

THE ELIMINATION AND REDUCTION OF SHES RISKS AND HAZARDS DURING SCHEME DESIGN, INSTALLATION AND COMMISSIONING (SAFETY BY DESIGN)

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PURPOSE AND SCOPE

Whereas UKBP/TP137, the parent document, defines how National Grid implements the requirements of CDM 2007, this document defines the strategy for achieving a prime objective of CDM 2007, that is, a 'safety by design' work environment.

This procedure applies to all projects which comprise the Transmission Construction Electricity Capital Programme, including associated revenue projects. The requirements of this procedure must therefore be understood and enacted by all those with defined responsibilities within the procedure.

PART 1 – PROCEDURAL

1 RESPONSIBILITIES

1.1 The following roles are defined in UKBP/TP137 - CDM 2007.

- a) Client
- b) Designer
- c) Principal Contractor
- d) CDM Coordinator

1.2 Site Installation

The following roles are defined in UKBP/TP137 – CDM 2007.

- a) Temporary Works Coordinator
- b) Temporary Works Designer

1.3 Design Management

The following roles are defined in UKBP/TP188 – Design Management.

- a) Design Assurance Engineer
- b) Design Verification Engineer

1.4 System Designer

For the purpose of this document the term System Designer relates to those in Electricity Network Investment Asset Management (ENI) who prepare the System Design Specification.

2 SAFETY BY DESIGN - STRATEGY

The strategy for achieving 'safety by design' comprises two key requirements as follows.

2.1 Duty Holder Actions

- a) Clients
- b) Designers
- c) Principal Contractors
- d) Temporary Works Coordinators
- e) CDM Coordinator Representatives
- f) Everyone

ie. specific actions in support of those defined in the CDM 2007 ACOP.

2.2 SHES Organisational Infrastructure

The organisational framework created by National Grid and the Electricity Delivery Units to facilitate excellence in SHES.

3 SAFETY BY DESIGN – THROUGH DUTY HOLDER ACTIONS

3.1 Duty Holder Actions - Client

The Client has a major influence on the establishment of a 'safety by design' environment.

Clients in ENI must balance business benefits against SHES hazards and risks to achieve an appropriate design. These considerations must be recorded in the Design Justification Report.

Within this context Clients must consider the implications of the design including the following.

- a) New build as opposed to replacement in situ is likely to lead to a more incident free SHES environment.
- b) Installations that minimise the duration of time on site are more likely to lead to a more incident free SHES environment.
- c) Standardisation of design leads to familiarity with the work, known problems, minimisation of time on site, routine working practices and refinement of best practice.
- d) The introduction of new technology often embodies new risks, thereby requiring careful consideration and management.

3.2 Duty Holder Actions - Designers

3.2.1 Safety by Design Concept

The concept of safety by design does not mandate the most risk free design from a SHES perspective but rather that conscious thought is given to SHES hazards and risks – and conscious thought is given to satisfactory solutions for hazard elimination and risk reduction. Within this context most incidents arise from designs which have not been subject to such a thought process.

3.2.2 Installation Lifecycle Stages

Designers, when evaluating SHES hazards and risks, must consider the task sequence for each stage of the installation lifecycle. This is:

- a) Construction
- b) Operation
- c) Maintenance
- d) Extend / alteration
- e) Demolition

3.2.3 Principles of Prevention (Hierarchy of Risk Control)

Designers, when considering hazard elimination and risk reduction, must enact the principles of prevention (hierarchy of risk control). This is:

- a) Eliminate
- b) Reduce
- c) Inform
- d) Control

See Appendix A for details.

3.2.4 Stages of Design

The following stages of design will be considered.

- a) System design - (Alternatively termed concept design – this is the project development stage of UKBP/TP146)
- b) Project design - (Alternatively termed scheme design – this is the project design stage of UKBP/TP146)
- c) Detail design
- d) Temporary works design
- e) Design assurance
- f) Technical specifications

These will be considered in the following sections.

Each stage tends to be a handover from one group of designers to another, demanding both excellent communications and data flow management from all of the designers concerned.

Appendix G provides a link to the SHES Asset Design Handbook which provides guidance to all those with an ability to influence asset design in regard to safe access, operability and maintenance.

3.2.5 System Designers

- a) The system design stage ranges from scheme inception to point of sanction. It is recorded in both the System Design Specification (SDS) and Construction Design Specification.
- b) This stage considers the high level design building blocks, eg.
 - (i) Substation type, bays and location
 - (ii) OHL and cable type and approximate route
 - (iii) Equipment ratings
- c) System designers within ENI must consider the implications of the design including the following.
 - (i) New build as opposed to replacement in situ is likely to lead to a more incident free SHES environment.
 - (ii) Installations that minimise the duration of time on site are more likely to lead to a more incident free SHES environment.
 - (iii) Standardisation of design leads to familiarity with the work, known problems, minimisation of time on site, routine working practices and refinement of best practice.
 - (iv) The introduction of new technology embodies new risks, thereby requiring careful consideration management.
 - (v) Whether the proposed design is covered by existing National Grid technical specifications (TS) or whether a new TS has to be prepared.

3.2.6 Project Designers

- a) The project design stage ranges from point of 'sanction' to point of 'authority to proceed' as defined in UKBP/TP146.

- b) This stage considers intermediate level design, concerned with equipment and site infrastructure requirements (as opposed to system requirements) to a point where confidence has been reached that the detailed design may commence. This stage is recorded in the Design Intent Document.
- c) At the project design stage the designers must consider the exact equipment to be installed / worked upon, and the sequence by which the site installation task will be accomplished. Requirements which are essential for achieving a safety by design work environment must be notified by those undertaking the detailed design or installation work – and either recorded in, or referenced by, the Design Intent Document.
- d) Some of the key considerations that project designers within the Delivery Units must take into account at this stage are
 - (i) demolition considerations
 - (ii) spatial considerations and physical layout of equipment
 - (iii) access and egress
 - (iv) ground conditions
 - (v) design suitability of existing equipment
 - (vi) underground hazards including utility services
 - (vii) third party impacts
 - (viii) vehicle movement
 - (ix) environmental considerations
 - (x) specification of security requirements
- e) Hazard elimination and risk reduction benefits from designs employing the following – which must be considered. [NB: This is not an exhaustive list]
 - (i) Type Registered equipment (mandatory requirement for power system equipment)
 - (ii) Off-site manufacturing
 - (iii) Modular build techniques
 - (iv) Proven site installation techniques

3.2.7 Detail Designers

- a) This comprises the drawings and schedules which define the permanent design.
- b) Detail designers within the Delivery Unit, when preparing the detail design documentation, must consider the instructions required by the Principal Contractor and site installation team to satisfactorily install / work on /demolish the equipment and/or site installation. Such instructions may be specified as follows.
 - (i) Statements on the drawings / schedules defining the work sequence which ensures hazard elimination and risk reduction.
 - (ii) References on the drawings / schedules to method statements which define the work sequence, which ensures hazard elimination and risk reduction.

NB:

 - The above methods must be defined and explained in the Project Quality Plan (includes all phases of work i.e. development, design, delivery, commissioning).
 - Such statements may also define the requirement for the designer to meet with the installation team to fully explain the work sequence prior to work commencing.

3.2.8 Temporary Works Designers

- a) Design of temporary works fall within the scope of CDM 2007. This comprises requirements such as falsework, formwork, temporary access routes, scaffolding etc.

- b) Temporary works designers, when preparing the temporary design, must also encompass the requirements as outlined for detail designers.

3.2.9 Design Assurance Engineers

- a) The design assurance task is that of assuring that the design throughout the lifecycle accords with National Grid policy, process and governance requirements – not only for purposes of system reliability but most importantly to achieve a 'safety by design' environment.
- b) Design Assurance Engineers must proactively carry out the following.
 - (i) Ensure that National Grid policy and process is enacted – particularly relating to HAZID reviews, hazard reviews and design reviews.
 - (ii) Consider all design from the perspective of eliminating hazards and reducing risk.
 - (iii) Work with all other designers to ensure the existence of a 'safety by design' environment. Where areas of concern are encountered these must be escalated to achieve satisfactory resolution.
- c) It is to be noted that all design work must be subject to an assurance evaluation undertaken at the key stages of development and prior to site installation commencing (design compliance audit). Work cannot proceed from one stage to another without the formal agreement of an Authorised Design Assurance Engineer. Delays in progressing from one stage to another must be notified to the Client.

3.2.10 Technical Specification Engineers

- a) National Grid prepares a suite of Technical Specifications (TSs) defining National Grid's functional requirements for equipment which is to become part of the transmission system. The Technical Specifications are underpinned by National Grid policy documents.
- b) ENI Asset Policy engineers when preparing Technical Specifications must ensure that they both incorporate SHES legal requirements and promote the development of installation that embody safety by design requirements, eg.
 - (i) safe access/egress across the installation of lifecycle stages (see section 4.1)
 - (ii) the installation facilitates good SHES practice for Construction (ie. can it be constructed safely), operation, maintenance, extend / alter and demolish
 - (iii) the installation embodies good ergonomic design.
- c) The Technical Specification suite mandates that all power equipment must have achieved Type Registration prior to being commissioned onto the transmission system.
- d) All ENI Asset Policy engineers, when considering the award of Type Registration, must ensure that requirements specified in (b) above are incorporated into the equipment design under consideration.

3.3 Duty Holder Actions - Principal Contractors

The Principal Contractor, through those undertaking each site task, must enact the following.

- a) Prior to site implementation, question every design with reference to hazards and risks – and refer back to the permanent or temporary works designer as appropriate.

- b) Be assured that the specified work sequence for the task satisfactorily addresses hazard elimination and risk reduction – before the work commences.

Such requirements should comprise part of the Principal Contractor safety management system.

3.4 Duty Holder Actions – Temporary Works Coordinators

The role of the Temporary Works Coordinator (TWC) is specified in TP163 Site Installation, and with reference to all temporary work the TWC must enact the following.

- a) Ensure that each task has been specified by a designer of appropriate competency.
- b) Ensure that appropriate RAMS have been undertaken and prepared for each task.
- c) Ensure that appropriate inspections have been undertaken
- d) Ensure that the Site Quality Plan (or an equivalent for temporary works) is adequate for undertaking the temporary works.

3.5 Duty Holder Actions – CDM Coordinator

CDM Coordinators must ensure that the following is satisfactorily enacted.

- a) Due process is rigorously followed.
- b) All personnel are competent for the duties for which they are responsible.
- c) When difficulties are encountered or anticipated they are brought to the attention of line management to aid resolution.
- d) Take the lead role in proactively encouraging and being assured of the establishment of a 'safety by design' environment.

3.6 Duty Holder Actions – Everyone

The task of planning / execution of work must be accompanied by a proactive task by task thought process which considers hazards / risks and their elimination / reduction. To this end each and every duty holder must

- **STOP** before they act
- **THINK** about the appropriateness of the action to be undertaken
- **ACT** in accordance with correct SHES behaviour
- **REVIEW** about what has been done, was it executed correctly, is remedial action required

NB: Within the context of the above, the management of Health & Safety at Work Regulations 1999 requires all tasks to be subject to risk assessment and, if the task employs five or more people, the risk assessment and results formally recorded.