



AISI S901-13



AISI STANDARD

Rotational-Lateral Stiffness Test Method for Beam-to-Panel Assemblies

2013 Edition

Approved by
the AISI Committee on Specifications for the Design of
Cold-Formed Steel Structural Members

The material contained herein has been developed by the American Iron and Steel Institute (AISI) Committee on Specifications for the Design of Cold-Formed Steel Structural Members. The organization and the Committee have made a diligent effort to present accurate, reliable, and useful information on testing of cold-formed steel members, components or structures. The Committee acknowledges and is grateful for the contributions of the numerous researchers, engineers, and others who have contributed to the body of knowledge on the subject. With anticipated improvements in understanding of the behavior of cold-formed steel and the continuing development of new technology, this material will become dated. It is anticipated that future editions of this test procedure will update this material as new information becomes available, but this cannot be guaranteed.

The materials set forth herein are for general information only. They are not a substitute for competent professional advice. Application of this information to a specific project should be reviewed by a registered professional engineer. Indeed, in most jurisdictions, such review is required by law. Anyone making use of the information set forth herein does so at their own risk and assumes any and all resulting liability arising therefrom.

1st Printing – May 2014

Produced by American Iron and Steel Institute

Copyright American Iron and Steel Institute 2014

PREFACE

The American Iron and Steel Institute Committee on Specifications developed this standard to provide test methods for determining the rotational-lateral stiffness of beam-to-*panel* assemblies.

The Committee acknowledges and is grateful for the contribution of the numerous engineers, researchers, producers and others who have contributed to the body of knowledge on this subject.

User Notes are non-mandatory and copyrightable portions of this standard.

This page is intentionally left blank.

AISI S901-13

Rotational-Lateral Stiffness Test Method for Beam-to-Panel Assemblies

1. Scope

1.1 The purpose of this test method is to determine the rotational-lateral stiffness of *beam-to-panel* assemblies.

1.2 This test method applies to structural subassemblies consisting of *panel*, *beam*, and joint components, or of the joint between a wall, floor, ceiling, or roof *panel* and the supporting *beam* (purlin, girt, joist, stud, etc.).

1.3 This test method is also used to establish a limit of the displacements for avoiding joint failure.

Commentary:

This test method is used primarily in determining the strength of *beams* connected to *panels* as part of a structural assembly. The unattached “free” flange of the *beam* is restrained from lateral displacements and twisting by the bending stiffness of the *beam* elements, the *connection* between the “attached” flange of the *beam* and the *panel*, and the bending stiffness of the *panel*.

The combined stiffness, K , of the assembly determined by this test method consists of: (a) the lateral stiffness of the *beam*, K_a , which is a function of the geometry of the *beam* and geometric details of the *beam-to-panel connection*, (b) the local stiffness of the joint components in the immediate vicinity of the *connection*, K_b , which is affected by the type of fasteners, the fastener spacing used, and the geometry of the elements connected, and (c) the bending stiffness of the *panel*, K_c , which is a function of the moment of inertia of the *panel*, the *beam* spacing, and the *beam* location (edge vs. interior). The latter stiffness should be taken into account by theoretical analysis or by using the alternative test procedure described in Standard Section 13.

For specific geometric conditions, the design engineer is permitted to require duplicate testing using a new specimen with the *beam* orientation, or the force direction, reversed.

2. Referenced Documents

The following documents or portions thereof are referenced within this Standard and shall be considered as part of the requirements of this document:

- a. American Iron and Steel Institute (AISI), Washington, DC:

S100-12, *North American Specification for the Design of Cold-Formed Steel Structural Members*

- b. ASTM International (ASTM), West Conshohocken, PA:

A370-12a, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

E6-09be1, *Standard Terminology Relating to Methods of Mechanical Testing*

IEEE/ASTM-SI10-10, *American National Standard for Metric Practice*

3. Terminology

Where the following terms appear in this Standard, they shall have the meaning as defined herein. Terms not defined in Section 3 of this Standard, AISI S100 or ASTM E6 shall have the ordinary accepted meaning for the context for which they are intended.

Subassembly. A representative portion of a larger structural assembly consisting of a wall, floor, ceiling, or roof *panel* with one beam connected to the *panel* either continuously or at regular intervals. See Figure 1.

Panel. Panel used in the *subassembly*, which is made of any structural material (i.e., aluminum, reinforced concrete, fiberboard, gypsum board, plastic, plywood, steel, etc.). See Figure 1.

Beam. A beam that has either an open or closed cross-section. One flange of the beam is connected to the *panel*, and is called the “attached” flange. The other is the “unattached” flange. See Figure 1.

Joint or Connection. A local area around a mechanical fastener, weld, or adhesively bonded area that connects the beam with the *panel*. The local area also includes filler material such as insulation located between the *panel* and the beam flange.

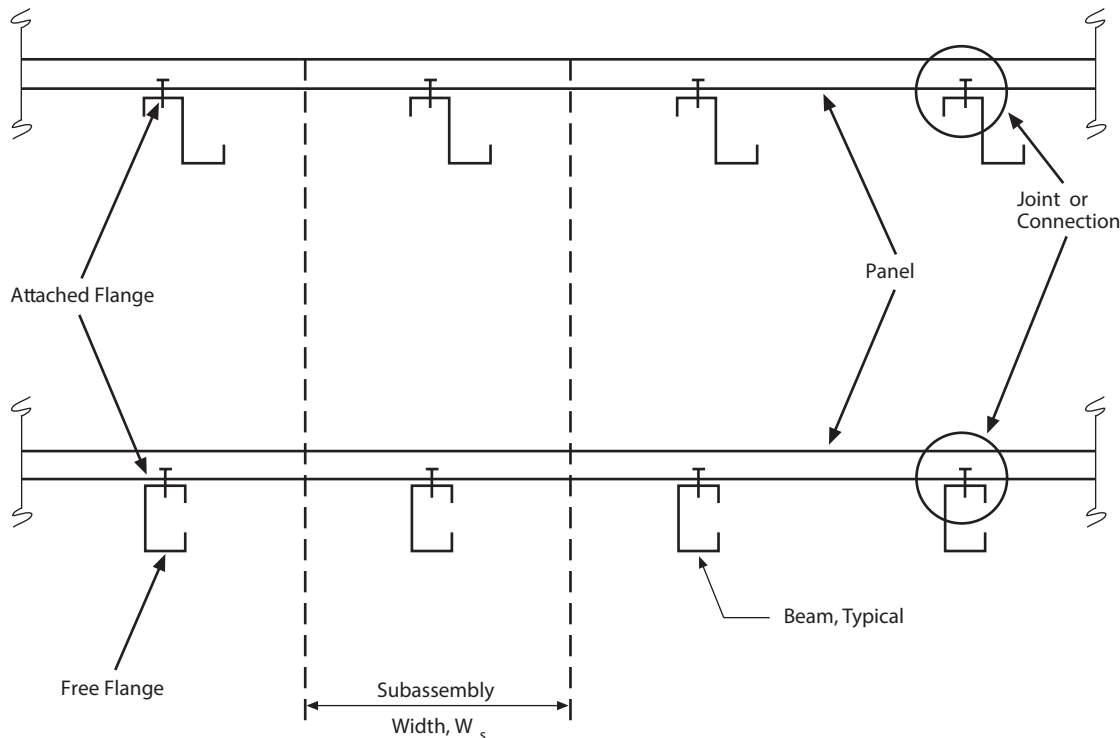


Figure 1 - Wall, Floor, Ceiling or Roof Assembly

Lateral Load. Total load, P , in kips (kN), applied to the unattached flange of the beam in a plane parallel to that of the original *panel* position. See Figure 2.

Lateral Deflection. Lateral displacement, D , in inches (mm), of the unattached flange due to the lateral load, P . See Figure 2.

Rotational-Lateral Stiffness. Total lateral load applied on the unattached flange of the test beam, divided by the length dimension of the beam, L_B (Figure 3b), and divided by the lateral deflection of the unattached flange of the beam at that load level.