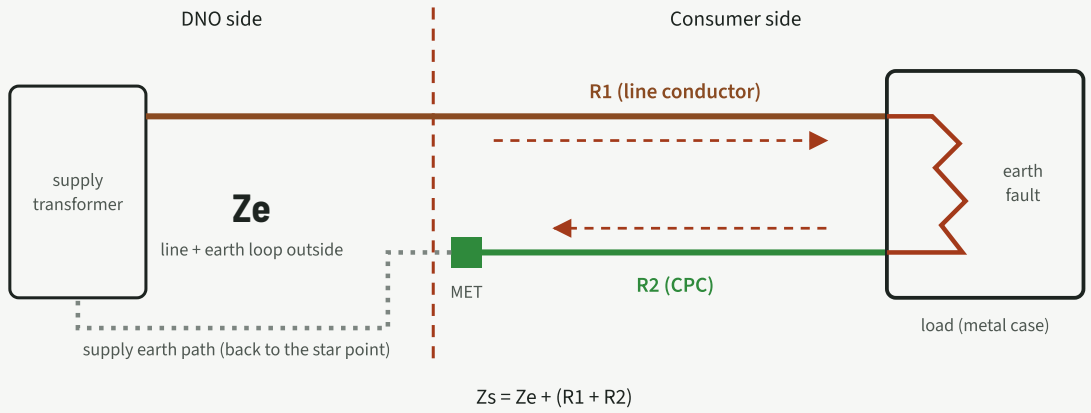
R1 + R2 AS A DESIGNER: TABLE B3

WHY MULTIPLY BY TABLE B3?

What it's for: the designer's next question is **"will ADS happen on my circuit?"** Automatic disconnection of supply can't happen without a **path to earth** from the exposed-conductive-parts back to the MET. So the designer needs the circuit's **Zs**, and for that they need **R1 + R2**.



The earth fault loop. The **DNO** gives us **Ze** (the line and earth loop *outside* the installation). We finish it off with the circuit, **R1 + R2** (the line and CPC loop *inside*). The fault path is basically the line and the earth path together.

DESIGN, INSTALL, VERIFY

This one **overlaps with testing**. The designer works out R1 + R2 on paper. The installer builds it. Months later the inspector measures R1 + R2 with a low-resistance ohmmeter (test method 1) and checks it against the design. Design → install → verify → back to the design. That's why several books print the same table.

WHERE TO FIND THE RESISTANCE PER METRE

Table B1 gives the resistance of line + CPC **per metre** (mΩ/m) at 20 °C, for each combination of sizes. The same table appears in three books, with identical values. For 2.5 mm² line with 1.5 mm² CPC (standard 2.5 mm² twin and earth), all three give **19.51 mΩ/m**.

- **Guidance Note 3** · Appendix B · Table B1 R1 + R2 per metre (mΩ/m) · **p.174**
- **On-Site Guide** · Appendix I · Table I1 (the same table) · **p.226**
- **Electrical Installation Design Guide** (IET, Level 4 book) · Appendix F · Table F1 (the same table)

You have GN3 in your inspection and testing exams, so use **Table B1**. The On-Site Guide isn't used in most exams. Strictly, GN3 is an inspection and testing

book, not a design book. But it's the one everyone knows, and the values are the same.

DESIGNER'S FORMULA

$$R1 + R2 = (\text{Table B1} \times \text{Table B3} \times L) \div 1000$$

B1 in mΩ/m · B3 = multiplier · L = length in m · ÷ 1000 turns milliohms into ohms

Table B3 is a short table of just **six multipliers**. It corrects the resistance to the conductors' **operating temperature**. Earth faults only happen while a circuit is **on** (a live part touching an earthed part). A working circuit's conductors are warmer, and warmer copper has more resistance. B3 lets the designer copy those operating conditions on paper.

TABLE B3 MULTIPLIERS USED HERE	VALUE
70 °C thermoplastic, CPC **incorporated in a cable** (e.g. twin and earth) or bunched	1.20
Conductors run on their own, separated (e.g. singles spaced out on cable tray)	1.04
90 °C thermosetting, incorporated in a cable	1.28

Guidance Note 3 · Table B3 operating-temperature multipliers · **p.176**

SIX MULTIPLIERS IN TOTAL. CHECK THE REST IN YOUR COPY

WORKED EXAMPLE: RADIAL, 2.5/1.5 MM² TWIN AND EARTH, 17 M

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Table B1 (2.5 mm² line + 1.5 mm² CPC) = 19.51 mΩ/m
Table B3 (70 °C thermoplastic, in a cable) = 1.2
L = 17 m (the designer knows it from the drawings)

R1 + R2 = (19.51 × 1.2 × 17) ÷ 1000
        = 398.0 ÷ 1000
        = 0.40 Ω
```

Watch outA common slip is to give the answer as **0.33 Ω**. That's 19.51 × 17 ÷ 1000, which **leaves out the 1.2** from Table B3 (even though it's written in the working). With the multiplier included it's 19.51 × 1.2 × 17 ÷ 1000 = **0.398 ≈ 0.40 Ω**. The method is right. Only the final number slips.

The designer is saying: *"If you follow my design, when the inspector comes to verify it, they should measure this value or something close to it."*

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