



Transport Canada
Safety and Security

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Sécurité et sûreté

Road Safety

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TEST METHOD 221

School Bus Body Joint Strength

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Motor Vehicle Standards and Research Branch
Road Safety and Motor Vehicle Regulation Directorate
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1. Introduction

Test Method 221 — School Bus Body Joint Strength (October 20, 2000) is to be used for demonstrating compliance with the requirements of section 221 of Schedule IV to the *Motor Vehicle Safety Regulations*.

(Original signed by)

Director, Motor Vehicle Standards and Research
for the Minister of Transport
Ottawa, Ontario

2. Definition

“**ASTM Tension Testing Method**” means the test method as specified in Volume 03.01, Designation: E 8-99 or E 8M-99, *Standard Test Method for Tension Testing of Metallic Materials*, of the 1999 *Annual Book of American Society for Testing and Materials*.

3. Test Procedure

3.1 Applicability

The following procedure applies in determining compliance with section 221 of Schedule IV to the *Motor Vehicle Safety Regulations*.

3.2 Test Specimen

Cut a test specimen as follows:

- 3.2.1 For body joints 203 mm or longer, cut any 203 mm segment of the joint, together with a portion of the bus body whose dimensions are those specified in Figure 1, so that the specimen’s centerline is perpendicular to the joint at the midpoint of the joint segment.

- 3.2.2 For body joints shorter than 203 mm, cut the test specimen with sufficient adjacent material to permit it to be held in the tension testing machine specified in subsection 3.5.
- 3.2.3 Where the body panel joint is not fastened continuously, select the segment so that it does not bisect a spot weld or a discrete fastener and the dimensions from the outboard fasteners to the outboard edges of each side of the test specimen are as equal as possible.
- 3.2.4 Support components which contribute to the strength of a body panel joint, such as rub rails on the outside of body panels or underlying structure attached to joint components, shall remain attached to the test specimen, except that material may be removed from the support components as necessary to clear the gripping areas of the joint components being tested.
- 3.2.5 For complex and curved joints where the two body components are not flat surfaces the strength test is to be completed using identical materials joined by the same means as is used in the bus body manufacturer. The materials shall be flat and conform to Figure 1 and shall be tested as specified in subsection 3.5.

3.3 *Preparation of Test Specimen*

Prepare the test specimen in accordance with the ASTM Tension Testing Method.

3.4 *Determination of Minimum Allowable Strength*

For purposes of determining the minimum allowable joint strength, determine the tensile strength of the joined body components as follows:

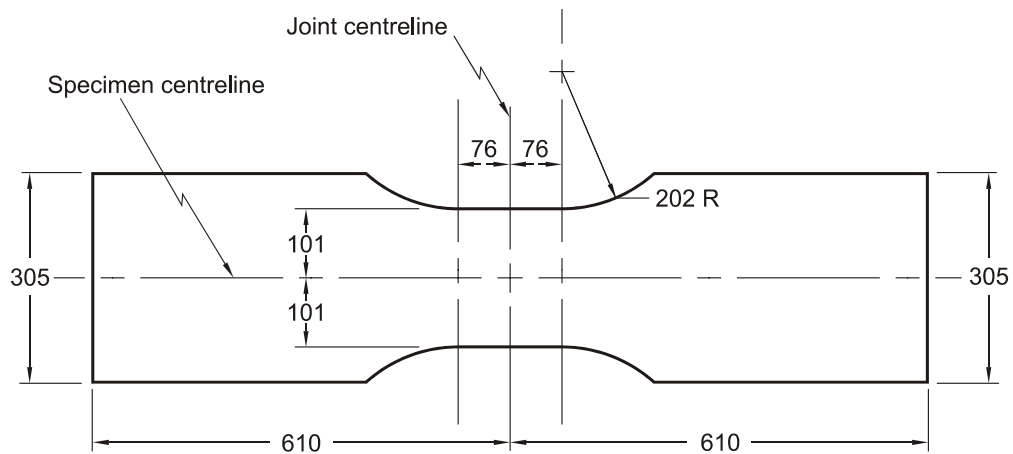
- 3.4.1 If the mechanical properties and/or minimum thickness of a joint component material are specified by the *Annual Book of ASTM*, the lowest value of that material's tensile strength per unit of area and minimum thickness shown in that source shall be used.
- 3.4.2 If the mechanical properties of a material are not specified by the *Annual Book of ASTM*, determine its tensile strength by cutting a sheet specimen from outside the joint region of the bus body in accordance with the ASTM Tension Testing

Method, and by testing it in accordance with subsection 3.5 of Test Method 221.

- 3.4.3 The cross sectional area of material removed to facilitate the installation of fasteners shall be subtracted from the cross sectional area of the panel in the determination of the tensile strength of the weakest joined body panel.

3.5 *Strength Test*

- 3.5.1 The joint specimen is gripped on opposite sides of the joint in a tension testing machine in accordance with the *ASTM Tension Testing Method*.
- 3.5.2 Adjust the testing machine grips so that the applied force on the joint is at 90 degrees plus or minus 1 degree from the joint centerline.
- 3.5.3 A tensile force is applied to the specimen by separating the heads of the testing machine at any uniform rate not less than 3 mm and not more than 10 mm per minute until the specimen separates.



- Notes:
 1. Dimensions in mm
 2. Not to scale

Figure 1 – Body Joint Test Specimen Example