# OVERVIEW EN 1317

## VEHICLE RESTRAINT SYSTEMS

South African Road Traffic Safety Management Association

THE TRADE ASSOCIATION FOR BUSINESSES ENGAGED IN THE MANUFACTURING AND SUPPLY OF ROAD TRAFFIC SAFETY DEVICES AND RELATED PRODUCTS WITHIN SOUTH AFRICA

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## STANDARDISED SAFETY

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# STANDARDS & GUIDELINES : OVERVIEW OF EN 1317

## 1. GENERAL

This document provides and overview of the standards for vehicle restraint systems, listing the most important tables and sketches of the standards, and will be reviewed and updated regularly to incorporate revisions to the national standard as they are released.

### 1.1 SOURCES

The content of this document is an extract from the European Standards EN 1317-1, EN 1317-2, ENV 1317-4 and EN 1317-5 as listed in the table below. In case of ambiguity and for detailed information, these original documents should be consulted.

### 1.2 Table 1 | Standard parts of EN 1317

| RELEVANT PARTS OF EN 1317 ROAD RESTRAINT SYSTEMS | |
|---|---|
| PART OF STANDARD | CONTENTS OF STANDARD |
| EN 1317-1:2010-07 | Terminology and general criteria for test methods |
| EN 1317-2:2010-07 | Performance classes, impact test acceptance criteria and test methods for safety barriers including vehicle parapets |
| ENV 1317-4:2001 | Performance classes, impact test acceptance criteria and test methods for terminals and transitions of safety barriers |
| EN 1317-5:2007<br>+A2:2012-03<br>+AC:2012-08 | Product requirements and evaluation of conformity for vehicle restraint systems |

### 1.3 Table 2 | Types of Vehicle Restraint Systems

| RELEVANT TYPES OF VEHICLE RESTRAINT SYSTEMS | | |
|---|---|---|
| SYSTEM TYPE | EXPLANATION | PART OF STANDARD |
| Safety Barrier | Continuous vehicle restraint system installed alongside or on the central reservation of a road. | EN 1317-2 |
| Terminal | Structural termination of a safety barrier. | ENV 1317-4 |
| Transition | Connection of two safety barriers of different constructive designs and/or performances. | ENV 1317-4 |

## 2. LONGITUDINAL BARRIERS

### 2.1 Table 3 | Acceptance Tests according to EN 1317-2

| ACCEPTANCE TESTS | | | | | |
|---|---|---|---|---|---|
| TEST | TYPE OF VEHICLE | TOTAL MASS [KG] | IMPACT SPEED [KM/H] | IMPACT ANGLE [°] | REQUIRED FOR CONTAINMENT LEVELS |
| TB 11 | Car | 900 | 100 | 20 | N2, H1 to H4b, L1 bis L4b |
| TB 21 | Car | 1,300 | 80 | 8 | T1, T3 |
| TB 22 | Car | 1,300 | 80 | 15 | T2 |
| TB 31 | Car | 1,500 | 80 | 20 | N1 |
| TB 32 | Car | 1,500 | 110 | 20 | N2, L1 to L4b |
| TB 41 | Rigid HGV | 10,000 | 70 | 8 | T3 |
| TB 42 | Rigid HGV | 10,000 | 70 | 15 | H1, L1 |
| TB 51 | Bus | 13,000 | 70 | 20 | H2, L2 |
| TB 61 | Rigid HGV | 16,000 | 80 | 20 | H3, L3 |
| TB 71 | Rigid HGV | 30,000 | 65 | 20 | H4a, L4a |
| TB 81 | Articulated HGV | 38,000 | 65 | 20 | H4b, L4b |

Performance classes for safety barriers according to EN 1317-2 are mainly composed of:

Containment Level, Working Width, Vehicle Intrusion and Impact severity

## 2.2 Table 4 | Containment levels for safety barriers according to EN 1317-2

| CONTAINMENT LEVELS FOR SAFETY BARRIERS | | |
|---|---|---|
| **CONTAINMENT** | **CONTAINMENT LEVEL** | **ACCEPTANCE TESTS** |
| Low Angle Containment | T1 | TB 21 |
| | T2 | TB 22 |
| | T3[1)] | TB 21 and TB 41 |
| Normal Containment | N1 | TB 31 |
| | N2[2)] | TB 11 and TB 32 |
| Higher Containment | H1 | TB 11 and TB 42 |
| | L1[3)] | and TB 32 |
| | H2 | TB 11 and TB 51 |
| | L2[3)] | and TB 32 |
| | H3 | TB 11 and TB 61 |
| Very High Containment | L3[3)] | and TB 32 |
| | H4a | TB 11 and TB 71 |
| | L4a[3)] | and TB 32 |
| | H4b | TB 11 and TB 81 |
| | L4b[3)] | and TB 32 |

1) N1 and N2 do not include T3
2) H1 to H4b do not include N2
3) Containment levels L1 to L4b are supplemented with acceptance test TB32 compared to H1 to H4b

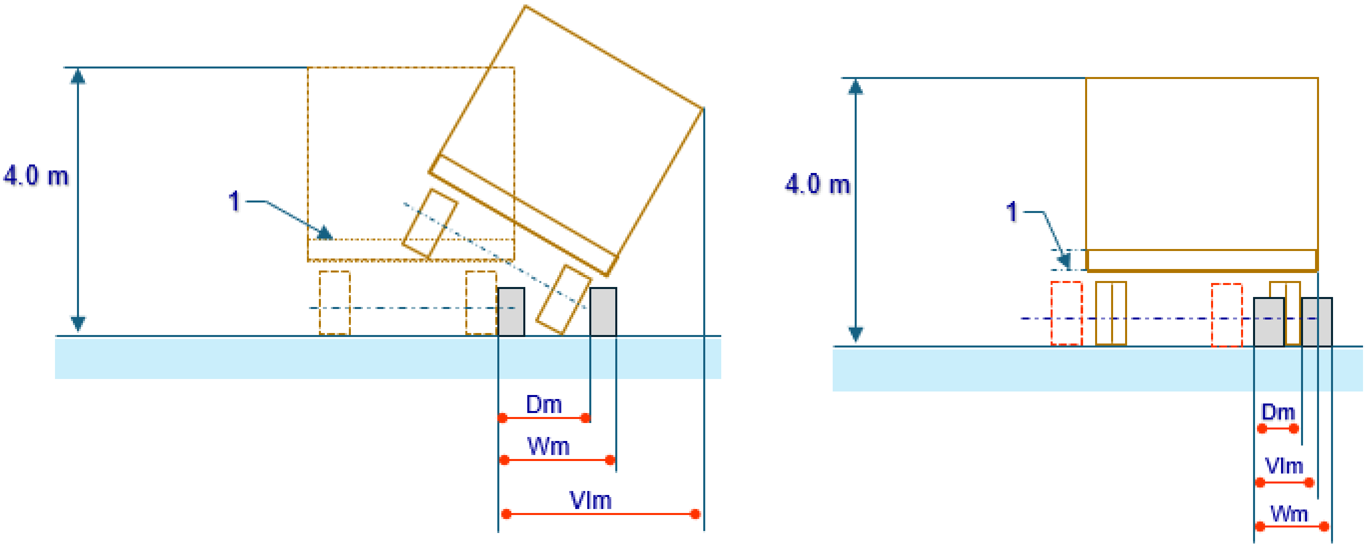
**USEFUL INFORMATION**
The working width, vehicle intrusion and dynamic deflection allow the conditions for installation to be determined for each protective device. Specifically, this allows the determination of the distances to be considered in front of obstacles in order for the vehicle restraint system to function satisfactorily.

## 2.3 Table 5 | Normalised Working Width and Table 6 | Normalised Vehicle Intrusion

| NORMALISED WORKING WIDTH | |
|---|---|
| **CLASS** | **LEVELS [M]** |
| W1 | $W_N \le 0.6$ |
| W2 | $W_N \le 0.8$ |
| W3 | $W_N \le 1.0$ |
| W4 | $W_N \le 1.3$ |
| W5 | $W_N \le 1.7$ |
| W6 | $W_N \le 2.1$ |
| W7 | $W_N \le 2.5$ |
| W8 | $W_N \le 3.5$ |
| | |

| NORMALISED VEHICLE INTRUSION | |
|---|---|
| **CLASSES** | **LEVELS [M]** |
| VI1 | $VI_N \le 0.6$ |
| VI2 | $VI_N \le 0.8$ |
| VI3 | $VI_N \le 1.0$ |
| VI4 | $VI_N \le 1.3$ |
| VI5 | $VI_N \le 1.7$ |
| VI6 | $VI_N \le 2.1$ |
| VI7 | $VI_N \le 2.5$ |
| VI8 | $VI_N \le 3.5$ |
| VI9 | $VI_N > 3.5$ |

### 2.4 Figure 1 | Measured working width ($W_m$), normalised vehicle intrusion (VIN) and dynamic deflection ($D_m$)




### 2.5 Table 7 | Impact Severity Levels

| IMPACT SEVERITY LEVELS | | |
|---|---|---|
| **IMPACT SEVERITY LEVELS** | **INDEX VALUES** | |
| A | ASI ≤ 1.0 | THIV ≤ 33km/h |
| B | ASI ≤ 1.4 | |
| C | ASI ≤ 1.9 | |

## 3. CRASH CUSHIONS

Crash cushions are tested according to EN 1317-3

| VEHICLE IMPACT TEST DESCRIPTION FOR CRASH CUSHIONS | | | | |
|---|---|---|---|---|
| **TEST[a)]** | **APPROACH** | **TOTAL VEHICLE MASS (KG)** | **VELOCITY (km/h)** | **FIGURE 2 TEST NO** |
| TC 1.1.50 | Frontal centre | 900 | 50 | 1 |
| TC 1.1.80 | | 900 | 80 | |
| TC 1.1.100 | | 900 | 100 | |
| TC 1.2.80 | | 1300 | 80 | 1 |
| TC 1.2.100 | | | 100 | |
| TC1.3.110 | | 1500 | 110 | 1 |
| TC 2.1.80 | Frontal, 1/4 vehicle offset | 900[b)] | 80 | 2 |
| TC 2.1.100 | | | 100 | |
| TC 3.2.80 | Head (centre), at 15° | 1300 | 80 | 3 |
| TC 3.2.100 | | 1300 | 100 | |
| TC3.3.110 | | 1500 | 110 | |
| TC 4.2.50 | Side impact at 15° | 1300 | 50 | 4 |
| TC4.2.80 | | 1300 | 80 | |
| TC 4.2.100 | | 1300 | 100 | |
| TC4.3.110 | | 1500 | 110 | |
| TC 5.2.80 | Side impact at 165° | 1300 | 80 | 5 |
| TC 5.2.10 | | 1300 | 100 | |
| TC 5.3.110 | | 1500 | 110 | |

a) Test notation is as follow:

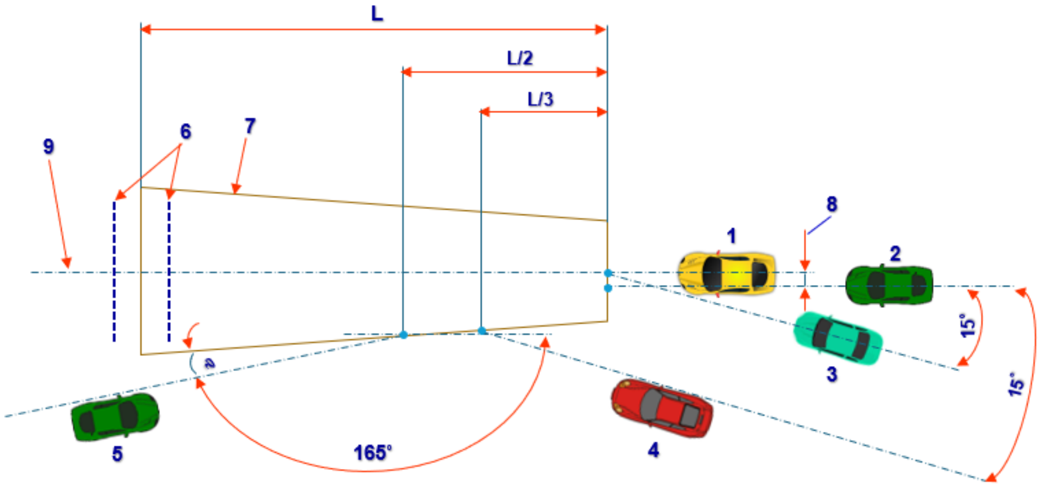
| **TC** | **1** | **2** | **80** |
|---|---|---|---|
| Test of crash cushion | Approach | Test vehicle mass | Impact speed |

b) For this test conditons, the ATD shall be located at the more distand location from the cetre line of cras cushion

**Vehicle Approach Paths for Tests 1 to 5**

Key 1 = Test 1, Key 2 = Test 2, Key 3 = Test, Key 4 = Test 4, Key 5 = Test 5, Key 6 = Alternative locations for front face of obstacle, Key 7 = Crash Cushion and Key 8 = ¼ Vehicle Width - For further details see Figure 5a

## 3.1 Figure 2 | Vehicle Impact Test for Crash Cushions




## 3.2 PERFORMANCE LEVELS FOR CRASH CUSHIONS

| PERFORMANCE LEVELS FOR CRASH CUSHIONS | | | | | | |
|---|---|---|---|---|---|---|
| LEVEL | ACCEPTANCE TEST | | | | | |
| 50 | TC 1.1.50 | - | - | - | TC 4.2.50[a)] | - |
| 80/100 | - | TC 1.2.80 | TC 2.1.80 | - | TC 4.2.80[a)] | - |
| 80 | TC 1.1.80 | TC 1.2.80 | TC 2.1.80 | TC 3.2.80 | TC 4.2.80[a)] | TC 5.2.80[a)] |
| 100 | TC 1.1.100 | TC 1.2.100 | TC 2.1.100 | TC 3.2.100 | TC 4.2.100[a)] | TC 5.2.1000[a)] |
| 110 | TC 1.1.100 | TC 1.3.110 | TC 2.1.100 | TC3.3.110 | TC 4.3.110[a)] | TC 5.3.110[a)] |
| a) Relevant for the redirective crash cushions only | | | | | | |

## 3.3 VEHICLE IMPACT SEVERITY VALUES

| VEHICLE IMPACT SEVERITY VALUES | | | |
|---|---|---|---|
| IMPACT SEVERITY LEVELS | INDEX VALUES | | |
| A | ASI $\leq$ 1,0 | and | THIV $\leq$ 44 km/h in tests 1,2 and 3<br>THIV $\leq$ 33 km/h in tests 4 and 5 |
| B | 1,0 < ASI $\leq$ 1,4 | | THIV $\leq$ 44 km/h in tests 1,2 and 3<br>THIV $\leq$ 33 km/h in tests 4 and 5 |
| Note<br>The limit value for THIV is higher in tests 1, 2 and 3 because experience has shown that higher values can be tolerated in frontal impacts (also because of better passive safety in this direction). Such a difference in tolerance between frontal and lateral impacts is already considered in the ASI parameter, which therefore does not need to be changed. | | | |

## 3.4 Table 8 | Parent Crash Cushion with minimum taper angle/width, 110 km/h

| PARENT CRASH CUSHION WITH MINIMUM TAPER ANGLE/WIDTH, 100KM/H | | | |
|---|---|---|---|
| PERFORMANCE CLASS KM/H | TAPER ANGLE/WIDTH | | |
| | MINIMUM | INTERMIDATE | MAXIMUM |
| 110 | TC 1.3.110<br>TC 3.3.110 | - | TC 4.3.110[a)] |
| 100 | All Tests | - | TC 1.1.100 |
| | | | TC 4.2.100[a)] |
| 80 | TC 1.2.80 | - | TC 4.2.80[a)] |
| 50 | TC 1.1.50 | - | TC 4.2.50[a)] |
| a) Relevant for the redirective crash cushions only | | | |

### 3.5 Table 9 | Parent Crash Cushion with minimum taper angle/width, 100 km/h

| PARENT CRASH CUSHION WITH MINIMUM TAPER ANGLE/WIDTH, 100KM/H | | | |
|---|---|---|---|
| PERFORMANCE CLASS KM/H | TAPER ANGLE/WIDTH | | |
| | MINIMUM | INTERMIDATE | MAXIMUM |
| 100 | All Tests | - | TC 1.1.100 |
| | | | TC 4.2.100[a] |
| 80 | TC 1.2.80 | - | TC 4.2.80[a] |
| 50 | TC 1.1.50 | - | TC 4.2.50[a] |
| a) Relevant for the redirective crash cushions only | | | |

### 3.6 Table 10 | Parent Crash Cushion with minimum taper angle/width, 80 km/h

| PARENT CRASH CUSHION WITH MINIMUM TAPER ANGLE/WIDTH, 80KM/H | | | |
|---|---|---|---|
| PERFORMANCE CLASS KM/H | TAPER ANGLE/WIDTH | | |
| | MINIMUM | INTERMIDATE | MAXIMUM |
| 80 | All Tests | - | TC 1.1.80 |
| | | | TC 4.2.80[a] |
| 50 | TC 1.1.50 | - | TC 4.2.50[a] |
| a) Relevant for the redirective crash cushions only | | | |

### 3.7 Table 11 | Parent Crash Cushion with minimum taper angle/width, 50 km/h

| PARENT CRASH CUSHION WITH MINIMUM TAPER ANGLE/WIDTH, 50KM/H | | | |
|---|---|---|---|
| PERFORMANCE CLASS KM/H | TAPER ANGLE/WIDTH | | |
| | MINIMUM | INTERMIDATE | MAXIMUM |
| 50 | All Tests | - | TC 1.1.50 |
| | | | TC 4.2.50[a] |
| a) Relevant for the redirective crash cushions only | | | |

### 3.8 Table 12 | Parent Crash Cushion with minimum taper angle/width, 100 km/h

| PARENT CRASH CUSHION WITH MINIMUM TAPER ANGLE/WIDTH, 110KM/H | | | |
|---|---|---|---|
| PERFORMANCE CLASS KM/H | TAPER ANGLE/WIDTH | | |
| | MINIMUM | INTERMIDATE | MAXIMUM |
| 110 | All Tests | - | TC 1.1.100 |
| | | | TC 4.3.100[a] |
| 100 | TC 1.2.100 | - | TC 4.2.100[a] |
| 80 | TC 1.2.80 | - | TC 4.2.80[a] |
| 50 | TC 1.1.50 | - | TC 4.2.50[a] |
| a) Relevant for the redirective crash cushions only | | | |

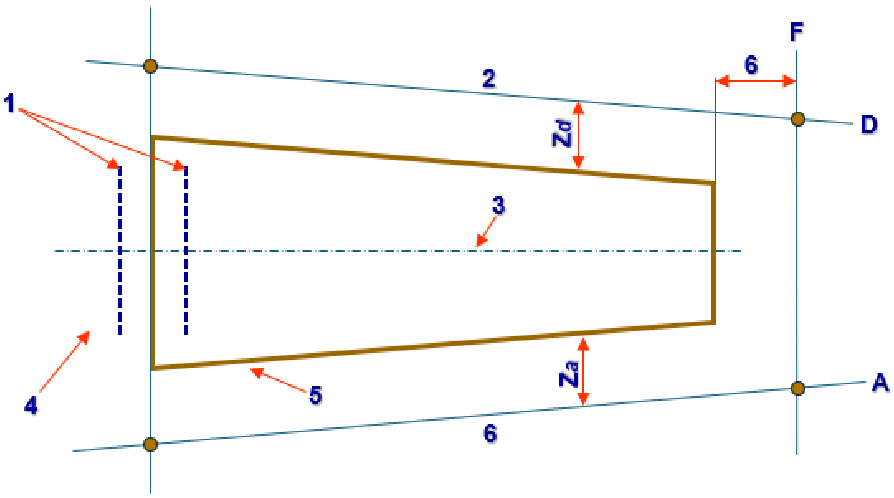
### 3.9 Table 13 | Parent Crash Cushion with maximum taper angle/width, 100 km/h

| PARENT CRASH CUSHION WITH MAXIMUM TAPER ANGLE/WIDTH, 100KM/H | | | |
|---|---|---|---|
| PERFORMANCE CLASS KM/H | TAPER ANGLE/WIDTH | | |
| | MINIMUM | INTERMIDATE | MAXIMUM |
| 110 | TC 1.3.110 | - | TC 4.3.110[a] |
| | TC 3.3.110 | | |
| 100 | TC 1.2.100 | - | All Tests |
| | TC 4.2.100[a] | | |
| | TC 5.2.100 | | |
| 80 | TC 1.2.80 | - | TC 4.2.80[a] |
| 50 | TC 1.1.50 | - | TC 4.2.50[a] |
| a) Relevant for the redirective crash cushions only | | | |

### 3.10 REDIRECTION ZONE DIMENSIONS (Za AND Zd)

| REDIRECTION ZONE DIMENSIONS (Za and Zd) | | |
|---|---|---|
| CLASSES OF CRASH CUSHION Z | APPROACH SIDE | DEPARTURE SIDE |
| | Za<br>m | Zd<br>m |
| Z1 | 4 | 4 |
| Z2 | 6 | 6 |
| Z3 | 4 | $\geq 4$ [a)] |
| Z4 | 6 | $\geq 6$ [a)] |
| a) Test 3 (see Figure 3) | | |

### 3.11 Figure 3 | REDIRECTION ZONE DIMENSIONS (Za and Zd)



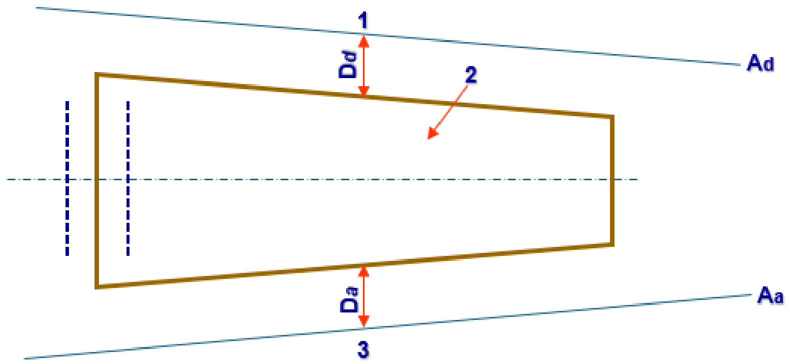

**Legend**

1. Alternative locations for front face of obstacle
2. Departure side
3. Crash cushion center line
4. Exit area
5. Trapezoidal envelope enclosing crash cushion
6. Approach side

### 3.12 PERMANENT LATERAL DISPLACEMENT ZONES FOR CRASH CUSHIONS

| PERMANENT LATERAL DISPLACEMENT ZONES FOR CRASH CUSHIONS | | |
|---|---|---|
| CLASSES OF CRASH CUSHION D | APPROACH SIDE | DEPARTURE SIDE |
| | Da<br>m | Dd<br>m |
| D1 | 0.5 | 0.5 |
| D2 | 1.0 | 1.0 |
| D3 | 2.0 | 2.0 |
| D4 | 3.0 | 3.0 |
| D5 | 0.5 | $\geq$ 0.5 Test 3, Figure 4 |
| D6 | 1.0 | $\geq$ 1.0 Test 3, Figure 4 |
| D7 | 2.0 | $\geq$ 2.0 Test 3, Figure 4 |
| D8 | 3.0 | $\geq$ 3.0 Test 3, Figure 4 |

### 3.13 Figure 4 | PERMANENT LATERAL DISPLACEMENT ZONES FOR CRASH CUSHIONS




**Legend**

1. Departure side
2. Trapezoidal envelope enclosing crash cushion
3. Crash cushion center line
4. Approach side

# 4. END TERMINALS

Terminals are tested according to ENV 1317-4.

### 4.1 Table 14 | Acceptance tests and performance classes according to ENV 1317-4

| ACCEPTANCE TESTS AND PERFORMANCE CLASSES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PERFORMANCE CLASS | LOCATION | | TESTS | | | | | |
| | | | APPROACH | APPROACH NO. | VEHICLE MASS [KG] | SPEED [KM/H] | TEST CODE1 |
| P1 | A | | Head on nose 1/4 offset to roads | 2 | 900 | 80 | TT 2.1.80 |
| P2 | A | U | Head on nose 1/4 offset to roads | 2 | 900 | 80 | TT 2.1.80 |
| | | | Side, 15°, 2/3 L | 4 | 1300 | 80 | TT 4.2.80 |
| | | D | Side, 165°, 1/2 L | 5 | 900 | 80 | TT 5.1.80 |
| P3 | A | U | Head on nose 1/4 offset to roads | 2 | 900 | 100 | TT 2.1.100 |
| | | | Head on centre | 1 | 1300 | 100 | TT 1.2.100 |
| | | | Side, 15°, 2/3 L | 4 | 1300 | 100 | TT 4.2.100 |
| | | D | Side, 165°, 1/2 L | 5 | 900 | 100 | TT 5.1.100 |
| P4 | A | U | Head on nose 1/4 offset to roads | 2 | 900 | 100 | TT 2.1.100 |
| | | | Head on centre | 1 | 1500 | 112 | TT 1.3.110 |
| | | | Side, 15°, 2/3 L | 4 | 1500 | 110 | TT 4.3.110 |
| | | D | Side, 165°, 1/2 L | 5 | 900 | 100 | TT 5.1.100 |

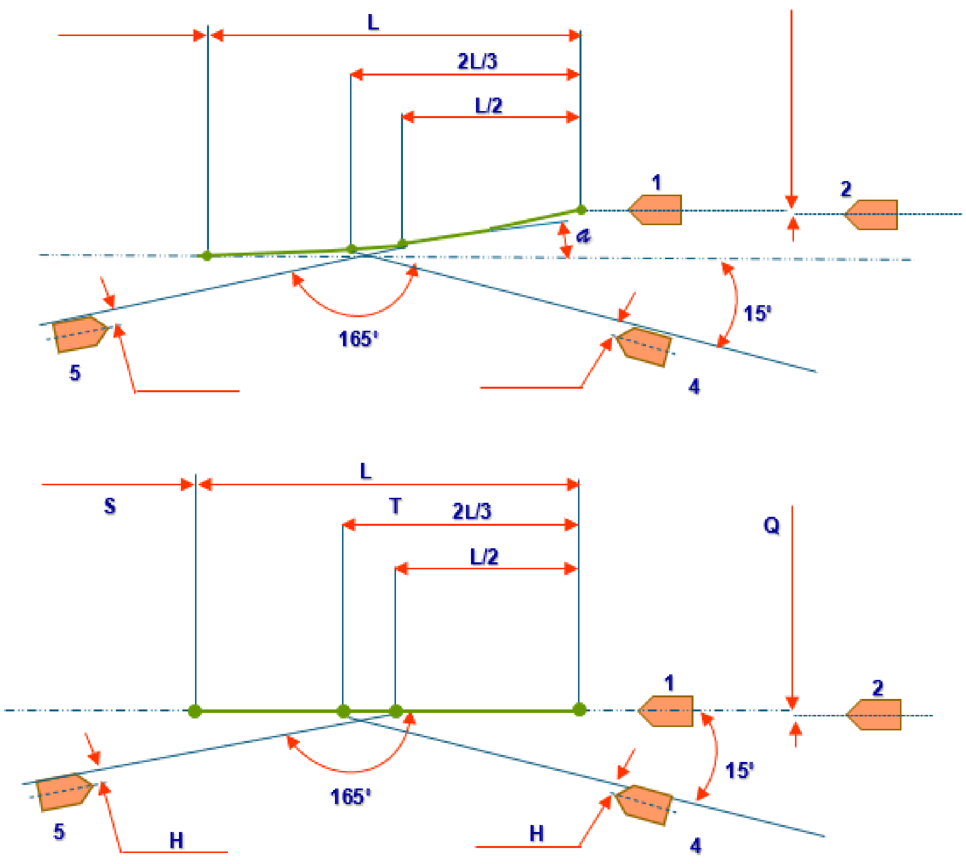
**Note 1)** To avoid ambiguity, the numbering of the approach paths used in Table 8 and in Figure 1 is the same as in EN 1317-3. Approach no. 3 is present in EN 1317-3 for crash cushions but is not required for terminals.

**Note 2**) The test with approach no. 5 is not run for a flared terminal when, at the relevant impact point, the angle (α) of the vehicle path to the traffic face of the terminal is less than 5°.

1) Test code notation: TT: Test of terminal; 1: Approach; 2: Test vehicle mass; 100: Impact speed.

2) Abbreviations: A: Terminal on upstream as well as downstream position; U: Terminal on upstream position; D: Terminal on downstream position; L:. Length of terminal or transition.

## 4.2 Figure 5 | Approach distances for two different versions of terminal (a and b)




**Legend**

- Approach 1
- Approach 2
- Approach 4
- Approach 5
- S Barrier
- T Terminal
- H ½ vehicle width
- Q ¼ vehicle width

## 4.3 Table 15 | Parent Terminal P4

| PARENT TERMINAL P4 | |
|---|---|
| **PERFORMANCE CLASS** | **TESTS** |
| P4 | All Tests TT |
| P3 | 1.2 100 TT |
| P2 | 2.1.80 |

## 4.4 Table 16 | Parent Terminal P3 (Shape a)

| PARENT TERMINAL P3 (SHAPE a) | |
|---|---|
| **PERFORMANCE CLASS** | **TESTS** |
| P3 | All Tests |
| P2 | TT 2.1.80 |

## 4.5 Table 17| Parent Terminal P3 (Shape b)

| PARENT TERMINAL P3 (SHAPE b) | |
|---|---|
| **PERFORMANCE CLASS** | **TESTS** |
| P4 | TT 1.2.100 |
| | TT 1.3.110 |
| P3 | All Tests |
| P2 | TT 2.1.80 |

### 4.6 Table 18 | Vehicle impact severity classes

| VEHICLE IMPACT SEVERITY CLASSES | | | |
|---|---|---|---|
| IMPACT SEVERITY CLASSES | INDEX VALUES | | |
| A | ASI ≤ 1.0 | THIV ≤ 44 km/h in tests 1 and 2 | PHD ≤ 20 g |
| | | THIV ≤ 33 km/h in tests 4 and 5 | |
| B | ASI ≤ 1.4 | THIV ≤ 44 km/h in tests 1 and 2 | PHD ≤ 20 g |
| | | THIV ≤ 33 km/h in tests 4 and 5 | |

Note 1) Impact severity class A affords a greater level of safety for the occupants of an errant vehicle than class B and is preferred when other considerations are the same.

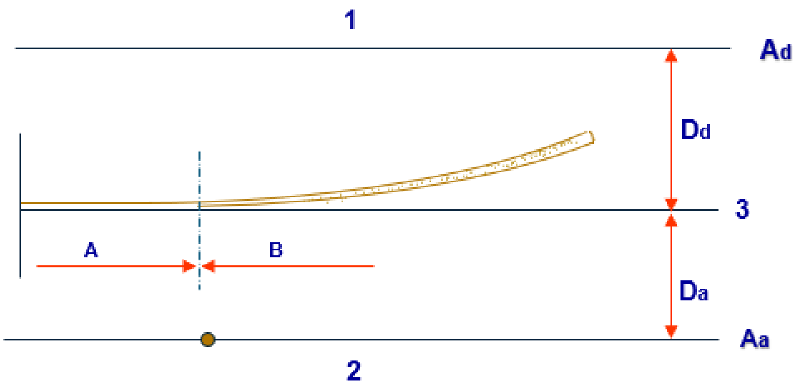
Note 2) The limit value for THIV is higher in tests 1 and 2 because experience has shown that higher values can be tolerated by occupants in frontal impacts (also because of better passive safety in this direction). Such a difference in human tolerance between frontal and lateral impacts is already considered in the ASI parameter, which therefore does not need to be changed

### 4.7 Table 19 | Limits for permanent lateral displacement

| LIMITS FOR PERMANENT LATERAL DISPLACEMENT | | | |
|---|---|---|---|
| CLASS CODE | LATERAL DISPLACEMENT [M] | | |
| x | 1 | $D_a$ | 0.5 |
| | 2 | | 1.5 |
| | 3 | | 3.0 |
| y | 1 | $D_d$ | 1.0 |
| | 3 | | 3.5 |
| | 4 | | > 3.5 |

**Note 1: The distances Da and Dd are shown in Figure 6**

### Figure 6 | Terminal permanent displacement zones




**Legend**

1. Departure Side
2. Approach Side
3. Traffic Face of Barrier
4. A Barrier
5. B Terminal

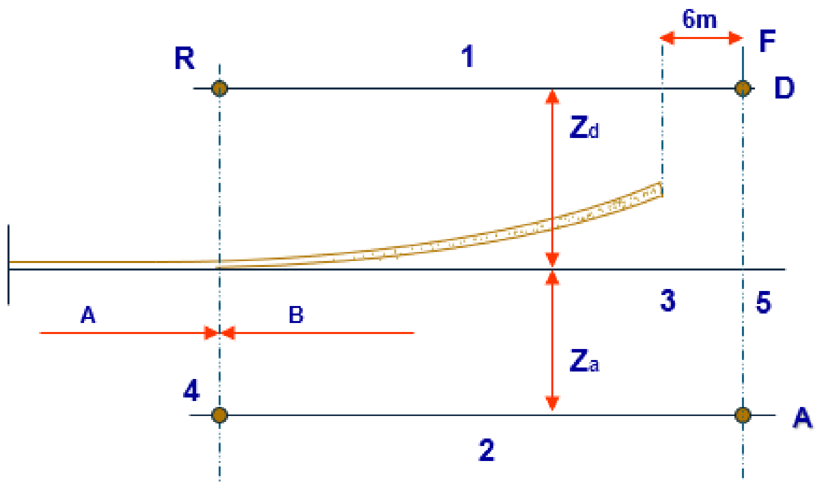
### 4.8 Table 20 | Exit box

| EXIT BOX | |
|---|---|
| APPROACH | EXIT BOX CONTROL LINES |
| 1, 2 | F, A, D |
| 4, 5 | A |

### 4.9 Table 21 | Exit box dimensions Za and Zd

| EXIT BOX DIMENSIONS $Z_a$ AND $Z_d$ | | |
|---|---|---|
| CLASSES OF Z | APPROACH SIDE $Z_a$ [M] | DEPARTURE SIDE OF $Z_d$ |
| $Z_1$ | 4 | 4 |
| $Z_2$ | 6 | 6 |
| $Z_3$ | 4 | No Limit |
| $Z_4$ | 6 | No Limit |

### 4.10 Figure 7 | Exit box




**Legend**

1. Departure side
2. Approach side
3. Traffic face of barrier
4. End of terminal
5. Rebound line
6. Barrier
7. B Terminal

## 5. TRANSITIONS

Transitions are tested according to ENV 1317-4.

**USEFUL INFORMATION**

With regard to the containment level, the acceptance tests, the working width, the dynamic deflection and impact severity level (ASI) as well as the acceptance criteria and test methods the same definitions and classifications apply to transitions as are specified in EN 1317-2.

## 6. SARTSMA ACCREDITATION LIST OF PRODUCTS THAT ARE SANAS COMPLIANT

For ease of reference, SARTSMA has provided SANRAL with a list of its members who supply SANAS-accredited road restraint systems. This initiative is intended to support the use of compliant and accredited products in road infrastructure projects, reinforcing safety and alignment with national standards. CE marking for vehicle restraint systems is carried out according to EN 1317-5.