



**Specification Number: 13320**

**MV Substation Buildings**

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Performance Section**

**Issued by : Specifications Manager  
Networks Procurement**

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## History of Revisions

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|---------------------|-------------|-----------------------------------|---------------|
| 6                   | May 2003    | General                           | Paul Shiel    |
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## Part 1: General

### 1.01 Scope

This document is intended for customers who are required to build an indoor substation for provision of a large LV (230V) connection or where a connection is being obtained at MV (10kV or 20kV) voltage. The requirements detailed herein form part of ESB's contract with the customer.

ESB will endeavour to meet agreed work schedules. Good co-operation between ESB and customers is very important to achieve this. In particular, care should be taken to ensure that safety and quality of work on site meets the standards in this document. To avoid unnecessary delays, the substation building should be completed in accordance with this specification before calling on ESB to equip the substation.

The "Customer" referred to throughout this document is the builder or developer responsible for the building project which requires the building of a substation for provision of electricity connection.

### 1.02 About this document

This document contains following information:

1. Safety requirements for design, construction, working conditions and access to site.
2. Design requirements for MV substations
3. Materials to be used
4. Methods of construction

### 1.03 Associated Documentation

Drawings as listed in table below:

| Item | Drawing No.          | Rev. | Title  | Date Approved |
|------|----------------------|------|--|---------------|
| 1    | A3D.205071           | 1    | MV Substation Building - General Outline   | 9/97          |
| 2    | A3D.205072 (sheet 1) | 4    | MV Substation Building - Floor and Foundation Details                            | 6/00          |
| 3    | A3D.205072 (sheet 2) | 2    | MV Substation Building - Floor and Foundation Details                            | 2/00          |
| 4    | A3D.205073           | 0    | MV Substation Building - Solid Block or Mass Concrete Door Ope and Fixing Detail | 12/96         |
| 5    | A3D.205074           | 1    | Freestanding MV Substation - Roof Slab Details                                   | 12/97         |
| 6    | A3D.205075           | 1    | Incorporated MV Substation - Roof Slab Details                                   | 12/97         |
| 7    | A3D.205197           | 1    | MV Substation Building - Provision for Earthing MV Substation                    | 2/00          |

A PDF version of these drawings can be found in Appendix 2 of this document. These drawings are also available in DXF format, stored in a zip file, for downloading from ESB's web-site. ([www.esb.ie/esbnetworks](http://www.esb.ie/esbnetworks)).

The ESB web-site also contains information on ESB's approved suppliers for doors, duct covers and earth mats

Fitting out of the substation by ESB Networks is covered by ESB document titled: "Design and construction of MV indoor substations and MV switchrooms" (ESB reference: DTIS-300600-AZW)

#### 1.04 Substation Description

The substation internal dimensions are:

|                         |          |
|-------------------------|----------|
| Width:                  | 4,000 mm |
| Length (front to back): | 3,500 mm |
| Height:                 | 2,600mm  |

**Fig. 1 Freestanding MV Substation**



The substation building may be free-standing, as shown in Fig. 1, or be incorporated as part of the customer's premises. The customer shall also provide an adjoining switchroom building, which accommodates the customer's main circuit-breaker and revenue metering. The customer is responsible for switchroom design in accordance with the Code of Practice for the Customer Interface.

Note:

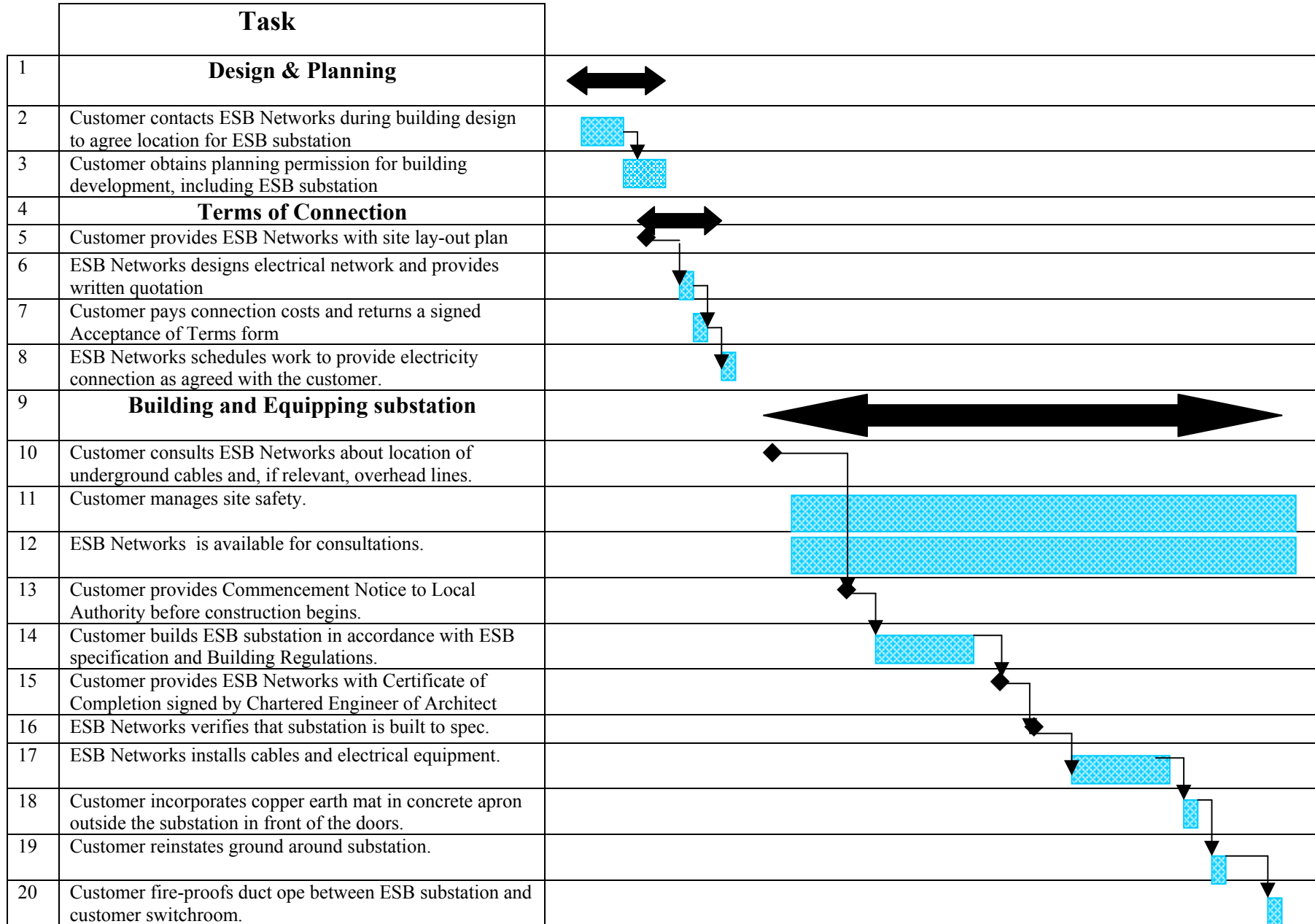
For very large LV customer loads, it may not be possible to house all electrical equipment within the standard substation. A larger substation shall be required in such cases and details will be provided by the local ESB office.

### **1.05 Early Contact with ESB**

The activity chart in Fig. 2 shows that early contact with ESB is essential to ensure that the substation can be integrated into the building design.

Network alterations to accommodate the new substation can take from 8 weeks to over 6 months to complete depending on the voltage level and nature of the alteration required.

**Fig. 2 MV Substation Tasks – from design to completion**



## **Part 2: Design and Planning**

### **2.01 Access**

The substation must be located at ground level. Vehicular access to the substation is required at any time of the day or night. This requires access corridor to be at least 3m wide and 4m high. If possible, access to the substation should be from a public road. The maximum allowable slope of the access road or driveway to the substation is 1:10. To facilitate installation or replacement of heavy electrical equipment, it is essential that immediate area around the substation is level. There is a document titled "Code of Practice in relation to access to land and/or premises" approved by the Commission for Energy Regulation outlining access requirements.

If the only available site is behind locked gates or barrier, a Keysafe must be installed. The keys or swipe-cards required for gaining access to the substation will be stored in the Keysafe. It must be possible to open the locked gates or barriers even if electric power is not available.

### **2.02 Siting of Substation within Building Complex**

The customer must incorporate the substation into the overall building design in compliance with the Irish Building Regulations. A fire within the substation must not put people at unacceptable risk by the spread of fire, interference with means of escape or the spread of smoke. Substations should be located so that doors open onto low fire risk, outside locations.

Substation doors shall be at least 10 metres from main entrances and exits, air-conditioning intakes, escape stairways, oil pipes, gas pipes, fuel tanks or similar risks. Doors should not be located immediately beneath windows that can be opened.

If LV connection is being provided, substation must be located reasonably close to the customer load to minimise possibility of customer experiencing low voltage problems.

### **2.03 Risk Assessment**

A risk assessment must be carried out to ensure that the precautions put in place will facilitate the safe evacuation of all buildings that could be affected by a substation fire.

### **2.04 Fire-Rating**

Substation structure, including floor, walls and ceiling shall have a four-hour fire-rating to contain a fire that starts within the substation. The standard substation doors have no certified fire-rating because they open onto a low fire risk, outside location.

### **2.05 Doors**

Hot-dip galvanised steel doors have been designed to include vertical louvres for ventilation. It must be possible to open doors through 180°.

Doors are only available in one standard size. The door ope must be 2465 mm by 2465 mm with a tolerance of 0 to + 20mm.

Cladding may be attached to substation doors provided it complies with conditions specified in section 3.08.F.

## **2.06 Earthing**

To ensure electrical safety, the reinforcing steel incorporated in the substation floor will be earthed. See drawing A3D.205197 for details. The reinforcing steel for the substation floor must not be connected to any other steelwork.

If reinforcing steel is not incorporated in the substation floor, it will be necessary to install a copper mesh for electrical safety.

It will also be necessary to install a copper earth mat outside the substation. This earth mat is installed 200mm below the concrete surface. See drawing A3D.205197 for details.

## **2.07 Smoke Detector**

A smoke detector may be installed and linked to a central fire alarm. Housing has been designed so that the smoke detector can be installed at the top of the substation doors. The smoke detector can be accessed for testing without the need for ESB presence. However, there are special considerations for wiring to be used and precautions must be taken before carrying out any electrical work on the smoke detector installed in the substation door. Further details are included in Section 3.08.E.

## **2.08 Drainage**

Adequate ground level drainage must be provided to ensure the substation – and ducts - are not liable to flooding.

## **2.09 No Impediments**

There must not be any beams or columns within the substation. Pipes or services not related to the electricity connection must not be routed through the substation.

## **2.10 Customer Switchroom**

A customer switchroom must be provided adjoining the ESB substation. The switchroom houses the customer's main circuit-breaker and revenue metering.

## **2.11 Planning Permission**

The customer is responsible for obtaining planning permission for all buildings, including ESB substation.

## **Part 3: Execution - Construction**

### **3.01 Terms for Connection**

#### **A Quotation and Terms for Connection**

Details on how to apply for an electricity connection can be found on ESB Networks' web-site ([www.esb.ie/esbnetworks](http://www.esb.ie/esbnetworks)).

ESB will provide a quotation letter or connection agreement, which will specify if the customer has to provide a substation building.

Where there is a connection agreement, this document will specify the expected date of completion of the substation building by the customer to fit in with the schedule for providing the connection. This completion is referred to in the connection agreement as "the terminal substation completion date".

Where a substation is required, the customer shall undertake to transfer the substation site and provide a legal easement for electricity cables as part of the acceptance of the connection offer. The connection works cannot be authorised until these legal issues have been finalised, payment has been received and the customer has officially accepted any other requirements specified in the quotation letter or connection agreement.

Type of substation required is determined by guidelines set down in document titled "The Distribution System Security and Planning Standards". This document can be downloaded from ESB Network's web-site.

#### **B Connection Works**

The quotation letter will provide the name of an ESB contact person who will deal with all queries relating to the connection works. The Customer should contact this person one week after payment is made to discuss and agree the timetable for the connection works.

### **3.02 Safety During Construction**

#### **A Safety – Statutory Obligations**

The customer is responsible for managing safety for the entire building project in accordance with Irish safety legislation.

This legislation includes:

1. The Safety, Health and Welfare at Work Act 1989 (Act 7 1989)
2. The Safety, Health and Welfare at Work (General Application) Regulations (S.I. 44-1993) and subsequent amendments
3. Safety, Health and Welfare at Work (Construction) Regulations 2001(S.I. 481-2001)

## **B Site Safety**

1. ESB, Builders and Developers must meet all the requirements of S.I.44 in order that site conditions and practices provide a safe working environment.
2. ESB or ESB contractors are required to work on building sites to equip substations and install cables. If ESB find that the work-site is unsafe they are required to leave the site until it has been made safe.
3. Where safety precautions have not been taken by the Customer and there is a risk of coming into contact with live apparatus, ESB will issue an 'Instruction to Stop Work'. If the instruction is ignored the Health and Safety Authority will be requested to intervene.
4. Safety standards for the installation of electrical equipment in substations are covered in this document. ESB, the Customer and all contractors working on site must adhere to these standards.

## **C Electrical Safety**

Part VIII of the General Application Regulations 1993 (S.I.44) requires precautions to be taken against the risk of death or personal injury from electricity in the work area. In particular, regulation 36 states 'that all electrical equipment and installations shall at all times be so constructed, installed, maintained, protected and used so as to prevent danger'. This puts an onus on everybody including ESB, Customers and Subcontractors to protect the workforce and the general public from the hazards associated with electricity.

### **1. ESB Overhead Lines**

Where building is taking place close to ESB overhead power lines, certain precautions are necessary.

- a) It is a statutory requirement for the Customer to advise ESB at least two months in advance of any construction work taking place within 25 metres of an overhead line. ESB must be contacted to see if the lines can be diverted or switched out while the work is taking place. If the lines cannot be diverted or switched out, then the Customer must ensure the safety precautions shown are put in place.
- b) Tipper trucks, cranes, diggers, concrete delivery trucks and material escalators are particularly at risk in coming into contact with ESB overhead lines. The Customer must ensure that all drivers and operators of these vehicles are made aware of such hazards before they enter the work site.
- c) Tipper trucks, cranes, diggers, concrete delivery trucks and material escalators are particularly at risk in coming into contact with ESB overhead lines. The Customer must ensure that all drivers and operators of these vehicles are made aware of such hazards before they enter the work site.

## SAFETY POSTER

**SITE WHERE THERE WILL BE NO WORK OR PASSAGE OF PLANT UNDER A LIVE OVERHEAD LINE**



- A barrier should run parallel to the line.
- This may be fixed post fencing or steel drums filled with rubble spaced 1.5 metres apart.
- If cranes are in use a line of bunting at a height of 3 metres should supplement the barriers.
- Danger notice stating "Danger Live Overhead Line" should be spaced at intervals.

**SITE WHERE PLANT WILL PASS UNDER A LIVE OVERHEAD LINE**

- In addition to the above, Goal Posts should be erected as shown

**Dimensions as follows:**

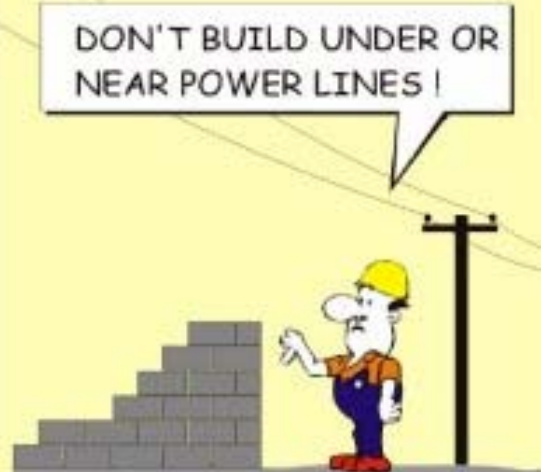
|  |                     |
|--|---------------------|
| Height of goalposts                    | - As advised by ESB |
| Width of Goalposts                     | - Max. 10 metres.   |
| Height of bunting                      | - 3 metres.         |
| Distance between steel drums           | - 1.5 metres.       |
| Distance between danger notices        | - 20 metres.        |
| Horizontal distance of barrier to line | - 6 metres.         |



**ESB EMERGENCY (and No Supply) number**  
**1850 372 999**


## SAFETY

**DON'T BUILD UNDER OR NEAR POWER LINES!**



**LINES CAN KILL**

**IF YOUR DIGGER CONTACTS A CABLE**  
**JUMP CLEAR**  
**AND KEEP OTHERS AWAY**



**CABLES CAN KILL**

**ALWAYS CHECK WITH ESB BEFORE YOU START - ADVICE IS FREE!**

## **2. ESB Underground Cables**

Underground cables constitute one of the more common hazards encountered when digging in the street, near buildings or on building sites, always assume electric cables will be present. If ESB cables, cable slabs or warning tape are uncovered then digging in the vicinity must stop until the site has been inspected by ESB.

The Customer is required to ensure that when digging is taking place, the location of all underground cables in the vicinity is known. Maps giving the general location of cables are available from ESB. A Cable Avoidance Tool, which should be used by a skilled operator, can give a more precise location of cables when used in conjunction with the maps.

## **3. Generators**

If a generator is used on site it is essential that no back-feed can occur to ESB networks. If it is a fixed generator type, then it must be installed by a competent person with the correct protection and changeover arrangement provided. Extra care is needed with portable generators. A dangerous occurrence has been reported a number of times when sockets in a house awaiting connection were made live by connecting a generator to one of the socket outlets. This is a highly dangerous practice and has the effect of making the fuse board live creating an imminent danger to life.

Customers and ESB are required to notify the Health and Safety Authority if they come across such practice.

Generator connections must comply with ETCI requirements.

## **4. Temporary Connections and Portable Electrical Equipment**

Temporary electrical connections are regularly used on building sites. They provide power for electric tools and equipment. In many cases leads are strung on scaffolding or laid on the ground. A few simple safety rules should be observed:

- a) Temporary connections must comply with ETCI requirements.
- b) All leads and equipment must be regularly inspected and replaced if faulty.
- c) All switchgear, plugs and sockets used on a building site must be of an industrial type and comply with the standards in IEC 60309. Such equipment must have at least an IP 44 protection rating against the entry of foreign objects and moisture.
- d) Leads laid on the ground should be suitably protected against possible damage by passing vehicles.
- e) Special care should be taken in installing leads on structures where vehicles can pass underneath.

- f) All 380/220Volt connection leads must be screened, kept short and must be protected with an RCD.
- g) Portable transformers must be used to power all tools and equipment at 110Volts.
- h) Hand lamps must not exceed 25Volts AC.

### 5. Safety Literature

Safety literature in the form of videos, posters and cab stickers are available free of charge from your local ESB office

**FREE SAFETY MATERIAL**

Safety Videos  
Posters and  
Cab Stickers  
are available  
free of charge  
from your local  
ESB Office

**Lifelines**  
Avoiding Accidents  
From Overhead  
Lines &  
Underground  
Cables

**power2check**

ESB EMERGENCY (and No Supply) number  
**1850 372 999**

### 3.03 Construction – Commencement Notice

The Customer is responsible for providing a commencement notice to the appropriate Local Authority before construction begins.

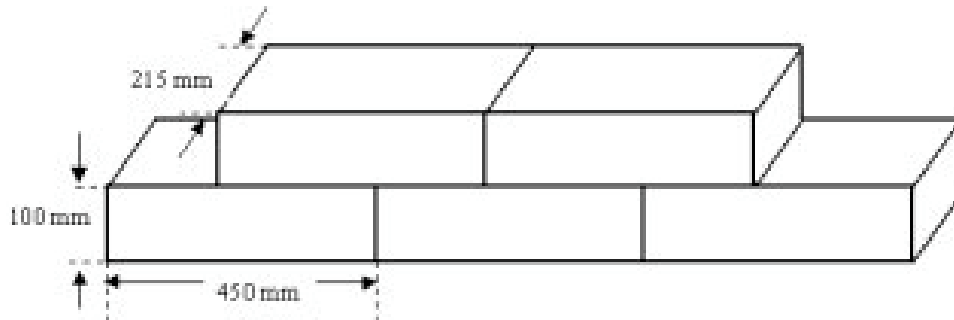
### 3.04 Excavations and Foundations

Excavation for wall foundations must be to a minimum depth of 1,400mm. This depth is required to cater for ducts, which are 900mm deep, in the substation floor. It may be necessary to excavate deeper if required to reach a sufficiently firm stratum.

### 3.05 Substation Wall Blockwork

All substation walls will have an inner leaf built with standard fine textured concrete blocks conforming to IS20, laid flat as shown in Fig. 3.

**Fig. 3 Substation Walls built with blocks laid flat**

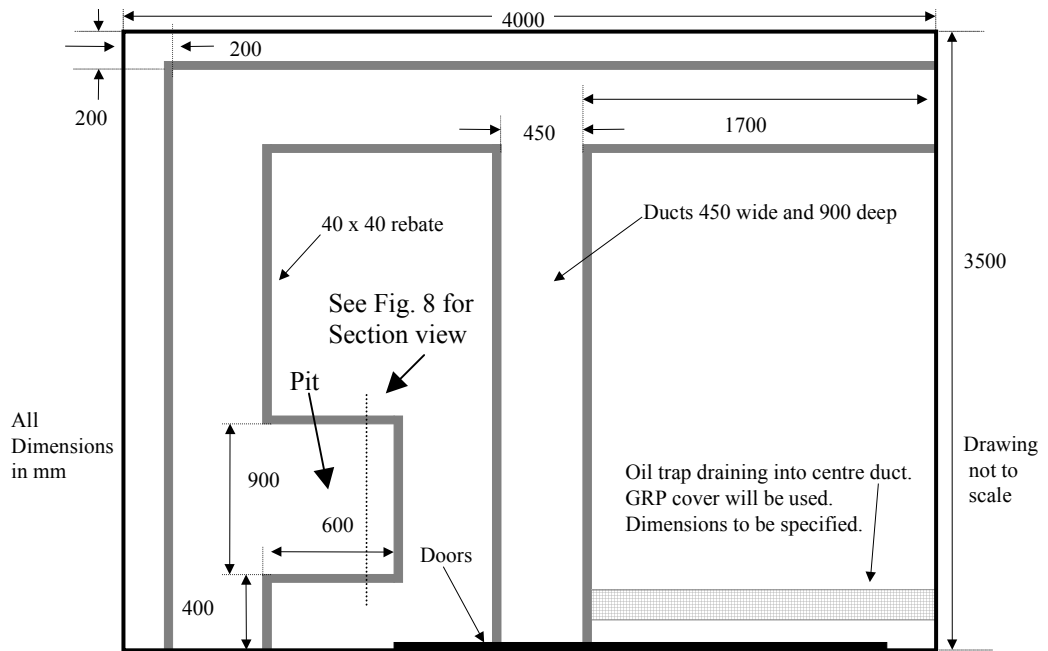


External walls will also have an outer leaf.

### 3.06 Floor

A poured concrete floor will be installed. The floor will incorporate a duct lay-out and oil trap as shown in Fig. 4.

**Fig. 4 Substation Floor Duct Lay-out**



The floor shall be 150mm  $\pm$  50mm above the ground level outside the substation.

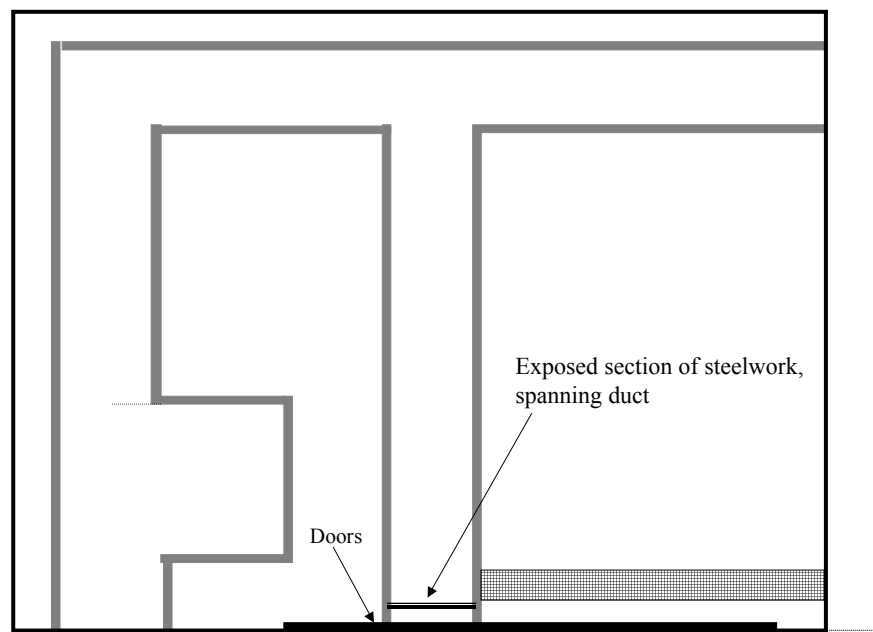
## A Reinforcing Steel

If reinforcing steel mesh is not incorporated in the substation floor, a copper mesh will be included in the floor 200mm beneath the surface.

ESB earth the reinforcing steel in the substation floor to improve electrical safety within the substation, which typically houses both MV and LV equipment. In general, earthing arrangements within the substation are isolated from customer electrical installations. Consequently, steelwork within the substation floor must not be extended outside of the ESB substation.

Steel mesh should span the duct at one point as shown in Fig. 5 to allow ESB to make an electrical connection. All sharp edges must be removed from the section of exposed steel.

**Fig. 5 Exposed Steelwork Spanning Substation duct**



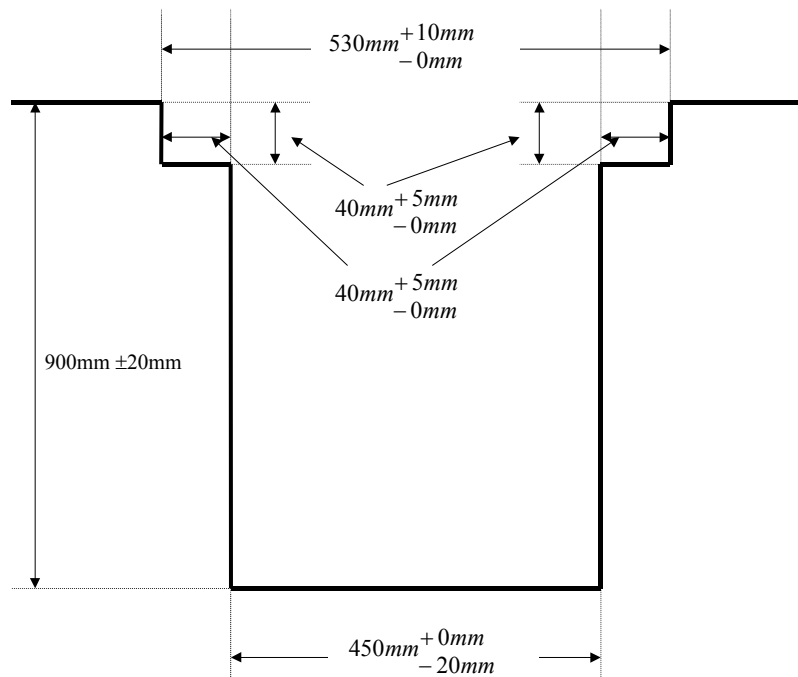
### 3.07 Ducts

The duct profile is shown in Fig. 6. Walls and base of duct must be constructed from poured concrete. Critical dimensions are shown in Fig. 5, namely:

1. Height of rebate must be  $40\text{mm}^{+5\text{mm}}_{-0\text{mm}}$
2. Total width of duct plus rebate on either side must be :  $530\text{mm}^{+10\text{mm}}_{-0\text{mm}}$

These dimensions are tightly specified because prefabricated duct covers have been sourced. These duct covers are factory-cut to minimise amount of work on site.

**Fig. 6 Duct Profile**

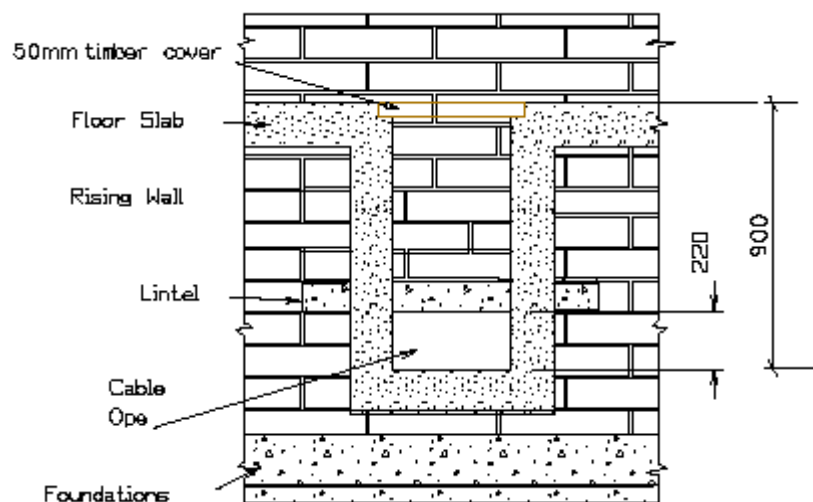


**A Duct Opes**

At duct opes, where cables enter the substation, a lintel should be installed 220mm above the duct floor as shown in Fig. 7. The substation wall is built on this lintel, leaving a gap 220mm high and 450mm wide for cables to enter. The duct ope between the ESB substation and the Customer switchroom should be constructed in this manner also.

Location of duct opes depends on cable routing for each substation and should be agreed with ESB prior to construction.

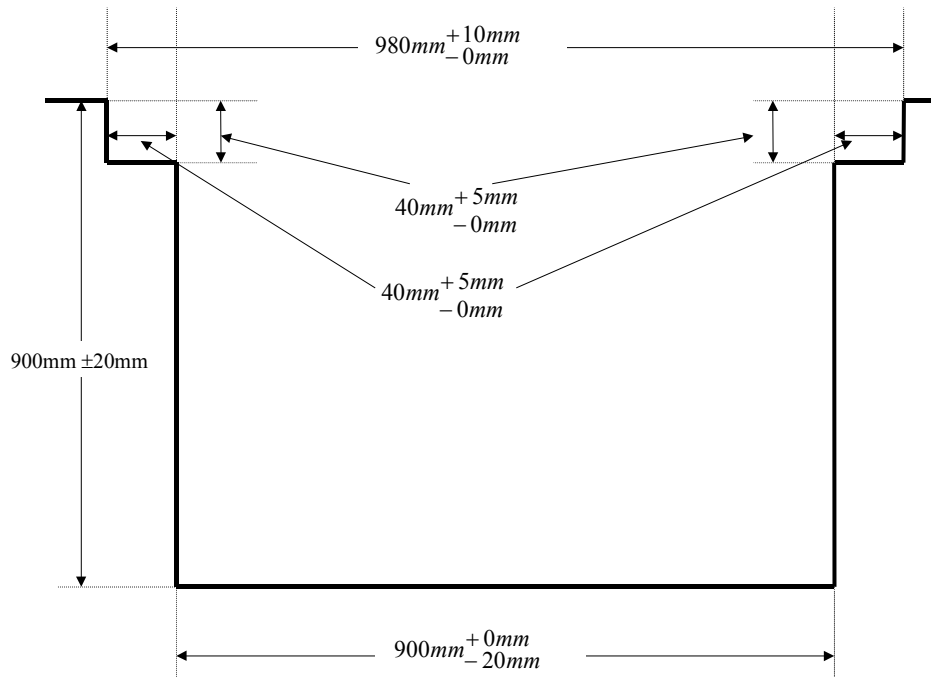
**Fig. 7 Duct Opes**



**B Pit**

A pit is incorporated in the substation floor as shown in Fig. 4. This pit is required to facilitate making cable terminations to the MV switchgear. Pit profile is shown in Fig. 8. As shown in Fig. 4, the pit dimension (left to right) is 600mm. There is also a 40mm x 40mm rebate at the front of the pit.

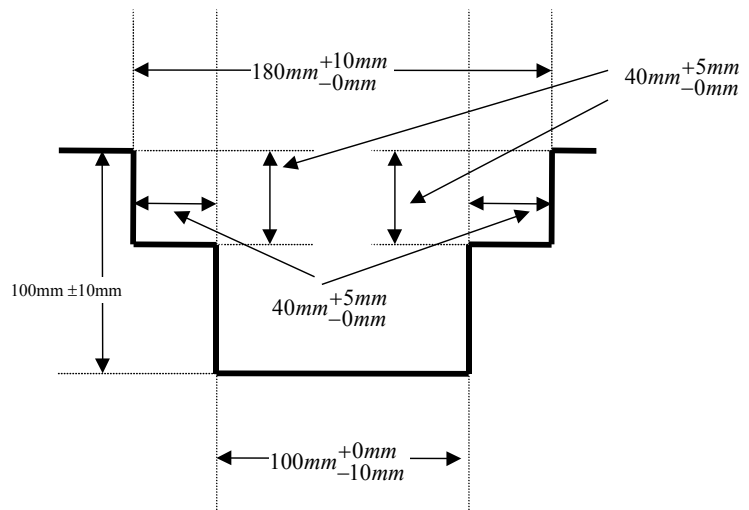
**Fig. 8 Pit Section**



**C Oil Trap**

Position of oil trap is shown in Fig. 4 and profile in Fig. 8. The oil trap drains into the centre duct.

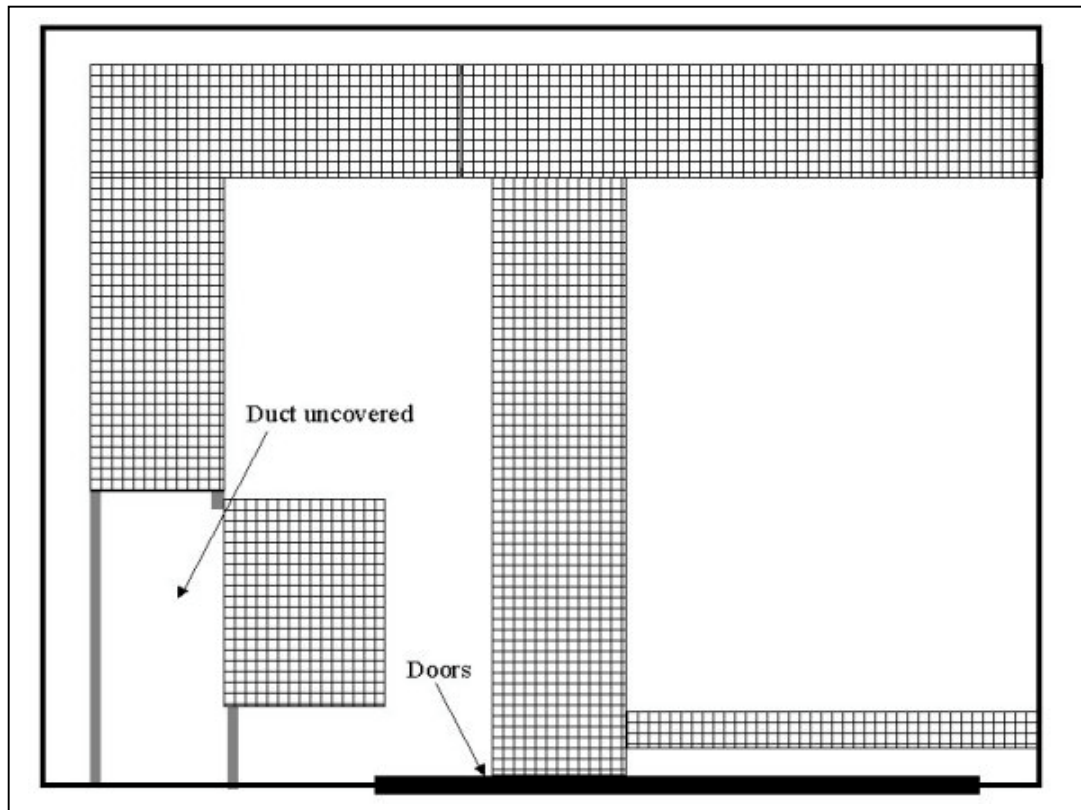
**Fig. 9 Oil Trap Profile**



**D Duct Covers**

ESB has sourced an approved supplier for GRP (Glass Reinforced Polyester) duct covers. Duct covers will be delivered cut to size and to be installed as shown in Fig. 10. The duct covers fits into the 40mm x 40mm rebates on either side of the ducts. The duct covers are 40mm thick. It is important that depth of rebates is 40mm ±1mm to avoid possibility of a tripping hazard.

**Fig. 10 Duct Covers in Position**



Fixings will be delivered with the duct covers for:

1. Attaching each duct cover to adjacent covers.
2. Bolting end duct covers to the substation floor.

The duct on the front left can be left uncovered as shown in Fig. 10. The MV switchgear is installed over the duct in this location.

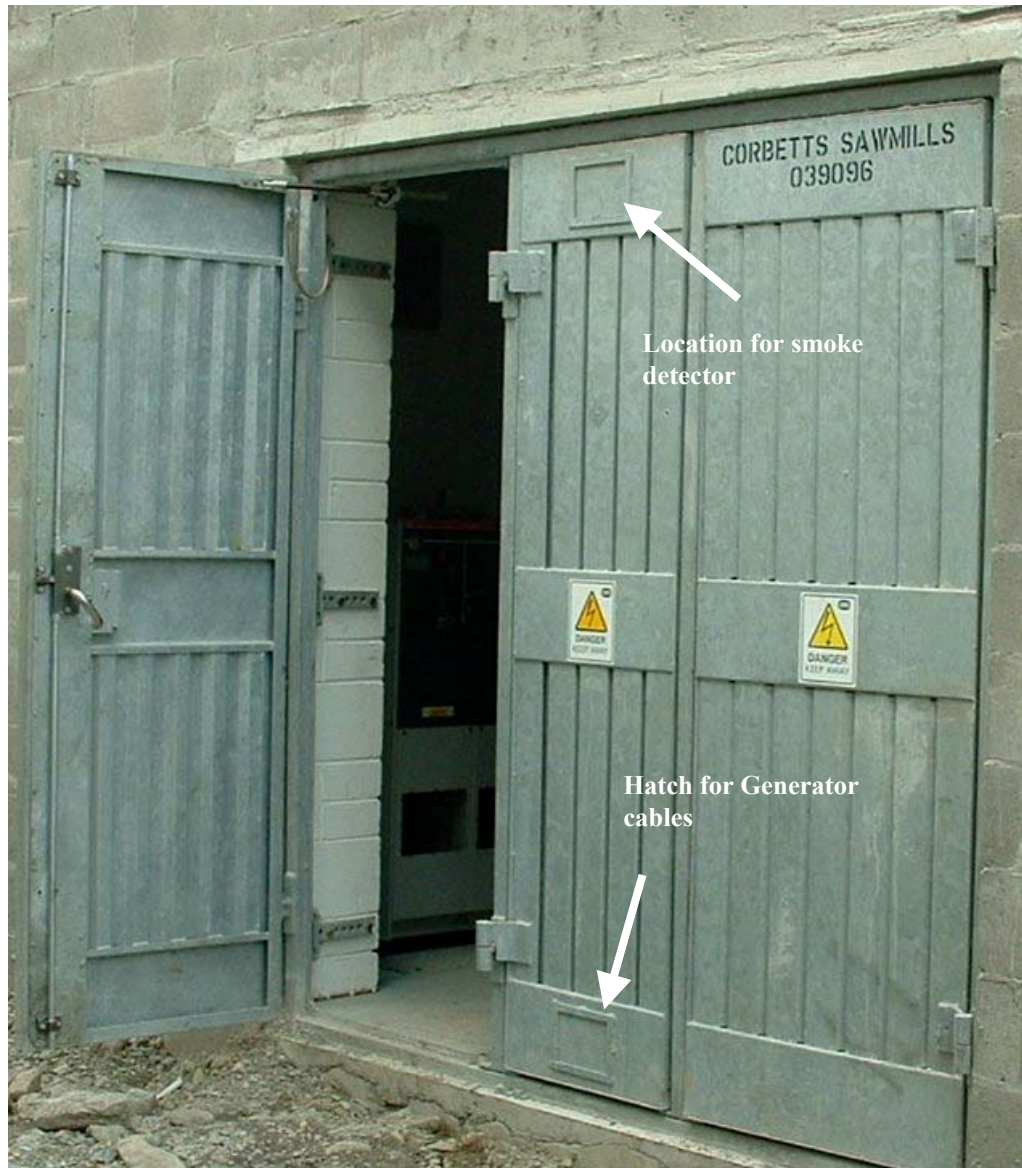
### **3.08 Doors**

Doors have been designed with following features:

1. Door set is manufactured from hot-dip galvanised mild steel.
2. Ventilation grilles have been incorporated in each door leaf so that separate wall vents are not required.
3. Door set consists of a frame, three door leaves with two removable vertical supports. Double doors on right are only opened for equipment installation/replacement. Centre door leaf and two vertical supports can be removed if full width of door frame is required for equipment installation. Personnel access door is on the right.

- Centre door leaf incorporates a hatch at the bottom for temporary installation of generator cables, if required. There is also a hatch provide at the top of this door leaf to allow the customer to install a smoke detector.

**Fig. 11 Substation Doors**



**A Approved Suppliers**

Substation doors shall be sourced from ESB approved suppliers. A list of these suppliers is available on ESB's web site. The suppliers are willing to deliver and, if requested, fit the doors anywhere in Ireland. Suppliers have guaranteed to deliver doors within two weeks of receipt of order. Number of approved suppliers will be reviewed if suppliers fail to meet the delivery guarantee.

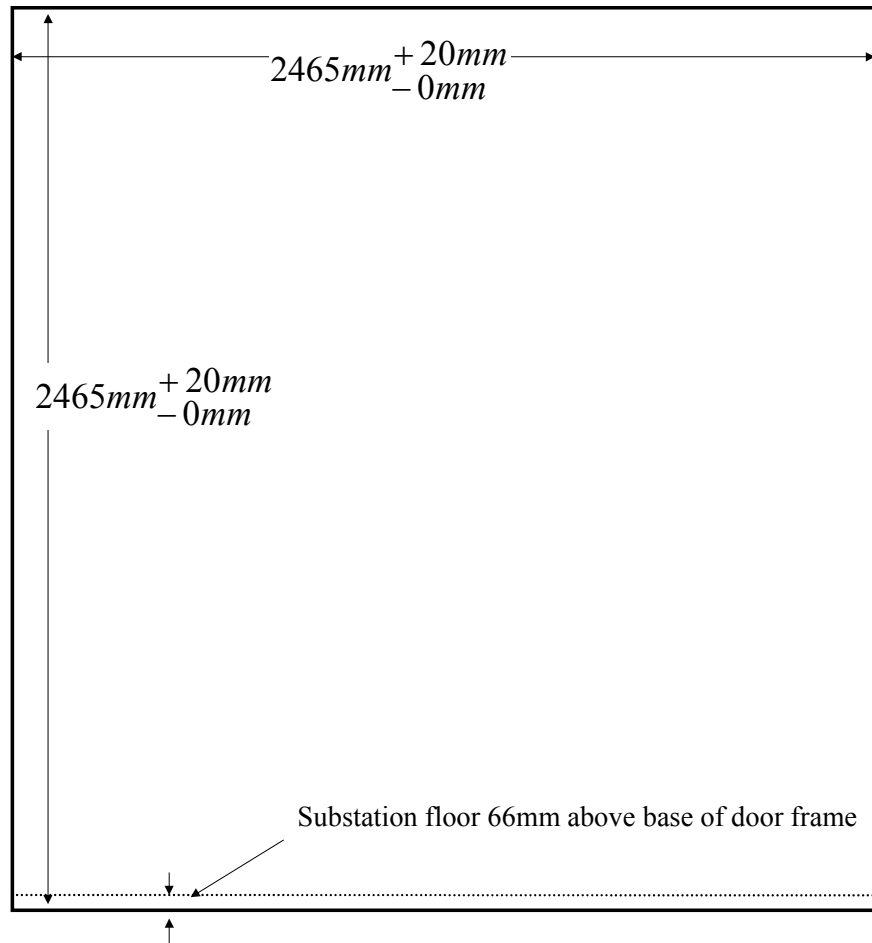
**B Door Ope**

A door set is 2465mm wide and 2465mm high. Dimensions of door ope should be

$2465mm^{+20mm}_{-0mm}$  wide and  $2465mm^{+20mm}_{-0mm}$  high.

The doors are only available in one standard size. The ope dimensions must be within the limits stated.

**Fig. 11 Door Ope**

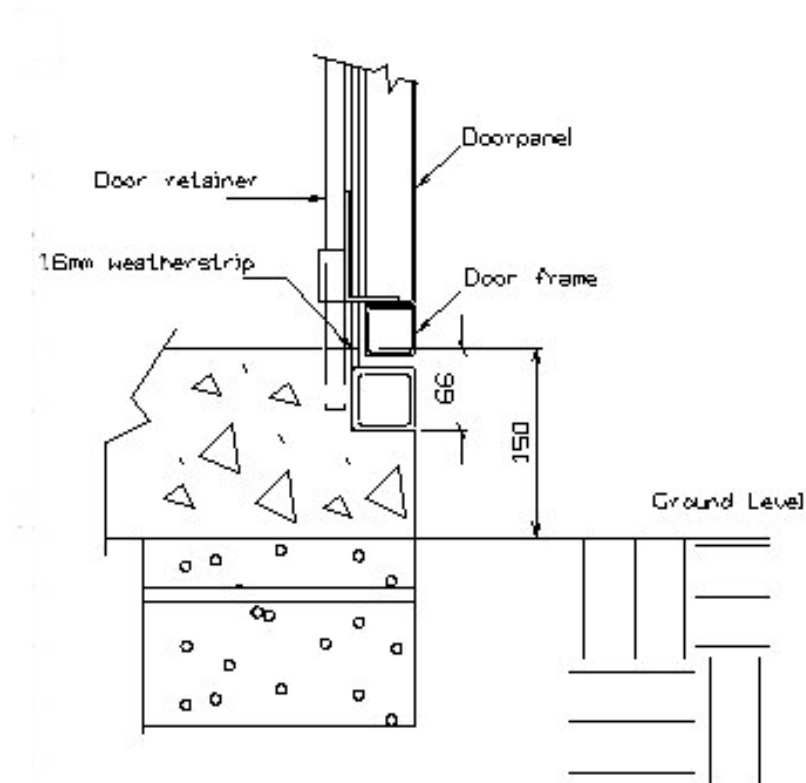


The base of the door frame is 66mm below the substation floor.

Fig. 12 shows base of door frame in relation to the substation floor and the external ground.

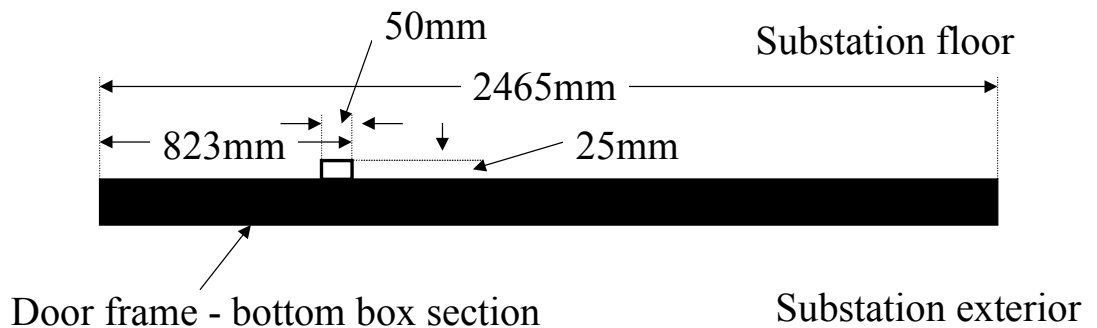
There should be no step outside the substation doors.

**Fig. 12 Base of Door Frame in relation to Substation Floor**



Plan view of the base of the door frame shows that a bracket for securing the locking mechanism downbolt protrudes into the substation floor from the box frame section.

**Fig. 13 Plan view of bottom section of Door Frame**



### C Delivery

Door suppliers will deliver doors to any location in Ireland. The customer will provide a forklift or teleporter with sufficient lifting capacity to offload the doors on site. In general, doorsets will be delivered with door leaves installed on the frame. Lifting eyes have been included for securing straps to the doorset.

If necessary, doors can be delivered for manual offloading. In this case, doorsets will be dispatched with door leaves removed from the frame. However, suppliers must be notified of this requirement at time of placing the order. Sufficient manpower must be available on site to manually offload door leaves and frame with weights as shown in the table below.

| Item | Description  | Weight (kg) |
|------|--|-------------|
| 1    | Door frame including one removable upright and mounting brackets | 116         |
| 2    | Personnel access door leaf                                       | 115         |
| 3    | Centre door leaf   | 95          |
| 4    | Right door leaf  | 111         |
|      | Total doorset  | 437         |

The customer is responsible for storing the doorset in a safe and secure location.

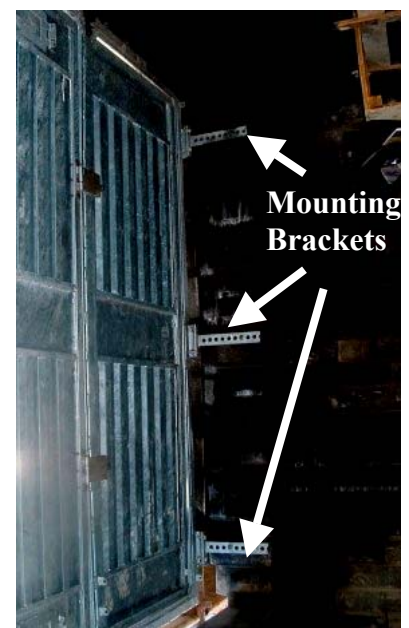
### D Fitting

Door suppliers will fit the doors on request at time of placing the order. If door suppliers are to fit the doors, the customer must provide a teleporter or forklift with sufficient lifting capacity for lifting and manoeuvring the doorset.

Procedure for fitting doors includes the following steps:

1. There should be a clear unobstructed pathway to the substation door ope, with sufficient room for the teleporter or forklift to manoeuvre.
2. Check dimensions of door ope to ensure doorset will fit. Minor imperfections can be removed with a jack hammer or chisel with hammer.

**Fig. 14 Mounting Brackets**



3. Lift doorset into door ope and rest on base of ope and check plumbness. Door can be mounted flush with outer leaf.
4. Mounting brackets must be bolted to the inner solid block leaf. There are three brackets to be installed on each side of the door frame.
5. Mark fixing holes. Then drill and fit and tighten rawl bolts.
6. Ensure door leaves have a smooth swinging and closing action.
7. If mounting bracket protrudes beyond inner leaf, excess length can be cut off. Ensure sharp edges are removed on cut surface.

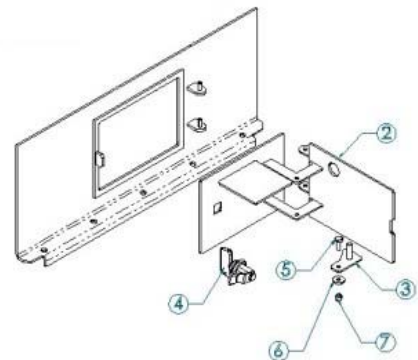
## E Smoke Detector

The customer can install a smoke detector in the substation door if required. A special housing can be purchased from the door suppliers for this purpose. The smoke detector can be accessed within this housing without opening the substation doors.

However, ESB keep substation earths separate from customer earths for safety reasons. Consequently, certain precautions must be followed if a smoke detector is installed:

**Fig. 15 Housing for Smoke Detector**

1. Housing of smoke detector must be non-metallic.
2. Cabling to smoke detector within the substation will be installed in plastic conduit.
3. Cabling must have an insulated sheathing.
4. Before any electrical work is carried out on the smoke detector in the substation or the associated cabling, the wiring must be disconnected at the remote end.



## F Cladding

Cladding can be attached to the substation doors provided:

1. It does not restrict door opening through 180°. Cladding, including supporting framework, can be up to 40mm thick.
2. It does not impede access to cover plate for locking mechanism or hatch included at base of centre door.
3. Galvanised door surface is not broken when securing the supporting framework. Brackets should be designed that wrap around the frame of each door leaf.
4. It is still possible for air to circulate through the vertical ventilation louvres.

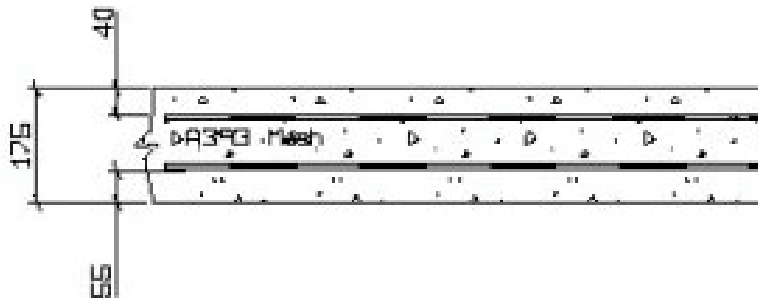
### 3.09 Roof

The substation roof shall be constructed from poured concrete with reinforcing steel. Structure as shown in Fig. 16 ensures roof fire-rating is four hours.

If there's no building over the substation, external roof surface will be finished as shown in Drawing A3D.205074.

### 3.10 Finishing Details

**Fig. 16 Poured Concrete Roof with Reinforcing Steel**



#### **A House Supply**

The terms and conditions for connection at Medium Voltage require the customer to provide, free of charge, a single-phase LV supply for the heating and lighting of the ESB substation.

In most cases, ESB keeps substation earths separate from customer earths for safety reasons. The customer shall provide a 6mm<sup>2</sup> stranded copper phase and earth wire into the ESB substation in a plastic conduit.

#### **B Internal Painting**

The finished walls and ceilings shall be coated with a polybond sealer prior to painting them with two coats of an approved white emulsion. It is not acceptable to have any other colour finish or to leave the walls unpainted.

The floor of the substation shall be painted with a single-pack moisture curing polyurethane coating for sealing and dust proofing the floor. The colour of the floor paint shall be red or grey.

It is essential that the floor has a non-slip finish. Apply the floor paint onto a clean, dry surface as follows:

1. Prime the floor surface. The primer consists of single-pack polyurethane paint mixed with the appropriate thinner in proportions specified by the paint manufacturer.
2. Apply the first top coat after the primer has dried.

3. Sprinkle fine grade aggregate evenly onto the first top coat whilst still wet.
4. Allow to cure. Then brush off excess aggregate.
5. Apply a second top coat to seal in the aggregate and allow to cure. Avoid pin holing by applying the second top coat at right angles to the first.
6. Follow paint manufacturer's instructions for application of the floor paint.
7. Apply paint with a brush or roller.

**C Door Reveal**

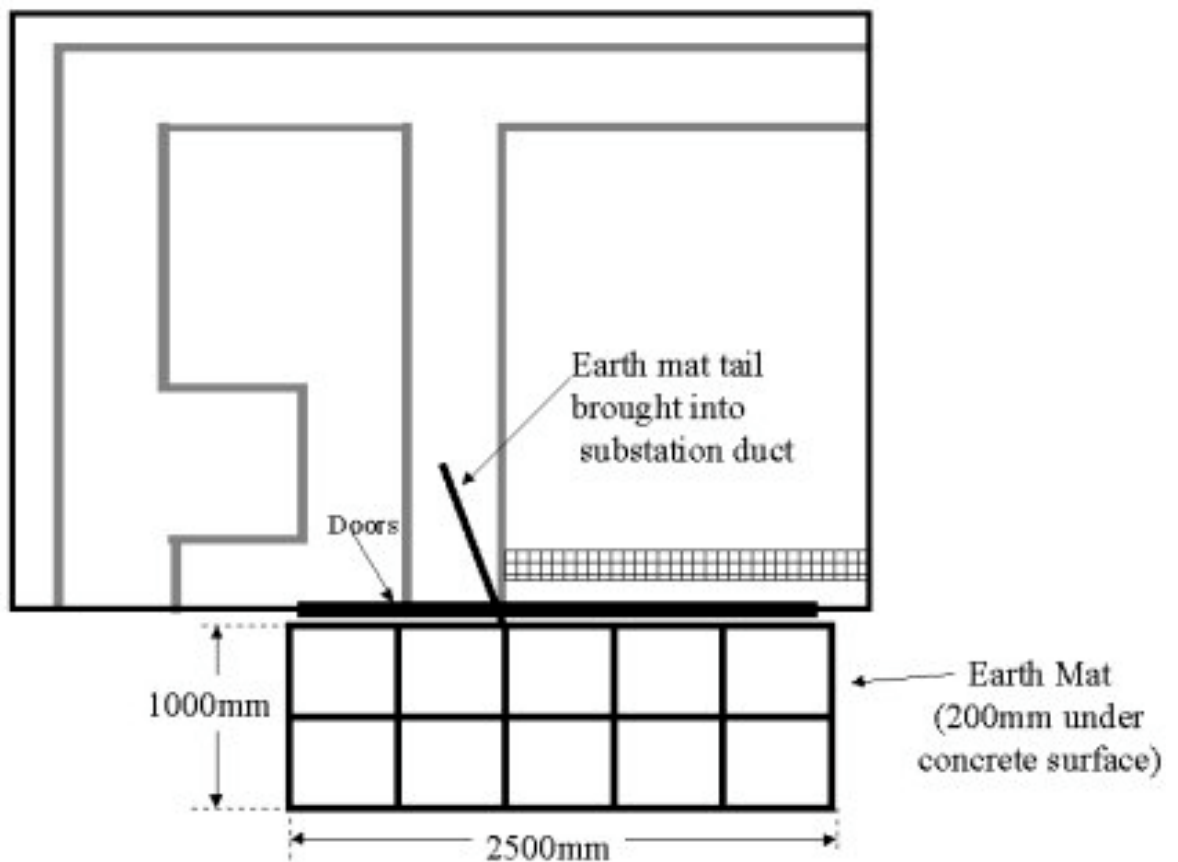
The cavity in the door reveal must be sealed with material that will provide a four-hour fire rating.

**D External Walls**

External walls should be finished to blend in with the surrounding buildings. Finish applied should require no maintenance.

**E Installation of Cables and provision for earthing**

**Fig. 17 Earth Mat in front of Substation Doors**



The customer shall obtain ESB's approval before filling in any cable trenches or starting work on the substation entrance or surrounds.

The customer will install an earth mat in front of the substation doors. The earth mat will be sourced from an ESB approved supplier.

**F Approach**

ESB require vehicular access to the substation. Where necessary, a driveway, 3m wide, will be laid consisting of a 100mm layer of concrete on a 150mm bed of hardcore.

If the substation is located in a parking area, it may be necessary to install demountable bollards or paint yellow hatching on the ground to ensure ESB can gain access to the substation.

**G Rainwater Pipe**

For free-standing substations a non-metallic rainwater pipe has to be provided. Drainage pipes must not pass inside the substation.

### **3.11 Final Inspection of Substation Building**

A formal final inspection of the completed Substation building will be made by ESB before acceptance of the building and before commencing work on the installation of the electricity connection.

This inspection requires the substation to be completed in accordance with ESB specification. The inspection will take place after the customer has provided a Certificate of Completion covering the workmanship and materials used in the construction of the substation building.

The certificate must be completed and signed by the Chartered Engineer/Architect in charge. A copy of Certificate is included in Appendix 1.



## **Appendix 1: Certificate of Completion for MV Substation.**

This certificate of completion must be completed to ESB's satisfaction and signed before work begins on providing an electrical connection.

Working conditions on site must comply with the SHAWW Act and its regulations.

Scaffolding must not be over the work area as any excavation nearby for the installation of ducts/cables could undermine it - also there may be a danger in working underneath.

Similarly, there must be a clear unobstructed access route in order to safely reach the work-place.

**It is critical that these requirements are complied with in order to give you connection on time - if ESB can't carry out the work because of obstructions on site, then delays are inevitable**

Substation Location: \_\_\_\_\_

### 1. Design of Substation

| Item | Clause |  | Yes | No |
|------|--------|--|-----|----|
| 1.1  | 2.02   | Has risk assessment been carried out to ensure location selected for the substation is low-risk? |     |    |

### 2. External Conditions

| Item | Clause |   | Yes | No |
|------|--------|---|-----|----|
| 2.1  | 2.01   | Is there an unobstructed access route 3m wide x 4m high?  |     |    |
| 2.2  | 2.02   | Is access external to the main building where substation is incorporated?   |     |    |
| 2.3  | 2.02   | Is the substation located at least 10m from main entrances and exits?   |     |    |
| 2.4  | 2.02   | Are substation doors and vents at least 10m away from storage locations of flammable substances?                    |     |    |
| 2.5  | 2.02   | Is there adequate clearance between the substation vents and the intake/outlet for the building ventilation system? |     |    |
| 2.6  | 2.06   | Has an earth mat been installed in the ground immediately in front of the substation doors?                         |     |    |
| 2.7  | 2.08   | Is ground level drainage satisfactory?  |     |    |
| 2.8  | 3.02.A | Has all excess material been removed?   |     |    |
| 2.9  | 3.02.A | Has this ground been re-instated to allow safe access for installation of equipment?                                |     |    |
| 2.10 | 3.10.G | Is roof level drainage installed external to building?  |     |    |

### 3. Doors

| Item | Clause   |  | Yes | No |
|------|--|--|-----|----|
| 3.1  | 3.08.A   | Are ESB standard steel galvanised doors installed? |     |    |
| 3.2  | 3.08.D   | Do the doors open through 180 <sup>0</sup> ?       |     |    |
| 3.3  | 3.08.D   | Do the doors open and close freely?                |     |    |
| 3.4  | Information from door name-plate:<br><br>Manufacturer: _____<br>Serial Number: _____<br>Year of Manufacture: _____ |  |     |    |

### 4. Internal Condition

| Item | Clause |   | Yes | No |
|------|--------|---|-----|----|
| 4.2  | 1.04   | Are the internal dimensions: 3.5m x 4.0m x 2.6m   |     |    |
| 4.2  | 3.02.A | Has all excess material been removed?   |     |    |
| 4.3  | 3.06   | Is duct layout in accordance with ESB drawing A3D.205072?   |     |    |
| 4.4  | 3.06   | Is reinforcing steel in substation floor isolated from all other structural steelwork?  |     |    |
| 4.5  | 3.06   | Has the floor been neatly finished with a smooth level surface?   |     |    |
| 4.6  | 3.06   | Is the substation floor 100mm to 200mm above the finished ground level?   |     |    |
| 4.7  | 3.06.A | Does bar of reinforcing mesh span the duct at the point indicated in the drawing A3D.205197?                                  |     |    |
| 4.8  | 3.07   | Are the cable ducts 900mm deep x 450mm wide   |     |    |
| 4.9  | 3.07D  | Are GRP cable duct covers properly installed, flush with the concrete floor, so that they don't constitute a tripping hazard? |     |    |
| 4.9  | 3.07.D | Are GRP cable duct covers and oil trap cover secured in position?   |     |    |
| 4.10 | 3.10.B | Are the walls and ceilings neatly finished and painted white?   |     |    |
| 4.11 | 3.10.B | Has the floor been painted as specified with red or grey single-pack polyurethane paint to give a non-slip finish?            |     |    |
| 4.12 | 3.10.C | Has cavity in door reveal been sealed with four-hour fire-rating?   |     |    |

### 5. Ventilation

| Item | Clause |  | Yes | No |
|------|--------|--|-----|----|
| 5.1  | 2.05   | Is ventilation through the door leaves only? |     |    |

### 6. Fire Safety

| Item | Clause |   | Yes | No |
|------|--------|---|-----|----|
| 6.1  | 2.04   | Have the walls and ceiling a four-hour fire rating?   |     |    |
| 6.2  | 2.09   | Are there any pipes, ducts or services - not required by ESB's Specification - routed through the substation? |     |    |

### 7. Working Conditions

| Item | Clause |  | Yes | No |
|------|--------|--|-----|----|
| 7.1  | 3.02.B | Is a safe working environment assured for ESB staff on site by compliance with the SHAWW Act 1989 (Construction) Regulations SI 138 of 1995? |     |    |

## CERTIFICATION

I certify that it is my professional opinion that the substation located at:  
\_\_\_\_\_ has been constructed in accordance with:

- ESB's Specification 13320 Rev.7
- Additional conditions given in ESB's Terms of Connection letter dated \_\_\_/\_\_\_/\_\_\_ (if applicable)

Signed : \_\_\_\_\_

Company : \_\_\_\_\_

Qualifications : \_\_\_\_\_

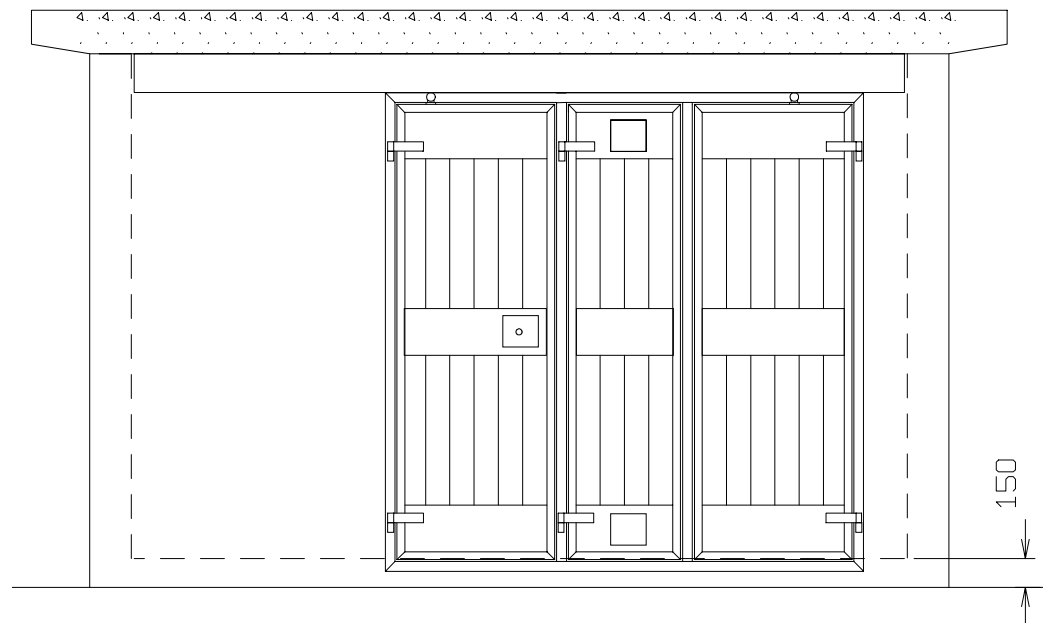
Position in Company : \_\_\_\_\_

Date : \_\_\_\_\_

## Appendix 2: Drawings

The following list of drawings is included in the following pages:

| <b>Drawing No.</b>      | <b>Rev.</b> | <b>Title</b>   | <b>Date Approved</b> |
|-------------------------|-------------|--|----------------------|
| A3D.205071              | 1           | MV Substation Building - General Outline   | 9/97                 |
| A3D.205072<br>(sheet 1) | 4           | MV Substation Building - Floor and Foundation Details                            | 6/00                 |
| A3D.205072<br>(sheet 2) | 2           | MV Substation Building - Floor and Foundation Details                            | 2/00                 |
| A3D.205073              | 0           | MV Substation Building - Solid Block or Mass Concrete Door Ope and Fixing Detail | 12/96                |
| A3D.205074              | 1           | Freestanding MV Substation - Roof Slab Details                                   | 12/97                |
| A3D.205075              | 1           | Incorporated MV Substation - Roof Slab Details                                   | 12/97                |
| A3D.205197              | 1           | MV Substation Building - Provision for Earthing MV Substation                    | 2/00                 |



## Notes

### 1. General

These drawings must be read in conjunction with ESB Specification 13320 Rev. 6, "General Specification for MV Substation .Failure to comply with the requirements of this Specification will delay installation of Supply.

### 2. Fire Safety Regulations

The substation building must comply with the FIRE SERVICES ACT 1980, and all regulations made under this Act. The location and construction of the Substation building must also comply with the Fire Safety requirements of ESB Specification 13320 Rev. 6.

### 3. Substation Walls

The substation walls must have a minimum 4 hour fire rating. Solid walls should be constructed using 215mm concrete blocks.

### 4. Substation Doors and Louvres

Galvanised steel substation doors and wall louvres fabricated to ESB Specification 08100 must be installed. Doors and louvres should be sourced from an ESB approved supplier. A list of these suppliers accompanies Spec 13320.

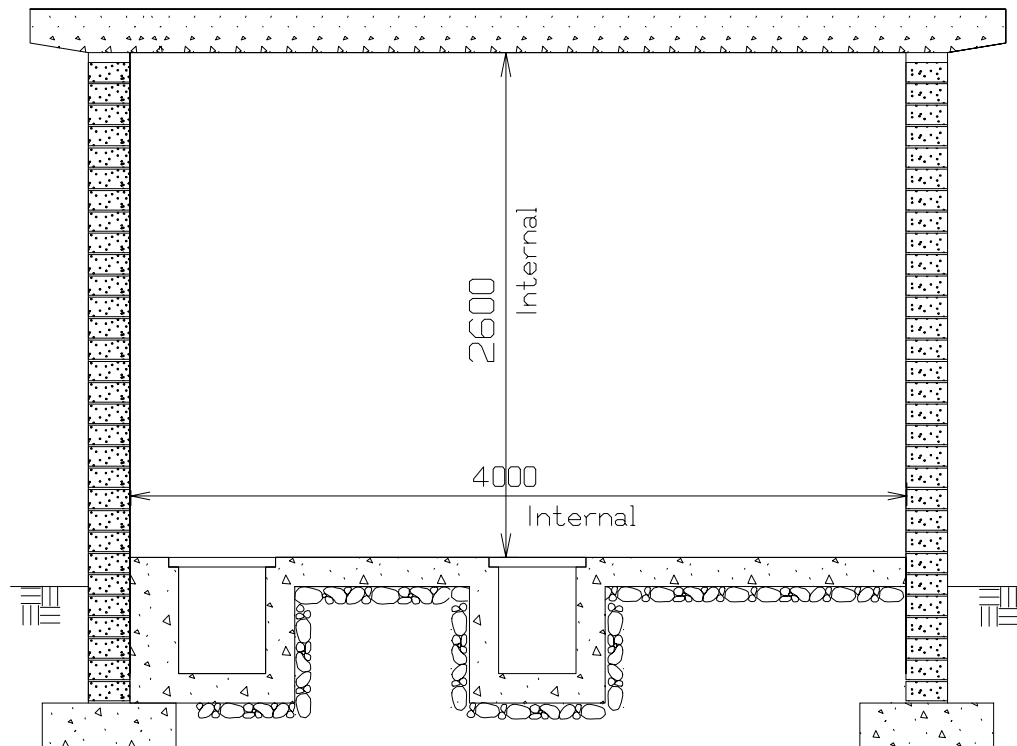
The masonry ope required for the Substation door is detailed on ESB Drawing No.D205073

### 5. Cable Ope

Cable ope are required to install cables from the ESB network and to the customers switchroom. The location of the ope must be agreed between ESB and the customer. Cable ope should be constructed as per the detail in ESB Drawing No.D205072 Sheet2.

### 6. Relevant Drawings

| FREESTANDING MV SUBSTATION BUILDING  |         | INCORPORATED MV SUBSTATION BUILDING  |         |
|--|---------|--|---------|
| MV Substation Building Floor and Foundation Details                            | D205072 | MV Substation Building Floor and Foundation Details                            | D205072 |
| MV Substation Building Solid Block or Mass Concrete Door Ope and Fixing Detail | D205073 | MV Substation Building Solid Block or Mass Concrete Door Ope and Fixing Detail | D205073 |
| Free Standing MV Substation Building Roof Slab Detail                          | D205074 | Incorporated MV Substation Building Roof Slab Detail                           | D205075 |
| Provision for Earthing MV Substations  | D205197 | Provision for Earthing MV Substations  | D205197 |



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PROJECT:

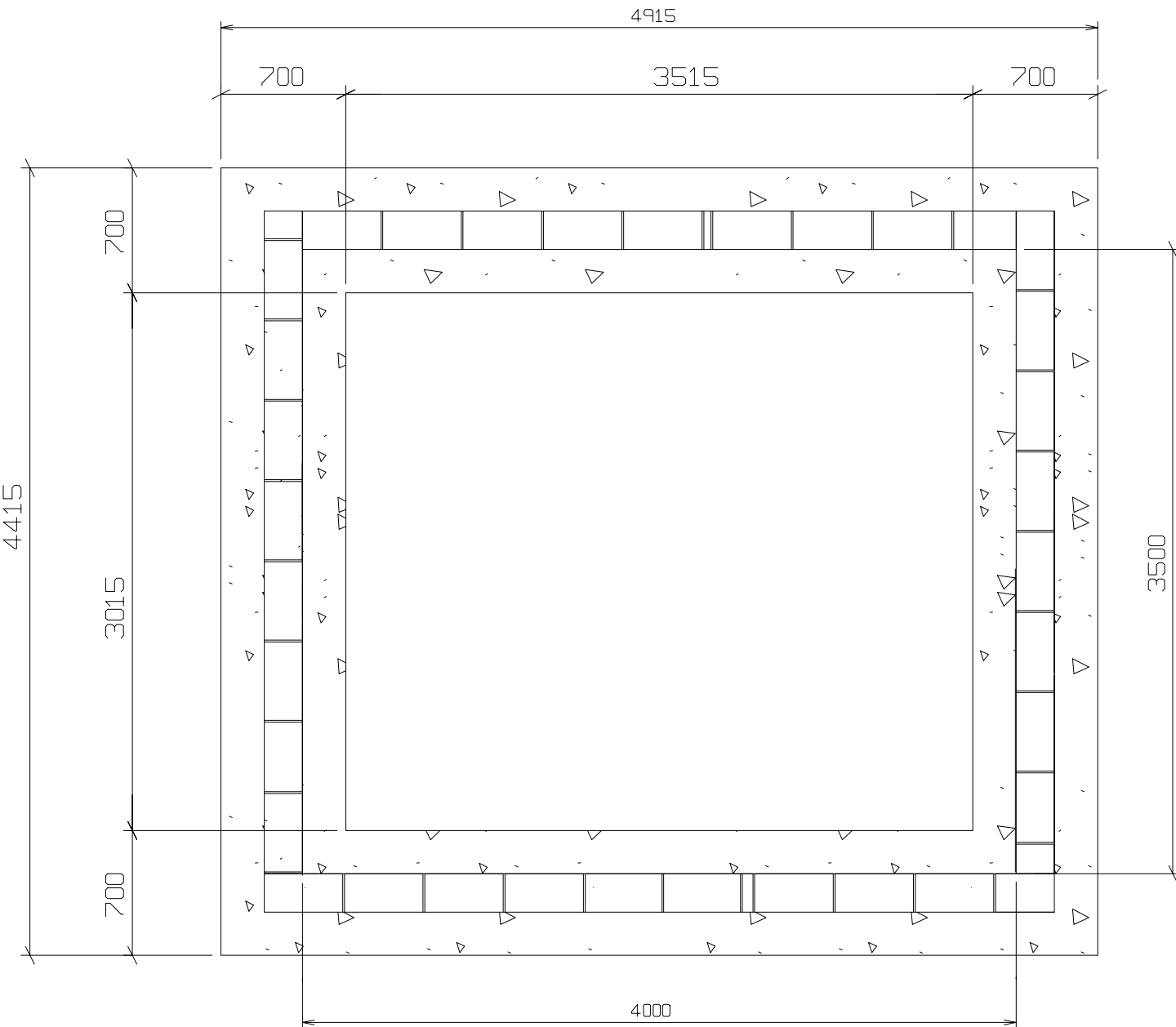
DO NOT SCALE

DRG. TITLE

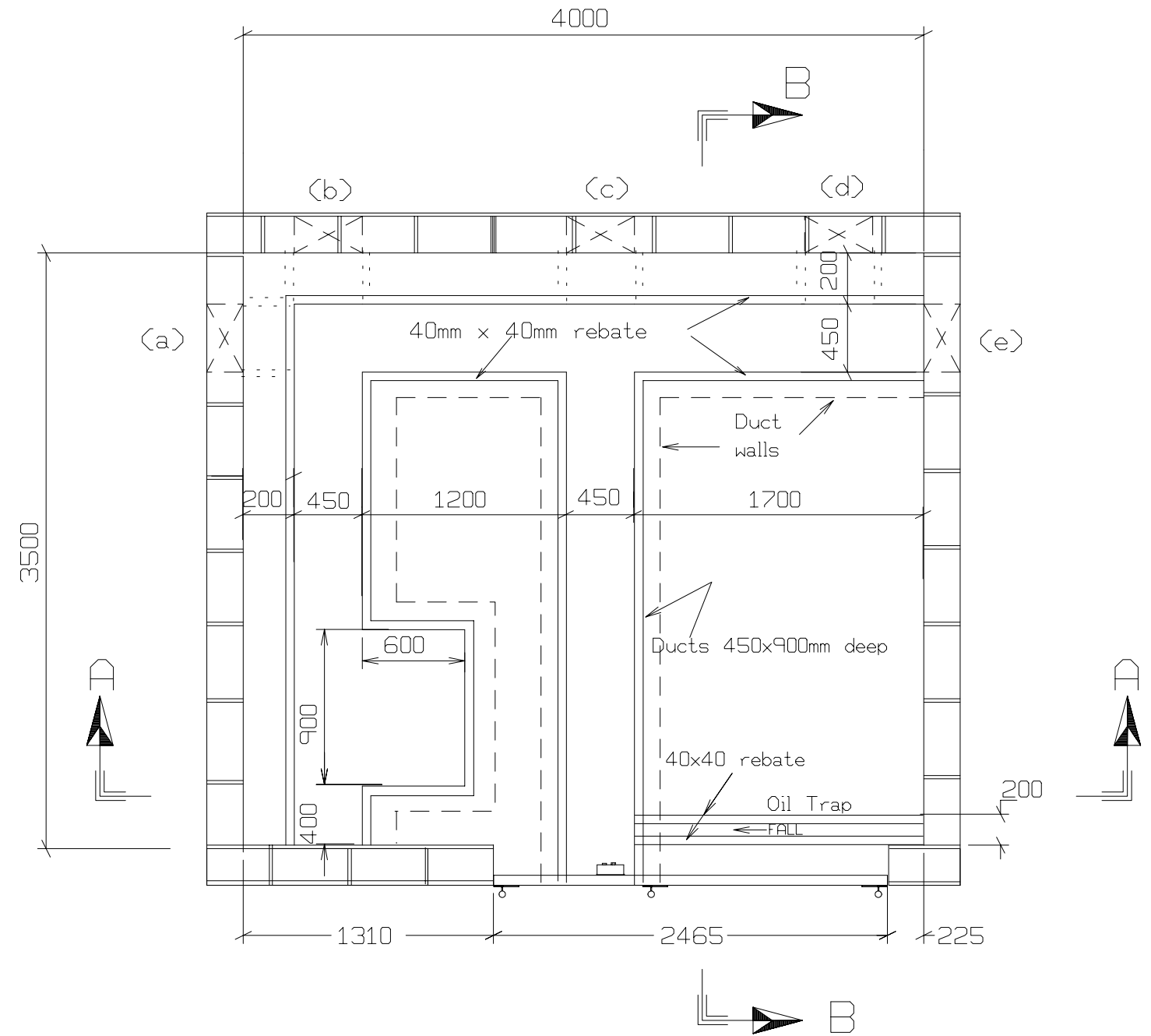
MV Substation Building  
General Outline

|      |       |             |            |
|------|-------|-------------|------------|
| DRN. | T.S   | DRAWING No. |            |
| CHD. | B.N   | A3D, 205071 |            |
| APP. | B.N   | SHEET No. 1 | REV. 1     |
| DATE | 12/96 | of 1        | DATE. 9/97 |

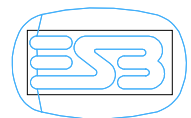
The duct exit to the customer switchroom depends on the actual layout and must be selected from the options (a) to (e) as shown.



Plan on Foundations



Plan on Floor Slab.



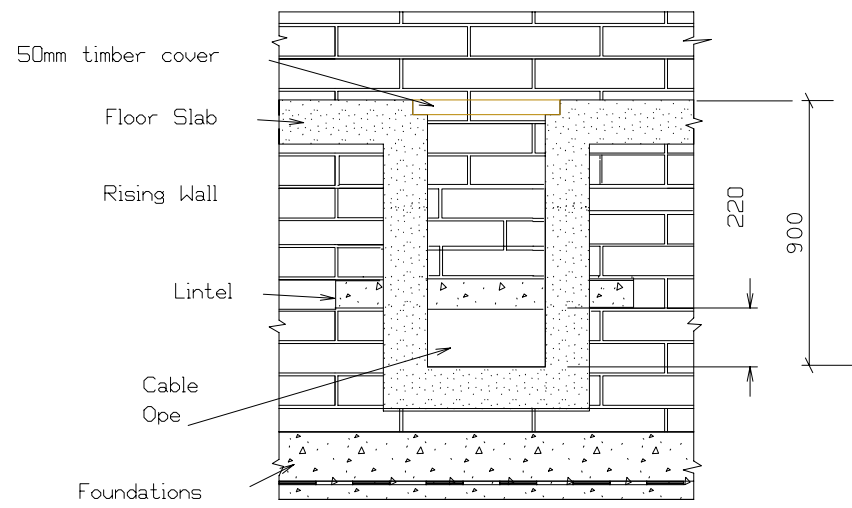
ELECTRICITY SUPPLY BOARD  
BORD SOLATHAIR AN LECTREACHAIS

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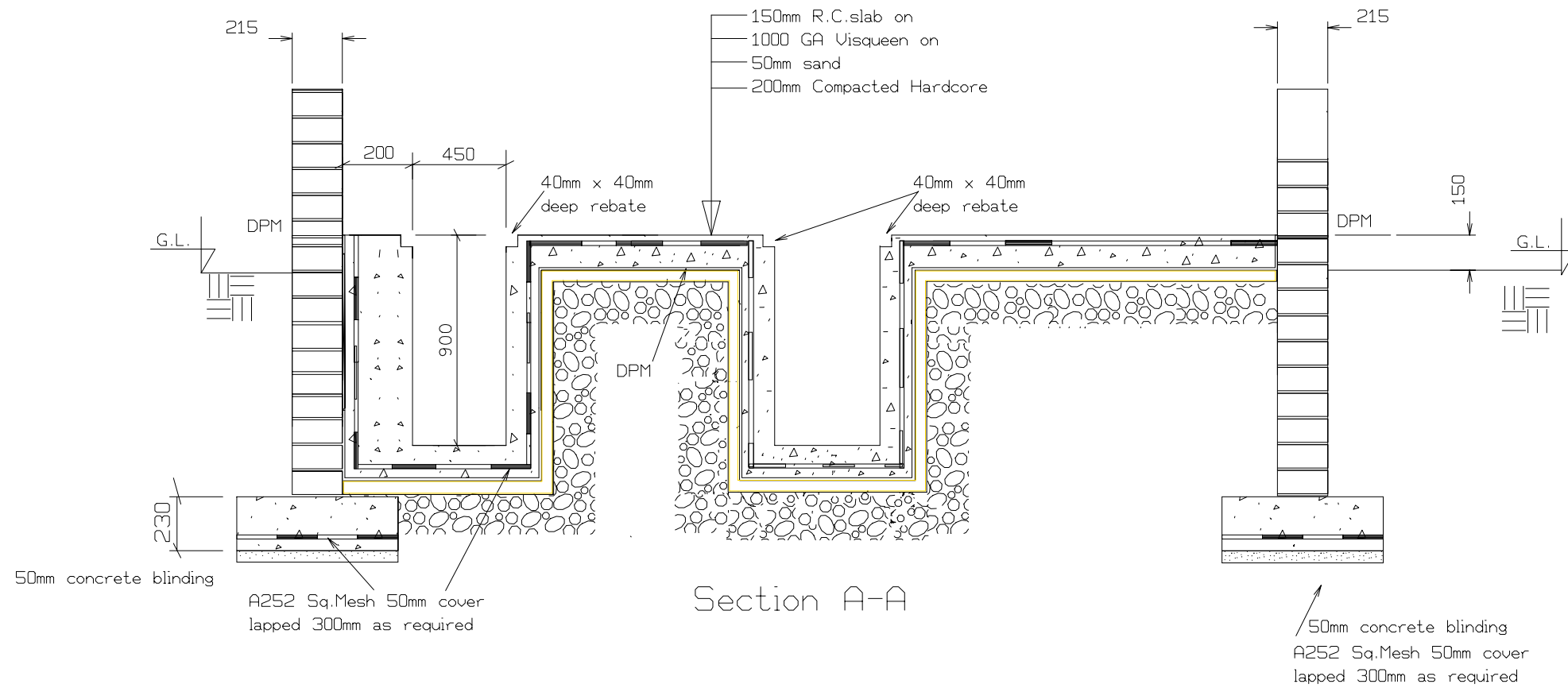
|   |          |              |     |     |           |
|---|----------|--------------|-----|-----|-----------|
| Ducts (a) to (e) shown & R.H. sw.rm. deleted. |          | BMcA         |     |     | 3         |
| Customer switchroom indicated                 | TS PS PS |              |     |     | 210/97    |
| Floor detail altered for grilled channel      | TS PS    |              |     |     | 1BN 12/96 |
| REVISION                                      |          | DRN          | CHD | APP | DATE No   |
| PROJECT:                                      |          | DO NOT SCALE |     |     |           |

DRG. TITLE  
MV Substation Building.  
Floor and Foundation Details.

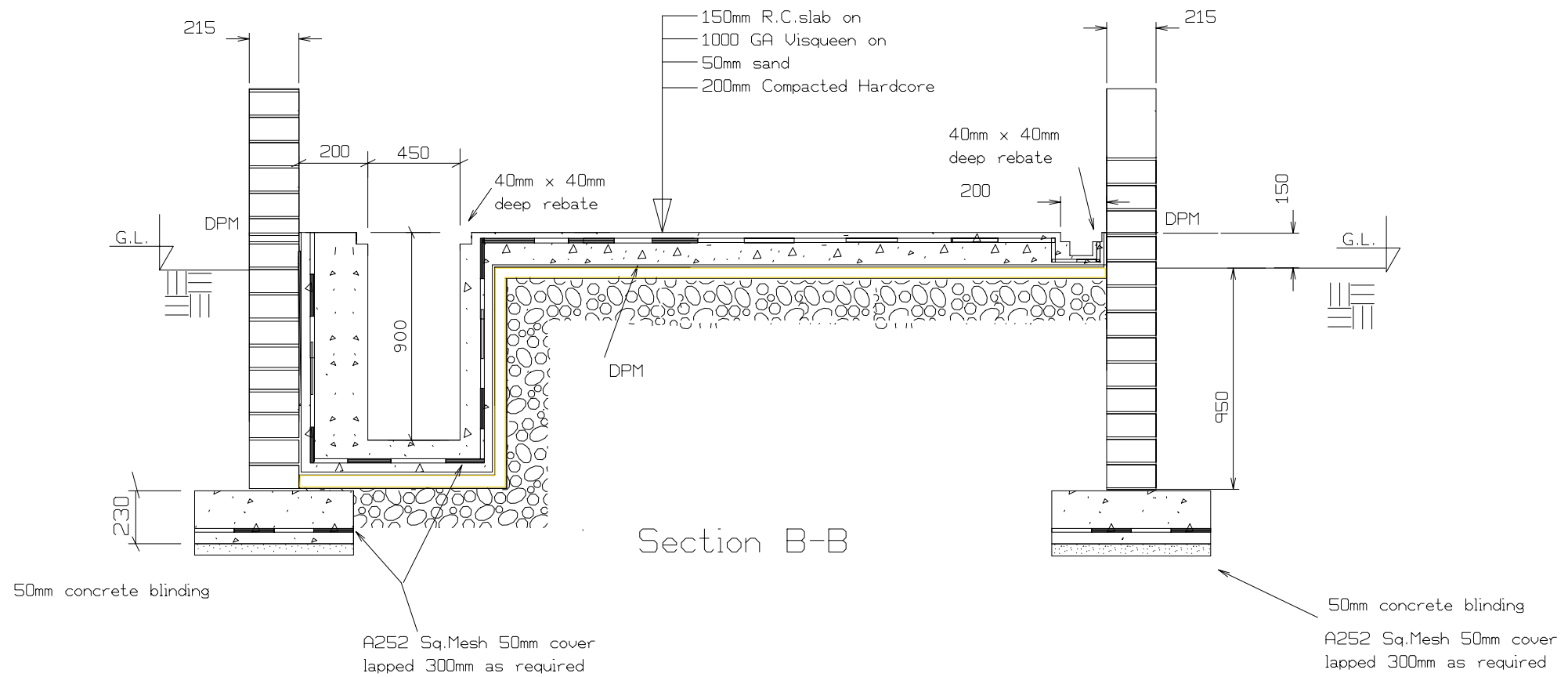
|      |       |             |            |
|------|-------|-------------|------------|
| DRN. | T.S   | DRAWING No. |            |
| CHD. | B.N   | A3D, 205072 |            |
| APP. |       | SHEET No. 1 | REV. 3     |
| DATE | 10/95 | OF 2        | DATE. 2/00 |



Typical section thro' cable duct showing cable ope thro' wall



Section A-A



Section B-B



ELECTRICITY SUPPLY BOARD  
BORD SOLATHAIR AN LECTREACHAIS

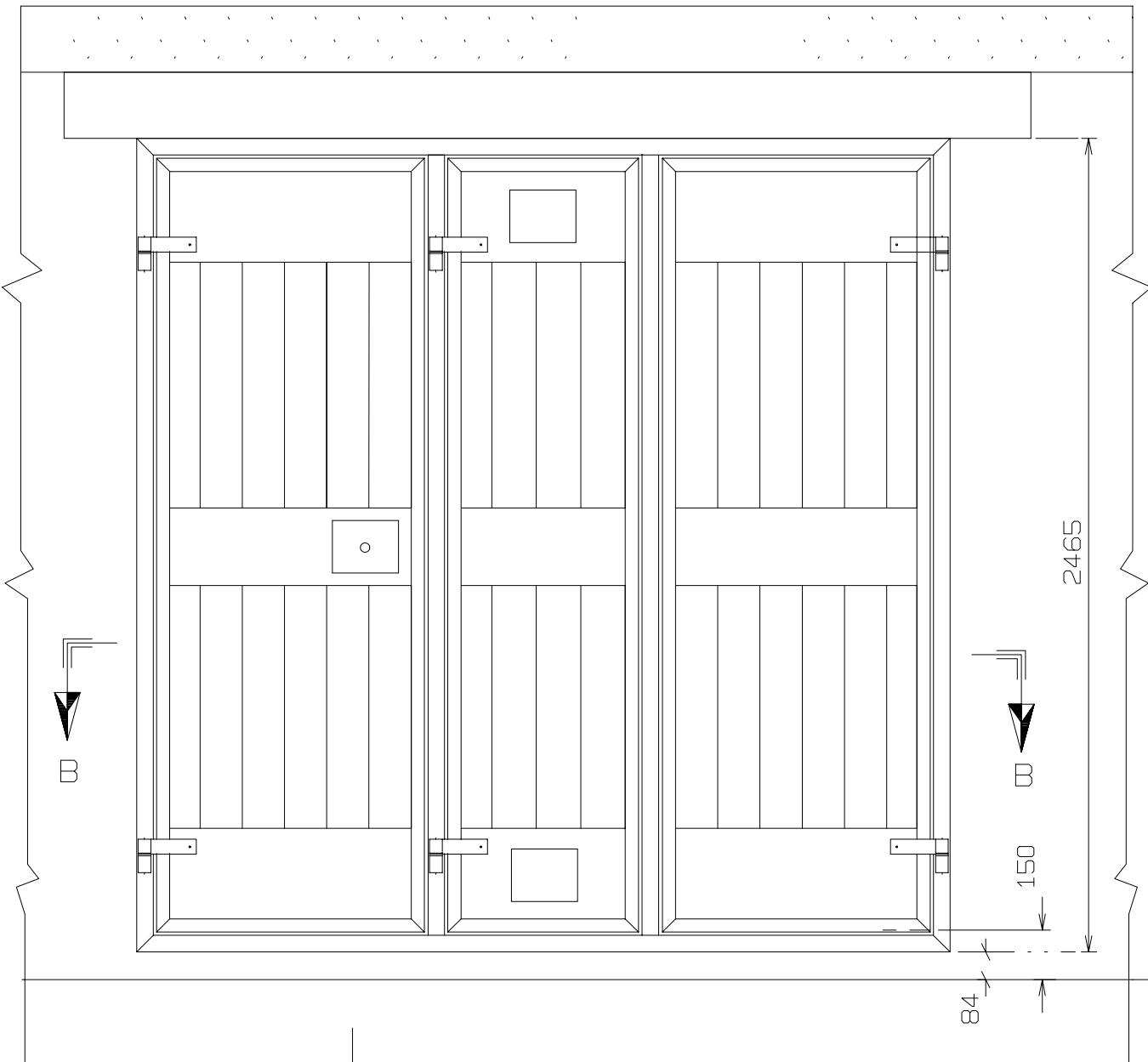
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|   |  |                     |     |      |       |    |
|---|--|---------------------|-----|------|-------|----|
| Duct depth increased & 125mm pipes shown. |  | BMcA                |     |      |       | 3  |
| Floor detail altered for grilled channel  |  | TS PS               |     | 1 ps | 10/97 |    |
| REVISION                                  |  | DRN                 | CHD | APP  | DATE  | No |
| PROJECT:                                  |  | <b>DO NOT SCALE</b> |     |      |       |    |

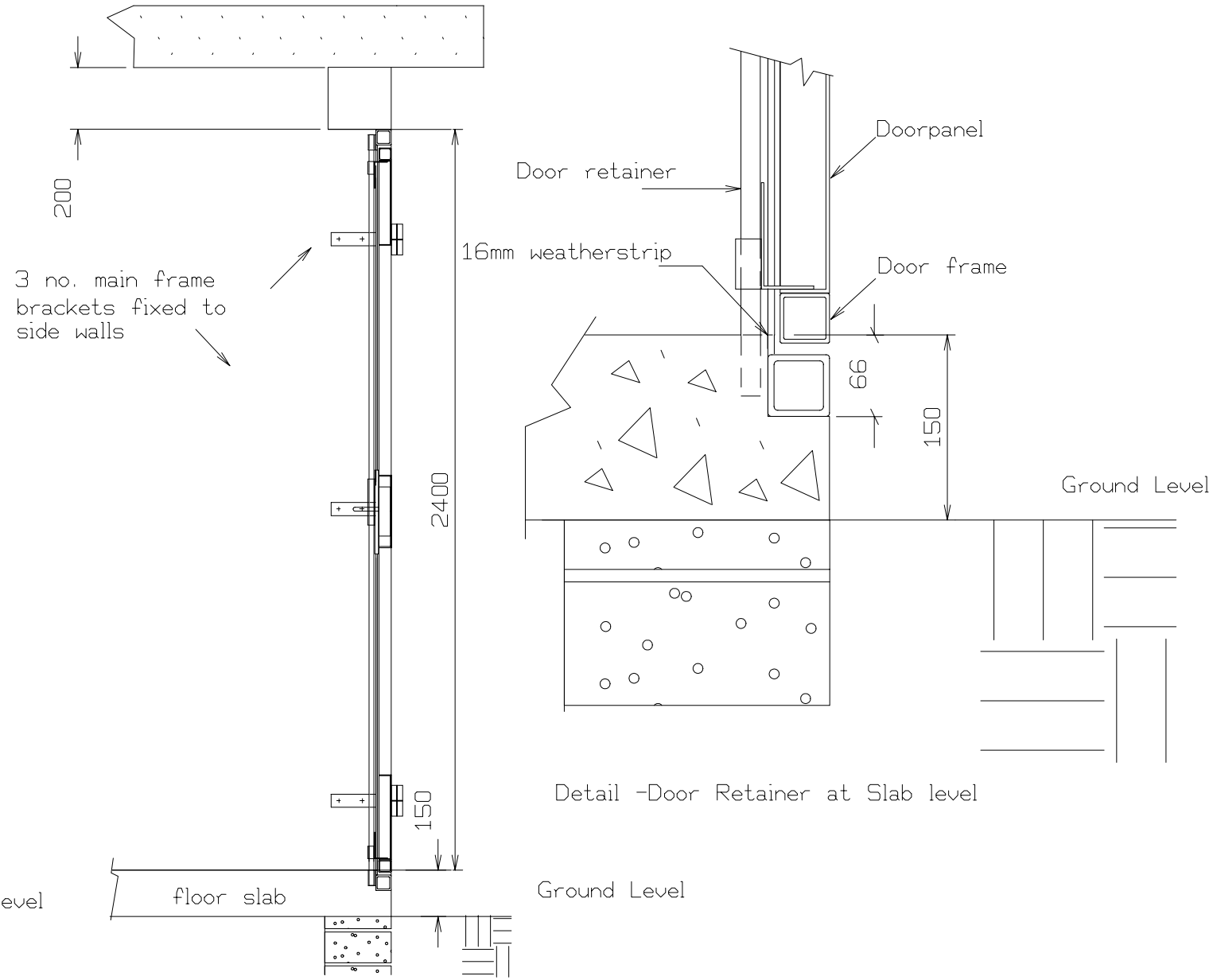
DRG. TITLE  
MV Substation Building  
Floor and Foundation Details

|      |       |             |            |
|------|-------|-------------|------------|
| DRN. | T.S   | DRAWING No. |            |
| CHD. | B.N   | A3D, 205072 |            |
| APP. | B.N   | SHEET No. 2 | REV. 3     |
| DATE | 12/96 | OF 2        | DATE: 2/00 |

A



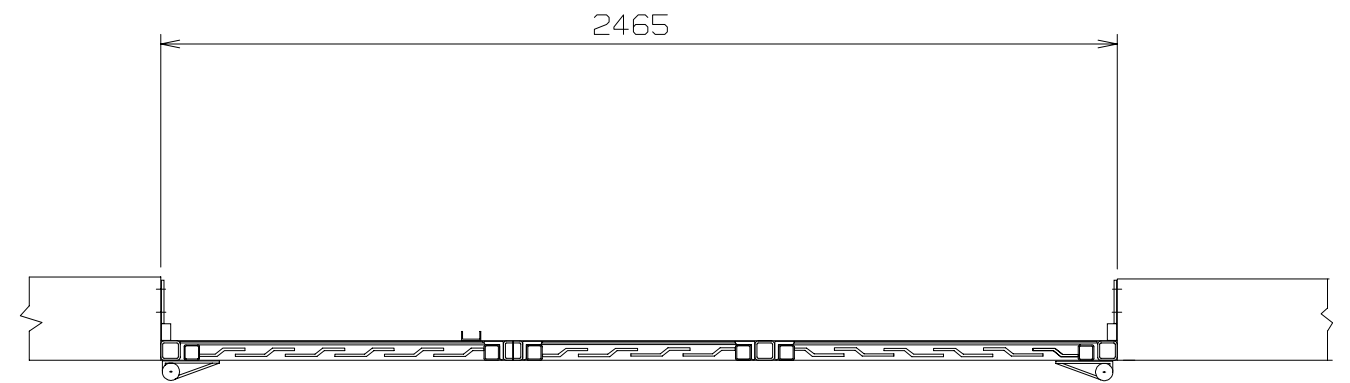
Ground Level



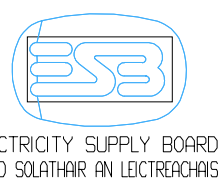
Section A-A

Detail -Door Retainer at Slab level

A



Section B-B



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PROJECT:

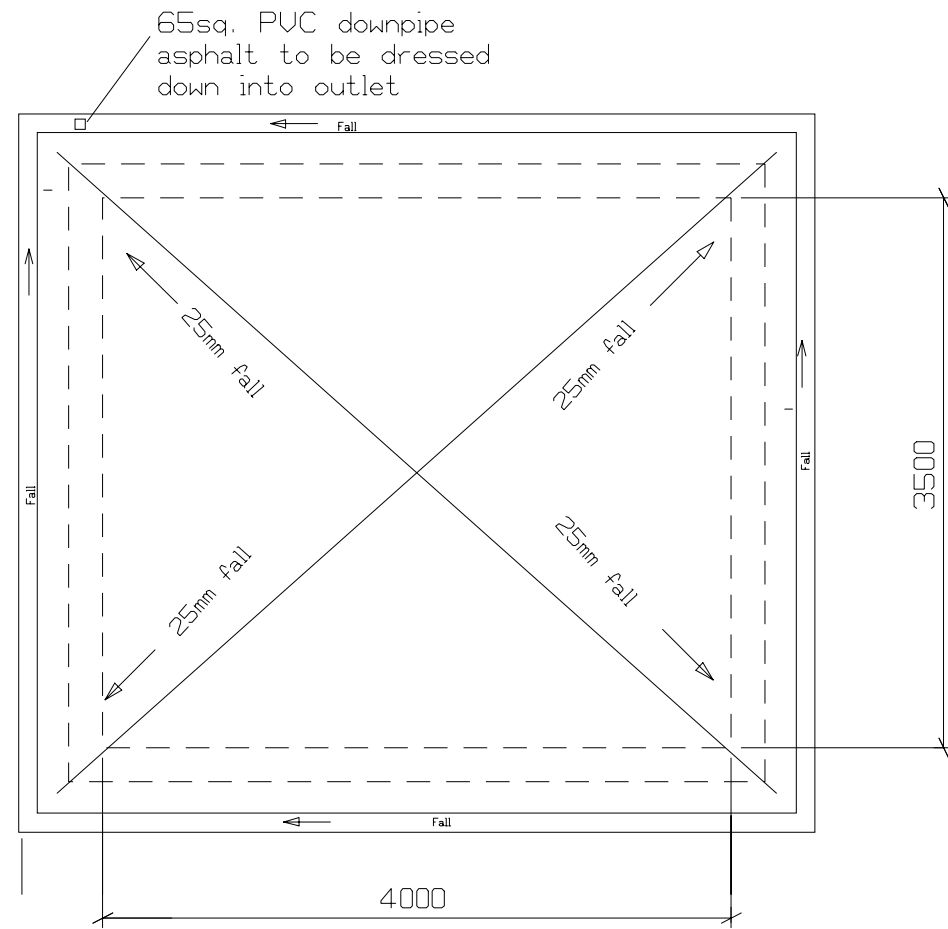
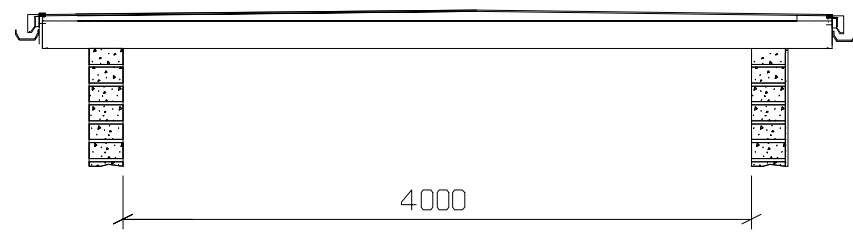
REVISION

| DRN | CHD | APP | DATE | No |
|-----|-----|-----|------|----|
|     |     |     |      |    |

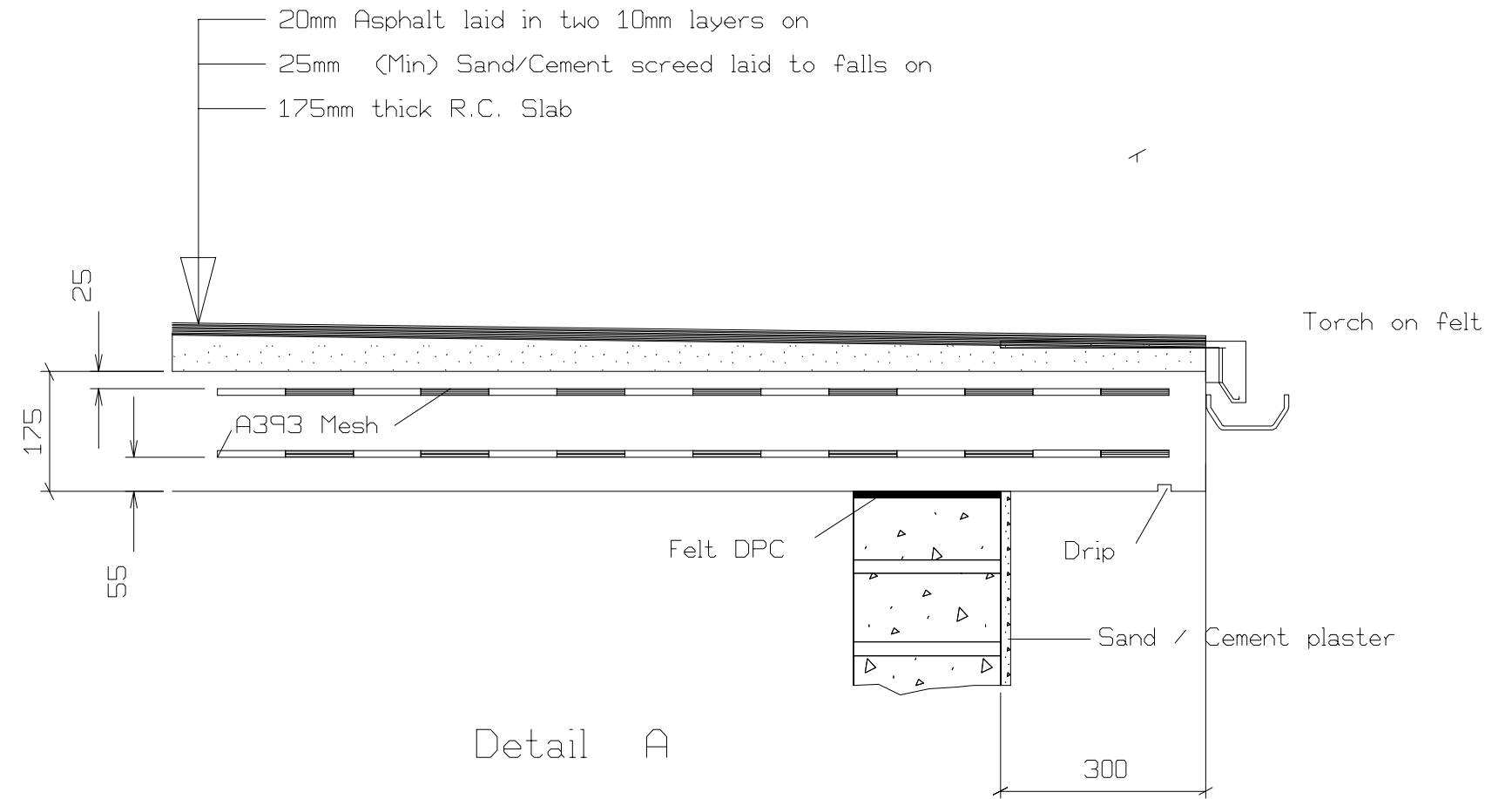
DO NOT SCALE

DRG. TITLE  
 MV STATION BUILDING  
 SOLID BLOCK OR MASS CONCRETE  
 DOOR OPE AND FIXING DETAILS

|      |       |             |        |
|------|-------|-------------|--------|
| DRN. | T.S   | DRAWING No. |        |
| CHD. | B.N   | A3D_205073  |        |
| APP. |       | SHEET No. 1 | REV. 0 |
| DATE | 12/96 | OF 1        | DATE.  |



Plan on Roof Slab



Detail A



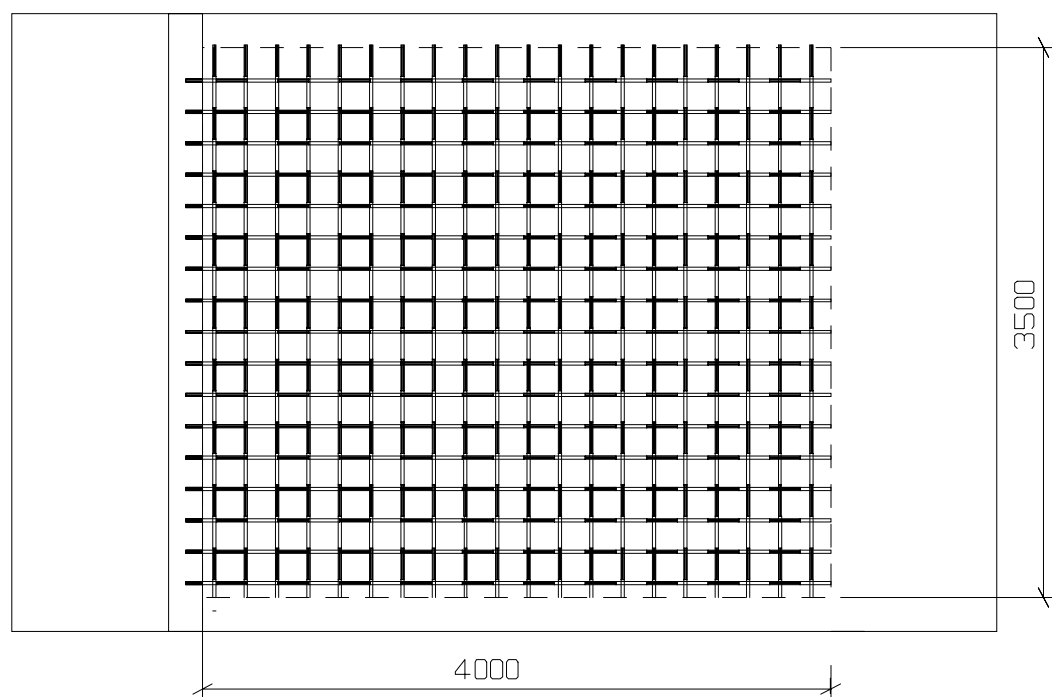
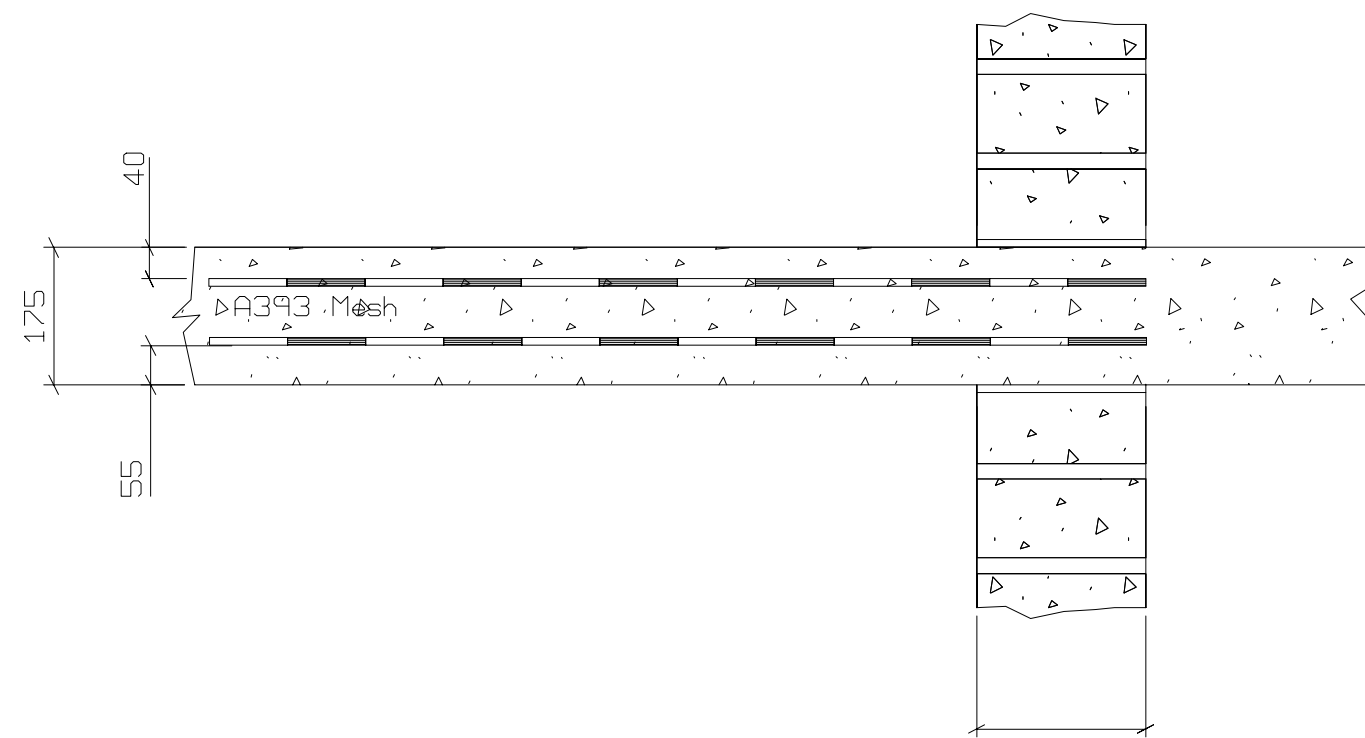
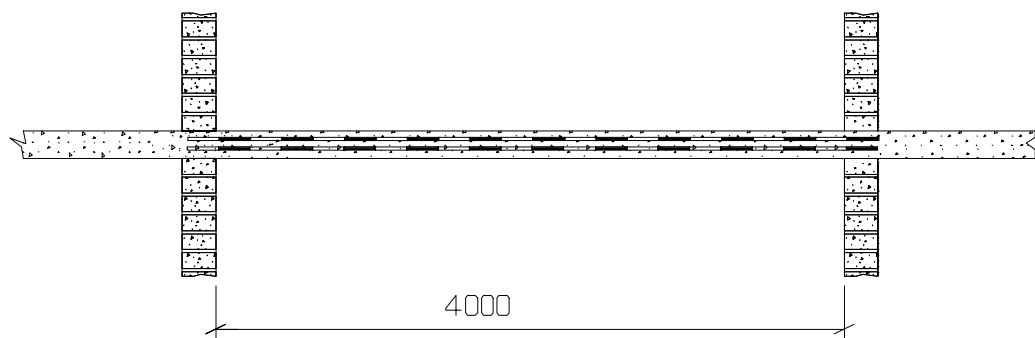
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|                       |  |              |     |     |      |    |  |  |  |  |
|-----------------------|--|--------------|-----|-----|------|----|--|--|--|--|
| Gutter detail changed |  | TS           | PS  |     |      |    |  |  |  |  |
| REVISION              |  | DRN          | CHD | APP | DATE | No |  |  |  |  |
| PROJECT:              |  | DO NOT SCALE |     |     |      |    |  |  |  |  |

DRG. TITLE  
 Freestanding MV Substation  
 Building  
 Roof Slab Details

|      |       |             |        |
|------|-------|-------------|--------|
| DRN. | T.S   | DRAWING No. |        |
| CHD. | B.N   | A3D. 205074 |        |
| APP. |       | SHEET No. 1 | REV. 1 |
| DATE | 12/96 | OF 1        | DATE.  |



Plan on Roof Slab



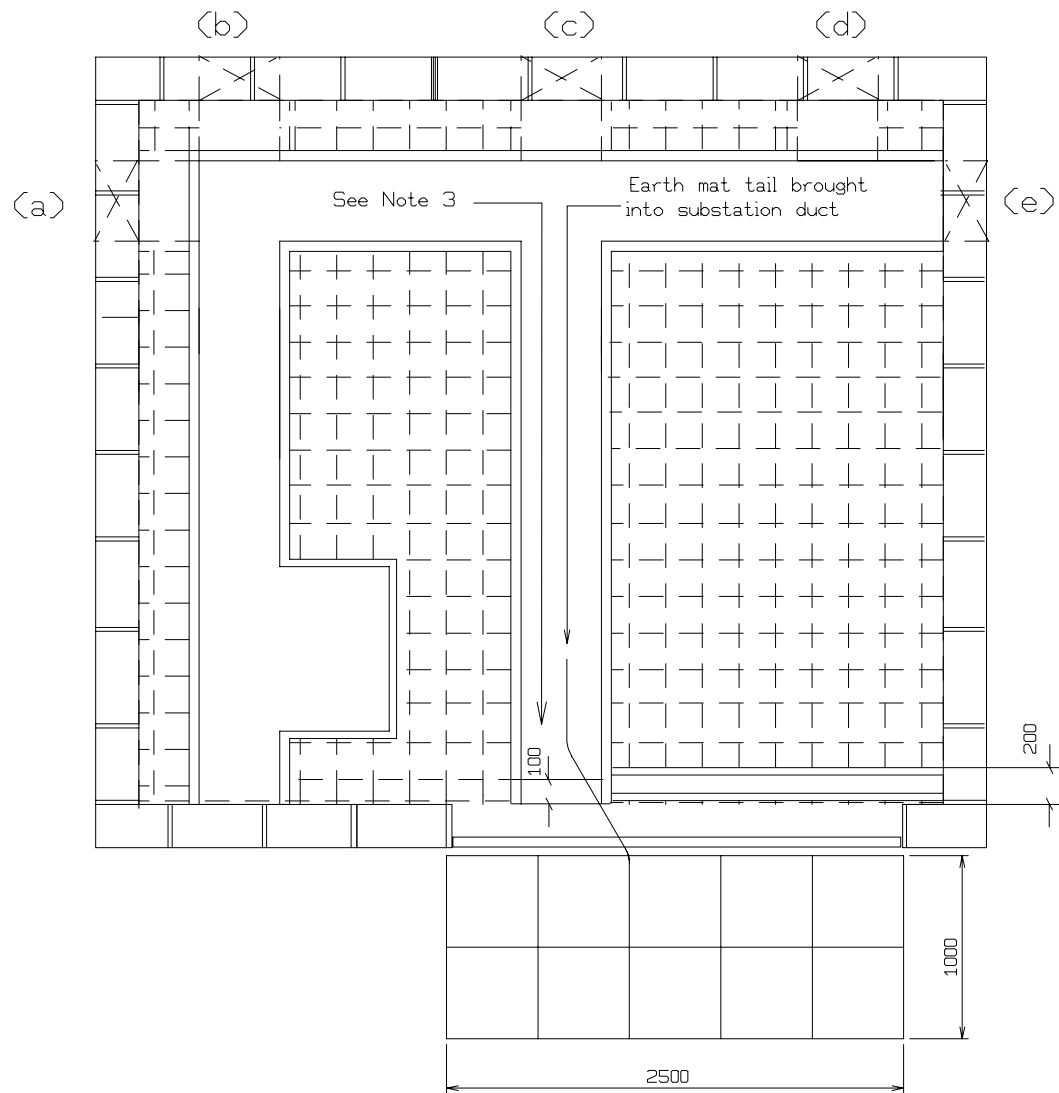
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 LR. GRAND CANAL ST., DUBLIN 2, EIRE.  
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 TELEX: 91145 ESB EI. FAX: 01 - 6785143



|              |     |     |     |       |    |
|--------------|-----|-----|-----|-------|----|
| REVISION     | TS  | PS  | PS  | 12/97 |    |
|              | DRN | CHD | APP | DATE  | No |
| PROJECT:     |     |     |     |       |    |
| DO NOT SCALE |     |     |     |       |    |

DRG. TITLE  
 Incorporated MV Substation  
 Roof Slab Details

|      |       |             |             |
|------|-------|-------------|-------------|
| DRN. | T.S   | DRAWING No. |             |
| CHD. | B.N   | A3D. 205075 |             |
| APP. |       | SHEET No. 1 | REV. 1      |
| DATE | 12/96 | OF 1        | DATE: 12/97 |



1. The actual mesh layout depends on which option (a) to (e) is used to access the customer switchroom.
2. Joints and overlaps in reinforcing mesh in floor should be welded as required to provide good electrical continuity
3. The mesh should be brought out at 1 point in the ducts as indicated. All sharp edges to be removed from section within duct.
4. Consult ESB before filling in the cable trenches or starting work on finishing the substation entrance and surrounds.

A copper earth wire has to be installed in the trenches along with the power cables.  
It may also be necessary to install an earth mat in front of the substation doors.

Earth mat to be annealed 25mm x 3mm copper strip laid 200mm under concrete surface.



DISTRIBUTION DEPARTMENT, ESB,  
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I.S. EN ISO 9001

|   |              |     |     |      |    |   |
|---|--------------|-----|-----|------|----|---|
| Earth points removed. - Mesh taken into duct. | BMcA         |     |     |      |    | 1 |
| REVISION                                      | DRN          | CHD | APP | DATE | No |   |
| PROJECT:                                      | DO NOT SCALE |     |     |      |    |   |

DRG. TITLE

MV Substation Building  
Provision for Earthing  
MV Substation

|      |       |             |            |
|------|-------|-------------|------------|
| DRN. | T.S.  | DRAWING No. |            |
| CHD. | P.S.  | A3D.205197  |            |
| APP. | P.S.  | SHEET No. 1 | REV. 1     |
| DATE | 12/97 | OF 1        | DATE. 2/00 |