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ENGINEERING CONSTRUCTION STANDARD

ECS 07-3005

PRECAST CONCRETE BASES

Network(s): EPN, LPN, SPN

Summary: This standard details the planning, delivery and installation aspects for precast concrete bases used for secondary distribution substation equipment.

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Approver: Paul Williams **Date:** 09/03/2026

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Revision Record

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Date	05/03/2026	**Author**	Tim Mitchell
Reason for update: Minor update to drawing ECS 07-3005_01. **What has changed:** Drawing number correction for ECS 07-3005_01.			
Version	2.0	**Review Date**	05/12/2030
Date	05/12/2025	**Author**	Tim Mitchell
Reason for update: New precast plinth for RTU (Type B11). Updated in line with latest standards and best practices. **What has changed:** • Table 4-1: Naming convention update to B3+B9 Combo and B5+B9 Combo in line with supplier reference and approvals documents. • Table 4-1: Inclusion of new precast concrete plinth for remote terminal unit (RTU). • Section 4: Update to ancillary items provided with precast bases. • Section 5: Update to roles and responsibilities of haulier, designated contractor and earthworks contractor. • Section 7: Update to ground works requirements including construction sequence. • Section 9: Update to post-assembly works. • Appendix A: New drawing ECS 07-3005_05 for Type B11 precast base for RTU. Updates to all drawings, including notes and construction sequence. • Appendix B: Minor update to check list requirements in line with standard updates.			
Version	1.0	**Review Date**	16/09/2027
Date	07/09/2022	**Author**	Uriel Arias
New document to detail the conditions and requirements when using precast concrete bases. Supersedes EBB 07-0055.			

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1 Introduction

This standard details the planning, delivery and installation aspects for precast concrete bases. Precast concrete bases are used to support secondary distribution substation equipment including transformers and switchgear. The bases are produced under controlled factory conditions which ensures a high-quality finish and a sustainable design. Each base is functionally equivalent to the traditional cast in-situ reinforced concrete bases specified in EDS 07-3102 ‘Secondary Substation Civil Design’.

The approved precast concrete bases use the steel reinforcement for structural purposes and to provide earth continuity throughout. They are supplied with accessible earth connectors to allow the substation earthing system to be connected to the rebar. All bases use a low-carbon cement mix to reduce the embodied carbon emissions, compared to Portland cement-based mixes.

The bases for transformers in GRP enclosures are bunded by design, hence oil spillages are fully controlled.

2 Scope

This standard applies to the delivery and installation of precast concrete bases for secondary distribution substation equipment during customer connection and asset replacement projects within the UK Power Networks geographical area.

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3 Glossary and Abbreviations

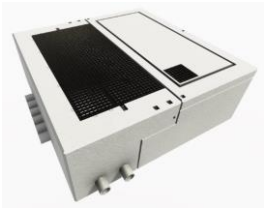
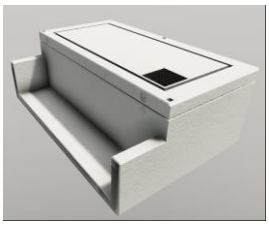
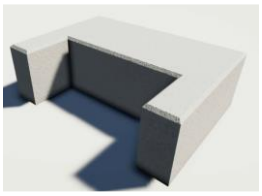
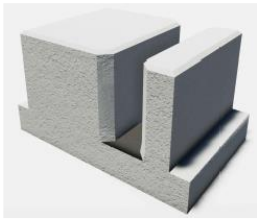
Term	Definition
Cable Pit	Excavated area for cables external to the precast base. Cable pits shall be constructed in accordance with ECS 02-0019.
Cable Trench	Area inside the front of the precast concrete base, into which cables can be pulled for jointing to equipment.
Designer	As per CDM 2015*: A designer is an organisation or individual whose business involves preparing or modifying designs for construction projects, or arranging for, or instructing, others to do this. Designs include drawings, design details, specifications, bills of quantity and design calculations. Designers can be architects, consulting engineers, quantity surveyors and interior designers, or anyone who specifies and alters designs as part of their work. They can also be principal contractors, specialist contractors, tradespeople or even commercial clients, if they get actively involved in design work for their project.* **Note**: The definition of roles and responsibilities in a project is outside the scope of this document. Given the broad definition of a 'designer', this is something to be determined in a project-to-project basis
Formation Level	Level at which the construction build up starts, from the existing ground.
GEN1	A designated concrete mix in accordance with BS 8500-1.
GRP	Glass Reinforced Plastic
ICP	Independent Connection Provider
RMU	Ring Main Unit
RTU	Remote Terminal Unit
Soft Spots	Area within the existing ground that is unable to sustain the loads defined within this construction standards.
TOC	Top of the concrete
Type 1 sub-base material	Crushed aggregate material used to provide a stable sub-base, both primary and recycled material can be used to produce a Type 1 sub-base. Type 1 Specification for Highway Works Clause 803 is often referred to as MOT Type 1 or DOT Type 1.
UK Power Networks	UK Power Networks (Operations) Ltd consists of three electricity distribution networks: • Eastern Power Networks plc (EPN). • London Power Network plc (LPN). • South Eastern Power Networks plc (SPN).

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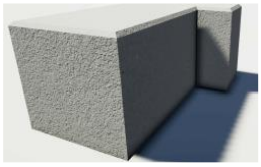
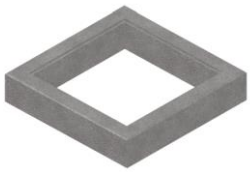
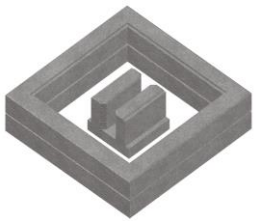
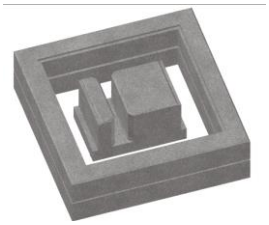
4 Base Types

The approved base types are shown in Table 4-1, and are available internally via Logistics. Customers and ICPs can also procure them directly from the approved manufacturer, refer to EAS 07-0000 for further details.

Table 4-1 – Precast Concrete Base Types

Base Type	Designed For	Drawing Reference	Image
A1	Secondary transformer, compact and micro substations in a GRP housing, includes flooring	ECS 07-3005_01	
A2	Transformer installation for use in an outdoor substation	ECS 07-3005_01	
B1	Micro Substations	ECS 07-3005_04	
B2	Compact Substations	ECS 07-3005_04	
B3	Outdoor RMU	ECS 07-3005_04	
B5	Outdoor RMU and HV Metering Unit	ECS 07-3005_04	

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Base Type	Designed For	Drawing Reference	Image
B8	All approved secondary transformers when standalone placed	ECS 07-3005_04	
B9	Ring beam for GRP housing support foundation. Normally B9 ring beams are combined with B3 or B5 bases, see below combinations	N/A	
B3 + B9x2 Combo	RMU in GRP housing, includes flooring. Package delivered to site includes 1No. B3 base, 2No. B9 ring beams, the GRP flooring, steel supports and the earth marshalling bar.	ECS 07-3005_02	
B5 + B9x2 Combo	RMU and HV Metering Unit in GRP housing, includes flooring Package delivered to site includes 1No. B5 base, 2No. B9 ring beams, the GRP flooring, steel supports and the earth marshalling bar.	ECS 07-3005_03	
B11	RTU unit supported on Unistrut frame. Package delivered to site includes 18No. precast concrete blocks, 2No. galvanised steel plates, 6No. galvanised M12 bolts (370mm long), 12No. nuts and 6No. washers, 2 No. P1000 Unistrut channels (650mm long).	ECS 07-3005_05	

RMU and metered RMU equipment have standalone precast plinths, B3 and B5 respectively. These can be used in combination with base type B9, the ring beam designed to support the GRP housing and the flooring inside the substation. Refer to the drawings listed in Appendix A for details.

Table 4-2 lists the ancillary items that are supplied loose for base types A1, B3 + B9x2 Combo and B5 + B9x2 Combo. The quantities of the ancillary items are detailed in the corresponding drawing.

Base type B11 is supplied with items listed in Table 4-1. The Unistrut frame that supports the RTU unit is a separate item that shall be ordered from UKPN stores (material code 66921X).

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Table 4-2 – Ancillary Items

Item Description	Base Type		
	A1	B3 + B9x2 Combo	B5 + B9x2 Combo
10-Way Earth Bar	x	x	x
38mm GRP Grating	x	x	x
Galvanised RHS Beam 2580mm long	x		
Galvanised Unequal Angle for GRP support		x	x
Halfen Channel T Bolts and Nuts		x	x
M16 Nuts and Washers	x		
TOK-strip Water Seal Bar	x		
Neoprene Strip	x		
Neoprene Shims	x		
Plastic Caps for Lifting Points	x		

5 Roles and Responsibilities

5.1 Supplier

The supplier casts the bases to UK Power Networks specification. Once the supplier receives a request, a quotation is generated, which includes the cost of the transport from the factory to the site location advised.

It is the responsibility of the supplier to prepare the precast items for delivery to site, to co-ordinate the pick-up and the delivery with the haulier company and, to provide lifting eyes and the loose items associated with each base type.

5.2 Haulier Company

The haulier company will pick up the base from the factory and transport it to site, where the off-loading will take place.

Providing that the site conditions are appropriate, the base drop off will proceed. Where the site has not been properly prepared in accordance with UK Power Networks specification, drop off may be refused.

5.3 Earthworks Contractor

The earthworks contractor is appointed by the designated contractor and is responsible for the excavation, ground preparation, backfilling and groundwork for cable entries.

The earthworks contractor shall confirm to the designated contractor and UK Power Networks that the ground preparation has been constructed, in accordance with this standard, prior to the precast base installation.

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5.4 Designated Contractor

The ‘designated contractor’ is the organisation responsible for site safety during delivery of the precast base.

Customer-driven schemes, where UK Power Networks is not responsible for delivering the civil works, shall appoint a competent ‘designated contractor’ to assist the haulier company during installation of the precast base.

For reinforcement and replacement schemes, UK Power Networks representatives will assume the function of the ‘designated contractor’. Planning and design works are typically carried out by the relevant Planning Engineer or Connections Designer. Enabling and site works are typically carried out by the relevant Network Operations Field Engineer.

To ensure a successful delivery of the base to site it is important that the designated contractor takes full responsibility of the following:

- Planning and enabling works described in Section 6.
- Informing the haulier company of any site details which could compromise the delivery or dropping off the base. The haulier company needs confirmation of the space available to deploy the vehicle’s outriggers and safety clearances shall be checked (to overhead utilities services) to allow the rotation of the loaded crane arm.
- Coordination with the earthworks contractor to ensure that the ground is properly prepared for the precast base installation.
- Completion of the risk checklist in Appendix B.
- Presence on site during delivery to assist with manual handling of the ancillary parts. This includes placing of the TOK-strip water seal bar, placing of any neoprene shims, fastening of threaded bars, making good of exposed holes and the laying of the GRP floor grating.
- Post assembly works described in Section 9.

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6 Planning and Enabling Works

Location and positioning of the base shall be in accordance with EDS 07-3101.

Where necessary, obstructions that impede the delivery of the base shall be removed, this shall include but is not be limited to:

- Overhead telephone lines.
- Overhead power lines located above the planned substation area or above the location where the delivery vehicle will be parked – check safety clearances to power lines.
- Tree branches – trim as necessary.

Headroom from ground level shall be 6.5m minimum above the area where the vehicle will be parked; the same headroom above the substation location applies but measured from the formation level.

A copy of the ‘site survey’ may be required to be sent to the haulier company to confirm the feasibility of the delivery.

A1 bases are typically delivered on a long-articulated vehicle. Some sites are too congested or too small for the base parts to be dropped safely; it is therefore important to confirm the feasibility of the delivery in advance as not all sites will have the logistical conditions to receive a precast base. At sites with space limitations for the delivery, it may be possible for the haulier to use smaller lorries to deliver the base items separately to site.

Access arrangements shall be made to allow the delivery of the precast base as soon as the delivery vehicle arrives onsite. Any delay may incur additional cost.

To assist with the landing of the base, a check list of the most relevant aspects to be considered is presented in Appendix B. Once the base is in place and ready to receive the equipment, the form shall be submitted to the UK Power Networks team responsible for the substation fit out.

Cable connections shall be considered at planning stage, making sure access is provided around the base as necessary. Cables should be installed following the guidance in ECS 02-0019.

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7 Groundworks

All groundworks shall be completed by the earthworks contractor. Figure 7-1 shows the minimum area that shall be prepared to receive a precast concrete base Type A1.

For all other base types, the area of the base plus 500mm clearance in all directions shall be prepared. Subject to the cables layout which are project-specific, more space may be required.

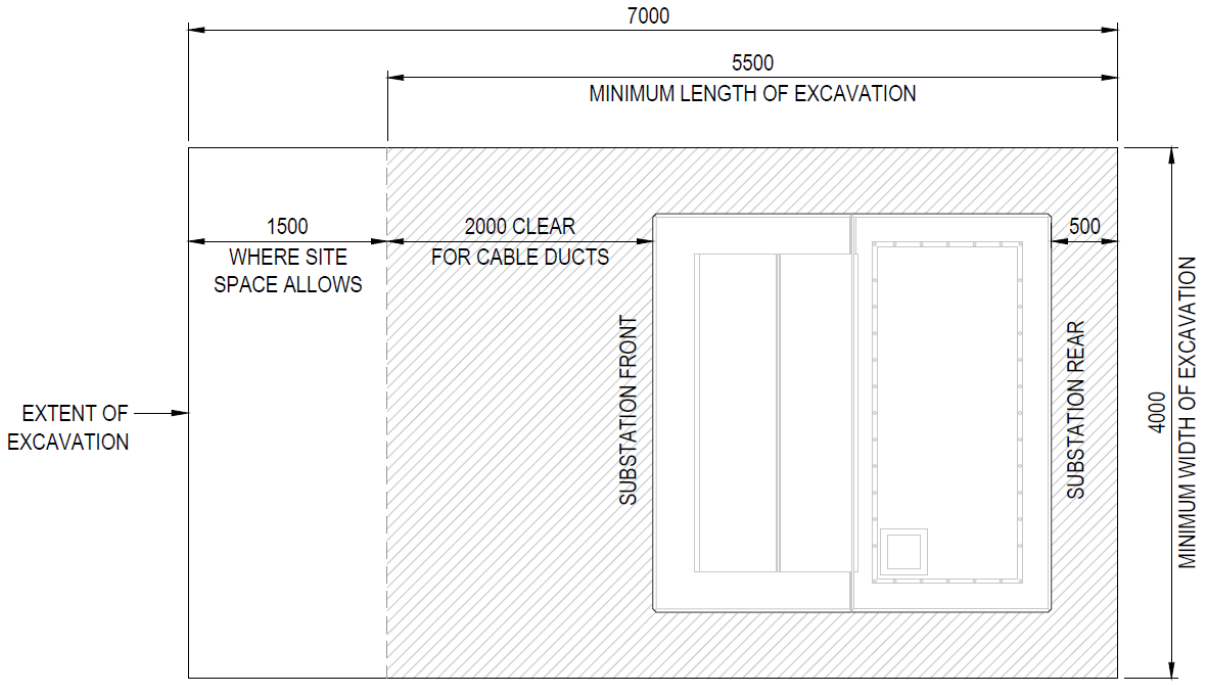


Figure 7-1 – Plan View of Area to be Prepared for Base Type A1

The change of ground pressure at formation level once the substation is complete is approximately 50kN/m^2. This includes the weight of the precast concrete base, equipment, GRP enclosure and snow, wind and personnel loads. Where the ground bearing capacity is insufficient or soft spots are present, the ground shall be excavated further and filled with compacted Type 1 (DPt1) material or GEN1 concrete, as required.

Unless otherwise agreed, UK Power Networks does not accept any responsibility for the specification and quality of the enabling works described in this document, this shall be confirmed by the appointed designer. The civil works required to prepare the ground is the responsibility of the earthworks contractor.

The groundwork shall consider the following guidelines:

- Excavation to formation level, to allow a final TOC to be 150mm above ground level.
- Access into open excavation is required during installation of the precast units and for cable installation. The earthworks contractor shall slope/bench the excavation to allow safe working conditions at all times and to provide safe access for personnel working around the base when the trench is open. The excavation shall not have continuously vertical sides.
- Removal of any local soft spots at formation level and fill with compacted Type 1 (DPt1) material or GEN1 concrete, as required.
- Provide sufficient working space around the base, see Figure 7-1. Providing that access to the back of the base in not required at any stage, the rear clearance can be reduced to

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250mm, access requirements are subject to site conditions and shall be assessed on a case-by-case basis.

- The bedding shall be flat and free from protrusions.
- The existing ground receiving the precast base shall have sufficient strength to provide 50kN/m^2 bearing capacity. This is generally achieved by compacting two or three layers of Type 1 (DTp1) sub-base material for a minimum thickness of 150mm. However, if in doubt, the designer's advice shall be sought for any further action necessary to prepare the ground.
- After Type 1 sub-base material has been placed and compacted, a 50mm GEN1 concrete blinding shall be poured to make the surface smooth and level with a +/- 2mm over 2000mm tolerance. A 1200 gauge membrane shall be laid over the concrete blinding.
- A top bedding layer of a dry mix of sand and cement shall be laid on the visqueen membrane. This bedding layer should be 50mm thick with a cement proportion of 200kg/m^3 and flattened to an even thickness. This gives flexibility when installing the precast components and allows for adjustment to levelling. The top bedding should extend at least 500mm beyond the precast base footprint. The top bedding is likely to sink due to the weight and movement of the base whilst assembling the parts, this can be accommodated by ensuring the bedding is slightly higher than required.
- If there is a risk of migration from the surrounding soil into the backfill, wrapping the bedding in a geosynthetic material will be necessary.
- Backfilling and groundwork for cable entries is the responsibility of the earthworks contractor in coordination with the designated contractor.

Note: The earthing system shall be installed at the same time as the excavation works to allow installation of earth rods and electrode. Refer to EDS 07-3102 and ECS 06-0023 for further information.

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8 Drop Off and Assembly of Parts

The recommendations for planning, enabling and preparation of the site, as described in Sections 6 and 7, shall be complete and confirmed by the designated contractor before delivery commences.

Refer to the drawings listed in Appendix A for details and recommendations associated with each base type.

9 Post-Assembly Works

With the base at its permanent location, the designated contractor shall undertake or coordinate the following actions:

- Make good openings for threaded bars using expanding foam topped with silicone sealant or general-purpose non-shrink grout, see Figure 9-1.
- Install plastic caps to lifting inserts, where required.
- Install steel support beam(s) and GRP flooring, see Figure 9-1.
- Where required install cable ducts, connecting to the duct couplers cast into the front of the base. This will require placement and compaction of backfill beneath the ducts. Once installed backfill is to be placed and compacted over the cable ducts to allow access to the cable trench within the base.
- Install the cables in accordance with ECS 02-0019. Sufficient space shall be allowed to safely pull the cables and to carry out the commissioning work associated with the substation equipment. For this is it important to provide temporary access means to both the open cable pit and the cable trench.
- Backfill around the base, ensuring that the top of concrete is 150mm above the final ground level.

Delivery of the network equipment and GRP enclosure is not covered in this standard, this shall be arranged via the UK Power Networks team delivering the scheme.



Figure 9-1 – Precast base post-assembly works. Making good holes (left). Install GRP grating (right).

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10 References

10.1 UK Power Networks Standards

ECS 02-0019	Installation of Underground Cables – LV to 132kV
ECS 06-0023	Secondary Distribution Network Earthing Construction
EAS 07-0000a	Approved Equipment List - Civils and Substations
EDS 07-3101	Pre-design Requirements for Secondary Substations
EDS 07-3102	Secondary Substation Civil Design Standard

10.2 National and International Standards

BS 8500-1:2023	Concrete. Complementary British Standard to BS EN 206. Method of specifying and guidance for the specifier
BS 8500-2:2023	Concrete. Complementary British Standard to BS EN 206. Specification for constituent materials and concrete

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Appendix A – List of Drawings

Drawing Reference	Drawing Title
ECS 07-3005_01	Type A1 Precast Base for Unit or Padmount Substations in a GRP Housing
ECS 07-3005_02	Type B3 + B9x2 Precast Bases for RMU in a GRP housing
ECS 07-3005_03	Type B5 + B9x2 Precast Bases for RMU and HV metering in GRP a housing
ECS 07-3005_04	Precast Concrete Plinths
ECS 07-3005_05	Type B11 Precast Plinth for RTU

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Appendix B – Risk Check List

	Subject	Action	Yes/No	Residual Risk
ENABLING WORKS (carried out before delivery)	**Overhead obstructions (if any)**	Trees are trimmed		
		Overhead lines are removed or disconnected		
		Other? (describe actions required)		
	Site preparation	Size of area cleared as specified in the standard drawing		
		Depth of excavation and compacted infill will allow the TOC to be 150mm above ground level		
		Ground is prepared as per standard guidelines and confirmed by designer's specification		
		Compacted Type 1, GEN1 blinding and 1200 gauge membrane has been installed as per the standard drawings.		
		Designated Contractor has confirmed that the prepared surface is clear from objects, flat and level with a ±2mm in 2m maximum tolerance		
		A 50mm top bedding layer of dry mix of sand and cement with a cement proportion of 200kg/m^3 is above the GEN1 blinding is flattened to an even thickness		
		The access road allows for the articulated delivery vehicle to reach site up to the point where the outriggers will be extended		
		The haulier company is aware of the site conditions and has confirmed the feasibility of the delivery (e.g. crane has enough space to rotate, outriggers can be extended and supported)		

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	Subject	Action	Yes/No	Residual Risk
DELIVERY OF PRECAST BASE	**Preliminary check**	Loose items are complete in the package delivered (e.g. GRP flooring, washers, nuts)		
	Drop off	First part (base rear) is in place to allow safe working clearances (e.g., 2000mm in front of the assembled base); neoprene pads are in place, water-seal is laid.		
		Second part (base front) is in place; the cross pins fixings connecting the two parts are fastened using the washers and nuts including in the loose items kit.		
		Third part is dropped on the base rear and guided by the B16 cross pins		
POST DELIVERY	**Flooring**	Steel support is in place (if required by design)		
		Grating is dropped in to cover the cable pit		
POST-ASSEMBLY WORKS	**Finishes**	Voids around fixings and cross pins are made good. Plastic caps have been installed into lifting insert holes.		
	Temporary access into trench	Safe access is provided into the trench and cable pit for cable jointing.		
	Backfilling	Base rear is backfilled if confirmed that access is not required during substation commissioning		
		Earthworks contractor is aware that upon cable installation all sides of the base need backfilling		

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