Notified version

Notice by J.-Ph. Girard: This is the official translation provided by the French Government to the European Commission, as mandatory by EU law.

This version is said the "notified version". When delivered by the French Nuclear Authority to us, this version was stamped:

Order of 12 /12/2005 on Nuclear Pressure Equipment

Official English translation provided for guidance
Only the original in French is the legal basis
See IDM:

Order 2005 December 12 for nuclear pressurised equipment (ESPN) FR (24FF4V)

The Minister for the Economy, Finance and Industry and the Minister responsible for Ecology and Sustainable Development,

Having regard to Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment;

Having regard to Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services, and in particular Notification No XXXXX;

Having regard to the Public Health Code, in particular Articles L. 1333-1, R. 1333-1, 8 and 9;

Having regard to the Employment Code, in particular Articles L. 231-1 and R. 231-73;

Having regard to Law No 571 of 28 October 1943, amended, on the steam pressure equipment used on land and gas pressure equipment used on land or aboard boats for inland navigation;

Having regard to the Decree of 2 April 1926, amended, regulating steam equipment other than equipment aboard boats;

Having regard to the Decree of 18 January 1943, amended, regulating gas pressure equipment;

Having regard to Decree No 63-1228 of 11 December 1963, amended, on nuclear installations;

Having regard to Decree No 99-1046 of 13 December 1999, amended, on pressure equipment, in particular Articles 2, 17 and 24 thereof;

Having regard to the Order of the Minister for Industrial and Scientific Development of 26 February 1974, amended, on the construction of the main primary circuits of nuclear steam supply systems;

Having regard to the Order of the Minister for Industry, Commerce and Craft Trades of 24 March 1978, amended, regulating the use of welding in the construction and repair of pressure equipment;

Having regard to the Order of the Minister for Industrial Redeployment and Foreign Trade of 10 August 1984 on the quality of the design, construction and operation of basic nuclear installations;

Having regard to the Order of the Minister for the Economy, Finance and Industry and of the Minister for Regional Planning and the Environment of 10 November 1999 on monitoring the use of the main primary circuit and main secondary circuits of pressurised water nuclear reactors;
Having regard to the Order of the Minister for the Economy, Finance and Industry of 21 December 1999 on the classification and assessment of conformity of pressure equipment;
Having regard to the Order of the Minister for the Economy, Finance and Industry of 15 March 2000, amended, on the use of pressure equipment;
Having regard to the opinion of 13 January 2005 of the Central Committee on pressure equipment;
Having regard to the opinion of 2 June 2005 of the Interministerial Committee on basic nuclear installations;
Hereby order:

TITLE I
DEFINITIONS, SCOPE AND CLASSIFICATION

Article 1 - For the implementation of this Order, in addition to the definitions that appear in Article 1 of the above-mentioned Decree of 13 December 1999, the following definitions shall apply:

a) "Body", a notified body pursuant to Article 12 of the above-mentioned Directive of 29 May 1997, accepted by the Ministers responsible for nuclear safety in implementation of Article 15 of this Order;
b) "Inspection body", a user inspectorate pursuant to Article 14 of the above-mentioned Directive of 29 May 1997, authorised by a Member State and accepted by the Ministers responsible for nuclear safety in implementation of Article 15 of this Order;
c) "User", the person holding the authorisation to construct the basic nuclear installation in which the nuclear pressure equipment is installed or intended to be installed;
d) "Recognised inspectorate", an inspectorate recognised by the prefect in implementation of Article 19 of the above-mentioned Decree of 1999.

Article 2 – I – In implementation of Article 2(IV) of the above-mentioned Decree of 13 December 1999, pressure equipment specially designed for nuclear applications, failure of which can give rise to radioactive emissions shall be called "nuclear pressure equipment" and shall be subject to the provisions of this Order. This is pressure equipment that meets the following conditions:

- it is defined by Article 2(I) of the Decree of 13 December 1999, with the exception of equipment referred to in points a) to r) in Article 2(II) thereof;
- it is used or intended to be used in a basic nuclear installation other than those cited in Article 17 of the above-mentioned Decree of 11 December 1963;
- it directly ensures, under the conditions defined for its operation, containment of radioactive substances;
- in case of failure, it leads to release of activity above 370 MBq, evaluated as specified in paragraph II below.

Permanent assemblies on the pressure components of nuclear pressure equipment, constructed under the responsibility of the manufacturer, shall form an integral part of this equipment.
II. - The release of activity referred to in the fourth indent of paragraph I above shall be evaluated as follows:

- for a container, the product of its volume times the activity concentration of the fluid contained, calculated as the sum of the activity concentration due to all elements present

except tritium, nitrogen 13, oxygen 15 and 19, fluorine 20, 21 and 22, neon 19 and 23, multiplied by a coefficient 1 and the activity concentration due to tritium, nitrogen 13, oxygen 15 and 19, fluorine 20, 21 and 22, neon 19 and 23, multiplied by a coefficient 1/1000;

- for a pressure accessory with reliable isolation, the higher of the releases evaluated for the nuclear pressure equipment to which it is connected;
- for a safety accessory, the higher of the releases evaluated for the nuclear pressure equipment it protects;
- for equipment other than that referred to above, the higher release of the nuclear pressure equipment, with the exception of pressure accessories with reliable isolation, to which it is connected. For the application of this indent, a collection of one or more pipelines and one or more pressure accessories that do not provide isolation on assemblies between them shall be called a circuit. The release of circuit equipment shall not be less than the lower release of the equipment to which the circuit is connected.

III. - Nuclear reactor containment systems and nuclear fuel cladding shall not be subject to the provisions of Article 3 *et seq.* of this Order.

Article 3 – I – Nuclear pressure equipment shall be classified on three levels, N1 to N3, depending on the magnitude of the radioactive emissions that could result from failure of the equipment.

a) Nuclear pressure equipment failure of which may lead to situations for which the safety report of the basic nuclear installation where it is installed or intended to be installed, together the associated files, does not lay down measures allowing the installation to be made safe, as well as nuclear pressure equipment that constitutes the main primary circuit and the main secondary circuits of nuclear steam supply systems as defined by the above-mentioned Order of 10 November 1999, shall be classified as N1.

b) Nuclear pressure equipment that is not class N1 and failure of which may lead to a release of activity above 370 GBq, evaluated as indicated in Article 2(II), shall be classified as N2.

c) Nuclear pressure equipment that is not class N1 or N2 shall be classified as N3.

II. - For pressurised water electronuclear reactors that are in regular use on the date of publication of this Order, nuclear pressure equipment classified as safe by the safety report pursuant to the fundamental safety regulation IV.1.a of 21 December 1984 on the classification of mechanical equipment, electrical systems and civil engineering structures, may be classified as level N2 if they belong to safety class 2, and as level N3 if they belong to safety class 3, with the exception of equipment making up the main primary circuit and main secondary circuits, which shall be classified as N1.

Article 4 – Nuclear pressure equipment shall be classified in five categories, from 0 to IV, depending on risks other than those referred to in Article 3 above, particularly those associated with the temperature and pressure of the fluids they contain.

a) Level N1 or N2 nuclear pressure equipment with characteristics that are less than or equal to the limits defined in Article 3(1) to (3) of the above-mentioned Decree of 13 December 1999, for pressure equipment containing group 1 fluids pursuant to Article 8(II) of the aforementioned Decree shall be classified as category 0.

b) Other level N1 or N2 nuclear pressure equipment shall be classified as category I to IV by applying the criteria defined in Title I of the above-mentioned Order of 21 December 1999 for group 1 fluids pursuant to Article 8(II) of the above-mentioned Decree of 13 December 1999.

c) Level N3 nuclear pressure equipment with characteristics that are less than or equal to the limited defined in Article 3(1) to (3) of the above-mentioned Decree of 13 December 1999 shall be classified as category 0.

d) Other level N3 nuclear pressure equipment shall be classified as category I to IV by applying the criteria defined pursuant to Title I of the above-mentioned Order of 21 December 1999.

Article 5 – The user of a basic nuclear installation shall draw up a list of the nuclear pressure equipment used in his installation. He shall determine and justify the levels and categories assigned to this equipment.
This list, and the associated justifications, shall be kept available to the Directorate-General of Nuclear Safety and Radiation Protection and agents responsible for monitoring pressure equipment in implementation of Article 3 of the above-mentioned Law of 28 October 1943.

TITLE II
DESIGN, MANUFACTURE AND ASSESSMENT OF CONFORMITY

Article 6 – I – Category 0 nuclear pressure equipment must, with regard to both its design and its manufacture, comply with good practice and the radiation protection requirements defined by this Order.
II. - For level N1 or N2 nuclear pressure equipment, good practice shall be defined by professional guides. These guides shall be revised as often as is necessary. They shall be sent by their authors to the Ministers responsible for nuclear safety, taking account of their comments.

Article 7 – Category I to IV nuclear pressure equipment must, with regard to both its design and its manufacture, comply with the essential safety requirements and the radiation protection requirements defined by this Order.

Article 8 – I – The essential safety requirements applicable to category I to IV and level N1 nuclear pressure equipment, except for pipework of the main primary circuit of nuclear steam supply systems of a nominal dimension DN less than or equal to 50 and other pipework of a DN less than or equal to 100, are set out in Annex 1 to this Order. The essential safety requirements applicable to pipework of the main primary circuit of nuclear steam supply systems of a DN less than or equal to 50, and other category I or II and level N1 pipework of a DN less than or equal to 100 are set out in Annex 2 to this Order.

II. - The essential safety requirements applicable to category I to IV and level N2 nuclear pressure equipment are set out in Annex 2 to this Order.

III. - The essential safety requirements applicable to category I to IV and level N3 nuclear pressure equipment are set out in Annex 3 to this Order.

Article 9 – Radiation protection requirements, referred to in Articles 6 and 7 of this Order, shall be defined by professional guides. These guides shall take account of the requirements cited in Annex 4 to this Order. They shall be revised as often as is necessary. They shall be sent by their authors to the Ministers responsible for nuclear safety, taking account of their comments.

Article 10 – I – Category I to IV nuclear pressure equipment must comply with the conformity assessment procedures defined in Articles 11 and 12 of this Order. At the end of this conformity assessment, the manufacturer shall draw up and sign a declaration of conformity, by means of which he shall attest to the conformity of the equipment with the essential safety requirements and the requirements of the guide referred to in Article 9. The

conformity declaration shall be drawn up in accordance with the specimen appearing in Annex 6 to the above-mentioned Decree of 13 December 1999.
The assessment of conformity shall involve collaboration by bodies. For level N2 or N3 nuclear pressure equipment, the conformity assessment may involve an inspection body under the following conditions:

- equipment whose conformity has been assessed by an inspection body may only be used in the industry group to which the inspection body belongs. An industry group shall apply a common safety policy with regard to the technical specifications for the design, manufacture, monitoring, maintenance and use of equipment and assemblies;
- inspection bodies shall work exclusively for the industry group to which it belongs;
- the applicable procedures shall be exclusively those defined by modules A1, C1, F and G of Annex 2 to the above-mentioned Decree of 13 December 1999.

II. - By way of derogation to the provision of paragraph I above, the prefect of the department in which a piece nuclear pressure equipment or an assembly comprising at least one piece of such equipment is installed, may, at the reasoned request of the user, authorise this equipment or assembly to be commissioned without undergoing the conformity assessment procedure laid down in paragraph I above, when used of the equipment or the assembly is for experimentation purposes.
The prefect may lay down any condition so as to ensure the safety of the equipment or assembly. The authorisation may be temporary.
No reply from the prefect for more than one year from the authorisation request shall constitute rejection of the request.

Article 11 – I – For category I to IV and level N1 nuclear pressure equipment, not including pipework of the main primary circuit of nuclear steam supply systems of a DN less than or equal to 50 and other pipework of a DN less than or equal to 100, the conformity assessment shall be carried out under the authority of the Directorate-General of Nuclear Safety and Radiation Protection, under the following conditions.

The manufacturer shall implement a quality management system for design, manufacture, final inspection and testing. This system shall undergo assessment and monitoring carried out by a body under the conditions laid down by module H of Annex 2 to the aforementioned Decree of 13 December 1999. The body that carries out this assessment and monitoring shall inform the Directorate-General of Nuclear Safety and Radiation Protection of the dates it is considering to carry out these tasks at the manufacturer's premises. The Directorate-General of Nuclear Safety and Radiation Protection may attend or have representation at these operations.

The manufacturer shall submit a request for inspection of the unit to the Directorate-General of Nuclear Safety and Radiation Protection, in accordance with the provisions of module G of Annex 2 to the aforementioned Decree of 13 December 1999. This request shall be investigated in accordance with the provisions of this module by the Directorate-General of Nuclear Safety and Radiation Protection, which may, in order to do this, appoint a body to perform some or all of the necessary operations, at the expense of the manufacturer.

In the light of the results of examinations and tests carried out during this assessment of the unit, and in the light of the results of the assessment and monitoring of the manufacturer's quality management system, the Directorate-General of Nuclear Safety and Radiation Protection shall affix the so-called "horse head" State mark to the equipment , and shall drawn up a report of the conformity assessment.

II. - For pipework of the main primary circuit of nuclear steam supply systems of a DN less than or equal to 50 and for other category I or II and level N1 pipework of a DN less than or equal to 100, the conformity assessment shall be carried out in implementation of the

procedures defined by one of the modules laid down for category IV by the aforementioned Order of 21 December 1999.

III. - For category III or IV and level N2 nuclear pressure equipment, the conformity assessment shall be carried out in implementation of the procedures defined by one of the modules laid down for category IV by the aforementioned Order of 21 December 1999, except for pipework for which it shall be performed in implementation of the procedures defined by one of the modules laid down for categories III or IV by the aforementioned Order of 21 December 1999.

For category I or II and level N2 nuclear pressure equipment, the conformity assessment shall be carried out in implementation of the procedures defined by one of the modules laid down for categories III or IV by the aforementioned Order of 21 December 1999.

IV. - For category I to IV and level N3 nuclear pressure equipment, the conformity assessment shall be carried out in implementation of the procedures defined by one of the modules laid down for the equipment category by the aforementioned Order of 21 December 1999.

V – Notwithstanding the provisions of paragraphs III and IV above, category I to IV pressure accessories regularly placed on the market, with the exception of those whose conformity has been assessed in accordance with module A of Annex 2 to the aforementioned Order of 21 December 1999, may be commissioned pursuant to this Order as level N2 or N3 nuclear pressure equipment if they undergo an additional conformity assessment. This additional assessment shall be carried out by an inspection body. It shall consist of ensuring, by any suitable means, compliance with:

- the essential safety requirements in addition to those of Annex 1 to the aforementioned Decree of 13 December 1999, defined by this Order;
- the radiation protection requirements referred to in Article 9 of this Order.

In order to do this, the user shall provide the inspection body with the information referred to in Annexes 2(1) or 3(1) to this Order.

Article 12 – Assemblies comprising at least one piece of category I to IV nuclear pressure equipment shall undergo a conformity assessment procedure consisting of:

a) assessment of the conformity of each piece of category I to IV pressure equipment constituting the assembly, when they have not previously undergone a conformity assessment;
b) assessment of the conformity of pressure equipment assemblies as a whole, carried out in accordance with the conformity assessment procedure laid down for the highest level and the highest category of the equipment concerned;
c) assessment of the protection of the assembly against exceeding the permissible service limits in accordance with the provisions of the conformity assessment procedure laid down for the highest level and highest category of the equipment protected;
d) a final examination and a test as defined in Annex 1(3.2.1) and (3.2.2) to the aforementioned Decree of 13 December 1999.

TITLE III
PROVISIONS APPLICABLE TO EQUIPMENT IN SERVICE

Article 13 – Nuclear pressure equipment shall be subject to the provisions of Article 17(II) to (III) of the aforementioned Decree of 13 December 1999 with regard to their installation, commissioning, monitoring, maintenance and use. These provisions shall be specified, for the main primary circuit and main secondary circuits of nuclear steam supply systems, by the

aforementioned Order of 10 November 1999 or, for other nuclear pressure equipment, by Annex 5 to this Order.

Article 14 – Annex 6 to this Order defines the nuclear pressure equipment subject to one or more of the inspections referred to in Article 18 of the aforementioned Order of 13 December 1999, as well as the specific rules for performing these inspection operations. The aforementioned Order of 10 November 1999 specifies the inspection operations referred to in the same Article, to which the main primary circuit and the main secondary circuits of nuclear steam supply systems shall be subject, as well as the specific rules for performing these inspection operations.

TITLE IV
MISCELLANEOUS AND TRANSITIONAL PROVISIONS

Article 15 – Acceptance, by the Ministers responsible for nuclear safety, of inspection bodies shall be declared in view of:

a) their competence for the activities they wish to undertake;
b) their competence in radiation protection;
c) their organisation, which must allow efficient accounting of experience gained.

Inspection bodies shall send an acceptance request to the Ministers responsible for nuclear safety, accompanied by a file presenting the appropriate proof with regard to points a), b) and c) of the previous paragraph.

II. - The Directorate-General of Nuclear Safety and Radiation Protection shall undertake the inspection of inspection bodies defined in Article 22 of the Decree of 13 December 1999, with regard to their activity concerning unclear pressure equipment. The report referred to in the last paragraph of this Article shall be sent to the Ministers responsible for nuclear safety. In case of failure to meet the acceptance conditions, the Ministers responsible for nuclear safety may suspend or withdraw this acceptance after the interested party has issued his comments.

Article 16 – I – The provisions of Title II shall enter into force the day after the publication of this Order in the Official Gazette. However:

- nuclear pressure equipment, except equipment making up the main primary circuit of nuclear steam supply systems, manufacture of which begins less than five years after the entry into force of Title II of this Order may be commissioned if it conforms either to the aforementioned Decree of 2 April 1926 or the aforementioned Decree of 18 January 1943 and their implementing texts, or the aforementioned Decree of 13 December 1999 and its implementing texts;
- nuclear pressure equipment making up the main primary circuit of nuclear steam supply systems, manufacture of which begins less than five years after the entry into force of Title II of this Order may be commissioned if it conforms to the applicable provisions of the aforementioned Decree of 2 April 1926 and its implementing texts and the aforementioned Order of 26 February 1974.

II. - The provisions of Article 5 of this Order shall enter into force three years after their publication in the Official Gazette. The provisions of Title III of this Order shall enter into force five years after their publication in the Official Gazette.

Equipment which, considering their characteristics, has not undergone the inspections or tests in implementation of the provisions of the aforementioned Decree of 2 April 1926 or of the aforementioned Decree of 18 January 1943 and which is subject, in implementation of this Order:

- to periodic inspection, shall undergo the first inspection before a period equal to the maximum time between two periodic inspections, counting from the entry into force of Title III of this Order, has expired;
- to periodic requalification, shall undergo the first inspection before a period equal to the maximum time between two periodic requalifications, counting from the entry into force of Title III of this Order, has expired.

Exceptions to regulatory provisions on the use of pressure equipment, granted in implementation of the aforementioned Decree of 2 April 1926 or of the Decree of 18 January 1943 or their implementing texts, shall be deemed specific implementation conditions of the provisions of Title III of the aforementioned Decree of 13 December 1999, as defined in Article 27 thereof, and of Title III of this Order, as long as the pressure equipment concerned does not undergo significant modification with the purpose of modifying its performance, intended use or type.

Article 17 – The aforementioned Order of 10 November 1999 is amended as follows:
I. – Point d) of Article 1 is deleted.
II. - A fourth indent is added to Article 3 "- to the part of emergency supply lines of main secondary circuits located inside the reactor building, in cases where their internal diameter is less than or equal to 25 mm".
III. - In Article 6, the word "producer" is replaced by the word "manufacturer".
IV. - In the first paragraph of Article 8, the words "in use" are replaced by "within the framework of the inspections laid down in Articles 14 and 15 below".
In the first and last indents of Article 8, the words "non-destructive examination" and "non-destructive inspection" are replaced by "non-destructive testing".
In the last indent of Article 8, the words "certified by an independent body authorised pursuant to legislation on pressure equipment" are replaced by "approved by a body authorised to this effect in accordance with Title IV of the Decree of 13 December 1999 on pressure equipment".
V. – In Article 10(I), the words "declared by an independent body authorised pursuant to legislation on pressure equipment" are replaced by "approved by a body authorised to this effect in accordance with Title IV of the Decree of 13 December 1999 on pressure equipment", and the words "qualification certificates" are replaced by "proof".
In Article 10(III), the words "qualified by an independent body authorised pursuant to legislation on pressure equipment" are replaced by "approved by a body authorised to this effect in accordance with Title IV of the Decree of 13 December 1999 on pressure equipment", and the word "certified" is replaced by "approved".
Article 10(IV) is replaced by "The Ministers responsible for nuclear safety shall set the conditions in which replacement parts may be fitted".
VI. – The last two sentences of Article 15(I) are deleted.
A fourth indent is added to Article 15(III): "The parts of equipment located upstream of the component of the last isolation device providing effective isolation may not be subjected to pressure during testing".

Article 18 – The Director-General for Nuclear Safety and Radiation Protection shall be responsible for the implementation of this Order, which shall be published in the Official Gazette of the French Republic.

Done at Paris, [date]

The Minister for the Economy, Finance and Industry,
For and on behalf of the Minister:
The Director-General for Nuclear Safety and Radiation Protection,

A.-C. LACOSTE

The Minister for Ecology and Sustainable Development
For and on behalf of the Minister:
The Director-General for Nuclear Safety and Radiation Protection,

A.-C. LACOSTE

ANNEX 1

Essential safety requirements applicable to category I to IV and level N1 nuclear pressure equipment, excluding certain pipework

The essential safety requirements applicable to category I to IV and level N1 nuclear pressure equipment, except for pipework of the main primary circuit of nuclear steam supply systems of a nominal dimension DN less than or equal to 50 and other pipework of a DN less than or equal to 100, shall be the requirements cited in Annex I to the aforementioned Decree of 13 December 1999, specified and supplemented as follows.

1. Preliminary and general points

The user shall provide the manufacturer with a description of all the situations which may apply to the equipment, in accordance with the safety report of the installation for which it is intended, supplemented by the associated files, as well as all the loads to be taken into account for each situation.
The manufacturer shall perform the risk analysis laid down in indent 3 of the preliminary comments of Annex 1 to the aforementioned Decree of 13 December 199, taking account of the data provided by the user and the radioactive nature of the fluid that will be contained.

2. Design

Equipment shall be designed in such a way as to minimise the risk of loss of integrity, taking account of foreseeable alterations to the materials.
The design shall be based on measures to reduce the risk of failure and on the calculation method intended to verify that the design guarantees the required level of safety.
These measures shall be implemented in order to reduce risks associated with:
- oligocyclic thermal fatigue or thermal fatigue due to a large number of cycles;
- the different thermal behaviours of materials welded together;
- vibration fatigue;
- local pressure peaks;
- creep;
- stress concentrations;
- corrosion phenomena;
- local harmful thermohydraulic phenomena;
- emptying of the equipment in case of rupture of the pipes.

The calculation method may be supplemented by an experimental design method.
The design shall take account of aging due to irradiation.

3. Manufacturing

3.1. - Forging and casting

Welded repairs of casting faults after the last quality heat treatment shall be limited in accordance with criteria specified by the manufacturer before the start of casting operations.

The processes used for the manufacture of forged components must ensure sufficient welding and adequate inclusion cleanliness, defined by the manufacture before the start of forging operations. The level of inclusion cleanliness shall be controlled at the end of manufacturing as necessary.

3.2. - Technical qualification

Before manufacturing, the manufacturer shall identify the components that pose a risk of heterogeneity of their characteristics linked to the production of materials or the complexity of the planned manufacturing operations. All manufacturing operations shall be subject to technical qualification. This is to ensure that components manufactured under the conditions and in accordance with the procedures of the qualification will have the required characteristics.

3.3 – Permanent assemblies and welded covers

Welds in areas exposed to significant irradiation during use shall be limited as much as possible.

The provisions of the procedures for welded coverings shall be intended to avoid detachments and the appearance of cracking in and under the covering.

Welding procedures, including welded coverings, and the staff implementing them shall be approved by a notified body pursuant to Article 12 of the aforementioned Directive 97/23/EC of 29 May 1997.

Welded connections on pipework shall be prohibited.

For welded joints, the joint coefficient shall be taken as 1.

3.4. - Non-destructive testing

The purpose of non-destructive testing shall be to detect manufacturing defects deemed unacceptable.

Non-destructive testing of permanent assemblies shall be performed by qualified staff, with an appropriate degree of aptitude, approved by a third party body that is recognised pursuant to Article 13 of the aforementioned Directive 97/23/EC of 29 May 1997.

Unless there is specific justification:

- permanent assemblies that have to withstand pressure shall undergo a test of their entire volume;
- cast components shall undergo testing of their entire volume;
- an examination of each of the final surfaces of the components shall be performed by appropriate means.

3.5. - Traceability

Traceability requirements shall apply to welding materials and other assembly materials.

3.6. - Final check

The hydrostatic pressure test, or the resistance test performed using a fluid other than water for equipment that does not have to contain water, shall be performed on each piece of equipment. The test shall be deemed passed if the pressure is supported without any leak or any lasting deformation visible under direct visual examination.

3.7. - Marking and labelling

The rules on marking laid down by the aforementioned Decree of 13 December 1999 shall apply, with the exception of the rules on “CE” marking.

3.8. - Service instructions

Pressure equipment shall be accompanied by instructions.

The instructions shall indicate the specific characteristics of the design which determine the lifespan of the equipment. As a minimum, these characteristics shall include:

- for creep, the theoretical number of hours of operation at given temperatures;
- for fatigue, the theoretical number of cycles at given stress levels;
- for corrosion, the reinforcement or the anti-corrosion protection characteristics;
- for heat aging, the theoretical number of hours of operation at given temperatures;
- for aging due to irradiation, the maximum theoretical fluence at given irradiation temperatures.

4. Materials

Without specific reasoning, materials shall be chosen based on significant experience of their proper behaviour in manufacture and operation.
Materials must not, *per se*, cause excessive limitations on manufacturing control or inspection during operation.
A certificate shall be drawn up by the manufacturer for each material, with specific product control, certifying its conformity with the compulsory requirements.
Materials with a ferritic surface zone, other than nuts and bolts, shall have, including in welds (formula and test coupons), a breaking strain at room temperature greater than or equal to 20%, shock flexural energy on a ISO V testpiece at 0°C greater than or equal to 40 J and, unless there are specific justifications relating in particular to their ductility, their weldability and machinability, tensile strength at room temperature limited to 800 MPa. The limit of 40 J shall be increased to 60 J for materials whose tensile strength at room temperature is greater than or equal to 600 MPa.

Materials with an austentite or austeno-ferritic structure, other than nuts and bolts, shall have, apart from welds, a breaking strain at room temperature greater than or equal to 35%, shock flexural energy on an ISO V testpiece at room temperature greater than or equal to 100 J and, unless there are specific justifications relating in particular to their ductility, their weldability and machinability, tensile strength at room temperature limited to 800 MPa. Verification of the shock flexural energy shall not be necessary if the breaking strain is greater than or equal to 45%. For deposited metal, the criterion of 35% shall be reduced to 25%, and the criterion of 100 J shall be replaced by a criterion determined in relation to the capacities of the process, as they are defined by their qualification. This criterion shall not be less than 60 J for the formula and 50 J for the test coupons.

Materials with a martensitic structure, other than nuts and bolts, shall have a breaking strain at room temperature greater than or equal to 14%, shock flexural energy on an ISO V testpiece at 0°C greater than or equal to 40 J, an appropriate transition temperature and, unless there are specific justifications relating in particular to their ductility and their weldability, a ration between their elasticity limit at room temperature and their tensile strength at room temperature at least equal to 0.85.
Nuts and bolts shall have a tensile strength at room temperature greater than or equal to 12%, shock flexural strength on an ISO V testpiece at 0°C greater than or equal to 40 J and, if the breaking strain at room temperature is less than 14%, a reduction of area greater than or equal to 0.45. For materials with an austensitic structure, the shock flexural energy criterion of 40 J at 0°C may be replaced by a criterion of 50 J at room temperature.

ANNEX 2

Essential safety requirements applicable to category I to IV and level N2 nuclear pressure equipment and certain category I or II and level N1 pipework

The essential safety requirements applicable to category I to IV and level N2 nuclear pressure equipment, pipework of the main primary circuit of nuclear steam supply systems of a nominal dimension DN less than or equal to 50 and other category I or II and level N1 pipework of a DN less than or equal to 100, shall be the requirements cited in Annex I to the aforementioned Decree of 13 December 1999, specified and supplemented as follows.

1. Preliminary and general points

The user shall provide the manufacturer with a description of all the situations which may apply to the equipment, in accordance with the safety report of the installation for which it is intended, supplemented by the associated files, as well as all the loads to be taken into account for each situation.
The manufacturer shall perform the risk analysis laid down in indent 3 of the preliminary comments of Annex 1 to the aforementioned Decree of 13 December 199, taking account of the data provided by the user and the radioactive nature of the fluid that will be contained.

2. Design

Equipment shall be designed in such a way as to minimise the risk of loss of integrity, taking account of foreseeable alterations in the materials.
The design shall take account of aging due to irradiation.

3. Manufacturing

Unless there are specific reasons, permanent assemblies that have to withstand pressure shall undergo a test of their entire volume.
All welded nozzles and flanges of cast equipment shall undergo appropriate non-destructive testing.
The rules on marking laid down by the aforementioned Decree of 13 December 1999 shall apply, with the exception of the rules on “CE” marking.

4. Materials

Materials with a ferritic structure, other than nuts and bolts, shall be deemed sufficiently ductile if their breaking strain in a tensile test, performed in accordance with a standardised procedure, is at least equal to 14%, and if their shock flexural energy on an ISO V testpiece at 0°C is at least equal to 27 J.
Materials with an austenitic structure, other than nuts and bolts, shall be deemed sufficiently ductile if their breaking strain in a tensile test, performed in accordance with a standardised procedures, is at least equal to 25% and if their shock flexural energy on an ISO V test piece at 20°C is at least equal to 60 J or, for deposited metal, 50 J on test coupons. Where the breaking strain is at least equal to 45%, and in the case of nickel-based alloys, verification of the shock flexural energy shall not be necessary.
Nuts and bolts shall have a tensile strength at room temperature greater than or equal to 12%, shock flexural strength on an ISO V testpiece at 0°C greater than or equal to 40 J and, if the

breaking strain at room temperature is less than 14%, a reduction of area greater than or equal to 0.45. For materials with an austensitic structure, the shock flexural energy criterion of 40 J at 0°C may be replaced by a criterion of 50 J at room temperature.

ANNEX 3

Essential safety requirements applicable to category I to IV and level N3 nuclear pressure equipment

The essential safety requirements applicable to category I to IV and level N3 nuclear pressure equipment shall be the requirements set out in Annex 1 to the aforementioned Decree of 13 December 1999, specified and supplemented as follows.

1. Preliminary and general points

The user shall provide the manufacturer with a description of all the situations which may apply to the equipment, in accordance with the safety report of the installation for which it is intended, supplemented by the associated files, as well as all the loads to be taken into account for each situation.
The manufacturer shall perform the risk analysis laid down in indent 3 of the preliminary comments of Annex 1 to the aforementioned Decree of 13 December 199, taking account of the data provided by the user and the radioactive nature of the fluid that will be contained.

2. Design

Equipment shall be designed in such a way as to minimise the risk of loss of integrity, taking account of foreseeable alterations in the materials.

3. Manufacturing

Pressure-resistance welds shall undergo adapted non-destructive testing.
The rules on marking laid down by the aforementioned Decree of 13 December 1999 shall apply, with the exception of the rules on “CE” marking.

ANNEX 4

Requirements for determining radiation protection requirements

1. Materials

Materials shall be chosen taking account of their possible activation and the release of corrosion products that may, following activation, necessitate radiation protection measures during operation.

2. Design

The design of all equipment that, during operation, has to be exposed to corrosion, erosion, internal abrasion or other chemical attacks shall be subject to appropriate measures in order to limit as far as possible the release of products and to avoid the equipment being activated.

3. Method of inspection and maintenance

Equipment shall be designed so that all operations laid down in implementation of Title III of this Order can be carried out in such a way as to ensure, in compliance with the principles and rules laid down by the Public Health Code and the Employment Code, that persons carrying out or monitoring these operations are protected against radiation.

ANNEX 5
Installation, commissioning, monitoring, maintenance and use of nuclear pressure equipment

The provision of this Annex shall not apply to the following nuclear pressure equipment:
- category 0 or I and level N2 or N3 equipment;
- category II to IV and level N2 or N3 equipment for liquids whose vapour pressure, at the maximum permissible temperature, is less than or equal to 0.5 bar above normal atmospheric pressure (1013 mbar).

1. Information on nuclear pressure equipment

The information laid down in Article 17(II) of the aforementioned Decree of 13 December 1999 shall include the following details:
a) the descriptive file, comprising:
- the technical documentation used for the conformity assessment of the equipment or assembly;
- any certifications issued by the inspection body that performed this conformity assessment;
- the conformity declaration drawn up by the manufacturer,

or the descriptive schedule as well as the test reports or certificates, if the equipment has been manufactured in accordance with the provisions of the aforementioned Decrees of 2 April 1926 or of 18 January 1943.
This file shall be supplemented as necessary by:
- documents certifying control of the safety accessories;
- documents that make it possible to verify that the products used for the thermal insulation of equipment and assemblies and the coverings used for the purposes of physical or chemical protection are chemically neutral with regard to the walls of the equipment to be protected and that their mechanical adherence is adapted to the operating conditions;

b) the manufacturer's instructions;
c) the operating manual, comprising:
- any attestation of commissioning control;
- the reports of maintenance and monitoring operations;
- the periodic requalification reports;
- documents certifying that the conformity assessment or the examination referred to in paragraph 4.2(b) of this Annex has been carried out after repair or modification;
- a list of degradations and defects detected, specifying the treatment applied;
- a list of operating incidents, in particular stress of the safety accessories.

2. Maintenance and monitoring of nuclear pressure equipment

The provisions laid down in Article 17(II) of the aforementioned Decree of 13 December 1999 are specified as follows:

2.1 – For all equipment, the manufacturer shall draw up and implement a programme of maintenance and monitoring operations. For certain equipment its shall include periodic inspections performed under the conditions laid down in paragraph 3 of this Annex.

2.2 – For level N1 equipment, implementation of the programme of maintenance and monitoring operations shall be intended to avoid defects and degradations leading to failure of the equipment. This programme shall lay down the implementation of measures necessary to understand the nature, origin and possible development of defects and degradations detected on equipment. Defects and degradations shall be removed unless there is convincing proof that they cannot cause failure of the equipment. The programme of maintenance and monitoring operations shall be sent to the prefect, who shall comment on it, to which the operator shall be bound to reply, and who may supplement these comments.

2.3. - For level N2 or N3 equipment, implementation of the programme of maintenance and monitoring operations shall be intended to maintain the level of safety of the equipment at the requisite level during design. This programme may be replaced, insofar as the operator uses a recognised inspection service, by an inspection plan drawn up in accordance with a professional guide accepted by the Ministers responsible for nuclear safety. This inspection plan shall detail all the inspection activities referred to in Article 19 of the aforementioned Decree of 13 December 1999.

2.4. - The operator shall update the programme of maintenance and monitoring operations as necessary, taking account of the actual use of the equipment, any changes during operation, in particular changes to the properties of materials and defects and degradations detected, as well as the experience and results of periodic requalifications.

2.5. - The non-destructive tests that appear in the programme of maintenance and monitoring operations or in the inspection plans shall be implemented by qualified staff, with the appropriate level of competence, approved by a body authorised to this effect in accordance with Title IV of the aforementioned Decree of 13 December 1999.

2.6. - Non-destructive testing procedures used on category I to IV and level N1 equipment shall, prior to their use, be qualified by an accredited body. The qualification shall be intended to prove that the procedure meets its objectives.

3. Periodic inspection of nuclear pressure equipment

The conditions of the periodic inspections referred to in paragraph 2.1 above are specified as follows:

3.1 – The periodic inspection shall be performed for the following nuclear pressure equipment:
- category I to IV and level N1 containers and pipework, as well as pressurised safety accessories connected thereto or associated therewith;
- category II to IV and level N2 containers and pipework, as well as pressurised safety accessories connected thereto or associated therewith;
- category II to IV and level N3 containers, as well as pressurised safety accessories connected thereto or associated therewith.

3.2 – The periodic inspection shall be performed under the responsibility of the operator by a competent person who is capable of recognising defects and degradations likely to be discovered and of assessing their seriousness. The prefect may oppose the person who performed the periodic inspection if he feels the person does not comply with these conditions. The challenge shall be notified to the person concerned and the operator.

3.3 – The period between two periodic inspections may not exceed:
- 12 months for equipment made of materials other than metal, unless these materials are subject to aging tests performed in accordance with specifications accepted by the Ministers responsible for nuclear safety, in which case the period shall be increased to 40 months;
- 40 months for containers and safety accessories and pressure accessories connected thereto or associated therewith;
- 40 months level N1 pipework and safety accessories and pressure accessories connected thereto or associated therewith;
- 72 months for level N2 pipework and safety accessories and pressure accessories connected thereto or associated therewith, the sum of two consecutive periods not exceeding 120 months.

However, if the equipment is out of service at the end of this period, the periodic inspection may be deferred, but must precede recommissioning of the equipment.

3.4 – The periodic inspection shall comprise external inspection of the equipment, including permanent assemblies on the equipment, as well as operating inspections and tests adapted to the type and function of the safety accessories on the equipment.
For containers, the periodic inspection shall also include internal inspection, unless the operator can guarantee that these containers have been continually filled with a fluid with characteristics such that no degradation can happen. In this case, exception from the internal inspection must be granted by the prefect on the basis of appropriate justifications.
External and internal inspections shall cover all visible parts after all removable parts have been stripped and removed. For equipment that is covered externally or internally, as well as for equipment fitted with an internal coating, some of these inspections may be replaced, if necessary, by specific examinations, the nature and scope of which take account of the operating, monitoring and maintenance conditions, and of the environmental conditions of each piece of equipment, and which are subject to an opinion from an independent approved and accepted body. Any situation involving the complete or partial stripping of the wall of such equipment shall be carried out so that inspection can take place.
For level N" heat-insulating pipework and pressure accessories connected thereto, periodic inspections may be restricted to areas deemed the most vulnerable to degradation, provided that the programmes of maintenance and monitoring operations lays down specific monitoring provisions for other areas, such as to guarantee their partial external inspection. The choice of areas deemed the most vulnerable as well as the specific provisions for other areas, and the frequency of implementation of these specific monitoring provisions shall be validated by an independent approved and accepted body.

3.5 – The periodic inspection shall lead to the drawing up of a report indicating the dates and results of the operations undertaken. This report shall be signed by the person who performed the periodic inspection and by the operator. In cases where the periodic inspection reveals a change in the level of safety of a piece of equipment, recommissioning of this equipment shall be subject to the positive outcome of a new periodic inspection performed under the same conditions, but the scope of which may be limited to only the parts affected by this change.

4. Installation and use of nuclear pressure equipment

4.1 – The provisions laid down in Article 17(IV) and (V) of the aforementioned Decree of 13 December 1999 are specified as follows:

a) permanent assemblies on nuclear pressure equipment, constructed after the conformity assessment, shall be constructed under the responsibility of the operator in accordance with the technical specifications defined in Title II of this Order, with the exception of the final inspection test;
b) pipework shall be marked so as to enable them to be identified, and fitted with all necessary accessories for their proper use (particularly drains and vents).

4.2 – The provisions laid down in Article 17(VII) of the aforementioned Decree of 13 December 1999 are specified as follows:
a) All repairs or modifications likely to affect the conformity of the equipment with the requirements laid down in Articles 6 to 9 of this Order shall be deemed significant. The criteria defining significant repairs and modifications shall be specified in a professional guide subject to acceptance of the Ministers responsible for nuclear safety. The conformity assessment performed in application of Article 17(VII) of the aforementioned Decree of 13 December 1999 may only affect the repaired or modified part. At the end of this conformity assessment, the operator shall draw up and sign a declaration of conformity, whereby he shall attest to the conformity of the equipment.
b) In other cases, the conformity assessment shall be replaced by examination, by the operator, of the accompanying documents relating to repair or modification, the performance of a visual inspection and appropriate non-destructive tests, which may be restricted to the repaired or modified parts.
c) Equipment manufactured in accordance with the aforementioned Decree of 2 April 1926 or the aforementioned Decree of 18 January 1943 and their implementing texts may be repaired or modified in accordance with the technical provisions defined by the applicable Decree and its implementing texts. The provisions of Articles 9, 10 and 12 of the aforementioned Decree of 24 March 1978 shall be deemed to be met if:

- the modes of operation are approved by a body authorised to this effect in accordance with Title IV of the aforementioned Decree of 13 December 1999;
- the staff responsible for inspections are approved by a body authorised to this effect in accordance with Title IV of the aforementioned Decree of 13 December 1999;
- welders and operators are approved as staff responsible for permanent assemblies by a body authorised to this effect in accordance with Title IV of the aforementioned Decree of 13 December 1999.

ANNEX 6
Inspection of nuclear pressure equipment in service

The provisions of this Annex shall not apply to level N2 or N3 nuclear pressure equipment for liquids whose vapour pressure, at the maximum permissible temperature, is less than or equal to 0.5 bar above normal atmospheric pressure (1013 mbar).
The nuclear pressure equipment to which the provisions of this Annex apply is cited in paragraphs 1.2 and 2.1 below. The following inspection operations shall be performed in accordance with Article 18 of the aforementioned Decree of 13 December 1999, by an independent body approved and accepted in accordance with the procedure in Article 15 of this Order, unless performance of the inspections is authorised under the direction of an inspection service recognised in accordance with Article 19 of the aforementioned Decree of 13 December 1999.

1. Commissioning inspection of nuclear pressure equipment

1.1 – Category I to IV and level N1 nuclear pressure equipment as well category IV and level N2 equipment, with the exception of category IV safety accessories associated with category 0 and level N1 or category 0, I, II or III and level N2 nuclear pressure equipment, shall undergo the commissioning inspection laid down in Article 18 of the aforementioned Decree of 13 December 1999. One inspection operation may cover several pieces of nuclear pressure equipment.
1.2 – This inspection shall comprise:
- verification of compliance with provisions on the installation of nuclear pressure equipment;
- verification of the existence of conformity declarations;
- verification of the functioning of the safety accessories;
- verification of the existence of programmes of maintenance and monitoring operations;
- verification that the programmes of maintenance and monitoring operations can be implemented;
- verification that this implementation complies with the principles and rules on radiation protection laid down by the Public Health Code and by the Employment Code.

The independent approved and accepted body or the recognised inspection service shall issue a commissioning inspection certificate to the operator. The operator shall send a copy of this certificate to the regionally competent regional director of industry, research and the environment.
When a fixed piece of equipment is newly installed, the commissioning inspection must be repeated and supplemented by an inspection performed in accordance with the inspection and periodic requalification procedures laid down in paragraph 2.4 of this Annex.

2. Periodic requalification of nuclear pressure equipment

2.1 – The following nuclear pressure equipment shall be subject to the periodic requalification laid down in Article 18 of the aforementioned Decree of 13 December 1999:
- category I to IV and level N1 equipment;
- category II to IV and level N2 or N3 containers and safety accessories and pressure accessories connected thereto or associated therewith;
- category III and level N2 or N3 pipework and safety accessories and pressure accessories connected thereto or associated therewith.

2.2 – Except for conversion authorised by the prefect in accordance with Article 9 of the aforementioned Decree of 13 December 1999, the maximum period between two periodic requalifications shall be set as:
- 2 years for equipment made of materials other than metal. This period shall be increased to 5 years if material aging tests have been performed in accordance with specifications accepted by the Ministers responsible for nuclear safety;
- 5 years for equipment containing a toxic, very toxic or corrosive fluid, with regard to the walls of the equipment;
- 10 years for other equipment.

2.3 – Unless there are specific procedures authorised by the prefect in accordance with Article 19 of the aforementioned Decree of 13 December 1999, the periodic requalification of equipment shall comprise the following operations:
- a periodic requalification inspection;
- a test, normally taking the form of a hydraulic test or, for equipment that does not have to contain water, a resistance test performed using a fluid other than water;
- inspection of the safety accessories protecting it.

These operations are described below.

2.4 – The periodic requalification inspection shall comprise:
- internal inspection and external inspection of the equipment, including permanent assemblies constructed on the equipment and pressure accessories installed on the equipment. For pipework and pressure accessories connected to it, the internal inspection may be replaced by appropriate non-destructive tests performed in accordance with a programme accepted by the recognised inspection body or service that performs the requalification inspection;
- verification of the existence of the documents laid down in Annex 5(1) and that they are adequate;
- any additional examination or test deemed useful by the recognised inspection body or service.

The periodic requalification inspection shall cover all visible parts after all removable parts have been stripped and removed.
For level N2 heat-insulating pipework and pressure accessories connected thereto, when the operator, for the periodic inspections, applies the last subparagraph of Annex 5(3.4), the periodic requalification inspection may be limited to the areas deemed the most vulnerable to degradation. When the operator uses a recognised inspections service, the periodic requalification inspection may be limited to the areas deemed the most vulnerable to degradation, definition of these areas having been approved by this recognised inspection service.
For level N3 heat-insulating pipework and pressure accessories connected thereto, the periodic requalification inspection may be limited to the areas deemed the most vulnerable to degradation. Definition of these areas shall be approved by an independent approved and accepted body or by the operator's recognised inspection service.

2.5 – The test shall be performed in the light of positive results from the inspection.
It shall consist of maintaining the equipment at a pressure equal to 120% of the maximum permissible pressure PS.
For equipment constructed in accordance with the provisions of the aforementioned Decree of 2 April 1926 and its implementing texts, the test may be performed with a test overpressure

reduced to a third of that set for the initial test, provided that the maximum period between two periodic inspections is that laid down by these texts.
The pressure shall be maintained for the entire time necessary for complete examination of the walls of the equipment.
The test shall be deemed passed if the equipment has not sustained any leaks throughout the duration of the test and does not have any lasting deformation visible under direct visual examination.
Level N2 pipework and safety accessories and pressure accessories connected thereto or associated therewith shall undergo either an individual test or an overall test, possibly in service, providing the same level of information regarding the level of safety of the equipment as that provided by a test performed on the heat-insulating pipework.
Level N3 pipework and safety accessories and pressure accessories connected thereto or associated therewith shall be exempt from the periodic requalification test.

2.6 – Verification of safety accessories shall comprise the operations necessary in order to guarantee:
- their presence;
- their conformity with the descriptive schedules or instructions of the equipment they protect;
- their suitability to protect against the permissible limits being exceeded.

2.7 – At the end of the requalification operations, the independent approved and accepted body or the recognised inspection service shall apply its mark to the nuclear pressure equipment concerned.
Periodic requalification operations shall be subject to a report, drafted and signed by the representative of the independent approved and accepted body or the recognised inspection service, whereby he certifies that these operations have been carried out. The detailed reports of the operations performed shall be attached to this report, indicating the procedures used, the findings, particularly defects discovered, and the measures taken following these findings.
This report shall be sent immediately to the operator.
The operator shall revise his programme of maintenance and monitoring operations to take account of the findings made during requalification.