War Department Specification

BLACKOUT REQUIREMENTS FOR HIGHWAY MOVEMENT

U. S. OFFICE OF CIVILIAN DEFENSE

Washington, D. C.

The following other subjects are covered in specifications being prepared by the War Department:

Street lighting during blackouts.
Blackout of buildings.
Blackout flashlights, lanterns, and flares.
Traffic control during blackouts.
Blackout of railroads.
Luminescent materials.

The other specifications will be published as soon as completed.

The purpose of these specifications is threefold:

To provide military and civilian authorities with authentic information on blackout equipment and its application.

To assist commanders in insuring the military security of installations under their jurisdiction.

To conserve the use of strategic and critical materials.

Prepared under the direction of the Chief of Engineers, United States Army, by the Engineer Board, with suggestions of the National Technological Civil Protection Committee, the National Defense Research Committee, the National Bureau of Standards, the Interstate Commerce Commission, the Office of Defense Transportation, and the War Production Board.

FOREWORD

The standards specified herein may be imposed by military authority during specified periods and in specified areas. Independent of such action these standards afford guides to civilian authorities as to measures that can be taken by them to conform their conduct with what may eventually be prescribed.

Due to the scarcity of certain critical materials which will be involved in the manufacture of the equipment called for in these specifications, it is probable that only the most exposed communities in the continental United States will be able to procure the equipment. For this reason these specifications are being given only a limited distribution at this time.

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BLACKOUT REQUIREMENTS FOR HIGHWAY MOVEMENT

1. Scope

This specification describes the equipment required by road users, military or civilian, who move on any highway, road, street, alley path, or other way, or on any exposed area which permits aerial observation of direct or reflected light, within those areas and during those periods specified by proper military authority. Traffic control measures and special traffic control devices specified for blackouts are included in War Department specification, Traffic Control During Blackouts. (Now in preparation.)

2. Objective

Blackout equipment required herein is designed to afford maximum safety of ground movement commensurate with provision of reasonable freedom from detection by enemy aircraft.

3. Dark Adaptation of Eyes

Because of the low level of illumination required for blackout and the time required for the human eye to become adapted for vision at such low illumination, no road user, except in emergency, should move in a blackout until his eyes become properly dark-adapted. At least 5 minutes in complete darkness is normally required for such adaptation.

4. Motor-Vehicle[1] *Blackout Equipment*

Only those motor vehicles and motor-vehicle combinations employing approved equipment (appendix B) as specified below shall move during blackouts.

a. Required Equipment on All Motor Vehicles.—(1) *Blackout driving lamp.*—One, and only one, approved blackout driving lamp shall be employed on all motor vehicles. This lamp shall be securely mounted on the front of the vehicle, between the left side and the center, as near as possible to normal line of operator's vision, and far enough forward to eliminate appreciable reflection of light from any portion of the vehicle. The mounting height shall be not less than 36 nor more than 55 inches, measured from road level to the bottom of the slot in the mask, and in no case higher than the top of the rim of the steering wheel. (Preferable mounting height is approximately 42 inches.) With vehicle on level surface and carrying normal load, the unit shall be so adjusted that bottom of slot is horizontal, and so aimed that the visual cut-off of the top of the beam, on a vertical screen 10 feet in front of the lamp, is at least 2 and not more than 3 inches below the bottom of the horizontal slot in the head-lamp mask. When mounted on motorcycles, the lamp shall be placed on the front, near the center, as near as possible to normal line of operator's vision, and far enough forward to eliminate any objectionable reflection of light from any portion of the motorcycle.

(2) *Combination blackout tail and stop lamp.*—One approved combination blackout tail and stop lamp shall be securely mounted on extreme rear of the vehicle, or vehicle combination, as near the *left* side as practicable, with red tail light below and amber stop light above, and aimed straight to rear so as to be clearly visible to traffic approaching from the rear. Such lamps shall be mounted not less than 20 inches nor more than 50 inches above road level. When mounted on motorcycles, this lamp shall be mounted on rear fender.

(3) *Blackout front clearance lamps.*—Two approved clearance lamps, showing white light only for emergency vehicles (appendix A) and amber light only for all other vehicles shall be securely mounted on the front of motor vehicle, or motor-vehicle combination, one on each side, as near the sides of the vehicle and as close to usual headlight level as is practicable, and aimed straight ahead with face of lens vertical and slot horizontal. One such lamp is required on the front at the center of motorcycles.

b. Additional Equipment Required on All Oversized Motor Vehicles and Motor-Vehicle Combinations.—(1) *80 inches or more in width.*—(*a*) An additional combination tail and stop lamp shall be securely mounted on the extreme rear as near the *right* side as practicable

[1] *See appendix A for definitions of terms used in this specification.*

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and at the same height and alinement as left combination tail and stop lamp.

(*b*) Two approved red reflectors shall be securely mounted on the extreme rear and two approved amber reflectors shall be securely mounted on the extreme front on each side, as low on the vehicle as practicable, and in no case higher than 30 inches above road level.

(2) *Over 35 feet in length.*—There shall be securely mounted on each side, one approved amber reflector near the front, one approved amber reflector at the center, and one approved red reflector at the rear. These reflectors shall be installed as low as practicable, and in no case higher than 30 inches above road level.

c. Optional Equipment.—(1) *Reflectors.*—Approved reflectors are highly recommended to mark the sides and ends of all vehicles. Such reflectors should be mounted as low as practicable, and not higher than 30 inches above road level. Amber reflectors only shall be mounted on the front or on the sides at or near the front, and red reflectors only shall be mounted on the rear or on the sides at or near the rear of the vehicle.

(2) *White paint and reflectorized materials.*—Flat white paint, reflectorized paint, or other reflectorized materials are highly recommended for use on bumpers, hub caps, and lower portions of vehicles.

(3) *Vehicle identification signs or signals and destination signs.*—The intensity of light emitted from this equipment shall be such that the maximum distance from which signs or signals are visible is not more than 2,000 feet when viewed on a clear, dark, moonless night, by observers whose eyes are thoroughly dark-adapted. Signs or signals should be legible for at least 100 feet. Signs utilizing light letters on a dark background are preferable to those having dark letters on a light background. New signs or signals manufactured for use on vehicles during blackouts shall employ a minimum of strategic or critical materials. Design approval and marking shall conform to paragraphs 12 and 13. This equipment shall be of rugged construction and not subject to derangement, tampering, or misuse in service.

d. Interior Lights.—(1) *Instrument and dashboard lights.*—Because normal illumination on dashboards and instrument panels tends to destroy dark adaptation and serves as an annoying glare source which distracts the driver, instrument and dashboard lights shall be extinguished, unless the illumination provided is of low intensity and deep red in color. Use of radioactive materials on indicator dials and/or pointers, although not as satisfactory as deep red illumination, may be employed.

(2) *Other interior lights.*—Other interior lights shall be extinguished, rendered inoperative, completely obscured [2] from outside view, or conform to requirements of appendix D.

5. Street-Car and Trolley-Bus Blackout Equipment

Only those street cars and trolley busses which conform to the following requirements shall be operated during blackouts:

a. Blackout Driving Lamp.—One, and only one, approved motor vehicle blackout driving lamp shall be securely mounted on the forward end of the street car, or trolley bus, between left side and center, near the normal line of sight of the operator. Mounting height and adjustment of this lamp shall conform to paragraph 4*a* (1). (Double end operation requires installation of one such driving lamp on each end of the car. Lamps shall be so wired that only the lamp facing in direction of movement is in operation.)

b. Blackout Combination Tail and Stop Lamp.—One approved motor vehicle combination blackout tail and stop lamp shall be mounted on the rear of street cars in a central position, red tail light below, amber stop light above, and shall be clearly visible to traffic approaching from the rear. The mounting height of such lamp shall be not less than 20 nor more than 50 inches above road level. (Double end operation will require installation of one combination tail and stop lamp on each end of the car.) Lamps shall be so wired that only the lamp facing away from direction of movement is in operation. Two combination tail and stop lamps shall be mounted on the rear of trolley busses as specified in paragraph 4*b* (1).

[2] *See War Department specification Blackout of Buildings.*

c. Blackout Clearance Lamps.—Two amber clearance lamps, of the design approved for use on the front of motor vehicles, shall be mounted on the front of a street car, as near the sides and as close to normal headlight level as practicable, and aimed with face of lens vertical and slot horizontal. (Double end operation will require two such lamps on each end of car.) During blackouts these marker lamps shall be in operation at all times when street car or trolley bus is in roadway, whether such vehicle is moving or standing.

d. Reflectors.—(1) *Front and rear.*—Two approved red reflectors shall be mounted on the rear and two approved amber reflectors shall be mounted on the front, one on each side, as low as practicable and in no case higher than 30 inches above road level. (Street cars used for double end operation shall be equipped throughout with amber reflectors.)

(2) *Sides.*—There shall be mounted on each side one amber reflector near the front, one amber reflector at the center, and one red reflector at the rear, mounted as low as practicable and in no case higher than 30 inches above road level. (Street cars used for double end operation shall be equipped throughout with amber reflectors only.) Such reflectors shall conform to approved standard (appendix B).

e. Arc Protection.—Operators shall be instructed to "coast" over section breakers. Trolley wheels should be replaced by proper carbon shoes wherever practicable.

f. Interior Lights.—Interior lighting of street cars and trolley busses shall conform to requirements of paragraph 4*d*.

g. Optional Equipment.—See paragraph 4c.

6. Blackout Equipment for Bicycles, Push Carts, and Other Vehicles Propelled by Human Power

No bicycle, push cart, or other vehicle propelled by human power shall move in traffic unless equipped front and rear with approved reflectors and/or approved blackout flashlights or lanterns.[3] Mounting height of reflectors shall be not more than 24 inches above road level. Number reflectors only shall be mounted on the front and red reflectors only shall be mounted on the rear. In addition to such required equipment, application to the lower portion of these vehicles of flat white paint, reflectorized paint, or other reflectorized materials is highly recommended.

7. Animal-Drawn Vehicles and Ridden or Herded Animals

Animal-drawn vehicles and ridden or herded animals shall not be driven over the highway during blackouts unless protected with one or more blackout flashlights or lanterns of approved type.[3] Such lights shall be so displayed that the presence in the roadway of the animals and vehicles is rendered clearly visible to approaching traffic. Approved reflectors mounted as described in paragraph 6, and/or flat white paint, reflectorized paint, or other reflectorized materials, are highly recommended for use on animal-drawn vehicles. Equipment recommended for use by predestrians in paragraph 9 is also applicable to animals.

8. Projecting Loads

Loads projecting more than 4 feet beyond the front of rear of any vehicle shall be protected by approved red reflectors (appendix C) and/or lanterns[3] placed at the end of the load. When reflectors are used, they shall be securely mounted at a height above road level of not more than 30 inches. Side projection of loads shall not be permitted.

9. Blackout Equipment for Individuals

Pedestrians and traffic control personnel should not stand or move in the roadway during blackouts except when absolutely necessary. Any pedestrian or traffic officer whose duties require him to be in the roadway during blackouts should wear white or reflectorized leggings, or anklets equipped with clear reflectors of suitable size and approved type (appendix C), and should carry an approved blackout flashlight or lantern.[3] If white or reflectorized leggings or anklets equipped with approved reflectors are not available, white handkerchiefs or other light-colored material should be tied around the lower portions of the legs. Under blackout conditions, pedestrians are generally not visible from moving vehicles. For this reason, pedestrians must learn to keep out of the path of

[3] *See War Department specification Blackout Flashlights, Lanterns, and Flares. (Now in preparation.)*

SUMMARY OF BLACKOUT EQUIPMENT REQUIRED ON VEHICLES[2]

Equipment	Type of vehicle	Location	Mounting height	Alinement
Blackout driving lamp.[1]	Motor vehicles (except motorcycles). Street cars and trolley busses.	1 on the front, far enough forward to eliminate objectionable reflection of light from vehicle, between left side and center and as near as possible to normal line of operator's vision.	At least 36 inches and not more than 55 inches above road level (measured to bottom of slot), but not higher than top of rim of steering wheel. (Preferred height approximately 42 inches.)	With vehicle on level surface and carrying normal load, so adjust lamp that bottom of slot in mask is horizontal. Then so aim lamp that light beam is projected straight forward and visual cut-off of top of beam on a vertical screen 10 feet in front of lens is at least 2 inches and not more than 3 inches below bottom of slot. Fasten lamp securely in this position.
	Motorcycles	1 on front at center.		
Combination blackout tail and stop lamp.[1]	Motor vehicles	1 unit on extreme rear, as near left side as practicable.	As near normal tail light level as practicable, but in no case lower than 20 inches nor higher than 50 inches above road level.	Aim straight to rear with lens vertical; red tail light below and amber stop light above.
	Street cars	1 unit on extreme rear at center.		
	Motor vehicles 80 inches or more in width. Trolley busses.	2 units on extreme rear—1 as near left side as practicable, the other as near right side as practicable.		
Blackout front clearance lamp[1] (white for emergency vehicles,	Motor vehicles (except motorcycles.) Street cars.	1 on each side of front of vehicles and as near sides as practicable.[3]	As near normal headlight level as practicable.	Aim straight ahead with lens face vertical and slot horizontal.
S. A. E. "amber" for all other vehicles).	Motorcycles.	1 on front at center.		
Reflector (amber except when on rear or on sides near rear; red when on rear or on sides near rear).[4]	Vehicles 80 inches or more in width.	On the front, 1 on each side; on the rear, 1 on each side.	As low on vehicle as practicable, but in no case higher than 30 inches above road level.	Surface vertical and horizontal axis parallel to sides or ends of vehicle.
	Motor vehicles or motor-vehicle combinations more than 35 feet in length.	On each side, 1 near the front, 1 at the rear, and 1 near the center.		
	Bicycles, push carts, and other vehicles propelled by human power.[5] Animal-drawn vehicles.	At least 1 on the front and 1 on the rear.	Not more than 24 inches above road level.	

[1] *Proper operation of blackout vehicle lights.*—When properly installed, all normal lights will function with blackout switch in "Off" position. When blackout switch is in either "Park" or "Drive" position, normal lights will be turned off automatically.

[2] *Instrument lighting.*—Provision may be made for use of low intensity *deep red* light to illuminate instrument panels and dashboards during blackouts. *White light is not suitable for this purpose.* Radioactive materials may be employed on indicator dials and/or pointers.

[3] Street cars used for double end operation shall have 2 front clearance lamps on each end.

[4] Street cars used for double end operation shall have amber reflectors throughout.

[5] Approved blackout flashlights or lanterns may be substituted for reflectors.

moving vehicles during blackouts and not depend on vehicle operators to see them.

10. Luminescent Materials

Luminescent materials, including radioactive, phosphorescent, and fluorescent materials, are not generally recommended for outdoor use on vehicles or individuals because of their relatively low sustained brightness in comparison with starlight or moonlight, the high rate of deterioration of most of these materials when exposed to sunlight and moisture, and their high cost.[4] Where phosphorescent materials are used, they shall conform to Corps of Engineers Tentative Specification No. T–1225, dated January 16, 1942, entitled "Phosphorescent Coating System." Radioactive markers shall conform to Corps of Engineers tentative Specification No. T–1249, dated February 19, 1942, entitled "Markers, Luminous (Radioactive)."

11. Treatment of Shiny Surfaces

It is desirable that all chromium, aluminum, stainless steel, glossy paint, and other highly reflective surfaces be covered with lustreless paint (drab brown is recommended) or otherwise treated to minimize reflection of light in an upward direction. Reflectors and reflectorized materials, used as recommended in paragraph 4c., do not materially facilitate detection from the air.

12. Design Approval

Design approval of all blackout equipment required by this specification, including exterior and interior lighting units, switches, reflectors, signs, signals, and luminescent materials, together with installation and use instructions to be supplied with this equipment, shall be based on reports submitted to the War Department by a testing laboratory accredited by the War Department. A list of the laboratories which have been accredited as of this date is attached hereto, but does not constitute a part of this specification.

13. Marking of Approved Equipment

Approval of design shall be indicated by a marking which includes the words, "BLACKOUT (insert item of equipment)—WAR DEPARTMENT STANDARD." Units shall also display code numbers to be assigned by the War Department at time of approval which shall be placed directly beneath or after the word "Standard." This marking, together with manufacturer's name, shall be placed on each unit of approved equipment at a location which will facilitate inspection after installation.

APPENDIX A

DEFINITIONS

1. *Vehicle.*—Any device in, upon, or by which any person or property is or may be transported.

2. *Motor Vehicle.*—Any vehicle which is self-propelled, but not operated upon rails or by means of overhead trolley wires.

3. *Street Car.*—A vehicle or train of vehicles for transporting persons or property and operated upon rails principally on a public roadway.

4. *Trolley Bus.*—A vehicle not operated on stationary rails or tracks but which receives power from overhead trolley wires.

5. *Motor-Vehicle Combination.*—Any train of vehicles which includes at least one motor vehicle.

6. *Emergency Vehicles.*—*a.* The following are considered emergency vehicles:

(1) Vehicles of the armed forces of the United States and its allies.

(2) Vehicles of the fire departments.

(3) Vehicles of governmental police agencies.

(4) Ambulances and special public utility service vehicles, when properly identified and in emergency service.

(5) Such vehicles engaged in civil defense as may be designated by proper local military or civilian authority, when marked by proper identification sign or signal and when in emergency service.

[4] *See War Department specification Luminescent Materials. (Now in preparation.)*

b. Emergency vehicles, other than those of the armed forces of the United States and its allies, shall display in the lower right hand corner of the windshield (or other conspicuous place where this is not feasible) a certificate signed by the appropriate military or civilian defense official.

APPENDIX B

DESIGN, MANUFACTURE, AND INSTALLATION OF MOTOR VEHICLE BLACKOUT EQUIPMENT

1. *General.*[5]—Motor-vehicle blackout equipment shall conform to photometric and mechanical performance tests and to interchangeability requirements set forth on drawings referred to below. It is not the intent of this specification to discourage development of improved methods of construction and substitution wherever possible of materials less critical than those now indicated. Such modifications shall not only be permitted but are urgently desired.

2. *Blackout Driving Lamps.*—The approved blackout driving lamp shall conform to latest revision of Quartermaster Corps Drawing No. 09125–Y entitled "Blackout Driving Lamp."

3. *Blackout Combination Tail and Stop Lamp.*—The approved blackout combination tail and stop lamp shall conform to latest revision of Quartermaster Corps Drawing No. 08243–X, entitled "Lamp, Blackout Tail and Blackout Stop."

4. *Blackout Clearance Lamps.—a. Front clearance lamps.*—(1) *Emergency vehicles.*—The approved front clearance lamp for emergency vehicles shall conform to latest revision of either Quartermaster Corps Drawing No. 08235–X, entitled "Lamp, Parking with Blackout Device Fender Mounting." or Quartermaster Corps Drawing No. 08236–X, entitled "Lamp, Parking with Blackout Device."

(2) *Other vehicles.*—The approved lamp for other than emergency vehicles shall conform to requirements specified for front clearance lamps for emergency vehicles, except that the light emitted therefrom shall be amber instead of white. Such amber shall conform to Color Specification for Electric Lamps in the 1942 Handbook of the Society of Automotive Engineers.

5. *Wiring and Switches.—a. General.*—Blackout switches and wiring should be so arranged that when the switch is turned to light the blackout equipment, this switch will automatically disconnect all other normal lights on the vehicle, such as head, tail, parking, stop, license plate, driving, passing, fog, spot, backing, dome, stop, trunk, turn signal, standard marker and identification lights. Instrument panel lights, however, may remain lighted, if they provide red illumination. The switch and wiring arrangement should also provide a parking position, connected to light all blackout equipment on the vehicle except the blackout driving lamp. The blackout circuit should be separately fused.

b. Motor vehicles (except motorcycles).—The wiring and switches of the approved blackout lighting equipment on motor vehicles (except motorcycles) will meet the requirements of this specification if they conform to the latest revision of Quartermaster Corps Drawings Nos. 09126–W, 09129–W, and 09124–W, entitled "Blackout Wiring Diagram for Commercial Vehicles," "Black out Wiring Diagram for Commercial Trailers," and "Blackout Switch for Commercial Vehicles," respectively.

c. Motorcycles.—The wiring and switches of the required approved blackout lighting equipment on motorcycles will meet the requirements of this specification if they conform to latest revision of Quartermaster Corps Drawings Nos. 09187–W and 09186–W, entitled "Wiring Diagram for Blackout Lighting of Commercial Motorcycles," and "Blackout Switch for Commercial Motorcycles," respectively.

d. Stop lights and other automatic lights.—All lights on the vehicle controlled by automatic switches, such as stop lights, dome lights, stop lights, trunk lights, etc., shall either be made

[5] *The Quartermaster Corps drawings mentioned in this appendix will be furnished only to manufacturers on bona fide requests submitted to the Engineer Board, Fort Belvoir, Virginia.*

inoperative, disconnected, or the wiring circuits changed to require manual switching. When practicable, these lights shall be connected to terminal LS indicated in Quartermaster Corps Office Drawing No. 09126–W. (Blackout clearance lamp indicated on this drawing is not required.

e. Directional signalling devices and other manually operated lights.—Such lights shall be made inoperative and shall not be used during blackouts.

APPENDIX C

RETRODIRECTIVE REFLECTORS

An approved reflector shall possess light reflection and optical performance characteristics required by S. A. E. specification Reflex Reflectors, in the 1942 Handbook of the Society of Automotive Engineers.

APPENDIX D

EQUIPMENT FOR PROVIDING REDUCED INTERIOR ILLUMINATION IN VEHICLES

1. *Directional Characteristics.*—The design and installation of equipment used for providing reduced interior illumination in vehicles during blackouts shall be such that no direct light is projected outside the vehicle through windows, doors, or other light openings.

2. *Construction.*—Equipment shall be of rugged construction and not subject to derangement, tampering, or misuse in service. Use of strategic and critical materials shall be avoided wherever possible.

3. *Allowable General Illumination.*—Maximum illumination incident on a horizontal plane at seat level shall under no conditions exceed 0.006 footcandle. The color of light used for general interior illumination shall be white, yellow, orange, or orange red.

4. *Step Wells.*—Only orange or orange-red light shall be utilized for illuminating step wells on street cars, trolley busses, and motor busses. This light shall be of such intensity that the incident illumination on any surface visible from outside above the horizontal shall under no conditions exceed 0.02 footcandle.

5. *Fare Boxes.*—Only low-intensity deep red illumination shall be used for fare box lighting.

6. *Treatment of Shiny Surfaces.*—Unless light omitted from equipment used for reduced interior illumination of vehicles is directed in such a manner that it does not strike chromium, aluminum, porcelain, stainless steel, or other shiny surfaces, these surfaces should be covered with lustreless paint or other non-reflecting material.

LABORATORIES ACCREDITED BY THE WAR DEPARTMENT

Electrical Testing Laboratories, Inc., New York City, New York

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