TEMPORARY CHANGE REQUEST

TCR NO.TCR-ENG-030,R5-001
(e.g., TCR-ENG-021,R0-001)

The Temporary Change Request (TCR) Form is to be used to process urgent or minor changes for PPPL Policies, Organization/Mission Statements and Procedures. The TCR should be used when changes are:
1) urgent, and can not wait the 2-4 week period for Department Head review/comment, or
2) minor, and do not warrant Department Head review.

Person Requesting Change: T. Stevenson **Phone Ext: 2657**

Department Name: ENGR & INFR

Document Number: ENG-030 **Revision No.: 5**

Document Title: Technical Procedures

Reason for change:
Add USI & USID requirements per Procedure XXX

Change description: (Summarize and attach changed pages, with changes clearly indicated)

Add to Introduction final Note as last sentence:

Any activity or issue that may challenge the Safety Manual, SAD, or Safety Certificate shall be considered an Unreviewed Safety Item (USI) and must follow Procedure ESH-025 to reach an Unreviewed Safety Item Determination (USID). Any actions pertaining to a USID shall be reviewed by the applicable ACC for recommendation prior to any operation.

Add Procedure ESH-025 to references, Add to B. General Rules :
Review SAD/Safety Envelope considerations including USI/USID per Procedure ESH-025. Procedures shall not be approved prior to satisfactory closure of the USI/USID process.

1. Does this TCR significantly alter the intent or scope of the document? **YES:** **NO:X**

2. Does this TCR significantly impact **ES&H**? **YES:** **NO:X**

If 1 or 2 is **YES**, Explain why the changes should not be routed for Department Head review:

This TCR adds USI/USID per procedure ESH-025 which will receive department review.

T. Stevenson **2/15/16**
Department/Division Head Approval **Date**

J. DeLooper **2/15/16**
Head, Best Practices and Outreach/designee **Date**

Release/Effective date of this TCR: **2/15/16**

Incorporate this TCR into next revision of this document? **YES:X** **NO:**

Subject:	Effective Date:	Initiated by:
PPPL Technical Procedures	August 7, 2015	Associate Laboratory Director for Engineering and Infrastructure
	Supersedes: Revision 4, dated March 13, 2015	**Approved:** Director

TCR-ENG-030,R5-001

Management System (Primary): 03.00 Engineering
Management System Owner: Associate Director for Engineering and Infrastructure
Management Process: 03.07 Conduct of Operations
Process Owner: Associate Director for Engineering and Infrastructure
Sub-Process: 03.07.13 Operations Procedures
Sub-Process Owner: Head, Electrical Engineering
Subject Matter Expert (SME): Head, Project Management Office

Applicability

This document is applicable to all technical programs and facilities at PPPL This procedure covers the following specific types of technical facility procedures: access, administrative, alarm response, emergency operations, general operations, installation, integrated system test, maintenance, preoperational test, repairs, and system operations. It does not cover general laboratory procedures or Division internal procedures.

Introduction

This procedure specifies the requirements for creation, revision, approval, and implementation of procedures intended for both tritium and non-tritium systems. Procedures may be required as part of the Work Planning System (ref. ENG-032) or at the discretion of line management. Procedures approved prior to the effective date of this procedure may continue to be used; major and minor revisions of such procedures should be done according to this procedure. Technical procedures must comply with Laboratory-wide Policies, Procedures, and Manuals, applicable Safety Assessments and Safety Analyses, and governing project or site-specific policies and procedures. Procedures are used in conjunction with a Job Hazard Analysis form per ESH-004.

All technical procedures represent and document a work planning process and therefore fall within the purview of the Work Planning Review Board. The WPRB Chair will monitor and review the usage of technical procedures for compliance and consistency by COGs and RLMs to perform field work. Per ENG-032 and the Work Planning System, a COG is the person assigned the responsibility for performing and coordinating the engineering and technical work for a job; for technical procedures the COG will often be the Accountable Technical Individual. The WPRB Chair will provide feedback to RLMs for continuous improvement of Engineering work planning systems. This purview also includes the records management of procedures and use of the Operations Center.

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As with any form of communication, Authors, Accountable Technical Individuals (ATI) and Responsible Line Managers (RLM) need to consider the intended audience, the level of complexity, the sustainability of knowledge, and the quality of technical procedures and their implementation. Care must be taken to write, review, approve, and implement procedures that are in compliance with The Safety Manual ESHD-5008 and other lab policies and procedures. Strong and declarative statements for procedure steps, drawing references, sketches, definitive ranges for acceptable outcomes, diagrams, photos, and cautionary notes should be employed to clearly identify, describe, and execute procedures. To ensure the quality of the implementation and documentation it is strongly recommended that the procedure include sign offs for the ATI or designee on procedure steps, hold points, or at the conclusion of the procedure or its checklist.

Note: Per RLM discretion, for any procedure that has a direct impact on the Safety Assessment Document, Safety Envelope, or Safety Certificate, the procedure review process shall be brought to the attention of the applicable Activity Certification Committee.

Any activity or issue that may challenge the Safety Manual, SAD, or Safety Certificate shall be considered an Unreviewed Safety Item (USI) and must follow Procedure ESH-025 to reach an Unreviewed Safety Item Determination (USID). Any actions pertaining to a USID shall be reviewed by the applicable ACC for recommendation prior to any operation. TCR-ENG-030,R5-001

Reference Documents

a) ENG-032, Work Planning System
b) P-032, Hierarchy of Documents
c) P-048, Safety Analysis and Review System Program
d) OP-AD-77, Operation and Maintenance of Tritium Contaminated Systems
e) ENG-029, Technical Definitions and Acronyms
f) Plan: PPPL ISM Document, Integrated Safety Management implementation
g) OP-AD-09, D-Site work permits
h) P-086, Calibration of Measuring and Test Equipment
i) ESHD-5008 PPPL ES&H Directives (The Safety Manual)
j) ESH-025, Operations Hazard Classification Criteria and Safety Certification System TCR-ENG-030,R5-001

Definitions

Access Procedure	Procedures that are used to remove or minimize all hazards in an area prior to or during personnel access.
Accountable Technical Individual (ATI)	The ATI is appointed by the Responsible Line Manager (RLM) and is accountable for the technical content and accuracy of the procedure. The ATI works with the RLM and procedure writer to meet the technical requirements specified in the Procedure

	Requirements Checklist.
Administrative Operations Procedures	Procedures that provide direction for the administration and conduct of PPPL operations. Examples of the topics covered by Administrative Procedures include the duties of operations personnel and project specific conduct of operations.
Alarm Response Procedures	Written instructions that identify the source and probable cause of an alarm and define systems operator actions to be taken in response to specific system or component alarms. Additionally, these procedures describe the actions required by Security Personnel for the notification of subsystems personnel for certain alarm conditions. Alarm Response procedures shall provide guidance for multiple causalities.
Emergency Operations Procedures	Written instructions designating actions to be taken in the event of abnormal conditions which, if not corrected, could result in injury to personnel, damage to equipment, or an uncontrolled release of toxic substances or radiation to the environment. EO procedures coordinate operational interactions between different systems and augment individual Alarm Response Procedures to ensure smooth integration of overall facility response to emergencies. Emergency Operations procedures shall provide guidance for multiple causalities.
General Operating Procedures	Written instructions which describe the major steps required to pass from one normal operating mode to the next; e.g., Glow Discharge Cleaning (GDC) to Pulse Discharge Cleaning (PDC). They coordinate operational interactions between the different systems, and augment the individual System Operations Procedures to ensure smooth integration of overall facilities operations.
Installation Procedures	Procedures that outline, define, and describe the prerequisites, requirements, safety considerations, and actions entailed in the installation of all equipment. At D-Site Installation procedures are required in the Test Cell, the Test Cell Basement, the Tritium Systems area of D-SITE, Mechanical Equipment Room, Liquid Effluent Collection System and Tanks, the Mockup Decon / Cleanroom Facility, and the NSTX Test Cell as described in OP-AD-09. At C-Site Installation Procedures are left to the discretion of the RLM.
Integrated Test Procedures	Written instructions that define the equipment, methods, and steps required to test the integrated operation or interactions of multiple systems.
Maintenance Procedures	Approved and controlled documents that specify the actions required to perform Preventive Maintenance on PPPL

	Programmatic Equipment.
Minor Procedure Change (MPC)	An interim change to a procedure to allow deviation from the procedure or make minor corrections that do not alter the intent or scope of the procedure as determined appropriate by the RLM.
Preoperational Test Procedures	Written instructions that define the equipment, methods and steps required to test equipment and systems in order to qualify them as fully operational at predetermined performance levels. These tests are normally conducted prior to the initial operation of a system, after a long shutdown period, and after some critical maintenance or repair tasks to assure systems are fully operational.
Repair Procedures	Procedures that specify the actions required to perform repairs on PPPL programmatic equipment. Repair procedures are required: a) When the repairs involve personnel or equipment safety considerations, b) On equipment governing the movement or containment of tritium, or c) For repair of a tritium containing system or potentially tritium contaminated systems.
Responsible Line Manager (RLM)	The manager who accepts responsibility for the work and the process leading to the performance of the work. This includes accepting responsibility for the change and the process leading to the change and all associated procedure changes. These individuals are identified by the Department Heads. The list of approved RLMs is available on the Engineering & Technology Department home page.
Run copy	A copy of a controlled document issued for use in the field and stamped “Run Copy.” This copy is to be used to document the performance of the procedure.
Satellite Areas	Subsystem areas outside of the Operations Center which are authorized to issue run copies of approved procedures.
System Engineer	The individual assigned responsibility by line management for a specific system, such as the C-Site Motor Control System. A list of approved system engineers is available on the Engineering Department web page.
Systems Operations Procedures	Approved and controlled procedures that specify the prerequisites, requirements, and actions for operating individual systems in various modes. The procedures describe the normal startup, startup after a long shutdown, shutdown, periodic testing, and operation of a single system or subsystem, using

checklists to specify and document action steps wherever feasible.

Test Director — The individual assigned responsibility to manage a test defined by an Integrated System or Preoperational Test Procedure.

Responsibilities

Each procedure has an assigned writer, Accountable Technical Individual (ATI), and Responsible Line Manager (RLM). The ATI is appointed by the RLM and is accountable for the technical content and accuracy of the procedure. The RLM has responsibility for the writing, approval, execution, and consequences of procedures and their revisions that s/he approves. In addition, individuals performing work under the guidance of a technical procedure are responsible to adhere to the steps of the procedure unless verbal concurrence is obtained from the ATI. The ATI is often the COG for a job or project, the System Engineer, or the individual having the definitive technical knowledge for the work being done. (See Attachment 1). The System Engineer is responsible for any pre-requisite Preventive Maintenance per ENG-016 and shall be included as a reviewer if not otherwise associated with the development and approval of the procedure.

Procedural Details

This procedure is divided into six sections. They are:

A. Types of procedures
B. General rules applicable to all procedures
C. Planning, writing, reviewing, and approving of new procedures or major revisions to existing procedures
D. Implementing minor procedure changes (MPCs)
E. Use of run copies
F. Cyclical review of procedures
G. Satellite Areas
H. Procedure Training/ Pre and Post-Job Briefs

A. Types of Procedures

The types of procedures covered by this procedure are: access, administrative operations, alarm response, emergency operations, general operating, installation, integrated test, maintenance, preoperational test, repair, and systems operations.

B. General Rules Applicable to all Procedures

All procedures are required to list the procedure number, revision number, and page number in the upper right corner.

Definitions and acronyms for use within procedures are contained in ENG-029.

Attachment 1 contains the following:

- Types of procedures
- Numbering convention for these procedures
- The identification of the Accountable Technical Individual and Responsible Line Manager, by position.
- Review requirements.

General rules and guidelines applicable to all procedures are:

1. The principles and functions of Integrated Safety Management should be considered when developing procedures. The guiding principles are line management responsibility for safety, clear roles and responsibilities, competence commensurate with responsibilities, balanced priorities, identification of safety standards and requirements, and hazard controls tailored to work being performed. The functions are to define the work, analyze the hazard, develop/implement controls, perform the work, and provide feedback and improvement.
2. Upper tier documents should be referenced as appropriate.
3. A procedure should consist of step-by-step instructions for the work to be done. If steps in a procedure section do not have to be performed in a specified sequence or specific steps should only be performed when certain conditions prevail, they should be so indicated.
4. Procedures should be written in sufficient detail as to be understandable by the field personnel performing the work and by the technical and safety reviewers. Ancillary detail for background, explanation, reference data, instruction, etc., should be placed in well organized and clearly titled appendix sections. Care should be taken to include information for sustainability of the procedure to guide future usage including examples, photos, special techniques, acceptable ranges and outcomes, and other types of job knowledge to correctly, accurately, and repeatedly perform the work scope across assigned staff skills, training, and experience, as well as time between uses.
5. Installation, maintenance and repair procedures need to include functional verification of installed safety items starting or returning equipment to operation.
6. The need for calibrated tools or equipment should be explicitly identified. See policy P-086 on further guidance on when calibrated tools should be used. Specification of measurement instruments shall include proper scaling for the quantity to be measured, and accuracy consistent with monitoring quantities ensuring safety and equipment integrity.
7. A blank signoff line should be provided in the document for each critical action step of the procedure. These lines should be initialed by the individual executing the procedure to indicate and document that the required actions have been taken. A substitute is to have signoff lines at the end of sections of the procedure.
8. Steps or sections requiring verification or independent verification should contain an additional blank line in the document for the verifying person to initial

9. Hold points requiring consultation with the system engineer or ATI should be used if the analysis of data taken during the performance of the procedure is used as criteria in determining future actions in the procedure.
10. Checklists may be included to expedite extensive series of action steps. Each step of the checklists should be initialed or simply checked; in the later case, there should be a sign off line for the person completing the checklist.
11. All text, drawings, graphs, etc. should utilize 8-1/2 X 11 inch format. Full size drawings are acceptable when needed.
12. Review SAD/Safety Envelope considerations including USI/USID per Procedure ESH-025. Procedures shall not be approved prior to satisfactory closure of the USI/USID process. TCR-ENG-030,R5-001
13. Typical sections include but are not limited to:

    a) Purpose A brief statement explaining the purpose of the equipment or system to which it applies, the reason the procedure is being run, and the purpose of the document.

    b) Scope A summary of what the procedure covers or includes, any special circumstances deemed necessary to perform the procedure, and any limitations on the applicability of the procedure for given facility conditions or systems

    c) Responsibilities Responsibilities of the various positions involved in the procedure.

    d) Definitions

    e) Reference A listing of documents that may need to be accessed and that have information or instructions relevant to the procedure. Unnecessary references should be avoided. References may include appropriate codes and standards, design drawings, procedures, vendor manuals, etc

    f) Background Background information relevant to the procedure

    g) Special Tools, Equipment, and Materials: List of equipment, tools, apparatus, and consumables needed to perform the procedure which may not be readily available. For each tool that is required to be calibrated, this section must include the associated tool identifier as well as the most recent calibration date.

    h) Precautions/Limitations A list of potential hazards and how they should be mitigated. This alerts the individuals to the concerns or dangers that may or will exist during execution of the procedure and the safeguards which should or must be implemented. The appropriate warnings and cautions required to protect personnel and equipment are inserted in the procedure prior to the step to which they pertain.

    i) Prerequisities A list of specific activities or special plant conditions which must be performed or exist prior to execution of the procedure. The

supporting systems required to be operational for the procedure should be listed. Verification of performance of prerequisite tests should be listed and documented by a check-list. Prerequisites identified should be clear, concise instructions, each written as a single task.

j) Step-by-step instructions Instructions for the procedure. Test criteria for test procedures.

k) Acceptance Criteria Relevant for test procedures only.

l) Emergency Actions For any anticipated emergencies, steps required to leave system in safe state.

m) Records Records required to be maintained

n) Final Conditions Final conditions that the system should be left in at the end of the procedure.

o) Completion Signoff Signatures of ATI, system engineer, physicist, as appropriate, to acknowledge that work has been properly completed and that the implementation and documentation in the run copy of the procedure and any data collected are professional, acceptable, and compatible with proper Conduct of Operations.

p) Appendices For forms, checklists, test data sheets, calibration sheets etc.

q) Qualifications Qualification or training requirements for those who will execute the procedure.

Attachment 2 contains additional rules and guidelines for Alarm Response Procedures.

Integrated System Test Procedures (ISTPs) require the appointment of a Test Director by the RLM or ATI. Preoperational Test Procedures (PTPs) may require such an appointment. The name of the Test Director shall be entered into the run copy. Test exceptions must be approved by the ATI and documented in the run copy.

C. Planning, writing, reviewing, and approving new procedures or major revisions to existing procedures

Responsibility	Action
Responsible Line Manager (RLM)	1. Determines the need for a procedure to be developed, written, revised, or implemented. Assigns the individual who will write the procedure and the Accountable Technical Individual (ATI).
	2. Determines the need for an Independent Review and identifies the appropriate individual. Note that Independent Review is required for all procedures governing the movement and containment of tritium or maintenance of a tritium containing system or potentially tritium contaminated system.
	3. Completes the Procedure Requirements portion of the Procedure

Cover Sheet (Attachment 3). Determines which organization(s) and individual(s) should review the draft procedure based on the items selected on the Procedure Requirements and indicates so.

Procedure Writer

4. Obtains a procedure number or a revision number from the Operations Center.

5. Researches and writes a draft procedure or revision in accordance with this procedure and in compliance with applicable sections of the ES&H Manual, 5008. Identifies all hazards and the appropriate methods for mitigation. Reviews all Minor Procedure Changes (MPCs) against the existing procedure revision to assure proper inclusion. This step includes identifying any potential hazards to the environment, public, or workers that may result from execution of the procedure and establishing controls to mitigate these hazards. Attachment 8 contains guidance for the use of Human Performance Improvement concepts in the identification of and mitigation for error-likely situations.

ATI and Procedure Writer

6. Investigate and resolve any potential conflicts with documents of higher precedence (See Section 4, Hierarchy of Documents).

Procedure Writer

7. Prepares, if revising an existing procedure, a Revision Sheet (Attachment 4) to identify briefly the reason for the revision.

8. Distributes the draft procedure and Revision Sheet if applicable, Specifies due date for comments.

ATI

9. Performs a consistency check and walkdown of the procedure, if specified in the Procedure Requirements. Generates a marked up copy of the procedure and/or marked up drawings and diagrams, as appropriate.

Procedure Reviewers (may be individually or via peer review)

10. Marks up procedure and returns to writer in a timely manner. Signs next to name on the list of reviewers if does not require feedback on comments. In addition to the review of the technical content of the procedure, reviews the procedure for human performance concerns. Attachment 8 provides additional guidance for these concerns. Verifies accuracy to source documents (DOE, OSHA, ANSI, ETC.).

ATI and Procedure Writer

11. Receive, evaluate, and resolve the comments, suggestions, or objections generated by the reviews of steps 9 and 10. Obtains signature of reviewer indicating concurrence with resolution if not already on “Reviewers” form.

RLM	12. Reviews procedure and comment resolution objections for technical and ES&H impact on the systems, equipment, operation, or personnel. Specifies an Independent Review and selects an Independent Reviewer for any procedure pertaining to movement or containment of tritium or maintenance of a tritium contaminated system.
Independent Reviewer	13. Performs and completes an independent review per OP-AD-79. [An Independent Reviewer is required for any procedure governing the movement of tritium, containment of tritium, or maintenance of a tritium containing system or potentially tritium contaminated system.]
ATI and Procedure Writer	14. Resolve Independent Reviewer's comments.
Procedure Writer	15. Signs the 'Author' approval line on the Procedure Cover Sheet (Attachment 3).
ATI	16. Checks the final procedure package and signs if satisfied with all comment resolutions.
	17. Fills in the training information on the Training Requirements (Attachment 3).
RLM	18. Reviews the final procedure package and, if satisfied, signs the procedure. Otherwise, identifies concerns to ATI and procedure writer.
	19. Forwards copy of the procedure with the training requirements to Human Resources.
RLM	20. Forwards the original of the procedure and the documentation, including all marked up copies of the draft procedures containing comments and drawings, to the Operations Center.
ATI	21. Replaces all long standing previous revision Run Copies (such as Alarm Responses) with the new procedure.

D. MINOR PROCEDURE CHANGES

Minor procedure changes (MPCs) are only allowed for changes that do not alter the intent or scope of the procedure as determined by the RLM.

If a proposed change would alter the intent or scope of the procedure, the steps of Part C of this procedure must be followed. Also, a maximum of four active MPCs are allowed for a procedure. If the proposed MPC is the fifth, the steps of Part C of this procedure must be followed.

Responsibility	Action
MPC Originator	1. Determines the need for an MPC to an existing procedure and completes the MPC form (Attachment 5). Attaches copies of pages to be changed clearly indicating the changes. Changes shall be initialed and dated. Indicates all affected pages on the MPC form. Determines if the MPC could significantly impact ES&H or affect other operations; if so, notes the concern on the MPC Form.
	2. Requests MPC number from the Operations Center and writes MPC number on any attached sheets.
Operations Center	3. Assigns the MPC number.
ATI and RLM	4. Perform a technical review of the MPC to determine if the MPC significantly alters the scope or intent of the original. If yes, a major revision of the procedure is required, per Section C.
	5. Reviews the MPC to determine if executing the modified procedure could potentially result in a significant ES&H impact. If so, requests ES&HS Department review. If no, go to step 7.
ES&HS Department	6. Reviews the impact of the MPC on ES&H considerations. Signs MPC upon satisfactory resolution of any ES&H concerns.
RLM	7. Signs MPC indicating concurrence with the proposed change and that steps 1 – 6 above were properly performed.
RLM	8. Forwards signed copy to the Operations Center.
Operations Center	9. Files MPC with original procedure. Assures that all current run copies of the procedure and any new distributions of the procedure contain all open MPCs.
MPC Originator	10. Attaches signed copy of the MPC to the run copy of the procedure in use when the MPC was generated, if required. Either replaces pages in the run copy of the procedure with annotated pages or notes changes in the procedure at the affected steps.
ATI	11. Replaces all long standing previous revision Run Copies (such as Alarm Responses) with the new procedure.

E. RUN COPY PROCEDURE

Run copies are official copies of approved and controlled procedures issued for use in the field and are required when performing specific technical activities with recordable data such as installation procedures, pre-operational and integrated system test procedures, and maintenance or repair procedures. Run copies may be required for other procedures such as general operating procedures and access procedures if specified on the procedure cover sheet. Run copies are not required for procedures that are established and maintained to safely conduct more global project activities as is the case in administrative, alarm response, and emergency operations procedures. Run copies are stamped "Run Copy" and used to document the actual performance of the procedure. Run copies are usually issued directed by the Operations Center though they may be issued from official Satellite Areas (section F).

The following rules apply for the execution of run copies:

a) All blanks shall be filled in with the required information.
b) With concurrence (oral or written) of the Accountable Technical Individual (ATI), steps may be marked not applicable, e.g., writing "N/A" or crossing out blank spaces, or writing "N/A" and placing an arrow down a column.
c) In the event that a run is terminated, add after the last step performed, "Run Terminated", along with an explanation of what caused the termination. Blank spaces after the "Run Terminated" do not have to be marked N/A.
d) Entry errors shall be corrected, with concurrence of the ATI, by drawing a single line through the incorrect information and entering the correct information adjacent to it or in space available with reference to the deleted information. The individual making the correction shall initial and date the deleted information.
e) Unusual conditions: In the event that a procedure activity is interrupted prior to completion for a reason such as procedure conflicts, procedure inadequate for the intended task, or when unexpected results occur, the operator shall bring the equipment to a safe condition, not necessarily shutting down the equipment. For parameters exceeding the specified maximum/minimum values, the out-of-specification condition shall be circled in the procedure and promptly reported to the System Engineer. The causes of the unusual condition shall be promptly investigated with supervisors becoming involved as appropriate. Disposition of the circled parameter shall be explained in the comment section of the procedure or in the margin, as appropriate.

Note that in emergency situations only, operators have the authority to deviate from written procedures during an emergency if necessary to protect personnel and equipment. The deviation shall be documented in the procedure and the operator's supervisor shall be promptly notified. In all cases where the supervisor can be contacted without undue risk, the operator shall obtain his permission to deviate from the procedure.

Responsibility	Action
Authorized User	1. Obtains a run copy from the Operations Center or Satellite Area. The Authorized User must be trained on the procedure prior to obtaining the run copy. If a run copy is already in the possession of the Authorized User, he/she verifies that the

working copy is current (with Ops Center), or if not, returns the obsolete version for destruction and obtains a current version.

2. Conducts pre-job brief, if necessary. The briefing should be documented on a Record of Training Sheet (Attachment 6). Topics to be covered in the brief are:
   a) The purpose and scope of the procedure
   b) The procedure prerequisites
   c) The roles of the participants
   d) How communications among the participants will be conducted during the procedure
   e) Who will be responsible for overseeing the work activity
   f) Safety related issues including hazards and human performance concerns and how they are mitigated. See attachment 9 for further guidance.
   g) Post-procedure activities (e.g. restoration of equipment, system turnover).
   h) Other issues of concern (meal breaks, shift changes, etc.)

   Participants should be given the opportunity to ask questions or express concerns.

Authorized User

3. Executes procedure in accordance with planned operations using trained and qualified personnel. Documents compliance with the procedure in the run copy of the procedure. Unqualified personnel-in-training are permitted to operate a system only under the constant direct supervision of a fully qualified operator.

4. Writes MPC's if required following the steps of part D.

5. Conducts post job brief, when appropriate. Post job briefs are valuable if the procedure is expected to be executed again in the future or if problems were encountered in the execution of the procedure. Attachment 9 contains additional guidance for post-job briefs. - Post-job briefs provide an excellent opportunity to obtain sustainability information to the procedure for its next revision. Notes added to the Run Copy during execution can be copied and forwarded to the ATI and RLM so any lessons learned can be incorporated into revisions and other procedures.

6. Ensures that all required signoffs are in the procedure and annotates the applicable portions of the document for the given

operation. Returns completed "run copies" to the Operations Center per instructions on the procedure cover sheet. Completed run copies are filed in the Operations Center unless special archiving requirements have been specified by the RLM.

Lost or unexecuted procedures:

a. In the event that a completed run copy is lost, the person who received the run copy shall notify the Operations Center and complete Attachment *7*.

b. If controlled run copies are distributed for planned operations and subsequent events result in the cancellation of the planned operations, the user of these run copies will contact the Operations Center and cancel the run copies.

F. Cyclical Review of Procedures

All procedures must be reviewed every three years to determine if any changes are required.

Responsibility	Action
Operations Center	1. Sends out a Document Review Request to the ATI and RLM prior to three year expiration of procedures.
ATI, RLM	2. Evaluates procedures to determine if any changes are required and implements these changes per Parts C and D of this procedure. If no changes are needed, a new signature page must be generated.

G. Procedure training/ Pre and Post-Job Briefs

Training on the use of a procedure is required to ensure that the procedure is carried out as intended by the author and the Accountable Technical Individual (ATI). The Responsible Line Manager (RLM) will make the final decision on what level of procedure training is appropriate and specify that requirement on page 2 of attachment 3. Training considerations are as follows:

No Training Required	The RLM may determine that no training is required for a particular procedure. This is appropriate in the case where the procedure is to be performed only by the author or ATI of a procedure
Read Only	"Read Only" training is prescribed in cases where either a group is expected to read and understand a procedure in support of general activities (such as in the case of Administrative, Alarm Response, and Emergency Operations procedures) OR when a person or group performing the procedure is expected to read and understand a procedure when issued a Run Copy (as in the case of other types of procedures). In the case of Administrative,

Alarm Response, and Emergency Operations procedures, training is a pre-requisite for starting general project operations and a well defined set of employees will be trained on these procedures before operations begin. "Read Only" training on these procedures should be documented on a Record of Training form (attachment 6) and forwarded to the Human Resources and Training office. In the case of other types of procedures (general operations procedures, installation procedures, pre-operational and integrated system test procedures, maintenance procedures, repair procedures, and access procedures), the completed Run Copy on file in the Operations Center will serve as a record of "Read Only" training.

Pre-Job Briefs

Pre-Job Briefs and instructional discussions are prescribed by the RLM in cases where it is appropriate that the responsibilities of the participants in specific work activities be further reinforced. These discussions should also include related safety issues such as job hazards and required permits, and respond to all questions and concerns of the participants. This training should be documented on a Record of Training form and forwarded to Human Resources. See ESH-004, Job Hazards Analysis, attachment 3, Human Performance Tools for an Enhanced Pre-Job Brief, for further guidance.

Post-Job Briefs

Post-Job Briefs are prescribed by the RLM if the procedure is expected to be executed again in the future or if problems were encountered in the execution of the procedure. Discussions at a Post-Job Brief should include the parts of the procedure that went well, improvements that can be made, any safety related issues, and overall lessons learned. Minutes of the Post-Job Brief should be sent to the Operations Center with the completed Run Copy of the procedure and to the Responsible Line Manager for review and for further distribution as appropriate. See Attachment 9 for further guidance. Post-job briefs provide an excellent opportunity to add sustainability information to the procedure for its next revision. Notes added to the Run Copy during execution can be copied and forwarded to the ATI and RLM so any lessons learned can be incorporated into revisions and other procedures.

H. Satellite Areas

Satellite areas are physical areas outside of the Operations Center which are authorized to issue run copies of approved procedures. Typically, this authorization is limited to those procedures related to the work performed in the area.

Responsibility	Action
RLM	1. Requests, from the Operations Center, creation of a Satellite Area providing appropriate justification and documenting type of work to be performed in the area. Identifies individual responsible for the integrity of the Satellite Area and types of procedures to be located in the Satellite Area.
Operations Center	2. Approves the Satellite Area with the appropriate limitations.
	3. Assures that copies of all appropriate, approved procedures are transmitted to the Satellite Area. Maintains lists of procedures located in each Satellite Area.
Individuals responsible for Satellite Area	4. Assures that usage of run copies issued from the Satellite Area adhere to the requirements of part E.

TRAINING

Head, Project Management Office

1. Ensures the appropriate training methods and means (below) are provided and obtains concurrence of the Management System Owner and the Management Process Owner.

A. Target Audience: COGs and RLMs
Instructor: Head, Project Management Office
Training Method:
X Read only initial - once only
X Email distribution only for major changes – as needed
X Online COG/RLM updates – annual

B. Target Audience Supervisors

X Best Practices sends out notice of new/changed Procedures to all Supervisors.

Management System Owner or Designee

2. Notifies the Human Resources Training Office of the training so that they will be aware of the training requirements and be able to provide assistance and guidance in the course development, implementation, tracking, and maintenance if needed.

Records Requirements Specific To This Procedure

Records Custodians must assure records are maintained as follows:

Record Title	Record Custodian	Location	Retention Time
Master, Controlled Procedures	Ops Center/ Satellites	Ops Center/ Satellites	Cut off the records at the end of the fiscal year, and destroy them 5 years after the date of the completion of the task or the completion of the performance of the activity or the action. *Reference: Admin 18 Security, Emergency Planning and Safety Records(35.b)*
Procedure Run Copies	Ops Center/ Satellites	Ops Center/ Satellites	Cut off the records at the end of the fiscal year, and destroy them 5 years after the date of the completion of the task or the completion of the performance of the activity or the action. *Reference: Admin 18 Security, Emergency Planning and Safety Records(36)*
Minor Procedure Change (MPC) Approval Form	Operations Center	Operations Center	Cut off the records at the end of the fiscal year, and destroy them 5 years after the date of the completion of the task or the completion of the performance of the activity or the action. *Reference: Admin 18 Security, Emergency Planning and Safety Records(35.b)*
Lost or Destroyed Run Copies Form	Operations Center	Operations Center	Cut off the records at the end of the fiscal year, and destroy them 5 years after the date of the completion of the task or the completion of the performance of the activity or the action. *Reference: Admin 18 Security, Emergency Planning and Safety Records(36)*
Document Review Request	Operations Center	Operations Center	Cut off the records at the end of the fiscal year, and destroy them 5 years after the date of the completion of the task or the completion of the performance of the activity or the action. *Reference: Admin 18 Security, Emergency Planning and Safety Records(36)*
Training Form	Operations Center or Human	Operations Center or Human	Check specific type of training record in PPPL Record Schedules for Record Custodian and retention

	Resources	Resources	schedule.

Attachments

1. Procedure Review and Approval Matrix
2. Alarm Response Procedures
3. Procedure Cover Sheet
4. Revision Sheet
5. Minor Procedure Change (MPC) Approval Form
6. Record of Training form
7. Lost or Destroyed Run Copies Form
8. Human Performance Considerations for Procedures
9. Human Performance Considerations for Pre- and Post-job Briefs

Procedure Review and Approval Matrix

Note: If the procedure is applicable for entire D-Site or C-Site omit project designation

FOR C-SITE

Procedure Type/Name	Accountable Technical Individual (ATI)[1]	Responsible Line Manager (RLM)	Required Reviews
Administrative C-Project-OP-AD-XX	As designated by RLM	Department Head	None
General Operations C-Project-OP-G-XX	As designated by RLM	System/Project Division Head	None
System Preoperational Test Plan C-Project-PTP-Sys-XX	System Engineer	System/Project Division Head	None
Integrated System Test Procedure C-Project-ISTP-XX	As designated by RLM	System/Project Division Head	None
System Operations C-Project-OP-Sys-XX	System Engineer	System/Project Division Head	None
Alarm Procedure C-Project-AR-Sys-XX	System Engineer	System/Project Division Head	None
Access Procedure C-Project-AP-Sys-XX	System Engineer	System/Project Division Head	Electrical (4)
Installation Procedure C-Project-IP-XXX	System Engineer	Responsible Branch Head	Electrical (4)
Maintenance Procedure C-Project-MP-Sys-XX	System Engineer	Responsible Branch Head	None
Repair Procedure C-Project-RP-Sys-XX	System Engineer	Responsible Branch Head	None

FOR D-SITE

Procedure Type/Name	Accountable Technical Individual (ATI)1	Responsible Line Manager (RLM)	Required Reviews
Administrative D-Project-OP-AD-XX	As designated by RLM	D-Site Manager	None
General Operations D-Project-OP-G-XX		Caretaking Manager	Tritium (1) and D-Site Shift Supervisor (2)
General Operations D-Project-OP-G-XX	As designated by RLM	Caretaking Manager	Tritium (1) and D-Site Shift Supervisor (2)
Alarm Response D-Project-OP-AR-XX	System Engineer	System Division Head	Tritium (1) and D-Site Shift

[1] Lists of system engineers and approved RLMs are available on the Engineering and Technology Department web page.

			Supervisor(2)
Emergency Operations D-Project-OP-EO-XX	As designated by RLM	Caretaking Manager	Tritium (1) and D-Site Shift Supervisor (2)
System Preoperational Test D-Project-PTP-Sys-XX	System Engineer	System Division Head	Tritium (1)
Integrated System Test Proc. D-Project-ISTP-XX	As designated by RLM	System Division Head	Tritium (1) and D-Site Shift Supervisor (2)
System Operations D-Project-OP-Sys-XX	System Engineer	System Division Head	Tritium (1)
Access procedure D-Project-AP-Sys-XX	System Engineer	System Division Head	Tritium (1) Electrical (4)
Installation Procedure D-Project-IP-XXX (non-tritium)	System Engineer	Responsible Branch Head	Operations (3) Electrical (4)
Installation Procedure D-Project-IP-XXX (tritium)	System Engineer	Caretaking Manager	Operations (3) Tritium (1)
Maintenance Procedure D-Project-MP-Sys-XX (non-tritium)	System Engineer	Responsible Branch Head	None
Maintenance Procedure D-Project-MP-Sys-XX (Tritium)	System Engineer	Caretaking Manager	Tritium (1)
Repair Procedure D-Project-RP-Sys-XX (non-tritium)	System Engineer	Responsible Branch Head	None
Repair Procedure D-Project-RP-Sys-XX (Tritium)	System Engineer	Caretaking Manager	Tritium (1)

Notes for:

1. Tritium - Independent Review required for any procedure governing the movement of tritium, containment of tritium or maintenance of a tritium containing system or potentially tritium contaminated system. The RLM specifies the Independent Reviewer.
2. Shift Supervisor - D-Site Shift Supervisor review required. Check Shift Supervisor for procedure review on Attachment 4.
3. Operations - Review of the procedure for any work in the Tritium Area by the Tritium Systems Supervisor. For the TFTR Test Cell, Test Cell Basement and DARM, by the Caretaking Manager. For the NSTX Test Cell, the NSTX Construction Manager.
4. Electrical – An ES&H Electrical Safety Specialist review is required for all electrical access and installation procedures to verify compliance with the National Electrical Code (NEC), the National Fire Protection Association (NFPA 70E) the Occupational Safety and Health Act (OSHA), and relevant DOE orders.

ALARM RESPONSE PROCEDURES (SITE-PROJECT-OP-AR-XX)

A recommended format for Alarm Response Action and Checklist is included in this attachment. Alarm Response Procedures are written for one of two groups:

1. Communication Officer of Security Personnel
2. Subsystem Personnel

Since it is impractical for operations personnel responding to alarms or emergency situations to obtain "run copies" of procedures from the Operations Center, controlled copies of the Alarm Response Procedures and Emergency Operations Procedure (or checklist associated with these procedures) will be distributed to Satellite Stations. Upon completion of these procedures (or checklists), these completed procedures will be returned to the Operations Center and handled in a way similar to other issued "run copy."

A. Alarm Response for Communication Officer of Security Personnel

1. Format

The format should include the following sections:

1. Purpose
2. Scope
3. Responsibilities
4. References
5. Alarm Description
6. Alarm Precedence
7. Procedure
   a. Security Actions
   b. System Personnel Actions
8. Alarm Response Checklist

2. Content Description

1. Alarm Response Procedures for Security Personnel are written mainly to ensure prompt notification of cognizant personnel in the event of an alarm condition. They are also written for conditions that require Security Personnel to perform minor actions to abate an alarm condition.
2. The Alarm Description should describe the indication (as seen in the C-Site Security Office) of the alarm condition.

3. The Alarm Procedures should contain a prioritized list of Alarm Response Procedures in the order to which they should be executed.
4. The Alarm Response Checklist is the portion to be used by Security personnel during the alarm event. The checklist should be an abbreviated version of the Alarm Response Procedure.

B. Alarm Response for Subsystems Personnel

1. Format

The format should include the following sections (when applicable):

1. Title line containing the alarm name, panel name, and facility location of the panel
2. The set point and source of the alarm
3. The most probable cause(s)
4. Automatic actions (if applicable)
5. Immediate operator actions
6. Subsequent Recovery Operator Actions
7. References and applicable drawing numbers (if applicable)

2. Content Description

1. Alarm Response Procedures for subsystems personnel are written mainly to ensure the proper actions of subsystems personnel to an alarm condition or report of an alarm condition from security personnel.
2. Each individual Alarm Response Procedure should contain concise information, including the origin and most probable cause of the specific alarm condition.
3. "Immediate Operator Action" Section should contain:
    a. Steps to: confirm that an alarm condition exists
    b. Steps to verify that the automatic actions occurred successfully;
    c. Steps required to determine the cause of the alarm condition; and, if necessary,
    d. Steps required to place the equipment in a safe condition or,
    e. If necessary, instructions to execute an Emergency Procedure.

4. "Subsequent Recovery Operator Action" section should contain steps to verify proper execution of the "Immediate Actions" and additional steps to place the system in a normal configuration.
5. Alarm Response Procedures do not take the place of Emergency Operations Procedures. They should not supersede any higher precedence procedure.
6. If an alarm condition could lead to an Emergency Operation Procedure, appropriate instructions should be included in the Operator Action section.

ALARM RESPONSE CHECKLIST

PRINCETON PLASMA PHYSICS LABORATORY *PROJECT NAME* PROJECT	***System/Panel #*** ***Row-Number***
PANEL LOCATION: *System, Panel Number* SYSTEM: *Enter system name here* INITIATING DEVICE: *Instrument responsible for alarm initiation*	***Annunciator Nomenclature***

Setpoint: *If applicable*

ALARM RESPONSE		
A	**POSSIBLE CAUSE(S) OF ALARM** *Enter a list of any scenarios , malfunctions or problems which could lead to the initiation of this alarm.*	
B	**AUTOMATIC ACTION (S)** *Enter a list of all actions which happen automatically due to the initiation of this alarm.*	
C	**CONTROL ROOM OBSERVATION(S)** *Enter a list of all observations/indications including any TRECAMS observations that should be available as a result of this alarm.*	**LOCAL OBSERVATION (S) INDICATION** *Enter a list of any indications in the area of the system equipment which could be observed during this alarm.*
D	**IMMEDIATE OPERATOR ACTION** *Enter a list of actions required to place the affected system(s) in a safe condition.. Include in this list any actions required to inform the appropriate personnel of the alarmed condition.*	
E	**CONSEQUENCES** *Enter a list of potential consequences due to receipt of this alarm.*	

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PROCEDURE COVER SHEET

Princeton Plasma Physics Laboratory Procedure		
Procedure Title:		
Number	**Revision:**	Effective Date: Expiration Date: *(2 yr. unless otherwise stipulated)*

Procedure Approvals	
Author	Date
ATI	Date
RLM	Date

Responsible Division:

Procedure Requirements
designated by RLM

LABWIDE:

	Work Planning Form #_____(ENG-032)		Lockout/Tagout (ESH-016)
	Confined Space Permit (5008, Sec. 8, Chap 5)		Lift Procedure (ENG-021)
	Master Equip. List Mod (MC-002/MC-003)		ES&H Review (NEPA, IH, etc.)
	RWP (HP-OP-20)		Independent Review
	ATI Walkdown		Pre-job Brief
	Post-job Brief		Job Hazard Analysis – JHA (ESH-004)
	Run Copy Required (performance of procedure must be documented and archived per ENG-030 page 10)		Special archiving requested for completed Run Copies:_____

D-SITE SPECIFIC:

	D-Site Work Permit (OP-AD-09)		Door Permit (OP-G-93)
	Work on Tritium Contaminated Sys. (OP-AD-77)		Activity Certification Committee Review
	Pre-job brief (ENG-030)		T-MOD (ENG-036)

REVIEWERS (designated by RLM)
Accountable Technical Individual
Test Director
Independent Reviewer
D-Site Shift Supervisor
NSTX
D-Site Caretaking
Vacuum
Computer
Tritium
Quality Assurance/Quality Control
AC Power
Maintenance and Operations Division
Energy Conversion Systems
Engineering
Materials and Environmental Services
Water Systems
Neutral Beam (Heating Systems Branch of Electrical Engineering)
Radiofrequency (Heating Systems Branch of Electrical Engineering)
Diagnostics
Environmental, Safety, & Health

TRAINING (designated by RLM)

No training required _____ Instructor _____

Personnel (group, job title or individual name)	Read Only*	Instruction	Hands-On

RLM _____

* "Read Only" training for Administrative, Alarm Response, and Emergency Operations procedures must be documented on a Record of Training form (attachment 6). The completed Run Copy will serve as the documentation of "Read Only" training for all other types of procedures.

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REVISION SHEET

Document No. _____ Rev._____

Description	Prepared by	Date

TCR-ENG-030,R5-001

MINOR PROCEDURE CHANGE (MPC) APPROVAL FORM

COMPLETED BY REQUESTER					
Procedure Title >				**No. >**	
Rev >		**Procedure Issue Date >**		**Procedure Expiration Date >**	
MPC No. >		**MPC Issue Date >**		**MPC Expiration Date >**	
Change Requested: (Attach Additional Documents, If Necessary):					
Reason for Change: (Attach Additional Documents, If Necessary):					
Training Determination None Required >				**Read Before Use >**	
Does the MPC "significantly impact ES&H?"		**Yes >**		**No >**	
Type of MPC *(Check ONLY One)*: Temporary/Limited >				**Permanent >**	
Person Requesting Change	*Printed Name*	*Signature*		*Date*	

REVIEW AND APPROVAL		
Technical Review Accountable Technical Individual from Procedure Cover Sheet	*Signature*	*Date*
ESHS Dept. Review *(Only if MPC "significantly impacts ES&H"):*	*Signature*	*Date*
Approval Responsible Line Manager from Procedure Cover Sheet	*Signature*	*Date*

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RECORD OF TRAINING

COURSE TITLE (From Training Office), DOCUMENT TITLE, OR TOPIC:

_____

DOCUMENT NUMBER: __ REVISION AND/OR DATE: ___

TYPE OF TRAINING (check one):

__ Read Only __ Instructional Discussion __ Video
__ Small Group Meeting __ Practical/Hands Only __ Other_____

INSTRUCTOR:_____ **SIGNATURE:**_____
(please print)

Use reverse side for any additional information or comments.

ATTENDANCE INFORMATION				
PRINT NAME CLEARLY	**SIGNATURE**	**DATE**	**SUPERVISOR (Print Name)**	**DB**
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				

Just a Reminder…

To ensure proper posting of the information contained herein, please complete this training form and *deliver original in person* to Human Resources and Training, C-Site, LOB B172 or file with procedure run copy in Ops Center.

Received by Training Office: Initials _____ Date _____

TF-FORM-10 Rev 3: 10/14/97

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REPORTING LOST OR DESTROYED RUN COPY FORM

COMPLETED BY REQUESTER					
Procedure Title >				**No. >**	
Rev >		**Run Copy Issue Date >**		**Procedure Completion Date >**	
Results of performance of this procedure:					
Technical Data recorded during performance of this procedure:					
Does this Procedure need to be repeated?			**Yes >**		**No >**
Person Requesting Change	*Printed Name*	*Signature*		*Date*	

REVIEW AND APPROVAL TO CLOSE RUN COPY		
Technical Review Accountable Technical Individual from Procedure Cover Sheet	*Signature*	*Date*
ESHS Dept. Review *(Only if ES&H related data is recorded on this run copy):*	*Signature*	*Date*
Approval Responsible Line Manager from Procedure Cover Sheet	*Signature*	*Date*

The information presented below is taken from the Human Performance Fundamentals Course Reference, National Academy for Nuclear Training, December 2002, Revision 6, pages 137 and 138 revised for applicability to this procedure.

Critical Task Analysis

1. Develop step list.	These are all steps within the procedure.
2. Identify the critical steps.	Steps are considered critical if the consequences of incorrect performance by people are significant. Consequences might be personnel or equipment safety, significant costs, or schedule delays.
3. Identify the error-likely situations for each of these critical steps.	Identify the possible errors that could result from each step. Errors may be active or latent. An action error concerns "changes to equipment, system or plant state triggering *immediate* undesired consequences." A latent error is "an error, act or decision that results in an organization-related weaknesses or equipment flaws that lie dormant until revealed either by human error, testing, or self-assessment."
4. Identify the consequences if errors occur at these critical steps.	The consequences can be characterized as either the worst that could happen or the most likely outcome.
5. Identify the error precursors or task demands which are "Unfavorable factors embedded in the job site that increase the chances of an error during the performance of a specific task by a particular individual."	A list of error precursors may be found on the subsequent pages of this attachment.

6. Identify tools that would prevent human error.	Tools include: - Self Checking - Peer Checking - Independent Verification – check performed by individuals not directly involved in the work and at a separate time from the work being performed - Knowledge/Training - Questioning Attitude - Place-keeping – marking in procedure that a step was performed successfully - Effective Communication – acknowledgement of communication - Pre-job Briefs - Job Hazard Analysis - Supervisor Involvement and Coaching - Turnovers – transfer of work responsibilities from team to team frequently as a result of shifts - Stop Work - Procedure Step Highlighting – Highlighting critical steps warranting greater attention

Error Precursors (Bold are most frequent)

Driver Code	1 – TASK DEMANDS	Driver Code	3 – INDIVIDUAL CAPABILITIES
1A	**-Time Pressure (in a hurry)**	**3A**	**-Unfamiliarity with task/ First time**
1B	**-High workload (memory requirements)**	**3B**	**-Lack of knowledge (faulty mental model)**
1C	**-Simultaneous, multiple tasks**	**3C**	**-New technique not used before**
1D	**-Repetitive actions/Monotony**	**3D**	**-Imprecise communication habits**
1E	**-Irreversible actions**	**3E**	**-Lack of proficiency; Inexperience**
1F	**-Interpretation requirements**	**3F**	**-Indistinct problem-solving skills**
1G	**-Unclear goals, roles, or responsibilities**	**3G**	**-"Can do" attitude for safety-critical task**
1H	**-Lack of or unclear standards**	**3H**	**-Illness or fatigue; general health**
1I	-Confusing procedure/Vague guidance	3I	-Unawareness of critical parameters
1J	-Excessive communication requirements	3J	-Inappropriate values
1K	-Delays: idle time	3K	-Major life event; medical, financial, emotional
1L	-Complexity/High information flow	3L	-Poor manual dexterity
1M	-Excessive time on task	3M	-Low self-esteem; moody
1N	-Long-term monitoring	3N	-Questionable ethics (bends the rules)
		3O	-Sense of Control. Learned helplessness
		3P	-Personality type
Driver Code	2 – WORK ENVIRONMENT	Driver Code	4 – NATURAL TENDENCIES/HUMAN NATURE
2A	**– Distractions/Interruptions**	**4A**	**–Stress**
2B	**-Changes/Departure from routine**	**4B**	**-Habit patterns**
2C	**-Confusing displays/controls**	**4C**	**–Assumptions**
2D	**-Work-arounds/OOS instrumentation**	**4D**	**-Complacency/Overconfidence**
2E	**-Hidden system responses**	**4E**	**-Mind set (intentions)**
2F	**-Unexpected equipment conditions**	**4F**	**–Inaccurate risk perception**
2G	**-Lack of alternative indication**	**4G**	**-Mental shortcuts or biases**
2H	**-Personality conflicts**	**4H**	**-Limited short-term memory**
2I	-Back shift or recent shift change	4I	-Pollyanna effect
2J	-Excessive degree of group cohesiveness	4J	-Limited perspective (bounded rationality)
2K	-Production overemphasis	4K	-Avoidance of mental strain
2L	-Adverse physical climate (habitability)	4L	-Tunnel vision (lack of big picture)
2M	-No accounting of performance	4M	-"Something is not right"
2N	-Conflicting conventions; stereotypes	4N	-Pattern matching bias
2O	-Poor equipment layout; poor access	4O	-Social preference
2P	-Fear of consequences of error	4P	-Easily bored
2Q	-Mistrust among work groups	4Q	-Close-in-time cause-effect correlation
2R	-Meaningless rules	4R	-Difficult to see own errors
2S	-Unavailable parts or tools	4S	-Frequency & similarity bias
2T	-Acceptability of "cook-booking"	4T	-Overload bias
2U	-"Rule book" culture	4U	-Imprecise physical actions
2V	-Equipment sensitivity (inadvertent actions)	4V	-Limited attention span
2W	-Lack of clear strategic vision or goals	4W	-Spatial disorientation
2X	-Identical & adjacent displays or controls	4X	-Physical reflex
2Y	-Out of service warning systems	4Y	-Anxiety (involving uncertainty)
2Z	-Nuisance alarms		

Common Error Precursor Descriptions

Task Demands	Description
1A–Time Pressure (in a hurry)	Urgency or excessive pace required to perform action or task. Manifested by shortcuts, being in a hurry, and an unwillingness to accept additional work or help others No spare time.
1B–High workload (high memory requirements)	Mental demands on individual to main high levels of concentration; for example, scanning, interpreting, deciding, while requiring recall of excessive amounts of information (either from training or earlier in the task)
1C–Simultaneous, multiple tasks	Performance of two or more activities, either mentally or physically, that may result in divided attention, mental overload, or reduced vigilance on one or the task.
1D–Repetitive actions/Monotony	Inadequate level of mental activity resulting from performance of repeated actions; boring Insufficient information exchange at the job site to help individual reach and maintain an acceptable level of alertness
1E–Irreversible actions	Action that, once taken, cannot be recovered without some significant delay No obvious means of reversing an action
1F–Interpretative requirements	Situations requiring "in-field" diagnosis, potentially leading to misunderstanding or application of wrong rule or procedure
1G–Unclear goals, roles, or responsibilities	Unclear work objectives or expectations Uncertainty about the duties an individual is responsible for in a task that involve other individuals Duties that are incompatible with other individuals
1H–Lack of or unclear standards	Ambiguity or misunderstanding about acceptable behaviors or results; if unspecified, standards default to those of the front-line worker (good or bad)
2A – Distractions/Interruptions	Conditions of either the task or work environment requiring the individual to stop and restart a task sequence, diverting attention to and from the task at hand
2B – Changes/Departure from routine	Departure from a well-established routine Unfamiliar or unforeseen task or job site conditions that potentially disturb an individual's understanding of a task or equipment status
2C – Confusing displays/controls	Characteristics of installed displays and controls that could possibly confuse or exceed working memory capability of an individual Examples: • missing or vague content(insufficient or irrelevant) • lack of indication of specific process parameter • illogical organization and/or layout • insufficient identification of displayed process information • controls placed close together without obvious ways to discriminate conflicts between indications
2D- Work-arounds/OOS instrumentation	Uncorrected equipment deficiency or programmable defect requiring compensatory or non-standard action to comply with a requirement; long-term materiel condition problems that place a burden on the individual
2E-Hidden system responses	System response invisible to individual after manipulation Lack of information conveyed to individual that previous action had any influence on the equipment system
2F-Unexpected equipment conditions	System or equipment status not normally encountered creating an unfamiliar situation for the individual

Task Demands	Description
2G – Lack of alternative indication	Inability to compare or confirm information about system or equipment state because of the absence of instrumentation.
2H-Personality conflict	Incompatibility between two or more individuals working together on a task causing a distraction from the task because of preoccupation with personal differences
3A–Unfamiliarity with tasks/First time	Unawareness of task expectations or performance standards First time to perform a task (not performed previously: a significant procedure change)
3B–Lack of knowledge(mental model)	Unawareness of factual information necessary for successful completion of task; lack of practical knowledge about the performance of a task
3C-New technique not used before	Lack of knowledge or skill with a specific work method required to perform a task
3D-Imprecise communications habits	Communication habits or means that do not enhance accurate understanding by all members involved in an exchange of information
3E-Lack of proficiency/inexperience	Degradation of knowledge or skill with a task because of infrequent performance of the activity
3F-Indistinct problem-solving skills	Unsystematic response to unfamiliar situations; inability to develop situations; inability to develop strategies to resolve problem scenarios without excessive use of trial-and-error or reliance on previously successful solutions Unable to cope with changing plant conditions
3G–"Unsafe" attitude for critical tasks	Personal belief in prevailing importance of accomplishing the task(production) without consciously considering associated hazards Perception of invulnerability while performing a particular task Pride; heroic; fatalistic; summit fever; Pollyanna; bald tire
3H-Illness/Fatigue	Degradation of a person's physical or mental abilities caused by a sickness, disease, or debilitating injury Lack of adequate physical rest to support acceptable mental alertness and function
4A–Stress	Mind's response to the perception of a threat to one's health, safety, self-esteem, or livelihood if task is not performed to standard. Responses may involve anxiety, degradation in attention, reduction in working memory, poor decision-making, transition from accurate to fast Degree of stress reaction dependent on individual's experience with task
4B–Habit patterns	Ingrained or automated pattern of actions attributable to repetitive nature of a well practiced task Inclinations formed for particular train/unit because of similarity to past situations or recent work experience
4C-Assumptions	Suppositions made without verification of facts, usually based on perception of recent experience; provoked by inaccurate mental model Believed to be fact Stimulated by inability of human mind to perceive all facts pertinent to a decision
4D-Complacency/ Overconfidence	A "Pollyanna" effect leading to a presumption that all is well in the world and that everything is ordered as expected. Self-satisfaction or overconfidence, with a situation unaware of actual hazards or dangers; particularly evident after 7-9 years on the job Underestimating the difficulty or complexity of a task based upon past experiences

Task Demands	Description
4E-Mind-set	Tendency to "see" only what the mind is tuned to see (intention): preconceived idea Information that does fit a mind-set may not be noticed and vice versa; may miss information that is not expected or may see something that is not really there; contributes to difficulty in detecting one's own error(s)
4F-Inaccurate risk perception	Personal appraisal of hazards and uncertainty based on either incomplete information or assumptions Unrecognized or inaccurate understanding of a potential consequence or danger Degree of risk taking behavior based on individual's perception of possibility of error and understanding of consequences; more prevalent in males
4GMental shortcuts (biases)	Tendency to look for or to see patterns in unfamiliar situations; application of thumbrules or "habits of mind" (heuristics) to explain unfamiliar situations • confirmation bias • frequency bias • similarity bias • availability bias
4H-Limited short-term memory	Forgetfulness; inability to accurately attend to more than 2 or 3 channels of information (or 5 to 9 bits of data) simultaneously The mind's "workbench" for problem-solving and decision-making; the temporary, attention-demanding storeroom we use to remember new information

The information below is included in this procedure for ease of use. The source of this information is ESH-004, Job Hazards Analysis.

HUMAN PERFORMANCE TOOLS FOR AN ENHANCED PRE-JOB BRIEF

Ensure Situational Awareness: All individuals must understand the job requirements, the equipment conditions, and the work environment before starting work.

Perform a Job-Site Review: Take the time necessary to get all workers acquainted with the immediate work area.

Promote a Questioning Attitude: Encourage workers not to make assumptions or use opinion instead of fact. When any doubt exists, the work is unsafe.

Remind to Stop when Unsure: Workers should seek accurate information about the work situation before proceeding with an activity. If a question arises or uncertainty exists, every person has the responsibility and authority to stop work.

Practice Effective Communication: Issue instructions face-to-face, have the instructions repeated back to the original instructor, correct any misunderstandings.

Conduct Task Preview using SAFER:

1. **Summarize** the critical steps. Ask "What are the actions that if performed improperly, will cause irreversible harm to equipment or people?"

2. **Anticipate** errors for each critical step and relevant error precursors. Ask "What could go wrong?"

3. **Foresee** probable and worst-case consequences should an error occur during each critical step. Ask "What's the worst that could happen?"

4. **Evaluate** controls or contingencies at each critical step to prevent, catch and recover from errors, and to reduce their consequences. Ask "How do we prevent those errors or consequences from happening?"

5. **Review** previous experience and lessons learned relevant to the specific task and critical steps. Ask "Have we done anything like this before?"

HUMAN PERFORMANCE TOOLS FOR AN ENHANCED POST-JOB BRIEF

During a Post-Job Brief, ask the following questions:

- Were there any surprises? Was the task accomplished with expected results?
- Were procedures or work packages accurate? Is this the way the job should be performed in the future?
- What specific errors occurred during the task? What job-site conditions were associated with errors, flawed defenses, or near misses?

- Was the supervisor aware of conditions (precursors) that, if uncorrected, could lead to human error the next time the task is performed?
- Were planning and scheduling optimized to reduce the potential for human error?
- Were job-site resources and information sufficient?
- Was training for the job appropriate and effective?
- Were work processes efficient and supportive?
- Were any lessons learned from this job that should be recorded and passed on to others?
- Did supervision provide needed support and appropriate guidance when necessary?