

A floor distributor at handover. The 100 metres is spent here: in the tray, in the bundle and in the cords at both ends.

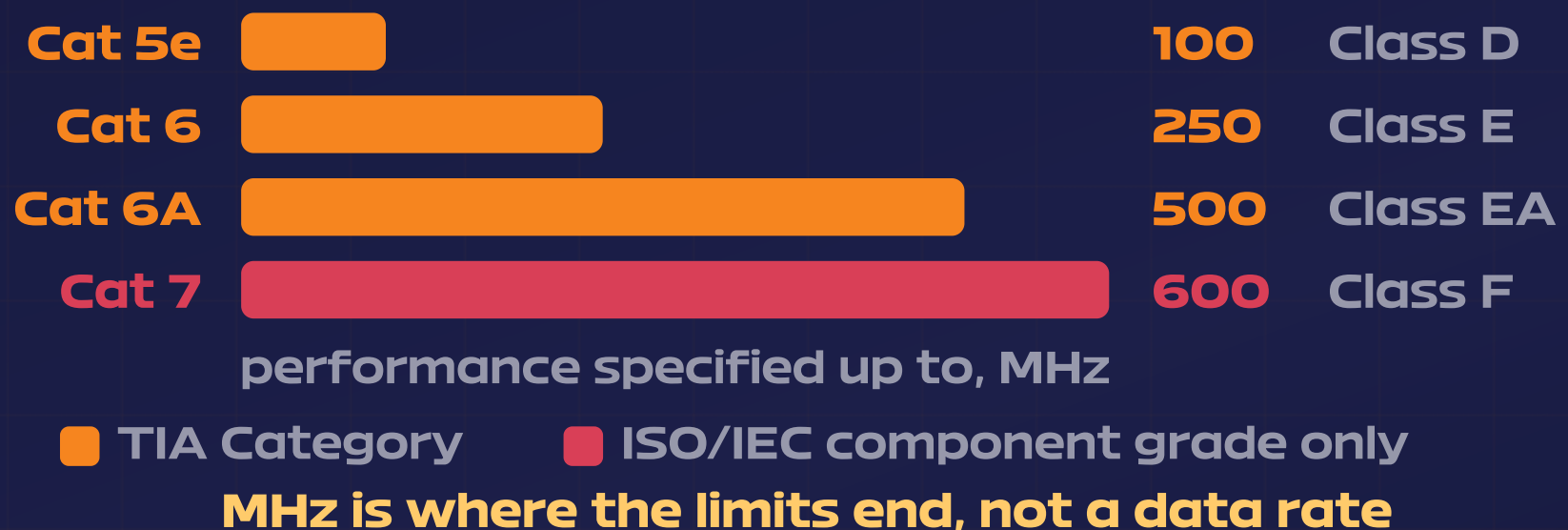
NLC ACADEMY · EPISODE 23

100 metres is a budget, not a length.

The cabling standard is more specific than the market thinks, and more generous in the places everyone over-specifies. Here is what it actually says, and what a 50 °C ceiling void does to that budget.

TWO VOCABULARIES, ONE PLANT

ISO/IEC: Category for components, Class for the installed link



MHz is where the limits end, not a data rate

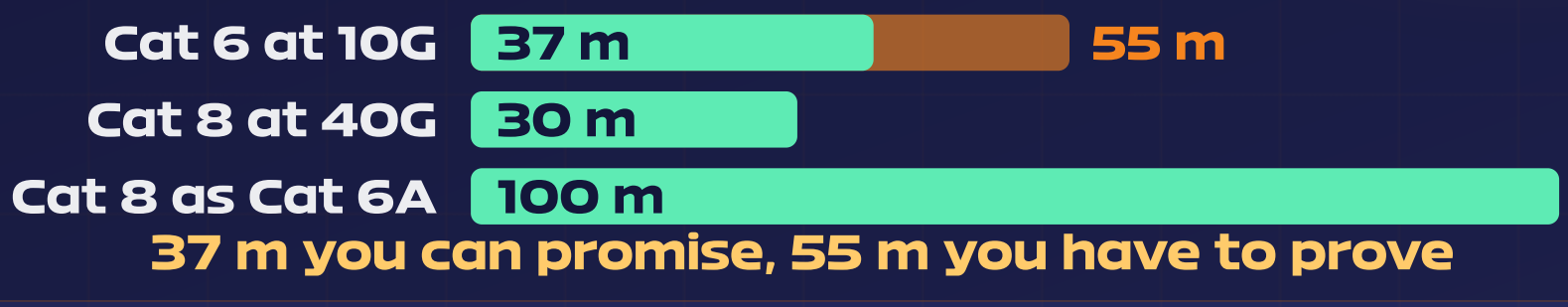
1. ISO/IEC 11801 separates the two: Category 6 components provide Class E performance. TIA uses Category for both components and installed cabling. [1][6]

2. A Category specifies component performance, including electrical limits such as insertion loss and crosstalk, up to a stated frequency: 100 MHz for Cat 5e, 250 MHz for Cat 6, 500 MHz for Cat 6A. MHz is not a data rate. [1]

TIA does not recognise Category 7. It is ISO/IEC component terminology, associated with Class F. Name the governing standard instead of mixing terms from both systems. [1][6]

WHAT THE CATEGORY ACTUALLY BUYS

Two numbers that get quoted without their conditions



Cat 6 at 10 Gbps

TIA's Table 5 note: installed Cat 6 qualified to TSB-155 supports 10GBASE-T from 37 m to 55 m, **depending on the alien crosstalk environment**. 37 m is what you can promise. [3]

37-55 m

Cat 8 at 30 m

A 30 m channel with no more than two connections: the data-centre topology defined for 25GBASE-T and 40GBASE-T. [2][3]

30 m

Cat 8 parts in a Cat 6A channel

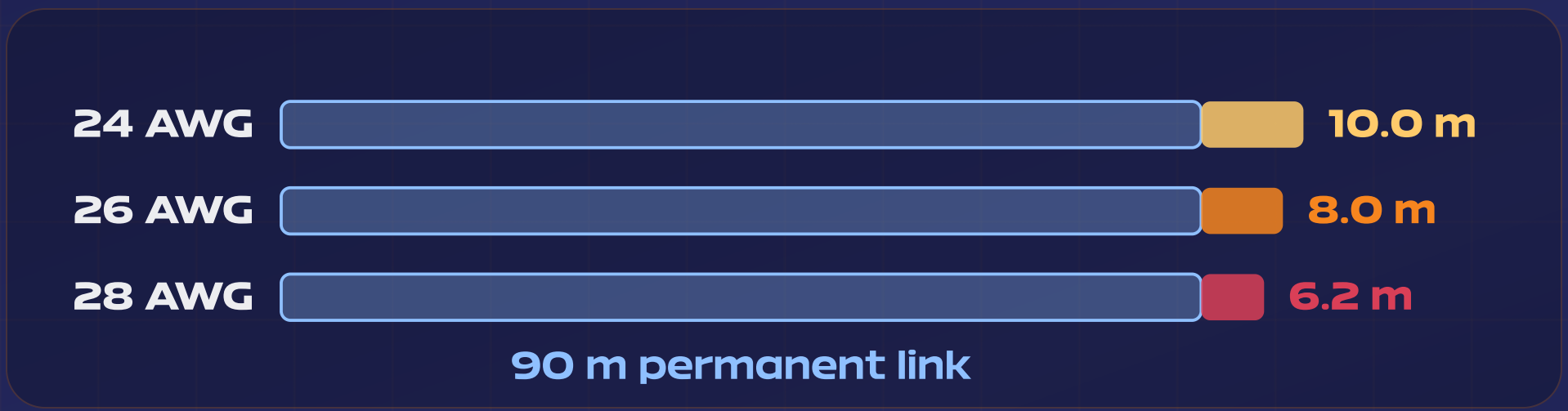
Category 8 components can be used to build 100 m Category 6A channels. That channel performs to Category 6A. [2]

= Cat 6A

The useful reading of all three: a category is a bandwidth spec with conditions attached, not a speed badge. Ask what frequency, over what length, in what alien crosstalk environment, and at what temperature.

THE ARITHMETIC NOBODY QUOTES

The channel is 102 metres of insertion loss





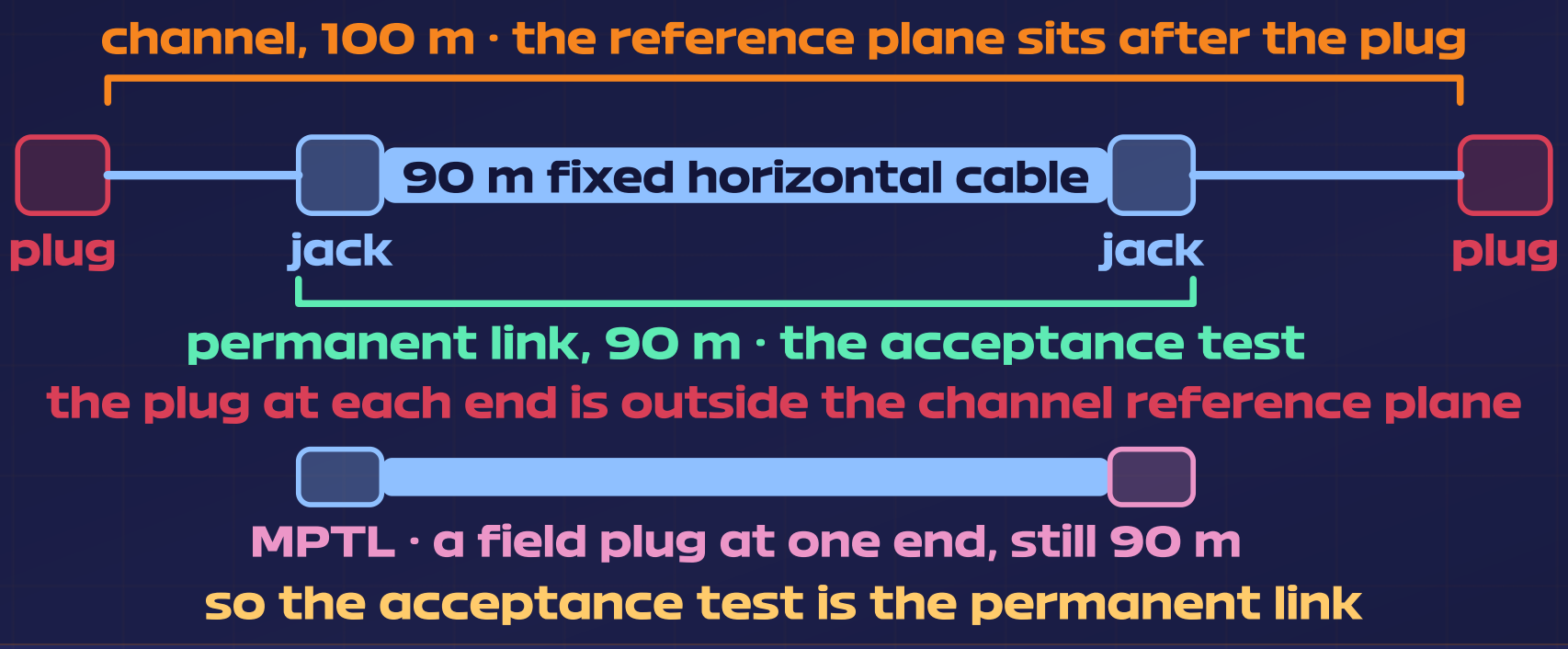
A field certifier reporting a Cat 6A link pass. The channel adds the two patch cords, and the line above is what they cost.

ANSI/TIA-568.0-E works in equivalents: cord allowance = (102 - link length) / D, where D is 1.2 for 24 AWG stranded, 1.5 for 26 AWG and 1.95 for 28 AWG. Beside a 90 m link that is 10 m of 24 AWG cord but only 6.2 m of 28 AWG. [2][3]

So thin patch cords consume the cord allowance faster. Cords with a 1.95 factor (28 AWG) are also limited to 15 m in any channel. [2]

WHY THE ACCEPTANCE TEST IS THE PERMANENT LINK

A channel test does not assess its end plugs

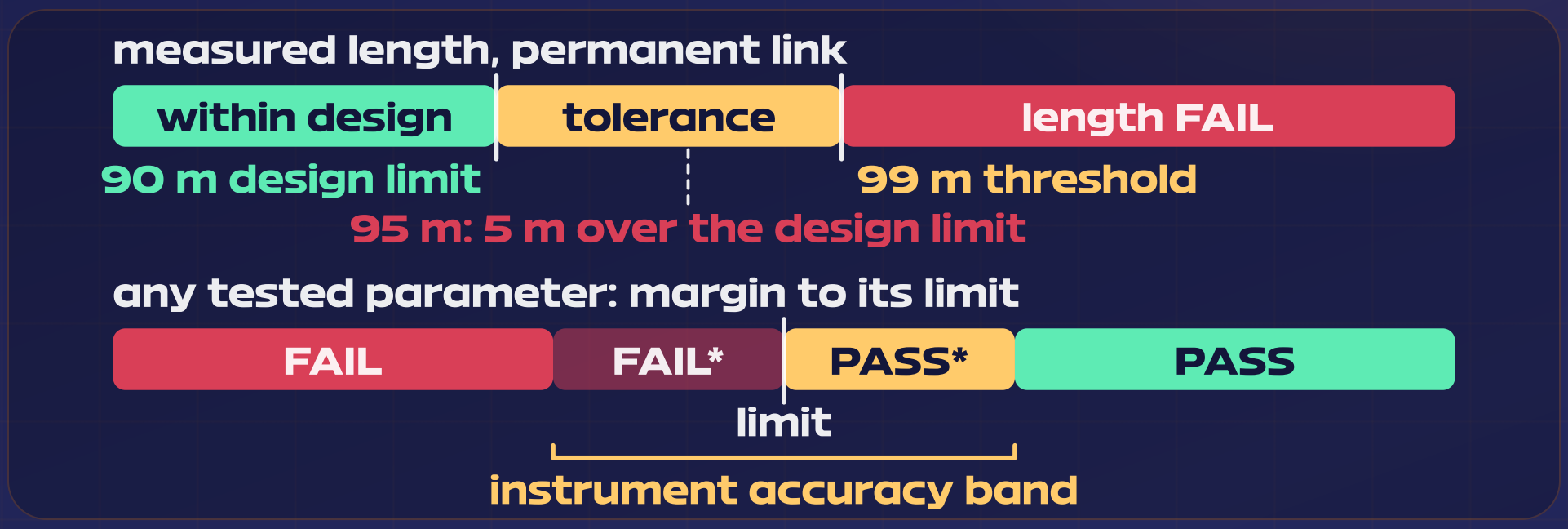


1. In a channel test the tester interface sits **after** the plug at each end, so the mated performance of those end plugs is not assessed. That is why acceptance is tested on the permanent link. [5]
2. Permanent link limits are deliberately tighter: TIA sets them "to ensure that permanent links can be extended into compliant channels". [4]

An MPTL (jack at one end, field-terminated plug at the other) is a recognised topology in ANSI/TIA-568.2-D Annex F, up to 90 m, tested to permanent link limits. It is not a way around permanent link testing. [4]

READING A TEST REPORT

Length limit, tolerance and PASS*



Design limit: 90 m permanent link

Set by the cabling standard. Channel: 100 m. [2]

90 m

Length tolerance: about +10%

Delay and NVP carry uncertainty, so a tester may not fail length before about 99 m. [5]

99 m
110 m

PASS*: inside the accuracy band

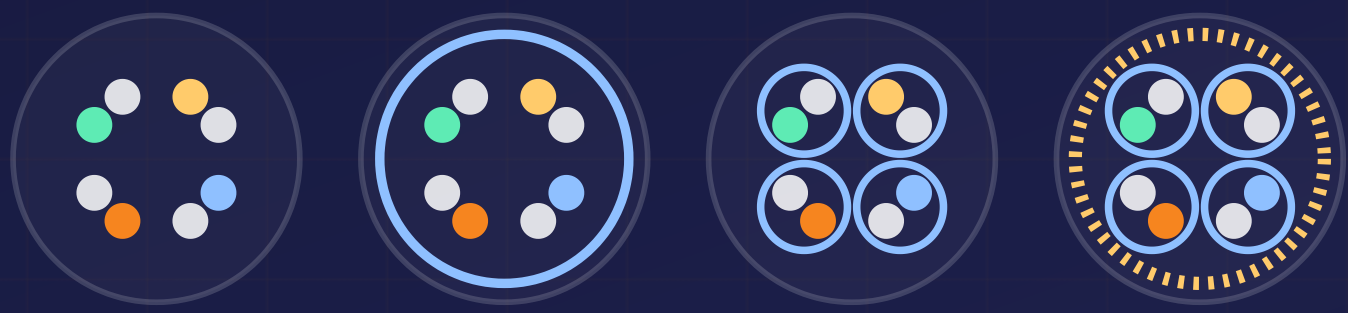
Within the instrument's accuracy band of its limit. The overall result depends on every required test. [5]

PASS*

Tolerance is not design permission: a 95 m permanent link is 5 m over the design limit.

BEFORE THE GULF NUMBER

Screened is a construction, not a category



	U/UTP	F/UTP	U/FTP	S/FTP
overall	none	foil	none	braid
each pair	none	none	foil	foil

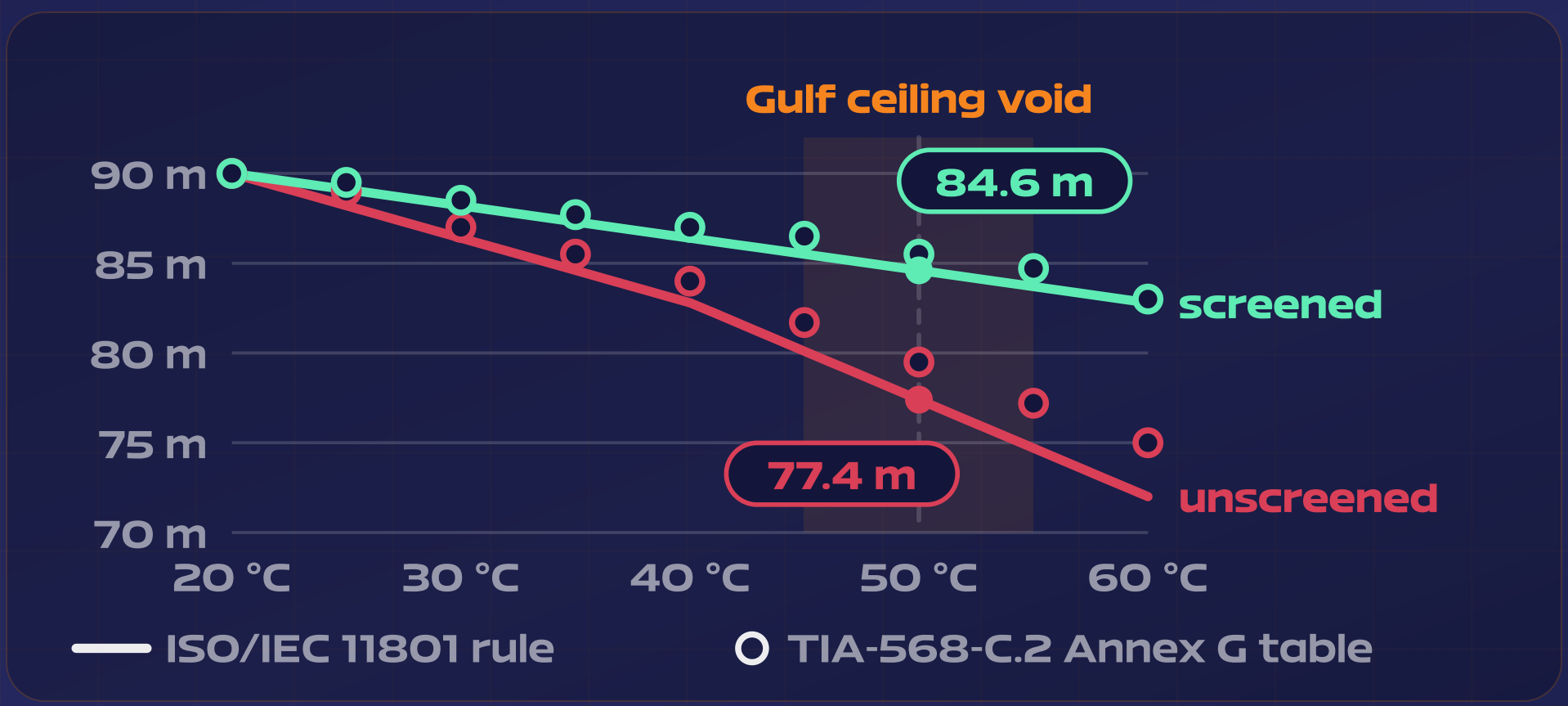
Cat 6A is sold in all four: the Category does not say which

1. The name reads in two halves: the overall screen before the slash, the pair screen after it. U is unscreened, F is foil, S is braid. ISO/IEC 11801-1 carries the schema in Annex D. [7]
2. TIA's Category definition never mentions a screen, so U/UTP, F/UTP and S/FTP Cat 6A are all Cat 6A. A tender that says only "Cat 6A" has not chosen a construction yet. [1]

Shielding depends on correct termination and bonding. ANSI/TIA-568.0-E requires the screen bonded to the PBB or SBB, and treats over 1.0 Vrms screen to outlet earth as improper grounding. A drain-wire-only contact is less effective at high frequencies. [2][10]

THE GULF NUMBER

Heat does not break the cable. It shortens it.



1. Insertion loss rises with temperature, and the guidance responds by **shortening the permitted run**, not by relaxing the limit. Published lengths assume 20 °C. [6]

2. At 50 °C an unscreened horizontal run falls from 90 m to 77.4 m, and a screened one only to 84.6 m, because ISO/IEC 11801:2002 de-rates screened cable at a lower rate. [6]

The strongest commercial argument for screened cable in a Gulf ceiling void, and it is not about noise: unscreened loses 12.6 m of design length at 50 °C, screened loses 5.4 m.

SAME PROBLEM, DIFFERENT METHODS

Name the document, not just the rule



the same cable, 2.1 m apart at 50 °C and 3.0 m at 60 °C

ISO/IEC 11801 states a percentage rule. ANSI/TIA-568-C.2 Annex G publishes a table. At 50 °C they give 77.4 m and 79.5 m for the same unscreened cable, a gap of 2.1 m. [1][6]

A specification that says "de-rate for temperature per the standard" is therefore ambiguous by about 2 m. Name the document and the table. TIA's table also assumes the patch cords stay at 20 °C, so a hot distributor room adds loss the table does not show.

POE AND CATEGORY

Type 4 PoE: 90 W at the source, 71.3 W at the device

	Type 3 · 60 W at PSE	Type 4 · 90 W at PSE
Cat 5e	100 m	100 m
Cat 6	100 m	100 m
Cat 6A	100 m	100 m
Cat 8	100 m	100 m

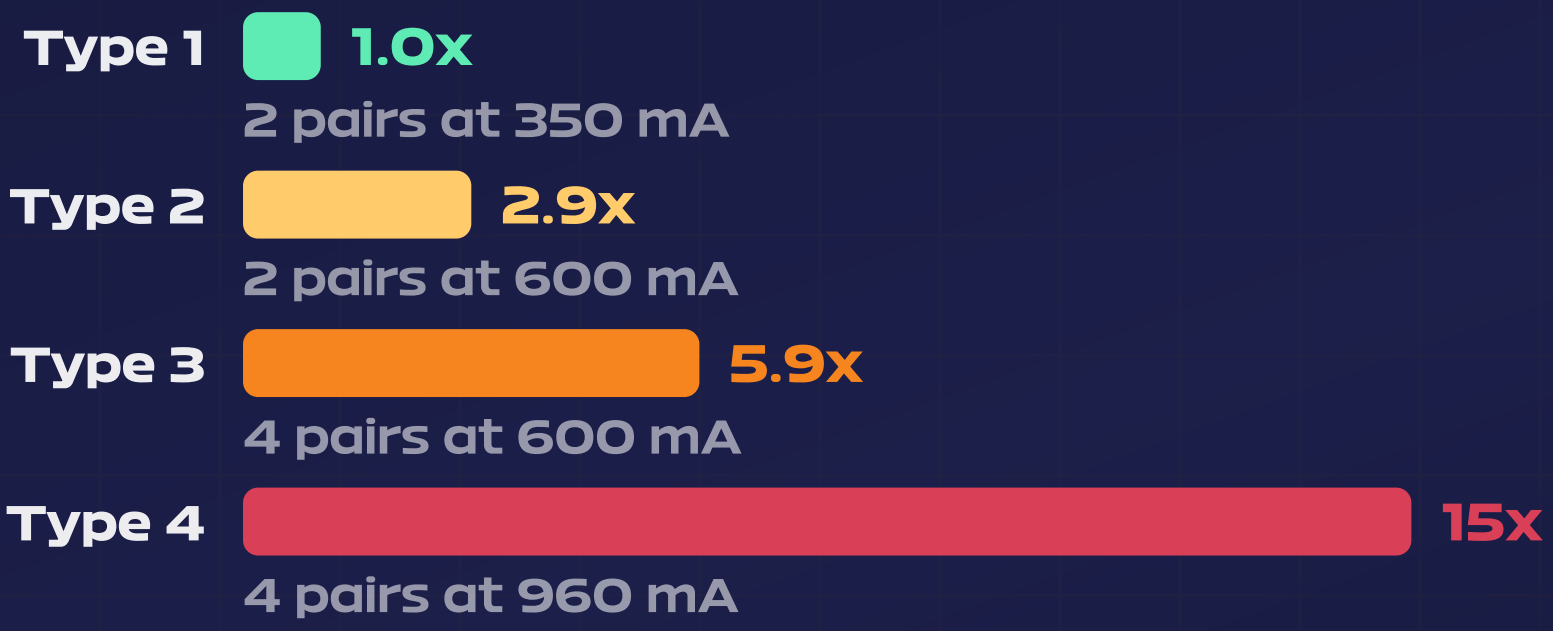
listed length, TIA-568.0-E Annex C Table 5
Type 4 at the PD: 71.3 W over a compliant channel

ANSI/TIA-568.0-E Annex C Table 5 lists IEEE 802.3bt Type 3 and Type 4 PoE on Category 5e, 6, 6A and 8, each to 100 m. Type 4 specifies up to 90 W at the PSE and 71.3 W available at the PD over a compliant channel. [3][8][15]

Category alone does not guarantee a safe bundle temperature. Bundle size, ambient, current and installation decide that (slides 11 and 12). A higher Category can add thermal margin; it is not a prerequisite for a PoE Type.

WHY THE BUNDLE IS THE PROBLEM

Heat goes as the current squared, times the pairs



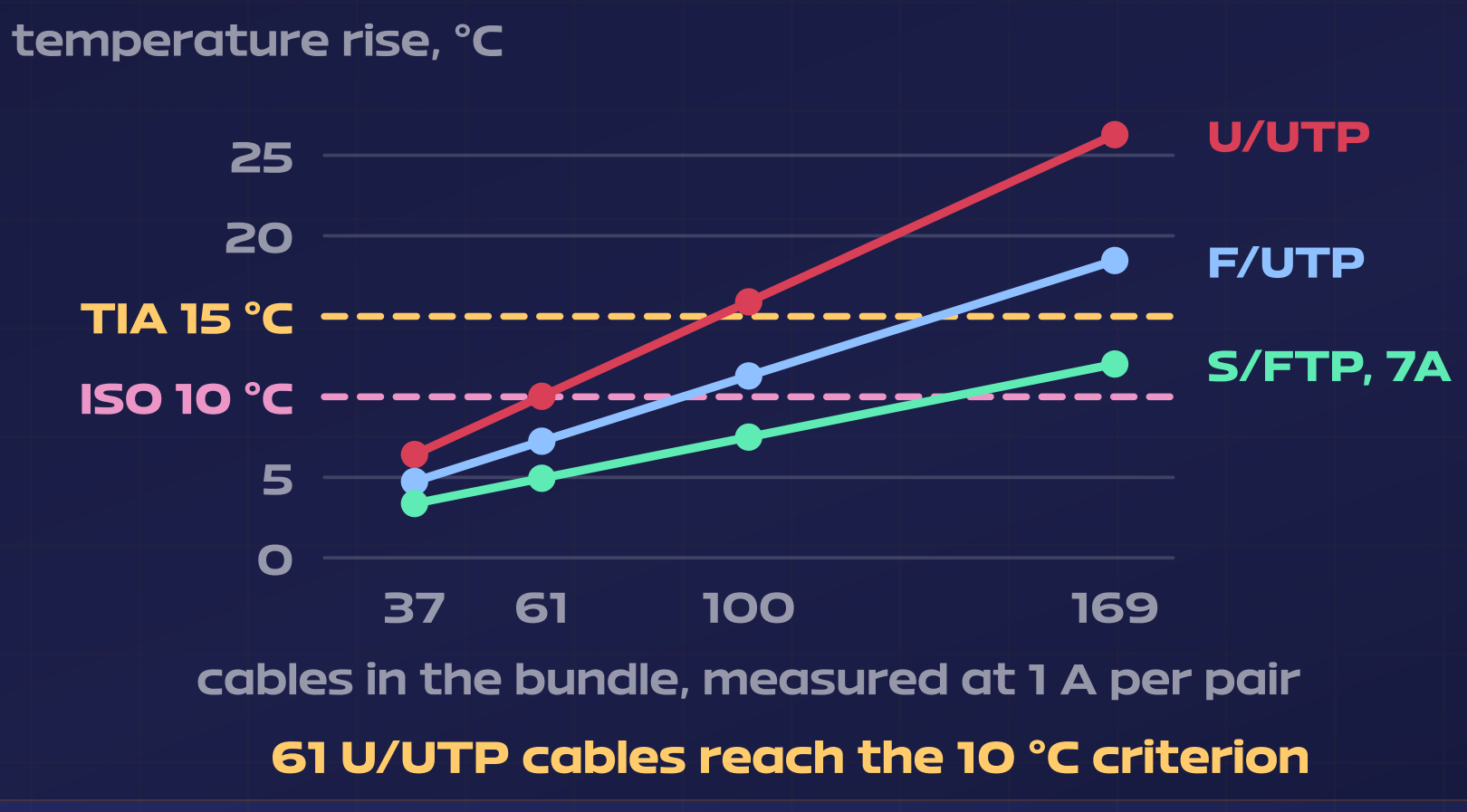
first-order model: pairs times current squared
Type 1 to Type 4: 7.5x per pair, 15x per cable

So Type 3 to Type 4, 600 mA to 960 mA per pair, is not a 60% increase in resistive loss: it is **2.56 times**. Type 1 runs two pairs where Type 4 runs four, so per cable the ratio is **15 times**, not 7.5. [8]

The square law is the model the IEEE cable-heating work assumed, so treat it as a first-order comparison, not a temperature multiplier. Measured: tidy bundles run hotter than random ones, and a bundle needs four to six hours to reach equilibrium. [13]

THE WHOLE THERMAL ARGUMENT IN ONE LINE

Your budget is 60 °C minus the ambient



61 U/UTP cables reach the 10 °C criterion

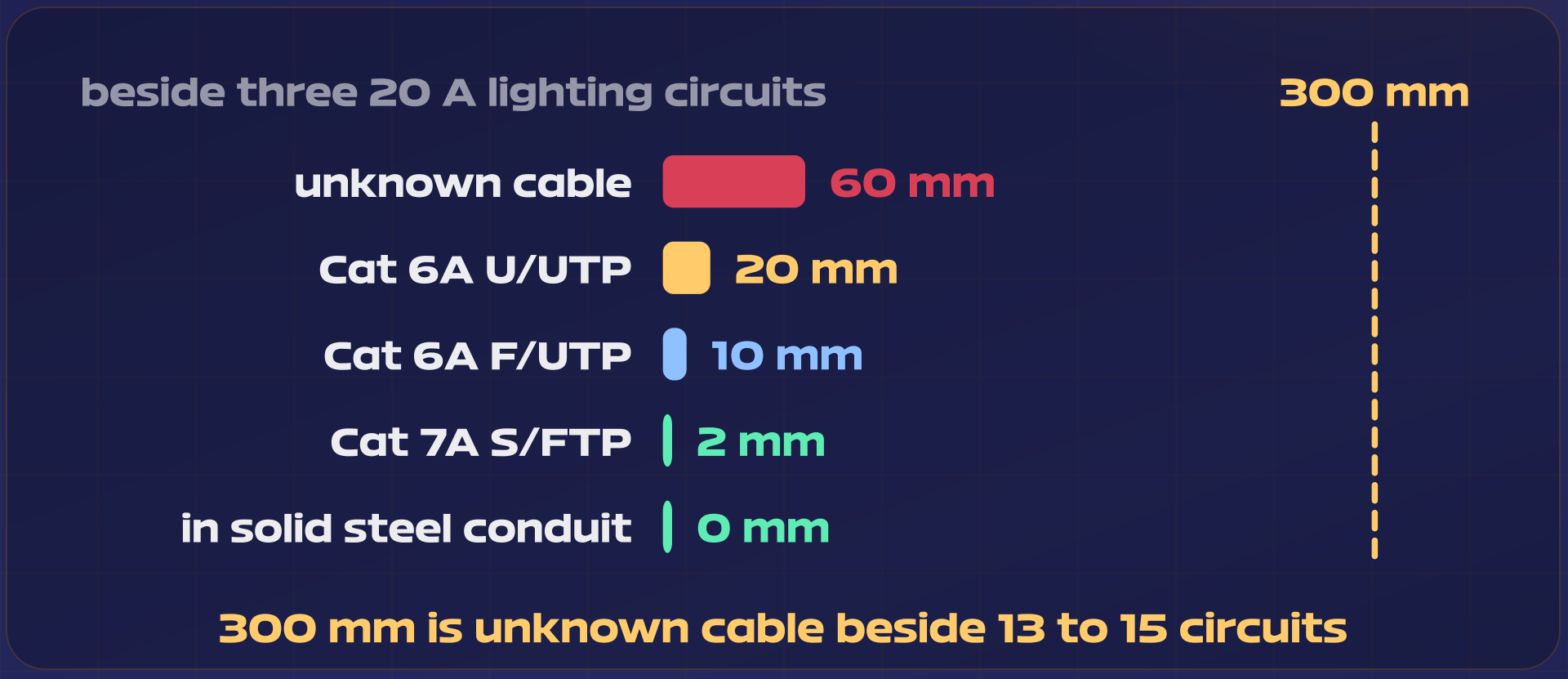
1. That is the cable's rating. TIA TSB-184-A assumes a 45 °C ambient and 15 °C of PoE rise; ISO/IEC TS 29125 assumes 50 °C and 10 °C. Both are design guidance. [9]

2. In Siemon's test at 1 A per pair, a 61-cable Cat 6A U/UTP bundle rose 10.0 °C, reaching the 10 °C criterion. At 100 cables U/UTP rose 15.9 °C and F/UTP 11.3 °C, about 29% cooler. [12]

Diversity is the cheapest margin. In TSB-184 partial-loading data (Cat 5e, 100 cables, 600 mA), 96 of 400 pairs energised rose 2.4 °C; all 400 rose 10.0 °C. [14]

THE CEILING VOID IS SHARED

300 mm is a calculation, not a rule

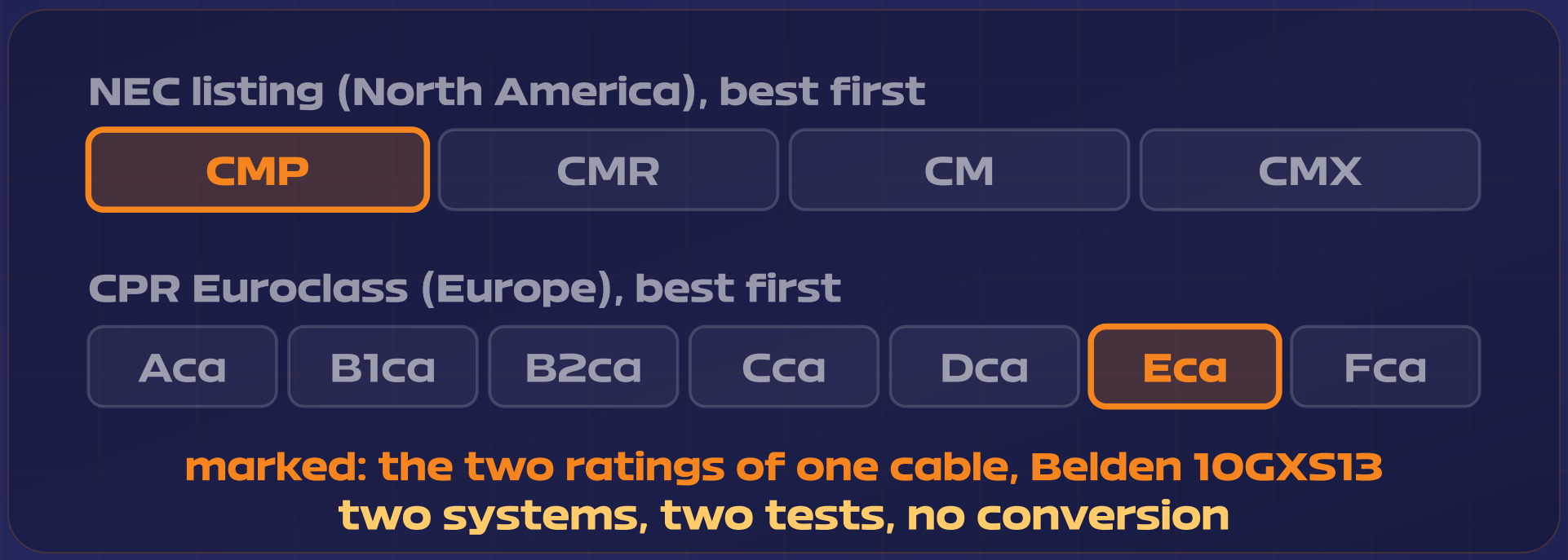


1. EN 50174-2:2018 calculates separation as A = S × P. S depends on the cable's segregation class and the containment; P on the number of 20 A circuits (0.2 for one to three). [10]
2. In this example: unscreened Cat 6A 20 mm, screened 10 mm. Solid steel containment (equivalent to 1.5 mm steel conduit) gives 0 mm. [10]

Clause 6.2.2 allows zero separation in an E1 environment for class b, c or d cable with sheathed circuits up to 100 A, except in distributor spaces. Local regulations may require more. [10]

FIRE CLASSIFICATION

CMP and Euroclass are different fire systems



CMP is a North American listing (NEC Article 800, NFPA 262 test). Euroclasses belong to the European CPR (EN 13501-6, EN 50575) and use different tests. A product carries a rating in each system only if it is tested for each. [11]

Example: **Belden 10GXS13**, a Cat 6A U/UTP plenum cable, is listed CMP and declares Euroclass Eca. That is one product with two separate ratings, not an equivalence. And "LSZH" alone is not a complete reaction-to-fire classification. [11][16]

THE WARRANTY

A 25-year system warranty is a manufacturer programme, not a standard

system warranty	25 years · vendor terms	
ISO/IEC 11801:2002	10 years	no upper figure

a warranty term and an expected life are different things

The cabling standards do not define a system warranty. ANSI/TIA-568.0-E uses "warrant" only in its notice; ISO/IEC 11801:2002 does not use the word. [2][6]

WHAT TO CHECK IN THE WARRANTY YOU ARE OFFERED

- approved installer and registered project
- specified components from one vendor
- certified test results submitted
- rules for later moves, adds and changes
- exclusions and any liability cap

Terms vary by vendor; two examples are cited. [17]

ISO/IEC 11801:2002 expects a usable life in excess of 10 years, and advises designing horizontal cabling for the longest operational life. [6]

THE CLAUSE TO WRITE

Four lines that can be tested

HORIZONTAL CABLING: DESIGN BASIS AND ACCEPTANCE

"a. Each permanent link shall be tested to ANSI/TIA-568.2-E Category 6A limits with an ANSI/TIA-1152-A Level IIIe tester; native results per link.
b. Link length shall be de-rated for a declared 50 °C cable temperature per ISO/IEC 11801:2002 Table 21 note: 84.6 m screened, 77.4 m unscreened.
c. PoE bundles shall be sized to TIA TSB-184-A for the declared ambient, PoE Type and energised pairs.
d. Separation from power shall be calculated to EN 50174-2:2018 cl. 6.2 (A = S × P) and shown on the containment drawings."

1. Each line names a document, a quantity and a method. The references are chosen per topic, not one combined standard.
2. Fire is its own line: a named Euroclass with sub-classes, or the NEC listing. Never LSZH alone.

Deliberately absent: TIA Category 7 · a Category-to-PoE-Type ladder · a universal 300 mm rule · a standards-defined 25-year warranty.

SOURCES

Where every number in this deck comes from

STANDARDS AND GUIDANCE

[1] ANSI/TIA-568-C.2 (2009) cl. 4.2; Annex G Table G.2
[2] ANSI/TIA-568.0-E (2020) cl. 5.8, 5.10.2, 6.2.5, 6.2.6
[3] ANSI/TIA-568.0-E (2020) Table 1; Annex C Table 5
[4] ANSI/TIA-568.2-D (2018) Annex F; ANSI/TIA-568.2-E (2024)
[5] ANSI/TIA-1152-A (2016), field tester accuracy
[6] ISO/IEC 11801:2002 Intro; cl. 5.3.5, 7.2.2; Table 21
[7] ISO/IEC 11801-1:2017+AMD1:2025 Annex D
[8] IEEE 802.3bt objectives; IEEE Std 802.3-2022 cl. 145
[9] TIA TSB-184-A; ISO/IEC TS 29125
[10] EN 50174-2:2018 cl. 6.2, Tables 7-10; 2009+A1 cl. 5.3.6
[11] NFPA 70 Table 800.179; NFPA 262; EN 13501-6; EN 50575

MEASURED DATA AND VENDOR DOCUMENTS

[12] Siemon, IEEE 802.3bt, Jan 2014, slide 13
[13] CommScope (Larsen), Belden (Kish), IEEE 802.3bt, 2014
[14] DiMinico, IEEE 802.3bt, Jan 2015, slide 10
[15] Ethernet Alliance, 802.3bt overview v2.1 (2019)
[16] Belden 10GXS13 datasheet (CMP, Euroclass Eca)
[17] CommScope BR-111043.1-EN (2018); Panduit H2-2692 (2018)

Measured and vendor data are examples under stated conditions, not normative limits.

PRACTICAL LIGHTING ENGINEERING

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Read the full episode article

https://nlc.com.sa/academy/structured-cabling.html

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