

Additional protection: Verification of the supplementary protective equipotential bonding system in medical locations of group 1 and group 2

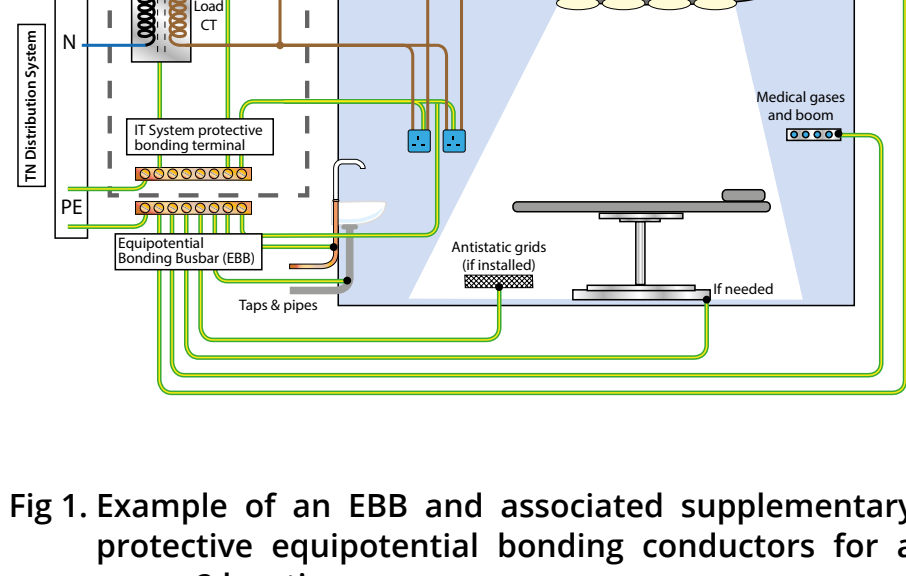
Like all aspects of verification, the visual inspection is very important and to this end the following points should be considered:

- Has the equipotential bonding busbar (EBB) been installed?

- Is the location of the EBB suitable i.e. in or near to the medical location it serves?
- Is the EBB readily accessible, and have local infection

- Are the connections/conductors connected to the EBB arranged so that they are accessible, clearly labelled, and able to be disconnected individually?
 - Has the EBB been connected directly to the system earthing arrangement with a conductor cross-sectional area at least equal to that of any conductor connected to the EBB.
- Note:** The earthing arrangement will form part of a TN or TT earthing system. **It is not** permitted to connect the EBB to the earthing arrangement indirectly via the medical IT system protective bonding terminal.
- Typical medical IT system with insulation monitoring

The diagram shows a monitoring system (including an insulation monitor) connected to an alarm panel. The alarm panel is connected to a power source (battery) and a communication line (green line).



Once all of the above have been confirmed visually, continuity testing of the conductors shall be undertaken as follows:

- The end-to-end resistance of the conductor connecting the

EBB to the system earthing arrangement (while there is not a specific resistance value for this conductor it is desirable to be as low as possible).

- the end to end resistance of the individual conductors from the EBB to the numerous items within the group locations as required by **regulation 710.415.2.101** (while there is not a specified maximum value for the resistance of these conductors it is desirable for the resistance to be as low as possible and not uncommon, given the length of runs, for them to be less than 0.1 Ω)
- It is then necessary to undertake testing between points as required by **regulation 710.415.2.102**; the purpose of this test is to verify that the resistance values point-to-point are such that the voltages given in **regulation 710.415.2.2** (25 V AC or 60 V DC) are not exceeded and in any case, the resistance must not exceed 0.2 Ω .
- For AC systems the following formula is used:
- $$R \times I_a \leq 25 \text{ V}$$
- $$0.2 \times (5 \times 25) = 25 \text{ V}$$
- Where:
- R is the resistance between simultaneously accessible exposed

conductive parts, including the terminals
conductor of socket-outlets and of fixed equip-
ment, extraneous conductive-parts and the supply
equipotential bonding connection points (see

known as point-to-point earthing arrangements may be required.

l_a is the
within

Where a circuit-breaker to *BS EN 60898-1* is used, I_a may be taken from the instantaneous operating characteristic for the device. For example, for a type B circuit-breaker, the instantaneous operating current is taken as:

$$I_a = 5 \times I_n$$

For a type C circuit-breaker, the instantaneous operating current

is taken as:

$$l_a = 10 \times l_n$$

It is important to understand that the value 0.2Ω is not a performance criterion for every circuit arrangement.

Note: The 0.2Ω value is based on the use of a type B circuit-

Therefore:

ces having different
ed, the required

verify that the voltages given in **regulation 710.415.2.2** are not exceeded is required. This can be proven using the formula above.

It is important to remember and understand that with a medical IT system the circuit is intended to not automatically disconnect

on first fault to earth, however consideration should be given to a second fault to earth scenario where the fault path could be created when a fault to earth occurs on a different conductor of the same transformer either the same circuit or a different circuit.

Example 1

For a type B 20 A circuit breaker with an assumed maximum recorded resistance of 0.2 Ω as stated in **regulation 710.415.2.102**, the touch voltage under fault conditions would be as follows:

$$V = R \times (5 \times I_n)$$

$$V = 0.2 \times (5 \times 20) = 20 \text{ V}$$

As can be seen, the resulting voltage is less than 25 V and as

Example 2

$$V = R \times (10 \times I_n)$$

resulting voltage is greater than the input voltage.

$$R \leq \frac{25}{200} = 0.125 \Omega$$

Additional protection: RCDs

Regulation 710.411.4.205 requires additional protection by

characteristics specified in *reg*
circuits (except medical I
and group 2.

regulation 710.415.2.2 will typ

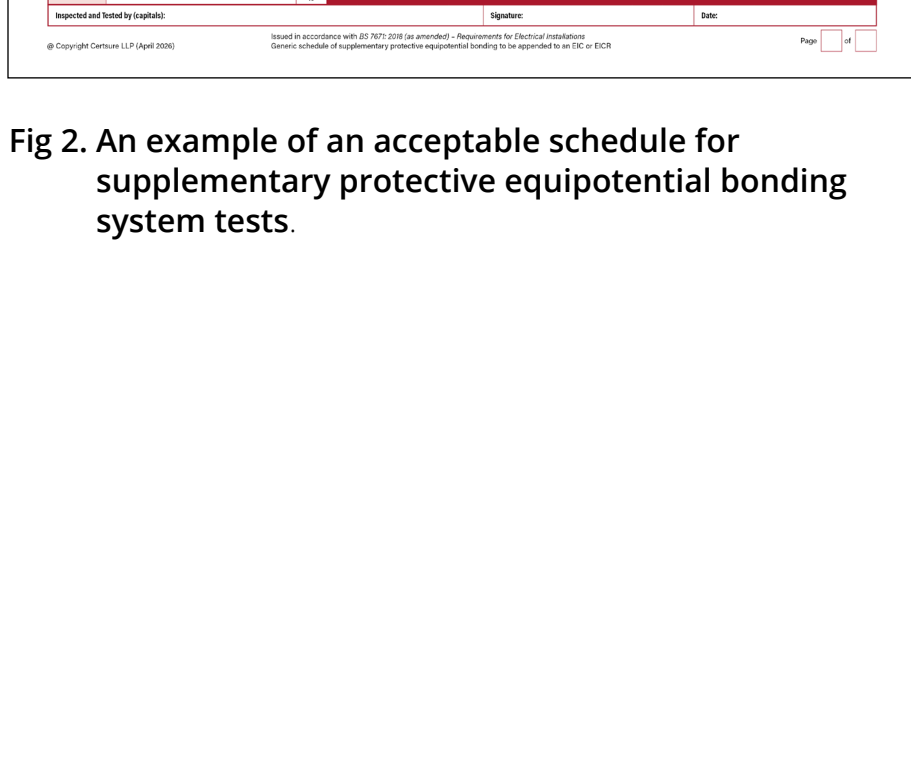
$$V = R \times I_{\Delta n}$$

The test results should be recorded on a schedule (see Fig. 2), and this should be appended to the Electrical Installation Certificate relevant to the work undertaken.

The schedule should identify all exposed-conductive-parts and extraneous-conductive-parts connected to the EBB and record the measured resistance values between the relevant points

Module is given in **Annex E**
of this is shown below as

 APPROVED CONTRACTOR	This certificate is not valid if the serial number has been indicated or altered.	EBB18.4
SUPPLEMENTARY PROTECTIVE EQUIPOTENTIAL BONDING		
MEDICAL LOCATION : GENERIC SCHEDULE OF SUPPLEMENTARY PROTECTIVE EQUIPOTENTIAL BONDING INSPECTION AND TEST RESULTS		
ROOM LOCATION: _____ MEDICAL LOCATION GROUP NUMBER: _____		
Protective conductor (PE) connecting EBB to system earthing TBB Reference: _____		
TBB connected to _____ CSA (mm ²) _____ Connections/continuity Verified: ☐ ☐ ☐ ☐ ☐ ☐		
TBB Details	Conductor Ref: _____ Continuity ID: _____ Connected Y/N: _____ Description: _____	Conductor Ref: _____ Continuity ID: _____ Connected Y/N: _____ Description: _____

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