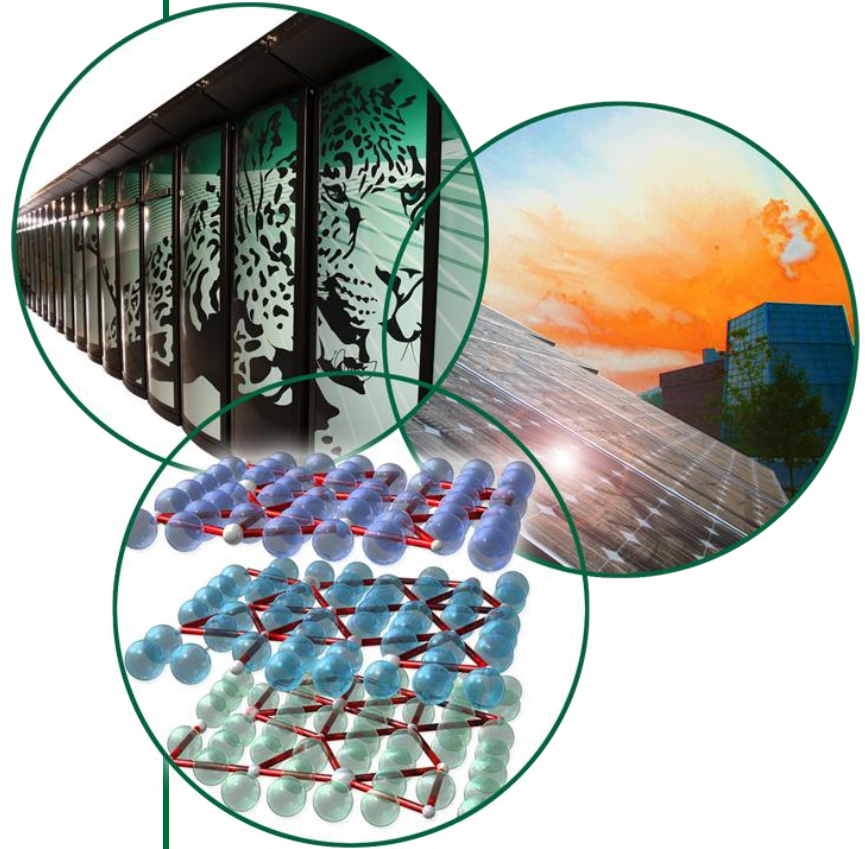


Establishment of a Federal Inspection Agency at ORNL

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Premise for Pressure Equipment Safety at Oak Ridge National Laboratory

- **United States Department of Energy (US DOE) operated National Laboratories are located on US Government Federal Property.**
- **The Boiler and Pressure Vessel Laws of most States and Municipal Jurisdictions of the United States recognize Federal sovereignty over these lands, and specifically exclude from their laws and regulations all boilers and pressure vessels installed and operating on Federal Property and owned by the Federal Government.**

Premise for Pressure Equipment Safety at Oak Ridge National Laboratory

- **The US Government has ownership and ultimate authority over the boilers, pressure vessels, piping systems, and other equipment installed and operated at these facilities.**
- **Responsibility for pressure equipment safety therefore is assumed by the Federal Government and DOE, which at ORNL is delegated to UT-Battelle, LLC as the prime management contractor at Oak Ridge National Laboratory.**

Premise for Pressure Equipment Safety at Oak Ridge National Laboratory

- The primary expertise for pressure equipment engineering and inspection rests in the Surveillance Office of the Fabrication, Hoisting and Rigging Division.
- In my position as a Mechanical Engineer assigned to the Surveillance Office, I have been assigned responsibility for developing and managing the pressure equipment safety inspection and assessment program.

Fundamental Requirements Governing Pressure Equipment Safety

- All Federal property is subject to compliance with the requirements of 10 CFR 851
- A part of the Code of Federal Regulations (CFR) 10 CFR 851 is a comprehensive regulation requiring the development and implementation of a personnel health and safety program to ensure a safe work place
- Includes many areas of safety concern, including: Construction, Fire Protection, Explosives, Pressure Equipment, Firearms, Biological, Occupational Medicine, Motor Vehicles, Electrical, etc.

Fundamental Requirements Governing Pressure Equipment Safety

- **10 CFR 851 requires pressure equipment and systems to be compliant with recognized consensus standards such as the ASME Boiler and Pressure Vessel Codes and ASME Piping Codes (among others) and the strictest applicable state or local codes to the greatest extent possible.**

Fundamental Requirements Governing Pressure Equipment Safety

- When such Codes cannot be applied due to the materials of construction, the configuration of the object, or other reasons; the systems and components must be designed and constructed to ***“...provide equivalent protection and ensure a level of safety greater than or equal to the level of protection afforded by the ASME or applicable state or local code”***.

Fundamental Requirements Governing Pressure Equipment Safety

- **Specific measures are given which are intended to address how equivalence is to be achieved, but these measures are not well detailed or defined.**
- **A Task Team comprised of representatives from all of the DOE Laboratories has been working to implement the requirements of 10 CFR 851 to ensure personnel safety and to comply with the DOE Site management contract requirements.**
- **ORNL has assumed a leadership role in this effort**

Fundamental Requirements Governing Pressure Equipment Safety

- **Part 4, Pressure Safety, requires a personnel health and safety program for pressure safety to be developed and implemented.**
- **The ORNL Standards Based Management System (SBMS) provides guidelines for the owners (or purchasers) of pressure equipment for design, operation, hazard assessment, reconfiguration, etc.**

Fundamental Requirements Governing Pressure Equipment Safety

- **ORNL's Pressure Systems Safety program elements include:**
 - **Identify personnel hazards**
 - **Identify hazard mitigating strategies, including:**
 - **Engineering controls**
 - **Administrative controls**
 - **Personnel protective equipment**

Fundamental Requirements Governing Pressure Equipment Safety

- **ORNL Pressure Systems Safety program elements (cont'd)**
 - **Periodic reviews of accidents to evaluate the effectiveness of mitigating strategies and identify opportunities for improvement**
 - **Management audits to determine effective implementation and identify opportunities for improvement**
 - **Periodic inspection to ensure fitness for service**

Fundamental Requirements Governing Pressure Equipment Safety

- **The Pressure safety program applies to both the currently installed pressure equipment and systems and to newly constructed and installed pressure systems.**
- **This breadth of applicability requires:**
 - **Identifying and evaluating currently installed “legacy” pressure retaining items for continued operation and compliance with 10 CFR 851.**
 - **Developing procedures and guidelines for procurement , design, and construction of new pressure retaining items.**

Development of Pressure Safety Inspection Program

- **Linkage to the NBIC and to Jurisdictional Laws was already established in the tenets of 10 CFR 851**
- **NBBI is recognized by State and Federal authorities as technical experts in pressure equipment safety**
- **ORNL chose to have an Inservice Inspection program, intended to:**
 - **Implement a recognized consensus standard like NB-23, “The National Board Inspection Code”**
 - **Apply risk based evaluation safety criteria such as ASME FFS-1/API-579 “Fitness for Service”**

Development of Pressure Safety Inspection Program

- **Intentions (cont'd)**

- **Apply objective standards for development of our Inservice Inspection program, following NB-390, “Qualifications and Duties for Federal Inspection Agencies (FIAs) Performing Inservice Inspection Activities”**
- **Obtain accreditation by the National Board as a Federal Inspection Agency (FIA), earning us recognition as a technically competent Inspection Organization**

Development of Pressure Safety Inspection Program

- Intentions (cont'd)
 - Complement our current ASME Accreditation to apply the ASME “U” and “U2” Code Symbol Stamps for newly constructed objects, and our NB Accreditation to apply the “R” Code Symbol Stamp for Repairs and Alterations

Challenges for Pressure Safety Inspection

- **Our installation originated with the Manhattan Project during World War II, so we have many “relics” of pressure equipment**
- **We also have lots of newer equipment**
- **As we began to survey and catalog pressure retaining items installed and operating at ORNL, we expected difficulties in assessing installed items, since many are non-Code, have little or no identification, and virtually no design or construction information available**

Graphite Reactor



Cryo Module



Spallation Neutron Source



High Flux Isotope Reactor



JAGUAR Super Computer



Challenges for Pressure Safety Inspection

- **We established a risk-categorization criteria to prioritize our efforts on objects presenting the highest risk, and applied a graded approach to the inspection and evaluation of pressure retaining items.**
- **We chose to implement a forensic engineering process to fully assess each pressure retaining item we have identified and inspected for current safety, and to determine the item's fitness for continued service.**

Pressure Safety Inspection and Assessment Procedures

- **Every identified pressure retaining item is subjected to a complete inspection following NB-23 guidelines**
- **Whenever possible, UT thickness readings are taken to provide an assessment of the current condition and estimate the rate of deterioration.**
- **The inspection report is sent to the Mechanical Engineer for review and assessment**
- **Screening calculations are performed to verify the object is safe for continued operations at its service rating, and calculate a projected service life**

Pressure Safety Inspection and Assessment Procedures

- **When an inspection or safety deficiency is noted, a Nonconformance Report is issued to document the identified deficiency, and track corrective actions taken until the deficiency is resolved**
- **The assessment concludes with the assignment of an appropriate interval for reinspection, using the rate of deterioration to calculate the remaining service life of the pressure retaining item**
- **the process is repeated at every subsequent inspection**

Pressure Safety Inspection and Assessment Procedures

- We developed an Inservice Inspection Database to document:
 - Information obtained during the inspections
 - The current status of the pressure retaining item
 - The dates of current inspections
 - The upcoming inspection due dates

Opportunities for Further Improvement

- **Opportunities for improvement we have identified and are continuing to work on include:**
 - **Tracking and documentation of overpressure protection device inspection and testing**
 - **Developing a process for evaluating flow capacity adequacy for installed overpressure protection devices**