BS 7671: 2008 - EXTRANEOUS-CONDUCTIVE-PARTS

"A conductive part liable to introduce a potential, generally earth potential, and not forming part of the electrical installation"

This definition has not changed in the 17th Edition. In fact, it is basically the same as it was when it was first introduced in the 15th Edition.

It is worth just taking a look at it to remind ourselves of its meaning.

It is a conductive part that is not part of the electrical installation - so it is capable of conducting an electric current but that is not its intended function. Typical examples are: metallic service pipes; structural steel work; etc.

It is not part of the electrical installation so we do not expect that it would become 'live' under fault conditions. In our context - what we mean by 'become live' is attain a potential above zero volts that is sufficient to cause a dangerous current to flow through a person or animal depending on the situation.

Let's stick to people for now - what constitutes a dangerous current depends on the situation - but a commonly used value is 10 mA. This is the non-release threshold for most of the population. If a current above this value flows through your body you may not be able to control your muscles and break away from the source of the electric shock.

To complete our look at this, we need to explain 'introduce a potential, generally earth potential'. Let's do the easy bit first: earth potential - this is usually taken to be zero volts - so our extraneous-conductive-part is usually at or about zero volts and this means that if we touch it whilst also holding onto something that is 'live', i.e. above zero volts, we will get an electric shock.

Next is the hard part: 'introduce a potential' - the word 'introduce' is used in the context - introduce into. This generally means introduce into some defined area - many would call this area an 'earthed equipotential zone'. However, this term is not defined in the 17th Edition (it was in the 16th) - so we must take it to mean the electrical installation.

Let's keep it simple and assume that we are talking about a building with a single electrical installation inside it.

BS 7671 lists various extraneous-conductive-parts in 411.3.1.2 - most are straightforward but some cause endless discussion - is it or isn't it!?

Let's take a look at 'Other installation pipework and ducting' and 'Central heating and air conditioning systems'. In many cases these do not extend outside of the building so how can they introduce a potential?

Taking those that do not extend outside, they will not introduce a potential directly from the outside, but in some cases they may introduce the potential of the structure - that is, of the building. This will generally be at earth potential. After all, it does sit on the earth!

Now this will only happen if they are extensive systems with many points of contact to the building structure.

Another example we could look at would be an internal steel structure such as a staircase. This may or may not introduce earth potential - it all depends on how it is fixed to the building.

So how do we determine whether something should be bonded? Well some will say 'if in doubt' bond it, and this has some merit. Running bonding conductors to say, a staircase, after 'fit out' could be a big problem.

There is a method of testing that is described in the 16th Edition Guidance Note 5 (Protection against electric shock) & Guidance Note 8 (Earthing and bonding).

You need to read these for complete detail because situations will vary and it is the installation designer's responsibility to ensure that any decisions about bonding produce a safe installation.

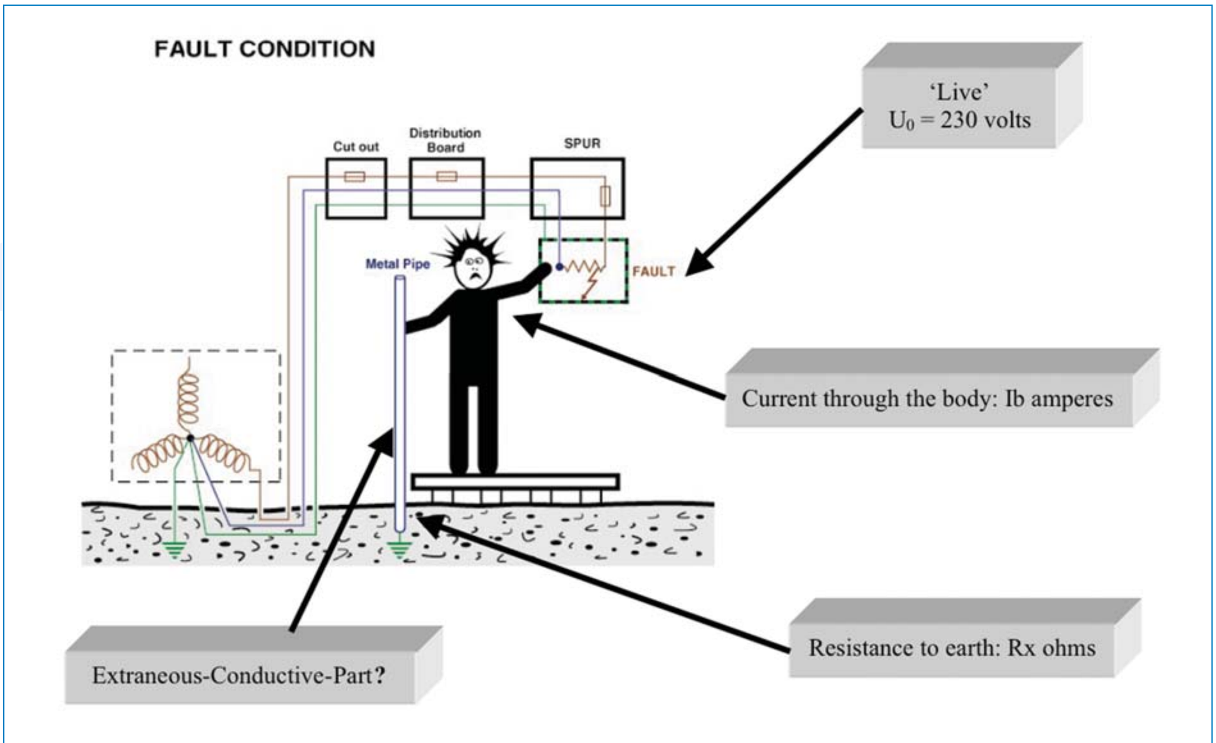
The basic idea is to check to see if we could get a dangerous shock between some part of the electrical installation that has become 'live' and the metalwork in question.

Obviously we can get an electric shock if we touch 'live' and a source of zero volts, but would it be a dangerous shock? To determine this we need to assess how much current would flow through the body.

Now this means that we need to know the resistance of the human body. This depends on the person and on the conditions, but a generally accepted figure for 95% of the population in dry conditions is around 1000 ohms.

LOOK AT THE DIAGRAM (below)

We said above that if the current flow through the body does not exceed 10 mA we may be considered to be relatively safe. It does depend on conditions, but using this for our example we can determine if the suspect extraneous-conductive-part needs to be bonded.



We want the current Ib to be less than 10 mA (0.01A).

So: $Ib < 0.01 < U0/(Rb + Rx)$

Where: Ib = Current through the body in amperes

Rb = Body resistance in ohms

Rx = Resistance to earth of the suspected extraneous-conductive-part

We can rearrange this equation to:

$Rx > (U0/Ib) - Rb$

Let's put some figures in:

$Rx > (230/0.01) - 1000$ ohms

$Rx > 22000$ ohms or 22 kOhms.

You might want to add a factor of safety to allow for measurement errors and use a value of, say, 25 kOhms.

SO HOW DO WE MEASURE IT?

We just need to test between the suspected extraneous-conductive-part and the MET or nearest known connection to Earth, such as the cpc of a local circuit (so long as its connection to true earth has been verified).

We would normally use an insulation resistance test instrument set on a low range (values in the region of 25 kOhms) and carry out a test between the suspect part and the known earth to determine the resistance.

Further details on this method can be referenced from the IET Guidance Notes 5 & 8 and the designer should always satisfy themselves that they are confident the method is satisfactory for the situation.

FURTHER INFORMATION

Contact: Electrical Contractors' Association Tel: 020 7313 4800 or visit the website www.eca.co.uk