WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Company Directive

STANDARD TECHNIQUE: NC1V/4

Relating to Standard Foundation and Enclosure Details and Specifications for HV Substation Plant

Policy Summary

This Standard Technique sets out the approach for WPD staff specifying foundation and enclosure arrangements for HV plant, either for installations constructed by WPD, through its appointed contractors or by Customers.

Author: Simon Waldron

Implementation Date: May 2018

Approved by

Policy Manager

Date: 23 May 2018

IMPLEMENTATION PLAN

Introduction

This document has been reviewed predominantly to incorporate the following

- A link to a new Frequently Asked Questions Document to assist planners in the application of this ST
- An update of the details for a raised distribution substation detail (where siting within a floodplain is unavoidable)

Main Changes

Availability of a link to a FAQ document

Impact of Changes

None, but users of this document may wish to note the additional guidance provided within he FAQ document

Implementation Actions

Planners are advised to access the FAQ document for additional guidance on the application of this ST

Implementation Timetable

Immediate effect

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
May 2018	• Addition of link to frequently asked questions document (reference clause 1.9)	S Waldron
November 2016	• Document revised to incorporate arrangements where a generator constraint panel must be accommodated at an HV metered substation • Drawings revised to incorporate use of CG Padmount transformers • alternative substation/ trench configuration introduced (at request of various area team Planners) for an HV 'Unit Type' substation built within a conventional building	S Waldron

1.0 INTRODUCTION

1.1 It is essential that wherever possible, a common approach is adopted by WPD for the specification and construction of HV substation foundations, buildings and enclosures. This is equally applicable for substations constructed by WPD through its appointed contractors and those constructed by Customers.

1.2 A common approach has the following benefits:

- It simplifies the tasks of Network Services planners, field teams and third party constructors.
- It ensures that there is a consistent response to Customer/ Developer/ other third party enquiries across the entire WPD region.
- It ensures that a robust specification (together with supporting drawings) detailing the size, format and performance of foundations/ enclosures is communicated to Customers/ Developers and Contractors as part of each connection offer.
- It greatly reduces the need to develop project-specific designs/ specifications.

1.3 This document is predominantly aimed at providing guidance for WPD Planners but the document is made available to external subscribers to the WesternPowerTechInfo.co.uk website portal. Although it provides information that may assist, for example, ICP's developing designs for HV connections for submission to WPD, it is not intended to be a comprehensive guide on WPD requirements for contestable HV connection activity. Although observance of the standard design solutions may be one means of achieving design approval, alternative design solutions are not excluded (provided that they meet WPD criteria)

1.4 WPD generally purchases HV substation plant (transformers, circuit breakers, ring main units, metering units and LV fuse cabinets) on term contract from selected nominated suppliers. This philosophy ensures that full benefit is made from economies of scale and a common civil design approach can generally be adopted for the installation of all combinations of HV substation plant on WPD term contract.

1.5 Increasingly, due to the specifics of a proposed new connection, a Customer elects to construct foundations and/ or enclosures to house WPD substation plant. This standard technique has been prepared primarily to assist Network Services Planners when liaising with Customers, Developers, their appointed agents/ consultants/ contractors and other third parties. The use of standard specifications supported by the drawings contained in this document provides a means of communicating WPD requirements to third parties consistently and effectively.

1.6 It is anticipated that the specifications and drawings contained in this document will be issued to Customers/ Developers as appropriate, by WPD Planners as part of a discussion on/ response to a connection request. The Customer shall accommodate WPD requirements into his design for comment/ approval by the WPD Planner prior to the agreement of connection terms.

1.7 WPD, in the role of 'designer' under the Construction Design and Management Regulations has certain obligations to appraise a Customer, or his appointed agent, of any specific hazards pertinent solely to the installation/ operation/ maintenance and eventual decommissioning of substation plant.

1.7.1 Although occurrences are extremely rare, there is a risk that the without appropriate control measures, venting of over-pressure arising from an internal fault within WPD plant may result in structural damage and fire spread to compartment walls/ceilings/ floors and adjacent features.

Where there is a proposal to accommodate WPD plant within (or in close proximity to) an existing or proposed building which serves a third party use, the risks can be minimised by ensuring that the substation is located on the external envelope of a building (providing some degree of venting via external doors and vent grilles), ensuring that the compartment walls to the substation are non-structural (minimising the risk of progressive collapse) and affording the customer the opportunity to extend smoke/ heat-sensing systems into the substation (ensuring early warning of the outbreak of fire).

1.7.2 Although incidences are exceedingly rare, when power system fault current flows to earth via a HV substation earth electrode, the potential on the earth electrode and on any metalwork connected to it, along with the ground in which the electrode is installed, rises.

a) The potential rise is greatest at the earth electrode and falls away with distance and the potential difference between points which are able to be touched simultaneously presents a hazard to people and animals. Without appropriate control measures there is a risk that the "touch" and "step" potentials i.e. potential differences between hands, between hands and feet, and between feet, could be high enough to cause electrocution.

This risk is addressed by designing earthing systems to ensure touch and step potentials are within safe limits. This is facilitated by connecting foundation reinforcing steelwork to the earthing system and by the use of suitable surfacing material around the substation, especially in front of the housing doors.

b) The potential rise can also be transferred into areas with low or no potential rise, for example, by means of a conductive path such as a metallic cable sheath, pipe, steel-framed building, rail etc. Equally, a low potential can transferred into the area with high potential rise via similar conductive paths. In both cases, the resulting potential difference between the conductive path and its surroundings can present a hazard to people and animals. Without appropriate control measures there is a risk that these potential differences could be high enough to cause electrocution.

This risk is addressed by designing earthing systems to ensure there is adequate physical separation between individual earth electrode systems and any metalwork connected to them. This is fundamentally determined by the location of the HV substation and its proximity to other pieces of equipment.

1.7.3 Whilst transformer manufacturers endeavour to make their product as quiet as possible, a certain amount of noise emission is inevitable. Although the noise level does not present a hazard as such, it can give rise to complaints.

Transformer noise is generally most noticeable during the night, when the background noise level abates. This risk can be mitigated by locating HV substations at least 5m away from dwellings in general, and from bedrooms in particular.

1.8 The specification document contained in the appendices is available electronically from the Engineering Design shared area \\AVODCS01\EDS\S WALES\Subs\11kV General\Standard Technique NC1V 4 (Feb 18), together with the drawings, which are available in PDF format and in AutoCAD DWG format. This affords the facility for WPD Planners to issue the data electronically to Customers/ Developers for incorporation into their design proposals.

1.9 To assist WPD planners in communicating the requirements of this ST to Customers, or their representatives, a 'Frequently Asked Questions' document is available. This can be accessed using the hyperlink below:

\\AVODCS01\EDS\S WALES\Subs\11kV General\Standard Technique NC1V 4 (Feb 18)\Frequently Asked Questions.docx

2.0 DEFINITIONS

2.1 ***HV*** - either 6.6kV or 11kV.

2.2 ***LV*** - either 400V three-phase or 230V single-phase.

2.3 ***Unit Substation Construction*** - is defined as the close coupling/ interconnection of an HV/LV transformer, switchgear and LV fuse cabinet where the switchgear and LV fuse cabinet are supported solely by the transformer.

2.4 ***Non-Unit Substation Construction*** - is defined as the individual siting of HV/LV transformer, switchgear, LV fuse cabinet and, where applicable, HV metering unit where each unit is separately ground-mounted.

2.5 ***GRP Enclosure*** - is defined for the purpose of this document as a glass-reinforced plastic substation enclosure, specified by EE Spec 19, customarily of clear internal dimensions – 3000mm wide X 2125mm deep X 2265mm high.

2.6 ***Vandal Resistant Enclosure*** - is defined as a heavy-duty steel framed/ skinned enclosure of identical internal dimensions and format to 2.2 (above) specifically designed for high-risk sites.

2.7 ***Non-Extensible HV Switchroom*** - is defined as the installation of a single free-standing HV ring main unit, metering unit and outgoing cable box.

2.8 ***Extensible HV Switchboard*** - is defined as the installation of a series of HV circuit breakers with the facility of sharing a common set of busbars.

2.9 ***Minor Works Contractors*** - are defined as contractors approved by WPD to carry out building/ civil engineering works. Consult the Procurement shared area of WPD Corporate Information or the Procurement department for details if required.

3.0 GENERAL PRACTICE

For clarity, the general practice for the installation of HV substation plant is subdivided below into supplies metered at LV (primarily standard ***unit substation construction***) and those metered at HV (generally involving the construction of a ***non-extensible HV switchroom***).

3.1 LV Metered Supplies

Generally there are three distinct approaches to the construction of foundations, buildings and enclosures for LV metered supplies.

3.1.1 The majority of HV substation work (either replacement, reinforcement or new business driven) is of the ***unit substation*** approach using conventional ***GRP enclosures.*** It is estimated that approximately 300 such new installations are commissioned company-wide annually. The use of ***unit substation*** construction ensures a compact substation plant footprint and minimises the foundation size and spatial requirements for any building/ enclosure. These installations may involve the appointment of ***minor works contractors*** to carry out civil construction works on behalf of WPD.

Occasionally, where the output of a risk assessment carried out in accordance with ST:SP2D dictates, there will be a need to install a ***vandal resistant substation enclosure***.

3.1.2 There are a small number of situations where the use of a standard ***GRP enclosure*** is not appropriate. Depending upon the specifics of a connection agreement, a Customer may undertake to design and construct foundations and buildings/ enclosures to WPD approval or proposes to accommodate WPD plant within an existing, new or converted building structure. This approach is most likely to occur for new ***LV metered supplies*** to large (often residential) developments where a customer desires to/ is compelled by local authority planning officers to match the external appearance of an HV ***unit substation*** enclosure with an adjoining development. Other examples may include the selection by WPD planners of an existing building to house a unit substation in the absence of a suitable site for a new-build ***unit substation***.

3.1.3 Infrequently, ***non-unit substation construction*** may need to be adopted for the selective replacement of individual items of existing ***non-unit substation*** plant. Here, due to the constraints of the existing substation, separate transformer, switchgear and LV cabinet bases may need to be re-used/ modified or replaced.

3.2 HV Metered Supplies

3.2.1 Where a new ***HV metered supply*** is to be provided, this will generally be by means of a ***non-extensible switchroom*** i.e. a metering ring main unit/ breaker accommodated within an enclosure designed and constructed by the Customer to WPD approval. A separate room/ area will be provided to accommodate metering equipment and this will be physically segregated from the switchroom itself (although within the constraints of the maximum multi-core cable route between the metering unit and the meter panel).

3.2.2 Depending upon the required capacity/ network configuration and protection requirements of a ***HV metered supply***, there may be a requirement to install an ***extensible HV switchboard*** for a customers supply. This would normally be housed within a dedicated switchroom designed and constructed by the customer to WPD approval.

4.0 ACTIONS REQUIRED

4.1 Unit Substation Construction – Civil Construction Works by WPD (or through its appointed contractors)

4.1.1 The standard 'up to 1000kVA unit substation' foundation arrangement (see drg no EKV0014 in appendix A), is configured to accommodate all anticipated combinations of transformer, switchgear and LV fuse cabinets, using ***unit substation*** construction housed within a ***GRP enclosure***.

4.1.2 The standard foundation detail and standard ***GRP enclosure*** should be used for all ***unit substation*** installations unless planning authority requirements prohibit this approach.

4.1.3 The standard GRP enclosure requires the use of a GRP lintel/ support beam to span across the cable area and support the door cill to the enclosure. The beam also provides a clearly defined edge up to which developers or WPD may reinstate hard surfacing following backfilling of the cable excavation in front of the substation. For details on the installation of the GRP lintel/ beam, see appendix C

4.1.4 It is accepted that there will be occasions where standard designs may be insufficient or inappropriate, without modification, to suit special circumstances. However, wherever possible, ***unit substation*** construction should prevail. Please note that as outlined earlier, there occasionally may be a requirement for a ***GRP enclosure*** to be substituted by a ***vandal resistant enclosure*** depending upon the output of a risk assessment carried out in accordance with ST:SP2D. The base detailed on drawing no EKV0014 will accommodate the vandal resistant enclosure without modification

4.1.5 Where compelled by local planning authorities to match enclosure construction materials with those used elsewhere on a residential or commercial development, the spatial requirements and cable access provision indicated on drawing no EKV0016 (appendix A) shall be afforded. In addition to the substation configuration indicated on EKV0016, an alternative arrangement is detailed on drawings EKV0098 and EKV0099. This has the benefit of optimal operational and switching access/ egress but has the demerit that it requires the unit constructed plant to be installed over the cable trench. For this reason it is of paramount importance that this operation is conducted utilising the load-rated trench covers of the type/ configuration detailed on the drawings.

4.1.6 When selecting a site for a new ***unit substation***, the WPD planner shall consider the potential fire risk, likelihood of noise complaints and the requirements for earthing.

a) Fire

Detached substations shall be at least 1m away from occupied buildings to minimise the potential risk of fire spread.

Where a ***unit substation*** is to be constructed within, or directly attached to, an existing third party building, the WPD planner should consider the access requirements, potential fire hazard and over-pressure venting hazard associated with the WPD plant. The requirements for the establishment of a durable, readily accessible, fire resistant and structurally independent enclosure can be satisfied by compliance with the *'Functional/ Performance Specification for* HV Substations Constructed by the Customer to Accommodate WPD Electrical Plant/ Apparatus' (see appendix B). The spatial requirements and cable access provision indicated on drawing no EKV0016 (appendix A) shall be provided as a minimum.

b) Noise

Where a substation is to be located within a residential area it should be positioned at least 5m away from dwellings

c) Earthing

The substation shall be at least 10m away from (see ST: TP21D):

- Swimming pools, camping and caravan sites, gardens, and other areas where people may reasonably be barefoot
- Ponds / lakes used for commercial fish farming
- Telephone exchanges
- Railway installations
- Overhead line towers

Where it is necessary to segregate the substation HV and LV earths i.e. where the earth potential rise (EPR) under fault conditions exceeds 430V (see ST: TP21D), the substation HV earthing system and any metalwork connected to it must be at least 9m away from the LV earthing system and any metalwork connected to it. Assuming the HV earthing system encircles the substation at a 1m distance then the substation shall be at least 10m away from:

- Buildings, especially steel framed ones
- Items of street furniture
- Buried metalwork (e.g. pipes)
- Earth electrodes associated with lightning protection
- The LV earth electrode
- PME earth electrodes

This latter requirement means that it is not permissible to locate a new substation with an EPR greater than 430V within an existing, new or converted third-party building unless the building is exclusively for the substation as it will be very difficult to achieve the HV to LV earth segregation otherwise. It also imposes additional requirements / constraints for substation auxiliary supplies and HV metering.

4.1.7 Foundation reinforcing steelwork shall have at least one, and preferably two, connections to the substation earth system. Connections onto rebar should preferably be exothermically welded, although phosphor bronze U bolt clamp arrangements are acceptable.

4.2 Unit Substation Construction – Construction Works by Customer

4.2.1 As above, the standard foundation detail and standard ***GRP enclosure*** approach should be adopted wherever possible for all ***unit substation*** installations constructed by Customers for adoption by WPD.

4.2.2 Increasingly, to satisfy the requirements of local planning authorities or Developers, Customers propose stand-alone enclosure construction materials that match those used elsewhere on a residential or commercial development. Where a Customer proposes architectural enhancements to, or an alternative construction technique to a ***GRP enclosure***, the spatial requirements and cable access provision indicated on drawing no EKV0016 (appendix A) shall not be compromised. Additionally, a copy of WPD document *'Functional/ Performance Specification for* HV Substations Constructed by the Customer to Accommodate WPD Electrical Plant/ Apparatus*'* (see appendix B) shall be forwarded to the Customer.

4.2.3 Similarly, where a Customer proposes to accommodate WPD ***unit substation*** plant within an existing or proposed building, they shall be issued with drawing no EKV0016 and the above WPD specification document.

The specification document highlights control measures for the fire hazard and over-pressure venting hazard associated with the WPD plant. It is important that the WPD Planner considers proposals for the siting/ construction of the substation enclosure in the context of the document/ good practice.

4.2.4 As an alternative arrangement to the arrangement referenced in 4.2.2 and 4.2.3 (above), WPD have developed a substation design that positions the HV/LV cable trench in front between the Transformer and the entrance doors. This is detailed on drawings no EKV0098 and EKV0099 (appendix A). Similarly, this drawing should be read in conjunction with the document entitled *'Functional/ Performance Specification for* HV Substations Constructed by the Customer to Accommodate WPD Electrical Plant/ Apparatus*'* (see appendix B).

As this alternative requires the unit constructed plant to be installed over the cable trench, it is of paramount importance that this operation is conducted utilising the load-rated trench covers of the type/ configuration detailed on the drawings For clarity, the cover requirements are scheduled below with reference to both the load-rating and details of an indicative suppliers product that is known to meet the required specification. These products may be purchased direct from Alcomet (01384 404488 www.Alcomet.net), but we are happy to accept suitable alternative products, provided that they meet the defined criteria below.

Covers situated on the transformer haulage path : to be rated as **B125** to BSEN 124 over the 1200mm span (for example Alcomet Trenchlite Yellow Heavy Duty covers)

Covers not on the transformer Haulage path : to be rated as **A15** to BSEN 124 over the 1200mm span (e.g. Alcomet Trenchlite Grey Covers)

Caution- Under no circumstances are transformer loads to be imparted to light-duty (A15) covers as these are not rated for this purpose. Heavy duty (B125) covers must be securely in place on the path of transformer haulage before plant is moved over the trench.

4.3 HV Intake Switchrooms – Construction Works by Customer

4.3.1 Where a Customer is to be provided with an HV supply, they are to be issued with a copy of WPD document *'Functional/ Performance Specification for* HV Substations Constructed by the Customer to Accommodate WPD Electrical Plant/ Apparatus' (see appendix B) and drawing no EKV0018 (see appendix A) which details the spatial and other requirements for HV switchgear currently on WPD term contract.

4.3.2 Where a Customer proposes to accommodate WPD HV substation plant within the envelope of a larger existing or proposed building, they shall be issued with drawing no EKV0018 and the WPD specification document above. The minimum spatial requirements and cable access provision indicated on the drawing shall not be compromised.

Once again, the specification document highlights control measures for the fire hazard and over-pressure venting hazard associated with the WPD plant. It is important that the WPD Planner considers proposals for the siting of substation plant in the context of the document/ good practice.

4.3 HV Metered Generator Connection Switchrooms – Construction Works by Customer

4.3.1 Where a Customer is proposing a to install generation with a capacity of 500kW or more, or where a Soft Intertrip Scheme, a Timed Scheme or Active Network Management scheme is proposed the HV switchgear at the metering substation will need to be equipped with a Generator Constraint Panel (GCP) in accordance with ST:TP18A or an Active Network Management Panel (ANMP). The panel will be installed 'close coupled' to the HV switchgear as set out in the ST:SP10L. For such situations a larger switchroom environment is required to accommodate the GCP, its door swing and requisite personnel access. In such situations the minimum internal spatial requirements of the substation enclosure are set out on drawing EKV0093. This drawing indicates a GRP enclosure solution but alternative enclosure materials may be proposed by the Customer provided that they comply with the *Functional/ Performance Specification.* To further assist understanding of this solution, a detailed GRP enclosure drawing and foundation drawing have been prepared for this type of connection. Please see EKV0091 and EKV0092 accordingly (appendix A).

4.4 Pad-Mount Transformer Installations

4.4.1 Refer to standard drawings EKV0054 (appendix A) for details of foundation construction for the range of HV pad-mount transformers currently on WPD term contract.

4.4.2 Drawing EKV0054 is suitably sized to accommodate a GRP enclosure that may be required to prevent a touch potential issue. This enclosure is separately detailed on drawing EKV0095

4.5 Installations Outside the Scope of the Above

4.5.1 There will be occasions where, due to specifics of a particular connection or a proposed site, the direct application of the standard approach laid out in this document is difficult. As a minimum, the appropriate specification document contained in the appendices should be applied to such projects.

4.5.2 Where it is proposed to accommodate WPD plant within a building/ enclosure that differs in size/ shape from that indicated within the standard drawings, Planners should give due consideration to the requirements for safe access/ egress and to the potential need to realign/ rotate plant in plan during installation and final placement.

4.5.3 As a guide for some less frequently encountered installations, appendix A contains further standard installation drawings. See the drawing schedule for more information.

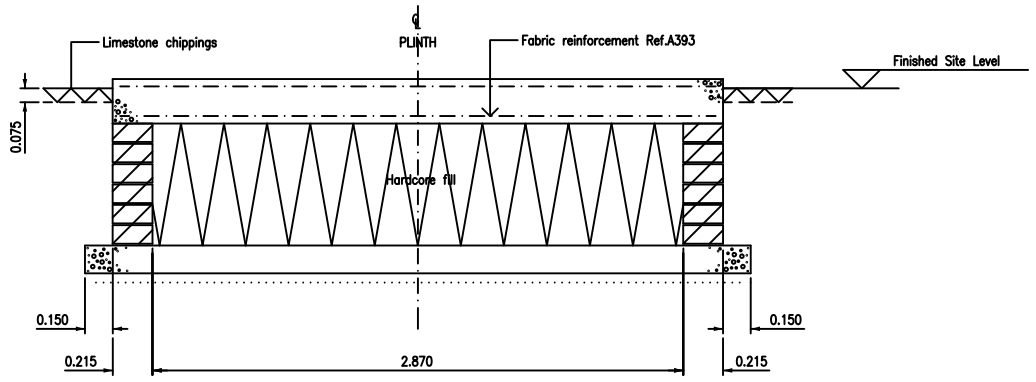
4.5.4 The Engineering Design Team, based at Avonbank are responsible for policy setting in the area of substation civil works. If queries arise regarding the application of the standards then please contact the author Simon Waldron on 332483 (internal).

APPENDIX A

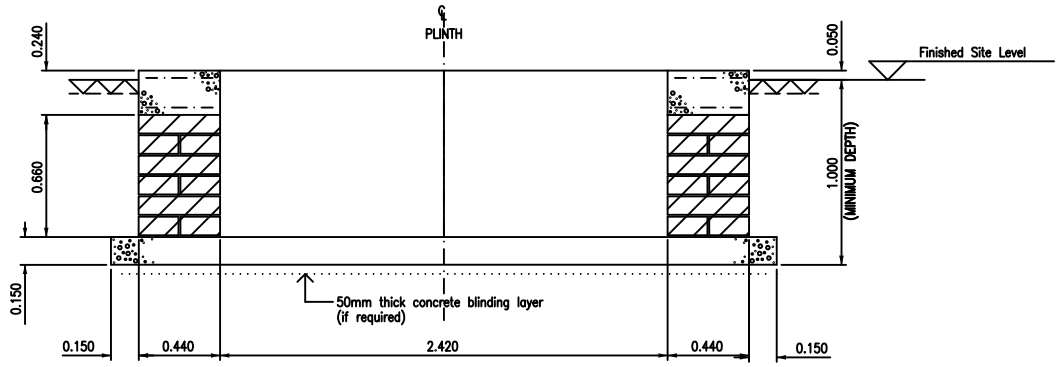
SCHEDULE OF STANDARD HV SUBSTATION DRAWINGS

Drawing No	Drawing Title
EKV0014	Standard Foundation for up to 1000kVA Pocket Substation
EKV0015	Standard GRP Enclosure and Threshold Beam Detail for up to 1000kVA Pocket Substation
EKV0016	Foundation/ Enclosure Details for up to 1000kVA Substation (TX Mount RMU/ LV Cabinet in Customers Building)
EKV0017	Foundation Detail for free Standing HV Intake Substation (RMU with or without Metering Unit in GRP Enclosure)
EKV0018	Foundation/ Enclosure Detail for Free-Standing HV Intake Substation (RMU and Metering Unit in Customers Building)
EKV0019	Standard Steel Subframe Details for Ringmaster Switchgear (As provided by WPD Plant Centre)
EKV0020	Up to 400A/ 3.5 MVA HV Intake Substation using Ringmaster Extensible Switchgear in GRP Enclosure
EKV0021	Foundation Detail for free Standing HV Intake Substation with Metering Room (RMU and Metering Unit)
EKV0022	Plinth for Free-Standing Cabinet/ Enclosure to accommodate HV Metering Panel and Emergency Trip Button
EKV0024	Substructure/ Enclosure Detail for 5 Panel Extensible Ringmaster Switchgear
EKV0025	Substructure/ Enclosure Detail for 7 Panel Extensible Ringmaster Switchgear
EKV0026	Substructure/ Enclosure Detail for 9 Panel Extensible Ringmaster Switchgear
EKV0027	General Arrangement of Flood Resistant (Elevated by 1200mm) up to 1000kVA Substation
EKV0028	Blockwork Foundation Arrangement for Schneider LV Feeder Pillar (Types FP3, 5 and 7)
EKV0029	Insitu Concrete Foundation Arrangement for Schneider LV Feeder Pillar (Types FP3, 5 and 7)
EKV0054	Standard Foundation for CG 11kV Pad Mounted Three Phase Transformer
EKV0057	Substructure / Enclosure Detail for 5 Panel Extensible Ringmaster Switchgear without Metering Room
EKV0059	~~Standard Foundation for Cooper Power Systems 11kV Pad Mounted Single Phase Transformer~~ – Withdrawn Oct 16

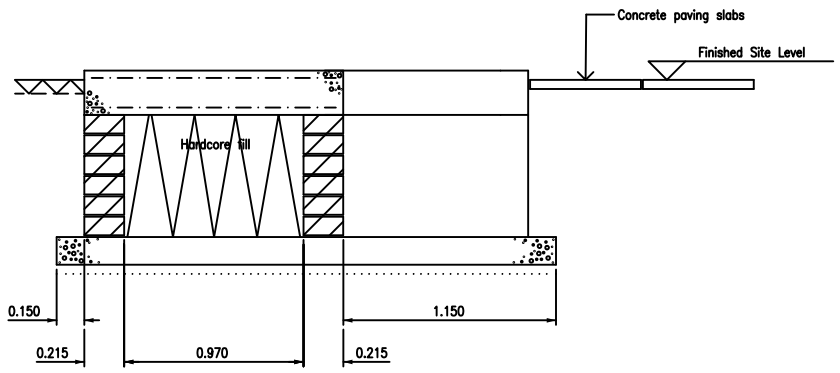
Drawing No	Drawing Title
EKV0091	Enclosure Detail for HV Metered Substation with Generator Constraint Panel
EKV0092	Foundation Detail for HV Metered Substation with Generator Constraint Panel
EKV0093	General Arrangement Drawing for HV Metered Substation with Generator Constraint Panel
EKV0095	GRP Enclosure Detail for CG Pad-mount 11kV Transformer
EKV0098	Foundation/ Enclosure Details for up to 1000kVA Substation (TX Mount RMU/ LV Cabinet in Customers Building) Alternative Trench Configuration
EKV0099	Trench Bridging Technique for EKV0098
EKV0104	General Arrangement of Flood Resistant (Elevated by 600mm) up to 1000kVA Substation



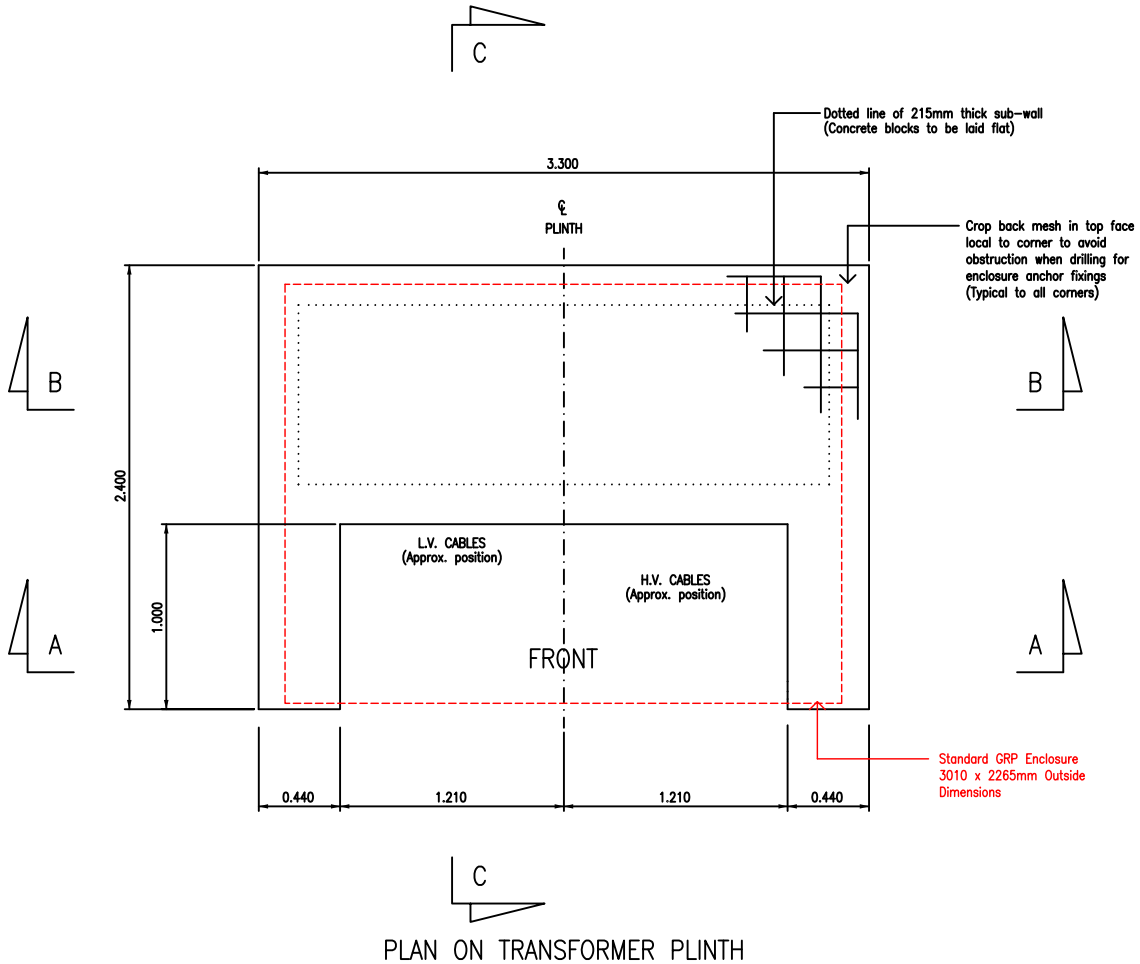
SECTION B–B



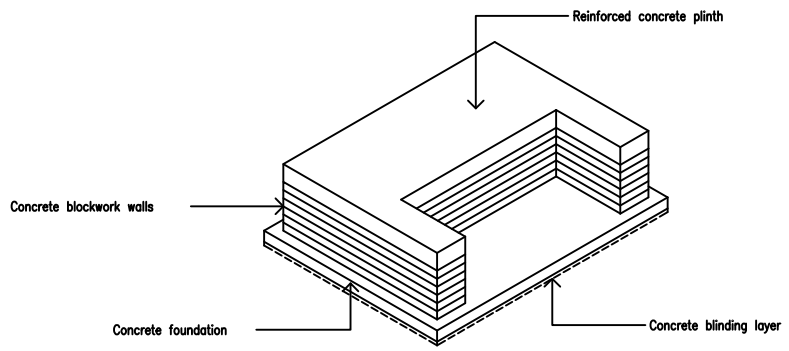
SECTION A–A



SECTION C–C



PLAN ON TRANSFORMER PLINTH



ISOMETRIC VIEW OF TRANSFORMER PLINTH
(NOT TO SCALE)

SPECIFICATION:

SITE CLEARANCE: Before commencing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc. and remove from same.

EXCAVATION: Excavate to reduced levels (or to firm foundation as directed by the Engineer) and remove spoil from site.

Level and compact bottom of excavation to recieve concrete blinding layer/concrete foundation.

BLOCKWORK: Solid concrete blocks to comply with B.S. 6073

Work size dimensions to be 440 (L) x 215 (H) x 100 (W) mm.

Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.

CONCRETE: Blinding concrete to be grade C15 with a minimum crushing strength of 15N/sq.mm at 28 days.

Plinth/foundation concrete to be grade C35 with a minimum crushing strength of 35 N/sq.mm at 28 days.

Top surface of plinth to be level with smooth steel float finish.

REINFORCEMENT: Concrete plinth to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom).

Steel fabric reinforcement to comply with B.S. 4483.

Steel bar reinforcement to comply with B.S. 4449.

Reinforcement to be free from all loose rust and mill scale.

Minimum cover to all reinforcement to be 40mm.

BACKFILLING: Void in front of plinth to be backfilled with selected hardcore after protecting cables with min. 150mm stone dust.

ON COMPLETION: Where applicable area between front of plinth and site boundary to be paved with 600 x 600 x 50 mm thick concrete paving slabs.

All remaining exposed ground surfaces within site boundary to be dressed with a 75 mm thick layer of clean limestone chippings.

GENERAL NOTES:

All dimensions in metres unless otherwise stated.

Vibration pads must be used on all transformers.

The Contractors attention is drawn to the need for strict accuracy in setting out the foundation.

All lines and angles to be formed square, plumb and true.

Rev No	Drawn	Chk'd	App'd	Date	Revision
A	C.J.B.			7.9.11	ANTI–VANDAL ENCLOSURE RESIZED, FOUNDATION DEPTH REDUCED.

ORIGINAL ISSUE		Date
Drawn	C.J.B.	11.07.08
Checked		
Approved		

SCALE: N.T.S. (A1)

WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
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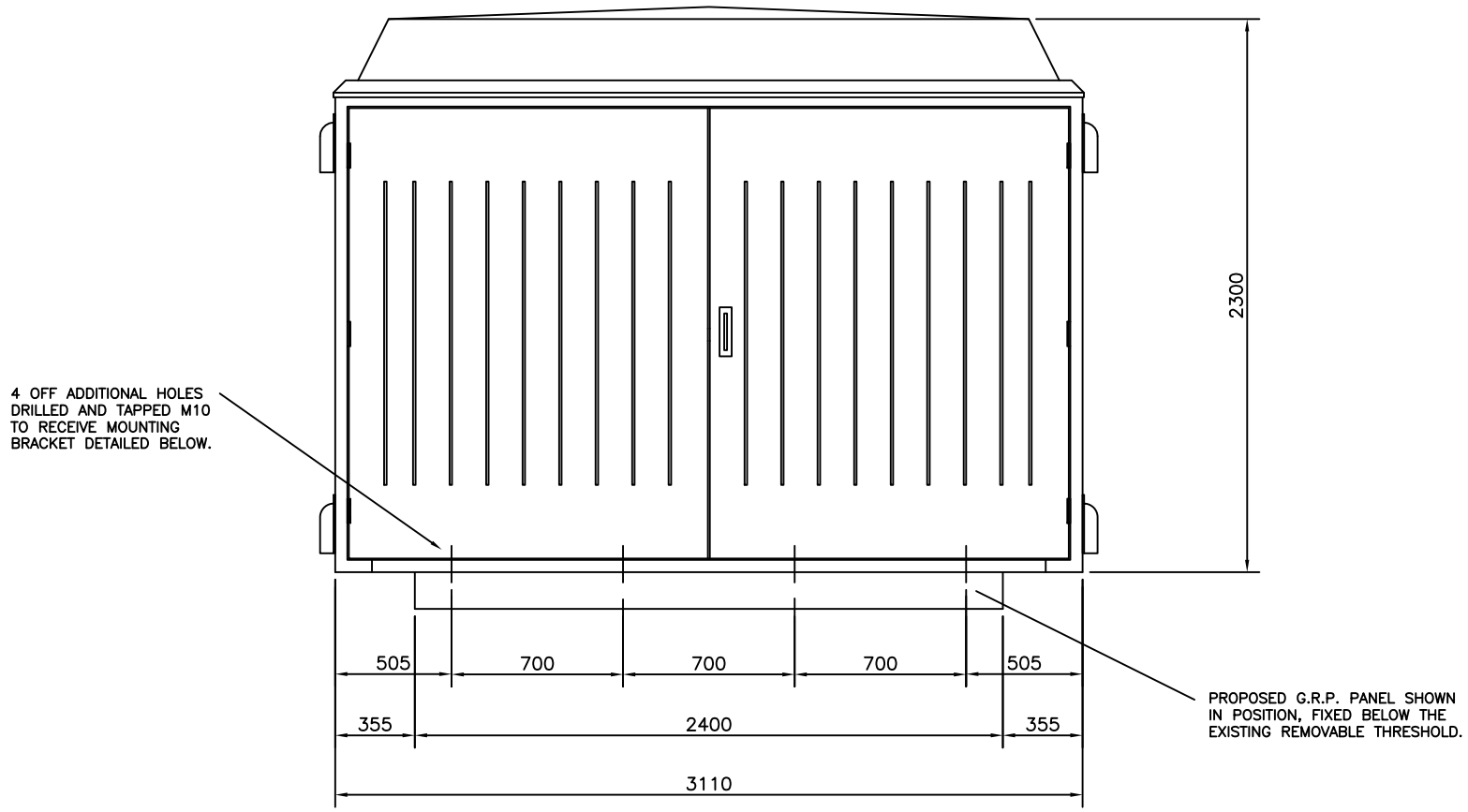
WESTERN POWER DISTRIBUTION

Title: STANDARD FOUNDATION FOR UP TO 1000kVA POCKET SUBSTATION

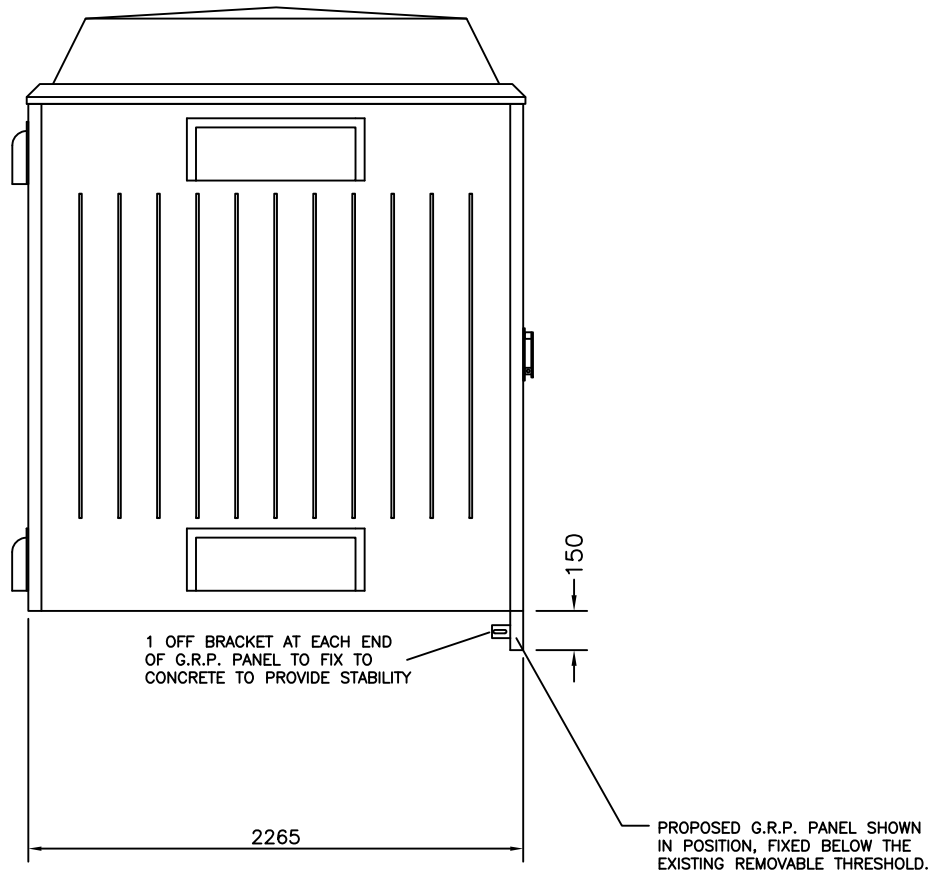
Drg. No. EKV0014

Rev No. A

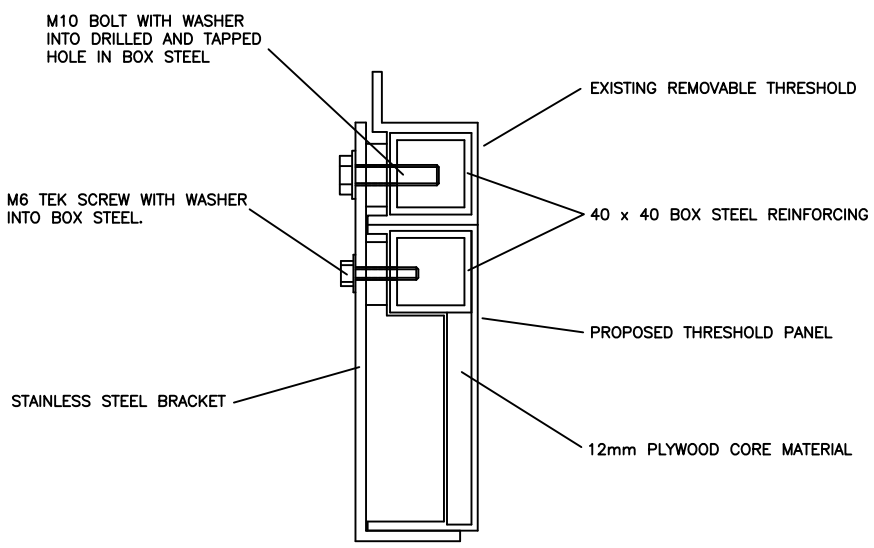
DRAWING NUMBER
EKV0015



FRONT ELEVATION



SIDE ELEVATION



CROSS SECTION SHOWING FIXING DETAIL FOR PROPOSED PANEL

100mm

A2

Revision:	Drawn:	Date:	Revision:	Drawn:	Date:	Revision:	Drawn:	Date:	Revision:	Drawn:	Date:	Revision:	Drawn:	Date:
Work Done			Work Done			Work Done			Work Done			Work Done		
Checked			Checked			Checked			Checked			Checked		

Approvals for

Construction

WESTERN POWER DISTRIBUTION

Western Power Distribution
Engineering Design Department
Lamby Way
Rumney
Cardiff
CF3 2EQ
Tel: 01179 332 000

Title

STANDARD GRP ENCLOSURE AND THRESHOLD BEAM DETAIL FOR UP TO 1000kVA POCKET SUBSTATION.

Drawn C.J.B. Checked

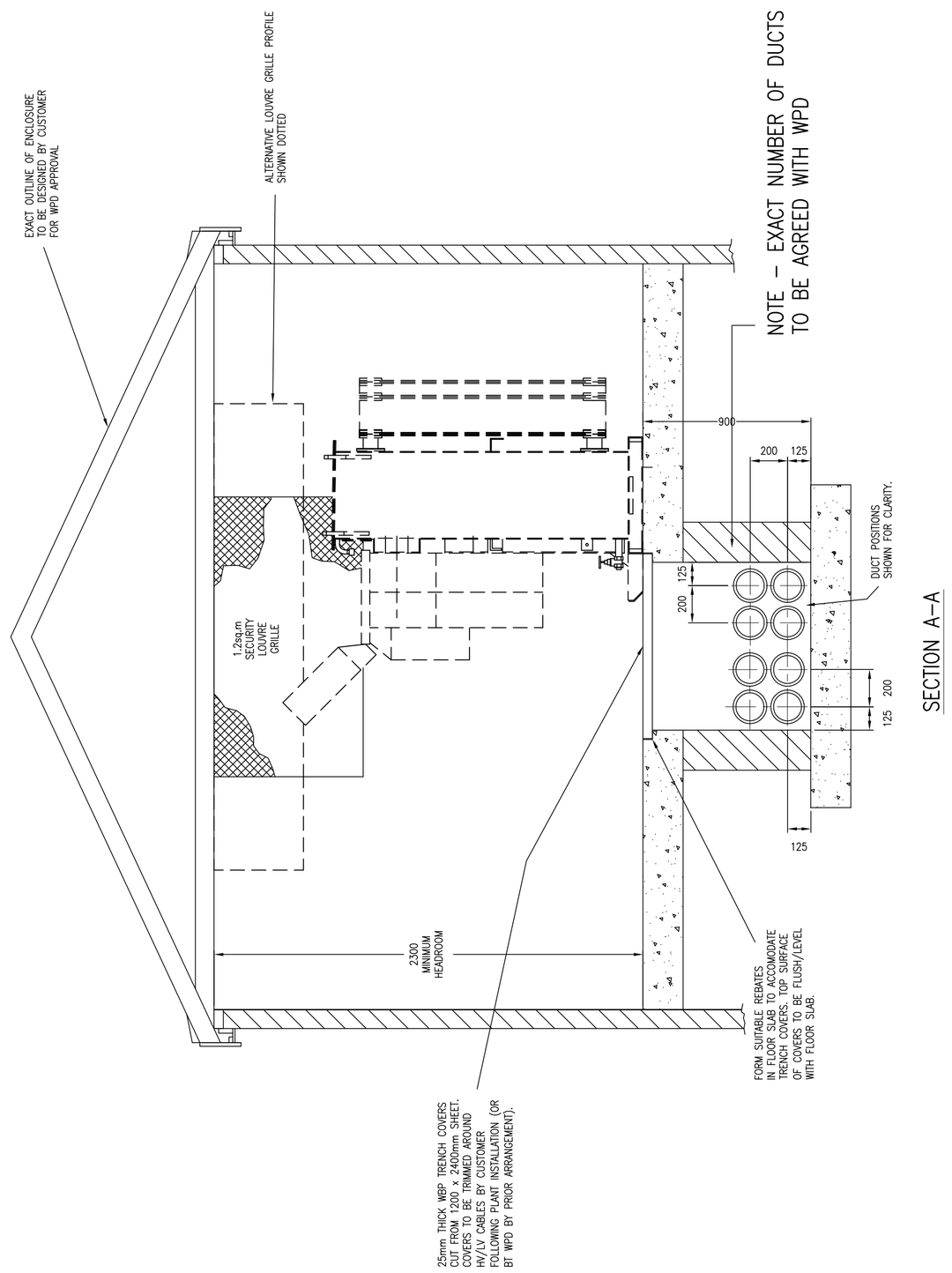
Date 08/09/08 Scale of original 1:20

DRAWING NUMBER EKV0015

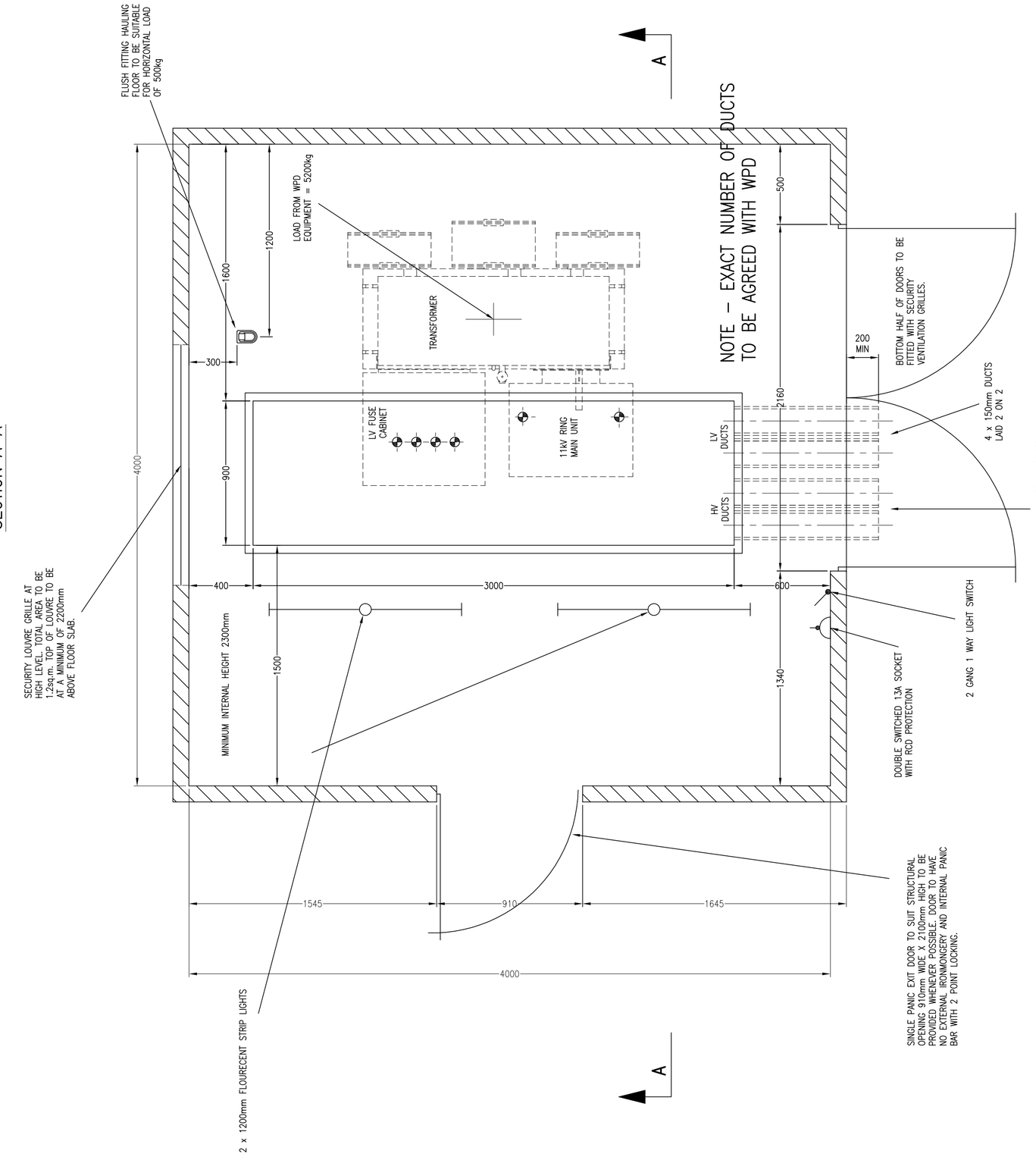
Revision

STANDARDS

THIS DRAWING IS ONLY TO BE READ IN CONJUNCTION WITH WPD DOCUMENT, FUNCTIONAL PERFORMANCE SPECIFICATION FOR UNIT SUBSTATION



SECTION A-A



GENERAL NOTES

DESIGN LIFE:
The design life of the enclosure shall be a minimum of 50 years. All components are to be maintenance free or at the least low maintenance items.

SITING
For a free-standing enclosure, its walls should be positioned no closer than 1000mm from occupied buildings to minimise the potential risk of fire spread to/ from the structure. Where it is proposed to provide a dedicated substation enclosure within a larger building, the Customer shall ensure that access to the substation for the purpose of plant installation, maintenance and removal/ replacement is adequate. Two of the compartment walls forming part of the substation enclosure should be externals wall and the substation floor should be notionally at ground floor level. The substation doors should be configured to open directly through the external envelope of the building at ground level, on to a level road/ accessway as detailed in the performance specification. Consult WPD for detailed, project-specific access requirements.
To ensure compliance with BS9999 the HV substation shall be separated from the customers building by construction that affords fire resistance of minimum duration 2 hours.

APPROVALS:
Detailed drawings/specifications for the enclosure are to be submitted to WPD for comment prior to agreement of connection terms/submission for local authority approvals by the Customer.

WPD ACCESS:
The enclosure shall be sited to afford 24 hour WPD access. For specific access/offloading requirements see WPD performance specification.

STRUCTURAL DESIGN:
The Customer is responsible for the sizing/framing/configuration of all components as necessary to safely transfer/impart all adverse combinations of dead and imposed loadings to the natural foundation. (Total vertical dead load from WPD switchgear = 700kg).
Where the enclosure is to be constructed within a larger building, it is essential that its walls, roof/ ceiling and floor offer no structural support to the components of the main building.
There is a conceivable risk that in the unlikely event of an internal fault within the WPD plant, a controlled venting of over-pressure may occur. This overpressure may have an adverse effect upon the structural elements forming the substation enclosure. It is essential that any resulting structural distress does not adversely affect the structural integrity/ robustness of the main building.

DIMENSIONS:
This drawing details the minimum internal dimensions and juxtaposition of elements to accomodate WPD plant. External dimensions are to be specified by the Customer to suit the proposed construction materials.

DRAINAGE:
The enclosure shall be designed to adequately collect and convey surface water to a suitable point of disposal.

SPECIFICATION FOR WORKMANSHIP/MATERIALS

SITE CLEARANCE:
Before commencing excavations, clear site of all rubbish,debris, shrubs, general vegetation, topsoil etc.

EXCAVATION:
Excavate to reduced levels and remove spoil from site.

Level and compact bottom of excavation to recieve concrete blinding layer/concrete foundation.

BLOCKWORK:
Solid concrete blocks to comply with B.S. 6073

Work size dimensions to be 440 (L) x 215 (H) x 100 (W) mm.

Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.

CONCRETE:
Blinding concrete to be grade C15 with minimum crushing strength of 15N/sq.mm at 28 days.

Plinth/foundation concrete to be grade C35 with a minimum crushing strength of 35 N/sq.mm at 28 days.

Top surface of plinth to be level with smooth steel float finish.

REINFORCEMENT:
Concrete plinth to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom).

Steel fabric reinforcement to comply with B.S. 4483.

Steel bar reinforcement to comply with B.S. 4449.

Reinforcement to be free from all loose rust and mill scale.

Minimum cover to all reinforcement to be 40mm.

DOORS:
Doors to be low maintenance GRP or hardwood with heavy-duty hold-open devices. (All WPD approved).

Generally, bottom half of doors to be fitted with security ventilator louvre grilles to ensure cross-flow of ventilation.

Supply and fit Union 1001 or similar locking arrangement to accept WPD suited 1 x 1 6 pin cylinder (supplied by WPD). As an alternative if specifically agreed with WPD supply and fit heavy duty hasp and staple to receive padlock supplied by WPD.

Supply and fit internal panic release mechanism to active leaf.

Minimum clear height of door opening to be 2.1 metres.

VENTILATION
Adequate ventilation is essential to prevent adverse heat build-up within the substation. Passive ventilation via louvre gilles indiacted on the drawing (at high level and the bottom half of doors) should be provided.

No air conditioning/ cooling plant shall be installed within the substation.

Rev No	Drawn	Chk'd	App'd	Date	Revision
1	CJW			111116	HAULING LOOP DETAIL AMENDED

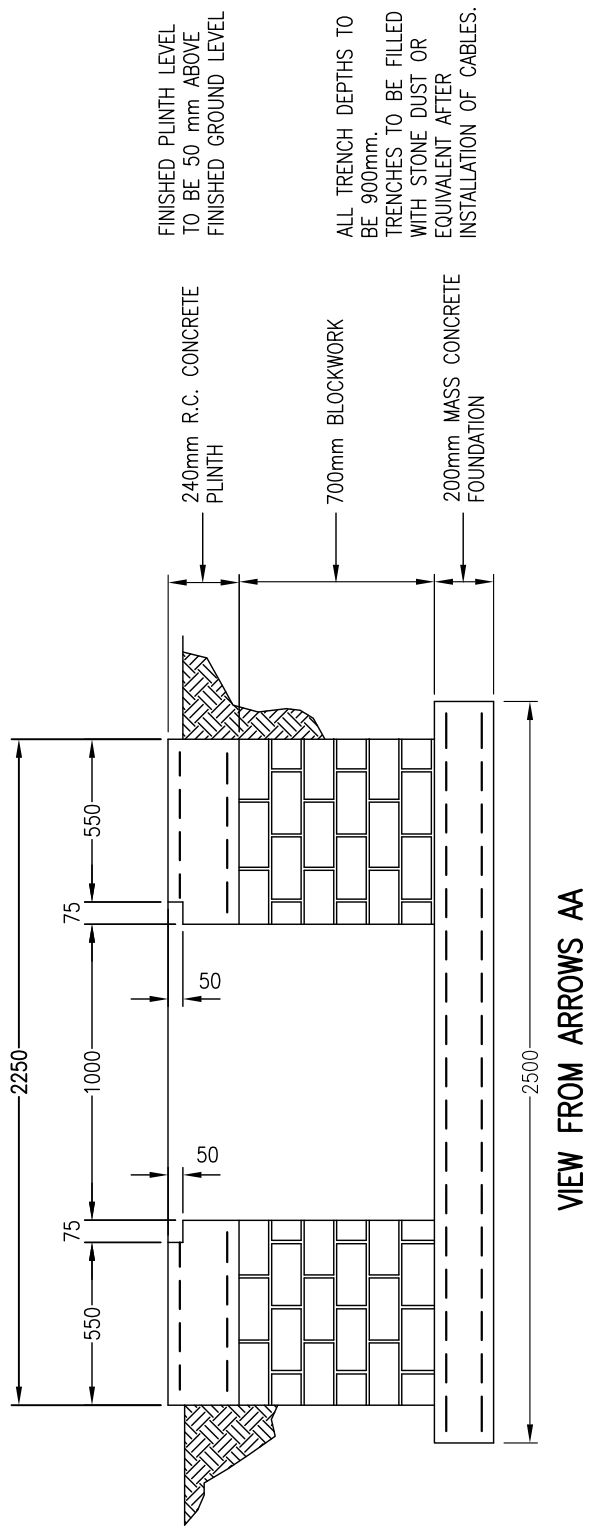
ORIGINAL ISSUE		Date
Drawn	C.J.B.	01.04.09
Checked		
Approved		
SCALE:	1:20 (A1)	

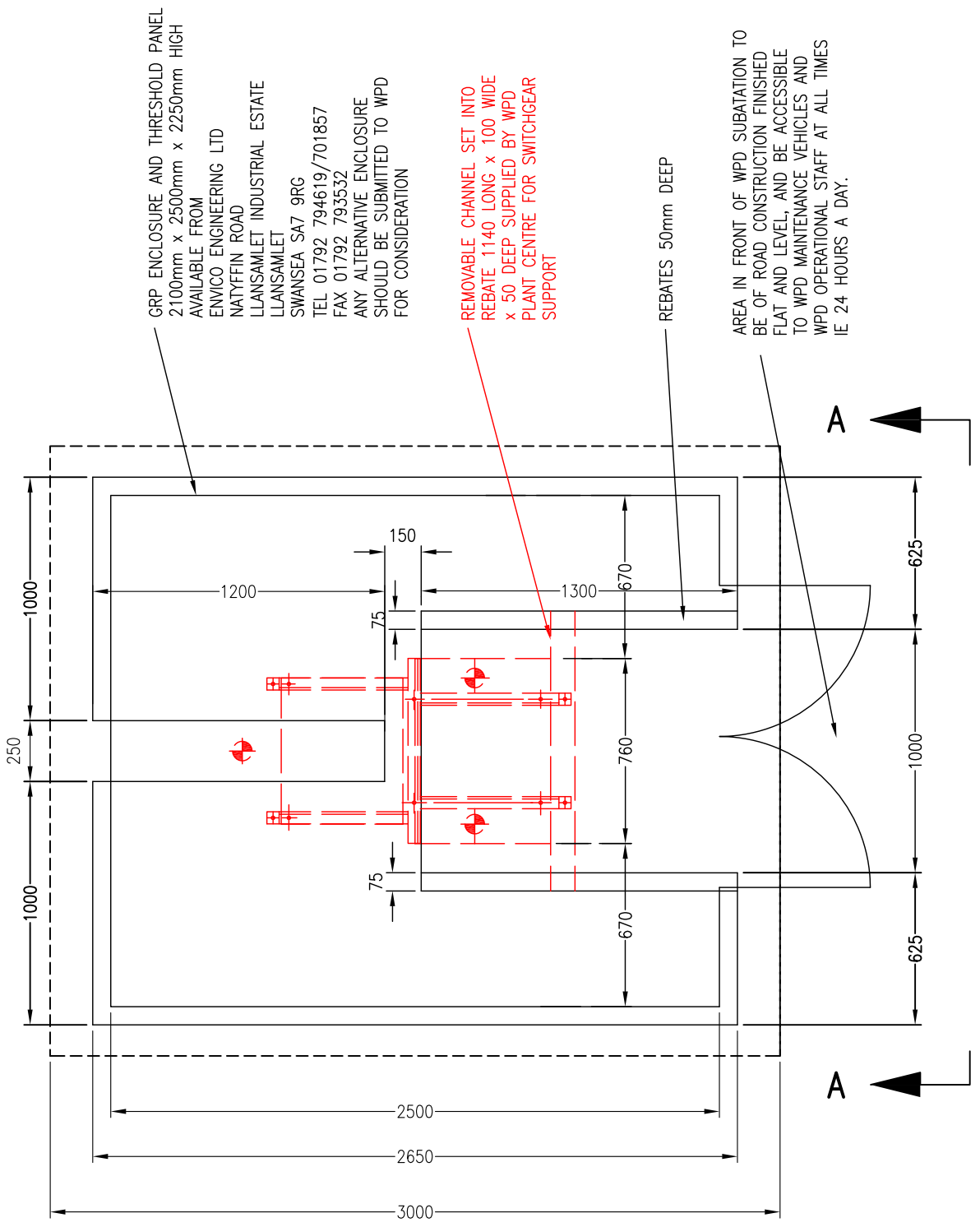
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

Title
FOUNDATION/ENCLOSURE DETAIL FOR UP TO 1000kVA SUBSTATION (UNIT CONSTRUCTION-WORKS BY CUSTOMER)

Drg. No.	Rev No.
EKV0016	1





SPECIFICATION OF PLINTH

SITE CLEARANCE
Before commencing excavation clear site of all rubbish, debri, shrubs, general vegetation, topsoil etc.

EXCAVATION
Excavate to reduced levels (or to firm foundation as directed by the engineer) and remove spoil from site. Level and compact bottom of excavation to receive concrete blinding layer/concrete foundation.

BLOCKWORK
Solid concrete blocks to comply with B.S. 6073
Work size dimensions to be 440(L) X 215(H) X 100(W)mm.
Concrete blocks to have minimum compressive strength of 7.0 N/sq.mm.

CONCRETE
Blinding concrete to have a minimum crushing strength of 15N/sq.mm at 28 days.
Plinth/foundation concrete to have a minimum crushing strength of 35N/sq.mm at 28 days.
Top surface of plinth to be level with steel float finish.

REINFORCEMENT
Concrete plinth to be reinforced with 2 No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom).
Steel fabric reinforcement to comply with B.S. 4483.
Steel bar reinforcement to comply with B.S. 4449.
Reinforcement to be free from all loose rust and mill scale.
Minimum cover to all reinforcement to be 40mm.

BACKFILLING
Void within plinth to be backfilled with well compacted hardcore (Type 1 or similar) and sand blinded.
Void in front of plinth to be back filled with selected hardcore after protecting cables with a minimum 150mm stone dust.

GENERAL NOTES
No GAS, WATER, BT or other stats fixtures are to be located near through or under the substation base.
The contractors attention is drawn to the need for strict accuracy in setting out the foundation.
All lines and angles to be formed square, plumb & true.
Any planning consents required are to be gained by the developer prior to comencement of works on site.
Vibration pads are to be fitted as standard practice beneath all transformers.
All dimendions are in millimetres unless otherwise stated.

WHERE A SUBSTATION PROVIDES SUPPLY TO A CUSTOMER THEN THE CUSTOMER MUST PROVIDE THIS 230V SUPPLY.

DEPENDING ON EARTHING ARRANGEMENTS IT MAY BE NECESSARY TO INSTALL A 1:1 ISOLATION TRANSFORMER IN THE 230V SUPPLY – AS PER ST NC1V/2. REFER TO WPD PLANNER.

Rev No.	Drawn	Chk'd	App'd	Date	Revision
B	C.J.B.			01.13	NOTE REFERRING TO 230V SUPPLY ADDED.
A	C.J.B.			07.09	FOUDATION FOR RING MAIN UNIT WITH OR WITHOUT METERING UNIT.

ORIGINAL ISSUE		Date
Drawn	C.J.B.	06.04.09
Checked		
Approved		
SCALE:	1:25 (A3)	

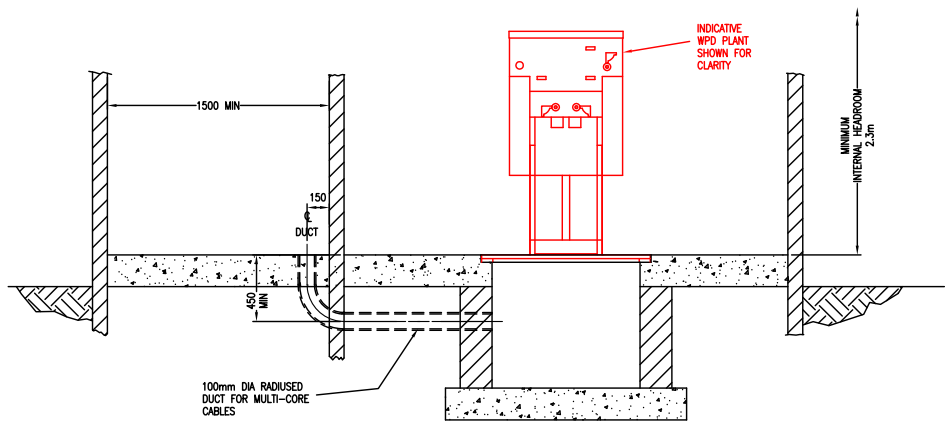
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

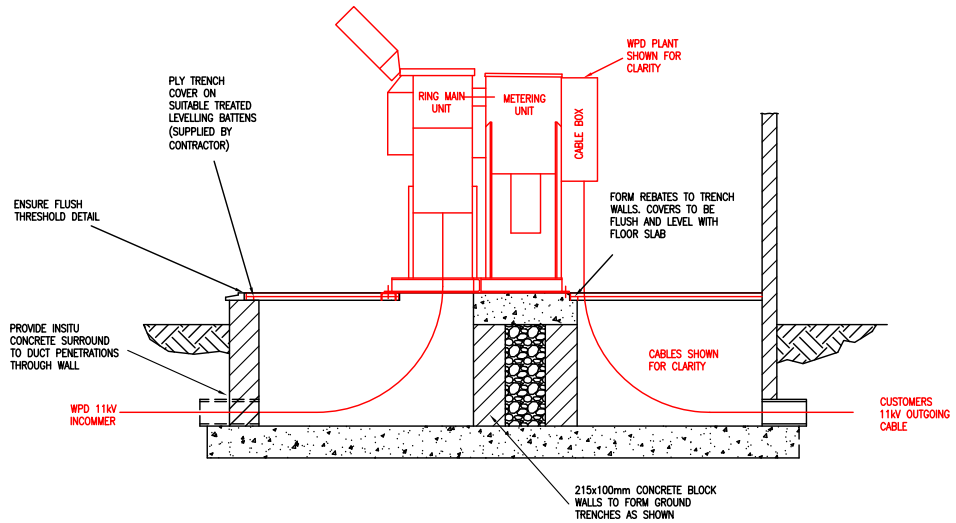
Title
FOUNDATION DETAIL FOR FREE-STANDING HV INTAKE S/S (RING MAIN UNIT WITH OR WITHOUT METERING UNIT)

Drg. No. EKV0017

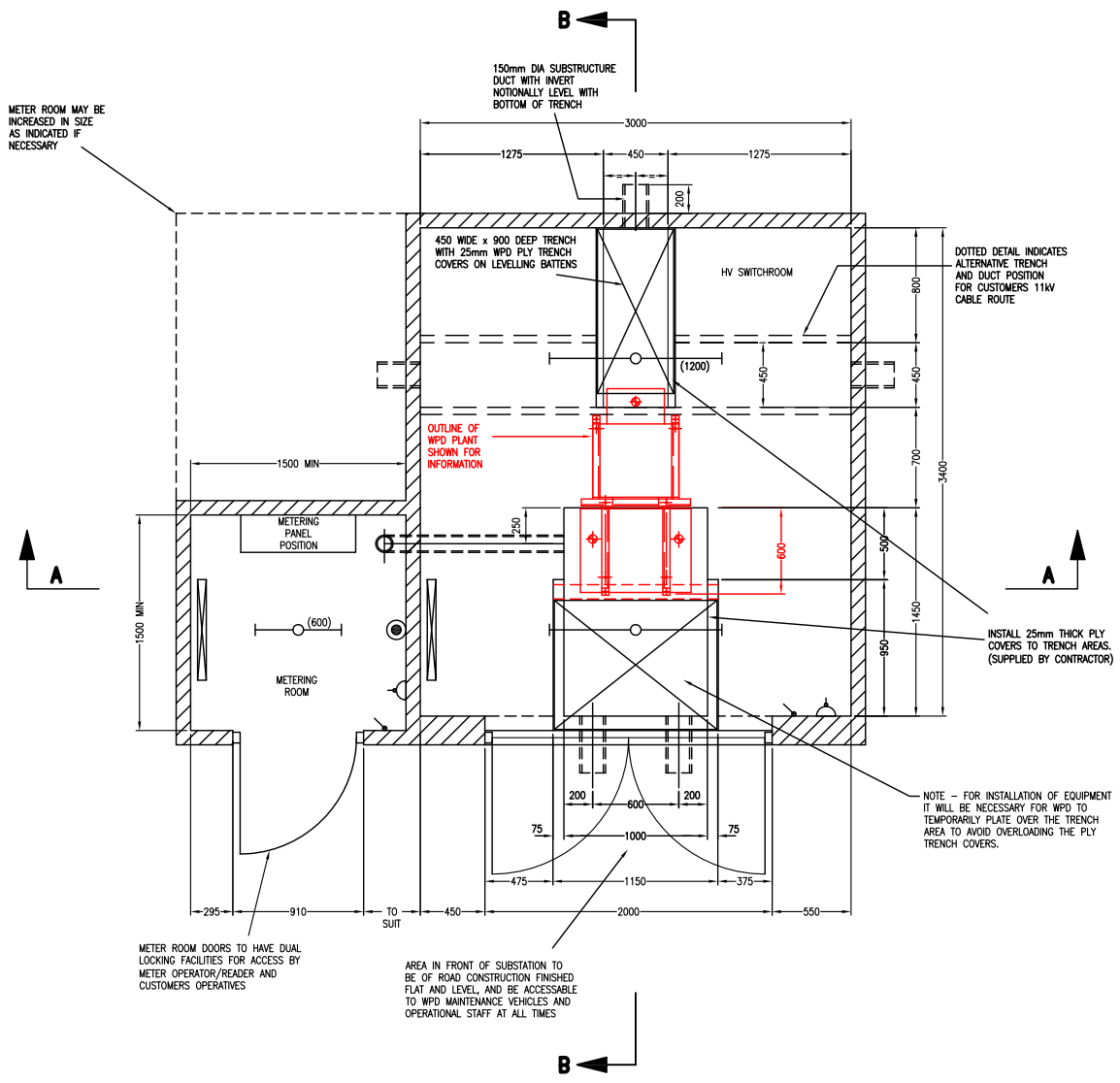
Rev No. B



SECTION_A-A



SECTION_B-B



KEY TO SYMBOLS

TWIN 13A INDUSTRIAL SWITCHED SOCKET WITH RCD PROTECTION.

HEAVY DUTY SINGLE GANG 1 WAY LIGHT SWITCH.

EMERGENCY PUSH-BUTTON TO TRIP WPD BREAKER.

120 WATT THEMOSTATICALLY CONTROLLED TUBULAR HEATER.

SURFACE FIXED FLOURESCENT BATTEN FIXING WITH LENGTH INDICATED IN BRACKETS.

GENERAL NOTES

DESIGN LIFE:
The design life of the enclosure shall be a minimum of 50 years. All components are to be maintenance free or at the least low maintenance items.

SITING
For a free-standing enclosure, its walls should be positioned no closer than 1000mm from occupied buildings to minimise the potential risk of fire spread to/ from the structure. Where it is proposed to provide a dedicated substation enclosure within a larger building, the Customer shall ensure that access to the substation for the purpose of plant installation, maintenance and removal/ replacement is adequate. At least one of the compartment walls forming part of the substation enclosure should be an external wall and the substation floor should be notionally at ground floor level. The substation doors should be configured to open directly through the external envelope of the building at ground level, on to a level road/ accessway as detailed in the performance specification. Consult WPD for detailed, project-specific access requirements.
To ensure compliance with BS9999 the HV switchroom shall be separated from the customers building by construction that affords fire resistance of a minimum duration of 2 hours.

APPROVALS:
Detailed drawings/specifications for the enclosure are to be submitted to WPD for comment prior to agreement of connection terms/submission for local authority approvals by the Customer.

WPD ACCESS:
The enclosure shall be sited to afford 24 hour WPD access. For specific access/offloading requirements see WPD performance specification.

STRUCTURAL DESIGN:
The Customer is responsible for the sizing/framing/configuration of all components as necessary to safely transfer/impart all adverse combinations of dead and imposed loadings to the natural foundation. (Total vertical dead load from WPD switchgear = 700kg).
Where the enclosure is to be constructed within a larger building, it is essential that its walls, roof/ ceiling and floor offer no structural support to the components of the main building. There is a conceivable risk that in the unlikely event of an internal fault within the WPD plant, a controlled venting of over-pressure may occur. This overpressure may have an adverse effect upon the structural elements forming the substation enclosure. It is essential that any resulting structural distress does not adversely affect the structural integrity/ robustness of the main building.

DIMENSIONS:
This drawing details the minimum internal dimensions and juxtaposition of elements to accomodate WPD plant. External dimensions are to be specified by the Customer to suit the proposed construction materials.

DRAINAGE:
The enclosure shall be designed to adequately collect and convey surface water to a suitable point of disposal.

SPECIFICATION FOR WORKMANSHIP/MATERIALS

SITE CLEARANCE:
Before commencing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc.

EXCAVATION:
Excavate to reduced levels and remove surplus material from site.

Level and compact bottom of excavation to recieve concrete blinding layer/concrete foundation.

BLOCKWORK:
Solid concrete blocks to comply with B.S. 6073

Work size dimensions to be 440 (L) x 215 (H) x 100 (W) mm.

Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.

CONCRETE:
Blinding concrete to have a minimum crushing strength of 15N/sq.mm at 28 days.

Plinth/foundation concrete to have a minimum crushing strength of 35 N/sq.mm at 28 days.

Top surface of plinth to be level with smooth steel float finish.

REINFORCEMENT:
Concrete plinth to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom).

Steel fabric reinforcement to comply with B.S. 4483.

Steel bar reinforcement to comply with B.S. 4449.

Reinforcement to be free from all loose rust and mill scale.

Minimum cover to all reinforcement to be 40mm.

BACKFILLING:
Void in front of plinth to be backfilled with selected hardcore after protecting cables with min. 150mm stone dust.

HV SWITCHROOM DOORS:
Doors to be low maintenance GRP or hardwood with heavy-duty hold-open devices and concealed hinge fixings.

Supply and fit Union 1001 or similar locking arrangement to accept WPD suited 1 x 1 6 pin cylinder (supplied by WPD).

Supply and fit internal panic release mechanism to active leaf.

Doors to be 1 hour fire rated. See WPD performance specification for more information.

Minimum height of door opening to be 2.0 metres.

METERING ROOM DOORS:
Generally as above but consult meter operator for locking arrangement/requirements.

VENTILATION
The HV switchroom shall be designed to provide adequate ventilation and to prevent adverse levels of condensation likely to cause damage to the fabric of the structure and its contents or pose a risk to health and safety.

In the absence of detailed design data, the Customer is to afford ventilator grilles/ trickle vents/ other proprietary ventilators in accordance with the current edition of the Building Regulations.

No air conditioning/ cooling plant shall be installed within the substation.

CUSTOMER TO PROVIDE 230V SUPPLY.

DEPENDING ON EARTHING ARRANGEMENTS IT MAY BE NECESSARY TO INSTALL A 1:1 ISOLATION TRANSFORMER IN THE 230V SUPPLY - AS PER ST NC1V/2. REFER TO WPD PLANNER.

NOTE - THIS DRAWING IS ONLY TO BE READ IN CONJUNCTION WITH WPD DOCUMENT 'FUNCTIONAL AND PERFORMANCE SPECIFICATION FOR HIGH VOLTAGE SWITCHROOM'

Rev No	Drawn	Chk'd	App'd	Date	Revision
					ORIGINAL ISSUE
B	C.J.B.			01.13	NOTE REFERRING TO 230V SUPPLY ADDED.
A	C.J.B.			6.07.10	TRENCH WIDTH INCREASED FROM 900mm TO 1000mm.

		Date
Drawn	C.J.B.	06.04.09
Checked		
Approved		
SCALE: 1:25 (A1)		

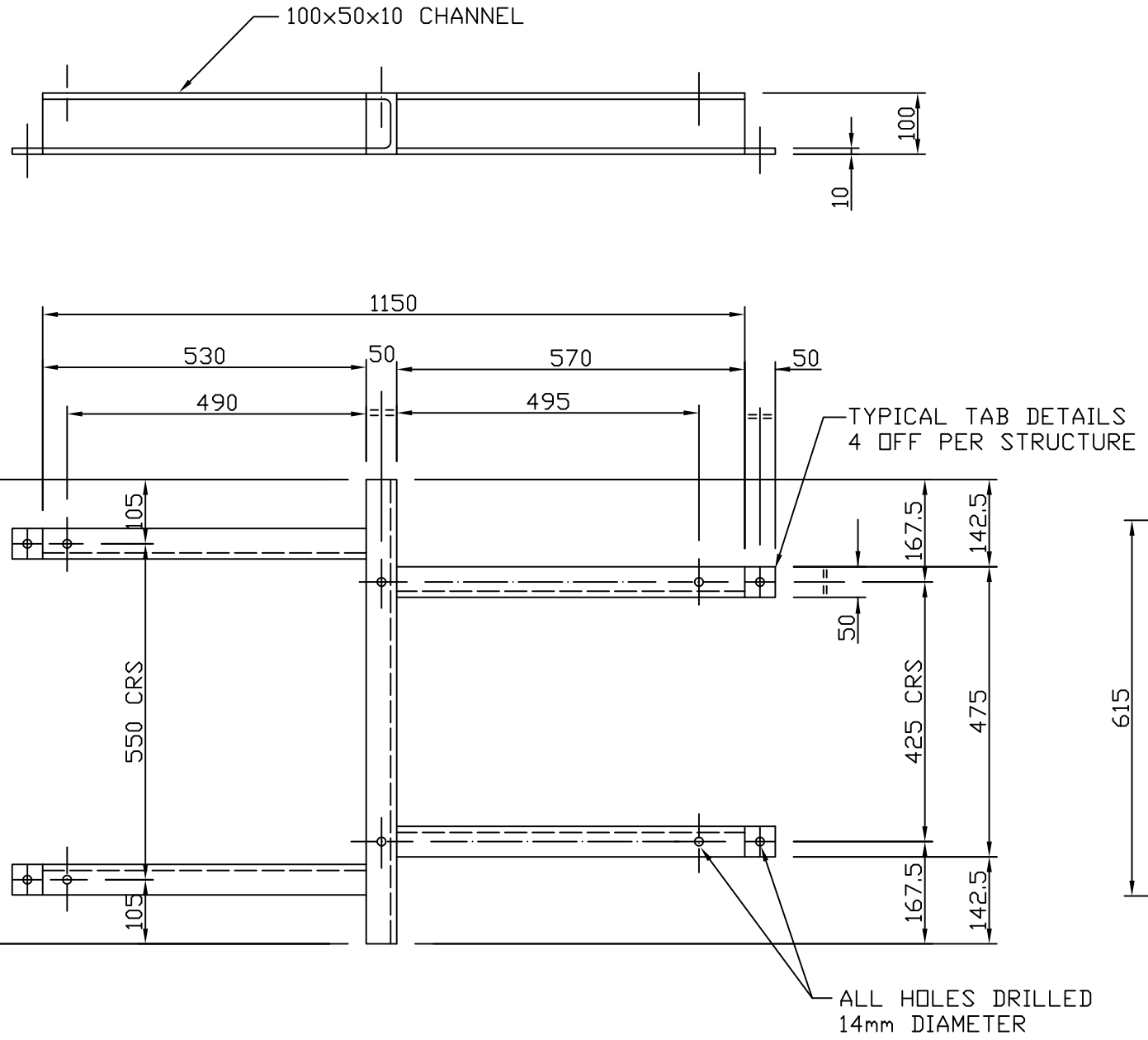
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

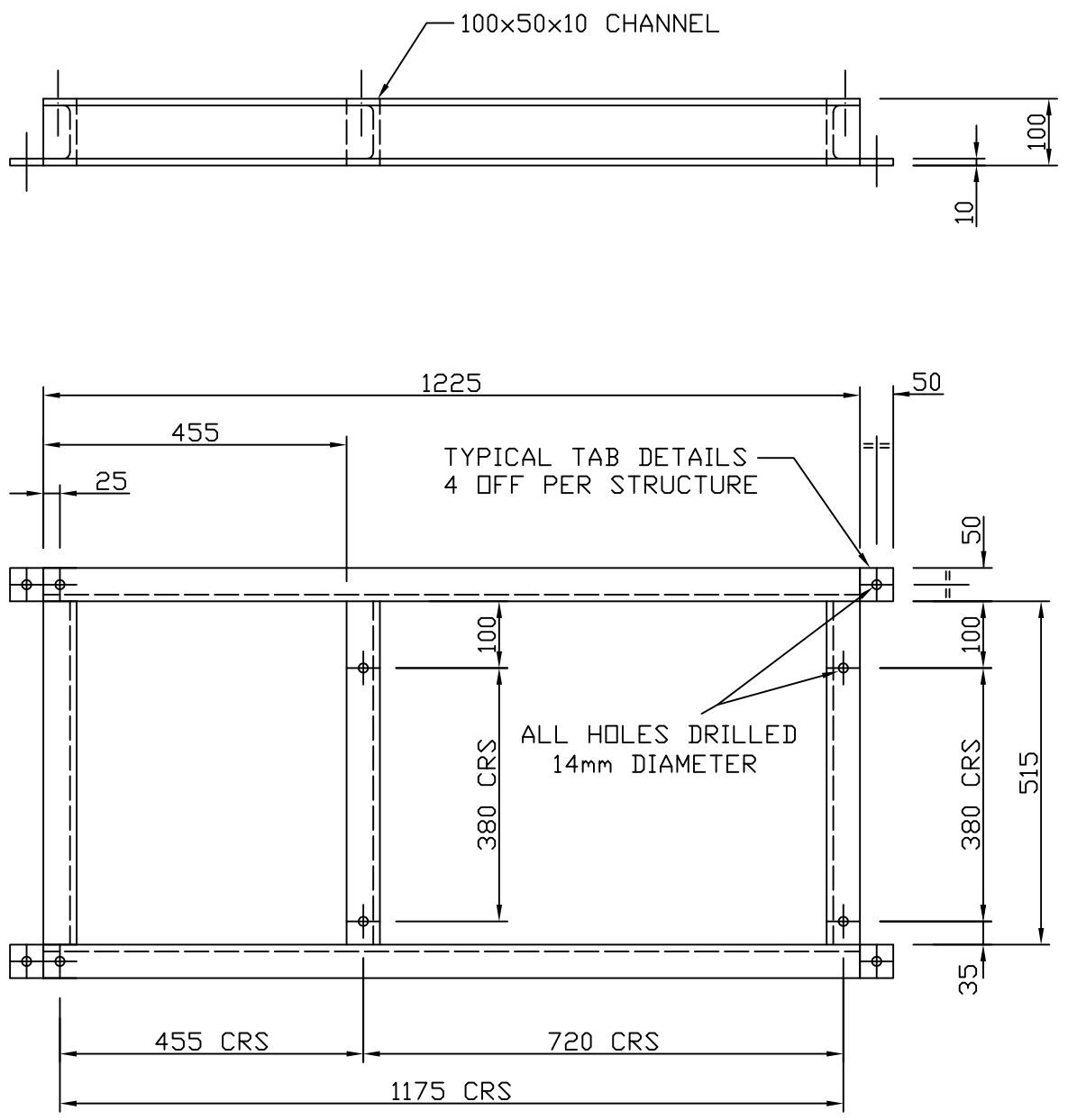
Title: FOUNDATION/ENCLOSURE DETAIL FOR HV INTAKE SUBSTATION (RING MAIN UNIT & METERING UNIT) CONSTRUCTION WORKS BY CUSTOMER.

Drg. No. EKV0018

Rev No. B



STEEL SUBFRAME FOR MERLIN GERIN RINGMASTER AND METER UNIT MKII.



STEEL SUBFRAME FOR CN2 SWITCH AND METER UNIT.

* THIS DRAWING DETAILS THE STEEL SUBFRAME ASSEMBLIES PROVIDED BY WPD PLANT CENTRE *

Rev No.	Drawn	Chk'd	App'd	Date	Revision

ORIGINAL ISSUE		Date
Drawn	C.J.B.	07.04.09
Checked		
Approved		
SCALE: 1:10 (A3)		

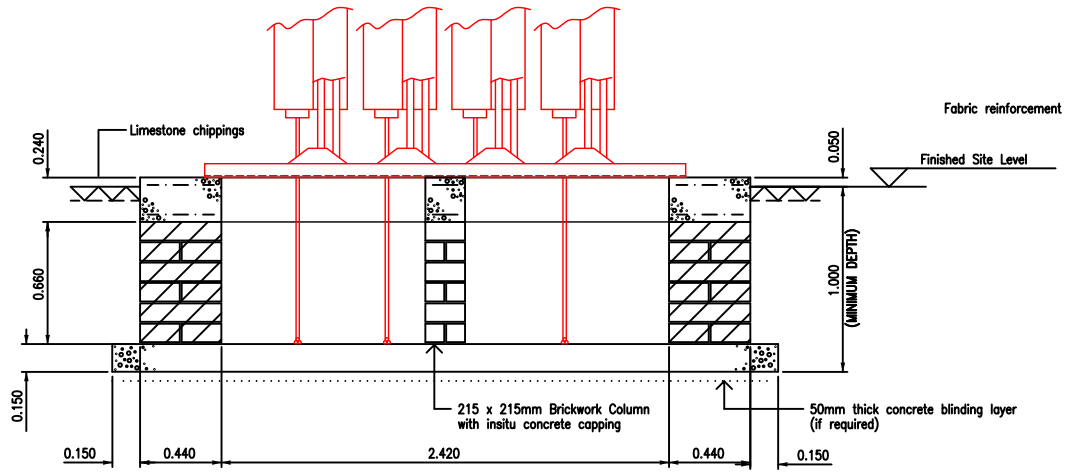
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

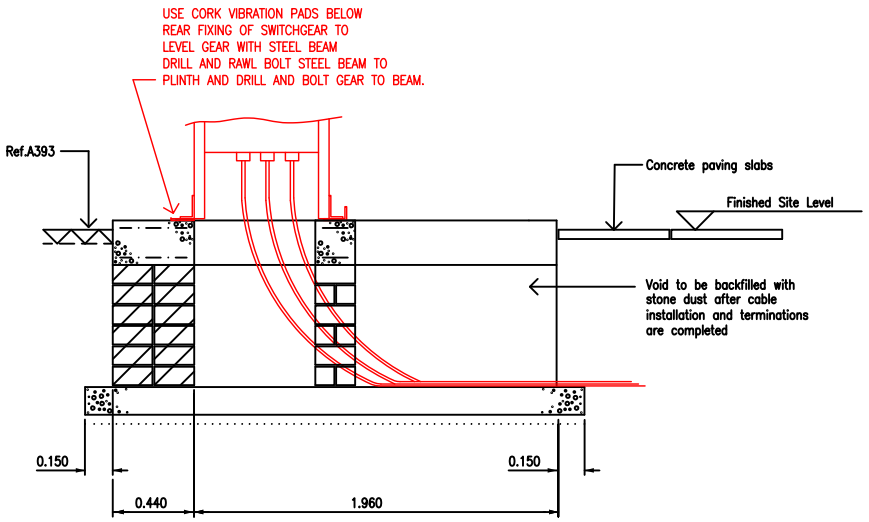
Title: STANDARD STEEL SUBFRAME DETAILS FOR RINGMASTER SWITCHGEAR.

Drg. No. EKV0019

Rev No.



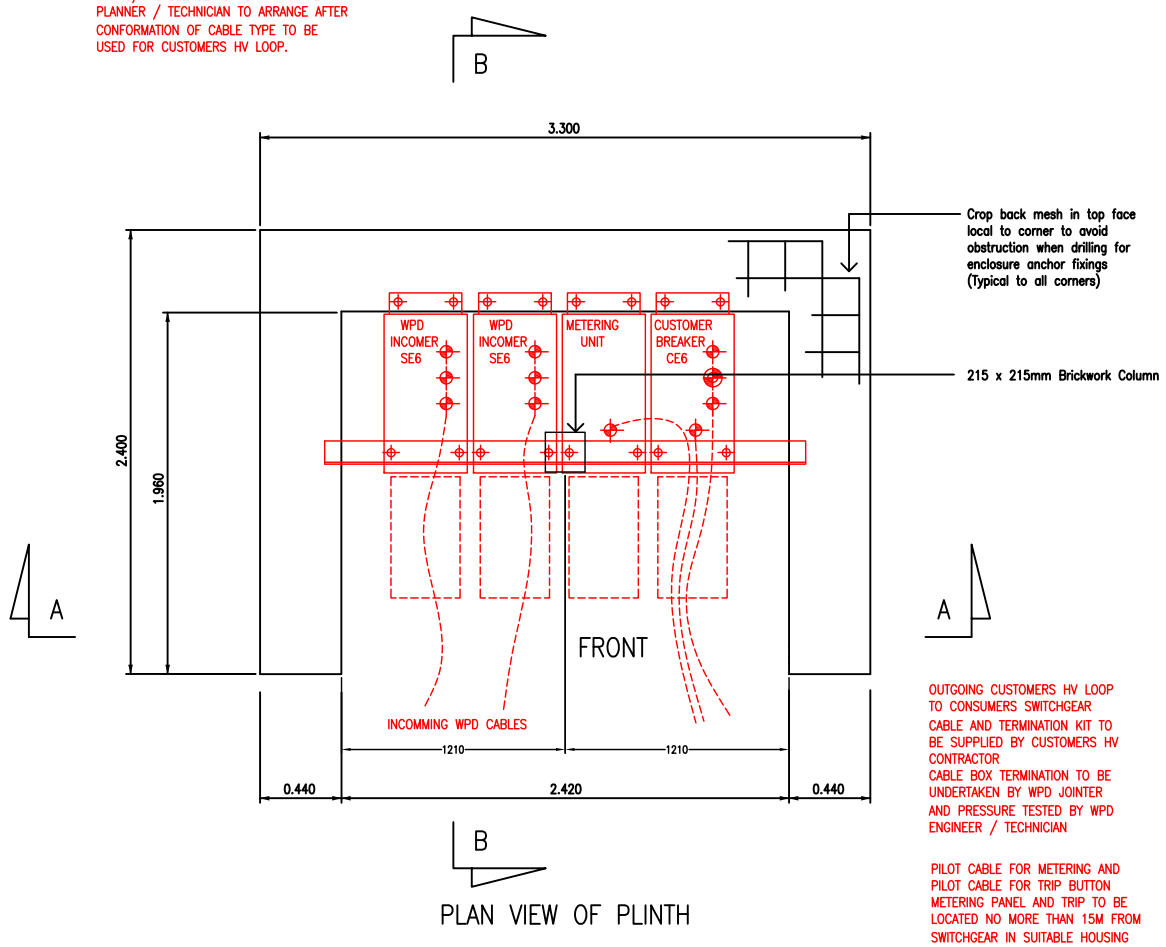
SECTION A–A



SECTION B–B

SWITCHGEAR
2 X MERLIN GERIN SE6 ISOLATORS
FITTED WITH STRAIGHT CABLE BOXES
AND 3 X 1C CEMBRE GLANDS
1 X MERLIN GERIN CE6 METERING CIRCUIT BREAKER
FITTED WITH STRAIGHT CABLE BOX
AND EITHER
3 X 1C CEMBRE GLANDS OR
1 X 3/C CABLE GLAND TOP HAT TYPE
PLANNER / TECHNICIAN TO ARRANGE AFTER
CONFORMATION OF CABLE TYPE TO BE
USED FOR CUSTOMERS HV LOOP.

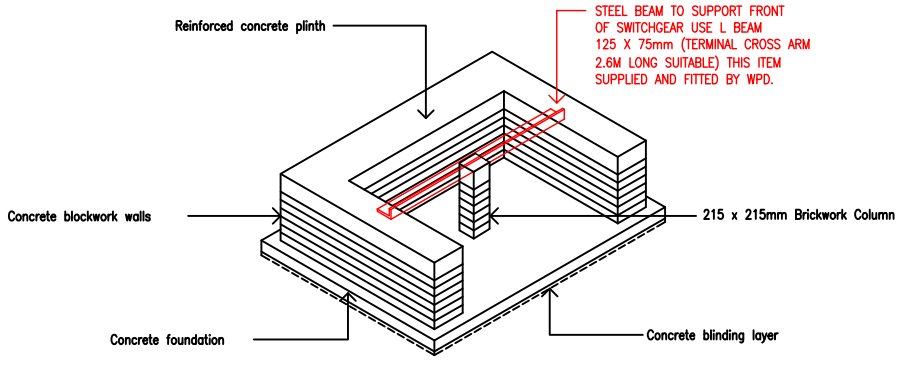
WPD CABLE BOXES SUPPLIED WITH
3 X SINGLE CORE ENTRY AND
CEMBRE PG42 PLASTIC GLANDS
METERING UNIT CABLE BOX TO BE
SUPPLIED WITH EITHER :–
3 X SINGLE CORE ENTRY AND
CEMBRE PG42 PLASTIC GLANDS
OR
1 X SINGLE 3/CORE CABLE GLAND
TOP HAT TYPE
DEPENDANT ON CABLE USED FOR
CUSTOMERS HV LOOP.



PLAN VIEW OF PLINTH

OUTGOING CUSTOMERS HV LOOP
TO CONSUMERS SWITCHGEAR
CABLE AND TERMINATION KIT TO
BE SUPPLIED BY CUSTOMERS HV
CONTRACTOR
CABLE BOX TERMINATION TO BE
UNDERTAKEN BY WPD JOINTER
AND PRESSURE TESTED BY WPD
ENGINEER / TECHNICIAN

PILOT CABLE FOR METERING AND
PILOT CABLE FOR TRIP BUTTON
METERING PANEL AND TRIP TO BE
LOCATED NO MORE THAN 15M FROM
SWITCHGEAR IN SUITABLE HOUSING
CONSULT PLANNER FOR REQUIREMENTS



ISOMETRIC VIEW OF PLINTH
(NOT TO SCALE)

CONSTRUCTION DETAILS

SITE CLEARANCE: Before commencing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc. and remove from same.

EXCAVATION: Excavate to reduced levels (or to firm foundation as directed by the Engineer) and remove spoil from site.

Level and compact bottom of excavation to recieve concrete blinding layer/concrete foundation.

BLOCKWORK: Solid concrete blocks to comply with B.S. 6073

Work size dimensions to be 440 (L) x 215 (H) x 100 (W) mm.

Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.

CONCRETE: Blinding concrete to be grade C15 with a minimum crushing strength of 15N/sq.mm at 28 days.

Plinth/foundation concrete to be grade C35 with a minimum crushing strength of 35 N/sq.mm at 28 days.

Top surface of plinth to be level with smooth steel float finish.

REINFORCEMENT: Concrete plinth to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom).

Steel fabric reinforcement to comply with B.S. 4483.

Steel bar reinforcement to comply with B.S. 4449.

Reinforcement to be free from all loose rust and mill scale.

Minimum cover to all reinforcement to be 40mm.

BACKFILLING: Void in front of plinth to be backfilled with selected hardcore after protecting cables with min. 150mm stone dust.

ON COMPLETION: Where applicable area between front of plinth and site boundary to be paved with 600 x 600 x 50 mm thick concrete paving slabs.

All remaining exposed ground surfaces within site boundary to be dressed with a 75 mm thick layer of clean limestone chippings.

GENERAL NOTES

No gas, water, telcoms or other stats equipment or fixtures are to be located in the near vicinity of WPD intake or substation.

All dimensions in metres unless otherwise stated.

The Contractors attention is drawn to the need for strict accuracy in setting out the foundation.

All lines and angles to be formed square, plumb and true.

WHERE A SUBSTATION PROVIDES SUPPLY TO A CUSTOMER THEN THE CUSTOMER MUST PROVIDE THIS 230V SUPPLY.

DEPENDING ON EARTHING ARRANGEMENTS IT MAY BE NECESSARY TO INSTALL A 1:1 ISOLATION TRANSFORMER IN THE 230V SUPPLY – AS PER ST NC1V/2. REFER TO WPD PLANNER.

Rev No	Drawn	Chk'd	App'd	Date	Revision
A	C.J.B.			7.9.11	ANTI–VANDAL ENCLOSURE RESIZED, FOUNDATION DEPTH REDUCED.

ORIGINAL ISSUE		Date
Drawn	C.J.B.	07.04.09
Checked		
Approved		

SCALE: N.T.S. (A1)

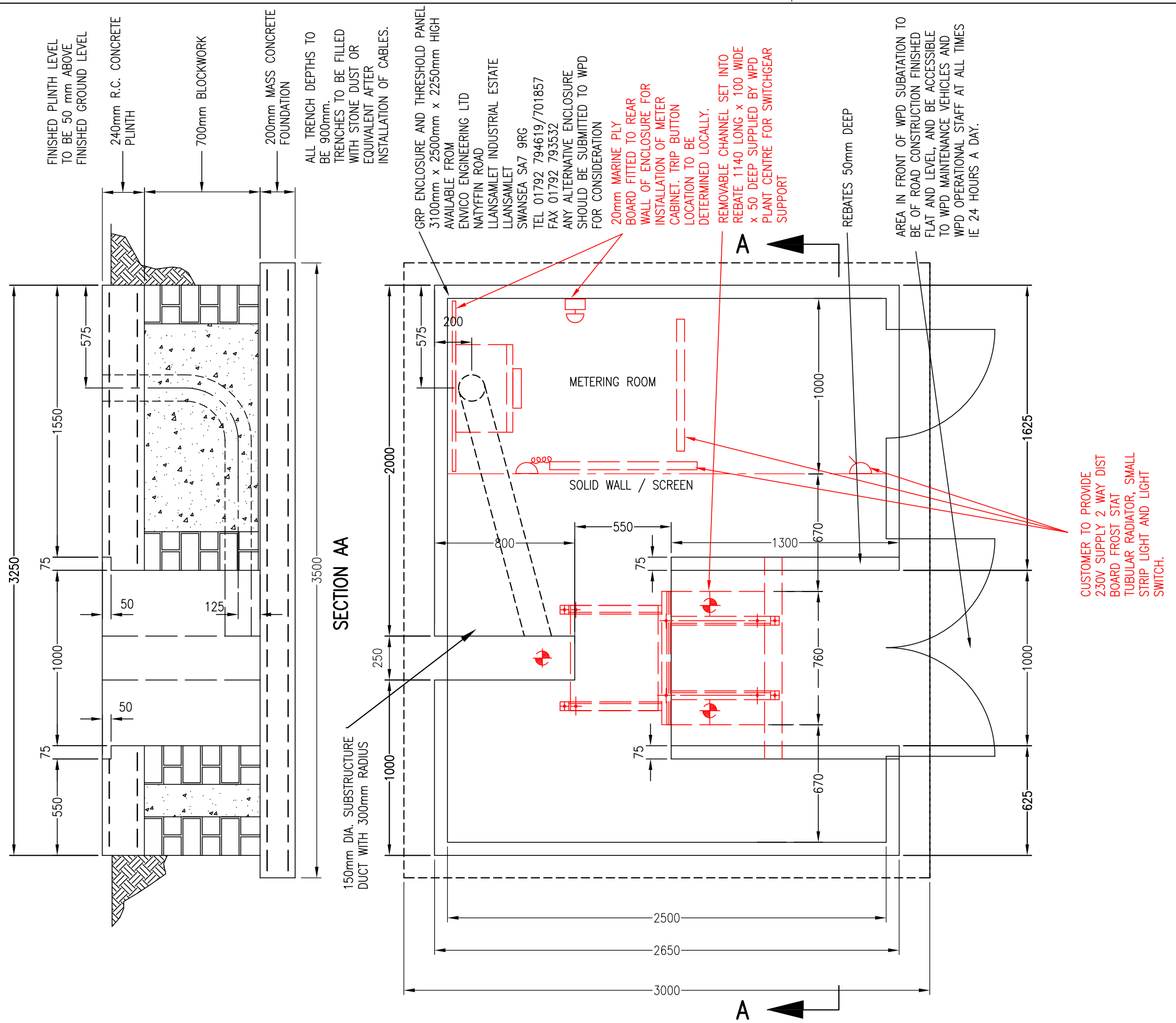
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

Title: HIGH VOLTAGE INTAKE (UP TO 400A–3.5MVA) USING M.G. EXTENSIBLE SWITCHGEAR IN GRP ENCLOSURE.

Drg. No. EKV0020

Rev No. A



SPECIFICATION OF PLINTH

SITE CLEARANCE
Before commencing excavation clear site of all rubbish, debri, shrubs, general vegetation, topsoil etc.

EXCAVATION
Excavate to reduced levels (or to firm foundation as directed by the engineer) and remove spoil from site. Level and compact bottom of excavation to receive concrete blinding layer/concrete foundation.

BLOCKWORK
Solid concrete blocks to comply with B.S. 6073
Work size dimensions to be 440(L) X 215(H) X 100(W)mm.
Concrete blocks to have minimum compressive strength of 7.0 N/sq.mm.

CONCRETE
Blinding concrete to have a minimum crushing strength of 15N/sq.mm at 28 days.
Plinth/foundation concrete to have a minimum crushing strength of 35N/sq.mm at 28 days.
Top surface of plinth to be level with steel float finish.

REINFORCEMENT
Concrete plinth to be reinforced with 2 No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom).
Steel fabric reinforcement to comply with B.S. 4483.
Steel bar reinforcement to comply with B.S. 4449.
Reinforcement to be free from all loose rust and mill scale.
Minimum cover to all reinforcement to be 40mm.

BACKFILLING
Void within plinth to be backfilled with well compacted hardcore (Type 1 or similar) and sand blinded.
Void in front of plinth to be back filled with selected hardcore after protecting cables with a minimum 150mm stone dust.

GENERAL NOTES
No GAS, WATER, BT or other stats fixtures are to be located near through or under the substation base.
The contractors attention is drawn to the need for strict accuracy in setting out the foundation.
All lines and angles to be formed square, plumb & true.
Any planning consents required are to be gained by the developer prior to comencement of works on site.
Vibration pads are to be fitted as standard practice beneath all transformers.
All dimendions are in millimetres unless otherwise stated.

DEPENDING ON EARTHING ARRANGEMENTS IT MAY BE NECESSARY TO INSTALL A 1:1 ISOLATION TRANSFORMER IN THE 230V SUPPLY – AS PER ST NC1V/2. REFER TO WPD PLANNER.

Rev No.	Drawn	Chk'd	App'd	Date	Revision
					ORIGINAL ISSUE
					Drawn C.J.B. 06.04.09
B	C.J.B.			01.13	NOTE REFERRING TO 230V SUPPLY ADDED.
A	C.J.B.			07.09	FOUNDATION FOR SEPARATE METERING ROOM
					REPLACES EXISTING DRAWING EKV0021.
					Checked / Approved / SCALE: 1:25 (A3)

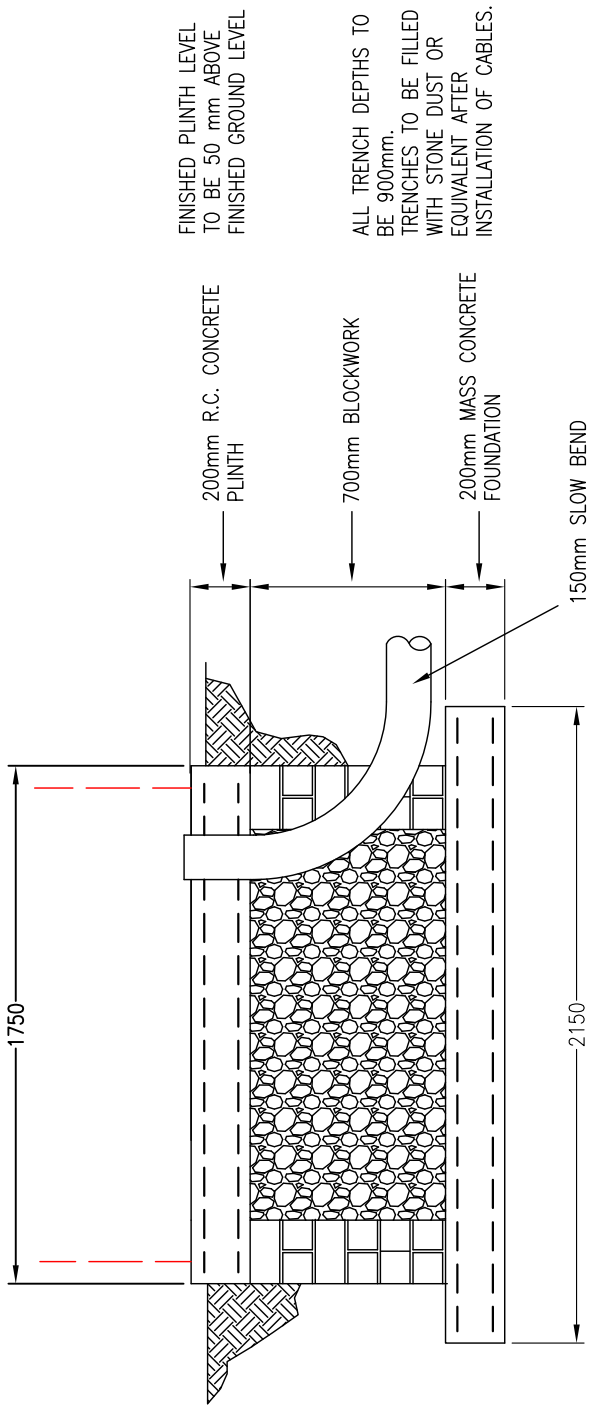
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

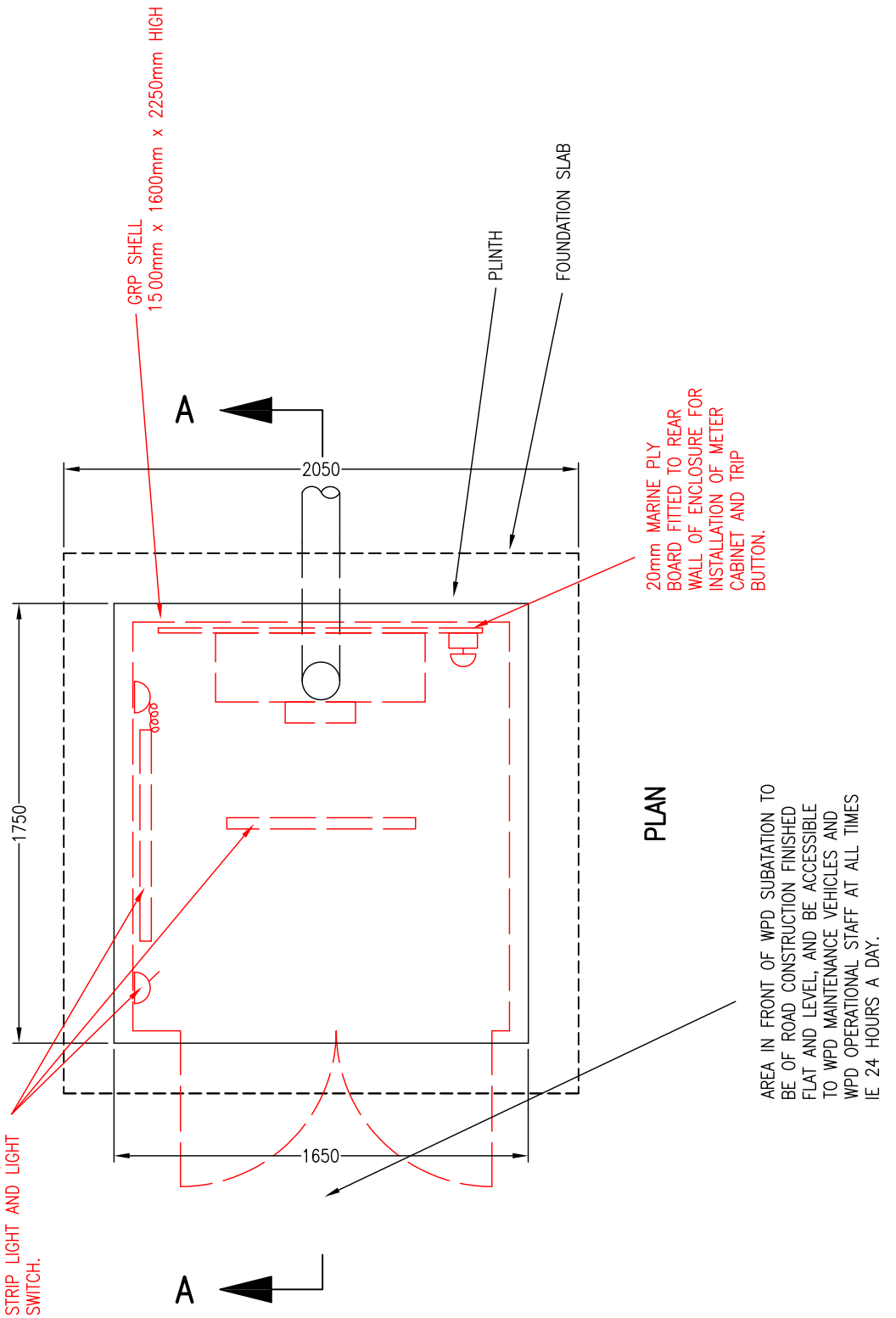
Title
FOUNDATION DETAIL FOR FREE-STANDING HV INTAKE S/S WITH METERING ROOM (RING MAIN UNIT AND METERING UNIT)

Drg. No. EKV0021

Rev No. B



SECTION A-A



PLAN

AREA IN FRONT OF WPD SUBATATION TO BE OF ROAD CONSTRUCTION FINISHED FLAT AND LEVEL, AND BE ACCESSIBLE TO WPD MAINTENANCE VEHICLES AND WPD OPERATIONAL STAFF AT ALL TIMES IE 24 HOURS A DAY.

SPECIFICATION OF PLINTH

SITE CLEARANCE
Before commencing excavation clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc.

EXCAVATION
Excavate to reduced levels (or to firm foundation as directed by the engineer) and remove spoil from site. Level and compact bottom of excavation to receive concrete blinding layer/concrete foundation.

BLOCKWORK
Solid concrete blocks to comply with B.S. 6073
Work size dimensions to be 440(L) X 215(H) X 100(W)mm.
Concrete blocks to have minimum compressive strength of 7.0 N/sq.mm.

CONCRETE
Blinding concrete to have a minimum crushing strength of 15N/sq.mm at 28 days.
Plinth/foundation concrete to have a minimum crushing strength of 35N/sq.mm at 28 days.
Top surface of plinth to be level with steel float finish.

REINFORCEMENT
Concrete plinth to be reinforced with 2 No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom).
Steel fabric reinforcement to comply with B.S. 4483.
Steel bar reinforcement to comply with B.S. 4449.
Reinforcement to be free from all loose rust and mill scale.
Minimum cover to all reinforcement to be 40mm.

BACKFILLING
Void within plinth to be backfilled with well compacted hardcore (Type 1 or similar) and sand blinded.
Void in front of plinth to be back filled with selected hardcore after protecting cables with a minimum 150mm stone dust.

GENERAL NOTES
No GAS, WATER, BT or other stats fixtures are to be located near through or under the substation base.
The contractors attention is drawn to the need for strict accuracy in setting out the foundation.
All lines and angles to be formed square, plumb & true.
Any planning consents required are to be gained by the developer prior to commencement of works on site.
Vibration pads are to be fitted as standard practice beneath all transformers.
All dimensions are in millimetres unless otherwise stated.

DEPENDING ON EARTHING ARRANGEMENTS IT MAY BE NECESSARY TO INSTALL A 1:1 ISOLATION TRANSFORMER IN THE 230V SUPPLY – AS PER ST NC1V/2. REFER TO WPD PLANNER.

Rev No.	Drawn	Chk'd	App'd	Date	Revision
					ORIGINAL ISSUE
					Drawn C.J.B. 21.04.09
					Checked
					Approved
A	C.J.B.			01.13	NOTE REFERRING TO 230V SUPPLY ADDED.

SCALE: 1:25 (A3)

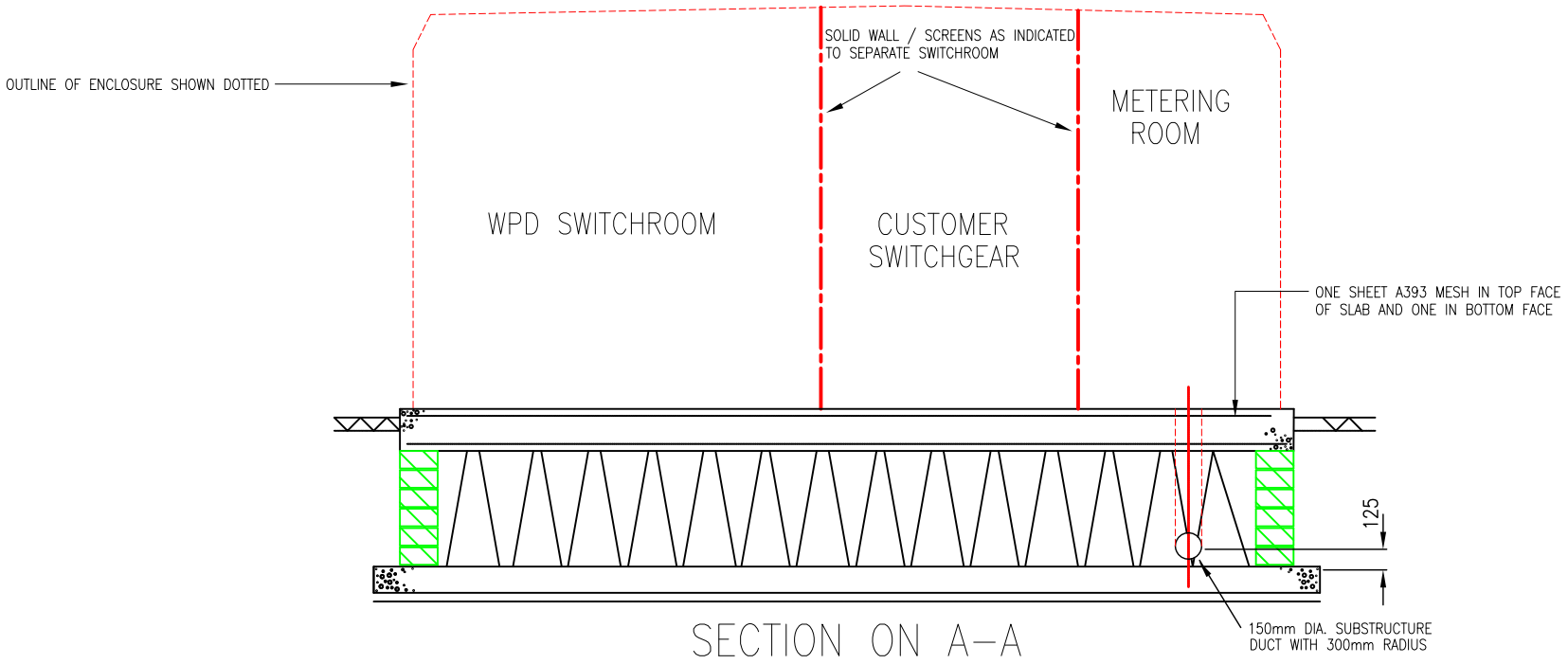
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

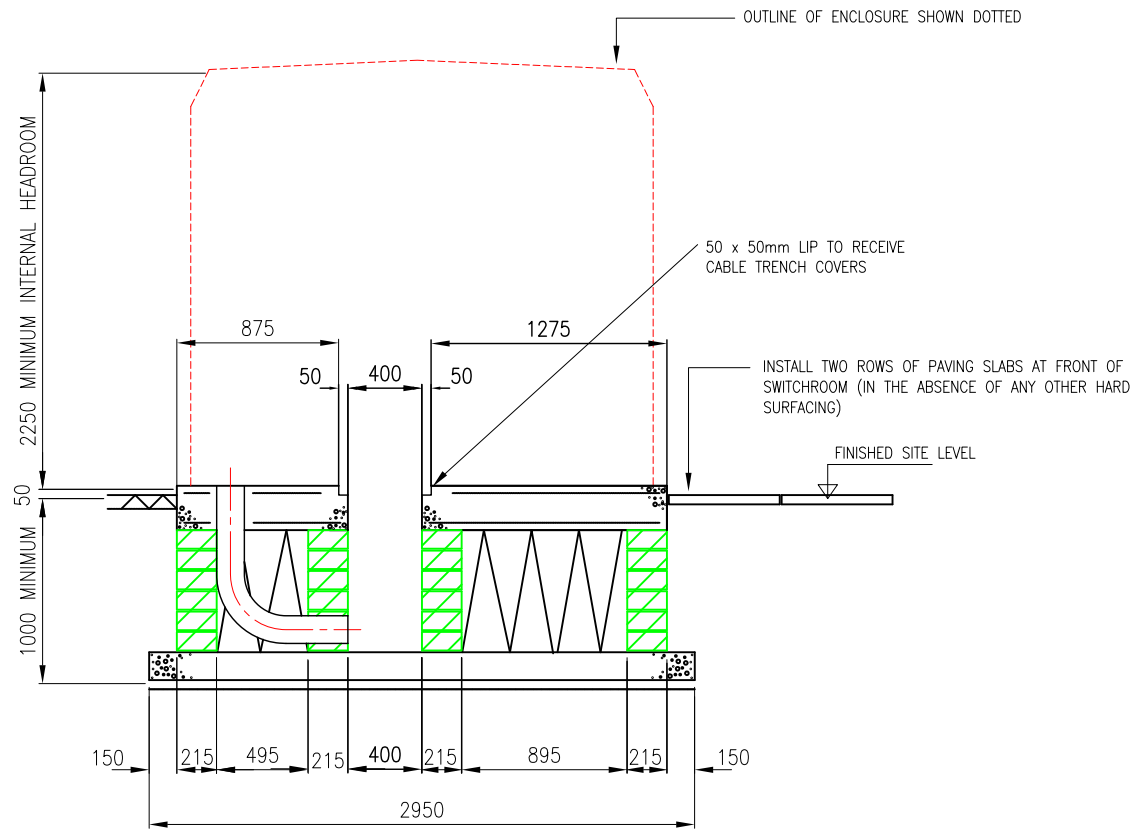
Title
PLINTH FOR FREESTANDING HV METERING CABINET AND EMERGENCY TRIP BUTTON IN GRP ENCLOSURE.

Drg. No. EKV0022

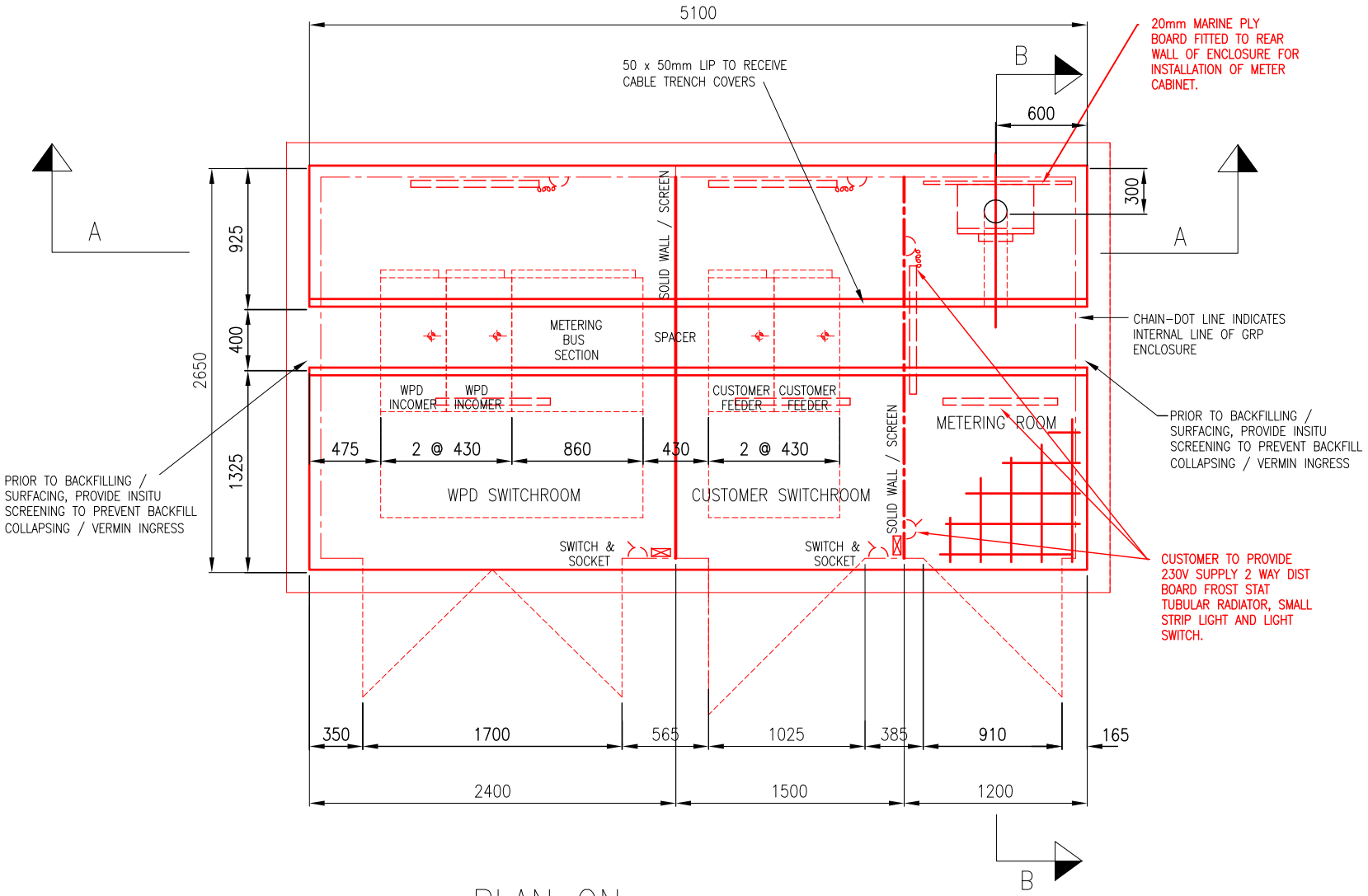
Rev No. A



SECTION ON A–A



SECTION ON B–B



PLAN ON SWITCHROOM

GENERAL NOTES

1 – THIS DRAWING TO BE READ IN CONJUNCTION WITH WPD DOCUMENT 'FUNCTIONAL/ PERFORMANCE SPECIFICATION FOR HIGH VOLTAGE SWITCHROOM' (OBTAINED BY LINKING FROM WPD STANDARD TECHNIQUES DOCUMENT ST NC1V/1).
2 – SEE ABOVE DOCUMENT FOR DETAILS OF LV ELECTRICAL REQUIREMENTS

SPECIFICATION:

SITE CLEARANCE: Before commencing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc. and remove from same.

EXCAVATION: Excavate to reduced levels (or to firm foundation as directed by the Engineer) and remove spoil from site.
Level and compact bottom of excavation to recieve concrete blinding layer/concrete foundation.

BLOCKWORK: Solid concrete blocks to comply with B.S. 6073
Work size dimensions to be 440 (L) x 215 (H) x 100 (W) mm.
Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.

CONCRETE: Blinding concrete to be grade C15 with a minimum crushing strength of 15N/sq.mm at 28 days.
Plinth/foundation concrete to be grade C35 with a minimum crushing strength of 35 N/sq.mm at 28 days.
Top surface of plinth to be level with smooth steel float finish.

REINFORCEMENT: Concrete plinth to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom).
Steel fabric reinforcement to comply with B.S. 4483.
Steel bar reinforcement to comply with B.S. 4449.
Reinforcement to be free from all loose rust and mill scale.
Minimum cover to all reinforcement to be 40mm.

ON COMPLETION: Where applicable area between front of plinth and site boundary to be paved with 600 x 600 x 50 mm thick concrete paving slabs.
with a 75 mm thick layer of clean limestone chippings.
All remaining exposed ground surfaces within site boundary to be dressed

DEPENDING ON EARTHING ARRANGEMENTS IT MAY BE NECESSARY TO INSTALL A 1:1 ISOLATION TRANSFORMER IN THE 230V SUPPLY – AS PER ST NC1V/2. REFER TO WPD PLANNER.

Rev No	Drawn	Chk'd	App'd	Date	Revision
B	C.J.B.			01.13	NOTE REFERRING TO 230V SUPPLY ADDED.
A	C.J.B.			09.09	BASE TOTALLY RE–DESIGNED DUE TO CHANGE OF CABLE SPEC.

ORIGINAL ISSUE — Date
Drawn C.J.B. 7.04.09
Checked
Approved
SCALE: 1:20

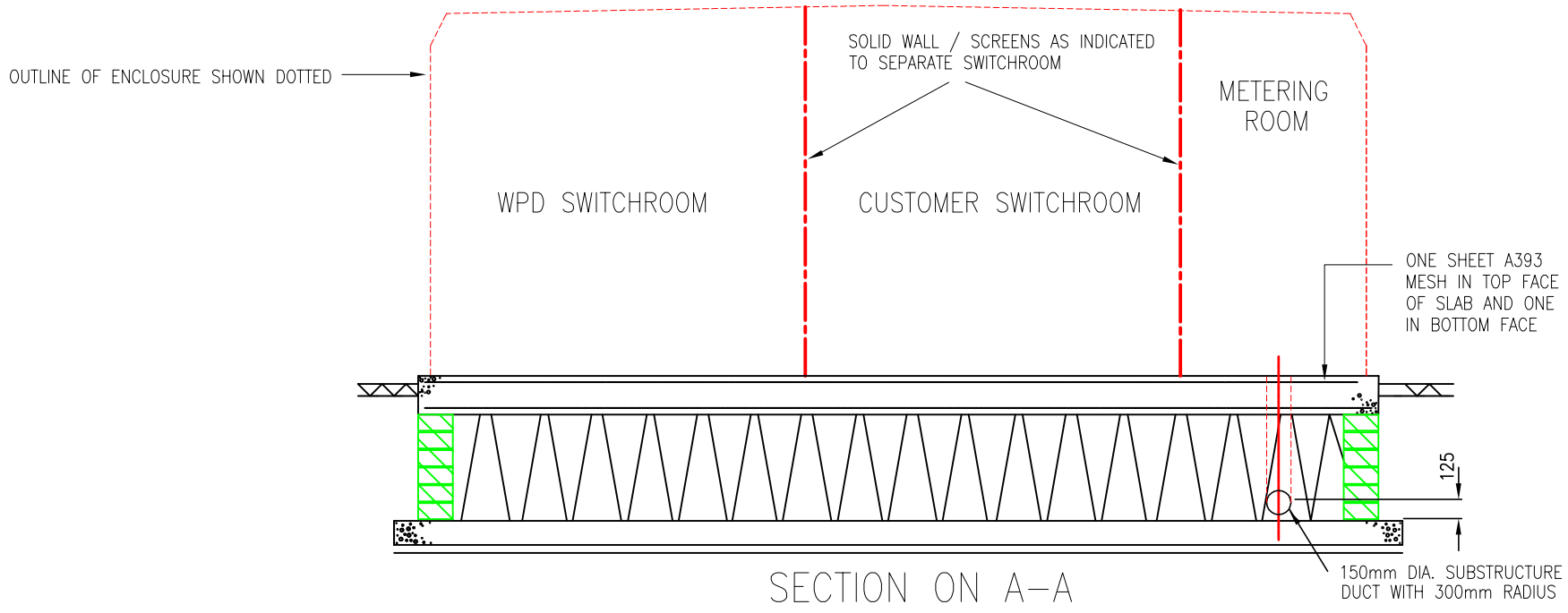
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

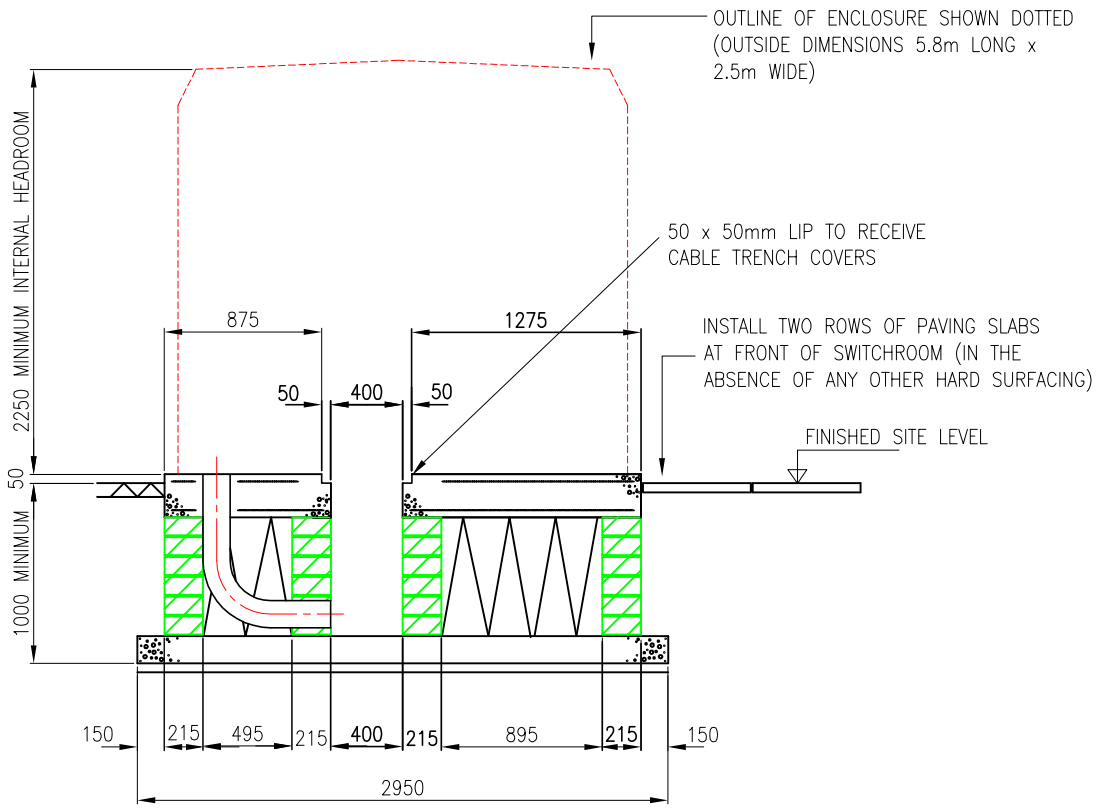
Title: SUBSTRUCTURE DETAIL FOR 5 PANEL 11kV EXTENSIBLE RINGMASTER SWITCHGEAR

Drg. No. EKV0024

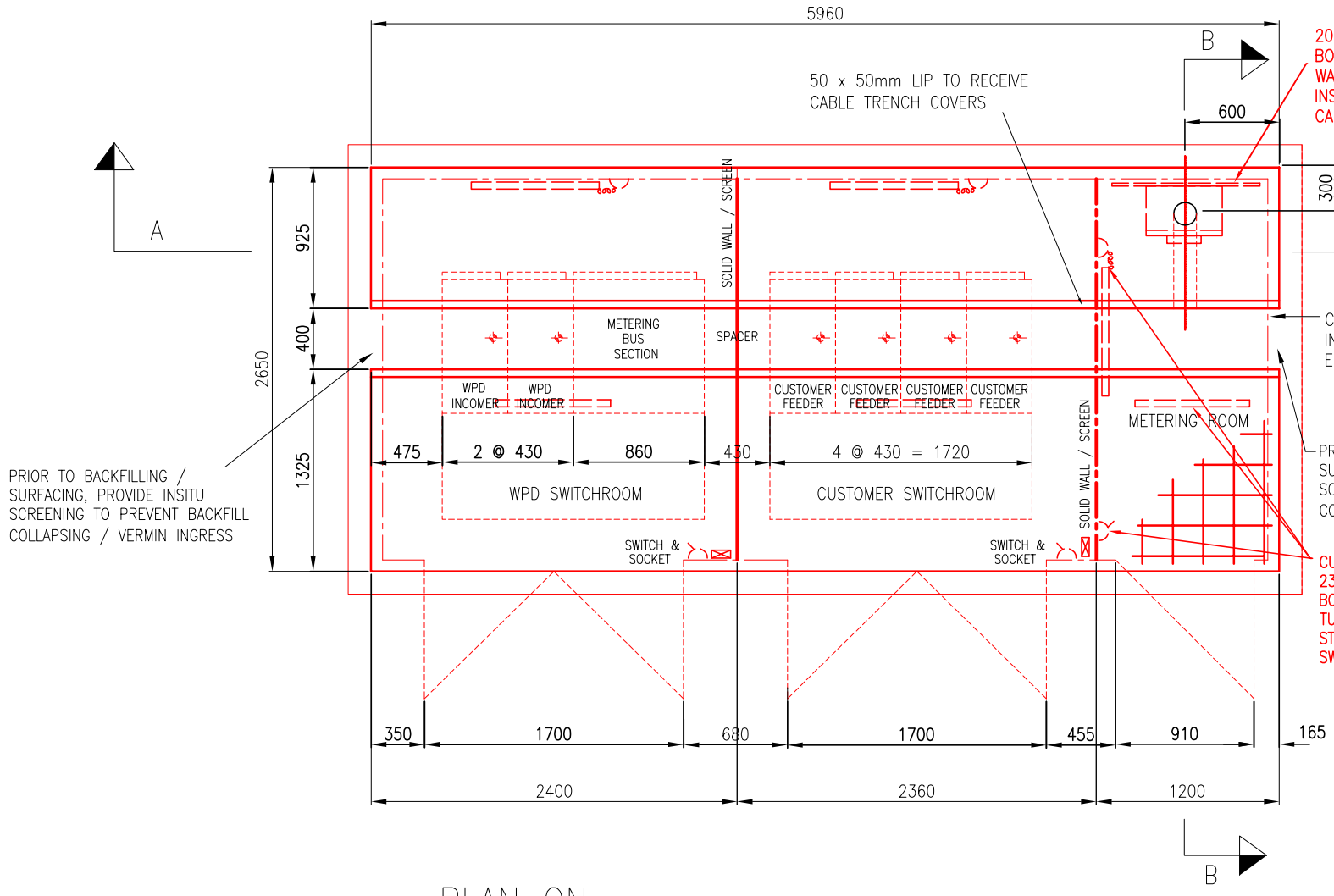
Rev No. B



SECTION ON A–A



SECTION ON B–B



PLAN ON SWITCHROOM

GENERAL NOTES

1 – THIS DRAWING TO BE READ IN CONJUNCTION WITH WPD DOCUMENT 'FUNCTIONAL/ PERFORMANCE SPECIFICATION FOR HIGH VOLTAGE SWITCHROOM' (OBTAINED BY LINKING FROM WPD STANDARD TECHNIQUES DOCUMENT ST NC1V/1).
2 – SEE ABOVE DOCUMENT FOR DETAILS OF LV ELECTRICAL REQUIREMENTS

SPECIFICATION:

SITE CLEARANCE:	Before commencing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc. and remove from same.
EXCAVATION:	Excavate to reduced levels (or to firm foundation as directed by the Engineer) and remove spoil from site. Level and compact bottom of excavation to recieve concrete blinding layer/concrete foundation.
BLOCKWORK:	Solid concrete blocks to comply with B.S. 6073 Work size dimensions to be 440 (L) x 215 (H) x 100 (W) mm. Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.
CONCRETE:	Blinding concrete to be grade C15 with a minimum crushing strength of 15N/sq.mm at 28 days. Plinth/foundation concrete to be grade C35 with a minimum crushing strength of 35 N/sq.mm at 28 days. Top surface of plinth to be level with smooth steel float finish.
REINFORCEMENT:	Concrete plinth to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom). Steel fabric reinforcement to comply with B.S. 4483. Steel bar reinforcement to comply with B.S. 4449. Reinforcement to be free from all loose rust and mill scale. Minimum cover to all reinforcement to be 40mm.
ON COMPLETION:	Where applicable area between front of plinth and site boundary to be paved with 600 x 600 x 50 mm thick concrete paving slabs. with a 75 mm thick layer of clean limestone chippings. All remaining exposed ground surfaces within site boundary to be dressed

DEPENDING ON EARTHING ARRANGEMENTS IT MAY BE NECESSARY TO INSTALL A 1:1 ISOLATION TRANSFORMER IN THE 230V SUPPLY – AS PER ST NC1V/2. REFER TO WPD PLANNER.

Rev No	Drawn	Chk'd	App'd	Date	Revision
					ORIGINAL ISSUE
B	C.J.B.			01.13	NOTE REFERRING TO 230V SUPPLY ADDED.
A	C.J.B.			09.09	BASE TOTALLY RE–DESIGNED DUE TO CHANGE OF CABLE SPEC.

Date: Drawn C.J.B. 7.04.09; Checked; Approved
SCALE: 1:20

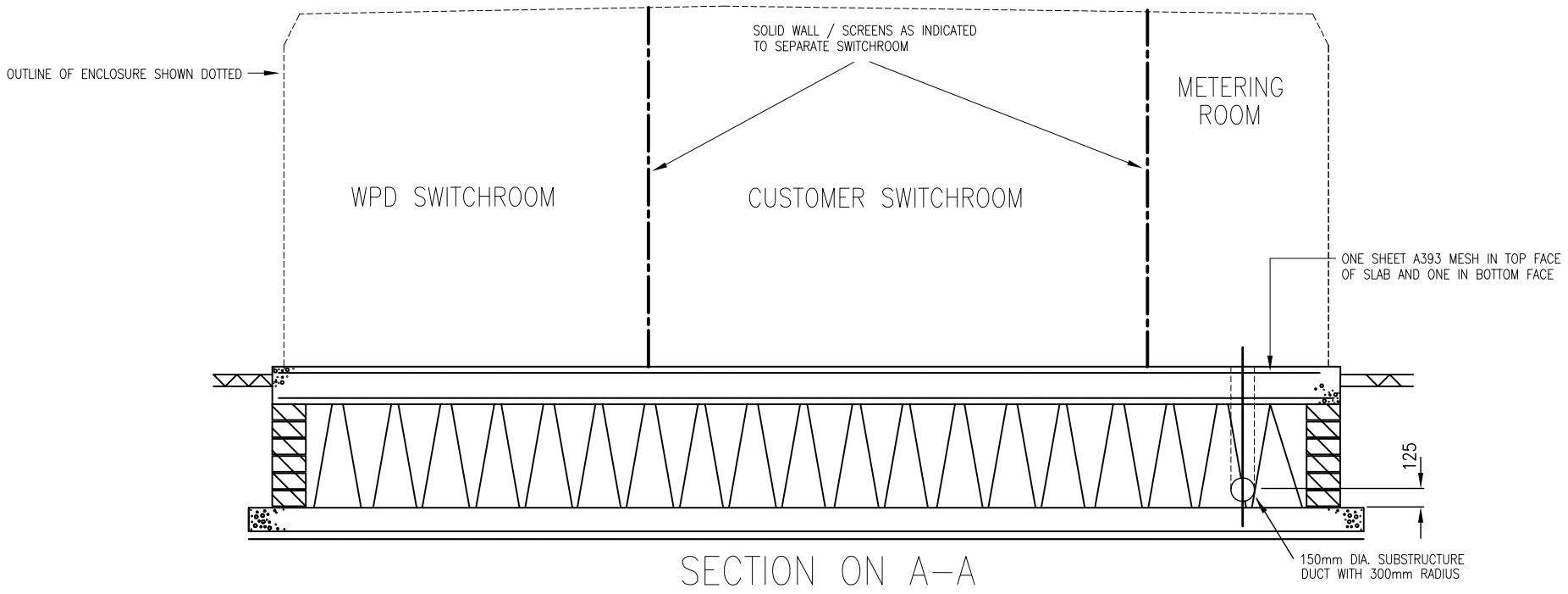
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

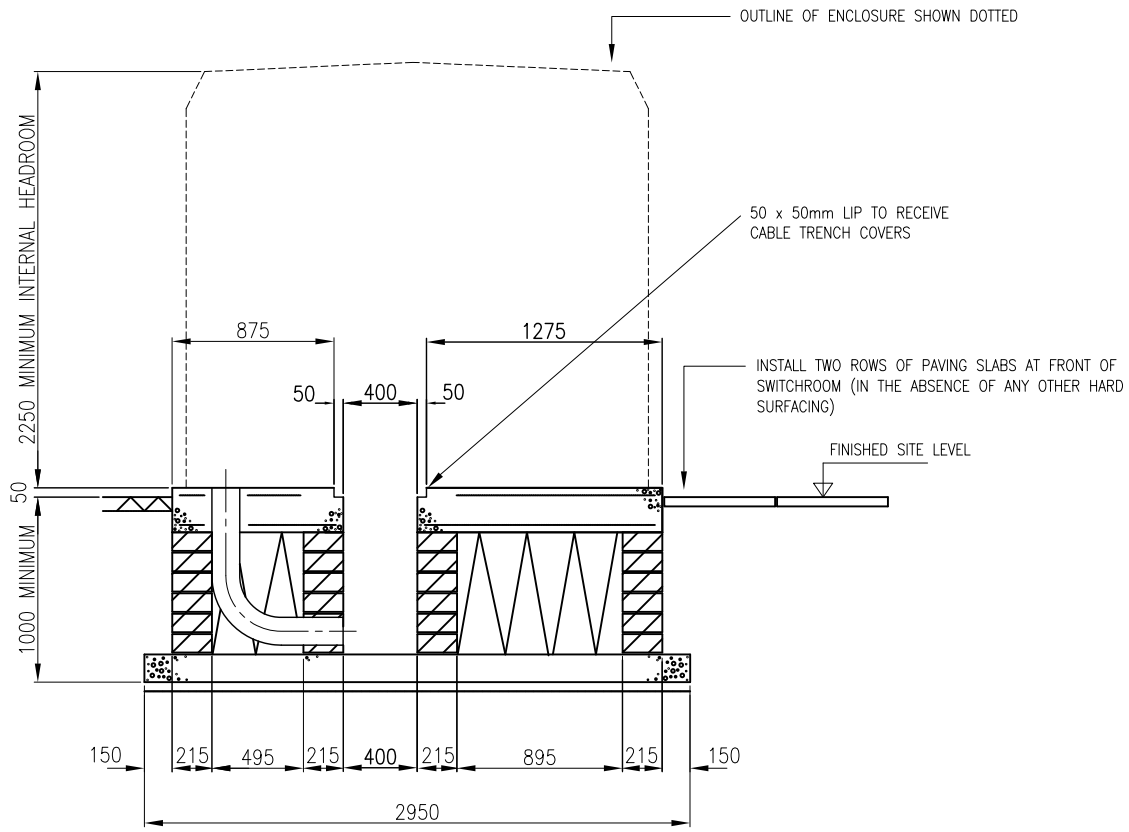
Title: SUBSTRUCTURE DETAIL FOR 7 PANEL 11kV EXTENSIBLE RINGMASTER SWITCHGEAR

Drg. No. EKV0025

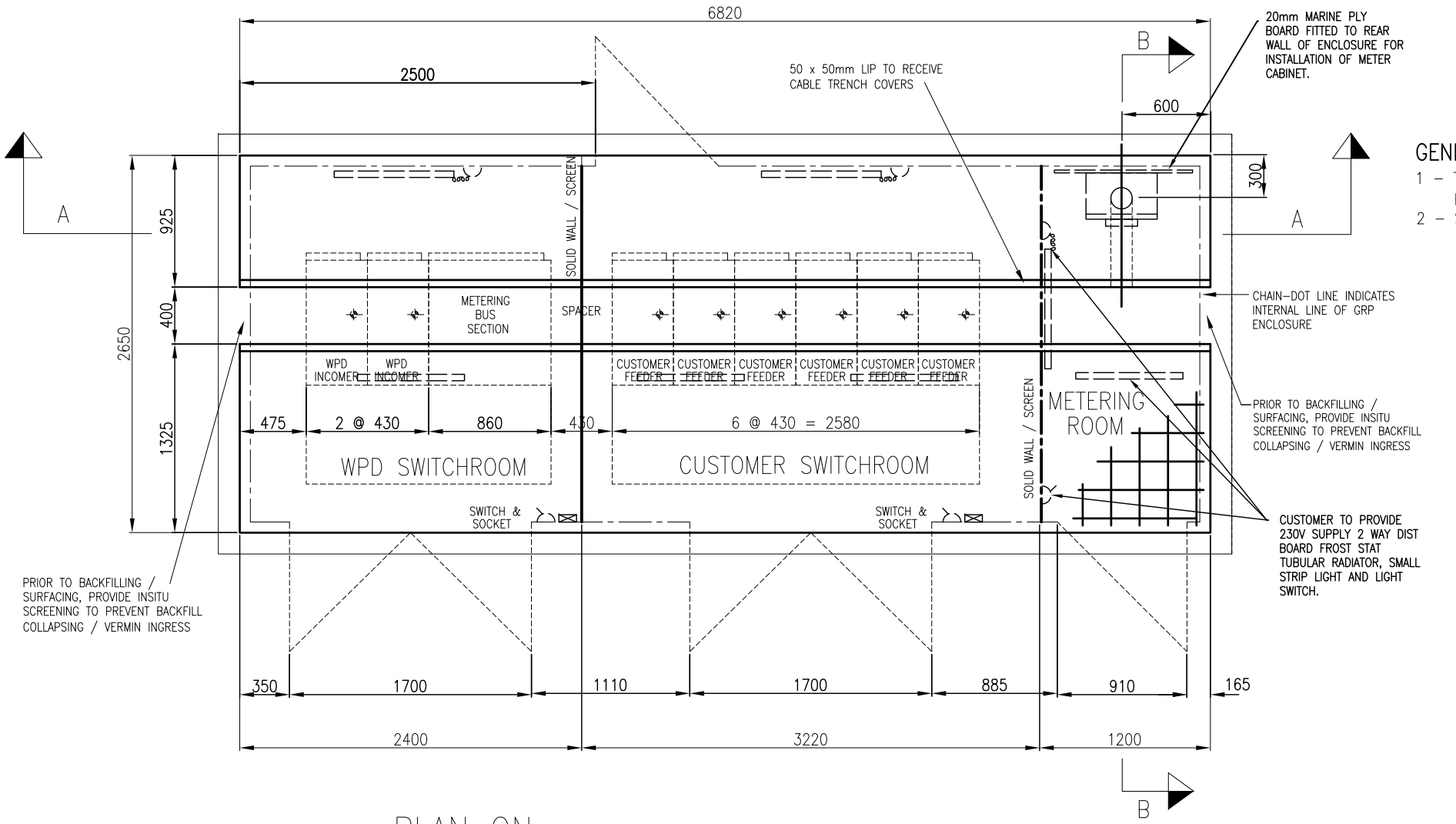
Rev No. B



SECTION ON A–A



SECTION ON B–B



PLAN ON SWITCHROOM

GENERAL NOTES

1 – THIS DRAWING TO BE READ IN CONJUNCTION WITH WPD DOCUMENT 'FUNCTIONAL/ PERFORMANCE SPECIFICATION FOR HIGH VOLTAGE SWITCHROOM' (OBTAINED BY LINKING FROM WPD STANDARD TECHNIQUES DOCUMENT ST NC1V/1).
2 – SEE ABOVE DOCUMENT FOR DETAILS OF LV ELECTRICAL REQUIREMENTS

SPECIFICATION:

SITE CLEARANCE:	Before commencing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc. and remove from same.
EXCAVATION:	Excavate to reduced levels (or to firm foundation as directed by the Engineer) and remove spoil from site. Level and compact bottom of excavation to recieve concrete blinding layer/concrete foundation.
BLOCKWORK:	Solid concrete blocks to comply with B.S. 6073 Work size dimensions to be 440 (L) x 215 (H) x 100 (W) mm. Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.
CONCRETE:	Blinding concrete to be grade C15 with a minimum crushing strength of 15N/sq.mm at 28 days. Plinth/foundation concrete to be grade C35 with a minimum crushing strength of 35 N/sq.mm at 28 days. Top surface of plinth to be level with smooth steel float finish.
REINFORCEMENT:	Concrete plinth to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom). Steel fabric reinforcement to comply with B.S. 4483. Steel bar reinforcement to comply with B.S. 4449. Reinforcement to be free from all loose rust and mill scale. Minimum cover to all reinforcement to be 40mm.
ON COMPLETION:	Where applicable area between front of plinth and site boundary to be paved with 600 x 600 x 50 mm thick concrete paving slabs. with a 75 mm thick layer of clean limestone chippings. All remaining exposed ground surfaces within site boundary to be dressed

DEPENDING ON EARTHING ARRANGEMENTS IT MAY BE NECESSARY TO INSTALL A 1:1 ISOLATION TRANSFORMER IN THE 230V SUPPLY – AS PER ST NC1V/2. REFER TO WPD PLANNER.

Rev No	Drawn	Chk'd	App'd	Date	Revision
C	C.J.B.			01.13	NOTE REFERRING TO 230V SUPPLY ADDED.
B	C.J.B.			02.12	PANIC DOOR ADDED TO REAR OF CUSTOMER FEEDERS.
A	C.J.B.			09.09	BASE TOTALLY RE–DESIGNED DUE TO CHANGE OF CABLE SPEC.

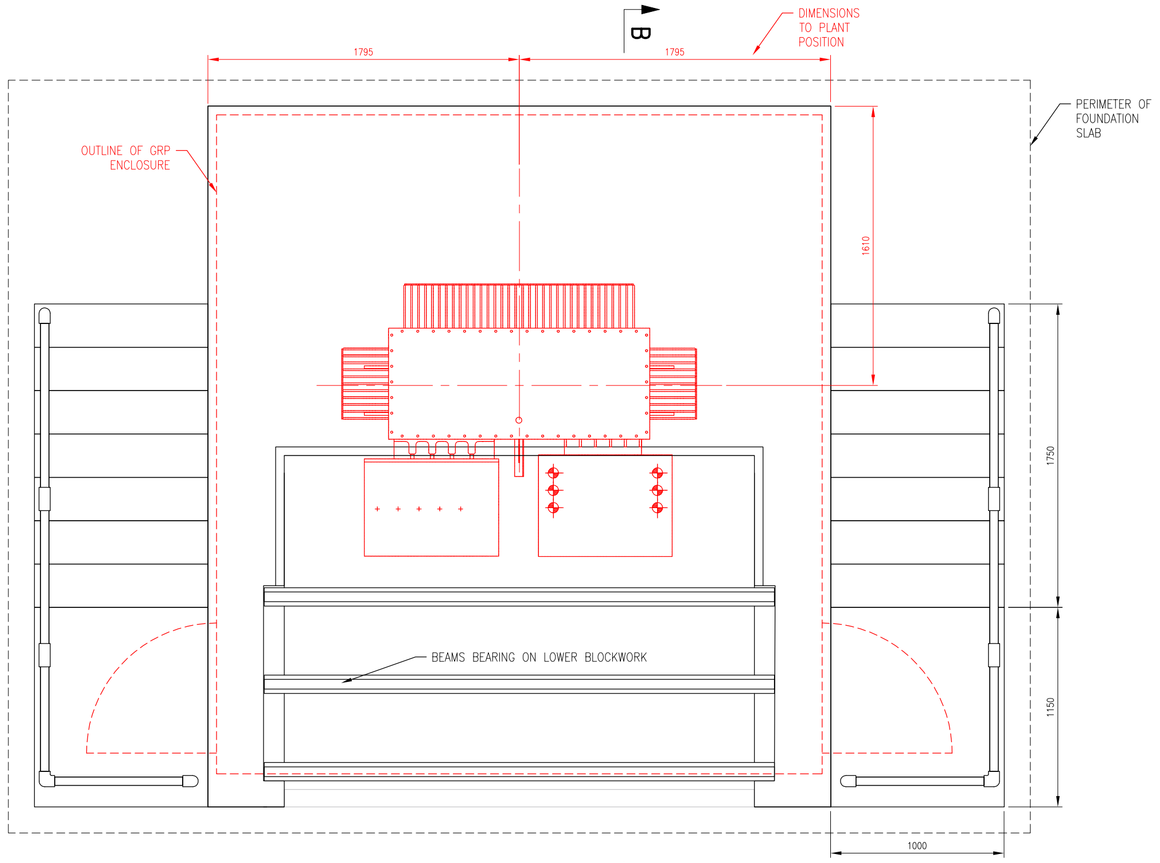
ORIGINAL ISSUE — Drawn C.J.B. 7.04.09; Checked; Approved; SCALE: 1:20

WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

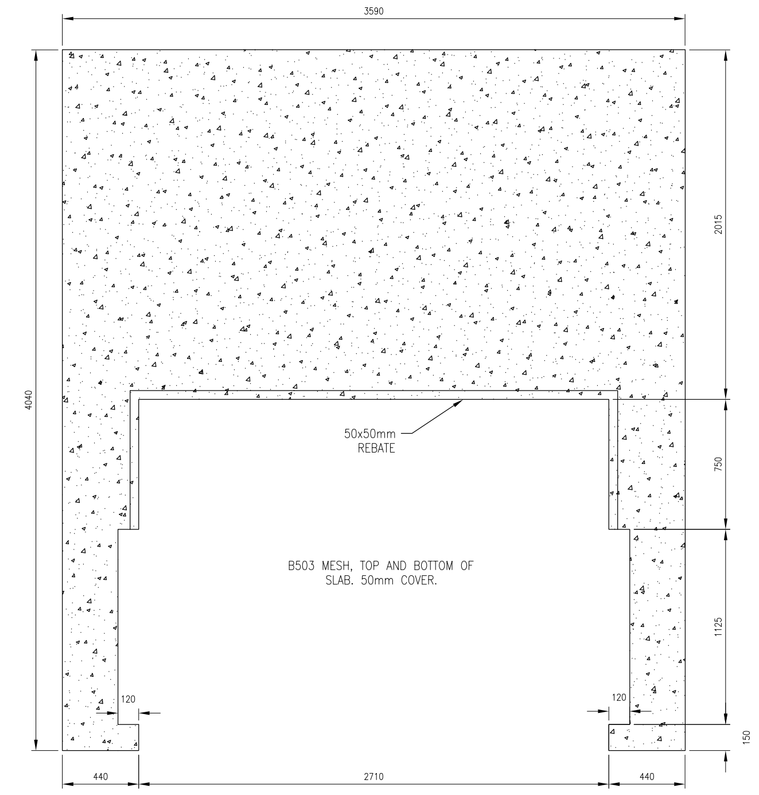
WESTERN POWER DISTRIBUTION

Title: SUBSTRUCTURE DETAIL FOR 9 PANEL 11kV EXTENSIBLE RINGMASTER SWITCHGEAR

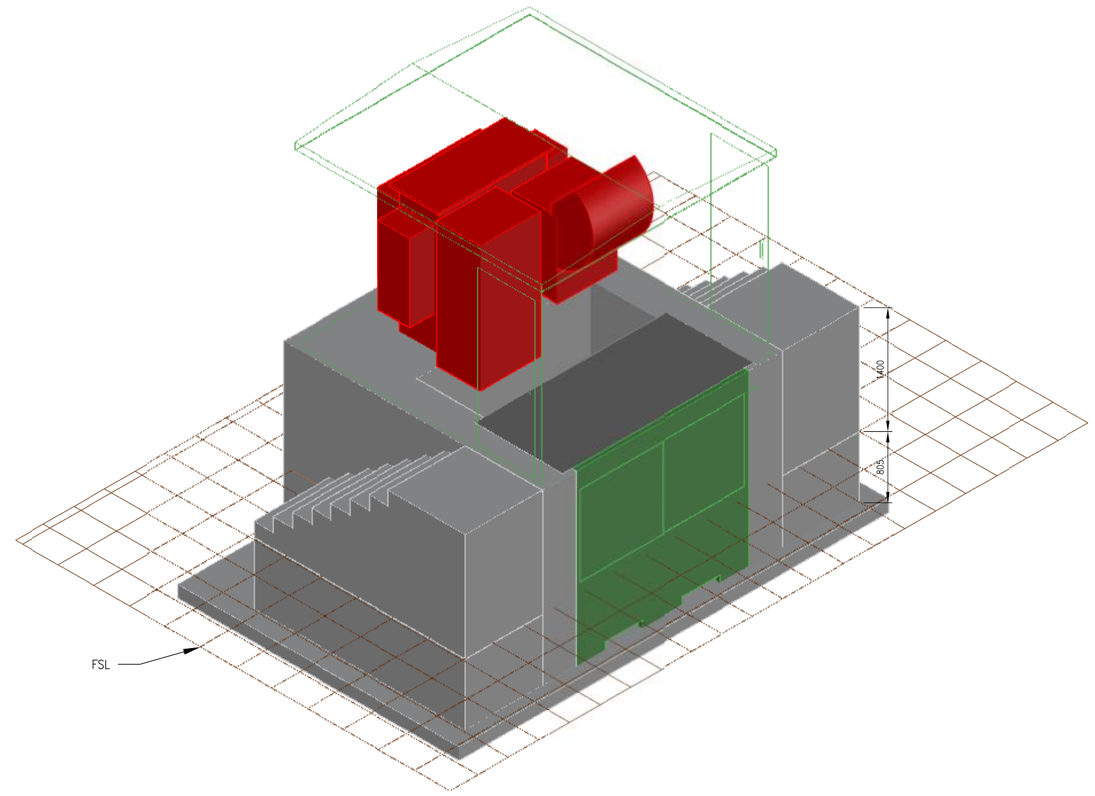
Drg. No. EKV0026 | Rev No. C



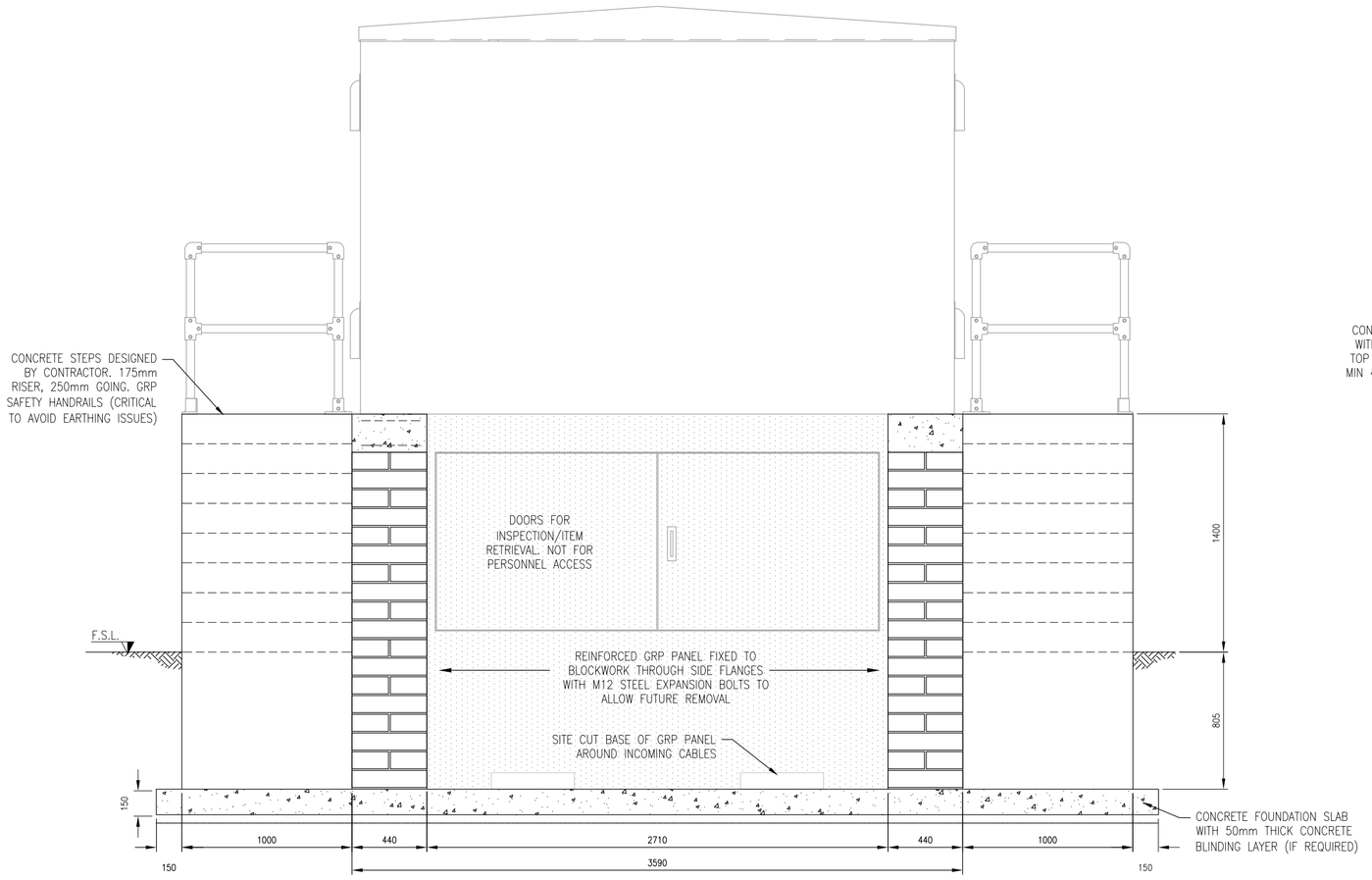
PLAN VIEW
(SCALE: 1:25 @A1)



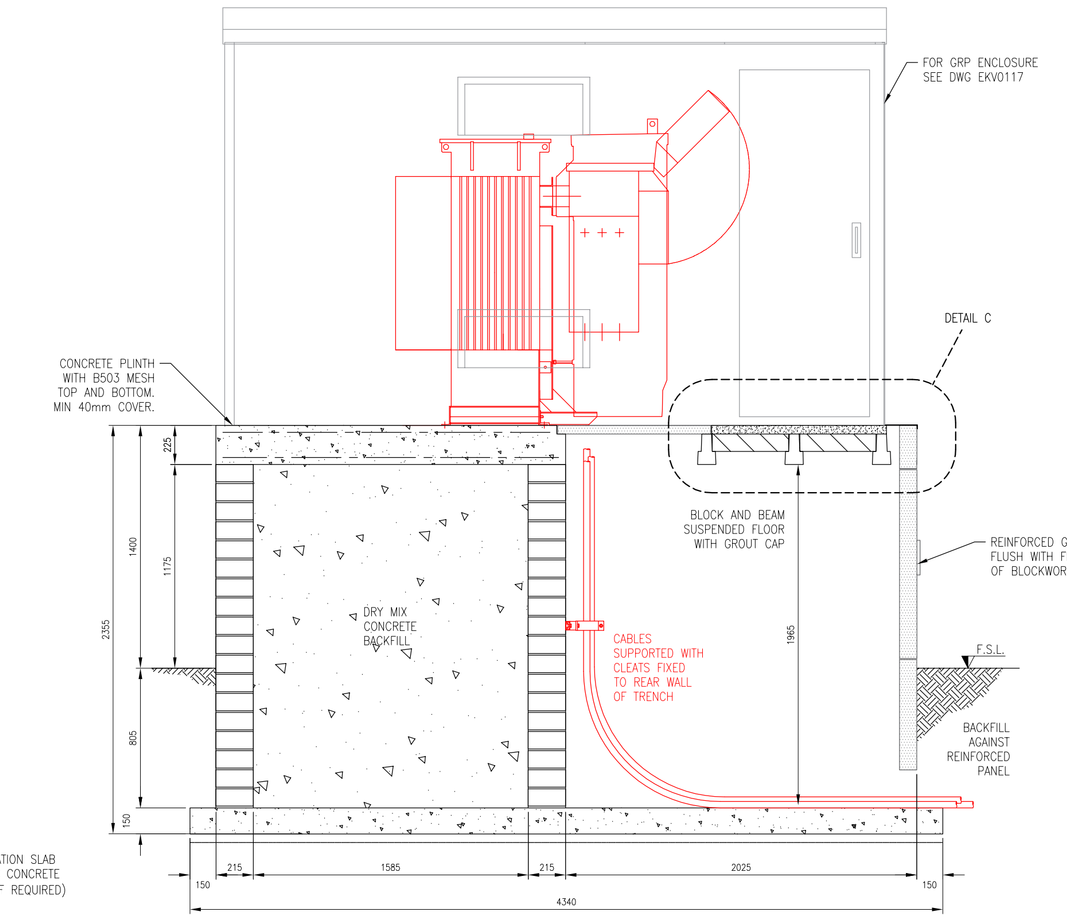
PLINTH DETAIL
(SCALE: 1:25 @A1)



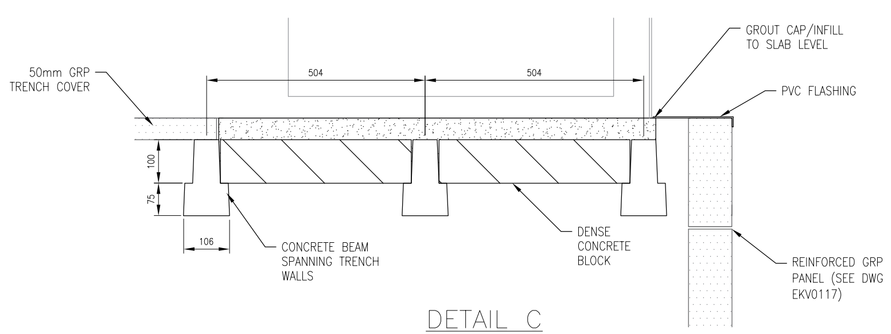
ISOMETRIC VIEW
(SCALE: DNS @A1)



VIEW ON A
(SCALE: 1:25 @A1)



SECTION B–B
(SCALE: 1:25 @A1)



DETAIL C
(SCALE: 1:10 @A1)

SPECIFICATION:

SITE CLEARANCE:

BEFORE COMMENCING EXCAVATIONS, CLEAR SITE OF ALL RUBBISH, DEBRIS, SHRUBS, GENERAL VEGETATION, TOPSOIL ETC. AND REMOVE FROM SAME.

EXCAVATION:

EXCAVATE TO REDUCED LEVELS (OR TO FIRM FOUNDATION AS DIRECTED BY THE ENGINEER) AND REMOVE SPOIL FROM SITE.

LEVEL AND COMPACT BOTTOM OF EXCAVATION TO RECIEVE CONCRETE BLINDING LAYER/CONCRETE FOUNDATION.

BLOCKWORK:

SOLID CONCRETE BLOCKS TO COMPLY WITH B.S. 6073

WORK SIZE DIMENSIONS TO BE 440 (L) X 215 (H) X 100 (W) MM.

CONCRETE BLOCKS TO HAVE A MINIMUM COMPRESSIVE STRENGTH OF 7.0 N/SQ.MM.

CONCRETE:

BLINDING CONCRETE TO BE GRADE C15 WITH A MINIMUM CRUSHING STRENGTH OF 15N/SQ.MM AT 28 DAYS.

PLINTH/FOUNDATION CONCRETE TO BE GRADE C35 WITH A MINIMUM CRUSHING STRENGTH OF 35 N/SQ.MM AT 28 DAYS.

TOP SURFACE OF PLINTH TO BE LEVEL WITH SMOOTH STEEL FLOAT FINISH.

REINFORCEMENT:

CONCRETE PLINTH TO BE REINFORCED WITH 2NO. LAYERS OF STEEL FABRIC REINFORCEMENT REF. B503 (PLACED TOP AND BOTTOM).

STEEL FABRIC REINFORCEMENT TO COMPLY WITH B.S. 4483.

STEEL BAR REINFORCEMENT TO COMPLY WITH B.S. 4449.

REINFORCEMENT TO BE FREE FROM ALL LOOSE RUST AND MILL SCALE.

MINIMUM COVER TO ALL REINFORCEMENT TO BE 40MM.

BACKFILLING:

VOID IN FRONT OF PLINTH TO BE BACKFILLED WITH SELECTED HARDCORE AFTER PROTECTING CABLES WITH MIN. 150MM STONE DUST.

ON COMPLETION:
AREA IN FRONT OF PLINTH TO BE OF ROADWAY CONSTRUCTION FINISHED FLAT AND LEVEL.

ALL REMAINING EXPOSED GROUND SURFACES WITHIN SITE BOUNDARY TO BE DRESSED WITH A 75 MM THICK LAYER OF CLEAN LIMESTONE CHIPPINGS.

GENERAL NOTES:

THIS FOUNDATION IS CONFIGURED TO RECEIVE A GRP ENCLOSURE AND REINFORCED PANEL AS DETAILED ON DRG EKV0117

VIBRATION PADS MUST BE USED ON ALL TRANSFORMERS.

THE CONTRACTORS ATTENTION IS DRAWN TO THE NEED FOR STRICT ACCURACY IN SETTING OUT THE FOUNDATION.

ALL LINES AND ANGLES TO BE FORMED SQUARE, PLUMB AND TRUE.

Rev No	Drawn	Chk'd	App'd	Date	Revision
2	CJW			120318	PLINTH DETAIL AMENDED, HANDRAILS INDICATED
1	CJW			230218	COMPLETE REDESIGN

ORIGINAL ISSUE — Date
Drawn — CJB — 080409
Checked
Approved
SCALE: As shown @A1

WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

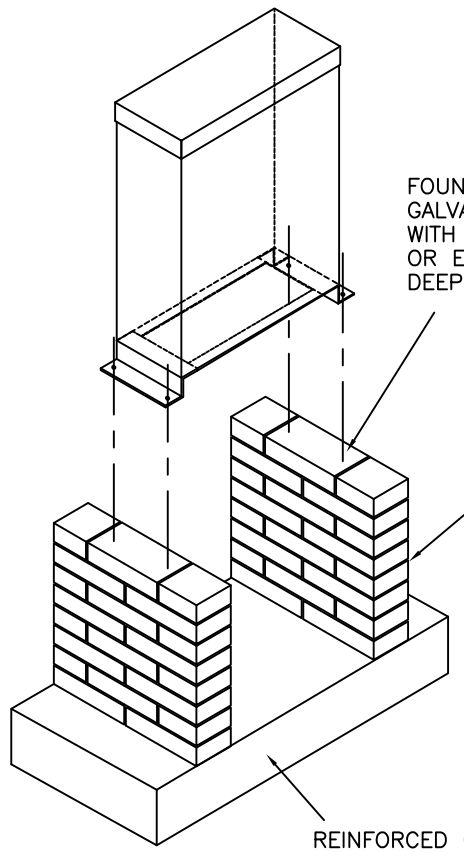
WESTERN POWER DISTRIBUTION

Title: 11kV STANDARD DRAWINGS
GENERAL ARRANGEMENT OF RAISED FLOOD RESISTANT SUB UP TO 1000KVA

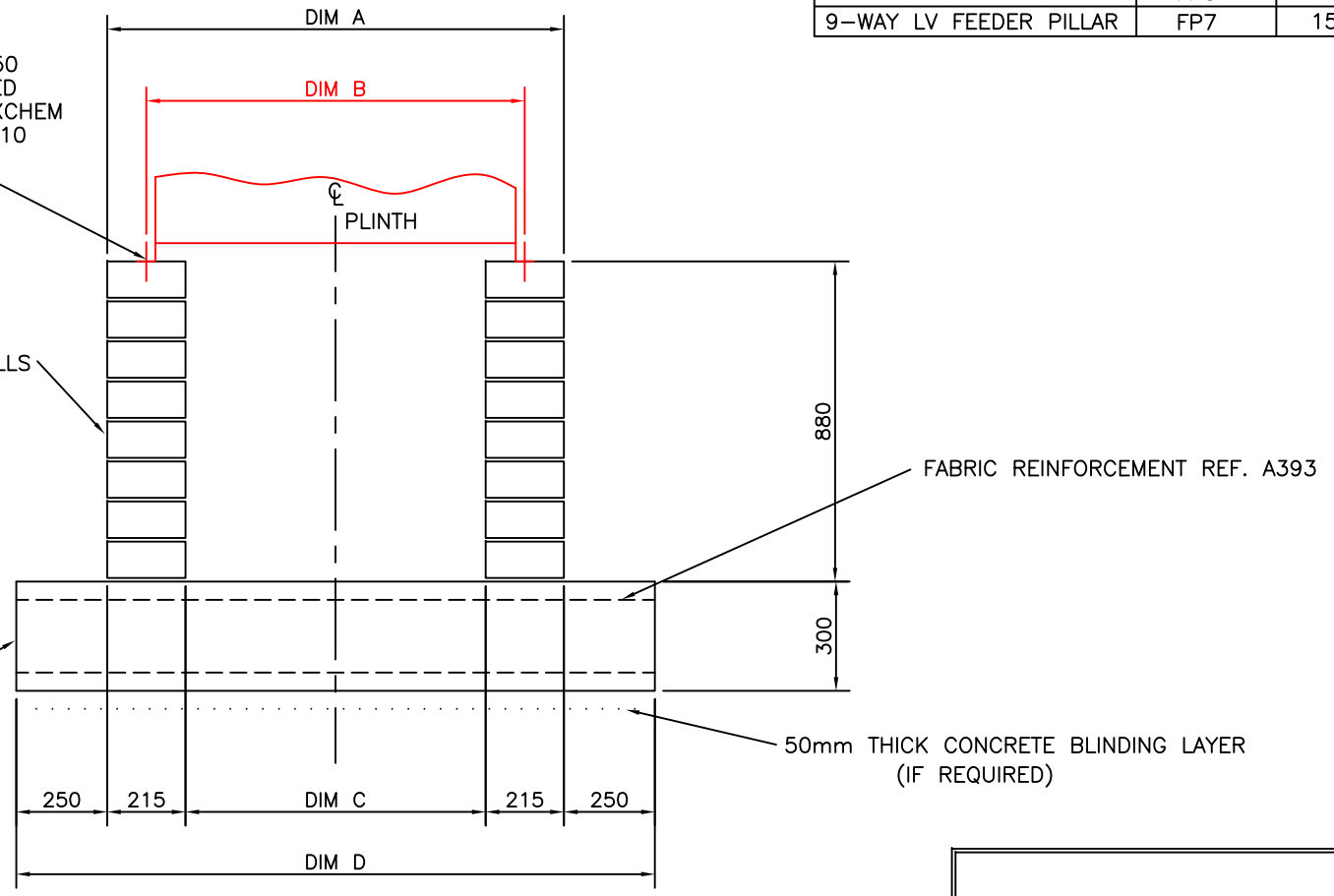
Drg. No. EKV0027
Rev No. 2

DRAWING NUMBER
EKV0028

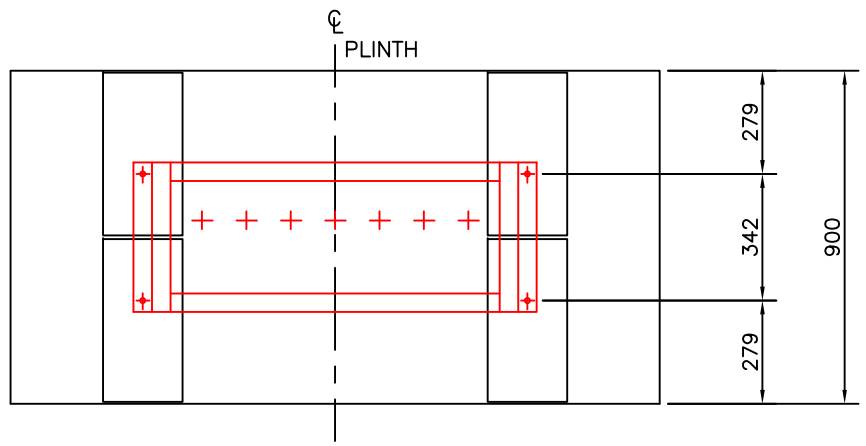
TYPE	WPD REF.	DIM A	DIM B	DIM C	DIM D
4–WAY LV FEEDER PILLAR	FP3	975	760 CRS	545	1475
7–WAY LV FEEDER PILLAR	FP5	1255	1040 CRS	825	1755
9–WAY LV FEEDER PILLAR	FP7	1535	1320 CRS	1105	2035



ISOMETRIC VIEW
SCALE :- 1:20



FRONT ELEVATION



PLAN VIEW

SPECIFICATION

SITE CLEARANCE Before commensing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc.and remove from site.

EXCAVATION Excavate to reduced levels (or to firm foundation as directed by the Engineer) and remove from site.
Level and compact bottom of excavation to recieve concrete blinding layer / concrete foundation.

BLOCKWORK Solid concrete blocks to comply with B.S. 6073.
Work size dimensions to be 440(L) x 215(H) x 100(W)mm.
Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.

CONCRETE Blinding Concrete to be grade C15 with a minimum crushing strength of 15N/sq.mm at 28 days.
Foundation concrete to be grade C35 with a minimum crushing strength of 35N/sq.mm at 28 days.

REINFORCEMENT Foundation to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom)
Steel fabric reinforcement to comply with B.S. 4483.
Steel bar reinforcement to comply with B.S. 4449.
Reinforcement to be free from all loose rust and mill scale.
Minimum cover to all reinforcement to be 40mm.

All dimentions are in millimeters unless otherwise stated.
The contractors attention is drawn to the need for strict accuracy in setting out foundation
All lines and angles to be formed square, plumb and true.

Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:
Work Done			Work Done			Work Done			Work Done			Work Done			Work Done			Work Done			Work Done		
Checked			Checked			Checked			Checked			Checked			Checked			Checked			Checked		

Approvals for ☐ Construction

WESTERN POWER DISTRIBUTION
Western Power Distribution
Engineering Design Department
Lamby Way
Rumney
Cardiff
CF3 2EQ

Title
BLOCK WORK FOUNDATION ARRANGEMENT FOR SCHNEIDER ELECTRIC LV FEEDER PILLARS (TYPES FP3, FP5 & FP7)

Drawn C.J.B. Checked
Date 08/04/09 Scale of original 1:10

DRAWING NUMBER EKV0028 Revision

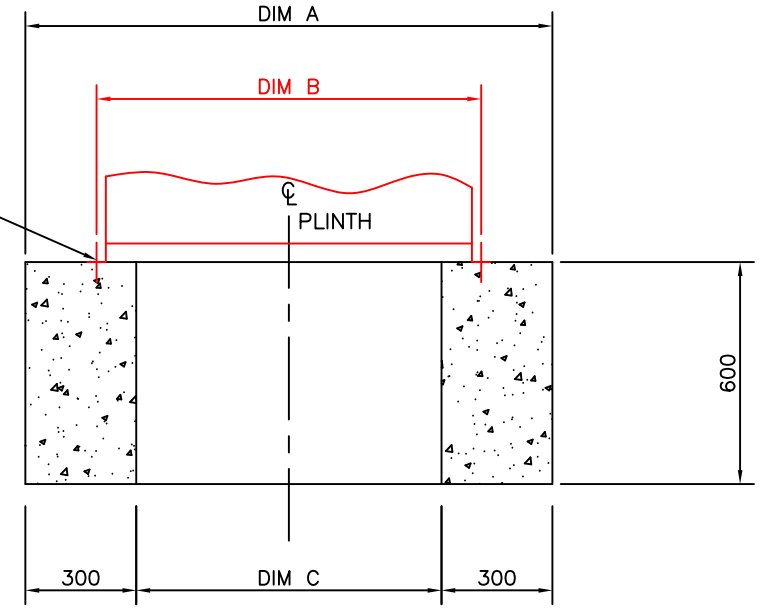
11kV STANDARD DRAWINGS

100mm
A1

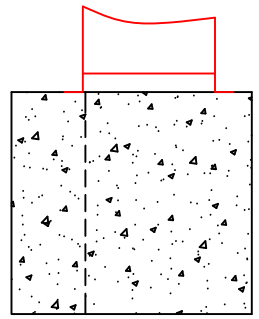
DRAWING NUMBER
EKV0029

TYPE	WPD REF.	DIM A	DIM B	DIM C
4–WAY LV FEEDER PILLAR	FP3	1150	760 CRS	550
7–WAY LV FEEDER PILLAR	FP5	1425	1040 CRS	825
9–WAY LV FEEDER PILLAR	FP7	1700	1320 CRS	1100

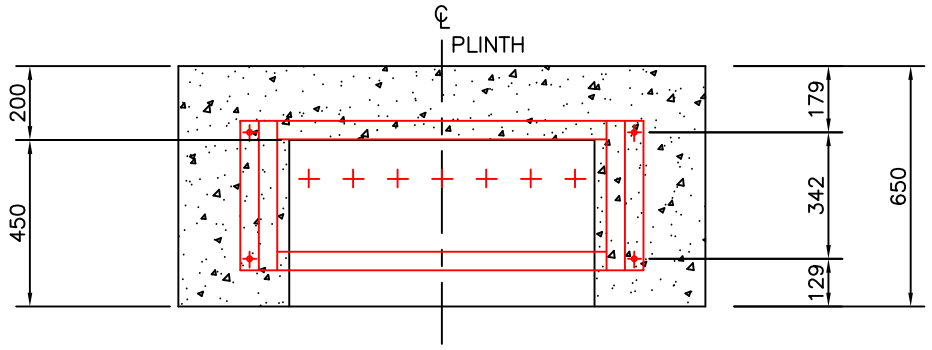
FOUNDATION BOLTS TO BE M12x150 GALVANISED THREADED REBAR FIXED WITH RESIFIX 3PLUS GROUT BY EXCHEM OR EQUAL. 16 DIAMETER HOLES 110 DEEP IN CONCRETE.



FRONT ELEVATION



SIDE ELEVATION



PLAN VIEW

SPECIFICATION

SITE CLEARANCE Before commensing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc.and remove from site.

EXCAVATION Excavate to reduced levels (or to firm foundation as directed by the Engineer) and remove from site.
Level and compact bottom of excavation to recieve concrete foundation.

CONCRETE Foundation concrete to be grade C35 with a minimum crushing strength of 35N/sq.mm at 28 days.

All dimentions are in millimeters unless otherwise stated.
The contractors attention is drawn to the need for strict accuracy in setting out foundation
All lines and angles to be formed square, plumb and true.

Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:	Revisions:	Drawn:	Date:
Work Done			Work Done			Work Done			Work Done			Work Done			Work Done			Work Done		
Checked			Checked			Checked			Checked			Checked			Checked			Checked		

Approvals for Construction

WESTERN POWER DISTRIBUTION
Western Power Distribution
Engineering Design Department
Lamby Way
Rumney
Cardiff
CF3 2EQ

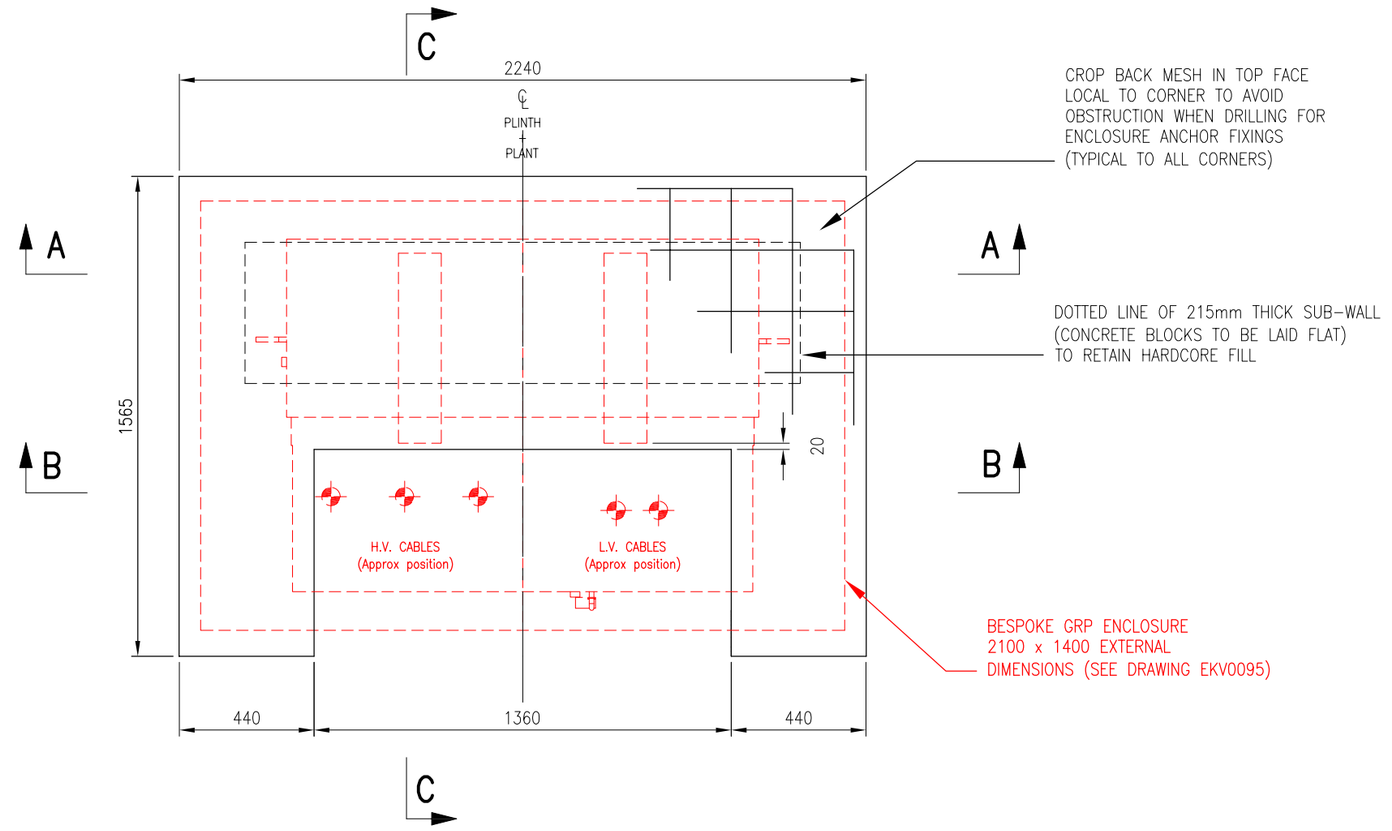
Title
MASS CONCRETE FOUNDATION ARRANGEMENT FOR SCHNEIDER ELECTRIC LV FEEDER PILLARS (TYPES FP3, FP5 & FP7)

Drawn C.J.B. Checked
Date 21/04/09 Scale of original 1:10

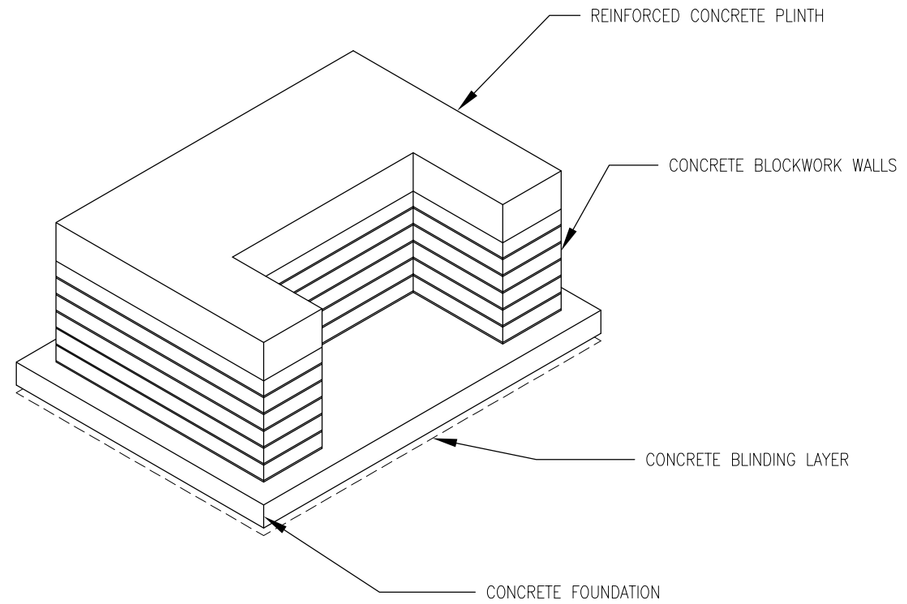
DRAWING NUMBER EKV0029 Revision

11kV STANDARD DRAWINGS

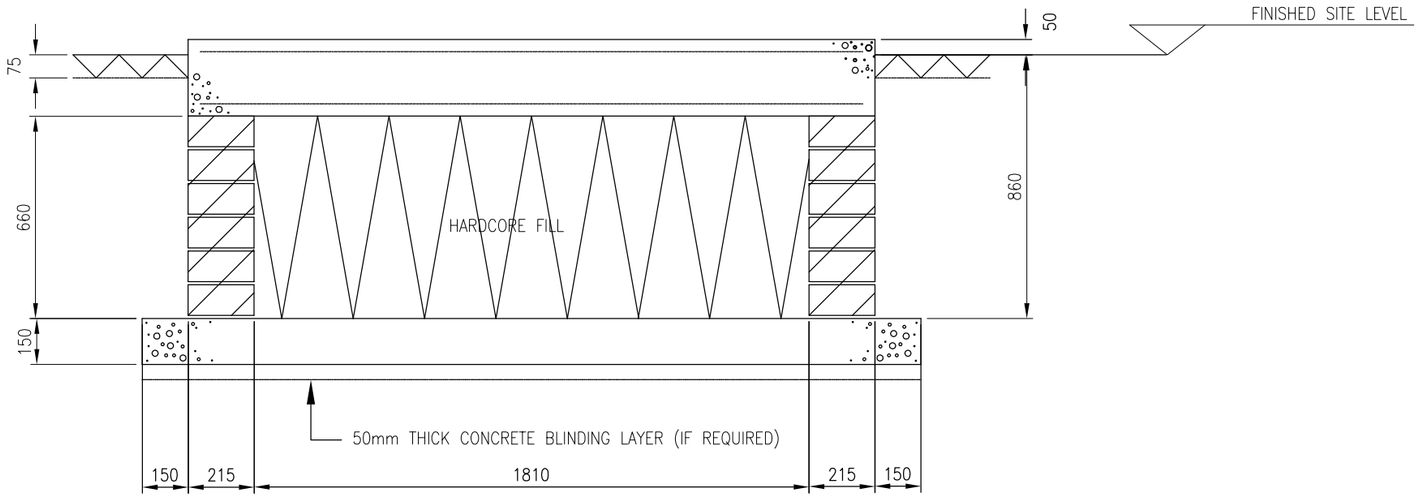
100mm
A1



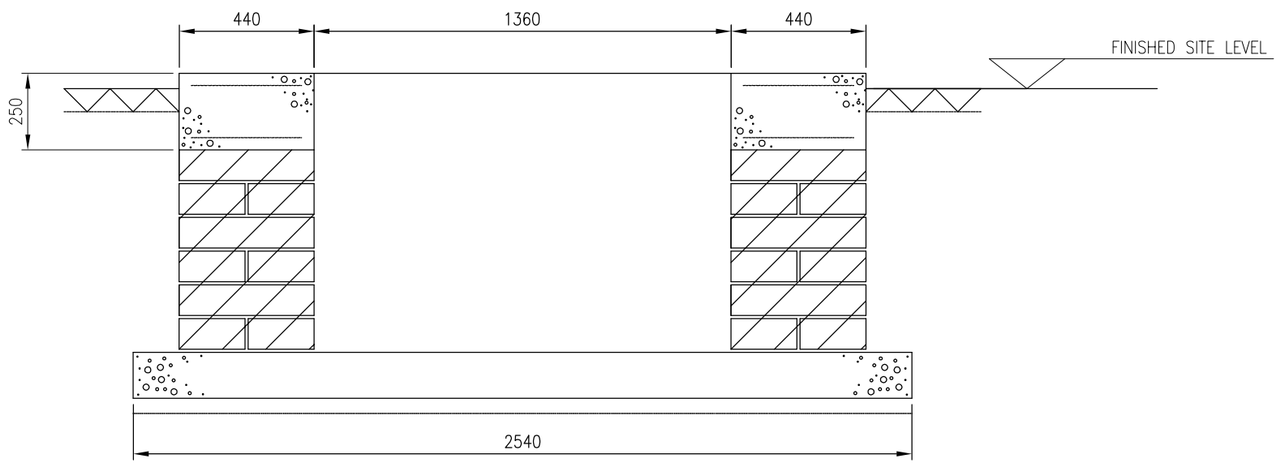
PLAN VIEW OF TRANSFORMER PLINTH



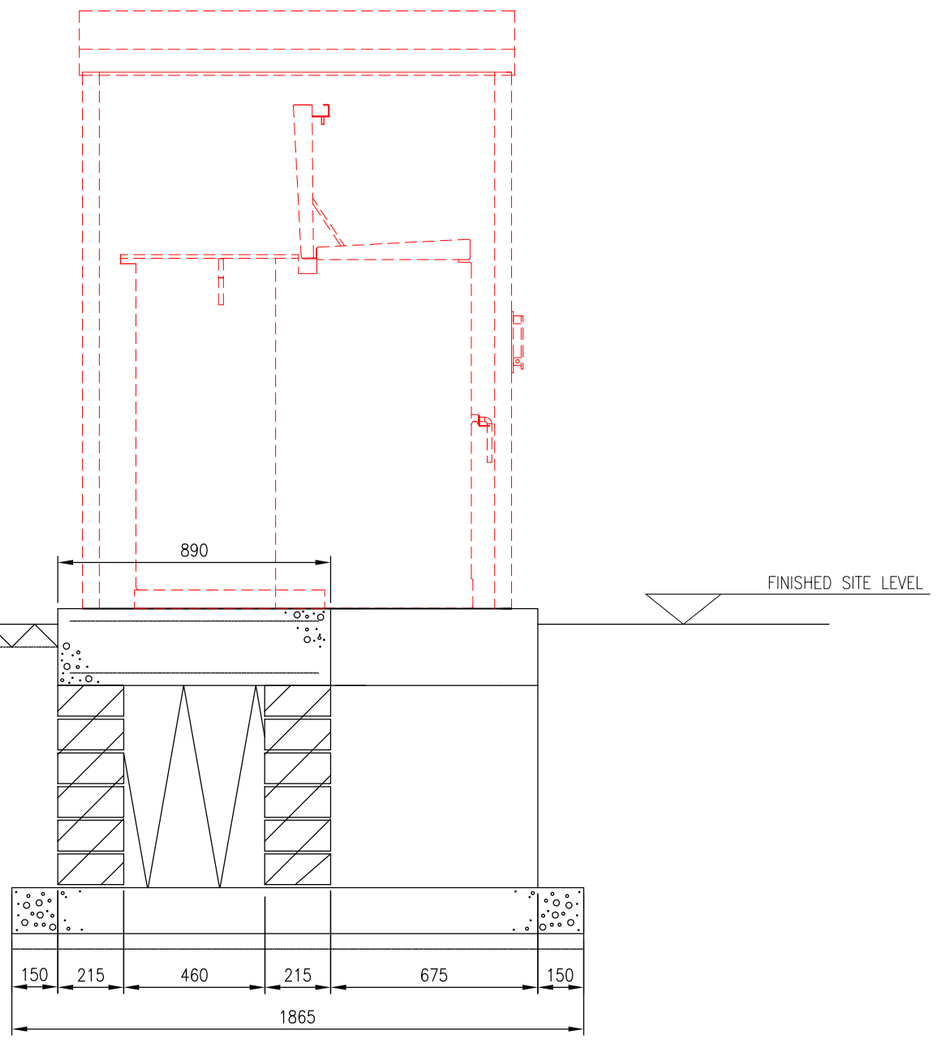
ISOMETRIC VIEW OF ENCLOSURE PLINTH
(NOT TO SCALE)



SECTION A–A



SECTION B–B



SECTION C–C

SPECIFICATION:

SITE CLEARANCE: Before commencing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc. and remove from same.

EXCAVATION: Excavate to reduced levels (or to firm foundation as directed by the Engineer) and remove spoil from site.

Level and compact bottom of excavation to recieve concrete blinding layer/concrete foundation.

BLOCKWORK: Solid concrete blocks to comply with B.S. 6073

Work size dimensions to be 440 (L) x 215 (H) x 100 (W) mm.

Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.

CONCRETE: Blinding concrete to be grade C15 with a minimum crushing strength of 15N/sq.mm at 28 days.

Plinth/foundation concrete to be grade C35 with a minimum crushing strength of 35 N/sq.mm at 28 days.

Top surface of plinth to be level with smooth steel float finish.

REINFORCEMENT: Concrete plinth to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom).

Steel fabric reinforcement to comply with B.S. 4483.

Steel bar reinforcement to comply with B.S. 4449.

Reinforcement to be free from all loose rust and mill scale.

Minimum cover to all reinforcement to be 40mm.

BACKFILLING: Void in front of plinth to be backfilled with selected hardcore after protecting cables with min. 150mm stone dust.

ON COMPLETION: Area in front of plinth to be of roadway construction finished flat and level

All remaining exposed ground surfaces within site boundary to be dressed with a 75 mm thick layer of clean limestone chippings.

GENERAL NOTES:

This foundation is configured to receive a GRP enclosure as detailed on drg EKV0095

Vibration pads must be used on all transformers.

The Contractors attention is drawn to the need for strict accuracy insetting out the foundation.

All lines and angles to be formed square, plumb and true.

Rev No	Drawn	Chk'd	App'd	Date	Revision
1	CJW			080916	UPDATED FOR CG PLANT

ORIGINAL ISSUE — Date

Drawn	CJB	281011
Checked		
Approved		

SCALE: 1:20 @ A2

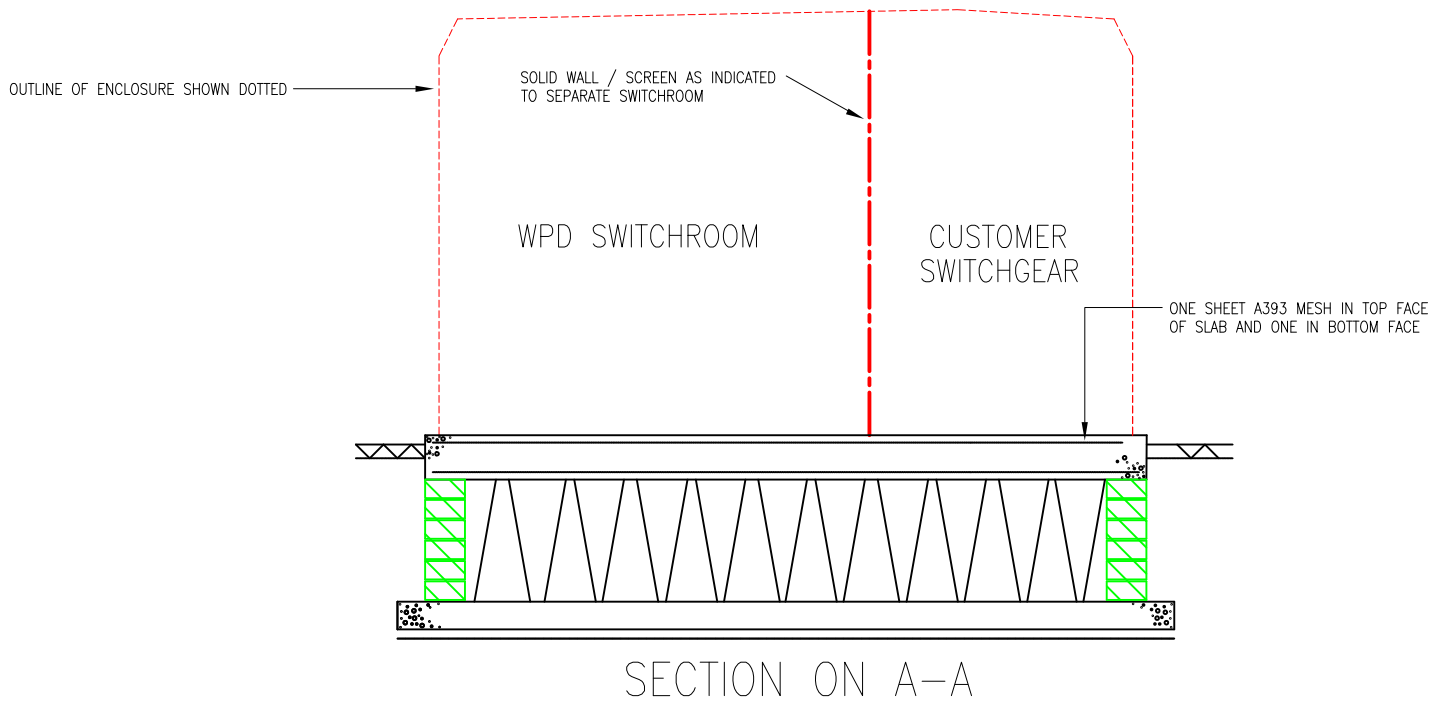
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

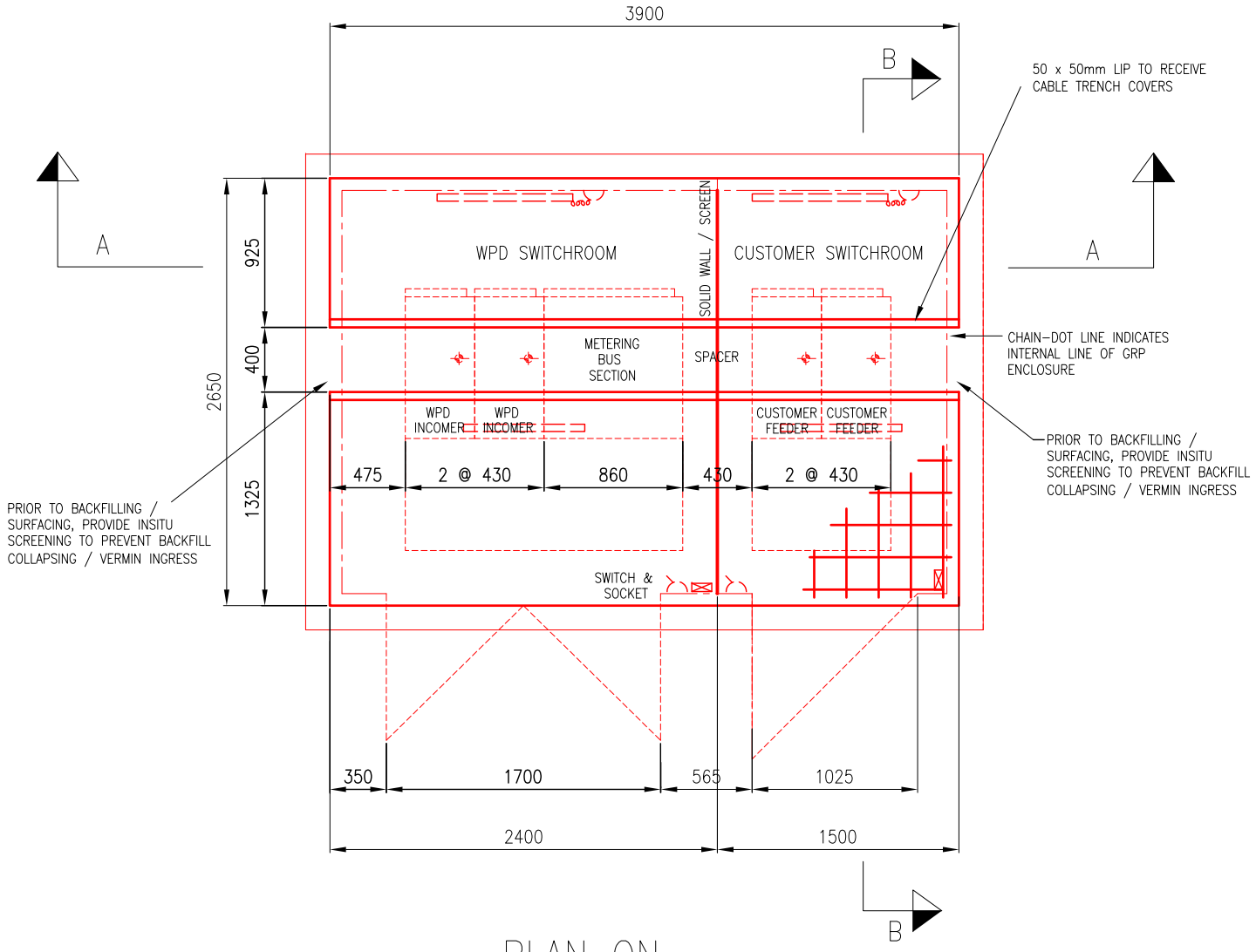
Title: STANDARD DRAWINGS
FOUNDATION DETAIL FOR 11kV PAD MOUNTED THREE PHASE TRANSFORMER

Drg. No. EKV0054

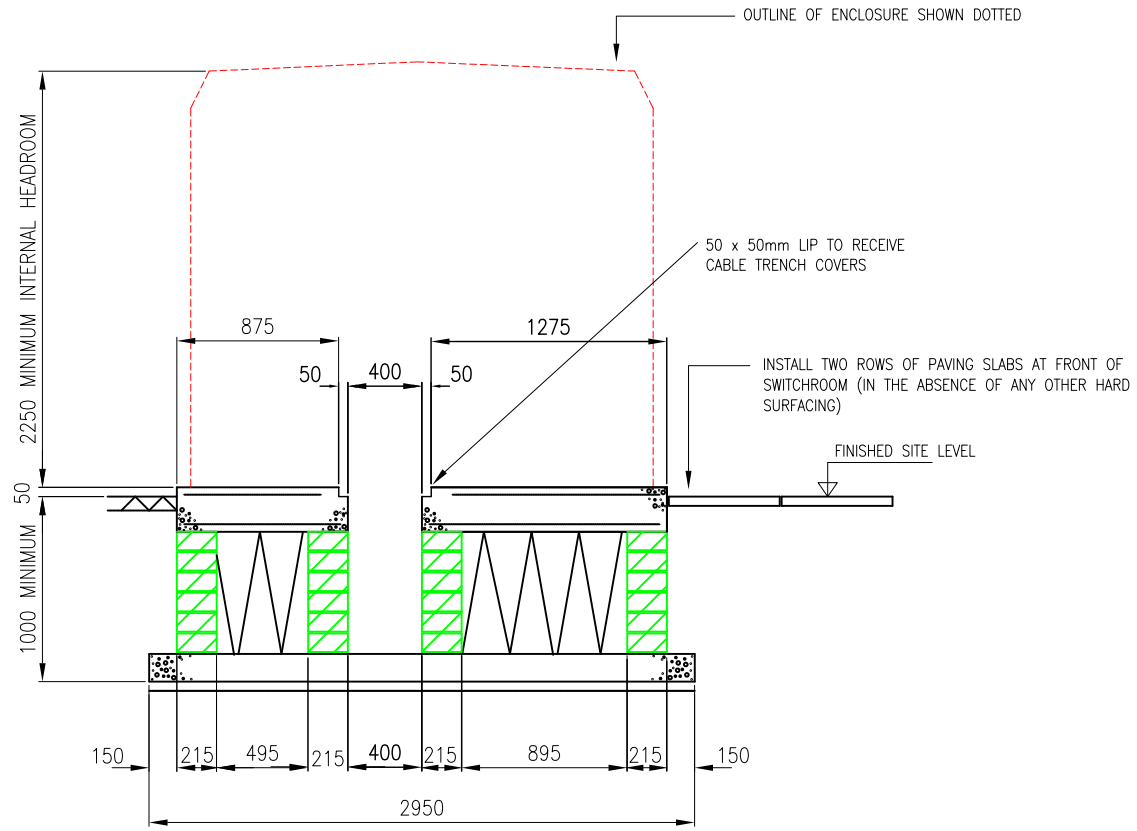
Rev No. 1



SECTION ON A–A



PLAN ON SWITCHROOM



SECTION ON B–B

GENERAL NOTES

1 – THIS DRAWING TO BE READ IN CONJUNCTION WITH WPD DOCUMENT 'FUNCTIONAL/ PERFORMANCE SPECIFICATION FOR HIGH VOLTAGE SWITCHROOM' (OBTAINED BY LINKING FROM WPD STANDARD TECHNIQUES DOCUMENT ST NC1V/1).
2 – SEE ABOVE DOCUMENT FOR DETAILS OF LV ELECTRICAL REQUIREMENTS

SPECIFICATION:

SITE CLEARANCE:	Before commencing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc. and remove from same.
EXCAVATION:	Excavate to reduced levels (or to firm foundation as directed by the Engineer) and remove spoil from site. Level and compact bottom of excavation to recieve concrete blinding layer/concrete foundation.
BLOCKWORK:	Solid concrete blocks to comply with B.S. 6073 Work size dimensions to be 440 (L) x 215 (H) x 100 (W) mm. Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.
CONCRETE:	Blinding concrete to be grade C15 with a minimum crushing strength of 15N/sq.mm at 28 days. Plinth/foundation concrete to be grade C35 with a minimum crushing strength of 35 N/sq.mm at 28 days. Top surface of plinth to be level with smooth steel float finish.
REINFORCEMENT:	Concrete plinth to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom). Steel fabric reinforcement to comply with B.S. 4483. Steel bar reinforcement to comply with B.S. 4449. Reinforcement to be free from all loose rust and mill scale. Minimum cover to all reinforcement to be 40mm.
ON COMPLETION:	Where applicable area between front of plinth and site boundary to be paved with 600 x 600 x 50 mm thick concrete paving slabs. with a 75 mm thick layer of clean limestone chippings. All remaining exposed ground surfaces within site boundary to be dressed

WHERE A SUBSTATION PROVIDES SUPPLY TO A CUSTOMER THEN THE CUSTOMER MUST PROVIDE THIS 230V SUPPLY.

DEPENDING ON EARTHING ARRANGEMENTS IT MAY BE NECESSARY TO INSTALL A 1:1 ISOLATION TRANSFORMER IN THE 230V SUPPLY – AS PER ST NC1V/2. REFER TO WPD PLANNER.

Rev No	Drawn	Chk'd	App'd	Date	Revision

ORIGINAL ISSUE		Date
Drawn	C.J.B.	10.2.12
Checked		
Approved		
SCALE: 1:20		

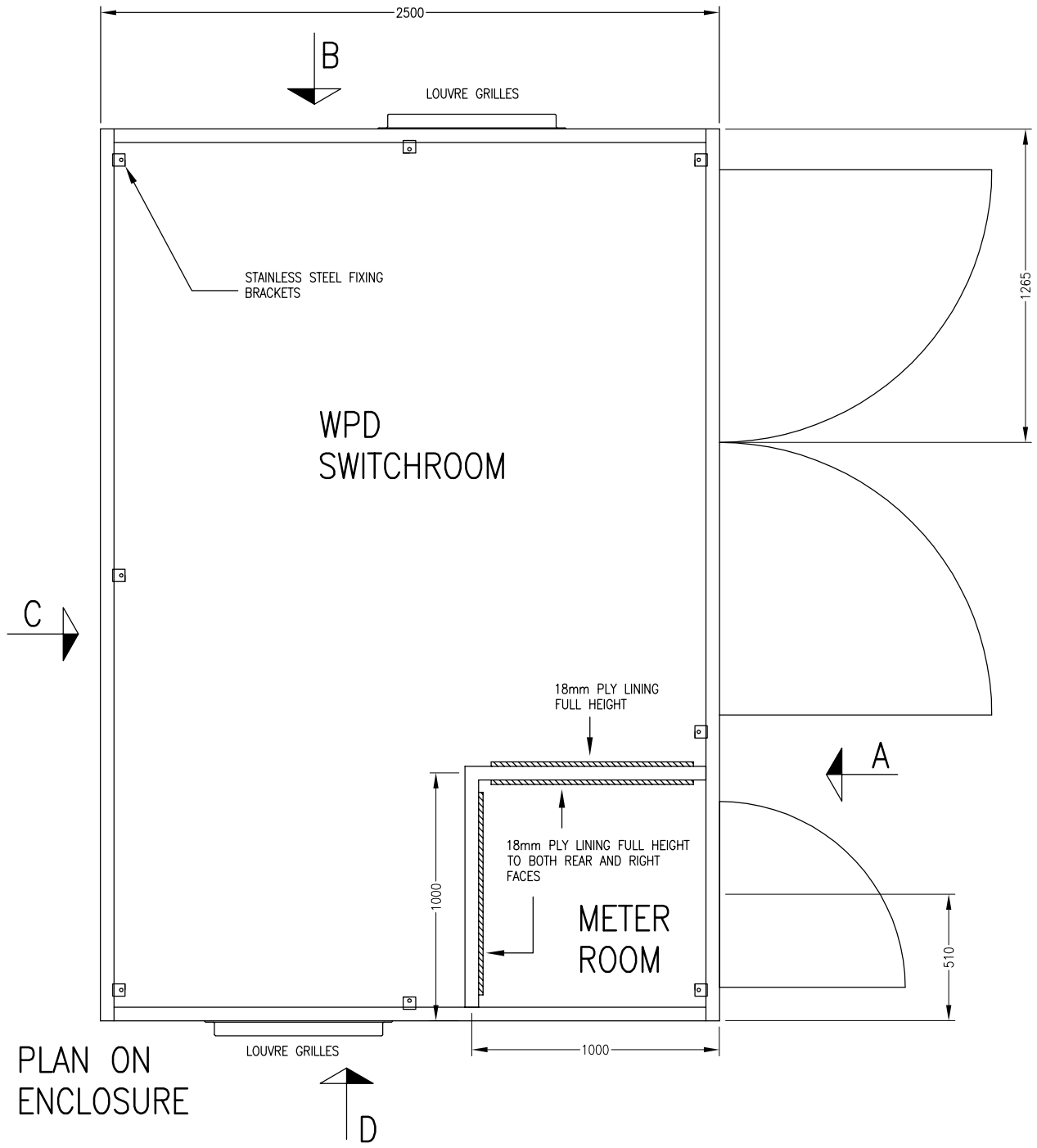
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

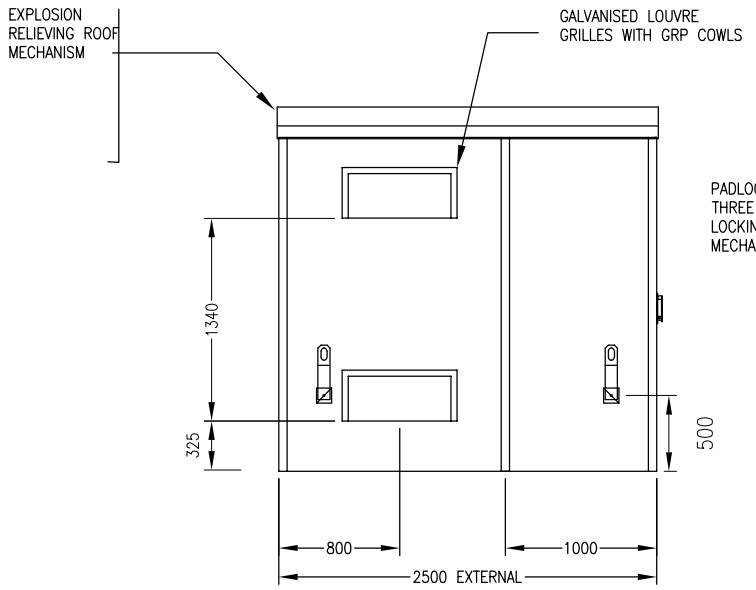
Title: SUBSTRUCTURE DETAIL FOR 5 PANEL 11kV EXTENSIBLE RINGMASTER SWITCHGEAR

Drg. No. EKV0057

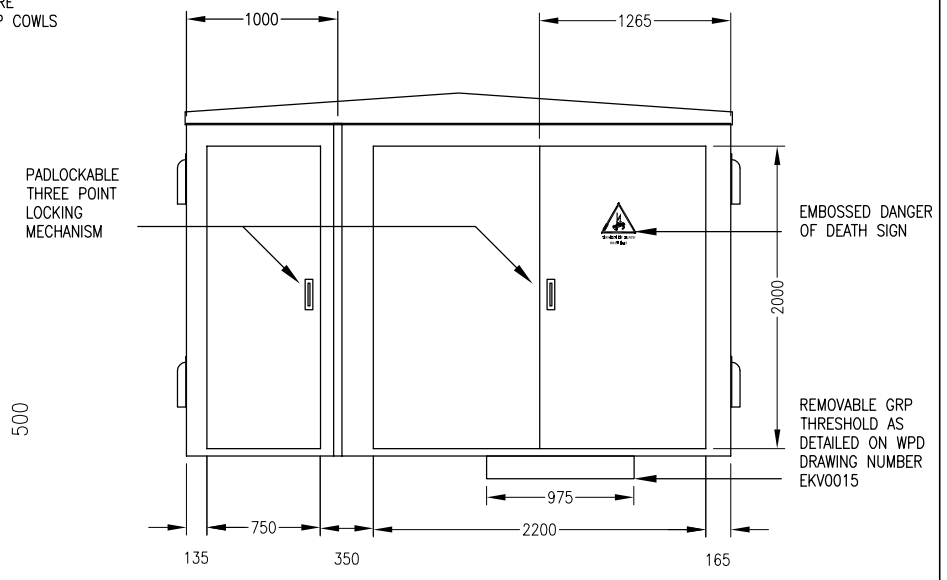
Rev No.



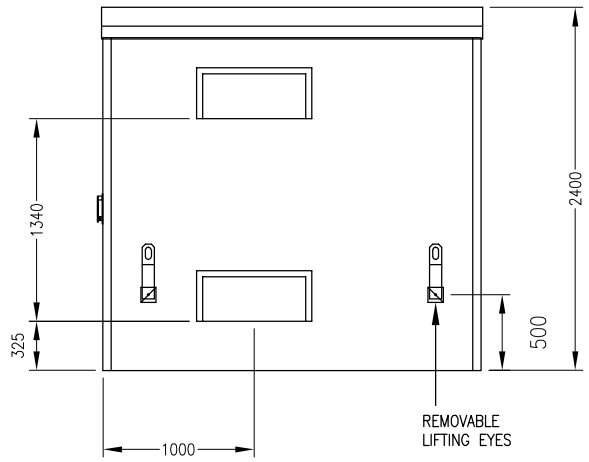
PLAN ON ENCLOSURE



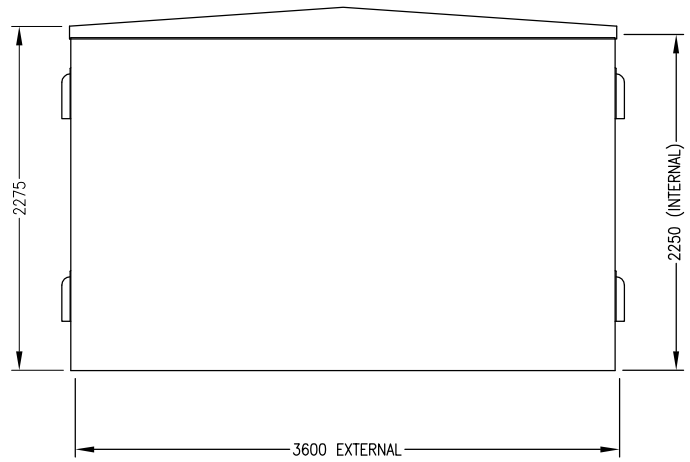
VIEW ON ARROW D



VIEW ON ARROW A



VIEW ON ARROW B



VIEW ON ARROW C

NOTES

1. DO NOT SCALE THIS DRAWING
2. UNLESS OTHERWISE STATED, ENCLOSURE IS TO BE FORMED WITH EXTERNAL FINISH OF SEMI GLOSS GREEN (14 C 39)
3. DOORS TO BE AFFORDED WITH HEAVY DUTY STAINLESS STEEL HINGES, STAINLESS STEEL THRESHOLD STRIP AND STAINLESS STEEL DRIP.
4. DOORS TO BE FURTHER PROVIDED WITH GALVANISED 10/10 CORD PULL DOOR STAYS AND SPRUNG TOWER BOLTS
5. INSIDE FACE OF METERING ROOM TO BE LINED WITH 18mm EXTERIOR QUALITY PLY
6. THIS ENCLOSURE IS DESIGNED TO COORDINATE WITH THE STANDARD SUBSTRUCTURE DESIGN DETAILED ON WPD DRAWING EKV0092
7. PLEASE NOTE REQUIREMENT FOR GRP THRESHOLD UNDER DOUBLE DOORS LOCALLY. THIS IS REQUIRED TO FORM EDGING FOR SURFACING IN FRONT OF ENCLOSURE
8. WPD SWITCHROOM DOOR TO BE EMBOSSED WITH DANGER OF DEATH SIGN
9. LIFTING EYES TO BE FIXED AT HEIGHT SHOWN, AT A HORIZONTAL POSITION THAT CORRELATES WITH STRUCTURAL STEELWORK (GENERAL POSITION TO BE SIMILAR TO THAT SHOWN)

Rev No.	Drawn	Chk'd	App'd	Date	Revision
4	CJW			281116	GRP DOUBLE DOORS WIDENED TO 2200mm
3	CJW			270115	MODIFIED TO ALIGN WITH MORGAN MARINE DESIGN
2	SW			060115	LIFTING EYES RELOCATED. VENTS REPOSITIONED AND COWLED
1	CJW			050115	REMOVAL OF SWITCHGEAR, ADDITION OF PLY LINING IN METER ROOM AND SWICHROOM

ORIGINAL ISSUE		Date
Drawn	CJW	231215
Checked		
Approved		
SCALE: 1:25 PLAN & 1:50 ELEVATIONS @ A3		

WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

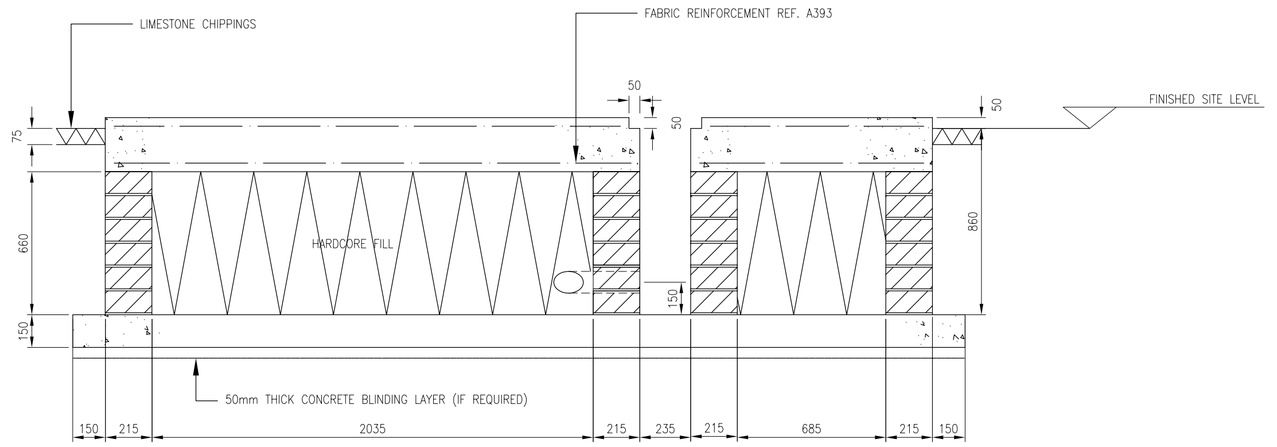
WESTERN POWER DISTRIBUTION

Title: 11kV STANDARD DRAWINGS

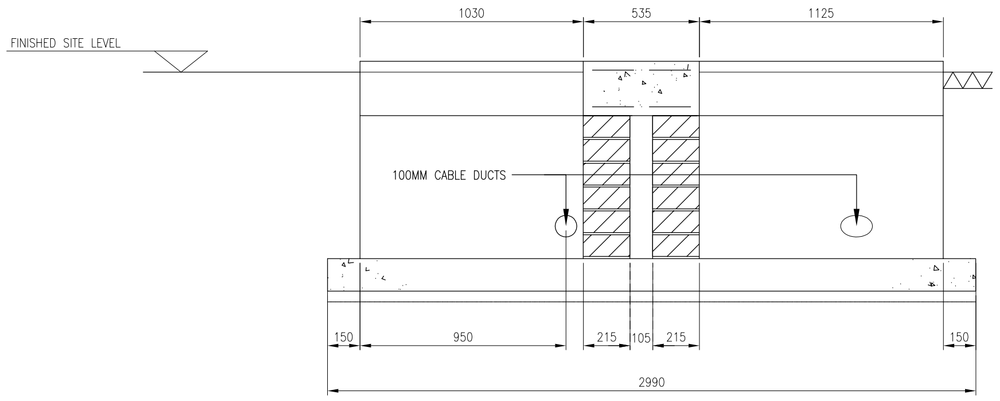
GRP ENCLOSURE DETAIL FOR 11kV METERED GENERATOR CONNECTION

Drg. No.: EKV0091

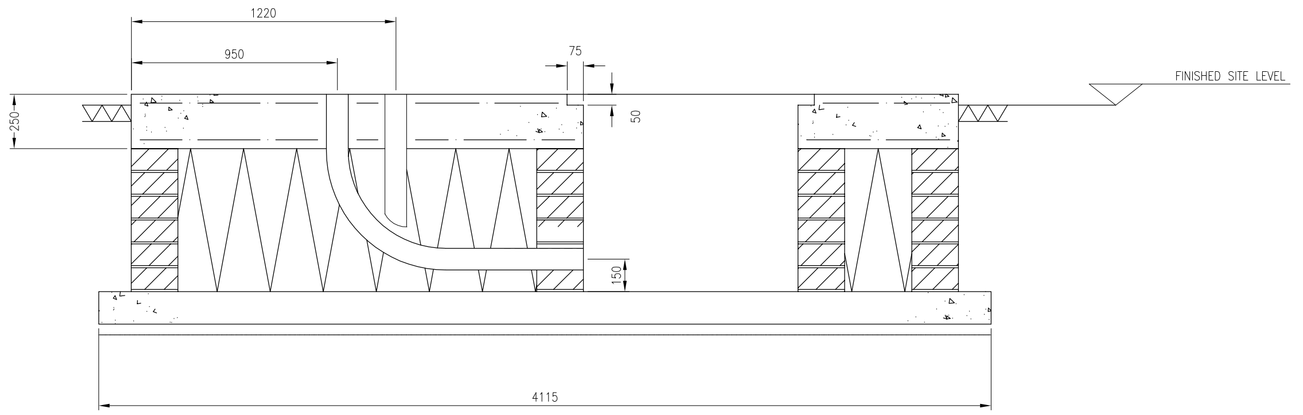
Rev No.: 4



SECTION A–A



SECTION B–B



SECTION C–C

SPECIFICATION:

SITE CLEARANCE: Before commencing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc. and remove from same.

EXCAVATION: Excavate to reduced levels (or to firm foundation as directed by the Engineer) and remove spoil from site.

Level and compact bottom of excavation to recieve concrete blinding layer/concrete foundation.

BLOCKWORK: Solid concrete blocks to comply with B.S. 6073

Work size dimensions to be 440 (L) x 215 (H) x 100 (W) mm.

Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.

CONCRETE: Blinding concrete to be grade C15 with a minimum crushing strength of 15N/sq.mm at 28 days.

Plinth/foundation concrete to be grade C35 with a minimum crushing strength of 35 N/sq.mm at 28 days.

Top surface of plinth to be level with smooth steel float finish.

REINFORCEMENT: Concrete plinth to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom).

Steel fabric reinforcement to comply with B.S. 4483.

Steel bar reinforcement to comply with B.S. 4449.

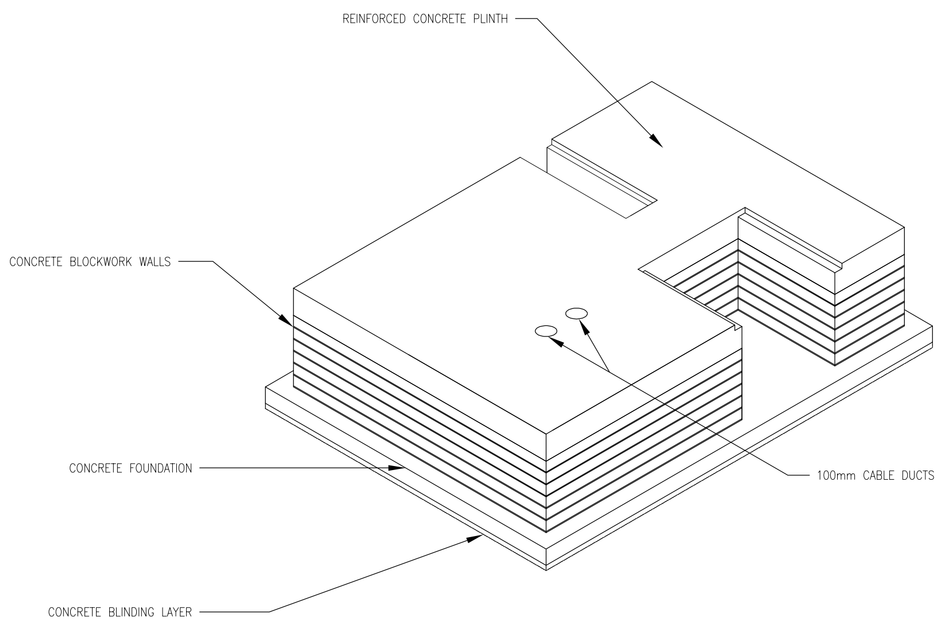
Reinforcement to be free from all loose rust and mill scale.

Minimum cover to all reinforcement to be 40mm.

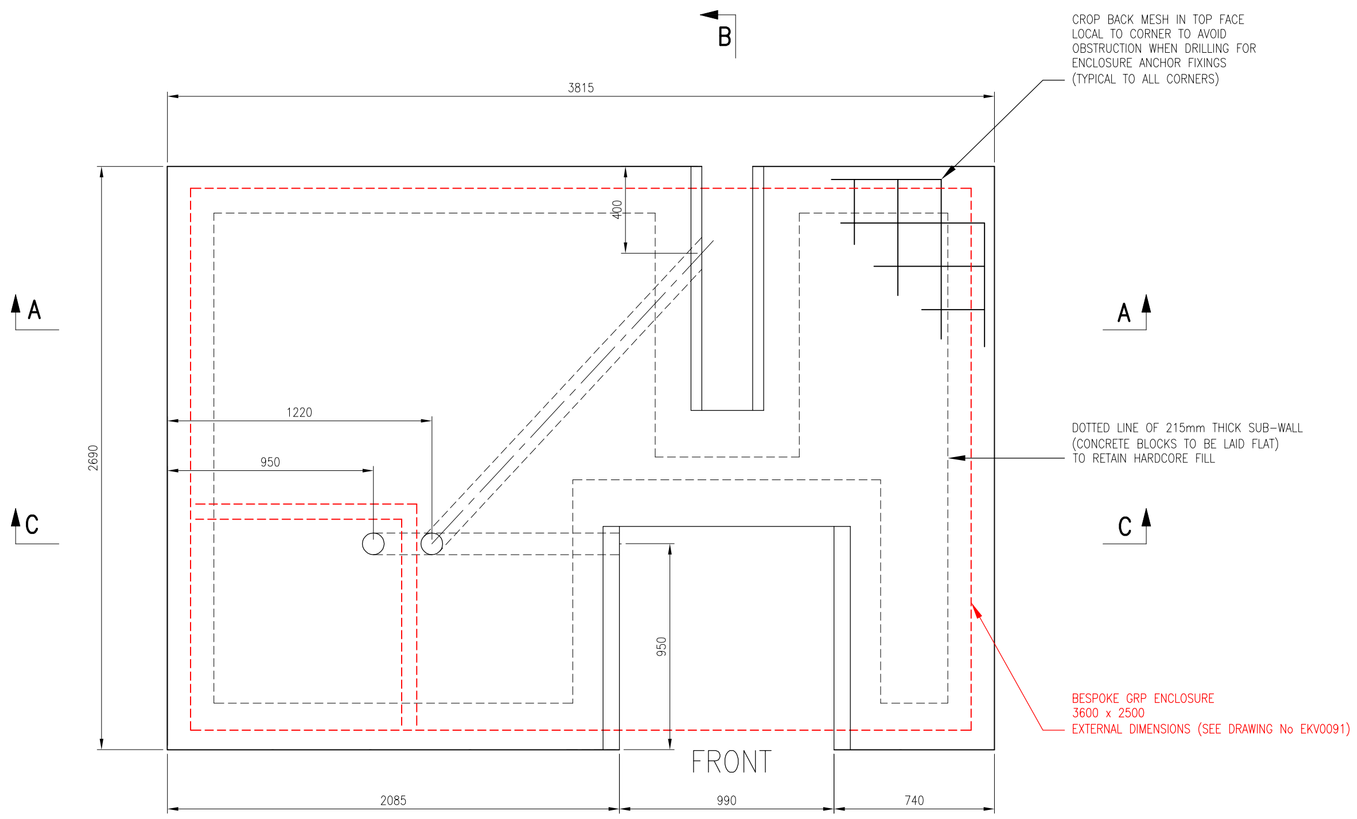
BACKFILLING: Void in front of plinth to be backfilled with selected hardcore after protecting cables with min. 150mm stone dust.

ON COMPLETION: Area in front of plinth to be of roadway construction finished flat and level

All remaining exposed ground surfaces within site boundary to be dressed with a 75 mm thick layer of clean limestone chippings.



ISOMETRIC VIEW OF ENCLOSURE PLINTH
(NOT TO SCALE)



PLAN VIEW OF ENCLOSURE PLINTH

GENERAL NOTES:

This foundation is configured to receive a GRP enclosure as detailed on drg EKV0091

Vibration pads must be used on all transformers.

The Contractors attention is drawn to the need for strict accuracy in setting out the foundation.

All lines and angles to be formed square, plumb and true.

Rev No	Drawn	Chk'd	App'd	Date	Revision
1	SW			060115	LVAC SUPPLY DUCT POSITION REVISED
1	CJW			301215	PLAN VIEW SHOWING PLANT REMOVED, ADDITIONAL DUCT FOR LV AC SUPPLY

ORIGINAL ISSUE — Date

Drawn CJW 231215

Checked

Approved

SCALE: 1:20 @ A1

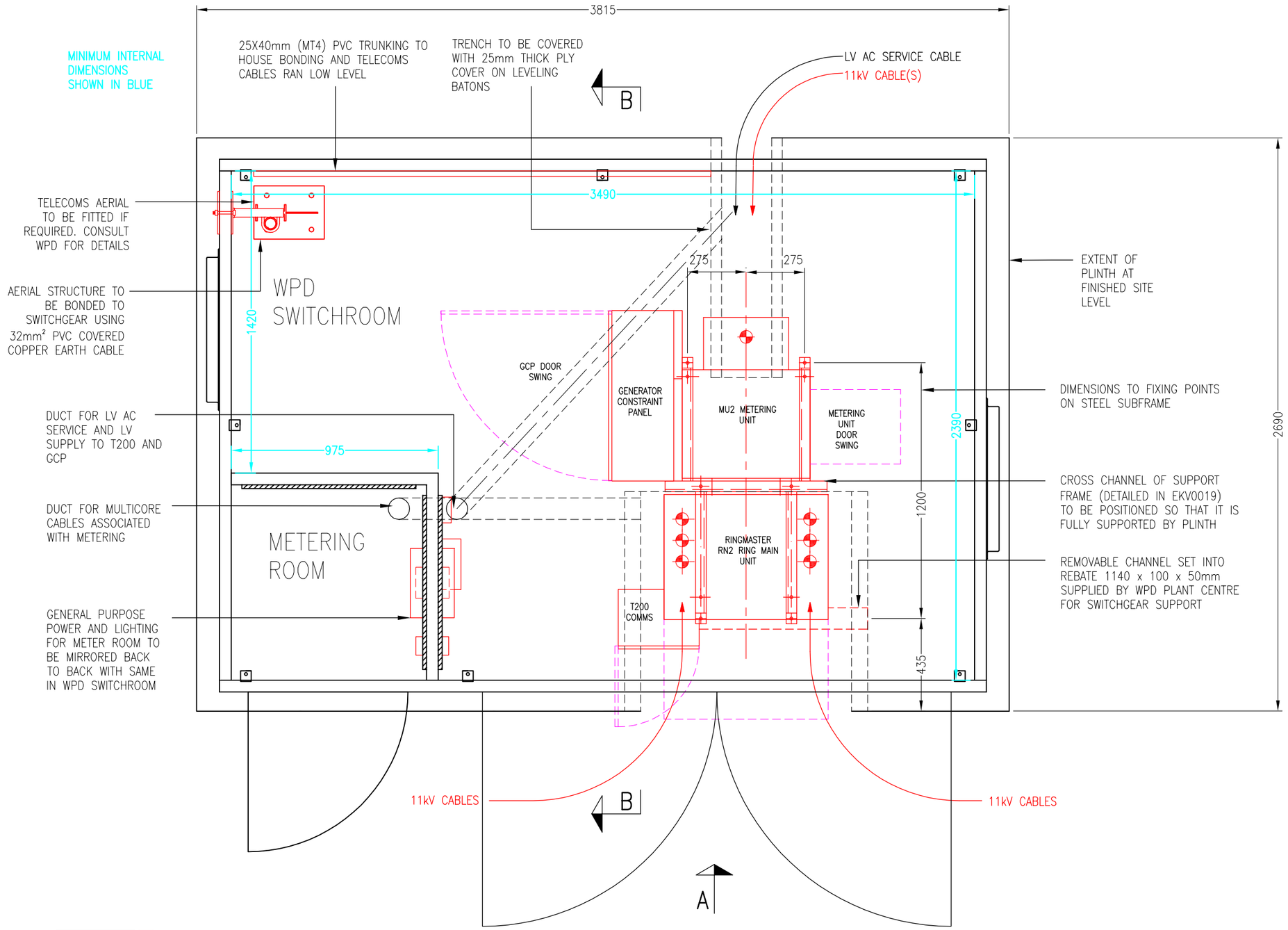
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

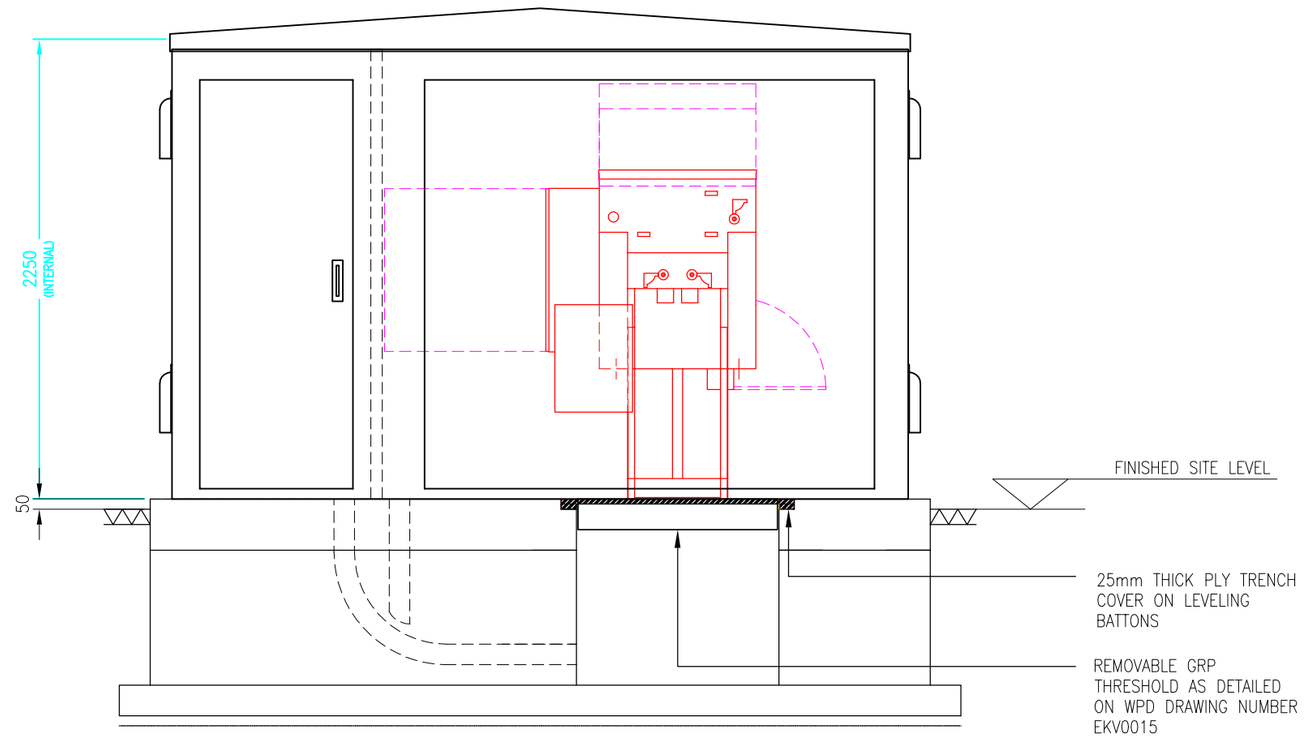
Title: 11kV STANDARD DRAWINGS
FOUNDATION DETAIL FOR 11kV METERED GENERATOR CONNECTION (WITH GC PANEL)

Drg. No. EKV0092

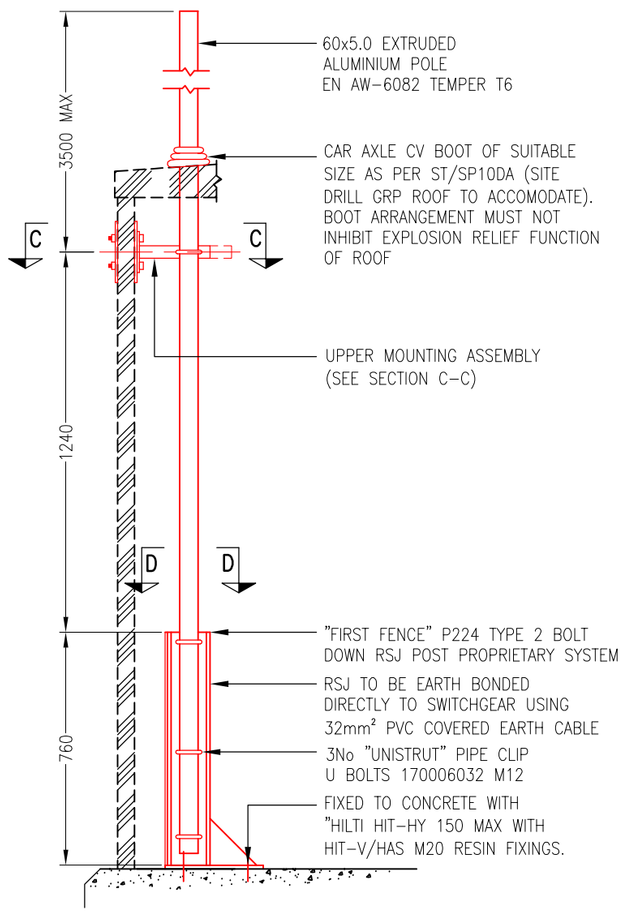
Rev No. 2



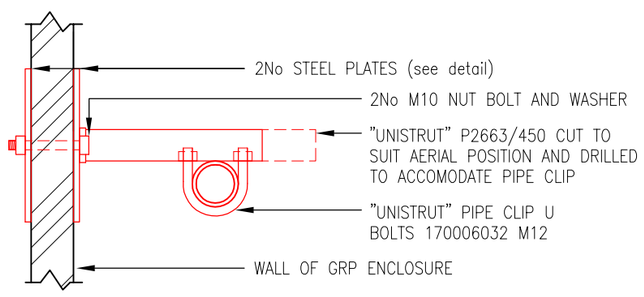
PLAN VIEW



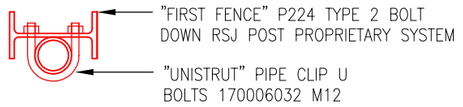
VIEW ON ARROW A 1:30



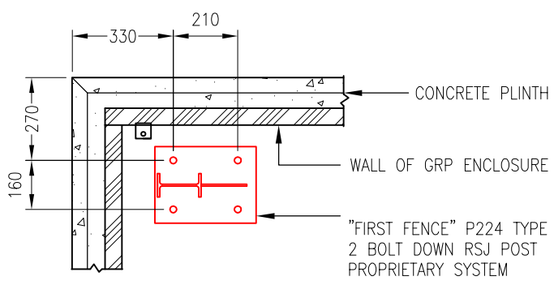
TELECOMS AERIAL FIXING DETAIL
(where required)



SECTION C-C



SECTION D-D



POST FIXING DETAIL
(approximate position)

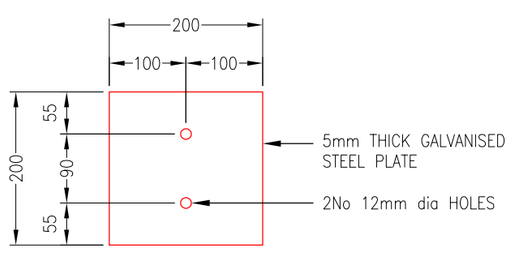
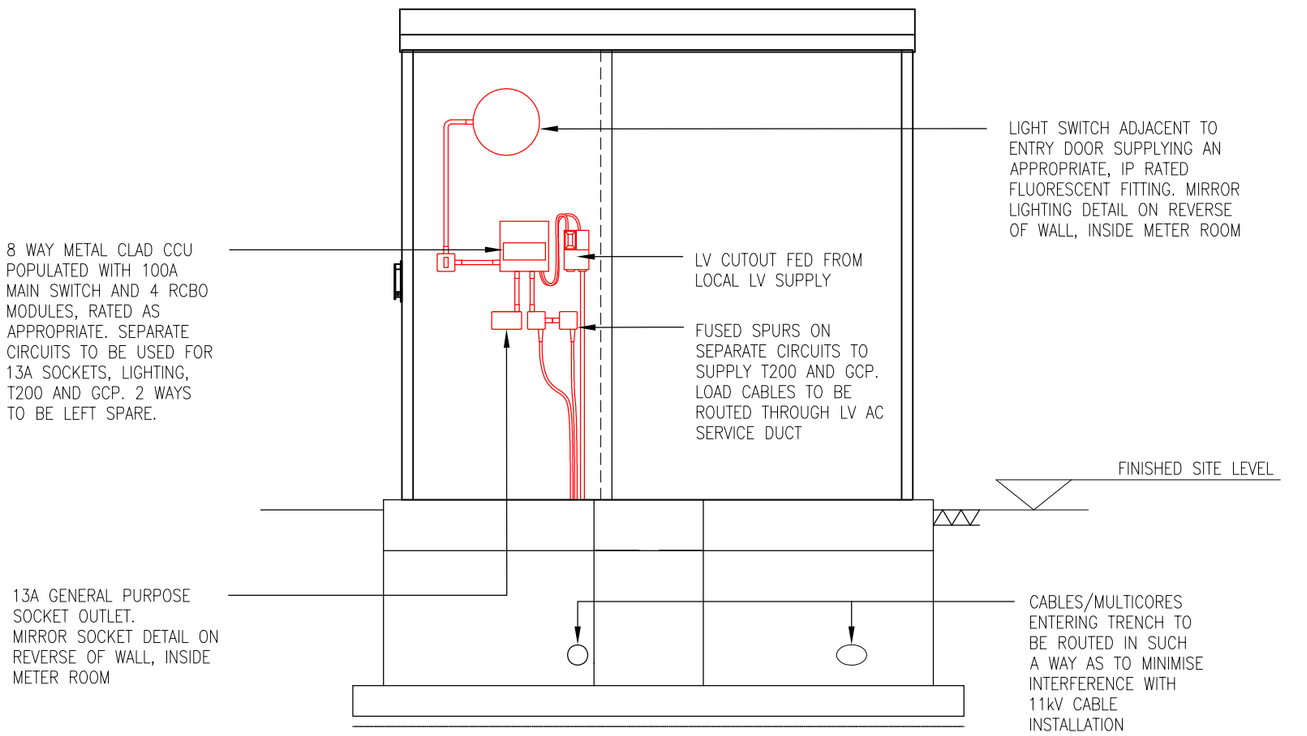


PLATE DETAIL



SECTION B-B (LV AC INSTALLATION) 1:30

NOTES:
1. DO NOT SCALE THIS DRAWING
2. THIS DRAWING TO BE READ IN CO-ORDINATION WITH DRAWINGS EKV0091 (GRP DETAILS) AND EKV0092 (FOUNDATION DETAILS)
3. PLANT MOUNTED ON STEEL SUBFRAME AS DELIVERED FROM PLANT CENTRE. SUBFRAME DETAILED ON DRAWING EKV0019
4. LV AC LAYOUT LARGELY INDICATIVE, PROVIDED SPECIFICATION AND GENERAL POSITION ARE OBSERVED
5. ALL LV AC ACCESSORIES TO BE OF METAL CLAD CONSTRUCTION, ALL CONDUIT TO BE PVC SIZED AS APPROPRIATE

Rev No	Drawn	Chk'd	App'd	Date	Revision
4	CJW			060317	AERIAL DETAIL ADDED
3	CJW			281116	GRP DOUBLE DOORS WIDENED TO 2200mm
2	CJW			080916	INTERNAL DIMENSIONS ADDED
1	CJW			270116	GRP DETAIL UPDATED IN LINE WITH REVISION 3 OF EKV0093

ORIGINAL ISSUE		Date
Drawn	CJW	301215
Checked		
Approved		
SCALE:	NTS @ A2	

WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

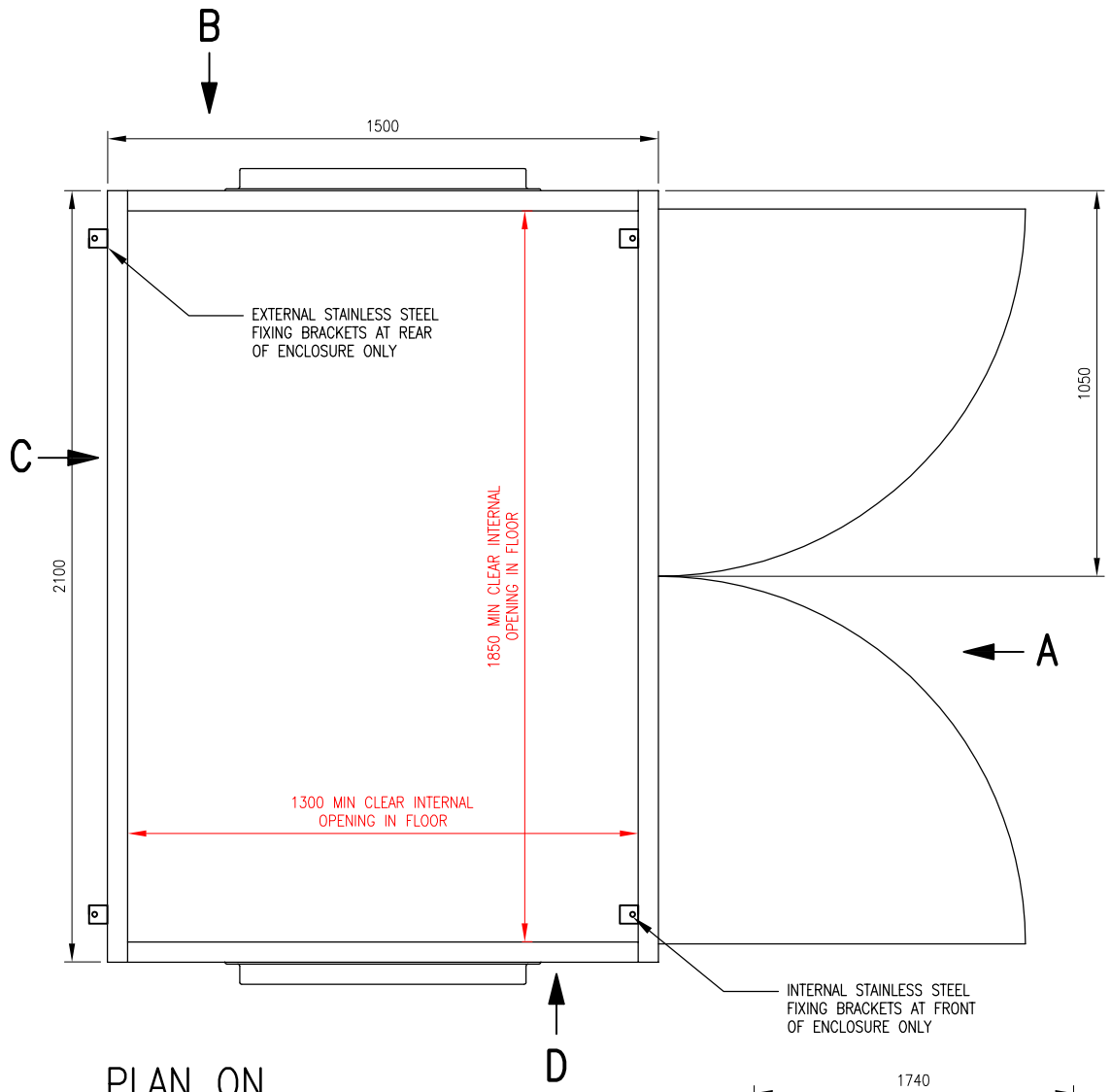
WESTERN POWER DISTRIBUTION

Title: 11kV STANDARD DRAWINGS

GENERAL ARRAGEMENT DRAWING FOR 11kV METERED GENERATOR CONNECTION

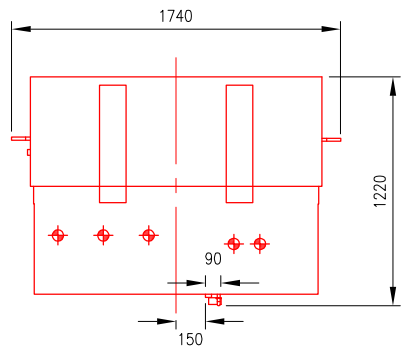
Drg. No. EKV0093

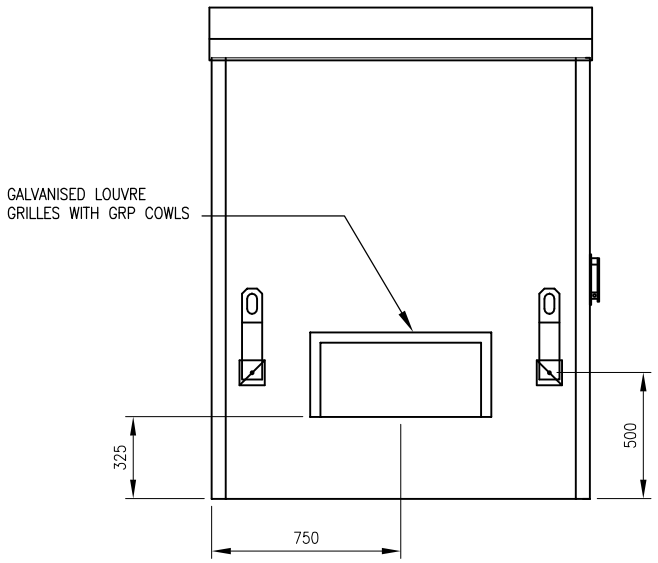
Rev No. 4



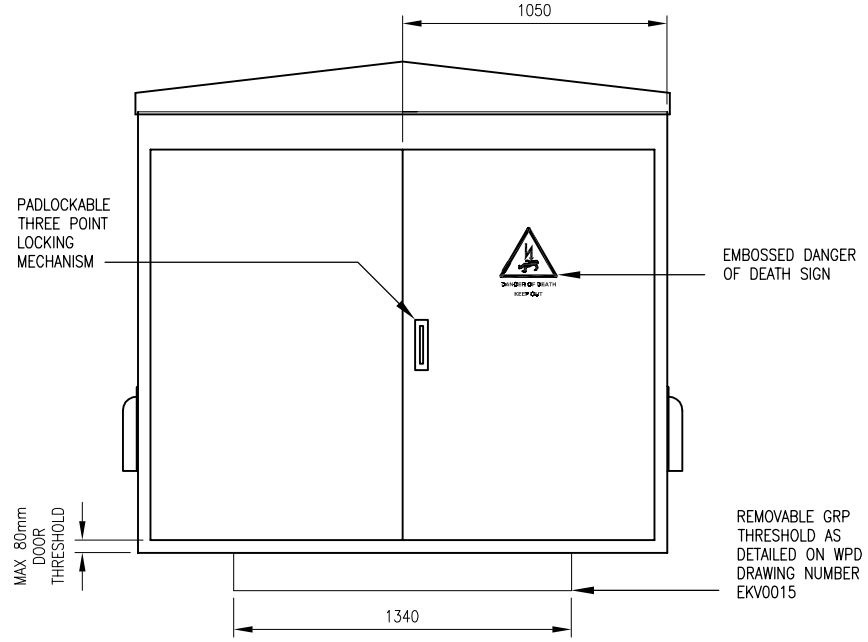
PLAN ON ENCLOSURE

PLANT MEASURES 1740x1220. INTERNAL DIMENSIONS OF ENCLOSURE INCLUDING LOCKING MECHANISM MUST ACCOMMODATE THIS

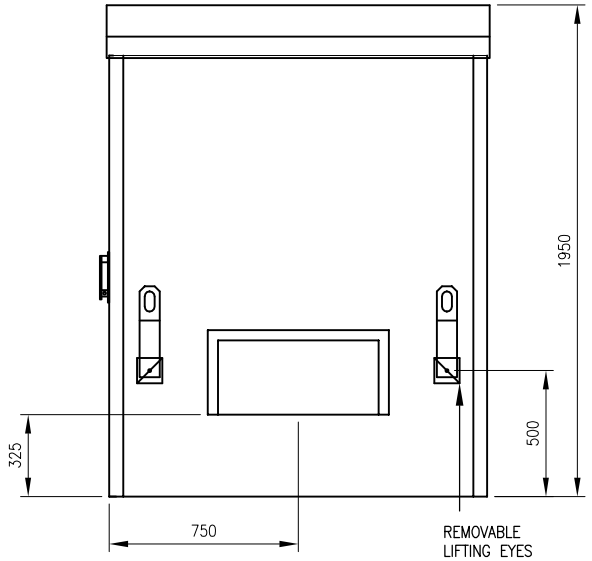




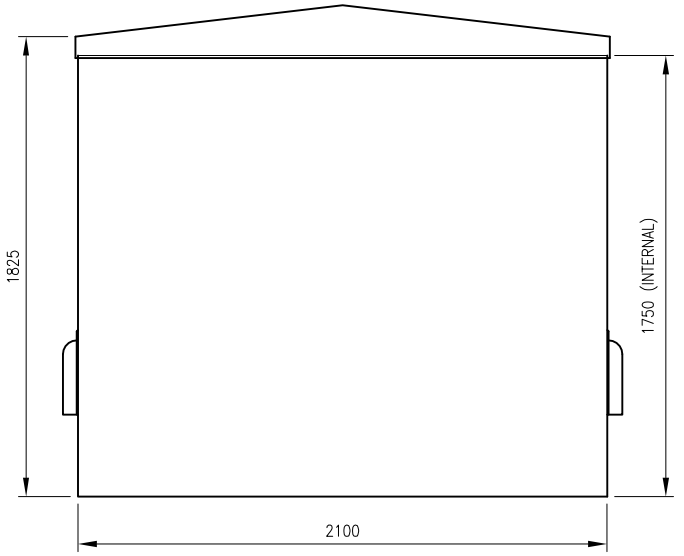
VIEW ON ARROW D



VIEW ON ARROW A



VIEW ON ARROW B



VIEW ON ARROW C

NOTES
1. DO NOT SCALE THIS DRAWING
2. UNLESS OTHERWISE STATED, ENCLOSURE IS TO BE FORMED WITH EXTERNAL FINISH OF SEMI GLOSS GREEN (14 C 39)
3. DOORS TO BE FURTHER PROVIDED WITH GALVANISED 10/10 CORD PULL DOOR STAYS AND SPRUNG TOWER BOLTS
4. THIS ENCLOSURE IS DESIGNED TO COORDINATE WITH THE STANDARD SUBSTRUCTURE DESIGN DETAILED ON WPD DRAWING EKV0054
5. PLEASE NOTE REQUIREMENT FOR GRP THRESHOLD UNDER DOUBLE DOORS LOCALLY.
   THIS IS REQUIRED TO FORM EDGING FOR SURFACING IN FRONT OF ENCLOSURE
6. DOOR TO BE EMBOSSED WITH DANGER OF DEATH SIGN
7. DOORS TO BE AFFORDED WITH HEAVY DUTY STAINLESS STEEL HINGES, STAINLESS STEEL THRESHOLD STRIP AND STAINLESS STEEL DRIP.
8. LIFTING EYES TO BE FIXED AT HEIGHT SHOWN, AT A HORIZONTAL POSITION THAT CORRELATES WITH STRUCTURAL STEELWORK (GENERAL POSITION TO BE SIMILAR TO THAT SHOWN)

Rev No.	Drawn	Chk'd	App'd	Date	Revision
1	CJW			120917	UPDATED DIMENSIONS/ANNOTATION

ORIGINAL ISSUE — Date

Drawn	CJW	050216
Checked		
Approved		

SCALE: DNS

WESTERN POWER DISTRIBUTION
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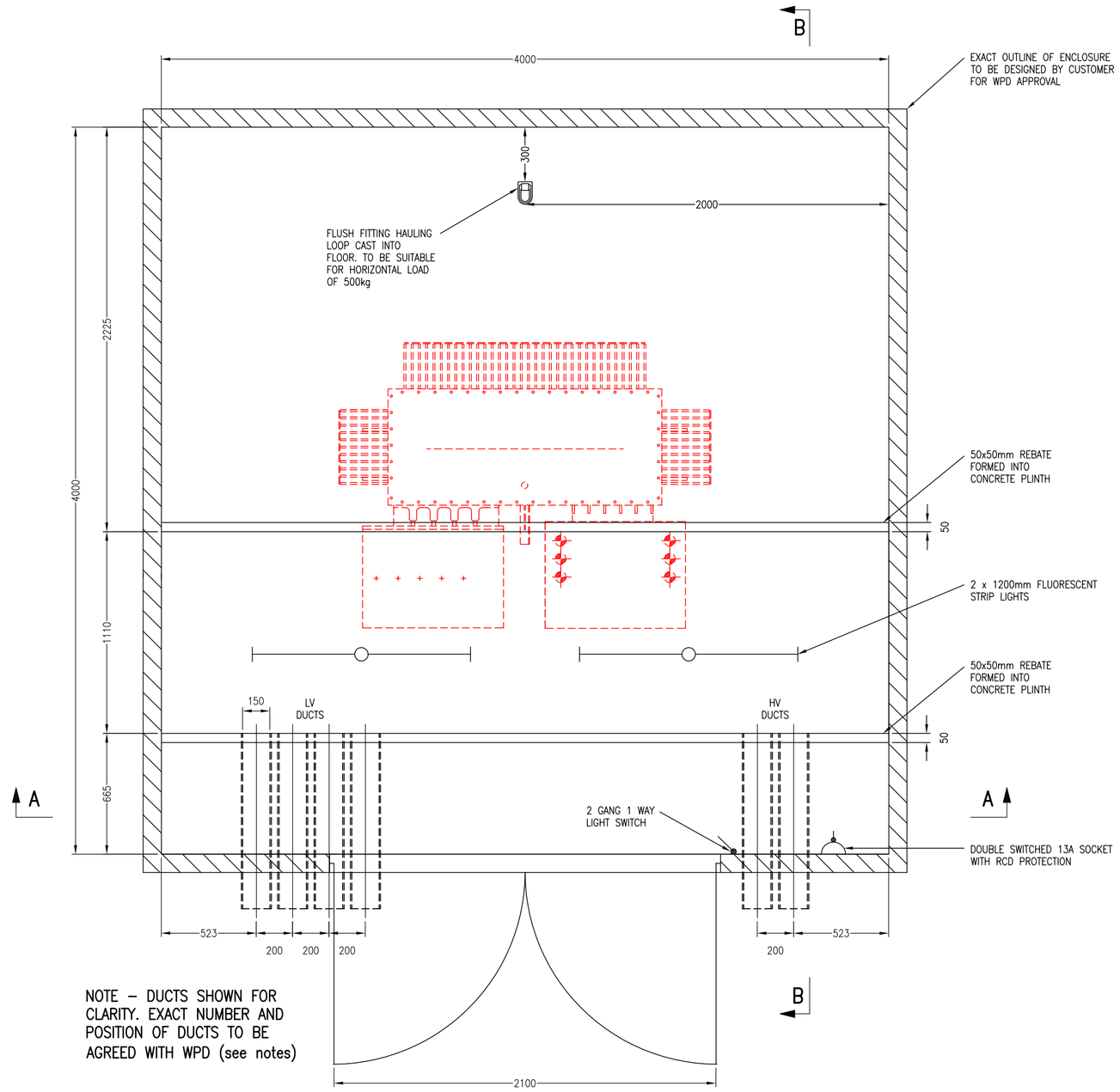
WESTERN POWER DISTRIBUTION

Title: 11kV STANDARD DRAWINGS
GRP ENCLOSURE DETAIL FOR 11kV PAD MOUNTED SUBSTATION

Drg. No. EKV0095

Rev No. 1

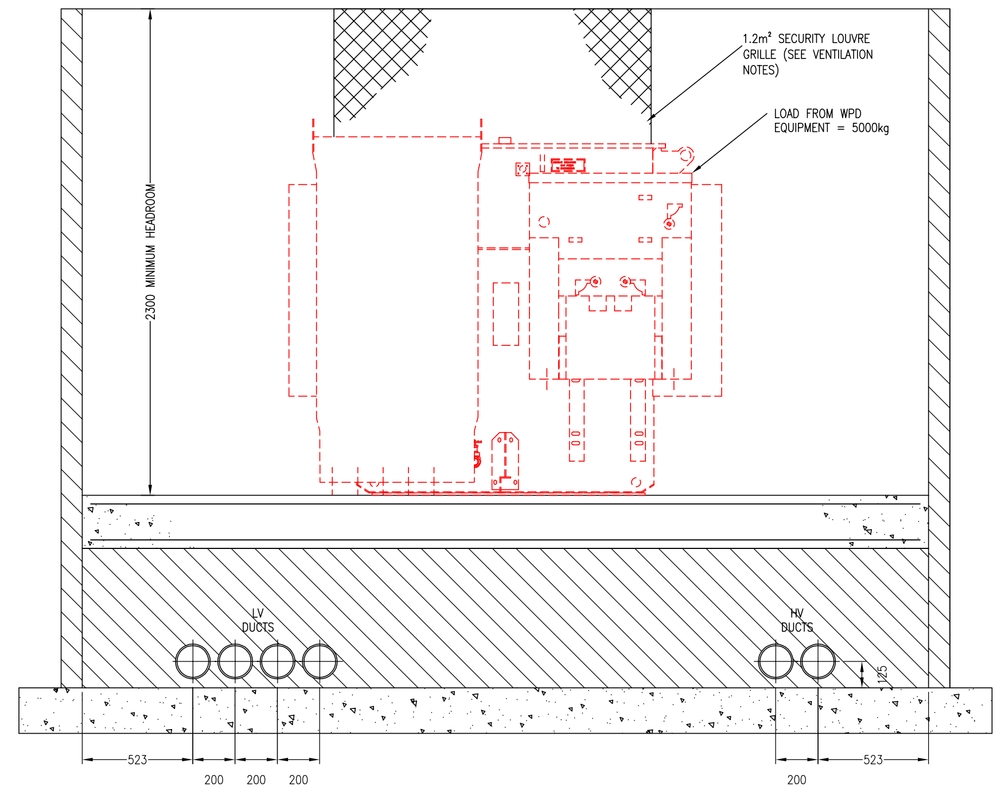
THIS DRAWING IS ONLY TO BE READ IN CONJUNCTION WITH WPD DOCUMENT, FUNCTIONAL PERFORMANCE SPECIFICATION FOR UNIT SUBSTATION



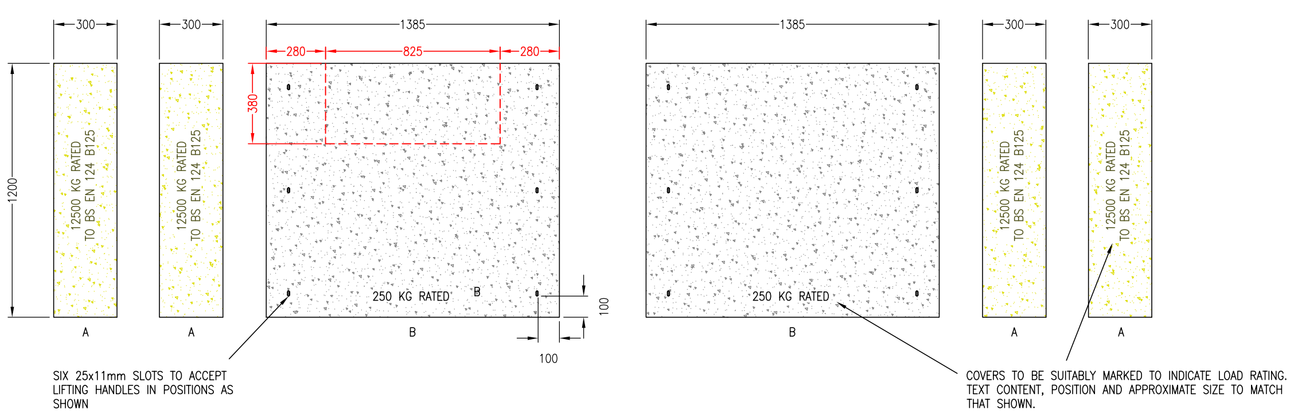
NOTE – DUCTS SHOWN FOR CLARITY. EXACT NUMBER AND POSITION OF DUCTS TO BE AGREED WITH WPD (see notes)

PROVISIONS FOR EARTHING MUST BE MADE AS APPROPRIATE TO THE REQUIREMENTS OF THE SITE. PLEASE CONSULT WPD PRIOR TO CONSTRUCTION

PLAN VIEW



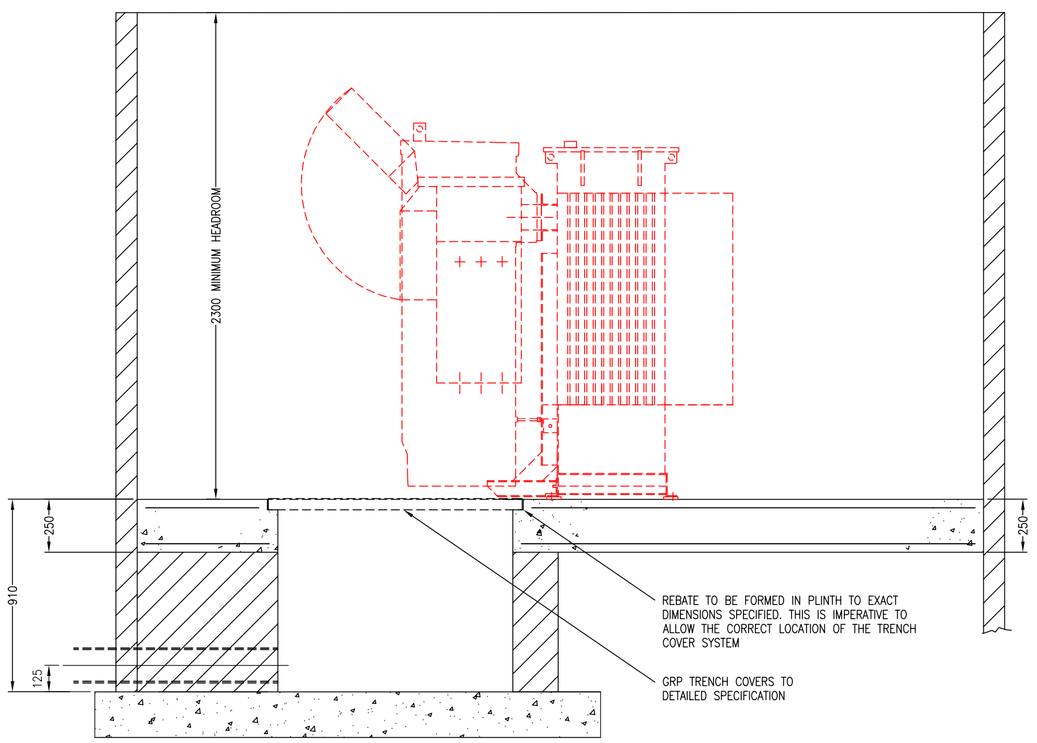
SECTION A–A



A – 50mm B125 RATED GRP TRENCH COVER IN YELLOW TO BS EN 124 SPECIFICATION (APPROX. 14KG PER COVER)
B – 50–53mm A15 RATED SOLID TOP GRP TRENCH COVER IN GREY TO BS EN 124 SPECIFICATION (APPROX. 50KG PER COVER)
– – – MAXIMUM TO BE REMOVED FOR LV CABLE ACCESS

NOTE: TWO 1200x600 B125 COVERS MAY BE USED IN PLACE OF THE FOUR 1200x300 COVERS SHOWN, IF AVAILABLE FROM MANUFACTURER.

TRENCH COVER SPECIFICATION (1:20)



SECTION B–B

NOTES

THIS DESIGN SHOULD ONLY BE USED WHERE THERE IS NO OPTION TO SITE A FREE–STANDING ENCLOSURE SEPARATE FROM ANY CUSTOMER BUILDINGS, OR, IF IT IS PART OF A LARGER BUILDING, WHERE THE COMPARTMENT CANNOT BE SITUATED WITH TWO WALLS TO THE EXTERNAL. IN THOSE INSTANCES, PLEASE REFER TO DRAWING EKV0016

DESIGN LIFE:
The design life of the enclosure shall be a minimum of 50 years. All components are to be maintenance free or at the least low maintenance items.

SITING
The Customer shall ensure that access to the substation for the purpose of plant installation, maintenance and removal/ replacement is adequate. The substation floor should be notionally at ground floor level. The substation doors should be configured to open directly through the external envelope of the building at ground level, on to a level road/ accessway as detailed in the performance specification. Consult WPD for detailed, project–specific access requirements.
To ensure compliance with BS9999 the HV substation shall be separated from the customers building by construction that affords fire resistance of minimum duration 2 hours.

APPROVALS:
Detailed drawings/specifications for the enclosure are to be submitted to WPD for comment prior to agreement of connection terms/submission for local authority approvals by the Customer.

WPD ACCESS:
The enclosure shall be sited to afford 24 hour WPD access. For specific access/offloading requirements see WPD performance specification.

STRUCTURAL DESIGN:
The Customer is responsible for the sizing/framing/configuration of all components as necessary to safely transfer/impart all adverse combinations of dead and imposed loadings to the natural foundation. (Total vertical dead load from WPD switchgear = 5000kg).
Where the enclosure is to be constructed within a larger building, it is essential that its walls, roof/ ceiling and floor offer no structural support to the components of the main building.
There is a conceivable risk that in the unlikely event of an internal fault within the WPD plant, a controlled venting of over–pressure may occur. This overpressure may have an adverse effect upon the structural elements forming the substation enclosure. It is essential that any resulting structural distress does not adversely affect the structural integrity/ robustness of the main building.

DIMENSIONS:
This drawing details the minimum internal dimensions and juxtaposition of elements to accommodate WPD plant. External dimensions are to be specified by the Customer to suit the proposed construction materials.

DRAINAGE:
The enclosure shall be designed to adequately collect and convey surface water to a suitable point of disposal.

SPECIFICATION FOR WORKMANSHIP/MATERIALS

SITE CLEARANCE:
Before commencing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc.

EXCAVATION:
Excavate to reduced levels and remove spoil from site.

Level and compact bottom of excavation to recieve concrete blinding layer/concrete foundation.

BLOCKWORK:
Solid concrete blocks to comply with B.S. 6073

Work size dimensions to be 440 (L) x 215 (H) x 100 (W) mm.

Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.

CONCRETE:
Blinding concrete to be grade C15 with minimum crushing strength of 15N/sq.mm at 28 days.

Plinth/foundation concrete to be grade C35 with a minimum crushing strength of 35 N/sq.mm at 28 days.

Top surface of plinth to be level with smooth steel float finish.

REINFORCEMENT:
Concrete plinth to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom).

Steel fabric reinforcement to comply with B.S. 4483.

Steel bar reinforcement to comply with B.S. 4449.

Reinforcement to be free from all loose rust and mill scale.

Minimum cover to all reinforcement to be 40mm.

BACKFILLING:
Area in in front of access doors must be completely backfilled and compacted BEFORE plant can be installed, to ensure safe use of manual handling techniques.

DOORS:
Doors to be low maintenance GRP or hardwood with heavy–duty hold–open devices. (All WPD approved).

Generally, bottom half of doors to be fitted with security ventilator louvre grilles to ensure cross–flow of ventilation (see ventilation notes)

Supply and fit Union 1001 or similar locking arrangement to accept WPD suited 1 x 1 6 pin cylinder (supplied by WPD). As an alternative if specifically agreed with WPD supply and fit heavy duty hasp and staple to receive padlock supplied by WPD.

Supply and fit internal panic release mechanism to active leaf.

Minimum clear height of door opening to be 2.1 metres.

VENTILATION
Adequate ventilation is essential to prevent adverse heat build–up within the substation. Passive ventilation via louvre grilles indiacted on the drawing (at high level and the bottom half of doors) should be provided. Where circumstances dictate that only the front wall of the building is available for external venting, full louvre security doors to be used in addition to louvre grilles, covering as much front wall area as structurally feasible

No air conditioning/ cooling plant shall be installed within the substation.

DUCTS
Ducts shown in recommended position. Method for manually moving plant over trench relies upon the cables being laid into the trench with the GRP covers laid over them. Ducts in this position should allow maximum slack on cables.

TRENCH COVERS
Trench covers to be supplied by the developer to the specification indicated.

Trench covers designed around and MUST MATCH OR EXCEED load specification of:
- B125 rated – Alcomet Trenchlite heavy duty grp trench cover
- B15 rated – Alcomet Trenchlite solid top GRP trench cover

These have been rated in line with BS EN 124 for the span used.

PLANT INSTALLATION METHOD DETAILED IN DRAWING EKV0099

CAUTION – UNDER NO CIRCUMSTANCES ARE TRANSFORMER LOADS TO BE IMPARTED TO LIGHT–DUTY (A15) COVERS AS THESE ARE NOT RATED FOR THIS PURPOSE. HEAVY DUTY (B125) COVERS MUST BE SECURELY IN PLACE ON THE PATH OF TRANSFORMER HAULAGE BEFORE PLANT IS MOVED OVER THE TRENCH. HEAVY DUTY COVERS MUST NOT BE MODIFIED.

Rev No	Drawn	Chk'd	App'd	Date	Revision
4	CJW			141216	DOOR WIDTH DIMENSION
3	CJW			251016	WARNING NOTE ADDED. TRENCH COVER SPECIFICATION MODIFIED.
2	CJW			280916	EARTHING NOTE ADDED
1	CJW			080916	HAULING LOOP DETAIL AMENDED

ORIGINAL ISSUE | Date 110716
Drawn | Checked | Approved
SCALE: 1:20 @ A2

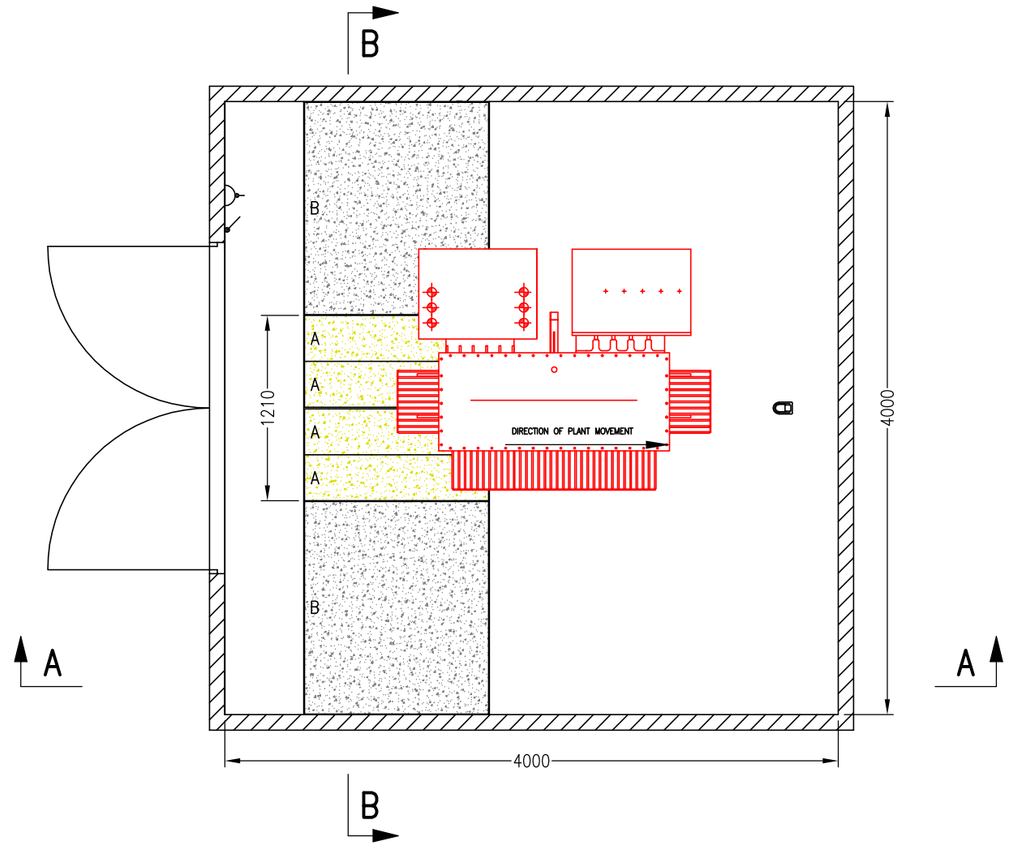
WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

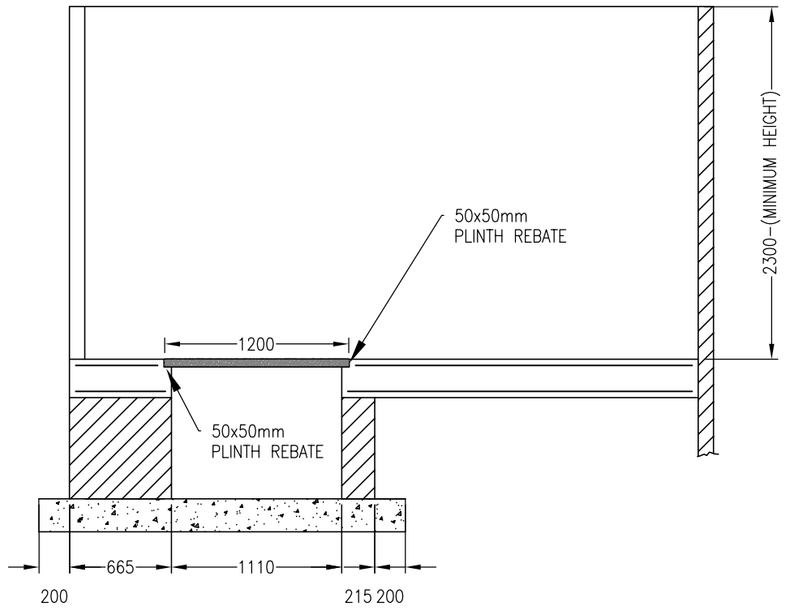
Title: FOUNDATION/ENCLOSURE DETAIL FOR UP TO 1000kVA SUBSTATION
UNIT CONSTRUCTION – WORKS BY CUSTOMER (ALTERNATIVE TRENCH CONFIGURATION)

Drg. No. EKV0098
Rev No. 4

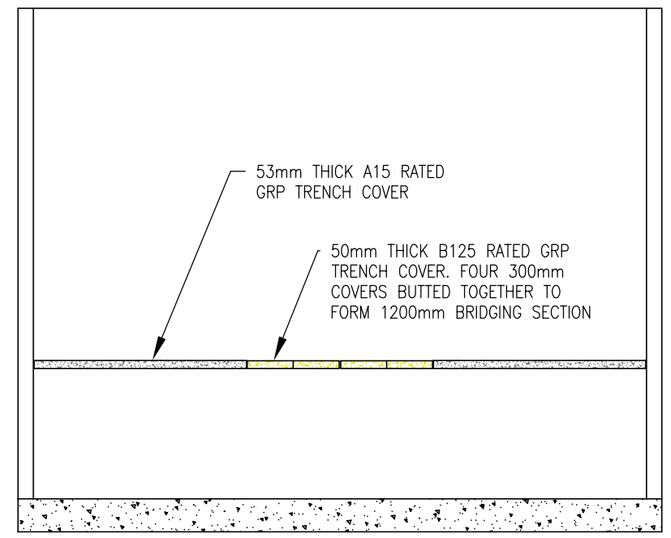
TO BE READ IN CONJUNCTION WITH DRAWING EKV0098



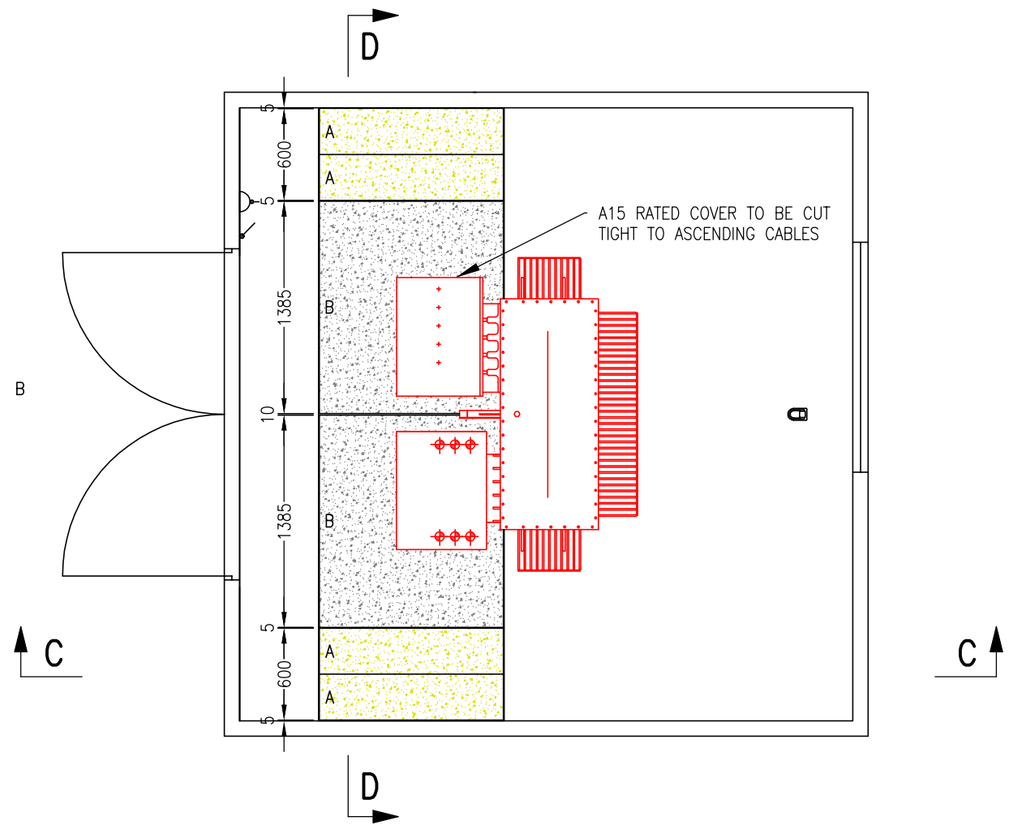
PLAN VIEW – INSTALLATION/REMOVAL



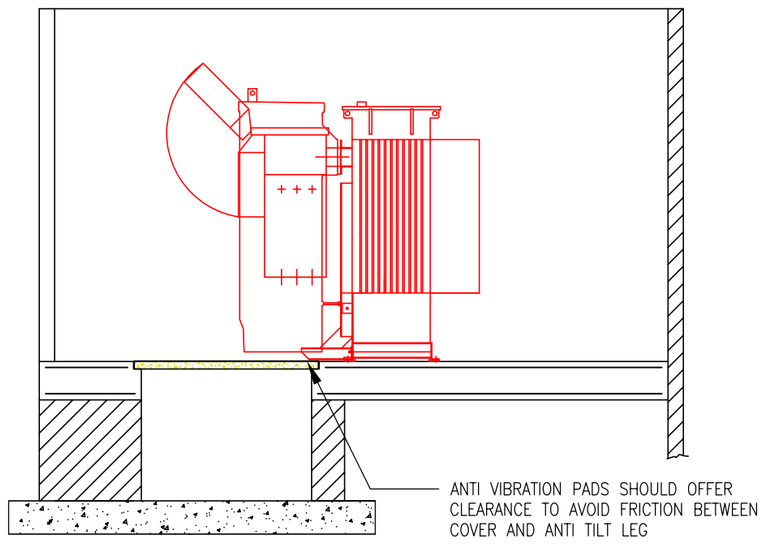
SECTION A–A



SECTION B–B

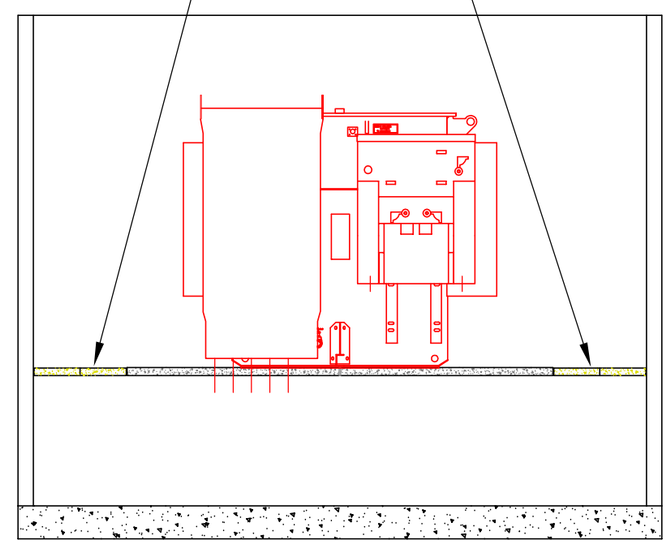


PLAN VIEW – PLANT IN POSITION



SECTION C–C

HEAVY DUTY SECTIONS TO BE MOVED FROM CENTRE OF TRENCH TO EXTREMITIES ONCE PLANT IS INSTALLED TO NEGATE THE REQUIREMENT TO CUT THEM AROUND CABLES. THIS MAINTAINS THEIR STRENGTH RATING. THE PEDESTRIAN SECTIONS CAN BE CUT AROUND THE CABLES. THE HEAVY DUTY SECTIONS CAN THEN BE MOVED BACK TO THE CENTRE WHEN THE PLANT NEEDS TO BE REMOVED.



SECTION D–D

A – 50mm B125 RATED GRP TRENCH COVER IN YELLOW TO BS EN 124 SPECIFICATION (APPROX. 14KG PER COVER)

B – 50–53mm A15 RATED SOLID TOP GRP TRENCH COVER IN GREY TO BS EN 124 SPECIFICATION (APPROX. 50KG PER COVER)

CAUTION – UNDER NO CIRCUMSTANCES ARE TRANSFORMER LOADS TO BE IMPARTED TO LIGHT–DUTY (A15) COVERS AS THESE ARE NOT RATED FOR THIS PURPOSE. HEAVY DUTY (B125) COVERS MUST BE SECURELY IN PLACE ON THE PATH OF TRANSFORMER HAULAGE BEFORE PLANT IS MOVED OVER THE TRENCH. HEAVY DUTY COVERS MUST NOT BE MODIFIED.

NOTES:

1. TRENCH COVERS DESIGNED AROUND AND MUST MATCH OR EXCEED LOAD SPECIFICATION OF:
   - B125 RATED – ALCOMET TRENCHLITE HEAVY DUTY GRP TRENCH COVER
   - A15 RATED – ALCOMET TRENCHLITE SOLID TOP GRP TRENCH COVER
2. DESIGNED AROUND A MAXIMUM PLANT WEIGHT OF 5000KG

Rev No	Drawn	Chk'd	App'd	Date	Revision
1	CJW			111116	CAUTION NOTE ADDED

ORIGINAL ISSUE		Date
Drawn	CJW	170216
Checked		
Approved		
SCALE:	DNS @ A2	

WESTERN POWER DISTRIBUTION
Design Department.
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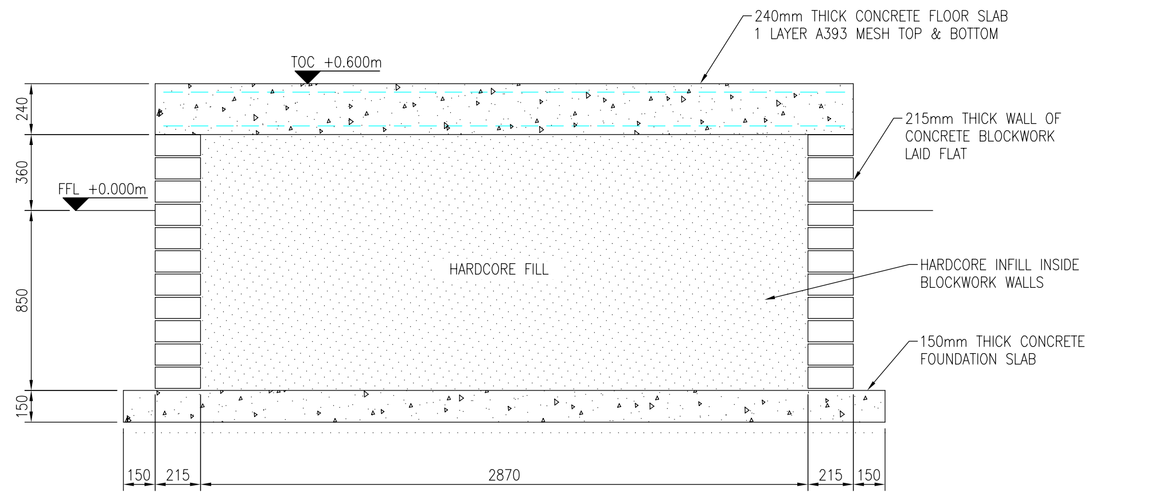
WESTERN POWER DISTRIBUTION

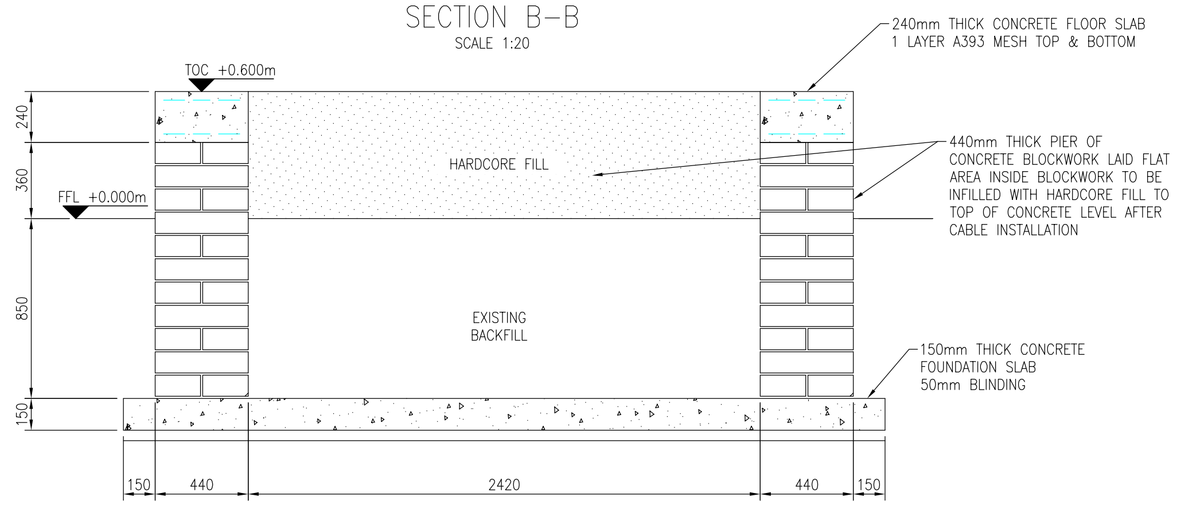
Title: Method for bridging trench with 11kV unit substaion in masonry built enclosure

Drg. No.: EKV0099

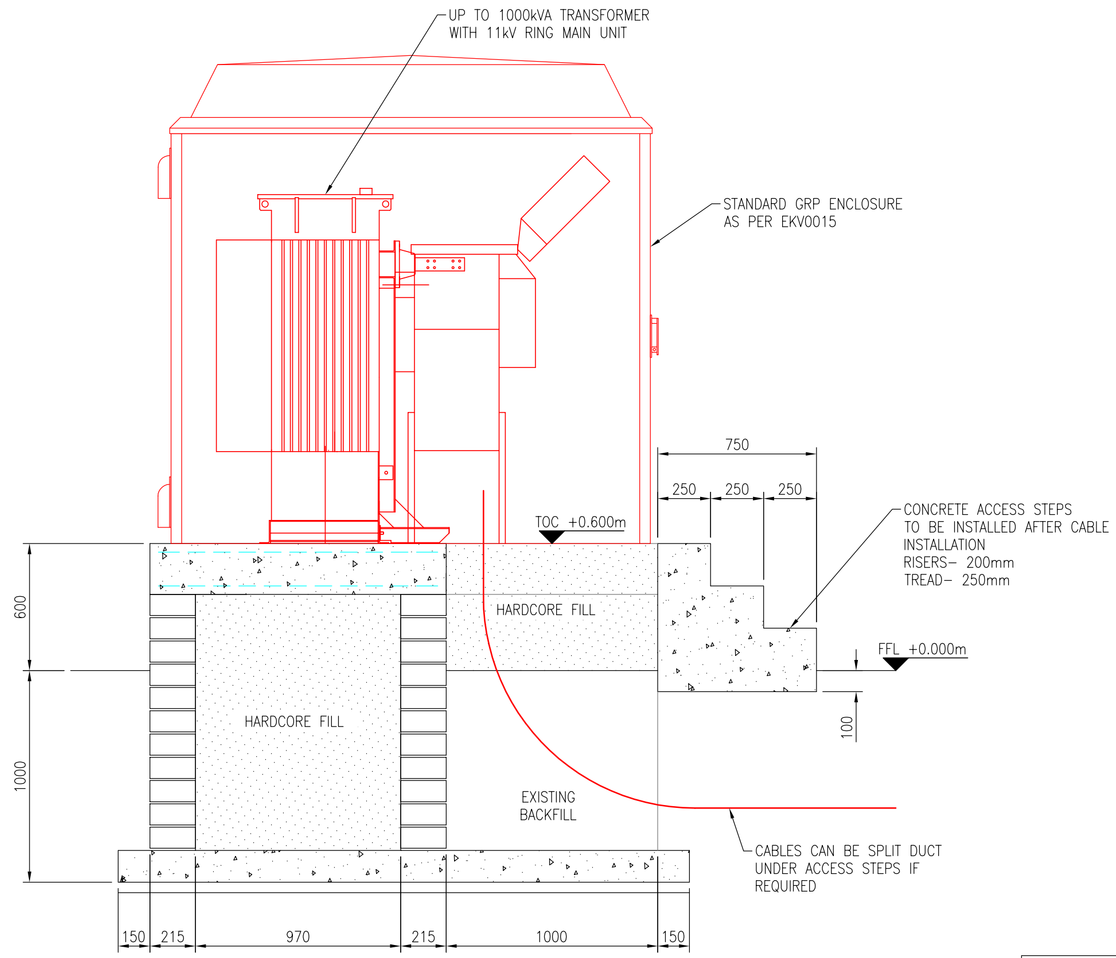
Rev No.: 1



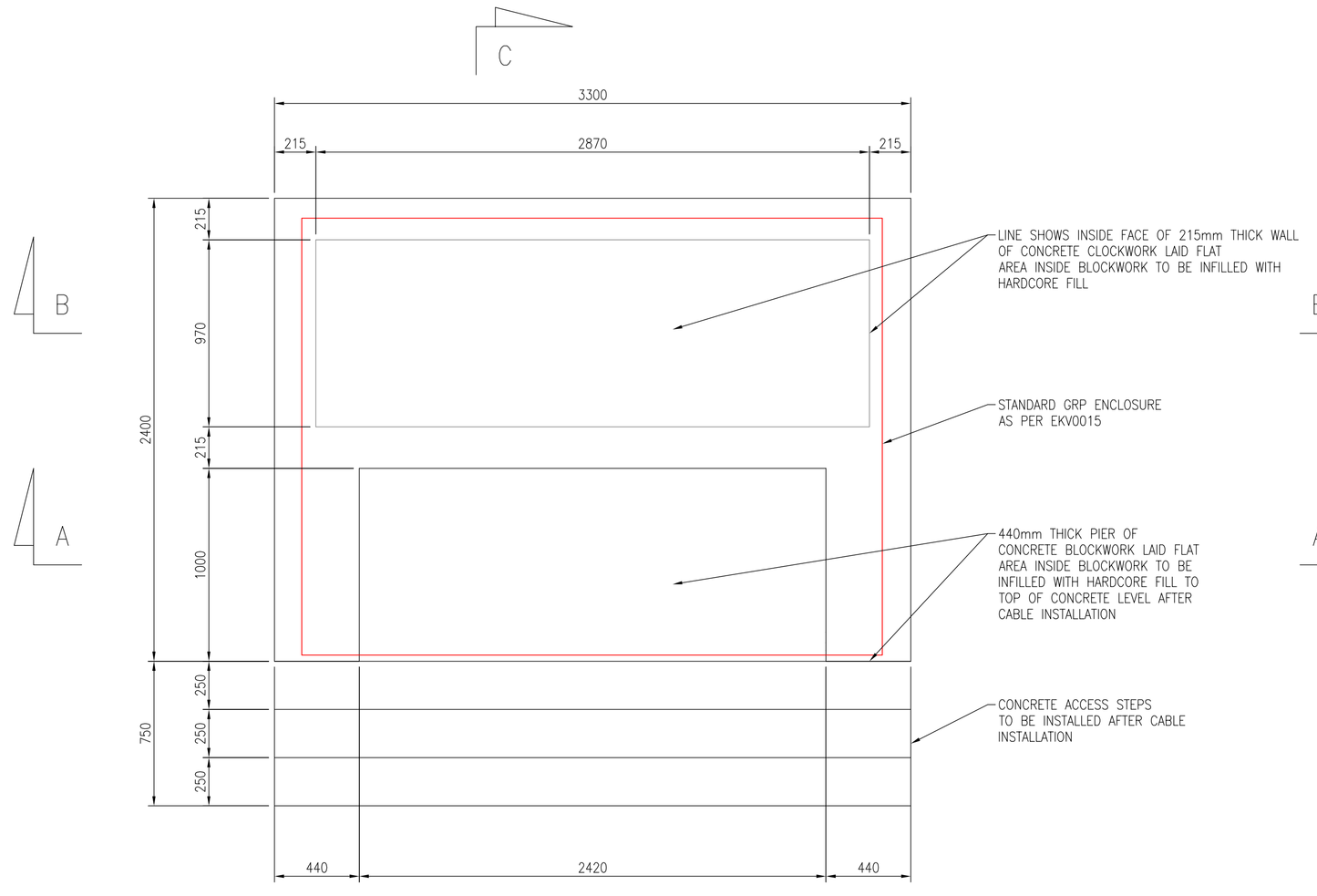
SECTION B–B
SCALE 1:20



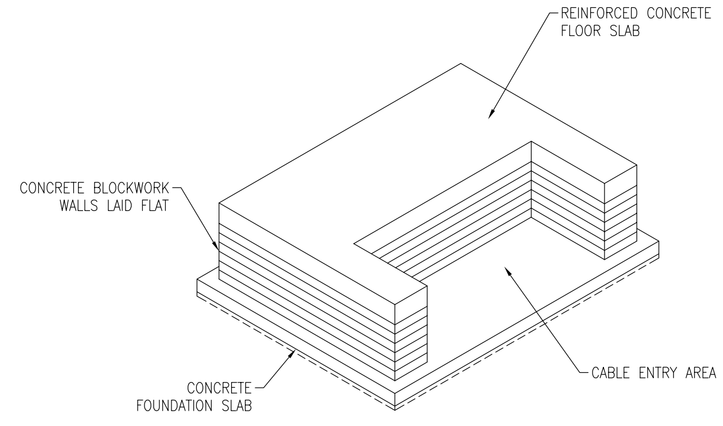
SECTION A–A
SCALE 1:20



SECTION C–C
SCALE 1:20



TRANSFORMER PLINTH PLAN
SCALE 1:20



ISOMETRIC VIEW OF
TRNASFORMER PLINTH
N.T.S

SPECIFICATION:

SITE CLEARANCE: Before commencing excavations, clear site of all rubbish, debris, shrubs, general vegetation, topsoil etc. and remove from same.

EXCAVATION: Excavate to reduced levels (or to firm foundation as directed by the Engineer) and remove spoil from site.

Level and compact bottom of excavation to recieve concrete blinding layer/concrete foundation.

BLOCKWORK: Solid concrete blocks to comply with B.S. 6073

Work size dimensions to be 440 (L) x 215 (H) x 100 (W) mm.

Concrete blocks to have a minimum compressive strength of 7.0 N/sq.mm.

CONCRETE: Blinding concrete to be grade C15 with a minimum crushing strength of 15N/sq.mm at 28 days.

Plinth/foundation concrete to be grade C35 with a minimum crushing strength of 35 N/sq.mm at 28 days.

Top surface of plinth to be level with smooth steel float finish.

REINFORCEMENT: Concrete plinth to be reinforced with 2No. layers of steel fabric reinforcement Ref. A393 (placed top and bottom).

Steel fabric reinforcement to comply with B.S. 4483.

Steel bar reinforcement to comply with B.S. 4449.

Reinforcement to be free from all loose rust and mill scale.

Minimum cover to all reinforcement to be 40mm.

BACKFILLING: Void in front of plinth to be backfilled with selected hardcore after protecting cables with min. 150mm stone dust.

ON COMPLETION: Where applicable area between front of plinth and site boundary to be paved with 600 x 600 x 50 mm thick concrete paving slabs.

All remaining exposed ground surfaces within site boundary to be dressed with a 75 mm thick layer of clean limestone chippings.

GENERAL NOTES:

All dimensions in metres unless otherwise stated.

Vibration pads must be used on all transformers.

The Contractors attention is drawn to the need for strict accuracy in setting out the foundation.

All lines and angles to be formed square, plumb and true.

FLOOD RESILIENCE:

This drawing demonstrates a design solution for raising electrical plant 600mm above finish floor level to improve flood resillience.

Rev No	Drawn	Chk'd	App'd	Date	Revision
					ORIGINAL ISSUE

		Date
Drawn	PAS	16.05.17
Checked	PAS	16.05.17
Approved	PAS	16.05.17

SCALE: AS SHOWN @A1

WESTERN POWER DISTRIBUTION
Design Department.
Avonbank, Feeder Road, Bristol BS2 0TB
Tel: 0117 933 2000 Fax: 0117 933 2001.

WESTERN POWER DISTRIBUTION

Title: GENERAL 1000kVA POCKET SUBSTATION
RAISED 600mm ABOVE FINISHED FLOOR LEVEL

Drg. No. EKV0104

Rev No. 0

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Serving the Midlands, South West and Wales

ST:NC1V APPENDIX B

FUNCTIONAL / PERFORMANCE SPECIFICATION FOR HV (11000, or 6600 Volt) SUBSTATIONS CONSTRUCTED BY THE CUSTOMER TO ACCOMMODATE WPD ELECTRICAL PLANT/ APPARATUS

Introduction

This specification aims to set-out the performance requirements for HV substations constructed by Customers to house Western Power Distribution (WPD) electrical apparatus. Backed-up by indicative WPD drawings, the specification is intended to assist the Customer (and their appointed consultants/ contractors) in understanding the key aspects of HV substation configuration/ design.

This document and the supporting drawings should not be seen as the output of a detailed site-specific design exercise, but as a functional/ performance specification. It provides a means in which WPD may adequately inform the Customer of the substation/ enclosure requirements:

- to ensure the ideal environmental conditions are provided and maintained for electrical plant
- to minimise the residual safety implications of the installation upon WPD operatives, Customer's personnel and third parties.

All supporting WPD standard drawings should only be used by the Customer to ascertain substation spatial dimensions/ cable entry requirements etc. Any substructure details shown on the drawings are indicative and assume competent and consistent founding strata. The Customer is to carry out a geotechnical investigation/ detailed structural design work as necessary to ascertain the most appropriate solution for the site.

WPD/ Customer Responsibilities

See the connection agreement/ responsibility schedule for project specific information.

Each metered electricity connection has to be given a Metering Point Administration Number (MPAN) also referred to as a Supply Number. This is provided by WPD after acceptance of our Formal Offer and Terms and Conditions for the provision of an electricity connection.

The Customer is responsible for appointing an Electricity Supplier once he is in receipt of the MPAN.

The Customer is also responsible for appointing his own Meter Operator, or electing to use one appointed by the Electricity Supplier. In both cases, the supply, installation and maintenance of tariff metering and associated equipment is the responsibility of the Meter Operator.

Where instrument transformer operated metering is employed, the supply, installation and maintenance of the instrument transformers will be a WPD responsibility. The Customer is responsible for the supply and installation of the wiring between the instrument transformers and the meters.

Generally, all HV switchgear, network HV supply cables and safety signage, will be supplied, installed, operated and maintained by WPD.

Private HV and LV cables, general LV wiring/ switching and heating/ lighting/ power fittings, will be supplied and installed by the Customer.

All building /civil construction works described within this document, the connection agreement, or on the drawings, are to be provided by the Customer.

The Customer has responsibility for carrying out utility searches/ enquiries as necessary to determine the presence, or otherwise of other utility asset in the vicinity of the proposed building works and any utility constraints/ restrictions associated with their asset.

It is expected that the Customer will develop a site-specific design for each substation installation and that this will be forwarded to WPD for comment/ agreement at least 4 weeks prior to commencement of construction. Where local authority Planning consents/ Building Regulation/ other statutory approval is required for the building that houses the substation, obtaining such consents shall be the responsibility of the Customer. The Customer shall agree the detailed designs with WPD prior to submission for statutory approvals.

Design/ Workmanship Generally:

The HV Substation is to be designed and constructed by the Customer / developer and is to provide a secure, internal, dry, stable, level, clean, dust-free, non-aggressive and non-hazardous environment to accommodate WPD equipment with minimised structure / fabric maintenance requirements.

The design life of the HV Substation shall, as a minimum, be equivalent to the nominal life of the electrical plant / switchgear at 50 years. Building components where practicable shall be of a maintenance-free type or, at the least, of a low-maintenance type.

All design / construction is to comply with the current edition of the Building Regulations irrespective of whether formal approval is being sought by the Customer.

Products to be incorporated into the construction shall be of a standard appropriate to the works (EC, BS, BBA certified), of consistent quality and appearance and installed in a workmanlike manner in accordance with good building practice.

The minimum internal spatial dimensions and required substructure layout for the substation to conform with WPD cabling, operational and safety requirements (including means of escape) are indicated on the supporting drawing/s.

Workmanship shall be to an acceptable standard to accommodate the electrical apparatus and WPD reserve the right to request that any defects are rectified prior to installation/ energising plant

Substation Siting/ Access Requirements:

WPD will require unrestricted 24 hour access to and egress from the substation. Wherever possible, the substation shall be located in such a way that it avoids the need for WPD personnel to pass through any external perimeter fence/ security controls. Where present however, site access gates and the like are to be provided with a dual locking facility, incorporating a WPD substation security lock, or are to be opened upon request by 24 hour on-site security staff.

For a free-standing Substation enclosure, its walls should be positioned no closer than 1000mm from occupied buildings to minimise the potential risk of fire spread to/ from the structure.

When considering potential substation locations, it should be borne in mind that transformer noise is generally most noticeable during the night, when the background noise level abates. This risk can be mitigated by locating HV substations at least 5 metres (horizontally) away from dwellings.

Due to earthing considerations, the substation shall be at least 10m, on plan, away from (see ST: TP21D):

- Swimming pools, camping and caravan sites, gardens, and other areas where people may reasonably be barefoot
- Ponds / lakes used for commercial fish farming

- Telephone exchanges
- Railway installations
- Overhead line towers

Where it is necessary to segregate the substation HV and LV earths i.e. where the earth potential rise (EPR) under fault conditions exceeds 430V (see ST: TP21D), the substation HV earthing system and any metalwork connected to it must be at least 9m away from the LV earthing system and any metalwork connected to it. Assuming the HV earthing system encircles the substation at a 1m distance then the substation shall be at least 10m away from:

- Buildings, especially steel framed ones
- Items of street furniture
- Buried metalwork (e.g. pipes)
- Earth electrodes associated with lightning protection
- The LV earth electrode
- PME earth electrodes

This latter requirement means that it is not permissible to locate a new substation with an EPR greater than 430V within an existing, new or converted third-party building unless the building is exclusively for the substation as it will be very difficult to achieve the HV to LV earth segregation otherwise. It also imposes additional requirements / constraints for substation auxiliary supplies and HV metering.

Unless appropriate protective measures are proposed by the Customer and agreed by WPD, the HV Switchroom floor level shall be positioned to minimise flood risk. In practical terms, the switchroom floor level should be at least 300mm above the 1 in 100 year fluvial flood level, 300mm above the 1:100 year pluvial flood level and 300mm above the 1 in 200 year tidal flood level (also preferably 300mm above the 1 in 1000 year fluvial flood level). Care shall be taken to ensure that the presence of cable ducts/ cut-out's/ entries within the switchroom substructure do not breach any flood defences/ protective measures.

External ground / access road levels shall be designed such that there is no hazardous / detrimental build up of surface water in the proximity of the Substation enclosure. Hard surfacing should, wherever possible, be laid to falls in such a way as to discharge away from the substation doors. Where this is not possible, a high capacity channel drain shall be located immediately outside the 'threshold' of the substation.

The Substation shall be provided with an external access road / safe unloading area immediately in front of the entrance door(s) as follows:

The access road shall be a minimum of 3.0m wide, with 4.5m minimum headroom, and designed to accept a minimum weight of 13 tonnes.

The unloading area shall be a minimum of 3.0m x 3.0m, with 6.5m minimum headroom to allow for mechanical lifting.

Both areas should be surfaced/ prepared/ maintained to such a standard that WPD light goods vehicles can readily access the site at all times (from initial installation to final decommissioning) without the need for special control measures

Where it is proposed to provide a dedicated substation enclosure within a larger building, the Customer shall ensure that access to the substation for the purpose of plant installation, maintenance and removal/ replacement is adequate. At least one of the compartment walls forming part of the substation enclosure should be an external wall and the substation floor should be notionally at ground floor level (subject to the above flood risk mitigation requirements). The substation doors should be configured to open outwards directly through the external envelope of the building, on to a level road/ accessway as detailed above. The substation should only be accessed from the open air.

The minimum internal spatial dimensions and required substructure layout shall correspond with those indicated on the standard drawings.

No gas / water / telecomm / other utility fixtures are to be located within the substation enclosure/ within the proposed HV cable termination area.

Where required for a HV metered connection, a metering room shall be provided within a maximum distance of 10 metres from the HV Switchroom. A suitable layout for the metering room is indicated on the WPD standard drawing/s but the Customer should consult his appointed Meter Operator to confirm requirements. A clear duct run of a minimum diameter of 100mm shall be provided between the any HV Switchroom and metering room for the installation of multi-core cabling. All bends in duct runs shall be smooth and a pair of draw wires will be installed to the duct run.

Loading/ Structural Issues:

The Substation shall be designed in accordance with the codes of practice relevant to the proposed structural materials and shall adequately carry and transmit to the natural foundation all dead, imposed and wind loads (including adverse combinations) with due regard to deformation, structural stability, subsoil conditions / effects and the proximity of adjacent structures.

Details of the significant anticipated dead loads imparted to the substructure by WPD electrical plant are indicated on the standard drawing/s

To allow for routine access/ maintenance, the floor surface around all electrical plant shall generally be designed to support a default imposed load of 5kN/m2.

The evaluation of loads other than those specified for the electrical plant / equipment manufacturer(s) shall be in accordance with appropriate British Standards for the assessment of dead and imposed, wind and snow loads.

Where the enclosure is to be constructed within a larger building, it is essential that its walls, roof/ ceiling and floor offer no structural support to the components of the main building.

There is a conceivable risk that in the unlikely event of an internal fault within the WPD plant, a controlled venting of over-pressure may occur. This overpressure may have an adverse effect upon the structural elements forming the substation enclosure. It is essential that any resulting structural distress does not adversely affect the structural integrity/ robustness of the main building.

Overpressures are transient events caused by the rapid evolution and discharge of gases consequent of an internal arcing event within an insulating medium. In a worst-case overpressure event, temperature and pressure tend to be initially very localised and intense, but dissipate rapidly into the substation space, if unimpeded by obstructions. The dynamic nature of pressure evolution and dissipation will vary depending upon network characteristics and substation/ plant configuration. For this reason WPD are not in a position, on a project-by-project basis, to define a design loading intensity that the substation compartment should be designed to withstand.

We are aware that building structure designers need to ensure adequate robustness to low, medium and high rise structures as prerequisite of the Building Regulations approval. For this reason, we take a view that the safest approach is for building structure designers to discount the supporting effect of substation compartment walls from any analysis of building stability. This does not necessarily mean that these walls would yield in the unlikely occurrence of an overpressure event, but provides a conservative assessment.

Fire Resistance/ Performance:

The equipment contained within the substation should be seen as a potential source of combustion.

The Substation shall be of fire resistant construction and designed to ensure that in the event of fire the structure is not materially impaired and the spread of fire (and smoke where applicable) is restricted over internal surfaces and to other buildings / adjacent structures. All doors, frames and fittings shall be designed to open outwards.

Where the Switchroom is to be accommodated within a larger building, the fire resistance of the Substation compartment constructed by the Customer shall be appropriate to ensure Building Regulations/ Fire Authority approvals. To ensure compliance with BS9999, the Substation shall be separated from the Customers building by construction that affords fire resistance of minimum duration of 2 hours. The substation shall also only be accessed directly via the open air.

The Customer will be required to advise WPD of any specific requirements for the use of intumescent seals/ pillows/ blankets etc necessary to ensure the integrity of the fire compartment.

The Customer should make provision for the extension of existing, or provision of new, smoke/ heat sensors to the WPD substation linked to a fire alarm panel with internal/ external sounders and remote monitoring as necessary.

Durability / Moisture Resistance:

The Substation shall be designed to protect the structure and its contents from damage or risks to health and safety due to the effects of weather, water / moisture penetration and ground contaminants.

Generally, flat roof construction is unacceptable for WPD substations. Customers proposals should incorporate a roof fall of at least 5 degrees (measured from the horizontal).

Ventilation:

The Substation shall be designed to provide adequate ventilation and to prevent adverse levels of condensation likely to cause damage to the fabric of the structure and its contents or pose a risk to health and safety.

In the absence of detailed design data, the Customer is to afford the following:

- For HV Switchrooms containing no transformer/s - ventilator grilles/ trickle vents/ other proprietary ventilators in accordance with the current edition of the Building Regulations.
- For HV Substations containing HV/LV transformers, adequate passive ventilation by means of louvre grilles as indicated on the drawings

No air conditioning/ cooling plant shall be installed within any WPD substation.

Drainage:

The Substation shall be designed to adequately collect and convey surface / storm water to a suitable point of disposal. Where the Customer proposes to use soakaway's it shall be ascertained, by percolation tests that this approach is appropriate for the ground conditions

Thermal Performance / Insulation:

The thermal performance requirements for a substation building/ enclosure vary depending upon the electrical plant installed:

- For a nominally heated HV switchroom containing no HV/LV transformer/s, the enclosure shall be designed to limit heat losses through the fabric of the building in accordance with the Building Regulations.

- For an unheated HV substation containing HV/LV transformers, no insulation is required (other than that necessary to prevent condensation)

Security:

The Substation shall be constructed with no areas of glazing and designed to prevent any unauthorised entry or access to the electrical plant / equipment. Appropriate safety / warning / danger signs and notices (provided and installed by WPD) shall be permanently displayed.

All entrance doors shall be outward opening, of robust / vandal resistant / durable / maintenance-free hardwood or g.r.p. construction. Steel/ aluminium doorsets (or those constructed from other conductive materials) may be used, where the site is 'cold' provided that the doors/ frame are bonded to the HV earth. Where a site is 'hot' the use of conductive door finishes shall be avoided. For further information in this respect, please consult ST:TP21. The Substation doors shall be fitted with a secure locking arrangement capable of receiving a Europrofile cylinder which will be supplied and fitted by WPD. The metering room shall be provided with a locking arrangement to that affords access to the Customer, Meter Operator and Data Retriever.

Double leaf entrance doors shall be designed such that the right hand leaf (viewed from outside) will open first. The meeting stiles shall be rebated / overlap or otherwise be resistant to prising. The left hand leaf shall be fixed internally by short top and bottom sliding bolts into receptors within the frame head and cill.

Heavy duty door restraints shall be fitted at the head of each door leaf and shall be capable of holding the doors open at 90 degrees.

All door hinges shall be vandal resistant / heavy duty with concealed fixings.

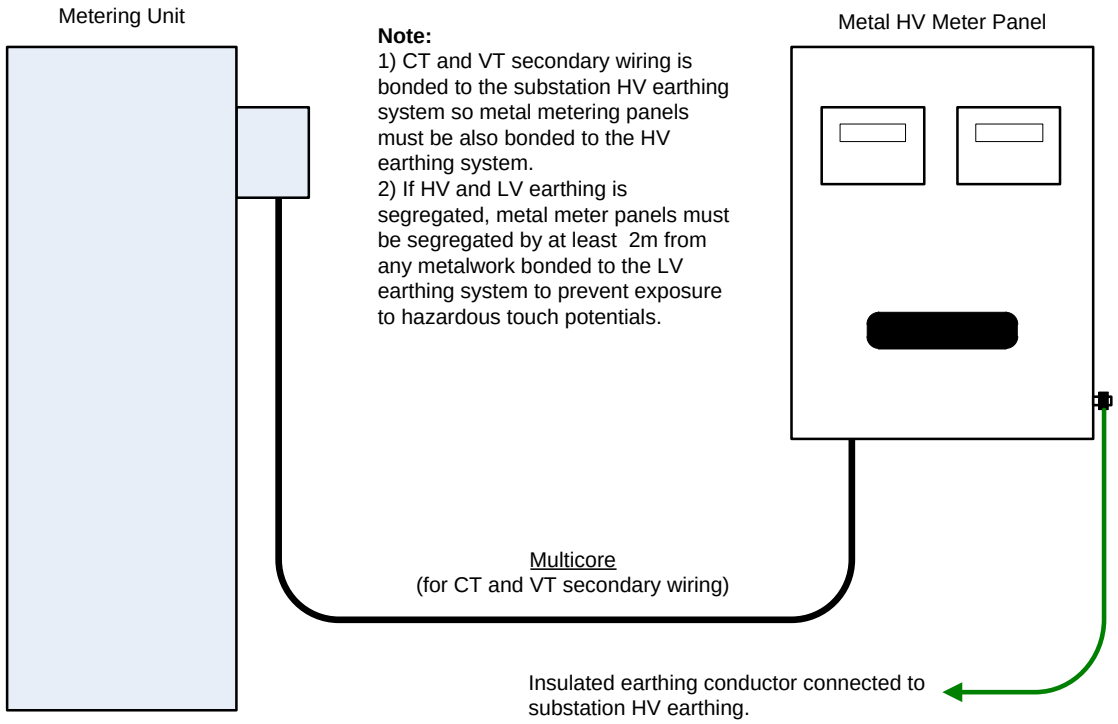
HV Metering

Meters and associated equipment are not permitted to be installed inside the substation housing for safety and operational reasons. A suitable external enclosure / cabinet to house the meters and associated equipment which is accessible to the customer, Electricity Supplier and Meter Operator shall be provided.

The preferred arrangement is for the metering equipment to be contained within a GRP housing positioned immediately adjacent to the substation housing, unless the customer prefers to construct a suitable building for this purpose.

The metering room shall be located within a maximum distance of 10 metres from the HV Switchroom. A suitable layout for the metering room is indicated on the WPD standard drawing/s but the Customer should consult his appointed Meter Operator to confirm requirements. A clear duct run of a minimum diameter of 100mm shall be provided between the any HV Switchroom and metering room for the installation of multi-core cabling. All bends in duct runs shall be smooth and a pair of draw wires will be installed to the duct run.

Instrument transformer secondary wiring is bonded to the substation HV earthing system and consequently special precautions are required when it is necessary to segregate the substation HV and LV earths i.e. where the earth potential rise (EPR) under fault conditions exceeds 430V. Where the metering equipment is to be housed within a metal enclosure it should be positioned immediately adjacent to the substation housing so that it is enclosed within the HV earthing system. Further information is given in the drawing below.



L.V. Electrical:

The heating, lighting and power requirements are indicated on the standard drawing/s

As a minimum, the Substation is to be provided with a two-way MCB consumer unit (fed from Customers LV network), light fittings switchable from inside the entrance door(s) and a 13A double socket incorporating a 30mA residual current device (RCD).

For an HV Switchroom containing no transformer/s a thermostatically controlled tubular heater shall be provided. For HV substations containing HV/LV transformer/s no dedicated heating is required

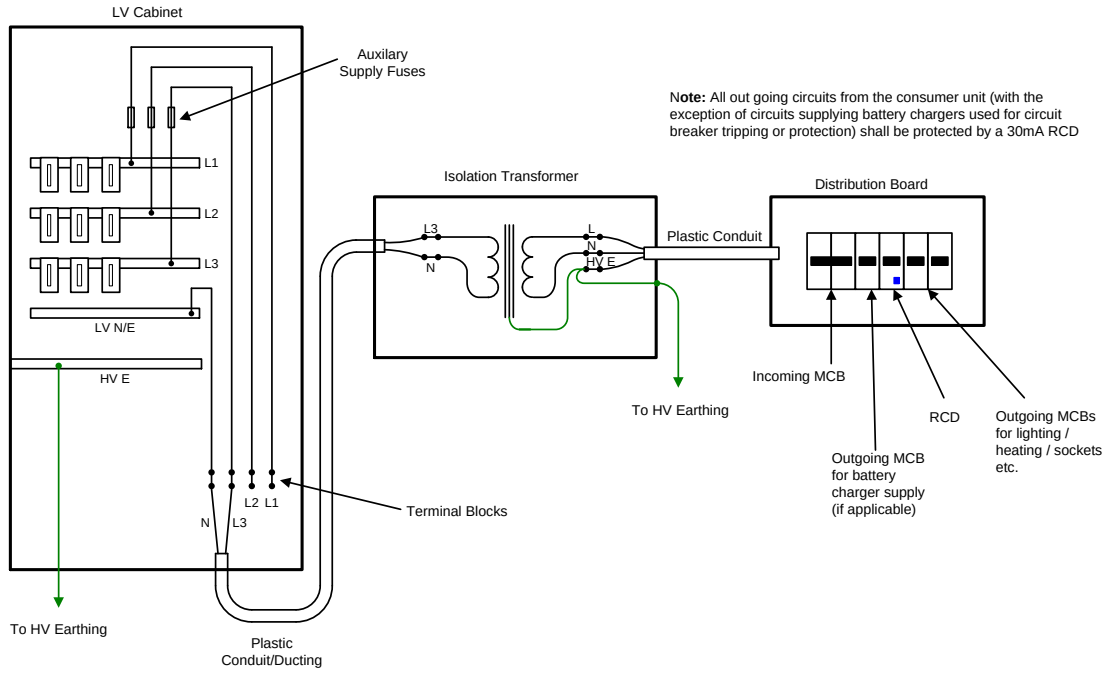
LV equipment requirements for the Metering Room are indicated on the drawing although these should be clarified with the Meter Operator.

All wiring shall be run in galvanised steel conduit. All switch boxes, sockets and the like are to be of a heavy duty metal-clad type.

Only electrical cabling/ apparatus dedicated for WPD use shall be located within the substation.

The design and installation shall incorporate recommendations, where applicable, contained within BS 7671 'Requirements for Electrical Installations' (The IEE Wiring Regulations)

Where it is necessary to segregate the substation HV and LV earths i.e. where the earth potential rise (EPR) under fault conditions exceeds 430V, the LV electrical supply shall be via a 1:1 LV isolation transformer. The transformer shall be able to withstand 7kV ac for 1 minute between windings, and between the incoming winding and the casing. Further information is given in the drawing below.



Appendix C

PHOTOGRAPHS/ NARRATIVE RELATING TO INSTALLATION OF GRP LINTEL/ BEAM - STANDARD UNIT CONSTRUCTION WITH GRP ENCLOSURE

View Showing Door Cill with GRPLintel Directly Underneath

Front View with Door Closed - Prior to Backfilling

Close-up of inside of Cill/ Lintel Showing Site Fixings

APPENDIX D

SUPERSEDED DOCUMENTATION

This document supersedes ST:NCIV/3 dated November 2016 which must now be withdrawn.

APPENDIX E

ASSOCIATED DOCUMENTATION

ST:SP2D
Relating to substation records of risks to public and risk reducing actions – Electricity Safety Quality and Continuity Regulations 2002

ST : TP21D
11kV, 6.6kV and LV Earthing

EE SPEC:19
Specification for GRP Substation Enclosures

APPENDIX F

IMPACT ON COMPANY POLICY

Minor changes have been made to this ST and the supporting specification in line with current site practice / regulations

APPENDIX G

IMPLEMENTATION OF POLICY

Team Managers having responsibility for alteration shall bring to the attention of planning and construction staff as necessary.

APPENDIX H

KEY WORDS

Civil, 11kV, 6.6kV, Substation, Unit Construction, HV Switchroom, Enclosure.