NATIONAL ROAD TRANSPORT COMMISSION

SLEEPING BERTH STANDARD FOR NEW BUSES MANUFACTURED AFTER 31 DECEMBER 2000

July 2000

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MANUFACTURED AFTER 31 DECEMBER 2000
{For the Purposes of the Road Transport Reform (Driving Hours) Regulations}

DEFINITIONS

Sleeping Berth - A place set aside in a commercial bus where a driver may sleep while the vehicle is being operated by another driver.

Self-illuminating - A luminescent material which can retain its luminescence for at least 15 minutes after the source of illumination is removed and which takes no more than 20 minutes to charge.

REQUIREMENTS

Every sleeping berth must comply with the following requirements:

1. Location

The sleeping berth must be located within the passenger compartment or be immediately adjacent and interconnected to it.

Sleeper berths should not be located so as to hinder free access to roof hatch emergency exits.

The longitudinal axis of the sleeping berth must be transverse to the longitudinal axis of the bus.

2. Dimensions and Shape

The sleeping berth must have at least the following internal dimensions:

Length: 1980 mm measured on the centreline of the longitudinal axis

Width: 600 mm for 1200 mm along the required length and 450 mm for the remainder of the length

Height: (Above mattress) 800 mm for 1200 mm along the required length and 630 mm for the remainder of the length.

Corners: Vertical corners and the horizontal roof corners may be truncated to not exceed a radius of 270 mm.

The mattress surface must be substantially level when the vehicle is standing on a roadway surface with a crossfall to the left side of the vehicle of 3%.

3. Access

Access openings must be provided, allowing ready entry and egress for the occupant without the assistance of other persons. Access openings must have the following minimum dimensions:

a) Berths within passenger compartments

At least one opening 600 mm in one direction and 900 mm in another direction in the case of a single doorway or opening with direct access to the passenger compartment; or

b) Berths adjacent or interconnected to passenger compartment

At least two openings 600 mm high and 600 mm wide, in different panels of the compartment, with at least one having direct access to the passenger compartment.

4. Occupant Safety

The sleeping berth must meet the design requirements below for protective interior surfaces, occupant retention and structural strength:

(i) The sleeping berth interior must be free from potentially injurious projections. Brittle fittings such as lamps, switches, mirrors or communication devices that may shatter in a crash should be recessed or protected. All hard edges in the sleeping berth interior contactable by a 165mm diameter sphere must present a radius of curvature of at least 5mm.

(ii) Internal surfaces of the berth must be padded to provide an energy dissipation equivalent to that required by ADR 3/02 clause 5.9 for contactable areas of seats.

(iii) The berth must be so constructed that a 95th percentile male occupant as defined in SAE J833 May 89 - “Human Physical Dimensions” is retained within the berth:

(a) when the occupant in the berth is subjected to a deceleration of 20 times the acceleration due to gravity in a forward direction relative to the vehicle.

(b) when the side wall of the berth is impacted by the occupant subjected to a deceleration of 4 times the acceleration due to gravity in a direction transverse to the vehicle. Window glass shall be considered to provide no assistance in meeting this requirement.

(iv) Conformance to these requirements may be demonstrated by strength calculation or static load testing in the case of berths with rigid wall and door construction. For static tests, the load must be sustained for at least 0.2 seconds.

Where flexible materials form part of the occupant restraint system, compliance may be considered to be demonstrated if the flexible restraint barrier retains the occupant when tested in accordance with the impact test procedure in AS/NZS 4034:1992 “Motor Vehicles - Cargo barriers for occupant protection” at energy ratings of:

(a) 100 kg for clause 4 (iii) a

(b) 20 kg for clause 4 (iii) b

(v) Where a sleeping berth is located within or adjacent to the bus luggage compartment the dividing walls must be designed to withstand the impact loads of luggage in the event of an accident.

This requirement will be deemed to be met if the dividing wall is calculated to withstand the distributed force imposed by the luggage bearing directly on it, assuming a 100 kg/m^3 density of luggage, 20G deceleration for a rear facing wall and 4G deceleration for all other walls.

The luggage volume to be used in this calculation is that occupying the space which directly impinges on the wall area.

The force to be withstood in kilonewtons is therefore:

(a) For a rear facing dividing wall: Force kN = 20 x luggage space volume (m^3)

(b) For a side or front facing dividing wall: Force kN = 4 x luggage space volume (m^3)

(vi) A restraint system that has to be closed by the occupant, must be easy to operate from inside the berth and any latching devices for the system must be protected against accidental opening.

5. Protection against Exhaust System and Fuel System

A sleeping berth must be sealed against the entry of exhaust gases and insulated against heat input from adjacent exhaust piping. It must not be possible for defects in the fuel system to result in fuel leakage or fumes entering the berth.

6 . Communication with Driver

A facility to enable its occupant to readily speak to the driver must be provided within a sleeping berth. If the occupant can't speak to the driver directly, the facility may include telephones, intercoms, or speaker tubes.

7. Closures

Closures must meet design requirements for privacy, transmission of light and sound, external sealing and signage.

(i) The berth must be separated from the passenger compartment by a closure which can be readily opened or removed in an emergency whether or not there is something blocking the enclosure on the inside of the berth. The closure must completely cover the opening and reduce the ingress of light and the transmission of sound from the passenger compartment to levels which do not inhibit sleeping.

The sound level reduction requirements are detailed in Section 8.

The illumination level reduction requirements are detailed in Section 10.

Closures may be designed as part of the occupant restraint system or remain separate from it. Flexible screens or curtains may be used for interior access closures.

(ii) A dressing space, if provided adjacent to the berth, must be capable of being visually separated from the passenger compartment by a curtain or flexible screen which will not impede access to the berth.

(iii) Where an exit is provided to the exterior of the vehicle, the closure must be sealed against the ingress of dust and moisture and must be provided with both interior and exterior opening mechanisms.

(iv) Where latches are used to secure closures**,** clear instructions concerning the method of operation must be placed on or close to the closure on both sides of the opening. The instructions must be printed on self-illuminating material where internal to the vehicle and on retroreflective material where external to the vehicle.

(v) An external door to a sleeping berth must be identified with an adjacent external sign of retroreflective material with the inscription “SLEEPING BERTH EMERGENCY EXIT” in letters at least 50 mm high in a colour which contrasts with the background.

8. Protection against Noise and Vibration

The berth must be insulated from vibrations and noise, including conversation from adjacent seating, which are likely to disturb the occupant’s sleep.

The maximum recorded noise level***** measured 200 mm above and on the centreline of the mattress at the head end must not exceed:

(i) 80 dB(A) when the vehicle is accelerated as rapidly as possible from rest to maximum limited speed on level road; and

(ii) 76 dB(A) when travelling without acceleration at maximum limited speed on level road.

The closure separating the sleeping berth from the passenger compartment should have acoustic attenuation properties to reduce noise transmission into the berth from

the passenger compartment by a minimum of 15dB(A). This may be established by simultaneous sound level measurements on either side of the closure, using a suitable sound source such as a radio receiver to replicate passenger conversation. The test should be conducted with the vehicle engine stopped and with the reference source sound level sufficient to provide a measurable increase above ambient sound level in the berth.

***Note:** Driver interviews were used to identify sleeping berths that provided a good environment for sleeping/resting and factors that might reduced the quality of rest. The critical sleep disturbance issue for resting drivers was found to be sudden peaks in noise level from gear changes and hard accelerations etc. Accordingly, an averaging L_{eq} approach was not used to specify the limits above. Berths said to provide good accomodation were tested for a range of characteristics including noise levels. Good berths exhibited an average noise level in the range 72 to 78 dB(A) with peaks of up to 83 dB(A). The standard above provides a 3 dB(A) reduction on the measured limits.

9. Heating, Cooling and Ventilation

A sleeping berth adjacent to a heat source such as the engine compartment or exhaust system must be insulated against heat input from that source.

A supply of refrigerated and heated air must be provided, capable of maintaining the internal temperature at a stable level conducive to sleep. The air flow within the berth must be adjustable by the occupant to create air movement in the region of the occupants face. A minimum air velocity of 0.5 m/s would be considered to meet this requirement.

A sleeping berth located other than in the passenger compartment must additionally be provided with an adjustable source of fresh air ventilation, free from dust and water, not dependent on a forced flow device to provide the specified air velocity.

10. Lighting

Lighting controlled from within the berth must be provided to illuminate the entire berth and to provide a level of illumination sufficient to permit reading in the region intended for the occupier's head. Indicative figures of 20 lux for background lighting and 80 lux for reading surface intensity would be considered satisfactory.

The closure separating the berth from the passenger compartment and the curtains provided across external windows must reduce the entry of light to a level which would not inhibit sleeping. An indicative figure of 2 lux (maximum) of interior surface illuminance under external daylight conditions would be considered satisfactory.

11. Interior materials

The interior lining and trimming of a sleeping berth must be made of a material that is not readily flammable.

12. Furnishings

Furnishings provided must include:

(i) A mattress of innerspring or high density cellular foam construction, of 150 mm minimum thickness, fitted with a readily removable, washable cover. The mattress must cover at least the minimum berth area.

(ii) A pillow.

(iii) Bed linen including a pillowcase, two sheets and a blanket.

(iv) An enclosure for garment storage including hanging or horizontal storage space for a jacket and shirt.

13. Dressing area

An area of floor contiguous with the berth should be provided to facilitate occupant dressing. Provision of this dressing space is optional for vehicles not used exclusively for two-up driving where removal of passenger seats would be required to create the necessary floor space. The area should be screened from the passenger compartment and should have the following minimum dimensions:

(i) Where the height projected vertically above the area is less than 1800 mm

Width standing area	500	mm
Standing Area	0.4	m^2

(ii) Where the height projected vertically above the area exceeds 1800 mm

Width standing area	500	mm
Standing area	0.25	m^2

(iii) The minimum vertical height of the dressing area (over the minimum standing) area must not be less than 1650mm.

(iv) Surfaces directly adjacent to the dressing area must be free from potentially injurious projections.