MEGA-DUCT

MAYDUCT TECHNOLOGY SDN.BHD.

# OPERATION
# &
# INSTALLATION MANUAL
# (OIM)

## ELECTRICAL BUSWAY
## TRUNKING SYSTEM
## (MEGA-DUCT)

MEGA-DUCT

**CONTENTS**

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# SECTION 1:

# GENERAL

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# 1. GENERAL

This Operation and Instruction Manual (OIM) provides technical data and basic electrical information which serves as a guide to the proper procedure and care to be taken during handling, installation and maintenance of Megaduct Busway Trunking System and accessories.

Reference should be made to the catalogues and drawings attached in this manual. Please refer to the manufacturer for advice should you have any doubts against the interpretation of the information contained herein.

## 1.1 General Construction

Mega-Duct Busway Trunking System are totally enclosed, well insulated and ventilated within the steel housing which consists of copper bar, insulation material and tap off unit c/w MCCB.

Mega-duct Busway Trunking System are designed for use a 400V and up to 1000V / 3P / 50Hz constructed in various configurations of 3 phase 4 wire or 3 phase 4 wire with 50% integral earth bar installed inside the housings.

Mega-Duct Busway Trunking System are tested and certified by ASTA to comply with BS 5486 Part 2 1990, IEC 439-2 1987 & 2000.

### 1.1.1 Housing

The Mega-Duct housing profile is designed to provide the most efficient way to dissipate heat through conduction and natural convection. All housings are constructed from 1.6mm / 2.0mm electro galvanised steel sheet coated with oven baked polyester epoxy coated powders which also provides maximum mechanical strength against electromagnetic stresses during short circuit.

### 1.1.2 Copper Busbar

The Mega-Duct copper busbars are of high conductivity 99.98% ETP hard drawn copper with a minimum of 99.95% and above purity and fully tin plated.

### 1.1.3 Copper Busbars Insulation

The Mega-Duct copper busbar insulation are of Class H-180°C standard epoxy coating provides a 100% waterproof, chemical resistance and high mechanical strength. The advantages of using epoxy coating as insulation are;

- Design to withstand glitch and spikes in electrical system
- Design to cater for expansion and contraction during peak & off-peak hours.
- Capable of withstand heat shock
- High reliability under static conditions, high mechanical strength against impact and high thermal conductivity.

### 1.1.4 Joints

The Mega-Duct joint has been designed precisely and manufactured using the highest quality of materials to minimized all possible problems and enhance system performance.

This special design provides outstanding features as follows:

- Incorporates a 5mm thermal expansion and movement at every joint.
- Allows ± 15mm of lateral adjustment to correct site measurement inaccuracy.
- Able to tilt an angle of ± 5° (total 10° > along single axis)
- Longer overlapping length ( > 40mm) to increase contact area.
- One bolt bridge joint system
- Easy to remove / install joints without removing the busducts.
- Shear off twin headed bolts to required torque of 70 Nm.

### 1.1.5 Tap Off Units

The Mega-Duct tap off units with MCCB of various current rating are available to cater for most installations & requirements. The tap off unit has design such that can only plug into the busduct opening provide the phase sequence of their contacts and busbars are in the correct sequence. We have 3 type of TOU system to cater for the normal installation;

- Plug-In Type – For MCCB 30A upto MCCB 400A
- Bolt –On Type – For MCCB 600A upto MCCB 800A
- Tee-Off Type – For MCCB 1000A upto MCCB 2000A

## 1.2 Factory Routine Test

Every busduct and accessories are subjected to the following standard routine test before packing and delivery to the site;

### 1.2.1 Insulation Test

Insulation Test is conducted with 1.0 KV DC Megger test equipment. This test is conducted on every busduct and accessories to ensure that the system is not failed. The insulation testing will withstand for 60 seconds at 1 KV DC system. The reading of Megger Test recorded in the test report.

### 1.2.2 High Pressure Test

High Pressure Test is conducted with a 5.0 KV AC High Pressure Test equipment. This test is conducted on every busducts and accessories to ensure the insulation are not damaged or broken. The testing will withstand for 60 seconds at 5KV AC System. The reading of High Pressure Test recorded in the test report.

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## 1.3 Packing & Handling

The Mega-Duct busducts and accessories are normally wrapped and protected with 3 to 5 layers of PVC stretched films. Both ends (joint) of busduct are protected with soft materials. For overseas project or at the Client's request, sometimes the busducts are placed in timber crates of 2 to 3 tons for safe or easy handling and nasty transportation conditions particularly. All busducts are labelled with tag number in accordance with drawings.

## 1.4 Product Final Inspection

All busducts must be visually inspected for technical execution and conformity with the latest issue of approved drawings before packing and delivery to site. Sport check must be made to verify the following;

- Standard Mega-Duct Sticker
- Factory Routine Test
- Effectiveness and reliability of operating mechanism, locks and interlock system for TOU.
- Suitability of clamping, earthing and termination arrangements.

## 1.5 Product Warranty And Guarantee

MTSB warrants that each of the goods and its components directly supplied by MTSB will conform to the applicable manufacturer's specification for a period of 18 months upon delivery of goods at site.

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## SECTION 2:

# MEGA-DUCT BUSWAY TRUNKING SYSTEM AND ACCESSORIES

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## 2. MEGA-DUCT BUSWAY TRUNKING SYSTEM AND ACCESSORIES

### 2.1 General

Mega-Duct busway trunking system consist of flange end, straight lengths, bends and other fitting and tap off units joining together for distributing large quantity of current from one source to other destinations. Each assembly comprises of busbars which are supported by high-impact fire resistant insulating material and house in metal ducting or enclosure. The busduct can be installed in any orientation without any current deration.

| *A.* | *Product Materials* | |
|---|---|---|
| 1. | Feeder Busducts | Refer to Attached Catalogue – Page 8 |
| 2. | Plug In Busducts | Refer to Attached Catalogue – Page 8 |
| 3. | Joints | Refer to Attached Catalogue – Page 7 |
| 4. | Elbows | Refer to Attached Catalogue – Page 9,10,11,12,13,14 &15 |
| 5. | Tap Off Units | Refer to Attached Catalogue – Page 21 |
| 6. | Flange End | Refer to Attached Catalogue – Page 17 |
| 7. | End Feed Cable Box | Refer to Attached Catalogue – Page 18 |
| 8. | End Cover | Refer to Attached Catalogue – Page 20 |
| 9. | Expansion Joint Unit | Refer to Attached Catalogue – Page 19 |
| 10. | Horizontal Hanger Support | Refer to Attached Catalogue – Page 22 |
| 11. | Vertical Spring Hanger Support | Refer to Attached Catalogue – Page 23 |
| 12 | Flexible Wire Braided | |

### 2.2 System Description

#### 2.2.1 Busduct & Accessories

This busduct system are totally enclosed, low impedence, maximum temperature rise upto 95° and easy maintenance. In the event, if have any failure to the system, the busduct joint is a main part need to check and inpection either the joint nut loose or water dripping.

#### 2.2.2 Tap Off Unit

This tap off unit has designed with interlocking mechanism as protection;

- All tap-off units are interlocked to prevent removal when outgoing device is in 'On' position.
- When the tap off unit is 'Open', it is interlocked that MCCB cannot be turned 'On'.
- Earth contact shall make before the live contact are made.
- Live contacts shall break before the earth contact is broken.

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## SECTION 3:

# DETAILS OF MEGA-DUCT MANUFACTURER

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## 3. DETAILS OF MEGA-DUCT MANUFACTURER

### 3.1 INTRODUCTION

Mayduct Technology Sdn.Bhd., a manufacturer specializing in busduct, has produced safe and high quality busducts to our valuable customers.

Mega-Duct Busway Trunking Systems have been established since 1992 and have successfully completed many projects in Malaysia and overseas.

With continued product research and development process carried out by Mayduct Technology Sdn.Bhd, we are able to provide uniquely designed and highly reliable products. This is achieved by adopting sophisticated thermodynamic design applications and quality manufacturing methods to deliver high performance products to our customers.

Mega-Duct Busway Trunking Systems are tested and certified by ASTA to comply with BS 5486 Part 2: 1990 and IEC 439 - 1 & 2 1987 and 2000.

Mayduct Technology Sdn.Bhd. has also adopted a Quality Management System and is certified as ISO 9001: 2000 manufacturing company.

Our factory address is;

Mayduct Technology Sdn.Bhd.
Ground Floor, Wisma LFE,
Lot 993, Off Jalan Balakong,
43300 Balakong,
Selangor.

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SECTION 4:

# TECHNICAL DATA OF MEGA-DUCT BUSWAY TRUNKING SYSTEM

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## 4. TECHNICAL DATA OF MEGA-DUCT BUSWAY TRUNKING SYSTEMS

| *Specification* | **Description** |
|---|---|
| Standards / Technical Specification | IEC 439-Part 1 and Part 2, BS 5486. Tested and certified by ASTA to the latest editions. |
| Ingress Protection (IP) | IP 42, IP54, IP 55, IP 65, IP 67 |
| Type | Totally enclosed and well insulated feeder, non ventilated, sandwiched & compact. |
| Materials | Copper Bars: High conductivity copper bars> 99.95% purity and 99.98% IACS conductivity, ETP half hard copper bar<br>Housings : 1.6mm to 2.0mm E.G / SPCC / Al sheet |
| System | 3P3W/ 3P4W / 3P3W50%E / 3P4W50%E / 3P4W200%N |
| Ratings | 100A up to 6500A |
| Insulation | Epoxy Powder Coating – Class H 180°C |
| Plating Protection | Electro tin plated over contact surfaces of busducts |
| Painting | Polyester oven baked painted |
| Joints | Single bolt bridge joint system with special twin headed shearing bolt on Belleville disc spring washers. |
| Plug In Opening | Standard plug-in type and bolt on type. |
| Earthing | External & Integral Earth |

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## SECTION 5:

# MEGA-DUCT INSTALLATION & MAINTENANCE PROCEDURE

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## 5. MEGA-DUCT INSTALLATION & MAINTENANCE PROCEDURE

### 5.1 Objective

This Megaduct Installation & Maintenance Manual (OIM) is a supplementary document to our standard installation manual and defines the correct installation procedures and method for tradesmen/ workers and the project site team to follow when they perform the work and to ensure that installation is balanced, static and completed with zero defects.

### 5.2 Introduction

This OIM defines the Mega-Duct Busway Trunking System preparation and installation work instructions for tradesmen / workers and project site team to follow when they perform the job.

#### 5.2.1 Standard Feeder Busduct

- Feeder busducts are used for floor power distribution within the riser space and are supplied and installed complete with all accessories such as joints, elbows, end feed cable box, flange end, T-Sections, end covers, trunking support bracket and adaptor junction boxes for connection of main electrical equipment to this Busway Trunking System.

- The system shall be designed for routing of power distribution to avoid clashes with other M&E services.

#### 5.2.2 Plug-In/Bolt-On Type Busduct

- Plug-In/Bolt-On type busduct system shall be used in the tapping of and distribution of power within the riser or floor space and in accordance with the customers' needs as shown in the drawings and as specified.

- The Plug-In/Bolt-On boxes supplied shall be from a proprietary system complete with all necessary plug-in boxes, MCCBs protection interlocking devices, fixing clips and all other accessories necessary to form a complete working system. The method of installation of the plug-in box shall comply with the manufactures instructions.

### 5.3 Scope of work

This OIM applies to all sites which require Mega-Duct Busway Trunking System installation works carried out by the Company or any authorised agent.

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## 5.4 Standard

Manufacture of Electrical Busway Trunking System comply with BS 5486 Part 2:1990 and IEC 439 Part 1 and Part 2: 2000. Tested and certified by ASTA to the latest editions.

## 5.5 Installation Procedures

### 5.5.1 Pre-Installation of Busway Trunking System

- The preparatory works shall be provided as per Installation Manual prior to the installation of the Busway Trunking System trunking.
- A complete system installation shall be based on the "Approved" shop drawings by the Consultant.
- The builders shall provide the datum line for alignment and level.

### 5.5.2 Installation of the Busway Trunking System

- Mark out trunking layout in accordance with relevant construction and installation drawings, clearly mark the positions of joints and supports.
- The floor level will be determined from the datum line for installation of busduct hangers.
- The horizontal string will be used to check that the trunking paths/routes are in straight line from the wall or column upon erection of the busducts.

### 5.5.3 Caution

- Any uneven level of the Busway trunkings paths should be rectified and adjusted prior to testing.

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## 5.6 Material

### 5.6.1 Feeder, Plug-in Busducts, Bolt-On Busudcts & Accessories

- Busducts shall be modular design in sections to facilitate installation and subsequent removal and interchange of components.
- It shall be a removable joint between each length of the busduct. The joints shall be easily removed and readily reinstated with the use of special tools.
- Any screws or bolts / nuts used in any part of the busduct particularly for the jointing of each busduct shall not be removed.
- Manufacture of busducts shall comply with BS 5486 Part 2 : 1990 and IEC 439-2 : 2000.
- Two types of busducts are used for horizontal and vertical risers with the feeder and plug-in types as indicated in the shop drawings.

### 5.6.2 Earthing Bars

- Integral earth bar, ½ size is provided within the metal clad housing.
- The cover of the service outlet box shall be provided with a brass earth terminal and shall be earthed to the main trunking body.
- Copper earth links shall be used for each joint to maintain electrically earth continuity and shall be installed at the internal side of the trunking. All electrically conductive parts shall be properly earth and the entire trunking system shall be earth continuity maintained.

## 5.7 Inspection

All busducts installed must be inspected, tested and approved by Client representatives after completing installation.

### 5.7.1 Inspection Upon Completion Of Installation

1. Ensure both alignments (vertical & horizontal) are straight before energizing.
2. Ensure all joint bolts are tightened to recommend torque.
3. Check for continuity of connections.
4. Check for any water ingress due to leaks from the facilities.
5. Check for pressure test / current leakage on site with proper test instruments.
6. The stretched films as a wrapping material need to remove.
7. Check for correct phasing sequence of busducts.

### 5.7.2 Inspection Before Energization

1. Re-check all joints connections for tightness. Follow the manufacturer's torquing recommendations.
2. Ensure that all tap-off or plug-in devices are in the 'OFF' position
3. Isolate the busduct run by disconnecting all connections to transformer, switchboards, cable box and etc.
4. Conduct an insulation resistance test with an insulation resistance tester to ensure that the system is free from short circuit and grounds. It should be noted that readings vary inversely with the length of run and width or number of bars per phase.
5. Verify that the system phasing matches the busway phasing before re-connecting all connections to transformer, switchboards, cable box and etc.

### 5.7.3 Inspection After Energization

1. Check for adverse temperature rise with proper test equipment (infra-red thermometer)
2. If high temperature (> 100°C) at joints detected, de-energized the busway system and check for tightness of joints to correct torque setting.
3. Look for moisture or any signs of wetness or dripping on housings

## 5.8 Recommend Service & Maintenance Schedule

### 5.8.1 Periodic Inspection

Periodic inspection (recommended to be every six (6) months) shall be to identify trouble areas:

1. Loosening of joints bolts.
2. Busduct temperatures particularly at the joints and plug-in units.
3. Moistures or water dripping from leaks.
4. Dusty conditions.
5. Check operating amperes of busducts.
6. Humming noise of busducts.

### 5.8.2 Recommend Equipment to use:

1. Contactless thermometer (laser type) and map temperature of busduct (both at bodies and at joints) per year basis.
2. Torque wrench to check for joint torque setting on half-year basis (1st year after energizing) and on yearly basis for the following years.

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## SECTION 6:

# EMERGENCY PROCEDURE

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## 6. EMERGENCY PROCEDURE

### 6.1 General

For any problem or failure to the Mega-Duct Busway Trunking System during operation or maintenance work, please immediately contact manufacturer for technical assistance;


Mayduct Technology Sdn.Bhd
Ground Floor, Wisma Mayduct,
Lot 993, Off Jalan Balakong
Balakong, 43300
Selangor Darul Ehsan.
Tel: 603-89616151, 89612804, 89613639
Fax: 603-89615417
e-mail: mayduct@po.jaring.my


Or our technical people to contact;

| | |
|---|---|
| Mr.Lew Chih Bok Managing Director) | – H/P No. 012-6080010 |
| En. Rulhassan Bin Salleh (Mktg Director) | – H/P No. 016-2135414 |
| En. Noor Bin Bakran (Project Manager) | – H/P No. 016-3302623 |
| Mr. Wong Yew Choong (Project Manager) | – H/P No. 016-2752033 |

### 6.2 Fault Finding For Mega-Duct Busway Trunking System & Accessories

| Item | Symptom | Possible Causes | Possible Remedies |
|---|---|---|---|
| 1 | Busduct Temperature rise up to 80° to 100° C | Busduct joint tightened had loose | Re-tightened all the busduct joints at required torque setting |
| 2 | Humming Sound | The earth bar not proper tightened to the busduct housing | Re-tightened a screw & nut for the earth bars. |
| 3 | Megger Test failed | 1.The joints insulation material had water.<br>2. The joint insulation not properly installed.<br>3.The copper bar insulation had damaged. | 1. Dry the insulation and re-installed at joint<br>2.Check the joint assembly.<br>3.The busudct need to return to the manufacturer for servicing. |

**Caution:**

Always aware that to isolate the electrical power supply and / or disconnected with other electrical equipment if necessary before conducting the repairing work or otherwise the repairing work should be carried out by the licensed electrical people.

## SECTION 7:

# CATALOGUE

## SECTION 8:

# INSTALLATION & MAINTENACE MANUAL

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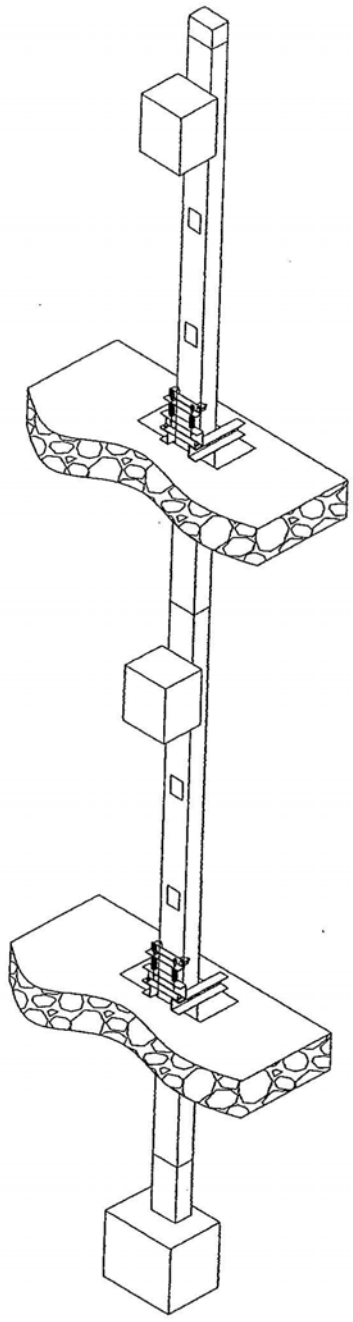
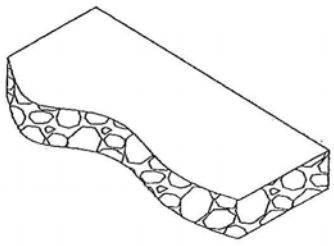
## SECTION 9:

# VERTICAL INSTALLATION & TESTING PROCEDURE



Conduct test from EFCB



## Step 1:

Ensure that all tap off unit boxes are in 'off' position and the cables in EFCB are not terminated yet.
Ensure that the neutral link in the TOU is not connected yet.

## Step 2:

Do a megger test 1kv DC for 1 minute for every phase and record the reading.
If the reading is zero that means there's a short along the busduct.
Stop the test and do not energize.

## Step 3:

If the contract mention a high potential test is needed, make sure the test values do not exceed 5.3kV DC otherwise the insulation will be damaged.
If this procedure is not in contract, then ignore this step.
Please note that the MCCB in the TOU must be able to withstand 5.3kV DC as well.
(Please check with MCCB standards under IEC 947).

## Step 4:

Connect the cables into the EFCB. Make sure the phase sequence is correct and align to the busduct phase indicator.

## Step 5:

Energize to be done by a qualified person.

## Additional Information:

In accordance to IEC 439 part 1 and 2,

(1) Ue (operational voltage) must not exceed 1000V.

(2) Ue (operational voltage) must not exceed Ui (Insulation voltage).

(3) For high potential test in AC, maximum value 5.3kV AC (rms). Vpeak to peak = 5.3 x root 2 = 7.5kV AC.

(4) Maximum high potential test in DC, = 5.3kV DC.

# BUSDUCT INSTALLATION PROCEDURE –INSTALLATION OF VERTICAL BUSDUCT

## Step 7:

Repeat step 4 for the installation of spring hanger, then lower the second busduct length and connect to the one below.

Repeat steps 4 and 7 for every floor till the installation is completed according to the shop drawings.

Note that some floors may consist of two spring hangers.
(2500A and above AND Floor Height >3.5m).

| Ampere Rating | Weight, kg/m | Compressed Length,mm | No. of Spring Support | | | |
|---|---|---|---|---|---|---|
| | | | FL3.5m | FL4.5m | FL5.0m | FL5.5m |
| 1000A | 33 | 67 | 1 | 2 | 2 | 2 |
| 1750A | 47 | 62 | 1 | 2 | 2 | 2 |
| 2000A | 56 | 58 | 1 | 2 | 2 | 2 |
| 2500A | 70 | 62 | 2 | 2 | 2 | 2 |
| 3000A | 95 | 60 | 2 | 2 | 4 | 4 |
| 4000A | 109 | 58 | 2 | 4 | 4 | 4 |

Spring Free Length : 110mm

## Step 8:

On the top floor final length, place the end cover (EC) on the busduct.
In future if additional lengths are needed, then remove the EC, insulation and repeat step 7.
After completing the installation place the EC to the final length.

## Step 2:

Drop a plump line from the top floor as a guide to align the busducts during installation.

## Step 9:

Go to every spring hanger and release the tension by turning the M12 nut fully till the fix nut.

## Step 5:

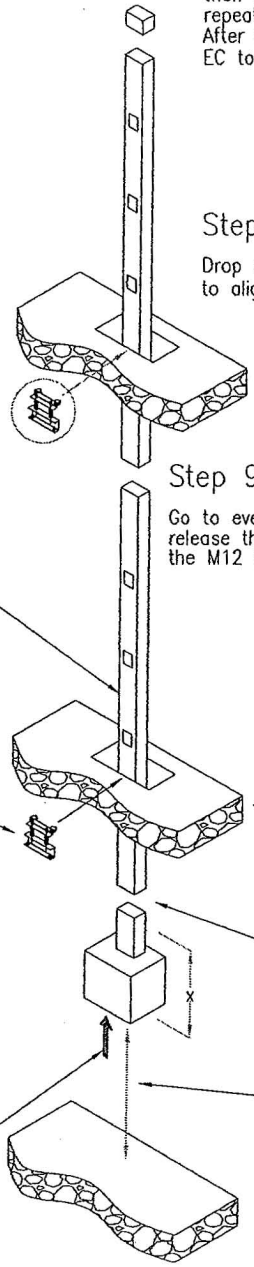
Lower the first busduct that connects to the EFCB till you reach the 'top reference point'.
DO NOT INSTALL the EFCB yet.
Clamp and bolt the busduct onto the spring hanger.

## Step 4:

Mount the first spring hanger in position. Note that spring hangers delivered to you are fully compressed. At this time do not release the spring.

Please note that installer have to supply two additional C–channels and placed them across the sides of the busduct. Mounting position and size of C– channel will depend on the site condition and floor opening.
(refer to installation manual).

* Double sided Spring Hanger required or Place another Spring Hanger at FL 3.5m +/– 0.5m if the floor level > 4.5m




## Step 3:

Mark the height 'x' of EFCB on the wall using the centre of joint bolt as 'top reference point'

## Step 1:

Mark the height clearance for End Feed Cable Box (EFCB) as indicated in the shop drawings. (from floor surface to the bottom of the EFCB).
Take note of the correct phase sequence.

## Step 6:

Connect the EFCB to the busduct. After connecting the EFCB, placed the joint covers on and tighten the joint bolt to 70Nm using a torque wrench.
Mount the EFCB firmly onto the wall.

At this stage prepare the cables and drill holes on EFCB panels for termination. Do not connect cables yet.

# BUSDUCT INSTALLATION PROCEDURE –INSTALLATION OF TAP OFF UNITS

## Step 4:

Repeat the same steps for other tap off units.

## Step 1:

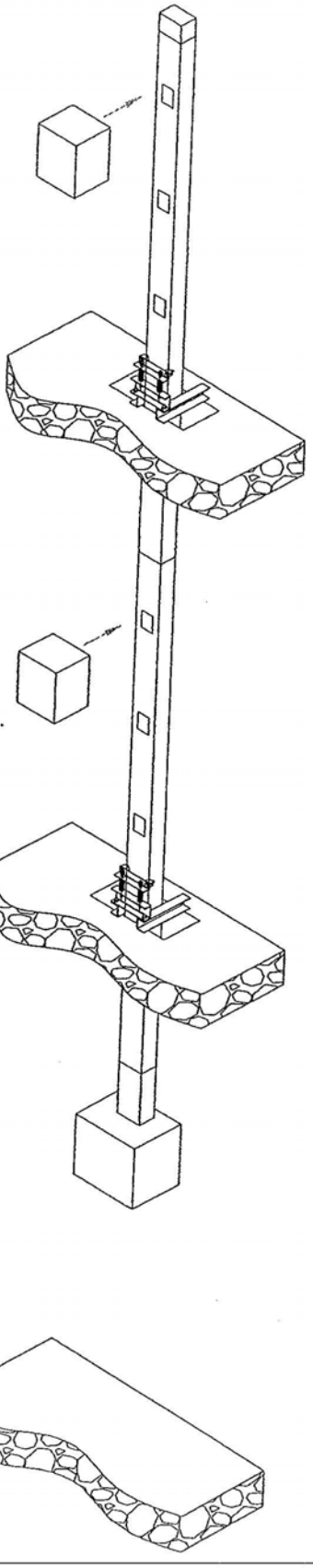
Check the Tap off unit for correct ampere rating.
Prepare the holes through the box for cable termination.

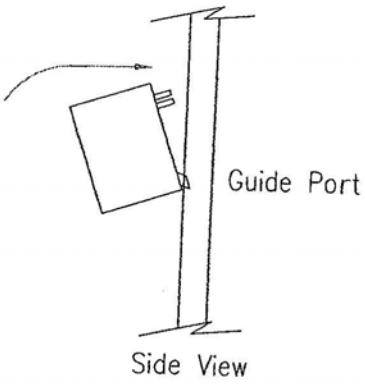
## Step 2:

Open the plug–in cover.
Place the guide port onto the slots provided on the busduct housing, then push the box in firmly.

## Step 3:

Insert the cables into the box and do the cable termination.
Take note of the phase sequence.
The tap–off unit boxes are design to plug and unplug without de–energizing the busduct.





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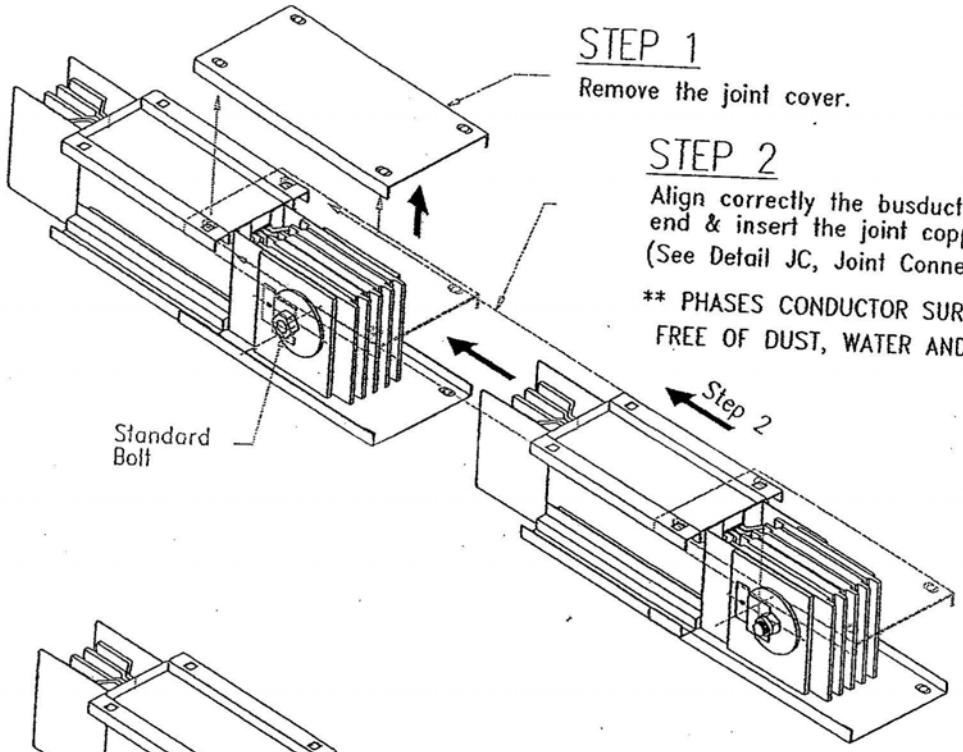
## SECTION 10:

# JOINT INSTALLATION PROCEDURE

# JOINT INSTALLATION PROCEDURE

## STANDARD BOLT.



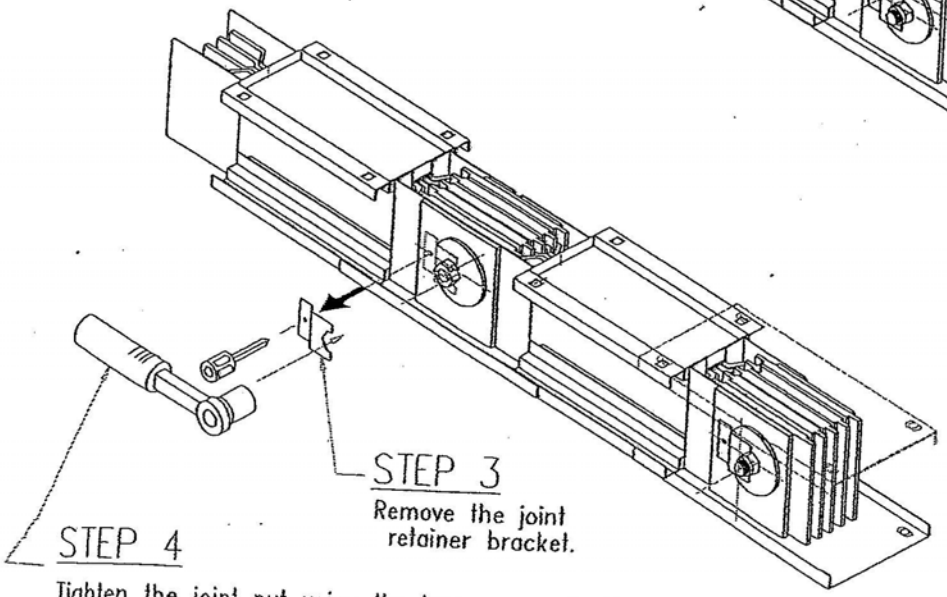

**STEP 1**

Remove the joint cover.

**STEP 2**

Align correctly the busduct end to end & insert the joint copper faces. (See Detail JC, Joint Connection Detail)

** PHASES CONDUCTOR SURFACES MUST FREE OF DUST, WATER AND OIL.**



**STEP 3**

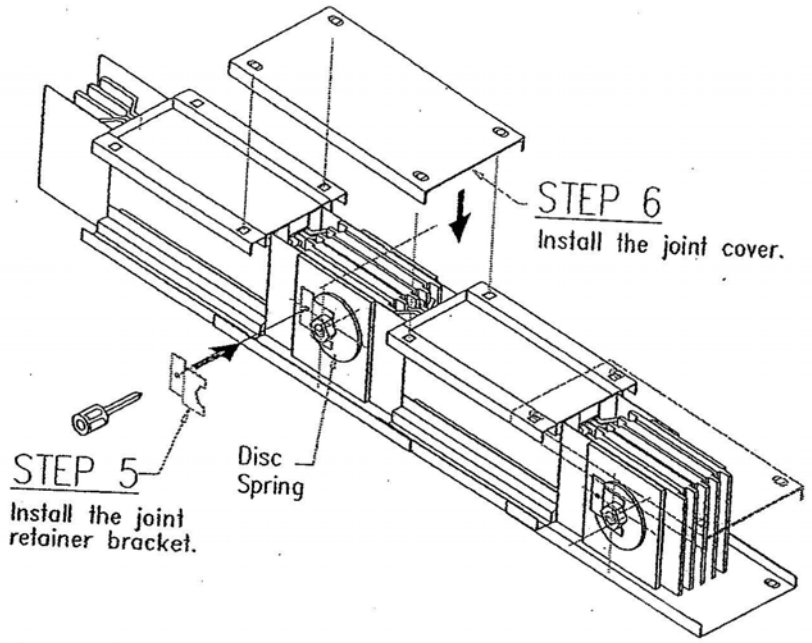
Remove the joint retainer bracket.

**STEP 4**

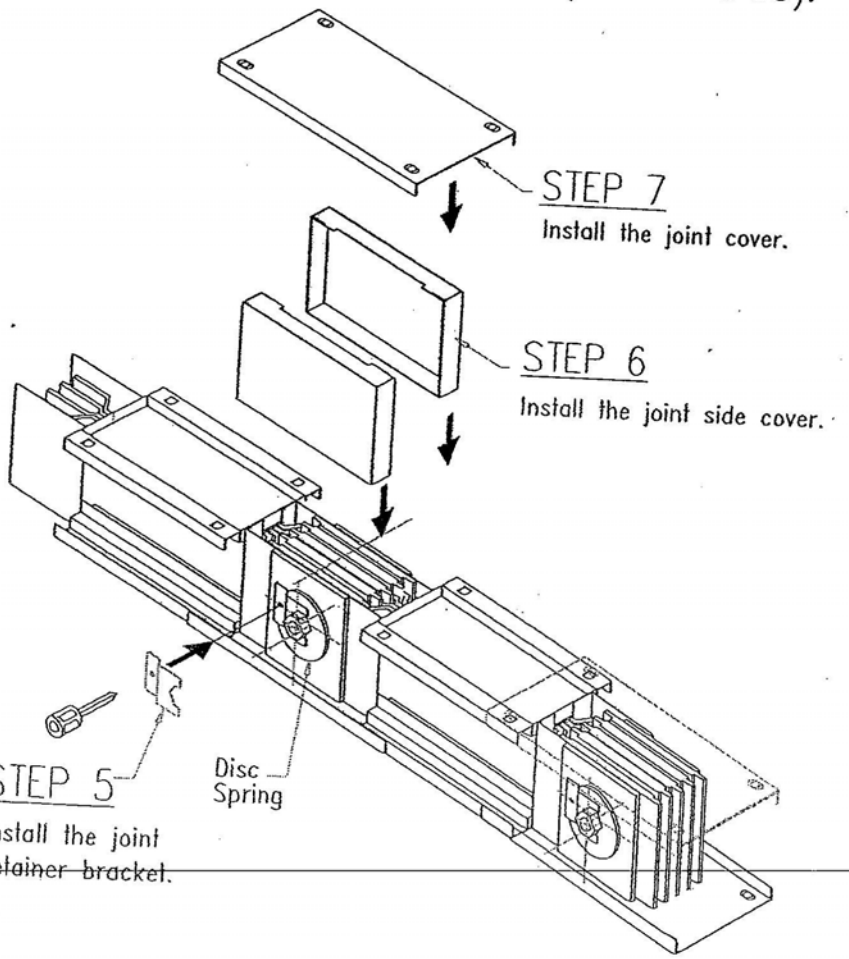
Tighten the joint nut using the torque wrench. Torque to 70NM.

*Ensure edequate overlaping contact surfaces & buduct alingnment horizontaly/verticaly before tightening.

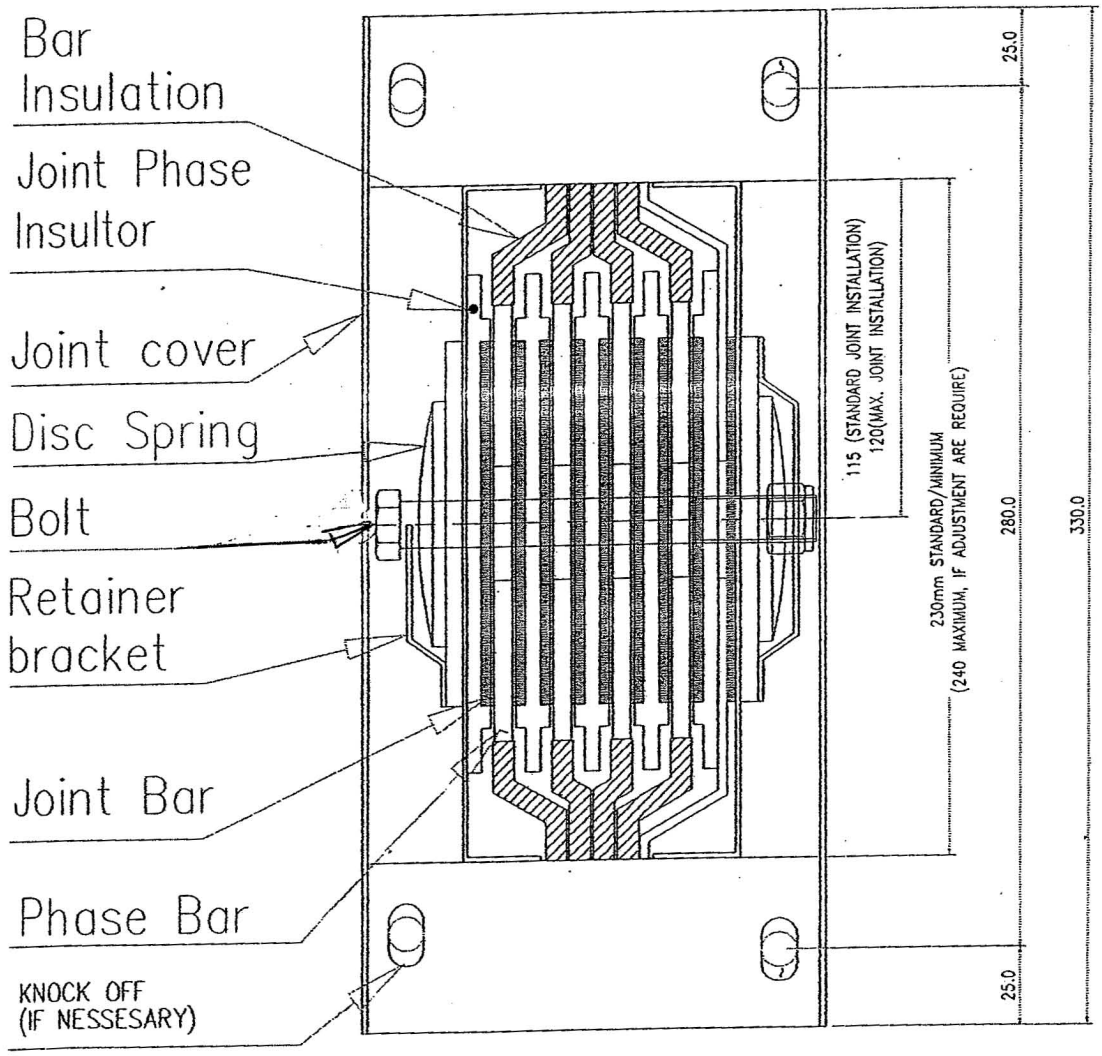
STANDARD BOLT.




INSTALLATION OF JOINT SIDE COVER (IP55 & IP65).



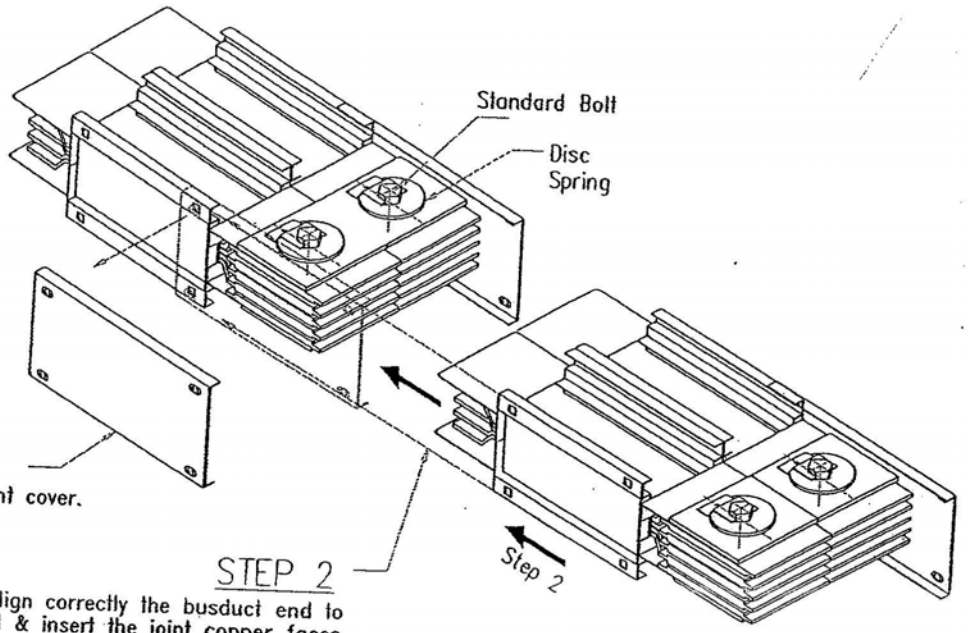
## JOINT CONNECTION DETAIL




Joint Connection Detail

# JOINT INSTALLATION PROCEDURE

## STANDARD BOLT.



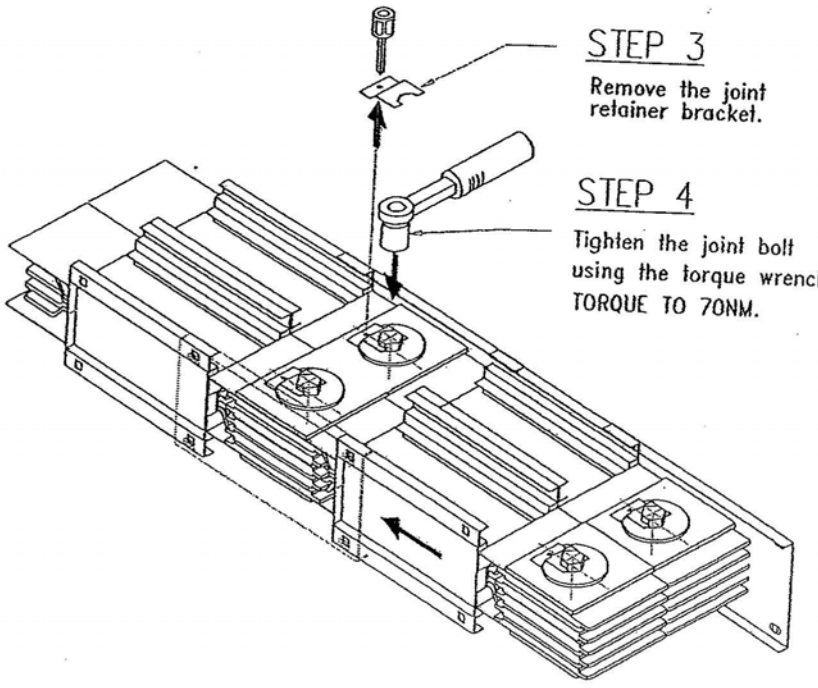

**STEP 1**

Remove the joint cover.

**STEP 2**

Align correctly the busduct end to end & insert the joint copper faces. (See Page 5/5, Joint Connection Detail)

** PHASES CONDUCTOR SURFACES MUST BE FREE OF DUST, WATER AND OIL.**



**STEP 3**

Remove the joint retainer bracket.

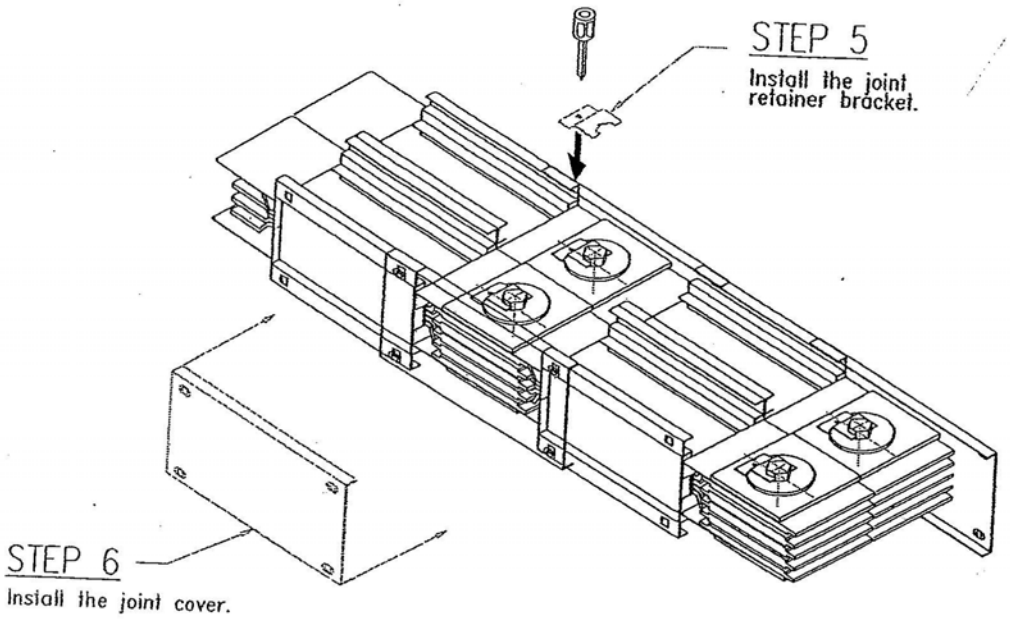
**STEP 4**

Tighten the joint bolt using the torque wrench. TORQUE TO 70NM.

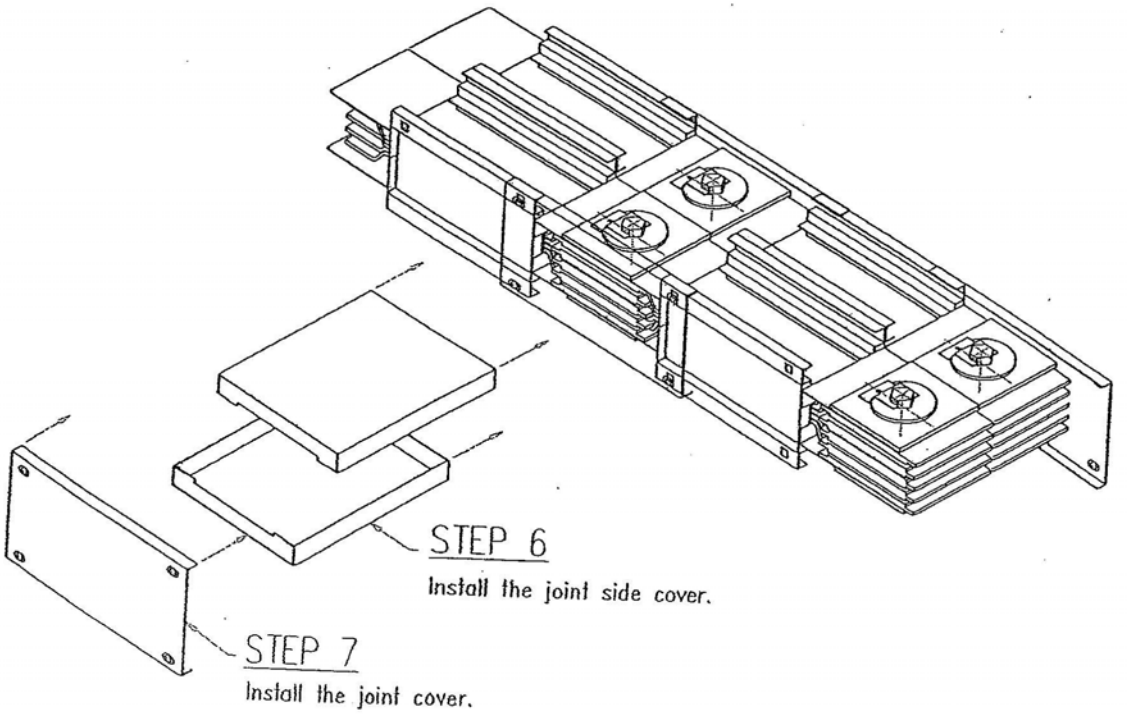
*Ensure edequate overlaping contact surfaces & buduct alingnment horizontaly/verticaly before tightening.

# JOINT INSTALLATION PROCEDURE

## STANDARD BOLT.




## INSTALLATION OF JOINT SIDE COVER (IP55).



Layout dated 18/12/06

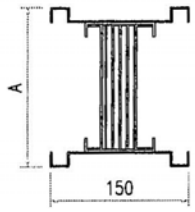
# 11. VERTICAL SUPPORT INSTALLATION PROCEDURE FOR HONG KONG PROJECT

# BUSDUCT INSTALLATION PROCEDURE

## TYPE : SINGLE BUSDUCT RUN FOR RISER

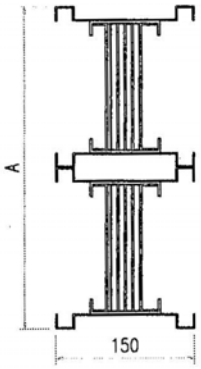
PRE-INSTALLATION DATA

1. Single stack busduct.




| NO. OF BAR | CROSS SECT. AREA (mm²) | CURRENT RATING (A) | DIMENSION (mm) |
|---|---|---|---|
| | | | A |
| 1 | 120 | 400 | 65 |
| | 180 | 600 | 79 |
| | 270 | 800 | 95 |
| | 330 | 1000 | 114 |
| | 420 | 1250 | 139 |
| | 660 | 1750 | 164 |
| | 900 | 2000 | 189 |
| | 1200 | 2500 | 238 |

2. Double stack busduct.




| NO. OF BAR | CROSS SECT. AREA (mm²) | CURRENT RATING (A) | DIMENSION (mm) |
|---|---|---|---|
| | | | A |
| 2 | 660 | 3000 | 328 |
| | 900 | 4000 | 378 |
| | 1200 | 5000 | 476 |

PRE-INSTALLATION DATA

1.The type of spring that is being use in Megaduct spring hanger system is generally called the compression spring.

2. The load of spring is calculated as below :

1. Length of free coil
2. Diameter of coil
3. Diameter of coil wire
4. Fully compress length

Consider the case where a single spring is fully loaded.

$$k = \frac{G \times d^4}{8 \times D^3 \times n_{act}}$$

where G = modulus of shear, ($kp/mm^2$ )

$n_{act}$ = number of active coils

D = mean spring diameter (mm)

d = wire diameter (mm)

F = k (Free length – Compressed length)

PRE-INSTALLATION DATA

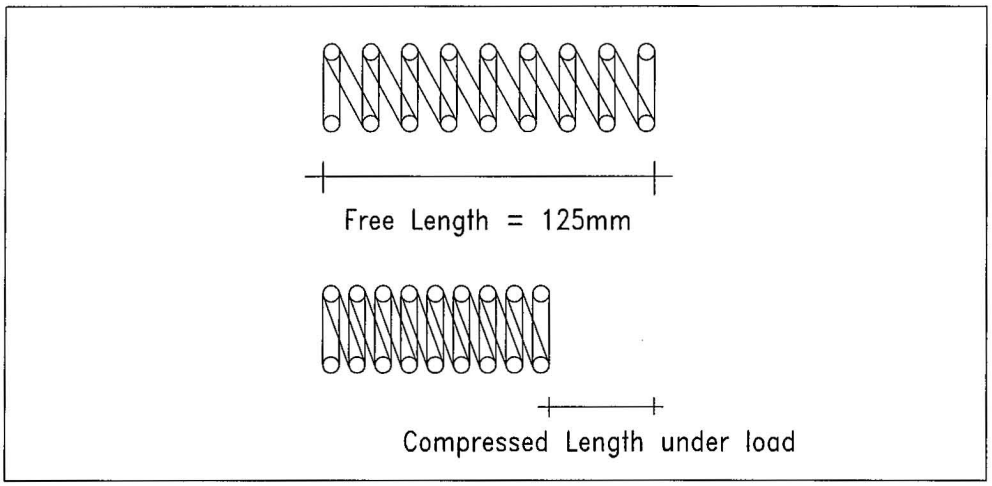



Diagram 1: Description of compressed length

3. When the compressed (25mm) spring hanger is delivered to site, the workers will install this as usual and mount them onto the busducts.
4. Upon completion on an entire run in riser, the workers will have to go back to every single spring hanger and release the nut in order to assure that there is a positive load on all hangers.
5. Please bear in mind that there cannot be an even load distributing across all floors due to the different sizes of tap off unit and cable attachment.

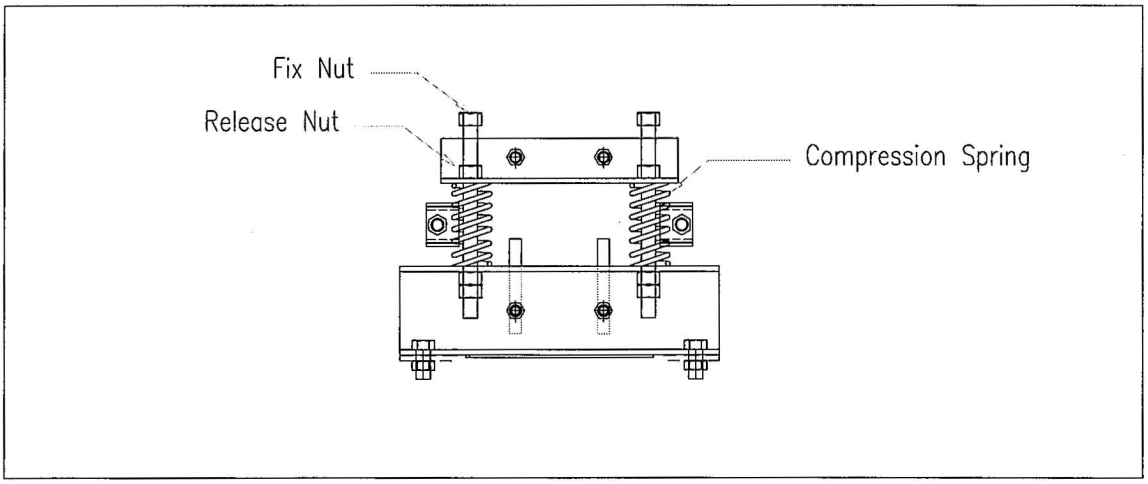



Diagram 2: Factory preset compressed at 100mm

Revised 2/1/07

PRE-INSTALLATION DATA

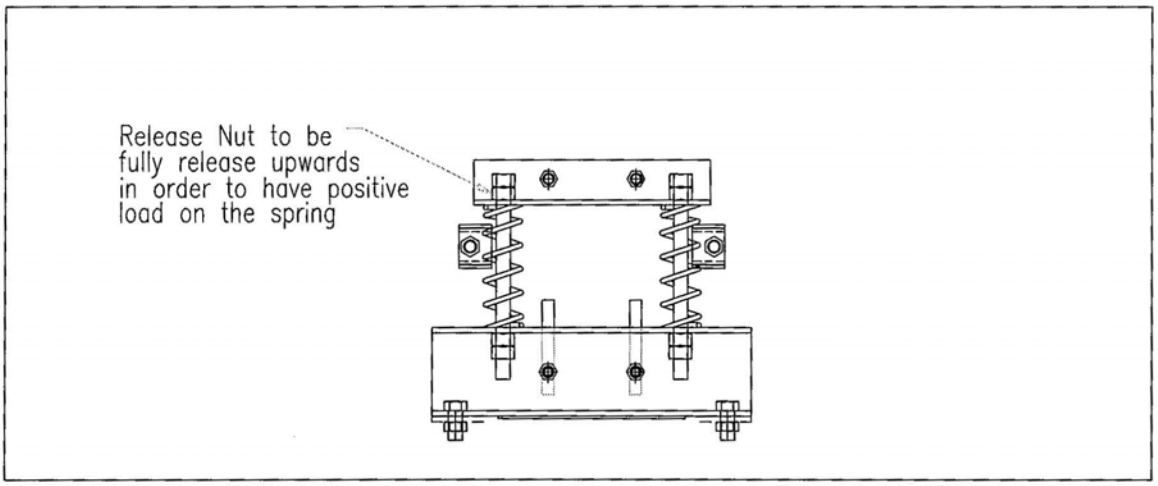



Diagram 3: Fully release the 'Release nut'

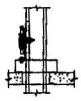
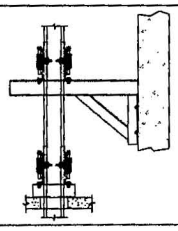
Revised 2/1/07

# BUSDUCT INSTALLATION PROCEDURE

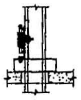
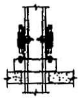
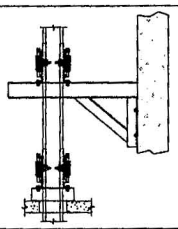
## TYPE : SINGLE BUSDUCT RUN FOR RISER

PRE-INSTALLATION DATA

### FOR BUSDUCT 3.000M LENGTH

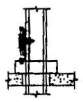
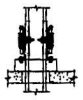
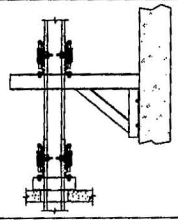
| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 99 | 17 |
| | | 1250A | 120 | 21 |
| | | 1750A | 144 | 24 |
| | | 2000A | 165 | 28 |
|  | Double Spring Set | 2500A | 210 | 18 |
| | | 3000A | 285 | 24 |
| | | 4000A | 330 | 28 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 492 | 21 |

### FOR BUSDUCT 3.100M LENGTH

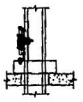
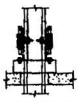
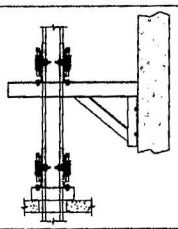
| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 103 | 18 |
| | | 1250A | 124 | 22 |
| | | 1750A | 149 | 25 |
| | | 2000A | 171 | 29 |
|  | Double Spring Set | 2500A | 217 | 19 |
| | | 3000A | 295 | 25 |
| | | 4000A | 341 | 29 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 508 | 22 |

PRE-INSTALLATION DATA

FOR BUSDUCT 3.200M LENGTH

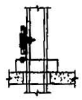
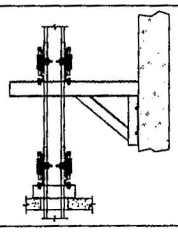
| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 106 | 18 |
| | | 1250A | 128 | 22 |
| | | 1750A | 154 | 26 |
| | | 2000A | 176 | 30 |
|  | Double Spring Set | 2500A | 224 | 19 |
| | | 3000A | 304 | 26 |
| | | 4000A | 352 | 30 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 525 | 23 |

FOR BUSDUCT 3.300M LENGTH

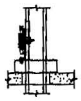
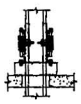
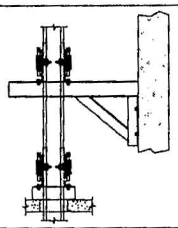
| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 109 | 19 |
| | | 1250A | 132 | 23 |
| | | 1750A | 159 | 26 |
| | | 2000A | 182 | 31 |
|  | Double Spring Set | 2500A | 231 | 20 |
| | | 3000A | 314 | 26 |
| | | 4000A | 363 | 31 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 541 | 23 |

PRE-INSTALLATION DATA

FOR BUSDUCT 3.400M LENGTH

| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 112 | 19 |
| | | 1250A | 136 | 24 |
| | | 1750A | 163 | 27 |
| | | 2000A | 187 | 32 |
|  | Double Spring Set | 2500A | 238 | 20 |
| | | 3000A | 323 | 27 |
| | | 4000A | 374 | 32 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 558 | 24 |

FOR BUSDUCT 3.500M LENGTH

| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 116 | 20 |
| | | 1250A | 140 | 25 |
| | | 1750A | 168 | 28 |
| | | 2000A | 193 | 33 |
|  | Double Spring Set | 2500A | 245 | 21 |
| | | 3000A | 333 | 28 |
| | | 4000A | 385 | 33 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 574 | 25 |

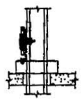
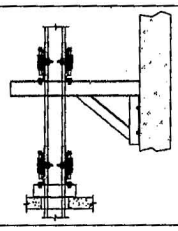
cable attachments.

# BUSDUCT INSTALLATION PROCEDURE

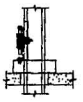
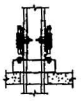
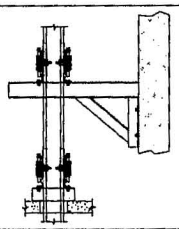
## TYPE : SINGLE BUSDUCT RUN FOR RISER

PRE-INSTALLATION DATA

### FOR BUSDUCT 3.600M LENGTH

| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 119 | 20 |
| | | 1250A | 144 | 25 |
| | | 1750A | 173 | 29 |
| | | 2000A | 198 | 34 |
|  | Double Spring Set | 2500A | 252 | 22 |
| | | 3000A | 342 | 29 |
| | | 4000A | 396 | 34 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 590 | 25 |

### FOR BUSDUCT 3.700M LENGTH

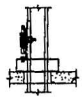
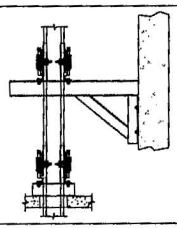
| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 122 | 21 |
| | | 1250A | 148 | 26 |
| | | 1750A | 178 | 30 |
| | | 2000A | 204 | 35 |
|  | Double Spring Set | 2500A | 259 | 22 |
| | | 3000A | 352 | 30 |
| | | 4000A | 407 | 35 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 607 | 26 |

# BUSDUCT INSTALLATION PROCEDURE

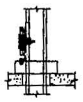
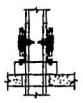
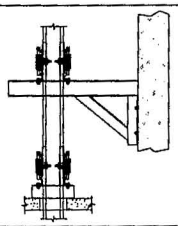
## TYPE : SINGLE BUSDUCT RUN FOR RISER

PRE-INSTALLATION DATA

### FOR BUSDUCT 3.800M LENGTH

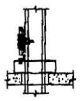
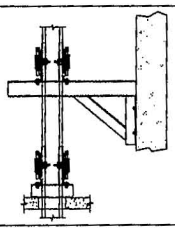
| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 125 | 22 |
| | | 1250A | 152 | 27 |
| | | 1750A | 182 | 30 |
| | | 2000A | 209 | 36 |
|  | Double Spring Set | 2500A | 266 | 23 |
| | | 3000A | 361 | 30 |
| | | 4000A | 418 | 36 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 623 | 27 |

### FOR BUSDUCT 3.900M LENGTH

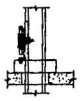
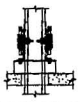
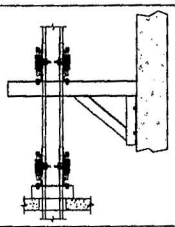
| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 129 | 22 |
| | | 1250A | 156 | 27 |
| | | 1750A | 187 | 31 |
| | | 2000A | 215 | 36 |
|  | Double Spring Set | 2500A | 273 | 23 |
| | | 3000A | 371 | 31 |
| | | 4000A | 429 | 36 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 640 | 28 |

PRE-INSTALLATION DATA

FOR BUSDUCT 4.000M LENGTH

| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 132 | 23 |
| | | 1250A | 160 | 28 |
| | | 1750A | 192 | 32 |
| | | 2000A | 220 | 37 |
|  | Double Spring Set | 2500A | 280 | 24 |
| | | 3000A | 380 | 32 |
| | | 4000A | 440 | 37 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 656 | 28 |

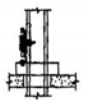
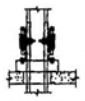
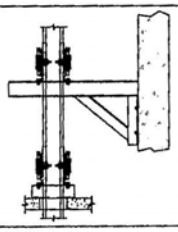
FOR BUSDUCT 4.100M LENGTH

| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 135 | 23 |
| | | 1250A | 164 | 29 |
| | | 1750A | 197 | 33 |
| | | 2000A | 226 | 38 |
|  | Double Spring Set | 2500A | 287 | 25 |
| | | 3000A | 390 | 33 |
| | | 4000A | 451 | 38 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 672 | 29 |

TYPE : SINGLE BUSDUCT RUN FOR RISER

PRE-INSTALLATION DATA

FOR BUSDUCT 4.200M LENGTH

| TYPE | | Ampere rating | Weight per 3 meter (Kg) | Compressed length under load (mm) |
|---|---|---|---|---|
|  | Single Spring Set | 1000A | 139 | 24 |
| | | 1250A | 168 | 29 |
| | | 1750A | 202 | 34 |
| | | 2000A | 231 | 39 |
|  | Double Spring Set | 2500A | 294 | 25 |
| | | 3000A | 399 | 34 |
| | | 4000A | 462 | 39 |
| | | – | – | – |
|  | Double Spring 2 Sets | 5000A | 689 | 30 |

1. Please take note that the weight of the busducts has added in the following consideration.
    1. The weight of the joint has been added in.
    2. 15% of the additional weight has been added on for the Tap Off Units and other cable attachments.

# BUSDUCT INSTALLATION PROCEDURE

## TYPE : SINGLE BUSDUCT RUN FOR RISER

### Step 8:

On the top floor final length, place the end cover (EC) on the busduct.
In future if additional lengths are needed, then remove the EC, insulation and repeat step 7.
After completing the installation place the EC to the final length.

### Step 7:

Repeat step 4 for the installation of spring hanger, then lower the second busduct length and connect to the one below.

Repeat steps 4 and 7 for every floor till the installation is completed according to the shop drawings.

### Step 2:

Drop a plump line from the top floor as a guide to align the busducts during installation.

### Step 9:

Go to every spring hanger and release the tension by turning the M12 nut fully till the fix nut.

### Step 5:

Lower the first busduct that connects to the EFCB till you reach the 'top reference point'.
DO NOT INSTALL the EFCB yet.
Clamp and bolt the busduct onto the spring hanger.

### Step 4:

Mount the first spring hanger in position. Note that spring hangers delivered to you are compressed (25mm). At this time do not release the spring.

Please note that installer have to supply two additional C-channels and placed them across the sides of the busduct. Mounting position and size of C- channel will depend on the site condition and floor opening.
(refer to installation manual).

* Double sided Spring Hanger required or Place another Spring Hanger at FL 3.5m +/- 0.5m if the floor level > 4.5m

Floor Slab

### Step 3:

Mark the height 'x' of EFCB on the wall using the centre of joint bolt as 'top reference point'

x

### Step 1:

Mark the height clearance for End Feed Cable Box (EFCB) as indicated in the shop drawings. (from floor surface to the bottom of the EFCB).
Take note of the correct phase sequence.

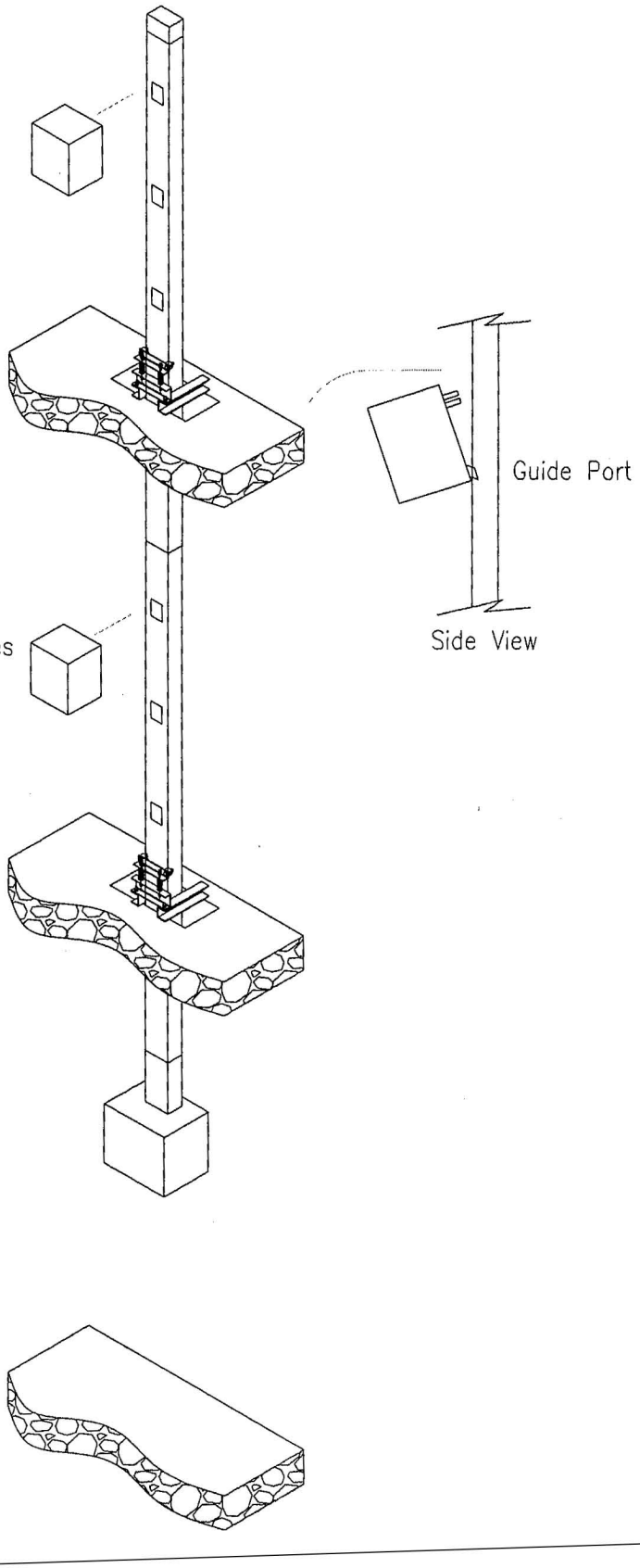
### Step 6:

Connect the EFCB to the busduct. After connecting the EFCB, placed the joint covers on and tighten the joint bolt to 70Nm using a torque wrench.
Mount the EFCB firmly onto the wall.

At this stage prepare the cables and drill holes on EFCB panels for termination. Do not connect cables yet.

## Step 13:

Repeat the same steps for other tap off units.




## Step 10:

Check the Tap off unit for correct ampere rating.
Prepare the holes through the box for cable termination.

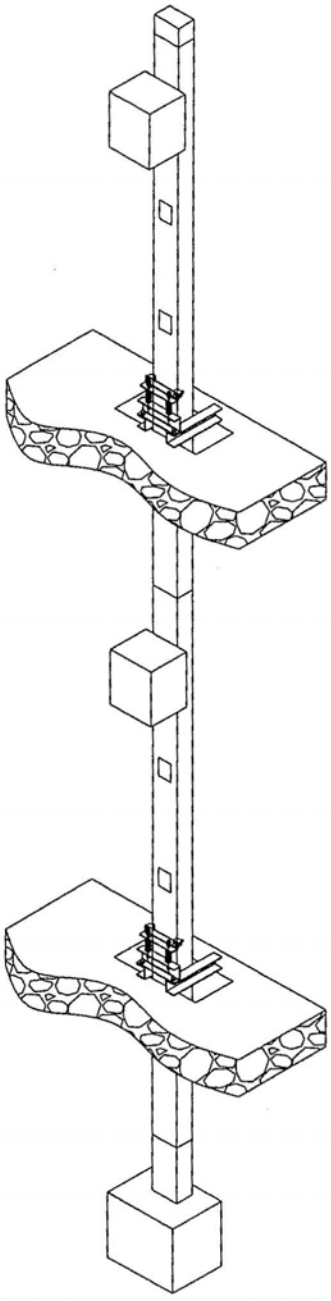
If the contract mention a high potential test is needed, make sure the test values do not exceed 5.3kV DC otherwise the insulation will be damaged.
If this procedure is not in contract, then ignore this step.

## Step 11:

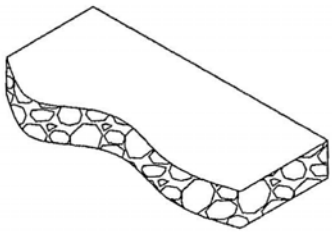
Open the plug-in cover.
Place the guide port onto the slots provided on the busduct housing, then push the box in firmly.

## Step 12:

Insert the cables into the box and do the cable termination.
Take note of the phase sequence.
The tap-off unit boxes are design to plug and unplug without de-energizing the busduct.



Conduct test from EFCB



## Step 14:

Ensure that all tap off unit boxes are in 'off' position and the cables in EFCB are not terminated yet.
Ensure that the neutral link in the TOU is not connected yet.

## Step 15:

Connect the cables into the EFCB. Make sure the phase sequence is correct and align to the busduct phase indicator.

## Step 16:

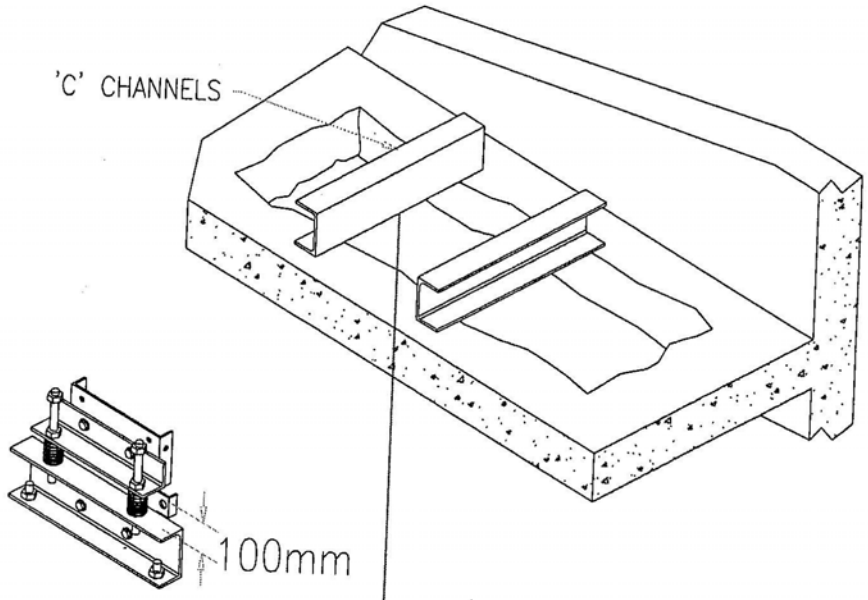
Energize to be done by a qualified person.

# BUSDUCT INSTALLATION PROCEDURE

## TYPE : SINGLE BUSDUCT RUN FOR RISER

### PRE-INSTALLATION ALIGNMENT

1. Mount the 'C' channels either from the top or most bottom floor.
2. Check for the alignment on all floors using the plump line.
3. Determine the distance 'A' which will be comfortable working distance. Typically 100 to 150mm.
4. Once confirmed mount the 'C' channels on the floor.

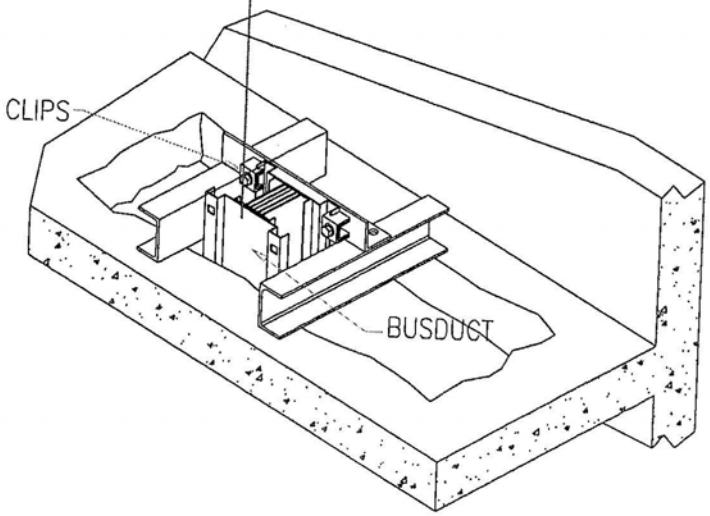


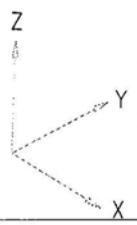




5. Spring supplied will be compressed from 125mm to 100mm.
6. To be fully released upon completion of the entire busduct run.

PLUMP LINE

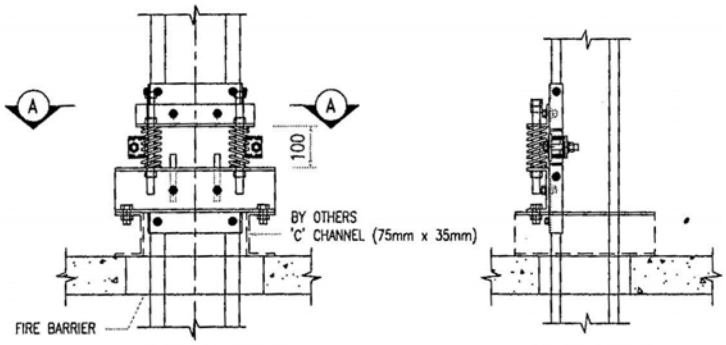


TYPE : SINGLE BUSDUCT RUN FOR RISER

PRE-INSTALLATION - TYPE OF SPRING HANGERS

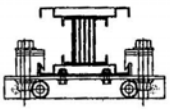
1. CLIP ON TYPE



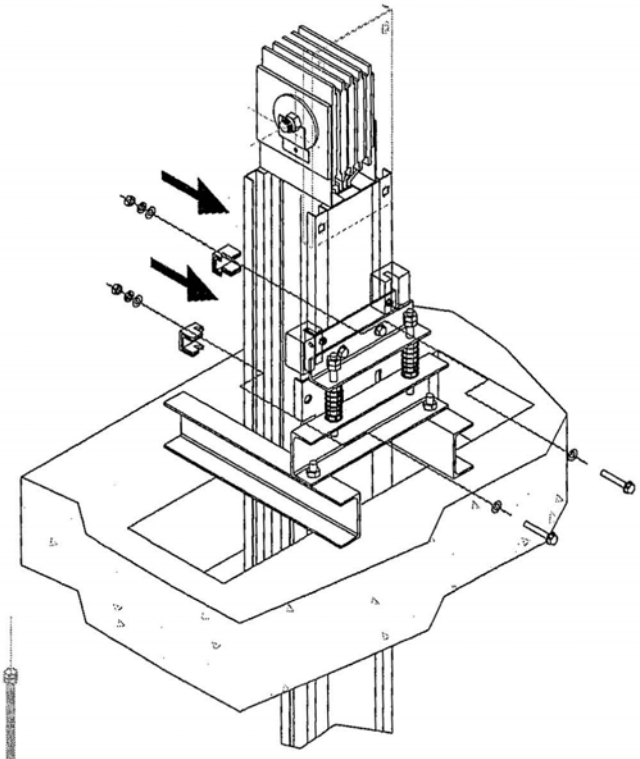

FRONT VIEW



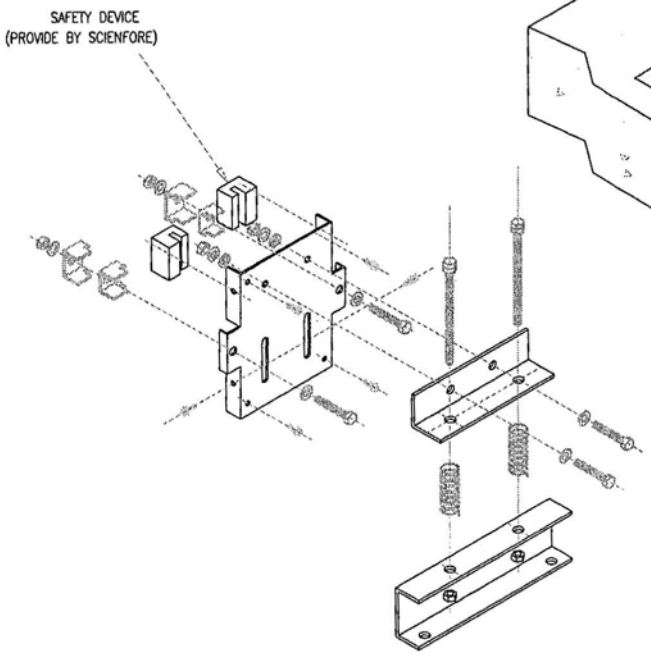
SIDE VIEW



ELEVATION A-A



ISOMETRIC VIEW



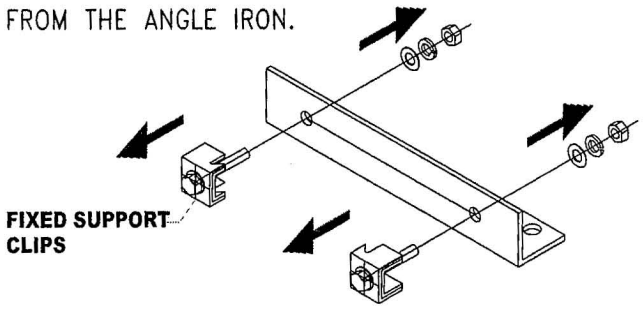
# BUSDUCT INSTALLATION PROCEDURE

TYPE : SINGLE BUSDUCT RUN FOR RISER

INSTALLATION PROCEDURE – CLIP ON TYPE

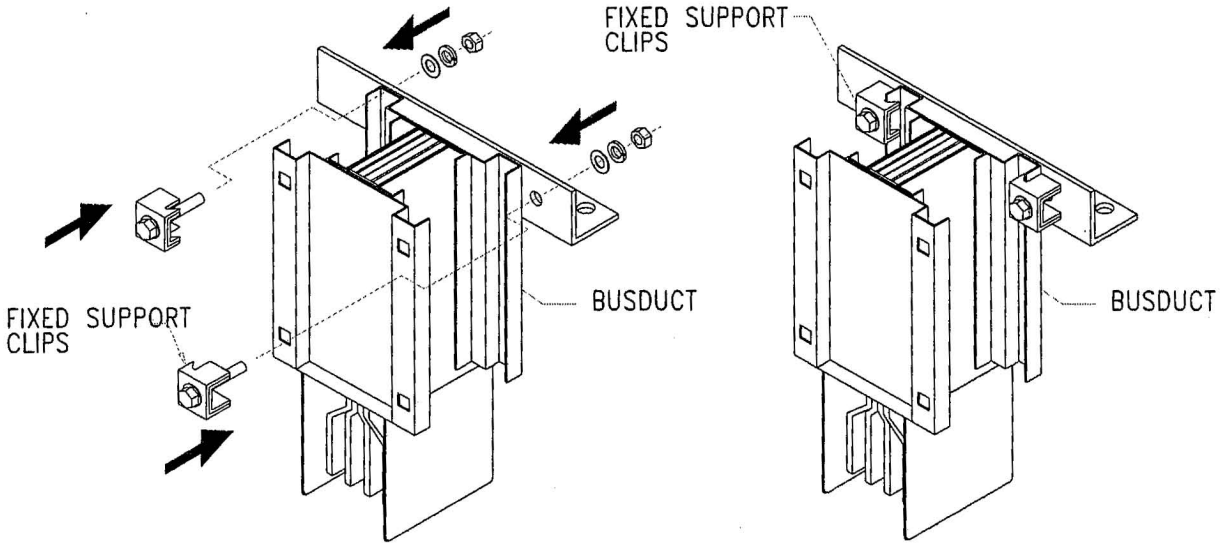
STEP 1

REMOVE THE 'CLIPS' FROM THE ANGLE IRON.

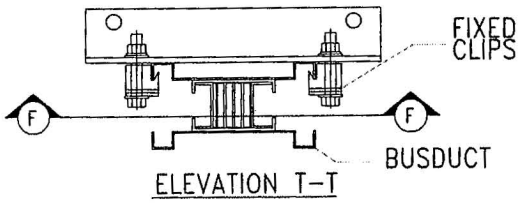



STEP 2

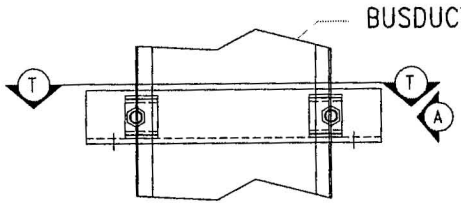
INSTALL THE BUSDUCT AND FIXED THE 'CLIPS'




FIXED SUPPORT DETAIL

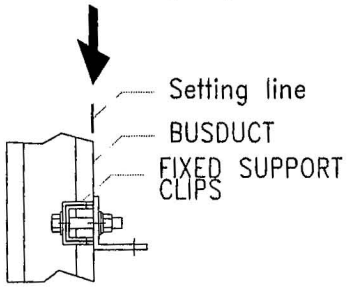



ELEVATION T–T



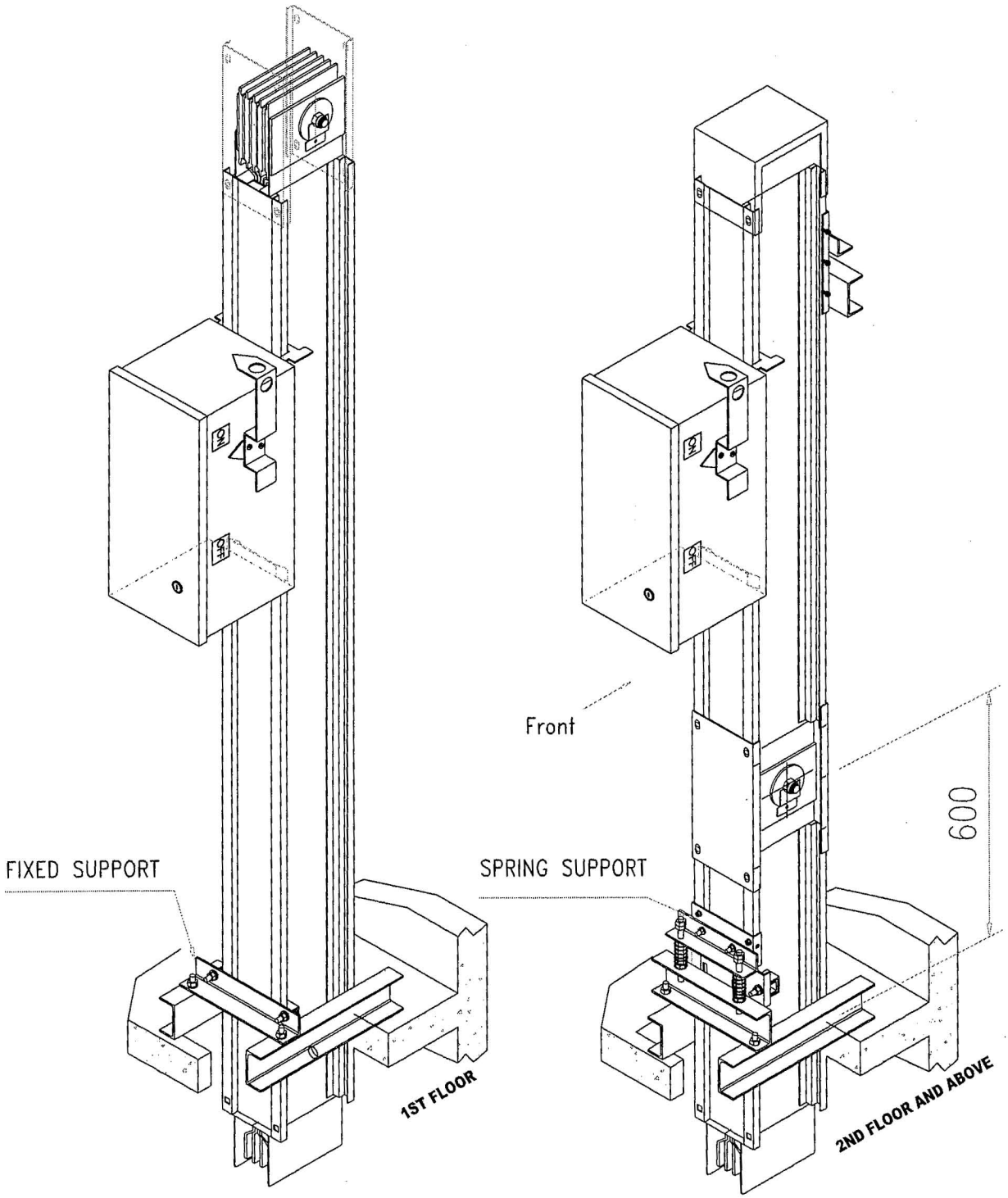

ELEVATION F–F

*Ensure that the setting of fixed support is vertically align every floor (See page 2/2).




ELEVATION A

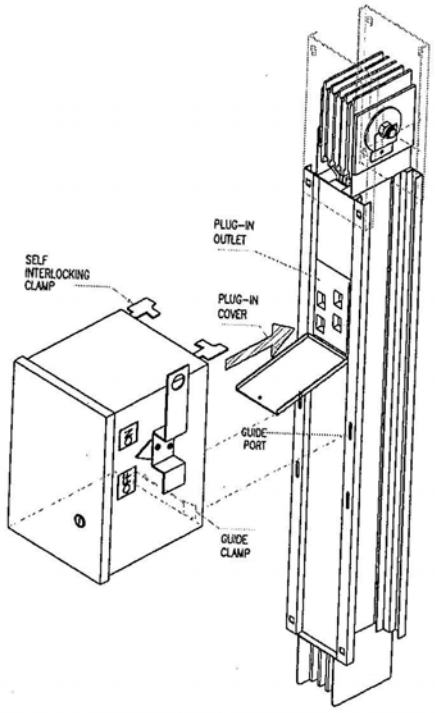
## SPRING AND FIXED SUPPORT




STANDARD SUPPORT ARRANGEMENT
(VERTICAL SUPPORT FOR PLUG IN BUSDUCT AT THE RISER ROOM)

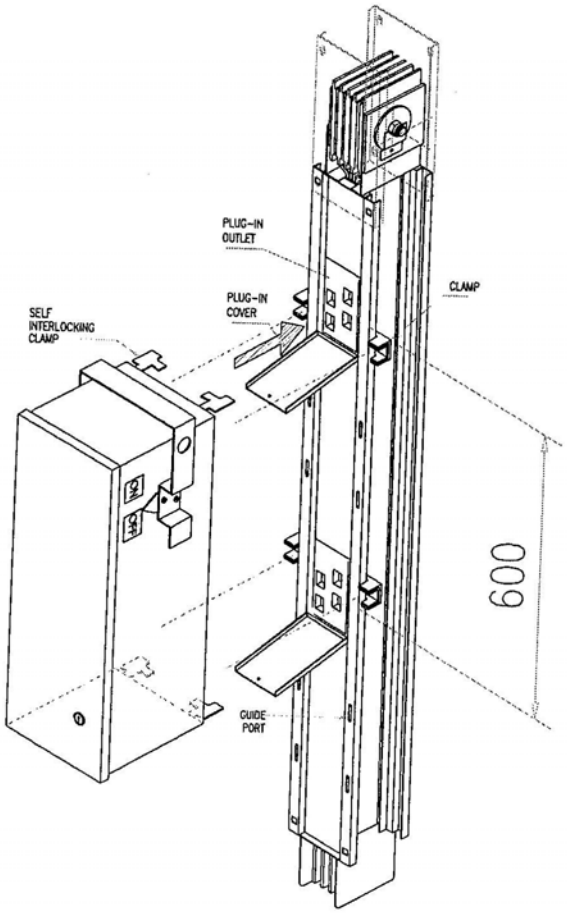
*Ensure that the setting of fixed support is vertically align every floor.

## TAP OFF UNIT




ISOMETRIC VIEW

(STANDARD)




ISOMETRIC VIEW

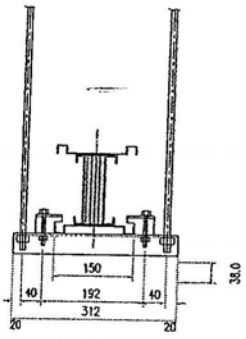
(FOR TAP OFF UNIT 450A & ABOVE
ARE REQUIRE 2 PLUG IN HOLE)

MEGA-DUCT

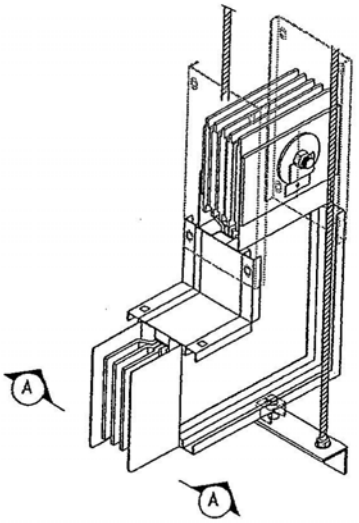
## SECTION 12:

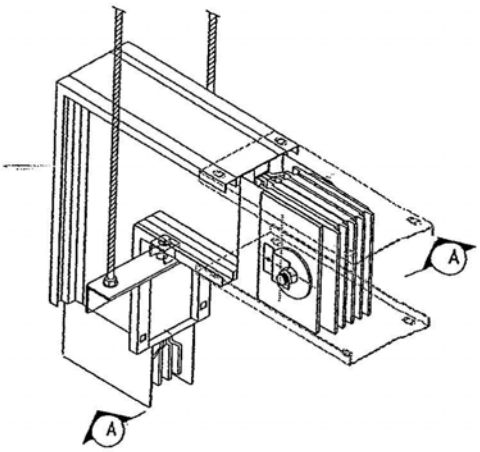
# HORIZONTAL SUPPORT INSTALLATION PROCEDURE

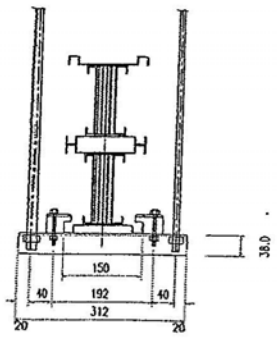
# BUSDUCT INSTALLATION PROCEDURE - BUSDUCT SUPPORT



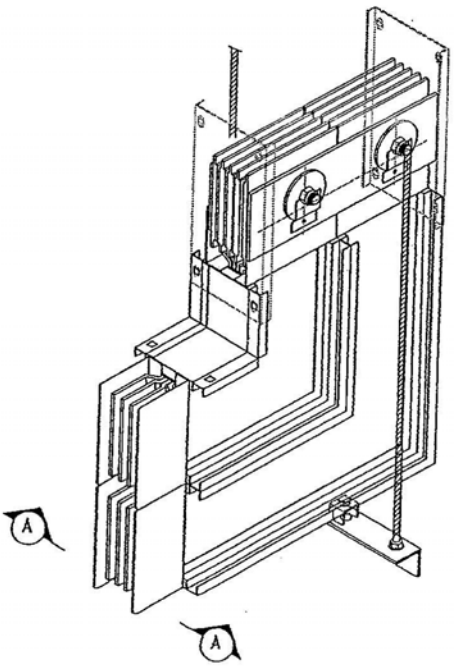

ELEVATION A – A

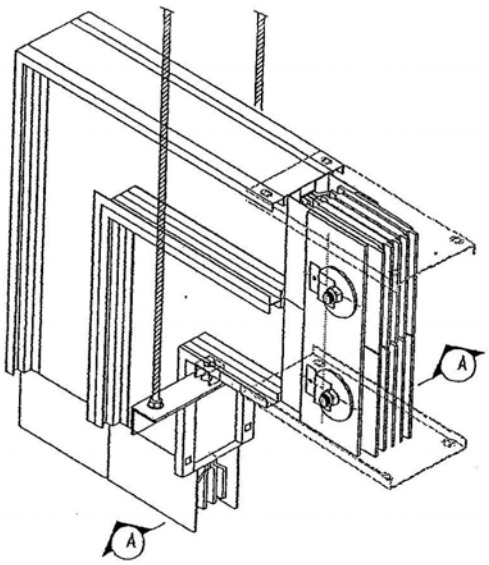


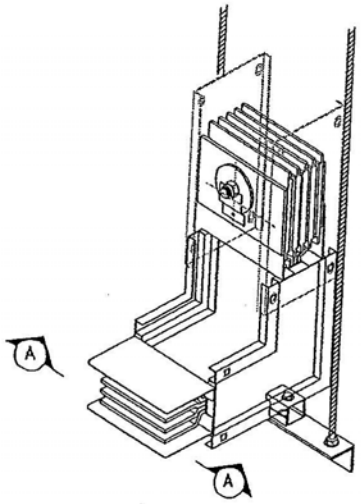

ELEVATION A – A

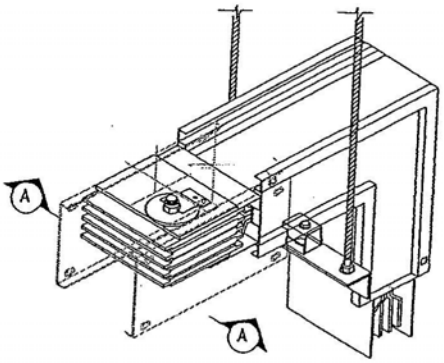


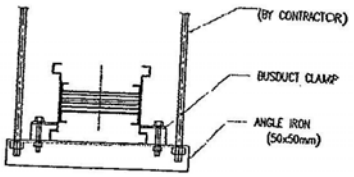




HORIZONTAL BUSDUCT SUPPORT
FLATWISE ELBOW

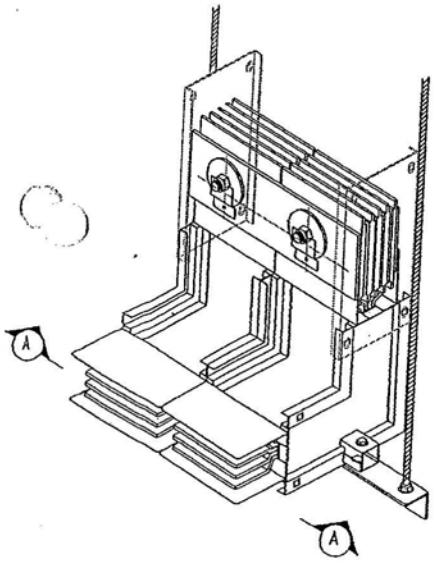
# BUSDUCT INSTALLATION PROCEDURE - BUSDUCT SUPPORT

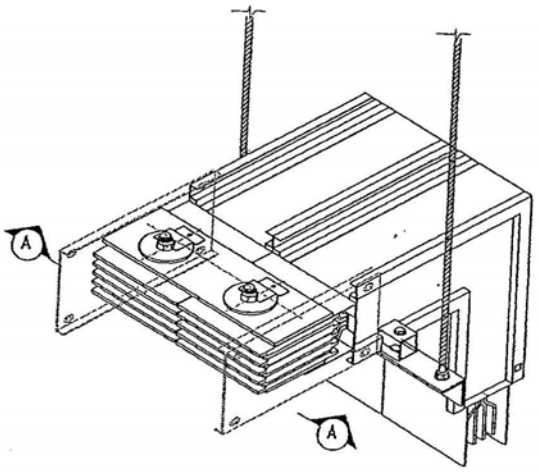


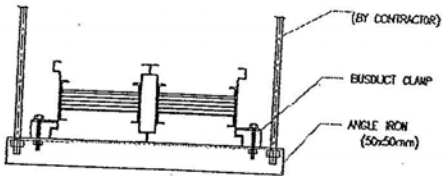




ELEVATION A – A



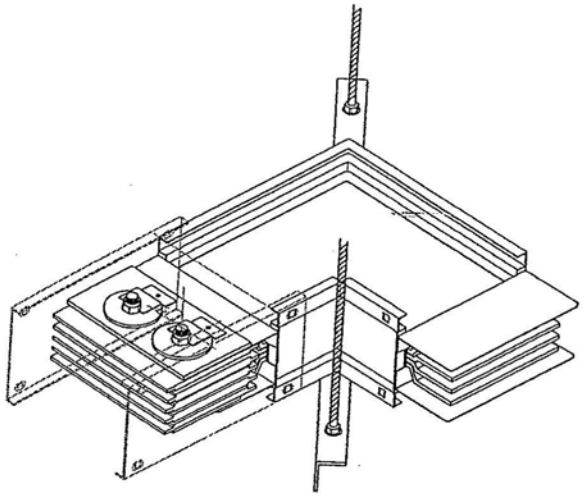



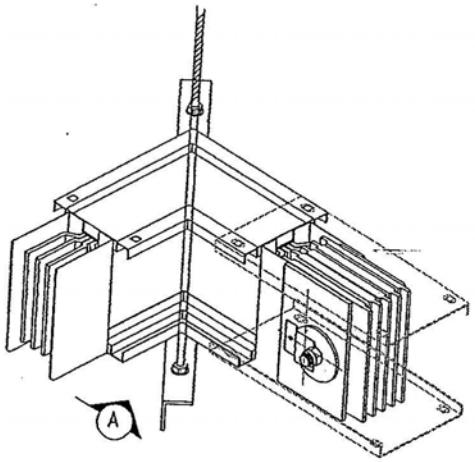



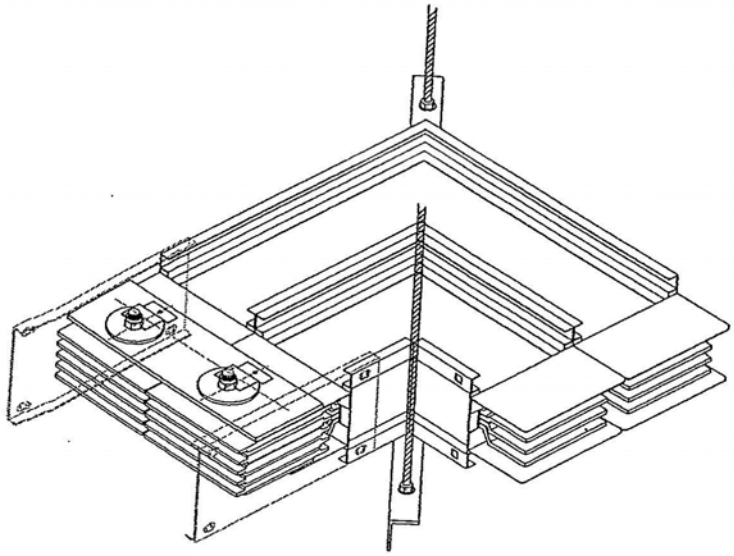

ELEVATION A – A

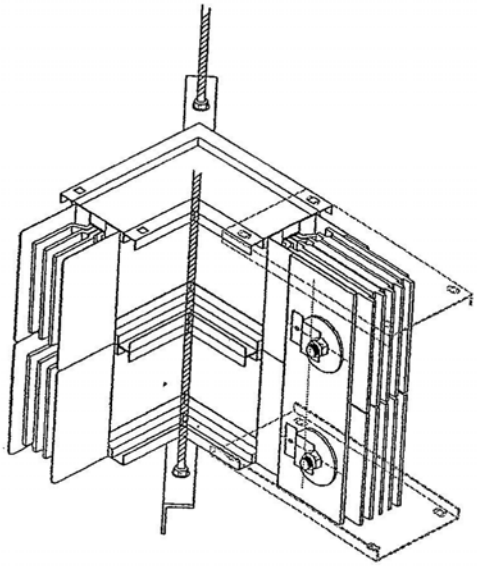
HORIZONTAL BUSDUCT SUPPORT
EDGEWISE ELBOW

# BUSDUCT INSTALLATION PROCEDURE - BUSDUCT SUPPORT



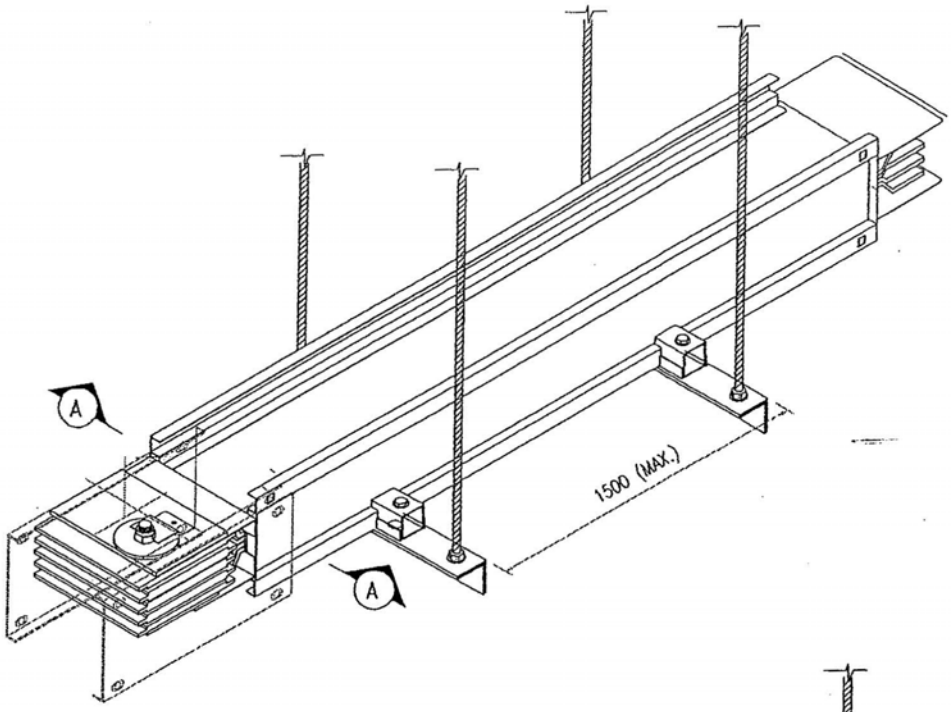


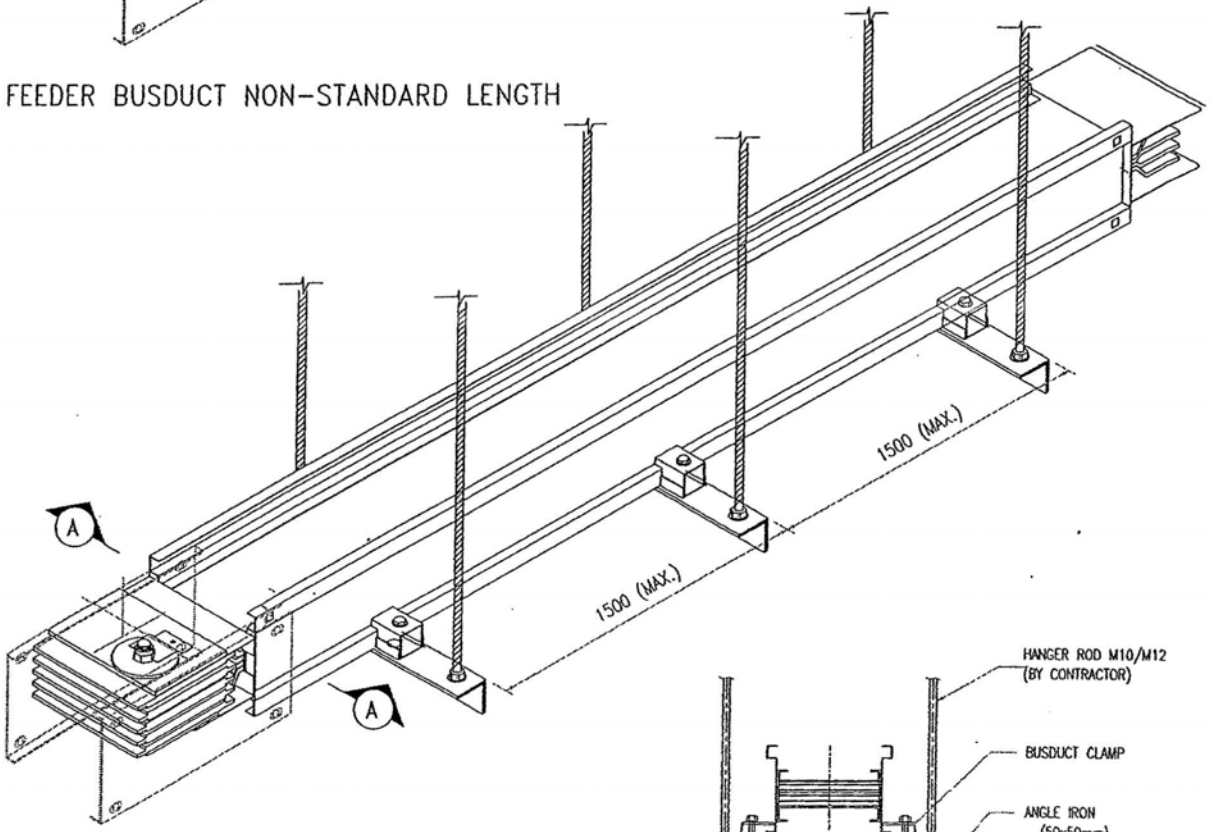


HORIZONTAL BUSDUCT SUPPORT
FLATWISE ELBOW

HORIZONTAL BUSDUCT SUPPORT
EDGEWISE ELBOW




FEEDER BUSDUCT NON-STANDARD LENGTH




FEEDER BUSDUCT STANDARD LENGTH

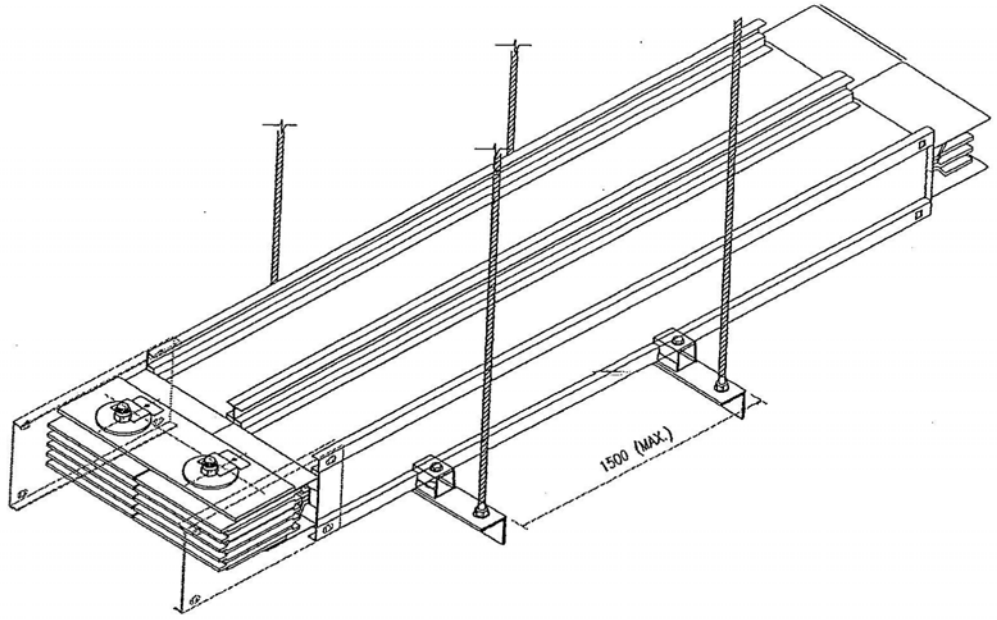



ELEVATION A - A

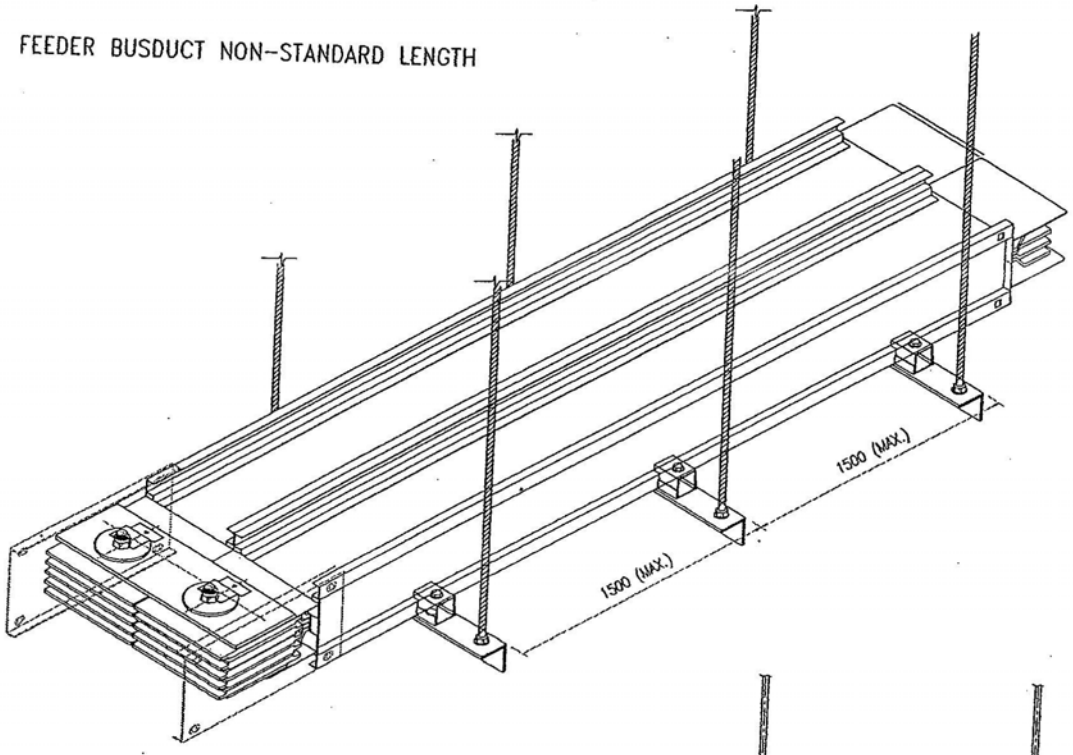
## HORIZONTAL BUSDUCT SUPPORT

FEEDER BUSDUCT STANDARD LENGTH

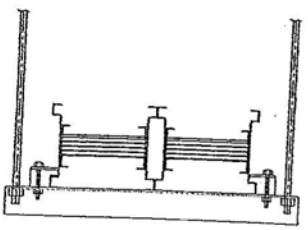
# BUSDUCT INSTALLATION PROCEDURE - BUSDUCT SUPPORT




FEEDER BUSDUCT NON-STANDARD LENGTH

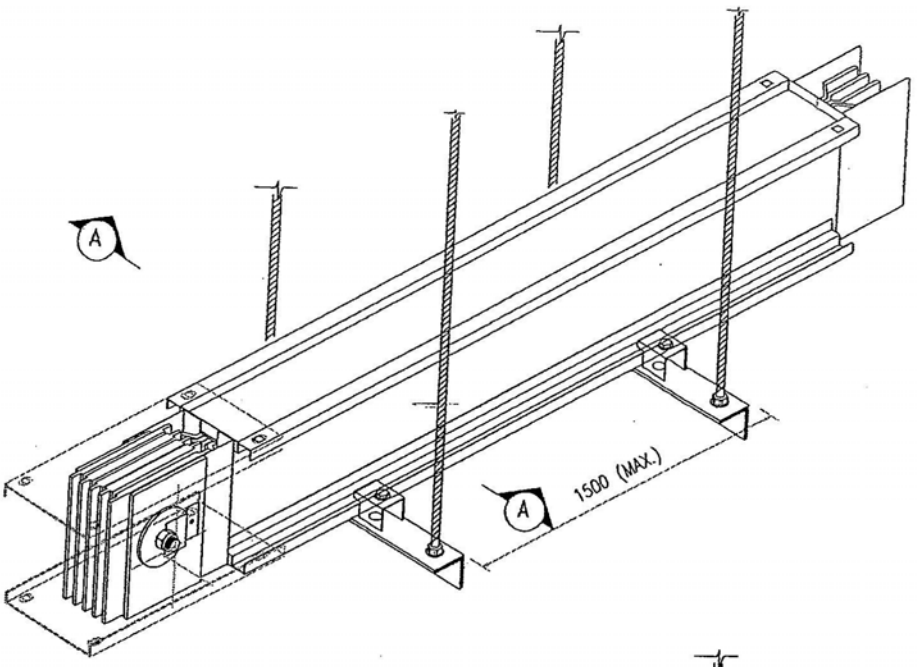



FEEDER BUSDUCT STANDARD LENGTH

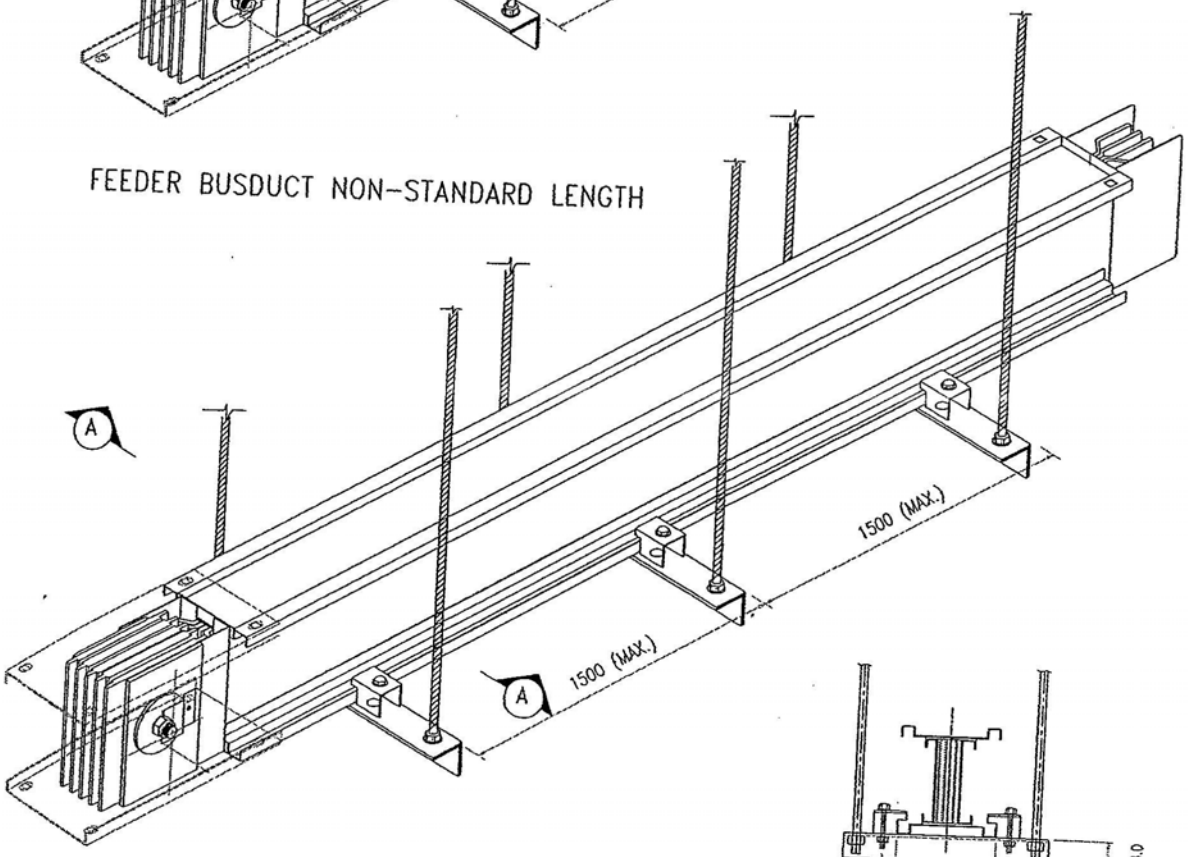


ELEVATION A - A

HORIZONTAL BUSDUCT SUPPORT




FEEDER BUSDUCT NON-STANDARD LENGTH



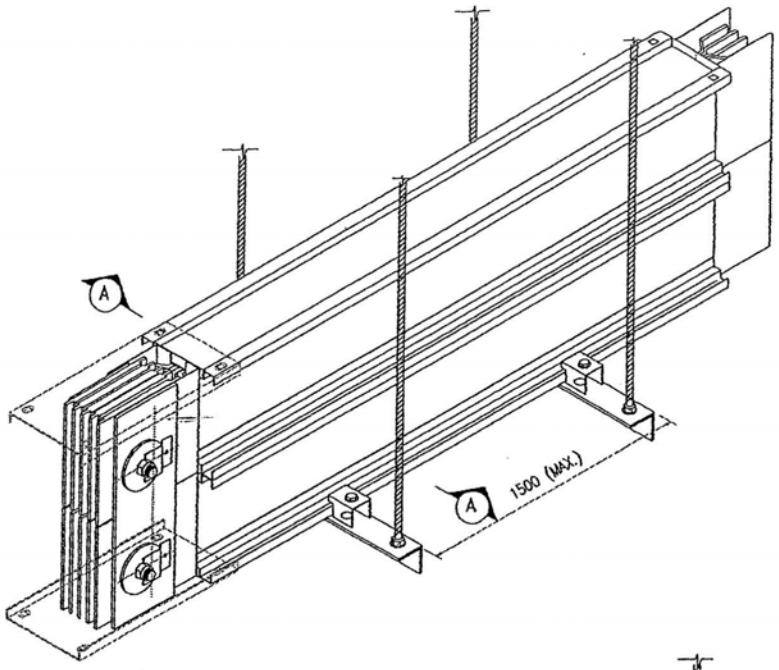

FEEDER BUSDUCT STANDARD LENGTH



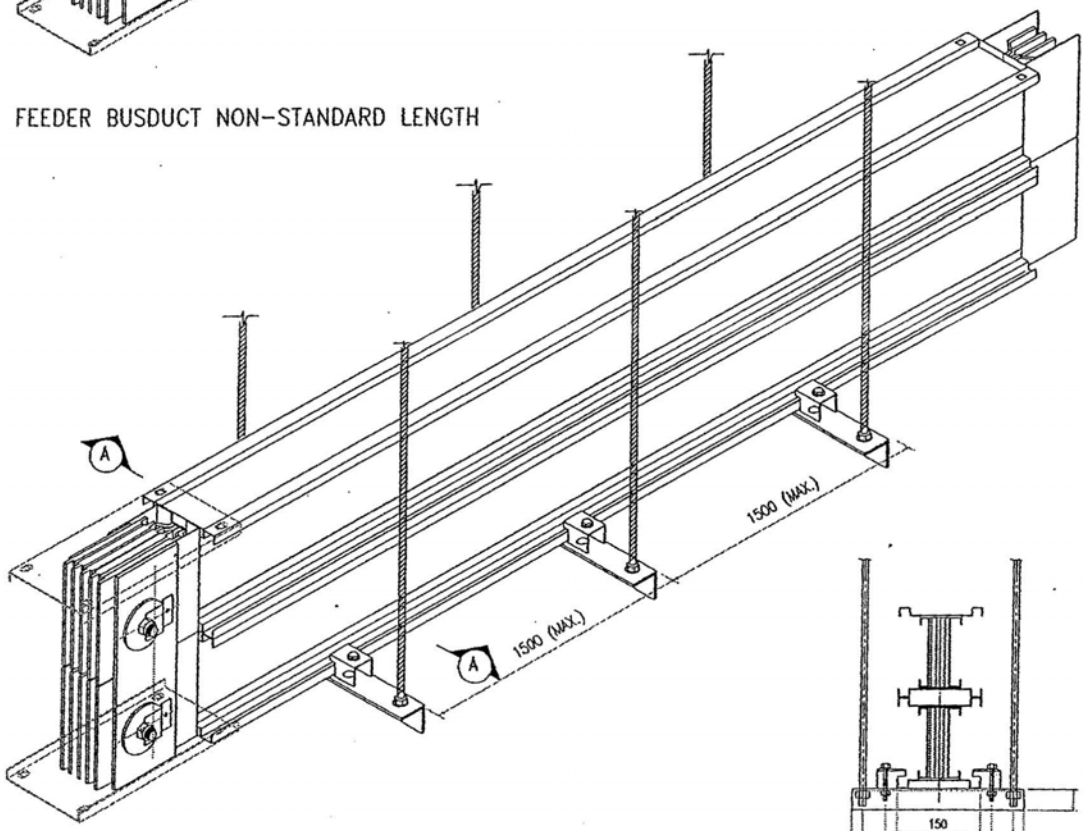

ELEVATION A – A

HORIZONTAL BUSDUCT SUPPORT

# BUSDUCT INSTALLATION PROCEDURE - BUSDUCT SUPPORT




FEEDER BUSDUCT NON-STANDARD LENGTH




FEEDER BUSDUCT STANDARD LENGTH




ELEVATION A – A

HORIZONTAL BUSDUCT SUPPORT

MEGA-DUCT

## SECTION 13:

# PRODUCT TEST REPORT

MEGA-DUCT

# SECTION 14:

# AS BUILT SHOP DRAWINGS