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DATE 2021-05-10	**DATE** 2021-05-10	**DATE** 2021-05-10

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FCA	ALARA REVIEW	SUPERSEDES
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PAGE STATUS INDEX

	REVISION							
Page	2	3	4					
1	x	x	x					
2	x	x	x					
3	x	x	x					
4	x	x	x					
5	x	x	x					
6	x	x	x					
7	x	x	x					
8	x	x	x					
9	x	x	x					
10	x	x	x					
11	x	x	x					
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23	x	x	x					
24	x	x	x					
25	x	x	x					
26	x	x	x					
27	x	x	x					
28	x	x	x					
29	x	x	x					
30	x	x	x					
31	x	x	x					

	REVISION							
Page	2	3	4					
32	x	x	x					
33	–	x	x					
34	–	x	x					
35	–	x	x					
36	–	x	x					
37	–	x	x					
38	–	x	x					
39	–	x	x					
40	–	x	x					
41	–	x	x					
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52	–	x	x					
53	–	x	x					
54	–	x	x					
55	–	x	x					
56	–	x	x					
57	–	x	x					
58	–	x	x					
59	–	x	x					
60	–	x	x					
61	–	–	x					
END								

CONTENTS **PAGE**

1.0 PURPOSE

1.1 Describe Human Performance (HP) and error prevention tools to promote safe, error free operation of the Koeberg Nuclear Power Station.

2.0 SCOPE

2.1 This procedure is applicable to all employees and contractors within the Nuclear Operating Unit (NOU).

3.0 DEFINITIONS AND ABBREVIATIONS

3.1 Definitions

3.1.1 **Critical Steps** – Steps in the task that have an immediate consequence or plant impact, or that are irrecoverable.

3.1.2 **Error-Likely Situations** – Situations and circumstances that increase the potential for human error.

3.1.3 **Knowledge Worker** – Individuals who interact with the paper plant rather than physical plant work. Examples include Engineering, Work Management (OCC and Work Control), Nuclear Commercial, Quality Assurance (QA) etc.

3.1.4 **Plant Worker** – Individuals who directly and physically interact with the plant. Examples are Maintenance, Operating, Chemistry, Radiation Protection (RP)

3.1.5 **Procedure at the Job (Implementation Category 2)** – A procedure that has to be at the job site. The user should refer to the procedure at the beginning and the end, and as necessary during the performance of the task.

3.1.6 **Procedure for Reference (Implementation Category 3)** – A procedure that should be referred to as necessary to perform the job correctly. It need not be taken to the work site/station.

3.1.7 **Procedure in Hand (Implementation Category 1)** – A procedure that has to be at the work site/station that must be referred to at each step of the task. Individual step documentation should be completed before proceeding with the next step.

3.1.8 **SAFER** – This is the acronym to guide effective Pre Job Briefings:

- Summarise critical steps
- Anticipate error-likely situations

- Foresee consequences
- Evaluate defences
- Review OE (operational experience)

3.1.9 **Shall** – Used to denote a requirement considered enforceable by the appropriate regulatory body.

3.1.10 **Should** – Used to denote a recommended action, but not an enforceable requirement. Each employee is expected to carry out any "should" statement unless unique circumstances exist which necessitate not meeting the requirement.

3.1.11 **The Finger** – The common reference to the human performance aid of Point and Touch verification used in Self Checking. Use of The Finger assists in focusing the workers' mind, hand and eyes on the relevant component reducing possibility of wrong component operations. (See Appendix 1 HP Tool: Self-Checking – STAR (Common Take-5 Tool) – point 5).

3.1.12 **TWIN Analysis** – An aid to identify the presence of error precursors present in a task. See Appendix 4

3.2 Abbreviations

3.2.1 **HP** – Human Performance

3.2.2 **NOU** – Nuclear Operating Unit

3.2.3 **OCC** – Outage Control Centre

3.2.4 **OE** – Operational Experience

3.2.5 **PPE** – Personal Protective Equipment

3.2.6 **STAR** – STOP, THINK, ACT, REVIEW

3.2.7 **TWIN** – Task Demands, Work Environment, Individual Capabilities, Human Nature

4.0 REFERENCES

4.1 Referenced Documents

4.1.4 238-6, Rev 5: Nuclear Document and Records Management Requirements

4.1.3 238-8, Rev 5: Nuclear Safety and Quality Manual

4.1.1 238-28, Rev 3: Nuclear Safety Management Programme

4.1.2 335-2, Rev 5: Koeberg Nuclear Power Station Management Manual

4.1.5 INPO 05-002, Rev 2: Good Practice Human Performance Tools for Engineers and Knowledge Workers, February 2021

4.1.6 INPO 06-002, Rev 1: Good Practice Human Performance Tools for Workers, February 2021

4.1.7 INPO 15-008, Rev 0: Achieving High Levels of Human Reliability, July 2015

4.1.8 INPO: Report on Human Performance Excellence, March 2016

4.1.9 INPO: Excellence in Human Performance, September 1997

4.1.10 KAA-500, Rev 13: The Process for Controlled Documents

4.1.11 KGA-078, Rev 3: Coaching and Job Observation at Koeberg Nuclear Power Station

4.1.12 KSA-011, Rev 14: The Requirements for Controlled Documents

4.2 Applicable Documents

4.1.1 WANO GL 2002-02: Principles for Excellence in Human Performance, December 2002.

5.0 REQUIREMENTS

5.1 Overview

5.1.1 The HP tools/error reduction tools and techniques described in this procedure are based on the following principles:

- People are fallible, and even the best people make mistakes.
- Error-likely situations are predictable, manageable, and preventable.
- Organisational processes and values influence individual behaviour.
- People achieve high levels of performance due largely to encouragement and reinforcement received from leaders, peers, and subordinates.
- Understanding the reasons that mistakes occur and applying the lessons learned from past events or errors can prevent such errors from recurring.

5.1.2 HP tools are a final barrier in preventing errors from becoming plant events. Work should NOT be planned in a manner that it relies solely on the use of HP tools to prevent adverse consequences in the plant or to an individual. HP tools, when used consistently and appropriately, provide a method of minimising human fallibility when performing critical tasks.

5.1.3 These HP Tools are a potential defence against an Error Precursor that may be present during an activity. This requires that the individual, team, supervisor preview the activity against TWIN (see Appendix 4) to identify possible error precursors and identify the relevant HP Tool specific to those precursors.

5.1.4 Managers and Supervisors shall reinforce the proper use of the HP tools through observation and coaching.

5.1.5 Workers shall rigorously and mindfully apply the HP tools.

5.2 HP Tool Sets

5.2.1 For each set of HP tools noted, a detailed explanation of when to use, why use, and how to use the tool, for both plant and knowledge workers have been provided in Appendix 1.

Plant Worker Tools

- Operators, technicians, chemists and other plant workers benefit from using tools specifically tailored for their activities.

Knowledge Worker Tools

- Engineers, Planners, Schedulers, Trainers, and other knowledge workers benefit from using tools specifically tailored to their activities.

5.2.2 Take-5 HP Tools (Appendix 1)

- Take-5 HP tools are intended to be used for each task performed. When used for each task, the Take-5 HP tools (see table 1) add a high degree of reliability that adverse consequences will NOT occur during task performance.

Plant Workers	Knowledge Workers
2 M Rule	2 M Rule
Procedure Use & Adherence	Procedure Use & Adherence
Self-Check	Self-Check
Effective Communications	Validate Assumptions
Pre-Job Brief	Independent Review

Table 1: Take 5 HP tools for plant and knowledge workers

***NOTE**: There are slight differences noted for HP tools applied for Plant and knowledge workers.*

- For knowledge workers the,
  - fourth HP tool is the validate assumptions unless they are performing work in a plant where Effective Communication is applicable.
  - fifth HP tool is the independent review unless they are performing work in a plant where Pre-Job Brief is applicable.

- These five HP tools were selected by workers and supervisors as the five most important HP tools and because of that, they will be used on every task, every time.
- It must be noted that use of these tools should NOT in any way inhibit or prevent use of other conditional tools that help ensure success.

5.2.3 Conditional HP Tools (Appendix 2)

Conditional HP tools (see table) are intended to be used when specific conditions exist and add a high degree of reliability that adverse consequences will NOT occur during task performance. They complement the Take-5 HP tools and shall be used as needed and when directed by authorised line group procedures.

***NOTE:** Additional conditional HP tools may be required and identified, as directed by authorised line group procedures.*

Plant Workers	Knowledge Workers
Questioning Attitude and Stop When Unsure	Questioning Attitude
Correct Component Verification	Signature
Flagging	Decision-Making
Post job review	Handover
Handover	
Peer Check	
Concurrent Verification	

Table 2: Conditional HP tools for plant and knowledge workers

5.2.4 Supervisors HP Tools (Appendix 3)

Supervisor HP tools are intended to be used to ensure that supervisors enhance and oversee HP efforts leading to high reliability and safe worker execution.

Supervisor HP Tools include:

- Work Preparation
- Task Assignment
- Field Involvement, Observation, and Coaching

5.2.5 TWIN Analysis (Appendix 4)

TWIN Analysis assist in identifying Potential Error Precursors Related to Task.

NOTE: *TWIN refers to Task demands, Work Environment, Individual characteristics and human Nature (See figure 1 below).*

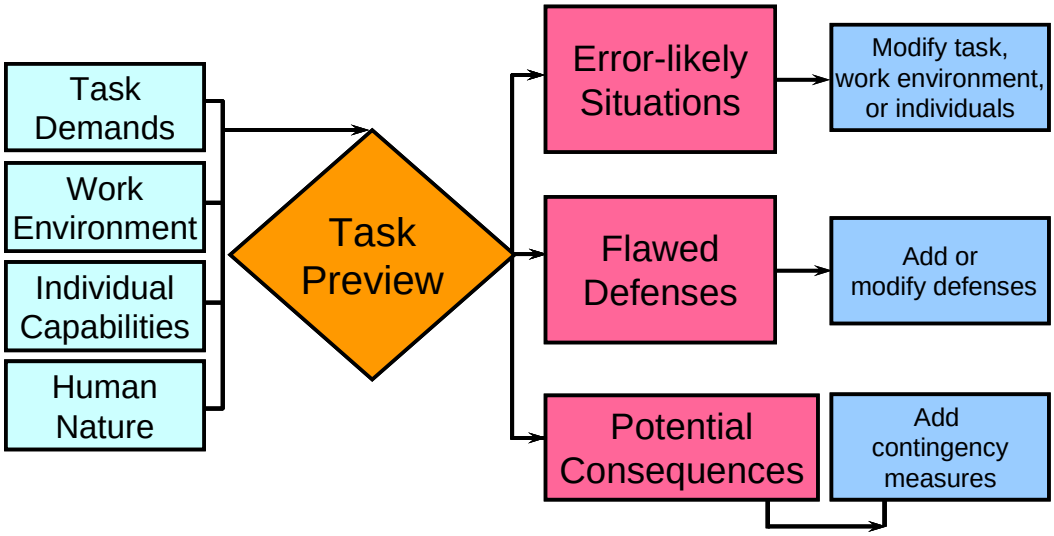

Figure 1: TWIN analysis flow chart

- The presence of any of these TWIN factors is a flag/prompt to take any additional action/protection of some sort to eliminate or mitigate the error precursor.
- The key is to recognise – BEFORE the job starts – that these factors are setting the team up for possible errors. The use of the HP Tools can protect against the influence of these error-precursors.
- Where you decide on a HP Tool as a mitigation, ensure that the team understands what particular risk that HP Tool is addressing.

6.0 ATTACHMENTS

Appendix 1 – Take-5 HP Tools

Appendix 2 – Conditional Tools

Appendix 3 – Supervisors HP Tools

Appendix 4 – TWIN Analysis

Appendix 5 – Justification

APPENDIX 1

TAKE-5 HP TOOLS

I. INTRODUCTION

The members of nuclear industry carries a responsibility to keep nuclear operations safe. Mistakes are unwelcome in every industry, but the consequences in the nuclear industry is particularly serious because of the potential for public and environmental harm and the scrutiny that accompanies nuclear activities. For this reason, tolerance for mistakes is extremely low.

Individuals are each responsible and accountable to reduce errors in the work place. The following actions are recommended:

- Be aware that you, like all others, will make mistakes. Build the habit of avoiding mistakes by using the HP Tools.
- Ask what can go wrong and take action to prevent it.
- Positively reinforce others when you see them using the HP tools.
- Ask if there have been errors on similar tasks and take action to prevent a repeat.
- Correct co-workers if they are NOT using the HP tools, or are using them incorrectly.

Station Management and Supervisors shall reinforce the proper use of the HP tools through observation and coaching. Individuals welcome and apply the management and supervisor observation and coaching feedback.

II. TAKE-5 TOOLS

NOTE: *As deemed appropriate by the Senior Reactor Operator (SRO) or Operating Shift Manager, the Take-5 HP tools may be considered conditional when using Emergency Procedures (EMs), Emergency Operating Procedures (EOPs), Abnormal Operating Procedures (AOPs), Accident Assessment Guidelines (AAGs), Severe Accident Management Guideline Procedures (SAGs/SAMGs), Incident Stabilization Guidelines (ISGs), Extreme Damage Mitigation Guidelines (EDMGs) and other similar documents for off normal operations.*

The Take-5 HP tools are a fundamental set of five tools that, when used effectively, prevent most human errors from becoming plant events. While other HP tools are conditional, the five Take-5 HP tools are expected to be used on every task, every time. The Take-5 HP tools do NOT replace other HP tools, nor do they mean that workers at every level are NOT required to use the other tools as conditions and tasks deem them beneficial.

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

Plant Workers	Knowledge Workers
2M Rule	2M Rule
Procedure Use & Adherence	Procedure Use & Adherence
Self-Check	Self-Check
Effective Communications	Validate Assumptions
Pre-Job Brief	Independent Review

HP Tool: 2M Rule (Common Take-5 Tool)

1. Introduction:

The 2M Rule ensures that;

- hazards in the work area are identified and eliminated or properly mitigated such that injury CANNOT occur.
- critical aspects of a job and job site conditions reflect those that are expected or were discussed during the pre-job briefing and,
- the workers are focused on the critical situational awareness aspects of the job immediately prior to commencing a task or re-commencing a task after a break.

NOTE: *This tool supplements, but does NOT supersede, pre-job briefings or other HP tools applicable to the task.*

2. What is it

The 2M Rule is a risk recognition tool used to improve a person's situational awareness as it pertains to the 2 meter virtual bubble around them. This tool is used when arriving at the job site and preparing to safely and reliably execute assigned tasks.

3. Why use it

This tool helps the worker develop an accurate understanding of work area hazards, system and equipment conditions, and even other team member's focus and understanding of the hazards, risks, defences and barriers for the task. Taking the time necessary to get acquainted with the immediate work area helps workers establish a healthy sense of uneasiness, boosting their questioning attitude and enhancing the accuracy of their situational awareness.

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

4. When to use it

a. Upon arriving at the work location or site (for both hands on and inspection activities) to ensure any new hazards are identified and addressed

b. When environmental conditions change or moving to another general area

c. When PPE requirements change

d. When work scope changes

e. When a potential new safety hazard is observed to be present in an area

f. After extended breaks or interruptions, such as lunch

5. How to use it

a. Explore the job site for a few minutes by walking and looking around the work area (near the hands-on touch points) and adjacent surroundings to identify conditions such as the following:

- Identify industrial safety, radiological, and environmental hazards
- Identify potential distractions that could prevent successful performance
- Ensure personal protective equipment (PPE) matches requirements and conditions
- Validate that energy sources are properly isolated

b. IF the hazards and conditions are NOT consistent with the procedure and pre-job briefing THEN STOP!

c. Talk with co-workers or the supervisor about unexpected hazards or conditions and the precautions to take.

d. Eliminate hazards, install appropriate defences, or develop contingencies before proceeding with the task. Involve the Supervisor if unsure. The primary intention is to REMOVE hazards. If this is not possible, then take appropriate MITIGATIVE actions to ensure the hazard does not impact the activity.

e. IF your plan changes, THEN STOP, and perform a new 2M.

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

HP Tool: Procedure/Work Instruction Use and Adherence (Common Take-5 Tool)

1. Introduction

Procedure/work instruction use and adherence means understanding the procedure's intent and purpose and following its direction. We perform all actions as written in the order stated by the document. If uncertainty exists or the procedure CANNOT be used as written, then the activity is stopped, a supervisor is contacted and, if needed, the procedure is corrected before continuing – this is an industry requirement. Procedures sometimes contain flaws. Understanding the overall purpose and intended result of the procedure promotes safer outcomes.

2. What is it

Procedure adherence means following the intent and direction provided in the written procedure or work instruction.

3. Why use it

Procedures guide your interactions with systems and components, provides a systematic process to follow to ensure requirements are met, as well as your response to unusual situations.

We use procedures to:

- Ensure activities are performed correctly, safely and consistently
- Direct behaviour in the proper sequence and minimize choices
- Minimize the potential for mistakes

4. When to use it

Procedure and work instruction adherence as a human performance tool, should be applied when:

- A procedure or work instruction exists for a work activity
- No procedure or work instruction exists, but there should be one (STOP and get help)
- A procedure or work instruction is required by plant documents

When procedure or work instruction requirements exist for a work activity, you should always use procedure use and adherence tools.

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

5. How to use it

There are minimum standards for performing procedure use and adherence before and during a work activity. There are also specific situations when you must stop performing a work activity; for example, if the procedure CANNOT be executed as written or if the procedure has an error, even if we recognize the error and feel confident we can complete the task anyway. When using procedures and work instructions, we SHALL:

- Validate that the procedure is the most current revision
- Ensure that everyone involved in the task understands the procedure's overall purpose
- Review all prerequisites, initial conditions, instructions, limits and precautions during the pre-job briefing. This requires consciously reading and understanding the whole procedure to pre-emptively identify possible error traps.
- Take the procedure document to the job site with you as required by usage category levels
- Use the procedure according to its designated category level of use
- Follow the procedure as written without deviating from its intent
- Track your progress through the work instruction/procedure by using an appropriate form of place keeping such as initials, check-marks or circle/slash as directed by the instruction/procedure format.
- Ensure that a step is fully complete before signing it off

IF any of the following criteria are met, THEN, stop the task, place the equipment or system in a safe condition, and contact a supervisor

a. The step CANNOT be performed as written

b. Injury to workers or damage to equipment will occur if procedure is used as it is written

c. Use of the procedure will result in incorrect or unsafe conditions

d. The procedure is technically incorrect

e. Unexpected results are achieved after performing the step

f. The procedure conflicts with another procedure

g. An N/A is needed on a non-conditional step

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

6. Procedure Level of Use (Procedure and Work Instruction Use and Adherence)

Procedures are used in a manner consistent with the complexity and risk of the task being performed. The three categories of procedure used are as follows:

- **Category 1** – Procedure in Hand
  These activities require the procedure to be in continuous use.
  Each step is read and understood before it is performed.
  Each step is completed before the next step is started. Steps are completed as written, in the sequence specified.
  A place keeping method shall be used to track progress through the instructions that identifies which step is in progress and when the step is completed and the document is kept in the user's presence continuously.

- **Category 2** – Reference Use
  The Procedure must be at the job site and must be referred to at least once and as often as required to successfully complete the task in accordance with procedure requirements.
  Sign-off steps must be signed
  Non-sign-off steps will be place kept as frequently as practical

- **Category 3** – Information Use
  The activity can be performed from memory but the document is available if needed (does NOT mean specifically at the job site).

- **Multiple Use** – procedures are for work activities which include any combination of the other three usage levels. Levels of use classifications for different sections are to be identified at the beginning of each section in the procedure.

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

HP Tool: Self-Checking – STAR (Common Take-5 Tool)

1. Introduction

Self-check (STAR) shall be used for component identification, equipment manipulation and during calculations as a minimum.

2. What it is

Self-checking means stopping to think before taking an action; taking the action if appropriate and reviewing the completed action to be sure what was expected actually happened. It is an attention-management technique to help focus attention on the appropriate component, to think about the intended action (activity) and its expected outcome before performance, and to verify results after performance.

- Use self-checks to confirm that you are about to work on the correct equipment before taking action.
- Your mind works much faster than your hands and it is easily distracted. Self-checking keeps your brain engaged with your physical movements during an activity.

3. Why use it

Humans are fallible, and our attention span changes throughout the day depending on many factors, including proficiency with a task, fatigue, time pressure and the activities occurring around you. Using self-checking can help catch mistakes before they happen and are particularly important toward the end of a long shift.

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

4. When to use it

Self-checking focuses your attention at important points in an activity before executing a specific act. In most activities, some steps are more important than others. Therefore, attention must peak when the risk is greatest. For example, be sure to use self-checking when:

- Manipulating or altering plant equipment or controls.
- Entering plant data into a computer or recording it on a form
- Performing a calculation
- Assembling components that contain similar parts that could be interchanged
- Revising procedures using cut and paste on a computer or by making handwritten annotations
- During physical activities or interfaces with plant equipment (tests, walkdowns, inspections, and so forth)
- Performing an irreversible act (both prior and during)
- During time pressure , and following a task interruption
- When performing critical tasks identified during pre-job briefings

If visual or physical contact with the object is lost, self-check again to ensure you are still focused on the proper component to be manipulated.

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

5. How to use it

The STAR method represents the four steps for proper performance of self-checking.

The four steps are performed in sequence.

STAR: Stop, Think, Act and Review

Stop

- Pause
- Focus attention on the task's immediate objective
- Eliminate distractions

Think

- Understand what you are going to do
- Understand what your action will do
- Understand what you will do if it goes wrong
- If uncertain, stop and contact a supervisor

Act

- Identify the component (if practical, put your finger on the trigramme label)
- Read the label
- Read your instruction
- Perform the correct action on the correct component

Review

- Verify that what you expected to happen actually happened
- Perform the contingency you previously identified if the expected result does NOT occur
- Notify supervisor, as needed

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

HP Tool: Effective Communications (Plant Worker Take-5 Tools)

1. Introduction

The goal of effective communication is mutual understanding between two or more people, especially communication involving technical information related to plant or personnel safety.

At KNPS the recognised tool for effective communications is the HP Tool Three Way Communications.

Three-Way Communication

2. What it is

Face-to-face, telephone, or radio communication about changes to plant equipment during work activities requires three verbal exchanges between a sender and a receiver to promote a reliable transfer of information and understanding.
To illustrate: When workers in the plant communicate with the control room via radio or telephone, it is expected that they use three-way communication.

3. Why use it

To ensure clear and accurate communication, industry professionals use three-way communication when giving and receiving instructions. For example, in noisy plant locations, three-way communication can catch listener errors.

4. When use it

Use three-way communication in verbal conversations whenever issuing instructions or communicating information involving the following:

- The operation or alteration of plant equipment
- The condition of plant equipment
- The value of an important parameter
- The performance of steps or actions using an approved procedure
- Task assignments that impact plant equipment or plant activities
- The safety of personnel, the environment or the plant

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

5. How to use it

The goal is mutual understanding between the Sender and the Receiver. The person responsible for the communication is the sender of the message, and the sender must verify that the receiver understands the message as intended. Three-way communication has three steps:

- The sender gets the attention of the receiver (by calling the receiver by name), then clearly states the message.
- The receiver repeats the message restating equipment-related information exactly as spoken by the sender, which helps the sender know that the receiver understands accurately.
- The sender either informs the receiver that the message is properly understood or corrects the receiver and restates the message (returning to step 1).

NOTE: *The relevant action should only be taken after the communication has been confirmed.*

Example:

Sender: Reactor Operator: "Jay Jay, start condensate pump 1 CEX 002 PO."

Receiver: NPO: "Brandon, I understand that you want me to start condensate pump 1 CEX 002 PO."

Sender: Reactor Operator: "That is correct."

(Then the NPO takes the action)

The weakest link of a communication is often the third leg, because the sender may assume the receiver heard the message. If the receiver does NOT understand the message, he or she should ask for clarification, confirmation or repetition of the message. If practical, it is helpful to support three-way communication with other information aids, such as procedures, work packages and indicators.

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

HP Tool: Pre-Job Briefs (Plant Worker Take-5 Tool)

1. What it is

A pre-job briefing is a meeting conducted before performing a job, to discuss the tasks involved, hazards and related safety precautions. A pre-job briefing helps individuals better understand what to accomplish and what to avoid. Pre-job briefings help participants avoid surprises in the field and reinforce the idea that there are no routine activities.

2. Why use it

A pre-job briefing is used to ensure workers, supervisors and leads understand the scope, critical activities and safety requirements of the task to be performed. Use of the tool promotes accomplishing the task the first time without error or personnel injury.

3. When to use it

There are certain times when pre-job briefings are particularly critical in reducing error, such as for highly technical tasks or tasks with potential personnel safety hazards.

A pre-job briefing shall be used at the following times:

- Prior to work activities involving plant equipment
- Once per shift, if the activity exceeds one shift in duration
- When the job scope changes

4. How to use it

a. Pre-job briefings can vary in the amount of detail covered. This is determined by the Supervisor based on his/her assessment of the TWIN risks of that task, such as whether the task is simple or complex, repetitive or infrequent, or low or high risk.

b. Typically, during a pre-job briefing the team or group should review or discuss:

- Task purpose – discussion of scope and nature of work
- Review of procedures – the review of work package documents, drawings, turnover information and prerequisites that will be used to complete the task
- Task assignments – identifying and understanding roles and responsibilities, qualifications, personal limitations, handoffs and the controlling authority
- Personnel safety and radiological hazards – discuss potential safety, exposure and contamination hazards

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

- Any Critical Steps that will be encountered, along with tools and barriers to be used to prevent errors on those steps.
- Error Likely Situations – discussion of error likely situations, conditions, and common traps
- Operating experience – discussion of similar errors, events or how the causes of similar events will be avoided. This includes establishing who has performed the task before and the team individuals' level of familiarity with the task.
- Know when to stop – the crew should discuss conditions that would require stopping and contacting the supervisor
- Oversight – defining the degree of management and supervisory involvement
- Questions and concerns – discussion of questions workers may have with the job

c. Before leaving a pre-job briefing, each individual should understand the scope of work, potential hazards, their individual's role. If individuals have any remaining questions/concerns should be answered/addressed by the supervisor or lead. Remember, take time to think!

Items that must be discussed and clearly understood by all team members (SAFER):

- **S**ummarise critical steps (Steps that have an immediate consequence or plant impact.)
- **A**nticipate error-likely situations (What are the contributors to an error? Review job-specific error traps – use TWIN).
- **F**oresee consequences (What has gone wrong before? What is the worst that can happen? Use OE)
- **E**valuate defences (Review job-specific HP tools and discuss usage.)
- **R**eview OE (Review specific and relevant operational experience related to the task. This includes external and internal OE, including personal OE from the team).

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

Department specific checklists can be used to facilitate conducting briefs.

The level of the pre-job brief is commensurate with the risks associated with the task being performed. The following factors should be considered in determining the level of brief:

- Scope of work
- Required interface with other departments/disciplines
- Complexity of the activity
- Potential impact on plant safety and availability
- Frequency at which the activity is performed
- Qualifications/experience of the individuals performing the activity
- Special hazards such as lead, chemical, asbestos, confined space, etc.
- Operating experience (site and industry)
- Safety hazards (industrial, radiological, electrical, etc.) associated with the task, and if the risks so warrant then a safety representative is to be in attendance at the brief.

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

HP Tool: Validate Assumptions (Knowledge Worker Take-5 HP Tool)

1. What is it

a. Assumptions are a necessary part of engineering work so that a problem can be bounded. For situations such as these, engineers devote additional effort to justify why the assumption is conservative, providing detailed evidence that supports it. Engineering judgment is applied and documented only when all uncertainties are bounded by the margins in the analysis and when inputs CANNOT be further substantiated.

b. Non-engineering work such as planning work packages, writing procedures, and creating training documents are also considered knowledge work. Assumptions made in these areas can have equally adverse impact to safe and reliable plant operation.

c. The Validate Assumptions tool ensures that all assumptions made by knowledge workers, regardless of their particular function are documented, tracked, and verified, leading to their closure before the product is delivered to the customer or placed into service.

2. Why use it

a. Engineers and other knowledge workers can inadvertently treat an assumption as fact or can forget that they made the assumption. Professional judgment is sometimes involved at this point. While performing a knowledge-based activity, engineers and other knowledge workers encounter potential pitfalls related to assumptions. Assumptions tend to occur during knowledge-based work situations because they ease mental effort, reducing the detail involved. The lack of requisite knowledge also tends to promote erroneous assumptions that may lead to errors and defects.

b. In these cases, an assumption is a special mental shortcut, which becomes particularly tempting during stressful, anxious situations when time may be scarce. Qualifying statements, such as "I think ...," "We've always done it this way," "I'm pretty sure that …," "We didn't have a problem last time," or "I believe ...," are hints that an assumption has been made. Consequently, until the additional information is available, engineers and other knowledge workers are tempted to make assumptions to improve efficiency or to simply make progress with the task.

c. From incorrect or un-validated assumptions, non-engineering knowledge workers can introduce latent errors into training elements, work packages, and other knowledge tasks that manifest themselves later in plant events. These latent errors depend on the worker as the final barrier to recognizing and preventing the error from becoming an event.

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

3. When to use it

It would be impractical to document all possible usage modes for assumptions made by knowledge workers. As a general statement, we use this tool whenever assumptions are determined to be present for work that directly impacts the safe and reliable operation of the plant such as calculations, operability determinations, elevated troubleshooting efforts, creation of procedures and work documents and work instructions.

4. How to use it

For non-engineering knowledge workers, consider if assumptions have been made in the work product produced. If assumptions have been made, determine how those can be validated and use appropriate additional sources to do so.

Probe for assumptions

- Ask:
  "How do you know this?"
  (where did you get this information from)
- "Does someone else know it too?"
  (check with a peer)
- "Where can you check it?"
  (Is there some sort of reliable source they can reference)
- If an assumption has been made, determine how those can be validated and use appropriate additional sources to do so.

For Engineers, the Validate Assumptions behaviour standard for engineers is described by the mnemonic DEFT:

- Documentation – Write down the assumption
- Evidence – Is there objective evidence to support/justify the assumption?
- Field Walkdown – Were in-field factors considered? Perform a hands-on/eyes-on review of the physical environment where possible
- Track and Close Out – Close out all unverified assumptions as valid or otherwise resolve them before delivering the product to the plant customer

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

HP Tool: Independent Review (Knowledge Worker Take-5 Tool)

1. What is it

A reviewer provides a defence to detect errors and defects before the completion of documents by reading and checking the quality of another's work product. The purpose of peer-review is to catch errors with a risk-important work product or to verify that a decision or plan of action is appropriate before proceeding. A peer review takes advantage of a fresh set of eyes that may see problems or flaws the responsible preparer did not see or consider. However, the document preparer and the reviewer are equally accountable for the quality of the document.

This tool provides a structured method to help the reviewer identify errors that could lead to failure-likely situations with the product and to obtain assurance that a design-related document meets its intended purpose. This method aids the reviewer in clarifying the purpose and scope of the review, identifying critical attributes of the document, and applying a questioning attitude to the review using the FACTS questioning attitude tool. The peer review is an informal technique and does not supplant procedurally required checklists.

The following practices will help reduce the occurrence of review errors.

- Use qualified reviewers/Subject Matter Experts/cross or multi-disciplinary teams
- Define the scope of the review. Use review aids (checklists).
- Provide the reviewer with technical input documents.
- Allow sufficient time.
- Avoid an excessive number of reviewers (to avoid team errors).
- Incorporate accountability into the process through periodic work product reviews by management/supervision.

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

2. Why use it

To take advantage of these elements, a peer review involves multiple readings, integrating the above features. These separate readings (reviews) help the reviewer stay focused, minimizing the person's mental workload during each reading while studying the documents associated with the product. Depending on the purposes of each review, each may be done separately.

Depending on the complexity and risk significance of the product, the engineering organization may institute specific administrative standards for certain reviews, such as calculation reviews.

Also, for the review to be effective, the reviewer has the same or greater level of qualifications as the preparer with respect to the product or project under review. Documenting the results of a review provides a learning opportunity. Errors with the product can be trended, and comment resolutions can benefit those assigned similar tasks in the future.

3. When to use it

- For reviews of new documents with no predecessor products
- For design documents; experimentation, operating, or maintenance procedures and work packages
- During engineering evaluations
- For informal requests for a review from a co-worker
- When verifying a technical decision or plan of action

4. How to use it

Recommended Practices When Using This Tool

a. Define the review. Clarify the following attributes of the review.

- Purpose – why
- Qualified person assigned – who
- Scope – what
- Time allotted for the review – when
- Method – how
- Acceptance and rejection criteria – quality

APPENDIX 1 (continued)

TAKE-5 HP TOOLS

b. Denote the critical attributes. With the aid of operating experience and knowledge of the product's risk importance, pinpoint the key aspects of the engineering product that could directly affect one or more critical attributes.

c. Dig for facts. Using a questioning attitude, take the following steps.

- 1st reading – Develop a general overview that highlights critical attributes or conditions that could lead to failure.
- 2nd reading – Verify data and technical accuracy, and validate assumptions related to the critical attributes of the product.
- 3rd reading – Identify and document concerns and possible resolutions; using a questioning attitude (FACTS), validate conclusions and that the product addresses the stated problem.

Avoid These At-Risk Practices

- Involving the reviewer in document development or preparation
- Using reviews to train less experienced personnel
- Being in a hurry; shortcutting the review time because of schedule pressure
- Performing a concurrent task(s)
- Being interrupted and distracted
- Not documenting the review
- Reviewer not having a questioning attitude

APPENDIX 2

CONDITIONAL TOOLS

While the conditional error reduction tools are NOT included in the Take-5 set of HP tools, they are equally valuable in prevention of events when used for activities for which they apply. Using the Take-5 HP tools in no way negates the use of the conditional tools when they are appropriate or desired. The tools that follow are intended to be used by plant and knowledge workers whenever they are seen as necessary by the worker or the supervisor.

Conditional Error Reduction Tools for Plant Workers

I. HP Tool: A Questioning Attitude and Stop when Unsure

1. What is it

a. We create situational awareness by asking questions about our work task, process and environment. Asking questions is fundamental to a questioning attitude. A questioning attitude is fundamental to situational awareness.

b. A questioning attitude is questioning our work task, process and environment, then using the information gained in taking appropriate action.

- For example, as we observe and question the work area around us, we might see an overhead hazard or equipment that does **NOT** appear to be in the correct position. Either condition might need to be addressed before continuing.

2. Why use it

We use a questioning attitude to identify and address conditions that are **NOT** as expected and to **KNOW WHEN TO STOP**. Asking questions can help us recognise hazards and increase our situational awareness. A questioning attitude helps us focus and can prepare us for situations in which an error is likely to occur. We use a questioning attitude to develop situational awareness so that we **KNOW WHEN TO STOP** and check or correct any situation. For example, if an equipment label does **NOT** match our drawing, we should question this and stop to resolve the conflict.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

3. When to use it

a. Use a questioning attitude at all times to maintain focus on the work task, process and environment to prevent injuries or damage to the plant.

b. Examples of when to use a questioning attitude:

- You encounter unexpected results or unfamiliar situations
- There are unresolved uncertainties, doubts, confusion, or questions
    - Something expected does NOT happen
    - Conditions are inconsistent with the procedure
    - Uncertainty exists regarding compliance with expectations or procedures
    - Worker is inexperienced or lacking knowledge with a task
    - Anytime someone else expresses doubt or concern
    - Anytime an activity is NOT clearly understood or if there are reservations about how or when an activity is to be performed

4. How to use it

a. Looking, seeing, validating assumptions, and asking questions are the primary behaviors that characterize an engaged worker. We continually observe our surroundings to see if conditions are as expected. When conditions do **NOT** meet expectations, we appropriately address them.

b. Stop, Look and Listen – Proactively search for work situations that do **NOT** appear acceptable.

- Pause periodically to check the work situation
- Identify inconsistencies, confusion, uncertainties and doubts
- State your uneasiness or question in clear terms

c. Ask questions – What is – known and what are the – unknowns?

- Consider – what if…? or use a – devil's advocate approach in a spirit of helpfulness
- Identify inconsistencies, confusion, uncertainties and doubts

d. Proceed when sure – Continue the activity if the uncertainty has been resolved with facts.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

5. Do NOT proceed in the face of uncertainty!

a. Know when to stop – If inconsistencies, confusion, uncertainties or doubts still exist:

- Stop the activity
- Place equipment and the job site in a safe condition
- Notify your immediate supervisor

II. HP Tool: Correct Component Verification (CCV)

1. What is it

CCV is an important tool to ensure that we work on precisely the correct component every time. It is a tool that was created to ensure that work documents, plant labeling, and other available documents were used prior to affecting plant equipment in order to prevent all inadvertent contact with an incorrect component.

2. Why to use it

To ensure that only the equipment intended to be affected by the task or evolution was affected. This allows Operating to be confident in their understanding of the alignment of equipment in the plant at all times by preventing incorrect equipment from being manipulated.

3. When to use it

a. Correct Component Verification should be performed at the following times:

- Prior to beginning work or task activity
- When returning to an interrupted task after initial CCV
- When assuming a task from the previous shift or group

APPENDIX 2 (continued)

CONDITIONAL TOOLS

4. How to Use it

- Prior to performing CCV ensure that controlling documents to be used for performing CCV are correct.
- Pause and focus attention on component to be identified.
- Stop and re-focus when distractions cause a break or lapse in attention.
- Hold the work order, work request or procedure as close as practical to the equipment label to ensure a positive identification.
- Touch the equipment or component identifying label if practical while maintaining visual contact. When impractical to touch the label, point to the label.
- Verbalize aloud the information from the identifying label.
- When touching labels, always ensure personnel safety is **NOT** jeopardized
- When Sub-components are **NOT** labeled, trace lines, wiring, or process tubing/piping back to the identifying Equipment or Component using controlled documents.
- **STOP** work and contact supervisor or management oversight if you **CANNOT** positively identify the equipment or component.
- If two people are working together, they must both agree with the CCV determination prior to beginning work.
- Initiate corrective actions such as CAP, label request form, etc., to ensure discrepancy is resolved.
- Ensure questioning attitude is maintained and assumptions about correct components are validated before initiating action.

III. HP Tool: Flagging

1. What is it?

Flagging is a tool that helps the user consistently touch the correct component when a component is physically near other similar-looking components and is handled multiple times. Workers can also use flags to denote components **NOT** to be touched during a work activity. These are commonly referred to as "robust operational barriers".

APPENDIX 2 (continued)

CONDITIONAL TOOLS

2. Why use it:

Flagging helps a worker visually return to the correct component during the activity or after a distraction or interruption. Flagging can also be used to shield components from inadvertent touching or manipulation, such as trip-sensitive equipment in the vicinity of the manual activity.

3. When to use it:

- When handling a component near similar-looking components multiple times
- While working on multiple trains in close proximity
- While working on a component that will be manipulated multiple times
- During work near trip-sensitive or otherwise risk-important equipment
- When the need for flagging is identified during the pre-job briefing
- When needed to identify sub-components

4. How to use it:

- **Identify** the component to be flagged using self-checking.
- **Flag** the designated component to be handled or worked on using an approved device. Flagging remains in place while work is in progress.
- **Perform** work assignment or equipment manipulation.
- **Remove** flagging device(s) when work is complete.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

IV. HP Tool: Post Job Review

1. What is it?

A post-job review is a standardised post-work-activity feedback tool. Post-job reviews provide workers and their supervisor a forum to document or discuss what went well and to identify potential enhancements. Workers review the work activity just completed to identify opportunities for improvement. An effective post-job review identifies lessons learned to improve future task performance. For example, a post-job review might be conducted after a job that had errors or a job that went exceptionally well.

2. Why use it

Post-job reviews provide a consistent process to identify, document and eliminate weaknesses within processes, programs and policies that could interrupt event-free plant performance, as well as identify success strategies to repeat in the future. The review also serves as a forum for workers to provide feedback on the task to improve performance and prevent future error-likely situations. For example, workers may have identified an error in the work instruction or a potentially unsafe field condition that had to be addressed before proceeding.

3. When to use it

Post job reviews are often performed:

- When completing any work in which complications occurred
- After completing a non-routine or important work activity
- After each high-risk phase of a high-risk project
- At the conclusion of emergent work
- After routine work in which improvements were identified
- At the discretion of station management

APPENDIX 2 (continued)

CONDITIONAL TOOLS

4. How to use it

We conduct a post-job review by:

- Comparing what actually happened to what was planned
- Identifying what went well and improvement opportunities (Document this when required)
- Following up on resolution for items of high importance
- Issuing corrective action documents when required
- Revising documented pre-job briefs

For instance, if during the post-job review, workers identify a procedure step that was performed incorrectly, a condition report shall be initiated.

V. HP Tool: Handover

1. What is it

A handover is a meeting between the off-going and oncoming crew, or between individuals, to discuss information about the job, schedule, progress and problems so that the oncoming crew has a clear mental picture (situational awareness) of the job status and working conditions. For example, during an outage a crew may be working on removing scaffold. A good handover ensures the on-coming crew is familiar with the current status of the job and any special needs or issues.

2. Why use it

A handover provides time for the oncoming crew to establish an accurate mental picture of the work activity before assuming responsibilities or starting work. For example, the scaffold crew coming onto a new shift might NOT be aware of other work that has started in proximity to its job location.

3. When to use it

The HP Handover can be particularly critical to reducing error, especially:

- Prior to and during the shift change
- When responsibilities are transferred between people, work groups, or departments (handoffs)
- When responsibilities for in-progress tasks/activities change

APPENDIX 2 (continued)

CONDITIONAL TOOLS

4. How to use it

Use a checklist, work instructions comments section or other written document to correctly record information relevant to the job during the turnover meeting. The off-going individual shares information with the oncoming individual, such as:

- Status of the job(s): work completed, work remaining, and equipment status, plus specific parameters and related values
- Schedule requirements, changes and parallel activities
- Procedures being used and last step(s) completed
- Problems or unusual conditions
- Possible error-likely situations
- Key contacts and support personnel
- Known job hazards (industrial, radiological, environmental).
- Changing plant conditions if applicable
- Risk status for plant work
- Component re-positioning that has occurred as a result of the activities being turned over
- Clearance status

5. Review the turnover log and walk down the work area.

The oncoming worker individually reviews and checks the accuracy of the information being shared. Preferably, the oncoming and off-going individuals walk down the work location together.

6. Discuss the information.

Conduct a face-to-face meeting addressing critical information and responsibilities using three-way communication. Each person listens for and challenges assumptions, asking questions as needed.

7. Transfer responsibility

Officially transfer responsibility for work activities from the off-going individual to the oncoming individual.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

VI. HP Tool: Peer-Checking

1. What is it

Peer-checking is a series of actions by two knowledgeable and competent individuals working together at the same time and place, before and during a specific action, to prevent an error by the performer. A peer-check is usually informal. For example, an electrician may ask for a peer to ensure the right component train is selected before taking an action.

2. Why use it

Peer-checking is used to prevent errors by providing a fresh set of eyes that are focused on personally performing the task. The peer-checker is able to focus primarily on the actions of the performer to prevent performer errors. For example, the electrician providing the peer-check would be technically competent to understand the task, but provides a fresh perspective of the task.

3. When to use it

While peer-checking may be less formal at times, it is important to use this tool when:

- Required by procedure or work instruction
- Required by station management

In general, peer-checking can be used at any time before, during and after an action and in any work situation in which an immediate undesired consequence is **NOT** present if the action is performed incorrectly; for example, if the wrong component train is selected because equipment is similar in appearance.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

4. How to use it

Peer-checking involves two people: the performer and a peer. Self-check is used by each person in parallel, following these steps in order:

- The performer self-checks the correct component or actions to the working document.
- The peer self-checks the correct component or actions to the working document.
- The performer and the peer agree on the action to take and on which component.

This includes a review of the guidance instructions, i.e., Procedure, Work Order, Clearance, etc.

- The peer observes the performer before and during the execution of the actions and confirms the performer takes the correct actions on the correct component.
    - If the peer disagrees with the performer, they stop the performer prior to the performer completing the actions. To illustrate, if during the peer-check, the peer-checker believes the person being checked may be on the wrong component, the job should be stopped and the concern resolved.

VII. HP Tool: Independent Verification (IV)

Verification practices IV and Concurrent Verification (CV) are required actions for maintaining status control for the plant.

1. What it is

Independent verification is a series of actions by two individuals working independently to confirm the condition of a component after the original act that placed it in that condition. For example, when hanging tags for an upcoming task, an independent verification might be performed to ensure the tags are correctly placed before starting the task.

2. Why we use it

Independent verification is a valuable tool because of the independence of the verifier; the verifier is unaffected by the performer. In many cases in the nuclear industry, an independent verifier has identified that the tag-out boundaries are NOT correct.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

3. When we use it

a. Independent verification can only be used when there will be no immediate consequence if a mistake is made. For example, if the first person were to make a mistake when aligning a system for operation after maintenance, there would be no immediate adverse consequence because the system is **NOT** yet operating. The second person has time to identify the mistake before the system is operated.

b. You should use independent verification:

- During system alignments of safety-related or important equipment
- During placement and removal of clearance tags
- During verification of calculations
- During installation and removal of temporary modifications such as jumpers and hoses

4. How we use it

a. Independence exists when the verifier has freedom of thought from the performer. Separating the acts of the two individuals by time and distance promotes freedom of thought.

b. Separation in time is created by having the verifier check the components after the performer has completed the task. Separation by distance is accomplished by having the performer and verifier work independently. They are **NOT** in the same place at the same time.

c. In a typical independent verification process, the performer takes the following actions:

- Self-check the correct component
- Perform the action per the guiding document
- Confirm the expected results
- Sign or initial the guiding document
- Return the document to a neutral location so as **NOT** to influence the verifier
- Inform the supervisor that the task is complete

APPENDIX 2 (continued)

CONDITIONAL TOOLS

d. When notified, the verifier performs the following actions:

- Self-check the correct component
- Determine the as-found condition without changing it
- Compare the as-found condition with the guiding document
- Notify the supervisor if the component condition does **NOT** agree with the guiding document
- Sign or initial the guiding document if the condition agrees with the guiding document
- Notify the supervisor or performer upon completion of the independent verification

VIII. HP Tool: Concurrent Verification (CV)

Verification practices IV and CV are required actions for maintaining status control for the plant.

1. What it is

a. Concurrent verification is a series of actions by two individuals working together at the same time and place to separately confirm the condition of a component before and during an action, when the consequences of an incorrect action would lead to immediate and possibly irreversible harm to the plant or personnel. For example, unbolting a flange before verifying the system has no pressure could result in workers being sprayed.

2. Why we use it

a. A concurrent verification is a formal, structured, peer-check and is a regulatory requirement for maintaining plant status control as well as other actions that might have immediate, irreversible consequences. As such, it is used for the same reasons a peer-check is used; to ensure an action is completed as intended and without error, but specifically when an immediate consequence must be avoided.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

3. When we use it

a. Concurrent verification is used when the consequences of an incorrect action would lead to immediate and possibly irreversible harm to the plant or personnel. Instances when a concurrent verification would be appropriate include steps in procedures in which the following could occur if the step is performed incorrectly:

- Nuclear fuel damage
- Death or severe injury
- Overexposure to radiation
- Plant trip
- Environmental impact
- Equipment damage or property loss

b. Concurrent verification should always be used when performing a critical step.

4. How we use it

a. The performer and verifier maintain an independence of thought and reach conclusion on the intended action based on their reviews of the document directing the action. Because concurrent verification requires both individuals to work side by side, true independence **CANNOT** be achieved, but each person attempts to be as objective and unbiased as possible.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

b. Commonly Accepted Practices:

- Prior to execution, the performer and verifier mutually agree on the action to take, equipment condition to be achieved, and expected system response by referencing the guiding document separately.
- The performer self-checks the correct component.
- The verifier separately self-checks the correct component.
- The performer and the verifier agree once more on the action to take, on which component and the final condition of the component.
- The verifier observes the performer before and during execution to confirm the performer takes the correct action on the correct component.
- The performer executes the correct action on the correct component.
- If the performer's action is inconsistent with the guiding document, the verifier directs the performer to stop the action. The performer places the equipment in a safe condition and notifies the supervisor.
- The performer and the verifier separately confirm that the condition and the expected response are correct.
- The performer and verifier sign or initial the guiding document to record the verification.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

Conditional Error Reduction Tools for Knowledge Workers

I. HP Tool: Questioning Attitude

1 What it is

A questioning attitude fosters awareness of uncertainty, assumptions, risk factors, and the significance of a decision or action before proceeding.

2. Why we use it

It helps a person make sure that planning, judgment, and decision-making are appropriate for the product in development. Questions, such as "If-then," "What if…," and "Why is this okay?" help improve recognition of actual or possible mistakes. A healthy questioning attitude will overcome the temptation to rationalize away "gut feelings" that something is NOT right. To avoid dependence on unsubstantiated assumptions or subjective opinions, a structured approach promotes the discovery of facts.

3. When we use it

Prior to a pre-job briefing or anytime important information is being provided upon which actions may be taken or knowledge worker products are developed.

4. How we use it

A good pre-job briefing enhances a person's questioning attitude. From information discussed during the briefing, engineers and knowledge workers will know the potential hazards, critical activities (steps), risk-important parameters, and error-likely situations and their potential consequences before starting the work activity. The pre-job briefing sensitizes personnel to what should and should NOT be. Regular cook booking of procedures and over reliance on thumb rules tend to promote an unthinking response to perceived simple problems and will eventually lead to rule-based errors. A questioning attitude will help prevent such at-risk practices.

5. A good questioning attitude is demonstrated by the FACTS mnemonic

- Foresee technical activities or tasks that involve one or more critical attributes.
- Ask open-ended questions.
- Confirm knowns and unknowns for critical activities.
- Test the current situation.
- Stop when unsure.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

II. HP Tool: Signature

1. What it is

Documentation of engineering or knowledge worker products often provide a record of the design of structures, systems, and components in the plant. These products typically make up the quality assurance record of the plant design bases. Before engineering products are released to the next step in an engineering work process, the individual concludes the work by signing or affixing a seal to the document to signify that he or she performed the task completely and accurately in accordance with all standards, procedures, and code requirements.

2. Why we use it

The purpose of this tool is to remind the user of what a signature or seal means on an engineering document. It helps others in the related engineering process recognize the level of technical rigor applied to the engineering product at its present stage of development. The signature implies the level of scrutiny an individual has applied to the functionality, accuracy, and safety of the product. Because a personal signature (or initials) reflects one's professionalism and character, it is important that personnel NOT give away their signatures.

3. When we use it

Prior to handing off work or products to another group or individual that may take action which could induce unintended consequences.

4. How we use it

a) An individual using the Signature tool affirmatively acknowledges each of the following before signing and releasing the product to the next step in the Engineering process:

- Knowledge – The individual possesses the knowledge, expertise, qualifications, understanding, and authority to perform the task that has been completed or for the area the signature encompasses. He or she knows the role or function being signed for, such as author, reviewer, peer reviewer, supervisor, or peer.

- Involvement – The individual prepared, reviewed, or supervised the product he or she is signing.

- Independent – The individual possesses the required level of "freedom of thought" from those earlier in the work process.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

- Quality – The product satisfies the following criteria:
  - Possesses appropriate factors of safety and design margin
  - Satisfies all design basis requirements for the intended application; product resolves the problem
  - Conforms to accepted standards and codes
  - Is complete and correct in all respects
- Right and Proper – The individual believes the product is the right thing to do.
- No Doubt – The individual has no doubts or uncertainties with the product, as is, at this stage in its development. He or she is willing to take ownership and accountability of its technical accuracy and completeness. Otherwise, the individual stops and asks for help.

III. HP Tool: Decision-making

1. What it is

Decision-making is a forward-looking method used to anticipate the potential effects of a decision. Personnel attempt to understand all possible effects of various alternatives and choose the one that best meets the needs within known constraints. A professional who follows a methodical decision-making process guards against rule-based and knowledge-based errors.

2. Why we use it

Conservative decisions place the safety needs of the reactor core above the near-term production goals of the organization. Most often, the choice to make is clear. However, for purely knowledge-based situations, this may NOT be apparent. A deliberate, methodical approach promotes better decision-making. For all decisions, clarify the goal, identify options, include appropriate analysis of those options in accomplishing the goal, develop a plan to implement the selected solutions, and identify ways to measure the effectiveness of the plan.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

3. When we use it

a) Decision-making occurs in either a short-term or long-term context. Under some conditions people must make immediate decisions, while others have sufficient time for a more formal analysis. Regardless of the time constraints, plant and personal safety require conservative decisions. The following practices promote conservatism:

- Stay within a safe operating envelope of the plant or equipment
- Use all available information, resisting the temptation to discount contradictory or disconfirming data
- Use all available people (expertise) who can provide additional insight; involve management in decision-making, taking advantage of front-line worker input (user stakeholders)
- Develop contingency actions
- Minimize as much uncertainty as possible; rely on facts and challenge assumptions
- Maintain safety despite production pressures
- Consider the cumulative risk (consequences) of the decision

b) Team or project leaders can assign a devil's advocate role to promote conservative decision-making by the team and to monitor and challenge the team decision-making process. A designated challenger (devil's advocate) keeps a watchful eye out for possible flaws and oversights, because most people focus on accomplishing the task rather than on what to avoid.

APPENDIX 2 (continued)

CONDITIONAL TOOLS

4. How we use it

a) The process for implementation of the Decision-Making tool is described as follows:

- Goal - Write a brief statement that defines the desired future state and the critical attributes for success.
- Options - Develop several alternatives that will achieve the desired outcome, consistent with critical attributes for success.
- Analysis - Gather detailed information on each option to allow in-depth consideration of the following elements:
  - o critical assumptions
  - o potential effects on stakeholders and users
  - o pros and cons of each option
  - o short and long-term risks, benefits, and costs of each alternative
  - o operating experience relevant to the decision

APPENDIX 2 (continued)

CONDITIONAL TOOLS

IV. HP Tool: Handover

1. What it is

In its simplest form, a handover is the systematic and orderly transfer of work-related information between two individuals and the subsequent relief of one individual by the other. Handover may involve a small work team or a crew.

2. Why we use it

We use handover to ensure that information critical to the successful continuation of a project or activity passes from one group or individual to another in a manner that limits interruption of work and promotes safe and efficient work completion.

3. When we use it

Handover can occur during major activities, such as watch or shift exchange of information, or for simple projects. Handover should be used when information critical to the successful continuation of a project or activity passes from one group or individual to another.

4. How we use it

a) Handovers differ in detail and form depending on the risk importance of the task and the nature of the work involved. Yet all handovers share a common purpose. Information critical to the successful continuation of a project or activity passes from one group or individual to another in a manner that limits interruption of work and promotes safe and efficient work completion. Handover is often misunderstood and, in some cases, misused. As with most processes, there are basic principles that apply to a good handover. These principles are given below:

- Identify specific tasks the relieving individual will perform
- Start a handover log
- Over communicate

APPENDIX 3

SUPERVISORS HP TOOLS

I. Work Preparation

1. What it is

Work preparation is a supervisory tool intended to provide an organized, methodical approach to ensuring the team is adequately prepared to execute their task without event.

2. Why we use it

We use the work preparation tool because inadequate planning and preparation may lead to confusion among team members, inefficiencies, and unclear expectations.

3. When we use it

This tool should be used during the work planning and preparation process to ensure the team has all the right tools to complete the right work at the right time with the right results.

4. How we use it

a) Establish team meetings at appropriate frequency.

b) Determine correct priority, schedule, and distribution of work and any barriers to task completion.

c) Ensure team understands work goals and direction.

d) Provide lateral integration with other teams as needed.

APPENDIX 3 (continued)

SUPERVISORS HP TOOLS

II. Task Assignment

1. What it is

Task assignment is the tool used by supervisors to ensure that the best decisions are made regarding the task to be performed and the individual(s) responsible for accomplishing the activity.

2. Why we use it

We use task assignment to make appropriate decisions regarding the task to be performed and the individuals involved. Task assignment ensures that we consider risk, skills, and qualifications as we assign the task.

3. When we use it

This tool is used during the decision making process prior to and during to process for releasing the work to the team.

4. How we use it

a) Verify skills and qualifications.

b) Assess impact of human error traps such as heavy workloads, time of day, personal distractions, first day back and time pressure. See Common Error Precursors (TWIN) in Appendix 4 as a job aid to identify error precursors.

c) Ensure workers understand expectations.

APPENDIX 3 (continued)

SUPERVISORS HP TOOLS

III. Coaching and Job Observation

1. What is it

The On Job Observation and Coaching programme is a Tool to increase manager and supervisory visibility on site. This programme has two distinct components:

- On Job Observations is the means by which managers, supervisors and peers observe worker practices on the job and capture this information for trending purposes in the On Job Observation and Coaching Database.
- Coaching is the act of observing and engaging individual behaviours, either directly or through other performance indications, and positively reinforcing desired behaviours and immediately correcting behaviours that do not meet expectations.

2. Why it's important

On Job Observations are necessary to monitor the worker practices in the field to identify undesirable behaviours. This information is analysed to identify any adverse trends in worker behaviours.

Coaching is a necessary element in achieving and maintaining the desired workforce behaviours. Coaching is a proactive means of improving HP and preventing events. Coaching is most effective when it is regular and heavily weighted with positive reinforcement of the desired behaviours. To be effective, coaches must be very knowledgeable of the desired behaviours and able to identify subtle flaws in the implementation of HP Tools.

3. When to apply

On Job Observations can be performed at any time, and on any activity whenever the opportunity presents itself.

Coaching can be effective at any time and should be performed whenever the opportunity presents itself.

4. Who should use it

Everyone at the station is expected to coach the desired industrial safety, radiological safety and HP behaviours. No station employee should walk past an unsafe practice or behaviour.

Peer-to-peer coaching is an effective coaching tool. Coaching one another to more consistent and effective performance improves team performance.

APPENDIX 3 (continued)

SUPERVISORS HP TOOLS

5. How to do it

Engage worker behaviour through observing and discussing job planning and performance, preferably directly at the jobsite or secondarily through performance results. Based on these opportunities, provide either positive reinforcement of desired behaviours or correction of behaviours that do not meet expectations. Coaching comments are provided in a prompt manner given directly to the involved individuals and focused on the specific behaviours observed.

Coaching has not occurred unless there is interaction between the coach and the individual being coached. Capture your coaching opportunity in the On Job Observation and Coaching Database to help trend site-wide behaviours and improve overall site performance.

Your coaching will be most effective when you are properly prepared to coach. Follow the ten steps below in order to maximise your coaching effectiveness.

Formal Observations:

Step 1 – Schedule the Observation/Coaching

- Identify the task to be observed
- Inform the relevant supervisor of your intention to perform an Observation on the task
- Establish the time and venue of the activity

NOTE: *Observation/Coaching can be on selected elements of a task (i.e.) pre-job brief, job site preparation, a specific phase of execution, etc.*

Step 2 – Review the Task

- Review the work package/procedure.
- Identify any traps in the activity.
- Review Standards that will apply to the activity.

Step 3 – Perform the Observation/Coaching

- Coach and worker must work together to make the activity successful.
- Identify both desired and undesired behaviours during the activity.
- Stick to the facts. Do not use words such as perceived, felt, thought, looked like etc.
- Focus on behaviours (not on the person).

APPENDIX 3 (continued)

SUPERVISORS HP TOOLS

Step 4 – Compare Behaviours to Standards

- Behaviours observed are compared against approved standards, not personal preferences.
- The standard is to be maintained for all workers. No allowance for individual characteristics should be made. The focus is on the behaviour – not the person.

Step 5 – Enforce High Standards

- All standards are coached at all times regardless of how non-significant they may seem.
- Never make allowance for not meeting a standard because the overall the job was satisfactory.

Step 6 – Provide Timely Feedback

- If possible without disrupting the task, reinforce good behaviours or correct undesired behaviours as they occur.
- If the activity does not allow immediate feedback, do it at a break in the activity or as soon as the activity is complete.
- Ensure feedback is specific and addresses behaviours (not individuals).
- Timely feedback corrects undesired behaviours allowing positive reinforcement once the desired behaviour is demonstrated.

Step 7 – Use Positive Reinforcement

- Take every opportunity to positively reinforce desired behaviours. It is the most effective method to ensure consistent performance.
- Be sure positive reinforcement is specific and addresses the behaviour and the standard.

Step 8 – Listen to the Worker

- Did the worker view the coaching as helping improve worker performance and reduce errors?
- Was the coach positive and supportive?
- Did the worker view the coaching as being consistent with day-to-day expectations?
- What issues did the worker have that require follow up?

APPENDIX 3 (continued)

SUPERVISORS HP TOOLS

Step 9 – Review Performance with Worker

- Discuss observed versus desired behaviours during the feedback phase or after the activity.
- Ensure the worker agrees and understands any areas needing improvement.
- Ask if there is any way you can improve your coaching.

Step 10 – Follow Up

- Address and follow to resolution deficiencies identified during the activity.
- Provide feedback as appropriate to the performer.
- Document your coaching in the On Job Observation and Coaching Database
- Document any training concerns.

Safety concerns, technical inaccuracies, misunderstandings, observed mistakes in performance should be coached immediately or “on the spot”. The coach must interrupt and communicate in a manner that does not create a HP trap for the worker. By interrupting, the coach assumes a shared responsibility for preventing an error when work is restarted.

Coachable items where immediate intervention is not required are discussed at the next natural break from the activity, such as at the end of a pre-job brief, between sections of a procedure, or even after all of the work is completed. The situation and the item should dictate the optimum coaching moment.

6. General Rules and Insights

Effective coaching requires a thorough understanding of the standards being coached. Someone lacking this detailed understanding may provide positive feedback for a behaviour that is actually flawed and thereby have a negative impact.

When the desired behaviours are observed, positively reinforce those behaviours. Don’t simply mark your On Job Observation and Coaching card “Met Expectations”. This does nothing to reinforce the desired behaviours. Be specific, don’t just say “good job”, tell workers what behaviours produced the good job.

On Job Observations and Coaching is a management responsibility and a peer opportunity.

Documentation of coaching comments through the On Job Observation and Coaching database is a management expectation to facilitate proactive identification of emerging trends via departmental quarterly assessment reviews. Identification of emerging trends in undesired behaviours allows focused emphasis of coaching to close performance gaps.

APPENDIX 4

TWIN ANALYSIS

TWIN Analysis

Identify Potential Error Precursors Related to Task

The presence of any of these factors is a flag/prompt to take any additional action/protection of some sort to eliminate or mitigate the error precursor. The key is to recognise – BEFORE the job starts – that these factors are setting the team up for possible errors. The use of the HP Tools can protect against the influence of these error-precursors.

Where you decide on a HP Tool as a mitigation, ensure that the team understands what particular risk that HP Tool is addressing.

(*TWIN refers to Task demands, Work Environment, Individual characteristics and human Nature*)

Task Demands	Description
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 to help others; no spare time
High workload (high memory requirements)	Mental demands on individual to maintain 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)
Simultaneous, multiple tasks	Performance of two or more activities, either mentally or physically possibly resulting in divided attention, mental overload, or reduced vigilance on one or the other tasks
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
Irrecoverable acts	Action that, once taken, cannot be recovered without some significant delay despite best efforts No obvious means of reversing an action
Interpretation requirements	Situations requiring “in-field” diagnosis potentially leading to misunderstanding or application of wrong rule or procedure
Unclear goals, roles, & 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
Lack of or unclear standards	Ambiguity or misunderstanding about acceptable behaviours or results. If unspecified, standards default to those of the front-line worker (good or bad)

APPENDIX 4 (continued)

TWIN ANALYSIS

Work Environment	Description
Distractions/Interruptions	Conditions of either the task or work environment requiring the individual to stop and restart a task sequence diverting one's attention to and from the task at hand
Changes/Departure from routine	Departure from a well-established routine Unfamiliar or unforeseen task or job site conditions that potentially disturb individual's understanding of task or equipment status
Work-arounds/ OOS instrumentation	Uncorrected equipment deficiency or programmatic defect requiring compensatory or non-standard action by a worker to comply with a requirement. Long-term material condition problems that place a burden on the individual
Hidden system response	System response invisible to individual after manipulation Lack of information conveyed to individual that previous action had any influence on the equipment or system
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
Unexpected equipment condition	System or equipment status not normally encountered creating an unfamiliar situation for the individual
Lack of alternative indication	Inability to compare or confirm information about system or equipment state due to absence of instrumentation
Personality conflict	Incompatibility between two or more individuals working together on a task causing a distraction from the task due to preoccupation with personal difference

APPENDIX 4 (continued)

TWIN ANALYSIS

Individual Capabilities	Description
Unfamiliarity with task/ First time	Unawareness of task expectations or performance standards First time to perform a task (not performed previously or a serious procedure change)
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
New technique not used before	Lack of knowledge or skill with a specific work method required to perform a task
Imprecise communication habits	Verbal communication habits or means that do not enhance accurate understanding by all members involved in an exchange of information
Lack of proficiency/Inexperience	Degradation of knowledge or skill with a task due to infrequent performance of the activity
Indistinct problem-solving skills	Unsystematic response to unfamiliar 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
"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 tyre" syndrome
Illness/Fatigue	Degradation of a person's physical or mental abilities due to sickness, disease, or debilitating injury; Lack of adequate physical rest to support acceptable mental alertness and function

APPENDIX 4 (continued)

TWIN ANALYSIS

Human Nature	Description
Stress	Mind's response to the perception of a threat to one's health, safety, self-esteem, or livelihood if task 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
Habit patterns	Ingrained or automated pattern of actions attributable to repetitive nature of a well-practiced task Inclination formed for particular train/unit because of similarity to past situations or recent work experience
Assumptions	Suppositions made without verification of facts, usually based upon 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
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 with task

APPENDIX 4 (continued)

TWIN ANALYSIS

Human Nature	Description
Mind-set	Tendency to "see" only what the mind is *tuned* to see (intention); preconceived ideas Information that doesn't 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)
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 behaviour based upon individual's perception of possibility of error and understanding of consequences; more prevalent in the males
Mental shortcuts (biases)	Tendency to look for or see patterns in unfamiliar situations; application of thumb rules or "habits of mind" (heuristics) to explain unfamiliar situations: • confirmation bias • frequency bias • similarity bias • availability bias
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

APPENDIX 5

JUSTIFICATION

Revision 2

1. Post-job briefs included as a result of NI 72473 audit finding.

Revision 3

1. Full review.
2. Inclusion of the Take - 5 HP Tools.
3. Inclusion of Supervisors HP Tools.

Revision 4

1. Full review.