GUIDE TO LOW VOLTAGE BUSBAR TRUNKING SYSTEMS

beama *Installation*

BEAMA*Installation* Ltd

ABOUT BEAMA*Installation*

BEAMA*Installation* is an independent, incorporated association of manufacturers of electrical installation equipment and cable management products, representing 95% of the industry.

Its roots go back to the early days of the electrotechnical industry.

During 1972 EIEMA was formed from the Electrical Installation Equipment Department of BEAMA – The British Electrotechnical and Allied Manufacturers' Association. April 2003 saw the creation of BEAMA*Installation* Limited through the merger between EIEMA (the Electrical Installation Equipment Manufacturers' Association) and BESA (the British Electrical Systems Association).

BEAMA*Installation* has many members - from UK divisions of large multi-nationals to small owner-managed niche market companies. The association is organised into these product groups:

- **Single Phase Product Group (SPPG)**
  Wiring accessories, MCBs, RCDs, consumer units.
- **Industrial Products Group (IPG)**
  Fuses, distribution boards (standard), switch & fusegear, MCCBs
  (as well as MCBs and RCDs), ACBs, industrial plugs and sockets.
- **Engineered Systems Product Group (ESPG)**
  Low voltage switchboards, busbar trunking systems (busduct) products.
- **Cable Management Product Group (CMPG)**
  Cable trunking, cable tray and Powertrack systems.
- **Cutout & Feeder Pillar Group (COFP)**
  Cut-outs, feeder pillars.

Benefits of membership fall into two broad categories - representation and access to association services. The main areas in which the association represents its members are in legislative and standardisation matters. The former is by established relationships with appropriate government/EU departments in London and Brussels, through BEAMA and various European manufacturers' groups including ORGALIME, the European Federation for Engineering.

Active participation in the work of numerous national, international and European standards committees has ensured the safety and performance of the design, development and manufacture of BEAMA*Installation* members' products.

The result is quality equipment of the highest standard throughout each association group.

Other services include legal, statistics and export support. The association is also a channel for liaison with customer associations such as the Electrical Distributors' Association (EDA) and the Electrical Contractors' Association (ECA).

Acknowledgements

BEAMAInstallation would like to thank IEC and BSI for allowing references to their standards.

This publication is available at £15 plus postage and packing

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PREFACE

The object for this guide is to provide an easily understood document, aiding interpretation of the requirements to which Busbar Trunking products are designed and how they should be safely installed and used in service.

Principally, these requirements are detailed in BS EN 60439-2:2000 (IEC 60439-2:2000) and for a more thorough understanding this guide should be read in conjunction with this standard.

The guide seeks to provide an understanding of the standard, accompanied by some typical examples as foreseen for the general products available from BEAMA*Installation* member Companies.

Certain additional information has been included regarding:

- Use
- Application
- Installation
- Site testing
- Safe working with busbar trunking systems.

It is the intention of BEAMA*Installation* to review this guide periodically, to reflect changes in related specifications, product standards and working practices.

In addition to the above standards the following are applicable for the design, installation and use of Busbar Trunking Systems:

BS EN 60439-1:1999 (IEC 60439-1:1999)

Low Voltage Switchgear and Controlgear Assemblies: Requirements for Type Tested and Partially Type Tested Assemblies

BS 7671:2001 (IEC 60364)

Requirements for Electrical Installations (IEE Wiring Regulations 16th Edition).

BS 6423:1983

Code of practice for Maintenance of Electrical Switchgear and Controlgear up to and including 1000V.

BS EN 60529:1992 (IEC 60529:1992)

Specification for Degrees of Protection provided by Enclosures (IP Code).

European Directives

Busbar trunking systems come within the scope of 73/23/EEC Low Voltage Directive, as amended by 93/68/EEC (CE Marking Directive), and UK Low Voltage Electrical Equipment (Safety) Regulations 1994.

BS EN 13601:2002

Copper and copper alloys: copper rod, bar and wire for general electrical purposes

BS 1474:1987

Wrought aluminium and aluminium alloys for electrical purposes: bars and sections

1.0 USE AND APPLICATION

Modern electrical installations are placing increasing demands on all products of the electrical equipment manufacturer.

Products must have:

- Reliable service life
- Adaptability to new requirements
- Low installation costs
- Low maintenance costs
- Inherent safety features
- Minimal purchase cost
- Energy efficiency

In today's market one of the most important elements is cost effectiveness. In an electrical installation, one area where savings can be made and provide the features listed above is in the use of busbar trunking systems.

Busbar trunking installations can be categorised into two basic types: Distribution and Feeder.

1.1 DISTRIBUTION TRUNKING

This is the most common use of busbar trunking and is applied to distribute power over a predetermined area. Busbar trunking can be run vertically or horizontally, or a combination of both.

Typical applications would be:

- Supply to large numbers of light fittings
- Power distribution around factories and offices
- Rising main in office blocks or apartment blocks to supply distribution boards serving individual floors.

Power is taken from busbar trunking by the use of tap off units which connect at defined positions along the busbar trunking, and allow power to be taken from the system, usually via a suitable protective device.

Advantages over cable:

- The contractor can achieve savings with respect to material i.e. cable trays and multiple fixings and also labour costs associated with multiple runs of cable.
- Reduced installation time since busbar trunking requires less fixings per metre run than cable.
- Multiple tap-off outlets allow flexibility to accommodate changes in power requirements subsequent to the initial installation (subject to the rating of the busbar trunking).
- Repositioning of distribution outlets is simpler.
- System is easily extendable.
- Engineered product with proven performance.
- Type tested to recognised international and national standards.
- Aesthetically pleasing in areas of high visibility.

1.2 FEEDER TRUNKING

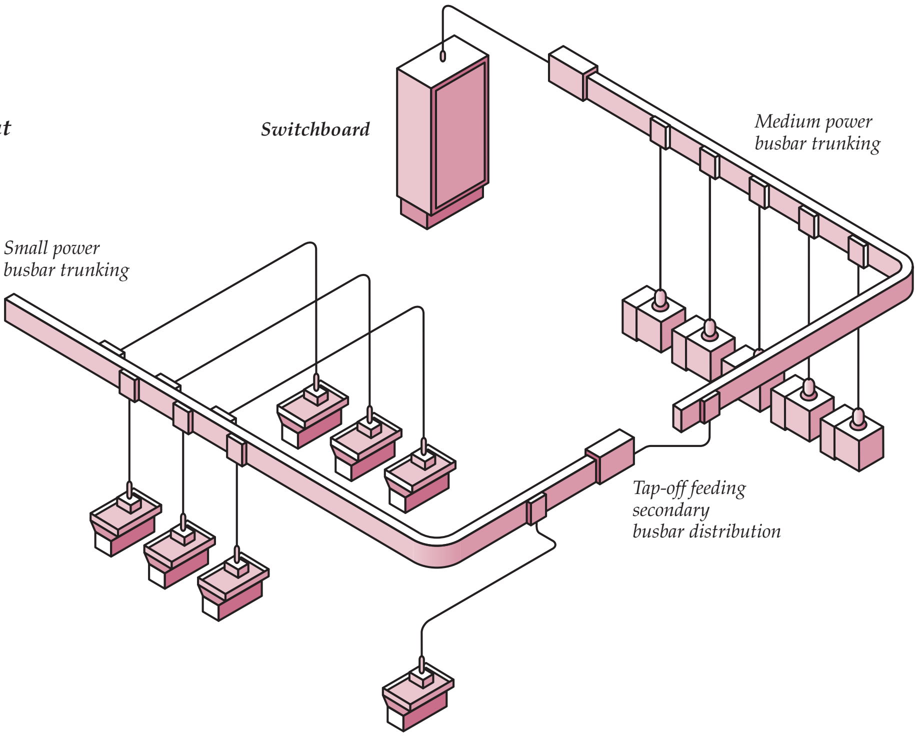
When used for the interconnection between switchboards or switchboard and transformer, busbar trunking systems are more economical to use, particularly for the higher current ratings, where multiple single core cables are used to achieve the current rating and compliance with voltage drop and voltage dip requirements.

Advantages over cable:

- Greater mechanical strength over long runs with minimal fixings resulting in shorter installation times.
- Replaces multiple runs of cable with their associated supporting metalwork.
- Easier to install compared to multiples of large cables with all of the associated handling problems.

- Less termination space required in switchboards.
- Type tested short circuit fault ratings.
- Takes up less overall space, bends and offsets can be installed in a much smaller area than the equivalent cable space.
- Cable jointer not required.
- Busbar trunking systems may be dismantled and re-used in other areas
- Busbar trunking systems provide a better resistance to the spread of fire.
- Voltage drop and voltage dip in the majority of cases is lower than the equivalent cable arrangement.

Typical busbar layout



1.3 TAP-OFF UNITS

Tap-off units are of two types, either plug-in or fixed. Plug-in units are designed to be accommodated at tap-off outlets at intervals along the distribution busbar trunking. Fixed tap-off outlets are engineered and positioned during manufacture to suit the specified installation.

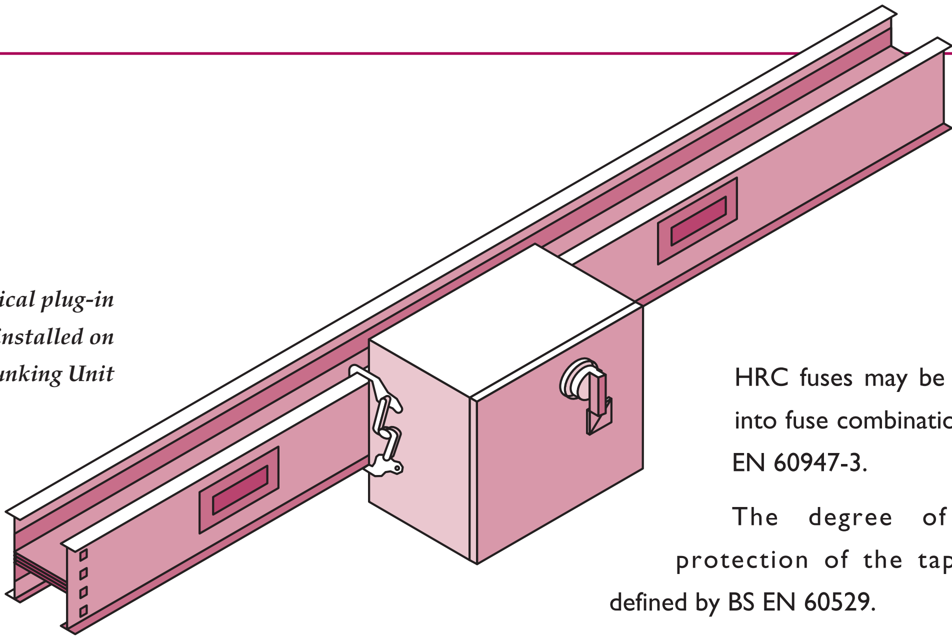
The tap-off unit usually contains the device providing protection to the outgoing circuit terminated at the unit to distribute power to the required load. There are various types of protective devices, for example:

a) HRC fuses to BS EN 60269-1 (BS88)

b) Miniature Circuit Breakers to BS EN 60898

c) Moulded Case Circuit Breakers to BS EN 60947-2

Typical plug-in tap off unit installed on Busbar Trunking Unit



HRC fuses may be incorporated into fuse combination units to BS EN 60947-3.

The degree of enclosure protection of the tap-off unit is defined by BS EN 60529.

Each tap-off unit contains the necessary safety features for systems and personnel protection, as follows:

- Plug-in units are arranged to be non-reversible to ensure that they can only be connected to give the correct phase rotation.
- Plug-in units are arranged to connect the protective circuit before the live conductors during installation and disconnect the protective circuit after the live conductors while being removed.
- Where units are provided with a switch disconnector or circuit-breaker these are capable of being locked in the OFF position.
- Covers permitting access to live parts can only be removed by the use of a tool and will have any internally exposed live parts shielded to a minimum of IP2X or IPXXB in accordance with BS EN 60529.
- Outgoing connection is achieved by cable terminations in the unit or by socket outlets to BS EN 60309-2 or BS 1363.

1.4 FIRE-STOPS

Recommendations for the construction of fire-stops and barriers where trunking penetrates walls and floors classified as fire barriers.

Internally the trunking may or may not require fire-stop measures according to the construction; where they are required these will generally be factory-fitted by the manufacturer and positioned according to a schematic drawing for the installation. Compact or sandwich-type trunking does not require internal fire-barriers, as suitability as a fire-barrier is inherent in the design. However in all cases verification of the performance of the trunking under fire conditions needs to be provided by the manufacturer.

The following information is provided for guidance, and the method used should be agreed with the trunking manufacturer. It is not the responsibility of the trunking manufacturer to provide the specification or detail the rating or construction of the fire-stop <u>external</u> to the trunking.

1.5 PROTECTIVE EARTH CONDUCTOR SIZES

The sealing external to the busbar trunking (with or without an internal fire barrier) will need to conform to applicable building regulations. This may require filling the aperture around the busbar trunking with material to maintain the same fire proofing as the wall or floor.

Careful consideration needs to be given to the access required to complete the fire-stop. It may be necessary to install sections of fire-stop at the stage of installation of the trunking if access afterwards is impossible e.g. trunking runs in close proximity.

The protective earth connection(s) to the busbar trunking system shall conform to Section 543-01 of BS 7671 (IEE Wiring Regulations Sixteenth Edition).

1.6 LOW-NOISE EARTH SYSTEMS

A low-noise earth, commonly referred to as a 'clean earth', is typically specified when electronic apparatus supplied from the system is sensitive to spurious voltages arising on the system earth. This is particularly true with IT equipment, found in all commercial premises these days, where data processing functions can be corrupted.

The low-noise earth is provided by a conductor separated from the protective earth (PE) and from all extraneous earth paths throughout the distribution system.

Many busbar trunking systems provide a 'clean earth' conductor in addition to the three phase conductors plus neutral, using the case or an external conductor as PE.

Tap-off units must be specified as 'clean earth' for the circuits concerned since the separation of the earths must be maintained and an additional termination will be provided for the load circuit 'clean earth' conductor.

Sizing of the 'clean earth' conductor is not specified in BS 7671 (IEE Wiring Regulations Sixteenth Edition) but the usual practice is to calculate the size in the same way as for the protective earth conductor.

1.7 NEUTRAL SIZES/HARMONICS

The designer of the electrical network specifies the size of the neutral conductor depending upon the network loading. Typically this tends to be a neutral conductor the same size as the phase conductors (i.e.100% neutral). As a minimum a 50% neutral may be specified.

The BS 7671 (IEE Wiring Regulations Sixteenth Edition) states "In a discharge lighting circuit and polyphase circuits where the harmonic content of the phase currents is greater than 10% of the fundamental current, the neutral conductor shall have a cross-sectional area not less than that of the phase conductor(s)."

With the increase of non-linear (almost anything electronic) single phase loads connected to a network, for example electronic ballasts in lighting fittings, or switch-mode power supplies (the type found in personal computers and servers) the total harmonic distortion is increased.

1.8 NEUTRAL CONDUCTOR SIZING FOR COMMERCIAL LOADS

It has been established using typical waveforms for switch-mode power supplies that the third harmonic is approximately 70% of the fundamental. If it is assumed that the loading of the three phases is balanced with similar load characteristics, the rms phase and neutral currents can be approximated as follows:

$I_{phase} = (I_1^{2} + I_3^{2})$ _ $= (1.0^2 + 0.7^2)$ ½ $= 1.22$

$I_{neutral} = (I_3 + I_3 + I_3) = (0.7 + 0.7 + 0.7) = 2.1$

$$\mathbf{I_{neutral} / I_{phase} = 2.1/1.22 = 1.72}$$

The neutral current in this case will be 172% of the rms phase current magnitude. The conclusion from this calculation is that the neutral conductors in circuits supplying totally electronic single phase loads should have almost twice the capacity of the phase conductors.

The above represents the worst case condition, in practice the proportion of electronic loading to total loading must be established to allow correct sizing of the neutral. This factor must also be taken into account in the case of existing installations that are being refurbished, extended or a change of use occurs affecting the network loading.

1.9 IMPLICATIONS OF HIGH HARMONIC CURRENTS AND NEUTRAL RATING

By specifying and using a 200% rated neutral conductor throughout the system, the heating effect and possible overloading from the harmonic current does not occur. However neutral currents will continue to generate voltage distortion and neutral–earth potentials and the phase conductors will continue to transmit and suffer the ill effects of harmonic current. An oversized neutral conductor does not therefore address the cause but rather the symptom.

The 200% neutral design philosophy will have to apply to the whole of the busbar system including tap-offs and associated devices in the neutral. Busbar trunking manufacturers may provide "oversized" devices in order to accommodate the high neutral current, or, in extreme cases, use parallel devices to meet the specification.

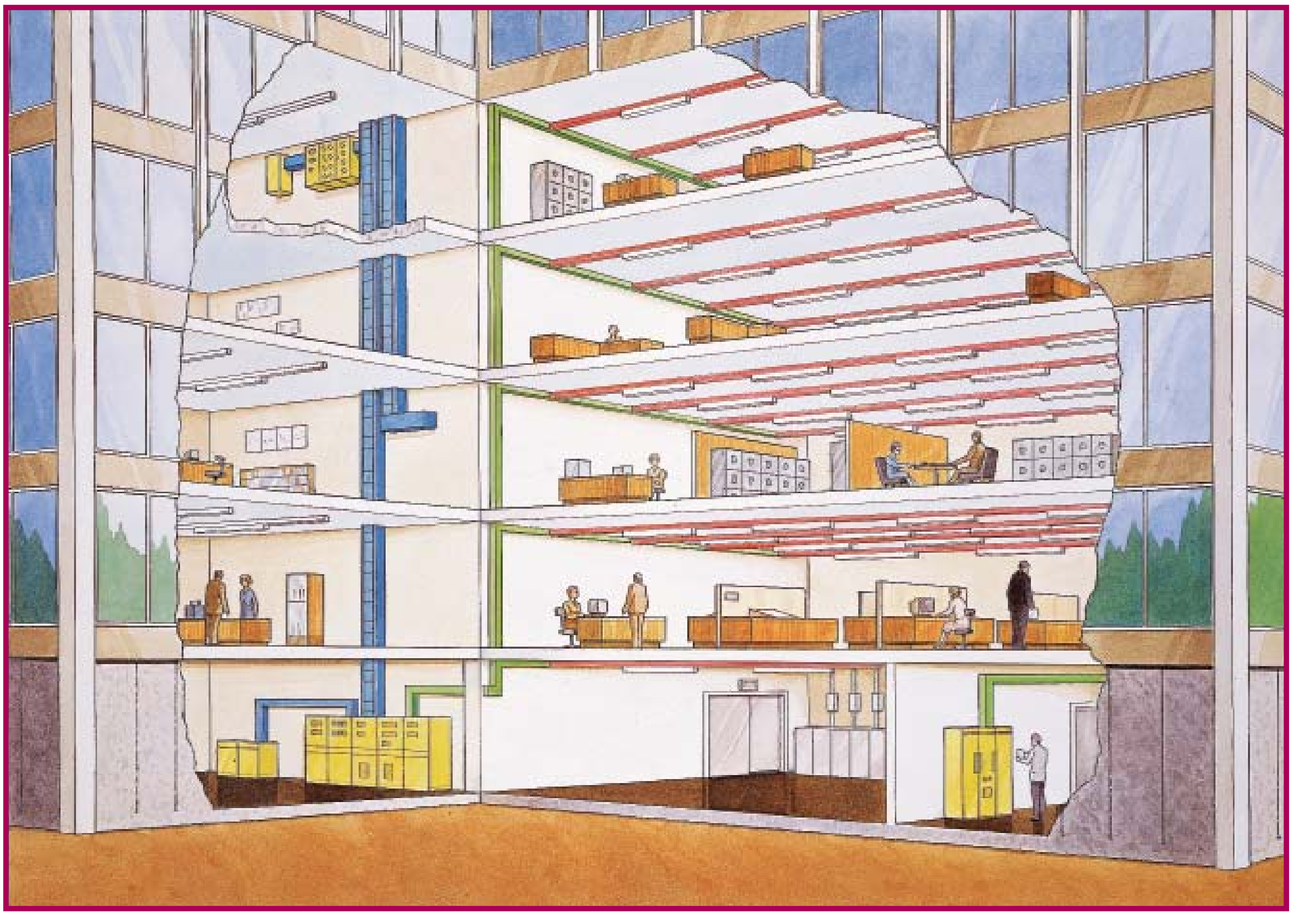
Note: To meet the requirements of Electricity Association Engineering Recommendation G5/4[1], electrical system designers have the responsibility to help ensure "the user" of the electrical network does not pollute the electrical supply (in other countries different national requirements may apply). Additional equipment may be considered to remove the harmonics from the neutral. Typically, this may be 'active harmonic filters', connected at load source will then allow the use and connection of standard (100% rated) equipment and compliance with BS7671. See IEE Guidance Note 1; Section 6.3 - neutral conductors.

The extra heat produced in the neutral conductors within a busbar system leads to the need for temperature de-rating factors to be applied to the standard designs of busbar systems. Typical de-rating figures that may need to be applied as in the table below:

Neutral current due to harmonics	*Rating factor*	
	100% neutral	200% neutral
50%In	0.96	0.98
100%In	0.87	0.93
150%In	-	0.85

1.10 TYPICAL AREAS OF APPLICATION

Offices	*Hospitals*	*Electrical Generation*
Apartments	*Shopping Centres*	*Petrochemical Industries*
Schools	*Factories*	*Oil & Gas Platforms*
Hotels		



2.0 TECHNICAL SPECIFICATIONS

2.1 PERFORMANCE UNDER SHORT-CIRCUIT CONDITIONS

Busbar trunking systems to BS EN 60439-2 are designed to withstand the effects of short-circuit currents resulting from a fault at any load point in the system, e.g. at a tap-off outlet or at the end of a feeder run.

2.1.1 RATING UNDER SHORT-CIRCUIT CONDITIONS

The withstand ability will be expressed in one or more of the following ways:

a) short-time withstand rating (current and time).

b) peak current withstand rating.

c) conditional short-circuit rating when protected by one or more short-circuit protective device(s) (SCPDs) or (SCPD) where appropriate.

These ratings are explained in more detail:

a) Short-time withstand rating

This is an expression of the value of rms current that the system can withstand for a specified period of time without being adversely affected such as to prevent further service. Typically the period of time associated with a short-circuit fault current will be 1 or 3 seconds, however other time periods may be applicable.
The rated value of current may be anywhere from about 10kA up to 50kA or more according to the construction and thermal rating of the system.

b) Peak current withstand rating

This defines the peak current, occurring virtually instantaneously, that the system can withstand, this being the value that exerts the maximum stress on the supporting insulation.
In an a.c. system rated in terms of short-time withstand current, the peak current rating must be at least equal to the peak current produced by the natural asymmetry occurring at the initiation of a fault current in an inductive circuit. This peak is dependent on the power-factor of the circuit under fault conditions and can exceed the value of the steady state fault current by a factor of up to 2.2 times.

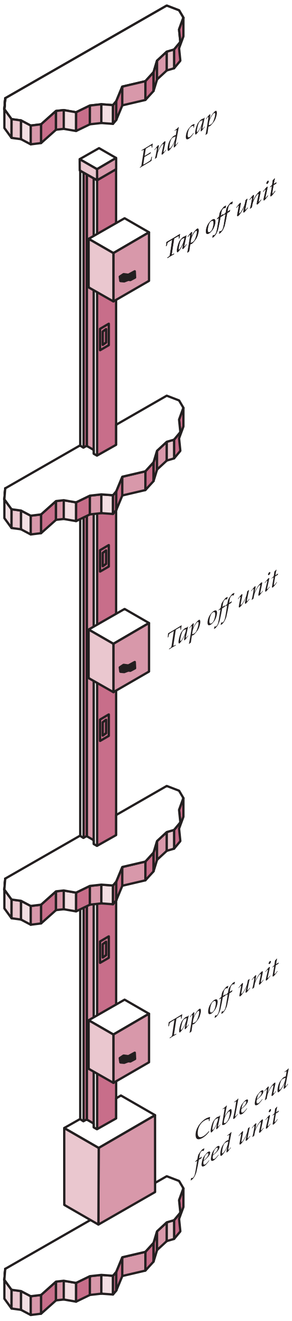
c) Conditional short-circuit rating

Short-circuit protective devices (SCPDs) are commonly current-limiting devices; that is they are able to respond to a fault current within the first few milliseconds and prevent the current rising to its prospective peak value. This applies to HRC fuses and many circuit breakers in the instantaneous tripping mode. Advantage is taken of these current limiting properties in the rating of busbar trunking for high prospective fault levels. The condition is that the specified SCPD (fuse or circuit breaker) is installed upstream of the trunking.
Each of the ratings above takes into account the two major effects of a fault current, these being heat and electromagnetic force. The heating effect needs to be limited to avoid damage to supporting insulation. The electromagnetic effect produces forces

between the busbars, which stress the supporting mechanical structure, including vibrational forces on a.c. The only satisfactory way to verify the quoted ratings, is by means of a type test to the British Standard.

2.1.2 TYPE TESTING

Busbar trunking systems are tested in accordance with BS EN 60439-2 to establish one or more of the short-circuit withstand ratings defined above. In the case of short-time rating the specified current is applied for the specified time. A separate test may be required to establish the peak withstand current if the quoted value is not obtained during the short-time test. In the case of a conditional rating with a specified SCPD, the test is conducted with the full prospective current value at the trunking feeder unit and not less than 105% rated voltage, since the SCPD (fuse or circuit-breaker) will be voltage dependent in terms of let through energy.



Typical Busbar Riser Application

2.1.3 APPLICATION

It is necessary for the system designer to determine the prospective fault current at every relevant point in the installation by calculation, measurement or based on information provided, e.g. by the supply authority. The method for this is well established, in general terms being the source voltage divided by the circuit impedance to each point. The designer will then select protective devices at each point where a circuit change occurs, e.g. between a feeder and a distribution run of a lower current rating. The device selected must operate within the limits of the busbar trunking short-circuit withstand. The time delay settings of any circuit-breaker must be within the specified short time quoted for the prospective fault current. Any SCPD used against a conditional short-circuit rating must have energy limitation not exceeding that of the quoted SCPD. For preference the SCPD recommended by the trunking manufacturer should be used.

2.2 VOLTAGE DROP

The requirements for voltage drop are given in BS 7671:Regulation 525-01-02. For busbar trunking systems the method of calculating voltage drop is given in BS EN 60439-2 from which the following guidance notes have been prepared.

Voltage drop

- Figures for voltage drop for busbar trunking systems are given in the manufacturers' literature.
- Figures are expressed in volts or milli-volts per metre or 100 metres, allowing a simple calculation for a given length of run.
- Figures are usually given as line-to-line voltage drop for a 3 phase balanced load.
- Figures take into account resistance of joints and temperature of conductors and assume the system is fully loaded.

Standard data

BS EN 60439-2 requires the manufacturer to provide the following data for the purposes of calculation, where necessary:

R_{20} the mean ohmic resistance of the system, unloaded, at 20°C per metre per phase.

X the mean reactance of the system, per metre per phase.

For systems rated over 630A:

R_T the mean ohmic resistance when loaded at rated current per metre per phase.

Application

In general the voltage drop figures provided by the manufacturer are used directly to establish the total voltage drop on a given system; however this will give a pessimistic result in the majority of cases.

Where a more precise calculation is required (e.g. for a very long run or where the voltage level is more critical) advantage may be taken of the basic data to obtain a more exact figure.

i) **Resistance** - the actual current is usually lower than the rated current and hence the resistance of the conductors will be lower due to the reduced operating temperature.

$R_x = R_{20}$ [1+0.004 (T_c - 20)] ohms/metre and T_c is approximately $T_a + T_r$

where R_x is the actual conductor resistance.

T_a is the ambient temperature

T_r is the full load temperature rise in °C (assume say 55°C)

ii) **Power factor** - the load power factor will influence the voltage drop according to the resistance and reactance of the busbar trunking itself.

The voltage drop line-to-line (Δv) is calculated as follows:

$\Delta v = \sqrt{}\div 3$ I (R x cos Ø+ X sin Ø) volts/metre

where I is the load current and Rx is the actual conductor resistance (Ω/m)

X is the conductor reactance (Ω/m)

cos Ø is the load power factor

sin Ø = sin ($\cos^{-1}$ Ø)

iii) **Distributed load** - where the load is tapped off the busbar trunking along its length this may also be taken into account by calculating the voltage drop for each section.

As a rule of thumb the full load voltage drop may be divided by 2 to give the approximate voltage drop at the end of a system with distributed load.

iv) **Frequency** - the manufacturers' data will generally give reactance (X) at 50Hz for mains supply in the UK. At any other frequency the reactance should be re-calculated.

$$X_f = XF/50$$

where X_f is the reactance at frequency f in Hz

3.0 INSTALLATION & SITE TESTING

3.1 TRANSPORT STORAGE & INSTALLATION

The conditions should be no worse than the normal service conditions as BS EN 60439-2, with particular regard to temperature and humidity.

As typically the electrical connections are not protected (IP00) until installation is complete, the components must be protected from dust/water and condensation/corrosive materials, such protection may not be provided by manufacturer's packaging.

Suitable handling equipment should be used, appropriate to the weight and size of the busbar trunking.

Busbar systems must be fixed to the building in accordance with manufacturer's instructions.

3.2 INSPECTION/TEST BEFORE INSTALLATION

All components should be checked for mechanical damage and insulation resistance before installation.

3.3 MAKING JOINTS

As the electrical joints may be carrying high currents, the contact surfaces must be clean and particular care taken with alignment while the connections are made - best practice must be employed when making electrical connections. Since the current-carrying capacity is very dependent on contact pressure the torque settings specified by the manufacturer must be used.

3.4 INSPECTION/TEST AFTER INSTALLATION

The correct time to make the Initial Verification/Inspection to BS 7671, and any additional requirements from manufacturers' instructions, is during installation and not as a preliminary to commissioning.

To check that the installation has been made correctly, and to provide records for comparison during maintenance, the following should be considered:

(a) INSULATION RESISTANCE – BS 7671 requires the insulation resistance of a complete system to be checked, and sets minimum values. The measured value not only depends on the quality of the insulation and length of the busbar system, but can also be affected by for example, ingress of moisture.

(b) DIELECTRIC (FLASH) – This test is made in the factory using voltage specified in the busbar Standard BS EN 60439-2. It is not advisable to repeat on an installed busbar trunking due to the safety hazards from high voltages and currents (2500V 50Hz at 3000mA is typical). If the client requires a test then the safety hazards can be reduced by the use of 2500V dc at 1mA.

It is essential to discharge the stored capacitance following such a test.

(c) EXTERNAL SURFACE TEMPERATURE – One method of monitoring performance of busbar trunking is to take a temperature profile during commissioning under typical load conditions. Periodically repeat checks of the temperature profile are then made for comparison.

Note: A typical temperature rise of the external surface of 55K at full rated current may be expected.

3.5 INSTALLATION CERTIFICATION & REPORTING

Required by Chapter 74 of BS 7671 and Code 28 of BS 6423

(a) AS PART OF COMMISSIONING – An Electrical Installation Certificate to be signed by the Client's Consulting Engineer as the designer, electrical contractor as the constructor, and electrical contractor as the tester. Advice and recommendations on the results may be requested from the manufacturer(s).

(b) AS PART OF MAINTENANCE - Periodic Inspection Report to be signed by the electrical contractor as the tester. Advice and recommendations on the results may be requested from the manufacturer(s).

3.6 SAFE WORKING WITH BUSBAR TRUNKING SYSTEMS

First and foremost within the UK, the requirements of The Electricity At Work Regulations 1989, ***must*** be complied with; Regulation 14 is particularly pertinent and requires:

"No person shall be engaged in any work activity on or so near any live conductor (other than one suitably covered with insulating material so as to prevent danger) that danger may arise unless: -

a) it is unreasonable in all the circumstances for it to be dead; and

b) it is reasonable in all the circumstances for him to be at work on or near it while it is live; and

c) suitable precautions (including where necessary the provision of suitable protective equipment) are taken to prevent injury."

Regulation 4(4) in particular also applies to the provision and use of protective equipment. Effectively this means that, where live working is being contemplated, a risk assessment and judgement must be made for every situation by the ***Duty Holder****. This must take account of all relevant factors, some of which include:

- the effectiveness of isolating equipment,

  Correctly secured isolation of the supply is the most effective safety precaution against electric shock and inadvertent short-circuits during work on the equipment.

- the task to be performed,
- the skill level of the personnel carrying out the work,
- use of correct tools, instruments and other work equipment,
- use of warning signs, etc.

NOTE: For further reference see HSE publication Electricity at Work – Safe working practices HS(G)85.

Manufacturers cannot give all-embracing assurances for safe working with the system live. This can only be determined on a case by case basis depending on the work to be done.

****Duty Holder:** The term used within the Electricity At Work Regulations 1989 to refer to the person appointed to be responsible for the electrical equipment, systems and conductors and any work or activities being carried out on or near electrical equipment. The Duty Holder must be competent and may be the employer, an employee, or a self-employed person.*

4.0 USEFUL DEFINITIONS

Busbar Trunking System:
A totally enclosed electrical distribution system comprising solid conductors separated by insulated materials.

Distribution Busbar Trunking:
Busbar trunking having tap-off points on one or more faces

Feeder Busbar Trunking:
Straight busbar trunking with no tap-off facilities.

Angle Unit:
Busbar trunking, which enables the system to change direction.

End Feed Unit:
Busbar trunking unit as an incoming unit to permit connection of supply cables.

Make-up Piece:
A custom-engineered trunking unit to complete a trunking system (made to measure).

Busbar Trunking Conductor Expansion Unit:
A busbar trunking unit permitting axial movement of the busbar conductors due to the differing coefficients of expansion for differing material.

Busbar Trunking Building Expansion Unit:
A busbar trunking unit permitting enclosure and conductor movement to compensate for structural displacement.

Busbar Trunking Phase Transposition Unit:
A busbar trunking unit which changes the relative positions of the phase conductors within the enclosure to balance inductive reactance or to facilitate connection between items of fixed equipment.

Busbar Trunking Adapter (Reducer)Unit:
A busbar trunking unit for connecting two elements of the same system but of a different type or current rating.

Busbar Trunking Fire Barrier:
A busbar trunking unit intended to prevent the propagation of fire through a wall or floor, for a specified time.

Tap-Off Outlet:
A location on a busbar trunking unit, which permits the connection of external loads to the busbar system via the appropriate tap-off unit.

Tap-Off Unit:
An outgoing unit for tapping off power from a busbar trunking system. *(see page 3).*

Flanged-end (Flange)
A connection unit for terminating a trunking system at a switchboard or transformer.

eama Installation

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Guide to Switch & Fusegear Devices

Guide to Fuse Link Applications

Guide to Circuit Breaker Standards

Guide to Forms of Separation

Guide to Type Tested Assemblies and Partially Type Tested Assemblies

RCD Handbook