



UPF PAGE/PROCEDURE CHANGE NOTICE (PRCN)

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Associated Document Title:	UPF Analysis of Standard Industrial Hazards in the Design Process										
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Section 4.6, Hazard Analysis Facilitator											
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Record or Form Number	Record Title	System/ Location	Document Type								
Document Specific	Standard Industrial Hazard Analysis of The Uranium Processing Facility	InfoWorks	AR								
Renumber subsequent sections.											
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Section 7.1, Source References											
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AR-SH-801768-A001, Standard Industrial Analysis for the Uranium Processing Facility PL-CM-801768-A007, Uranium Processing Facility Project Constructability Plan PL-PJ-801768-A027, Uranium Processing Facility Concept of Operations Plan.											



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PL-CM-801768-A007, Uranium Processing Facility Project Constructability Plan
PL-PJ-801768-A027, Uranium Processing Facility Concept of Operations Plan.

Section 7.2, Reference Documents


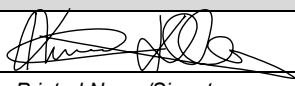
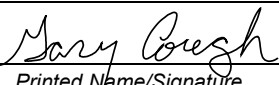
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DOE G 440-1B, Worker Safety and Health Program for DOE (Including the National Nuclear Security Administration) Federal and Contractor Employees, (10 CFR 851.21).

TO:
3DP-U04H-0199, Rev.001 2011, April 15; Bechtel Corporation
[AR-SH-801768-A001, Standard Industrial Analysis for the Uranium Processing Facility](#)
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Section 8, Appendices

FROM:
Appendix 1, Criteria for Standard Industrial Hazards
Appendix 2, Table for Summarizing Analysis of Standard Industrial Hazards
Appendix 3, Description of the Hierarchy of Controls
Appendix 4, Guidance for Assessing the Risk of Standard Industrial Hazards.

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Appendix 1, Criteria for Standard Industrial Hazards
Appendix 2, Table for Summarizing Analysis of Standard Industrial Hazards
Appendix 3, Description of the Hierarchy of Controls
Appendix 4, Guidance for Assessing the Risk of Standard Industrial Hazards
[Appendix 5, Risk Zone Matrix](#)

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THE NATION'S
URANIUM
PROCESSING
FACILITY

UPF ES&H PROCEDURE

Uranium Processing Facility

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PAGE	1 of 15

SUBJECT: UPF ANALYSIS OF STANDARD INDUSTRIAL HAZARDS IN THE DESIGN PROCESS

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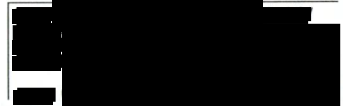
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Revision History

Revision	Reason/Description of Change
1	Clarified integration of ES&H into Design Process. Modified Hazard Analysis Facilitator's responsibilities.
0	Initial Issue

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1.0 PURPOSE

To describe the way in which standard industrial hazards will be analyzed during the design of the Uranium Processing Facility (UPF). This procedure helps fulfill the hazard identification and assessment requirements specified in the Department of Energy (DOE) Worker Safety and Health Program Rule (10 CFR 851.21). That regulation requires that contractors must “analyze designs of new facilities and modifications to existing facilities and equipment for potential workplace hazards.”

2.0 GENERAL

2.1 Description

UPF Project work process is to evaluate standard industrial hazards throughout the design process, and make recommendations to designers in order to mitigate hazards as they are identified. This strategy will be facilitated by having Safety and Health professionals participate in various meetings, such as design reviews, 3D model reviews, constructability reviews, and management of change meetings. In addition, Safety and Health professionals will participate in Facility Safety hazard assessments (HAs). A team of Industrial Hygiene and Safety Subject Matter Experts will review data gathered from the HAs. Supplemental discussions will be held with Operations, Maintenance, and Design professionals, as necessary.

A comprehensive list of chemical, physical, and biological standard industrial hazards will be produced for analysis. The risk assessment process described in this procedure will then be applied to the list of hazards. Controls will be identified and evaluated to ensure that the hierarchy of controls has been applied appropriately. A risk assessment will be completed for each hazard to ensure that residual risk is acceptable. Feedback will be provided to designers if the residual risk is unacceptable, or if the hierarchy of controls has not been applied appropriately. Like the Facility Safety HAs, the standard industrial hazard analyses will be updated as the design achieves maturity milestones.

The scope of this procedure is limited to standard industrial hazards, defined as routinely- encountered hazards that (1) are well understood, (2) have adequate safety guidance relative to their use, and (3) may be adequately controlled by compliance with OSHA regulations or consensus standards.

2.2 Applicability

Applies to (1) key individuals required to perform analysis of standard industrial hazards, and their roles and responsibilities; (2) procedure instructions; and (3) the scope of the procedure.

3.0 ACRONYMS/DEFINITIONS

Acronyms

None

Definitions

Consequence - Harmful outcome of an incident, which occurs from the release of a hazard.

Control - A risk-mitigating measure, which reduces or eliminates the likelihood of a hazardous event, AND/OR reduces the consequences if the event occurs.

Frequency - The number of times an incident occurs over time.

Hazard – A source of danger (e.g., material, energy source, or operation) with potential to cause illness, injury, or death to personnel, OR to cause damage to an operation or the environment, without regard for likelihood or credibility of accident scenarios or consequence mitigation.

Likelihood - A measure of probability that something will happen.

Risk - The likelihood that a specific hazardous outcome will occur in a given time frame. Risk is defined as a combination of the severity of consequence AND the likelihood of occurrence or frequency.

Risk Assessment - The process of evaluating the severity of consequences and the likelihood of occurrence-risk associated with each identified hazard.

Severity - A description or measure of the damage or harm (to people, assets or the environment) caused by an identified hazard.

Standard Industrial Hazard - Routinely encountered hazards that (1) are well understood, (2) have adequate safety guidance relative to their use, and (3) may be adequately controlled by compliance with OSHA regulations or consensus standards.

Workplace Hazard - Physical, chemical, biological, or safety hazard with any potential to cause illness, injury, or death to a person.

4.0 KEY INDIVIDUALS, ROLES, AND RESPONSIBILITIES

4.1 Project Director

The Project Director is responsible for the following:

- Sponsors analysis of industrial hazards associated with UPF processes, functions, and buildings.
- Ensures that a process for hazard analysis is maintained.
- Ensures that analyses are conducted in accordance with contractual obligations.

4.2 ES&H Manager

The ES&H Manager is responsible for the following:

- Ensures that analyses are conducted in a timely manner to support overall project schedule.
- Ensures that analyses are conducted according to established procedures.
- Confirms that Safety and Health professionals participate in Design Review process.
- Provides input (related to mitigation of standard industrial hazards) to designers.
 - Ensures that all recommendations are properly incorporated into the project design, and that all actions are closed.
 - Elevates any unresolved risk issues to Project Director.

4.3 Project Engineering Manager

The Project Engineering Manager is responsible for the following:

- Ensures that necessary engineering resources, such as people with the required expertise, are available to support the hazard analyses.
- Resolves recommendations provided by Safety and Health professionals during Design Review processes.

4.4 Project Operations Manager

The Project Operations Manager is responsible for the following:

- Ensures that the necessary operations resources, such as people with the required expertise, are available to support the hazard analyses.
- Resolves operations recommendations generated by study teams.

4.5 Project Maintenance Manager

The Project Maintenance Manager is responsible for the following:

- Ensures that the necessary resources, such as people with the required expertise, are available to support hazard studies.
- Resolves maintenance recommendations generated by study teams.

4.6 Hazard Analysis Facilitator

The Hazard Analysis Facilitator is responsible for the following:

- Executes the hazard analysis in accordance with this procedure.
- Provides expertise on the methodology.
- Guides the group through the application of this procedure.
- Defines specific work processes for each analysis, in accordance with this procedure and any additional client or regulatory requirements.
- Obtains primary source documents for the analysis, such as process flow diagrams, piping and instrumentation drawings, and System Design Descriptions.
- Schedules ES&H SME review meetings in follow-up to design input.
 - Ensures the necessary resources are available to conduct meetings, such as people with the required expertise, meeting rooms, supplies, design documents, etc.
 - Establishes the ground rules for the meeting.
 - Ensures that the team participates actively and openly, but within the rules established.
 - Prepares agendas and runs the meetings.
 - Provides opportunity for each person to offer input, when appropriate.
 - Documents all issues raised.
- Provides immediate feedback to Engineering if residual risk is not acceptable.
- Provides all recommendations/action items to the appropriate Project Engineering Manager for resolution.
 - Prepares preliminary report, summarizing the team meetings and hazards analyzed.
 - Prepares final report to document the process and outcome of the hazard analysis.
 - Prepares the Standard Industrial Hazard Analysis and submits it to Document Control

4.7 Scribe

The Scribe is responsible for the following:

- Records meeting notes.
- Demonstrates proficiency with the chosen software (e.g., Excel).
- Reads and understands design documents.
- Exhibits familiarity with technical language and abbreviations.
- Assists Facilitator with planning meetings, as necessary.

4.8 Safety and Health Subject Matter Expert

The Safety and Health Subject Matter Expert is responsible for the following:

- Participates in hazard analyses.
- Asks questions and provides technical expertise during study meetings.
- Assists the Facilitator in the execution of risk assessments.

- Conducts research and analysis of specific hazards, as necessary to support resolution of identified hazards.
- Assists in the preparation of the Standard Industrial Hazard Analysis, as necessary

5.0 PROCESS

5.1 Instructions

Hazard analyses help guarantee that facilities are designed so they can be constructed, commissioned, operated, and maintained without unacceptable risk to the health and safety of personnel, and without causing environmental degradation, commercial loss, or facility damage. The fundamental objectives accomplish the following:

- Identify hazards, which may result in harm to people's safety and health, or to the environment, assets, or production;
- Assess the risk in terms of likelihood of occurrence, and the severity of consequences.

The principal steps in hazard studies are illustrated in Figure 1. The requirements of each step are described in Bechtel Corporation Engineering Department Procedure 3DP-U04H-00199, Rev. 001 2011, April 15. Refer to that procedure for a more detailed description.

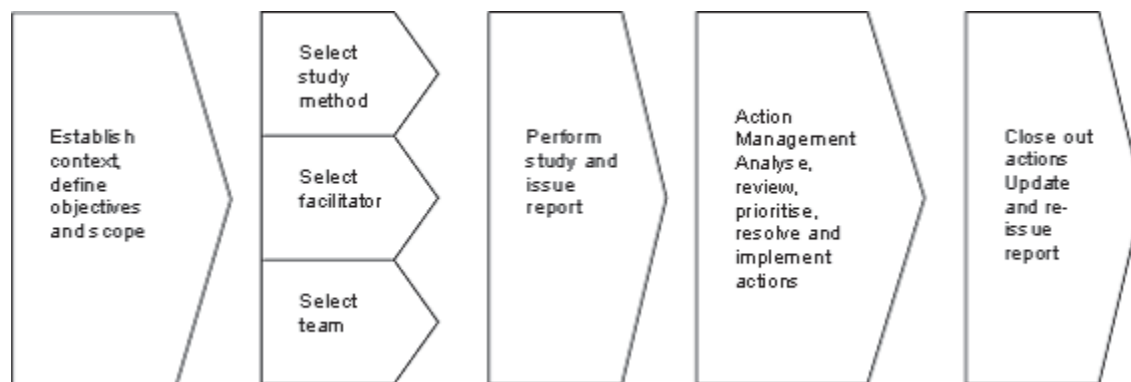


Figure 1. Principle Steps in the Hazard Assessment Process

5.2 Perform Risk Assessment

Specific steps for conducting the risk assessment of industrial hazards consist of the following:

- 5.2.1 Identifying potential hazards – List and describe all chemical, physical, and biological hazards. Be specific and thorough. Compare the hazards to the criteria for standard industrial hazards (see **Appendix 1**). List the hazards in a summary table (see **Appendix 2**).

- 5.2.2 Identifying hazard controls – List all controls incorporated into the design. Document the controls in the summary table (see **Appendix 2**).
- 5.2.3 Categorizing the effectiveness of hazard controls – Use the description of the hierarchy of controls to categorize the effectiveness of the controls (see **Appendix 3**).
- 5.2.4 Assessing the risk – Considering the controls in the current design, assess the risk:
1. Use the criteria in **Appendix 4**, Table 1, to estimate the severity of the hazard.
 2. Use the criteria in **Appendix 4**, Table 2, to estimate the probability of an event.
 3. Use the matrix in **Appendix 5** to determine the Risk Zone for each hazard.
 4. Document the risk assessment in the summary table (see Appendix 2).
- 5.2.5 Making recommendations – If the risk assessment indicates that a hazard is in Risk Zone 1 or 2, then develop recommendations for additional controls anticipated to reduce the risk to Zone 3. Document those recommended controls in the summary table (see Appendix 2).
- 5.2.6 Reporting the results - Refer to AR-SH-801768-A001, Standard Industrial Analysis for the Uranium Processing Facility, for an example of how to report the results of the hazard assessment.

5.3 Scope

Studies of standard industrial hazards will be performed on the following UPF processes and facilities. Some processes and facilities may be combined to facilitate reporting:

- Casting
- Chemical processing, including conversion to uranium compounds
- Nondestructive analysis
- Waste preparation
- Decontamination
- Maintenance
- Main Process Building (MPB)
- Salvage and Accountability Building (SAB)
- Mechanical/Electrical Equipment Building (MEB)
- Personnel and Support Building (PSB).
- Process Support Facility (PSF)
- Other Miscellaneous areas (as needed)

6.0 RECORDS

Records generated by this Document shall be maintained in accordance with Y15-95-800, *UPF Document Management*.

The following records generated are:

Record or Form Number	Record Title	System/Location	Document Type
Document Specific	<i>Standard Industrial Hazard Analysis of the Uranium Processing Facility</i>	InfoWorks	AR

7.0 REFERENCES

7.1 Source References

- PL-CM-801768-A007, Uranium Processing Facility Project Constructability Plan
- PL-PJ-801768-A027, Uranium Processing Facility Concept of Operations Plan.

7.2 Reference Documents

- 3DP-U04H-0199, Rev.001 2011, April 15; Bechtel Corporation
- AR-SH-801768-A001, Standard Industrial Analysis for the Uranium Processing Facility
- DOE G 440-1B, Worker Safety and Health Program for DOE (Including the National Nuclear Security Administration) Federal and Contractor Employees, (10 CFR 851.21)
- Y15-95-800, *UPF Document Management*

8.0 APPENDICES

Appendix 1, Criteria for Standard Industrial Hazards

Appendix 2, Table for Summarizing Analysis of Standard Industrial Hazards

Appendix 3, Description of the Hierarchy of Controls

Appendix 4, Guidance for Assessing the Risk of Standard Industrial Hazards

Appendix 5, Risk Zone Matrix

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APPENDIX 1 Criteria for Standard Industrial Hazards

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Hazard	Criteria	Non-standard Conditions Requiring Special Analysis
Asphyxiant	Any asphyxiant in sufficient quantity to reduce the volume of oxygen in the workplace atmosphere to <20.9%	
Biologically derived contaminant	Any biohazard regulated by the Occupational Safety and Health Administration (OSHA) or with guidelines from the American Conference of Governmental Industrial Hygienists (ACGIH)	Human pathogens not regulated by OSHA or ACGIH
Carcinogen	Man-made or naturally-occurring substances recognized as carcinogens by the, OSHA, ACGIH, or the U.S. National Toxicology Program	
Electrical Energy	Applications regulated by OSHA and National Fire Protection Association (NFPA) 70 <i>National Electrical Code</i> and NFPA 70E <i>Standard for Electrical Safety in the Workplace</i>	Unusual applications not adequately controlled by OSHA (e.g., soil vitrification); >800 volts and 24 milli-amperes output; or stored energy >50 joules at 600 volts
Entrapment	Confined spaces regulated by OSHA and means of egress regulated by NFPA 101 <i>Life Safety Code</i> or OSHA	
Ergonomic Stress	Physical agents regulated by OSHA or with ACGIH guidelines	
Explosive Material	Applications regulated by OSHA	Any explosive defined by 49 CFR 173 Shippers – <i>General Requirements for Shipments and Packages</i> , Division 1.1, 1.2, or 1.3; or >10 oz. of Division 1.4.
Flammable Material	Applications regulated by OSHA and American National Standards Institute (ANSI) Z49.1 <i>Safety in Welding, Cutting and Allied Processes</i>	
High Pressure	Applications regulated by OSHA	3,000 psig or 0.1 lb. TNT (1.4 x 105 ft-lbf) equivalent energy.

APPENDIX 1

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Hazard	Criteria	Non-standard Conditions Requiring Special Analysis
Kinetic Energy	Applications regulated by OSHA	High energy (e.g., flywheel or centrifuge-type equipment)
Laser	Physical agents regulated by OSHA, ACGIH, or ANSI Z136.1 <i>Safe Use of Lasers</i>	Any Class IIIb or IV laser with non-enclosed beam per ANSI Z136.1
Lighting	Physical agents regulated by OSHA or with ACGIH guidelines	
Noise	Physical agents regulated by OSHA or with ACGIH guidelines	Noise sources that exceed 110 decibels A-scale (continuous)
Non-ionizing Radiation	Physical agents regulated by OSHA or with ACGIH guidelines	
Potential Energy	Applications regulated by OSHA	
Reactive Material	Applications regulated by OSHA	>10 lb. of a substance with an NFPA reactivity hazard level >2
Temperature Extreme	Physical agents regulated by OSHA or with ACGIH guidelines	
Toxic Substance	Chemical substances with occupational exposure limits established by ACGIH or OSHA	Chemical substances without a published occupational exposure limit

*Hazards associated with ionizing radiation, radioactive material, radioactive surface contamination, radioactive waste, mixed waste, nuclear criticality, accelerators, and X-ray machines are excluded.

APPENDIX 3

Description of the Hierarchy of Controls

(Page 1 of 1)

Order of Preference and Effectiveness	Category	Description
1	Design Features	Elements of the architectural and/or engineering design that eliminate or mitigate a safety hazard (e.g., pedestrian walkways that are isolated from moving vehicles)
2	Engineered Safety Systems	Fixed, active devices that mitigate a safety hazard (e.g., local exhaust ventilation system)
3	Safety Devices	Fixed, passive, protective barriers between workers and hazards (e.g., expanded metal grate covering a floor trench)
4	Warning Devices	Visual and audible alarms designed to trigger avoidance or corrective responses (e.g., vehicle back-up alarms)
5	Safety Equipment	Manufactured articles that are placed in the work environment to help mitigate safety hazards (e.g., eye-wash stations)
6	Programs, Procedures, and Training	Administrative systems and processes that, when properly implemented, help mitigate a safety hazard (e.g., Hazard Communication Program)
7	Personal Protective Equipment	A device or garment worn by a worker that serves as a barrier between them and a safety hazard (e.g., respirators)

APPENDIX 4

Guidance for Assessing the Risk of Standard Industrial Hazards

(Page 1 of 1)

Table 1. Severity of Consequences Interpretation

Severity Category	Severity Category Description	Severity of Personnel Illness/Injury
I	Catastrophic	Death
II	Critical	Severe injury or severe occupational illness
III	Marginal	Minor injury or minor occupational illness
IV	Negligible	No injury or illness

Table 2. Probability of Mishap Interpretation

Probability Level	Probability Level Description	Probability of Personnel Illness/Injury
A	Frequent	Likely to occur repeatedly in facility life cycle
B	Probable	Likely to occur several times in facility life cycle
C	Occasional	Likely to occur sometime in facility life cycle
D	Remote	Not likely to occur in facility life cycle but possible
E	Improbable	So unlikely it can be assumed occurrence may not be experienced in facility life cycle
F	Impossible	Physically impossible to occur

APPENDIX 5 Risk Zone Matrix (Page 1 of 1)

		Probability of Mishap						
		Level	F	E	D	C	B	A
		Descriptive Word	Impossible	Improbable	Remote	Occasional	Probable	Frequent
		Definition	Physically impossible to occur	So unlikely it can be assumed occurrence may not be experienced	Unlikely but possible in system life cycle	Likely to occur sometime in system life cycle	Likely to occur several times in system life cycle	Likely to occur repeatedly in system life cycle
		Category/ Descriptive Word	Personnel Illness or Injury					
Severity of Consequences	I Catastrophic	Death						1
	II Critical	Severe injury or severe occupational illness				2		
	III Marginal	Minor injury or minor occupational illness			3			
	IV Negligible	No injury or illness						
Risk Codes/Actions	1	Imperative to control risk to Level 3	Notes: 1. Personnel must not be exposed to hazards in Risk Zones 1 and 2. 2. Risk assessment matrix adapted from MIL-STD-882C. 3. Probability of mishap based on 50 year exposure interval.					
	2	Imperative to control risk to Level 3						
	3	Operation permissible						

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