INSPECTION DURING THE STARTING-UP PHASE OF NUCLEAR POWER PLANTS IN SPAIN

José M. Figueras Clavijo.
Departamento de Seguridad Nuclear.
Junta de Energía Nuclear.

Dentro del programa nuclear español, existen siete unidades que han recibido ya el Permiso de Construcción, y de estas, tres se encuentran en avanzado estado de construcción (más del 75%), y cercanas a la fase de verificación prenuclear. La primera parte de la comunicación se refiere al tratamiento técnico del arranque de una central nuclear en España según la reglamentación legal vigente. La segunda parte trata la problemática relacionada con las inspecciones en servicio, en especial la de referencia.

Within the spanish nuclear program, there are seven units which have received building permits, and of these, three are in the advanced building stage (over 75%), and close to starting the prenuclear tests phase. The first part of this report deals with technical -- treatnent refering to the commissioning of a nuclear power plant in Spain in view of the provisions set forth by the Regulations on Nuclear Installations. The second part of the report deals with the - problems related to the application of in-service inspections, in - particular with the reference inspection.

1. INTRODUCTION

The supply of electrical energy from nuclear sources commenced in Spain in the year 1968 with the starting of the "José Cabrera" (Zorita) nuclear power plant. One decade has gone by from that date until now, and at present, Spanish nuclear potential has grown to the extent that there are three nuclear power plants in operation, a further 7 in various stages of construction, and about 12 pending official licensing, which means a growth from 160 MWe in 1968 to an expected 18,000 - 20,000 MWe in 1985-86.

This considerable increase has forced all sectors concerned to work with advanced technology, from the owner-electric companies, components manufacturers, construction-assembly companies, inspection agencies and auxiliary industries, down to the Administration itself.

In particular, tests during the starting-up phase of a nuclear power plant, both in the pre-nuclear and nuclear phase itself, no longer are carried out solely according to the set rules applied in other similar plants, but are undertaken using a mixed system of applying experience gained in the field together with "reference plant" concept.

2. ADMINISTRATIVE REGULATIONS

In Spain, the starting-up phase (commissioning) of a nuclear power plant is dealt with in Chapters 4 and 5 of Title II of the Regulation on Nuclear and Radioactive Installations, in force since 1972. Article 20 of said Regulation textually states: "Pre-nuclear tests will be understood as tests, verifications and checks to be carried out in each of the different systems which comprise the installation (plant), once these have been incorporated into same, and in any event prior to the intake of nuclear substances or the loading of nuclear fuel".

Also, Article 24 states: ".... the carrying out of nuclear tests which shall be understood to be the tests and checks to be carried out in the installation (plant) after the intake of nuclear substances or the loading of nuclear fuel, including in same the different phases of experimental operation which allow basic data to be obtained for an evaluation of the installation's nuclear safety condition".

We can deduce from the foregoing that in Spain, the nuclear tests commence with the initial loading of nuclear fuel, and end when, by means of trials, it is proven that the requirements for nuclear safety, radiological protection and quality assurance set out in the Preliminary and Final Safety Reports are met in a practical sense, in accordance with the design and construction.

On looking at the date of the Regulation, 24th October,1972, it can be observed that the three nuclear power plants in operation, José Cabrera (PWR), Santa Maria de Garoña (BWR) and Vandellós (GCR), were not subject to its rules. With regard to the setting-up phase, the three plants were tested by the supplier himself, as these projects were undertaken using a "turn-key" system, by which the principal suppliers (Westinghouse, General Electric and SOCIA respectively), took charge of the design, construction, assembly and starting-up tests, handing over the plant to the operator.

Once the Regulations came into force in 1972, the plants under construction found that their start-up programs had to be adapted to the provisions of Regulations. In particular, the documentation which the permit applicant (electric company or group of companies) has to present to the Administration, follows the administrative formalities which are included in Annex I, and included in the application documentation for the Provisional Operation Permit.

3. PRE-NUCLEAR TESTS

For pre-nuclear tests, the holder of the construction permit (the applicant) may propose a global or staggered test program, and he is responsible for executing same. These tests and verifications must "guarantee the adequate performance of the equipment or component parts which comprise the installation, both with regard to nuclear safety and radiological protection, and in accordance with Spanish industrial and technical regulations",(Art. 21). Compliance with the guarantee and quality control during this phase is insured as the applicant is obliged to carry out a quality control program for the components and equipment related to nuclear safety. (Art. 21).

The Regulations indicate the main points of the start-up program contents when it points out that "the pre-nuclear tests shall aim to insure the correct performance of the system or the adequacy of the installation's characteristics in relation to the following points:

1. Mechanical conditions of the installation, strength and leakproof qualities.

2. Prolonged performance of the elements when subjected to alternate or cyclical stresses.

3. Heat conditions, temperature resistance and dilation compatability.

4. Thermodynamic conditions, heat transfer and extraction.

5. 1. Radioactivity regulation and control systems
   2. Nuclear safety systems.

6. Radiation containment and efficiency of the protective shields, if and wherever necessary.

7. Systems for emergency protection and elimination of radioactive waste,and

8. Electrical supply systems."

However, it is also indicated that specific considerations, applicable in each case, will be taken into account.

The documentation normally presented by the applicant consists of three basic documents:

- Organization manual of the start-up personnel.

- Program and timetable for pre-nuclear tests, and

- Basic procedures (preliminary) for pre-nuclear tests.

Each of the three basic documents is evaluated in the following manner:

- Organization Manual: an audit is made of the technical-administrative method of the start-up Manual, with special attention being given to the following points:

  - Organization of the start-up personnel
  - Start-up program administration
  - Start-up documentation control
  - Design modifications and changes during start-up
  - Maintenance during tests
  - Equipment cleaning and protection
  - Test instrumentation equipment
  - Training of test personnel
  - Labelling and marking of components, equipment and systems
  - Tested systems delivery procedures.

- Start-Up Program: the list of tests to be carried out is reviewed, comparing same with the index presented in Appendix A of the USAEC Regulatory Guide 1.68, revised in November 1973, which should be complied with by Spanish installations as a consequence of the "reference plant" concept previously mentioned.

- Start-Up Timetable: the applicant proposes the dates, for carrying out the tests, using a graph or PERT, which should be comprehensive.

- Basic procedures: each programmed test is described and evaluated by means of a thorough check emphasizing that the minimum contents should be:

  - Object of the test
  - Pre-requisites
  - Initial conditions
  - Reference documents
  - Precautions, limits and signal points
  - Instructions and step-by-step check lists
  - Criteria for approval of results
  - Labelling and system discharging
  - Signature sheet (preparation, revision, approval...)
  - Personnel and equipment required.

During the period of start-up documents evaluation, several technical meetings are held with the applicant in order to carry out audits and to request additional documentation, if necessary. Inspection visits are also organized to the site, to observe the condition of the offices and start-up files.

Once the evaluation has been completed, which supposes an average effort of 20-30 weeks x man, a preceptive report is drawn up for presentation to the Energy Administration Board, which in turn issues the authorization for pre-nuclear verification of the installation, if appropriate and this authorization "will indicate the tests and cehcks which, within the scope of the approved program, must be carried out in the presence of specialized personnel from the Provincial Delegations of the Ministry of Industry or the personnel appointed by the Energy Administration Board and the Nuclear Energy Board (JEN). In each case, the official representative shall issue an official report which summarizes the tests carried out and the results obtained. The permit holder may make any comments he considers pertinent, for their inclusion in the offical report" (Art. 22).

Included in each authorization is the list of tests in which the obligatory presence of the JEN inspectors is required; the hold-point tests normally selected are:

- Containment spray system.
- Emergency electrical system (diesel, batteries).
- Cold hydrostatic test of the primary cooling system.
- Tightness and integrity of the containment area.
- Hot functional test of the primary cooling system.
- Emergency core cooling system.
- Reactor protection and radiation surveillance systems.
- Control room ventilation system.
- Essential component cooling system.
- Checking of nuclear fuel handling tools.
- Communications system.
- Firefighting system.

In addition, it is normally required that a physical protection system (anti-sabotage) for the plant be functioning before the start-up tests are commenced. Of the above list of tests, which must be carried out in the presence of the JEN inspectors, the applicant must submit the subsequent editions of the detailed

procedures (final) to JEN so that their technical services may evaluate same. As from the date of authorization of the pre-nuclear check, the applicant initially submits a quarterly review of the test timetable, and this is later submitted with greater frequency and he informs when the preceptive tests have to be carried out.

For each witnessed test, an official report is issued by the JEN inspectors, and for those which are not witnessed by the inspectors and "which may be carried out without the presence of official specialized personnel, an official record must be made of the tests carried out and the results obtained, which shall be signed by the permit holder and the representative of the Institute, Laboratory, Center or Body executing the work" (Art. 22). The results obtained are evaluated by means of an audit which emphasizes that the report of the results shall contain, at least:

- review of changes during the test
- review of deficiencies found
- review of results and approval or rejection of same
- review of quality assurance
- signature sheet.

4. NUCLEAR TESTS

Once the pre-nuclear tests are completed and all the relative results reports, both those prepared by the official representatives and those prepared by the permit holder, have been submitted to the Energy Administration Board and which state that the pre-nuclear check is completed, the licensee should request the provisional operation permit, submitting various documents. One of these documents is the Nuclear Test Program. which basically consists of:

- Organization manual of the start-up personnel (already submitted to the Administration when applying for the pre-nuclear check authorization).

- Nuclear test program and timetable, and

- Basic procedures (preliminary) of the nuclear tests.

The study and evaluation process used in this case is identical to that used for pre-nuclear study and evaluation. The Administrative manual revisions which have been edited are evaluated;

the list of nuclear tests is compared to those indicated in Appendix A of the Regulatory Guide 1.68 (November 1973), and the procedures are evaluated. When the evaluation period ends, the Nuclear Energy Board sends its preceptive report to the Energy Administration Board, which in turn issues - if appropriate and if all the documentation is complete - the Provisional Operation Permit, in which the nuclear tests to be carried out, among others, are indicated. These nuclear tests are preceptive, in other words, they must be carried out in the presence of inspectors from JEN, from the Provincial Delegation of the Ministry of Industry and from the Energy Administration Board (Art. 30).

In addition, as in the case of pre-nuclear tests, periodic meetings are held with the licensee to qualify doubts which may have arisen in the evaluation and to request additional documentation, if necessary.

It is more difficult to calculate the necessary effort in this nuclear phase as there is no temporary separation between the pre-nuclear and nuclear tests, but we can estimate a figure of 10-12 weeks x man.

In the same manner, "an official report summarizing the tests carried out and the results obtained will be prepared and signed by the permit holder and, if applicable, the official representatives and each one of the parties, can indicate in said report any statement they consider pertinent". (Art. 30).

During this phase, "the official representatives have the power to suspend execution of the tests at any time, when their continuation represents a potential danger, and the Energy Administration Board will be advised so that it may adopt the necessary measures". (Art. 30, paragraph 4).

When all the nuclear tests indicated in the nuclear test program have been completed and if all the test reports are complete and formalized and the results are correct - using Procedure C (Var 02-77, Rev. 2) to audit same - the start-up phase of the nuclear power plant will be considered as terminated and the operation phase will begin, with the owner/operator requesting a definite operation permit, and presenting various documents, which include amongst others "a) certificates and vouchers relative to the nuclear test program and the provisional operation". (Art. 31).

Independent of the official regulations, there is another rule which the applicants are obliged to fulfill and it is indicated in the different authorizations: preliminary construction, etc. In particular, each installation's preliminary authorization specifies that "the plant will be designed in accordance with the codes and national rules which are applicable. In addition, those guidelines established by international Organizations and adhered to by the Spanish Government will also be followed. For those cases not covered by the rules, codes or national and international guidelines, the codes and rules whose application is well-known in the nuclear industry will be applied. If it is not contrary to that stated above, the codes and rules established in the project's country of origin will be applied. By means of this obligation, foreign rules can be used in Spain and in particular, for the starting-up operation, they are basic documents for evaluating all those edited by the American NRC, such as the CFR Regulations, the Regulatory Guides applicable and the rules and codes such as the ASTM, ASME, ANS, IEEE, etc.

The start-up period of a nuclear power plant can last, on the average, from one year to a year and a half and, therefore, an approximate effort of 100-120 weeks x man must be made to evaluate the requests and inspections during the tests, according to the formalities indicated in Annex I.

5. PRE-SERVICE INSPECTION

Before starting up the nuclear power station it is necessary to specifically test that all the components and weldings in the pressure barrier meet the applicable standards for each case. This preliminary inspection, which is carried out by the application of non-destructive test techniques, is used as a reference inspection (fingerprint) in relation to future inspections to test that the status of the different components and weldings of the primary barrier does not deteriorate with use.

The basic documentation for drawing up an inspection program is referred to in the ASME Code, Section XI, in its various triennial revisions. As a result of the "reference plant" concept already mentioned, the Spanish nuclear power plants, which are of American design, in the pressure water or boiling water types, are obliged to follow the rules contained in Section XI of the ASME Code. Depending on the authorization dates (provisional operation permit), each plant is obliged to follow the

requisites contained in different editions, in other words, in certain units such as José Cabrera and Santa M. Garoña, edition 1971 was followed until the winter 1972 and summer 73 addendas, respectively. However, at the present time there is a tendency to utilize later revisions (in Garoña, now, the Edition covering 1974 to summer 1975 is used), which are not obligatory from a legal point of view, but which are of technical interest for obtaining greater safety and confidence in the installation in view of the high reliability level which the use of new revisions can represent over the old ones.

A similar case occurs in the plants under construction of Almaraz, Lemoniz, Ascó, and Cofrentes, where the Edition 1971 to winter 1973 is legally applicable, but as automated techniques are already being applied in Spain for non-destructive tests, the edition that the owners have voluntarily chosen is the 1974 to summer 1975 edition.

Preparation, execution and analysis of the results obtained during in-service inspection in nuclear power plants is normally carried out by companies in this field of non-destructive tests who have had to make considerable technical efforts to meet the strict requirements demanded by nuclear energy. In 1970, and in this regard, a company called TECNATOM, was created and established with capital from the seven largest electric companies in the Country, in order to have a technical back-up service to carry out specific jobs in the nuclear field. Within this private organization, there is a Special Techniques Department, which takes care of offering the preparation of inservice inspection programs. Therefore, the Spanish nuclear power plants which, in their majority, belong to the seven electric companies, contract preparation and execution of the inservice inspection work with TECNATOM who, in turn, usually sub-contracts it to other companies in the field (CIAT NUCLEAR, TECNICONTROL, BRENT IBERICA, KRAUTKRAMER FORSTER, etc.) to carry out the work under TECNATOM's supervision. TECNATOM also has technical assistance contracts signed with foreign firms or organizations such as NUCLEAR SERVICES INTERNATIONAL CO., SOUTHWEST RESEARCH INST. (SWRI) or UKAEA, which act as its advisors in non-destructive test problems or supply the necessary equipment.

Another important organization in carrying out in-service inspections is the Independent Inspection Agency. Although, during the construction phase, the mission of the Agency (which acts as a third party) is clearly defined (Section III, ASME Code), this is not so in that which refers to the requirements of Section XI of the ASME Code and this need for independent inspection is not completely defined in Spain.

With reference to the qualifications of the personnel who execute and supervise the non-destructive ISI tests, in the beginning they were established following the ASNT rules, as established in Section XI (Recommended Practice No. SNT-TC-1A) of the ASME Code, but as of 1971 the Non-Destructive Test Committee was created in Spain, within the Spanish Association for Quality Control (AECC) which forms part of the International Non-Destructive Test Committee; in 1973 this National Committee started publishing recommendations for personnel qualification and certification (END-F5, 1974 Rules), which are very similar to the ASNT Rules, they both employ the same I, II and III levels. The problems existing in this field refer to the preparation and qualification of the personnel in new techniques that evolve and to the different qualifications requisites existing between companies, and it occurs that personnel qualified and certified in accordance with the rules in a given country are not accepted - or accepted with drawbacks - in companies in other countries.

This last aspect could be solved if the International Committee would issue International Recommendations which would compile the most suitable rules in each member country and adopt them as their own, so that they could be used on an international level.

With reference to the teaching of quality control by means of non-destructive tests, we wish to point out that since 1975, theory-practice courses are being given in Spain in private companies and in the University, with about 200 hours duration.

There is a document called "Documentation to be sent to JEN in association with the in-service inspection of a LWR-type nuclear power plant", of which a copy is attached as Annex II, wherein the minimum estimated documentation required is indicated as well as the amount of advance time with which it must be sent to JEN so that their technical services can evaluate it, carry out inspections during the execution of the inspection work, audit the interested parties and inform the Energy Administration Board of the validity or ineffectiveness of the in-service inspection.

The estimated effort required during in-service inspections of a LWR-type nuclear power plant, on the average, is as follows:

Evaluation of the ISI Program	1-2 weeks x man
Inspection during execution	2-3 " "
Evaluation of the ISI results	3-4 " "
TOTAL	6-9 weeks x man

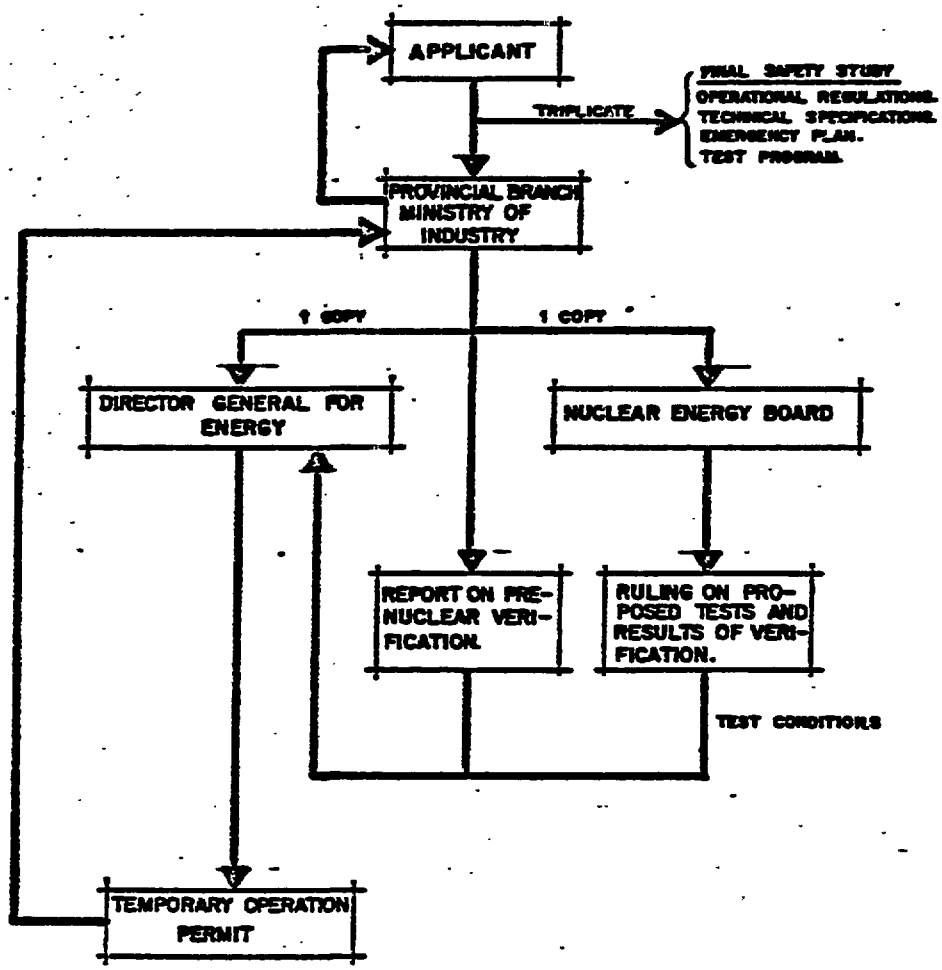
Bearing in mind that, at the present time, there are two plants with in-service inspection programs underway and two more carrying out pre-operational inspection, as mentioned above, the total average effort which must be applied is 12-18 weeks x man for the plants in operation and 20-30 weeks x man for those in the pre-operational phase, which results in the hypothesis that a pre-operational inspection represents 1.66 times greater effort than an in-service inspection.

Therefore, the true total effort for 1977 is calculated at about 40 weeks x man, which represents the work of a technician during an entire year (45 weeks x man). Actually, we do not have sufficient personnel and therefore this effort is not totally fulfilled.

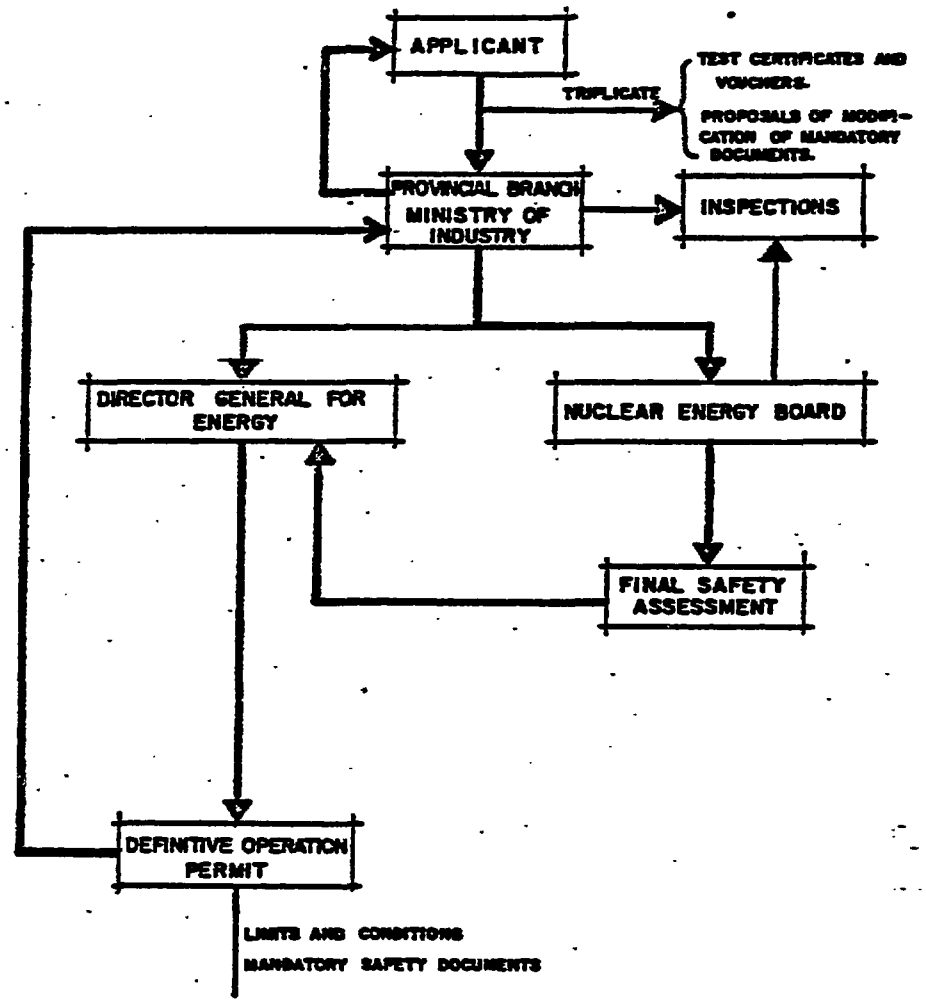
Note: The results of the in-service inspections of the plants in operation are mentioned in the paper "Inspection during operation of a nuclear power plant in Spain".

ANNEX I. ADMINISTRATIVE FORMALITIES

a) TEMPORARY OPERATION PERMIT



b) DEFINITIVE OPERATION PERMIT



ANNEX II

DSN/007/INU/77
CLASE III

JEN. DPTº. SEGURIDAD NUCLEAR
UNIDAD O. INSPECCION

DOCUMENTACION A REMITIR A LA JUNTA DE ENERGIA NUCLEAR ASOCIADA A LA INSPECCION EN SERVICIO (IES) DE UNA CENTRAL NUCLEAR TIPO LWR

Madrid, 1 de Junio de 1977

1. PRESENTACION

Con objeto de normalizar la documentación a remitir a la JEN para la vigilancia y control por el Departamento de Seguridad Nuclear de las inspecciones en servicio (IES), tanto las programadas en los - periodos de recarga de una Central Nuclear como las programadas en - otros periodos del ciclo de funcionamiento, se señala a continuación la documentación mínima estimada necesaria y la antelación con que de be ser remitida.

2. ESPECIFICACIONES

2.1. IES realizada durante una parada de recarga

Este tipo de inspecciones en servicio está contemplado en el Código ASME, Sección XI, tanto en la edición de 1971 como en la de 1974, con sus respectivas addendas.

Las IES se han de realizar periódicamente, cada 10 años, durante la vida de la central nuclear y a partir de la fecha de operación comercial de la misma, con un calendario que se adapte a alguna de las tres posibilidades que se muestran en el anexo I y salvando las excepciones que el Código indica, se realizará entre el 25% y el 33,3% de su extensión en el primer periodo, entre el 50% y el 66,6% en el segundo y el resto, o sea, hasta llegar al 100% de IES, en el tercero.

En relación con cada inspección se deberá:

a) DOS MESES, como mínimo, antes de la fecha prevista de parada para recarga, se remitirá la Revisión 0 de la "Especificación de trabajos de IES a realizar", incluyendo un índice que contenga:

- Alcance: Item y categoría ASME aplicable.
  Tipo y número de componentes a examinar.
  Métodos de ensayo.
- Códigos aplicables según el método de inspección.
- Agencia de Inspección que realizará los ensayos.
- Agencia de Inspección Independiente seleccionada.
- Procedimientos básicos de inspección, según el método a emplear.
- Contenido básico del informe final de inspección.
- Estimación de dosis al personal.
- Referencia al acta del Comité de Seguridad del Explotador donde conste se haya discutido y aprobado el programa de IES, así como la transcripción de las conclusiones a que llegase el Comité.

b) DOS SEMANAS, como mínimo, antes de la fecha prevista de parada para recarga, se remitirá la Revisión final de la "Especificación de trabajo de IES a realizar", acompañada de los siguientes documentos:

- Identificación de sistemas, componentes, equipos y soldaduras a revisar; categoría y método de inspección aplicables en cada caso; tipo de material base.

- Procedimientos de soldadura de construcción y/o posibles reparaciones posteriores junto con las correspondientes homologaciones de procedimientos y soldadores (sólo para la IES del primer intervalo).

- Procedimientos y resultados de END previamente realizados (en particular, BASELINE o FINGER PRINT Inspection).

- Métodos de inspección: procedimientos detallados, según la Sección aplicable del Código ASME (en particular, la Sección V).

- Planos y diagramas complementarios de cada sistema, componente, equipo o soldadura (isométricos, planos de construcción, etc).

- Cualificaciones, en cada método, del personal examinador y supervisor, incluída la Agencia de Inspección Independiente, según la Norma SNT-TC-1A de la ASNT.

- Situación de los trabajos de IES dentro del programa general de la parada de recarga (camino crítico).

- Previsiones detalladas dosimétricas (planos con los niveles radiológicos en las zonas a inspeccionar, dosis al personal examinador y supervisor e historial dosimétrico previo de dicho personal).

c) DURANTE la realización de la IES, se facilitarán las sucesivas revisiones, si las hubiere, de cualquier documento de la misma.

d) FINALIZADA la IES y siempre con, al menos, 48 horas de anticipación al inicio del arranque de la central, se remitirá un "Informe PRELIMINAR de resultados de IES", el cual debe contener:

- Sistemas, componentes, equipos y soldaduras realmente examidos; códigos aplicados.

- Resultados de la IES efectuada.

e) TRES MESES, como máximo, después de la fecha de finalización de la parada de recarga, se remitirá el "Informe FINAL de resultados de IES", cuyo contenido debe ser, como mínimo:

- Alcance final de la IES (Identificación de componentes, sistemas, equipos y soldaduras realmente examinados).

- Métodos de END aplicados; procedimientos aplicados (revisión final); especificaciones y Códigos utilizados.

- Fechas de realización de la IES, personal examinador y supervisor y Agencia de Inspección Independiente; homologaciones no enviadas con el documento "Especificación de trabajos de IES a realizar", de acuerdo con la Norma SNT-TC-1A (última revisión) del ASNT y apéndices de la misma.

- Equipos y materiales de END utilizados, junto con los certificados de homologación pertinentes.

- Análisis final de los resultados obtenidos.

- Referencia al acta del Comité de Seguridad del Explotador donde conste se hayan discutido y aprobado los resultados de IES, así como la transcripción de las conclusiones a que llegase el Comité.

Como ANEXOS al Informe FINAL se acompañarán:

- Hojas de calibración de equipos y materiales utilizados.
- Hojas de registro de indicaciones obtenidas con cada método empleado.
- Historiales dosimétricos finales del personal que intervino en la IES.
- Planos, esquemas, diagramas, fotografías y otros registros complementarios que sean necesarios.
- Los documentos, según proceda, vendrán avalados con la: Fecha y firmas del Director de la Agencia encargada de la realización de la IES, del de la Agencia de Inspección Independiente y del de la compañía propietaria de la central nuclear inspeccionada.

2.2. IES realizada fuera de la parada de recarga

Normalmente este tipo de IES se realiza por una necesidad perentoria de comprobación del correcto funcionamiento de algún sistema, componente, equipo o soldadura de los que se haya comprobado alguna posibilidad de fallo inminente.

Por tanto, la programación tendrá como fecha de partida aquella en que, después de analizar los efectos y consecuencias, se decidiera por parte de la compañía propietaria de la central afectada o por parte de la Administración (DGE), la necesidad de realizar una IES en el sistema, componente, equipo o soldádura afectados. Asímismo, y debido al efecto de presentoriedad ya indicado el tiempo de presentación de documentos será:

a) Dentro de las DOS SEMANAS siguientes a la fecha de decisión para la realización de la IES, se enviará la documentación indicada en el apartado 2.1.a. antedicho.

b) Al menos con UNA SEMANA de antelación a la fecha prevista de parada programada para la realización de la IES, se remitirá la documentación señalada en el apartado 2.1.b, exceptuando la situación de los trabajos de IES dentro del camino crítico de la parada, la cual será sustituída por una programación de la IES en la parada programada.

En cuanto a los apartados 2.1.c, 2.1.d, y 2.1.e anteriores se mantienen en este caso, tanto las fechas de presentación de documentos como el tipo y contenido de los informes descritos en dichos apartados.

2.3. IES que motiva una reparación

Si como consecuencia de la evaluación de algún o algunos defectos en sistemas, componentes, equipos o soldaduras, según lo indicado en el Código ASME, Secciones III y XI, y sus posteiores addendas, se encuentra que las indicaciones son relevantes y están por encima de los máximos admisibles, será necesario hacer una reparación en los sistemas, componentes, equipos o soldaduras afectadas.

Una vez decidida la reparación, como resultado o conclusión final de la evaluación hecha por la compañía propietaria de la Central, teniendo en cuenta las recomendaciones de:

- la empresa encargada de la IES (Agencia de inspección),
- la Agencia de Inspección Independiente,
- el suministrador principal del sistema afectado,
- la empresa encargada de la reparación, si existe, y
- el Comité de Seguridad Nuclear del Explotador de la central,

se preparará un conjunto de documentos que contendrán la siguiente información, como mínimo, y que estarán disponibles en el archivo de la central:

- Identificación del sistema, componente, equipo o soldadura afectados; planos de construcción y diagramas complementarios (isómetricos...); tipos de material (base de aporte...)

- Procedimientos de soldadura y características del metal base y de aporte a emplear en la reparación, junto con las correspondientes homologaciones de procedimientos y soldadores.

- Procedimientos de corte de tuberias, y taponado de las mismas, en su caso.

- Procedimientos de END a realizar antes, durante y después de la reparación, incluídas las pruebas hidrostáticas, junto con las homologaciones del personal de IES y la Agencia de Inspección Independiente involucradas, según la Norma SNT-TC-1A de la ASNT.

- Estimaciones de dosis radiológicas al personal de reparación y de END, en las zonas a reparar.

Una vez terminada la reparación e inspeccionada posteriormente, se añadirá a los anteriores documentos un "Informe Final de la reparación efectuada", el cual contendrá, al menos, lo siguiente y será enviado TRES MESES, como máximo,después de la fecha de finalización de la reparación:

- Alcance de la reparación (identificación final del sistema, componente, equipo o soldadura afectado).

- Métodos de reparación empleados; procedimientos de corte, de soldadura empleados y sus correspondientes homologaciones de procedimientos y personal; especificaciones y códigos aplicados.

- Métodos de END empleados; procedimientos de ensayo utilizados y sus correspondientes homologaciones de procedimientos y personal; especificaciones y códigos aplicados.

- Materiales y equipos utilizados, tanto en la reparación como en la inspección por END, y los certificados de homologación pertinentes.

- Análisis final de los resultados obtenidos; referencia al acta del Comité de Seguridad del Explotador donde conste se hayan discutido y aprobado los resultados de la reparación, así como la transcripción de las conclusiones a que llegase el Comité.

Como ANEXOS al Informe FINAL se acompañarán:

- Hojas de registro de indicaciones obtenidas con cada método de END empleado.
- Historiales finales dosimétricos del personal de reparación y de inspección por END.
- Planos, esquemas, diagramas, fotografías y otros registros complementarios que sean necesarios.
- Los documentos, según proceda, vendrán avalados con la:

- Fecha y firmas del Director de la empresa encargada de la reparación (si la hubiere), de de la Agencia de inspección por END, del de la Agencia de Inspección Independiente y del de la compañía propietaria de la central nuclear.

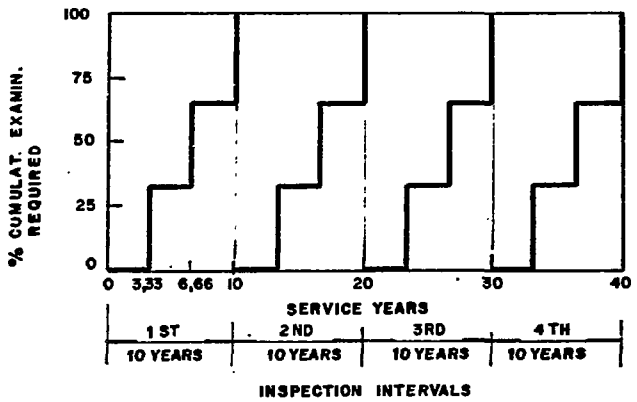


FIG.1.- INSPECTION PROGRAM - A EXAMINATION PER PLANT OUTAGES (IWB2410)
ASME XI-ED.1971 AND 1974 (TILL ADD. W-75)

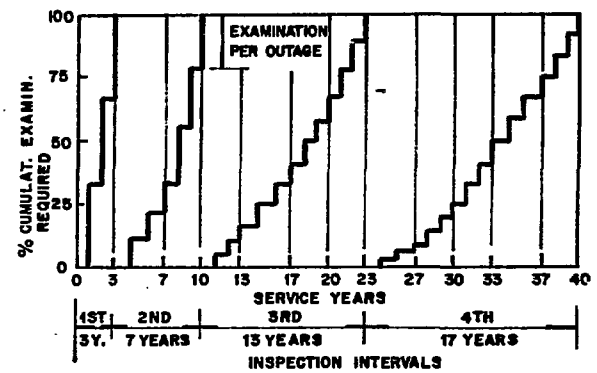


FIG.2.- INSPECTION PROGRAM-A EXAMINATIONS PER PLANT OUTAGES (IWA 2410)
ASME XI - ED. 1974, ADD. W-75

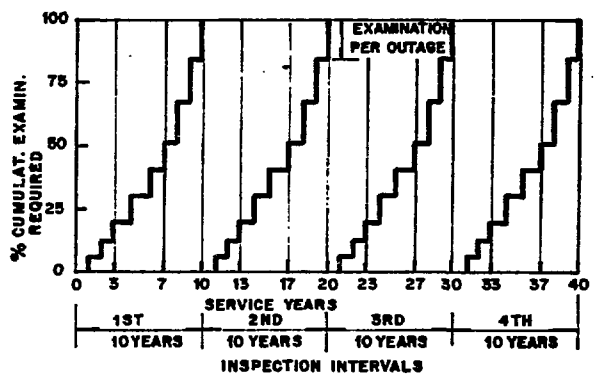


FIG.3.- INSPECTION PROGRAM-B EXAMINATIONS PER PLANT OUTAGES (IWA 2420)
ASME XI-ED. 1974, ADD. W-75

ANEXO