PARTE II RULES FOR THE CONSTRUCTION AND CLASSIFICATION OF SHIPS IDENTIFIED BY THEIR MISSIONS

TITLE 25 HIGH SPEED CRAFT

SECTION 4 ACCOMODATION

CHAPTERS

A APPROACH

B DOCUMENTS AND REGULATIONS

C MATERIALS
See Part II, Title 11, Section 4

D DESIGN PRINCIPLES

E CONSTRUCTION PRINCIPLES
See Part II, Title 11, Section 4

T INSPECTIONS AND TESTS

CONTENTS

CHAPTER A
APPROACH

CHAPTER CONTENTS

A1. INCORPORATION OF THE INTERNATIONAL CODE OF SAFETY FOR HIGH SPEED VESSELS BY THE RBNA RULES

100. Incorporation of the Code

101. The present Part II, Title 25 of the Rules incorporates the International Code of Safety of High Speed Vessels in its entirety.

102. The original terminology of the Code has been maintained.

103. Under the conditions of A1.101 and A1.102 above and in those provisions of the HSC Code that are being used for classification purposes the words “Administration” and “Code”, wherever mentioned, are to be understood as equivalent to the words “Society” and “Rules”, respectively. The RBNA “Rules for the Construction and Classification of Ships destined to Open Sea Navigation” are referred to below simply as “Society Rules”.

104. Equipment and arrangements dealt with in the parts of the Code such as those concerning life-saving appliances, radio communications and operational aspects, which are not subject to control by the Society, have been maintained to keep the integrity of the Code, and are to be covered by the relevant certification.

105. Additional requirements and comments are inserted at the relevant Part of the Code are identified by the words “RBNA comment” before the text.

A2. APPLICATION

100. Application

101. The present Section 4 of Part II, Title 25, applies to:

a. passenger craft which do not proceed in the course of their voyage more than four hours at operational speed from a place of refuge; and

b. cargo craft of 500 gross tonnage and upwards which do not proceed in the course of their voyage more than 8 h at operational speed from a place of refuge when fully laden.

102. RBNA comment: In addition to the cargo craft specified in A4.303.b, these Rules also apply as far as appropriate to cargo craft of less than 500 tons gross tonnage.

200. Application for vessel with GT ≥ 500 engaged in international voyages

201. 1.4 This Code applies to high speed craft as specified in Part II, Title 25, Section 1, A4.303 engaged in international voyages the keels of which are laid or which are at a similar stage of construction on or after 1 July 2002.

300. RBNA comment: Application for vessels with GT < 500 engaged in national or international voyages

301. In addition to the craft specified in in Part II, Title 25, Section 1, A5.130, these Rules also apply to:

a. high speed craft engaged in national voyages;

b. high speed craft having GT < 500.

302. Exemptions from some of the requirements of the Rules may be granted when particular circumstances (e.g. restricted services) warrant this, in the opinion of the RBNA.

A3. DEFINITIONS

100. Terms

101. The terms employed in this section are to be in accordance with Part II, Title 11, Section 3, E.3 as follows:

102. For the purpose of this chapter, unless expressly provided otherwise, the following definitions shall apply:

103. **Accommodation space**s are those spaces used for public spaces, corridors, lavatories, cabins, offices, hospitals, cinemas, game and hobby rooms, barber shops, pantries containing no cooking appliances and similar spaces.

104. **"A" class divisions** are those divisions formed by bulkheads and decks which comply with the following criteria:

a. they are constructed of steel or other equivalent material;

b. they are suitably stiffened;

c. they are insulated with approved non combustible materials such that the average temperature of the unexposed side will not rise more than 140ºC above the original temperature, nor will the temperature, at any one point, including any joint, rise more than 180ºC above the original temperature, within the time listed below:

class "A-60"	60 min
class "A-30"	30 min
class "A-15"	15 min
class "A-0"	0 min

104. "**B" class divisions** are those divisions formed by bulkheads, decks, ceilings or linings which comply with the following criteria:

a. they are constructed of approved non-combustible materials and all materials used in the construction and erection of "B" class divisions are non combustible, with the exception that combustible veneers may be permitted provided they meet other appropriate requirements of this chapter;

b. they have an insulation value such that the average temperature of the unexposed side will not rise more than 140ºC above the original temperature, nor will the temperature at any one point, including any joint, rise more than 225ºC above the original temperature, within the time listed below:

class "B-15"	15 min
class "B-0"	0 min

105. **"C" class divisions are divisions** constructed of approved non-combustible materials. They need meet neither requirements relative to the passage of smoke and flame nor limitations relative to the temperature rise. Combustible veneers are permitted provided they meet the requirements of this chapter. Adhesives used in the construction of the "C" class divisions are not required to be non-combustible; however, they are to have low flame-spread characteristics.

106. **Fire Safety Systems Code** means the International Code for Fire Safety Systems as adopted by the Maritime Safety Committee of the Organization by resolution MSC.98(73).

107. **Fire Test Procedures Code** means the International Code for Application of Fire Test Procedures as adopted by the Maritime Safety Committee of the Organization by resolution MSC.61(67)

108. **Non combustible material** is a material which neither burns nor gives off flammable vapours in sufficient quantity for self-ignition when heated to approximately 750°C, this being determined in accordance with the Fire Test Procedures Code.

109. **Standard fire test** is a test in which specimens of the relevant bulkheads or decks are exposed in a test furnace to temperatures corresponding approximately to the standard time-temperature curve in accordance with the test method specified in the Fire Test Procedures Code.

CHAPTER B
DOCUMENTS AND REGULATIONS

CHAPTER CONTENTS

B1. STANDARDS AND REGULATIONS

100. Applicable Regulations (RBNA)

101. **Craft for which classification only is requested**
These craft are to comply in full with the requirements of the present Title 25 of the Rules, except for those identified otherwise identified as part of the Code but not applicable to classification.

102**. Craft for which both classification and the IMO Certification are requested**
These craft are to comply in full with the requirements of the present Title 25 and of the Code.

103**. Craft for which NORMAM 01 classification and the IMO Certification are requested**
For Brazilian Flag craft under 500 GT, the requirements of Title 25 of the Rules are to be complied with as far as possible, with exceptions wherever a requirement is not possible to apply due to the size of the craft and/or to the navigation conditions (e.g., very short crossings, small craft with a large passenger saloon, etc.). The statutory regulations shall be in accordance with NORMAM 01 for cargo or for passenger ships.

104. **Craft for which NORMAM 01 classification and the IMO Certification are requested**
For foreign Flag craft under 500 GT, the requirements of Title 25 of the Rules are to be complied with, with exceptions wherever a requirement is not possible to apply due to the size of the craft and/or to the navigation conditions (e.g., very short crossings). The statutory regulations shall be in accordance with National Regulations or, in the absence of those, according to the IMO Code of Safety for High Speed Craft, 2000.

B3. TECHNICAL STANDARDS

100. Industrial Standards (RBNA)

101. The present Rules follow industrial standards where applicable to materials and equipment destined to be installed on board vessels classified by RBNA or other societies. Where this is the case, the applicable standards are indicated in the relevant Chapters of the Rules.

300. IMO Codes

301. IMO Fire Safety Systems Code (FSS Code)

302. IMO Fire Test Procedure Code (FTP Code)

303. IMO Code of Safety for High Speed Craft

B2. DOCUMENTATION FOR RBNA

100. Plans and specifications

101. The following plans and documents are to be submitted at least in triplicate, for approval. The Society reserves its right to ask for supplementary copies, if deemed necessary in particular cases.

a. Windows, arrangements and details.

b. Plan showing the arrangement of means ofcommunication.

c. Calculation of the collision load and relevant arrangement of the accommodation spaces (containing the indication of seat characteristics, arrangement and installation, the characteristics of the safety belts).

CAPÍTULO D
DESIGN PRINCIPLES

CHAPTER CONTENTS

D1. ACCOMODATION

100. 4.1 General

101. 4.1.1 Public spaces and crew accommodation shall be designed and arranged so as to protect the occupants from unfavourable environmental conditions and to minimize the risk of injury to occupants during normal and emergency conditions.

102. 4.1.2 Spaces accessible to passengers shall not contain controls, electrical equipment, high-temperature parts and pipelines, rotating assemblies or other items, from which injury to passengers could result, unless such items are adequately shielded, isolated, or otherwise protected.

103. 4.1.3 Public spaces shall not contain operating controls unless the operating controls are so protected and located that their operation by a crew member shall not be impeded by passengers during normal and emergency conditions.

104. 4.1.4 Windows in passenger and crew accommodation shall be of adequate strength and suitable for the worst intended conditions specified in the Permit to Operate and be made of material which will not break into dangerous fragments if fractured.

105. 4.1.5 The public spaces, crew accommodation and the equipment therein shall be designed so that each person making proper use of these facilities will not suffer injury during craft' s normal and emergency start, stop and manoeuvring in normal cruise and in failure or mal-operation conditions.

200. 4 Accommodation

201. 4.4.1 The public spaces, control stations and crew accommodation of high-speed craft shall be located and designed to protect passengers and crew in the design collision condition. In this respect, these spaces shall not be located forward of a transverse plane (see figure 4.4.1) such that:

$A_{bow} = 0.0035\ A \times m \times f \times V$, but never less than 0.04 A,

where:

Abow= the plan projected area of craft energy absorbing structure forward of the transverse plane (m^2)

V = 90% of maximum speed (m/s).

A = total plan projected area of craft (m^2)

m = material factor = 0.95/M

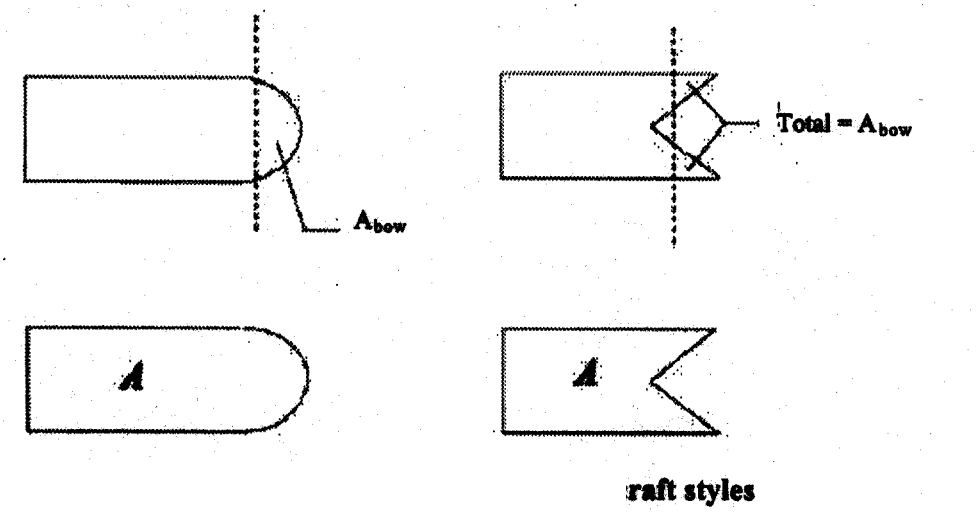
M = appropriate hull material factor as given in 4.3.4

Where materials are mixed, the material factor shall be taken as a weighted means, weighted according to the mass of material in the area defined by Abow

F – framing factor as follows:

- longitudinal deck and shell stiffening = 0.8
- mixed longitudinal and transverse = 0.9
- transverse deck and shell stiffening = 1.0

FIGURE FD1.201.1. PLAN VIEW OF TWO DIFFERENT CRAFT STYLES



202. 4.4.2 The public spaces and crew accommodation shall be designed based on the guidelines given in table 4.4.2 or by other methods which have been proven to give equal protective qualities.

203. 4.4.3 Equipment and baggage in public spaces and in the operator' s compartment shall be positioned and secured so that they remain in the stowed position when exposed to the collision design acceleration according to 4.3.4, 4.3.5 and table 4.3.3.

204. 4.4.4 Seats, life-saving appliances and items of substantial mass and their supporting structure shall not deform or dislodge under any loads up to those specified in D3.104, D3.105 and table T.D1.204.1 in any manner that would impede subsequent rapid evacuation of passengers.

205. 4.4.5 There shall be adequate handholds on both sides of any passage to enable passengers to steady themselves while moving about. The armrests and backrests of seats in public spaces may serve as handholds.

Table T.D1.204.1 - Overview general design guidelines*

Design level 1: g_{coll} less than 3
1 Seat/seat belts 1.1 Low or high seatback 1.2 No restrictions on seating direction 1.3 Sofas allowed 1.4 No seat belts requirement 2 Tables in general allowed 3 Padding of projecting objects 4 Kiosks, bars, etc., no special restrictions 5 Baggage, no special requirements 6 Large masses, restrainment and positioning
Design level 2: g_{coll} = 3 to 12
1 Seat/seat belts 1.1 Seatbacks with protective deformation and padding 1.2 Forward or backward seating direction 1.3 No sofas allowed as seat 1.4 Lap belt in seats when no protective structure forward unless satisfactorily tested without belts in that orientation and arrangement 2 Tables with protective features allowed. Dynamic testing 3 Padding of projecting objects 4 Kiosks, bars, etc., on aft side of bulkheads, or other specially approved arrangements 5 Baggage placed with protection forward 6 Large masses, restrainment and positioning

Other arrangements may be employed if an equivalent level of safety is achieved.

D2. 4.2 PUBLIC ADDRESS AND INFORMATION SYSTEM

100. Public Address and information system

101. 4.2.1 A general emergency alarm system shall be provided. The alarm shall be audible throughout all the public spaces, corridors and stairways, crew accommodation and normal crew working spaces and open decks, and the sound pressure level shall be at least 10 dB(A) above ambient noise levels under way in normal cruise operation. The alarm shall continue to function after it has been triggered until it is normally turned off or is temporarily interrupted by a message on the public address system.

102. 4.2.2 There shall be a public address system covering all areas where passengers and crew have access, escape routes, and places of embarkation into survival craft. The system shall be such that flooding or fire in any compartment does not render other parts of the system inoperable. The public address system and its performance standards shall be approved by the Administration having regard to the recommendations developed by the Organization.

* Refer to the Recommendations on performance standards for public address systems on passenger ships, including cabling (MSC/Circ.808) and the Code on Alarms and Indicators, 1995 (resolution A.830(19)).

103. 4.2.3 All passenger craft shall be equipped with illuminated or luminous notices or video information system(s) visible to all sitting passengers, in order to notify them of safety measures.

104. 4.2.4 The master shall, by means of the public address system and the visual information system, be able to request passengers "please be seated" when found to be appropriate to safeguard passengers and always when the safety level 1 according to table T.K1.302.3 of Chapter K is exceeded.

D3. 4.3 DESIGN ACCELERATION LEVELS

100. Design acceleration levels

101. 4.3.1 For passenger craft, superimposed vertical accelerations above 1.0 g at longitudinal centre of gravity shall be avoided unless special precautions are taken with respect to passenger safety.

102. 4.3.2 Passenger craft shall be designed for the collision design acceleration g_{coll} with respect to the safety in, and escape from, the public spaces, crew accommodation and escape routes, including in way of life-saving appliances and emergency source of power. T he size and type of craft together with speed, displacement and building material shall be taken into consideration when the collision load is determined. The collision design condition shall be based on head-on impact at a defined collision speed.

103. 4.3.3 Mounting of large masses such as main engines, auxiliary engines, lift fans, transmissions and electrical equipment shall be proved by calculation to withstand, without fracturing, the design acceleration given in table T.D3.103.1.

TABLE T.D3.103.1 - DESIGN ACCELERATION AS MULTIPLES OF G

	Types of craft	
Direction	**All HSC except amphibious ACVs**	**Amphibious ACVs**
Forward direction	g_{coll}	6
After direction	2 or g_{coll} if less	3
Transverse direction	2 or g_{coll} if less	3
Vertical direction	2 or g_{coll} if less	3

where:

g_{coll} = the collision design acceleration expressed as a multiple of the acceleration due to gravity (9.806 m/s2)

104. 4.3.4 Collision design acceleration g_{coll} (for craft other than amphibious ACVs where g_{coll} = 6) shall be calculated as follows:

$g_{coll} = 1.2\ [P/(g \times \Delta)]$, but not to be taken greater than 12,
where the load P shall be taken as the lesser of P_1 and P_2,
where:

$P_1 = 460\ (M \times C_L)^{2/3} \times (E \times C_H)^{1/3}$

$P_2 = 9000\ M \times C_L \times (C_H \times D)^{1/2}$

where the hull material factor M shall be taken as:
M = 1.3 for high tensile steel
M = 1.0 for aluminium alloy
M = 0.95 for mild steel
M = 0.8 for fibre-reinforced plastics,
where the length factor C_L of the craft is:

$$C_L = \frac{(165 + L)}{245}\left(\frac{L}{80}\right)^{0,4}$$

where the height factor $C_H = (80 - L)/45$ but not greater than 0.75 or less than 0.3,

where the kinetic energy of the craft at speed V_{imp} is:
$E = 0.5\Delta \times V_{imp}^2$

where the main particulars of the craft are:

L = craft length (m), as defined in Part II, Title 25, Section 1, Chapter A, A5.
D = depth of the craft from the underside of keel to the top of the effective hull girder (m)

Δ = craft displacement, being the mean of the lightweight and maximum operational weight (t)
V_{imp}= estimated impact speed (m/s) = 60% of maximum speed as defined in chapter 1
g = acceleration due to gravity = 9.806 m/s².

For hydrofoils, the collision design acceleration, g_{coll} shall be taken as the greater of either the g_{coll} as calculated above or:

$g_{coll} = F/(g \times \Delta)$

where:

F = failure load of bow foil assembly applied at the operational waterline (kN).

105. 4.3.5 As an alternative to the requirements of D3.104, the collision design acceleration gcoll may be determined by carrying out a collision load analysis of the craft on a vertical rock having a maximum height of 2 m above the waterline and using the same assumption for displacement dep and impact speed Vimp as described in D3.104. This evaluation may be carried out as part of the safety analysis. If the collision design accelerations are determined by both D3.104 and the collision load analysis, the lower resulting value may be used as the collision design acceleration.

106. 4.3.6 Compliance with the provisions of D1.105 and D3.101 shall be shown for the actual type of craft, as described in Part II, Title 25, Section 2, T2

107. 4.3.7 Limiting sea states for operation of the craft shall be given in normal operation condition and in the worst intended conditions, at 90% of maximum speed and at reduced speed as necessary.

D4. 4.5 SEATING CONSTRUCTION

100. Seating construction

101. 4.5.1 A seat shall be provided for each passenger and crew member for which the craft is certified to carry. Such seats shall be arranged in enclosed spaces.

102. 4.5.2 Seats fitted in addition to those required under 4.5.1 and which are not permitted to be used in hazardous navigational situations or potentially dangerous weather or sea conditions need not comply with D4 or D5. Such seats shall be secured according to 4.4.4 and clearly identified as not being able to be used in hazardous situations.

103. 4.5.3 The installation of seats shall be such as to allow adequate access to any part of the accommodation space. In particular, they shall not obstruct access to, or use of, any essential emergency equipment or means of escape.

104. 4.5.4 Seats and their attachments, and the structure in the proximity of the seats, shall be of a form and design, and so arranged, such as to minimize the possibility of injury and to avoid trapping of the passengers after the assumed damage in the collision design condition according to D1.101. Dangerous projections and hard edges shall be eliminated or padded.

106. 4.5.5 Seats, seat belts, seat arrangements and adjacent parts such as tables shall be designed for the actual collision design acceleration as specified in D3.104.

107. 4.5.6 All seats, their supports and their deck attachments shall have good energy-absorbing characteristics and shall meet the requirements of Chapter T, T1 below.

200. 4.6 Safety belts

201. 4.6.1 One-hand-release safety belts of three-point type or with shoulder harness shall be provided for all seats from which the craft may be operated for all craft with the g_{coll} acceleration from the collision design acceleration exceeding 3, as prescribed in 4.3.4.

202. 4.6.2 Safety belts shall be provided on passenger seats and crew seats, if necessary, to obtain the protective performance measures described in annex 10.

D5. 4.10 NOISE LEVELS

100. Noise levels

101. 4.10.1 The noise level in public spaces and crew accommodation shall be kept as low as possible to enable the public address system to be heard, and shall not in general exceed 75 dB(A).

102. 4.10.2 The maximum noise level in the operating compartment shall not in general exceed 65 dB(A) to facilitate communication within the compartment and external radio communications.

CHAPTER T
TESTS AND INSPECTIONS

CHAPTER CONTENTS

T1. CRITERIA FOR TESTING AND EVALUATION OF SEATS [ANNEX 10]

100. 1 Purpose and scope

The purpose of these criteria is to provide requirements for revenue and crew seats, seat anchorage and seat accessories and their installation to minimize occupant injury and/or disruption of egress/ingress if the craft suffers a collision.

200. 2 Static seat tests

201. 2.1 The requirements of this section are applicable to all crew and revenue seats.

202. 2.2 All seats to which this paragraph applies, along with their supports and deck attachments, shall be designed to withstand at least the following static forces applied in the direction of the craft:

a. Forward direction: a force of 2.25 kN,

b. After direction: a force of 1.5 kN,

c. Transverse direction: a force of 1.5 kN,

d. Vertically downward: a force of 2.25 kN, and

e. Vertically upward: a force of 1.5 kN.

A seat shall comprise a frame, bottom and back. Forces applied in the fore or aft direction of the seat shall be applied horizontally to the seat back 350 mm above the seat bottom. Forces applied in the transverse seat direction shall be applied horizontally to the seat bottom. Vertical upward forces shall be evenly distributed to the corners of the seat bottom frame. Vertical downward forces shall be uniformly distributed over the seat bottom.

If a seating unit consists of more than one seating position, these forces shall be applied at each seating position concurrently during the tests.

203. 2.3 When the forces are applied to a seat, consideration shall be given to the direction in which the seat is to face in the craft. For example, if the seat faces sideways, the transverse craft force would be applied fore and aft on the seat and the forward craft force would be applied transversely on the seat.

204. 2.4 Each seating unit to be tested shall be attached to the support structure similar to the manner in which it will be attached to the deck structure in the craft. Although a rigid support structure can be used for these tests, a support structure, having the same strength and stiffness as the support structure in the craft, is preferred.

205. 2.5 The forces described in T1.202.a to T1.202.c shall be applied to the seat through a cylindrical surface having a radius of 80 mm and a width at least equal to the width of the seat. The surface shall be equipped with at least one force transducer able to measure the forces applied.

206. 2.6 The seat shall be considered acceptable if:

a. under the influence of the forces referred to in T1.202.a to T1.202.c3, the permanent displacement measured at the point of application of the force is not more than 400 mm;

b. no part of the seat, the seat mountings or the accessories become completely detached during the tests;

c. the seat remains firmly held, even if one or more of the anchorages is partly detached;

d. . all of the locking systems remain locked during the entire test but the adjustment and locking systems need not be operational after the tests; and

e. rigid parts of the seat with which the occupant may come into contact shall present a curved surface with a radius of at least 5 mm.

207. 2.7 The requirements of section 3 may be used in lieu of the requirements of this section provided that the accelerations used for the tests are at least 3 g.

300. 3 Dynamic seat tests

301. 3.1 The requirements of this section are applicable in addition to those in T1. for crew and revenue seats in craft having a design collision load of 3 g or greater.

302. 3.2 All seats for which this section applies, the seat supporting structure, the attachment to the deck structure, the lap belt, if installed, and shoulder harness, if installed, shall be designed to withstand the maximum acceleration force that can be imposed upon them during a design collision. Consideration shall be given to the orientation of the seat relative to the acceleration force (i.e. whether the seat is forward-, aft-, or side-facing).

303. 3.3 The acceleration pulse to which the seat is subjected shall be representative of the collision time-history of the craft. If the collision time-history is not known, or cannot be simulated, the acceleration time-history envelope shown in the figure can be used.

304. 3.4 In the test frame, each seat unit and its accessories (e.g., lap belts and shoulder harnesses) shall be attached to the support structure similar to the manner in which it will be attached in the craft. The support structure can be a rigid surface; however, a support structure having

the equivalent strength and stiffness as the support structure in the craft is preferred. Other seats and/or tables with which an occupant may come in contact during a collision shall be included in the test frame in an orientation and with a method of attachment typical of that in the craft

FIGURE - ACCELERATION TIME-HISTORY ENVELOPE

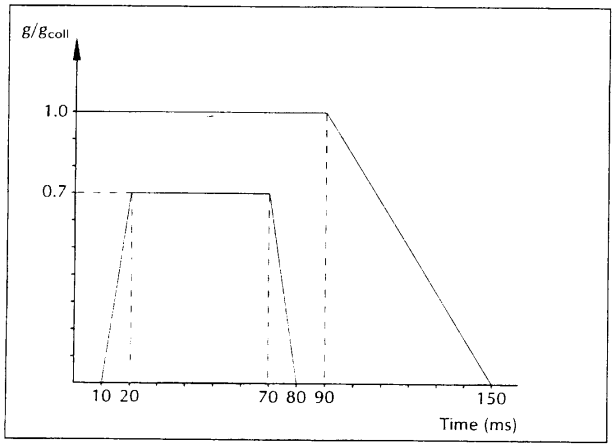


Figure – Acceleration time-history envelope

305. 3.5 During the dynamic seat test, a fiftieth percentile anthropomorphic test dummy, suitable for the test being conducted, shall be placed in the seat in an upright seating position. If a typical seating unit is composed of more than one occupant seat, a test dummy shall be placed in each occupant seat in the unit. The dummy, or dummies, shall be secured in the seat unit in accordance with procedures of recognized national standards* and be secured using only the lap belt and shoulder harness if they are installed. Tray tables and other such devices shall be placed in the position that would cause the greatest potential for an occupant to become injured.

* Refer to ECE 80 with addendum 79. Other national standards may be acceptable.

306. 3.6 The test dummy shall be instrumented and calibrated, in accordance with the requirements of a recognized national standard, so as to permit, as a minimum, calculation of the head injury criterion, calculation of the thoracic trauma index, measurement of force in the femur, and measurement, of extension and flexion of the neck.

307. 3.7 If more than one dummy is used in the tests, the dummy located in the seat having the highest potential for an occupant to be injured shall be the one instrumented. The other dummy or dummies need not be instrumented.

308. 3.8 The tests shall be conducted and the instrumentation shall be sampled at a rate sufficient to reliably show response of the dummy in accordance with the requirements of a recognized national standard

* Refer to the specifications of International Standard ISO 6487 - Technique of measurement in impact tests (1987) or SAE J211 - Instrumentation.

309. 3.9 The seat unit tested in accordance with the requirements of this section shall be considered acceptable if:

a. the seat unit and tables installed in the seat unit or area do not become dislodged from the supporting deck structure and do not deform in a manner that would cause the occupant to become trapped or injured;

b. the lap belt, if installed, remains attached and on the test dummy's pelvis during the impact. The shoulder harness, if installed, remains attached and in the immediate vicinity of the test dummy's shoulder during the impact. After the impact, the release mechanisms of any installed lap belt and shoulder harness shall be operative;

c. the following acceptability criteria are met:

c.1. the head injury criterion (HIC), calculated in accordance with the formula, does not exceed 500

$$HIC = (t_2-t_1) \times \{[1/(t_2-t_1)] \times \int_{t_1}^{t_2} a(t)dt\}^{2.5}$$

where:

t_1 and t_2 are the beginning and ending times (in seconds) of the interval in which the HIC is a maximum. The term a(t) is the resultant measured acceleration in the head of the dummy in g;

c.2. .3.2 the thoracic trauma index (TTI), calculated in accordance with the formula, does not exceed 30 g except for periods totalling less than 3 ms

$T_{TI} = (g_R + g_{LS})/2$ or acceleration at the centre of gravity

where:

g_R is the acceleration in g of either the upper or lower rib;

g_{LS} is the acceleration in g of the lower spine; and

c.3. neck flexion does not exceed 88 Nm;

c.4. neck extension does not exceed 48 Nm;

c.5. in lieu of the requirements of subparagraphs .3.3 and .3.4 above, a seatback or headrest of at least 850 mm above the seat cushion was acceptable; and".

c.6. the force in the femur does not exceed 10 kN except that it cannot exceed 8 kN for periods totalling more than 20 ms; and

d. loads on the upper torso harness straps do not exceed 7.8 kN or a total of 8.9 kN if dual straps are used.

Rgmm14en-PIIT25S4-abdt-00