EEHC DISTRIBUTION MATERIALS SPECIFICATION	EDMS 15 - 302 - 2
BUS TRUNKING SYSTEM	Date: 1-10-2024

EDMS 15-302-2

Technical specification for
Bus Trunking System

Issue: Oct-2024 / Rev- 2

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CONTENTS

Clause	Description	Page
1	SCOPE	3
2	APPLICABLE STANDARDS	3
3	ENVIRONMENTAL CONDITIONS	4
4	SYSTEM PARAMETERS	4
5	DESIGN & MATERIAL CHARACTERISTICS	5
6	IDENTIFICATION OF BTS AND MARKING	9
7	DESIGN REVIEWS AND TIME SCHEDULE	10
8	TESTS	10
9	SUBMITTALS	10
10	INSTALLATION, TESTING AND COMMISSIONING AT SITE	12
11	WARRANTEE	13
12	CHECK LIST FOR INSPECTION	14
13	ANEX.1 DRAWING	15

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EEHC DISTRIBUTION MATERIALS SPECIFICATION	EDMS 15 - 302 - 2
BUS TRUNKING SYSTEM	Date: 1-10-2024

1. SCOPE

- This specification covers the Busbar Trunking System (BTS) for which the rated voltage doesn't exceed 1000 v in case of AC. or 1500 v in case of DC.
- BTS used to distribute and control electrical energy for all types of loads, intended for industrial, commercial and similar applications, in the form of a conductor system comprising bus bars which are spaced and supported by insulating material in a duct, through or similar enclosure. B.T.S and their accessories may be installed, according to the design, indoor and outdoor locations, in various altitudes, and in different mounting conditions.
- This document specifies the minimum technical requirements for design, manufacturing, testing, inspection &supply and delivery of BTS of 3 phases and 4wires (bus bars).

2. APPLICABLE STANDARDS

Unless otherwise specified in this specification, the offered insulators shall comply with all the latest relevant applicable standards Issued by "International Electro Technical Commission (IEC)''

S.No	Standard No.	Description
1	IEC 60332-3-10	Tests of electrical and optical fiber cables under fire conditions. Part 3-10: Test For Vertical Flam Spread or vertically mounted bunched wires or cables apparatus.
2	IEC 60439-1	Low-voltage switchgear and controlgear assemblies – Part 1: Type-tested and partially type-tested assemblies
3	IEC 60439-2	Low Voltage Switchgear and controlgear assemblies Part 2 : Particular requirements for busbar-trunking systems (Bus ways)
4	IEC 61439-1	Low voltage Switch gear and control gear assemblies Part 1 : General Rules
5	IEC 61439-6	Low-voltage switchgear and controlgear assemblies – Part 6: Busbar-trunking systems (busways)
6	IEC 61786	Measurements of low Frequency magnetic and electrical Fields with regard to exposure of human beings – Special requirements for instruments and guidance for measurements.
7	IEC 60092-302	Low-voltage switchgear and controlgear assemblies
8	IEC 61084 (all parts)	Cable trunking and ducting systems for electrical installations
9	IEC 61534 (all parts)	Power track systems
10	Egyptian code(302/2)	Egyptian code for the principles of design and conditions for the implementation of electrical connections and installations

In case of any deviation from the listed standard, it should be indicated in the list of deviations list submitted by the supplier.

3. ENVIRONMENTAL CONDITIONS:

The performance of BTS should be guaranteed for following environmental conditions, any differences in the guaranteed performance should be clearly set out in the offer.

Ambient air temperature – Lower limit	Indoor: -5°C outdoor :-25°C
Ambient temperature – Upper limit	45 °C (50°C as option)
Ambient air temperature – Daily averagemaximum	35°C
Maximum relative humidity	Indoor:50 % at 40 °C Outdoor: 100 % at 25 °C
Altitude	≤2000m
Pollution degree (of the installation environment)	pollution degree 3
Fire resistance in building penetration	0 min Optional (40/ 60 / 90 / 120 / 180 / 240 min)

4. SYSTEM PARAMETERS

Nominal system voltage :	≤ 1 000 V a.c. or 1 500 V d.c.
BTS Rating current (at 40°C)	Aluminum up to 5000A Copper up to 6300A
Frequency	50 Hz
Minimum Rated impulse withstand voltage (50/1.2μs)	8 kV
Minimum Enclosure ingress protection	indoor IP54 outdoor IP65
Mechanical Impact	Indoor :IK 7 Outdoor :IK8

Temperature rise	
Parts of ASSEMBLIES	**Temperature rise K**
Terminals for external insulated conductors	70
Accessible external enclosures and covers: – metal surfaces – insulating surfaces	 30 [1)] 40[1)]
Manual operating means: – of metal – of insulating material	 15 [2)] 25 [2)]
1) In the case of external surfaces of enclosures of BTS which are accessible but do not need to be touched during normal operation, an increase in the temperature-rise limits by 25 K is permissible for metal surfaces and by 15 K for insulating surfaces.	
2) Manual operating means within ASSEMBLIES which are only accessible after the ASSEMBLY has been opened, for example draw-out handles which are operated infrequently, are allowed to assume a 25 K increase on these temperature-rise limits.	
A maximum temperature rise of 105K for bare copper busbars and conductors shall not be exceeded	

5. DESIGN &MATERIAL CHARACTERISTICS:

5.1. GENERAL

5.1.1. Feeder Trunking Run: Used for the interconnection between switchboards or switchboard and transformer as shown in Anex.1 (drawing).

5.1.2. Tab off unit: is one of two types, either plug-in or fixed.

4.1.2.1 Plug-in units are designed to be accommodated at tap-off outlets at intervals along the distribution busbar-trunking.

4.1.2.2 Fixed tap-off outlets are engineered and positioned during manufacture to suit the specified installation

5.1.3. The system may consist of many BTU Feeder unit, tab-off unit, Reducer, Flange end unit, flexible BTU (fittings) [elbow (Horizontal / Vertical/offset, combination), Tees, and flanges for passing through roof, wall, ceiling and floor], Expansion, and Support system (Hanger).

5.1.4. Creepage distances of supplementary insulation shall be not less than those specified for basic insulation according to IEC 60439-1.Creepage distances of reinforced insulation shall be twice those specified for basic insulation. Creepage distances of double insulation are the sum of the basic and supplementary insulation which compose the double insulation system

5.1.5. Short Circuit withstand capacity level for 1 sec shall be at least as the values mentioned in the following table :

Bus way Ratings A	Short Circuit Levels For Aluminum kA For 1 Sec.	Short Circuit Levels For Copper kA for 1 Sec.
250	10	
400	18.8	
630	30	25
800	40	40
1000	50	50
1200	50	50
1250	50	50
1350	50	50
1500	50	50
1600	50	50
2000	65	65
2500	80	75
3000	80	80
3200	80	80
4000	100	100
5000	100	100
6000-6300		100

5.2. CONSTRUCTION

5.2.1. Enclosure

The metal enclosure of the BTS shall be hot dip galvanized steel painted or powder coated extrude aluminum with thickness mentioned according to type test certificate to provide high protection and mechanical resistance for the phase conductors along the entire length. The BTS shall be totally enclosed, non-ventilated for protection against mechanical damage and dust accumulation. Resistance to corrosion is carried out according to IEC 61439-6

Where the trunking enclosure is used as the protective conductor, provided that they do not impair the electrical continuity and provided adjacent flammable parts are not ignited

Removal of the cover for access facility should necessitate the use of tool.

5.2.2. Bus Bar

- Bus Bar shall be hard drawn highly conductive electrical grade aluminum or 99.9% purity highly conductive electrical grade copper.
- Bus Bar shall be in the form of rectangular bars with rounded corners, and their length shall be according to the connection used in them.

- Live conductor shall be insulated as minimum class B material. The insulation shall be Certified as "Flammability Grad – V0" by the manufacturer.
- Junctions and tap off positions conductors shall be fitted with Tin or silver- plated for copper and aluminum conductors (not less than 5 µ m), or bimetal copper / aluminum for aluminum conductors.
- Junctions and tap off positions conductors shall be fitted with Tin or silver- plated copper for copper conductors (not less than 5 µ m) and, silver plated aluminum (not less than 5 µ m) or bimetal copper / aluminum for aluminum conductors.
- BTU installation of 3-phase- 4 wire system, the associated neutral busbar should have the same cross section area CSA of the phase busbar, except for higher rating BTU above than 630A,the neutral busbar may have CSA less than the CSA of the phase busbar according to ..EDC and manufacturer design (optional).

5.2.3. Tap off unit box :

The tap-off unit box contains the overcurrent protection device at the outgoing circuit terminated at the unit to distribute power to the required load. The protection device shall be Low voltage Circuit breaker according to EDMS 19-303-1.

- Tap off box door with interlock that prevents opening of door except when protection device is in off position. The interlock will prevent also the insertion or removal of tap-off box from BTS when it is in “ON” position, as well as interlock to prevent closing of circuit breaker with door open shall be provided.
- Tap off unit jaws shall be fitted with Tin or silver- plated for copper and aluminum conductors (not less than 5µ m) or bimetal copper / aluminum for aluminum conductors.
- Tap off unit jaws shall be fitted with Tin or silver- plated copper for copper conductors (not less than 5 µ m) and, silver plated aluminum (not less than 5 µ m) or bimetal copper / aluminum for aluminum conductors.
- The earthing contact of the tap-off unit shall always be made before that of the live conductors and the last to break during removal**.**
- The tab off box should be guaranteed for Ingress protection as per requirement for indoor/outdoor application

5.2.4. <u>Flanged end box</u>:

a) Flanged end box shall be provided to accommodate flange end for connecting the bus trunking with the flanges of panels, transformers etc. through flexible braided connections or as recommended by manufacturer as example shown in Anex.1 (Drawing).

b) The flange end termination on panel should be guaranteed for Ingress protection as per requirement for indoor/outdoor application and should be backed by a type test report from the manufacturer.

c) Phase matching of bus trunking with equipment shall be done prior to installation.

d) Minimum clearance between two phases after braid termination installed should be as per standards

5.2.5. Joints :

The BTS joint shall be of the one-bolt or two bolts type (according to manufacturer design) which utilizes a high strength steel bolt and to maintain proper pressure over a large contact surface area. The bolt shall be torque indicating and at earth potential. The bolt shall be two-headed design to indicate when proper torque has been applied and require only a standard long handle wrench to be properly activated. It should be possible to remove any joint connection assembly to allow electrical isolation or physical removal of a BTS length without disturbing adjacent BTS lengths. There shall be no bolts passing through the bus bars of the bus way as a part of safety.

5.2.6. Support system:

Both horizontal and vertical spacing between support structures (hanger) shall be as per the recommendations of the manufacturer.

Vertical spring hangers are used on subsequent floors to absorb any vibration and expansion of the busduct**.**

Installation shall be done with all the required hot dipped galvanized iron/steel supports as per the manufacturer's recommendations as shown in Annex.1.

5.2.7. End of Runs

End pieces and end caps will be provided to install at the ends of each run.

6. IDENTIFICATION OF BTS AND MARKING:

Marking made by moulding, pressing, engraving or similar, including labels with a laminated plastic covering. One nameplate shall be located near one end of each BTS unit and one on each tap-off box unit.

- ✓ BTS manufacturer's name or trade mark
- ✓ Type designation or identification number or any other means of identification, making it possible to obtain relevant information from the BTS manufacturer.
- ✓ Rated Voltage.
- ✓ Material of conductors.
- ✓ Year of manufacture.
- ✓ Customer name (…EDC).
- ✓ Type (indoor / outdoor).

- ✓ Protection degree (IP)
- ✓ Rated current
- ✓ Short circuit level.
- ✓ Length of BTS
- ✓ The relevant BTS certified standard as IEC 61439-6 may specify where additional information is to be provided by designation label.

7. DESIGN REVIEWS AND TIME SCHEDULE

a) The manufacturer (Contactor) is responsible for site survey and takes the necessary measurements to perform the appropriate design for BTS installation and taking into consideration that BTS Shall Not Pass through Walls or Floor Unless:

1. The wall or floor is dry.
2. The busway is in an unbroken length where it passes through the wall or floor.
3. The busway is provided with an internal barrier of non-ignitable insulating material to prevent the spread of fire where the bus-way passes through the wall or floor.
4. Where a BTS passes through a floor slab, the floor surrounding the busway shall be raised by a minimum of 100 mm to prevent any water draining into the floor penetration. The raised floor area or nib shall be constructed of concrete.
5. Any sub mains, or final circuits, supplied from a BTS shall be protected against over current by a circuit breaker.

b) The co-ordination of protective devices shall be taken into consideration by manufacturer during design.

c) The manufacturer shall indicate his overall system design configuration and the Electricity Distribution Company (..EDC) shall have the right to ask for and require any explanations.

d) All BTS Parts, fittings, and joints shall be supplied from the same manufacture.

8. TESTS

BTS shall be tested in accordance to the latest relevant all relevant applicable IEC standards and this specification. It shall be the responsibility of the manufacture to perform or to have performed all the tests specified. All type tests had to be performed by accredited laboratories. The test required will be as mentioned in Table.1.

All tests should be carried out by the manufacturer and at his expense and under control.

9. SUBMITTALS

The tenderer shall submit with his offer the following items for review, evaluation and approval:

a) Single copies of detail drawings of BTS construction, instructions illustrating and explaining the design criteria and design bases.(Such as MCB, ratings and data sheets, the rating of each BTU, etc)

b) Reference standards applied to the BTS and instructions for erection, operation, quality control procedure and maintenance.

c) Applicant's proposal for product sample test and routine test

d) Certified copies of all Type Test Reports

e) List of all component used and its rating and ID No. corresponding to the drawing:

- Busway ratings including:

Short-circuit rating
Voltage
Continuous current
Insulation material and class
Cross section for the 3phase and neutral conductors

Average Weight in kg for each BTS unit

- Major component ratings (Such as MCB)including:

Voltage
Continuous current
Interrupting ratings

f) The tenderer shall fill in thoroughly in type-writing the attached guarantee data for the offered BTS as sample table 2

g) In addition the tenderer shall indicate in his offer the proposed implementation time schedule

Table1. BTS Routine Test and Type Test according to IEC Specification

Tests	Specification of tests	TT	RT
Visual inspection		X	X
Temperature rise IEC 61439	IEC 61439-1/6, 10.10.2	X	
Short circuit strength	IEC 61439-1/6, 10.11.5.	X	
Mechanical impact	IEC 61439-1/6, 10.2.6	X	
Ability to withstand mechanical loads	IEC 61439-1/6, 10.2.101	X	
Insulation resistance test for main ,and auxiliary circuits (if applicable)	IEC 61439-1/6, 10.2.3	X	X

Power-frequency withstand voltage	IEC 61439-1, 10.9.2	X	
Impulse withstand voltage	IEC 61439-1, 10.9.3	X	
Clearance &creepage distance	IEC 61439-1,10.4	X	
Verification of protection degree	IEC 60529	X	
Flame propagation	IEC 61439-6,10.101	X	
Fire resistance (if required)	IEC 61439-6,10.102	X	
Mechanical /particular characteristics of sheathing compounds (if applicable)	IEC60092-350 IEC60092-360 Table 6&8	X	
Resistance to corrosion	IEC 61439-6	X	
Terminals for external conductors	IEC 61439-1/6, 10.8	X	
TT = Type test RT = Routine test			

10. Installation, Testing and Commissioning at site:

- The BTS components shall be supplied in properly packed conditions. After ascertaining that there is no damage to the packing, all the items shall be inspected after unpacking. It is the responsibility of the manufacturer to inspect all the materials for damage, if any, after unloading at site. Installation shall be done with required supports, joints etc strictly as per the recommendations of the manufacture and IEC standards. Care should be taken by the manufacturer to ensure that no damage is caused either to the product or the technicians who are deployed for the installation work.
- EDC shall not be responsible for any such losses that may occur during installation, testing and commissioning works.
- EDC representatives shall have a check list completed before commissioning as table 2
- All the required commissioning tests shall be carried out in the presence of EDC representatives.
- Installation, Testing & Commissioning shall be done strictly by the contractor personnel only. The system shall be commissioned only after the EDC's engineer qualifies that the product has been installed and tested as per the proposed design and in conformation with IEC 61439-6-2012.

- All the required operating and maintenance manuals, as-built layout of the bus way along with complete details of all the components of the system, necessary protocols to be followed during maintenance etc shall be handed over to the Department.
- The EDC shall reserve the right to accept / reject any part of work, which is not complying with submitted approved offer by manufacturer.

11. WARRANTY

Manufacturer shall warrant BTS against all defects arising out due to faulty design and defects in materials or workmanship for the period of 1 year from the date of substantial handover.

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Guarantee Table: Sample of at least data will be informed by tenderer in Guarantee Table

Description /Parameter	EDC Requirement	Tenderer Design
Model of the bus way	Manufacture model	
No of phases	3 phase , 4 wire	
Rated operation Current (A)	----------A	
Rated operation current of Neutral (A)	----------A	
Conductor dimensions/ phase	As mentioned by manufacturer	Mm, Mm2
Conductor material	Aluminum Copper	
Insulation material	As mentioned by manufacturer	
Insulation thickness (mm)	Type test	
Class of Insulation	Min. Class B	
Rated insulation Voltage (V)	1000 V	
MinimumRated Impulse withstand	8kV	
Rated operated voltage	400V	
Rated Symmetrical Short Circuit Current for 1Sec	kA	
Ingress Protection (IP)	Min. Indoor IP:54 Min. Outdoor IP:65	
Mechanical impact	Indoor Ik:07 Outdoor Ik:08	
Resistance to corrosion test According to IEC 61439-6	Mandatory	Enclosed/Not Enclosed
Type test certificate for bus trunking system in confirmation with IEC61439-6-2012 certified by certified lab	Mandatory	Enclosed/Not Enclosed

EEHC DISTRIBUTION MATERIALS SPECIFICATION	EDMS 15 - 302 - 2
BUS TRUNKING SYSTEM	Date: 1-10-2024

CHECK LIST FOR INSPECTION

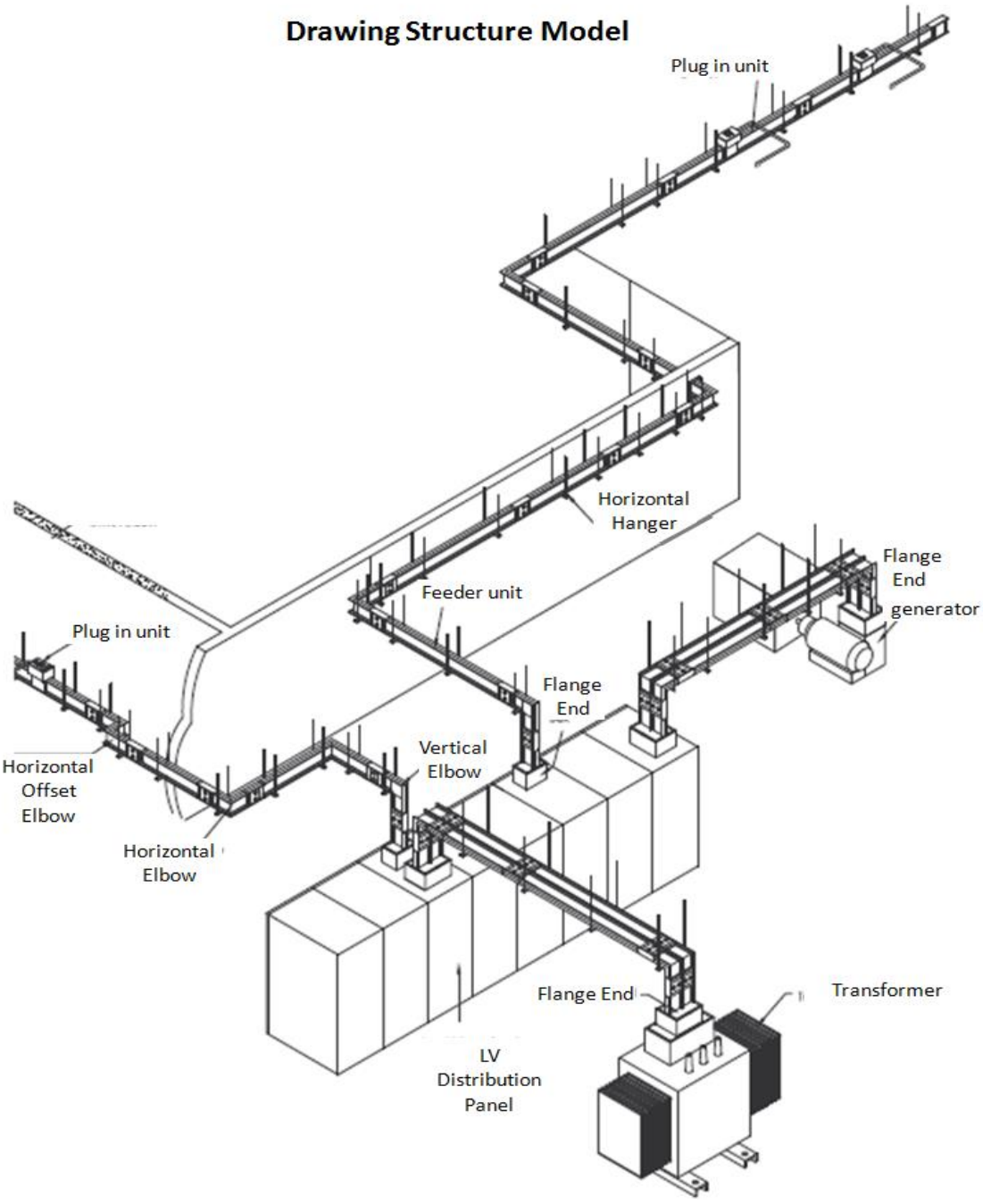
Project Name Date

Description	Result	observation
Check the physical appearance of busway (labels, paint, and shape), there should be no damage visible outside.	☐ OK	☐ Not OK
BTS are installed as per approved drawings and direction are strictly followed for installation	☐ OK	☐ No
BTS distance from beams, ceiling , and other ducts maintained as per manufacturer installation guideline	☐ OK	☐ No
Distance between two adjacent hangers/clips is maximum 1.5 m. Extra hangers in between are acceptable however ensure hanger is not coming in joint section	☐ OK	☐ No ☐ NA
Additional supports are given at each Bend irrespective of the above mentioned supports	☐ OK	☐ No ☐ NA
No joints are installed inside the wall or floor slab and minimum distance from wall/ceiling is maintained as per guideline	☐ OK	☐ No ☐ NA
All the bolts (of joints, joint covers , termination)are tightened to recommended torque value	☐ OK	☐ No
Maintenance Free Nut is broken, Lock Nut is formed and red marking done at Nut side	☐ OK	☐ No
Flange End , Flexible connector is fixed right	☐ OK	☐ No
Plug in boxes/tap-off boxes are as approved drawing, over current protection device rating	☐ OK	☐ No
Ensure wiring is done between Plug in box and Plug in feeder, after installation of plug in box with plug in feeder, continuity of same should be verified after installation	☐ OK	☐ No
Ensure that there is no water spilled on BTS	☐ OK	☐ No
Megger value for each route found more than 100M ohm before commissioning	☐ OK	☐ No
If any unit is kept unused ,ensure the proper storage	☐ OK	☐ Not OK

Tested By manufacturer representative:
Witnessed by EDC Representative:

EEHC DISTRIBUTION MATERIALS SPECIFICATION	EDMS 15 - 302 - 2
BUS TRUNKING SYSTEM	Date: 1-10-2024

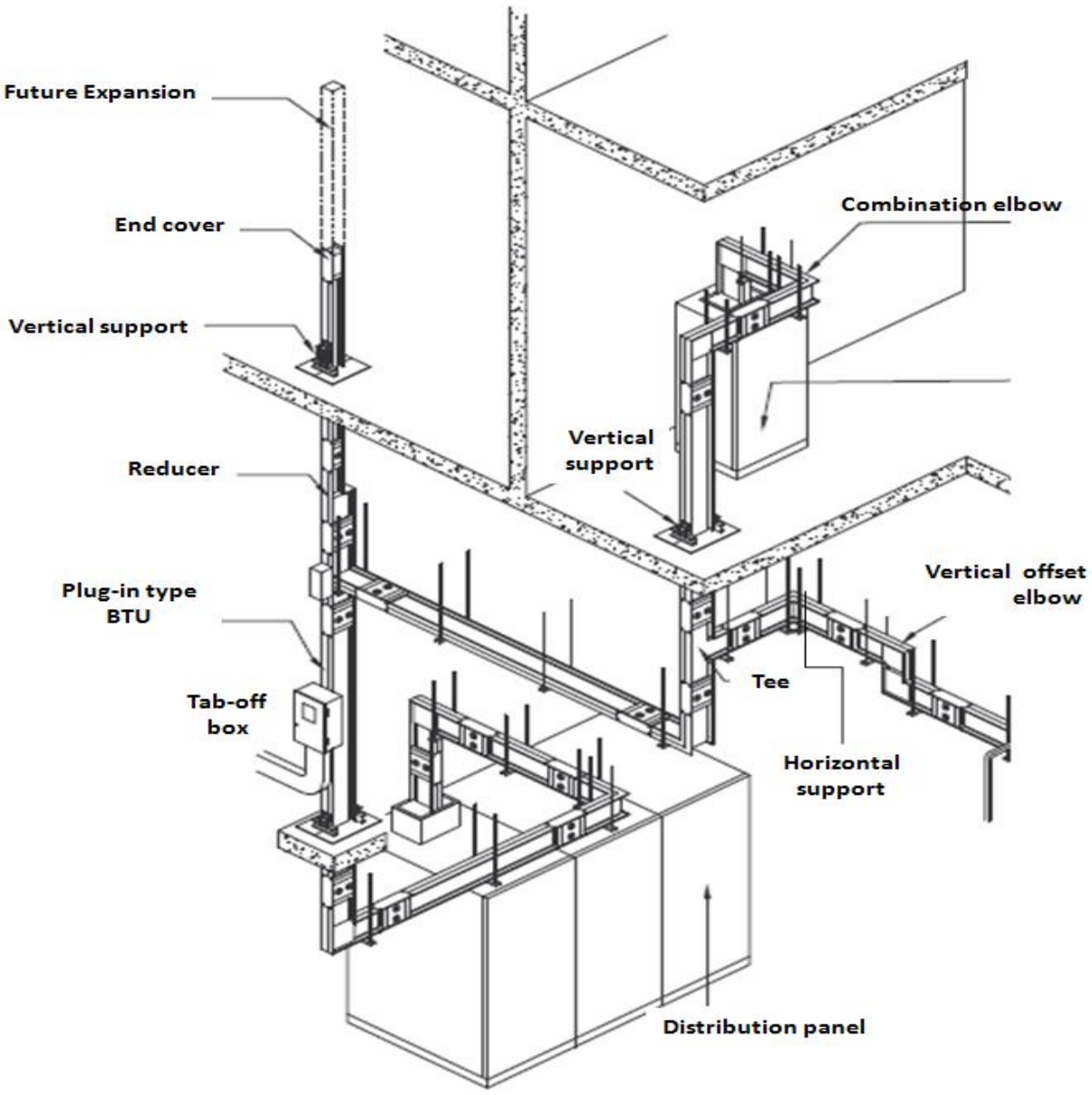
Anex.1 .Drawing



The drawings for clarification only, and do not belong to a specific manufacturer

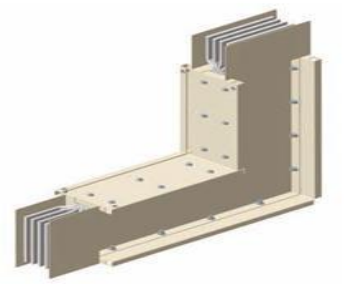
EEHC DISTRIBUTION MATERIALS SPECIFICATION	EDMS 15 - 302 - 2
BUS TRUNKING SYSTEM	Date: 1-10-2024

Drawing Structure Model

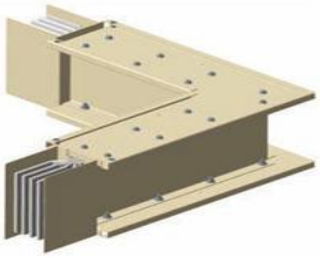


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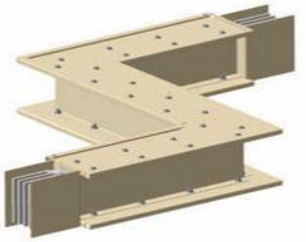
Fitting Component



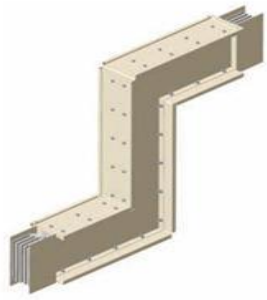
Vertical Elbow



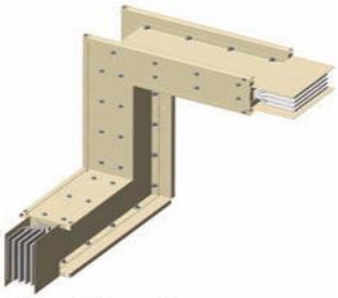
Horizontal Elbow



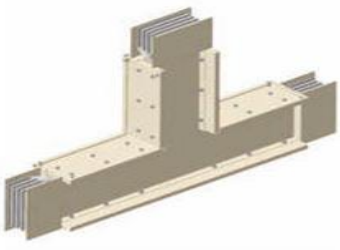
Horizontal Offset Elbow



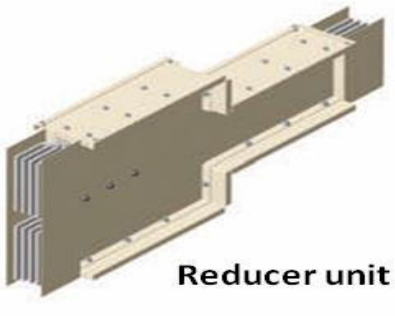
Vertical Offset Elbow



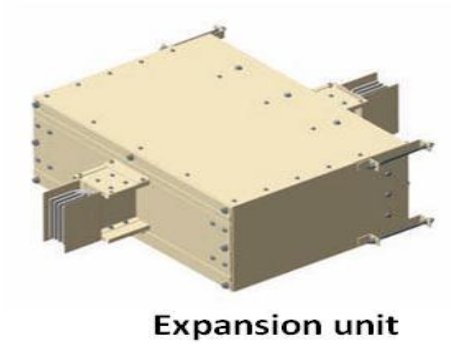
Combination Elbow



Vertical Tee Elbow



Reducer unit



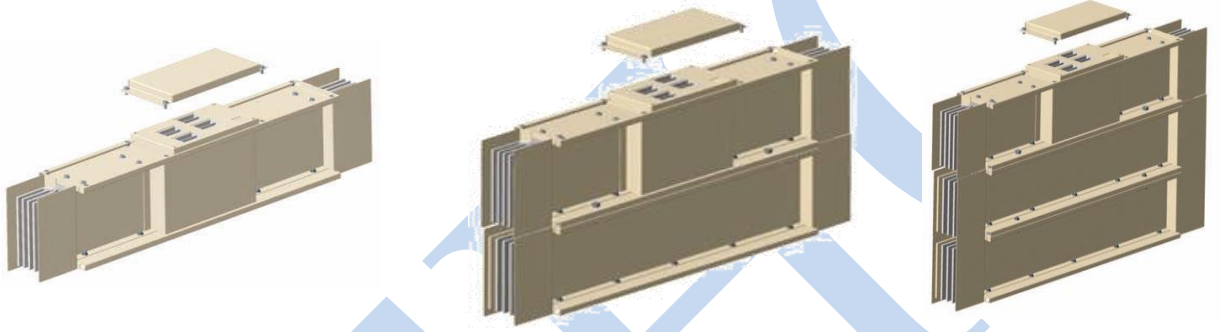
Expansion unit

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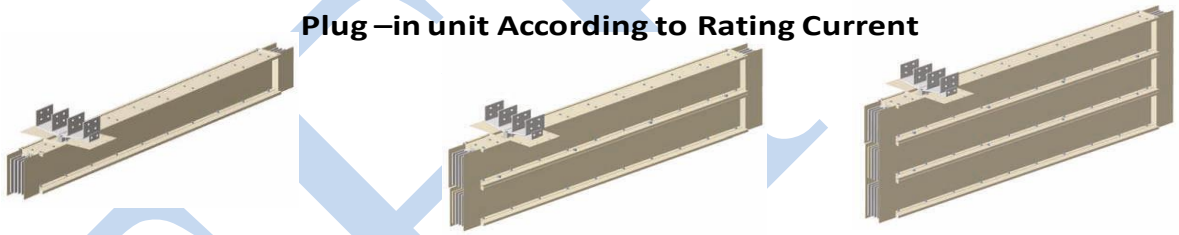
EEHC DISTRIBUTION MATERIALS SPECIFICATION	EDMS 15 - 302 - 2
BUS TRUNKING SYSTEM	Date: 1-10-2024



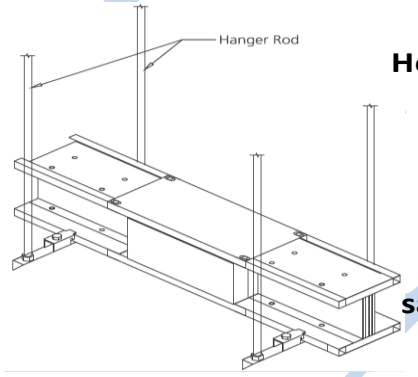
Feeder Type According to Rating Current



Plug –in unit According to Rating Current

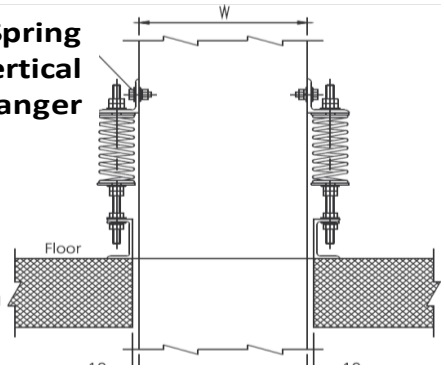


According to Rating Current Tab off unit



Horizontal hanger

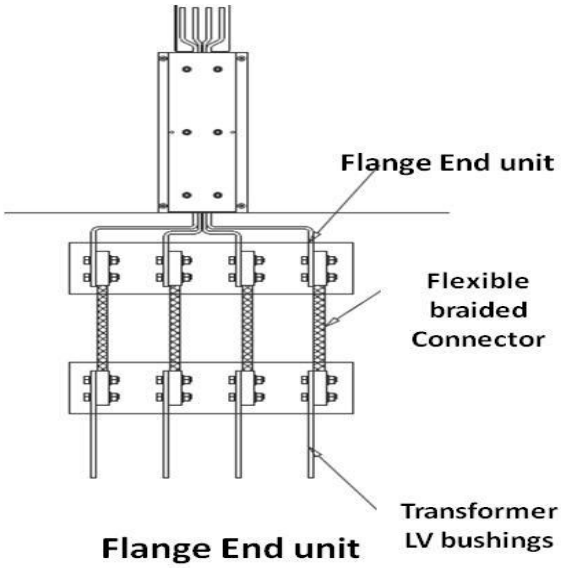
Spring vertical hanger



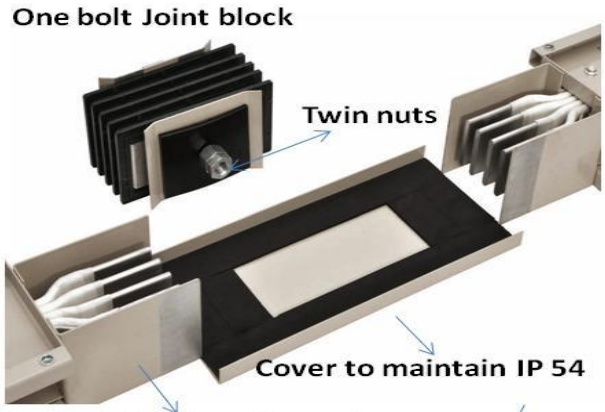
sample of support system design

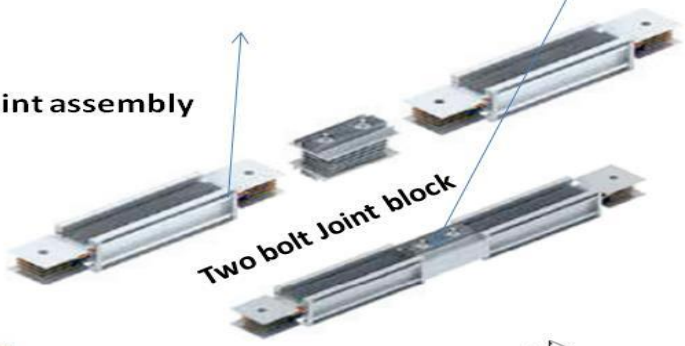
The drawings for clarification only, and do not belong to a specific manufacturer

EEHC DISTRIBUTION MATERIALS SPECIFICATION	EDMS 15 - 302 - 2
BUS TRUNKING SYSTEM	Date: 1-10-2024



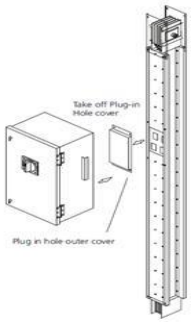
Flange End unit











Tab-off box –plug in feeder

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