SIZING A CABLE: CORRECTION FACTORS AND IT

WHICH CORRECTION FACTORS HAPPEN AT THE SAME TIME?

What it's for: choosing the cross-sectional area (CSA) of a conductor from the information you have. It's a **selection**, not measuring a conductor. Before you start you need to know four things:

1. the **cable type** (e.g. 90 °C thermosetting singles),
2. the **installation (reference) method**,
3. any **correction factors** present, and
4. the **device rating**, `In`. On a 6 A circuit breaker, the "6 A" is the In.

OUR SCENARIO

```
90 °C thermosetting unsheathed single-core conductors
protected by a 16 A Type C circuit breaker
ambient temperature 35 °C
passing through 100 mm of thermal insulation
grouped with one other circuit, in conduit (on a surface)
single-phase circuit

→ In = 16 A · Reference Method B (conduit on a surface)
```

A common mix-up is "70 °C thermosetting". It's **90 °C thermosetting**. (70 °C cable is thermo*plastic*, PVC.) **Ambient temperature** just means the air temperature around the cable.

FIND EACH CORRECTION FACTOR

FACTOR	WHAT IT'S FOR	WHERE TO FIND IT	VALUE
Ca	Ambient temperature. Read down the **90 °C thermosetting** column to **35 °C**.	Table 4B1	0.96
Cg	Grouping. **2 circuits in total** (always count the one you're designing), item 1 "bunched in air, on a surface, embedded or **enclosed**" matches cables in conduit.	Table 4C1	0.8
Ci	Cable surrounded by thermal insulation, 100 mm length of insulation (e.g. through a cavity wall)	Appendix 4 section 2.6 table (it has no table number)	0.78 (not used)

BS 7671 · Appendix 4 · Table 4B1 ambient temperature factors (Ca)

BS 7671 · Table 4C1 grouping factors (Cg)

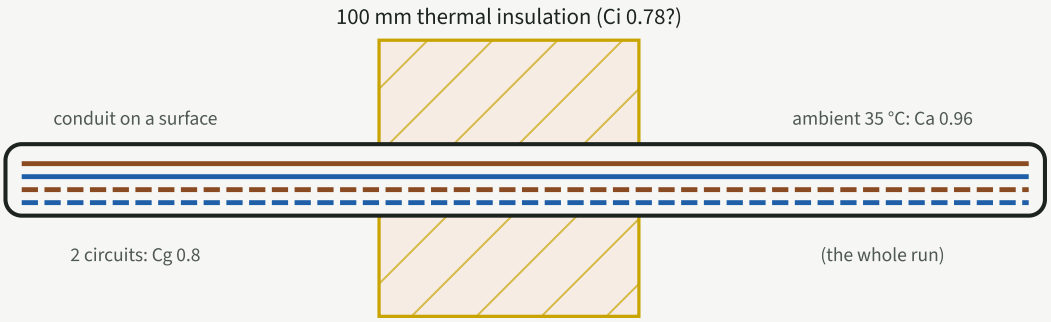
BS 7671 · Appendix 4 · 2.6 cable surrounded by thermal insulation (Ci), table with no number · **p.451**

Sparky's tip: the Ci table

The thermal insulation table is in Appendix 4 (p.451), but it has no table number. Tab it so you can find it.

WHICH FACTORS ARE HAPPENING AT THE SAME TIME?

This is the designer's key question. You only multiply together the factors that affect the cable **at the same place, at the same time**.



Ca and Cg: all along the run, at the same time → use both
Ci: the insulation surrounds the conduit, not the cable → left out

Our reasoning. The section 2.6 wording is "where a **cable** is totally surrounded by thermal insulation", not "a cable **or its containment**". Here the cables are surrounded by **conduit**, so we didn't apply Ci. Some designers would disagree and include it. There's a lot of judgement in design.

- **Ca**: there's **always** an ambient temperature.
- **Cg**: the two circuits run in the conduit together all the way, in that same ambient temperature. So Ca and Cg **are** happening at the same time.
- **Ci**: crossed out, "not used due to cable being surrounded by conduit, not thermal insulation".

The tailor analogy

Correction factors are like going to a tailor. Instead of buying trousers off the peg that fit a thousand other people, each factor is one of **your** measurements (waist, leg…). Put them together and you get a cable "made to measure" for its real surroundings. Some people are lucky and the off-the-peg size fits. Most of us need the tailor, and that's the It calculation.

THE IT CALCULATION

$$It \geq In \div (Ca \times Cg \times Ci \times Cf \ldots)$$

Divide the device rating by the factors that apply, multiplied together. It is in amps.

WORKED EXAMPLE: IT FOR OUR SCENARIO

```
It ≥ In ÷ (Ca × Cg)          (Ci not used)
   ≥ 16 ÷ (0.96 × 0.8)
   ≥ 16 ÷ 0.768
   ≥ 20.83 A
```

BS 7671 · Appendix 4 · the It ≥ In ÷ (Ca × Cg × Ci × Cf …) formula · **p.453**

On-Site Guide · Appendix F · the same formula

20.83 A isn't the current flowing in the circuit. It's the rating the cable would need in "perfect" conditions to cope with its real surroundings. People look in Chapter 43 for It, alongside Ib, In and Iz, and can't find it. That's because It is really the "tailoring" step in Appendix 4.

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