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Road vehicles — Collection of accident data for evaluation of occupant restraint performance

Véhicules routiers — Recueil de données des accidents pour évaluer les performances de retenue des occupants

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6546 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 12, *Passive safety crash protection systems*.

This first edition cancels and replaces the Technical Report ISO/TR 6546:1979, which has been technically revised.

Introduction

This International Standard was originally published as an ISO Technical Report in 1979 and specified information for the study of vehicle occupants wearing seat belts and included information on vehicle identification, pre-crash situation, vehicle damage, and accident reconstruction data (e.g. EES, Δv). Since then there has been a rapid development of more advanced occupant restraint features such as multi-stage airbags. Therefore, an update of ISO/TR 6546 was necessary to cover these restraint system features.

This revision includes:

— seat belt data elements from ISO/TR 6546:1979;

— data elements extracted from current and prior U.S Department of Transportation (DOT), National Highway Traffic Safety Administration (NHTSA) field accident data forms;

— data from the EU sponsored project STAIRS Version 8.1; and

— data elements from ISO 13218.

Data elements in this revision are grouped according to the Standardization of Accident and Injury Registration Systems (STAIRS) categorization scheme.

The data elements are not listed in priority order.

Road vehicles — Collection of accident data for evaluation of occupant restraint performance

1 Scope

This International Standard specifies information for the field collection of traffic accident data that is necessary or may assist in the evaluation of occupant restraint systems in passenger cars and trucks. The specific occupant restraints covered are seat belts, head restraints, knee protection, airbag systems and child restraint systems.

This International Standard does not cover an assessment of the structural performance of the vehicle for which items such as crush, intrusion, and structural architecture may be necessary.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6813, *Road vehicles — Collision classification — Terminology*

ISO 12353-1, *Road vehicles — Traffic accident analysis — Part 1: Vocabulary*

ISO 13216-1, *Road vehicles — Anchorages in vehicles and attachments to anchorages for child restraint systems — Part 1: Seat bight anchorages and attachments*

ISO 13218, *Road vehicles — Child restraint systems — Report form for accidents involving child passengers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6813, ISO 12353-1, ISO 13216-1, and ISO 13218 apply.

4 Vehicle data

Vehicle data shall be obtained for each case vehicle.

Beyond vehicle identification, pre-crash situation, crash configuration, vehicle damage/intrusion, collision partner, and impact severity data (e.g. EES, Δv), the following occupant restraint related data elements should be recorded:

a) total number of deployed airbags;

b) for each impact where an airbag deploys:

- crash event sequence number,
- CDC,
- longitudinal component of Δv,
- lateral component of Δv;

c) setting of manual airbag deactivation switch (if applicable);

d) type of automatic deactivation (if applicable):

- occupant detection system,
- child seat detection system,
- other _____;

e) airbag diagnostic or warning lights/messages (post-crash);

f) modifications or service performed on the airbag system or parts of the vehicle relevant to the operation of the airbag in this crash;

g) whether the vehicle has been involved in previous traffic crashes;

h) retrievable accident data (if available):

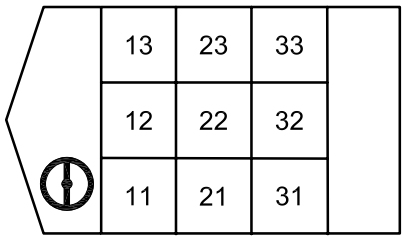
- acceleration pulse (total, X, Y and Z directions as available),
- change of velocity (total, X, Y and Z directions as available),
- belt buckle latch engagement,
- vehicle speed,
- pre-impact braking,
- pre-impact yawing and skidding,
- deployments in prior accidents,
- multiple event data,
- rollover event data,
- restraint deployment timing,
- restraint deployment level (one-stage, two-stage, etc., other),
- deactivation or suppression of deployable restraint(s),
- driver seat in forward track position status,
- occupant detection status,
- child seat detection/recognition status,
- other (as applicable) _____.

5 Restraint data by seating position

5.1 General

Beyond recording seat description (such as type, fabric), record the seat and restraint data elements in 5.2 to 5.8. Data is to be obtained for each seating position in vehicle.

For each set of seat and restraint data, also record the corresponding seating position code (according to Figure 1).



NOTE 1 Mirror image for right-hand drive.

NOTE 2 Seating matrix can be further expanded, if needed.

Figure 1 — Seating position codes

5.2 Seating

Factors to take into account for seating include the following:

a) determine whether or not the seat was occupied;

b) determine seat track adjusted position prior to impact (front, middle, back, exact);

c) if seat is a multi-way powered seat, describe position in each axis of movement.

5.3 Head restraint and seat evaluation

Factors to take into account for head restraint and seat evaluation include the following:

a) head restraint type (bolster, ladder, integral);

b) active head restraint equipped (activated);

c) other neck injury protection systems (activated);

d) head restraint vertical adjustment at impact (up, mid, down, or exact position);

e) distance from seat bight (lower front edge of the seat back) to top of head restraint;

f) head restraint horizontal adjustment at impact;

g) head restraint damage by occupant, other occupant, intrusion, interior loose item(s);

h) seat cushion angle relative to horizontal;

i) seat back angle relative to vertical (pre-impact and post-impact).

5.4 Knee protection evaluation

Factors to take into account for knee protection evaluation include the following:

a) type and covering of knee protection (e.g. bolster, airbag);

b) location of deformation;

c) deformation by collision (with or without occupant contact);

d) location of occupant knee contact.

5.5 Steering column/steering wheel

Factors to take into account concerning the steering column/steering wheel include the following:

a) steering column/wheel type (e.g. diameter, number of spokes, energy absorption device available);

b) tilt steering column (pre-crash) adjustment;

c) telescoping steering column (pre-crash) adjustment;

d) o'clock position of wheel at time of deployment;

e) steering rim/spoke deformation;

f) location of steering rim/spoke deformation;

g) extent of energy absorption device function (if applicable).

5.6 Belt restraint system

Factors to take into account for belt restraint system include the following:

a) belt system availability;

b) belt system type (e.g. manual 2-point, 3-point, 4-point, integrated in seat);

c) type of anchorages (wire loop, semi-rigid stalk, seat attached, etc.);

d) automatic (motorized shoulder belt, etc.);

e) geometry modifiers fitted (i.e. guide loop, comfort clip, etc.);

f) retractor type and position (i.e. vehicle/belt/dual sensitivity);

g) shoulder belt upper anchorage adjustment: available? position?

h) type of latch/ release mechanism;

i) belt pre-tensioner: fitted? activated?

j) belt pre-tensioner type (mechanical, pyrotechnic, other);

k) belt pre-tensioner location (buckle, retractor, B-pillar, etc.);

l) belt pre-tensioner load limited?

m) belt load limiter: fitted? activated?

n) belt load limiter type (tear webbing, metal bending, torsion bar, other);

o) webbing lock: fitted? activated?

p) occupant position control? functioned?

5.7 Belt restraint usage

Factors to take into account for belt restraint usage include the following:

a) belt system use, proper use?

b) belt system type (active, passive, etc);

c) primary information source used in determining belt use;

d) belt failure modes during impact, if any;

e) police reported belt use.

5.8 Airbag system operation data

Record number of airbags and deployments at each seat position.

The following shall be obtained for each airbag:

a) type of airbag (not equipped, original, replacement, retrofitted);

b) size (in litres);

c) deployed/activated;

d) customer/user setting of airbag activation status;

e) location of airbag:

- steering wheel hub;
- instrument panel;
- lower instrument panel (knee airbag);
- side door/quarter panel;
- side seat mounted;
- side header roof rail;
- back of seat;
- footwell area;
- seat cushion (anti-submarining);
- other _____;

f) are there indications of airbag system problems?

g) did airbag cover flap(s) open at designated tear points?

h) were airbag cover flap(s) damaged?

i) was there damage to the airbag?

j) source of airbag damage?

k) was the airbag tethered?

l) did the airbag have vent ports?

m) was the airbag in this occupant's position contacted by another occupant?

n) was there damage to airbag support assembly?

o) sketch damage and contact evidence on airbag (front and back);

p) sketch and measure size of airbag cover flap(s);

q) sketch of airbag vent ports and location.

6 Occupant data

6.1 General

This shall be obtained for each occupant in the vehicle, where relevant.

Beyond the occupant's demographics, seating location, ejection/entrapment, and injury severity/consequence data (such as death, maximum AIS, functional loss, and treatment), record the occupant restraint-related data elements in 6.2.

The items in this clause would ideally contribute to the assessment of restraint systems and injury mechanisms; however, it is recognized that many of them will regularly be difficult or impossible to ascertain using contemporary methods of accident investigation.

6.2 Occupant physical description

6.2.1 General

This includes:

a) height;

b) weight;

c) occupant dimensions (e.g. seated height, hip to knee, knee to foot bottom, arm length);

d) medical history (cardiovascular, hearing, etc.) and relevant prior physical conditions or disabilities.

6.2.2 Occupant clothing

Factors to take into account for occupant clothing include the following:

a) clothing style, upper garment (thick, thin);

b) clothing style, lower garment (thick, thin);

c) shoes.

6.2.3 Occupant body position

Factors to take into account for occupant body position include the following:

a) any pre-impact braking or other action likely to cause occupant to be out of position?

b) occupant's posture (sitting, lying, kneeling, standing);

c) where were occupant’s upper torso and head in relation to normal position at time of impact?

d) what was occupant’s leg position at impact?

e) what was position of occupant’s arms at impact?

f) how was occupant’s head turned at impact?

g) did occupant brace with arms?

h) did occupant brace with legs?

i) did occupant rotate during impact?

j) post-crash position of occupant;

k) vision aid used (glasses, contact lenses);

l) did occupant carry something in his/her arms, on lap?

6.2.4 Supplemental data for driver only

Factors to take into account for supplemental data for driver only include the following:

a) is vehicle equipped with adjustable driver control pedals? position at time of crash?

b) what was driver’s hand position on wheel at impact (with wheel at normal straight ahead position)?

c) were driver’s hands knocked off wheel? by what means?

d) what was driver’s estimated chin to hub measurement?

e) what was driver’s estimated chest to hub measurement?

f) where were driver’s feet? knees?

g) did driver attempt to control vehicle after impact? did he/she succeed?

h) did driver move airbag after deployment to re-establish visual contact with the road? was such necessary for visibility?

6.3 Occupant awareness

Factors to take into account for occupant awareness include the following:

a) was occupant aware of smoke in the vehicle interior? what was the source?

b) was there any particular concern at the time over this smoke?

c) was the odour particularly noxious?

7 Occupant injury data

7.1 General

This shall be obtained for each injured occupant, where relevant.

Beyond the routine recording of injury source/contacts, occupant injury classification (body region, aspect, anatomical structure), and injury severity (AIS) data, the specific occupant injury source/contact codes in 7.2 should be recorded.

7.2 Restraint injury source/contacts

These are specific restraint related sources/contacts only. Any and all other injury source/contact codes should also be recorded as deemed appropriate for individual field crash investigation programs.

7.2.1 Interior contacts

These include:

a) knee bolster;

b) seat cushion, seatback.

7.2.2 Restraint system contacts

These include:

a) restraint system elements, e.g. webbing;

b) airbag, driver side (frontal, side-torso, side-head, etc);

c) airbag, passenger side (frontal, side-torso, side-head, etc).

7.2.3 Non-contact sources

These include airbag gases.

8 Child restraint system evaluation

A comprehensive report form for the investigation of vehicle accidents involving child passengers is given in ISO 13218. Below are a few general items to register from that International Standard:

a) child restraint system (CRS) make/model;

b) type of CRS (including built-in, or add-on);

c) installation configuration:

- CRS orientation (forward facing, rearward facing, other),
- orientation as intended by the CRS manufacturer?
- compatibility between child and CRS?

d) type of CRS fixation/attachment (adult seat belt, ISOFIX/LATCH/UAS, other):

- seat belt type (lap belt, separate lap/diagonal belts, three-point belt, other),
- seat belt routing correct? describe: _____;
- CRS top/bottom tether usage as intended by the manufacturer?

e) type of CRS harness? describe: _____;

f) CRS harness usage;

g) CRS shield usage;

h) damage to CRS? describe: _____;

i) correct use or misuse of CRS?

NOTE For guidance of determining correct use or misuse, see ISO 13215-1.

Bibliography

ISO 13215-1, *Road vehicles — Reduction of misuse risk of child restraint systems — Part 1: Forms for field studies*

ICS 43.020

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