VOLTAGE DROP IN MILLIVOLTS PER AMP PER METRE

DOES 1.5 MM² PASS VOLT DROP AT 37 METRES?

What it's for: checking there are enough volts left to **push the current through the load**. It's less about "how many volts are left at the end" and more about whether the push is enough. Drop too many volts and the load may not work as intended.

THE LIMITS: TABLE 4AB

SUPPLIED FROM A PUBLIC SUPPLY	LIGHTING (3%)	OTHER USES (5%)
Single-phase 230 V	6.9 V	11.5 V
Three-phase 400 V	12 V	20 V

"Other uses" is the book's wording for any circuit that **isn't lighting**. The second row of Table 4Ab (installations supplied from a **private** supply) is very rarely used. You'll almost always use the first row, the public supply.

BS 7671 · Appendix 4 · Table 4Ab maximum voltage drop

THE CALCULATION

$$VD = (mV/A/m \times Ib \times L) \div 1000$$

mV/A/m from the cable's **B** table · Ib in amps · L = length in metres · answer in volts

Why ÷ 1000? mV/A/m is **milli**volts per amp per metre. Without dividing by 1000, the answer comes out in millivolts. Dividing by 1000 turns it into **volts**, so you can compare it with Table 4Ab.

WORKED EXAMPLE: THE SAME CIRCUIT (MADE-UP VALUES)

```
Length 37 m · Ib 13.2 A (must be ≤ In of 16 A) · 1.5 mm²
Table 4E1B: ignore the DC column
  use the single-phase AC column for reference methods
  A and B (in conduit or trunking)
  1.5 mm² → 31 mV/A/m

VD = (31 × 13.2 × 37) ÷ 1000
   = 15 140.4 ÷ 1000
   = 15.14 V

Not lighting → max 5% = 11.5 V
15.14 V > 11.5 V  ✗  → voltage drop exceeded → increase the CSA
```

BS 7671 · Table 4E1B · 90 °C thermosetting single-core, voltage drop (mV/A/m) · **p.487**

31 mV/A/m means that cable, installed that way, loses 31 millivolts for **every amp, for every metre**. You fix too much voltage drop by **increasing the conductor size** until the answer comes in under the limit. You never make the device bigger to fix it.

ONE MORE CHECK: THE LARGEST MV/A/M THAT WOULD PASS

```
max mV/A/m = (max VD × 1000) ÷ (Ib × L)
           = (11.5 × 1000) ÷ (13.2 × 37)
           = 11 500 ÷ 488.4
           = 23.55 mV/A/m
→ go down that Table 4E1B column to the first size at or below 23.55.
```

Level 4 preview: the Ct calculation

In Appendix 4 there's a formula for **Ct** that looks complicated. You **won't** do it at Level 3, but here's the idea. Say volt drop pushes you from 1.5 mm² up to 2.5 mm². There's still only 13.2 A flowing, but in a bigger conductor, so it runs **cooler**. A bigger conductor gets rid of heat more easily. Stir a boiling pan with a teaspoon and it burns your fingers fast. A big dessert spoon takes much longer. Ct lets a Level 4 designer take account of that cooler running.

BS 7671 · Appendix 4 · Ct formula (Level 4 only) · **p.457**

Recap so far Amps in a circuit? Power triangle, `P ÷ V` ($\sqrt{3} \times V_L$ for three-phase).
Cable size? Know the cable type, installation method, In and the correction factors. Decide which factors happen at the same time. Work out `It = In ÷ factors`. Find a table value at least that big.
Voltage drop? Use the **B** table that goes with your cable table, take the mV/A/m and do `mV/A/m × Ib × L ÷ 1000`.

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