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SUB-CHAPTER 3.2 – CLASSIFICATION OF STRUCTURES, SYSTEMS AND COMPONENTS

1. PURPOSE OF CLASSIFICATION – APPROACH FOLLOWED

The safety of the plant is dependent on the performance of its structures, systems and components (SSCs) in normal, hazard and fault conditions. The effect on nuclear safety of the failure of a structure, system or component depends on its significance and role.

The main purpose of a classification scheme is to help ensuring that the plant is designed, manufactured, constructed, commissioned and operated so that the appropriate level of reliability and integrity is achieved for its SSCs.

The classification process involves the systematic assessment of the importance to nuclear safety of each SSC and its allocation to a safety class on the basis of this safety significance. The safety class allocated to an SSC defines the design, testing and maintenance measures to be applied in its design, construction, commissioning, and operation.

The classification approach presented in this sub-chapter of the safety report has been adapted from UK and other recognised international guidance and represents a 'functional' approach to classification [Ref]. The steps in the classification approach can be summarised as follows:

1. Identify safety functions and assign categories based on their importance to safety.

2. Identify the safety functional groups of SSCs and safety features which fulfil the safety functions, and assign a classification based on the importance of the safety functions they perform.

3. Link the classification to a set of requirements for design, construction and operation which will ensure that the SSCs perform the safety functions expected at the required level of quality.

The consequences of the classification approach are far-reaching and extend to operational requirements, e.g. in-service inspection, periodic testing, etc. The scope of this sub-chapter is, however, limited to the design and manufacturing phases.

The structure of the sub-chapter is as follows:

Section 2 gives the definitions of specific vocabulary and describes the main international and UK guidelines that form the basis of the classification approach and provides an overview of the classification process.

Section 3 describes the first step of the methodology and details how safety functions are identified, before being categorised.

Section 4 defines a safety functional group, and explains the criteria for assigning safety classes to a safety functional group containing SSCs.

Section 5 defines the architecture and system requirements applied at the level of the safety functional groups and safety features.

Section 6 explains how the safety classification is linked to design requirements for the SSCs. The different types of requirements are defined and an explanation is given of how they are applied.

Finally, section 7 gives the classification of main EPR SSCs

2. OVERVIEW OF THE CLASSIFICATION METHODOLOGY

2.1. DEFINITIONS

The classification methodology uses a number of definitions which are listed below:

Anticipated Operating Occurrence (AOO)	An operational process deviating from normal operation which is expected to occur at least once during the operating lifetime of a facility but which, in view of appropriate design provisions, does not cause any significant damage to items important to safety nor lead to accident conditions (IAEA Safety Glossary, 2007 Edition [Ref])
Controlled State	The state of the plant, where stabilisation of a transient has been achieved, the reactor is subcritical, adequate heat removal is ensured and radioactive releases are limited.
Final State	The core is subcritical, residual heat is being removed via primary or secondary systems, and radioactive discharges remain acceptable after an RRC-A event.
Front-line SSCs	The SSC(s) performing a Lower Level Safety Function, excluding the SSC(s) performing support functions for this Lower Level Safety Function. (IAEA DS367 [Ref])
Function (Safety Function)	A specific purpose or objective to be accomplished, that can be specified or described without reference to the physical means of achieving it
Functional Capability	The ability of a component in a pressurised system to resist the specified loads with limited deformation such that its operational capacity is not impaired by a possible flow reduction.
Integrity	The ability of a component in a pressurised system to resist the specified loads without leakage.
Lower Level Safety Functions	Safety Functions decomposed from a Plant Level Safety Function under a specific plant operating condition. (IAEA DS367 [Ref])
Main Safety Function	One of the three high level safety functions – Reactivity Control, Heat Removal, Containment
Mitigating Functions	Functions required to reduce the consequence (or potential consequence) of a Postulated Initiating Event (PIE), fault, etc. that has occurred.

Normal Operation	The operating condition in which the plant parameters are within normal range i.e. no PCC-2 to PCC-4 or RRC event has been initiated.
Operability	The ability of a system, or component of a system, including its necessary auxiliaries, supports and electrical power supplies, to perform its functions and meet the safety objectives
Operating Conditions	The condition in which the plant is operating under normal and fault conditions (PCC, RRC, Hazards) considered in the safety analysis and for which a safe state must be reached (e.g. Controlled and Safe states for PCC analyses, Final state for RRC-A sequences, …).
Postulated Initiating Event (PIE)	An event identified in the design as capable of leading to an anticipated operational occurrences or accident conditions (IAEA Safety Glossary, 2007 Edition [Ref])
Plant Level Safety Functions	Safety Functions derived from the Main Safety Functions, on the highest level. Plant level safety functions are defined independently of the operating condition. (IAEA DS367 [Ref])
Preventive Functions	Functions performed in normal operation to prevent or manage deviations from normal operation, or to prevent Anticipated Operating Occurrences from escalating to accident conditions.
Safe State	The core is subcritical, residual heat removal is established on a long-term basis, and radioactive discharges remain acceptable.
Safety Category	A reflection of the safety significance of the Lower Level Safety Functions in terms of predefined categorisation rules. Note: The terms ‘category’ and ‘class’ are sometimes used as synonyms. For the purpose of clarity in this sub-chapter, the term ‘category’ is reserved for the functions and the term ‘class’ for the SSCs.
Safety Class	A reflection of the safety significance of an SSC in terms of predefined classification rules.
Safety Functional Group	All the SSCs that must work together to perform a Lower Level Safety Function. This will include the Front line and Support SSCs and associated I&C systems. A Safety Functional Group is composed of one or several Safety Features.
Stability	The ability of a structure or component to resist loads which have a tendency to modify its position or orientation (for example, which have a tendency to cause the structure or component to tilt, fall or slide in an unacceptable manner or which could lead to a breakage of the structure or component). The stability of a structure or component relies upon the stability and resistance of its supports.

Structures, Systems and Components	A physical means of fulfilling a function, encompassing all of the elements (items) of a facility or activity which contribute to protection and safety, except human actions. Groups of SSCs cooperate to form safety functional groups. Structures are the passive elements corresponding to the civil structures. A system comprises several components, assembled in such a way as to perform a specific function. A component is a discrete element of a system. Examples of components are wires, transistors, integrated circuits, motors, relays, solenoids, pipes, fittings, pumps, tanks and valves. (IAEA Safety Glossary, 2007 Edition [Ref])
Support SSCs	SSCs (such as component cooling, lubrication, as well as energy supply) needed by a Front-line System for fulfilling its safety functions.
System / safety feature	Group of components generally belonging to a single system and working together to achieve a single action which is part of an SFG purpose. These are basically I&C instrumentation features, I&C automation features, front-line mechanical features and mechanical support features.

2.2. BACKGROUND

The classification methodology is based on HSE‘s Safety Assessment Principles (SAPs), IAEA requirements NSR-1, IAEA guidelines DS367 [Ref] and consideration of IEC 61226 [Ref]. A brief description of these texts is reproduced here.

2.2.1. Safety Assessment Principles

The HSE Nuclear Directorate uses the Safety Assessment Principles (SAPs), together with the supporting Technical Assessment Guides (TAGs), to guide regulatory decision making in the UK nuclear licensing process.

The SAPs provide HSE inspectors with a framework for making consistent regulatory judgments on nuclear safety cases. The principles are supported by TAGs and other guidance. The SAPs also provide current and prospective nuclear site licensees with information on the regulatory principles against which their safety submissions will be judged. However, the SAPs are not intended as design or operational standards, reflecting the non-prescriptive nature of the UK nuclear regulatory system. In most cases the SAPs are only intended as guidance to HSE inspectors, but where legal requirements are involved they may be mandatory.

The SAPs state that the safety functions to be delivered within a nuclear facility, both in normal operation and in fault or accidents, should be categorised based on their significance to safety as follows:

1. Category A – any function that plays a principal role in ensuring nuclear safety.

2. Category B – any function that makes a significant contribution to nuclear safety.

3. Category C – any other safety function.

It is further suggested that the methodology for applying this scheme should consider the following points:

- the consequence of failing to deliver the safety function;
- the extent to which the function is required, either directly or indirectly, to prevent, protect against, or mitigate the consequences of initiating faults;
- the potential for a functional failure to initiate a fault or exacerbate the consequences of an existing fault;
- the likelihood that the function will be called upon.

The categorisation of safety functions should take no account of redundancy, diversity or independence within the design; these aspects relate to the SSCs required to deliver the safety function.

The safety function categorisation is used to classify the SSCs required to deliver the safety function.

2.2.2. IAEA standards – NS-R-1 and DS367

IAEA safety standard series NS-R-1 establishes the idea of classification of NPP SSCs according to their importance to safety.

The main requirements for this classification process are summarised below:

- The first step is to identify the SSCs that are necessary to fulfil the safety functions at the various times following a Postulated Initiating Event.
- All SSCs that are important to safety are first identified and then classified on the basis of their function and significance with regard to safety.
- The method for classifying the safety significance of an SSC shall primarily be based on deterministic methods, complemented where appropriate, by probabilistic methods and engineering judgement, with account taken of factors such as:
  - the safety function(s) to be performed by the item;
  - the consequences of failure to perform its function;
  - the probability that the item will be called upon to perform a safety function;
  - the time after a postulated initiating event at which, or the period throughout which, it will be called upon to operate.”
- Appropriately designed interfaces shall be provided between SSCs of different classes to ensure that any failure in an SSC in a lower class will not propagate to an SSC in a higher class.

DS-367 provides guidance on how to meet the requirements for identification of safety functions and classification of SSCs established in the NS-R-1 and in particular how to ensure appropriate quality and reliability of SSCs. The process applied to UK EPR SSC classification follows the main proposals in this document.

2.2.3. IEC standards – IEC 61226 and IEC 61513

The international I&C standard IEC 61226 has been adopted as a British Standard and builds on the requirements established in NS-R-1 to provide guidance on the categorisation of functions according to the importance to safety of these functions. Although IEC 61226 concerns the categorisation of I&C functions, the methodologies it suggests are applicable to other areas.

IEC 61226 extends the categorisation strategy discussed in section 2.2.2 and establishes the criteria and methods to be used to assign the functions of an NPP into three levels reflecting the importance to safety (A, B and C). A non-classified category is used for functions with no significant safety role.

IEC 61226 accepts that the national application of the principles and criteria may assign differing nomenclature to categories A, B and C but states that the principles, criteria and associated requirements should be upheld.

IEC 61513 provides the link between the categorisation of functions, and the classification of SSCs which perform them.

2.3. OVERVIEW

The purpose of a classification system is to ensure that the SSCs are systematically designed, constructed, and operated so as to fulfil the safety functions they perform and, ultimately, the fundamental safety functions, with sufficient quality.

The classification process provides a structured, clear and logical method to identify the necessary safety requirements for all items important to safety. This allows the identification of appropriate design solutions to fulfil the fundamental safety functions, and also provides confidence to the plant operator and the regulatory bodies that the standard of design is of sufficient quality.

This section describes the overall methodology for categorising functions and classifying SSCs which has been developed for the EPR and which is in line with the standards discussed above.

This methodology can be divided into four general areas:

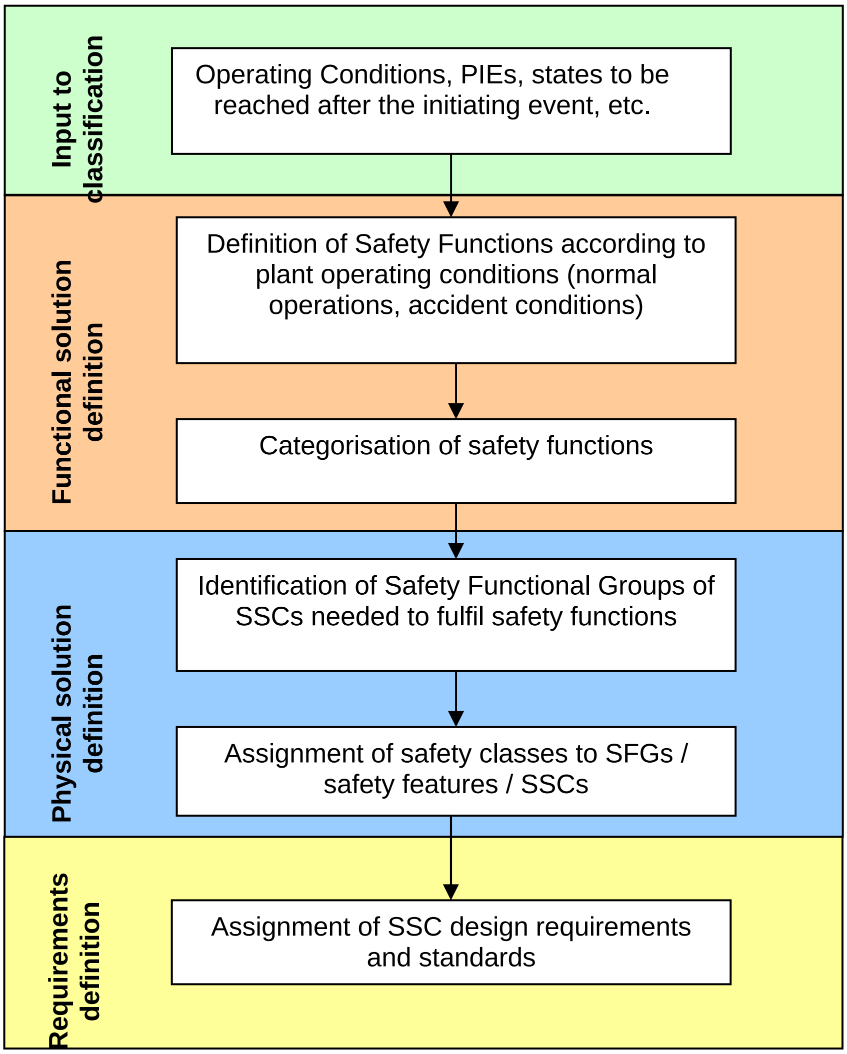
1. Identify the input to the classification process;

2. Categorise safety functions;

3. Classify SSCs;

4. Assign requirements to SSCs.

The methodology is summarised below:



3. SAFETY FUNCTIONS DEFINITION AND CATEGORISATION

3.1. DERIVATION OF SAFETY FUNCTIONS

IEC 61226 defines a function as “a specific purpose or objective to be accomplished that can be specified or described without reference to the physical means of achieving it”. A safety function therefore is thus a function that contributes to safety.

There are three main safety functions which are necessary for achieving the overall safety objective of protecting people and the environment from harmful effects of ionising radiation:

- Control of fuel reactivity;
- Fuel heat removal; and

- Containment of radioactive material.

These main safety functions are too high-level to allow physical solutions to be developed, so it is necessary to derive more detailed functions which are specific to the plant type or technology. For the EPR this has led to the development of Plant Level Safety Functions (PLSF). PLSFs are functional solutions based on the EPR process, which are necessary in order to fulfil the main safety functions. The PLSFs have evolved from a synthesis of IAEA standards for PWR, good practice (Sizewell B) and analysis of the EPR plant process.

The PLSFs define, at a high level, the specific safety purpose or objective to be accomplished and they do not refer to a physical means of achieving the objective.

A list of PLSFs is provided below:

Main Safety Function	Plant Level Safety Function
Control of reactivity	R1 - Maintain core criticality control
	R2 - Shutdown and maintain core sub-criticality
	R3 - Prevention of uncontrolled positive reactivity insertion into the core
	R4 - Maintain sufficient subcriticality of fuel stored outside the RCS but within the site
Residual heat removal	H1 - Maintain sufficient RCS water inventory for core cooling
	H2 - Remove heat from the core to the reactor coolant
	H3 - Transfer heat from the reactor coolant to the ultimate heat sink
	H4 - Maintain heat removal from fuel stored outside the reactor coolant system but within the site
Radioactive material containment	C1 - Maintain integrity of the fuel cladding
	C2 - Maintain integrity of the Reactor Coolant Pressure Boundary
	C3 - Limit the release of radioactive material from the reactor containment
	C4 - Limit the release of radioactive waste and airborne radioactive material
Other	O1 - Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a plant level safety function
	O2 – Maintain and control environmental conditions within the plant for operation of safety systems and for habitability for personnel necessary to allow performance of operations important to safety

The pseudo main safety function (called “Other” in the table above) is defined in order to address transverse safety functions. Those functions especially relates to:

- Hazards prevention and mitigation, with functions whose failure could lead to the simultaneous impairment of the original three fundamental safety functions

- Monitoring of plant operation or other functions

To have a list of safety functions at an adequate level of detail, the Plant level Safety Functions are broken down into Lower Level Safety Functions. The LLSF combines the PLSF and the operating conditions of the plant to indicate what must physically be achieved in order to fulfil the PLSF. This allows the subsequent identification of the SFGs (groups of SSCs) required to perform these safety functions.

The Lower Level Safety Functions are categorised based on their safety significance. The definitions for the categorisation and their assignment criteria are presented in section 3.2.

3.2. SAFETY FUNCTIONS CATEGORIES

The safety functions to be delivered within the facility, both during normal operation and in the event of a fault or accident, are categorised based on their significance to safety.

This section provides definitions of the categories that may be assigned to safety functions. The criteria that shall be applied to the assignment of functions to categories are also provided.

Function categories are applied at the level of Lower Level Safety Function. In other words, categories reflect the importance to safety of the Plant Level Safety Function leading to a specific operating condition. There are three categories to be considered: A, B and C. These categories are based on the definitions presented in the SAP ECS.1 and the associated guidance and in IEC 61226.

The function categories are defined below.

3.2.1. Category A

Category A represents any function that plays a principal role in ensuring nuclear safety.

In particular, the following functions are category A:

1. any function required to reach the controlled state and so prevent a PCC-2 to PCC-4 event from leading to exceed the limits and criteria defined for the PCC;

2. any function, the failure of which in normal operation, would lead to exceedance of the limits and criteria associated with PCC-4 events, where no other category A function exists to prevent such consequences.

3. functions required to provide information and control capabilities that allow specified manual actions necessary to reach the controlled state.

3.2.2. Category B

Category B represents any function that makes a significant contribution to nuclear safety.

In particular, the following functions are category B:

1. any function required to reach and maintain a safe shutdown state after the controlled state has been reached following a PCC-2 to PCC-4 event;

2. any function that forms a diverse line supplementing a category A function required in the analysis of a frequent fault;

3. any function used to prevent or mitigate a radioactivity release, or prevent fuel degradation beyond the limits and conditions of normal operation, as defined in the safety analysis[1];

[1] Note: this refers to functions that are not already leading to category A.

4. functions required to provide information or control capabilities that allow specified manual actions necessary after the controlled state has been reached to prevent a PCC-2 to PCC-4 event from leading to unacceptable consequences, or mitigate the consequences;

5. functions, the failure of which during normal operation, would require the operation of a category A function to prevent an accident whose study is required;

6. functions to reduce considerably the frequency of a PCC as claimed in the safety analysis;

7. plant process control functions operating so that the main process variables are maintained within the limits assumed in the safety analysis, if these control functions are the only means of control of these variables. If different means are provided, clause a) of category C may apply; NOTE: this refers to functions that are not already covered by the analysis of PCC leading to category A classification.

8. functions that provide continuous or intermittent tests or monitoring of functions in category A to indicate their continued availability for operation and alert control room staff to their failures, if no alternative means (e.g. periodic tests) are provided to verify their availability. NOTE: Where the monitoring function is the only means of detecting otherwise unrevealed failures, then assigning the function to category B ensures that the equipment providing the function is suitably qualified.

3.2.3. Category C

Category C is used to represent functions with a safety role which are not assigned to category A or category B.

In particular, the following functions are category C:

1. plant process control functions which operate so that the main process variables are maintained within the limits assumed in the safety analysis. Generally a combination of category C functions is used for this purpose;

2. functions used to prevent or mitigate a minor radioactive release, or minor degradation of fuel, within the design basis;

3. functions used to provide continuous or intermittent testing or monitoring category A and B functions, to indicate their continued availability and alert control room staff in the event of their failure;

4. functions necessary to reach the safety probabilistic goals including those required to reduce the expected frequency of a PCC;

5. functions which reduce the demands on category A functions, as claimed in the safety analysis;

6. functions which monitor or mitigate the consequences of internal hazards considered within the design basis (e.g. fire, flood);

7. functions which warn personnel or ensure personnel safety during or following events that involve release of radioactivity, or risk of radiation exposure;

8. functions which monitor or mitigate the consequences of external hazards considered within the design basis (e.g. seismic disturbances, extreme wind, accidental aircraft crash);

9. functions provided for the benefit of the accident management strategy to reach and maintain safe state for RRC-A and RRC-B sequences;

10. functions provided to minimise the consequences of severe accidents;

11. functions which provide access control for the plant;

12. some additional functions that are not essential to the ability of the design to maintain a safe shutdown state but which may, however, be required to maintain such a state in the period between 24 and 72 hours.

3.3. LOWER LEVEL SAFETY FUNCTIONS CATEGORISATION

Based on the previous criteria and the importance to safety of a safety function, it is possible to categorise the lower level safety functions. This categorisation which is based on the plant conditions of operation (PCC, RRC) is shown in the fault schedule provided in PCSR Sub-chapter 14.7. The fault schedule applies the proposed approach to categorisation of safety functions which mitigate PCC-2 to PCC-4 and RRC-A events for the faults considered in Chapter 14 and Sub-chapter 16.1 of the PCSR.

Sub-chapter 3.2 - Table 6 focuses on hazards, describing the hazard prevention and mitigation safety functions. The relevant safety functions are categorised accordingly to previous criteria.

Functions that are not liable for a category A, B or C according to the following definitions are not categorised.

4. SAFETY FUNCTIONAL GROUPS AND CLASSIFICATION OF SSC

This section aims at defining what a safety functional group is and how it is classified. It also introduces an important terminology which is the safety feature. The safety feature is the elementary piece of information that is used to achieve the classification of any SSC.

Safety classes and fundamental architecture requirements applied at the level of the safety functional groups are then defined. These two types of requirements aim at defining a level of safety commensurate with the importance to safety of the means provided to ensure safety functions.

4.1. IDENTIFICATION OF SAFETY FUNCTIONAL GROUPS AND SAFETY FEATURES

A physical means of fulfilling each LLSF must be identified. This physical means is known as a Safety Functional Group (SFG). The SFG is a group of SSCs that work together to perform an identified action contributing to the Safety Function.

The safety classification is applied first at the SFG level: SFGs are classified on the basis of the most significant safety function that they perform. The SFG safety class is then applied to the SSCs which are part of the SFG.

In order to ease the process of SSC classification, the elementary piece of system(s) worked with is the safety feature. The safety feature is a gathering of SSC of the same kind participating in an SFG. I&C instrumentation, I&C processing, I&C display, frontline mechanical systems, support mechanical systems are the main labels of safety features. Safety functional groups and frontline mechanical components safety features are usually named identically. The use of safety functional groups is adequate to provide simple information on classification like that provided in the fault schedule. However, from a practical point of view, the classification process is performed system by system and the safety features are more relevant for this purpose.

4.2. SAFETY CLASSES APPLIED TO SAFETY FUNCTIONAL GROUPS

4.2.1. Safety class definitions

Safety classes recognise the importance to safety of the SSCs contributing to a safety function through the safety functional groups. Subsequently, safety classes represent the level of robustness that will be required to design and manufacture the SSCs according to the design requirements rules provided in section 6. In the present section, robustness is understood from a technological point of view (product development process, choice of technology, quality assurance level, codes and standards applied, etc.).

The safety class assigned to a safety feature depends on the classification of the most highly classified safety functional group to which it contributes unless the specific rules defined in section 4.2.2 apply.

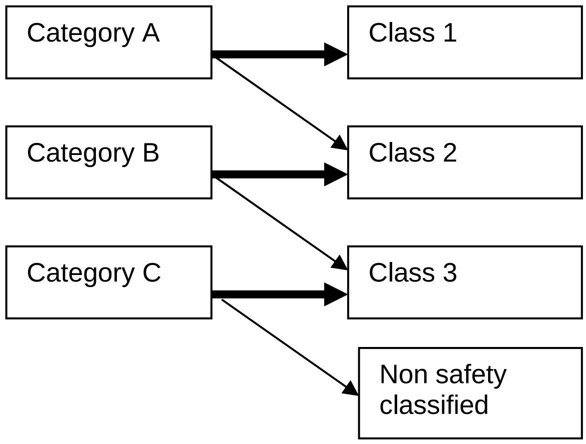
The classification system is independent of the technology employed. It is primarily based on deterministic methods, complemented where appropriate by probabilistic methods and engineering judgement with due account taken of:

1. the category of safety function to be performed by the safety functional group;
2. the consequences of failure to perform its function;
3. the probability that the safety functional group will be called upon to perform a safety function;
4. the time after any initiating fault at which, or the period during which, it will be called upon to operate.

The proposed safety class definitions are the following:

- Class 1 – any SFG or safety feature that forms a principal means of fulfilling a category A safety function
- Class 2 – any SFG or safety feature that makes a significant contribution to fulfilling a category A safety function, or forms a principal means of ensuring a category B safety function.
- Class 3 – any SFG or safety feature that contributes to a category B function, or fulfils a category C function.

The figure below presents a simplified illustration of the relationship between categories and classes.



4.2.2. Safety functional groups and safety features classification

The general rule is that the level of safety class should correspond to the same level of safety category (e.g. category A corresponds to class 1, category B to class 2 and category C to class 3). In practice, there is not a one-to-one correspondence between categories and classes; specific rules are applied at the level of the safety features as follows:

<u>General rules applied at the level of the safety functional groups:</u>

- A category A function must be fulfilled by at least one class 1 safety functional group
- If, for at least one event, a safety functional group must fulfil a category A function, then that safety functional group should normally be classified as class 1
- If, for at least one event, a safety functional group must fulfil a category B function, then that safety functional group should normally be classified as class 2
- If, for at least one event, a safety functional group must fulfil a category C function, then that safety functional group should normally be classified as class 3

<u>Specific rules applied at the level of the safety features:</u>

- A class 2 safety feature can contribute to a category A function provided one of the following assertion is verified:
  - o The safety feature does not directly support the accomplishment of the LLSF,
  - o The safety feature is already in operation or subject to the same service loads at the time of occurrence of the initiating event and is not affected by it,
  - o The safety feature fulfils the safety function in combination with at least one diverse class 1 safety feature, when the class 2 safety feature plays a secondary role and can be deployed in sufficient time.

- A class 3 safety feature can be used to perform a category B function provided one of the following assertion is verified:
  - The safety feature does not directly support the accomplishment of the LLSF,
  - The safety feature is already in operation when the event occurs and is not affected by it,
  - The class 3 safety feature fulfils the safety function in combination with at least one diverse safety feature at class 2 (or higher), when the class 3 safety feature plays a secondary role and can be deployed in sufficient time.
  - The safety feature makes only a moderate contribution to risk reduction (typical value for reduction of core damage frequency less than 2 decades)
  - Adequate justifications shall be provided to take credit of non safety features for category C safety functions. This addresses notably functions ensured under normal operation and for which no safety claims are made on the corresponding SSCs.

Note: over-classification of safety features (e.g. using a class 1 safety feature to carry out a category B function) may be implemented for practical reasons (i.e. to limit interfaces between differently classified safety features).

Sub-chapter 3.2 - Table 1 presents a list of SSCs derived from mitigating functions under PCC and RRC conditions, as presented in the fault schedule (see PCSR Sub-chapter 14.7), with their associated safety classes and design requirements.

5. ARCHITECTURE AND SYSTEM REQUIREMENTS APPLIED TO SAFETY FUNCTIONAL GROUPS

Architecture requirements aim at completing with deterministic rules the requirements inherited from the safety class. They address in particular the need for a safety functional group to be redundant or robust to the single failure criterion, and electrically backed-up.

It is necessary to define these architecture requirements consistently with the deterministic analysis rules applied to demonstrate the safety of the design.

5.1. NORMAL OPERATION REQUIREMENTS

Normal operation only refers to SSCs participating in the industrial process of the NPP. Any other SSC contributing to nuclear safety is treated in section 5.2.

5.1.1. Main process variables I&C control

According to sections 3.2.2 and 3.2.3, plant process controls used to maintain the main process variables within the limits assumed in the safety analysis are class 2 (if it is the only means of control of these variables) or class 3 (if two independent means are provided).

In any case, single failure criterion and emergency power supply back-up are not required for the main parameters controls, because a single failure, or the loss of offsite power would lead to exit the normal operating mode; the resulting situation being part of PCC-2 events.

This is in line with IEC 61226 standard that states “The reliability of systems that perform category B I&C functions shall be assessed and compared to the specification. A function in this category shall be accomplished by redundant and separated means, unless justification is provided.”

5.1.2. Other systems used in normal operations

Single failure criterion and emergency power supply back-up are not required for any systems used in normal operations. In such cases, and similar to I&C controls, the safety class will address the requirement for robustness.

5.2. MAIN LINE OF PROTECTION

Architecture requirements which are defined in this section address those SFGs which form the principal means of fulfilling a mitigation function, as presented in PCSR Sub-chapter 14.7.

There are three levels of architecture and system requirements: these are given a one to one correspondence with the safety classification of the safety functional group:

- Class 1 safety functional groups are assigned to F1A requirements
- Class 2 safety functional groups are assigned to F1B requirements
- Class 3 safety functional groups are assigned to F2 requirements

The table below shows the minimum architecture requirements associated with the above three levels. Additional design requirements may be imposed if needed as a result of the functional analysis.

Safety class	Architecture requirements	Single failure criterion	Physical and electrical separation	Emergency power supply (emergency diesels)
1	F1A	Yes at system level	Yes	Yes
2	F1B	Yes (2) at function level	Yes	Yes
3	F2	No (1)	Yes, where redundancy is claimed	No (3)

(1) May be required by the functional analysis. Especially, the analysis of internal hazards considers a single failure.

(2) May be fulfilled by functional diversity. The single failure criterion (active or passive) is applied in the design of F1A systems. This means that such SFGs necessarily contain redundant elements. For F1B systems, the single failure criterion (active or passive) is applied at the function level. This means that such SFGs do not necessarily contain redundant elements and when they do not, other functions must be assessed to demonstrate compliance with the single failure criterion. In this case, a requirement for physical and electrical separation is applied to the other functions.

(3) Required for SFGs necessary in case of some hazards: fire, earthquake, external flooding, extreme temperatures, industrial environment

Note: in addition to the requirements mentioned in the table above, common requirements apply to each of the three safety classes, relating to:

- Feasibility of Periodic Tests for active components
- Quality Assurance
- Qualification for accident conditions

5.3. RISK REDUCTION LINES OF PROTECTION

For those safety functional groups which form the diverse means of fulfilling a mitigating function, architecture requirements are different from those of the main line:

- The single failure criterion is not considered, because the common cause failure of the main line of defence consumes the single failure criterion. This is in line with IEC 61226 standard that states “The reliability of systems that perform category B I&C functions shall be assessed and compared to the specification. A function in this category shall be accomplished by redundant and separated means, unless justification is provided.”
- Electrical support and seismic requirements are considered on a case by case basis, depending on whether loss of off-site power or seismic events are part of the sequence to be considered, or not.

The table below shows the minimum architecture requirements to be applied. Additional design requirements may be imposed if needed as a result of the functional analysis.

Safety class	Single failure criterion	Physical and electrical separation	Emergency power supply (emergency diesels)
2	No (1)	Yes, where redundancy is claimed	No (2)
3	No	No	No

(1) May be required if redundancy is necessary to achieve the reliability claim of class 2 systems (especially for I&C systems).

(2) May be required by the functional analysis.

Common requirements apply to each safety class, relating to:

- Feasibility of Periodic Tests for active components
- Quality Assurance
- Qualification for accident conditions

6. REQUIREMENTS APPLIED TO STRUCTURES, SYSTEMS AND COMPONENTS (SSC)

Once a safety class is assigned to an SFG or safety feature, and associated architecture requirements defined, requirements are applied to SSCs by covering the following design aspects:

- Seismic design;
- Civil Structure design;
- Mechanical design and manufacturing;
- Electrical and I&C design;
- Qualification.

The requirements applied to an SSC depend on its safety classification, which in turn depends on the safety classification of the most highly classified SFG to which it contributes.

The design requirements applicable to an SSC also depend on other factors, such as the type of SSC (i.e. whether it is a structure, a system or a component), and its safety role and associated functional requirements.

Different requirements may be applied depending on the role of the SSC or SFG. Typical requirements are stability, integrity, operability, functional capability or some combination of the latter. Definitions of these terms are given in section 2.1.

The different types of design requirements are discussed in the following sub-sections.

6.1. SEISMIC REQUIREMENTS

The seismic requirements applicable to an SSC depend on its safety role during and following an earthquake. The seismic requirements are related to the safety class of the SFG or SSC. Two levels of seismic requirements are defined: SC1 and SC2.

The design requirement depends on the role and the type of the SSC or SFG. The fundamental requirements which may be applied are stability, integrity, operability, functional capability or a combination of the latter, under the specified loads caused by the seismic motion (see section 2.1 for definitions).

6.1.1. SSCs subject to SC1 requirements

SSCs subject to SC1 requirements are discussed below.

- SC1 requirements apply to all class 1 or class 2 SFGs and SSCs except:
  - Class 2 mechanical equipment that performs a barrier role, to which SC1 requirements are applied only on a case-by-case basis, taking into account the design of the building,
  - Class 1 and class 2 SSCs which are used only in normal operation (see section 5.1), to which SC2 requirements are applied, on a case-by-case basis (see section 6.1.2).
- SC1 requirements do not apply to class 3 SFG and SSCs, except for the following:
  - Station Blackout diesel generator (SBO-DG) sets (i.e. the diesel generator sets used in the event of loss of off-site power conditions combined with failure of the emergency diesel generators) and their support systems,
  - Containment heat removal systems used in RRC-B conditions,
  - Partitions, fire detection and fire-fighting systems installed in buildings which contain class 1 systems and components,
  - Systems that may be required to sustain the safe state for periods of between 24 and 72 hours.

6.1.2. SSCs subject to SC2 Requirements

<u>The following SSCs are subject to SC2 requirements:</u>

- Class 3 SSCs which have a protection role, or whose failure in a seismic event could have an unacceptable impact on SC1 equipment. An ‘unacceptable impact’ could arise if one of the following consequential internal hazards was caused by the seismic motion:
  - Equipment toppling or falling on equipment with SC1 requirements,
  - Missile generation,
  - Effects caused by high energy component failures,
  - Flooding caused by failures of pipes, tanks or reservoirs,
  - Explosion (according to ETC-F),
  - Fire (according to ETC-F).
- Class 1 and class 2 SSCs which are used only in normal operation (see section 5.1), and whose failure in a seismic event could have an unacceptable impact on SC1 equipment (same as above).

Analysis of the consequences of failure that could be caused by an earthquake must take into account the possibility of multiple failures.

Consequential failures caused by the failure of electrical and I&C equipment must be prevented by the decoupling between protected and non-protected parts.

In particular, if the earthquake could lead to an internal hazard, the provisions for dealing with this internal hazard or the measures to prevent it, must comply with SC2 requirements.

SC2 SSCs are to be designed using methods appropriate to their intended use. The table below shows the mapping between the safety class and the minimum seismic requirement.

SFG/SSC Safety Class	Seismic requirements
1	SC1 (*)
2	SC1 (*)
3	SC1(**) or SC2(***)

(*) except for some systems/component used only in normal operation or having a barrier role, as explained in section 6.1.1

(**) for some systems/component as explained in section 6.1.1

(***) for class 3 SCs which protect, or whose failure could have an unacceptable impact on equipment with SC1 requirements

6.2. REQUIREMENTS FOR CIVIL STRUCTURES

The civil structures requirements apply only to structures and are not applicable to systems or components.

Civil Structures have two main objectives:

- Protecting systems/components against hazards;
- Providing a barrier to the release of radioactivity.

Two requirement levels (C1, C2) are defined for Civil Structures as follows:

- Generally speaking, civil structures which house or support class 1 or 2 components or class 3 components which have a barrier role, are classified at Safety Class 1 and must meet C1 requirements. An exception is the turbine hall that is classified at Safety Class 2 and must meet C2 requirements;
- Civil structures which ensure a containment function are also classified as Safety Class 1 and must meet C1 requirements;
- Civil structures whose failure could impair the integrity of class 1 structures or those structures which house class 3 components, are classified as Safety Class 2 structures and must meet C2 requirements;

For C1 civil structures:

- The main structures (e.g. the Reactor Building internal containment, foundation raft…) must comply with the ETC-C design code and be seismically designed and constructed to SC1 requirements.

- The other structures such as shielding protection inside the Reactor Building (see Sub-chapter 3.2 - Table 5, which presents the list of these "other structures" in the Reactor Building and associated design requirement) must comply with dedicated design and construction rules and be seismically designed to SC2 as far as necessary. The anchorages of those "other structures" shall comply with ETC-C rules (see PCSR Sub-chapter 3.8 for the ETC-C code).

For C2 civil structures:

- The structures must comply with dedicated design and construction rules and be seismically designed to SC2 as far as necessary.

The table below shows the mapping between civil structures safety classes and civil structures requirements levels.

Civil structure Safety Class	Civil Structure requirements level	Codes and Standards	Seismic requirements
1	C1 (main structures)	ETC-C	SC1
	C1 (other structures)	Dedicated rules	SC2 as far as necessary (1)
2	C2	Dedicated rules	SC2 as far as necessary (1)

(1) SC2 requirements apply to buildings/structures that protect or whose failure can have unacceptable impact on SSC with an SC1 requirement. In particular, if the collapse of a structure/building can directly or indirectly have unacceptable impact on SSC designed with an SC1 requirement (domino effect), this structure/building must be designed with an SC2 requirement. Unacceptable impact may result from the internal hazards subsequent to an earthquake (see section 5.1.2).

The design requirements for civil structures are defined for the different load combinations considered in the design basis, including loads due to postulated earthquake (see PCSR Sub-chapter 3.3). The requirements cover the following aspects:

- Stability: behavioural requirements the purpose of which is to prevent the collapse of a civil structure.

- Local stability: behavioural requirements which are expressed in terms of static balance, mechanical resistance and rigidity.

- Integrity of equipment supports: behavioural requirements which describe the fact that the structural elements that support items of equipment must meet the requirements attributed to the equipment.

- Containment: the aim of the containment function is to limit the release of hazardous materials into the environment.

- Avoidance of interaction: the aim is to prevent impacts between adjacent components (including structures) during earthquakes. Interactions occur when the relative displacement of the components is greater than the separation distance between them.

Sub-chapter 3.2 - Table 4 presents the classification list for the UK EPR civil structures and the main associated requirements in terms of seismic design and protection against aircraft crash and explosion pressure waves.

6.3. COMPONENT REQUIREMENTS

6.3.1. Types of components to be classified

The components in the EPR design can be grouped into a number of types for the purpose of allocating the codes and standards which they need to satisfy. The following groupings have been identified:

- Pressure retaining equipment:
  - Pumps
  - Tanks
  - Valves
  - Pipes
  - Heat exchangers
- Non Pressure retaining equipment :
  - supports of pressure components and electrical components
  - vessel internals
  - mechanical components of ventilation systems
  - component that are parts of handling devices
  - Fuel assembly and Reactor Cluster Control Assembly
- Electrical and I&C equipment

Some components, such as motorised valves or pumps, may not fall within the above groups. In such cases, design requirements, codes and standards applied must be adequately chosen to reflect all the different aspects of the design (electrical, mechanical, etc.).

6.3.2. General requirements for components

The general requirements applicable to classified components are as follows:

- Design and construction must follow specific common codes and standards (see PCSR Sub-chapter 3.8 for the RCC-M, RCC-E, ETC-F and ETC-C codes). These common codes and standards define the methodologies, rules and criteria to be used for procurement, design, construction, inspection and testing of the components.

- A quality assurance programme is to be followed. QA programmes must be applied at the different stages of component life (design, construction, installation, inspection, testing, operation, modification).

- Environmental qualification is required. Qualification aspects are developed in section 6.4

6.3.3. Mechanical requirements for pressure retaining components

The mechanical requirements applicable to a pressure retaining component depend on:

- The safety classification of the component; and

- The potential for radioactivity release in the case of failure of the component (i.e. its barrier role) which is reflected in the role of the component in performing a containment function. Components, whose failure can, under normal and accident conditions (operational conditions PCC-1 to PCC-4 and RRC-A or RRC-B) lead to a discharge of radioactivity significantly greater than that existing in the surrounding environment, are subject to mechanical requirements (M1/M2/M3).

Requirements on mechanical components ensure that appropriate code or standards are applied in the design and manufacturing of the equipment so that its quality is appropriate for the function that it fulfils.

The mechanical requirements include provisions for the application of a Quality Assurance programme, the degree of qualification for particular operating conditions, seismic qualification, and periodic testing/in-service inspection.

6.3.3.1. Assignment of component mechanical quality requirements (M)

Three requirement levels (M1, M2 and M3) are defined for pressurised mechanical components.

The rules relating the mechanical requirements to the component class are as follows:

- Class 1 components must meet M2 requirements unless the following rules apply.
    - o Upgrading to M1 requirements must be made if any of the following two conditions are met:
        - The components is part of the Reactor Coolant Pressure Boundary [RCPB],
        - The component is an High Integrity Component (HIC) [Ref] (see PCSR Sub-chapter 3.1 and section 0 of Sub-chapter 3.4) [3]
    - o Downgrading to M3 requirements may be made when it can be shown that the failure of the component would not lead to exceed the limits and criteria associated with PCC-4 events.

[3] M1 is not applicable to pipes leading to breaks that can be compensated for by the RCV [CVCS].

- Class 2 components must meet M3 requirements unless higher requirements apply due to the barrier role of the component (“barrier role” as defined hereafter).

- Class 3 components do not need to meet M1, M2 or M3 requirements (i.e. they do not need to be mechanically classified) unless mechanical requirements apply due to the barrier role of the component (“barrier role” as defined hereafter).

If a component has a “barrier role”, the following rule is applied:

- A component whose failure can, under normal or accident conditions (operational conditions PCC-1 to PCC-4 and RRC-A or RRC-B) lead to a discharge of radioactivity significantly greater than that existing in the surrounding environment[4] must meet at least M3 requirements.

- A component which is required in a condition where it is not isolated from the primary coolant under PCC or RRC conditions in which fuel cladding integrity is not required must meet M2 requirements.

The following definitions apply in the interpretation of the above criteria:

- "required” means that the component belongs to a system or a part of system required to perform the safety analysis under PCC or RRC conditions.

- "cladding integrity required" refers to acceptance criteria applicable to the Plant Condition or Risk Reduction Category being considered (see PCSR Chapter 14 for PCCs and Sub-chapter 16.1 for RRC-A): it does not depend on the results of specific accident studies (which may show no clad failures).

- "not isolated from the primary coolant" includes ventilation systems which could be operated in an environment contaminated by primary coolant (e.g. due to leakages) as well as systems which directly handle primary fluid.

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[4] Activity is considered as being significantly greater than that existing in the environment when the following two conditions occur:

- The activity concentration of the fluid concerned exceeds 1 MBq/l

- The activity concentration of the fluid concerned exceeds that existing in the environment by a factor of 1000.

These thresholds are proposed on the basis of values observed in natural radioactivity (approximately 1 to 10^3 Bq/kg). Such thresholds exclude components which contain low-activity fluids, as well as systems that operate only inside the containment in conditions where the containment environment is degraded.

6.3.3.2. Specific components: Isolation devices

When an isolation device, whether motorised or not, is used to separate two sections of a mechanical system with different mechanical requirements (e.g. M1 and M2 pipes separated by an isolation device), the following additional requirements apply:

- If the isolation device is redundant, the same requirements apply to both the isolation valves and to the part (e.g. pipework) of the mechanical system which may link them.
- The isolation device(s) inherits of the highest safety requirements of the two sections of the system which it separates.

6.3.3.3. Application of RCC-M code and European standards

The mechanical requirements M1, M2 and M3 relate directly to the design level in the design code or standard to be applied. The mechanical quality requirements for pressurised equipment imply the following design codes and standards:

- M1 requires application of RCC-M1;
- M2 requires application of RCC-M2 or ASME III with supplements or KTA with supplements;
- M3 requires application of RCC-M3 or harmonised European standards with supplements or any code compliant with Pressure Equipment Directive (PED) 97/23/EC with supplements, the quality level being equivalent. The supplements bridge the gap between these standards/codes and RCC-M3.

The application of the RCC-M (or equivalent) code ensures there are sufficient design margins to provide adequate integrity and mechanical stability for the components. The table below summarises the basic set of RCC-M criteria levels to be applied, which depend on the various operating situations. The design principle is to provide sufficient margin between the stress level and the integrity criteria such that the probability of failure is acceptably small.

Unit operating condition	**Reference**	**Normal**	**Upset**	**Emergency**	**Faulted**
Criteria levels	0	A	A/B (*)	C	D

(*) Level A for RCC-M class 1 components and Level B for other components (class2/3)

In addition to the safety class of the component, other factors such as the functional requirements placed on a mechanical component (i.e. integrity, operability and functional capability) can influence the extent to which the standards are applied. For example, a component for which only integrity needs to be maintained following a fault may not need to meet such stringent requirements as a component whose functional capability must be maintained.

The requirements on integrity, operability, functional capability depend on the safety function that the component contributes to. Functional requirements add to mechanical requirements and may result in more stringent criteria on a component under faulted conditions.

Where the functional requirement includes functional capability under faulted conditions the following increase in the criteria level apply:

- RCC-M1/2/3: increased from level D to level C

The equivalent increases in the criteria level for an operability functional requirement are:

- RCC-M1: increased from level D to level 0

- RCC-M2/3: increased from level D to level B

The supplements which are applied to harmonised European standards to provide equivalence to RCC-M3 are discussed below.

The supplements are a set of additional requirements which are based on EDF/AREVA expertise and experience in the nuclear equipment design and manufacturing. They ensure a quality level similar to that of equipment designed and procured according to RCC-M3 [Ref]. The supplements define restrictions on the options available within the standard, limits on the possibilities presented by the standard, and impose complementary requirements where the standard is deemed too permissive according to EDF/AREVA best practice.

In the area of design, the supplements require consideration of additional faulted conditions and consideration of earthquakes according to EDF/AREVA practice. Design limits to be met in fault conditions may also be upgraded.

In the area of manufacturing, supplements are defined in all the main technical aspects covered by the RCC-M code, namely: choice and procurement of materials, manufacturing (welding, hard-rolling, heat treatment, etc.), non-destructive testing, cleanliness and quality assurance.

EDF has established generic technical reports to formalise these supplements:

- BTS [CST] = Book of Technical Specification. Each particular type of component or equipment item has a BTS (e.g. BTS for “piping”, BTS for “Thermal and Nuclear power plant tanks”, etc.); and

- BTR [CRT] = Book of Technical Rules. As with the BTS there are BTRs for “welding”, “cleanness”, “non destructive examination”, etc.)

6.3.3.4. Synthesis

The table below summarises the relationship between the safety class, the mechanical requirements and the standards applied.

Component Safety Class	Part of RCPB or HIC?	Mechanical requirement	Standard applied	Quality assurance
1	Yes	M1	RCC-M1	Yes
	No	M2	RCC-M2 or ASME III with supplements or KTA with supplements	Yes
	No	M3	RCC-M3 or Harmonised European Standards with supplements or any code compliant with PED, with supplements	Yes
2	No	M3 (*)	RCC-M3 or Harmonised European Standards with supplements or any code compliant with PED, with supplements	Yes
3	No	NC (**)	Harmonised European standards (Compliant with PED)	Yes

(*) Class 2 components may need to meet M2 requirements if they have a barrier role (see section 6.3.3.1)

(**) Class 3 components may need to meet M2 or M3 requirements if they have a barrier role (see section 6.3.3.1)

6.3.4. Mechanical requirements for non pressure retaining components

In the case of non pressure retaining components, the M1, M2 and M3 mechanical quality requirements are inapplicable (M) and are thus replaced with other mechanical requirements, as described below.

6.3.4.1. Assignment to non pressure retaining components requirements

For mechanical components that are not pressurised, precise requirements are defined in dedicated technical specifications (i.e. BTS for most duty systems notably), which may be specific to an individual piece of equipment or may apply to a component type. Such requirements are generally graduated according to the safety class of the component as defined in section 4. In particular, for non pressure retaining High Integrity Components several measures are taken into account (sound design, use of proven materials, integrity analysis, high standards of manufacture, in-service inspections, etc) to prevent any risk of failure.

6.3.4.2. Application of codes and standards

The quality of most non pressure retaining components is ensured by application of requirements defined in the BTS as mentioned in 6.3.4.1. However, some components require the application of specific codes as defined below.

6.3.4.2.1. Supports of fluid system components

The criteria applicable to supports are based on the principle that the supports of a fluid component are as important as the component being supported. Consequently, the classification process does not explicitly consider them.

Requirements on supports are divided into three sub-levels:

- Supports of M1 components: the requirements of the dedicated RCC-M sub-section are applied (Volume H, requirements for S1 supports),
- Supports of M2 components: the requirements of the dedicated RCC-M sub-section are applied (Volume H, requirements for S2 supports), or equivalent requirements from another nuclear code (ASME section III or KTA),
- Supports of M3 components: the requirements of harmonised European standards are applied or equivalent industrial practices compliant with the PED (if it is decided to use RCC-M, requirements for S2 supports will be applied).

The supports of large RCC-M valve motors and large RCC-M pump motors are considered as supports for the corresponding RCC-M components.

The supports of other electrical equipment (cables, connections, electrical cabinets, etc.) are dealt with in RCC-E.

Design rules for supports or support components which are embedded in concrete are given with in ETC-C (see Sub-chapter 3.8 of the PCSR).

6.3.4.2.2. Vessel internals

With regard to their contribution to safety functions, vessel internals are divided into two sub-classes:

- Core support structures (CS),
- Other internal structures (IS)

CS components are those that are necessary to ensure the mechanical integrity of the fuel assemblies.

Vessel internals are covered by a dedicated sub-section of RCC-M (volume G), which specifies applicable design rules in accordance with the CS/IS classification.

6.3.4.2.3. Fuel assemblies and Rod Cluster Control Assemblies

For fuel assemblies and Rod Cluster Control Assemblies (RCCA), the M1, M2, M3 mechanical quality requirements are not relevant. These components are designed according to the dedicated standard RCC-C (see Sub-chapter 4.2 of the PCSR).

6.3.5. Electrical and I&C equipment requirements

Electrical and I&C requirements are only applied to electrical components of an SFG that have the operability functional requirement. Architecture requirements (i.e. single failure criterion, physical and electrical separation, emergency power supply) described in section 5 apply at the electrical system level (supporting system that work together with front-line SSCs to perform a safety function).

Classified SFG involved in the mitigation of a PCC-2 to PCC-4 event or RRC sequences:

For these SFG, three levels of requirements for electrical and I&C equipment are defined. The minimum requirements for electrical and I&C equipments are presented in the table below[5]:

SSC Safety Class	Quality Assurance	Qualification for operating conditions	Seismic Qualification	Use of design codes	RCC-E C1320 classification
1	Yes	Yes	According to seismic requirements	Yes (RCC-E)	C1
2	Yes	Yes	According to seismic requirements	Yes (RCC-E)	C2
3	Yes	Yes	According to seismic requirements	Yes (RCC-E or other design code)	C3 (when RCC-E is retained as design code)

Additional requirements, for instance seismic qualification for class 3 SSCs, may be required as a result of the functional analysis.

Note: the RCC-E defines the same design requirements for electrical equipment independently from the safety class of the electrical equipment, and there is in general no graded requirement in the BTS applicable for specific electrical equipment.

Classified SFG not involved in the mitigation of a PCC-2 to 4 or RRC sequences

For these SFG, electrical and I&C components requirements can be defined according to RCC-E or through the Book of Technical Specification of the dedicated components.

The design of electrical equipments complies with the best international practice for class 1 electrical equipments.

Note: If I&C equipment is integrated with electrical equipment (e.g. smart device on a busbar), the I&C requirements defined in the applicable code (RCC-E) and the associated standards apply to the I&C part of the electrical equipment.

[5] An electromechanical component (valve, pump...) may not inherit its electrical and I&C requirements from the highest categorised function that it supports since the SFG that fulfils the highest categorised function may not have an operability functional requirement.

6.4. QUALIFICATION

The objective of qualification is to confirm that equipment is capable of fulfilling its functions under the postulated environmental conditions to which it may be subjected. All safety classified equipment is required to be qualified against the ambient conditions (normal, incident or accident conditions) to which it may be subjected. In practice, the scope of qualification is limited by considering the safety function and nature of the equipment in question.

Definition of qualification parameters is generally based on standardised conditions which envelope the conditions that could be encountered by a particular piece of equipment.

Multiple standardised conditions have been defined for the EPR so as to be as close as possible to more realistic conditions, while at the same time maintaining a healthy margin to actual accident conditions. These multiple standardised conditions, termed "families", are used to demonstrate qualification in design basis accident conditions.

The standardised qualification conditions are intended to represent the conditions to which equipment may be subjected in the situations of normal operation, seismic loading, and in the extreme conditions which result either from an event linked to the nuclear steam supply system or from an internal or external hazard. The standardised conditions are described as follows:

Normal operation: the objective of qualification "in normal conditions" is to assess equipment operation over time. A qualification programme specific to each equipment type is drawn up which may, depending on the operating conditions, include:

- Design testing in nominal operating conditions, which can be used to define a reference point for its characteristics,
- Functional limit testing in which the influence of the main environmental parameters (vibrations, temperature...) representative of installation conditions are assessed,
- Robustness and/or operational assessment testing over extended time periods (e.g. under exposure to irradiation, temperature…) designed to artificially age equipment. Even though a proposed service life might be used to specify these tests, they would not be used to demonstrate a qualified service life.

Seismic loads: seismic events are dealt with specifically in the qualification programme since, an earthquake is a hazard capable of threatening the whole installation. The qualification approach is developed from seismic spectra (defined in PCSR Chapter 13) and the floor response spectra, either by design calculations or by "seismic tests", using methods based on IEC 60980. Seismic qualification includes the requirement for stability and/or integrity. Functional capability or operability requirements are included as necessary according to functional requirements.

Extreme situations: these situations may either be the result of an event linked to the nuclear steam supply system or an internal or external hazard. The safety classification of the equipment concerned and the potential ambient conditions associated with the related events or hazards determine the qualification requirements. Qualification conditions are grouped as follows:

- For PCC2-4 events and RCC-A sequences, families of ambient conditions are defined in the relevant buildings. Equipment is assigned to one of the families depending on the type and duration of the situation to which it will be exposed. Taking into account the location of equipment, periodicities for replacing age-sensitive components and the family of ambient conditions has led to the definition of several standardised qualification conditions, each corresponding to a thermodynamic profile and an exposure dose.

- For qualification of a given component, the applicable standardised conditions (thermodynamic envelope, exposure dose) depend on its location, replacement periodicity for age-sensitive components and on its family of ambient conditions.

Different internationally recognised methods may be used for qualification, based on RCC-E, KTA or IEEE standards. An initial check is carried out to ensure their appropriateness for specific EPR applications.

- High Energy Line Break: qualification of isolating devices which have to close in the event of rupture in "high energy" conditions and qualification for operation in the presence of suspended solids and radioactive contamination are also taken into account in qualification for accident conditions.

- For severe accidents, qualification conditions specific to each item of equipment concerned are defined, based on the required missions.

- Ambient conditions resulting from internal and/or external hazards: demonstration covers the capacity to resist hazards. Such is the case, for example, with fire, explosion, flooding, while earthquakes are dealt with specifically as set out previously. This qualification may be supplemented by installation provisions. Different methods of qualification are used depending on the nature of the hazard in question. For example, in the event of fire, methods described in the EPR Technical Code for Fire Protection (ETC-F) are used.

This design aspect is set out in PCSR Sub-chapter 3.6 for PCC and RRC events and in Chapter 13 for hazards.

7. UK EPR CLASSIFICATION OF EQUIPMENT

The following tables present, based on the classification principles presented in this sub-chapter, the classification of the main systems or components of the plant, with their associated design requirements and main design codes:

- Sub-chapter 3.2 - Table 1: Classification of main mechanical SSCs,

  Note: for those SSCs which fulfil mitigating functions under PCC or RRC conditions, further information is given in the fault schedule presented in PCSR Sub-chapter 14.7.

- Sub-chapter 3.2 - Table 2: Classification of main electrical SSCs,

- Sub-chapter 3.2 - Table 3: Classification of I&C systems,

- Sub-chapter 3.2 - Table 4: Classification of main civil structures,

- Sub-chapter 3.2 - Table 5 : List of “other structures” in the Reactor Building and associated design requirements
- Sub-chapter 3.2 - Table 6: Classification of fuel handling and storage SSCs (mechanical parts)

SUB-CHAPTER 3.2 - TABLE 1

Classification of main mechanical SSCs

Note 1: for those SSCs which fulfil mitigating functions under PCC or RRC conditions, further information (especially about the architecture requirements) is given in the fault schedule presented in PCSR Sub-chapter 14.7.

Note 2: the column “mechanical design code” gives an indication of the required level of the code. The code really used for the different components may not be this one.

Note 3: as electromechanical components (valves, pumps) may have several safety classes addressing the mechanical or the electrical and I&C parts of the components, the safety class indicated corresponds to the highest safety class of safety features. It does not mean that the whole component is class 1. It addresses only the mechanical parts.

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
APG [SGBS]	**Steam generator blowdown system**					
	- Lines connected to steam generators (DN100) up to and including the 2nd isolation valve for DI ³ 100 and including the 1st isolation valve for DI < 100 (1)	A	1	M2	SC1	RCC-M2
	- Transfer lines (Secondary System Pressure Boundary – DN 100)	B	2	M2	SC1	RCC-M2
	- Containment penetrations	A	1	M2	SC1	RCC-M2
	- *Other containment internal components*	C	3	NC	SC2	N/A
	- *Other containment external components*	C	3	NC	NC	N/A

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
ARE [MFWS]	**Steam generator main feedwater system**					
	- Lines connected to the steam generators up to and including the 2nd isolation valve (Secondary System Pressure Boundary, SSPB)	A	1	M2	SC1	RCC-M2
	- Isolation valves	A	1	M3	SC1	RCC-M3
	- Sluicing station (low and high capacity – excl. isolation valves)	C	3	M3	SC1	EHS + comp
ASG [EFWS]	**Steam generator emergency feedwater system**					
	- Lines connected to the steam generators up to and including the 2nd isolation valve (SSPB) for DI > 25, and including the 1st isolation valve for DI < 25 (1)	A	1	M2	SC1	RCC-M2
	- Header at ASG [EFWS] pump discharge	A	1	M3	SC1	EHS + comp
	- Header at ASG [EFWS] pump suction	B	2	M3	SC1	EHS + comp
	- Re-supply of ASG [EFWS] tanks by JAC (Fire Fighting Water Supply System)	C	3	NC	SC1	Indus.
	- Rest of the system	A	1	M3	SC1	EHS + comp
CFI [CWFS]	**Sea water filtering**					
	- Low-speed rotation of filtering devices (FAC and TF)	B	2	M3	SC1	EHS + comp
	- Low-pressure washing of filtering devices (FAC and TF)	B	2	M3	SC1	EHS + comp
	- Water level measurements downstream of filtering devices	C	3	NC	SC2	Indus.
CRF	**Water circulation (lubrication, filtering and separation)**					
	- Automatic shutoff of CRF pumps in the event of high CFI [CWFS] pressure drop	B	2	N/A	SC1	N/A

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
DCL [CRACS]	**Control room and electrical equipment rooms atmospheric conditioning**					
	- Ventilation, heating and air conditioning of the control room	B	2	N/A	SC1	Indus.
	- Normal filtering	B	2	N/A	SC1	Indus.
	- Iodine filtering and isolation dampers	C	3	N/A	SC1	Indus.
	- Fresh air supply isolation	C	3	N/A	SC1	Indus.
DEL	**Electrical building emergency chilled water system**	B	2	M3	SC1	EHS + comp
DER	**Reactor building chilled water production**					
	- Containment isolation	A	1	M2	SC1	RCC-M2
	- Rest of the system	C	3	NC	SC2	Indus.
DFL	**Electrical building fume extraction**	C	3	N/A	SC2	Indus.
DMK	**Handling equipment and plant for the fuel building**					
	- Lines connected to the loading pit or to the cask	C	3	M2	SC1	RCC-M2
	- Other parts in contact with the fluid	C	3	M3	SC2	EHS + comp
DVD	**Ventilation and heating of diesel building**					
	- Ventilation of emergency diesel rooms					
	+ Extraction of heat from diesel areas	A	1	N/A	SC1	Indus.
	+ Air supply, cooling and extraction from electrical equipment rooms	A	2	N/A	SC1	Indus.
	+ Heating of diesel area	C	3	N/A	SC2	Indus.
	- Ventilation of SBO diesel rooms					Indus.
	+ Extraction of heat from diesel areas	C	3	N/A	SC1	Indus.
	+ Air supply and extraction from electrical equipment rooms	C	3	N/A	SC1	Indus.
	+ Heating of diesel area	C	3	N/A	SC2	Indus.

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	**Highest safety class of safety features**	**Mechanical quality for pressure retaining components**	**Seismic**	
DVL	**Ventilation of the electrical rooms in the electrical building**					
	- Filtering, heating, cooling and ventilation systems	A	2	N/A	SC1	Indus.
	- Ventilation of PICS rooms and shutdown station	C	3	N/A	NC	Indus.
DVP	**Ventilation of the pumping station**					
	- Cooling of pumping station rooms	A	2	N/A	SC1	Indus.
	- Heating of pumping station rooms	B or C	2 or 3	N/A	SC1/SC2[6]	
	- Cooling of outfall structure rooms	C	3	N/A	SC1	Indus.
	- Heating of outfall structure rooms	C	3	N/A	SC1/SC2[8]	Indus.
DWB	**Ventilation of the contaminable rooms in the operational production centre**					
	- Air supply to the operational branch monitored zone	C	3	N/A	NC	Indus.
	- Extraction and filtering of the operational branch monitored zone	C	3	N/A	NC	Indus.
DWK	**Ventilation of the fuel building (FB)**					
	- Isolation of air supply/extraction of FB fuel handling area	A	1	N/A	SC1	RCC-M2
	- Isolation of air supply of room adjacent to the emergency air lock	A	1	N/A	SC1	Indus.
	- Isolation of extraction of room adjacent to emergency air lock	C	3	N/A	SC1	Indus.
	- Isolation of air supply/extraction of the room adjacent to the TAM	A	1	N/A	SC1	Indus.

[6] SC1 for cold service design basis equipment, SC2 for extreme cold equipment

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
DWL	**Ventilation for the safeguard auxiliary building (SB) and the electrical building**					
	- Isolation of air supply of the room adjacent to personnel air lock	A	1	N/A	SC1	Indus.
	- Isolation of normal ventilation of SB		1, 2 or 3	N/A	SC1	Indus.
	- Extraction in accident condition of SB and iodine filtering	A	1	N/A	SC1	Indus.
	- Isolation of EVU [CHRS] and RIS [SIS] rooms	C	3	N/A	NC	Indus.
DWN	**Ventilation of the nuclear auxiliary building**					
	- Isolation dampers for nuclear auxiliary building fresh air and outlet	C	3	N/A	SC1	Indus.
	- Extraction of normal ventilation of nuclear auxiliary building	C	3	N/A	NC	Indus.
	- Normal and iodine filtering	C	3	N/A	NC	Indus.
	- Rest of the system	C	3	N/A	NC	Indus.
DWQ	**Ventilation of the effluent treatment building**					
	- Extraction and filtering of the monitored zone	C	3	N/A	NC	Indus.
	- Rest of the system	C	3	N/A	NC	Indus.
DWW	**Ventilation of the contaminable rooms in the access tower**					
	- Extraction and filtering of the monitored zone	C	3	N/A	NC	Indus.
	- Rest of the system	C	3	N/A	NC	Indus.
EBA [CSVS]	**Purging of the reactor building**					
	- Isolation of containment low- and high-capacity air supply	A	1	N/A	SC1	Indus.
	- Isolation of air supply of the room adjacent to the TAM	A	1	N/A	SC1	Indus.
	- Low-capacity extraction and iodine filtering	B	2	N/A	SC1	Indus.
	- Isolation of containment low- and high-capacity extraction	A	1	N/A	SC1	Indus.
	- Rest of the system	C	3	N/A	SC2	Indus.

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
EDE [AVS]	**Annulus ventilation system**					
	- External containment penetrations	A	1	M2	SC1	RCC-M2
	- Iodine filtering	A	1	N/A	SC1	Indus.
	- Normal filtering					
	. Isolation of normal filtering	A	1	N/A	SC1	Indus.
	. Rest of normal filtering	C	3	N/A	NC	Indus.
ETY	**Containment H2 control**					
	- Recombiners	C	3	N/A	SC2	Indus.
	- "2-room" isolation valves	C	3	N/A	SC2	Indus.
EVF	**Internal containment filtration (fire dampers)**	**C**	3	N/A	SC2	Indus.
EVR [CCVS]	**Containment cooling and ventilation**					
	- Ventilation of the reactor pit	C	3	N/A	SC1	Indus.
	- Rest of the system	C	3	N/A	SC2	Indus.
EVU [CHRS]	**Containment heat removal**					
	- Reactor Building (RB) internal spray lines	C	3	NC	SC1	Indus.
	- Corium spreading zone cooling lines (int. RB)	C	3	NC	SC1	Indus.
	- Sump filter unplugging lines (int. RB)	C	3	NC	SC1	Indus.
	- Containment penetrations (lines and isolation valves) except for IRWST suction	A	1	M2	SC1	RCC-M2
	- Containment penetrations (lines and isolation valves) for IRWST suction lines	A	1	M2	SC1	RCC-M2
	- Containment penetration for the sump filter unplugging line	A	1	M2	SC1	RCC-M2
	- External RB equipment (lines, pumps, heat exchangers) except sodium hydroxide injection	C	3	M2	SC1	RCC-M2
	- Sodium hydroxide tank and injection lines	B	2	M3	SC1	EHS + comp

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
	- Component cooling systems Trains 1 and 2 (inclusive of EVU [CHRS] / SRU [UCWS] heat exchangers)	C	3	NC	SC1	Indus.
JAC	**Classified fire-fighting water production**	C	3	NC	SC1	Indus.
JDT [FDS]	**Fire detection**	C	3	NC	SC1	Indus.
JPI	**Nuclear island fire-fighting water protection and distribution**					
	- Containment penetration	A	1	M2	SC1	RCC-M2
	- Rest of the system	C	3	NC	SC1	Indus.
JPV	**Diesel generator sets fire-fighting water protection and distribution**	C	3	NC	SC1	Indus.
KER [LRMDS]	**Control and discharge of effluents from the nuclear island**					
	- Header and associated lines	C	3	NC	NC	Indus.
KRT [PRMS]	**Radiological protection measurement**					
	- Containment isolation	A	1	M2	SC1	RCC-M2
	- Reactor building radiation detection during shutdown states	A	1	M3	SC1	EHS + comp
	- Fuel handling area radiation detection	A	1	M3	SC1	EHS + comp
	- Steam Generators (SG) radiation detection					
	- on main steam lines	A	1	NC	SC1	Indus.
	- on blowdown lines		2	NC	SC1	Indus.
	- Containment radiation measurement (high containment radiation)	B	2	M2	SC1	RCC-M2
	- Containment annulus radiation measurements	C	3	M2	NC	RCC-M2
	- Reactor building radiation measurement during normal operation	C	3	M3	SC2	EHS + comp
	- Condenser radiation measurements	C	3	NC	NC	Indus.
	- RRI [CCWS] (component cooling system) radiation detection	C	3	NC	SC1	Indus.
	- Primary system radiation measurement	C	3	NC	NC	Indus.

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
	- Nuclear auxiliary building sump radiation measurements	C	3	NC	NC	Indus.
	- Control room dose rate measurement	C	3	NC	NC	Indus.
	- DCL [CRACS] air intake radiation measurement	C	3	NC	NC	Indus.
	- TEG [GWPS] (gaseous waste treatment system) radiation measurements	C	3	M3/NC	NC	EHS + comp
	- Nuclear auxiliary building stack radiation measurements	C	3	NC	NC	Indus.
	- Ventilation systems radiation measurements	C	3	M3	NC	EHS + comp
PTR [FPPS / FPCS]	**Pool water purification and cooling**					
	- Containment penetrations	A	1	M2	SC1	RCC-M2
	- Spent fuel pool cooling (Fuel Building)					
	. Main trains upstream of heat exchangers	B	2	M2	SC1	RCC-M2
	. Heat exchangers of main cooling trains and lines downstream	B	2	M2	SC1	RCC-M2
	. 3rd train upstream of heat exchangers	C	3	M2	SC1	RCC-M2
	. PTR [FPPS/FPCS] 3rd train heat exchanger and lines downstream	C	3	M2	SC1	RCC-M2
	- Overflow line to IRWST	A	1	M2	SC1	RCC-M2
	- Skimming, purification and transfer of reactor and spent fuel pool water					
	. Compartment drainage lines up to and including the 2nd isolation valve	A	1	M2	SC1	RCC-M2
	. Rest of the system	C	3	M3	SC2	EHS + comp

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
RBS [EBS]	**Extra boration system**					
	- CPP [RCPB] branch pipes up to and including the 1st isolation valve on the RBS [EBS]	A	1	M1	SC1	RCC-M1
	- Containment penetrations	A	1	M2	SC1	RCC-M2
	- Rest of the system	A	1	M3	SC1	RCC-M3
RCP [RCS]	**Reactor coolant system**					
	- Reactor vessel					
	. Vessel body and head	A	1	M1	SC1	RCC-M1
	. Vessel support ring	A	1	N/A	SC1	N/A
	. Vessel sealwater leak-off line (DI<25) up to and including the 1st isolation valve [(1)]	C	3	M3	SC2	EHS + comp
	- Vessel vent lines up to and including 1st isolation valve (DI<25)	A	1	M1	SC1	RCC-M1
	- Vessel vent line downstream of the 1st isolation valve (DI<25)	C	3	M3	SC2	EHS + comp
	- Vessel internal					
	. Components considered as core supports	A	1	CS	SC1	RCC-M CS
	. Other internal structures	A	1	IS	SC1	RCC-M IS
	- Control Rod Drive Mechanisms (see RGL)					
	. Anti-seismic supports	B	2	N/A	SC1	N/A
	- Primary coolant loops	A	1	M1	SC1	RCC-M1
	- Steam generators					
	. Tube assembly / secondary assembly	A	1	M1/M2	SC1	RCC-M

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
	. Supporting elements directly welded onto the pressure boundary	A	1	M1/M2 supports	SC1	RCC-M
	. Secondary sampling lines up to the 1st isolation valve (since DN < 100)	A	1	M2	SC1	RCC-M2
	- Pressuriser					
	. Pressuriser, pressure relief valves and surge line	A	1	M1	SC1	RCC-M1
	. Normal spray lines and valves	A	1	M1	SC1	RCC-M1
	. Auxiliary spray lines and valves up to the 2nd isolation valve	A	1	M1	SC1	RCC-M1
	. Severe accident depressurisation line up to the 2nd isolation valve	A	1	M1	SC1	RCC-M1
	. Pressuriser vent lines up to and including the 2nd isolation valve	A	1	M1	SC1	RCC-M1
	. REN [NSS] (nuclear sampling system) sampling line up to the 1st isolation valve	A	1	M1	SC1	RCC-M1
	. Heater sleeves, heater well flanges	A	1	M1	SC1	RCC-M1
	- Reactor coolant pumps					
	. RCP flywheel	A	1	N/A	SC1	N/A
	. Casing, diffuser and cavity gap seal no. 1	A	1	M1	SC1	RCC-M1
	. Cavity gap seals nos. 2 & 3	A	1	M2	SC1	RCC-M2
	. DEA [SSSS]	B	2	M2	SC1	RCC-M2
	. DEA [SSSS] nitrogen supply lines	B	2	M3	SC1	RCC-M3
	. Injection lines at no. 3 seals from check valve to pump	B	2	M2	SC1	RCC-M2
	. Injection line at no. 1 seals	A	1	M1	SC1	RCC-M1

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	**Highest safety class of safety features**	**Mechanical quality for pressure retaining components**	**Seismic**	
	. Leak-off lines for seals nos. 1, 2 & 3 up to and including the 1st isolation valve	A	1	M2	SC1	RCC-M2
	. Leak-off lines for seals nos. 1, 2 & 3 downstream of 1st isolation valve	C	3	M3	SC1	
	. Thermal barrier supply lines (except for Reactor Coolant Pumps)	B	2	M3	SC1	
	- Pressuriser relief tank (tank, lines, bursting disks)	C	3	M3	SC1	
RCV [CVCS]	**Chemical and volume control system**					
	- RCV [CVCS] letdown, from the CPP [RCPB] to the 2nd isolation valve	A	1	M1	SC1	RCC-M1
	- Regenerative heat exchanger	C	3	M3	SC2	EHS + comp
	- Non-regenerative heat exchangers	C	3	M3	SC2	EHS + comp
	- Filtering / purification	C	3	M3	NC	EHS + comp
	- RCV [CVCS] tank	C	3	M3	SC2	EHS + comp
	- 1st isolation valve downstream of the RCV [CVCS] tank	A	1	M3	SC1	EHS + comp
	- Charging pumps	C	3	M3	NC	EHS + comp
	- Charging line, from the CPP [RCPB] to the 2nd RCV [CVCS] isolation valve	A	1	M1	SC1	RCC-M1
	- Auxiliary spray line from the 1st RCP [RCS] isolation valve to the 2nd RCV [CVCS] isolation valve	A	1	M1	SC1	RCC-M1
	- Vessel penetrations [charging, discharging, injection and seal return]	A	1	M2	SC1	RCC-M2
	- IRWST – RCV [CVCS] connection	C	3	M2	SC1	RCC-M2
	- Boron meter	A	1	N/A	SC1	
	- Lines conveying hydrogen	C	3	-	SC2(1)	

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
REA [RBWMS]	**Reactor boron and water makeup system**					
	- (Boron) storage tanks	C	3	NC	SC2	Indus.
	- Preparation tank	C	3	NC	SC2	Indus.
	- Rest of the system (water and boron)	C	3	NC	SC2	Indus.
REN [NSS]	**Nuclear sampling**					
	- RCP [RCS] (reactor coolant system) sampling					
	. Lines connected to the RCP [RCS] up to and including the 1st isolation valve	A	1	M1	SC1	RCC-M1
	. Containment penetrations	A	1	M2	SC1	RCC-M2
	. REN [NSS] heat exchangers	C	3	M3	SC2	EHS + comp
	- RIS [SIS] (safety injection system) sampling					
	. Lines connected to RIS [SIS] trains	C	3	M3	NC	EHS + comp
	. RIS [SIS] accumulator sampling containment penetrations	A	1	M2	SC1	RCC-M2
	- Lines conveying hydrogen		-	-	SC2 [7(1)]	
	- Rest of the system	C	3	M3	NC	EHS + comp
RES	**Steam generator secondary system sampling**					
	- Lines connected to the Secondary System Pressure Boundary (containment penetrations)	A	1	M2	SC1	RCC-M2
	- Steam Generator sampling (for radiation detection)	B	2	M3	SC1/NC[8]	EHS + comp
	- Rest of the system	C	3	NC	NC	Indus.

[7] Where an SC1 SSC may be damaged by hydrogen explosion

[8] SC1 in the Reactor Building and Fuel Building

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
RGL [CRDM]	**Control rod drive mechanisms**	A				
	- Latch units	A	1	N/A	SC1/SC2[9]	EHS + comp
	- RCCA spiders	A	1	N/A	SC1	RCC-C
	- Pressure housing	A	1	M1	SC1	RCC-M1
	- Drive rods	A	1	N/A	SC1	N/A
	- Displacement limiter	B	2	N/A	SC1	N/A
RIC	**Core internal instrumentation**					
	- Fixed measurements of local flux (SPND self-powered neutron detectors)	A	1	M3	SC1	EHS + comp
	- Core outlet temperature	B	2	M3	SC1	EHS + comp
	- Vessel level measurement	B	2	M3	SC1	EHS + comp
RIS [SIS]	**Safety injection system**					
	- MHSI - LHSI common injection lines and connected lines, from the CPP [RCPB] up to the 2nd isolation valve (1)	A	1	M1	SC1	RCC-M1
	- Cold leg injection lines and connected lines, from the CPP [RCPB] up to and including the 2nd isolation valve (1)	A	1	M1	SC1	RCC-M1
	- IRWST suction lines	A	1	M2	SC1	RCC-M2
	- IRWST suction containment penetrations	A	1	M2	SC1	RCC-M2
	- MHSI / LHSI low-flow lines	A	1	M2	SC1	RCC-M2
	- LHSI heat exchangers	A	1	M2	SC1	RCC-M2
	- RIS [SIS] accumulators and connected lines	A	1	M3	SC1	EHS + comp
	- Lines downstream of accumulator valves	C	3	NC	SC2	

[9] SC1 for release function, SC2 for stepping function

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
RPE [NVDS]	**Nuclear vent and drain**					
	- Containment penetrations	A	1	M2	SC1	RCC-M2
	- Collection of reactor building primary waste (storage tanks & connected lines)	B	2	M3	SC2	EHS + comp
	- Collection of safeguard building primary waste (storage tanks & connected lines)	B	2	M3	SC2	EHS + comp
	- Collection of nuclear auxiliary building primary waste (storage tanks & connected lines)	B	2	M3	NC	EHS + comp
	- Reactor building process vents and drains (storage tanks & connected lines)	B	2	M3	SC2	EHS + comp
	- Safeguard building / Fuel building process drains (storage tanks & connected lines)	B	2	M3	SC2	EHS + comp
	- Nuclear auxiliary building process drains (storage tanks & connected lines)	B	2	M3	NC	EHS + comp
	- Nuclear auxiliary building chemical drains (storage tanks & connected lines)	B	2	M3	NC	EHS + comp
	- Floor 1 drains (storage tanks & connected lines)	B	2	M3	SC2	EHS + comp
	- Floor 2 drains (storage tanks & connected lines)	B	2	M3	SC2	EHS + comp
	- Floor 3 drains (storage tanks & connected lines)	B	2	M3	SC2	EHS + comp
	- Collection of valve discharge in the nuclear auxiliary building (storage tanks & connected lines)	B	2	M3	NC	EHS + comp
	- Re-injection of waste into the reactor building	B	2	M3	NC	EHS + comp
RPN [NIS]	**Nuclear power measurement**	A	1	N/A	SC1	

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
RRI [CCWS]	**Component cooling water**					
	- F1 utilisation equipment on 1/2/3/4 trains: associated lines and valves	A	1	M3	SC1	EHS + comp
	. To LHSI heat exchangers	A	1	M3	SC1	EHS + comp
	. To MHSI / LHSI pump motor coolers	A	1	M3	SC1	EHS + comp
	. To MHSI pump sealing fluid coolers	A	1	M3	SC1	EHS + comp
	. DEL cooling	A	2	M3	SC1	EHS + comp
	- Fuel Building : 1 and 2 commons					
	. To PTR [FPPS/FPCS] heat exchangers: associated lines and valves	A	2	M3	SC1	EHS + comp
	. RCV [CVCS] pump cooling	C	3	M3	SC1	EHS + comp
	. RES heat exchangers cooling	B	2	M3	SC1	EHS + comp
	. To all other utilisation equipment: associated lines and valves	C	3	M3	SC1	EHS + comp
	- Reactor Building : RCP [RCS] utilisation equipment					
	. To thermal barriers: associated lines and valves	A	2	M3	SC1	EHS + comp
	. To Reactor Coolant Pump motor coolers: associated lines and valves	C	3	M3	SC1	EHS + comp
	. Containment penetrations: associated lines and valves	A	1	M2	SC1	RCC-M2
	. To RCV [CVCS] HP heat exchangers: associated lines and valves	C	3	M3	SC1	EHS + comp
	. To other utilisation equipment: associated lines and valves	C	3	M3	SC2	EHS + comp
	- Nuclear auxiliary building RRI [CCWS] user equipment: associated lines and valves	C	3	M3	NC	EHS + comp
SAT	**Service compressed air distribution**					
	- Containment penetration	A	1	M2	SC1	RCC-M2
	- Rest of the system	C	3	NC	SC2	Indus.

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
SEC [ESWS]	**Essential services water system (RRI [CCWS] component cooling system)**					
	- The whole of the main pumping system (pumps, lines, valves…)	A	1	M3	SC1	EHS + comp
	- Sump pumps	C	3	NC	SC2	Indus.
	- SEC [ESWS] / RRI [CCWS] tube cleaning	C	3	NC	SC2	Indus.
SED	**Distribution of demineralised reactor water**					
	- Containment penetration	A	1	M2	SC1	RCC-M2
	- Rest of the system	C	3	NC	SC2	Indus.
SEF	**Water intake – Filtering – Trash rakes**					
	- Floating pontoons	C	3	NC	SC2	Indus.
	- Grids	C	3	NC	SC2	Indus.
	- Trash rakes	C	3	NC	SC2	Indus.
	- SEF pressure drop measurements at grid level	C	3	N/A	SC2	Indus.
SEK [CILWDS]	**Collection, control and discharge of secondary system effluents**					
	- Headers (EPR assembly)	C	3	NC	NC	Indus.
SEN	**SRI raw water cooling**					
	- Automatic tripping of SEN pumps in the event of high CFI [CWFS] pressure drop	B	2	N/A	SC1	
SGH	**Distribution of hydrogen**					
	- Lines conveying hydrogen	C	3	NC	SC2[(1)]	Indus.
SGN	**Distribution of nitrogen**					
	- Containment penetration	A	1	M2	SC1	RCC-M2
	- Rest of the system	C	3	NC	SC2	Indus.

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
SIR	**Chemical conditioning (injection with reagent)** - Containment penetration - Rest of the system	 A C	 1 3	 M2 NC	 SC1 SC2	 RCC-M2 Indus.
SNL	**Steam generator unit cleaning - Lancing** - Containment penetration - Rest of the system	 A C	 1 3	 M2 NC	 SC1 SC2	 RCC-M2 Indus.
SRU [UCWS]	**Ultimate cooling** - Cooling system of train 1 SRU [UCWS] assembly (pumps, valves) - Cooling system of train 2 SRU [UCWS] assembly (pumps, valves) - Diversity via suction in the outfall structure	 C C C	 3 3 3	 NC NC NC	 SC1 SC1 SC2	 Indus. Indus. Indus.
TEG [GWPS]	**Gaseous waste processing** - Containment penetrations - Lines conveying hydrogen - Rest of the system	 A C	 1 3	 M2 M3	 SC1 SC2(1) NC	 RCC-M2 EHS + comp
TEP [CSTS]	**Primary liquid effluent** - TEP [CSTS] storage - Boric acid column and connected lines - Treatment of distillates / concentrates and low-capacity degasser - High-capacity degasser	 C C C C	 3 3 3 3	 M3 M3 M3 M3	 NC NC NC NC	 EHS + comp EHS + comp EHS + comp EHS + comp
TER [ExLWDS]	**Residual liquid effluent** - Header	 C	 3	 NC	 NC	 Indus.

ECS	Description	Safety classification		Design requirements		Mechanical design code
		Highest safety function category ensured	Highest safety class of safety features	Mechanical quality for pressure retaining components	Seismic	
TES [SWTS]	Solid waste treatment	C	3	M3	NC	EHS + comp
TEU [LWPS]	**Non-recycled liquid waste treatment**	C	3	M3	NC	EHS + comp
VDA [MSRT]	**Main Steam atmospheric dump**					
	- Vent to atmosphere lines, isolation valves and VDA [MSRT] control valves	A	1	M2	SC1	RCC-M2
	- Vent lines downstream of control valves and VVP [MSSS] valves	A	1	M3	SC1	EHS + comp
VVP [MSSS]	**Main steam system, vents valves and steam generator vents and valves**					
	- Main steam lines up to main steam isolation valves VIV [MSIV]	A	1	M1	SC1	RCC-M1
	- Main lines downstream of VIV [MSIV] up to fixed points	A	1	M1	SC1	RCC-M1
	- Conditioning lines (VIV bypass) up to and including the 2nd isolation valve	A	1	M2	SC1	RCC-M2
	- Conditioning lines (VIV bypass) downstream of the 2nd isolation valve	A	1	M2	SC1	RCC-M2
	- Blowdown lines up to and including the 1st isolation valve	A	1	M2	SC1	RCC-M2
	- Blowdown lines of the 1st isolation valve up to and including the 2nd isolation valve	A	1	M2	SC1	RCC-M2
	- VIV pilot valves	A	1	M3	SC1	ASME VIII
	- Pressure relief valves	A	1	M2	SC1	RCC-M2

SUB-CHAPTER 3.2 - TABLE 2

Classification of main electrical systems

ECS	Description	Safety class	Seismic requirement
LH.	Production and distribution AC> or = 5.5 kV backed up	1	SC1
LJA/B/C/D/F/I	690 V AC backed up nuclear island	1	SC1
LJU/X	690 V alternate backed up nuclear island, diesels generator buildings	3	SC1
LJZ	690V AC backed up nuclear island, third PTR [FPCS] pump	3	SC1
LJP/S	690 V emergency diesel generator sets division 1/4	3	SC1
LLA/B/C/D	Backed up 400 V distribution nuclear island	1	SC1
LLF/G/H/I	Backed up 400 V distribution nuclear island (LH diesel auxiliaries)	1	SC1
LLP/Q/R/S	Backed up 400 V distribution nuclear island	2	SC1
LHP/Q/R/S	10 kV diesel unit division 1/2/3/4	1	SC1
LO.	400V AC regulated distribution	1	SC1
LVA/B/C/D/F/G/H/I	Uninterrupted 400V production and distribution nuclear island	1	SC1
LVP/S	Uninterrupted 400V production and distribution nuclear island	3	SC2
LA. BTD	Production and distribution of electricity at 220 V DC	1	SC1
LA.	Production and distribution of electricity at 220 V DC	1	SC1
LG.	Distribution > or = to 5.5 kV (not backed up)	3	SC2
LG.	Distribution > or = to 5.5 kV (not backed up)	1	SC1
LI.	690 V alternate normal distribution	3	SC2
LK.1	400 V AC normal distribution (under LG. Board)	3	SC2
LK.2	400 V AC normal distribution (under LG. Board)	3	SC2
LL.2	400 V backed up distribution (under LH board)	3	SC2
LK.2	400 V AC normal distribution (under LG. Board)	3	SC2
LTR	Earth circuit	3	SC2
DN	Normal lighting for building and open areas of site	NC	SC2
DS	Emergency lighting for building and open areas of site	3	SC1
KKK	Site and building access control system	NC	SC2
JDT [FDS]	Fire detection systems and alarms	3	SC1
	Cabling & wiring associated with F1 functions	1	SC1

ECS	Description	Safety class	Seismic requirement
	Electrical containment penetrations for F1 functions	1	SC1
RGL	Operating Coil Assembly	NC	SC2
	Position Indicator	1	SC1

SUB-CHAPTER 3.2 - TABLE 3

Classification of I&C systems

I&C system	Safety classification	Seismic requirement
RPR [PS] – Reactor protection system	1	SC1
RCSL – Reactor Control, Surveillance and Limitation System	2	NC (*)
PAS – Process control system	3	SC2
SAS – Safety automation system	2	SC1
RRC-B SAS – RRC-B Safety Automation System	3	SC1
SA I&C – Severe Accident I&C system	3	SC1
MCS [SICS] – Safety information and control	1	SC1
MCP [PICS] – Process information and control	3	SC1
Dedicated interface in MCR and RSS	1	SC1
PACS – Process and protection priority system	1	SC1
NCSS – Non Computerised safety system	2	SC2 (**)

(*) as a system used in normal operation and whose failure in a seismic event has no unacceptable impact on SC1 equipment

(**) exception to the rule defined in section 6.1.1 (NCSS contributes to a category C function, but is class 2 due to its reliability claim)

SUB-CHAPTER 3.2 - TABLE 4

Classification of main civil structures

Description	Civil structure classification	Requirements	Seismic requirement	Protection from aircraft crashes	Protection from external explosion
Reactor building (RB)	**1**	**C1**		**Yes**	**Yes**
Internal containment and dome (Containment barrier)					
- Inclusive of structures, i.e.			SC1		
Prestressing (including anchoring and anchoring concrete)					
Containment penetration sleeves, polar crane brackets, equipment hatch material					
Others					
- Other structures and components			SC2		
Internal structures and external containment, raft foundation and containment dome					
- Inclusive of structures, i.e.			SC1		
IRWST steel liner					
Reactor cavities steel liner					
Metal parts embedded in the concrete					
- Protection shields			SC2		
- Other structures and components			SC2		
Nuclear auxiliary buildings (NAB)	**1**	**C1**		**No**	**Yes (1)**
- Structures			SC1		
Safeguard buildings (SB)	**1**	**C1**		**Yes (3)**	**Yes**
- Structures, i.e. ASG [EFWS] tank liners, metal parts embedded in the concrete			SC1		
- Other structures and components			SC2		
Fuel buildings (FB)	**1**	**C1**		**Yes**	**Yes**

Description	Civil structure classification	Requirements	Seismic requirement	Protection from aircraft crashes	Protection from external explosion
- Structures i.e. metal liners (spent fuel pool, transfer compartment), metal parts embedded in the concrete			SC1		
- Other structures and components			SC2		
Diesel generator buildings	**1**	**C1**		**No (2)**	**Yes**
- Structures			SC1		
- Other structures and components			SC2		
Pumping station	**1**	**C1**		**Yes (3)**	**Yes**
- Structures, i.e. water intake structure from the pumping station and pipes connected to class 1 seismic buildings			SC1		
- Other structures and components			SC2		
Effluent treatment building (ETB)	**1**	C1	SC1	No	Yes
Nuclear Auxiliary Building stack	**2**	C2	SC2	No	Yes
Turbine hall	**2**	C2	SC2	No	No
Nuclear Auxiliary Building /Effluent Treatment Building tunnel	**1**	C1	SC1	No	No
SEC [ESWS] galleries	**1**	C1	SC1	No (1)	No
Electrical Building access tower	**2**	C2	SC2	No	Yes

(1) Protecting the Nuclear Auxiliary Building must take into account radioactive discharge risks.
(2) Protecting diesel generator buildings from aircraft crashes is ensured by physical separation
(3) by physical separation or aircraft shell

SUB-CHAPTER 3.2 - TABLE 5

List of “other structures” in the Reactor Building and associated design requirements

ECS reference	Location	Level	Room	Function	Design requirements						Material	Dimensions (mm)			Clamping and anchorage	ETC-C compliant clamping and anchorage	Description
					Radiation protection	Fire	Air tightness	Earthquake	Water tightness	Mechanical strength		thickness	height	width			
Handling slabs																	
HRA1101DB	Handling slab	+1.50 m	HRA1123ZL	Biological and radiological protection	minimum thickness 60 cm	no indication	yes	SC2	yes	no indication	concrete	600	4960	2460	Placed on the floor equipped with steel angles	yes	Concrete slabs
HRA1110DB	Handling slab	+1.50 m	HRA1116ZL	Biological and radiological protection	minimum thickness 60 cm	no indication	yes	SC2	yes	no indication	concrete	600	4960	2460	Placed on the floor equipped with steel angles	yes	Concrete slabs
RCP slabs																	
HRA2961DB	Above the reactor coolant system pump (south)	+19.50 m	HRA3801ZL	Biological and radiological protection - limit between 2 fire compartments - physical separation between "service areas" and "equipment areas"	minimum thickness 130 cm	EI120 (2-hour fire wall) if possible	yes	SC2	yes	125 t (MSTM + Lorry)	concrete	1300	4678	4221	Placed on the floor equipped with steel angles	yes	Concrete slabs
HRA2972DB	Above the reactor coolant system pump (south)	+19.50 m	HRA3801ZL	Biological and radiological protection - limit between 2 fire compartments - physical separation between "service areas" and "equipment areas"	minimum thickness 130 cm	EI120 (2-hour fire wall) if possible	yes	SC2	yes	no indication	concrete	1300	4678	4221	Placed on the floor equipped with steel angles	yes	Concrete slabs
HRA3432DB	Above the reactor coolant system pump (north)	+28.50 m	HRA3801ZL	Biological and radiological protection - limit between 2 fire compartments - physical separation between "service areas" and "equipment areas"	minimum thickness 65 cm	EI120 (2-hour fire wall) if possible	yes	SC2	yes	no indication	concrete	650	5094	5010	Placed on the floor equipped with steel angles	yes	Concrete slabs
HRA3433DB	Above the reactor coolant system pump (north)	+28.50 m	HRA3801ZL	Biological and radiological protection - limit between 2 fire compartments - physical separation between "service areas" and "equipment areas"	minimum thickness 65 cm	EI120 (2-hour fire wall) if possible	yes	SC2	yes	no indication	concrete	650	5094	5010	Placed on the floor equipped with steel angles	yes	Concrete slabs

ECS reference	Location	Level	Room	Function	Design requirements						Material	Dimensions (mm)			Clamping and anchorage	ETC-C compliant clamping and anchorage	Description
					Radiation protection	Fire	Air tightness	Earthquake	Water tightness	Mechanical strength		thickness	height	width			
Pressuriser slabs																	
HRA3434DB	Pressuriser	+28.50m	HRA3801ZL	Biological and radiological protection - limit between 2 fire compartments - physical separation between "service areas" and "equipment areas"	minimum thickness 50 cm	EI120 (2-hour fire wall) if possible	yes	SC2	yes	Slabs likely to be stacked in storage	concrete	500	7766	2480	Placed on the floor equipped with steel angles	yes	Concrete slabs
HRA3435DB	Pressuriser	+28.50 m	HRA3801ZL	Biological and radiological protection - limit between 2 fire compartments - physical separation between "service areas" and "equipment areas"	minimum thickness 50 cm	EI120 (2-hour fire wall) if possible	yes	SC2	yes	Slabs likely to be stacked in storage	concrete	500	7766	2790	Placed on the floor equipped with steel angles	yes	Concrete slabs
HRA3436DB	Pressuriser	+28.50 m	HRA3801ZL	Biological and radiological protection - limit between 2 fire compartments - physical separation between "service areas" and "equipment areas"	minimum thickness 50 cm	EI120 (2-hour fire wall) if possible	yes	SC2	yes	Slabs likely to be stacked in storage	concrete	500	approx.7000	3079	Placed on the floor equipped with steel angles	yes	Concrete slabs
Fuel pool slabs																	
HRA2923DB	Reactor pool cover	19,65	HRA2913ZL	Radiological protection from radioactive radiation and neutrons - Physical limit of the equipment area in the context of the "two-rooms" concept - anti missile barrier (control rod assemblies) - satisfactory operation of the CCVS and negative pressure in the service area/equipment area	total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	no indication	yes	SC2	yes and slab gradient to avoid the retention of water	Fall of a heavy load from the polar crane and anti-missile for rod assembly ejection	concrete	1200	7248	2864	Positioning using 2 steel centring pins - 4 steel support bases	yes	Concrete slabs
HRA2924DB	Reactor pool cover	19,65	HRA2913ZL	Radiological protection from radioactive radiation and neutrons - Physical limit of the equipment area in the context of the "two-rooms" concept - anti missile barrier (control rod assemblies) - satisfactory operation of the CCVS and negative pressure in the service area/equipment area	total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	no indication	yes	SC2	yes and slab gradient to avoid the retention of water	Fall of a heavy load from the polar crane and anti-missile for rod assembly ejection	concrete	1200	7248	3000	Positioning using 2 centring pins - 4 steel support bases	yes	Concrete slabs

ECS reference	Location	Level	Room	Function	Design requirements						Material	Dimensions (mm)			Clamping and anchorage	ETC-C compliant clamping and anchorage	Description
					Radiation protection	Fire	Air tightness	Earthquake	Water tightness	Mechanical strength		thickness	height	width			
HRA2925DB	Reactor pool cover	19,65	HRA2913ZL	Radiological protection from radioactive radiation and neutrons - Physical limit of the equipment area in the context of the "two-rooms" concept - anti missile barrier (control rod assemblies) - satisfactory operation of the CCVS and negative pressure in the service area/equipment area	total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	no indication	yes	SC2	yes and slab gradient to avoid the retention of water	Fall of a heavy load from the polar crane and anti-missile for rod assembly ejection	concrete	1200	7248	3000	Positioning using 2 centring pins - 4 steel support bases	yes	Concrete slabs
HRA2926DB	Reactor pool cover	19,65	HRA2913ZL	Radiological protection from radioactive radiation and neutrons - Physical limit of the equipment area in the context of the "two-rooms" concept - anti missile barrier (control rod assemblies) - satisfactory operation of the CCVS and negative pressure in the service area/equipment area	total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	no indication	yes	SC2	yes and slab gradient to avoid the retention of water	Fall of a heavy load from the polar crane and anti-missile for rod assembly ejection	concrete	1200	7248	3000	Positioning using 2 centring pins - 4 steel support bases	yes	Concrete slabs
HRA2927DB	Reactor pool cover	19,65	HRA2913ZL	Radiological protection from radioactive radiation and neutrons - Physical limit of the equipment area in the context of the "two-rooms" concept - anti missile barrier (control rod assemblies) - satisfactory operation of the CCVS and negative pressure in the service area/equipment area	total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	no indication	yes	SC2	yes and slab gradient to avoid the retention of water	Fall of a heavy load from the polar crane and anti-missile for rod assembly ejection	concrete	1200	7248	3000	Positioning using 2 centring pins - 4 steel support bases	yes	Concrete slabs

ECS reference	Location	Level	Room	Function	Design requirements						Material	Dimensions (mm)			Clamping and anchorage	ETC-C compliant clamping and anchorage	Description
					Radiation protection	Fire	Air tightness	Earthquake	Water tightness	Mechanical strength		thickness	height	width			
HRA2928DB	Reactor pool cover	19,65	HRA2913ZL	Radiological protection from radioactive radiation and neutrons - Physical limit of the equipment area in the context of the "two-rooms" concept - anti missile barrier (control rod assemblies) - satisfactory operation of the CCVS and negative pressure in the service area/equipment area	total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	no indication	yes	SC2	yes and slab gradient to avoid the retention of water	Fall of a heavy load from the polar crane and anti-missile for rod assembly ejection	concrete	1200	7248	2134	Positioning using 2 centring pins - 4 steel support bases	yes	Concrete slabs
SG walls																	
HRA3463VB	SG bunker	19,5	HRA2913ZL	Protection against SG RCP1410CH and RCP2410CH - possible replacement of these SG	minimum thickness 50 cmtotal dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	2-hour fire wall	yes	SC2	no indication	no indication	concrete	500	1560	13505	placed, positioned with angle, held in position with anchor bolts cast in the concrete and connected to the SG	yes	Concrete wall
HRA3462VB	SG bunker	19,5	HRA2913ZL	Protection against SG RCP1410CH and RCP2410CH - possible replacement of these SG	minimum thickness 50 cm total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	2-hour fire wall	yes	SC2	no indication	no indication	concrete	500	1560	13505	placed, positioned with angle, held in position with anchor bolts cast in the concrete and connected to the SG	yes	Concrete wall
HRA3461VB	SG bunker	19,5	HRA2913ZL	Protection against SG RCP1410CH and RCP2410CH - possible replacement of these SG	minimum thickness 50 cm total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	2-hour fire wall	yes	SC2	no indication	no indication	concrete	500	1560	13505	placed, positioned with angle, held in position with anchor bolts cast in the concrete and connected to the SG	yes	Concrete wall

ECS reference	Location	Level	Room	Function	Design requirements						Material	Dimensions (mm)			Clamping and anchorage	ETC-C compliant clamping and anchorage	Description
					Radiation protection	Fire	Air tightness	Earthquake	Water tightness	Mechanical strength		thickness	height	width			
HRA3460VB	SG bunker	19,5	HRA2913ZL	Protection against SG RCP1410CH and RCP2410CH - possible replacement of these SG	minimum thickness 50 cm total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	2-hour fire wall	yes	SC2	no indication	no indication	concrete	500	1560	13505	placed, positioned with angle, held in position with anchor bolts cast in the concrete and connected to the SG	yes	Concrete wall
HRA2959VB	SG bunker	19,5	HRA2913ZL	Protection against SG RCP1410CH and RCP2410CH - possible replacement of these SG	minimum thickness 50 cm total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	2-hour fire wall	yes	SC2	no indication	no indication	concrete	500	1560	13505	placed, positioned with angle, held in position with anchor bolts cast in the concrete and connected to the SG	yes	Concrete wall
HRA2958VB	SG bunker	19,5	HRA2913ZL	Protection against SG RCP1410CH and RCP2410CH - possible replacement of these SG	minimum thickness 50 cm total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	2-hour fire wall	yes	SC2	no indication	no indication	concrete	500	1880	13505	placed, positioned with angle, held in position with anchor bolts cast in the concrete and connected to the SG	yes	Concrete wall
HRA3458VB	SG bunker	19,5	HRA2913ZL	Protection against SG RCP3410CH and RCP4410CH - possible replacement of these SG	minimum thickness 50 cm total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	2-hour fire wall	yes	SC2	no indication	no indication	concrete	500	1560	13505	placed, positioned with angle, held in position with anchor bolts cast in the concrete and connected to the SG	yes	Concrete wall
HRA3457VB	SG bunker	19,5	HRA2913ZL	Protection against SG RCP3410CH and RCP4410CH - possible replacement of these SG	minimum thickness 50 cmtotal dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	2-hour fire wall	yes	SC2	no indication	no indication	concrete	500	1560	13505	placed, positioned with angle, held in position with anchor bolts cast in the concrete and connected to the SG	yes	Concrete wall

ECS reference	Location	Level	Room	Function	Design requirements						Material	Dimensions (mm)			Clamping and anchorage	ETC-C compliant clamping and anchorage	Description
					Radiation protection	Fire	Air tightness	Earthquake	Water tightness	Mechanical strength		thickness	height	width			
HRA3459VB	SG bunker	19,5	HRA2913ZL	Protection against SG RCP3410CH and RCP4410CH - possible replacement of these SG	minimum thickness 50 cm total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	2-hour fire wall	yes	SC2	no indication	no indication	concrete	500	1560	13505	placed, positioned with angle, held in position with anchor bolts cast in the concrete and connected to the SG	yes	Concrete wall
HRA3450VB	SG bunker	19,5	HRA2913ZL	Protection against SG RCP3410CH and RCP4410CH - possible replacement of these SG	minimum thickness 50 cm total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	2-hour fire wall	yes	SC2	no indication	no indication	concrete	500	1560	13505	placed, positioned with angle, held in position with anchor bolts cast in the concrete and connected to the SG	yes	Concrete wall
HRA2951VB	SG bunker	19,5	HRA2913ZL	Protection against SG RCP3410CH and RCP4410CH - possible replacement of these SG	minimum thickness 50 cm total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	2-hour fire wall	yes	SC2	no indication	no indication	concrete	500	1560	13505	placed, positioned with angle, held in position with anchor bolts cast in the concrete and connected to the SG	yes	Concrete wall
HRA2950VB	SG bunker	19,5	HRA2913ZL	Protection against SG RCP3410CH and RCP4410CH - possible replacement of these SG	minimum thickness 50 cm total dose rate <2.5 uSv/h (green zone) and neutron dose rate <2.5 uSv/h to access the floor and the service area	2-hour fire wall	yes	SC2	no indication	no indication	concrete	500	1880	13505	placed, positioned with angle, held in position with anchor bolts cast in the concrete and connected to the SG	yes	Concrete wall
Neutron and bio protections																	
HRA0751VM		(-)2.30 m	HRA0721ZL	Protection RPE3402EX				SC2			steel	80	3200	2000	Defined by the contractor (mobile)		Biological protection - Mobile partition
HRA0750VM			HRA0726ZL	Protection RCV1240EX				SC2			steel	50	3200	2900	Defined by the contractor (mobile)		Biological protection - Mobile partition

ECS reference	Location	Level	Room	Function	Design requirements						Material	Dimensions (mm)			Clamping and anchorage	ETC-C compliant clamping and anchorage	Description
					Radiation protection	Fire	Air tightness	Earthquake	Water tightness	Mechanical strength		thickness	height	width			
HRA0752VM			HRA0727ZL	Protection RCV1230EX				SC2			steel	50	3200	2900	Defined by the contractor (mobile)		Biological protection - Mobile partition
HRA1160VM			HRA1113ZL	Protection PTR4253TY PTR7252TY				SC2			steel	50			welded (mobile)		Steel plate parallel to train PTR4253TY, 3-sided pack for train PTR7252TY and valve PTR7252VB. It must be possible to access the valve by dismantling the protection in elements weighing less than 25 kg.
HRA1161VM			HRA1113ZL	Protection RCV7515TY RCV7321TY				SC2			steel	50			welded (mobile)		3-sided pack
HRA1162VM			HRA1116ZL	Protection RCV7331TY				SC2			steel	50			welded (mobile)		3-sided pack
HRA1163VM		(+)1.50 m	HRA1118ZL	Protection RCV6514TY				SC2			steel	50			welded (mobile)		3-sided pack
HRA11xxVM			HRA1124ZL	Ceiling protection HRA1124ZL				SC2			steel	80 and 120			welded (mobile)		Steel plate running along the ceiling (in step format)
HRA1195VM			HRA1124ZL	Protection RCV6220EX				SC2			steel	400	2900	2600	Defined by the contractor (mobile)		Biological protection - Mobile partition
HRA11xxVM			HRA1125ZL	Protection HRA1103VB/-1				SC2			steel	50	600	1900	Bolted or welded		Protection for banana rooms
HRA11xxVM			HRA1126ZL	Protection HRA1103VB/-1				SC2			steel	50	600	1900	Bolted or welded		Protection for banana rooms
HRA11xxVM			HRA1127ZL	Protection HRA1119VB/-1				SC2			steel	50	600	1900	Bolted or welded		Protection for banana rooms
HRA11xxVM			HRA1128ZL	Protection HRA1119VB/-1				SC2			steel	50	600	1900	Bolted or welded		Protection for banana rooms
HRA1101KZ			HRA1125ZL HRA1126ZL	Protection HRA1103VB				SC2			HDPE	50 (HDPE)	740	8200	welded		Polyethylene plate in a ventilation plenum
HRA1102KZ			HRA1127ZL HRA1128ZL	Protection HRA1119VB				SC2			HDPE	50 (HDPE)	740	8200	welded		Polyethylene plate in a ventilation plenum

ECS reference	Location	Level	Room	Function	Design requirements						Material	Dimensions (mm)			Clamping and anchorage	ETC-C compliant clamping and anchorage	Description
					Radiation protection	Fire	Air tightness	Earthquake	Water tightness	Mechanical strength		thickness	height	width			
HRA15xxVM		(+)5.15 m	HRA1509ZL	Ceiling protection HRA1509ZL				SC2			HDPE	50 (HDPE)	22000	21000	welded		Polyethylene plate running along the ceiling - must cover the area under room HRA1816ZL
HRA1501VM			HRA1510ZL HRA1110ZL	Protection HRA1508VB and HRA1108VB				SC2			steel	50	4700	3300	welded		steel plate
HRA1511WZ			HRA1503ZL	Protection of the reactor pit opening				SC2				300 (neutron absorbing material)			welded + sliding system		Sliding plate system around the reactor coolant loop in front of the reactor pit opening. The plate is in neutron absorbing material.
HRA1512WZ			HRA1502ZL	Protection of the reactor pit opening				SC2				300 (neutron absorbing material)			welded + sliding system		Sliding plate system around the reactor coolant loop in front of the reactor pit opening. The plate is in neutron absorbing material.
HRA1521WZ			HRA1504ZL	Protection of the reactor pit opening				SC2				300 (neutron absorbing material)			welded + sliding system		Sliding plate system around the reactor coolant loop in front of the reactor pit opening. The plate is in neutron absorbing material.
HRA1522WZ			HRA1505ZL	Protection of the reactor pit opening				SC2				300 (neutron absorbing material)			welded + sliding system		Sliding plate system around the reactor coolant loop in front of the reactor pit opening. The plate is in neutron absorbing material.

ECS reference	Location	Level	Room	Function	Design requirements						Material	Dimensions (mm)			Clamping and anchorage	ETC-C compliant clamping and anchorage	Description
					Radiation protection	Fire	Air tightness	Earthquake	Water tightness	Mechanical strength		thickness	height	width			
HRA1531WZ			HRA1507ZL	Protection of the reactor pit opening				SC2				300 (neutron absorbing material)			welded		Sliding plate system around the reactor coolant loop in front of the reactor pit opening. The plate is in neutron absorbing material.
HRA1532WZ			HRA1506ZL	Protection of the reactor pit opening				SC2				300 (neutron absorbing material)			welded		Sliding plate system around the reactor coolant loop in front of the reactor pit opening. The plate is in neutron absorbing material.
HRA1541WZ			HRA1508ZL	Protection of the reactor pit opening				SC2				300 (neutron absorbing material)			welded		Sliding plate system around the reactor coolant loop in front of the reactor pit opening. The plate is in neutron absorbing material.
HRA1542WZ			HRA1509ZL	Protection of the reactor pit opening				SC2				300 (neutron absorbing material)			welded		Sliding plate system around the reactor coolant loop in front of the reactor pit opening. The plate is in neutron absorbing material.
HRA18xxVM		(+)8.70 m	HRA1813ZL	Protection /-SNL9919TY-				SC2							welded (mobile)		Neutron protection
HRA18xxVM			HRA1814ZL	Protection /-SNL9914TY-				SC2							welded (mobile)		Neutron protection
HRA18xxVM			HRA1815ZL	Protection /-SNL9906TY-				SC2							welded (mobile)		Neutron protection
HRA18xxVM			HRA1816ZL	Protection /-SNL9904TY-				SC2							welded (mobile)		Neutron protection
HRA23xxDM			HRA2309ZL	Protection HRA2308VB				SC2			steel	75	100	169	welded or bolted		Polyethylene plate in a ventilation plenum

ECS reference	Location	Level	Room	Function	Design requirements						Material	Dimensions (mm)			Clamping and anchorage	ETC-C compliant clamping and anchorage	Description
					Radiation protection	Fire	Air tightness	Earthquake	Water tightness	Mechanical strength		thickness	height	width			
HRA23xxDM			HRA2341ZL	Aeroball opening protection				SC2			steel or HDPE	450 HDPE / 150 steel			? (mobile)		Polyethylene/steel plate in the aeroball lance opening
HRA34xxDM		(+)24.10 m	HRA3415ZL	Protection RPE2160TY				SC2			steel	80		3500	welded or bolted (mobile)		Two-sided steel pack in an L-shape
HRA34xxDM			HRA3411ZL	Protection HRA3426VB				SC2			steel	40	2500	3100	welded or bolted (mobile)		Steel plate against the concrete wall
HRA1501KZ		Reactor building fuel pool	HRA1521ZL	Protection of the opening between the Reactor building fuel pool and the transfer compartment				SC2			steel or HDPE	200 steel / 350 HDPE	8870	1720	placed (mobile)		Polyethylene/steel plate in the fuel opening

SUB-CHAPTER 3.2 - TABLE 6

Classification of fuel handling and storage SSCs (mechanical parts)

Description of the mechanical handling devices (mechanical parts only)	Safety class	Applicable Codes and standards and/or requirements		Seismic requirements	Quality assurance
		KTA	BTS		
Refuelling machine	2	Requirements for refuelling machine	HS Level 2	SC2	Yes
Fuel transfer device facility	2	Additional requirements	HS Level 2	SC1	Yes
Spent fuel mast bridge	2	Requirements for spent fuel mast bridge	HS Level 2	SC2	Yes
New fuel elevator	2	Additional requirements	HS Level 2	SC2	Yes
Auxiliary crane	1	Increased requirements	HS Level 1	SC2	Yes
Spent fuel cask transfer facility (DMK) [(1)] (Specific parts of the spent fuel cask transfer machine, including the structure, travel and direction drives, travel guides, cask upper trunnion clamping system and anti-seismic locking devices)	2	Additional requirements	HS Level 2	SC1	Yes
Penetration upper cover	2	Additional requirements	HS Level 2	SC2	Yes
Biological lid handling station	2	Additional requirements	HS Level 2	SC2	Yes

Description of the mechanical handling devices (mechanical parts only)	Safety class	Applicable Codes and standards and/or requirements		Seismic requirements	Quality assurance
		KTA	BTS		
Penetration docking device	2	Additional requirements	HS Level 2	SC2	Yes
Polar crane main hoist	1	Not applicable	HS Level 1	SC2	Yes
Polar crane secondary hoist	1	Not applicable	HS Level 1	SC2	Yes
Polar crane auxiliary hoist	1	Not applicable	HS Level 1	SC2	Yes
Spent fuel handling tool	2	Additional requirements	HS Level 2	SC2	Yes
New fuel handling tool	1	Increased requirements	HS Level 1	SC2	Yes
Fuel cluster handling tool	2	Additional requirements	HS Level 2	SC2	Yes
Instrumentation lances platform	3	Non classified	Non classified	SC2	Yes
Reactor building platform	3	Non classified	Non classified	SC2	Yes
Spent fuel examination facility	3	Non classified	Non classified	SC2	Yes
Fresh fuel dry storage rack	3	Non classified	Non classified	SC1	Yes
Fuel underwater storage rack	3	Non classified	Non classified	SC1	Yes

SUB-CHAPTER 3.2 - TABLE 7

Hazards safety functions and main safety functional groups

Hazard category	Hazard	Plant level safety function	Lower level safety function	Cat.	Associated SSC	Safety class	Comments
Internal hazard	Fire	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Prevent common modes between safety divisions	A/B/C depending on conseq.	Fire dampers	1/2/3	Applicable codes and standard : see ETC-F.
					Fire walls, floors and doors + penetration sealings	1/2/3	
			Detect a fire	C	JDT	3	
			Fight against a fire	C	JAC, JPI, JPV	3	
	Internal explosion	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Ensure adequate hydrogen concentration inside systems	C	Ventilation of battery rooms	2	Class 2 due to HVAC function (fulfilled by the same equipment)
				C	Monitoring of inadequate hydrogen concentration	3	
			Detect a hydrogen leakage	C	KRH	3	
			Automatic isolation of hydrogen supply	C	Isolation valve at SKZ gas storage yard	3	

Hazard category	Hazard	Plant level safety function	Lower level safety function	Cat.	Associated SSC	Safety class	Comments
			Detect the loss of ventilation of battery rooms	C	DVL Alarm	3	
	Piping and component failure	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Prevent piping and component failure	A/B/C depending on conseq	Piping and components	1/2/3	A => 1 or 2, B => 2 or 3, C => 3
			Detect a leakage/break	C	System-specific detection devices (tank level, flow difference)	3	
			Operability of equipment in HEPB conditions	C	Isolation valves	3	
			Protect safety equipment from HEPB	A/B/C depending on conseq.	Resistance of civil works to piping failure forces, Piping anti-whip restraints	1/2/3	Restraints : same class as piping
	Internal missile	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety	Prevent missile generation in case of rotating features malfunctioning	A/B/C depending on conseq.	RCP flywheel	1	Flywheel disintegration failures are discounted
					Monitoring instrumentation, Overspeed trips	NC	e.g. Turbine protection
			Limit missile travel	A/B/C depending on conseq.	Restraints: valve stem threads, restraints, slabs, partition walls, casings, etc…	1/2/3	C1 for civil works, component class for casings

Hazard category	Hazard	Plant level safety function	Lower level safety function	Cat.	Associated SSC	Safety class	Comments
		function	Protect major safety buildings against turbine missile	A	APC shell for BR, BK BAS/BL 2&3	1	Applicable codes and standard : see ETC-C
	Internal flooding	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Prevent common modes between safety divisions	A/B/C depending on conseq.	Tightness of civil works, doors and penetration sealings between safety divisions and between buildings Draining pathes	1/2/3	
			Detect a leakage/break	A/B/C depending on conseq.	System-specific detection devices (tank level, flow difference)	1/2/3	
			Keep safety equipment above flooding level	C	Civil works raising safety equipment above flooding level	3	
			Isolate flooding source (if necessary)	A/B/C depending on conseq	Flooding detection + valve isolation (automatic or manual)	1/2/3	

Hazard category	Hazard	Plant level safety function	Lower level safety function	Cat.	Associated SSC	Safety class	Comments
	Load drop	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Prevent load drop (or rupture of handling device) with unacceptable consequences	A	Structural parts, lifting brakes of "higher requirements" handling devices	1	Unacceptable consequences = criticality accident, or loss of decay heat removal function, or release of radioactivity leading to radiation exposure in the vicinity of the unit which exceeds PCC-4 limits

Hazard category	Hazard	Plant level safety function	Lower level safety function	Cat.	Associated SSC	Safety class	Comments
			Prevent load drop (or rupture of handling device) with serious consequences	B	Structural parts, lifting brakes of "additional requirements" handling devices	2	Serious consequences = non-isolable release of primary coolant in the containment, or failure which leads to consequential failure of a class 1 or 2 system, or release of radioactivity leading to increased radiation levels inside the area which affects the classification of radiological zones
Natural external hazards	Earthquake	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Allow SSCs with SC1 requirements to ensure their function	A/B (same as the function to which the SSC contribute)	Civil structures which house or support class 1 or 2 systems or components. Seismic qualification of components, to sollicitations transmitted by civil structures Design of layout features (pipe works, cable trays, ventilation ducts), to seismic sollicitations transmitted by civil structures	1/2	Note : turbine hall is class 2

Hazard category	Hazard	Plant level safety function	Lower level safety function	Cat.	Associated SSC	Safety class	Comments
			Prevent radioactive release from components not qualified to DBE	A/B depending on conseq.	Civil structures which house components containing radioactive material not qualified to DBE Isolation of associated ventilations	1/2 3	BAN, BTE : C1 Isolation of DWN, DWQ : class 3 with SC1 seismic requirement
			Cool the fuel assembly container in case of earthquake	C	Circulation of JPI water in the container support skirt	3	
			Prevent damage on class 1 or 2 or C1 SSCs due to other SSCs	C	SSC whose failure could damage SSC with SC1 requirement	3	SC2 seismic requirement
	External flooding	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Prevent platform flooding	A	Protection devices	1	Site specific First defence line = adequate setting of the platform level
				C	CRF pump trip in case of high water level in condenser pit	3	
			Drainage of groundwater	A/B/C depending on conseq.	Water drainage system	1/2/3	Site specific

Hazard category	Hazard	Plant level safety function	Lower level safety function	Cat.	Associated SSC	Safety class	Comments
			Prevent water ingress in safety buildings	A	Water tight volumetric protection against ground water	1	Design of buildings (C1)
				A	Sealing of potential by-pass of volumetric protection	C1	Design of buildings (C1)
	Snow and wind	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Resistance to static and dynamic loads from wind and snow	A/B/C depending on conseq.	Civil structures which house or support safety systems or components Protection devices for outdoor equipment	1/2 3	Designed in accordance with the appropriate "Snow and Wind" design codes
			Resistance to projectiles generated by wind	C	Protection devices for outdoor equipment	3	
	Heat sink clogging Frasil ice and freeze-up	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Prevent loss of heat sink	B	Low speed rotation & low pressure washing of filter units (CFI)	2	
				B	Intake coarse pre-filtration (SEF)	3	Site specific
				B	CRF & SEN pump trip in case of high differential pressure on filter units	2	
			Ensure plant autonomy in case of loss of heat sink	B	Safety provisions for LUHS (VDA/ASG + make-up to ASG tanks)	3	RRC-A sequence

Hazard category	Hazard	Plant level safety function	Lower level safety function	Cat.	Associated SSC	Safety class	Comments
	Drought - low heat sink water level	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Ensure a minimal water level at intake	A	Water intake structures	1	Site specific design. Water intake structures are protected from the possible effects of drought by siting and designing them to the Lowest Safe Water Levels.
			Ensure plant autonomy in case of loss of heat sink	B	Safety provisions for LUHS (VDA/ASG + make-up to ASG tanks)	3	RRC-A sequence
	Extreme air temperatures	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Ensure operation of safety classified components	A/B/C	Civil structures which house or support safety systems or components	1/2	A/B/C : same as the function to which the SSCs contribute. Civil structures and ventilation and air conditioning systems are designed to accommodate the extreme air temperatures
					Ventilation systems + heat-tracing	1/2/3	

Hazard category	Hazard	Plant level safety function	Lower level safety function	Cat.	Associated SSC	Safety class	Comments
	Lightning	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Ensure neither damage nor maloperation in case of lightning strike	C	Lightning arrestors Lightning rods	3	
Man induced external hazards	Aircraft crash	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the impairment of a safety function	Protect safety classified buildings against an aircraft crash	A	APC shell	1	C1, designed against aircraft crash
	Industrial environment and transport	Prevent the failure or limit the consequences of failure of an SSC whose failure would cause the	Protect safety classified SSCs against external explosion pressure wave	A/B/C depending on conseq	Civil structures which house or support safety systems or components	1/2	Pressure wave is used as a loading case in the design of civil structures
					Ventilation systems : air intake/exhaust Explosion Pressure Wave protection dampers	1/2/3	

Hazard category	Hazard	Plant level safety function	Lower level safety function	Cat.	Associated SSC	Safety class	Comments
		impairment of a safety function	Protection against oil slick	B	CRF & SEN pump trip in case of high differential pressure on filter units	2	
				C	Warning system	3	Site specific
					SEF floating pontoons	3	Provisions implemented through procedures Site specific
			Ensure plant autonomy in case of loss of heat sink	B	Safety provisions for LUHS (VDA/ASG + make-up to ASG tanks)	3	RRC-A sequence
			Protection against radiological accident beyond site boundary (neighbour units, etc…)	C	Detection of activity at the air inlet of Control Room Air Conditioning System (DCL) DCL iodine filtration	3	

SUB-CHAPTER 3.2 – REFERENCES

External references are identified within this sub-chapter by the text **[Ref]** at the appropriate point within the sub-chapter. These references are listed here under the heading of the section or sub-section in which they are quoted.

1. PURPOSE OF CLASSIFICATION – APPROACH FOLLOWED

[Ref] Classification of structures, systems and components. NEPS-F DC 557 Revision C. AREVA NP. January 2011. (E)

2. OVERVIEW OF THE CLASSIFICATION METHODOLOGY

2.1. DEFINITIONS

[Ref] IAEA Safety Glossary. Terminology Used in Nuclear Safety and Radiation Protection. ISBN 92-0-100707-8. 2007 Edition. (E)

[Ref] IAEA Safety Standards – Safety Classification of Structures, Systems and Components in Nuclear Power Plants. Draft Safety Guide DS 367. Draft 5.5. December 2009. (E)

2.2. BACKGROUND

[Ref] IAEA Safety Standards – Safety Classification of Structures, Systems and Components in Nuclear Power Plants. Draft Safety Guide DS 367. Draft 5.5. December 2009. (E)

[Ref] Nuclear power plants – Instrumentation and control important to safety – Classification of instrumentation and control functions. BS IEC 61226:2009. (E)

6. REQUIREMENTS APPLIED TO STRUCTURES, SYSTEMS AND COMPONENTS (SSC)

6.3. COMPONENT REQUIREMENTS

6.3.3. Mechanical requirements for pressure retaining components

6.3.3.1. Assignment of component mechanical quality requirements (M)

[Ref] Identification of High Integrity Components : components whose gross failure is discounted. ENSNDR090183 Revision B. EDF. December 2010. (E)

6.3.3.3. Application of RCC-M code and European standards

[Ref] UK EPR - Justification of the adequacy of engineering standards with supplements associated to M3 requirements. ENSNDR100104 Revision A. EDF. July 2010. (E)