

Cable tray systems and cable ladder systems for cable management

The European Standard EN 61537:2001 has the status of a
British Standard

ICS 29.120.10

National foreword

This British Standard is the official English language version of EN 61537:2001. It is identical with IEC 61537:2001.

The UK participation in its preparation was entrusted to Technical Committee PEL/213, Cable management, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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This British Standard, having been prepared under the direction of the Electrotechnical Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 14 March 2002

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 62, an inside back cover and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

© BSI 14 March 2002

ISBN 0 580 39060 8

**Cable tray systems and cable ladder systems
for cable management
(IEC 61537:2001)**

Systèmes de chemin de câbles et
systèmes d'échelle à câbles pour
systèmes de câblage
(CEI 61537:2001)

Kabelträgersysteme zum Führen von
Leitungen für elektrische Energie und
Informationen
(IEC 61537:2001)

This European Standard was approved by CENELEC on 2001-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 23A/365/FDIS, future edition 1 of IEC 61537, prepared by SC 23A, Cable management systems, of IEC TC 23, Electrical accessories, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61537 on 2001-10-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2002-07-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2004-10-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes D and ZA are normative and annexes A, B, C, E, F, G, H and I are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61537:2001 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60093 NOTE Harmonized as HD 429 S1:1983 (not modified).

IEC 60364-5-54 NOTE Harmonized as HD 384.5.54 S1:1988 (not modified).

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CABLE TRAY SYSTEMS AND CABLE LADDER SYSTEMS FOR CABLE MANAGEMENT

1 Scope

This International Standard specifies requirements and tests for cable tray systems and cable ladder systems intended for the support and accommodation of cables and possibly other electrical equipment in electrical and/or communication systems installations. Where necessary, cable tray systems and cable ladder systems may be used for the segregation of cables.

This standard does not apply to conduit systems, cable trunking systems and cable ducting systems or any current-carrying parts.

NOTE Cable tray systems and cable ladder systems are designed for use as supports for cables and not as enclosures.

2 Normative references

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60068-2-75:1997, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60364-5-523:1999, *Electrical installations of buildings – Part 5: Selection and erection of electrical equipment – Section 523: Current-carrying capacities in wiring systems*

IEC 60695-2-1/1:1994, *Fire hazard testing – Part 2: Test methods – Section 1/sheet 1: Glow-wire end-product test and guidance*

IEC 60695-2-4/1:1991, *Fire hazard testing – Part 2: Test methods – Section 4/sheet 1: 1 kW nominal pre-mixed test flame and guidance*

ISO 4046:1978, *Paper, board, pulp and related terms – Vocabulary*

3 Definitions

For the purpose of this International Standard, the following definitions apply.

3.1

cable tray system or cable ladder system

assembly of cable supports consisting of cable tray lengths or cable ladder lengths and other system components

3.2

system component

part used within the system. System components are as follows:

- a) cable tray length or cable ladder length
- b) cable tray fitting or cable ladder fitting
- c) support device
- d) mounting device
- e) system accessory

NOTE System components may not necessarily be included together in a system. Different combinations of system components may be used.

3.3

cable tray length

system component used for cable support consisting of a base with integrated side members or a base connected to side members

NOTE Typical examples of cable tray types are shown in figures A.1 to A.3.

3.4

cable ladder length

system component used for cable support consisting of supporting side members, fixed to each other by means of rungs

NOTE Typical examples of cable ladder types are shown in figure A.4.

3.5

fitting

system component used to join, change direction, change dimension or terminate cable tray lengths or cable ladder lengths

NOTE Typical examples are couplers, bends, tees, crosses.

3.6

cable runway

assembly comprised of cable tray lengths or cable ladder lengths and fittings only

3.7

support device

device designed to provide mechanical support and which may limit movement of a cable runway

NOTE Typical examples of support devices are shown in annex B.

3.8

mounting device

system component used to attach or fix other devices to the cable runway

NOTE A typical example is an apparatus mounting device.

3.9

apparatus mounting device

component used to accommodate electrical apparatus like switches, socket outlets, circuit-breakers, telephone outlets, etc. which can be an integral part of the electrical apparatus and which is not part of the cable tray system and cable ladder system

3.10

system accessory

system component used for a supplementary function such as cable segregation, cable retention, and covers, etc.

3.11

cable segregation

under consideration

3.12

metallic system component

system component which consists of metal only. Screws for connections and other fasteners are not considered

3.13

non-metallic system component

system component which consists of non-metallic material only. Screws for connections and other fasteners are not considered

3.14

composite system component

system component which consists of both metallic and non-metallic materials. Screws for connections and other fasteners are not considered

3.15

non-flame propagating system component

system component which is liable to catch fire as a result of an applied flame, along which the flame does not propagate and which extinguishes itself within a limited time after the flame is removed

3.16

external influence

presence of water, oil, building materials, corrosive and polluting substances, and external mechanical forces such as snow, wind, and other environmental hazards

3.17

safe working load (SWL)

maximum load that can be applied safely in normal use

3.18

uniformly distributed load (UDL)

load applied evenly over a given area

NOTE Methods of applying uniformly distributed loads are shown in annexes D and E.

3.19

span

distance between the centres of two adjacent support devices

3.20

internal fixing device

device for joining and/or fixing system components to other system components. This device is part of the system but not a system component

NOTE Typical examples are nuts and bolts.

3.21

external fixing device

device used for fixing a support device to walls, ceilings or other structural parts. This device is not part of the system

NOTE Typical examples are anchor bolts.

3.22

base area of cable tray length or cable ladder length

plan area available for cables

3.23

free base area

part of the base area which is open to the flow of the air. Holes in cable ladder rungs are included in the free base area

3.24

load plate

rigid means through which a load is applied to the sample for testing purposes

3.25

product type

group of system components which vary in the case of

- cable runways in the width only
- cantilever brackets in the length only
- pendants in the length only

NOTE Different jointing methods and position constitute different product types.

3.26

topological shape

group of product types which varies in thickness and height only

4 General requirements

Cable tray systems and cable ladder systems shall be so designed and so constructed that in normal use, when installed according to the manufacturer's or responsible vendor's instructions, they ensure reliable support to the cables contained therein. They shall not impose any unreasonable hazard to the user or cables.

The system components shall be designed to withstand the stresses likely to occur during recommended transport and storage.

Cable tray systems and cable ladder systems according to this standard are not intended to be used as walkways.

Compliance is checked by carrying out all the relevant tests specified in this standard.

5 General conditions for tests

5.1 Tests according to this standard are type tests.

5.2 Unless otherwise specified, tests shall be carried out with cable tray system components or cable ladder system components assembled and installed as in normal use according to the manufacturer's or responsible vendor's instructions.

5.3 Tests on non-metallic system components or composite system components shall not commence earlier than 168 h after manufacture.

5.4 Unless otherwise specified, tests shall be carried out at an ambient temperature of $20\text{ °C} \pm 5\text{ °C}$.

Unless otherwise specified, all tests are carried out on new samples.

5.5 When toxic or hazardous processes are used, precautions should be taken to safeguard the person performing the test.

5.6 Unless otherwise specified, three samples are subjected to the tests and the requirements are satisfied if all the tests are met.

If only one of the samples does not satisfy a test due to an assembly or a manufacturing fault, that test and any preceding one which may have influenced the results of the test shall be repeated and also the tests which follow shall be made in the required sequence on another full set of samples, all of which shall comply with the requirements.

NOTE The applicant, when submitting a set of samples, may also submit an additional set of samples which may be necessary, should one sample fail. The testing station will then, without further request, test the additional set of samples and will reject only if a further failure occurs. If the additional set of samples is not submitted at the same time, the failure of one sample will entail rejection.

5.7 If the relative humidity of the atmosphere has a significant effect on the classified properties of the samples under test, the manufacturer or responsible vendor shall declare this information.

5.8 If a system component or system is coated in paint or any other substance which is likely to affect its classified properties, then the relevant tests in this standard shall be performed on the coated sample.

6 Classification

6.1 According to material

6.1.1 **Metallic system component**

6.1.2 **Non-metallic system component**

6.1.3 **Composite system component**

6.2 According to resistance to flame propagation

6.2.1 **Flame propagating system component**

6.2.2 Non-flame propagating system component

6.3 According to electrical continuity characteristics

6.3.1 Cable tray system or cable ladder system without electrical continuity characteristics

6.3.2 Cable tray system or cable ladder system with electrical continuity characteristics

NOTE For cable tray systems and cable ladder systems with PE function, see annex C.

6.4 According to electrical conductivity

6.4.1 Electrically conductive system component

6.4.2 Electrically non-conductive system component

6.5 According to material coating

6.5.1 Non-coated system component

NOTE Examples of non-coated materials are stainless steel, aluminium alloy, PVC and glass reinforced plastic (GRP).

6.5.2 System component with metallic coating

NOTE Examples of metallic coatings are zinc-galvanized and aluminium-electroplated.

6.5.3 System component with organic coating

NOTE Examples of organic coatings are epoxy powder and PVC.

6.5.4 System component with metallic and organic coating

6.6 According to temperature

6.6.1 Minimum temperature as given in table 1

Table 1 – Minimum temperature classification

Minimum transport, storage, installation and application temperature °C
+20
+5
–5
–15
–20
–40
–50

6.6.2 Maximum temperature as given in table 2

Table 2 – Maximum temperature classification

Maximum transport, storage, installation and application temperature °C
+20
+40
+60
+90
+105
+120
+150

6.7 According to the perforation in the base area of the cable tray length as given in table 3

Table 3 – Perforation base area classification

Classification	Perforation in the base area
A	Up to 2 %
B	Over 2 % and up to 15 %
C	Over 15 % and up to 30 %
D	More than 30 %
NOTE For the purpose of ventilation, classification D relates to IEC 60364-5-523, subclause 523.8.2, third paragraph.	

6.8 According to the free base area of cable ladder length as given in table 4

Table 4 – Free base area classification

Classification	Free base area
X	Up to 80 %
Y	Over 80 % and up to 90 %
Z	More than 90 %
NOTE For the purpose of ventilation, classification Z relates to IEC 60364-5-523, subclause 523.8.2, fourth paragraph.	

6.9 According to impact resistance

6.9.1 System component offering impact resistance up to 2 J

6.9.2 System component offering impact resistance up to 5 J

6.9.3 System component offering impact resistance up to 10 J

6.9.4 System component offering impact resistance up to 20 J

6.9.5 System component offering impact resistance up to 50 J

7 Marking and documentation

7.1 Each system component shall be durably and legibly marked with

- the manufacturer's or responsible vendor's name or trade mark or identification mark;
- a product identification mark which may be, for example, a catalogue number, a symbol, or the like.

When system components other than cable tray lengths and cable ladder lengths are supplied in a package, the product identification mark may be, as an alternative, marked on the package only.

NOTE 1 The necessity to mark flame propagating system components is under consideration.

Compliance is checked by inspection and, for marking on the product, by rubbing by hand for 15 s with a piece of cotton cloth soaked with water and again for 15 s with a piece of cotton cloth soaked with petroleum spirit.

After the test, the marking shall be legible.

NOTE 2 Petroleum spirit is defined as the aliphatic solvent hexane with a content of aromatics of maximum 0,1 % volume, a kauributanol value of 29, an initial boiling point of 65 °C, a dry point of 69 °C and a specific gravity of approximately 0,68 kg/l.

NOTE 3 Marking may be applied, for example, by moulding, pressing, engraving, printing, adhesive labels, or water slide transfers.

NOTE 4 Marking made by moulding, pressing, or engraving is not subjected to the rubbing test.

7.2 If a system component can, by taking precautions, be stored and transported at a temperature outside the declared temperatures according to tables 1 and 2, the manufacturer or responsible vendor shall declare the precautions and the alternative temperature limits.

Compliance is checked by inspection.

7.3 The manufacturer or responsible vendor shall provide in his literature all information necessary for the proper and safe installation and use. The SWL and impact resistance is valid for the whole temperature classification declared. The information shall include

- a) instructions for the assembly and installation of system components and for the precautions required to avoid excessive transverse deflection, which could cause damage to the cables (see 5.2, 9.2, 10.3, 10.7, 10.8, and 14.1),
- b) thermal expansion properties and precautions to be taken, if necessary,
- c) classification according to clause 6,
- d) relative humidity if it affects the classifications (see 5.7),
- e) information on holes or devices when provided for equipotential bonding (see 6.3.2) in particular when a specific electrical connection device is necessary,
- f) precautions for transport and storage outside the declared temperature classification, where applicable (see 7.2),
- g) product dimensions (see clause 8),
- h) torque settings in Nm for screwed connections and internal fixing devices as well as threads, where applicable (see 9.3d) and 9.3.1),
- i) end span limitations (see 10.3),
- j) position and type of coupling along the span, where applicable,
- k) SWL in N/m for the fittings when not directly supported and the distance *Y* from the supports adjacent to the fittings (see 10.7),
- l) fixing method for installing cable tray or cable ladder to the supports when declared for the test (see 10.3, 10.4 and 10.8.1),
- m) SWL in N/m for the cable tray lengths or cable ladder lengths including joints, where applicable for one or more of the following installation methods (see 10.1):
 - i) mounted in the horizontal plane running horizontally on multiple spans (see 10.3)
 - ii) mounted in the horizontal plane running horizontally on a single span (see 10.4)
 - iii) mounted in the vertical plane running horizontally (see 10.5)
 - iv) mounted in the vertical plane running vertically (see 10.6),
- n) SWL in N for cantilever brackets and if used for cable tray only (see 10.8.1),
- o) SWL for pendants as a bending moment in Nm and/or as a force in N (see 10.8.2),

- p) the appropriate material specification and environmental conditions, chemical environments or aggressive agents for which the product is suitable (see 14.2).

NOTE SWL information can be given in the form of a diagram, table, or similar.

Compliance is checked by inspection.

8 Dimensions

The manufacturer or responsible vendor shall give the following information:

- the overall envelope of the cross-section of the cable tray length or cable ladder length;
- the base width of the cable tray length or cable ladder length available for the accommodation of cables;
- the height of the cable tray length or cable ladder length available for the accommodation of cables when a cover is fitted;
- the minimum internal radius of fittings available for the accommodation of cables;
- the dimensions of the perforations, and their arrangements on the cable tray lengths;
- the dimensions of the rungs including perforations, if any, and the centre line spacing of the rungs.

NOTE System components, such as fittings, when used as part of the system, may change the effective area available for the accommodation of cables.

Compliance is checked by inspection.

9 Construction

The same sample may be used for all the tests in this clause.

9.1 Surfaces of system components which are likely to come into contact with cables during installation or use shall not cause damage to the cables when installed according to the manufacturer's or responsible vendor's instructions.

Compliance is checked by inspection and, if necessary, by manual test.

9.2 Surfaces of system components which do not come into contact with cables during installation or use and where the manufacturer or responsible vendor does not require the use of gloves for installation purposes shall ensure safe handling.

Compliance is checked by inspection and, if necessary, by manual test.

9.3 Screwed connections and other internal fixing devices shall be so designed to withstand the mechanical stresses occurring during installations according to the manufacturer's or responsible vendor's instructions and normal use. They shall not cause damage to the cable when correctly inserted.

Screwed connections can be either

- a) ISO metric threads, or
- b) a thread forming type, or
- c) a thread cutting type if suitable design provisions are made, or

d) threads other than a) to c) as specified by the manufacturer or responsible vendor.

Compliance is checked by 9.3.1 or 9.3.2 or 9.3.3.

9.3.1 *Sudden or jerky motions shall not be used to tighten reusable screwed connections. To test the screwed connection, it shall be tightened and removed*

- *10 times for metal screwed connections in engagement with a thread of non-metallic material and for screwed connections of non-metallic material,*

or

- *5 times in all other cases.*

The test is carried out using a suitable screwdriver or spanner to apply the torque as specified by the manufacturer or responsible vendor.

After the test, there shall be no breakage or damage, that will impair the further use of the screwed connection.

9.3.2 *Reusable connections other than screwed connections, for example push-on and clamping connections, shall be tightened and removed 10 times.*

After the test, there shall be no damage to impair the further use of the reusable connections.

9.3.3 *Non-reusable connections are checked by inspection and, if necessary, by manual test.*

9.4 Any apparatus mounting device shall meet the requirement of the appropriate standard.

9.5 Cable tray systems or cable ladder systems may include system components for the segregation of cables. These shall be adequately secured to other system components.

Compliance is checked by manual test.

NOTE Possible requirements for covers, cable retention devices and mounting devices are under consideration.

9.5 Cable tray lengths, when perforated, shall exhibit a regular perforation pattern over the base area.

Compliance is checked by inspection and measurement.

9.6 Cable ladder lengths shall exhibit a regular rung pattern over the base area.

Compliance is checked by inspection and measurement.

10 Mechanical properties

10.1 Mechanical strength

Cable tray systems and cable ladder systems shall provide adequate mechanical strength.

The main criterion for the SWL is safety in use of the product.

For the declared application, the manufacturer or responsible vendor shall declare the SWL to be tested:

- in N/m for each type of cable tray length or cable ladder length at specified distances, preferably in spans of 0,5 m increments, between the support devices,
- in N/m for each type of fitting which is not directly supported by a support device,
- in N or N/m for each type of support device.

NOTE This information can be given in the form of a diagram or table or similar.

Compliance for cable runways is checked by carrying out the relevant tests according to the manufacturer's or responsible vendor's declaration as specified in 10.3, 10.4, 10.5, 10.6 and 10.7 on samples of the widest and narrowest width for each product type. For the intermediate widths the SWLs shall then be determined by interpolation of the test results. The alternative is to test only the widest product. For the tests specified in 10.3, 10.4 and 10.7, the SWL of an untested narrower width may be derived by multiplying the SWL of the tested widest width by the factor of the narrower width divided by the widest (tested) width.

Compliance for support devices is checked by carrying out the tests specified in 10.8.

Cable tray system components and cable ladder system components shall withstand impacts occurring during transport, storage and installation.

Compliance is checked by the test specified in 10.9.

10.2 SWL test procedure

Deflection measurements shall be used only as a method of assessing the SWL, if no clear indication of failure occurs, i.e. where the product continues to deflect greatly without collapse.

Tests shall be carried out at the maximum and minimum temperature declared according to the classification in tables 1 and 2. During the test, the spatio-temporal uniformity of the temperature shall be within the range of ± 5 °C, 0,25 m around the sample. Alternatively, tests can be carried out

- *at any temperature within the declared range if documentation is available which states that the relevant mechanical property values of the materials as used within the sample do not differ by more than ± 5 % of the average between the maximum and minimum property values due to temperature change within the declared temperature range,*

or

- *only at the maximum temperature within the range, if documentation is available, which states that the relevant mechanical property values of the materials, as used within the sample, improve when the temperature is decreasing,*

or

- *at the maximum and minimum temperature within the range only for the smallest and largest size of cable tray lengths or cable ladder lengths, having the same material, joint and topological shape. The other sizes can be tested at ambient temperature only.*

This procedure can only be used if the percentage of the difference between the TDF (SWL temperature dependence factor) of the smallest size and the largest size is less than 10 % using the following formula for the calculation:

$$\left| \frac{\text{TDF smallest size} - \text{TDF largest size}}{\text{maximum value of the TDF either of the smallest size or the largest size}} \right| < \frac{10}{100}$$

The TDF for these sizes is obtained by testing at minimum, ambient, and maximum temperature to determine the loads which provide the maximum allowed deflection. The loads for each temperature are averaged. Then the TDF is calculated by dividing the minimum of these averaged loads by the averaged load at ambient temperature.

If documentation is available which states that the relevant mechanical property values of the materials, as used within the system, improve when the temperature is decreasing, then testing at minimum temperature is not needed and the TDF can be calculated by dividing the averaged loads at maximum temperature by the averaged loads at ambient temperature.

Other sizes with the same topological shape can be tested at ambient temperature but increasing the declared load for the maximum or minimum temperature within the range by dividing it by the TDF for the range tested (TDF_R), where TDF_R is the arithmetic mean of the TDF for the smallest size and TDF for the largest size, in order to simulate the worst case within the temperature range. For an example of how to determine the TDF_R , see annex F.

All loads shall be uniformly distributed over the length and width of the samples as shown in annex D.

The load shall be applied in such a way that a UDL (uniformly distributed load) is ensured even in the case of extreme deformation of the samples.

Typical methods of applying a UDL are shown in annex E.

To allow for settlement of the samples, a pre-load of 10 % of the SWL, unless otherwise specified, shall be applied and removed after 5 min. At this time, the measurement apparatus shall be calibrated to zero.

The load shall then be increased evenly longitudinally and transversely up to the SWL continuously or, when a continuous increase is impractical, the load shall be increased by increments, these increments not being heavier than a quarter of the SWL. The load increments shall be distributed through the load plates as evenly longitudinally and transversely as is practical.

After loading, the deflection shall be measured at the points specified for each test arrangement.

For the tests in 10.3, 10.4, 10.5, 10.6, and 10.7, the mid span deflection is the arithmetic mean of the deflections at the two measuring points near the side members as shown in figure 1, key 8.

Where necessary, a third measurement of deflection shall be taken in the centre of the cable tray base or cable ladder base at mid-span as shown in figure 1, key 7, or figure 5, point s, for fittings. The transverse deflection shall be calculated by subtracting the mid-span deflection from the third reading.

The samples shall be left and the deflections measured every 5 min until the difference between two consecutive sets of readings is less than 2 % with regard to the first set of the two consecutive sets of readings. The first set of readings measured at this point are the deflections measured at the SWL. For an example see annex G.

When subjected to the SWL, the samples, their joints and internal fixing devices shall show no damage or crack visible to normal view or corrected vision without magnification and the deflections shall not exceed the values specified in 10.3, 10.4, 10.5, 10.6, 10.7, and 10.8.

The load shall then be increased to 1,7 times the SWL.

The samples shall be left and the deflections measured every 5 min until the difference between two consecutive sets of readings is less than 2 % with regard to the first set of the two consecutive sets of readings.

The samples shall sustain the increased loading without collapsing. Buckling and deformation of the samples is permissible at this loading.

10.3 Test for SWL of cable tray lengths and cable ladder lengths mounted in the horizontal plane running horizontally on multiple spans

The test is carried out on cable tray lengths and joints or cable ladder lengths and joints to verify the declared SWL when mounted over multiple spans with the cable tray or cable ladder in the flat and horizontal plane.

The test is carried out with the samples consisting of two or more cable tray lengths or cable ladder lengths. These shall be coupled, as shown in figure 1 to form two full spans plus a cantilever. Joints are to be positioned as required for each test type following the manufacturer's or responsible vendor's instructions.

The samples shall be placed on fixed, rigid supports a, b and c which shall be horizontal and level with a width of 45 mm $\pm$ 5 mm. The samples shall not be fixed to the supports unless a fixing method is declared by the manufacturer or responsible vendor in which case this fixing method shall be used.

For all test types, full standard cable tray lengths or cable ladder lengths shall be used for all intermediate lengths. Cut lengths shall only be used at the end positions required.

The cantilever of 0,4L can be increased slightly in length as described in annex D, if necessary, to ensure a UDL on the cantilever.

Depending on the installation method(s) declared by the manufacturer or responsible vendor, one or more of the following test types shall be used.

10.3.1 Test type I

Test type I shall be used when the manufacturer or responsible vendor does not declare any end span limitations and where the joints shall be placed on all installations. In this case, joints can occur anywhere on an installation. The test arrangement shall be as shown in figure 2a.

10.3.2 Test type II

Test type II shall be used when the manufacturer or responsible vendor declares that on all installations there shall be no joints in the end span. The test arrangement shall be as shown in figure 2b.

If the manufacturer or responsible vendor declares that on all installations the end span shall be reduced in length, the end span X shall then be declared.

10.3.3 Test type III

Test type III shall be used when the standard cable tray length or cable ladder length is equal to the span or multiples of the span and the manufacturer or responsible vendor declares the joint position, relative to the end support, to be used on all installations. The test arrangement shall be as shown in figure 2c.

If the manufacturer or responsible vendor declares that on all installations the end span shall be reduced in length, the end span X shall then be declared.

10.3.4 Test type IV

Test type IV shall be used for products with localized weakness. In this case, the localized weakness is positioned over support b as shown in figure 3. If this can be achieved by modifying test type I or II by moving the joint by up to $\pm 10\%$ of L from its specified position, then this shall be done.

10.3.5 Test type V

Test type V may be used as an alternative to test type I to IV if the span is greater than 4 m. In this case, subclause 10.4 shall be used to check the SWL with a joint positioned at mid-span or as declared by the manufacturer or responsible vendor. The test arrangement shall be as shown in figure 4.

The test shall be carried out in accordance with 10.2.

The practical mid-span deflection of either span at the SWL shall not exceed 1/100th of the span.

The transverse deflection at the SWL shall not exceed 1/20th of the width of the sample and the samples shall still ensure reliable support to any cables that would normally be contained therein without imposing any unreasonable hazard or danger to the user or cables.

10.4 Test for SWL of cable tray lengths and cable ladder lengths mounted in the horizontal plane running horizontally on a single span installation

The test is carried out on cable tray lengths or cable ladder lengths to verify the declared SWL when used as a single beam over a single span with the cable tray or cable ladder in the flat and horizontal plane.

The samples shall be placed on fixed, rigid supports a and b which shall be horizontal and level with a width of $45\text{ mm} \pm 5\text{ mm}$ as shown in figure 4. The samples shall not be fixed to the supports unless a fixing method is declared by the manufacturer or responsible vendor, in which case this fixing method shall be used.

If the span is greater than the cable tray length or cable ladder length and the manufacturer or responsible vendor does not declare where the joints shall be placed, they shall be at mid-span position as shown in figure 4. This does not apply to test type V of 10.3.

The test shall be carried out in accordance with 10.2.

The practical mid-span deflection at the SWL shall not exceed 1/100th of the span.