

INTRODUCTION - TS 2.10.00

GENERIC ELECTRICITY SUBSTATION DESIGN MANUAL
FOR CIVIL, STRUCTURAL AND BUILDING ENGINEERING

SECTION NO 00

TITLE : INTRODUCTION

INTRODUCTION

This document is for internal and contract specific use only.

Disclaimer

NGG and NGET or their agents, servants or contractors do not accept any liability for any losses arising under or in connection with this information. This limit on liability applies to all and any claims in contract, tort (including negligence), misrepresentation (excluding fraudulent misrepresentation), breach of statutory duty or otherwise. This limit on liability does not exclude or restrict liability where prohibited by the law nor does it supersede the express terms of any related agreements."

TABLE OF CONTENTS

PURPOSE AND SCOPE.....	3
PART 1 – PROCEDURAL.....	5
1 INTRODUCTION	5
PART 2 - DEFINITIONS AND DOCUMENT HISTORY	8
2 REFERENCES	8
3 AMENDMENTS RECORD	8
4 IMPLEMENTATION	8

PURPOSE AND SCOPE

This Technical Specification (TS) forms the introduction to a suite of documents which outline the design requirements for Civil, Structural and Building engineering for all National Grid Electricity Substation works. The documents share the same numerical prefix (i.e. 2.10) and are subdivided into specific sections by the addition of a sequentially numbered suffix to create a series generically identified as 2.10.xx.

This suite of documents contains National Grid requirements previously covered by the following documents:

- Design Handbook DH10 Electricity Substation Construction Civil, Structured and Building Engineering Design Handbook
- Design Handbook DH18 400kV and 275kV Gas Insulated Switchgear (GIS) and Air Insulated Switchgear (AIS) Substations Buildings
- TS 2.20 Oil Containment at Substations and Other Operational Sites
- TS 2.22 Perimeter Security Fencing for New Substations and Cable Sealing End Compounds Including Extensions
- TS 3.01.03 Limitations of Fire Risk in Substations

The above documents are now superseded by the TS 2.10.xx series. However, the new suite of documents contain largely the same information but in the standard TS format.

Previous issues of TS 2.10.xx (Pre 2010) covered workmanship and construction issues and are now withdrawn, hence this document is not a revision of the previous issue and should be viewed as a new document. An updated version of the information contained within the previous issue of TS 2.10.xx is now contained in TS 3.10.xx. This is the outcome of National Grid's strategy to rationalise the numbering convention for Technical Specifications i.e. design information contained in the 2.10.xx series and construction information contained in the 3.10.xx series.

The full list of documents in the TS 2.10.xx suite is detailed below:

TS No.	Description	Issued (Yes/No)	Date of Issue
TS 2.10.00	Introduction	Issue 5	April 2017
TS 2.10.01	Oil Containment	Issue 1	April 2017
TS 2.10.02	Perimeter Security	Issue 1	April 2017
TS 2.10.03	Piling and Foundations	Issue 1	April 2017
TS 2.10.04	Site Lighting	Issue 1	April 2017
TS 2.10.05	Access Covers/Ducts/Trenches	Issue 1	April 2017
TS 2.10.06	Limitation of fire risk at electricity substations	Issue 1	April 2017
TS 2.10.07	Plant Noise Attenuation	Issue 1	April 2017

TS 2.10.08	Roadworks and Surfacing	Issue 1	April 2017
TS 2.10.09	Site Drainage	Issue 1	April 2017
TS 2.10.10	GIS and Substation Buildings	Issue 2	April 2017
TS 2.10.11	Seismic Design of Substations	Issue 1	April 2017
TS 2.10.12	Structural Steelwork and Aluminium	Issue 1	April 2017
TS 2.10.13	Flood Defences for Electricity Substations	Issue 2	February 2016
TS 2.10.14	Technical Security Specifications for Integrated Security Solution (ISS) Sites	Issue 4	July 2018

Any deficiency, ambiguity or inconsistency in the TS 2.10.xx suite or any cross references to third party documents that have become obsolete, deleted, superseded or amended shall be immediately identified to the Client (National Grid).

Where a design solution is proposed which is either not covered by, or contravenes the guidance given in TS 2.10.xx, a Technical Deviation shall be raised which shall contain as a minimum the following supporting information:-

- (i) A technical description of the alternative design methodology proposed;
- (ii) A summary of the expected effect on project risks of adopting the alternative methodology;
- (iii) A summary of further alternatives considered and reasons for rejection;
- (iv) Details of the expected benefits to be realised from the alternative proposal;

Detailed procedural requirements for approval of proposals outside the scope of TS 2.10.xx are outlined in TP 188 – 'Transmission Construction Electricity – Design Management'.

Where the text within the TS 2.10.xx series makes reference to the construction and workmanship requirements of TS 3.10.xx, CESWI or other third party documents, it is inherent in the design assumptions that the works will be constructed in accordance with these documents. Works constructed to other standards may invalidate the assumptions made in TS 2.10.xx. Where no direct reference is made, it shall be assumed that works are to be constructed in accordance with TS 3.10.xx

Where TS 2.10.xx describes general requirements for particular areas of design, but does not enforce specific methods of design, it is assumed that the professional expertise of a suitably qualified design engineer will be employed to make detailed decisions about the methods adopted. However, design aspects wholly omitted from TS 2.10.xx will require prior approval from National Grid (The Client) before the commencement of the works.

Mandatory requirements are identified by use of the verb "shall" or "must". Clauses containing the verb "should", "can" or "may" give a recommendation of how to comply with the requirements of the specification. However, alternative methods may be used if it can be demonstrated that they are technically and economically equivalent or superior in terms of design function, health and safety, environment and maintenance requirements.

Text contained in boxes provides an **informative commentary**. It does not form part of the formal requirements of the document, but aims to explain the rationale and 'spirit' of the requirements.

Although the contents do not form part of the mandatory requirements, it is expected that the designer will give due consideration to the information contained in the informative commentary when producing designs.

PART 1 – PROCEDURAL

1 INTRODUCTION

- 1.1.1 This document details mandatory prescriptive and functional requirements and/or performance characteristics relating to new build and existing 'Civil, Structural and Building Engineering' assets forming part(s) of substation construction projects. It is an elaboration on, and shall be read in conjunction with, all relevant National Grid standards as appropriate.
- 1.1.2 Design work shall comply with all appropriate National Grid Technical Specifications (NGTSs and TSs), European Standards, British Standards and Codes of Practice as appropriate and be in accordance with recognised analytical methods. It is noted that there are several National Grid standards which, whilst not explicitly associated with Civil, Structural and Building Engineering nonetheless contain requirements which may impact on aspects of such designs. For example earthing requirements will, in certain configurations, be applicable to fencing and handrail installations. It shall be the designer's responsibility to ensure a holistic design solution is achieved.
- 1.1.3 The term 'Civil, Structural and Building Engineering' shall apply to the design, manufacture, installation and demolition of the following permanent works items:
- Access roads
 - Footpaths
 - Drainage
 - Oil containment works
 - Fencing
 - Site security
 - Surfacing
 - Service ducts and trenches
 - Buildings
 - Site and Building services (excluding electricity and telecommunications services)
 - Foundations
 - Piling works
 - Earthworks
 - Ground Improvement/Stabilisation
 - Plant support structures
 - Holding down systems
 - Fire protection & control
 - Cable Tunnels
 - Acoustic enclosures
 - Site Lighting
 - Landscaping
 - Other enabling infrastructure (Operational & Non-operational) - e.g. retaining structures, bridges, culverts etc.

-
- 1.1.4 Unless stated to the contrary this scope shall also apply to all surveys, site investigations, condition assessments and temporary works necessary to facilitate the construction of these items. It shall additionally apply to the design only of the structural integrity of all items not specifically listed above. This includes all electrical components such as plant, busbars, clamps etc.
- 1.1.5 Where the terms 'Civil', 'Civil Engineering' or similar are used in any contractual context they shall be deemed to mean 'Civil, Structural and Building Engineering' as defined in this document.
- 1.1.6 Where there is conflict between the requirements in this document and any other National Grid specifications this document shall generally take precedence otherwise the more demanding standard shall always apply. Where the conflicts persist this shall be brought to Contract Administrator.
- 1.1.7 All drawings shall be annotated with cross-references to the appropriate specification clauses specific to that drawing.
- 1.1.8 The designer shall ensure that in all instances new and existing works do not compromise each other either functionally or aesthetically.
- 1.1.9 Any reference made in this document to a requirement for NG approval shall be taken to mean whichever 'Client side' Design Assurance process is appropriate at the time of contract award.
- 1.1.10 All construction work shall be classed as 'new build' unless specifically identified as otherwise and as such shall be in accordance with all appropriate standards at the time of contract award.
- 1.1.11 Wherever viable existing items of Civil, Structural and Building Engineering infrastructure shall be considered for re-use in accordance with agreed acceptance criteria (see DH 15 'The Reuse of Civil, Structural and Building Engineering Assets').
- 1.1.12 With the exception of piles or other specified elements all items becoming redundant under a contract shall be removed from site in their entirety and disposed of in an appropriate manner unless agreed otherwise with National Grid
- 1.1.13 Where necessary, and unless compliance with the specification dictates a higher standard, the site shall, as a minimum, be reinstated to match existing.
- 1.1.14 Reference to 'Design Life' shall mean the period of time (in years) for which an asset is required to perform in accordance with the project specification without any loss in functionality. In achieving the 'Design Life' 'Major Maintenance' and/or 'General Maintenance' will be necessary as described below.
- 1.1.15 Where appropriate reference to 'Maintenance' activities shall be specified as follows;
- 'Major Maintenance' shall mean any work involving the wholesale or significant inspection, replacement, reapplication or repair of any of the component systems or parts necessary to maintain the function, integrity and design life of the asset in question. It is permissible for 'Major Maintenance' activities to require electrical outages however these shall be minimised and shall be consistent, in duration and interval, with those required for the associated HV plant and equipment. An example of 'Major Maintenance' would be a complete repaint of an acoustic enclosure or the period of time after which sufficient metal coating still remains to re-establish a steelwork protective system.
 - 'General Maintenance' shall mean any work involving inspections, cleaning operations and/or any minor repairs necessary to achieve the first and all subsequent 'Major Maintenance' milestones. 'General Maintenance' shall not necessitate (and therefore pre-assume) any electrical outages however it may be possible to take advantage of

these if and when they occur. Examples of 'General Maintenance' are washing down or clearing the gutters of acoustic enclosures, localized repairs to protective treatment systems and roof inspections.

- 1.1.16 All 'Maintenance' requirements shall be identified/confirmed as part of the design process and, on completion of the project, recorded in the appropriate site documentation - most usually the 'Health and Safety File' as required by the Construction (Design and Management) Regulations).
- 1.1.17 All steel shall be galvanised to minimum 85microns. Where the steel thickness cannot take 85microns appropriate galvanising thickness shall be used.
- 1.1.18 JR Steel shall not be used for anything that supports plant and the transmission system eg line gantries, plant support structures. However non-system critical structures such as noise enclosures, fences, flood gates can utilise JR steel.
- 1.1.19 All bolts shall be grouted to fill any void. Denzo tap shall not be used.
- 1.1.20 Where it is required to use **packers**, plastic shall be used and under no circumstance shall steel shimms be utilised. This is to ensure that material of similar stiffness to grouting is used.

PART 2 - DEFINITIONS AND DOCUMENT HISTORY

2 REFERENCES

National Grid

DH 15 The Reuse of Civil, Structural and Building Engineering Assets
TS 3.10.XX Generic Technical Specification for Civil, Structural and Building Engineering
TP 188 Transmission Capital Delivery Electricity – Design Management

UK Water Industry Research Ltd

Civil Engineering Specification for the Water Industry (CESWI) 7th Ed.

3 AMENDMENTS RECORD

Issue	Date	Summary of Changes / Reasons	Author(s)	Approved By (Inc. Job Title)
5a	September 2018	Minor Changes to Issue Number References and other details	Lee Warren	Document Control
5	January 2017	Updates to TS 2.10.XX to comply with Eurocodes and General updates	Gibson Bhunu	EEPIG
4	February 2016	Updates to TS 2.10.13 Flood Defence & TS 2.10.14 Technical Security Specifications for Integrated Security Solution (ISS) Sites	Gibson Bhunu	Jon Fenn Head of Network Engineering
3	January 2015	Addition of TS 2.10.14 Technical Security Specifications for Integrated Security Solution (ISS) Sites	Gibson Bhunu	Jon Fenn Head of Network Engineering
2	December 2014	Addition of TS 2.10.13 Flood Defences for Electricity Substations.	Gibson Bhunu	Jon Fenn Head of Network Engineering
1	September 2014	Consolidation of information from DH10 into suite of TS 2.10.xx documents	Gibson Bhunu/Nick Tobin/Rob Everitt UK Construction	Jon Fenn Head of Network Engineering

4 IMPLEMENTATION

4.1 Audience Awareness

Audience	Purpose Compliance (C) / Awareness (A)	Notification Method Memo / letter / fax / email / team brief / other (specify)
Electricity Transmission Owner	A	e-mail
Capital Delivery	A	e-mail/Eurocodes Launch
Construction Delivery Units	C	Eurocodes Launch

4.2 Training Requirements

Training Needs	Training Target Date	Implementation Manager
N/A / Informal / Workshop / Formal Course		
Introduction and Launch of National Grid Eurocodes	25 May 2017	N/A

4.3 Compliance

This document introduces a series of documents which are essentially a reproduction of existing information previously available in DH10, DH18, TS 2.20, TS 2.22, TS 3.01.03. Consequently compliance is generally regarded as ongoing and retrospective application unnecessary in the main. Minor exceptions to this principle shall be incorporated into the works wherever possible and where not National Grid shall be advised via the appropriate project design management routes.

4.4 Procedure Review Date

5 years from publication date.

Copyright © National Grid plc 2018, all rights reserved

All copyright and other intellectual property rights arising in any information contained within this document are, unless otherwise stated, owned by National Grid plc or other companies in the National Grid group of companies.

No part of this publication may be reproduced in any material form (including photocopying and restoring in any medium or electronic means and whether or not transiently or incidentally) without the written permission of National Grid plc

This information should not be forwarded to third parties