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Annex 9 to the Govt. Decree No. 118/2011 (VII. 11.)

**Nuclear Safety Code**

Volume 9

Requirements for the design and construction period of a new nuclear facility

**9.1. INTRODCUTION**

*9.1.1. Scope of the regulation*

9.1.1.0100. The aim of this regulation is to specify additional requirements for the design and construction of a new nuclear installation.

**9.2. MANAGEMENT SYSTEM REQUIREMENTS**

*9.2.1. Requirements for the organisation of Licensee*

9.2.1.0100. A management system shall be established by the Licensee for the complete management of the design and construction process, including work planning and time scheduling, procurement, and the control of suppliers. In the framework of the management system, a management manual and a documentation system shall be established for the subordinated management functions specified in the manual.

9.2.1.0200. The organisations and roles involved in design, construction and future operation, the rights and obligations assigned to these roles, as well as the way of obtaining information shall be clearly and fully identified in the management manual.

9.2.1.0300. The management system shall ensure the continued accountability of all parties involved in the design and construction project, with regard to their responsibility for the safety.

9.2.1.0400. The availability of all required competencies shall be provided by the Licensee in all phases of the construction. Licensee shall ensure, in all phases of the construction, the sufficiency of its own, and its supplier's competence, particularly, the collective competence of the general designer, the manufacturers, the construction and installation organisations and the operator.

9.2.1.0410. The licensee shall provide human resources in appropriate number and with appropriate qualifications as well as technical resources in appropriate quantity and quality for the construction and maintenance of the management system.

9.2.1.0420. The licensee shall regularly review the effectiveness of the management system and the existence of the required resources; it shall forecast to the extent reasonably achievable what changes are expected in the future and shall show how it prepares for their management.

9.2.1.0500. Licensee shall have, at all times, a knowledge, experience, resource and responsibility minimum, which shall be determined with appropriate margin.

9.2.1.0600. The functions, responsibilities, organisational structure, the staff number and qualification requirements of the organisation performing the design and construction work shall be specified and documented prior to the commencement of the given work. If the design and construction are not carried out entirely or partially by the licensee, then the relationship of the organisation doing so with the licensee shall also be determined.

9.2.1.0700. The Licensee shall establish a safety organisation for the independent evaluation of activities having significant effect on safety, which are carried out during the design and construction work, and for the conduction of the supervisory actions within its scope of authority. The direction and the supervision of the safety organisation shall be subordinated to the top management of Licensee.

9.2.1.0710. In agreement with Section 2.2.2 of Annex 2, the organisations involved in the design, construction and commissioning, including suppliers and concerned authorities, shall establish a work environment that facilitates a high-standard safety culture and encourages the employees to clarify their questions relating to their work in accordance with documented rules.

9.2.1.0800. The documents including the information required for making the decisions in safety related issues shall be identified in the documentation system.

9.2.1.0900. The Licensee shall elaborate a system for the management of non-compliances, which shall be suitable for the management of all safety important non-compliances identified during the construction process in the activity of all the participants of the construction.

9.2.1.0910. The processes listed in Section 2.6.5.0210. of Annex 2 shall be developed and operated during the design, before the beginning of fabrication and procurement, and shall be periodically reviewed with the progress of construction.

9.2.1.1000. In addition to the non-compliances specified in Annex 2, the following deviations shall be considered non-compliance during the construction process:

a) physical characteristics deviating from the specified limit values, particularly the dimensions and material parameters, assembly errors, product or system malfunctions;

- b) deviation from the approved processes and procedures;
- c) error of the personnel responsible for performing the activity, inspection or test instruction or the failure to comply with the regulations;
- d) deficient documentation or incorrect content thereof;
- e) insufficient qualification of the personnel for safety related activities to be carried out within their respective scope of responsibility;
- f) failures, deviations, and other events;
- g) deficiency of a regulation; and
- h) unpermitted operational state or process.

9.2.1.1100. The Licensee, to manage the deviations from the licenses issued by the nuclear safety authority (modification) shall develop a documented approach graded according to safety significance of the deviations.

9.2.1.1200. The licensee, after the construction, building, commissioning, fabrication, purchase or assembly license became final, may deviate from the provisions of the license or from the documentation supporting the license in a regulated manner.

9.2.1.1300. Knowing the character of the deviations recognized per Section 9.2.1.1600. and planned according Section 9.2.1.1200. and the requirements on the deviations, the Licensee, after assessing the safety consequences of the deviation, shall prepare a preliminary safety assessment, and then based on that it shall carry out the categorization per Section 9.2.1.1400. During the assessment the deviation shall be addressed in a complex manner, from the aspect of its effect on the safety of the whole nuclear facility.

9.2.1.1400. The deviations from the issued licenses shall be categorized according to the following based on their safety significance:

- a) The deviation affects the capability of the safety system, structure or component to fulfil its safety function, or the change considerably influences the operation of the organization implementing the licensed activity;
- b) the deviation does not have a safety effect or it is negligible.

9.2.1.1500. The safety organization of the Licensee determined in Section 9.2.1.0700. shall perform the oversight of management of the deviations and enforcement of the related regulatory prescriptions. The employees who initiated the deviation or were involved in its planning, preparation or implementation shall not be assigned to perform the oversight or the internal independent review.

9.2.1.1600. During the activities performed based on the issued construction, building, commissioning, fabrication, purchase or assembly license or after its completion, the Licensee shall identify if a deviation from the issued license or the documentation supporting the license occurred and shall promptly take care of safe suspension of the activities affected by the deviations. The activity can be continued if a positive decision is made in the procedures per Section 1.10.1.0500.

*9.2.2. Requirements for the employment and control of suppliers*

9.2.2.0100. The decision on the involvement of suppliers shall be based on well-established strategy. Pre-defined criteria shall be used for the selection of suppliers.

9.2.2.0200. The process of evaluation of suppliers shall cover at least the following:

a) evaluation of the past performance of the supplier:

aa) user's experience on identical or similar products and services of the supplier,  
or

ab) review of the documentation gathered during the fabrication, procurement or use of a former product of the suppliers, or

ac) historical data on the ordered products or services, which are typical to the supplier's present capabilities;

b) evaluation of the quality management system operated by the supplier, in which the certification of the field of activity by a third party can also be considered;

c) evaluation of the supplier's capability important from the aspect of the activity to be performed by assessing the supplier's sites, technologies, instruments, personnel, and the operation of its quality management system;

d) objective evaluation of the quality management documentation of the supplier on the basis of documented quantitative and qualitative information; and

e) evaluation of the supplier's capability by testing samples taken from on-going activities.

9.2.2.0300. The licensee, the organisation performing the design and construction work shall identify the rules of cooperation with the suppliers.

9.2.2.0400. The authorities and responsibilities, the information necessary for taking these authorities and responsibilities, and the decision competencies of the suppliers shall always be in harmony with each other.

9.2.2.0500. The organisations performing the design and construction work shall establish and operate a quality management system for their work.

9.2.2.0600. No supplier shall be allowed to undertake nuclear safety related work unless permitted to do so by the Licensee, under continuous competent supervision.

9.2.2.0700. The capacity and capability of suppliers for fulfilling their duties shall be assessed and certified prior to the commencement of their works, and shall be reviewed at regular intervals. The licensee shall evaluate the suppliers' activities from the aspect of nuclear safety requirements related thereto.

9.2.2.0800. The responsibility for the trainings to be provided to suppliers and for the availability of the work permitting system shall lie with the Licensee.

9.2.2.0900. The licensee shall develop and operate such a process for the supervision of the suppliers that ensures the compliance with the nuclear safety requirements regarding the entire supply chain.9.2.2.1000.

9.2.2.1100. The licensee shall appraise the risks entailing the application of suppliers that are relevant from nuclear safety point of view, and shall have appropriate processes to manage them. The management of risks shall cover the opportunity for substitution of the suppliers.

9.2.2.1200. The licensee shall have such processes that are suitable to manage the situation when a supplier having significant impact on nuclear safety is lost.

### **9.3. REQUIREMENTS FOR THE QUALITY MANAGEMENT SYSTEM OF THE DESIGN**

#### *9.3.1. General requirements*

9.3.1.0100. The Licensee shall ensure that the design work is carried out in an appropriate quality management system. The quality management system of the design work shall be planned for the entire lifecycle of the nuclear power plant unit. The preservation of the documentation and information important to the safety, and the access of the Licensee to such documentation and information shall be ensured for the entire service life of the nuclear power plant unit.

9.3.1.0200. If the conversion of the documentation and information into new electronic format becomes required due to the development of science and technology, this shall take place in a pre-defined manner and scope, as approved by the nuclear safety authority.

9.3.1.0300. The design work shall be primarily based on systems, system components and materials, the adequacy of which have been verified under similar circumstances. In addition, the latest achievements of science and technology shall also be considered in the design work.

9.3.1.0400. A design manual shall be developed to identify the responsibilities and authorities of the design organisation even if the design work is carried out by manufacturing, construction, or installation organisations.

9.3.1.0500. A valid master documentation shall be established and maintained, which includes the actual status of the design and the implemented design modifications, and is made available to all participants of the construction involved in the given task.

9.3.1.0600. An organised computer database shall be established, which includes the results of the design work. This database shall be intended to provide all necessary information, in the following scope, to all participants of the construction work involved in the given task:

- a) logical division of the nuclear facility into systems and system groups, including:
  - aa) establishment of a function identification method for each system and system component,
  - ab) establishment of a physical and technical identification and tracking method for system components including spare parts;
- b) establishment of a document identification method;
- c) establishment of a facility model providing the users directly in the computer with the same data as provided in the documentation;
- d) establishment of methods for filling and requesting data (retrieval and organisation) of the engineering database; and
- e) assignment of persons responsible for modifications in the engineering database.

9.3.1.0700. The priority of the nuclear safety shall be ensured by the design process by cost-benefit analysis and risk assessment.

9.3.1.0800. The aspects of operability and maintainability shall be considered in the design.

9.3.1.0900. To ensure the enforcement of the aspects of construction and operation, the construction organisation shall be involved in the preparation and the use of the design documentation.

9.3.1.1000. The licensee shall make copies of all documents important to the safety of the facility. The copies shall be stored in a safe, separate place.

9.3.1.1100.

9.3.1.1200. The review of the design documentation shall be performed by an independent review organisation holding designer or expert authorisation specified in the relevant law at the request of the licensee.

9.3.1.1300. The nuclear safety of a nuclear facility in the vicinity shall be taken into account and ensured during the design and planning of construction.

9.3.1.1400. Provisions related to systems, structures and components important to safety of the nuclear facility shall be determined and documented with such a detail that a designer independent of the development of the design specification shall be able to perform a re-design that is required for the in-service maintenance of the systems, structures and components, and for the modifications throughout the lifecycle of the facility.

9.3.1.1500. The non-functional requirements, such as the quality management requirements and standards to be applied shall also be determined.

9.3.1.1600. Applicability of the referenced standards and guidelines shall be justified. If the licensee makes an exception regarding the requirements of a standard or guideline, then the exception shall be justified and its effect shall be evaluated.

9.3.1.1700. The design specification shall be unambiguous, consistent and traceable. The verification of compliance with the requirements shall be made possible. Consistency of the design specifications shall be ensured.

9.3.1.1800. Accuracy, integrity and consistency of the design specifications of systems important to safety shall be evaluated by such experts, who are independent of the design and realization process. The licensee shall describe the observations and the justified conclusions in the evaluation report.

9.3.1.1900. Traceability of compliance with the requirements in the individual design phases shall be demonstrable.

### *9.3.2. Requirements for the adaptation of the design*

9.3.2.0100. The licensing and construction documentation, used during the construction of a nuclear power plant unit, shall comply with the requirements specified in the Hungarian legislation.

9.3.2.0200. At latest, prior to the given construction phase, the Licensee shall specify that documents in which languages can be used for what type of works and tasks.

9.3.2.0300. The training materials, operating and maintenance instructions and as-built design of the nuclear power plant unit shall be prepared in Hungarian language.

9.3.2.0400. It shall be clearly indicated in the design documentation whether a given design information was provided by the original designer or by the organisation carrying out the adaptation procedure.

9.3.2.0500. To ensure the mutual exchange of information, the coordination and review requirements specified for the adapted design, and the updating of the original design to incorporate the changes made in the adapted design shall be controlled.

9.3.2.0600. The conditions for the adaptation of the design documents, which were developed by designers having special design license but will need to be adapted by personnel who do not have such license, shall be specified with special attention to the cases where the reworking or complementation of the design documents is necessary to ensure their compliance with other national regulations.

9.3.2.0700. The method used for the numbering the original design documents and the versions adapted to national requirements and the identification of the system components shall ensure the unambiguous identification and assignment.

### *9.3.3. Identification of the design phases*

9.3.3.0100. A list of document types to be produced during the design process, including the identification of document types and their role in the design process shall be provided in the design manual.

9.3.3.0200. The purpose and the description of each design document shall be presented in the list established in Paragraph 9.3.3.0100.

9.3.3.0300. The design documents shall be categorized into three types:

- a) technical design documents,
- b) construction design documents, and
- c) as-built design documents.

9.3.3.0400. Unified table of contents shall be specified for each design document type. The required content of every design document type shall be specified for each field of expertise.

9.3.3.0500. The technical design documents shall include the following:

- a) design basis valid for the entire design process;
- b) description of principal safety parameters, particularly the radiation protection and release data and specifications, results of deterministic and probabilistic analyses;



c) presentation and substantiation of conceptual technical solutions, and the way of enforcing safety design principles, and a description of the process system and system engineering solutions: a description of applied safety principles, method and grounds of application.

d) the presentation of the connections, and the place of installation of systems and system components;

e) description of the technological processes;

f) analyses covering the assessment of the behaviour of the systems, structures and components under loads in DBC1-4 and DEC1-2 initiated by external and internal hazards, and the demonstration of compliance with the safety requirements;

g) reliability and failure analyses; and

h) description and design specification of systems, structures system components in a depth of details to allow the harmonization of various parts of the technical design among various fields of expertise, and to use the description and specification as basis for the construction design and procurement work, including the specification of nuclear safety and seismic safety classes, the environmental resistance qualification requirements, the determination of operational and accident condition parameters and material specifications.

9.3.3.0600. The construction design documents shall include the following:

a) manufacturing and construction information, in particular, drawings, schemes, technologies, organisational descriptions, and assembly, assembly verification and documentation requirements, as required for the execution of works;

b) assessments, particularly, strength calculations and reliability analyses, carried out to demonstrate the safe operation of system components;

c) description of the operation of the installed systems, structures and system components taking account of the exact characteristics of the given system, structure and system component;

d) deviations from the technical design documents and the demonstration of the acceptability thereof;

e) those additional or modified analyses, which, on the basis of the technical design documents, could not be carried out in a sufficient depth of details or with a sufficient accuracy;

f) quality assurance and quality control plan for the works;

g) commissioning procedure, scenario and requirements; and

*h)* preliminary operational and maintenance documentation.

9.3.3.0700. The denomination and the requirements for the construction design document types, which are different by fields of expertise, shall be identified in the design manual.

9.3.3.0800. The design documents shall be kept in an identification system, which allows the identification of the level and the interfaces of the design documents.

9.3.3.0900. The list of reference data and technical master data shall be compiled. It shall be made clear for all design document types which data were transferred from which previous design into the given design, and which data were generated during the preparation of the given design documentation.

9.3.3.1000. The responsibilities for, and conditions of, checking and approval by the general designer, the customer and the operator shall be identified at least within the specialist design organisation. The conditions of verification and approval by the nuclear safety authority shall be provided.

9.3.3.1100. It shall be identified which design documents shall be reviewed in the case of design modifications to maintain the consistency of the technical solutions. This shall apply to the design documents developed in an earlier phase, which was used as basis for the elaboration of the given design document, and to the design documents prepared in other fields of expertise, which are in relation to the given design.

9.3.3.1200. The technical design document shall be reviewed after any change in the design basis to verify whether the modification of further design documents or safety analysis reports is required as a consequence of the change made in the design basis.

9.3.3.1300. The following shall be included in the as-built design document:

*a)* accurate description of the installed systems and the operation thereof, specifically, drawings, schemes, and technical descriptions;

*b)* manufacturing and assembly documents and certificates, with particular attention to those used to certify the compliance of manufacture and installation and those, which will be required later as background information for operational, maintenance and review works;

*c)* results of commissioning and the evaluation of the results thereof, tests assessing and certifying the "0" condition;

d) deviation from the technical and construction design and the permissibility thereof, taking account of the information and requirements contained in the original design basis; and

e) final documentation of the operation, maintenance, testing, and inspection.

#### *9.3.4. Harmony of the design and construction*

9.3.4.0100. The design organisation shall lay down the time schedule of the design process, acceptance criteria for the designs and the engineering requirements set during the licensing procedure. It shall have them accepted by the licensee. Prior to the commencement of the given construction activity, the licensee or the constructing organisation shall carry out a standby review, in which it shall demonstrate that all required technical, administrative and other conditions are provided for the commencement of the construction activity, with special regard to the appropriate level of detail and elaboration of the detailed construction designs and the documentation. In addition, those areas shall be identified, where the construction designs and documentation are not yet complete. The design organisation shall prepare an action plan for the coordination of the remaining design activities and shall identify the resources required for carrying out the task. The licensee shall approve the action plan and the resource demands.

9.3.4.0110. If the design is modified after the commencement of the construction, then in addition to the requirements stated in Section 9.3.3.1100, an effort shall be made to minimise design modifications affecting safety, and it shall be demonstrated that the expected safety level can be met.

9.3.4.0200. The design manual shall include a schedule for the preparation, finalization and handing over of technical designs, detailed designs and as-built drawings, considering and presenting the schedule interrelations of the design of systems, structures and system components being in technological or placement relationship with each other.

9.3.4.0300. The design manual shall identify those construction activities, for which the defects revealed after completion of the work, particularly after covering phases, closure of building structures and man-holes, cannot be corrected without significant demolition or disassembly.

9.3.4.0400. Prior to the critical implementation activities explored on the basis of Section 9.3.4.0300, arrest points shall be established in order to allow a thorough examination of the existence of the conditions required for carrying out the operation prior to the activity, which shall also be demonstrated by an independent verification organisation.

### *9.3.5. Verifiability of the completeness of design documents*

9.3.5.0100. A standard functional identification system shall be established for the systems and system components, as well as a standard physical and technical identification system for the system components and their elements including the spare parts.

9.3.5.0200. The functional identifier system shall be suitable for the identification of all system components involved in the performance of the functions of the system. The technical identification system shall be suitable for the identification of the location of all activities required during the service life of the system components, particularly during construction, manufacture, assembly, welding, commissioning, operation, maintenance, material testing, repair, replacement, ageing management, and environmental qualification.

9.3.5.0210. A separate documentation system shall be established to identify the welding activities that contains all welding related information including, besides the identification of the welds, all related information that may influence the inspection, repair or modification activities, especially concerning the base metal and welding materials, the procedure, welding technology and construction.

9.3.5.0300. Suppliers shall identify their system components with the standard identifiers described in Sections 9.3.5.0100 and 9.3.5.0200 and these identifiers shall be used accordingly in their documentation and database.

9.3.5.0400. The Licensee shall provide all participants of the construction works with a document identification system, which is suitable for tracking changes. This document identification system shall be applied by all suppliers, which, however, shall not prevent suppliers from the use of their own identification system as well.

9.3.5.0500. The design boundaries and the way of indication of interfaces with other design documents, including the interfaces with the design documents belonging to different fields of expertise shall be presented in the design manual.

9.3.5.0600. A record of design document transmittals shall be kept for the entire nuclear facility. The completeness of the various design documents shall be monitored from the beginning of the design process.

9.3.5.0700. For the activities described in Section 9.3.4.0600, a unified documentation management system shall be operated, which shall indicate the status of documents as well as the level of their verification.

9.3.5.0800. The licensing documentation shall be stored separately or in a clearly marked manner.

### *9.3.6. Configuration management requirements*

## General requirements

9.3.6.0100. A comprehensive configuration management system shall be established and operated, from the commencement of the design work, in a manner to ensure that it can be used for the entire service life of the nuclear facility.

9.3.6.0200. Such configuration managements system shall ensure that the design requirements to be applied for the nuclear facility and its systems and system components, the as-built status and the documentation describing the as-built status of the nuclear facility are in harmony with each other.

9.3.6.0300. The configuration management system shall include information on the design, construction, commissioning, operation, and maintenance information, which can be used for the identification and management of the actual configuration of the nuclear facility.

9.3.6.0400. With the use of the design specification and design basis data, design requirements shall be specified in the design documentation for the nuclear facility, and its systems and system components, which guarantee the feasibility, inspection opportunity of the design work and consistency between the designs in compliance with the design basis.

9.3.6.0500. The design basis data shall be available at the beginning of the design work. In the case of changing the design basis, it shall be reviewed if such change comply with the original design objectives and whether the changes of the design basis result in changing design requirements.

9.3.6.0600. The documentation of the design solutions selected by taking account of engineering considerations shall be ensured. The documentation shall be prepared in a depth of details, which allows the assessment of the safety impacts of the potential modification.

9.3.6.0700. In the framework of taking over the nuclear facility for operation, the information contained in the configuration management system of the nuclear facility shall be delivered to the operating organisation in a controlled manner.

9.3.6.0710. The configuration management system shall ensure that modifications of the systems, structures and components are identified and planned, their evaluation and implementation is performed, and registered by the system.

## Configuration management system

9.3.6.0800. The configuration management system shall form a part of the quality assurance programme of the design, construction, commissioning, operation, and decommissioning work. The following shall be part of the programme:

- a) technical database and its IT background,
- b) documentation management system,
- c) change management,
- d) training and practicing for the operation of the configuration management system, and
- e) supervision and revision of the configuration management system.

9.3.6.0900. The protection of the technical database and the documentation against loss of information due to deliberate or inadvertent cause of damage.

The technical database and its IT background

9.3.6.1000. A computer based technical database shall be available from the commencement of the design work and shall include the following:

- a) information on the design, construction, commissioning, operation, and maintenance of the nuclear facility;
- b) logical division of the nuclear installation into system groups, systems and system components by taking the safety considerations into account;
- c) function identification methods and identifiers for the systems and system components;
- d) physical and technical identification methods and identifiers for the systems and system components, including the identification of spare parts;
- e) documentation identification methods and the storage of documentation on electronic media; and
- f) database model of the nuclear facility to be used as a network for the technical database.

9.3.6.1100. The technical database shall be established to ensure that the stored data and information can be protected and retrieved during the entire service life of the nuclear facility, irrespective of any change in the computer background.

9.3.6.1200. The methods and responsible persons shall be identified for filling in and maintaining the technical database, including the method of managing the information generated by any participant of the construction.

9.3.6.1300. The usability, availability and validity of the data contained in the technical database, and the separation of actual and archive data shall be ensured.

9.3.6.1400. Access to the technical database shall be provided for the organisations and individuals performing work in connection to the nuclear facility, to a degree as required for the completion of their work.

9.3.6.1500. Suppliers shall use the identification methods and identifiers specified in the technical database, the identification of the supplied system components and parts shall be guaranteed in the technical database.

The documentation management system

9.3.6.1600. A documentation management system shall be used for the controlled preparation, maintenance and updating of documents. Such system shall ensure the proper storage of the documents and the access to all important information available on the design, construction, commissioning, operation, and maintenance of the nuclear facility.

9.3.6.1700. The hard copies of the documentation shall be in agreement with the information stored in the computerized database.

Change management

9.3.6.1800. A change management programme shall be implemented during the design, construction, commissioning and operation of the nuclear power plant to ensure that the required modifications are uniformly incorporated in the design requirements, in the as-built state, and in the documentation describing the as-built state.

9.3.6.1900. In the course of planning changes, the general designer shall be involved in the assessment and review of the changes to ensure the establishment of a design configuration, which is consistent with the design basis and the design requirements specified for the nuclear facility.

9.3.6.2000. The interaction of the change with the concerned systems shall be assessed.

9.3.6.2100. The design documentation and the as-built documentation shall be updated to reflect the as-built state resulting from the change, and the relevant operational and maintenance documentation shall be correspondingly reviewed and updated.

Training and practicing for the operation of the configuration management system

9.3.6.2200. All information relating to the nuclear unit being constructed, required for the safe operation of the unit and updated to reflect the as-built status shall be delivered by supplier to Licensee in a timely manner and in systematised form. To this aim, Licensee shall have duly qualified and skilled personnel.

9.3.6.2300. The implementation of trainings required for the operation and the potentially required modification of the training and practising tools shall be ensured.

9.3.6.2400. To ensure the establishment and the efficient operation of the configuration management system, training shall be provided for the management as well as for the personnel, who play definitive role in the operation of the system.

9.3.6.2500. Training shall be provided for the personnel involved in the operation of the system, in a scope as required for fulfilling the specific functions, to ensure the delivery of the appropriate knowledge of organisational/personal accountabilities and responsibilities, execution procedures and the operation of computer systems.

The supervision and review of the configuration management system

9.3.6.2600. The operation of the configuration management system shall be supervised by the management of the nuclear facility. The management of the nuclear facility shall be responsible for the establishment, operation and periodical inspection of the operation of the programme.

9.3.6.2700. The operation of the configuration management system shall be inspected by means of audits and by reviewing the operation of the programme elements.

#### *9.3.7. Rules of using standards*

9.3.7.0100. The design, manufacture, construction, assembly, testing, and inspection of systems and system components shall be carried out as specified by the standards appropriate to the safety functions to be performed by them.

9.3.7.0200. The design manual shall include an up-to-date list of standards and other technical regulations, which are to be applied for the design, site evaluation, construction, commissioning, and operation of the nuclear installation. In addition to the actually used standards, such list shall also identify the previously used standards, along with the period and the areas of application covered by these standards.

9.3.7.0300. The list shall be integrated to the below presented hierarchical system:

- a) Level 1: legislative stipulations and resolutions of the nuclear safety authority,
- b) Level 2: national and international standards to be used for the processes,
- c) Level 3: nuclear standards for the system components,
- d) Level 4: conventional industrial standards.

9.3.7.0400. It shall be ensured during the design that the applied lower level standards are not in conflict with the higher-level regulations.

9.3.7.0500.



9.3.7.0600. If the Licensee fails to act as recommended in the guideline:

a) the standards intended to be used shall be exactly identified along with the indication of the their year of issue, the version number, and the amendment or the appendix. The applicability, accuracy and adequacy shall also be assessed, and they shall be completed or amended as necessary.

b) the coherence of the applied standards within the entire design shall be ensured, in particular, to prevent the combined use of various standards for an identical system component or activity.

### *9.1.1. Requirements for quality management plans*

9.3.8.0100. A quality management plan shall be developed for the design and realization of systems, structures and components important to safety and for any modification of such systems, and the plans shall be approved according to the design manual. The same quality management plan can be used for another system, if the quality management objectives, the methods to meet them and the organization that implements the plan are the same for the concerned systems.

9.3.8.0200. The quality management plan shall describe:

a) the responsibilities and connections of the organization designing the system and its connections with other organizations involved in the design;

b) standards and guidelines applicable during the design and realization;

c) phases of the design and realization process;

d) certificates, records and other data that are used as inputs for the particular design phases;

e) certificates, records that are produced as the result of the particular design phases;

f) review of the given phase after its completion, including the schedule, contents and performer of the review, the acceptance criteria and the decision making procedures and responsibilities to be applied;

g) procedures applied to supervise the suppliers;

h) configuration and change management, and product identifier procedures;

i) management of compliance, design modifications and non-compliances;

j) support processes applied together with design and realization, supplemented with the associated management and quality assurance procedures; and

k) distribution of responsibilities in the processes and decision making procedures, including the quality assurance plan modification procedure.

## **9.4. MANUFACTURING REQUIREMENTS**

### *9.4.1. Requirements for suppliers performing manufacture*

9.4.1.0100. The supplier carrying out the manufacturing work (hereinafter referred to as the manufacturer) shall have a quality management programme for the entire manufacturing process.

9.4.1.0200. The manufacturer, while performing the scope of activities in relation to manufactured product subject to licensing procedure, shall meet the requirements specified in Annex 2.

9.4.1.0300. Manufacturer shall provide for the certified qualification of its tools, procedures and workforce required for manufacturing and inspection.

9.4.1.0400. Prior to the start of manufacturing work, the manufacturer shall provide for the training and documented examination of the personnel responsible for the management, implementation and inspection, to ensure that the relevant requirements specified for the manufacturing and inspection technologies applied during the manufacture are known and understood.

### *9.4.2. Manufacturing documentation*

9.4.2.0100. Prior to the start of the manufacturing work, the product to be manufactured shall be identified with documents, i.e. design, technical specifications and drawings, to the extent as required for the manufacture and the certification of compliance.

9.4.2.0200. The legal regulations, technical regulations, national, industrial or manufacturer's standards, and other regulations to applied during the manufacture shall be determined.

9.4.2.0300. The product specifications and drawings shall be in agreement with the documents listed in Section 9.3.7.0300 and the requirements of the design manual.

9.4.2.0400. The manufacturing documentation shall contain all dimensions, material quality and other properties, and their tolerance values or other acceptance criteria as required for guaranteeing the specified quality of the product.

### *9.4.3. Manufacturing procedures*

9.4.3.0100. Procedure and work instruction shall be prepared for all of the following activities affecting the quality of the product:

- a) procurement of products required for the manufacture,
- b) manufacturing processes, including, in particular, the processes with limited possibility of correction,
- c) welding,
  - ca) qualification of manufacturer of welded structures,
  - cb) qualification of the personnel, in particular welding managers, welders, material testers,
  - cc) base and weld materials, and their certification,
  - cd) appropriate condition of the welding machines,
  - ce) qualification of weld technologies and weld instructions,
  - cf) technology examinations and their documentation,
  - cg) compliance of the work tests, and
  - ch) compliance of the applied weld technology instruction, within that:
    - cha) applied welds,
    - chb) application of temporary fixing elements,
    - chc) allowed edge displacement,
    - chd) pre-welding, in-welding and post-welding inspections,
    - che) pre-heating and thermal treatment,
    - chf) conditions of repairs, and
    - chg) requirements for the registration and handing over documentation,
- d) fabrication processes, in particular plastic shaping, thermal treatment, cutting, and within that:
  - da) inspection of the fabrication processes,
  - db) final inspection and examination,
  - dc) management,
  - dd) packaging,
  - de) requirements for temporary and permanent storage, and
  - df) documentation, temperature-time diagram during thermal treatment,
  - e) final inspection and examination, f) management,
  - g) packaging,

- h) requirements for temporary and permanent storage and
- i) transportation.

9.4.3.0200. The new manufacturing, inspection and testing technologies shall be applied only after the completion of appropriate qualifications, verifications, and tests.

#### *9.4.4. In-manufacture inspection*

9.4.4.0100. Inspection and test plans shall be developed by the possible earliest date prior to the scheduled implementation of the activities. Inspection of forged products shall be implemented in forged condition.

9.4.4.0200. In addition to the inspections considered required by the manufacturer for guaranteeing the quality of the product, the manufacturer shall take into account the requirements for sampling, arrest and inspection points specified by independent experts, customer, and the nuclear authority.

9.4.4.0300. In the framework of the in-manufacture inspection, the inspection of parts, which become covered and inaccessible during the manufacturing process, and the evaluation and reporting of the inspection results shall be ensured.

9.4.4.0400. The quality management system of manufacturer shall include the identification and control of those procedures, for which such a requirement exists that the given work shall be carried out by qualified personnel and that the parameters of the procedure shall be monitored and controlled to comply with the specified requirements. This provision shall also apply to processes, for which the results cannot be fully verified by subsequent inspection or testing of the product, and for which the manufacturing errors can be detected only during operation.

9.4.4.0450. To effectively perform non-destructive examinations, the pre-commissioning condition of the systems, structures and components shall be determined in a way that ensures the comparison with the in-service inspection results. Material testing of systems, structures and components shall be qualified to justify that the inspection system, including the inspection equipment, inspection technology and the inspection personnel, is able to examine the compliance with the requirements under real examination circumstances.

9.4.4.0500. The manufacturer shall use a product identification system from the receipt of the material through the entire manufacturing, shipment and assembly process to prevent mixing the various materials and parts.

9.4.4.0600. The product identification system shall comply with the design manual.

9.4.4.0700. It shall be ensured by evaluating the procurement sources, inspecting and protecting certification documents and by other appropriate measures that the purchased materials, system components and services meet the requirements specified in the procurement documents.

9.4.4.0800. Measurement procedures and regulations shall be established for the certification of the adequacy of the specified requirements and for the verification and certification of the classification, type, and accuracy of tools, gauges, instruments, other supervising, measuring and testing equipment and structures, which are used during the work and have effect on the quality of the product.

9.4.4.0900. The supervising, measuring and testing equipment shall be inspected, calibrated and maintained at specified intervals to ensure their required accuracy, in order to guarantee that prior to their repeated use, the calibrated devices comply with the requirements specified in the standards.

#### *9.4.5. Reporting and investigation of non-compliances*

9.4.5.0100. The manufacturer is obliged to notify the customer of any non-compliance with:

- a) manufacturing drawings,
- b) manufacturing technology descriptions,
- c) inspection instructions, and
- d) specifications included in the manufacturing documentation.

9.4.5.0200. The customer shall notify the Licensee of non-compliances important to nuclear safety.

9.4.5.0300. The notification of the Licensee is obligatory, if intolerable defects and dimensional deviations are detected during the manufacture by approved inspection instructions.

9.4.5.0400. The characteristics of non-corrected defects and non-compliances shall be documented and their effects on safety shall be analysed and evaluated.

9.4.5.0500. The Licensee shall submit the report and the outcomes of the investigation to the nuclear safety authority in accordance with the requirements specified in Section 1.7 of Annex 1.

9.4.5.0600. The Licensee shall inform the nuclear safety authority on defects important to safety revealed by the periodical and occasional inspections of the quality management system of the manufacturer.

9.4.5.0700. The manufacturer shall communicate the modifications made for any reason during the manufacturing process to the concerned designer organisation and shall have them approved as specified in this Decree. Such modifications shall be indicated in all design documents concerned.

#### *9.4.6. Delivery documentation*

9.4.6.0100. The scope of the delivery documentation shall be defined prior to the start of the manufacture in accordance with the nuclear safety regulations and the standards applied for the manufacture.

9.4.6.0200. The delivery documentation to be transported together with the supplied system component shall include sufficient information on the following:

a) certification of compliance of the system component as specified by the nuclear safety requirements, the manufacturing license and the relevant technical regulations for the system component.

b) verification of the assumptions made in the Preliminary Safety Analysis Report for the system component, and the preparation of the Final Safety Analysis Report,

c) safe operation, maintenance and surveillance of the system component,

d) prevention of failures of the system component, and

e) completion of replacements required for the system components.

9.4.6.0300. The delivery documentation shall include all information on the non-compliances, defects and anomalies revealed during manufacture and shall present the evidences, which certify the permissibility thereof.

#### *9.4.7. Acceptance inspection*

9.4.7.0100. The acceptance test shall be carried out as specified by the relevant inspection plan approved in accordance with the written internal procedure.

9.4.7.0200. The acceptance inspection plan shall include the following:

a) inspection of manufacturer's quality control organisation not involved in the manufacture,

b) inspection of the inspection organisation authorised according to law, which is independent of the manufacturer and the Licensee, and

c) authority inspection.

9.4.7.0300. The in-manufacture inspection, final acceptance test and the test prior to commissioning of pressure retaining equipment subject to licensing by the nuclear safety authority shall be carried out by an inspecting organisation authorised according to law, which is independent of the Licensee.

9.4.7.0400. The scope and conditions of the authority inspection shall be specified by the nuclear safety authority in the manufacturing license.

9.4.7.0500. The aspects of comparability with the conclusions of the in-service inspections required during the operation phase, shall be considered in the planning of the acceptance inspections.

## **9.5. CONSTRUCTION-ASSEMBLY REQUIREMENTS**

### *9.5.1. Requirements for the organisations performing construction-assembly works*

9.5.1.0100. The organisation directing the construction- assembly works shall be responsible for the planning and coordination thereof.

9.5.1.0200. The basic activities of the organisation directing the construction-assembly work shall include at least the following:

- a) inspection and supervision of the suppliers;
- b) providing the conditions for the preparation work to be carried out by the suppliers on the designated construction-assembly area;
- c) scheduling and monitoring of the work processes, including the coordination of activities of multidisciplinary suppliers responsible for certain technical field;
- d) ensuring that the work of suppliers complies with the requirements specified in the construction-assembly technology, process instructions, technical prescriptions and drawings, and that the quality management requirements and quality requirements are specified and met and that the inspection of the construction-assembly takes place as specified in the inspection plan;
- e) organization of the delivery of the completed work; and
- f) identification of the "0" state.

9.5.1.0300. Special training shall be provided to the technical personnel to complete the school education and training, to deliver expertise required for the new unit construction programme, and to prepare the individuals for the fulfilment of their respective duties.

9.5.1.0400. In addition to meeting the requirements addressed in Section 9.2.2.0500, the organisation performing construction-assembly works shall have an

established quality management system extending over the entire construction and assembly process.

9.5.1.0500. In the scope of activities to be carried out in relation to the construction of the nuclear power plant, the organisation performing the construction- assembly works shall meet the requirements specified in Annex 2.

9.5.1.0600. The organisation performing the construction-assembly works shall provide for qualified personnel on the site, which have appropriate authorisation and are capable of directing the performance and inspection of works and repairing of defects, and of carrying out works in the required quality.

9.5.1.0700. The provisions of the law on construction activities shall apply to the construction activities of the nuclear power plant and the related buildings, with the proviso that the construction technical inspector and the responsible technical manager shall hold authorisation in the subfield of nuclear energy buildings in the field of energy supply buildings as defined in the relevant law.

#### *9.5.2. Construction- assembly documentation*

9.5.2.0100. The task of the organisation performing construction-assembly works is to develop detailed plans for its works and to have these plans approved by the organisation supervising construction-assembly.

9.5.2.0200. The construction-assembly work shall be carried out as specified by the plan that is continuously kept up-to-date.

9.5.2.0300. The construction-assembly plan shall include the following:

a) the requirements for the working area, the system components, the assembly plans, the construction-assembly technologies, and the partial organisation plans shall be specified;

b) the presentation of the identification system established in the Section 9.3.5.0400, with a description of the rules applicable to the classification, acceptance, archiving, retrieval and invalidation of the construction-assembly documentation;

c) the registering documentation used for the performance and inspection of the construction-assembly and the delivery documentation including the as-built status of the systems, structures and system components shall be distinguished in the identification system, which shall regulate the process of transferring information from the registering documentation to the delivery documentation;

d) the non-compliances to be reported to the organisation directing the construction-assembly works shall be identified;



e) the special processes shall be regulated, particularly large mass concrete placing, pre-stressing concrete structures, preparation of special concretes, the implementation and supervision of welding, thermal treatment, destructive and non-destructive testing; and

f) the labour conditions for completing building works shall be regulated as well as for cases when many organisations performing assembly works at the same assembly area.

9.5.2.0400. The relation system of transferring design information between all the participants of the construction shall be regulated. Prior to issuing the information, the organisation performing the construction and assembly works shall ensure that the delivered information reflects the actual local conditions.

9.5.2.0500. The design information needed for the manufacturers outside the construction and assembly area shall be provided.

9.5.2.0600. A procedure shall be developed for managing questions received from the personnel performing the assembly works in relation to design information. If the information has an effect on nuclear safety, then the general designer and the nuclear safety authority shall be involved.

### *9.5.3. Construction-assembly conditions*

9.5.3.0100. A general organisation plan shall be prepared to support the construction and assembly works, which shall extend, as a minimum, over the provisions described in Sections 9.5.3.0200 to 9.5.3.0500.

9.5.3.0200. A facility arrangement model shall be developed for use in the design and construction phase. The model can form part of the configuration management system. The model shall be suitable for revealing conflicts, for the demonstration of the construction-assembly and maintenance operations, and the generation of arrangement design drawings. The model shall be made available for the operating organisation. The model shall present all such information that are necessary to decide on the compliance of the design principles laid down in Annex 3/A, particularly on the compliance with separation of systems important to safety and protection against internal and external hazard factors.

9.5.3.0300. A multilevel schedule shall be prepared, which is suitable for management overview and for the identification of the sequence of successive items of work. The schedule shall include the authority arrest points. The time requirement of the authority inspections shall be considered in the preparation of the schedule.

9.5.3.0400. To minimise the need for design modifications due to conflicts, an organisation description shall be prepared in such a depth of details, which demonstrates and substantiates the coordination of activities in time and space.

9.5.3.0500. In the case of the construction of a new nuclear facility on a site with an already operating nuclear facility in the vicinity, those potential hazards arising from the construction-assembly activities shall be assessed, in particular, soil works, fire and explosion hazard, operation of cranes, failure of installation systems, which may jeopardise the safety of the operating nuclear facility. Those measures shall be presented, which ensure that the construction-assembly activities do not cause any violation of the operational limits of the existing nuclear facility.

9.5.3.0510. The licensee of a nuclear facility planned in the precautionary protective action zone of an existing nuclear facility shall ensure that the protection of employees working on the construction site is taken into account in the relevant facility, local and regional Nuclear Emergency Response Plan.

9.5.3.0600. Facilities required for the site storage, processing and handling of materials required for construction and assembly works, particularly buildings, structures, immobile tools and equipment, specifically assembly, testing and material handling machines shall be provided.

9.5.3.0700. The construction-assembly work area shall be prepared in a way to ensure that the conditions for the quality work performance, particularly heating, ventilation and lighting equipment, and the conditions for the clean work, where required, are ensured.

9.5.3.0800. Housekeeping measures shall be taken and implemented to ensure the preservation of the quality of the system components to be installed. This shall include the method and procedure of handling the construction-assembly area, the facilities, the materials and system components to be installed.

9.5.3.0900. The cleanliness requirements shall be specified for the housekeeping activities. Where clean assembly area is used, this shall clearly be identified, and marked, and procedures or executive instructions or work instructions shall be issued to regulate their use.

9.5.3.1000. The licensee shall establish and operate a comprehensive, integrated quality control system for the continuous oversight of construction-assembly processes.

9.5.3.1100. As part of the quality control system, the following shall be elaborated:

a) a set of conditions for quality control and specific quality criteria,

b) a method for reviewing the comprehensiveness and technical compliance of the contractors' quality assurance documentation,

c) pre-approval review of the contractors' quality management plans and Sampling and Qualification Plans,

d) preliminary verification of the compliance of the construction products and building materials to be built in,

e) validation of the contractors' technologies applied during installation prior to the commencement of the construction activities,

f) verification of the tests and analyses of the contractors' quality control laboratories.

9.5.3.1200. The licensee may involve an independent quality control organisation, which shall have an accredited building industrial laboratory and accredited procedures for analysing at least in the fields of nuclear structural construction, architecture, building services engineering and building industrial chemistry for carrying out the tests specified in Section 9.5.3.1100.

#### *9.5.4. In construction-assembly inspection*

9.5.4.0100. For the assembly of system components classified into Nuclear Safety Class 1 and for construction of the containment, a step-by-step type assembly, welding, testing and documentation procedures shall be developed.

9.5.4.0200. The materials and system components to be installed shall be repeatedly inspected during the preparation for construction-assembly. No material or system component shall be installed, which is non-conforming, not identified or was delivered with defective or non-complying content certificate or without certificate.

9.5.4.0300. The condition of tools, devices, apparatus and other labour instruments to be used for the construction-assembly work shall be checked in order to ensure that they are suitable for the completion of work having the required quality and cleanliness.

9.5.4.0400. Measuring instruments and testing equipment of a type, measuring range and accuracy shall be used during the construction-assembly work as required for the data collection, inspection and testing.

9.5.4.0500. The completed construction-assembly works shall be preserved using temporary protection to ensure that the quality do not deteriorate until commissioning.

9.5.4.0600. The system components classified into Nuclear Safety Class 1 shall be assembled in compliance with the regulations approved according to Section 1.3.4 of Annex 1. The requirements for the construction-assembly of system components classified into lower Nuclear Safety Classes shall be specified in due consideration of the requirements in Section 1.3.4 of Annex 1, with the approval of the Licensee, by taking the ABOS classification of each component into account.

#### *9.5.5. Reporting and investigation of deviations*

9.5.5.0100. The organisation performing the construction-assembly works shall notify the customer if during the construction-assembly works they deviate from:

- a) construction-assembly drawings,
- b) construction-assembly and inspection instructions, or
- c) documentation requirements.

9.5.5.0200. The customer shall notify the Licensee of any deviation important to nuclear safety.

9.5.5.0300. The notification of the Licensee is mandatory if, any defect or dimensional non-conformance non-allowable on the basis the approved assembly instructions was revealed during the construction and assembly work, and if damages to the assembled system component is detected during commissioning.

9.5.5.0400. The impact of defects, deviations and damages on safety shall be assessed.

9.5.5.0500. The Licensee shall submit the report and the investigation results to the nuclear safety authority, pursuant to Section 1.7 of Annex 1.

9.5.5.0600. The Licensee shall notify the nuclear safety authority of defects important to nuclear safety observed during regular or casual inspections in the quality management system of suppliers.

9.5.5.0700. The organisation performing the construction-assembly works shall communicate every modification made for any reason during the construction-assembly works to the designer organisation and shall have them approved as specified in the present Govt. decree. The modifications shall be reflected on the designs and the assembly plan documentation shall be regularly updated.

#### *9.5.6. Delivery documentation*

9.5.6.0100. The scope of the delivery documentation shall be specified prior to the start of the construction and assembly work, in accordance with the nuclear safety

regulations and the requirements specified in the standards used for the manufacturing process.

9.5.6.0200. The documentation to be delivered together with the assembled systems and system components shall include sufficient information on the following:

a) demonstration of the compliance of the system and system component with the relevant nuclear safety authority requirements, the construction-assembly license, and the technical requirements relevant to the system and system component,

b) verification of assumptions made in the Preliminary Safety Analysis Report and the preparation of the Final Safety Analysis Report,

c) safe operation, maintenance and supervision of the system component,

d) elimination of failures of the system component, and

e) accomplishment of the required system component replacements.

9.5.6.0300. The delivery documentation shall include the data on defects, damages and other anomalies that occurred during the construction and assembly work, and the documents certifying their permissibility.

9.5.6.0400. The delivery documentation shall contain the as-built plans related to construction-assembly works.

### *9.1.2. Special requirements for building and building-structures*

9.5.7.0100. The tools of area-preparation, external railway, public road and river access, the public utility network and infrastructure and the staging area shall be arranged in a way that ensures safe transport, management, storage and use of raw materials and equipment necessary for construction to and on the site.

9.5.7.0200. The construction organization plan shall cover:

a) supply of the construction with building technical devices in the volume necessary for the construction-assembly works;

b) determination of the building sequence;

c) the possible pre-fabrication scope;

d) ensuring the erection of technology equipment to be placed concurrently with the construction and maintaining its condition during the construction; and

e) development of conditions for the construction-assembly works to be performed at the same area, at the same time.

9.5.7.0300. The licensee shall develop and approve at least the following documents as specified in the project management manual:

1. fire, labour and health safety rules of construction activities,
2. engineering-geodesy plan of the construction,
3. monitoring plan for ground water condition,
4. implementation and quality control plan of excavations and excavation related structures,
5. implementation and quality control plan of grounding and construction of building structures,
6. planning, implementation and quality control rules of concrete placing works (formulas, requirements for design for lifetime, ageing examinations),
7. rules for construction and quality control of a metal structures,
8. rules of splicing, welding of re-bars and inspection of the implementation,
9. implementation and inspection rules of water sealing and roof-laying,
10. rules for preparation and quality control of anti-corrosion and other special coatings,
11. requirement for welding and installation of technology inserts,
12. requirement for installation of hermetic pipeline and cable penetrations,
13. order of development and approval of implementation plans and implementation technologies,
14. order of acceptance tests of building materials and products,
15. regulation of civil engineering technical expert, technical building inspector and responsible construction supervisor with regard to the construction activity,
16. requirements for examination laboratories and audit organizations and for their involvement,
17. requirement for concurrent construction-assembly, and finishing construction works,
18. rules of inspection and documentation of building structures to be covered,
19. requirement for construction and delivery of personal and load elevators,
20. rule of acceptance of construction works,
21. documentations requirement of the step-by-step construction-assembly, welding and inspection of the containment, and

22. implementation plans, detailed technology plans of pre-stressed reinforced concrete structures, and the result of independent technical expert review.

9.5.7.0400. Construction shall take place under continuous designer supervision. Tasks, responsibilities and authorizations of designer inspection shall be included in the management system documentation.

9.5.7.0500. Before commencing the construction activities the construction area shall be designated and shall be surrounded by a fence. The following is considered as construction area:

- a) location of construction activities,
- b) staging and preparation areas related to work organization,
- c) area for placement of building materials, machines, structures, fittings necessary for the construction and for buildings necessary for the construction, but not necessary for operation, and
- d) areas for the preparatory technology processes.

### *9.1.3. Special requirements for assembly of technology systems, structures and components*

9.5.8.0100. The licensee shall develop and approve at least the following documents according to its management manual:

1. labour safety and fire protection of technology assembly works,
2. pre-assembly requirements before transporting technology equipment to the final erection location,
3. handover requirements of rooms for:
  - 3.1. delivery of equipment,
  - 3.2. technology assembly, clean assembly, electric and I&C assembly,
4. organization plan of technological assembly works,
5. requirement for implementation of welding works:
  - 5.1. qualification of assemblers and manufacturers of welded structures,
  - 5.2. qualification of personnel, especially welding supervisors, welders, material testers,
  - 5.3. base and welding materials and their certification,
  - 5.4. appropriate condition of the welder equipment,

- 5.5. qualification of welding technologies and welding instructions,
- 5.6. technology examinations and their documentation,
- 5.7. adequacy of work tests, and
- 5.8. adequacy of the applied welding technology instruction, within that:
  - 5.8.1. applied weld shape,
  - 5.8.2. application of temporary fastening elements,
  - 5.8.3. allowed edge displacement,
  - 5.8.4. pre-welding, in-welding and post-welding inspections,
  - 5.8.5. pre-heating and thermal treatment,
  - 5.8.6. conditions for repair, and
  - 5.8.7. requirements for registration and delivery documentation.
- 6. inspection of welding activity:
  - 6.1. preparation of elements for welding,
  - 6.2. prescription for implementation of welding and deposition welding,
  - 6.3. marking and documentation of welds,
  - 6.4. requirement of inspection of welding:
    - 6.5. preliminary inspection: personnel, weld materials and equipment, assembly of parts,
    - 6.6. in-welding inspection,
    - 6.7. class of welded joints,
    - 6.8. inspection of weld technology,
    - 6.9. quality control of welded joints and deposition welding,
    - 6.10. technology examination of welded joints,
      - 6.10.1. inspection by non-destructive methods,
      - 6.10.2. inspection by destructive methods,
      - 6.10.3. documentation of inspections, welding log, registry documentation of welding works,
  - 7. inspection of thermal treatment,
  - 8. geodesy inspection plan of assembly works,



9. requirements for examination laboratories and audit organizations and for their involvement,

10. rules of designer inspection activity performed during assembly works,

11. regulation of the work of manufacturer assembly supervisors,

12. requirement for step-by-step type assembly, welding inspection documentation of safety class 1 equipment,

13. rule of inspection and documentation of component to be concealed,

14. handing over of technology equipment for commissioning:

14.1. handing of technology systems and components for cleaning,

14.2. handover requirements for technology systems, structures and components for pressure, mechanical, functional, locking and other commissioning tests,

14.3. preparation of final configuration after commissioning operations,

15. special requirements for assembly of technology pipelines:

15.1. base and weld materials, and quality and documentation requirement of semi-products and pre-fabricated pipe-block products,

15.2. assembly, setting and documentation requirement for various type dampers, snubbers, pipe supports,

15.3. requirement for installing of chargers, dischargers, deaerators, gauges, checks and automation tools into pipelines,

15.4. implementation of installation of compensators and cold pre-stressing,

15.5. assembly of flanged joints,

15.6. installation of valves,

15.7. installation of valve drives,

15.8. cleaning and pressure tests of pipelines,

15.9. assembly of corrosion protection and thermal insulation,

15.10. inspection of assembly and handing over documentation of technology pipelines.

#### *9.1.4. Electric and instrumentation and control (EI&C) assembly works*

9.5.9.0100. The licensee shall develop and approve at least the following documents according to its management manual:

- a) labour safety rule of the EI&C assembly works,
- b) organization plan of EI&C assembly works,
- c) special requirements for assembly work phases for various EI&C components:
  - ca) power current equipment,
  - cb) transformers,
  - cc) in-house electric power distributors, equipment of direct current power supply,
  - cd) human-machine interface of control, protection and alarm systems,
  - ce) cable trays and electric cables,
  - cf) secondary networks,
  - cg) batteries,
  - ch) equipment, buses and cables of open space sub-station,
  - ci) lighting and ventilation networks,
  - cj) earth system, lightning protection, protection against electromagnetic disturbance,
- d) requirements of establishing temporary electric power connections,
- e) requirements for the organizations performing electric EI&C assembly works.

## **9.6. COMMISSIONING REQUIREMENTS**

### *9.6.1. General requirements*

9.6.1.0100. The commissioning work shall be planned for two phases as follows:

- a) an inactive phase prior to loading the nuclear fuel assemblies, and
- b) a nuclear phase following the loading of nuclear fuel assemblies into the core.

9.6.1.0200. The provisions established in Sections from 9.6.1.0400 to 9.6.1.1000 shall apply to the inactive phase of commissioning prior to loading the nuclear fuel assemblies into the core.

9.6.1.0300. The nuclear phase shall be subject to the requirements described in Annex 4.

9.6.1.0400. An organisation responsible for commissioning shall be established to direct commissioning, and this organisation shall operate in close cooperation with the operating organisation.

9.6.1.0500. The organisation responsible for the commissioning shall prepare a detailed commissioning programme to summarise the operations in a logical sequence from the start of the single tests to the fuel assembly loading operations.

9.6.1.0600. The commissioning programme shall demonstrate that the construction, the manufacture, and the assembly works were performed as specified in the design.

9.6.1.0700. The commissioning programme shall aim at putting of systems and system components into operation.

9.6.1.0800. The commissioning programme shall be sufficiently detailed in relation to the tests to be performed, the responsible persons, the duration and the connection of the test phases, the provision of the required resources, and to the arrest points. .

9.6.1.0900. The pre-operation tests can be performed after the completion of the assembly and the post-assembly inspections.

9.6.1.1000. The pre-operation tests shall demonstrate:

a) the operability of the systems and system components in accordance with their design;

b) the operability in design operation modes, i.e. manual operation, automatic operation, operation with secondary or alternative control;

c) the correct operation of measuring and control circuits and the functionality of interlocks and protective instrumentation of system components; and

d) the acceptability of the results of vibration, thermal expansion, displacement and unhindered movement and displacement tests.

## *9.6.2. Organisation and operation*

### Responsibilities

9.6.2.0100. The Licensee shall have a comprehensive direction and supervision over all activities. Accordingly,, the Licensee shall ensure the availability of commissioning programmes, instructions, tools and personnel to all participants of the construction concerned with the given activity. Additionally, the Licensee shall provide for the supervision of the work, including a safety review of the required technology modifications, and shall keep contact with the nuclear safety authority.

9.6.2.0110. The managers, bearing decision making responsibility in safety issues during the installation of nuclear facilities, shall present at least three years of relevant experience obtained in nuclear area and shall demonstrate the knowledge of the nuclear safety requirements.

9.6.2.0200. The operating organisation shall be involved in commissioning works.

9.6.2.0300. The commissioning organisation shall be responsible for:

- a) inspection of the correct completion of the assembly;
- b) preparation of the plans and documents of the commissioning;
- c) documentation and evaluation of the results of the commissioning and the events;
- d) review of the operational and maintenance documents; and
- e) handing over systems and system components for operation.

9.6.2.0400. The organisation performing the construction-assembly works shall be responsible for:

- a) the quality of the construction and assembly work as required in the relevant legislation, standards, and technical regulations, and the documentation thereof,
- b) the generation of documents demonstrating the as-built state,
- c) the preservation of the assembled systems and system components, and
- d) the elimination of failures during the commissioning.

#### Communication

9.6.2.0500. The commissioning organisation shall identify the requirements for communication with the persons and organisations working at the power plant units during the commissioning.

#### Training and practice

9.6.2.0600. The personnel performing commissioning work shall undergo appropriate training and exercise in accordance with the following principles:

- a) the existence of specific training and practising requirements for all job positions;
- b) comprehensive training programme, which covers the working methods, the periodical and final modifications of the technology and the documentation, the work management system, the fire, labour and nuclear safety, and the awareness of commissioning tasks and the feedback of experience;
- c) knowing the elements of safety culture; and
- d) regular knowledge refreshment.

#### Delivery and acceptance

9.6.2.0700. The delivery of the installed systems and the documentation, as well as the transfer of responsibilities during commissioning shall be controlled.

9.6.2.0800. The documentation to be delivered shall include the following, as a minimum:

- a) as-built documentation,
- b) results of the commissioning tests,
- c) defect statistics,
- d) event reports, and
- e) list of uncompleted tasks.

Test instructions

Preparation of test instruction

9.6.2.0900. The tests shall be carried out pursuant to test instructions.

9.6.2.1000. Such test instructions shall be developed as specified by the following requirements:

- a) detailed description of the commissioning of systems and system components,
- b) item by item inspection and approval process,
- c) similarity to the operation instructions, and
- d) deviations from the normal operation, in particular, minimising the use of disabled interlocks, the use of blinding and bypassing devices, and of other provisional structures, and their removal after completion of the tests.

Evaluation of the test results

9.6.2.1100. The test results shall be reviewed and approved to demonstrate the compliance with the design and that the tests can be continued.

9.6.2.1200. Single reports, phase reports and final reports shall be generated on the evaluation of the tests, which shall include the list of tests performed, summary of their purpose, the circumstances of their performance, and their results.

Management of deviations

9.6.2.1300. Modifications and unexpected test results and events shall be considered deviations in connection with commissioning.

9.6.2.1400. The reasons, the relevant operatory and nuclear safety authority requirements, and the safety and technology impacts of the modifications shall be demonstrated at the time of their implementation.

9.6.2.1500. Rules shall be developed for the implementation and registering of provisional and permanent modifications.

9.6.2.1600. In the case of unexpected test results and events, corrective actions and, if required, further interventions shall be identified by analysis.

## **9.7. PROCUREMENT REQUIREMENTS**

9.7.1.0100. The procurement documentation of system components important to nuclear safety shall include the following, as minimum, in a depth of details being in harmony with their safety classification.

- a)* detailed description of the task,
- b)* technical requirements,
- c)* inspection and test requirements,
- d)* providing access to supplier's site,
- e)* selection of the quality management regulation,
- f)* documentation requirements,
- g)* registering requirements,
- h)* schedule of the delivery of documentation,
- i)* reporting on non-compliances,
- j)* audit of suppliers, and
- k)* products and services supplied by the Licensee.

9.7.1.0200. Rules shall be developed for the modification of the procurement documentation.

9.7.1.0300. The responsibilities for reviewing and approval of the procurement documentation shall be identified.

9.7.1.0400. The methods and criteria of acceptance shall be identified, including the documents, which are used to certify the fulfilment of the acceptance criteria, and the inspection and arrest points, which are required by the recipient organisation and the nuclear safety authority.

9.7.1.0500. The inspection and testing activity on supplier's site shall be carried out in accordance with the requirements specified in the procurement documentation.

9.7.1.0600. Copies of the procurement documents shall be assigned to the delivered commercial product and the level of acceptance inspections shall be specified.

9.7.1.0700. In the case of procurement of a commercially available product, the procurement documentation shall include sufficient information, taken from

catalogues and supplier's specifications, to allow the supply of a product in compliance with the procurement specification. All important data and test information shall be acquired. It shall be demonstrated that the product can be used for the design purpose. If it cannot be demonstrated based on the procurement documentation, then additional demonstration analyses or tests shall be carried out.

## **9.8. HANDLING, STORAGE AND CONSERVATION REQUIREMENTS**

9.8.1.0100. For system components important to the nuclear safety, the following handling, storage and conservation requirements shall apply:

a) the conservation of products shall be ensured during their receipt, manufacture, assembly, inspection, testing and shipment, with due consideration of factors such as the weight and dimensions, the cleanliness, temperature conditions or other ambient factors;

b) designated storage areas or warehouses shall be used to prevent the occurrence of damage to or deterioration of the system components during their use and shipment;

c) the rules of receipt and issue, as well as the authorities shall be regulated in storage areas;

d) the required separation of the materials and system components shall be provided during storage prior to their use and installation, and the togetherness of parts and spare parts, which belong to the same system component but are to be installed on different dates shall be maintained;

e) storage methods and requirements shall be established to prevent the occurrence of corrosion, contamination, deterioration or physical damages;

f) the stored system components shall be regularly checked for deterioration;

g) the system components shall be packaged and marked in a way to demonstrate its compliance with the requirements;

h) the system components shall be packaged in a way to prevent the damage or loss or deterioration of the system component during transport, receipt and storage;

i) the system components shall be conserved and packaged in a way to prevent its deterioration during storage upon the effect of air, humidity and other ambient factors;

j) in the case of long term storage of a system component, the deconservation and reconservation processes shall be regulated; and

k) a system component prepared for shipment shall be packaged and marked to prevent its damage or loss or deterioration.

9.8.1.0200. The manufacturer shall check the following prior to shipment:

*a)* the products to be delivered comply with all specified requirements and the required documents, in particular, the acceptance and test records and the transport licenses are available;

*b)* the products are conserved and packaged in accordance with the requirements set forth in the contract and the design specifications;

*c)* the markings on the product and the packaging are in agreement with the content and are appropriate;

*d)* where it is required, registering instruments are placed within the packaging to register the conditions and events during shipment; and

*e)* the guidelines to be applied during transport and the subsequent delivery shall be available, including handling and storage instructions, assembly and operating instructions, and their placement is marked within the packaging.