



SURFACE VEHICLE INFORMATION REPORT

J2052™

JUL2016

Issued 1990-03
Revised 2011-01
Stabilized 2016-07

Superseding J2052 JAN2011

Test Device Head Contact Duration Analysis

RATIONALE

This document is based on based on laws of physics and basic stable technology which is not dynamic in nature.

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FOREWORD

A technique has been established for determining head impact contact duration called the "Force Difference Method." This technique allows calculation of Head Injury Criterion (HIC) only during head contact.

1. SCOPE

This methodology can be used for all calculations of HIC, with all test devices having an upper neck triaxial load cell mounted rigidly to the head, and head triaxial accelerometers.

1.1 Purpose

The purpose of this SAE Information Report is to describe a computer-adaptable technique for determining head engagement and disengagement times for use in the calculation of the HIC without reliance on contact switches or photography.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publication

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J211-1 JUL 2007 Instrumentation for Impact Test

2.1.2 Federal Publication

Available from the Superintendent of Documents, U.S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402-9320.

49 CFR Part 572, Subpart E Occupant Crash Protection, revised as of April, 1997

2.1.3 ISO Publication

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ISO Technical Report 12351 Determination of head contact and duration in impact tests—ISO/TC22/SC12/WG3N355

3. DEFINITIONS

3.1 HIC

The HIC is one of the "injury criteria" prescribed by S6 of the Federal Motor Vehicle Safety Standard (FMVSS) 208. It is the maximum value calculable from the head c.g. resultant acceleration-time profile in accordance with Equation 1:

$$HIC = \left[\frac{1}{(t_2 - t_1)} \int_{t_1}^{t_2} a \cdot dt \right]^{2.5} (t_2 - t_1) \quad (\text{Eq. 1})$$

where:

a is the resultant acceleration expressed as multiples of *G* (the acceleration of gravity), and *t*₁ and *t*₂ are any two points in time during the crash.

NOTE: Although a HIC window of 36 ms maximum was subsequently mandated by NHTSA, it is not utilized with this document.

3.2 Contact HIC

HIC values calculated only during the periods of each head contact.

3.3 *t*_e, *t*_d

The head engagement and disengagement times, *t*_e and *t*_d respectively, are determined by the method given in Section 5. These are the starting and ending times, i.e., the windows for the iterative HIC calculations for each head contact.

NOTE: The maximum contact HIC for each *t*_e, *t*_d interval will have associated with it times *t*₁, *t*₂ which may be equal to, or less than the *t*_e, *t*_d interval.