

# SAFETY MEASURES FOR THE STRUCTURE OF TRUCKS AND BUSES

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## ABSTRACT

There are an increasing number of cases in which the drivers and passengers of trucks and buses that become involved in collisions on expressways are subject to severe injury. For this reason, study committees --- consist of university scholars, fleet operators, vehicle manufacturers, etc. --- have been established, and framed the measures of protecting drivers and passengers with a focus on vehicle structure.

## INTRODUCTION

In recent years, the rising volume of traffic and the growing congestion on truck roads have led to a marked increase in the number of accidents involving trucks and buses, particularly on expressways, in which drivers and passengers sustain severe injuries. In view of this situation, two study committees — “The Committee to Study Bus Structure Improvement Measures to Protect Drivers and Passengers” and “The Committee to Study Truck Structure Improvement Measures to Protect Drivers and Passengers” — have been established. These committees consist of university scholars; fleet operators, drivers, and vehicle manufacturers; and representatives of the Ministry of Transport (MOT). These committees study vehicle structure and equipment in terms of measures to reduce injuries to drivers and passengers.

## FRAMEWORK OF STUDY

These study committees, which operate from the perspective of quickly advancing the spread of safer motor vehicles, do not have the objectives of devising completely new countermeasures or of devising countermeasures aimed at formulating regulations characterized by minimal safety measures. Instead, the objectives of these committees are to select items from among existing safety equipment, equipment that has proven effectiveness and has been adopted in passenger vehicles, or equipment that has high potential for development that are worthy of being spread widely but have failed to spread due to their cost or lack of

information, and to formulate measures to promote the spread of these items as early as possible.

These committees commenced activities by conducting questionnaires and holding hearings on bus and truck safety at fleet operators and drivers in order to learn just what actual users consider to be essential to safety in terms of vehicle equipment and structure.

Next, the results of the above questionnaires and hearings formed the basis for the discussions carried out by scholars, motor vehicle manufacturers, and other safety-related parties. During those discussions, certain effective safety measures were selected, and those particular safety measures were examined further in terms of their cost-efficiency.

Lastly, the study committees proposed the necessary action plans to be carried out by fleet operators, motor vehicle manufacturers, and government administrative agencies in order to ensure the spread and regular application of the various safety measures.

The presence of a limited number of concerned parties who shared common perceptions of the necessity and effectiveness of the various countermeasures was a key factor that enabled such a framework to be applied.

## SAFETY MEASURES FOR PASSENGERS etc.

Among the various safety measures aimed at passengers, the expenses and effectiveness of equipment were made as clear as possible, in addition to the specific content of the safety measures.

Safety measures to protect bus drivers and passengers were divided into short-term safety measures targeted at being put into practice as soon as possible, and medium- and long-term safety measures that will require substantial time in order to be put into practice.

Safety measures to protect truck passengers were handled in the same way as measures for buses.

**Table 1**  
**Specific short-term safety measures for large size buses**

a	Strengthening of front chassis structure
b	Three-point safety belts for driver's seat
c	Crash-absorbent steering wheel
d	Strengthening of roof and window pillars
e	Review of the location of seat for the tour guide
f	Elimination of protrusion set on seat backs
g	Adoption of crash-absorbent interior decorations
h	Device that warns when distance between vehicles is inadequate
i	Easy-fastening safety belts
j	Improvement of safety-belt use rate among drivers
k	Thorough notification to passengers on need to fasten safety belts
l	Thorough guidance by bus tour guide who is seated
m	Review of desirable methods of operation management
n	Improvement of method of displaying location of emergency exits, clarification of way of opening exits
o	Installation of Automatic Mayday System

**Table 2**  
**Medium- and long-term safety measures for large size buses**

a	Improvement of safety in frontal impacts
b	Three-point safety belts for guide seats
c	Crash-absorbent seat backs
d	Installation of safety belts on seat attached to emergency exit
e	Installation of safety belts on spare seats
f	Shift to high-back seats for all passenger seats
g	Uniformity of switch location and method of operation
h	Improvement of emergency exits

**EXAMPLES OF SPECIFIC SAFETY MEASURES**

Following are outlines of the content of two specific safety measures: improvement of safety in frontal impacts and three-point safety belts for driver's seat.

**1) Improvement of Safety in Frontal Impacts**

**(1) Content of Safety Measure**

Motor vehicle manufacturers carry out frontal impact tests based on "Guidelines for Frontal Impact Tests of Large Tourist Buses and Long-Distance Highway Buses," which are the guidelines on frontal impact tests for buses formulated voluntarily by the manufacturers, and implement safety measures to comply with the guidelines. The general content of the safety measures is as follows; however, their specific content differs depending on the manufacturer.

- a. Preservation of survival space for the driver's seat during impacts and prevention of secondary impacts
- b. Strengthening of the floor and sides of the driver's seat section and establishment of a crushable zone in part of the chassis as needed
- c. More secure attachment of the enclosure and floor of the driver's seat
- d. More secure attachment of the service box and floor
- e. Installation of a three-point safety belt on the guide seat located within the driver's seat enclosure
- f. Improvement of the safety of general passenger seats
- g. Installation of safety belts on seat attached the emergency exit and spare seats

**Table 3**  
**Outline of the Guidelines on Frontal Impact Tests for Large Tourist Buses and Long-distance Highway Buses**

Scope of application : GVW of 12 tons or more
Type of impact : Frontal impact collision against fixed barrier
Dummy : Hybrid II or III
Speed at impact : 35 km/h
Parts observed : HIC, chest acceleration, upper leg compressive force
Determination standards : HIC value: 1,000
Chest acceleration : 60 G
Upper leg compressive force : 10 kN
Others: Recognition of calculation methods

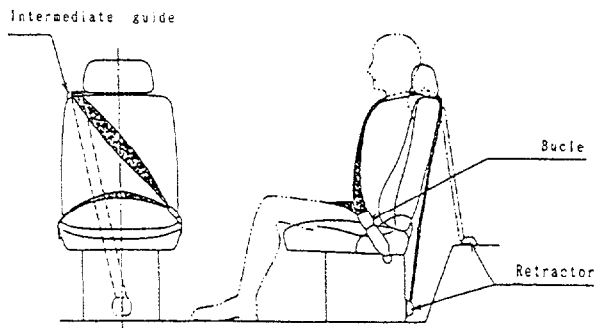
**2) Three-point safety belt for driver's seat**

**(1) Aim of measure**

To restrain the driver's upper body from pitching forward in impacts, to reduce injury, and to keep the vehicle from going out of control due to external disturbance.

**(2) Content of measure**

## The use of three-point safety belt for driver's seat



**Figure 1 Three-point safety belt for driver's seat**

**(3) Increase in weight due to the measure:**  
**approximately 5 kg.**

**(4) Increase in vehicle price due to the measure:**  
**¥90,000-¥100,000**

## CONCLUSION

These study committees consist of university scholars, fleet operators, vehicle manufacturers, and other parties have succeeded in formulating a recommended list of various measures to protect drivers and passengers. Motor vehicle manufacturers will from now on take steps to establish a systematic framework for providing the individual measures. In addition, the government and other authorities will actively supply information concerning the measures to transport businesses and drivers. In turn, fleet operators and drivers will review these information supplied and then work to introduce motor vehicles that have installed whatever safety measures they have deemed necessary.

Some of these measures will require further development, and there is a possibility that some will fail to spread and gain widespread acceptance. For this reason, The status of implementation of the individual measures will be checked periodically..