INSPECTION PROCEDURE 88057

HAZARD IDENTIFICATION AND ASSESSMENT

PROGRAM APPLICABILITY: 2603

88057-01 INSPECTION OBJECTIVES

01.01 To determine whether the licensee has an adequate Hazard Identification and Assessment (HIA) Program and has the necessary organization and controls in place to implement the program.

01.02 To determine whether the licensee's methods for HIA are appropriate, given the complexity of the process and the level of hazards involved.

01.03 To determine whether the skills and qualifications of those performing the HIA are sufficient.

01.04 To verify that the documentation of the HIA studies are sufficient, and to determine whether the hazard assessment team dealt adequately with the consequences identified during the study.

01.05 To determine whether the results of the HIA study are translated into action items to improve process safety at the site and whether there is a tracking system in place to ensure that all management-approved recommendations are implemented in a timely manner.

01.06 To determine whether the plant has conducted consequence analyses, and whether the results have been understood and used by plant management.

01.07 To determine whether the plant revalidates the HIA program every 3 years, to ensure that the HIA reflects current plant operations and configuration.

88057-02 INSPECTION REQUIREMENTS

Hazard Identification (HI)

02.01 Review the licensee's HI process to determine whether the licensee has identified all hazardous material inventories, the risks associated with each hazardous material, and the hazardous

effects of these materials on the safety of operations with Special Nuclear Material (SNM).

02.02 Review HI documentation to determine whether the methods used by the licensee to identify risks associated with hazardous chemicals are sufficient. Some of the methods used to identify potential chemical hazards include reviewing

incident history (both at the facility and industry-wide), human factors, administrative controls in place, consequences of failure of administrative controls, etc.

02.03 Review the licensee's HI results to determine whether, as a minimum, all materials present in quantities above U.S. Environmental Protection Agency (EPA) or Occupational Health and Safety Administration (OSHA) Threshold Quantity Limits have been identified.

02.04 Review the licensee's HI results to determine whether all materials that could affect the containment and safe operation of the SNM have been adequately addressed.

Hazard Assessment (HA)

02.05 Determine whether the licensee has a management plan and organization in place to perform HAs.

02.06 Determine whether the licensee has clearly stated the objective of the HA before adopting a methodology for the study.

02.07 Determine whether the HA methodology chosen by the licensee is appropriate given the stated objective and the complexity of the chemical process.

02.08 Determine whether the licensee used a multi-disciplinary team approach to the HA by selecting a team with a balanced composition. The inspector should verify that team members are chosen because of relevant skills/experience and not job title, alone.

NOTE: At least one operator knowledgeable in the process being studied should be included on the HA team. The team should include experts in fields relevant to the project (e.g., a material scientist to address corrosion, selection of materials of construction, etc., or a physical chemist to address chemical kinetics, thermodynamics, etc.). These experts could participate in the HA study on a part-time basis. The inspector should verify that a multi-disciplinary team is used by inspecting attendance records from completed HA studies.

02.09 Determine whether the HA study and findings were adequately documented. The inspector should ask to see the marked up Process Piping and Instrumentation Drawings (P&IDs) and other notes taken during the HA study. A qualitative risk-ranking table should be generated for all the recommended action items, to rank the risk associated with each of the scenarios identified and to prioritize implementation of management-approved recommendations of the HA team. This also helps the inspector determine whether plant management has adequately addressed the findings of the HA team.

02.10 Determine whether the licensee has addressed and resolved HA recommendations. Verify that disposition of recommendations has been documented and that hazard findings and their disposition have been communicated to relevant personnel.

02.11 Determine whether the licensee has actually implemented management-approved recommendations from the last HA study.

02.12 Determine whether the licensee has conducted any HA studies on the processes modified since the last baseline HA study. This should be addressed under Management of Change as well.

02.13 Determine whether the HA has been revalidated, if the initial HA was done more than 3 years ago.

88057-03 INSPECTION GUIDANCE

General Guidance

The inspection should be directed at determining whether the licensee has sufficiently identified and assessed chemical hazards. NRC's main focus is to make the determination that the plant has adequate programs in place to address the potential consequences of deviations from design intent which could affect the safety of operations with SNM. HIA is a critical initial element because other elements in the Nuclear Chemical Process Safety Program (NCPSP) are built around the results of the HIA effort. Thus it is crucial that the licensee correctly identify and adequately assess chemical hazards. Two separate steps are involved in this element of the NCPSP:

- HI - Identifies specific materials and their inventories at specific locations that present potential chemical hazards to be analyzed and managed. To prioritize its assessment effort, the licensee must first correctly identify the consequences of activities involving hazardous materials, present at the facility, that could affect operations and containment of SNM, which could have potential onsite and/or offsite consequences.

- HA - Involves the detailed examination of the operations and processes associated with the hazards identified above, to evaluate the hazards and identify potential actions for reducing the likelihood or severity of catastrophic events. The HA identifies actions necessary to prevent deviations from the design and operating intent of the system, when the consequences of these deviations could impact the ability of the licensee to contain and control licensed SNM.

Specific Guidance

Specific guidance is provided for each of the inspection requirements listed in Section 88057-02, to help the inspector determine whether the licensee's program is adequate.

03.01 The HI process should be described in a document available for inspection and should, as a minimum, address the following:

a. Identification of the systems where potential chemical hazards exist or when the consequences of plant activities

could affect operations with SNM. The location of these systems should be available on a plot plan.

b. A system to ensure that necessary plant-level Process Safety Information (PSI) (such as plot plan, inventory list, etc.) is available to identify inherent and/or primary hazards.

c. An inventory list, with quantities and locations, should be available that includes all hazardous materials present at the plant at any time, either in the process or in storage. Potential hazards associated with each hazardous material (e.g., extracted from relevant Material Safety Data Sheets (MSDS')), as well as effects of inadvertent mixing of incompatible materials, should be considered. The licensee should prepare a compatibility chart of all onsite inventory to ensure that inadvertent mixing of incompatible materials is minimized.

03.02 As a minimum the following should be addressed regarding the methods used by the licensee for the HI:

a. Documentation of methods used to identify hazards. These methods may include one or more of the following: previous operating errors, potential operating errors, industry-wide incident history, human factors, etc. Documentation should include how each of the above has been identified.

b. Determination of the priority order for conducting HA should be based on considerations such as the nature of process hazards, onsite and offsite consequences, age of the process, and operating history of the plant.

03.03 The licensee should have an inventory list of hazardous materials that includes, at a minimum, all the materials listed, in Table 1, that are used, generated, or stored onsite.

Table 1. Some Commonly Found Chemicals at Licensed Fuel Cycle Facilities

Chemical Name	**CAS #**
Ammonia, anhydrous	7664-41-7
Fines (UO_2 dust)	N/A
Flammable Material (Liquid/gas)	N/A
Fluorine	7782-41-4
Hydrofluoric Acid	7664-39-3
Hydrogen	1333-74-0
Nitric Acid	7697-37-2
Organic Solvents	N/A

Chemical Name	CAS #
Propane	74-98-6
Uranium Hexafluoride	7783-81-5
Zircalloy	N/A

03.04 The licensee should ensure that all hazardous materials have been included in the NCPSP. The licensee should ensure that unique hazards or operating conditions are adequately addressed (e.g., hydrogen could be present in small quantities around furnace areas, which, because of unusual operating conditions, could create an explosive, atmosphere especially because of readily available ignition sources. This, in turn, could affect the safe operation or containment of the licensed SNM.) Another example is the presence of octane in small quantities within a confined space, which potentially could create an explosive situation.

The threshold quantity limits (TQL) at which EPA or OSHA regulations (whichever has the lower TQLs) are activated are included as guidance to the inspector (Table 2).

Table 2.
EPA/OSHA TQLs for Some Commonly Used Chemicals at Licensed Fuel Cycle Facilities

Chemical Name	CAS #	TQL (lbs)
Ammonia, anhydrous	7664-41-7	10000
Flammable Material (Liquid or gas)	N/A	10000
Fluorine	7782-41-4	1000
Hydrofluoric Acid	7664-39-3	1000
Hydrogen	1333-74-0	10000
Propane	74-98-6	10000
Uranium Hexafluoride[1]	7783-81-5	4400

03.05 The licensee should have a system in place for performing HAs, which includes, as a minimum, the following features:

[1]Based on amount of UF_6 required to generate 1000 lbs of HF where $UF_6 + 2H_2O \rightarrow UO_2F_2 + 4HF$.

a. A schedule for performing chemical HAs, based on the potential impact of the chemical hazards at the facility. The schedule should include HA studies yet to be performed. The inspector should verify that the schedule is actually being followed.

b. An assignment of overall responsibilities for performing HA studies.

c. An assignment of leadership for individual HA studies scheduled in the near term.

d. A system to perform workplace consequence analysis and offsite consequence analysis.

e. A system to ensure senior plant management is aware of significant findings from each HA study.

f. A system to ensure that fully up-to-date PSI (especially P&IDs) is available for those areas where hazards have been identified before the start of the HA.

g. A system to ensure that updates are made to other NCPSP elements usually accomplished through the Management of Change (MOC) element that includes PSI, Standard Operating Procedures, Maintenance and Inspection, and Training, when the HA identifies them as being necessary.

h. A system to enforce participation/involvement of hourly employees in planning/performing the HA.

i. A system to review HA arrangements and methods to improve future studies.

03.06 The licensee should have a clearly stated objective for performing the HA before deciding on the methodology to be adopted for the HA study. This is because the choice of methodology depends on the objective of the study. Some of the common objectives in performing the HA could be generating a list of chemical hazards that could affect operations with SNM at the facility, safety improvement alternatives or specific accident scenarios, and safety improvement alternatives. Each of the above alternatives could lead to the selection of a different HA methodology.

The licensee should include, as an objective for the HA study, the identification and assessment of potential chemical hazards that could affect operations with SNM at the facility.

03.07 The licensee should provide the rationale, for selecting a particular HA methodology, that should be consistent with the stated objective of the study, availability of process safety information, complexity of the chemical process, and company policy/practices.

NOTE: The inspector is referred to Figure 5.3 (pp. 86 - 92) of "Guidelines for Hazard Evaluation Procedures with Worked

Examples," 2nd Edition, published by the Center for Chemical Process Safety (CCPS) of the American Institute of Chemical Engineers (AIChE). It is recommended that the licensee use a similar approach in selecting the HA methodology.

03.08 The licensee should have in place a system that ensures that the HA is performed by a qualified team. As a minimum the following should be addressed:

a. Identification of team members. A typical team should consist of at least:

   Team leader - Experienced in the methodology being used and has a good general knowledge about process operations. It is not necessary that the team leader have specific knowledge of the process being studied.

   Process expert - Experienced in the process being reviewed (i.e., has specific knowledge of process under study).

   Hourly employee - An operator or mechanic (as appropriate) from the area being studied.

   Instrumentation/Maintenance/Production - Use these personnel as required.

   Relevant specialists - Should be used where needed (e.g., material scientists, physical chemists, etc.).

b. Training provided to the team, both to the leader and to other members, should be sufficient for the HA study. The level of training required for each HA participant is not fixed. The team leader should have attended a training session on the methodology to be used for the HA (e.g., training conducted by the CCPS or equivalent), and should have demonstrated proficiency through experience. The rest of the team members should be familiar with the HA methodology and how the HA will be conducted.

03.09 The licensee should have in place a system to ensure that HA exercises have been sufficiently documented. As a minimum the following should be addressed:

a. All documentation on HA studies should be readily available.

b. All documentation should be reviewed for organization and content. It should include at least the following:

   - Listing of team members and qualifications (daily attendance sheet if available).
   - Timetable of team activities.
   - Overview of intent of process.

- Marked-up P&IDs to show completeness.

- Notes taken during HA exercise including explanation of deviations, their consequences, and related recommendations. The HA should adequately address inherent process hazards, previous incidents, engineering and administrative controls, consequences of failure of engineering and administrative controls, facility siting, human factors, and a qualitative evaluation of onsite and offsite safety and health effects of a failure of a control.

- Evidence that operating errors for each phase of operation (startup, normal operation, shutdown, emergency shutdown) were considered for continuous processes. For batch processes, operating errors on the time-line should be considered.

- Priorities for resolution of recommendations.

- A qualitative risk-ranking matrix based on severity of consequence and probability of occurrence of identified chemical hazards for which recommendations have been suggested by the HA study. The prioritization of recommended action items should be based on the qualitative risk-ranking matrix.

c. The findings of the HA study might address operability (or efficiency) issues as well as safety issues. The operability issues are not so important to the HA effort and they may be dealt with separately. It is not necessary to prioritize resolution of operability issues.

03.10 The licensee should have a system in place to address and resolve HA recommendations. The inspector should review the resolution of HA recommendations, and the subsequent implementation of management-approved recommendations to understand how the results of the HA are translated into action to improve process safety at the site. The following elements should be addressed:

a. There should be a system to review the recommendations and modify them if a better solution exists. These decisions should be recorded.

b. Review the number of HA recommendations that were refuted in entirety. A large percentage of refuted recommendations could be indicative of either overexuberance in the study or a lack of management commitment. The inspector should ask questions concerning this aspect, and be prepared to judge that this exercise meets a reasonable performance level.

c. A system for tracking management-approved recommendations on a plant-wide basis.

d. Documented evidence that recommendations from previous HA studies have been implemented.

e. A timetable and commitment for implementing other management-approved recommendations.

f. Documented evidence of responsibilities assigned with target completion dates. The inspector should ask to see documentation or field evidence that earlier assignments were completed and target dates met.

g. A system to update other pertinent elements (e.g., standard operating procedures, maintenance procedures, PSI, training, emergency procedures, MOC) as found necessary by the HA study. The system should, in some cases, activate the MOC procedures for recommended changes. (See NRC Inspection Manual, Inspection Procedure 88063, for "Management of Change".)

03.11 The inspector should field-check the implementation of management-approved recommendations to verify actual implementation. If any of the management-approved recommendations have not been implemented or scheduled for implementation, then the inspector should ascertain the reason for this. The lack of completion, or a schedule for implementation of recommendations is indicative of the lack of management commitment. This should be cross-checked with the management system in place for MOC procedures.

03.12 The inspector should determine if changes have been made since the last baseline HA study for that particular process. This should include a review of all past modifications since the baseline HA study. The inspector should review all modifications since the last site inspection by NRC. Selected modifications should be reviewed in detail and walk-downs of modifications conducted. HA studies should have been carried out in accordance with MOC procedures. The inspector should cross-check with the MOC procedures and actions.

03.13 The licensee should have in place a system for revalidation/updating HA to ensure the HA is consistent with current plant operations and practices. This revalidation should be performed at least every 3 years by a team whose composition satisfies the requirement above. Any documentation generated during the HIA process, updates and/or revalidations should be retained for the life of the process.

NOTE: The requirement of revalidation and updating is in addition to HA studies performed as part of MOC.

88057-04 RESOURCE ESTIMATE

An inspection performed using this Inspection Procedure is estimated to require 8 hours of inspector resources. This estimate

is only for the direct inspection effort and does not include preparation for and documentation of the inspection.

88057-05 REFERENCES

Center for Chemical Process Safety, *Guidelines for Hazard Evaluation Procedures*, "Second Edition with Worked Examples", American Institute of Chemical Engineers, New York, 1992.

OSHA, *Process Safety Management of Highly Hazardous Chemicals*, 29 CFR 1910.119(e), "Process Hazard Analysis."

EPA, *Risk Management Programs for Chemical Accident Release Prevention*, 40 CFR Part 68, Section 68.24, "Prevention program - process hazards analysis."

Chemical Manufacturers Association, *Responsible Care®, Process Safety Code of Management Practices*, Washington, 1990.

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