NEMA STANDARDS PUBLICATION BU 1.1-2000

GENERAL INSTRUCTIONS FOR HANDLING, INSTALLATION, OPERATION, AND MAINTENANCE OF BUSWAY RATED 600 VOLTS OR LESS



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GENERAL INSTRUCTIONS FOR HANDLING, INSTALLATION, OPERATION, AND MAINTENANCE OF BUSWAY RATED 600 VOLTS OR LESS

FOREWORD

This publication is a guide of practical information containing instructions for the proper handling, installation, operation, and maintenance of busway and associated fittings rated 600 volts or less.

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency regarding handling, installation, operation, or maintenance.

It is recommended that work described in this set of instructions be performed only by qualified personnel familiar with the construction and operation of busway and associated fittings and that such work be performed only after reading this complete set of instructions. For specific information not covered by these instructions, you are urged to contact the manufacturer of the busway directly.

These recommendations of the Busway Section of the National Electrical Manufacturers Association will be found useful by architects, electrical engineers, electrical contractors, electricians, maintenance engineers, and others. These recommendations will be reviewed periodically by the Section and updated as necessary. Please address any comments or questions you may have on the text to:

Vice President, Engineering
National Electrical Manufacturers Association
1300 N. 17th Street
Rosslyn, VA 22209

This Standards Publication was developed by the Busway Section. At the time it was approved, the Group/Section was composed of the following members:

Cutler-Hammer, Inc.—Pittsburgh, PA
GE—Plainville, CT
Siemens Energy & Automation, Inc.—Alpharetta, GA
Square D Company—Palatine, IL

Publication No. BU 1.1-2000 revises and supersedes BU 1.1-1996.

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Section 1
SCOPE

This standards publication covers products for distribution of electric power at 600 volts or less, consisting of enclosed sectionalized prefabricated busbars rated at 100 amperes or more, and associated structures and fittings, classified as follows:

a. Feeder busways (indoor or outdoor)
b. Plug-in busways (indoor only)
c. Accessories required to complete the busway system

It does not pertain to metal-enclosed busways as described in ANSI/IEEE C37.23.

Section 2
REFERENCED STANDARDS

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

NFPA 70-1999 — *National Electrical Code®*

NFPA 70E-2000 — *Standard for Electrical Safety Requirements for Employee Workplace*

Institute of Electrical and Electronics Engineers
445 Hoes Lane
Piscataway, NJ 08855-1331

ANSI/IEEE C37.23-1987 (R 1991) — *IEEE Guide for Metal-Enclosed Bus and Calculating Losses in Isolated-Phase Bus*

Section 3
GENERAL

3.1 Proper planning and coordination between trades, heating contractors, and plumbing contractors are important for a good busway layout.

3.2 The successful operation of busway is dependent upon proper handling, installation, operation, and maintenance, as well as upon proper design and manufacture. Neglecting certain fundamental installation and maintenance requirements may lead to personal injury and damage to electrical equipment or other property.

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3.3 Installation, operation, and maintenance of busway should be conducted only by qualified personnel.

3.4 For purposes of these guidelines, a qualified person is one who is familiar with the installation, construction, and operation of the equipment and the hazards involved. In addition, the person should be:

a. Knowledgeable of the requirements of the *National Electrical Code* and of all other applicable codes, laws, and standards.

b. Trained and authorized to test, energize, clear, ground, tag, and lockout circuits and equipment in accordance with established safety practices.

c. Trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, and flash resistant clothing in accordance with established safety practices.

d. Trained in rendering first aid.

WARNING: HAZARDOUS VOLTAGES IN ELECTRICAL EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. UNLESS OTHERWISE SPECIFIED, INSTALLATION, INSPECTION, AND MAINTENANCE SHOULD ONLY BE PERFORMED ON BUSWAY AND EQUIPMENT TO WHICH POWER HAS BEEN TURNED OFF, DISCONNECTED, AND ELECTRICALLY ISOLATED SO THAT NO ACCIDENTAL CONTACT CAN BE MADE WITH ENERGIZED PARTS. FOLLOW ALL MANUFACTURER'S WARNINGS AND INSTRUCTIONS.

WARNING: OPERATION OF BUSWAY WHICH HAS BEEN WATER OR MOISTURE DAMAGED CAN CAUSE PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH. OBSERVE THE PRECAUTIONS IN SECTIONS 6.8 AND 6.9 TO ASSURE ADEQUATE INSULATION RESISTANCE AND THAT SOURCES OF MOISTURE ARE ELIMINATED.

SAFETY RELATED WORK PRACTICES, AS DESCRIBED IN NFPA 70E, PART II, SHOULD BE FOLLOWED AT ALL TIMES.

CAUTION: Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the busway manufacturer before using these products to clean, dry, or lubricate compounds during installation or maintenance.

Section 4
HANDLING

These guidelines are provided to help avoid personal injury and equipment damage during handling and to facilitate moving the busway sections and fittings at the job site.

4.1 Follow the manufacturer's handling instructions for the specific equipment, if available.

4.2 Handle busway with care to avoid damage to internal components and the enclosure or its finish. Avoid subjecting busway to twisting, denting, impact, and, in general, rough handling.

4.3 Do not use busbar ends for lifting busway sections or fittings.

4.4 When the busway is received, unpack it sufficiently to inspect it for concealed damage and to determine that the shipment is complete and correct.

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4.5 If busway is to be stored prior to installation, restore the packing for protection during that period (see Section 5). When conditions permit, leave the packing intact until the sections or fittings are at their final installation location.

4.6 Verify that the weight of any busway sections or fittings are within the rated capacity of the handling equipment to be used.

4.7 Platform dollies provide a simple method of moving busway on one floor level if there is little or no incline. Balance the load carefully.

4.8 A fork-lift truck may offer a more convenient method of handling busway and has the added advantage of permitting it to be hoisted between levels. Balance the load carefully.

4.9 Platform lifts or elevators, either manual or power-operated, can be used advantageously in moving loads of busway between elevations.

Section 5
STORAGE

5.1 Busway sections and fittings which are not to be installed and energized immediately should be stored in a clean dry space having a uniform temperature to prevent condensation. Preferably, they should be stored in a heated building having adequate air circulation and protected from dirt, fumes, water, and physical damage.

5.2 It is recommended that busway not be stored outdoors. However, if it must be stored outdoors, cover it securely to provide protection from weather and dirt. Temporary electrical heating should be installed beneath the cover to prevent condensation. At least 3 watts per cubic foot is adequate for the average environment.

5.3 Outdoor busway is not weather resistant until completely and properly installed and should be treated exactly the same as indoor busway until after it is installed.

Section 6
INSTALLATION

6.1 GENERAL

6.1.1 Provide sufficient horizontal and vertical clearance from walls and ceilings to provide easy access to joints, both for the original installation and possible removal of a section when required. Busways may be installed behind panels if means of access are provided and if all the conditions of Article 364 of the *National Electrical Code* are met.

6.1.2 Follow the manufacturer's installation instructions and the current edition of the *National Electrical Code*.

6.1.3 Conduct an insulation resistance test on each busway device with an insulation resistance tester rated 1000 volts to ensure that the system is free from short circuits and grounds (phase-to-ground, phase-to-neutral and phase-to-phase). It should be noted that readings vary inversely

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with the length of run and width or number of bars per phase. Readings will vary with humidity. If readings of less than 1 megohm for a 100-foot run (MEGOHMS = 100 / Length of busway in feet) are obtained, contact the manufacturer.

6.2 UNPACKING

6.2.1 Care must be used in unpacking. Band cutters should be used on all banding securing the package.

6.2.2 Nail pullers should be used for unpacking wooden crates to avoid damage.

6.2.3 Remove any support blocks which may have been used for shipping.

6.3 HOISTING AND HANDLING (see also Section 4)

6.3.1 If a crane is used to install busway, use nylon straps and distribute or balance the weight of each lift. If cables are used, spreaders should be used to avoid damage to the busway's metal housing.

6.3.2 If a fork truck or similar hoist is used, properly position the busway on the fork to distribute its weight. Careful approach is a must to avoid any damage to the metal housing that could pinch the bus bar insulation and result in a failure.

6.3.3 Do not drag the busway across the floor.

6.3.4 When installing vertical sections, it is easier to lower the busway from the floor above where it will be installed. Vertical sections are often stored on the floor above their final location to facilitate lowering them into position.

6.4 HANGING OR SUPPORTING

6.4.1 Use the hangers or the hanging recommendations supplied by the manufacturer in the manner prescribed to afford a secure installation and proper spacing.

6.4.2 Horizontal Mounting

A busway which is mounted horizontally should be supported at a maximum of 5-foot intervals and in no case at more than 10-foot intervals if it is marked as being suitable for such intervals.

The supports and/or the busway should be braced to minimize swaying.

Bus plugs or cubicles that have considerable weight and are mounted with a horizontal run of busway should be separately supported by the building structure to prevent twisting or deformation of the busway. Exercise caution when plugs are used on one side of a busway or when there are more plugs on one side than on the other.

6.4.3 Vertical Mounting

A busway that is to be mounted vertically should be marked to indicate that it is suitable for that service. When the distance between floor supports is more than the busway is marked as suitable for, the manufacturer's recommendation regarding intermediate supports should be followed, but in no case should support intervals exceed 16 feet. Heavy cubicles, panel boards, and bus plugs should be separately supported by the building structure when so recommended by the manufacturer.

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6.4.4 Expansion Joints

A busway section that spans a building expansion joint should be provided with suitable expansion means for both the busbars and the busway housing unless the length of busway beyond the building expansion joint is sufficiently short so that the supporting means can be designed to withstand the expected building motion. Expansion joints may also be required on unusually long, straight runs or vertical risers. Consult the busway manufacturer for recommendations on specific layouts.

6.4.5 Level and plumb busway (align horizontally and vertically) before the final tightening of all joints.

6.5 JOINT ASSEMBLY

6.5.1 Ensure that all contact surfaces are clean and free of contaminants.

6.5.2 Align the busbar ends of adjoining sections, verifying proper phase alignment, and slide the sections together.

6.5.3 Use joint pullers, if available.

6.5.4 Follow the manufacturer's instructions for proper completion of joint assemblies and torquing of joint bolts.

6.5.5 Busway should be properly covered during installation to protect it from moisture or other types of contaminants.

6.6 GROUNDING

6.6.1 The enclosure of a UL listed busway marked with a short-circuit current rating is recognized as an equipment grounding conductor. However, the enclosure must be properly bonded to other equipment grounding conductors in the system, and all of these conductors must be properly connected to a suitable system ground. Consult the *National Electrical Code* for proper system grounding procedures.

6.7 MOUNTING PLUG-IN DEVICES

6.7.1 Follow the manufacturer's instructions for the proper mounting of plug-in devices.

6.7.2 Allow sufficient clearances to install, operate, and remove devices and open covers when necessary.

6.7.3 All plug-in openings that are not in use should be covered when such covers are provided.

6.7.4 All tap off or plug-in devices should be in the "OFF" position during installation and removal.

6.8 PROTECTION FROM LIQUIDS, MOISTURE, AND OTHER CONTAMINANTS

6.8.1 Busway should be protected from liquids, moisture, and other contaminants to prevent electrical failure.

6.8.2 Some common sources of such contaminants are:

6.8.2.1 *During construction*-Indoor busways must be protected from moisture during and after installation. Protective measures should be taken to prevent condensation formation inside the busway when installed in unheated buildings. Special attention should be given to riser busways

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during construction to protect them from moisture from uncompleted roofs, walls, etc. Outdoor busway is not weather resistant until completely and properly installed and should be treated exactly the same as indoor busway until after it is installed. It is not weather resistant until completely and properly installed. Always verify that the insulation resistance test of 7.4 has been conducted before energizing any busway for the first time

6.8.2.2 *Floor level liquids*—Four-inch minimum curbs should be installed around all floor openings for riser busways to prevent floor level liquids from entering the opening.

6.8.2.3 *Leaking Roof*—Protect indoor busway with a temporary sheet metal shield or other protective cover to prevent water from falling onto the busway until the roof is repaired.

6.8.2.4 *Pipes*—Protect indoor busway with a temporary sheet metal shield or other protective cover to prevent water from falling onto the busway until leaking pipes are repaired. Where pipes (especially cold water pipes) pass directly above indoor busway, the busway should be protected from dripping condensate by insulating the pipe or permanently shielding the busway with sheet metal or plastic.

6.8.2.5 *Sprinklers*—Protect indoor busway from direct spray of sprinklers.

6.8.2.6 *Snow*—Outdoor busway should be mounted sufficiently above the ground or roof so that snow build-up does not surround the busway and result in water being forced into the busway through weep holes.

6.8.2.7 TRANSVERSE BARRIERS

Where a busway extends through a floor or inside wall and where temperature differences could result in condensation, an internal transverse barrier, which is designed to restrict the free flow of air, should be provided.

Where a busway extends through a roof or outside wall, a suitable weather barrier should be installed in accordance with the manufacturer's instructions.

6.9 SUMMARY

6.9.1 Review erection drawings very carefully.

6.9.2 Check the bill of material.

6.9.3 Check description and identification of each piece before installing it.

6.9.4 Follow instructions on each piece for torque requirements.

6.9.5 Follow manufacturer's joint assembly instruction drawing for both indoor and outdoor procedures.

6.9.6 Conduct an insulation resistance test on each section of busway before it is installed.

6.9.7 Conduct an insulation resistance test on the portion of each run already installed on a daily basis.

6.9.8 Check for possible sources of water that may fall on indoor busway, and take corrective action to prevent this.

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Section 7
STEPS TO BE TAKEN BEFORE ENERGIZING

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7.1 Recheck all joint connections for tightness. Follow the manufacturer's torquing recommendations.

7.2 Ensure that all tap-off or plug-in devices are in the "OFF" position.

7.3 Isolate the busway run by disconnecting all connections to transformers, switchboards, meters, and so forth.

7.4 Conduct an insulation resistance test with an insulation resistance tester rated 1000 volts to ensure that the system is free from short circuits and grounds (phase-to-ground, phase-to-neutral and phase-to-phase). It should be noted that readings vary inversely with the length of run and width or number of bars per phase. Readings will vary with humidity. If readings of less than 1 megohm for a 100-foot run (MEGOHMS = 100 / Length of busway in feet) are obtained, contact the manufacturer.

7.5 Verify that the system phasing matches the busway phasing before reconnecting all connections to transformers, switchboards, meters, and so forth.

Section 8
ENERGIZING EQUIPMENT

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8.1 When the equipment is energized for the first time, qualified electrical personnel should be present. If short circuits and ground faults caused by damage or poor installation practices have not been detected in the check-out procedure, serious damage can result when the power is turned on.

8.2 There should be no electrical load on the busway when it is energized. Since busway typically extends through several rooms and floor levels, care should be taken to see that all devices fed from the busway are in the "OFF" position.

8.3 The equipment should be energized in sequence by starting at the source end of the system and working toward the load end. In other words, energize the main devices, then the feeder devices,

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and then the branch-circuit devices. Turn the devices to the "ON" position with a firm positive motion.

8.4 After all overcurrent devices have been turned on, loads such as lighting circuits, contactors, heaters, and motors may be turned "ON".

8.5 Busway, when operating properly, will have a moderate hum. Excessive noise may be an indication of hardware that has not been tightened or of metal parts that have been improperly assembled.

8.6 Occurrence of sparking at any point along the busway is not a normal condition. The busway must be de-energized immediately, and remain de-energized until the sparking condition has been corrected.

Section 9
CARE AND MAINTENANCE

9.1 OUTDOOR BUSWAY

9.1.1 Inspect busway once each year or after any severe electrical short circuit or ground fault.

9.1.2 Perform an infra-red temperature scan on all electrical connections and busway enclosures while busway is energized and operating under maximum load conditions. A permanent record should be kept. If readings change with time, deterioration may be taking place and must be corrected.

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WARNING: OPERATION OF BUSWAY WHICH HAS BEEN WATER OR MOISTURE DAMAGED CAN CAUSE PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH. OBSERVE THE PRECAUTIONS IN SECTIONS 6.8 AND 6.9 TO ASSURE ADEQUATE INSULATION RESISTANCE AND THAT SOURCES OF MOISTURE ARE ELIMINATED.

SAFETY RELATED WORK PRACTICES, AS DESCRIBED IN NFPA 70E, PART II, SHOULD BE FOLLOWED AT ALL TIMES.

CAUTION: Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the busway manufacturer before using these products to clean, dry, or lubricate compounds during installation or maintenance.

9.1.3 Turn off power to the busway.

9.1.4 If there is appreciable accumulation of dust and dirt, clean it off by using a brush, vacuum cleaner, or clean lint-free rags. In order to avoid blowing dust into busway joints, circuit breakers, or other equipment, do not use a blower or compressed air. Ensure that all drain holes are operating properly.

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9.1.5 Check the insulation resistance prior to re-energizing the busway. A permanent record should be kept of resistance readings. If readings decrease appreciably with time, deterioration is taking place and must be corrected. (Contact the manufacturer.) Also, refer to section 7.4

9.2 INDOOR BUSWAY

9.2.1 Inspect busway once each year or after any severe electrical short circuit or ground fault.

9.2.2 Perform an infra-red temperature scan on all electrical connections and busway enclosure while busway is energized and operating under maximum load conditions. A permanent record should be kept. If readings change with time, deterioration may be taking place and must be corrected.

WARNING: HAZARDOUS VOLTAGES IN ELECTRICAL EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. UNLESS OTHERWISE SPECIFIED, INSTALLATION, INSPECTION, AND MAINTENANCE SHOULD ONLY BE PERFORMED ON BUSWAY AND EQUIPMENT TO WHICH POWER HAS BEEN TURNED OFF, DISCONNECTED, AND ELECTRICALLY ISOLATED SO THAT NO ACCIDENTAL CONTACT CAN BE MADE WITH ENERGIZED PARTS. FOLLOW ALL MANUFACTURER'S WARNINGS AND INSTRUCTIONS.

CAUTION: Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the busway manufacturer before using these products to clean, dry, or lubricate compounds during installation or maintenance.

9.2.3 Turn off power to busway.

9.2.4 Look for any moisture or signs of previous wetness or dripping onto the busway or onto connection boxes from leaky roofs, pipes, sprinklers, or other sources of moisture. Look for any recent changes in sprinklers or other plumbing that might now be a source of trouble to busway.

9.2.4.1 Seal off any cracks or openings which have allowed moisture to enter the busway or its connection boxes. Eliminate source of any dripping onto the busway and any other source of moisture). See Section 6.8 for more specific details on preventing liquid from getting onto the busway.

9.2.4.2 Replace or thoroughly dry and clean any insulating material which is damp or wet or shows accumulation of deposited material from previous wettings. Consult the manufacturer for proper procedures.

9.2.5 If there is appreciable accumulation of dust, clean it off by using a brush, vacuum cleaner, or clean lint-free rags. In order to avoid blowing dust into busway joints, circuit breakers, or other equipment, do not use a blower or compressed air.

9.2.6 Carefully inspect all visible electrical joints and terminals.

9.2.7 Visually check connections to be certain that they are clean and secure. Loose and/or contaminated connections increase electrical resistance which can cause overheating. Such overheating is indicated by discoloration or flaking of insulation and/or metal parts. Pitting or melting of connecting surfaces is a sign of arcing due to a loose or otherwise poor connection. Parts which show evidence of overheating or looseness should be cleaned or replaced if damaged; contact the manufacturer before re-torquing joint bolts.

CAUTION: Do not remove plating from aluminum parts in joints or terminations. Removal of plating can result in overheating. Replace damaged aluminum parts.

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9.2.8 Check the insulation resistance prior to re-energizing the busway. A permanent record should be kept of resistance readings. If readings decrease appreciably with time, deterioration is taking place and must be corrected. (Contact the manufacturer.) Also, refer to section 7.4.

9.3 BUSWAY PLUGS AND CUBICLES WITH PROTECTIVE DEVICES

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CAUTION: Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the busway manufacturer before using these products to clean, dry, or lubricate compounds during installation or maintenance.

9.3.1 Turn off power to busway.

9.3.2 Examine fuse clip contact pressure and contact means. If there is any sign of over-heating or looseness, follow the manufacturer's maintenance instructions or replace the fuse clips. Loose fuse clips can result in over-heating.

9.3.3 Look for any signs of deterioration in insulating material or melting of the sealing compound. Replace such insulating parts and assemblies where the sealing compound has melted.

9.3.4 BE SURE THAT ALL CONDITIONS WHICH CAUSED THE OVERHEATING HAVE BEEN CORRECTED.

9.3.5 Check the operation of all mechanical components.

9.3.5.1 Exercise switch operating mechanisms and external operators for circuit breakers to determine that they operate freely to their full on and off positions.

9.3.5.2 Check the mechanisms of all electrical and mechanical interlocks and padlocking means.

9.3.5.3 Check for missing or broken parts, proper spring tension, free movement, rusting or corrosion, dirt, and excessive wear.

9.3.5.4 Examine all readily accessible arc chutes and insulating parts for cracks or breakage and for arc spatter, sooty deposits, oil, or tracking.

9.3.5.5 Clean off arc spatter, oil, and sooty deposits. Replace the device if appreciable material has burned away or if parts are charred or cracked.

9.3.6 Lubricate the operating parts of switch mechanisms, and other moving parts, according to the manufacturer's instructions.

CAUTION: Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the busway manufacturer before using these products to clean, dry, or lubricate compounds during installation or maintenance.

9.3.6.1 Use clean, nonmetallic, light grease or oil as instructed.

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9.3.6.2 Do not oil or grease parts of molded case circuit breakers.

9.3.6.3 If no instructions are given on the devices, sliding copper contacts, operating mechanisms, and interlocks may be lubricated with clean, light grease.

9.3.6.4 Wipe off excess lubrication to avoid accumulation of foreign material.

9.3.7 Operate each switch or circuit breaker several times to ensure that all mechanisms are free and in proper working order.

9.3.8 Re-tighten all wire connections according to the manufacturer's instructions.

9.3.9 Check circuit breakers and fuses to ensure they have the proper ampere, voltage, and interrupting ratings. Ensure that non-current-limiting devices are not used as replacements for current-limiting devices. Never attempt to defeat rejection mechanisms which are provided to prevent the installation of the incorrect class of fuse.

9.3.10 Check the insulation resistance of devices prior to their reinstallation on the busway.

9.4 FINAL TEST

9.4.1 After performing all of the above inspections and necessary repairs, it may be desirable to perform another infra-red temperature scan on all electrical connections after busway is re-energized and reaches a stabilized operating temperature. A permanent record should be kept. If readings change with time, deterioration may be taking place and must be corrected.

Section 10
PERMISSIBLE LOADING OF BUSWAYS

10.1 BUSWAYS—WITH OR WITHOUT OVERCURRENT PROTECTION

10.1.1 The total continuous load current should not exceed the current rating on the busway nameplate.

10.2 BUSWAY PLUGS

10.2.1 The total continuous load current on a busway fusible plug should not exceed 80 percent of the ampere rating of the fuses. The total continuous load current on other types of plugs should not exceed 80 percent of the ampere rating of the plug unless the device is rated to carry 100 percent of its ampere rating. Cycling loads with high inrush currents may require additional consideration when sizing plug-in units. Consult the manufacturers literature for proper sizing under these conditions.

Section 11
OPERATING CONDITIONS

11.1 NORMAL OPERATING CONDITIONS

11.1.1 Busways shall be suitable for operation:

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a. When and where the ambient temperature is within the limits -30°C through +40°C for busway and busway plug-in-units incorporating enclosed switches.
b. When and where the ambient temperature is within the limits 0°C through +40°C for busway plug-in-units incorporating molded case circuit breakers or electromagnetic and manual motor controls.
c. Where the altitude does not exceed 6600 feet (2000 meters).

11.1.2 Voltage Drop (General)

Good practice indicates that the voltage drop in feeder circuits up to the final distribution point where the load is divided into individual branch circuits should not exceed 3 percent for power, heating, or lighting loads or combination thereof. Total voltage drop for feeders and individual branch circuits up to the final utilization point should not exceed 5 percent overall.

11.2 UNUSUAL OPERATING CONDITIONS

11.2.1 When busways are installed in locations that have a continuous ambient temperature above 40°C (104°F), the busways should be de-rated in accordance with the manufacturers recommendations, if furnished, or the following table:

AMBIENT TEMPERATURE	MULTIPLIER
40°C (104°F)	1.00
45°C (113°F)	0.95
50°C (122°F)	0.90
55°C (131°F)	0.85
60°C (140°F)	0.80
65°C (149°F)	0.74
70°C (158°F)	0.67

11.2.2 For applications where the ambient temperature is lower than the minimum limits per 11.1.1a and 11.1.1b or at altitudes greater than 6600 feet (2000 meters), consult the manufacturer.

11.2.3 Unless specifically designed for such use, do not locate busway so that it is exposed to dust, vapors, abnormal vibration, shock, or other such unusual operating conditions. A busway should not be installed in wet locations or outdoors unless specifically identified as an outdoor busway.

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