MANUAL NO. AERB/NF/SM/G-2

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GOVERNMENT OF INDIA

A E R B S A F E T Y M A N U A L

REGULATORY INSPECTION AND ENFORCEMENT IN NUCLEAR FUEL CYCLE FACILITIES AND RELATED INDUSTRIAL FACILITIES OTHER THAN NUCLEAR POWER PLANTS AND RESEARCH REACTORS

ATOMIC ENERGY REGULATORY BOARD

AERB SAFETY MANUAL NO. AERB/NF/SM/G-2

REGULATORY INSPECTION AND ENFORCEMENT IN NUCLEAR FUEL CYCLE FACILITIES AND RELATED INDUSTRIAL FACILITIES OTHER THAN NUCLEAR POWER PLANTS AND RESEARCH REACTORS

Atomic Energy Regulatory Board
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Orders for this manual should be addressed to:

The Administrative Officer
Atomic Energy Regulatory Board
Niyamak Bhavan
Anushaktinagar
Mumbai - 400 094
India

FOREWORD

Activities concerning establishment and utilisation of nuclear facilities and use of radioactive sources are to be carried out in India in accordance with the provisions of the Atomic Energy Act, 1962. In pursuance of the objective of ensuring safety of members of the public and occupational workers as well as protection of environment, the Atomic Energy Regulatory Board (AERB) has been entrusted with the responsibility of laying down safety standards and framing rules and regulations for such activities. The Board has, therefore, undertaken a programme of developing safety standards, safety codes, and related guides and manuals for the purpose and while some of these documents cover aspects such as siting, design, construction, operation, quality assurance and decommissioning of nuclear and radiation facilities, other documents cover regulation aspects of these facilities.

Safety codes and safety standards are formulated on the basis of internationally accepted safety criteria for design, construction and operation of specific equipment, structures, systems and components of nuclear and radiation facilities. Safety codes establish the objectives and set minimum requirements that shall be fulfilled to provide adequate assurance for safety. Safety guides elaborate various requirements and furnish approaches for their implementation. Safety manuals deal with specific topics and contain detailed scientific and technical information on the subject. These documents are prepared by experts in the relevant fields and are extensively reviewed by advisory committees of the Board before they are published. The documents are revised, when necessary, in the light of the experience and feedback from users as well as new developments in the field.

AERB issued a safety code on 'Regulation of Nuclear and Radiation Facilities' (AERB/SC/G) to spell out the minimum safety related requirements/obligations to be met by a nuclear or radiation facility to qualify for the issue of regulatory consent at every stage leading to eventual operation. AERB also issued a safety guide on the 'Regulatory Inspection and Enforcement in Nuclear and Radiation Facilities' (AERB/SG/G-4), that provides guidance to AERB for regulatory inspection of nuclear and radiation facilities and enforcement actions.

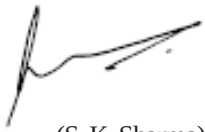
This safety manual elaborates the requirements of inspection programme of the nuclear fuel cycle facilities and related industrial facilities. This manual also covers the suggested types of enforcement actions. It is also intended to assist all the participating agencies in fulfilling the stipulated requirements of the above safety code and guide. In drafting it, extensive use has been made of information contained in the relevant inspection procedures/reports of AERB, especially the AERB safety manual on 'Regulatory Inspection and Enforcement in Nuclear Power Plants and Research Reactors' (AERB/NPP&RR/SM/G-1).

Consistent with the accepted practice, 'shall' and 'should' are used in this guide to distinguish between a firm requirement and a desirable option respectively. Appendix is an integral part of the document, where as, annexures and bibliography are included to provide information that might be helpful to the user. Approaches for implementation, different to those set out in the manual may be acceptable, if they provide comparable assurance against undue risk to the health and safety of the occupational workers and the general public, and protection of the environment.

For aspects not covered in this safety manual, applicable national and international standards, codes and guides acceptable to AERB should be followed. Non-radiological aspects of industrial safety and environmental protection are not explicitly considered in this manual. Industrial safety shall be ensured through compliance with the applicable provisions of the Factories Act, 1948 and the Atomic Energy (Factories) Rules, 1996.

This manual has been prepared in-house by the Atomic Energy Regulatory Board. It has been reviewed by experts and the Advisory Committee for Preparation of Code and Guides on Governmental Organisation for Regulation of Nuclear and Radiation Facilities.

AERB wishes to thank all individuals and organisations who have prepared and reviewed the document and helped in its finalisation. The list of persons, who have participated in this task, along with their affiliations, is included for information.



(S. K. Sharma)
Chairman, AERB

DEFINITIONS

Approval

A type of regulatory consent issued by the regulatory body to a proposal.

Atomic Energy Regulatory Board (AERB)

A national authority designated by the Government of India having the legal authority for issuing regulatory consent for various activities related to the nuclear and radiation facility and to perform safety and regulatory functions, including their enforcement for the protection of site personnel, the public and the environment against undue radiation hazards.

Authorisation

A type of regulatory consent issued by the regulatory body for all sources, practices and uses involving radioactive materials and radiation generating equipment (see also 'Consent').

Commissioning

The process during which structures, systems and components of a nuclear or radiation facility, on being constructed, are made functional and verified in accordance with design specifications and found to have met the performance criteria.

Competent Authority

Any official or authority appointed, approved or recognised by the Government of India for the purpose of the Rules promulgated under the Atomic Energy Act, 1962.

Competent Person

A person, who is having the degree in the discipline mentioned or equivalent, followed by experience as specified in Rule 31 of Atomic Energy (Factories) Rules, 1996, in responsible position in the field and designated by the competent authority.

Consent

A written permission issued to the 'consentee' by the regulatory body to perform specified activities related to nuclear and radiation facilities. The types of consents are 'licence', 'authorisation', 'registration' and 'approval', and will apply according to the category of the facility, the particular activity and radiation source involved.

Construction

The process of manufacturing, testing and assembling the components of a nuclear or radiation facility, the erection of civil works and structures, the installation of components and equipment and the performance of associated tests.

Decommissioning

The process by which a nuclear or radiation facility is finally taken out of operation in a manner that provides adequate protection to the health and safety of the workers, the public and the environment.

Inspection

Quality control actions, which by means of examination, observation or measurement determine the conformance of materials, parts, components, systems, structures as well as processes and procedures with predetermined quality requirements.

Inspector (Regulatory)

A person authorised by the regulatory body to carry out regulatory inspection.

Licence

A type of regulatory consent, granted by the regulatory body for all sources, practices and uses for nuclear facilities involving the nuclear fuel cycle and also certain categories of radiation facilities. It also means authority given by the regulatory body to a person to operate the above said facilities.

Nuclear Facility

All nuclear fuel cycle and associated installations encompassing the activities from the front end to the back end of nuclear fuel cycle processes and also the associated industrial facilities such as heavy water plants, beryllium extraction plants, zirconium plants, etc.

Occupier

One who has been given the ultimate control over the affairs of the installations.

Operation

All activities following and prior to commissioning performed to achieve, in a safe manner, the purpose for which a nuclear/radiation facility is constructed, including maintenance.

Plant Management

Members of the site personnel who have been delegated responsibility and authority by the operating organisation for directing the operation of the plant.

Regulatory Body

See 'Atomic Energy Regulatory Board'

Regulatory Inspection

An examination through review of documents, observation, measurement or test undertaken by or on behalf of the regulatory body during any stage of the regulatory consenting process, to ensure conformance of materials, components, systems and structures as well as operational and maintenance activities, processes, procedures, practices and personnel competence with predetermined requirements.

Test

An experiment carried out in order to measure, quantify or classify a characteristic or a property of an entity.

CONTENTS

1. INTRODUCTION

1.1 General

1.1.1 Nuclear fuel cycle facilities (NFCFs) are sited, designed, constructed, commissioned, operated and decommissioned in conformity with the current safety standards. The standards ensure adequate margin of safety so that the NFCFs can be operated safely without undue risk to the occupational workers, the members of public and the environment. The safety code on 'Regulation of Nuclear and Radiation Facilities' (AERB/SC/G) requires Atomic Energy Regulatory Board (AERB) to be responsible for regulatory control over matters relating to safety in the siting, design, construction, commissioning, operation and decommissioning of nuclear facilities.

1.1.2 This safety manual has been prepared to elaborate the provisions given in the AERB safety guide titled 'Regulatory Inspection and Enforcement in Nuclear and Radiation Facilities' (AERB/SG/G-4) for conducting the regulatory inspection and initiating enforcement actions for NFCFs under construction, commissioning and operation. The following facilities have been identified broadly as nuclear fuel cycle and related industrial facilities as per the AERB safety guide titled 'Consenting Process for Nuclear Fuel Cycle Facilities and Related Industrial Facilities other than Nuclear Power Plants and Research Reactors' (AERB/NF/SG/G-2).

- Uranium mining and processing including Uranium enrichment
- Beach sand minerals mining and processing including processing of Thorium
- Uranium/Thorium fuel fabrication
- Heavy water production
- Spent fuel reprocessing
- Plutonium recycling/fuel fabrication
- Zirconium, Beryllium extraction and processing
- Nuclear/ chemical waste management

Facilities set up with the objective of research and development, special investigations, pilot plants for process development or feasibility studies, will also require regulatory consents.

1.2 Objective

The objective of the manual is to outline the methodology of carrying out the regulatory inspections, implementation of the programme and enforcement actions in the NFCFs.

1.3 Scope

1.3.1 The safety manual deals with checking the functioning of project/plant systems, compliance with specifications, quality assurance programme, approved procedures, requirements specified in safety documents published and consents issued by the AERB.

1.3.2 The manual also covers the methodology of enforcement actions by the AERB, either directly or through appropriate safety committee appointed by the AERB.

1.3.3 The regulatory inspections to check the functioning of physical security systems of NFCFs are beyond the scope of this manual.

1.3.4 Typical checklist covering the regulatory inspection requirements attached as Annexures 1 to 4 are revised as required based on experience and issued separately and are independent of the manual.

2. REQUIREMENTS OF INSPECTION AND ENFORCEMENT

2.1 General

2.1.1 The objective of the regulatory inspection and enforcement is to ensure that the activities performed by the consentee during all stages of consenting process (siting, design, construction, commissioning, operation and decommissioning) are in compliance with the laid down safety requirements stipulated in various regulatory documents including

(i) The Factories Act, 1948

(ii) The Atomic Energy Act, 1962

(iii) The Atomic Energy (Working of Mines, Minerals and Handling of Prescribed Substances) Rules, 1984

(iv) The Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987

(v) The Radiation Surveillance Procedures for Safe Transport of Radioactive Materials, 1987

(vi) The Atomic Energy (Factories) Rules, 1996

(vii) The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 and amendments thereafter

(viii) The Atomic Energy (Radiation Protection) Rules, 2004.

In addition, compliance with the relevant requirements prescribed in the following documents are also checked.

(i) Technical specifications, surveillance, safety policies, procedures, safety analysis reports, quality assurance (QA) and in-service-inspection (ISI) manuals

(ii) The regulatory documents published by AERB

(iii) Stipulations of the AERB while authorising to perform a particular activity

(iv) Observations/recommendations brought out during the earlier inspections

(v) Emergency preparedness and response manual.

Compliance with the relevant requirements prescribed in other statutes are also checked generally as a good practice. Some examples of these statutes are:

(i) The Indian Boilers Act, 1923 and the Indian Boilers Regulations 1950

(ii) The Petroleum Act, 1934 and amendment thereafter and the Petroleum Rules, 1976 and amendments thereafter

(iii) The Water (Prevention and Control of Pollution) Act, 1974 and amendments thereafter and the Rules 1975 and amendments thereafter

(iv) The Gas Cylinder Rules, 2004

(v) The Air (Prevention and Control of Pollution) Act 1981 and amendments thereafter and the Rules 1982

(vi) The Environment (Protection) Act, 1986 and Rules framed under this Act like Environment (Protection) Rules, 1986 and amendments thereafter

(vii) The Hazardous Waste (Management and Handling) Rules 1989 and amendments thereafter

(viii) The Biomedical Waste (Management and Handling) Rules, 1998

(ix) The Batteries (Management and Handling) Rules, 2001

(x) The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and Central Rules, 1998

(xi) The Indian Electricity Act, 2003 and the Electricity Rules, 2005

(xii) The Static and Mobile Pressure Vessels (Unfired) Rules , 1981.

2.1.2 During the regulatory inspections, the NFCF as well as other associated on-site or off-site facilities, if any, under the jurisdiction of AERB, should be inspected. The inspections should cover the following areas:

Site Inspection Prior to Construction Clearance:

(i) Verification of site characteristics including any new information/changes

(ii) Verification of implementation of AERB's stipulations if any.

Design Stage:

The safety committees constituted by AERB review compliance with the safety requirements during design review stage. Normally inspections are not planned during design review. However, if AERB desires, inspections during design stage may be accomplished either fully or on case by case basis.

Construction Stage:

(i) Construction procedures

(ii) Industrial and fire safety aspects

(iii) Occupational health aspects

(iv) Compliance with stipulations made during authorisation, recommendations of review committees

(v) QA plans and procedures

(vi) Storage/preservation of safety related equipment

(vii) Compliance of statutory requirements for construction activities

(viii) Civil engineering aspects

(ix) Records and documentation.

Commissioning Stage:

(i) Commissioning schedule

(ii) Commissioning tests and procedures

(iii) Technical specifications for operation

(iv) Document on licensing operating personnel

(v) Radiation protection procedure

(vi) Emergency preparedness.

Operation Stage:

(i) Normal operating procedures and operating procedures under emergency conditions

(ii) QA plans and procedures

(iii) Surveillance procedures

(iv) Tests, measurements, ISI requirements etc.

(v) Radioactive waste management system

(vi) On-site/off-site emergency preparedness

(vii) Training- induction, refresher, training in industrial safety aspects, training in radiological safety aspects, first aid training, training in fire fighting etc.

(viii) Radiological safety aspects

(ix) Industrial and fire safety aspects

(x) Occupational health aspects

(xi) Maintenance and ageing aspects

(xii) Environmental aspects

(xiii) Compliance with technical specifications, other statutory requirements

(xiv) Equipment history dockets (EHDs) of safety related equipment / components

(xv) Personnel training and qualification for carrying out the specific activities

(xvi) Civil engineering aspects.

2.1.3 Regulatory enforcement actions are initiated in case the consentee does not comply with the safety requirements and stipulations laid down in the documents listed in 2.1.1.

2.2 Authority/Powers for Regulatory Inspections and Enforcement

2.2.1 Atomic Energy Regulatory Board is empowered to enforce rules and regulations framed under the Atomic Energy Act 1962 for nuclear and radiation safety. The executive functions of the Board are vested with the Chairman, AERB.

Based on section 23 of the Atomic Energy Act, AERB is empowered to administer the provisions of the Factories Act, 1948 in all the units of the Department of Atomic Energy.

The Atomic Energy (Radiation Protection) Rules, 2004 (Rules 29 to 32) empower the competent authority to authorize any person to undertake inspection, and to define the responsibility and the powers of such authorized persons.

The Atomic Energy (Factories) Rules, 1996 empower the competent authority to authorise any person as inspector to undertake the inspections to ensure industrial and fire safety aspects.

The competent authority may, accordingly, authorize the lead inspector/team leader to undertake activities related to regulatory inspection and enforcement.

2.2.2 The powers of lead inspector/team leader along with his/her team members are:

As per the provisions contained in section 8 of the Factories Act, 1948 and rule 5 of the Atomic Energy (Factories) Rules 1996, INSPECTORS are appointed for the purpose of execution of all or any of the rules contained in the Atomic Energy (Factories) Rules, 1996.

Every inspector shall for the purpose of the execution of all or any of these rules have powers to do all or any of the following:

(i) To photograph any worker, to inspect, examine, measure, copy, photograph, sketch or test as the case may be, any building or room, any plant, machinery, appliances or apparatus, any register or document or anything provided for the purpose of ensuring the health, safety and welfare of persons employed in the factory and living in the neighbourhood or for protecting the environment.

(ii) To enquire into the health and safety aspects related to any unusual occurrences or events.

(iii) To advise project/plant management against unsafe acts and practices and to point out unsafe conditions if any existing in the premises of the facility to enable him to take remedial measures forthwith.

(iv) To report any unsafe condition or practices existing in the factory to the Competent Authority.

(v) To take penal enforcement action through Competent Authority for withdrawing the authorization to continue further construction/operation of NFCF for non-compliance with specified requirements and stipulations which may endanger the safety of occupational workers, the public and the environment due to:

- non-conformance of stipulations mentioned in the authorizations, safety supervision and quality control procedures in the NFCFs under construction, and
- non-availability of safety/safety-related systems, violations of safety directives and technical specifications and non-adherence to radiation control measures in the NFCFs under operation.

In such cases the lead inspector/team leader should have the verbal/written permission from the Competent Authority before intimating the enforcement action to the consentee. Written enforcement letter from the Competent Authority shall be followed immediately.

2.2.3 The Competent Authority may issue empowerment letter in the name of the lead inspector/team leader in the format given in Annexure-5 to perform the above duties.

2.3 Designations of Regulatory Inspection Officers

Lead inspector/team leader :	The person qualified and certified to lead the inspection team for carrying out regulatory inspections. This person should preferably be from the AERB division responsible for safety review and inspection of the NFCFs.
Inspector :	The person qualified and certified for carrying out the inspection of any area independently.
Team member :	The person in the process of qualifying to become an inspector or to assist the inspector
Expert member :	An officer from AERB or other technical support organisation drawn for a particular inspection, e.g. radioactive waste management, health physics aspects, civil engineering etc.

2.4 Qualification and Training of Inspectors

The officer who is assigned the responsibilities for carrying out regulatory inspection of NFCFs should have adequate understanding of the plant and safety systems. He/she should be trained and qualified as indicated below.

2.4.1 Academic Qualification:

The inspector should be at least a graduate in engineering discipline. However, members of inspection team for specialised subjects (HP, waste management etc.) should have relevant qualification in their area of expertise with basic graduation. In special cases, trained diploma holders and science graduates/ post graduates with prescribed years of field experience/diploma in industrial safety may also be qualified as inspectors. Expert members should also be qualified as mentioned above.

2.4.2 Training:

Candidates should be trained to have adequate understanding in relevant areas for carrying out inspections. The candidates should be trained in the following areas of regulatory requirements prior to certifying them as Inspectors/team members.

(i) Statutory powers, responsibilities and functions of AERB

(ii) Regulatory inspection procedures and general inspection principles

(iii) Statutory provisions applicable to the NFCFs

(iv) Design basis and safety report of the NFCFs

(v) Technical specifications for operations of NFCFs

(vi) Non-destructive testing methods used for ISI

(vii) Relevant AERB regulatory documents (safety codes, safety standards, safety guides, safety manuals and safety directives)

(viii) Other international (IAEA, ASME, IEEE etc.) safety requirements, safety guides and technical documents

(ix) The current consenting/authorization process for new NFCFs

(x) Objectives of various commissioning tests for NFCFs

(xi) Radiation protection procedures

(xii) Flow sheets of NFCFs

(xiii) Standard and emergency operating procedures

(xiv) Industrial and fire safety requirements

(xv) On-site and off-site emergency preparedness and procedures

(xvi) Various maintenance activities in general

(xvii) Radioactive material handling and transportation

(xviii) Quality assurance in NFCFs operation and construction

(xix) Civil construction requirements pertaining to NFCFs

(xx) Storage, preservation and erection of equipment at construction site

(xxi) Communication skills and methods for efficient inspections

(xxii) Environmental safety aspects

(xxiii) Security systems at NFCFs

(xxiv) Team management

(xxv) Interviewing /questioning of plant personnel on safety

(xxvi) Report writing

(xxvii) Time management

(xxviii) Techniques to find out non-adherences quickly

(xxix) Confidentiality

(xxx) Safety culture.

2.4.3 Retraining

The inspectors should be periodically sent to appropriate training programs, workshops, seminars etc.

2.5 Experience of Inspectors

2.5.1 Experience of a Lead Inspector/Team Leader:

(i) A lead inspector/team leader should have the basic training and qualification laid down in 2.4 above.

(ii) The lead inspector/team leader should have sufficient experience and adequate knowledge in his area of specialization, and general idea about the various aspects of regulatory process.

(iii) Before assuming charge as lead inspector/team leader, he/she must be part of the inspection team as an inspector for at least 3-5 years to understand the requirements of all areas.

(iv) The lead inspector/team leader of NFCFs under construction should be associated with design safety review of NFCFs (DSRC/PDSC/ ACPSR) for its stage wise regulatory review and consenting.

(v) The lead inspector/team leader of operating plants should be associated with operational safety review of NFCFs (Unit safety committees, SARCOP etc.).

2.5.2 Experience of other Inspectors /Expert Member/Team Member:

(i) All the inspectors should have the basic training and possess the qualification laid down in 2.4 above.

(ii) The inspectors should have knowledge in their area of specialization and at least 2-3 years of field experience at any NFCFs or similar unit.

(iii) The expert members, consultants or officers drawn from other units should also have 2-3 years experience in their area of expertise.

(iv) Team members should undergo shadow/on the job training for at least 2-3 years under the supervision of an inspector during the inspections to become an inspector.

2.6 Delegation of Authority for Inspectors

2.6.1 AERB should appoint inspectors under the provisions of Factories Act, 1948 and Atomic Energy (Factories) Rules, 1996 through letters to individuals to inspect any NFCF independently.

2.6.2 Division of AERB responsible for safety review of NFCFs under construction and operation should formulate the inspection team with officials drawn from AERB and other units of DAE as follows:

(i) Team leader and other team members to carry out inspections

(ii) Expert members to carry out the inspection of the specific plant, under the supervision of lead inspector/team leader.

2.7 Related Abilities Required for Team Leaders/Inspectors:

The team leader/inspectors should have the capability to independently interact with the plant personnel to assess the plant and conduct appropriate discussions in order to produce a crisp, clear and accurate inspection report. He/she should collect reference documents from where information/evidences have been extracted. In case of difficulty he/she should take the help of other inspectors of the team or consult the Divisional Head/Director.

The inspectors should believe the site personnel unless they have sufficient evidence otherwise.

The inspectors should have the capability to draw conclusion and confirm the findings based on review of relevant/related documents, field observations, consultation with site personnel and their own judgment. The report should be backed up with the specific requirements under various statutes, codes, standards, rules, directives etc.

2.8 Confidentiality of Regulatory Inspection

2.8.1 While carrying out the regulatory inspections of certain areas of NFCFs, it would be necessary to maintain the confidentiality of the observations and reports as per Section 118 of the Factories Act, 1948.

2.8.2 In case the inspections related to physical security systems are covered along with routine inspections, then security related observations and the report should be kept fully confidential. Similarly the observations regarding proprietary items need not be reported. Lead inspector/team leader should take necessary precautions.

2.8.3 Lead inspector/team leader should exercise due care while reporting on the health of plant personnel as this may create unwarranted apprehensions among plant personnel. Similarly matters, which may create administrative problems to the plant management, may have to be avoided. However, these matters should be dealt with separately.

2.9 The Responsibilities of a Consentee for Regulatory Inspection

2.9.1 The consentee should extend full co-operation for carrying out the regulatory inspection of his plant/ project. The nature of co-operation to be extended to the lead inspector/team leader is elaborated in the following paragraphs.

2.9.2 The consentee should make the following arrangements:

(i) Provide access to any area of the facility and its site, for inspection purpose; however, consentee should inform the inspectors to follow special procedures to access the hazardous areas if any.

(ii) All concerned personnel at the facility are made available for discussion and should ensure that they properly respond to the queries or to provide assistance in obtaining response from the concerned persons.

(iii) Provide access to all relevant documentation, other associated and required facilities including vendors and contractors and arrange for the inspection team to observe the exercises, tests, measurements, surveillance and major maintenance activities that are in progress.

2.9.3 The consentee should provide the logistics support to the inspectors including equipment, assistance and support as may be necessary for carrying out their functions. This may include:

(i) Access to means of communication

(ii) Photography and/or sketch of reports, records/measurements, copies of documents, location/ building/equipment for the purpose of reporting

(iii) Radiation protection/monitoring equipment and other personal protective equipment (PPE) as required

(iv) On-site work facilities and secretarial assistance to prepare the reports in time.

2.9.4 Documents to be made available:

Typical examples of documents and reports to be submitted to inspection team for review are listed below. The list is not exhaustive and may include any other document required by the team member for his/her review.

2.9.4.1 Construction Unit

(i) Design basis reports

(ii) Contractor's safety manual

(iii) QA manual

(iv) Job hazard analysis

(v) Safety work permit system

(vi) Height pass system

(vii) Safety organisation (unit's and contractors')

(viii) Stipulations of authorisation by AERB

(ix) Accidents report

(x) First aid facility

(xi) Commissioning reports including test reports such as pneumatic test, hydro tests, leak tests, material handling equipment test etc.

(xii) Any other document required by the team member for his review like fire contingency plan, cyclone management plan, etc.

(xiii) Special tests/certificates/inspection reports

(xiv) Status of implementation of statutory requirements

(xv) Security aspects

(xvi) Records of monitoring of illumination levels, noise levels etc.

(xvii) Records of radiography and other NDT tests carried out

(xviii) Follow up of previous regulatory inspections, safety committee recommendations

(xix) Project schedule

(xx) Construction methodology

(xxi) Radiological emergency preparedness for multi-unit sites

(xxii) Non-conformance control procedures

(xxiii) Erection procedures

(xxiv) Storage and preservation procedure of equipment.

2.9.4.2 Operating Unit:

(i) Control room log books for the period from previous inspection period or as desired by inspecting officials

(ii) Jumper registers/books

(iii) Operating procedures for equipment/systems

(iv) P & I Ds, operational flow-sheets (Ref document)

(v) Operating procedures under emergency conditions (OPEC)

(vi) QA manual

(vii) Technical specifications for operations

(viii) Authorizations obtained from various authorities

(ix) Operators' log book/log sheet

(x) Accident reports

(xi) Unusual occurrence reports

(xii) Safety work permit system

(xiii) Industrial and fire safety aspects

(xiv) Occupational health aspects

(xv) Health physics reports

(xvi) Waste disposal data and relevant records

(xvii) Report on follow up of previous regulatory inspection, safety committee recommendations

(xviii) Training and qualification record

(xix) QA programme

(xx) Emergency preparedness manual

(xxi) Radiation protection procedures

(xxii) In-service inspection reports such as hydrotests, testing of hoists, cranes etc.

(xxiii) Safety related issues regarding sharing of common facilities in a multi-unit plant

(xxiv) Impact of any other activity in the nearby facilities like construction, up gradation/expansion.

3. REGULATORY INSPECTION PROGRAM

3.1 General

3.1.1 In order to achieve the objectives set out in section 2.1 of the manual, the following criteria should be used while selecting the type of inspection and the inspection areas for formulating the regulatory inspection program. The lead inspector/team leader should go through the past history of the plant to be inspected and related documents to identify areas of inspection prior to proceeding for inspection and finalize the inspection program. A typical list of reference documents is as follows.

Construction Unit:

(i) Responses to earlier inspection reports minutes of the meetings and recommendations of safety committees

(ii) Compliance reports addressing the directives of AERB and recommendations of safety committees

(iii) Records to confirm the adherence to relevant AERB regulatory documents such as safety codes and safety guides

(iv) Current status reports of construction and commissioning schedule of the NFCF

(v) Quarterly progress report of the project for identifying the areas to inspect

(vi) Commissioning documents

(vii) The checklist for inspection of NFCFs under construction (Ref. Annexure-2)

(viii) Operational health physics aspects – preparedness during commissioning.

Operating Unit:

(i) Responses to earlier inspection reports

(ii) Responses to the comments/recommendations based on the safety review in the division of AERB

(iii) Minutes of the meetings and recommendations of the safety committees and units' response

(iv) Minutes of the Apex Safety Committee and other reports e.g. Tri-annual safety, health and environment report issued from site

(iv) Compliance reports addressing the directives of the AERB and recommendations of safety committees

(v) Records to confirm the adherence to the AERB regulatory documents such as safety codes and safety guides as applicable

(vi) Quarterly performance report of the unit for identifying the areas to inspect

(vii) Technical specification violations

(viii) Health physics quarterly and annual reports

(viii) Industrial and fire safety reports

(ix) The checklist for inspection of operating NFCFs (Ref. Annexure-3)

(x) Safety related unusual occurrunce report

3.1.2 Preparation for Inspection:

Division of AERB for safety review of units under construction and operating unit should inform the site at appropriate time regarding the inspection program, areas of inspection along with the list of team members, list of documents required for inspection and arrangement/provision of other logistic supports.

The lead inspector/team leader should hold a meeting prior to proceeding for regulatory inspection to brief the members of the inspection team about previous inspection, discuss the current inspection program and areas to be covered. A working checklist may be prepared if required. The inspectors should carry with them relevant reference documents to facilitate effective inspection.

3.2 Classification and Objectives of the Inspections

3.2.1 Classification: The inspections are of three types based on their nature and requirements.

(i) Planned Regulatory Inspections: Planned and announced inspections

(ii) Special Regulatory Inspections: Reactive and announced inspections

(iii) Surprise Regulatory Inspections: Reactive and un-announced inspections

3.2.2 Objectives

3.2.2.1 Planned Regulatory Inspections:

The main objective of planned regulatory inspections is to cover all the activities of NFCFs periodically to check the compliance with statutory requirements, overall procedures and various requirements laid down in regulatory documents such as safety codes and safety guides, technical specifications, safety analysis reports, QA manual etc. These inspections will be carried out in line with the approved checklists. Normally the tentative schedule of inspection is intimated to all the NFCFs at the beginning of the year as an annual program. The details of the inspection program should be intimated to NFCFs well in advance so that inspection can be made more effective and fruitful. These inspections are carried out by a group led by the lead inspector/team leader.

3.2.2.2 Special Regulatory Inspections:

The main objective of special regulatory inspections is to conduct reactive type of inspections depending on the importance and urgency. These inspections should be conducted normally as announced ones and the inspection program may be intimated at short notice if felt necessary. The number of these special inspections may vary depending upon the situations prevailing in an NFCF and also based on the decisions of AERB.

In a construction unit or in an operating unit special inspections are initiated in response to unusual occurrence or to verify compliance with recommendations of AERB. AERB may conduct special inspections due to any other requirement also during the course of safety review.

Illustrative examples of some special activities and unusual incidents/events that may call for special inspections are listed below:

Construction/Operating Unit:

Unusual Occurrences/Events
Fire/explosion in the facility
Fatalities or serious injuries
Seismic event
Incidents of theft and/or sabotage involving radioactive material
Extensive damage due to natural events
Higher levels of radiation and contamination exceeding the technical specifications limit
Release of hazardous chemicals leading to emergency
Discharge of effluents beyond authorised limits
Inspections prior to or after issue of any major consent, as required.

3.2.2.3 Surprise Regulatory Inspections

The main objective of surprise inspections is to carry out reactive inspections depending on the safety review, safety implications, violations of safety, prevailing unsafe situations pertaining to industrial and fire and/or radiation practices by NFCF.

These inspections should be conducted mostly as unannounced ones based on the importance and urgency felt by AERB. Inspection program should be intimated after reaching the plant/project just before starting the inspection to check the prevailing situation. This will enable an inspector to get first hand information about the realistic condition of plant documentation and systems. One or two inspectors should carry out these inspections for a day or two.

3.2.3 Areas of Coverage of Regulatory Inspections and Frequency

Typical areas to be covered during regulatory inspection at various stages of NFCF are given in Appendix-A. Areas of coverage and frequency of regulatory inspection for construction and operating stages are given below.

3.2.3.1 Construction Unit

Regulatory inspections are carried out as per the inspection program and are scheduled in advance normally with a frequency of about once in six months for units under construction/commissioning depending on the project stage. The inspections may be more frequent in a year and usually linked to schedule of completion of certain activities at various stages of construction.

These inspections are to confirm safety in NFCFs and to identify potential problems, if any, at an early stage. These inspections should consider amongst others:

(i) Status of implementation of safety committee's recommendations and AERB stipulations

(ii) Compliance with AERB safety codes and safety guides

(iii) Industrial and fire safety measures taken

(iv) Review of compliance with statutory provisions in all areas of construction

(v) QA during site construction

(vi) Storage and preservation

(vii) Training and qualification (at the time of commissioning)

(viii) Details of major changes affecting safety

(ix) Emergency preparedness for multi-unit sites

(x) Compliance with design intent.

3.2.3.2 Operating Unit

Regulatory inspections are carried out as per the inspection program and are scheduled in advance. Frequency of twice in a year generally is followed for operating NFCFs.

AERB may increase the frequency of these inspections at any time for a particular unit or group of units based on safety review.

These inspections provide an opportunity for the examination of the consentee's activities in order to confirm safety in NFCF performance and to identify potential problems, if any, at an early stage. These inspections should consider amongst others:

(i) Implementation of safety committee's recommendations and AERB directives/ stipulations

(ii) Complying with AERB safety codes and safety guides

(iii) Safety significance of the areas to be inspected

(iv) Operating experience, generic problems and lessons learnt at the NFCF and other NFCFs

(v) Radioactive liquid, gaseous and solid waste management and discharges to environment

(vi) Seriousness of the reported and non-reported incidents and overall safety practices

(vii) Pending surveillance requirements, and unit's response to complete the same

(viii) Review of the in-service inspection activities in all areas of plant operation/construction

(ix) Fire and industrial safety measures

(x) Radiation protection practices

(xi) Training and qualification

(xii) Occupational health aspects

(xiii) Safety culture

(xiv) Details of major changes including design modifications affecting safety

(xv) Adherence to technical specifications

(xvi) Operational and maintenance aspects

(xvii) Criticality preventive measures including monitoring system and alarm setting (if applicable).

Typical program and areas which are covered during an inspection for a fuel cycle facility are given in Annexure- 6.

3.3 Annual Planning of Regulatory Inspections

3.3.1 The annual schedule/plan of the inspections with established frequency, of various units, should be drawn towards the end of the year, previous to the inspection year and should be approved by Competent Authority. Normally the inspections should be planned for four days.

3.4 Inspection Team Formation and Correspondence

3.4.1 The lead inspector/team leader of the respective unit will submit the composition of a proposed inspection team, for approval in the prescribed format. The total number of inspectors in the team may be limited to 5 to 8 for an operating/constructing NFCF depending on the hazard potential and the area of the unit. The area of coverage during the inspection should be clearly mentioned. A specimen format for regulatory inspection team formation is given in Annexure-7.

3.4.2 The lead inspector/team leader should follow the approved schedule of regulatory inspections, unless any special request from respective units is received due to local constraints or for other exigencies within AERB itself. Selection of inspectors should be done based on the areas of inspection. It is better to have a panel of inspectors authorized for each area of inspection so as to maintain the uniformity and quality in inspections. During formation of the inspection team, the frequency of coverage of an area based on 3.2.3 and operational safety experience feedback from the particular unit in the previous six month or from any other site should be considered.

3.4.3 The above approved inspection program should be expeditiously communicated to the unit both by electronic means as well through normal channels. The inspection program should be communicated to each member of the inspection team and to other respective divisions (either within regulatory board or other technical support organisations) whose representatives are required as necessary. Lead inspector/ team leader should conduct a meeting with inspection team members to discuss the areas of coverage.

3.5. Intimation to Plant Management by Lead Inspector/Team Leader

For regulatory inspections, the lead inspector/team leader should intimate the project/plant management in advance regarding the inspection/travel programme indicating the areas of inspection and team members. He should also request for providing necessary logistics support (transport arrangements, security clearances and entry to radiation areas) and other arrangements needed for conducting the regulatory inspection.

For surprise inspections, site is to be informed only by phone or facsimile transmission for providing logistics support and then program should be intimated just before startup of the inspection.

3.6 Documentation for Regulatory Inspection and Enforcement

AERB should maintain the following documents for future inspections, follow-up and enforcement actions.

(i) Inspection reports and the respective unit's response should be available with lead inspector/ team leader and also at the centralized documentation cell and data bank

(ii) A master file containing relevant inspection related documents such as inspection program, correspondence, filled in check-lists, draft findings, notings, documents, charts, data collected at site etc.

(iii) Pending recommendations of safety committee and AERB stipulations

(iv) Safety, health and environment reports/health physics reports/minutes of meeting of local safety committee of concerned unit with lead inspector/team leaders, till the next inspection

(v) Pending items of previous inspections and their latest status, with lead inspector/team leader for follow-up.

(vi) Latest approved technical specifications of all plants.

(vii) Latest approved design specifications/drawings during construction.

3.7 Documents/Equipment to be Carried by Inspectors/Team Leader

(i) Latest approved technical specifications of the respective plant

(ii) Last inspection reports and unit response

(iii) Latest approved design specifications/drawings during construction

(iv) Safety committee's pending recommendations

(v) Atomic Energy Act, 1962

(vi) Factories Act, 1948

(vii) Atomic Energy (Factories) Rules, 1996

(viii) Atomic Energy (Working of Mines, Minerals and Handling of Prescribed Substances) Rules, 1984

(ix) Atomic Energy (Radiation Protection) Rules, 2004

(x) Latest ACGIH book on Threshold Limit Values (TLVs)

(xi) AERB Standard for Fire Protection Systems of Nuclear Facilities

(xii) Checklist for inspection

(xiii) Telephone numbers/ directory of important persons of AERB

(xiv) TLDs issued by AERB for radiation recording

(xv) Photographic equipment as permitted

(xvi) Radiation protection manual of AERB

(xvii) Directives issued by AERB

(xviii) Monitoring instruments.

4. METHODOLOGY AND REPORTING OF REGULATORY INSPECTION

4.1 General

4.1.1 Regulatory inspection of a NFCF can be made more effective to achieve its objective by adopting proper methodology during the conduct of inspection and preparation/issue of the inspection report. The lead inspector/team leader should take care to achieve the objective.

4.2 Preparations for the Inspection

4.2.1 Administrative Aspects

The lead inspector/team leader should co-ordinate all the necessary administrative arrangements for conduct of an inspection from planning stage to issue of final inspection report. All steps shall be followed and completed as a part of the preparations for the inspection as brought out in section 2 and section 3.

4.2.2 Technical Aspects

The lead inspector/team leader should study all the relevant documents as and when received from the sites. He/she should make appropriate observations from various documents and discuss with other team members. The lead inspector/team leader should identify the items which need to be followed-up by various inspectors based on site response to previous inspection report. Compliance checking of implementation of safety committee's recommendations by site should also be identified. Similarly the lead inspector/team leader should identify the generic or specific issues from national and/or international experiences for checking at sites.

4.2.3 Exhaustive Study by the Inspectors

Each inspector should study the relevant technical material to visualize the present condition of the plant systems under the assigned area of inspection. The documents are:

Unit under Construction:

(i) Recommendations of various safety committees including status of pending recommendations

(ii) AERB safety codes and safety guides as applicable-e.g. AERB safety guide on 'Works Contracts' (AERB/SG/IS-1)

(i) Previous inspection report and project response

(ii) Current status of construction/commissioning

(iii) Design basis reports and manuals

(iv) QA manuals for construction

(v) Commissioning tests to check the design basis

(vi) Commissioning hazard identification and analysis

(vii) Any feedback from national/international NFCFs under construction

(x) Stipulations of regulatory board made during earlier stage clearances

(xi) Reports on Industrial and Fire safety

(xii) Tri-annual safety, health and environment report

(vi) Updated job hazard analysis

(vii) Design safety aspect of safety critical equipment and their storage and preservation.

Operating Unit:

(i) Status reports and quarterly reports of the last one year

(ii) Accident/unusual occurrence reports

(iii) Minutes of local safety committee, tri-annual safety, health & environment report, quarterly/ annual HP reports for the last one year

(iv) Recommendations contained in minutes of meetings of safety committees

(v) Previous inspection report and unit's response

(vi) Technical specifications

(vii) Fire safety standard, relevant AERB safety guides

(viii) ISI documents

(ix) Fire hazard analysis

(x) Flow sheets

(xi) Any relevant feedback from plants.(national/international)

(xii) Manuals on emergency plans

4.2.4 Inspection Team Meeting at Head office or Site

The lead inspector/team leader should call a meeting of all inspectors of the team prior to departure from head quarters to brief them about the various areas of coverage and any important items based on his review from previous inspection. If it is not possible to conduct the meeting at head quarters it should be conducted at site, prior to inspection to discuss the items to be covered during the inspection. During the meeting, areas of inspections of each inspector should be earmarked.

4.2.5 Working Check-lists

The inspectors should select the items from the exhaustive checklists given under Annexure-1 and also add new items based on 4.2.3 and 4.2.4. Each inspector should prepare a checklist of items to be inspected by him and on this checklist, should endorse his observations / recommendations if any, against the item concerned. This should be handed over to lead inspector/team leader at the end of the inspection as records for future reference. The detailed regulatory inspection checklist for NFCFs under construction/commissioning is given in Annexure-2 and for operating NFCFs is given in Annexure-3. For check list w.r.t. civil engineering inspection of construction facilities section 4 of the AERB manual titled 'Inspection during Construction of Civil Engineering Structures Important to Safety of Nuclear Facilities' (AERB/SM/CSE-4) should be referred .For civil engineering inspection of the operating facilities of NFCF checklist is given in Annexure –4.

4.3 Inspection Methodology

4.3.1 Meeting with the Plant Management:

An introductory meeting with the plant management should be arranged on the first day. The management may present the status of the plant operation/project works and the status of implementation of the previous inspection recommendations and the safety statistics. The lead inspector/team leader should introduce all the members of the team to the site personnel indicating the areas being covered by each one. Plant/Project will introduce their representatives who will co-ordinate with inspectors. In the brief introductory meeting the exit meeting timings and the schedule of visiting areas should be finalized.

4.3.2 Inspection Time Management:

After the introductory meeting, the lead inspector/team leader should plan his/her activity based on the importance and nature of inspection. Inspection time is very precious and should be properly allocated for:

(i) field visit,

(ii) safety audit/review of documents,

(iii) interview of plant personnel, and

(iv) consolidation of findings and record.

4.3.3 Field Visits:

During field visits inspectors should move with plant/project representatives only and should be alert all the time. This helps in protecting from radiation and industrial hazards and also in identifying problems of unsafe acts and unsafe conditions. During field visits, readings of pressure and level gauges and other instrumentation should be specifically checked. Correctness of the values may be verified. Housekeeping measures and safety practices, fire prevention and protection measures being followed should be checked. If during the course of inspection any tests/surveillance are done, they can be witnessed and reported.

4.3.4 Control Room Visits (Commissioning/Operation):

Inspectors should visit the control room to watch the system status, operator's activities, monitoring records of detectors, shift changeover processes and general work practices followed by the staff etc. Important control room parameters may also be noted and verified for their correctness compared to field readings.

4.3.5 Witnessing the Field Activities:

During the inspections, field activities should be observed to check compliance with procedures.

4.3.6 Tests and Measurements:

Inspectors should review the documents to verify satisfactory completion of tests and measurements. In case gross deficiencies are noticed in the testing procedures, test results and equipment used, a repeat test should be recommended to be carried out and if necessary in their presence. If it is not feasible to carryout the test immediately, appropriate enforcement actions should be taken in consultation with Regulatory Board.

4.3.7 Examination of Records and Documents:

The documents, which would be reviewed during inspection, should be informed by the team leader in advance to unit head so that these are made available. A sample list of documents to be verified during inspection is given in Annexure-10.

4.3.8 Discussions with the Plant/Project Personnel:

Observations made during inspection should be discussed with concerned plant personnel to arrive at a common understanding and proposed corrective action. The inspector should apprise the project/ plant personnel about the correctness/ authenticity of his observation and inform them to take required corrective measures for improving the situation. Important deviations observed should be reconfirmed/ verified.

4.3.9 Recording of Inspection Findings

Necessary assistance for documenting/recording the inspection findings and collection of evidences should be provided by plant/project officers who are coordinating the inspection. In case of any difficulty, inspectors should bring the matter to the notice of the lead inspector/team leader who should immediately sort out the problem with the plant management.

While making the observations it is always a good practice to quote the findings from various documents/ records of the unit with references. Similarly while giving the recommendations or conclusions it is always good to quote the requirements from statutory provisions, codes/standards/guides, technical specifications, approved procedures, safety committee recommendations, Regulatory Board stipulations/ directives etc. to be complied by plant/project to overcome the observed deficiencies.

4.4 Inspection Report Preparation

4.4.1 Findings of the regulatory inspection have to be documented for the following purpose:

(i) To document and record an assessment of safety practices of consentee

(ii) To record the information gathered during inspection

(iii) To record any findings and the conclusions of the inspectors

(iv) To record the recommendations, if any, for future action by the consentee or by safety committees and AERB

(v) To provide basis for notifying the consentee of the inspection findings, and of any requirements, to be complied with.

4.4.2 Contents of Inspection Report:

While deciding the scope and contents of inspection report, the following are taken into consideration:

(i) Type of NFCF and its consenting stage/operating status

(ii) The type of the inspection, i.e. whether routine or special. Inspection reports may typically contain:

  (a) type and date of inspection with unique number for a particular project/plant including a running overall number for all inspections done so far in that year;

  (b) details of NFCF areas, activities, processes, systems, or components which have been inspected, assessed or reviewed;

  (c) criteria used in the assessment;

  (d) compliance status of earlier inspection findings;

  (e) a record of the status of earlier regulatory actions;

  (f) a record of deficiency or violation found during regulatory inspections;

  (g) a record of potential problems relating to safety; and

  (h) a record of recommendations for future action.

A specimen format of an inspection report for NFCF under construction / operating NFCF is given in Annexure-11.

4.4.3 A section wise draft report should be prepared at the end of the inspection at site itself and should be consolidated by the lead inspector/team leader after discussing with the inspectors before the exit meeting. Any documentary evidence shown before the exit meeting should be considered.

4.4.4 Categorisation of Observations/Recommendations in the Inspection Report for further Review and Follow up:

To facilitate follow-up review, enforcement and corrective actions, observations and recommendations made during the inspection should be categorised generally based on severity of safety significance and follow-up of the required measures. The lead inspector/team leader in consultation with other members of the team should categorise each observation having relevant recommendation. The categorisation should help the utility in submitting the detailed and in depth responses giving full credence to the category level. The NFCF should be asked to give the responses to the reported observations/deficiencies/ recommendations, the corrective measures taken or proposed along with the target dates within a month to the AERB. If the categorisation is completed before the exit meeting, plant management will discuss the items more appropriately based on categorisation.

The findings of the inspection team have to be categorised in 4 categories (I to IV) based on the guidelines given below:

Construction/Operating Unit:

Category-I: Violation of Rules, Acts, AERB safety codes and standards, technical specification requirements (safety limits, limiting safety system settings and limiting conditions for operation), SARCOP/AERB directives, licensing stipulations, etc.

Category-II: Deficiencies in operating systems and safety related systems, deficiencies in surveillance procedures/practices, short comings identified in the design of safety related equipment and working conditions based on plant's operating experience including generic deficiencies, safety review related observations, etc.

Category-III: Procedural inadequacies in organisation, ISI, O&M procedures, training and qualification, radiation protection procedures, radiological waste management, effluent management, emergency preparedness, etc.

Category-IV: General observations/deficiencies regarding housekeeping and good operating/ maintenance practices.

Specimen format of a categorisation sheet along with enforcement/follow-up and review required for NFCFs is given in Annexure-12.

4.5 Exit Meeting with the Plant Management:

At the end of the inspection, when the draft report is ready, an exit meeting with the plant management is to be arranged. The purpose of this meeting is to brief the management about the strengths and weaknesses noticed during the inspection, and also to get additional information, if any, from the management, to review/modify as necessary the observations/recommendations made in the report. In the meeting, the lead inspector/team leader may present the entire draft report, himself/herself or may ask the members of the team to present their respective areas of report.

Cordial atmosphere should prevail in the meeting and the deliberations should be professional. The plant management may be complimented by the inspection team for the good practices / achievements noticed which may help in improving nuclear and industrial safety and may be mentioned in the report.

On deficiencies of serious concern noticed, the inspecting team should take a firm stand and quote the requirement laid down in various documents.

Where management's defensive response is convincing, the team may accept it and appropriately modify the relevant portions of the report. In case of disagreement, the lead inspector/team leader will take final decision in consultation with headquarters of AERB.

4.6 Report Submission and Utility Response

Final inspection report should be prepared and as far as possible an advance copy may be issued at plant site. Formal inspection report will be issued within 15 days along with the enforcement letter from the concerned Division of AERB and compliance should be sent by NFCF within a month. Issuing authority, may change any of the inspection finding recommendation and/or the categorisation if felt necessary before issuing.

4.7 Reporting of Confidential Matters

Although it may be the practice to include all the observations and findings in the inspection reports, lead inspector/team leader may decide to omit some information from reporting. Such information of personnel or medical information relating to individuals and proprietary in nature may be withheld for security reasons. Such confidential matters may be dealt separately instead of including in the report.

4.8 Publication of Inspection Findings

In order to inform the public about the safety of nuclear installations and about the effective functioning of AERB, findings of inspection and regulatory decisions may be made public through AERB annual reports and/or news letters.

5. ENFORCEMENT ACTIONS

5.1 General

5.1.1 AERB has been empowered by Government to enforce compliance with the requirements as laid down in relevant statutes and/or consents. This includes the authority to enforce the consentee to modify, correct or curtail any activity/aspect of an NFCF construction/operation, procedures, practices, systems, structures or components as necessary to ensure the required level of safety.

5.1.2 AERB has delegated the responsibility to one of its divisions for enforcing radiation safety and industrial and fire safety in the units under construction and operating units of NFCFs. The division should ensure that the consentee has effectively carried out corrective actions to comply with the recommendations included in the inspection report. The consentee is required to rectify the non-compliance, in an agreed time scale and take all necessary measures to prevent recurrence. The division should carry out enforcement actions either directly or through competent authority as brought out in subsequent paragraphs for units under construction and operating NFCFs. Lead inspector/team leaders are also given certain limited powers of enforcement.

5.1.3 Enforcement actions are designed to address non-compliance with specified conditions and requirements. These actions shall be commensurate with the seriousness of the non-compliance. Thus there are different kinds of enforcement actions, from written warnings to penalties and, ultimately, recommending to the Competent Authority for withdrawal/suspension of consent or license to operate.

5.2 Consideration for Enforcement Actions

The factors to be considered in deciding appropriate enforcement action in each case should include:

(a) the safety significance of the deficiency, and/or seriousness of the violation,

(b) whether the violation of less serious nature has been repeated,

(c) whether there has been a deliberate or willful violation of the prescribed limits and conditions of technical specifications, relevant statutes[1] and/or directives,

(d) lack of safety culture,

(e) whether the violation is identified and reported by consentee or regulatory body and others,

(f) the past performance of the operator and trend in performance, and

(g) the need for consistency and transparency in the treatment of operators/agencies.

5.3 Methods of Enforcement and Normalisation

Various enforcement methods available are:

- Sending an enforcement letter for the deficiencies found during inspection
- Issue of written directives[2]

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[1] NFCF has to comply with various requirements stipulated by other statutory organisations like Pollution Control Board, Controller of Explosives etc. and their compliance is checked during the inspections. In case of non- compliance of any issue pertaining to the stipulations by any such organisations, AERB is not involved in the enforcement activity since it is out of its purview.

[2] Written directive: AERB informs in writing to the consentee to submit a significant event report (SER) in case it was not submitted or the event itself was not reported in detail for the observed deviations from consent stipulations, technical specification requirements, radiological protection procedures, deviations with respect to industrial and fire safety and/or any unsatisfactory situation/incident along with corrective actions required to be taken within a specified period.

- Orders to curtail[3] activities or
- Modification, suspension or revocation of consents or authorisations or licenses
- Initiation of other penal actions.

5.3.1 Sending the Report and Enforcement Letter

As soon as the lead inspector/team leader submits the inspection report, the responsible division dealing with safety of NFCF under construction or operation should send enforcement letter to consentee asking for responses on the inspection report within a month. The issuing authority may modify any of the inspection findings/recommendations and the categorization if felt necessary before issuing the inspection report. The consentee/occupier should submit immediately his response for any issue of concern depending on severity. A specimen covering letter for sending report along with the enforcement letter is given in Annexure-11.

Consentee's/Occupier's response to the inspection report should be reviewed to:

- discuss the important items of inspection report having safety significance, in the respective safety committees for NFCFs under construction and unit safety committees for operating NFCFs.
- decide the further type of enforcement actions
- identify those items to be referred to the Competent Authority for his directive regarding further enforcement actions.

5.3.2 Written Directives

In case of deviations or violation of consent requirements, or unsatisfactory situations during any phase of the NFCFs life cycle, the responsible division should issue a written directive to the NFCF under intimation to the Competent Authority.

The written directive should specify the nature of and the regulatory basis for each violation, deviation or unsatisfactory situation. It should also specify a period of time for taking corrective action and may provide guidance on the nature of the corrective action.

5.3.3 Orders to Curtail Specific Activities

The division of AERB responsible for dealing with the safety of NFCF under construction or operating NFCF should recommend to the Competent Authority to direct the consentee to curtail specific activities, in the event of:

(i) Apparent deterioration of the NFCFs structures, systems or components and/or

(i) Serious violations which pose unsafe situations or an imminent radiation hazard to the site personnel or the public and the environment

(ii) Unsafe acts/unsafe practices

(iii) Any serious non-compliance observed during all the phases of NFCFs life cycle. During the construction phase, for example, this could mean suspension of construction activity. Similarly during the operational phase, for example, this could mean requiring reduction in production rate, pressure, temperature or other relevant parameters, including, if necessary, shutting down of specific plant/unit of the NFCF.

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3 Order to curtail: An order issued by AERB to the consentee to curtail the authorised activity in order that the observed deterioration in systems, structures and components, and/or serious violations do not pose an imminent radiological hazard, industrial and fire safety hazard to the site personnel, public and environment.

5.3.4 Modification, suspension or revocation of consents, authorisations

In the event of chronic or extremely serious non-compliance, repeated fatalities, highly deteriorated condition or significant contamination of the environment due to serious malfunction or damage to the NFCF, AERB may modify, suspend or revoke the consent (registration/ license / authorisation) depending on the nature and severity of the situation.

5.3.5 Other penal action

For serious violations or repeated ones of less serious nature or for deliberate non-compliance of the applicable provisions of the Atomic Energy Act, 1962 and the Rules issued thereunder, and of the requirements stipulated by AERB, penal action may be initiated as prescribed in Section 24 of the Atomic Energy Act 1962.

5.3.6 Normalisation:

5.3.6.1 AERB may lift the enforcement and authorise the consentee for resumption of particular activity after ensuring the following as applicable (list is for illustration only):

(i) Successful completion of identified corrective measures by the consentee

(ii) Successful carrying out of the required inspections and tests by the consentee

(iii) Satisfactory actions taken by the consentee to prevent recurrence of same or similar issue/ situation

(iv) Special regulatory inspections by AERB or its authorised representatives to check compliance with all directives and to confirm that measures taken to improve safety are satisfactory

(v) Completion of safety review by appropriate safety committees as applicable and if required, by the Board of AERB.

5.3.6.2 The process of normalisation for each of the enforcement action is mentioned in the subsequent paragraphs. AERB may follow any or all of the measures listed below on a case-by-case basis for normalising the different enforcement actions already taken:

(i) Enforcement Letter:

The regulatory inspection report is sent to the consentee along with the enforcement letter for compliance. The response to the enforcement letter and to the recommendations made in regulatory inspection report submitted by the consentee is reviewed in the respective divisions of AERB. If the responses along with corrective actions are satisfactory, the issue is closed. The compliance is verified in the next inspection. In case the issue has already been referred to safety committee or would be referred to safety committee based on the response, the recommendations of the safety committee will be continuously followed up in subsequent inspections till the issue is resolved. Based on the findings of the inspection and/or the review in safety committees, if any major modifications are carried out, the same are reviewed/verified during the next inspections to ensure satisfactory implementation.

(ii) Written Directives:

In general, for written directives issued by AERB, the consentee's responses are reviewed first in the respective divisions of AERB and appropriate safety committees as the case may be. The corrective measures suggested by the safety committees are followed up during the subsequent inspections. If required, special inspections are conducted either before or after normalising the enforcement.

In case on the spot enforcement actions are taken by the lead inspector or inspector with permission from Chairman/Vice Chairman, then the normalisation of enforcement action and final clearance to resume the activity would be under the directive of Chairman AERB based on satisfactory verification of compliances and through special inspections, if required.

In case a written directive is issued for non-reporting of events or significant events, the explanatory response and the event report submitted by the consentee should be studied in the respective divisions of AERB and if required, by the appropriate safety committees. Further, a review of the general performance of the facility and the steps taken to prevent recurrence of such issues in future is also done, before normalising the written directive.

In case a written directive is issued for non-compliance to certain stipulations of the consent, the explanatory response submitted by the consentee, bringing out the corrective measures taken to prevent recurrence of such issues should be studied in the respective divisions of AERB and if required, by the appropriate safety committees. Review of the general performance of the facility is done before normalising the written directive.

(iii) Curtailment:

In case of any specific activity was curtailed based on non-compliance with the stipulations of the consent (registration/licencse/authorisation), AERB will review the consentee's response and carry out special inspections to check that all the safety related deficiencies noticed earlier are addressed fully and also will ensure that there is no radiological, industrial and/or fire hazard to the site personnel, public and the environment. The concerned division may investigate, in detail, to understand the reasons that took place in the utility and resulted in any one of the following:

- Deterioration of structures, systems and components
- Serious violations
- Non-compliance with safety culture
- Non-compliance with security requirements
- Unsafe act or practices.

The investigation includes checking the corrective actions being taken and incorporation of lessons learnt in the specific utility (and others, if applicable). Based on satisfactory compliance with all the regulatory requirements, and clearances from appropriate safety committees, AERB may take up the issues either in Board of AERB or based on review, the concerned division will grant the relevant clearances/authorizations.

When it is determined that the reasons, on which curtailment was ordered are satisfactorily addressed and responded to, letter for normalising of curtailment may be issued. After all the above reviews, AERB may issue either the relevant clearance to resume the specific activity or the full consent or stage wise consent as a precautionary measure and may carry out additional inspections to check the performance during such operations. If required, additional tests/ experiments are asked for and they are to be conducted in the presence of authorised AERB personnel as appropriate before permitting normal operations.

(iv) Modifications, Suspension, Revocations:

In case of modification or suspension or revocation of the consent (registration/license/ authorisation) issued depending on the nature and severity of the situation, then AERB may set up a special task force for carrying out detailed review to:

- Determine the root cause for a particular occurrence/event
- Arrive at corrective actions to prevent recurrence
- Review implementation of all lessons learnt.

While modification and suspension of consent can be normalised after the above steps, thought has to be given in the case of revoking of consent, whether any of the earlier reviews done during the issue of initial consent need to be repeated in view of changed circumstances.

(v) Penal Action:

Since the penal action is envisaged after invoking the section 24 and 26 of the Atomic Energy Act, 1962 by court of law, penal action will be normalised as per the directives of court. However, accompanied enforcement actions, if any were taken along with the penal actions, may be normalised as per the guidelines given above.

5.4 Delegation of Powers to Lead Inspector//Team Leader

During an inspection, if some serious unsafe conditions are observed and require immediate enforcement, powers are delegated to the lead inspector/team leader to take necessary action on the spot after obtaining prior approval from Chairman/Vice-chairman, AERB.

Specimen letter format for on the spot enforcement by team leader is given in Annexure-13 and for delegation of powers of lead inspectors is given in Annexure-14.

5.5 Enforcement Procedures

5.5.1 All enforcement decisions shall be intimated to the consentee in writing and records of the same shall be maintained.

5.5.2 On the spot enforcement actions taken by lead inspector/team leader if authorised, are appropriate only in unusual situations based on a case - by- case basis.

5.5.3 In normal situations, the concerned Division of AERB shall take enforcement actions particularly those involving curtailment of activity or suspension of consents and other punitive actions in consultation with the Competent Authority.

5.5.4 A special inspection should be planned to check whether:

(a) the consentee/licensee has complied with the recommendations/stipulations within the period of time specified in the enforcement order; and

(b) the enforcement measures intended to protect the personnel, the public and the environment from an imminent radiological hazard have been implemented by the consentee even if the consentee intends to appeal against the decision of the regulatory body to the Board of AERB.

APPENDIX-A

INSPECTION STAGES

A.1 General

Inspection requirements during various stages of NFCF consent are described briefly in the subsequent sections based on AERB safety guide titled 'Consenting Process for Nuclear Fuel Cycle Facilities and Related Industrial Facilities other than 'Nuclear Power Plants and Research Reactors' (AERB/SG/G-2). The inspection areas mentioned here are broadly applicable to different types of plants under nuclear fuel cycle process. However, detailed inspection areas during the major consenting stages may be identified and facility specific checklists may be prepared and followed as required.

A.2 Site Inspection

A.2.1 Site preparation activities undertaken by the consentee, including verification of site characteristics, and authorised excavation and earthwork should be inspected.

A.2.2 Regulatory inspections during siting is to verify:

(i) the consentee is undertaking siting activities in full conformity with existing regulatory requirements,

(ii) the site preparation work does not proceed beyond the consent in force,

(iii) the site characteristics remain consistent with the information presented by the consentee in its application and in the subsequent supporting documentation,

(iv) the implementation of the recommendations of relevant committees for site evaluation and the stipulations mentioned by AERB while issuing the consent,

(v) any new information being revealed as a result of the activities during the site preparation, which will be useful in making subsequent consenting decisions, and

(vi) progress of site specific meteorological and radiological data collection and subsequent studies on activity dispersion.

A.2.3 Detailed checklist for inspection during siting should be prepared before each inspection as it is not a routine inspection and will be site specific.

A.3. Design and Construction

A.3.1 Regulatory inspection during design and construction is to verify that:

(i) site specific data are acceptable and appropriately incorporated in design,

(ii) safety related structures, systems and components (SSCs), conform to the requirements of relevant codes and standards and/or established good practices,

(iii) construction activities associated with fabricating and installing these SSCs are conducted in accordance with regulatory requirements for industrial and fire safety and in conformity with general safety objectives,

(iv) design concession records are maintained and concurrence obtained from various agencies , including those requiring regulatory review,

(v) QA requirements are established and are adhered to during all stages of construction,

(vi) Industrial and fire safety aspects covering all stages of construction activities are established and proper procedures are developed and implemented,

(vii) storage and preservation system is established and procedures followed,

(viii) emergency preparedness procedures are established especially for multi-unit sites, and

(ix) safety committee recommendations and stipulations of Regulatory Board are complied with.

A.3.2 A general checklist for inspection during construction/operation is given in Annexure-1 whereas detailed inspection checklist for construction stage is given in Annexure-2.

A.4 Commissioning

A.4.1 The commissioning phase for nuclear fuel cycle and related industrial facilities (i.e. system flushing, initial charging of process fluids/chemicals, etc.) should be identified. The inspection plan for this phase should cover:

(a) status of consent,

(b) verification of compliance with the approved design specifications during plant installation including any non-conformances,

(c) review of the "as-built" design of the plant,

(d) commissioning tests and results,

(e) provision for criticality safety, radiation protection, chemical, fire and industrial safety,

(f) waste management,

(g) limits and conditions for operation,

(h) qualification and training of plant personnel,

(i) quality assurance organisation and its programme,

(j) on-site and off-site emergency preparedness,

(k) nuclear/radioactive material inventory, and

(l) maintenance of records and systems of reporting to plant management and AERB

A.4.2 Activities associated with commissioning of the NFCF will normally begin before construction is completed. Accordingly, AERB should be prepared to inspect areas of commissioning activity concurrently with inspection of construction phase activities. Based on review of the commissioning program, certain hold points may be identified by safety review committees to be covered by inspections prior to next stage of consenting.

A.5 Operation Stage

A.5.1 Once the NFCF has attained the authorised operation stage, an inspection program to verify consentee's compliance with regulatory requirements and conformance to general safety objectives and to detect potential safety problems should be implemented. This verification should include direct observation of activities, interviews with plant personnel, including managers, review of qualification of the personnel, and a sampling documentation review. For waste management and particularly waste disposal facilities, the structure of the program and tests carried out will be primarily concerned with conformance to the relevant design and waste acceptance criteria for the facility and will be an important part of providing confidence for the long term safety.

A.5.2 Following areas of operating plant should be inspected.

(a) Control room

(b) Plant areas

(c) Workshops

(d) Ware houses

(e) Stores

(f) Fire station and other fire fighting aspects

(g) Effluent treatment plant

(h) Auxiliary plant buildings

(i) Utility services (compressor house, boiler house etc.)

(j) Occupational health centre/first aid centre

(k) Laboratories

(l) Health physics unit

(m) Emergency assembly areas

(n) Personal protective equipment (PPE) storage

(o) Waste storage facility

(p) Captive power plant

(q) Switchyard/ main receiving substation/transformer yards

(r) Security provisions.

Detailed checklist to inspect all areas during operation stage is given in Annexure-3.

A.6 Decommissioning Stage

A.6.1 Decommissioning of a NFCF is taken up before releasing the NFCF from regulatory control. Regulatory inspection should be carried out during decommissioning stage to confirm that any residual activity has been reduced to specified acceptable levels for general public use. Detailed checklist for inspection during and after decommissioning of NFCF has to be prepared at the time of job execution. However the following activities should be covered:

- the removal of radioactive materials,
- the management strategy for handling and storing of radioactive material,
- the depressurising and draining of any fluid,
- the decontamination and dismantling activities,
- the waste management strategy for the treatment, conditioning, storage and disposal of all radioactive wastes,
- the physical condition of the NFCF, especially the surveillance of the integrity and/or availability of relevant structures, systems and components of NFCFs, including protective barriers and appropriateness of the procedures at each stage of decommissioning,
- the characterisation of the residual activity,
- physical security, safeguards and access control,
- radiological monitoring and surveillance, including occupational and public protection plan,
- environmental monitoring,
- making the equipment free from all chemicals, and
- storage and disposal of hazardous materials/chemicals.

A.7 Occupational Health

A.7.1 Various requirements of medical examinations as laid down in the Factories Act, 1948 and the Atomic Energy (Factories) Rules, 1996 and the Radiation Protection Rules, 2004 should be checked at each NFCF during all stages of authorisation. Occupational health status of employees of the fuel cycle facilities is submitted to the AERB by the facilities periodically. The data submitted by the facility should be verified during regulatory inspection.

ANNEXURE-1

GENERAL CHECKLIST FOR REGULATORY INSPECTION OF CONSTRUCTION/OPERATING NFCF

No.	Aspect	Checkpoint	Remarks
1.	**Licenses**		
1.	License to run the factory under the Factories Act, 1948/Atomic Energy (Factories) Rules, 1996. [Chairman, AERB]	1. Validity 2. Stipulations complied with	
2.	License for storage of Petroleum products under Petroleum Act, 1934/Petroleum Rules, 1976. [Chief Controller of explosives]	Validity	
3.	License for storage/ (transport by road) of compressed gas in any vessel/static unfired pressure vessels under Static and Mobile Pressure Vessels (Unfired) Rules, 1981. [Chief Controller of Explosives]	Validity	
4.	License for storage/possession/filling of gas cylinders with compressed gas under Gas Cylinder Rules, 2004 (as applicable). [Chief Controller of Explosives]	Validity	
5.	License for possession, use, transport, import etc., of explosives under the Explosives Act, 1884/ Rules 1983 (where applicable) [Chief Controller of Explosives]	Validity	
6.	Licenses for mining and milling under Atomic Energy (WMM&HPS) Rules, 1984. [Joint Secretary, Dept of Atomic Energy]	Validity	
7.	License under Indian Electricity Act, 1910/ Indian Electricity Rules, 1956 for sub-stations. [Central Government/Central Electricity Authority]	Validity	
2.	**Consents**		
1.	Consent for discharge of effluents under water (Prevention and Control of Pollution) Act, 1974 / Rules [State Pollution Control Board]	Availability	
2.	Consent under Air (Prevention and Control of Pollution) Act, 1981/Rules [State Pollution Control Board]	Availability	

ANNEXURE-1 (Contd.)

No.	Aspect	Checkpoint	Remarks
3.	**Authorisations**		
1.	Authorisation for handling of any of the hazardous wastes listed under various categories in Hazardous Waste (Management and Handling) Rules 1989 and as amended in 2003 (if the quantities exceed those prescribed in the Schedules) [State Pollution Control Board]	Validity	
2.	Authorisation for disposal or transfer of radioactive waste under Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987 [Chairman, AERB]	1. Validity 2 Stipulations complied with	
3.	Authorisation of personnel for operating electrical installation under Indian Electricity Rules, 1956. [Facility Management]	Availability	
4.	Authorisation of operating personnel for plant operation (for Heavy Water Plants) [AERB]	Validity	
5.	Authorisation of [4]competent persons under Rule 31, AE(F)R-1996 / Section 6, 7, 21(2), 28, 29, 31,36, 41-C(b) & 87- FA,1948	Validity	
6.	Authorisation from AERB for siting, construction, commissioning and operation	Availability	
4.	**Certificates**		
	Certificate of registration and authorisation for use of boilers. [Chief Inspector/Inspector of Boilers]	Availability	
5.	**Documents**		
1.	Safety policy (u/s 7A of Factories Act, 1948)	1. Intention and objectives defined 2. Signed by occupier and displayed at various locations 3. Availability in local language 4. Review (once in 4 years)	
2.	Material Safety Data Sheet (u/s 15 of MISHC Rule, 1989)	1. Availability 2. Distribution	
3.	Fire Hazard Analysis (Clause 3.5 of AERB/S/IRSD-1)	Availability of fire hazard analysis report if any carried out for the facility at any stage	

[4] The Competent Person is a person who is having a degree in discipline mentioned or equivalent followed by experience as specified, in responsible position in the field and designated by the Competent Authority

ANNEXURE-1 (Contd.)

No.	Aspect	Checkpoint	Remarks
5.	**(Contd.)**		
4.	Standing Fire Order (Clause 8.2.3 of AERB/S/IRSD-1)	1. Approvals 2. Availability of latest revisions 3. Distribution.	
6.	**Records**		
1.	Safety Committee (u/s 41 & 41 G of Factories Act, 1948)	1. Workers representation 2. Availability of minutes of meeting 3. Frequency 4. Agenda as per Rules 5. Follow-up of recommendations.	
2.	[5] Safety Related Unusual Occurrences (Technical specifications)	1. Availability of reports 2. Compliance with recommendations	
3.	Accidents Investigation (Rule 89 of AE(F)R, 1996)	1. Whether all loss-time accidents investigated 2. Availability of reports 3. Compliance with recommendations	
4.	Emergency plans a. On-site Emergency (F.A, 1948, MSIHC Rules, AERB guidelines) b. Off-site Emergency. (where applicable)	1. Approval 2. Availability of latest revisions 3. Compliance including emergency exercise	
5.	a. Examination and testing of hoists and lifts b. Examination and testing of lifting machines, chains, ropes and lifting tackles (Rule 34 and 35), AE(F)R-1996)	1. Listing of equipment 2. Availability in prescribed formats 3 & 4 3. Signature of competent person 4. Updating	
6.	Medical Examination of a. Canteen workers (Rule 71), AE(F)R-1996 b. Fork-lift drivers/ Crane operators (Rule 55), AE(F)R-1996 c. Radiation workers (RPR-2004) d. Workers employed in noisy areas (Audiometry)	1. Availability of list of workers 2. Review and follow-up	
7.	a. Examination or test of pressure vessel or plant. b. Safety valve testing (Rule 36 of AE(F)R, 1996)	1. Listing of equipment 2. Availability in prescribed format 5 3. Signature of competent person 4. Updating	
8.	Technical specifications (SARCOP stipulations)	1. Approvals 2. Availability of latest revisions 3. Surveillance 4. Check violations	

[5] Safety related unusual occurrences are to be changed to significant event report/event report

ANNEXURE-1 (Contd.)

No.	Aspect	Checkpoint	Remarks
6.	**(Contd.)**		
9.	In-service inspection (Rule 36 of AE(F)R, 1996)	1. Approval of manual 2. Availability of latest revisions 3. Periodic tests 4. Checks and inspection	
10.	Implementation status of previous recommendations of regulatory inspections (AERB stipulation)	Field checks	
11.	Implementation of SARCOP/Unit Safety Committee recommendations (AERB stipulations)	Follow-up	
12.	BA set test records (The Gas Cylinder Rules, 2004)	1. Checks 2. Entries	
13.	BA set cylinders and other cylinders Hdro Test Records (The Gas Cylinder Rules, 2004)	1. Validity 2. Data entry	
14.	First aid boxes (Rule 65 of AE(F)R, 1996)	1. Location 2. Upkeep	
15.	Radiological safety (AE(RP)R, 2004 and AERB/NF/SM/O-2, 2005)	1. H.P. reports, dose records, surface contamination, exposure investigation report etc. 2. Waste transferred/disposed 3. Availability of radiological safety officer	
16.	Safety work permit records (Rule 44 of AE(F)R, 1996)	1. Availability for all jobs 2. Entries	
7.	**Area-wise**		
1.	Control Room	1. Control Room habitability during all likely emergencies 2. Availability of P&IDs, PFDs, operating manuals, technical specifications, trips jumpering (by-passing) register, log books, emergency plans. 3. Emergency resources like, communication equipment, area maps (off-site), vehicles, availability of PPE 4. Fire safety measures - fire detectors and alarms, portable fire extinguishers-testing and inspection. Provision of fire barriers, fire stop seals, cable protection etc.	

ANNEXURE-1 (Contd.)

No.	Aspect	Checkpoint	Remarks
7.	**(Contd.)**		
1.	Control Room (Contd.)	5. Emergency exits availability and marking 6. Communication system-availability and healthiness 7. Identification and healthiness of panels	
2.	Plant Area	1. Machine guarding 2. Housekeeping 3. Pipelines, equipment, valves identification and color coding 4. Fire safety measures 5. Levels of noise, dust, fumes, leaks and illumination 6. Condition of structural elements, staircases, foundation of equipment, walk-ways and barricading. 7. Mentioning of SWL, date of testing of EOT cranes, hoists and lifting tackles. Availability of walk-ways for cranes 8. Approach to equipment including electrical isolations. 9. Availability of communication system. 10. Lightning protection and earthing arrangements 11. Availability of emergency equipment like eyewash fountains and showers, wind socks, etc. 12. Criticality monitoring systems 13. Usage of PPE by working personnel and working practices 14. Suitability/condition of electrical fittings. 15. Pressure vessels condition 16. Ventilation system-air changes 17. Utilities (plant services) 18. Laying out of pipelines and cables.	
3.	Compressor & Boiler House	1. Machine guarding 2. Housekeeping 3. Pipelines, equipment, valves identification & color coding 4. Fire safety measures 5. Levels of noise, dust, fumes, leaks and illumination	

ANNEXURE-1 (Contd.)

No.	Aspect	Checkpoint	Remarks
7.	**(Contd.)**		
3.	Compressor & Boiler House (Contd.)	6. Condition of structural elements, staircases, foundation of equipment, walk-ways and barricading. 7. Mentioning of SWL, date of testing of EOT cranes, hoists and lifting tackles. Availability of walk-ways for cranes 8. Approach to equipment including electrical isolations. 9. Availability of communication system. 10. Lightning protection and earthing arrangements 11. Availability of emergency equipment like eyewash fountains and showers, wind socks, etc. 12. Usage of PPE by working personnel and working practices 13. Suitability/condition of electrical fittings. 14. Pressure vessels condition 15. Laying out of pipelines and cables. 16. Availability of operator's cabin 17. Insulation of hot pipelines and surfaces.	
4.	Chemicals Handling & Storage	1. Display of contents and capacity of the tanks. 2. Display of license number and fencing of premises in case of petroleum products 3. Availability of safety features like dykes, safety valves, overflow lines, level gauges, pressure gauges. 4. Display of procedures for storage and handling spills. 5. Availability of emergency procedures. 6. Position of local push buttons for pumps (location & access). 7. Availability of detectors for detecting toxic chemicals. 8. Availability of emergency facilities like eyewash fountains and showers, emergency kits, neutralizing agents and PPE.	

ANNEXURE-1 (Contd.)

No.	Aspect	Checkpoint	Remarks
7.	**(Contd.)**		
4.	Chemicals Handling & Storage (Contd.)	9. Display of properties of fire fighting chemicals. 10. Fire safety measures.	
5.	Maintenance Work Shops (Mechanical, Electrical & Instrumentation)	1. Housekeeping 2. Machine guarding 3. Access to electrical isolations 4. Wooden platforms to operators for high-powered machines 5. Healthiness of gas welding machines with respect to tube condition and pressure gauges. 6. Healthiness of gas welding machines with respect to cable condition (wear and tear, jointing), earthing provision. 7. Healthiness of portable powered tools with respect to insulation, wear and tear. 8. Provision of job rest gap and guard for pedestal grinders 9. Noise and illumination levels 10. First aid box availability 11. Proper scrap collection facility available 12. Fire safety measures. 13. Usage of proper PPE	
6.	Transformer Yard	1. Fencing of transformer area 2. Display of 'Danger Notices' permanently in conspicuous position. 3. Fire fighting arrangement - provision of manually operated sprinkler system for transformers of rating 1MVA to 5MVA and automatic sprinkler system for transformers above 5MVA [clause-4.5.18 of AERB Fire Standard] & Indian Electricity Rules (Rule 5, GSR.468, 2000). 4. Provision of oil soak pit for transformers using more than 2.275 KL of oil. 5. Provision for draining or removal of oil from a tank containing 9.1KL or more oil. 6. Provision of lightning arrestor and earthing for equipment.	

ANNEXURE-1 (Contd.)

No.	Aspect	Checkpoint	Remarks
7.	**(Contd.)**		
6.	Transformer Yard (Contd.)	7. Housekeeping	
7.	Electrical Substations	1. List of authorized persons availability 2. Display of 'Danger Notices' permanently in conspicuous position 2.1 Availability of Instructions in English, Hindi and the local language for the restoration of persons suffering from electric shock 2.2 Ability of authorised persons to carry out instructions for resuscitation of persons suffering from electric shock 3. Fire fighting and first aid 3.1 Fire fighting arrangement 3.2 Provision of first aid boxes 3.3 First aid training 4. Availability of clear space around the switch boards 5. Provision of earth wire and measurement of earth resistance value 6. Identification and housekeeping around equipment 7. Provision of rubber mats.	
8.	Battery Room	1. Hydrogen monitoring. 2. Condition of ventilation system-top exhaust 3. Acids handling - acid brick lining, eyes and spill washing arrangements. 4. Availability of PPE 5. Housekeeping 6. Provision of fire compartments, barriers, seals etc. to prevent spread of fire 7. Illumination.	
9.	Diesel Generator Room	1. Provision of fire barriers, fire seals, fire retardant paints for cables, fire doors in the area (as applicable) 2. Provision of automatic fire detection and alarm, suppression system, fire hose stations, portable fire extinguishers 3. Drainage and smoke venting facility	

ANNEXURE-1 (Contd.)

No.	Aspect	Checkpoint	Remarks
7.	**(Contd.)**		
9.	Diesel Generator Room (Contd.)	4. Day tank location, dyke and protection [Clause: 11.1.2.5.7 of AERB Fire Standard] 5. Testing of DGs - no load 6. Bulk diesel storage area display of licensing number and other requirements 7. Provision of rubber mats. 8. Noise levels and usage of PPE	
10.	Fire Station	1. Availability of fire organization and equipment as per AERB Fire Standard 2. Availability of standing fire order 3. Availability of fire hazard analysis report if any carried out for the facility at any stage 4. Availability of records for inspection, testing, maintenance carried out as per schedule given in Table-10.1 of AERB Standard for Fire Protection Systems of Nuclear Facilities. 5. Display of emergency telephone numbers for mutual aid. 6. Records of fire drills conducted once in every period of two months 7. Availability of drill tower 8. Availability of communication facilities, healthiness and adequacy 9. Availability of fire hydrant lay out diagram, identification of location of fire call points, fire detectors etc.	
11.	First aid Center (Ambulance Room)/Ambulance	1. Manning in round- the-clock shifts. 2. Availability of medical officer/ nurse in shifts 3. Updated injury on duty (I.O.D) records 4. First aid center equipped as per Rule-67 of Atomic Energy (Factories) Rules 1996 5. Ambulance with equipment availability and condition. 6. Fire safety measures. 7. Hygiene measures. 8. Availability of emergency lighting.	

ANNEXURE-1 (Contd.)

No.	Aspect	Checkpoint	Remarks
7.	**(Contd.)**		
12.	Laboratory	1. Labeling of containers and segregation. 2. MSDS availability 3. Cylinders securing, segregating and capping 4. Working of fume hoods and exhausts 5. Availability of PPE. 6. Fire safety measures 7. Emergency exits access 8. Availability of first aid charts and boxes	
13.	Stores/Ware Houses	1. Marking of aisles and emergency exits 2. Access to racks, exits, fire extinguishers 3. Proper labeling/identification of hazardous materials 4. Fire safety measures 5. Operation of exhaust fans 6. Proper bunding for oils and bulk chemicals storage area 7. Fencing and display of license number in cylinders storage area 8. Cylinders securing, segregating and capping	
14.	Canteen	1. Ventilation and lighting 2. Drinking water facility/hygiene 3. Housekeeping 4. Cooking gadgets condition 5. Fire fighting arrangement and training for fire fighting. 6. LPG connections and storage 7. Display of emergency telephone numbers 8. Painting of walls	
15	Radiological Aspects	1. Availability of safety documents 2. Issue of TLDs 3. Dose reports 4. Survey reports	
16	Waste Management Aspects	1. Records 2. Evaluation of procedures, methods 3. Survey reports	
17	Area of Work at Height	1. Anchorage for roof top work and for fixing grab ropes	

ANNEXURE-2

DETAILED REGULATORY INSPECTION CHECKLIST FOR INDUSTRIAL AND FIRE SAFETY AT NFCF UNDER CONSTRUCTION

CONTENTS

ANNEXURE-2 (Contd.)

A	**Organisation and Administration**	**Remarks**
1.	Name of the project under construction	
	Number of shifts and number of employees working	
2.	Details about fire and safety organisation	
3.	Does the unit have an industrial safety organisation manual?	
4.	Does the unit have a written policy on safety ?	
5.	If yes, is the policy reviewed periodically ?	
6.	Is the safety policy written down and circulated?	
7.	Have the responsibility and accountability been assigned ?	
8.	Is the safety officer authorised to stop the work if he finds that unsafe practices are being followed and/or unsafe conditions exist ?	
9.	Is there any safety committee ? Do the safety committees meet regularly	
10.	Are the meetings documented properly & records of safety meetings kept regularly ?	
11.	Are regular inspections made, of plant areas, facilities, buildings, machinery, equipment, tools and work methods for identifying accident hazards ?	
	By whom ?	
	How frequently ?	
	How extensively ?	
	How processed ?	
12.	What injury records are kept ? By whom ?	
13.	Are standard methods of frequency and severity rates recording used ?	
14.	Is there written procedure of accident investigation and analysis ?	
15.	Are all accidents and near misses thoroughly investigated ?	
16.	Is the 'accident register' up to date and accurate ?	
17.	Is job hazard analysis carried out for the different activities ?	
B	**Safe Means of Access**	
1.	Is adequate and safe means of access and exit provided for all work places ?	
2.	Are all workers working at height and exposed to risk of falling down, using safety belts, safety nets etc. ?	
3.	Are all openings suitably fenced/barricaded to prevent fall of persons ?	
C	**First Aid**	
1.	Is a first aid center available in the premises ?	

ANNEXURE-2 (Contd.)

C	**First Aid**	**Remarks**
2.	Is it functioning in all the shifts ?	
3.	Are suitable and sufficient number of stretchers provided and maintained ?	
4.	Are workers trained in first aid training ?	
5.	Is anybody responsible to take care of the first aid box ?	
6.	Is an ambulance posted in proper place ? Is it road worthy and available ?	
D	**Painting**	
1.	Are only adults (above 18 years age) employed on the work with lead paint ?	
2.	Are air respirators provided when paint is applied in the form of a spray or when a surface having dry lead paint is rubbed or scraped ?	
3.	Are overalls and facilities to wash provided at the cessation of work ?	
E	**Electricity**	
1.	Are competent or licensed electricians available to install temporary wiring and to make any changes that are needed ?	
2.	Are untrained persons prohibited from making changes or extensions ?	
3.	Are earth leakage circuit breakers (ELCBs) being used ?	
4.	Are all connections made by using appropriate plugs, receptacles or enclosures ?	
5.	Are there any make shift connection, bare wires or damaged cables ?	
6.	Are extension cords regularly inspected and protected from damage in service ?	
7.	Are there any overhead electric power lines on site ?	
8.	Can mobile cranes or workman on scaffold or ladder, come close to live lines ?	
9.	Are all terminal boxes equipped with proper covers ?	
10	Are all 3 phase equipment provided with double earthing ?	
11.	Is the complete installation of each contractor tested regularly and especially before onset of monsoon ? (IR, earth continuity, etc.)	
12.	Is space of 90 cm maintained in front of distribution boards ?	
13.	Is material or earth work not allowed to be dumped below bare overhead lines ?	
14.	Are provisions of safety guide for works contract enforced ?	
F	**Excavation, Earth Removal**	
1.	Is excavation shored or barricaded ? Is shoring inspected daily before work is resumed ?	
2.	Is there safe access to the excavation site and do means of escape comply with regulations ?	
3.	Are proper ladders, ramps provided where needed ?	

ANNEXURE-2 (Contd.)

F	**Excavation, Earth Removal**	**Remarks**
4.	Is earth from the excavation piled well back from the edge ?	
5.	Are open excavations suitably fenced off ?	
6.	Is the stability of excavation being disturbed by vehicles passing too close to it ?	
7.	Are adequate lighting and warning lights provided for excavation pits ?	
8.	Is permission of EIC taken for removal of earth from an earth mound ?	
9.	Is the slope maintained equal to the angle of repose of the earth ?	
G	**Housekeeping**	
1.	Are containers of refuse (waste) and trash emptied at the end of every day or soon after they are full ?	
2.	Are nails removed from scrap lumber or bent over ?	
3.	Are all floors in good condition ? Are all spills cleaned up promptly ?	
4.	Is the site kept free of empty food containers, wrappers, or discarded food that could attract rats or vermin ?	
5.	Are unused slings, hoses, and pallets properly stored to prevent them from obstructing traffic or becoming a tripping hazard ?	
6.	Are bricks and unloaded timber stacked in a safe manner ?	
7.	Is there adequate lighting and ventilation in all work areas ?	
8.	Are roads or truck routes well marked and clearly separated from the walk-ways that workers must use ?	
9.	Are open trenches and excavations protected by barriers ? Are they marked with lights if there is any traffic after dark (night) ?	
10.	Are cables of welding and other equipment routed properly as to allow safe traffic by all concerned ?	
H	**Scaffolding**	
1.	Are all scaffolds designed and erected by competent persons ?	
2	Are the scaffolds inspected every day before work begins ?	
3.	Has proper access been provided to the working levels ?	
4.	Are ladders securely clamped or lashed in place ?	
5.	Do they extend at least three feet above the working level	
6.	Are the scaffolds at height ? If yes, is a netting provided ?	
7.	Is minimum width of platform provided ?	
I	**Hand Tools and Portable Power**	
1.	Are proper tools being used for job ?	

ANNEXURE-2 (Contd.)

I	**Hand Tools and Portable Power**	**Remarks**
2.	Are damaged tools repaired or replaced promptly ?	
3.	Is there proper grounding to tools ?	
4.	Are tools and cords in good condition ?	
5.	Is the metallic part of power tool having double insulation ?	
6.	Is regular testing of portable power tools carried out ?	
J	**Ladders**	
1.	Are all ladders free from split rails, loose rungs, knots, cracks, all other obvious defects and all inspected regularly ?	
2.	Are ropes and metal parts of extension ladders in good condition ?	
3.	Are damaged ladders that are to be discarded cut up immediately to prevent them being used ?	
4.	Are ladders set up at the proper slope ?	
5.	Are metal ladders used around electrical hazards ?	
K	**Hoists and lifts, Lifting Machines, Cranes**	
1.	Is any new crane of contractor inspected by EIC before putting into use ?	
2.	Is a register maintained to record particulars of examination of hoists and lifts, lifting machines, chains, ropes and lifting tackles ?	
3.	What is the periodicity for examination of crane ?	
4.	Are the records of inspection maintained ?	
5.	Is the safe working load clearly marked ?	
6.	Are people kept out from under moving loads ?	
7.	Are crane booms kept clear off power lines at all times ?	
8.	Are slings, chains, pulleys, hooks inspected regularly ?	
9.	Are all equipment properly lubricated and maintained ?	
10.	Are adequate gates or safe accesses provided at all landings ?	
11.	Are they kept shut except when the hoist is at the landing ?	
12.	If the hoist is for materials only, is there a notice on the cage prohibiting people from riding on it ? Is the notice obeyed ?	
13.	Is the safe means of access provided to the driver's cabin and to every place where person engaged on the inspection, repair and lubrication of the crane has to work ?	
14.	Are all the tests like deflection test, over load test, and tests on limit switches, and checking the correctness of all circuits and interlocks and satisfactory operation of all protective devices, done regularly ?	

ANNEXURE-2 (Contd.)

K	**Hoists and Lifts, Lifting Machines, Cranes**	**Remarks**
15.	Is the repair work carried out with the written authority (work permit system) ?	
16.	Is the person employed to operate crane, fork-lift, or to give signals to crane been medically examined for eye sight and colour vision ?	
17.	Is the frequency of eye sight and colour vision examination, at least once in every period of 12 months up to the age of 45 years and once in every six months beyond that age ?	
L	**Machine Guarding**	
1.	Are all moving parts and points of operation of machinery adequately guarded ?	
2.	Are all mechanical safe guards in working order ?	
3.	Are dangerous parts such as saw blades, gears belts and shaft couplings adequately guarded ?	
4.	Are all fixed guards securely bolted in position and in good condition ?	
M	**Roofing**	
1.	Are crawling boards, lifelines and safety belts etc. provided on sloping roofs where needed ?	
2.	Are there weak spots, skylights, or deteriorated asbestos-cement boards through which a worker might fall ?	
3.	Is a safety net installed under roof ?	
4.	Is the worker trained to work on roof ? Does he wear suitable clothing and foot wear with non-slip soles, made preferably from rope.	
5.	Is the worker examined medically to detect any defect of equilibrium before being engaged as a roofer ?	
6.	Is anchorage provided for roof top work and for fixing grab ropes ?	
N	**Personal Protective Equipment (PPE)**	
1.	Types of PPE and their adequacy	
2.	Are effective screens or suitable goggles provided for the protection of persons employed in or in the immediate vicinity of process of grinding, turning of metals, drilling, welding and cutting, chipping and work involving risk to eye ?	
3.	Are all PPE provided to the workers conforming to the relevant Indian Standards ?	
4.	Use of PPE and awareness in employees	
O	**Welding and Gas Cutting**	
1.	Is the welding machine earthed properly and checked for any leakage of current by an authorised electrician ?	
2.	Are there extinguishers provided with all welding carts ?	
3.	Is hot work permit system introduced ?	

ANNEXURE-2 (Contd.)

O	**Welding and Gas Cutting**	**Remarks**
4.	Are oxygen and acetylene hoses protected from damage or kinking while in use ?	
5.	Are flash back arrestors in gas cutting unit checked and lighters provided for lighting the gas-cutting torch ?	
6.	Are power cables undamaged and protected ?	
7.	Are PPE available and used ?	
8.	Are all the flammable materials at safe distance from welding spark ?	
9.	Are the combustible materials which cannot be moved, protected and covered ?	
10.	Is adequate ventilation provided while welding in confined space ?	
11.	Are cables of welding and other equipment routed properly as to allow safe traffic by all concerned ?	
P	**Fire**	
1.	Are areas designated where smoking is not permitted ?	
2.	Are 'NO SMOKING' stickers or posters displayed near fire prone areas ?	
3.	Are fire extinguishers of appropriate size and type suitably located ?	
4.	Are workers trained to use them ?	
5.	Is there a local fire department ? Are phone numbers of fire department adequately displayed ?	
6.	Is any fire fighting training given to employees ?	
7.	Are fire extinguishers checked regularly ?	
8.	Are highly flammable liquids stored in a properly located and constructed enclosure ?	
9.	Are compressed gases such as LPG and acetylene isolated from possible sources of ignition ?	
10.	Are cylinder valves kept closed unless gas is being used ?	
11.	Have all fires been thoroughly investigated, regardless of whether serious damage to property or injury are involved ?	
Q	**Motor Vehicles and Machines**	
1.	Are vehicles and machine kept in good condition ? Who checks them ?	
2.	Are drivers qualified and having licence ?	
3.	Do workers check steering, brakes and operating controls in every shift ?	
4.	Do workers understand the dangers to which they are exposed when working behind dump trucks, unloading pipe or performing a similar task ?	

Q	Motor Vehicles and Machines	Remarks
5.	Have bridges over which heavy trucks must pass been inspected and approved for the weights to which they may be called on to carry ?	
6.	Are any oversize loads to be moved to the site ?	
7.	If so, are permits required ? Do they restrict the route, the time of day or day of the week when the load may be moved ?	
8.	Are rules against unauthorised riders enforced ?	
9.	Is every motorised tool or motor vehicle parked in a safe position and securely locked when its assigned operator is absent from immediate vicinity ?	
10.	When backing what precautions are taken to prevent injury to people or damage to property ?	
11.	Are warning horns, braking lights etc. checked ?	
R	**Documents**	
	Check the availability of the following documents:	
1.	Safety Policy	
	Industrial safety organisation manual, safety manual	
2.	Regulatory Body construction clearance	
	ACPSR/PDSC recommendations	
3.	Standing fire order	
	Safety and fire organisation chart	
	Fire incidents log book and investigation records	
	Inspection/testing of fire fighting appliances, fire extinguishers, sprinklers including fire hydrants	
4.	Approval of competent persons for industrial safety	
	Approval of [6]certifying surgeon for medical examination of occupational workers as per Atomic Energy (Factories) Rules, 1996	
5.	Records of periodic medical examination of employees	
	Status of first aid centre and ambulance	
6.	Minutes of meetings of safety committees	
	Statistics of accidents, near miss incidents and their investigation reports etc.	
	Job hazard analysis	

[6] Medical officer of the factory concerned, authorised by AERB.

ANNEXURE-2 (Contd.)

R	Documents	Remarks
7.	Material safety data sheets (MSDS)	
	Records of testing of cranes, hoists and lifts etc.	
	Safety work permit system-General/electrical	
	Portable power testing record etc.	
	Record of calibration of safety related instruments	
	Data of illumination level	
	Measurement of noise level	
	Storage data of hazardous chemicals	
	Inventory of personal protective equipment	
8.	Compliance status of recommendations of previous regulatory inspection	
9.	Records of training including first aid	
10.	Internal safety inspection/audit records	
11.	Job allocation register and pep talk register by contractor	

ANNEXURE-3

DETAILED REGULATORY INSPECTION CHECKLIST FOR OPERATING NFCFs

CONTENTS

ANNEXURE-3 (Contd.)

PART A - INDUSTRIAL AND FIRE SAFETY

A	**Organisation and Administration**	**Remarks**
1.	(i) Name of the plant	
	(ii) Year of commissioning	
	(iii) Number of shifts	
	(iv) Number of employees	
	(v) Check the details about fire and safety organisation	
2.	Does the plant have a written policy on safety ? If yes, is the policy reviewed periodically ?	
3.	Is the safety policy written down and circulated ?	
4.	Have the responsibility and accountability been assigned ?	
5.	Has environmental safety been taken care of in the policy ?	
6.	Is the safety officer authorised to stop the work if he finds those unsafe practices are being followed and/or unsafe conditions exist ?	
7.	Is there any safety committee ? Do the safety committee's meet regularly ?	
8.	Are the safety meetings documented and record kept properly ?	
9.	Are regular inspections made, of plant areas, facilities, buildings, machinery, equipment, tools and work methods for identifying accident hazards ?	
	By whom ?	
	How frequently ?	
	How extensively ?	
	How processed ?	
10.	What injury records are kept ? By whom ?	
11.	Are standard methods of frequency and severity rates recording used ?	
12.	Is there written procedure of accident investigation and analysis ?	
13.	Are all accidents and near misses thoroughly investigated ?	
14.	Is the 'accident register' up-to-date & accurate ?	
B.	**Housekeeping**	
1.	Are containers of refuse (waste) and trash emptied at the end of every day or soon after they are full ?	
2.	Are rags or wipers (cotton waste) that are contaminated with flammable or toxic materials put into designated safe containers immediately after use ?	
3.	Are those containers emptied regularly in approved manner ?	

ANNEXURE-3 (Contd.)

B.	**Housekeeping**	**Remarks**
4.	Are all floors in good condition ?	
5.	Are all spills cleaned up promptly ?	
6.	Are unused slings, hoses etc. properly stored to prevent them from obstructing traffic or becoming a tripping hazard ?	
7.	Are roads or truck routes well marked and clearly separated from the walk-ways that workers must use ?	
C.	**Electricity**	
1.	Are competent or licensed electricians available for electrical work ?	
2.	Are untrained persons prohibited from making changes or extensions ?	
3.	Are all connections made by using appropriate plugs, receptacles or enclosures ?	
4.	Are fuses provided ?	
5.	Are there any make shift connection, bare wires or damaged cables ?	
6.	Are electrical equipment in good condition ?	
7.	Are extension cords regularly inspected and protected from damage in service ?	
8.	Are metallic parts prohibited where contact with live wires might be possible ?	
9.	Are there any overhead electric power lines on site ? Are mobile cranes or workman reach from scaffold or ladder, come close to live lines ?	
10.	Is separate work permit issued for electrical work ?	
11.	Are earth connections checked periodically ?	
D.	**Welding and Gas Cutting**	
1.	Is the welding machine earthed properly and checked for any leakage of current by an authorised and trained electrician ?	
2.	Are there extinguishers provided with all welding carts ?	
3.	Is hot work permit system introduced ?	
4.	Are oxygen and acetylene hoses protected from damage or kinking while in use ?	
5.	Are power cables undamaged and protected ?	
6.	Are flash back arrestors in gas cutting unit checked and lighters provided for lighting the gas-cutting torch ?	
7.	Are PPE available and used ?	
8.	Are all the flammable materials at safe distance from welding spark ?	
9.	Are the combustible materials, which cannot be moved, protected and covered ?	
10.	Is adequate ventilation provided while welding in confined areas ?	

ANNEXURE-3 (Contd.)

D.	**Welding and Gas Cutting**	**Remarks**
11.	Are cables of welding and other equipment routed properly as to allow safe traffic by all concerned ?	
E.	**Pressure Vessels or Plants**	
1.	Is there a programme for periodically testing each pressure relief device and regulator ?	
2.	Is each container, which holds a flammable toxic, corrosive or otherwise dangerous fluid suitably identified and marked ?	
3.	Is each pressure vessel tested regularly (ISI-Hydrotest) ?	
F.	**Hoists and Lifts, Lifting Machines, Cranes**	
1.	Is a register maintained to record particulars of examination of hoists and lifts, lifting machines, chains, ropes and lifting tackles ?	
2.	What is the periodicity for examination of crane ? Are the records of inspection maintained ?	
3.	Is the safe working load clearly marked ?	
4.	Are people kept out from under moving loads ?	
5.	Are crane booms kept clear off power lines at all times ?	
6.	Are slings, chains, pulleys and hooks inspected regularly ?	
7.	Are all equipment properly lubricated and maintained ?	
8.	Are adequate gates or safe accesses provided at all landings ?	
9.	Are they kept shut except when the hoist is at the landing ?	
10.	If the hoist is for materials only, is there a notice on the cage prohibiting people from riding on it ? Is the notice obeyed ?	
11.	Is the safe means of access provided to the driver's cabin and to every place where the person engaged on the inspection, repair and lubrication of the crane has to work ?	
12.	Are all the tests like deflection test, over load test, limit switches, correctness of all circuits and interlocks, satisfactory operation of all protective devices, done regularly ?	
13.	Is the repair work carried out with the written authority (work permit system) ?	
14.	Has the person employed to operate crane, fork-lift, or to give signals to crane been medically examined for eye sight and colour vision ?	
15.	Is the frequency of eye sight and colour vision examination, at least once in every period of 12 months up to the age of 45 years and once in every six months beyond that age adopted ?	
G.	**Personal Protective Equipment**	
1.	Type of PPE and their adequacy.	

G.	**Personal Protective Equipment**	**Remarks**
2.	Are effective screens or suitable goggles provided for the protection of persons employed in or in the immediate vicinity of the processes of grinding, turning of metals, drilling, welding and cutting, chipping and work involving risk to eye ?	
3.	Are all PPE provided to the workers conforming to the relevant Indian standards ?	
4.	Use of PPE and awareness in employees.	
H.	**Fire Protection, Prevention and Fighting**	
1.	Check identification of fire compartments which contain nuclear safe shutdown equipment or systems or high fire load.	
2.	Check identification of locations where separation by distance is provided, fire load in the area, basis for separation distance and that separation distances are free from combustibles and ignition sources.	
3.	Check identification of locally applied separating elements, fire rating and their qualification.	
4.	Check categories of fire detectors are appropriate for the hazard area and for qualification of fire detection equipment.	
5.	Check detection system design and installation, standard followed, primary and secondary power supplies and adequacy of fire detectors for each area.	
6.	Check local (audible and visible) annunciation and remote annunciation at a constantly attended location is provided.	
7.	Check that the work involving ignition sources is controlled by a work permit system.	
8.	Check creation of fire squads amongst operating personnel and their training and mock drills. Also check whether list of fire squad members is prominently displayed.	
9.	Check familiarity of fire personnel with plant layout, equipment layout and fire potential.	
10.	Check existence of mutual aid scheme.	
11.	Check availability of communication system in fire station and places to which it can be directly connected from the fire station.	
12.	Check maintenance records of fire fighting equipment including mobile, first aid and fixed types.	
13.	Check application of fire retardant coating on critical cables and fire stop seal for cable penetration to control room and other strategic locations.	
14.	Check availability of fire order and its review with respect to assigning of responsibility and avoiding duplication of responsibility	
15.	Check adequacy and frequency of fire drills	
16.	Check that buildings containing safety-related systems are protected from exposure or spill fires involving outdoor oil filled transformers.	

ANNEXURE-3 (Contd.)

H.	Fire Protection, Prevention and Fighting	Remarks
17.	Check indoor transformers are of dry type.	
18.	Check that personal access and escape routes are provided for each fire area.	
19.	Check that buildings and plants are so laid out and roads, passageways etc. so maintained as to permit unobstructed access for fire fighting.	
20.	Check that the floor drains are sized to remove expected fire fighting water flow without flooding any safety-related equipment.	
21	Check that each branch line to a separate building has at least two independent connections to the fire water main loop.	
22.	Check that automatic water sprinkler system is provided for oil filled transformers above 5MVA rating, manually operated water sprinkler system are provided for transformers with a rating of 1 MVA to 5 MVA and adequate provision of fire hydrants near the transformers are made for transformers below 1 MVA rating.	
23.	Check adequacy and type of water supply and main source of water.	
24.	Check whether two separate reliable water sources are available or there is only one source of water supply.	
25.	Check supply and distribution pipe design and installation standard and for protection against mechanical damage, ground movement and corrosion.	
26.	Check that the fire water main loop is not connected with service or sanitary water system piping	
27.	Check the redundancy provided in the fire pumps and availability of alarms in control room.	
28.	Check if automatic CO_2 systems are used, which are equipped with a pre-discharge alarm system and a discharge delay to permit personnel evacuation.	
29.	Check that smoking is prohibited in designated areas and 'No Smoking' signs are appropriately displayed.	
30	Check adequate numbers of self-contained positive pressure breathing apparatus (SCBA) with full face positive pressure mask are provided in fire station and control room.	
	Check for proper training for use the SCBA.	
31.	Check that the plant emergency lighting system illuminates the fire access routes with light having an intensity of not less than 1.0 foot-candle.	
32.	Check that high temperature piping is properly insulated to exclude it as an ignition source.	
33.	Check that adequate fire water hydrant system with riser pipes to cope up with fire risks at any height in the operating plant is installed.	
34.	Check minimum number of people available for response	
35.	Check training program and syllabus, regular hot fire practice for fire brigade personnel.	

ANNEXURE-3 (Contd.)

H.	**Fire Protection, Prevention and Fighting**	**Remarks**
36.	Check frequency of drills, whether some are unannounced, whether performed in night shift, all areas covered including those containing safe shutdown equipment.	
37.	Check availability and adequacy of documented pre-fire fighting strategies especially for areas containing safe shutdown equipment and their use in drill.	
38.	Check manual fire fighting capability including availability of pre-fire, fire fighting strategies	
39.	Check type number of extinguishers, appropriateness and qualification of fire extinguishers.	
40.	Check access to fire fighting equipment	
I.	**Scaffolding**	
1.	Are all scaffolds designed and erected by competent persons ?	
2.	Are scaffolds inspected every day before work begins ?	
3.	Has proper access been provided to the working levels ?	
4.	Are ladders securely clamped or lashed in place ?	
5.	Do they extend at least three feet above the working level ?	
6.	Are the scaffolds at height ? If yes, is a netting provided ?	
7.	Is minimum width of platform provided	
J.	**Hand Tools and Portable Power**	
1.	Are proper tools being used for job ?	
2.	Are damaged tools repaired or replaced promptly ?	
3.	Is there proper grounding to tools ?	
4.	Are tools and cords in good condition ?	
5.	Is the metallic part of power tool having double insulation ?	
6.	Is regular testing of portable power tools carried out ?	
K.	**Machine Guarding**	
1.	Are all moving parts and points of operation of machinery adequately guarded ?	
2.	Are all mechanical safe guards in working order ?	
3.	Are dangerous parts such as saw blades, gears belts and shaft couplings adequately guarded ?	
4.	Are all fixed guards securely bolted in position and in good condition ?	
L.	**Ladders**	
1.	Are all ladders free from split rails, loose rungs, knots, cracks, all other obvious defects and all inspected regularly ?	

ANNEXURE-3 (Contd.)

L.	**Ladders**	**Remarks**
2.	Are ropes and metal parts of extension ladders in good condition ?	
3.	Are ladders tied off near the top even when used for only a short time ?	
4.	Are damaged ladders that are to be discarded, cut up immediately to prevent their being used ?	
5.	Are ladders set up at the proper slope ?	
6.	Are metal ladders used around electrical hazards ?	
M.	**Colour Coding**	
1.	Are the pipelines for water, air, oil and gas, colour coded ?	
N.	**Hazardous Chemicals**	
1.	Are material safety data sheets available ?	
2.	Are all containers clearly, indelibly identified ?	
3.	Are all chemicals stored as per safety regulations ?	
3.	Are the store rooms, tanks, bins and vessels of highly falmmable liquids marked 'Highly Flammable' ?	
4.	Is adequate natural ventilation provided to the store room ?	
O.	**First Asid**	
1.	What first aid facilities, equipment, supplies, and personnel are available in all shifts ?	
2.	What are the qualifications of the people responsible for the first aid program ?	
3.	What emergency first aid training and facilities are provided when normal first aid people are not available ?	
4.	What facilities are available for transportation of the injured to hospital ?	
5.	Are the names of the persons working within the precincts of the factory who are trained in first aid treatment available ?	
6.	Are suitable and sufficient stretchers provided and maintained ?	
7.	Are workers trained in first aid ?	
8.	Is anybody responsible to take care of first aid box ?	
9.	Is ambulance posted in proper place ? Is it available whenever required ?	
10.	Is periodic medical examination carried out ?	
P.	**Canteen**	
1.	Check the canteen building is situated not less than 15 meters from any boiler house, cool stacks, ash dumps and any other source of dust, smoke or obnoxious fumes.	
2.	Check the ventilation and illumination in the canteen building is adequate.	

ANNEXURE-3 (Contd.)

P.	**Canteen**	**Remarks**
3.	Check annual medical examination for fitness of each member of the canteen staff who handles food stuff, is carried out.	
Q.	**Noise**	
1.	Check if there are any very noisy machines or tools.	
2.	Check noise survey has been conducted.	
3.	Check if any sudden noises of over 140 dBA produced by any tools or equipment.	
4.	Check if audiometry test is conducted for persons working in high noise level areas.	
5.	Check records are available.	
R.	**Gas Cylinders**	
1.	Availability of protective caps for cylinders.	
2.	Availability of chlorine emergency kit for chlorine tonners.	
3.	Colour coding is followed for cylinders.	
4.	Proper storage of cylinders (segregation, protection from sunlight, etc.).	
5.	Availability of testing records.	
6.	Compatibility of stored cylinders.	
7.	Separate storage area for full/empty cylinders.	
8.	Ventilation/lighting in the area.	
S.	**Safety Work Permit System**	
1.	Availability of work permit system for work at height, excavation, work on fragile roof, hot work, work in confined spaces etc.	
2.	Availability of procedures for above jobs.	
3.	Are confined spaces defined ?	
4.	Is the safety division involved before starting work and informed after work is completed ?	
T.	**Training**	
1.	Regular industrial, fire and first aid training is provided.	
2.	Contract workers are provided safety training.	
3.	Workers have adequate knowledge about the hazards involved in the job, safety precautions etc.	

ANNEXURE-3 (Contd.)

U.	Documents	Remarks
	Check the availability of the following documents:	
1.	Safety policy	
	Safety manual.	
2.	Standing fire order	
	Safety and fire organisation chart	
	Fire incidents log book and investigation records	
	Inspection/testing of fire fighting appliances, fire extinguishers, sprinklers including fire hydrants.	
3.	Licenses from the Regulatory Board	
	Consents from Chief Controller of Explosives	
	Consents from State Pollution Control Board for discharges of emissions and effluents	
	Authorisation for management and handling of hazardous waste.	
4.	Approval of competent persons for industrial safety	
	Approval of certifying surgeon for medical examination of occupational workers.	
5.	Records of periodic medical examination of employees	
	Status of first aid centre and ambulance.	
6.	Minutes of meetings of safety committees	
	Statistics of accidents, near miss incidents and their investigation reports etc.	
	Analysis reports of gaseous emission, liquid effluents etc.	
7.	Material safety data sheets (MSDS)	
	Records of testing of cranes, hoists and lifts etc.	
	Safety work permit system-General/electrical	
	Portable power testing record etc.	
	Record of calibration of safety related instruments	
	Data of illumination level	
	Measurement of noise level	
	Storage data of hazardous chemicals	
	Inventory of Personal Protective Equipment.	
8.	Compliance status of recommendations of previous regulatory inspection	
9.	Records of training including first aid	
10.	Internal safety inspection/audit records	

PART B - RADIOLOGICAL ASPECTS

1. Availability of Safety Documents/Reports

(a) Radiation protection manual issued by AERB

(b) Plant radiation protection procedures

(c) Site radiation emergency preparedness manual.

2. Issues of TLDs

(a) TLD register with employee and contractors name

(b) TLD issue procedures- documentation.

3. Dose Reports

(a) Data on collective dose report, internal dose report

(b) Exposure investigation records

(c) Collective dose record trends.

4. Survey Reports

(a) Radiation survey reports of active areas

(b) Contamination level survey

(c) Airborne activity reports.

5. General

(a) Availability of radiological safety officer

(b) Display of radiation levels/ contamination levels

(c) Active area barriers

(d) Training of radiation protection procedures to workers

(e) Emergency procedures/ if any

(f) Availability of monitoring instruments, survey meters, dosimeters

(g) Report on periodic testing and calibration of installed and portable radiation monitors

(h) Safety related unusual occurrences (radiological) reports if any

(i) Whole body counting /bioassay reports.

6. Field Visits Including Sampling

(a) General

(i) If radiation level in full time occupancy area < 1mSv/h

(ii) If air concentration in full time occupancy area < 0.1DAC

(iii) If provision for monitoring radiation is provided where potential for exposure exist.

(b) Supervised Areas

(i) If supervised areas are identified and delineated.

(ii) If display of radiation warning signs exist at access points of supervised areas.

(c) Controlled Areas

(i) If controlled areas are identified and delineated.

(ii) If all workers are issued TLD in controlled areas.

(iii) If use of PPE is followed in controlled areas.

(iv) If ample number of PPEs are available and condition of PPEs

(v) If administrative control measures (radiological work permits), physical barriers (shoe change rack), interlocks etc. are provided for access to controlled areas

(vi) If radiation warning sign and caution boards at the access point and inside the controlled areas are displayed.

(vii) If display boards at specified location within the controlled areas indicating the external radiation level and air activity levels are provided.

(viii) If lockers, personnel monitoring devices, protective clothing and equipment are provided at the entrance of controlled areas.

(ix) If contamination monitor for checking contamination of personnel and equipment and their decontamination facilities exist at the exit points from controlled areas.

(x) If there exist suitable receptacle for effluent generated by personnel and equipment decontamination.

PART C - RADIOACTIVE WASTE MANAGEMENT

1. Records

(a) Solid/liquid and gaseous radioactive waste disposal/transfer

(i) Are the discharges with in AERB authorised limits ?

(ii) Are the discharges with in technical specification limits ?

(iii) Reasons for non-compliance, justifications and condonations sought from AERB in case of violations of above.

(b) Monthly records of radioactive waste disposals and transfers

(c) Verification of quarterly/half-yearly/annual waste disposal/transfer returns submitted to AERB

(d) Any returns to be sent to other relevant statutory bodies

2. Evaluation of Procedures, Methods of Radioactive Waste Treatment and Transportation and Field Visits

(a) Solid waste handling - status at

(i) Interim storage area

(ii) Disposal area

(b) Liquid waste handling - status at

(i) Collection systems and associated areas

(ii) Pre-treatment storage system and areas

(iii) Treatment systems and areas

(iv) Post-treatment storage system and areas

(v) Effluent monitoring system functioning

(vi) Report on periodic checking of effluent carrying pipelines and analysis of inspection chambers water samples

(c) Status of stack discharge monitoring system

3. Environmental Survey Reports

(a) Report on air, liquid waste and soil samples around plant site

(b) Report on bore-well samples around the solid waste disposal area

(c) Report on bore-well samples around the radioactive liquid waste storage area

(d) Report on storm drain water samples and accountability

(e) Activity levels in lake/river water etc.

ANNEXURE-4

CHECKLIST FOR CIVIL ENGINEERING INSPECTION OF OPERATING NFCF

S. No.	Item	Remarks
1	Does any well-defined maintenance programme with sufficient documentation supported by adequate staff/equipment exist for civil engineering structures/ facilities ?	
2	Does the programme cover maintenance procedures, responsibilities, work control system, preventive maintenance, outage maintenance, in-service inspection and predictive maintenance ?	
3	Is there any document defining organisation and staffing structure of maintenance unit with defined responsibilities of different sections/persons in maintenance unit ?	
4	Is there any training and qualification programme for civil maintenance personnel with minimum essential knowledge about problems related to civil maintenance and diagnostic/repair procedures, adequate knowledge about the plant, familiarity with various plant systems, radiation and industrial safety and work permit procedures ?	
5	Is there effective co-ordination with other maintenance sections, operation and technical support divisions ?	
6	Whether all safety related civil engineering structures are included in ISI programe.	
7	Whether documentation of the following exist (a) Maintence activities (b) ISI activities (c) Frequency of inspection (d) Inspection records (e) Do procedures exist and are updated for maintenance activities ?	
8	Whether the baseline data with which inspection and test results of the ISI programme may be compared available.	
9	Whether the frequency at which ISI/maintenance conducted is in conformance with the requirement of respective ISI/maintenance manuals?	
10	Whether frequency takes into consideration the aggressiveness of environmental conditions.	
11	What is the frequency of checking the integrity of any pre-stressing system employed at a plant, including anchorage hardware, effectiveness of corrosion inhibiting material (grease or grout), and level of pre-stress, where feasible	
12	Check the frequency of inspection of following structures (a) Spent fuel storage bay, reactor auxiliary building (b) Spent fuel transfer duct (c) Stack (d) Embedded parts (EPs) and penetrations (e) Steel structures exposed to external environment (f) All remaining structures and buildings	

ANNEXURE-4 (Contd.)

S. No.	Item	Remarks
13	Concrete Surfaces	
	(a) Presence of leaching and chemical attack	
	(b) Presence of abrasion, erosion and cavitation	
	(c) Presence of poorly consolidated concrete areas	
	(d) Presence of pop outs and voids	
	(e) Presence of scaling	
	(f) Presence of spalling	
	(g) Presence of any signs of corrosion in reinforcing steel system or anchorage components	
	(h) Presence of passive/active cracks	
	(i) Presence of deflections, settlements, or other physical movements in excess of design serviceability criteria	
	(j) Are laboratories and areas where chemicals are handled inspected for damages due to chemical weathering action?	
14	Concrete Surfaces Lined by a Metallic or Non-metallic Liner	
	(a) Without leak detection system	
	(i) Presence of bulges or depressions in liner plate (those appear age-related or created during construction)	
	(ii) Presence of any form of corrosion or other liner damage	
	(iii) Presence of cracking or deterioration of base and weld metal	
	(b) With leak detection system	
	(i) Whether detectable leakage observed in leak detection system	
	(ii) Presence of bulges or depressions in liner plate (those that appear age-related as opposed to construction phase related)	
15	Areas Around Embedments in Concrete	
	(a) Any concrete surface condition attributes as defined in items 13 and 14 above observed ?	
	(b) Presence of corrosion on the exposed embedded metal surfaces and corrosion stains around the embedded metal	
	(c) Presence of detached embedments or loose bolts	
	(d) Presence of degradation signs due to vibratory loads from piping and equipment	
16	Joints, Coatings, and Non-structural Components	
	(a) Signs of separation, environmental degradation, or water leakages are present in joints or joint material	
	(b) Loss or degradation in areas of coatings	
	(c) Presence of degradation in any waterproofing membrane protecting below-grade concrete surfaces	
	(d) Whether non-structural elements are serving their desired functions satisfactorily ?	

ANNEXURE-4 (Contd.)

S. No.	Item	Remarks
17	Pre-stressing Systems	
	(a) Presence of grease or corrosion inhibiting wax on exposed concrete or steel surface	
	(b) Presence of corrosion on exposed grease cans, bearing plates anchorages, or other components	
	(c) Configuration of anchorage components changed (as per structural drawings)	
	(d) Presence of concrete degradation around anchorages	
	(e) Signs of corroded, broken or failed pre-stressing elements	
	(f) Loss of pre-stress below acceptable levels established during the design and construction phases (percent maximum loss), as measured by lift-off testing method (where feasible)	
18	Steel Structures	
	(a) Presence of any corrosion and pitting	
	(b) Presence of paint damage	
	(c) Presence of any debris that may have been left on the surface, particularly on ferrous items such as screws, pop rivets, bolts, sheet metal off-cuts, etc.	
	(d) Presence of sand and dirt, salt deposition, etc. which may result in corrosion in the subsequent phase	
	(e) Presence of moisture buildup in and around the areas considered unless it is considered in the design originally	
	(f) Presence of visible damages, such as cracks due to impact of heavy loads or excessive loading, etc.	
	(g) Presence of weld deterioration /separation cracks	
	(h) Presence of fatigue cracks in welds or in members, particularly those subjected to cyclic loading	
	(i) Whether bolted connections are intact; any loosened bolted joints are observed; locknuts, if provided, do exist	
	(j) Presence of deflections in excess of design limits, impairing the serviceability of the structure	
	(k) Presence of vibrations/resonance in excess of design limits in the structures supporting the vibratory equipment	
	(l) Presence of buckling	
	(m) Condition of the handrails, treads and staircases are intact, particularly with respect to weathering of paint, rusting and breakages	
	(n) Whether the structure is used exactly for the purpose it is intended in the design and no further attachments by way of monorails, pulleys or member extensions have been added	
	(o) If any of the design/operating conditions are not matching with design basis, whether the structures are further investigated	
	(p) If any corrosion protection systems other than painting have been resorted to in the original design, whether the effectiveness of such systems or level of damage assessed	

S. No.	Item	Remarks
	(q) Whether thickness measurements done at a sufficient number of locations of the members, based on the member dimension (subject to a minimum of five measurements for arriving at the average thickness, in case of corrosion)	
	(r) Whether the maximum average decrease in the thickness of the member due to corrosion over any considerable area exceed the corrosion allowance provided in the design calculations	
	(s) Whether the loss of material is more than allowable ? If yes, whether it has been examined using non-destructive methods of examination	
	(t) Whether parts having failures and requiring repairs studied to ensure continued usage of the parts safely till the next inspection or till the completion of the repair. If no, whether, a warning for not using the same has been recorded and communicated to all concerned	
	(u) Inspection of cable tray supports, ventilation ducts ?	
19	Underground and Hydraulic Structures	
	(a) Are basements inspected for underground water leakages, cracking/ spalling of concrete, corrosion of rebars/embedments, expansions/cracking related to alkali aggregate reactions ?	
	(b) Are hydraulic structures inspected for erosion of surfaces, cavitation, leakage, silt deposition, damages due to scouring, settlement of supports and general cleaning of tanks ?	
	(c) Are underground trenches/tunnels and roads inspected for water logging problems ?	
	(d) Is there instrumentation for monitoring foundation settlement of safety related structures and whether the instruments are functional ?	
	(e) Are plant roads/emergency escape roads maintained properly ?	
20	Inner Containment	
	(a) External surfaces : as mentioned earlier in items 13 to 18	
	(b) Inner surfaces : as mentioned earlier in items 13 to 18	
	(c) Presence of leakage in excess of amounts and flow rates in the original design or technical specification	
	(d) Is there adequate instrumentation for leak monitoring/deflection monitoring in containment structures and whether checks are conducted to see that these instruments are functional ?	
21	Is there a monsoon gear-up plan ?	
22	Non-conformance	
	(a) Whether areas, which do not meet the requirements given in items 13 to 21 need further evaluation using enhanced visual inspection (magnification, etc.), testing or other analytical technique or repair.	
	(b) In detailed evaluation (if carried out), whether original member design conditions are utilised for qualifying the members safe. Whether record of such evaluation available and whether the consent of the design engineer obtained	

ANNEXURE-4 (Contd.)

S. No.	Item	Remarks
23	Is seismic tripping and other seismic instrumentation checked for its functionality ?	
24	Whether data are recorded at specified periods from instrumentation for structural/corrosion monitoring	
25	Feedback and Technical Upgradation	
	(a) Are data obtained during preventive maintenance inspections/repairs analysed to optimize inspections ?	
	(b) Are major repairs monitored for in-service performance ?	
	(c) Is the technical support staff for civil/structural engineering developed for job related codes, standards, technical specifications, regulations, supervisory skills and softwares ?	
	(d) Are the data obtained from maintenance division analysed for identifying generic problems and root causes ?	
	(e) Are the data systematically stored for preparing a data bank on structural performance vis-a-vis ageing studies related to ageing aspects and life extension ?	

ANNEXURE-5

EMPOWERMENT OF INSPECTORS

AERB / IPSD / PKG / 2004 / November 1, 2004

NOTIFICATION

Subject: Empowerment of inspectors - power to stop work in case of any unsafe acts or conditions at the work spot

Reference: Section 8 of the Factories Act, 1948
Rule 6 of the Atomic Energy (Factories) Rules, 1996
Rule 102 of the Atomic Energy (Factories) Rules, 1996

In view of the large number of projects currently under execution and large scale maintenance in operating plants, the industrial safety aspects in construction and erection activities in the units of the Department of Atomic Energy under the purview of Atomic Energy Regulatory Board have been reviewed in a discussion meeting on July 15, 2004. Considering the nature of the work and accident potential it was felt necessary to have certain minimum industrial safety requirements, which are required to be complied by the units. It was agreed that any violation of these requirements could result in immediate suspension of that activity. The purpose of this Notification is to specify the minimum industrial safety requirements and to empower AERB inspectors to order immediate suspension of work if these requirements are not in place in plant/site.

Based on the provisions of the Factories Act, 1948 and the Atomic Energy (Factories) Rules, 1996 it is hereby notified that AERB inspectors shall have power to stop work in case the industrial safety requirements as stipulated in Annexure are not in place.

While exercising the above enforcement actions in any of the DAE's operating plant or construction site, the following modalities shall be followed:

1. The inspector shall immediately communicate to Chairman/Vice Chairman, AERB about the prevailing situations orally and seek oral approval for cessation of activity/stoppage of work. A note ordering the same shall be given on the spot by the inspector with his/her signature and a formal order by the Competent Authority will be issued subsequently.
2. The Occupier shall take the necessary corrective action and inform Chairman/Vice Chairman, AERB about the actions taken. The inspector will again visit the work spot and give his/her recommendation for resumption of work after satisfying himself/herself that the industrial safety requirement is in place.
3. A written order for the resumption of the suspended work will be issued by the Chairman/Vice Chairman, AERB based on the report of AERB inspector.

(Competent Authority)

Unit Heads (Operating plants and Construction sites)
All AERB Inspectors under the Factories Act

Copy to: Vice Chairman, AERB
Chairman & Managing Director, NPCIL
Chairman & Managing Director, IREL
Chairman & Managing Director, UCIL
Chairman & Managing Director, ECIL
Chairman & Chief Executive, Heavy Water Board
Chairman & Chief Executive, Nuclear Fuel Complex
Chief Executive BRIT

Minimum safety precautions needed at any plant or site

1. Working at Height:

(i) All open sides of structure above a height of 3.5 metres from which a worker might fall and openings into which a worker might fall should be adequately covered or barricaded. Every opening in the floor of a building, or in a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing/railing of 1 m.

(ii) Where barricades could not be installed, safety net should be installed close to the level at which there is a danger of a fall. During erection of tall buildings/structures, above 3.5 m height nylon nets shall be provided to ensure safety of men if there is a fall from height in case it is not possible to provide barricades.

(iii) Where secure foothold is impracticable safety belts or harnesses with secure anchorage points should be provided at the working place as well as access to working spot. All persons working at heights more than 3.5 m above ground or floor and exposed to hazard of falling down shall use safety belts.

(iv) At elevated places secure access and foothold should be provided. Adequate and safe means of access and exit shall be provided at all work places for all elevations. Means of access may be portable or fixed ladder, ramp or a stairway. The use of cross braces or frame work as a means of access to the working surface shall not be permitted.

(v) Scaffolding or staging 3.5 m above the ground floor shall have a guard rail properly attached, bolted, braced or otherwise secured at least 1 m high above the floor and platform.

(vi) Where the platform is more than 3.5 m above ground floor for working / standing on the platform, the width should be minimum 1 m.

2. Excavation Works:

(i) Means for rapid access and egress should be provided. All trenches 120 cm or more in depth shall at all times be supplied with at least one ladder for every 30 m along the trench. Ladder shall be extended from bottom of the trench to at least 1 m above the surface of the ground.

(ii) Workers should not be exposed to dangers of being buried by excavated material or collapse of shoring. Measures to prevent dislodgment of loose or unstable earth, rock or other material from falling into the excavation by proper shoring shall be ensured.

(iii) Measures shall be taken to prevent persons who are not engaged in excavation work, from approaching excavation areas by placing warning signals, barricades, etc. near the site of the excavation.

(iv) Excavated material shall not be dumped within 1.5m of the edges.

(v) Excavated area shall have illumination level of 20 lux for night work.

3. Material Handling Operations:

(i) No lifting machine, chain, rope or lifting tackle shall be taken into use for the first time unless it has been tested and examined by a competent person and a certificate of such a test and examination specifying the safe working load and signed by the person making the test and the examination is kept available for inspection.

(ii) Cranes shall be operated only by authorised persons who are well trained and experienced.

(iii) Regular inspection and maintenance of material handling equipment should be scheduled. Load testing of crane at specified load shall be carried out by competent person at least once in twelve months.

(iv) Standard signals shall be used so that the operator and user would be able to synchronise their communication.

4. Portable Electrical Equipment:

(i) All portable appliances which are powered by single phase AC supply shall be provided with three core cable and three pin plug.

(ii) All connections to portable equipment or machines from the panel/distribution board/ extension board shall be taken using 3 core double insulated PVC flexible copper wire in one length.

(iii) ELCB should be provided.

5. Fire Safety:

(i) Personnel trained in fire safety shall always be available on the site.

(ii) Flammable materials should be stored away from the source of ignition such as generators, welding sets and electrical distribution boxes.

6. Personal Protective Equipment:

(i) It shall be ensured that commensurate with the nature of job appropriate PPEs with ISI marking are used by the workers.

7. Working in confined space:

(i) No person should enter any confined space like tanks, pit chamber etc. in which gas, fumes, vapours, dust etc. are likely to be present to such an extent that it may endanger his/her health without safety work permit.

ANNEXURE-6

TYPICAL PROGRAM AND INSPECTION AREAS

Government of India
Atomic Energy Regulatory Board

Niyamak Bhavan
Anushaktinagar
Mumbai -400 094

No. AERB/IPSD/File No/Year/ Date

The tentative schedule of inspections in different areas of the plant/verification of documents during the regulatory inspection are given below.

Date

1. Opening meeting
2. Area visits
   - Plant areas
   - Fire station, electrical substation and switch yard

Date

1. Area visits
   - All stores, workshops (electrical / mechanical), boiler house, compressor house, occupational health centre
   - Verification of documents (Industrial safety, fire safety and radiological safety)

Date

1. Area visits
   - Effluent treatment plant, solid waste disposal site, canteen
   - Verification of documents
2. Exit meeting

(Director/Head of concerned division/Team Leader)

Unit Head

ANNEXURE-7

SPECIMEN FORMAT: APPROVAL OF REGULATORY INSPECTION PROGRAM

Government of India
Atomic Energy Regulatory Board
Industrial Plants Safety Division

Niyamak Bhavan
Anushaktinagar
Mumbai- 400 094

No. AERB/IPSD/File No/Year

Date

Sub: Approval of Regulatory Inspection Program

The regulatory inspection of Unit name will be carried out from ———— to ———— by an inspection team of AERB consisting of the following members:

S. No.	Name and Designation	Area of Inspection
1	Shri/Smt _____ Director of concerned division [Inspector under Atomic Energy (Factories) Rules, 1996]	Over all Safety review
2	Shri/Smt _____ [Inspector under Atomic Energy (Factories) Rules, 1996] Team leader	Overall safety review with respect to industrial safety, fire safety, occupational health, environmental aspects, statutory provisions, radiological aspects etc.
3	Shri/Smt _____	Safety review with respect to industrial safety aspects
4	Shri/Smt _____	Safety review with respect to fire safety aspects
5	Shri/Smt _____	Safety review with respect to occupational health aspects
6*	Shri/Smt _____ OIC, HPU of the Facility	Safety review with respect to radiological safety aspects and radioactive waste management.
7	Shri/Smt _____	Safety review with respect to radiological safety aspects.
8	Shri/Smt _____	Safety review with respect to radiological safety aspects.
9**	One representative from OPSD, AERB	Safety review with respect to radioactive waste management.

* For applicable facility

** Optional for applicable facility

Lead Inspector/Team Leader

Director of concerned division, AERB - may please approve this regulatory inspection program

ANNEXURE-8

SPECIMEN FORMAT: REGULATORY INSPECTION SCHEDULE#

Government of India
Atomic Energy Regulatory Board
Industrial Plants Safety Division

Name
Director
Tel. & Fax:

Niyamak Bhavan
Anushaktinagar
Mumbai -400 094

No. AERB/IPSD/File No/Year

Date

The regulatory inspection of Unit name will be carried out from ____ to _____ by an inspection team of AERB consisting of the following members:

Sl. No.	Name	Area of Inspection
1	Shri/Smt _____ Director of concerned division [Inspector under Atomic Energy (Factories) Rules, 1996]	Over all safety review
2	Shri/Smt_____ [Inspector under Atomic Energy (Factories) Rules, 1996] Team leader	Overall safety review with respect to industrial safety, fire safety, occupational health, environmental aspects, statutory provisions, radiological aspects etc.
3	Shri/Smt_____	Safety review with respect to industrial safety aspects
4	Shri/Smt_____	Safety review with respect to radiological aspects
5	Shri/Smt_____	Safety review with respect to occupational health aspects
6*	Shri/Smt_____ OIC, HPU of the Facility	Safety review with respect to radiological safety aspects and radioactive waste management.
7	Shri/Smt_____	Safety review with respect to radiological safety aspects.
8	Shri/Smt_____	Safety review with respect to radiological safety aspects.
9**	One representative from OPSD, AERB	Safety review with respect to radioactive waste management.

The arrival schedule will be intimated to you later. Kindly arrange for accommodation accordingly.

* For applicable facility

** Optional for applicable facility

This format is indicative in nature. The actual number of inspection team members would be decided by the concerned division Head/Director depending on the facility being inspected.

(Director/Head of concerned division)

Unit Head

C.C: Director, OPSD - with a request to nominate one person for inspection w.r.t. radiological waste management aspects

ANNEXURE-9

SPECIMEN FORMAT: REQUEST FOR TRANSPORT AND ACCOMMODATION

Government of India
Atomic Energy Regulatory Board
Industrial Plants Safety Division

No. AERB/IPSD/ File No./Year Date

From: Name
Director of concerned division, AERB, Mumbai

To: Unit Head

Sub: Request for Transport and Accommodation

The Tour Programme of _____

Sl. No.	Name	Arrival (Flight/Train)	Date	Time	Departure (Flight/Train)	Date	Time
1.							
2.							
3.							
4.							

It is requested that arrangements may kindly be made for transport at _____ airport/ railway station and accommodation in the guest house accordingly.

Regards

(Director/Head of concerned division)

ANNEXURE-10

SPECIMEN LETTER FOR KEEPING THE DOCUMENTS READY FOR VERIFICATION DURING REGULATORY INSPECTION

Government of India
Atomic Energy Regulatory Board

Niyamak Bhavan
Anushaktinagar
Mumbai-400 094

No. AERB/IPSD / file no./ year/ Date

It is requested to keep the following documents / records ready for verification during the regulatory inspection, which will be carried out by a team of AERB from_____ to _____.

Documents:

1. Safety policy
2. Technical specifications
3. Safety manual
4. Preventive maintenance schedule
5. Emergency plan
6. Training manual
7. Standing fire order
8. Safety & fire organisation chart
9. Material safety data sheets (MSDS)

Records:

1. License from AERB, Chief Controller of Explosives
2. Consents from State Pollution Board for air, water and authorisation for hazardous wastes
3. Approval of competent persons
4. Approval of certifying surgeon
5. Minutes of meeting of safety committee
6. In-service testing records of vessels, equipment, pipelines, safety valves, cranes, hoists and lifts etc.
7. Status of periodic medical examination of employees and abnormalities if any, facility of first aid centre and ambulance
8. Statistics of accidents, near miss incidents and their investigation reports, SRUOR etc.
9. Safety work permit system- General/Electrical
10. Analysis report of gaseous emission, liquid effluents, solid waste disposal etc.
11. Testing of electrical system- earth resistance of pits, lightning arrestors, D.G. sets, explosive concentration in battery room, transformer oil testing record, portable power testing record etc.
12. Fire incidents log book and investigation records, fire drill records etc.
13. Inspection /testing of fire fighting appliances, fire extinguishers, sprinklers including fire hydrants
14. Calibration of safety related instruments

15. Equipment preventive maintenance records
16. Records of measurement of illumination level
17. Records of measurement of noise level
18. Storage data of hazardous chemicals
19. Inventory of Personal Protective Equipment
20. Up to date compliance status of previous recommendations of regulatory inspection, status of recommendations of SARCOP, status of recommendations of Unit safety committee
21. Training records including first aid
22. Internal safety inspection/audit records
23. Modification procedure and records

Radiological:

1. Dose records
2. Investigation records of overexposure if any
3. TLD issues
4. Air/water samples records
5. Radiation surveys
6. Whole body counting records
7. Bio-assay results
8. Environmental samples analysis records
9. Monitoring instruments calibration/maintenance records
10. Laboratory documents and procedures
11. Waste disposal records
12. Inventory of emergency cupboard

(Director/Head of concerned division/Team Leader)

Unit Head

ANNEXURE-11

SPECIMEN FORMAT FOR FORWARDING REGULATORY INSPECTION REPORT WITH CATEGORISATION OF OBSERVATIONS/ RECOMMENDATIONS

Government of India
Atomic Energy Regulatory Board
Industrial Plants Safety Division

Name
Director

Niyamak Bhavan
Anushakti Nagar
Mumbai-400 094

AERB/IPSD/ File no/Year/

Date

Please find enclosed a copy of the regulatory inspection report of Unit name carried out during date by an inspection team of AERB.

It is requested to send the compliance report with target date for completion of pending recommendations within a month. The compliance report should be sent to IPSD, AERB and SARCOP.

(Director/Head of concerned division)

Unit Head

C.C: Chairman, AERB
Chairman, SARCOP
Chairman, Unit Safety Committee
In-Charge Safety Corporate Office

ANNEXURE-11 (Contd.)

REGULATORY INSPECTION REPORT
OF
Unit Name

DATES OF INSPECTION : Date

INSPECTION TEAM : Shri/Smt _____

Shri/Smt _____

Shri/Smt _____

ATOMIC ENERGY REGULATORY BOARD
INDUSTRIAL PLANTS SAFETY DIVISION

ANNEXURE-11 (Contd.)

Government of India
Atomic Energy Regulatory Board
Industrial Plants Safety Division

Name
Director

Niyamak Bhavan
Anushakti Nagar
Mumbai -400 094

AERB/IPSD/File No./Year

Date

Some of the important recommendations arising out of regulatory inspection of Unit name carried out during date are as follows:

(1) _____

(2) _____

(3) _____

(Director/Head of concerned division)

ANNEXURE-11 (Contd.)

CATEGORISATION OF OBSERVATIONS/DEFICIENCIES BROUGHT OUT DURING THE REGULATORY INSPECTIONS OF Unit Name

Category Type	Particulars	Total number
CATEGORY-I (CAT.I)	· Violation of Rules, Acts, AERB Codes and Standards, Technical Specification requirements (safety limit, limiting safety system settings and limiting conditions of operation), SARCOP/AERB safety directives, licensing conditions	------
CATEGORY-II (CAT.II)	· Deficiencies in operating systems and safety related systems · Deficiencies in surveillance procedures/practices · Short comings identified in the design of safety related equipment and working conditions based on plant's operating experience including generic deficiencies. · Safety review related observations	------
CATEGORY-III (CAT.III)	· Procedural inadequacies in: ➢ Organisation ➢ ISI ➢ O&M procedures ➢ Training and qualification ➢ Radiation protection procedures, ➢ Radiological waste management, ➢ Effluent management ➢ Emergency preparedness	------
CATEGORY-IV (CAT.IV)	· General observations/deficiencies regarding ➢ Housekeeping and ➢ Good operating/maintenance practices	------

ANNEXURE-11 (Contd.)

REGULATORY INSPECTION REPORT ON Unit Name
Date

S. NO.	OBSERVATIONS	RECOMMENDATIONS	CATEGORY
1.0	Area wise		
1.1	———		
1.2	———		
1.3	———		
1.4	———		

Status of recommendations of regulatory inspection of previous years

Status of recommendations of SARCOP/Board

Status of recommendations of Advisory Committee on Fire Safety/other Committees

ANNEXURE-12

CATEGORISATION OF OBSERVATIONS/DEFICIENCIES BROUGHT OUT DURING THE REGULATORY INSPECTIONS OF INDUSTRIAL PLANTS

Category Type	Particulars	Follow-up and Information to	Item No. of the Regulatory Inspection Report
CATEGORY-I (CAT.I)	· Violation of Rules, Acts, AERB Codes and Standards, Technical Specifications requirements (safety Limit, limiting safety system settings and limiting conditions of operation), SARCOP/AERB safety directives, licensing conditions	Follow-up by: IPSD/ Follow-up by: IPSD/ AERB Information to: Chairman, SC/ Chairman, SARCOP	
CATEGORY-II (CAT.II)	· Deficiencies in operating systems and safety related systems · Deficiencies in surveillance procedures/ practices · Short comings identified in the design of safety related equipment and working conditions based on plant's operating experience including generic deficiencies. · Safety review related observations	Follow-up by: IPSD Information to: Chairman, SC	
CATEGORY-III (CAT.III)	· Procedural inadequacies in: ➢ Organisation ➢ ISI ➢ O & M procedures ➢ Training and qualification ➢ Radiation protection procedures ➢ Radiological waste management ➢ Effluent management ➢ Emergency preparedness	Follow-up by: IPSD	
CATEGORY-IV (CAT.IV)	· General observations/deficiencies regarding ➢ Housekeeping and ➢ Good operating/maintenance practices	Follow-up by: IPSD	

ANNEXURE-13

SPECIMEN LETTER FOR ON THE SPOT ENFORCEMENT BY TEAM LEADER

Government of India
Atomic Energy Regulatory Board

No. AERB/IPSD/file No./year Date

Sub : Regulatory Inspection of Unit's name

Regulatory Inspection of Unit's name was carried out during _____ to _____ by the AERB team. During the inspection on _____ day at _____ hours the inspection team noticed violation of stipulated safety measures. This was brought to the notice of the plant management.

In view of the prevailing unsafe situation in the unit, with the authority given to me by Chairman, AERB, I am requesting you to take the following corrective measures immediately.

(i) _____

(ii) _____

I am requesting you to submit a detailed report of measures taken. You are also requested to intimate the status to Director of concerned division of AERB immediately.

Team Leader

Shri . _____
Designation of unit Head
Unit's name

C.C.: Director of concerned division, AERB
Vice-Chairman, AERB
Chairman, AERB

ANNEXURE-14

DELEGATION OF POWERS OF LEAD INSPECTORS

Government of India
Atomic Energy Regulatory Board

No: AERB/IPSD/PKG/73/Year Date:

Sub : Delegation of Powers of Lead Inspector

In pursuance of Section 17(4) of the Atomic Energy Act 1962 and in exercise of the powers vested in me vide para 3 and 5 of the Government Notification No. 25/2.1983-ER dated 15.11.1983 and as per the provisions of

(i) Rule 30 and 31 of the Atomic Energy (Radiation Protection) Rules 2004 and

(ii) AERB safety code: AERB/SC/G including Safety Guides and Safety Manuals issued there under.

I hereby authorise Shri/Smt. _____ of (Division), Atomic Energy Regulatory Board to exercise the powers of lead inspector in connection with regulatory inspections assigned to him by Atomic Energy Regulatory Board.

For implementing any on-the-spot enforcement action the lead inspector shall obtain prior approval from Chairman/ Vice-chairman, AERB.

Chairman, AERB

Shri./Smt. _____

All Heads of DAE Units
Vice-Chairman, AERB
Secretary, AERB
All Directors/Heads of Division, AERB

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8. Atomic Energy (Safe Disposal of Radioactive Wastes) Rules (1987)

LIST OF PARTICIPANTS

WORKING GROUP

Draft document was prepared by:

Shri P.K. Ghosh	:	AERB (Former)
Shri R. Bhattacharya	:	AERB
Shri Diptendu Das	:	AERB
Smt. Soumya Varghese	:	AERB

ADVISORY COMMITTEE FOR PREPARATION OF CODE AND GUIDES ON GOVERNMENTAL ORGANISATION FOR REGULATION OF NUCLEAR AND RADIATION FACILITIES (ACCGORN)

Dates of meeting:

April 1, 2005
March 14, 2006
September 26, 2006
October 5, 2006

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LIST OF CODE, GUIDES AND MANUALS ON REGULATION OF NUCLEAR AND RADIATION FACILITIES

Safety Series No.	Title
AERB/SC/O	Code of Practice on Safety in Nuclear Power Plant Operation.
AERB/SC/G	Regulation of Nuclear and Radiation Facilities
AERB/NPP&RR/ SG/G-1	Consenting Process for Nuclear Power Plants and Research Reactors
AERB/NF/SG/G-2	Consenting Process for Nuclear Fuel Cycle Facilities and Related Industrial Facilities other than Nuclear Power Plants and Research Reactors
AERB/RF/SG/G-3	Consenting Process for Radiation Facilities
AERB/SG/G-4	Regulatory Inspection and Enforcement in Nuclear and Radiation Facilities
AERB/SG/G-5	Role of Regulatory Body with respect to Emergency Response and Preparedness at Nuclear and Radiation Facilities
AERB/SG/G-6	Codes, Standards and Guides to be Prepared by the Regulatory Body, for Nuclear and Radiation Facilities
AERB/SG/G-7	Regulatory Consents for Nuclear and Radiation Facilities: Contents and Format
AERB/SG/G-8	Criteria for Regulation of Health and Safety of Nuclear Power Plant Personnel, the Public and the Environment
AERB/NPP&RR/ SM/G-1	Regulatory Inspection and Enforcement in Nuclear Power Plants and Research Reactors
AERB/NF/SM/G-2	Regulatory Inspection and Enforcement in Nuclear Fuel Cycle Facilities and Related Industrial Facilities other than Nuclear Power Plants and Research Reactors
AERB/RF/SM/G-3	Regulatory Inspection and Enforcement in Radiation Facilities

AERB SAFETY MANUAL NO. AERB/NF/SM/G-2

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