SECTION 26 25 00
ENCLOSED BUS ASSEMBLIES

PART 1 - GENERAL

1.1 SCOPE

A. This section defines low voltage indoor busway, fittings and plug-in units for use in AC systems, rated 600 V or less.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
   1. ***[Related Sections (where applicable) include the following:***
      a. ***Section 26 24 13 – Switchboards]***

1.3 SUBMITTALS

A. Provide product information prior to fabrication and installation. Product data shall include all dimensions, weights, electrical ratings, wiring diagrams and required clearances.

B. When requested, provide additional product data and certifications necessary to show conformance with this specification. Additional data limited to routine factory tests.

C. Provide information for record purposes including field test reports and maintenance data.

1.4 RELATED STANDARDS

A. Comply with requirements of latest revisions of applicable industry standards, specifically including the following:
   1. NEMA BU 1.1 - Busways
   2. UL 857 - Underwriters Laboratories Busway Standard
   3. Underwriters Laboratories Listing
      a. All fittings and plug-in units shall be listed and marked in accordance with UL Standard No. 857.
      b. This listing shall include mounting of the busway in any position (i.e. horizontal flat wise, horizontal edgewise and vertical) without derating.
      c. All ampere ratings (100, 225, & 400A) shall be listed and marked in accordance with UL Standard No. 857. 400 ampere rated Track Busway or Continuous Plug-in Busway is not recognized in UL 857 and shall not be accepted.
      d. All ampere ratings shall be rated for the full load.
   4. ICC ES AC-156, "*Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems*," International Code Council, Evaluation Service, Inc. (ICC-ES), 11/01/10.
   5. IBC 2012, International Building Code
      a. Seismic compliance shall be qualified only through shake table testing. Compliance by calculation is not acceptable
   6. ASCE 7-10, "*Minimum Design Loads for Buildings and Other Structures*," American Society of Civil Engineers

B. ***[Manufacturer Seismic Qualification: The low voltage busway shall meet and be certified to seismic requirements specified in the [IBC 2012 International Building Code,* [ICC ES AC-156, International Code Council, Evaluation Service, Inc. (ICC-ES), 11/01/10], *[ASCE American Society of Civil Engineers 2010]. The low voltage busway shall be complaint with IBC 2012 parameters:***

   1. ***Building Occupancy Category (as defined in Table 1.1 from ASCE 2010: [I] [II] [III] [IV] [I – Agricultural facilities, certain temporary facilities, minor storage facilities]***

[II – All buildings and other structures not listed in I, III or IV] [III – Buildings and structures that represent a substantial hazard to human life in the event of failure or that can cause substantial economic impact or mass disruption of day-to-day civilian life. Examples include and are not limited to, places were >300 congregate in one area, daycare facilities with >150 occupants, elementary and secondary schools with >250 occupants, colleges and adult education with >500 occupants, health care facilities with >50 resident patients without surgery or emergency facilities, power generation stations for the national grid, water treatment, sewage treatment and telecommunication centers] [IV – Buildings and other structures deemed essential, including, but not limited to hospitals, surgery and emergency treatment facilities, fire, rescue, ambulance, police, emergency vehicle garages, earthquake hurricane and other emergency shelters, emergency preparedness, power generation stations required in an emergency, ancillary structures such as communication towers, fuel storage tanks, cooling towers, electrical substation structures, fire water storage tanks, aviation control towers, air traffic control centers, emergency aircraft hangers, water pressure for fire suppression and critical national defense functions.]

2. *Seismic Design Category: [A] [B] [C] [D] [E] [F]*
3. *Site Class: [A – Hard Rock] [B - Rock] [C – Very dense soil and soft rock] [D – Stiff soil profile] as defined in IBC 2006 Table 1613.5.2 Site Class Definitions*
4. *Ip – Importance Factor: [1.5 – Components must function after an earthquake for life safety purposes (Building Occupancy Code IV)] [1.25 - Buildings and structures that represent a substantial hazard to human life in the event of failure or that can cause substantial economic impact or mass disruption of day-to-day civilian life (Building Occupancy Code III)] [1.0 – Non-essential buildings. Function not life critical. (Building Occupancy Code I and II)]*
5. *Sds – 5% Damped Design Spectral Response Accelerations for Short Periods at 0.2 seconds – [2.5 - for 100A] [2.5 for 225A] [2.0 for 400A] [2.5 for 400A with lateral bracing]*
6. *z/h – height factor ratio: [___] Note: Ratio is a calculated value equal to the floor the gear is installed on divided by 12. A 6th floor installation is a 0.5 value. A basement or ground floor installation is a 0.0 value.*

C. *Equipment shall be designed to be located in a concrete and steel, moment-resisting frame building not exceeding 12 stories in height with a minimum story height of 10 feet.]*

1.5 QUALITY ASSURANCE

A. All busway products shall be manufactured in a facility which has:
   1. A Quality Management System registered to ISO9001:2000 (EN ISO 9001:2000; BS EN ISO 9001:2000; ANSI ASQ Q9001:2000).
   2. An Environmental Management System registered to ISO 14001:2004.

B. The manufacturer shall have been regularly engaged in the manufacture of busway systems for a period of at least twenty-five (25) years.

C. The manufacturer shall demonstrate that these busway products have been in functioning systems for similar applications for at least 15 years.

1.6 DELIVERY, STORAGE AND HANDLING

A. Refer to NEMA Publication BU1.1, which is a guide for proper installation, operation and maintenance of busway products.

B. Handle busway in accordance manufacturer's recommendations. Utilize factory provisions for all lifting, rigging, or hoisting.

C. Store busway prior to installation in a temperature and humidity controlled space.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The low voltage busway shall be XJ-L type manufactured by Siemens or pre-approved equal. Approved manufacturers are as follows:
   1. SIEMENS
   2. ***[ ]***

2.2 GENERAL REQUIREMENTS

A. General
   1. Furnish and install a complete prefabricated busway distribution system as shown on the plans.
   2. An optional ground or isolated ground bus shall be provided. The internal ground bus shall be no less than 100% for 100 amperes, 60% for 225 amperes and 52% for 400 amperes. The isolated ground bus, when provided, shall be 100% rated at all times.
   3. The busway shall be Siemens type XJL and shall be:
      [2 = 3Ø + Internal Ground]
      [3 = 3Ø + Isolated Ground]
      [4 = 3Ø + Internal Ground + Isolated Ground]
      [6 = 3Ø + 100% Neutral + Internal Ground]
      [7 = 3Ø + 100% Neutral + Isolated Ground]
      [8 = 3Ø + 100% Neutral + Internal Ground + Isolated Ground]
      [0 = 3Ø + 200% Neutral + Internal Ground]
   4. The ampere ratings, approximate footage, fitting, plug-in units, etc., are shown on the plans. The electrical contractor shall be responsible for routing the busway to coordinate with the other trades. Final field measurements shall be made by the contractor prior to release of the busway for fabrication.

B. Short-Circuit Rating And Tests
   1. The minimum short-circuit rating of the busway shall be ***[10kA for 100 amperage busway}, [22kA for 225 amperage busway]. [35kA for 400 ampere busway], [65kA UL series rated for 400A busway protected by 400A Siemens MCCB],*** RMS symmetrical amperes.
   2. The short circuit rating of the busway shall be determined according to UL Standard No. 857. This rating shall be based upon actual tests at the rated short-circuit current for no less than six (3) cycles.
   3. Busway shall be ***[___] volts [___] phase [___] wire***.

2.3 CONSTRUCTION

A. Housing
   1. The busway housing shall be fabricated steel and painted with polyester urethane powder paint to provide protection against corrosion.
   2. The busway housing shall be totally enclosed, non-ventilated and capable of being mounted in any position without derating.
   3. Track or continuous plug-in housing shall not be accepted.

B. Joints
   1. Bus bars shall be connected by means of a spring clamp pressure joint.
   2. Joint connections shall be maintenance-free.
   3. Joint connections shall be made without special tools, housing couplers or bus connectors.
   4. An inspection cover shall be provided at the joint of each section.

C. Bus Bars

1. The bus bars shall be fabricated from high strength, 98% conductivity copper, .125” solid bus bar and tin plated over the entire surface to ensure good electrical contact at all joints and plug-in tap-off points.
2. Formed continuous plug-in rail shall not be acceptable.
3. Aluminum bus bar shall not be acceptable.
4. The temperature rise at any point in the busway shall not exceed 55°C rise above ambient temperature when operating at rated load current.

D. Plug-In Openings
1. Plug-in outlets shall be finger safe (IP2X).
2. Busway shall be of the plug-in type with provisions for up to twelve (12) 100A bus plugs per 10 foot of plug-in busway.
3. All openings shall be usable simultaneously.

E. Support of Busway
1. The manufacturer’s standard hanger shall support busway sections and fittings.
2. Busway shall be approved for hanger spacing of up to 10’0”.
3. Seismic rating shall be based on use of standard busway hangers.

F. Voltage Drop
1. The voltage drop (input voltage minus output voltage) specified shall be based on the busway operating at full rated current and at stabilized operating temperature in 35º C ambient temperature.
2. The three-phase, line-to-line voltage drop shall not exceed 5.0 volts per hundred feet at 70% power factor concentrated load, which condition may exist during motor starting.

G. Plug-In Units
1. Where required, plug-in units of the types and ratings indicated on the plans and specifications shall be supplied. Plug-in units shall be ***[circuit breaker type] [fusible switch type]*** with quick make / quick break mechanism.
2. Plug-in units shall be equipped with a means for direct positioning or hanging, so that the weight is born by the busway before the stabs make contact with the bus bars.
3. The plug-in units shall be interchangeable without alteration or modification on all ratings of plug-in busway.
4. Bus plugs shall be able to be installed and removed by a qualified electrician, with the switch in the open position and load disconnected.
5. Bus plugs shall plug straight onto the busway bus bar. Twist-in or swing-on style plug-ins is not acceptable.
6. Fusible type plugs shall have a quick-make, quick-break disconnect switch
7. Circuit-breaker type plugs shall have an interrupting rating of not less than ***[___] RMS*** symmetrical amperes and shall meet all requirements of UL Standard 489.

H. Plug-In Unit Safety Devices
1. Plug-in enclosures shall make positive ground connection with the ground bus before the contact fingers make contact with the phase bars.
2. No projections shall extend into the busway housing other than the plug-in electrical stabs.

I. End Cable Tap Boxes
1. End cable tap boxes shall be configured to accept up to (2) 350 kcmil or (1) 500 kcmil cables per phase and shall conform to UL857 and NEC standards for wire bend space. Left and right side removable covers shall be provided for cable access.
2. End cable tap boxes shall allow for an optional power meter and CT’s to be mounted within the tap box for metering.

J. BUSWAY RUN METERING

1. A Siemens power meter shall be used to monitor power utilization for each busway run and shall be integral to the end cable tap box. ***[The meter shall be a Siemens [PAC3100][PAC3200][PAC4200][meter as shown on the drawings.]]***
2. Refer to Siemens SECTION ***[26 09 13] [16290]*** ELECTRICAL POWER MONITORING AND CONTROL for power meter specification.
3. The power meter shall have a digital display showing real-time critical power parameters for each phase. Each phase shall be visible on the display simultaneously.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install busway and accessories in accordance with manufacturer's instructions. Additional instructions are detailed in NEMA publication BU1.1 which is provided with the equipment by the electrical manufacturer.

B. Provide curb around interior floor penetrations per NFPA-70.

3.2 ADJUSTMENTS AND CLEANING

A. Set field-adjustable trip devices per coordination study.

B. Clean exposed surfaces using manufacturer recommended materials and methods. Touch-up damaged coating and finishes using non-abrasive materials and methods recommended by manufacturer. Eliminate all visible evidence of repair.

3.3 TESTING

A. …

3.4 WARRANTY

A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

3.5 ***[STARTUP SERVICES***

A. ***Engage a factory-authorized service representative to perform startup service.***

B. ***Train Owner's maintenance personnel on procedures and schedules for energizing and de-energizing, troubleshooting, servicing and maintaining equipment and schedules.***

C. ***Verify that circuit breaker is installed and connected according to the Contract Documents.***

D. ***Complete installation and startup checks according to manufacturer's written instructions.]***

END OF SECTION