Department of Energy
National Nuclear Security Administration
Washington, DC 20585

October 31, 2005

The Honorable A. J. Eggenberger
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW.
Suite 700
Washington, D.C. 20004

Dear Mr. Chairman:

Enclosed is a draft copy of the Technical Business Practice (TBP), "Hazard Analysis and Weapon Response," for your review and comment. The purpose of this TBP is to reflect the national laboratory and Pantex Plant interfaces associated with recent changes in the hazard analysis and weapon response process that resulted from the Value Streaming Analysis (VSA) effort conducted in mid-Fiscal Year 2005. The purpose of the VSA was to identify and improve areas of inefficiency in the hazard analysis and weapon response process and it included participants from the three national laboratories, National Nuclear Security Administration (NNSA), and Pantex Plant. Regarding the weapon response process, the VSA identified significant inefficiency in the existing practice of determining conditional weapon response probabilities for all scenarios no matter how insignificant or how similar they were to previously analyzed scenarios. The VSA identified a modification to the process to address hazards in a more systematic iterative manner. The modification includes a method to address hazards with lesser or known consequence through previous analysis on other programs using a standard set of weapon response rules in the form of thresholds and screening criteria. The Hazard Analysis Task Team (HATT), which includes laboratory and Pantex Plant members, can then utilize the set of rules to screen a large number of identified hazard scenarios. As part of the hazard analysis process, the Pantex Plant requests laboratory concurrence on the appropriate use of the rules via an Information Engineering Release. For the remaining scenarios, the HATT conducts an assessment to mitigate/eliminate the hazard via process and/or tooling changes or engineered/administrative controls. Hazard scenarios that were not mitigated or eliminated during this step are forwarded to the laboratories for formal assessment via the original method. The laboratories are then able to focus weapon response resources on a smaller more manageable set of hazard scenarios. In the resulting Hazard Analysis Report, each hazard scenario is still listed with the associated weapon response or screening rule.

The VSA results drove a change in the weapon response approach, which reduced the necessity to explicitly define expectations for the evaluation and documentation of weapon response as was indicated in the Recommendation 98-2 deliverable. In conjunction with this TBP, the NNSA is updating the Development and Production Manual, Chapter 11.8, "Integration of

Weapon Response into Authorization Bases at the Pantex Plant," which serves as the requirements document for hazard analysis and weapon response. In the updated version of Chapter 11.8, the NNSA will still require that the laboratories have a formal process compliant with the Title 10, Code of Federal Regulations, Part 830, rule to evaluate weapon response requests from the Pantex Plant. Each laboratory has an internal process for evaluation of weapon response that includes deterministic/probabilistic modeling, expert elicitation using subject-matter experts, and review of existing test and analysis. The benefits of this approach result in consistency among programs and more streamlined and prioritized efforts for weapon response.

Please provide your comments no later than November 30, 2005. Should you have any questions, please call me at 202 586-1730 or have your staff contact Ms. Wendy Baca at 505-845-6340.

Sincerely,

Doug Abbott
Director
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Enclosure

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TECHNICAL BUSINESS PRACTICE
for
HAZARD ANALYSIS AND WEAPON RESPONSE

1. PURPOSE

This Technical Business Practice (TBP) provides the process for developing and documenting the Hazard Analysis (HA) and Weapon Response (WR) information supporting nuclear explosive operations at the Pantex Plant. Key elements of the process include:

- identification and documentation of credible insults to nuclear explosives or their components that could result in an unacceptable response;
- identification of the parameters for those insults sufficient to establish the conditional probability of response;
- development and documentation of the WR to the insult; and
- identification of controls that prevent or mitigate the insult.

2. SCOPE

This TBP applies to nuclear weapon assembly, disassembly, associated testing operations, and repair functions performed at the Pantex Plant. This TBP also applies to facility upgrades and modifications when the facility is used for nuclear explosive operations.

3. ORGANIZATIONAL APPLICABILITY

Sandia National Laboratories (Design Agency)
Los Alamos National Laboratory (Design Agency)
Lawrence Livermore National Laboratory (Design Agency)
BWXT Pantex (Production Agency)
National Nuclear Security Administration (NNSA): Office of Nuclear Weapons Stockpile (NA-122), Pantex Site Office (PXSO), and NNSA Service Center

The organizations listed act in various team capacities to carry out the HA and WR processes. The two principle teams are the Project Team (PT) and the HA Task Team (HATT). The PT leads the overall project. The HATT is a sub-team that leads the HA effort.

The PT consists of representatives from NA-122 (project lead), PXSO, appropriate design agencies, and Pantex. These representatives serve as the spokesperson from their parent organization for the specific project. Specific duties of the PT are:

- establish the project scope of work;
- establish the appropriate task teams (including the HATT);
- derive and approve the project plan including scope/cost/schedule;
- develop and approve assembly and disassembly processes, procedures, and tooling;
- declare readiness for independent readiness reviews; and
- maintain progress against the project plan.

The NA-122 PT lead, in coordination with the PT members, derives the project-tasking memorandum signed by the NA-122 Director. The PT provides periodic project milestone status to NNSA, Pantex, and Laboratory management.

The HATT is comprised of members that maintain an expert level of knowledge in topical areas they support, such as but not limited to weapons design, assembly or disassembly operating procedures, tooling design, tester design, facility equipment use and layout, WR and HA. Representation from the Nuclear Explosive Safety and Safety Basis Review Team organizations is also encouraged. The HATT is lead by Pantex Authorization Basis personnel.

4. OVERVIEW

This TBP reflects HA process changes resulting from the Value Streaming Analysis (VSA) conducted by the national Laboratory, Pantex Plant, and NNSA stakeholders in mid-Fiscal Year 2005. The VSA identified areas of inefficiency in the previous process. The process reflected herein focuses on an improved communication flow among the stakeholders for development of hazard scenarios, WR, and related control set. Section 5 delineates the process for development of HA and WR supporting a new documented safety analysis (DSA) or major revision to an existing DSA. Section 6 delineates the processes for addressing new/changing hazard and WR information resulting from operational events or proposed changes. Section 7 provides a description of the process utilized by the laboratories to ensure high quality WR evaluation and documentation. Appendix A provides an example Hazard Identification Table. Appendix B provides an example HA Table. Appendix C provides flow charts (Chart A through E) that correspond with process step tables included in Sections 5 and 6. The HA and WR consequences and frequencies are listed in Chapter 11.8, "Integration of Weapon Response Into Authorization Bases at the Pantex Plant," of the Development and Production Manual (D&P).

5. NEW OR MAJOR REVISION TO DSA

In the case of a major revision to an existing DSA, development, review, and documentation of HA and WR is conducted in three phases: Initial, Conceptual, and Final. The purpose of the Initial Phase is to baseline an existing process where tooling and procedures already exist. In the case of DSA activities for new processes, the Initial Phase is omitted and the starting point is the Conceptual Phase.

5.1 INITIAL PHASE

These process steps/actions provide the initial baseline for safety basis development when processes and tooling already exist. (See Flow Chart A).

Step	Function/Activity	Responsibility
1	Prepare for initial walk down:	
	• Establish Hazard Assessment Task Team (HATT)	PT
	• Develop detailed process flow with weapon configurations for existing process	Production Agency Design Agency(s) (PA/DA)
	• Establish screening parameters by weapon configuration	DA(s)
	• Validate the need to use satellite facilities to accomplish the scope of activity identified in the tasking memo	DA(s)
	• Document weapon handling, testing, inspection requirements	DA(s)
2	Confirm acceptable level of Step 1 maturity to proceed with initial walk down process	HATT (Chairperson)
3	Conduct Initial Walk Down of existing process, procedures, and tooling using documentation from Step 1	PT/HATT
	• Identify and document hazards	HATT
	• Document hazards that do not result in unacceptable consequence using the screening parameters provided by the DA's	HATT
	• For hazards that do result in unacceptable consequence: 1) identify and document changes in process, procedures, and tooling that eliminate the hazard/unacceptable consequence; 2) eliminate/mitigate the hazard via engineered control(s); 3) eliminate/mitigate the hazard via administrative control(s).	HATT
4	Create appropriate documentation of hazards, WRs, controls to formulate process changes	HATT
5	Review and approve HATT proposed process, procedure, and tooling changes	PT
6	Go to Step 2 of Conceptual Phase	

5.2 CONCEPTUAL PHASE

The Conceptual Phase is the second step in HA for existing processes. The purpose is to derive tooling concepts and process changes in support of the desired end-state for improved safety. The PT shall use the scope defined in the tasking memorandum to formulate the end state. The pre-requisites from the Initial Phase include a draft detailed process flow of the end state, associated draft weapon configurations, hazards list, and WR rules (reference Flow Chart B). For new processes where existing tooling and procedures do not exist, the PT shall start at the Conceptual Phase, Step 1, to develop the draft HA and draft WR.

Step	Function/Activity	Responsibility
1	For newly proposed operations without existing tooling/procedures. Otherwise go to Step 2:	
	• Establish HATT	PT
	• Establish draft screening parameters	DA(s)
	• Establish tooling concepts and draft detailed process flow for proposed process	PA
	• Establish draft Hazard Tables (including assignment of WR rules	PA
2	Confirm documentation from Initial Phase complete and available for walk down	HATT (Chairperson)
3	Conduct Conceptual Walk Down of conceptual process (detailed process flow and tooling concepts)	
	• Identify hazards and hazard insult parameters	HATT & PT
	• Bin identified hazards into draft WR rules	PA
	• Provide draft (conservative) WRs for hazards greater than threshold screening criteria	DA(s)
	• Identify process/tooling changes that eliminate/mitigate hazards	HATT & PT
	• Identify engineered/administrative controls to mitigate/eliminate remaining hazards	HATT & PT
	• Record walk down results and closeout of actions	HATT & PT
	• Document identified controls in HA Table	PA
4	Identify and resolve arduous/inefficient controls driven by conservatism of WR	HATT
5	Review and approve draft detailed process flow, tooling concepts, and proposed controls	PT
6	Determine and document specific tooling required for Final Detailed Process Flow Walkdown	HATT & PT
7	Place Conceptual Process Documentation in formal change control	
	• Draft WR Rules	DA(s)
	• Updated Draft Detailed Process Flow	PA
	• Updated Hazard Tables and HA Table	PA
8	Prepare and assemble documentation for Final Phase	
	• Draft Final Weapons Response	DA(s)
	• Final tooling design and fabrication	PA
	• Final Process Description (Note – Process procedures must be maintained in concert with the process baseline as defined by the Detailed Process Flow document)	PA
	• Develop draft HA Report and initiate WR (including summary and bases) peer review and PX internal peer review	PA/DA
	NOTE: Attendance /support by NESS and SBRT personnel during Step 3 activities is encouraged for early identification and resolution of issues/questions.	

5.3 FINAL PHASE

These actions are performed to verify all hazards were addressed and documented during the Conceptual Phase and assure the final detailed process flow and tooling support completion of the HA Report and WR (reference Flow Chart C).

Step	Function/Activity	Responsibility
1	Reconvene HATT	Project Team (PT)
2	Determine appropriate level of readiness for final walkdown (Criteria include maturity levels of tooling design and fabrication, final detailed process flow description, and hazard tables/rules/WR)	HATT(Chairperson)
3	Conduct Final Walkdown using final Detailed Process Flow	
	• Identify any remaining hazards that were not eliminated from new process and tooling	HATT & PT
	• Identify further process/tooling changes to eliminate/mitigate remaining hazards	HATT
	• Bin any remaining hazards not eliminated through process or tooling changes within current WR rules	HATT
	• Establish new WR rules for remaining non-eliminated hazards where possible	DA(s)
	• Establish new engineered/administrative controls where required	HATT & PT
	• Record walk down results and actions	HATT
4	Review control feasibility and approve proposed process, tooling, controls, and procedures	PT
5	Revise Hazard Tables and HA Table as required	PA
6	Complete Final HA documentation	
	• Incorporate new controls and WR rules into HA Report (HAR); complete independent review and plant review.	PA/DA
	• Complete WR, including summary and bases documentation, conduct laboratory reviews (independent, peer, management), and WR Database (WRD) entry of WR Summary and Bases (Reference Section 7 of this TBP)	DA(s)
7	Issue WR Information Engineering Release (IER)	DA(s)
8	Validate WR, per D&P Manual 11.4 and issue IER stating DA validation that rules/WR applied appropriately in HAR	DA
9	Issue HAR for approval	PA

6. HA AND WR TO EVALUATE CHANGES ASSOCIATED WITH ONGOING OPERATIONS

When operational conditions and/or proposed nuclear explosive process changes introduce hazards not previously evaluated, a revision to the HA is required, driving formal change to the WR or confirmation of existing WR adequacy. Section 6.1 provides the process steps when changes are considered bounded by existing WR information. Section 6.2 provides process steps for addressing unbounded new/revised hazards or for addressing unit conditions that have deviated from original analysis assumptions, including damage or resulting different conditions.

6.1 For new/changed hazard(s) determined to be "bounded" by existing WR (Reference Flow Chart D):

Step	Function/Activity	Responsibility
1	Develop revision to the HA Table; incorporating proposed new/changed hazard(s) and potential insults to nuclear explosive.	PA
2	Enter revised HA Table information into the WRD and issue IER requesting Design Agency concurrence on use of existing WR	PA
3	Evaluate revised HA Table information and determine coverage by current WR	
	• If information is determined to be within existing HA, issue IER documenting concurrence	DA(s)
	• When evaluation determines that existing HA insufficient, review HA Table information for sufficiency and understanding.	DA(s) & PA
4	• If evaluation shows that existing HA is insufficient, issue IER documenting non-concurrence.	DA(s)
5	When non-concurrence exists, develop new WR	DA(s)
	• Delay implementation of operations associated with subject hazard changes until revised WR is incorporated.	PA
	• Develop new WR, complete peer review, enter revised WR into WRD, revise WR Summary Document (if required), and issue IER documenting completion of update. (Reference Section 7 of this TBP)	DA
9	Incorporate updated WR into Hazard Tables and HA Table; initiate USQ; and revise HAR (if required)	PA

6.2 For new/changed hazards determined to be not bounded by existing WR or where condition of the unit has changed from original assumptions (Reference Flow Chart E):

Step	Function/Activity	Responsibility
1	Develop draft revision to HA Table; incorporating proposed new/changed hazard(s), potential insults to nuclear explosive, and proposed controls	PA
2	Discuss sufficiency, clarity, and understanding of draft HA Table information, including possible mitigation/control actions. Incorporate agreed upon changes.	DA(s)/PA
3	Enter HA Table information into WRD and issue IER requesting formal WR	PA
4	Develop WR, complete peer review, enter revised WR in WRD, revise WR Summary Document (if required), and issue IER documenting completion of WR update. (Reference Section 7 of this TBP)	DA(s)
5	Incorporate IER'd WR into the Hazard Tables, HA Table, and HAR (as required).	PA

7. EVALUATION AND DOCUMENTATION OF WR

The D&P Manual, Chapter 11.8, "Integration of Weapon Response Into Authorization Bases at the Pantex Plant," requires that the evaluation of WR be conducted via a formal process and be documented in comprehensive safety documentation in accordance with Title 10, Code of Federal Regulations, Part 830, Subparts A&B. In determining conditional probabilities in conjunction with consequence categories, the national laboratories shall use various techniques to include probabilistic and deterministic models, past test data and analyses, and expert elicitation using subject matter experts. Reference material documents shall be listed in the Bases document and assumptions associated with the use of the controls shall be listed in the Summary Document. Each laboratory shall conduct an independent review of the computed conditional probabilities and WRs prior to the final peer review using subject matter experts. The laboratory peer review team shall use the bases document to determine if sufficient technical information exists to support corresponding WRs. The focus of national laboratory weapon responders and peer reviewers for a given hazard scenario, should center on the consequence category and adequacy of associated controls.

Appendix A – Example Hazard Identification Table

This table is used to identify the potential hazards (insults) with the parameters of the insult along with the hazardous event number, from the HA Table, where the hazard is evaluated. There are four main types of hazards: mechanical, electrical (AC or DC), electrostatic discharge (ESD), and process (process hazards include chemical insults to the unit or component).

- For mechanical hazards, the type of hazards include dropping the unit or component, dropping something onto the unit or component, pushing something into the unit or component, etc. The parameters can be drop height, velocity, and weight. The mechanical insult can be a simple drop, or can be an impact while the Production Technician is carrying or pushing the item.

- For electrical hazards, the type of hazard is an electrical insult (AC and/or DC) to the unit or component from an electrical source. The parameter is voltage.

- For ESD, the type of hazard is an ESD to the unit or component. The parameters are voltage and energy.

- For process hazards, there are no pre-identified hazards that apply. The HATT will review the process and identify process hazards based on the walk down. The type of process hazard (e.g., rotating the unit into the bay stand, lowering the unit and crushing into the bay stand) will dictate the parameters required.

No.	Config.	Item	Weight	Velocity or Height	Impact w/o technician	Impact with technician	Drop	ESD	AC/DC	Process Hazards

No.: This is a tracking number for the hazard. Generally, the hazard table is generated by task and the number includes the task number.

Configuration.: This is the configuration of the nuclear explosive or the component being insulted.

Item: This is the equipment, tooling, material, or weapon component that is providing the insult to the configuration.

Weight: The weight of the item is entered if there is a mechanical impact to the configuration.

Velocity or Height: This is the velocity of the item impacting the configuration or the height from which the item is being dropped.

Impact w/o PT: A hazardous event number is entered if the item can be dropped onto the configuration listed; otherwise, not applicable (NA) is entered.

Impact with PT: A hazardous event number is entered if the equipment, tooling, material, or component can be pushed into or can impact the unit with the item and the PT; otherwise, NA is entered.

Drop: A hazardous event number is entered if the process can result in the unit or weapon component being dropped; otherwise, NA is entered.

ESD: The ESD parameters are provided along with a hazardous event number. If ESD is not applicable, NA is entered.

AC/DC: AC and/or DC voltage is provided along with the hazardous event number. If AC and DC are not applicable, NA is entered.

Process Hazard: A description of the process hazard is provided for the type of insult being impacted on the configuration. Also, the hazardous event number is provided.

Appendix B – Example HA Table

The HA Table is used to identify the bounding hazardous events that support evaluation of all hazards identified in HATT walk downs. Each hazardous event provides the applicable configuration of the nuclear explosive or component, a description of the event, the insult parameters, the WR rule number, the conditional probability of a WR for each consequence, and a conclusion of the event (i.e., screened or carried forward to an accident analysis).

No.	Conf.	Descrip.	Parameters	Rule No.	Conditional Probability							Conclusion
					IND	HEVR	BD	TR	TR/F	MR	WS	

No.: This is a unique number assigned to the hazardous event

Configuration: This is the configuration of the nuclear explosive or component

Description: This is a description of the hazardous event. The description, when combined with the parameters must be sufficient for the design agency to develop a WR.

Parameters: This is the bounding parameters of the hazardous event. Many hazards from the Hazard Identification Table will be combined into each hazardous event.

Rule No.: This is the rule number of the WR developed by the design agency for the hazardous event.

Conditional Probability: This is the conditional probability (may be yes or no for WS) for each consequence listed. Tritium Release (TR) by Fire is not provided in this table. The frequency of TR will be used if there is an ignition source, otherwise the TR by Fire will be determined to not be applicable. This will be evaluated and documented in the HA Report or Safety Analysis Report.

Conclusion: This will either be screened or will provide a reference to the accident analysis where the hazardous event is further evaluated. Potential controls are entered for each hazardous event that is not screened.

Appendix C
Process Step Flow Charts

FLOW CHART A - INITIAL PHASE
(THIS FLOW CHART WILL BE INSERTED AT A LATER TIME)

Appendix C (cont'd)
Process Step Flow Charts

FLOW CHART B - CONCEPT PHASE
(THIS FLOW CHART WILL INSERTED AT A LATER TIME)

Appendix C (cont'd)
Process Step Flow Charts

FLOW CHART C - FINAL PHASE
(THIS FLOW CHART WILL BE INSERTED AT A LATER TIME)

Appendix C (cont'd)
Process Step Flow Charts

FLOW CHART D - BOUNDED CHANGES TO ONGOING OPERATIONS
(THIS FLOW CHART WILL BE INSERTED AT A LATER TIME)

Appendix C (cont'd)
Process Step Flow Charts

FLOW CHART E - UNBOUNDED CHANGES TO ONGOING OPERATIONS
(THIS FLOW CHART WILL BE INSERTED AT A LATER TIME)