF AGREEMENT

4. Conditions and Movement at Night

The conditions under which military traffic will move at night will be determined by the Command Headquarters in relation to the enemy threat and, insofar as possible, with due regard to regulations in force in the host country. Such conditions may be directly imposed on operations by this threat. These conditions are as follows:

(a) normal lighting conditions; and

(b) blackout lighting conditions.

5. Blackout Conditions

Blackout conditions implies:

(a) total blackout in which all vehicle lighting (both normal vehicle and blackout *lighting) is extinguished;*

(b) partial blackout in which blackout lamps are used in such a way as to reduce the possibility of enemy detection and collisions by other road users.

6. Vehicle Lighting Capabilities

The overall commander must be able to control vehicle lighting on the battlefield. Tactical land vehicle lighting systems shall have the following capabilities:

(a) normal lighting;

(b) complete lack of lighting or total blackout conditions;

(c) reduce lighting - guidance for member nations in the design and application of blackout lighting systems on tactical vehicles is set out in Annex A;

(d) the design of the vehicle electrical system must be such that it will prevent inadvertent switching from reduced lighting to normal lighting.

IMPLEMENTATION OF THE AGREEMENT

7. This STANAG will be considered to have been implemented when the necessary orders/instructions bringing into use the principles mentioned in this Agreement have been issued to the forces concerned.

REDUCED LIGHTING DESIGN PARAMETERS

Appendices: 1. Methods used to measure blackout lamp design parameters and sketches of blackout lamps.

2. Tactical Land Vehicle/Trailer blackout lighting equipment requirements and their locations.

GENERAL

1. The design parameters and the locations on tactical land vehicles of the three types of blackout lamps contained in this STANAG are based on the lamps referred to and manufactured to meet the specifications/drawings contained in MIL-STD-1179. Figures 1, 2 and 3 in Appendix 1 show sketches of the Blackout Driving Lamp; Blackout Composite Lamp - Front, turn, Park and Marker; and the blackout Composite Lamp - Tail, Stop, Turn and Marker respectively.

VEHICLE/TRAILER BLACKOUT LAMPS AND LOCATIONS

2. The minimum number of blackout lamps and their locations on tactical land vehicles/trailers shall be as specified in Appendix 2.

DESIGN PARAMETERS FOR BLACKOUT LAMPS

3. General. Blackout lamps may use light sources which emit radiation in both the visible and infra-red or only the visible portion of the electromagnetic spectrum. Blackout lamps which use light sources which emit radiation in both the visible and infra-red portion of the elecromagnetic spectrum are referred to as non infra-red secure blackout lamps while lamps which use light sources which primarily emit radiation only in the visible portion of the electromagnetic spectrum are known as infra-red secure blackout lamps. Parameters for both non infra-red secure and infra-red secure lamps are listed in the following paragraphs.

4. Non infra-red secure blackout driving lamps. The following photometric specification may be used as a guide for the design of these lamps:

PHOTOMETRIC SPECIFICATION

POSITION (Angular Degrees)	Candle power (candela)	
	minimum	maximum
Line H (see Appendix 1, para 2)	0	10
Line 1° Down - 6° Right to 6° Left	5	50
Line 2° Down -9° Right to 9° Left	5	55
Line 3° Down -12° right to 12° Left	5	55
Line 4° Down -15° Right to 15° Left	5	60
Line 5° Down -18° Right to 18° Left	5	55
Line 6° Down -21° Right to 24° Left	5	50
Line 7° Down -24° Right to 24° Left	5	30
Line 8° Down -27° Right to 27° Left	5	10

5. Infra-red secure blackout driving lamps. The following photometric specification may be used as a guide for the design of these lamps:

PHOTOMETRIC SPECIFICATION

POSITION (Angular Degrees)	Candle power (candela)	
	mean	maximum
Line H (see Appendix 1, para 1)	0	0
Line 1° Down - 6° Right to 6° Left	3	5
Line 2° Down -9° Right to 9° Left	5	15
Line 3° Down -12° right to 12° Left	8	20
Line 4° Down -15° Right to 15° Left	7	25
Line 5° Down -18° Right to 18° Left	7	20
Line 6° Down -21° Right to 24° Left	7	20
Line 7° Down -24° Right to 24° Left	3	15
Line 8° Down -27° Right to 27° Left	2	10

6. Non infra-red secure blackout front marker lamps. The following parameters may be used as a guide for the design of these lamps:

LAMP TYPE AND AREA	LUMINANCE (Foot-Lamberts)		
	MEAN VALUES	MAXIMUM VALUE	MINIMUM VALUE
FRONT MARKER LAMP	110.0	190.0	50.0

	CIE CHROMATICITY COORDINATE VALUES			
	MEAN VALUES		MAXIMUM TOLERANCE	
FRONT MARKER LAMP	x	y	x	y
	0.445	0.396	+/- 0.013	0.008

7. Infra-red secure blackout front marker lamps. The following parameters may be used as a guide for the design of these lamps:

LAMP TYPE AND AREA	LUMINANCE (Foot-Lamberts)		
	MEAN VALUE	MAXIMUM VALUE	MINIMUM VALUE
FRONT MARKER LAMP			
Brightest Zone	10	15	5
Least Bright Area	2.5	4	1

NOTE: An explanation of the "brightest zone", "least bright area", etc, is contained in Appendix 1, Paragraph 2.

	CIE CHROMATICITY COORDINATE VALUES				
	MEAN VALUES			MAXIMUM TOLERANCE	
FRONT MARKER LAMP	x	y		x	y
	0.596	0.406	+/-	0.008	0.008

8. Non infra-red secure blackout tail and stop lamps. The following parameters may be used as a guide for the design of tail and stop lamps (in Europe tail lamps are referred to as rear lamps):

LAMP TYPE AND AREA	LUMINANCE (Foot-Lamberts)		
	MEAN VALUES	MAXIMUM VALUE	MINIMUM VALUE
TAIL LAMP	17	26	11
STOP LAMP	35	50	25

LAMP TYPE AND AREA	CIE CHROMATICITY COORDINATE VALUES				
	MEAN VALUES			MAXIMUM TOLERANCE	
TAIL LAMP	x	y		x	y
	0.698	0.290	+/-	0.006	0.005
STOP LAMPS	x	y		x	y
	0.570	0.408	+/-	0.003	0.002

9. Infra-red secure blackout tail and stop lamps. The following parameters may be used as a guide for the design of secure tail and stop lamps:

LAMP TYPE AND AREA	LUMINANCE (Foot-Lamberts)		
	MEAN VALUES	MAXIMUM VALUE	MINIMUM VALUE
TAIL LAMPS			
Brightest Zone	10	14	5
Least Bright Area	2	7	1
STOP LAMPS			
Brightest Zone	6	8	5
Least Bright Area	2	3	1

LAMP TYPE AND AREA AND AREA	CIE CHROMATICITY COORDINATE VALUES MEAN VALUES			MAXIMUM TOLERANCE	
TAIL LAMP	x	y		x	y
	0.712	0.288	+/-	0.009	0.007
STOP LAMPS	x	y	+/-	x	y
	0.599	0.401	+/-	0.007	0.007

APPENDIX 1 to
ANNEX A to
STANAG 4381
(Edition 1)

METHODS USED TO MEASURE BLACKOUT LAMP

DESIGN PARAMETERS AND SKETCHES OF THE BLACKOUT LAMPS

BLACKOUT DRIVING LAMP

1. The following method can be used to measure the design parameters of this lamp:

   a. Measure the beam candlepower of the Blackout Driving lamp using an automated goniometer measuring system. Select horizontal scan measuring positions, both right and left of the center position, every three degrees to a maximum of thirty degrees. Select vertical scan measuring positions every one degree downward from zero degrees to eight degrees.

   b. To establish a central reference location from which horizontal and vertical angles of measurement for the beam pattern can be determined use the following procedure:

      (1) Align the photo detector at a distance of 305 cms normal to the surface plane of the goniometer and at a location such that the center of the detector is located on a line extended from a point on the goniometer surface coinciding with the center point of the bottom of the hood of the blackout drive lamps.

      (2) Mount the lamps so that the front surface of the lamp assembly is in contact with the plate on the goniometer and the bottom of the hood and the horizontal center of the lamp are as close to the rotation of the two axes of the goniometer as possible.

      (3) With the lamp mounted and powered at 28.00 Vdc, rotate the goniometer head in the vertical axis until the shadow from the hood (visual cutoff) and brightest horizontal area are aligned at the center of the photo detector. This is the center, or zero aiming point from which all test angles are referenced.

2. Treat the Blackout Composite Lamp-Tail, Stop, Turn and Marker and the Blackout Composite Lamp-Front, Park and Marker as luminance sources rather than illuminance projection sources. With this in mind the design parameters can be established in the following manner:

   (a) Measure brightness with a luminance spotmeter over an area with a diameter of approximately one millimetre.

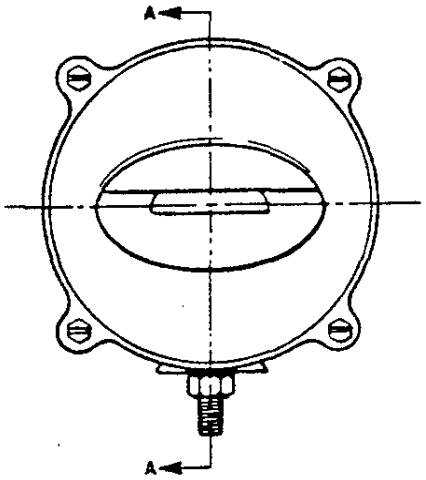
   (b) On the Composite Lamp-Tail measure and report on all four blackout elements (four openings which emit light) separately, on the Stop Lamp measure the single element and on the Front Marker Lamp measure and report on the two blackout elements separately.

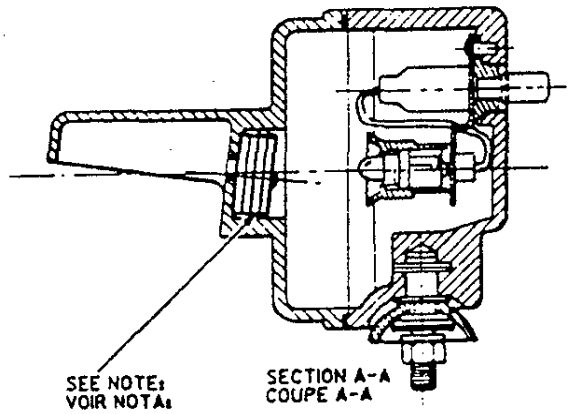
(c) Infra-red secure lamps use light emitting diodes as a source of illumination instead of light bulbs which results in an unevenly illuminated area with bright spots and a darker surround. Consequently, measure both the nominal brightest zone (area) and the least bright area within the region of greatest concern for each lamp.

(d) For non infra-red source lamps measure the brightest area.

(e) For both infra-red and non infra-red secure blackout lamps colour in units of CIE Chromaticity Coordinates are measured with the spotmeter from the brightest area only.

(f) Supply the lamps with 28.00 Vdc for the tests.





NOTE: INFRA-RED SECURE CAPABILITY IS ACHIEVED BY USING SPECIAL CONSTRUCTION TECHNIQUES WHICH RESTRICT RADIATION EMISSION TO THE VISIBLE PORTION OF THE ELECTROMAGNETIC SPECTRUM.

NOTA: LE DISPOSITIF ACQUIERT SES CARACTÉRISTIQUES DE FEU SÉCURITAIRE INFRAROUGE PAR L'APPLICATION DE TECHNIQUES DE CONSTRUCTION SPÉCIALES QUI RÉDUISENT LES ÉMISSIONS OU RAYONNEMENYT À LA PARTIE VISIBLE DU SPECTRE ÉLECTROMAGNETIQUE.

FIGURE 1 - INFRA-RED SECURE BLACKOUT DRIVING LAMP /
FEUX DE ROUTE MASQUÉS SÉCURITAIRES
INFRAROUGES

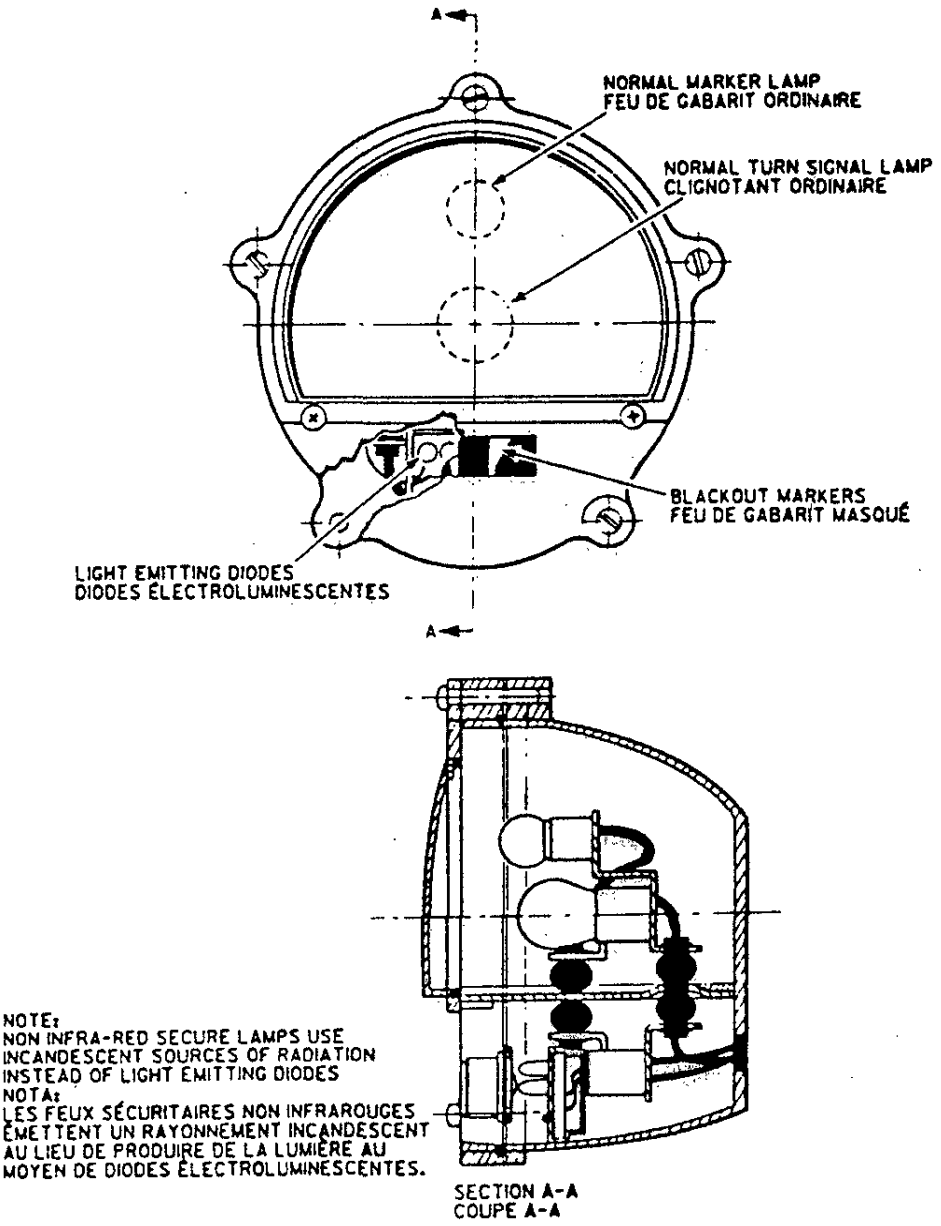
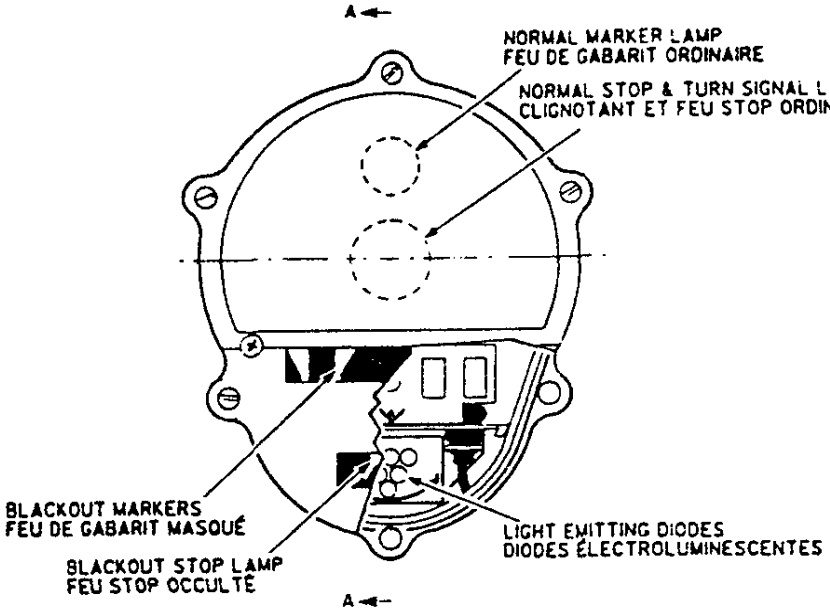
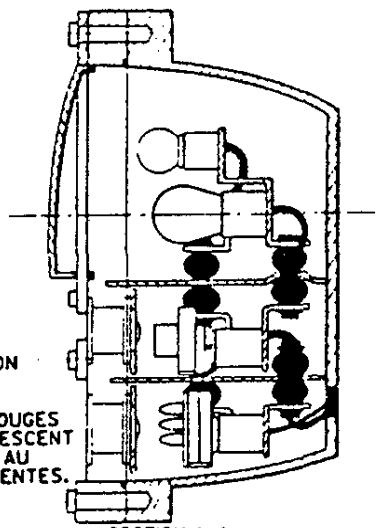


FIGURE 2 - INFRA-RED BLACKOUT COMPOSITE LAMP - FRONT, TURN, PARK AND MARKER / FEU MASQUÉ SÉCURITAIRE INFERAROUGE POLYVALENT - AVANT, CLIGNOTANT, DE STATIONNEMENT, DE GABARIT





NOTE:
NON INFRA-RED SECURE LAMPS USE INCANDESCENT SOURCES OF RADIATION INSTEAD OF LIGHT EMITTING DIODES
NOTA:
LES FEUX SÉCURITAIRES NON INFRAROUGES ÉMETTENT UN RAYONNEMENT INCANDESCENT AU LIEU DE PRODUIRE DE LA LUMIÈRE AU MOYEN DE DIODES ÉLECTROLUMINESCENTES.

SECTION A-A
COUPE A-A

FIGURE 3 - INFRA-RED SECURE BLACKOUT COMPOSITE LAMP - TAIL, STOP, TURN AND MARKER / FEU MASQUÉ SÉCURITAIRE INFRAROUGE POLYVALENT - ARRIÈRE, STOP, CLIGNOTANT, DE GABARIT

APPENDIX 2 to
ANNEX A to
STANAG 4381
(Edition 1)

TACTICAL LAND VEHICLE/TRAILER BLACKOUT LIGHTING EQUIPMENT

REQUIREMENTS AND THEIR LOCATIONS

Item	Quantity and Color		Location	Recommended height above road surface measured from center of lamp on vehicle/trailer at curb weight
	Wheeled Vehicle/Trailer	Tracked		
Blackout driving 1/	one blue	one blue	The light source shall be mounted between the center and left-hand side of the vehicle, as far forward and as near the line of the driver's vision as practicable.	Approximately 1060 mm
Blackout front marker lamp 1/	two yellow/white		On the front - one on each side of the vertical centerline, at the same level and as far apart as practicable.	Not less than 380 mm nor more than 1830 mm
Blackout tail & stop lamp	two tail red/orange two stop amber		On the rear - one on each side of the vertical centerline, at the same level and as far apart as practicable.	Not less than 380 mm nor more than 1830 mm
		one tail red/orange one stop amber	On rear right side of the vertical center-line at the same level as the rear left side and as far apart as practicable.	Not less than 380 mm nor more than 1830 mm

1/ These lamps are not fitted to trailers.