

Seat Belt Anchorages for Buses

1. Scope

This standard specifies anchorages, installation methods and strengths of anchorages upon installation of two-point seat belt assemblies provided in **JIS D 4604** (Seat Belt Assemblies for Automobiles) mainly for forward facing seats (excluding auxiliary seats) of buses in order to protect occupants from injuries caused by traffic accidents, especially fall accidents.

Remarks : In this standard, units and numerical values are based on SI (International System of Units), while units and numerical values given in { } are based on customary units system, which show the standard values.

2. Purpose

This standard is established in order to ensure safety of seat belt anchorages for buses.

3. Definition

Definitions of major terms used in this standard, other than those defined in **JIS D 4604** and **JIS D 0024** (Road Vehicles-Procedure for H-points Determination), are as follows.

(1) Anchorage

Attachment portion on vehicle side or seat side on which a seat belt or a through guide is installed.

(2) Attached-to-body-type

A type which has all anchorages for a seat belt assembly attached to the body.

(3) Built-in-to-seat type

A type which has some or all anchorages for a seat belt assembly built-in to the seat.

(4) Lower anchorage

Anchorage for the lap belt.

(5) Through guide anchorage

Anchorage on vehicle side or seat side for the through guide.

(6) Single-type anchorage

The portion at which one end of the seat belt assembly is installed (see **Fig.1**)

(7) Double-type anchorage

The portion at which one end each of two seat belt assemblies is installed together (see **Fig.2**)

(8) Hip point

A point on the seat which corresponds to the H point (hip point) of a three dimensional manikin, defined in **JIS D 4607** (Three Dimensional Manikins for Use in Defining Automobile Seating Accommodations) or in **JIS D 0024**, seated on the seat.

(9) Belt installing point

The centre point of the screw hole or bolt hole on the attachment plane of the anchorage. In case where the through guides, seat frames and others restrain the loaded webbing, the point where the webbing contacts with these parts.

In the case where the belt is directly installed on the seat frame, the centre of the width of the belt at the point contacting with the frame.

Applicable Standards :	JIS B 0208	Unified Fine Screw Threads
	JIS B 0212	Limits of Sizes and Tolerance for Unified Fine Screw Threads
	JIS B 1001	Diameter of Clearance Holes and Counterbores for Bolts and Screws
	JIS D 0024	Road Vehicle-Procedure for H-point Determination
	JIS D 4604	Seat Belt Assemblies for Automobiles
	JIS D 4607	Three Dimensional Manikins for Use in Defining Automobiles Seating Accommodations

4. General Provisions for Installation

Two-point seat belt assemblies for automobiles specified in JIS D 4604 shall be used and the installation method shall be as follows.

- (1) Two seat belt assemblies shall not be installed at a single-type anchorage.
- (2) A seat belt assembly shall not be installed in such a manner that the belts cross one another on the rear side of the seat and the belts fasten around the torso of the occupant.
- (3) Care shall be taken to avoid any damage of the buckles and webbing by being trapped in the seat adjusting unit, jump seat, etc.

5. Belt Installing Point Location

The locations of belt installing points shall be as follows.

- (1) The locations of belt installing points shall be so determined that restraints and twists harmful to the seat belt assemblies may not occur.
- (2) In the cases where the seat frame does not restrain the loaded lap belt, the locations of belt installing point shall be so determined that the straight line connecting the seat belt installing point and the hip point forms an angle within the range of $50 \pm 30^\circ$ against the vehicle horizontal reference line as shown in Fig.3 and Fig.4.

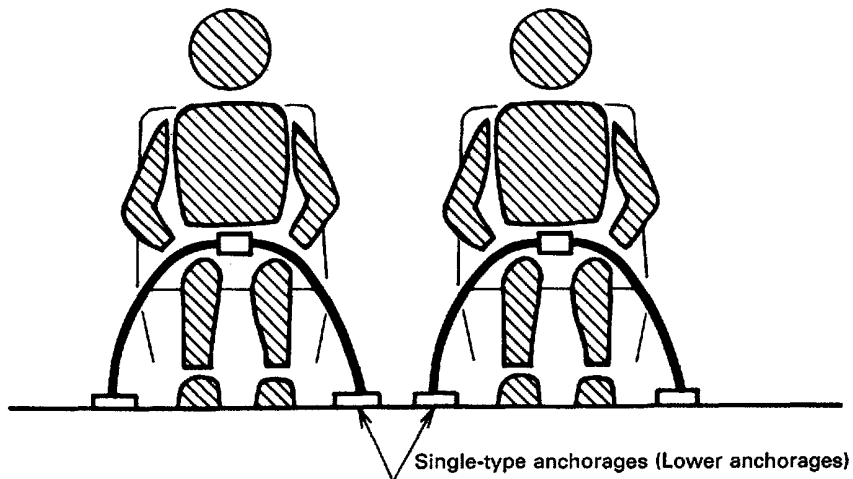


Fig.1

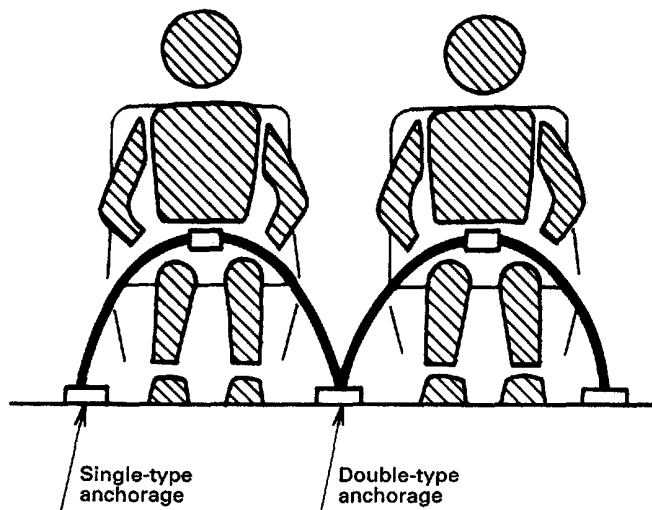


Fig.2

be, as a rule, in accordance with 7/16-20 UNF-2B(1)(2) and the bolt hole diameters shall be of the class 2 or higher provided in **JIS B 1001** (Diameter of clearance Holes and Counterbores for Bolts and Screws)

Notes : (1) Screw threads shall be in accordance with **JIS B 0208** (Unified Fine Screw Threads) and their tolerable dimensions shall be in accordance with **JIS B 0212** (Limits of Sizes and Tolerances for Unified Fine Screw Threads).

(2) In case using screw threads other than those specified in this standard is unavoidable due to vehicle body construction, they shall have performance equivalent to or better than that specified in this standard.

- (4) In case the seat belt assembly is installed directly to the seat frame without using the attachment fittings specified in **JIS D 4604**, the portion contacting with the frame shall be made smooth and not have any sharp edges.

7. Tests

Tests shall be static load tests with each seat adjusting mechanism set at the respective design standard position.

- (1) Tests shall be carried out with the seats mounted on the vehicle body.

Tests may be carried out, however, with the seats mounted on a test panel having construction and strength equivalent to the actual vehicle.

- (2) Tests may be carried out without seats in case where the loaded seat belt assemblies are not restrained by the seat frames, etc. (e.g. Fig.4).
- (3) Tests shall be carried out under such conditions that the seat belt assemblies are attached to the anchorages using the attachment fittings specified in **JIS D 4604** or using jigs which can reproduce such conditions.
- (4) Tests shall be classified into A and B and each test shall be carried out in accordance with the method indicated respectively in the table below.
- (5) Tests shall be carried out by applying the load prescribed in the Table being kept for more than 0.5 second.
- (6) Test loads shall be applied by using either one of the body blocks prescribed in Fig.9
- (7) Loading tests for anchorages installed on a same shall be carried out simultaneously.
- (8) Loading tests for anchorages installed at different seats may be carried out separately, but shall be carried out simultaneously if such anchorages are located closely each other.

Table

Classification	Applicable conditions	Occupant standard mass (kg)	Load-ing factor	Magnitude of load per occupant N (kgf)	Direction of loading	Reference figure
A	In case where the seat belt assembly is installed to the vehicle body and not restrained by the seat frame, etc.	75	4	736×4 (75×4)	$10 \pm 5^\circ$ above the horizontal line	Fig. 8
B	In case where the seat belt assembly is installed to the seat frame or installed to the vehicle body and restrained by the seat frame, etc.			$\left(\begin{array}{l} 736 + \text{seat} \\ \text{mass per} \\ \text{occupant} \times \\ \text{acceleration} \\ \text{of gravity} \end{array} \right) \times 4$ $\left(\begin{array}{l} 75 + \text{seat} \\ \text{weight per} \\ \text{occupant} \end{array} \right) \times 4$		

Remark : Acceleration of gravity $g = 9.80665 \text{ m/s}^2$

Fig. 7

Unit : mm

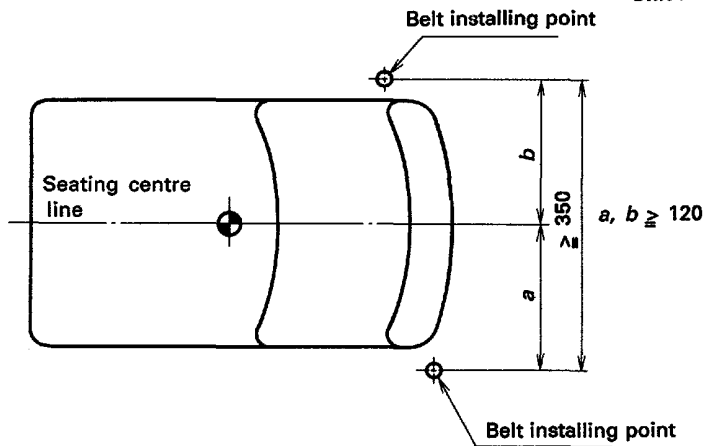


Fig. 8

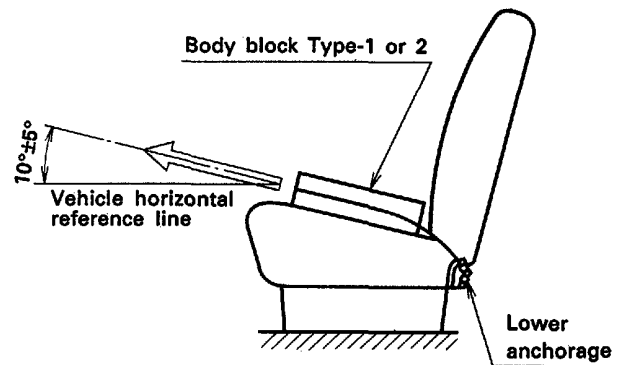
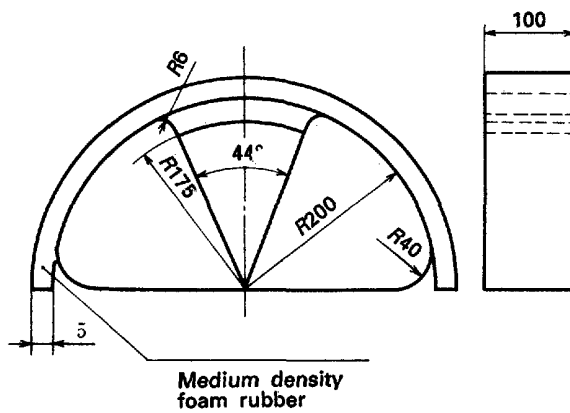
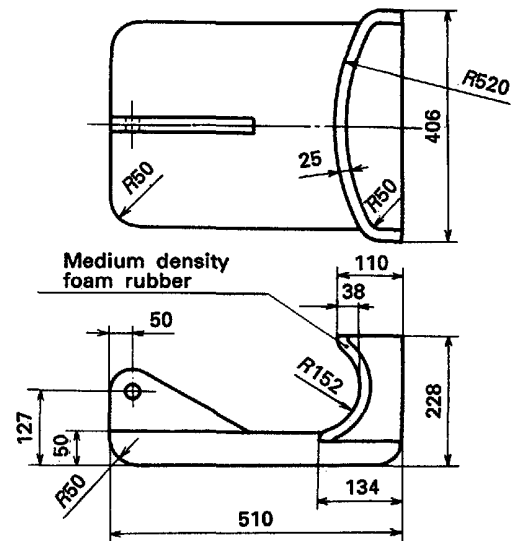


Fig. 9

Body block Type-1



Body block Type-2



Explanatory Note on JASO B 402-89 Seat Belt Anchorages for Buses

1. Scope

This standard specifies the relative dimensions and strength of anchorages for installation of seat belt assemblies for buses prescribed in JIS D 0101 (Glossary of Terms Relating to Automobiles). (Item numbers indicated below are the same as those in the Text.)

In Safety Regulations, the equivalent standard is required for seats installed on automobiles with number of occupants exceeding 11 persons as well as for driver's seats and other seats excluding those installed in parallel to the driver's seats on ordinary automobiles (other than those exclusively used for passengers).

That these seats are regarded as "the seats installed on buses, etc."

3. Definitions

- (8) **Hip point** Hip point is the position on a seat which corresponds to the H points of the three dimensional manikin with the seat adjusting mechanism set at a position suitable for driving or sitting.
- (9) **Belt installing point** The definition in the latter half corresponds to the Effective Point defined in ECE Regulation No.14

4. General Provisions for Installation

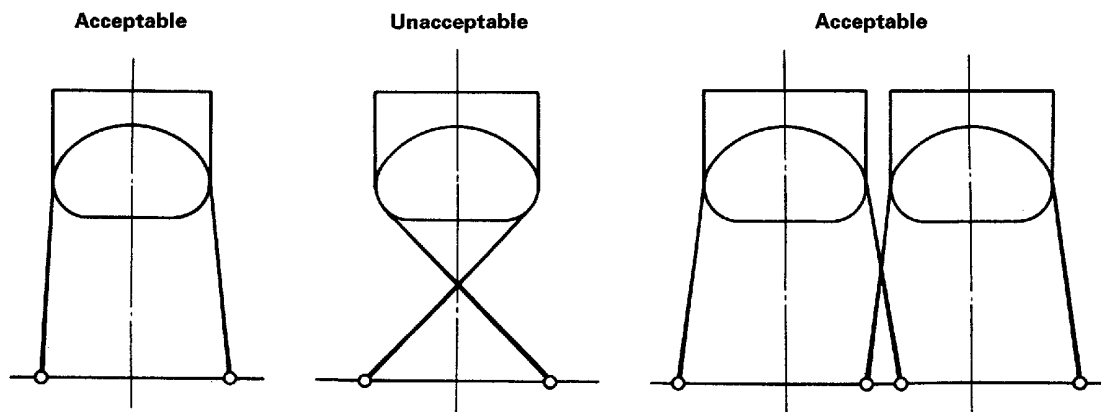
The meaning of the provision (2) is as shown in the Explanatory Figure below.

5. Belt Anchorage Location

Seat belt anchorage locations shall be so determined that they may be operated effectively for the safety of occupants without harming occupants by the fixtures during seat belt operation or causing damages of seat belts by seat frames, etc.

- (2) The lap belt shall be used to stay around the pelvis of the occupant, (Strength of pelvis is large.) IF the attachment angle of the lap belt as observed from the side becomes small, (i. e. if the stretching direction of the belt approaches to horizontal) the lap belt tends to slip over the pelvis and move to the abdomen. Therefore, the attachment angle of the lap belt has to be made large. The attachment angles prescribed in the standards, laws and regulations of each country are as in the Explanatory Table below.

Explanatory Figure



Explanatory Table

	Safety Regulations (Japan)	FMVSS No. 210	ADR No.5	ECE Reg. 14	JIS D 4609
Attachment angle of lap belt	20 ~ 75°	20 ~ 75°	25 ~ 80°	30 ~ 80° Rear seats 20 ~ 80°	25 ~ 80°

In this standard, the design target is set at 50°. Therefore, the locations of belt installing points are so specified that the angle formed by the straight line connecting the seat belt installing point and the hip point against the vehicle horizontal reference line shall be 50° as close as possible and within the range of 50±30°

Further, "loaded" means the condition that the belt is applied with a load by being operated by traffic accidents.

- (4) The lateral spacing of belt installing points is prescribed as "not less than 350 mm" in the Safety Regulations of Japan. It is advisable that the mid-point between two lower anchorages falls on the seating centre line. Thus, the locations of belt installing points are so specified that the distances from the seating centre line to the installing points shall be not less than the designated figure and that the ratio of these distances shall be as close to 1 as possible.

Further, in case where the loaded seat belt is restrained by the seat frame (in upward direction), it is not restrained in forward direction. Therefore, it is necessary that the lateral spacing of the lower anchorages satisfies the condition for the lateral spacing of the lower installing points prescribed in the Text. In this paragraph, the seating centre line means the centre line of the occupant seating position according to the according to the cabin or seat design.

6. Performance of the Anchorage

- (1) It is required that the anchorage shall endure the load test and shall not fail out.

- (2) In case of anchorages of built-in-to-seat type, the seats and seat anchorages after load test shall not be in such conditions that they do not fulfil their functions (e.g. the conditions such as the seat adjustment position changes or the seat is detached from the floor) when the seat belts are operated. In other words, it is not required that the sliding mechanism of the seat or the reclining mechanism of the seat back can be operated normally even after testing.

- (3) By improving materials and heat treatment of the bolts, it has become possible that even 7/16-20 UNF can endure the tension load of double type anchorages (40.0 kN). Therefore, 7/16-20 UNF is used also for double type anchorages, but it is necessary to set the belts in installed condition in this case.

7. Tests

Although static loading tests alone are provided in this Standard, it is necessary to carry out dynamic load tests as well since dynamic loads are applied to seat belt assemblies in operation. Appropriate provisions will be set forth after further studies are completed. Further, it is also necessary to specify test methods and test loads for backward and sideways facing seats and further studies are expected.

- (1) It is specified that the tests shall be made with the seats mounted on an actual vehicle as it is necessary to test not only seat belt anchorages but also their relation with the seats and vehicle body. However, test panels of equivalent construction and strength to actual vehicles may be used, when it is impossible to mount seats on a vehicle due to shapes and constructions of vehicles and test equipments.

Tests (1) and (2) shall be carried out with body blocks set according to the location and angle of the seat belts when they are fastened by occupants in their seating position designed, and apply the load in direction provided in (4). In case where loaded seat belt assemblies are not restrained by seat frames, etc., seats may be removed but jigs having relative locations and properties equivalent to seats shall be used.

- (3) Test may be carried out using objects other than belts, when seat belt assemblies are installed to the vehicle body and they are not restrained by seat frames while loaded. It is desirable, however, to test under actual installing conditions in order to investigate the matching between seat belts and their anchorages and between seats and their anchorages, which is one of the test objectives.
- (6) The body block Type-1 specified in this standard is equivalent to that provided in **SAE J 384** and **FMVSS No.210** and Type-2 to that of **ECE Regulation No.14**, **SAE J 384** and **FMVSS No.210**.
- (8) **ADR No.5** specifies the simultaneous test in case where anchorages are located less than 200 mm apart (on passenger vehicles and multi-purpose passenger vehicles).

B 402-89 Explanatory Note

Reference Data :

JIS D 0101 Glossary of Terms Relating to Automobiles

SAE J 384 Motor Vehicles Seat Belt Anchorages-Test Procedure

Safety Regulations (Japan)

Safety Regulations for Road Vehicles

Article 22-3 Technical Standards

FMVSS No.210

Seat Belt Assembly Anchorages

ECE Regulation No.14

Uniform Provisions Concerning the Approval of Vehicles with Regard to Safety-Belt Anchorage on Passenger Cars

ECE 82/318 On the Approximation of the Laws of the Member States Relating to Anchorages for Motor-Vehicle Safety Belts

DR No.5

Australian Design Rule No.5 for Seat Belt Anchorages

In the event of any doubt, the original standards in Japanese should be referred.

SI : **SECOND PHASED STANDARD**
(The standard where customary units and converted values are given in brackets after specified value SI units.)

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- (3) In the cases where the loaded lap belt is restrained by the seat frame or through guide and installed as shown in Fig.5 and Fig.6, the locations of belt installing points shall satisfy the conditions under (2).
- (4) The lateral spacing of belt installing points of a seat belt assembly shall be not less than 350 mm and a and b , the distances from the seating centre line to the installing points on the left and right, shall be both not less than 120 mm as shown in Fig.7. The ratio a/b shall preferably be as close to 1 as possible.

Anchorage Performance

Anchorage performance shall be as follows.

- (1) Anchorage shall endure the load test prescribed in 7.
- (2) In case of anchorage of built-in-to-seat type or in the cases where a part of the load is carried by the seat, seats and seat anchorage shall also endure the load test prescribed in 7.
- (3) When installing the seat belt assembly to the vehicle body, the attachment fittings specified in JIS D 4604 shall be used. The anchorage screw threads shall

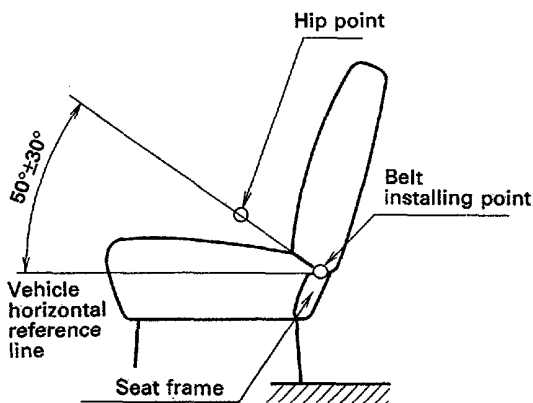


Fig.3

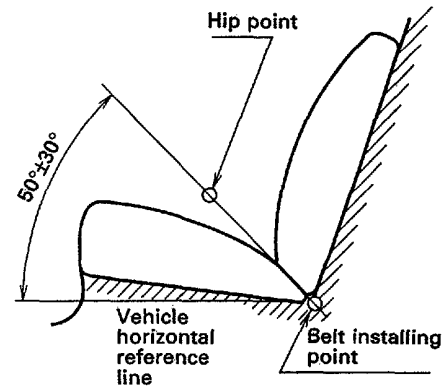


Fig.4

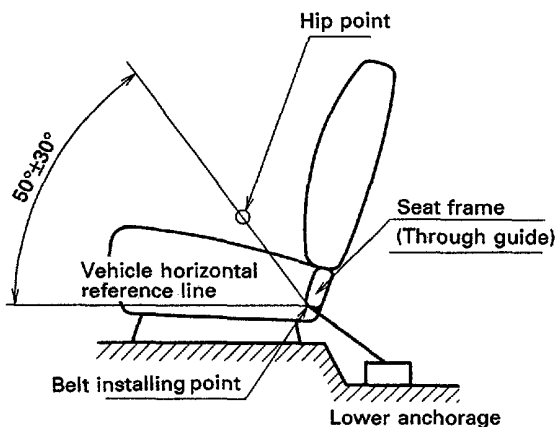


Fig.5

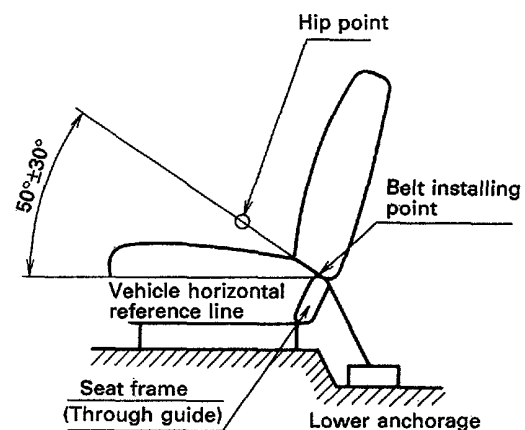


Fig.6