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|  | Guide | Nuclear Engineering |
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Title: **Design Extension Related Guidance
for Modifications and Equipment –
Severe Ambient Temperatures**

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1. Introduction

The events at Fukushima Daiichi in March 2011 highlighted the need for Nuclear Power Stations to be capable of mitigating the effects of severe external events exceeding their original design basis. Working teams and initiatives were established, by Nuclear Engineering at Koeberg Nuclear Power Station (KNPS), to purchase accident mitigation equipment and implement plant modifications based on the findings of stress tests performed.

This guide was developed to provide the temperature requirements for the design and manufacture of SSCs that are required for Design Extension Conditions (DEC). This guide focuses on the requirements related to severe ambient temperatures. These requirements shall be fulfilled by SSCs classified to mitigate the effects of severe ambient temperatures.

2. Supporting Clauses

2.1 Scope

This guide documents the design requirements for modifications and equipment required for DEC's focussed on severe ambient temperatures.

This guide does not detail the derivation of the requirements, as these are included in *External Hazards for Design Extension Conditions* (240-122120906).

This guide does not replace any of the existing design basis documents.

2.1.1 Purpose

2.1.2 Applicability

This document shall be applicable to Koeberg Nuclear Power Station.

2.1.3 Effective date

This guide is effective from the date of authorisation.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

- [1] 240-89294359 (rev. 1) – Nuclear Safety, Seismic, Environmental, Quality, Importance and Management System Level Classification Standard
- [2] 240-122120906 (rev. 1) – External Hazards for Design Extension Conditions
Koeberg Safety Analysis Report

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2.2.2 Informative

Site Safety Report for Duynefontein (*in draft*)

- [5] 331-93 (rev. 1) – Guide for Classification of Plant Components, Structures and Parts

2.3 Definitions

- [1] Design Extension Conditions – Specific accident conditions that are not considered as design basis accidents, but are considered in the design process for SSC required for the prevention or mitigation of accidents that exceed the design basis requirements. The design process (requirements) will be in accordance with best estimate methodology for which releases of radioactive material are kept within acceptable limits. Design extension conditions could include severe accident conditions.

2.4 Abbreviations

| Abbreviation | Explanation |
|---------------------|------------------------------------|
| DEC | Design Extension Conditions |
| KNPS | Koeberg Nuclear Power Station |
| SDE | System Design Engineering |
| SSC | Structures, Systems and Components |

2.5 Roles and Responsibilities

The requirements as stipulated in this guide shall be assigned by Nuclear Engineering through the accurate assignment of classifications and specification development. The design engineer shall have to consider the DEC's to prevent and mitigate based on the SSC's location and plant functional requirements.

The classifications and specifications, of the SSCs required during DEC's, are compiled by System Design Engineering (SDE) and authorised by the SDE manager.

The requirements as stipulated in this guide shall be incorporated into Design Extension Related (DER) designs by SDE to ensure that the SSC of the design are able to withstand the DEC's.

2.6 Related/Supporting Documents

The classification standard KSA-010, *Nuclear Safety, Seismic, Environmental, Quality, Importance and Management Safety Level Classification Standard (240-89294359 rev 1)*, makes allowance for the specification of design extension conditions. These classifications will specify if the design shall consider the requirements of this guide.

The basis for the intensities and design inputs as stipulated in this guide are given in *External Hazards for Design Extension Conditions (240-122120906)*.

The design input requirements for high winds and tornadoes, seismic events, and flooding are specified in the following guides:

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- 240-121010217 Design Extension Related Guidance for Modifications and Equipment – Seismic Event
- 240-120994091 Design Extension Related Guidance for Modifications and Equipment – Flooding
- 240-121005755 Design Extension Related Guidance for Modifications and Equipment – High Speed Winds and Tornadoes

3. Design Extension Condition Requirements

The design requirements for design base events shall remain unaffected by this guide.

For modifications and equipment that are required to be robust against high ambient temperatures, the design requirements as specified in this guide shall be utilised. The design codes and standards that will apply to DER SSCs need not comply with the codes and standards specified for Safety Related SSC. Design codes and standards appropriate for conventional SSCs may be used for DER SSCs and will be specified in the designs or specifications based on the requirements of the SSCs.

Equipment classified as safety related as it is required for design basis safety related functions, as well as and DEC's shall be shown to satisfy both the safety related and DEC requirements.

3.1 Design extension conditions for severe ambient temperatures

The ambient air temperature limits that shall be considered for DEC's are:

Table 1: Severe ambient temperatures for DEC's

| Minimum ambient air temperature (°C) | Maximum ambient air temperature (°C) |
|---|---|
| - 10 | 55 |

4. Acceptance

This document has been seen and accepted by:

| Name | Designation |
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| J. Austin | IPD-K Manager |
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5. Revisions

| Date | Rev. | Compiler | Remarks |
|--------------|-------------|-----------------|----------------------------|
| January 2017 | 1 | M.R. Kearns | Original revision of guide |

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6. Development Team

The following people were involved in the development of this document:

- N. Foster
- J. Austin

7. Acknowledgements

Not applicable

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