

HM NAVAL BASE DEVONPORT

SITE EVENT REPORT COMMITTEE (SERC) ANNUAL REPORT FOR 2012

Version 03 – Issue 1

DOCUMENT AUTHORISED

Signature *Signed on original*

Date 10 May 2013

DCBS(N)



Production History			
Revision No	Date	Amended pages	Reason for amendment
Version 01 Draft A	7 th Feb 2013	All	Initial production
Version 01 Draft B	18 th Feb 2013	All	Internal Review
Version 01 Draft C	15 th Mar 2013	All	Incorporation of emergent issues
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Version 03 Draft A	29 April 2013	All	Additional analysis incorporated following Site Safety Committee review
Issue 01	10 May 2013	Nil	DCBS(N) Authorisation

Amendment History			
Amendment No	Date	Amended pages	Reason for amendment
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Previous Authorised Issues		
Issue Number	Date Authorised	Reference
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Executive Summary

1. An “Event” is a generic term covering any occurrence or incident experienced on the Naval Base site, which may affect, or have the potential to affect, nuclear or radiological safety, breaches of Facility Safety Case Operating Rules or give cause for management concern in respect of nuclear and/or radiological safety. This definition encompasses both those events that have a direct nuclear or radiological consequence and “near misses” that have the potential for, but do not have a direct consequence.
2. The level of reporting of Nuclear and Radiological events across the Naval Base continues to be strong implying a good reporting culture. The number of events reported in 2012 is slightly up on the number seen in 2010-2011 but similar fluctuations have been noted in previous annual reports. In addition to routine maintenance work there was a higher level of nuclear activity at the TXB Berths in 2012 when compared to 2010-2011.
3. The severities of the events reported have remained at a consistently very low level, and when compared against the International Nuclear Event Scale (INES) all of the events were assessed as “below scale”.
4. The most significant number of events in 2012 has been generated from failures in, or failures to follow, process controls and procedures. Eleven events fall into this category but they were all Event Code C and D¹ but to put this into perspective approximately 370 Nuclear Procedures were issued for use on the TXB in 2012; typically each is made up of (on average) 100 individual activities (steps). This represents a Probability of Error of 0.03 per Nuclear Procedure or less than 0.0003 per activity (Step). These events were caused by a combination of unfamiliarity with the task, lack of attention to detail, miscommunication between the persons carrying out the task and optimising errors.
5. The most significant event on the Devonport Site in 2012 was the loss of the 60Hz Nuclear Ring Main for over 90 minutes. The Babcock internal investigation identified that the underlying cause of the event was a defect on Bus Section B2 on the Central Nuclear Switchboard. The Base Nuclear Safety Organisation (BNSO) conducted a separate and independent inspection/report as part of its own internal assurance processes.
6. Where appropriate BNSO has applied appropriate levels of intervention based on best practises and statistical analysis. The Site Event Reporting Committee (SERC) has provided detailed feedback on Nuclear Site Event Reports (NSER) to all submarine units and Facility Operators (FO), along with several high profile posters that highlight common issues at the root of many human errors.

The primary focus for development during 2013 will be to establish a way forward with Babcock to complete the introduction of Common Event Capture on the Babcock and MOD sites at Devonport.

¹ Definitions:

C - Some impact on safety or compliance - some impact on existing safety standards, compliance or operational performance has resulted, but there has been no serious compliance breach. A minor regulatory compliance breach may have occurred;

D - Minor impact on safety or compliance - very small or minor impact on safety, compliance etc, very minor nuclear or radiological events, near misses, and conventional safety events with potential nuclear safety concerns or any ideas for improvement to future performance.

BNSO 105.4

10 May 13

SITE EVENT REPORT COMMITTEE - ANNUAL REPORT FOR 2012

References:

- NB BP 19 (Issue 3) - Reporting and Recording of Nuclear and Radiological Events.
- A. JSP 518 Issue 3.1 - Authorisation Condition 7 (Incidents on Site).
 - B. SERC annual report for 2011, BNSO 105.4.
 - C. NRPA-3-11 (PORT) - NRP Event Reporting.

Purpose

1. The purpose of this report is to update the Site Safety Committee (SSC) on nuclear and radiological event reporting and to provide a summary of trends and emergent issues at HM NB Devonport during 2012.

Scope

2. The report covers nuclear and radiological events that occurred on the MOD owned NB Site during 2012 that were reported in accordance with Reference A². This satisfies the NB Commander's (NBC) requirements in accordance with Reference B. Feedback regarding the SERC targets set at Reference C and the aims and objectives of the SERC to work towards during 2013 are included in this report.

Event List

3. A list of nuclear and radiological events reported during 2012 are at Annex A. The list includes a basic description, event cause, event consequence code and remarks where appropriate. In some cases the assessment is provisional pending ongoing investigation, implementation of recommendations and/or agreement by the SERC.

Event History Analysis

This report considers trends for nuclear and radiological events reported to the SERC over the preceding 5 years, in this case 2008 up to and including 2012. A high proportion of the events have been allocated more than one Immediate Cause (IC) and Underlying Cause (UC) codes which should be considered when comparing the total number of events in any one year against the total number of IC codes for the same period.

History. A total of 50 events were reported during 2012. It can be seen from the 5 year event history at Figure 1 that the number of events reported in 2012 is broadly similar to that seen in 2008 and 2009, but more than in the last 2 years. Similar fluctuations in the number of events have been noted in the past (52 events in 2007 was preceded by 32 in 2006 and 35 in 2005). This indicates a positive reporting culture and a proactive safety culture.

In 2012 there were a total of 1024 submarine days at the TXB compared to 778 submarine days in 2011 (see Figure 1). In discussion with the Tidal X- Berth (TXB) Procedure Authorisation Group (PAG) Chairman, it is assessed that in addition to routine maintenance work, there was a higher level of nuclear activity at the TXB Berths in 2012 in comparison to 2011. With more routine and non-routine nuclear activity it is reasonable to expect an associated increase in the number of events.

² The report does not cover the DRDL Site for which the Company has separate arrangements.

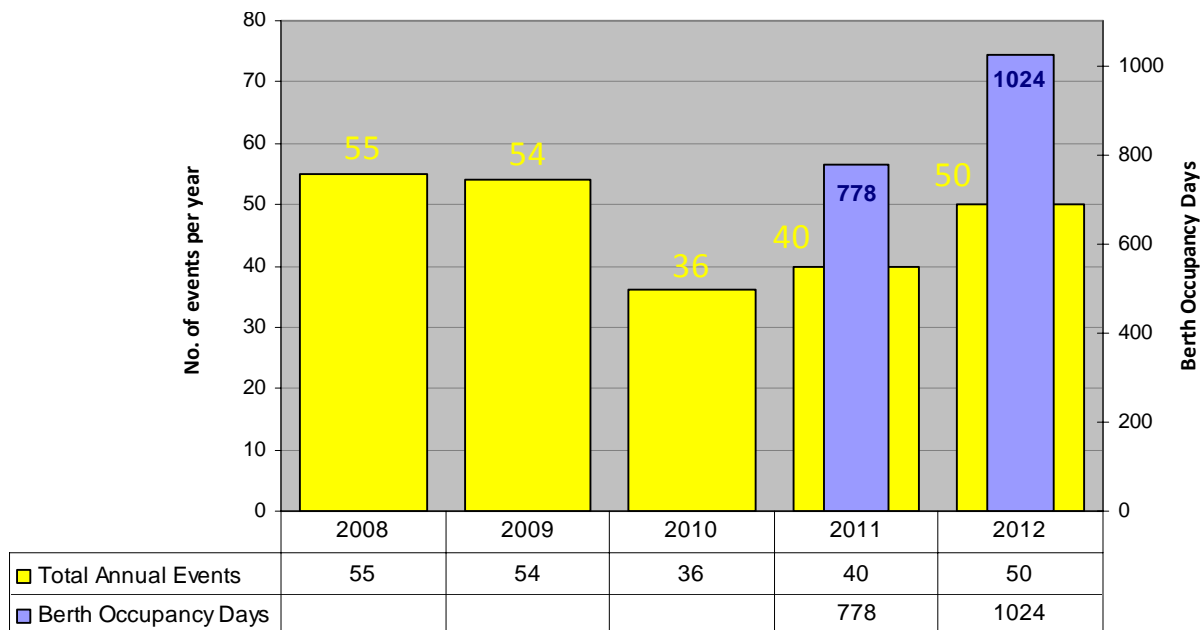


Figure 1 - Number of events over the past 5 years.

A breakdown of Nuclear Site Events by type, location and area is attached at Annex B. Annex B is a subjective analysis of the 2012 events in an attempt to identify areas of concern where remedial action may be required. Two submarines stand out; [REDACTED] suffered three events relating to equipment failure/damage whilst the remainder were relatively minor in nature. The majority of [REDACTED] events were, by comparison, more significant, relating to failures in processes and controls, in particular Nuclear Procedures.

Event Consequence (EC). All events during 2012 were allocated an EC code in accordance with Reference A. This functions on a sliding scale from EC Code A, the most severe, to EC Code D. The EC code considers the potential severity of an event and hence “near misses” are also investigated to facilitate Learning from Experience (LfE). The EC code used in conjunction with a Task Frequency code to determine the Level of Investigation to be attached to the event; Trend, Root Cause Analysis (RCA) or Board of Inquiry. During the period 2008 – 2011, most events fell within the two lowest EC code categories. 2012 saw only 1 NSER categorised as Category B. (NSER 29/12. Complete loss of the Nuclear Ring Mains throughout the Dockyard). This event is discussed at paragraph 24.

RCA. RCA was undertaken for 18 events, including some events where only a trend investigation was indicated but where the SERC Chairman, in consultation with the Responsible Officer, judged that it would be beneficial to conduct a deeper investigation.

NRPA Event Reports. NRPA Event Reports were required for 14 events on the MOD Site at Devonport during 2012 in accordance with Reference D; for comparison 4 were required in 2011, 8 in 2010 and 10 in 2009.

Breakdown of Events

4. **Event Types.** Events are categorised using the system described at Ref A. Three broad categories of cause are used for analysis of events (Annex C).

- **Equipment related event.**
- **Work control related event.**
- **Personnel failure event.**

5. Each of these categories is then sub-divided to into three or four IC codes. Applicable IC codes are allocated to each event. It is possible that a single event may be allocated more than one IC code, and may possibly be allocated more than one cause code under the personnel failure heading.

6. It should be noted that some events are still under investigation and for the purposes of producing this report provisional ICs and UCs (where applicable) have been allocated on the current understanding of the event.

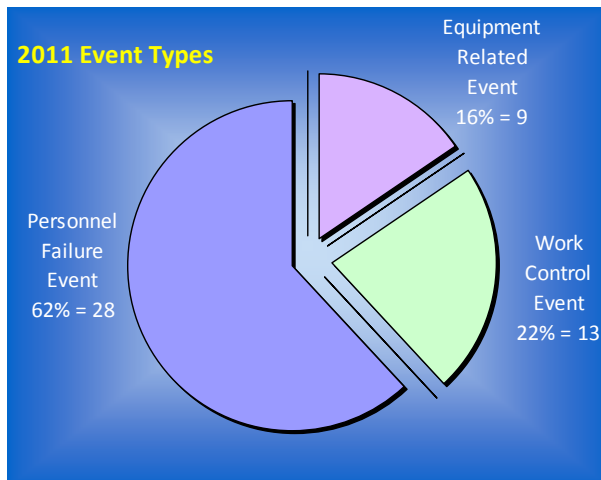


Figure 2. 2011 Event Types

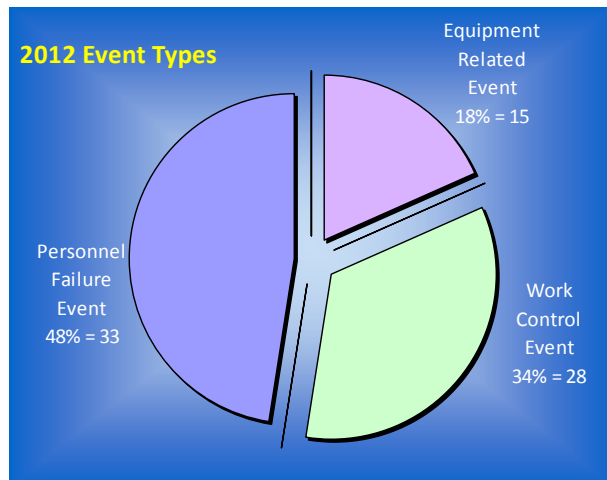


Figure 3. 2012 Event Types

7. The 2012 chart (**Figure 3**), when compared to 2011 (**Figure 2**) indicates that as a percentage of the total number of IC codes allocated, work control related events have increased from 22% to 34% whilst personnel failure is down from 62% to 48%. Equipment related events have remained relatively constant.

8. Personnel related events are associated with SQEP, safety culture and incorrect actions where as work control related events are planning, processes, written or verbal controls of work but both are inextricably linked. Attempting to identify why the causal event types have shifted from one type to another is not straightforward but a simple explanation for the reduction in personnel events would suggest an improved understanding of safety and culture across the Naval Base.

9. The rise in work control events is possibly a result of poor communications where there has been in failure in passing information in a clear and unambiguous way. Additionally, procedures are potentially unclear and deficient in quality, accuracy and relevance.

10. **Immediate Cause Code.** Figure 4 provides a breakdown of the ICs of these events. Incorrect action taken despite suitable guidance (3.2) although down on 2011, remains the most significant IC. Written Control Related events (2.2) and Equipment Breakdown (1.1) are both up on the levels seen in 2011. It should be noted that the IC codes are an initial assessment of the causation factors and further investigation often reveals a combination of other factors.

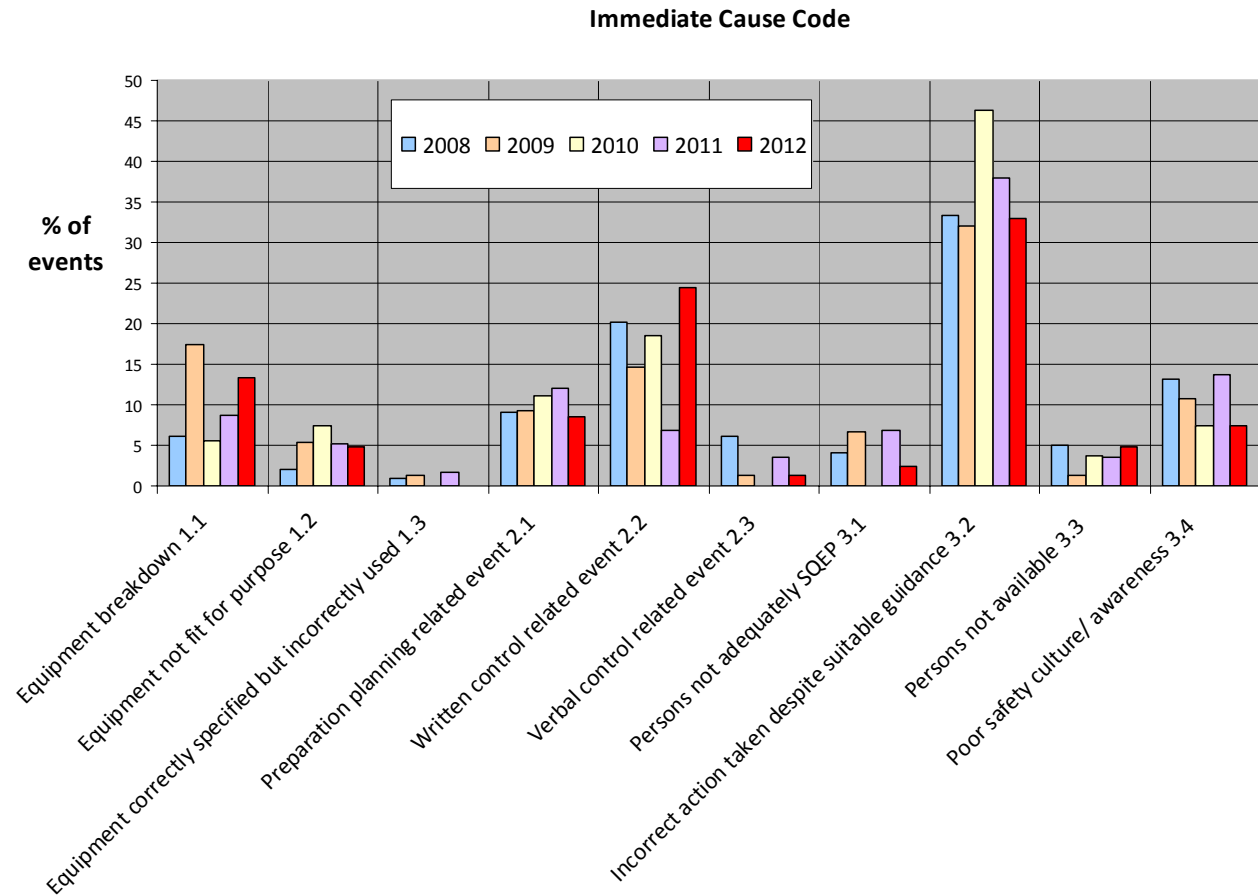


Figure 4 - Immediate Cause as a percentage over a 5 year period.

11. **Underlying Cause Code Analysis.** When considered in greater detail, the most frequent Underlying Causes³ for these particular IC codes are:

- Personal error (3.2.1)
- Ineffective written control (2.2.2)
- Written instruction not followed (2.2.3)
- Failure to comprehend risk present / impact on safety (3.4.2)
- Not made to specification (1.1.3)

³ At the time of writing, the underlying causes allocated to a number of events are a provisional assessment in the absence of final reports.

Event Process Performance

Figure 5 highlights the number of overdue events. During 2012, the SERC met 11 times, breaking over the Summer Leave period. Despite additional time to submit NSERs and the efforts of SERC members to progress event reports with limited resources, the number of overdue events saw a steady rise throughout 2012.

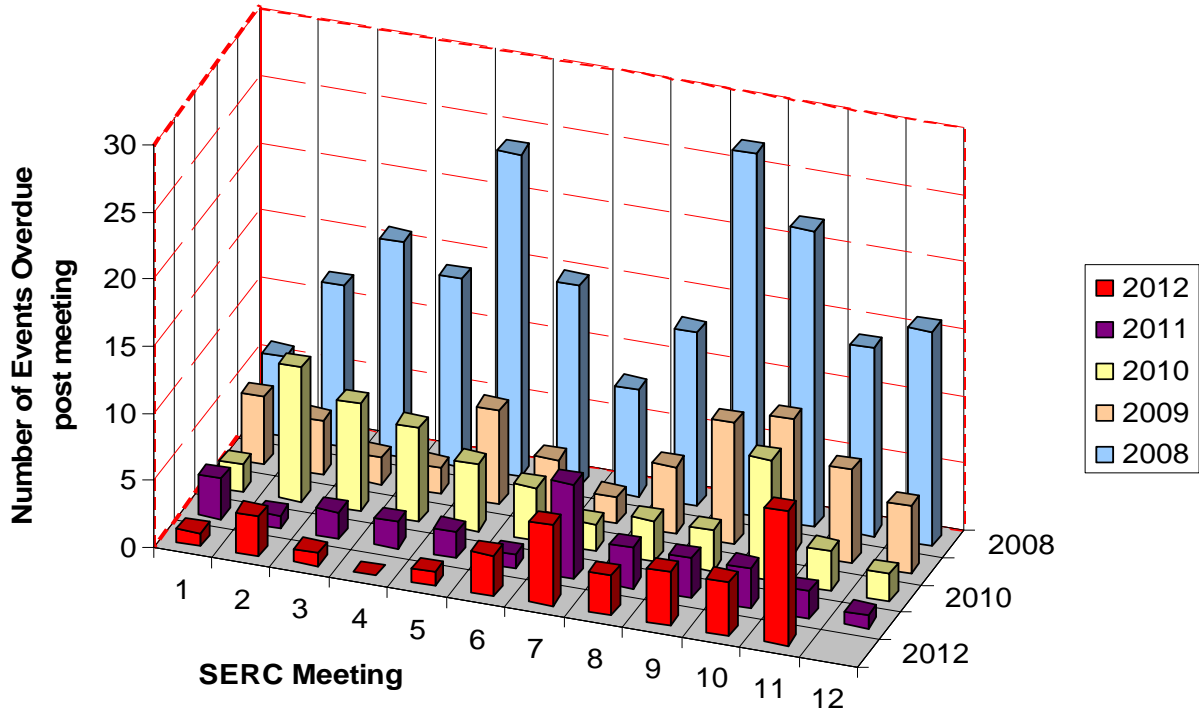


Figure 5 - Number of NSER submissions overdue each month.

A number of factors have contributed to the overall increase in late submissions, a breakdown by area can be seen at Figure 6. Several COMDEVFLOT NSERs have been dependant on timely investigation of NRPA Event Reports and the cumulative effects of manpower churn and personnel issues on Fleet units have delayed a number of reports.

NBRSD suffered resource shortages, often requiring assistance from BNSO to achieve their mandated output; manpower levels are expected to improve by Summer 2013.

The TXB were affected by resource shortages with the loss of the TXB Facility Operator’s representative at the SERC, who moved posts without relief, and late submissions from external agencies.

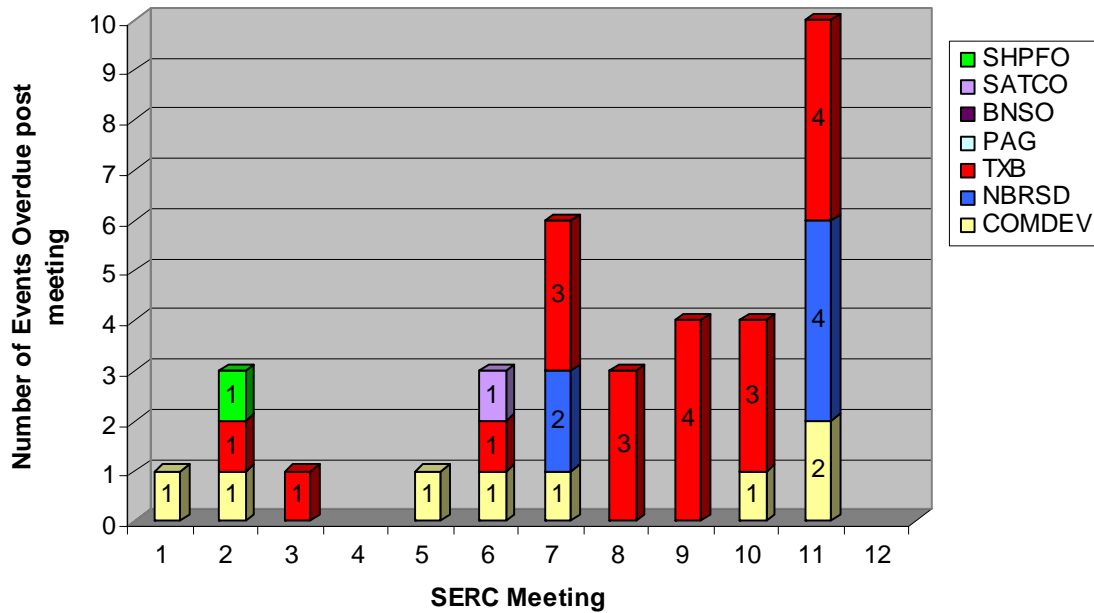


Figure 6 - Overdue Events by Owner/Area

At the beginning of 2013, all but one event from 2011 and 58% of 2012 NSERs had been closed out⁴. Typically, 6 months is allowed to address recommendations emerging from an event, although, in some cases, implementation of a design change or a technical investigation may require more time.

The SERC does not consider an event closed until the recommendations have been addressed and any consequent changes implemented it therefore not is unreasonable to expect that, at any time, there will be approximately 6 months worth of events open.

Prompt investigation is fundamental to event analysis and is pivotal in the quality and quantity of information that maximises learning from experience. Appropriate and proportional planning to submit timely submissions is an authorising requirement to comply with regulatory polices⁵. In future, persistent late submission of a NSERs will result in referral to the Site Safety Committee. Event owners will be invited to present their events and reasons for non-adherence to the site Authorising Condition Compliance Statements.

⁴ A nuclear site event report is deemed open until the SERC endorse the submitted Part 4 of the NBQ703 form. Endorsement is only granted once the implementation of the recommendations is complete.

⁵ JSP 518 – Regulation of the Naval Nuclear Propulsion Programme - 7th Authorising Condition - Adequate system of recording, investigating and assessing incidents on site

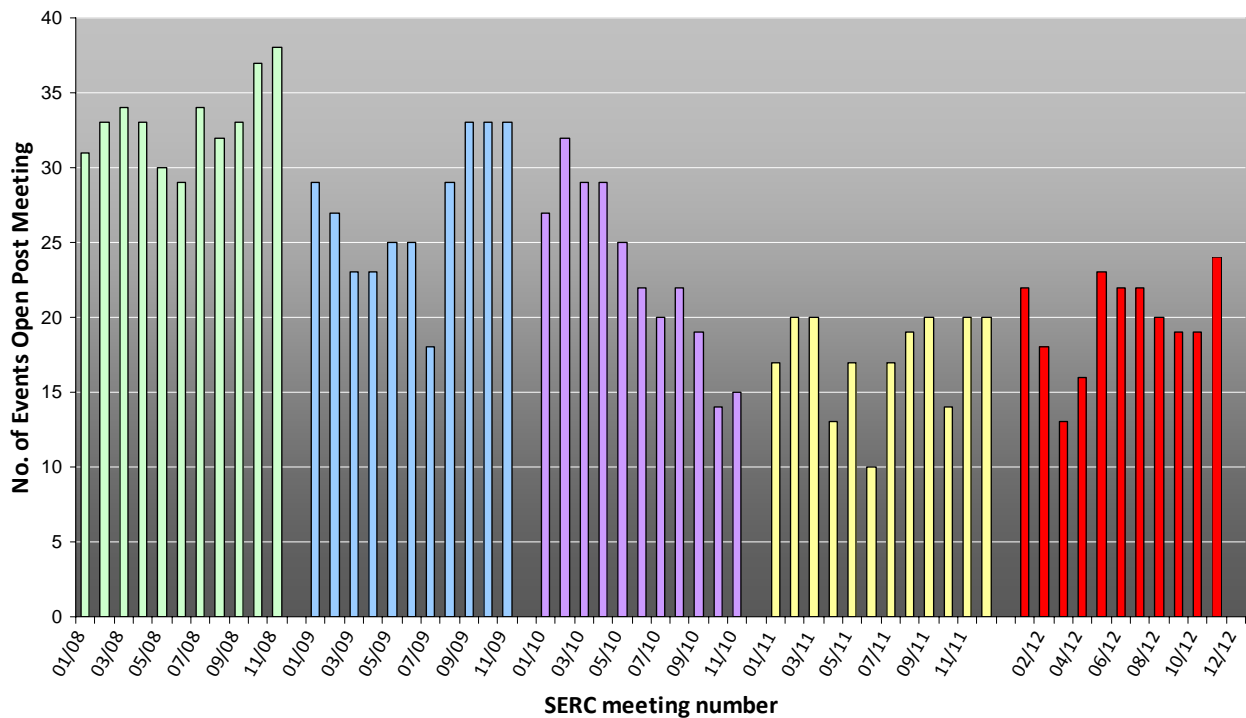


Figure 7 - Number of NSERs remaining open following a SERC meeting.

Figure 7 illustrates the number of events open following each SERC meeting. Whilst the total number of events raised in 2012 was slightly higher than the previous year and the number of late events has increased, the graph is broadly similar to 2011. This may be attributed to the prompt completion of lower severity events and active intervention of the SERC.

Events of Note

12. **Loss of 60Hz Nuclear Ring Mains.** NSER 29/12 (AIRSWEB Unique No. 56556). At 1900 hours, 29 Jul 12 the Devonport Naval Base (NB) 60Hz Nuclear Ring Main experienced a complete loss of supplies for over 90 minutes. The Babcock internal investigation⁶ revealed that the underlying cause of the event was a defect on Bus Section B2 on the Central Nuclear Switchboard. Through a combination of factors and additional unidentified defects this defect was revealed, and resulted in an event with potential nuclear implications.

13. The Babcock report⁷ into the 60Hz loss raised the following areas of concern:

- a. The quality of configuration control of the 60 Hz Nuclear System.
- b. The potential for hidden defects in the switchboard gear.
- c. Inability to learn from previous incidents and to implement the recommendations from previous event reports.
- d. The potential lack of redundancy afforded by the operation of preferred pairs of machines.
- e. The failure of a standby DG to start, and shortfalls in pre-shift checks, its associated batteries, and the state of preventative maintenance.

14. BNSO conducted its own review⁸ in to the investigation conducted by Babcock and similar occurrences on the Devonport site. The BNSO report concurs with some of the wider concerns

⁶ Babcock Event Report Iss. 01 – Investigation into Loss of 60Hz Nuclear Ring Mains – dated 29 Jul 12 and accepted 28 Sep 12

⁷ ibid

⁸ Review of the Investigation into the Loss of AC Shore supply in Devonport 29 Jul 12 dated 24 Oct 12 by BNSO (NCES)

about electrical distribution infrastructure cited in previous investigations^{9 10} and offer the following comments:

- a. The design intent has not been progressively recorded (Configuration Definition) and achievements monitored (Configuration Control). It highlights several deviations of system configuration that have either been missed or not recorded, and the accuracy or actual definition of how the systems are being maintained (Configuration Accounting). **Quality Assurance – shall be applied to activities associated with design, construction, manufacture, commissioning, operation, maintenance and decommissioning of any plant or systems on site.**
 - b. The faults associated with the unsuccessful connection of the diesels (DG3 and DG4), breaker operations and switchboard batteries questions the effectiveness of the maintenance methodology and its management. It is suggested that Babcock investigate utilising Reliability Centred Maintenance in order to address the identified shortfalls in their current maintenance regime. **Defects/Inadequate Maintenance – any tests, inspections and examinations specified by the authority to be carried out in connection with any plant or process shall be conducted under appropriate control commensurate with its safety significance.**
15. BNSO (NCES) continue to monitor the 14 actions arising from this report via the Cross Site Authorisation Group and SERC meetings that are recorded on the Babcock Q-Pulse system.¹¹
16. **Procedural Non-Compliance.** A number of events in 2012 have been generated from failures in, or failures to follow, process controls and procedures.
17. There are three elements that must be present for an intentional non-compliance (NC) to occur.
- a. **Motivation (Reward):** Motivation behaviours include a “can-do” attitude, internal pressure or external pressure from crew members/superiors.
 - b. **High probability of success:** A high probability of success is also a necessary element of intentional NC. A tendency to underestimate the seriousness of an action, such as skipping step in a procedure, overestimating one’s ability, or having previously done the same thing without a negative result allows the person to expect success and simply reinforces the behaviour.
 - c. **Absence of peer pressure or reaction:** A lack of negative peer pressure from others on the crew or from immediate superiors tends to reinforce negative behaviour.
18. The removal of any of these three elements will likely prevent the intentional NC behaviour from occurring. Intentional NC takes you outside the boundaries of established of good policies and procedures, circumventing a layer of defence that is there to ensure predictable and safe working practices. It breaches what may, in fact, be that last line of defence.
19. The real danger of intentional NC is when this behaviour goes unnoticed or unchallenged and corrected; it may become “the way we do it”. When individuals get in the habit of picking and choosing what rules, regulations and/or policies and procedures they are, or are not going to follow then there are no standards. The results are unpredictable and often catastrophic or extremely expensive.

⁹ Independent Technical Investigation into the Loss of Primary/Alternative Shore Supply Arrangement for HMS TALENT Berthed at 8 Wharf – Aug 14-15 2009.

¹⁰ HMS TRAFALGAR NRP Event Report 02/11 (Loss Of AC Shore Supply At 5 Basin East Wall North)

¹¹ Q-Pulse Actions recorded against Airsweb Event 56556 – Ref: 2012inv054

20. Annex B identifies that [REDACTED] had a number of NSERs raised where there have been failings in the implementation and control of Nuclear Procedures (NP). NSER 33/12, where at no point did BS hold the adaptor required to connect to the prescribed test point or NSER 48/12, where a BS fitter substituted an authorised gauge for one that was readily available. The systematic and repeated deviation from written instructions given in the NP by BS brings into question the **Safety Culture** of those fitters undertaking this task under procedural control.

21. If an operation cannot be completed as detailed in the NP then changes are not to be made at the discretion of the fitter, no matter how sound or safe his decision. A procedural change can only be made after consultation with the co-ordinator, the MEO (or his representative) and the PAG Chairman to request a Change Notice, if warranted. In these and other similar events, BS personnel should have highlighted the lack of equipment to SS and the event would have been prevented.

22. Clearly NP co-ordinators are ultimately responsible for the management of nuclear work and they must reinforce a **safety questioning attitude/strength in depth**. It should not be assumed that an NSQEP base maintainer implies infallibility or that the right to question work conducted is abrogated. SS must be vigilant and check that all parts and tools are mustered correct before conducting any work.

23. The effect of work and programme pressure to meet timelines and obligations needs to be evaluated against the capacity of personnel. SS are always best placed to make this assessment, which must be communicated to the senior management onboard and, if necessary, to external authorities. Programme pressure is not for any platform to own alone and if the balance affecting the ability to manage all works safely is compromised, it can result in the circumnavigation of due process.

24. Human Reliability Analysis (HRA) and Accident Theory studies have identified two different types of human failures: **errors** and **violations** (Reason, 1990¹²).

- a. **Human error** can be defined as the failure of planned actions to achieve their desired ends – without intervention of some unforeseeable event.

It is recognised that as humans, when we conduct even the simplest of tasks, we can all make errors. In most cases the errors are recognised and corrected before any consequence of the errors is realised.

- b. **Violation** is an intentional noncompliance (NC) that is defined as the deliberate failure to follow rules, procedures, established processes or policies.

The nuclear procedure events examined in detail in Annex D were caused by a combination of unfamiliarity with the task, lack of attention to detail, miscommunication between the persons carrying out the task and optimising errors. Often well meaning, optimising errors are a procedural violation where there is a conscious decision to deliberately deviate, to take short cuts or a failure to follow procedures to save time or effort in order to “get the job done”.

25. Human error likelihood (i.e. how frequently will a particular error actually occur?) is usually expressed as a probability, called a Human Error Probability (HEP), which is effectively the probability of an error per demand:

$$\text{HEP} = \text{number of errors observed} / \text{number of opportunities for error}$$

26. The Human Error Assessment and Reduction Technique (HEART) is designed to be a quick and simple method for quantifying the risk of human error. HEART has been empirically

¹² Reason J. (1990). *Human Error*. New York: Cambridge University Press.

Other SERC Issues

31. **Information Exchange with HMNB Clyde.** There continues to be a good level of information exchange between Devonport and Clyde. Whilst a number of Clyde events have been considered by SERC members with the aim of Devonport learning from these events, concern has been expressed at the quality of the investigations conducted by Clyde. The Nuclear Safety Organisation in Clyde has recognised this and is in the process of initiating an Investigator Training package.

Future Development – Review of Progress

32. Reference C identified 2 areas for future development:

- a. The development and implementation of a common initial event capture arrangement working with Babcock should be taken forward.
- b. Expansion of the number of trained investigators.

33. **Common Event Capture.** For several years the aspiration of the NBC has been to drive towards a Common Event Capture process; recognising that the multitude of different reporting mechanisms and the lack of common policy hinder overall event reporting within the Naval Base.

34. BNSO initially worked closely with the Babcock's Operating Experience Feedback (OEF) Team, from the requirements phase through to the launch of AIRSWEB in Jan 12. Since then there has been no movement towards Common Event Capture as the Company attempts to rectify deficiencies identified in their own OEF Management and Functional Procedures (FPs).

35. The 2011 SERC Report emphasised a number of issues that affect the usefulness and usability of the AIRSWEB software, preventing a general release across the Naval Base. BNSO continue to work with the Company to agree the necessary arrangements to support introduction of the OEF process. A recent Babcock Nuclear Assurance Group Licensing Condition (LC) 07 Process Audit¹⁷ conducted in Nov 12 reiterated many of the concerns highlighted by BNSO.

36. The utilisation of AIRSWEB as the common capture tool for the Naval Base requires further intelligence to meet all mutually agreed requirements. It is essential that clear lines of responsibility and authority, deliverables and established milestones are agreed. Without these it is difficult to predict when, or even if, the necessary arrangements will be in place to support introduction of the OEF process across the Naval Base.

37. **Expansion of the Number of Trained Investigators.** Work has continued over 2012 to broaden investigator training and has identified a course that will include modern cognitive interviewing techniques to enhance the quality of investigative interviews. People are fallible and due to the passage of time they will forget, overlook and "contaminate" information that is vital to any investigation.

38. The course is anticipated to involve up to 8 people (mainly from the SERC) in 2013, and an article reviewing the effectiveness of the technique along with Root Cause Analysis will be produced for inclusion with the 2013 SERC report.

¹⁷ Babcock LC 07 Audit Report, 2012DNS014, dated 19 Nov 12

Future Development – 2013

39. The following areas have been identified for future development:

- a. Develop and implement a common initial event capture arrangement with Babcock.
- b. Expand the number of trained investigators.
- c. Align NB BP19 and the NSER form, NBF703, with the recently released NRPA Event Reporting requirements at Ref D. It should be noted that the updated NRPA reporting processes and enhanced RCA have been developed from the BNSO proposed changes to NB BP19.
- d. Investigate the suitability of in-depth familiarity/refresher/safety presentations to the crews of submarine units returning from long term deployments or entering extended maintenance/docking periods.

Freedom of Information (FOI) Act

40. There has been one FOI request received at HMNB Devonport for SERC information during 2012. A member of the public requested a list of events at levels 2 and 3 on the International Nuclear Event Scale (INES). All of the events presented to the SERC were assessed as “below scale”. The NSER form will be updated with an assessment against the INES, on re-issue, to assist in answering similar future requests.

Ministerial Reporting

41. There have been no requirements for Ministerial reporting under Reference A during 2012.

Conclusions

This report has endeavoured to maintain a balanced perspective on the number of events captured, though this has proved both difficult and challenging. Some of the events encapsulated within this report potentially illustrate unfavourable behaviours in respect to the safety culture that the base organisation is collectively trying to create in the workforces across the site.

BNSO recognises that organisations and individuals are increasingly expected to deliver to tighter deadlines with limited resources. That said, the work control processes and safety management processes that underpin the safety programme within the Naval Base are delivering, and the benefits are self-evident. The workforce is trusted and feels involved in safety management, and this is apparent in the number of events reported so that failures and “bad news” can be learned from; this is vital in delivering a safe product to NBC.

Signed on Original

[REDACTED]

Lieutenant Commander, Royal Navy
SERC Chairman

[REDACTED]

Lieutenant, Royal Navy
SERC Secretary

[REDACTED]

MoD Development Post

Annexes:

- A. Nuclear and Radiological Events Reported During 2012.
- B. Breakdown of Nuclear Site Events.
- C. Event Cause Classification Code Trees.
- D. Examination of The Human Factors In Nuclear Procedure Events Reported During 2012

NUCLEAR AND RADIOLOGICAL EVENTS REPORTED DURING 2012

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
01/12	A member of HMS [REDACTED] Ship's Company mistakenly delivered a one litre bottle sample of [REDACTED] to the waterfront HPG. The bottle sample represents an unauthorised transfer of potentially active material from the Licensed to the Authorised Site.	6 Jan 12	Personnel Related Event	C	2	Waste Transfer. The bottle sample was quarantined by waterfront HPG staff and was then transported in the HPG transport to the Radio-Chemistry Lab
02/12	Whilst conducting [REDACTED] under NP [REDACTED], SS misread the NP and carried out steps F2, 3 and 4 concurrently. The NP does not authorise concurrent action.	9 Jan 12	Personnel Related Event	C	3	NRPA Event Report raised. The error was made by SQEP maintainers, who were neither fatigued nor under particular programme pressure, as a result of misreading of the note at the start of the procedure
03/12	Whilst monitoring the radiation dose accrual on the [REDACTED] NP [REDACTED], HPG staff noted that some MESM fitters were approaching the shift investigation level of 300uSv per day.	18 Jan 12	Work Control	C	2	No dose investigation level set for this task was exceeded.
04/12	5-Yearly Routine Electrical Testing for Wyvern Centre (Shelter Station B) found not to have been completed by the required date of 29th January therefore the maintenance has exceeded its tolerance end date. Facility still available.	30 Jan 12	Work Control & Equipment Related Event	D	4	The major causes of this event were the lack of communication between Interserve and NSSM organisation and NSSM manpower shortages. The stretch of NSSM and NBRSD resource to oversee these activities.

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
05/12	Shielding survey in the vicinity of the TS & D rig onboard HMS [REDACTED] revealed that the [REDACTED] for controlled area designation. A controlled radiation area was established for the [REDACTED] and more detailed radiation surveys requested.	9 Feb 12	Personnel Related Event	C	4	The high dose rate resulted from lack of work control during the adjustment of the temporary gamma-block shielding on 02 and 03 Feb 12 in order to re-site FP105.
06/12	Whilst carrying out NP [REDACTED] - To Investigate and Repair Temporary Sampling and Dosing System, a Health Physics Monitor (HPM) was not in attendance when called upon by the NP. Additionally the Radiological Work Control Permit (RWCP) did not reflect the F Steps in the Nuclear Procedure.	8 Feb 2012	Work Control	C	3	Investigation revealed a series of missed opportunities, both from the SRC PAG and the HP personnel, that would have prevented this event.
07/12	Civil works were carried out on the TXB Facility (8 Wharf North) without approval from the TXB FO.	17 Feb 2012	Work Control & Personnel Related Event	C	4	Design Manager approved work under programme pressure – retrospective approval sought and given.
08/12	During a routine inspection of the TXB facilities the bunded area underneath the Active Jet Vac (AJV) on 7W was found to contain items of rubbish. Secondly the AJV hose stowage arrangements on both 7W & 9W were not IAW the requirements of the Jet Vac Operations and Review audit dated 07-02-11.	27 Feb 12	Personnel Related Event	C	2	This NSER has raised identical issues that have been reported previously under NSER 34-11

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
09/12	Fitters were observed to use ordinary spanners to apply uncontrolled torque in an attempt to "squeeze up" on leaking PCD connection flange during air test. The procedure states that the fastenings are to be tightened, using a torque wrench, to 74Nm.	11 Mar 12	Work Control & Personnel Related Event	C	3	Raised as NBF60 88/11. Procedure violation - NP98-071, Issue 37 "To Connect And Test The Effluent Receipt Facility, At 8 & 9 Wharves, To T Class High Level Discharge Connections"
10/12	UMC Divers were found diving on the stern of HMS [REDACTED], whilst critical. The Health Physics Foreman asked the divers if they had been briefed on the change from [REDACTED], which they had not.	15 Mar 12	Work Control	C	2	Divers were only required to receive a brief at the start of the job which was protracted over several days, thus the [REDACTED] was missed. Dive Supervisors are now required to receive daily briefs.
11/12	During an out of hours unplanned return to Devonport a submarine should have gone to the nominated standby berth (7W(N) in accordance with procedure FP14-51-000. However, because doubts were raised over the preparedness of 7W(N) to receive a submarine, the submarine was put on an alternative berth.	12 Jan 12	Work Control	D	3	Telephone discussions with respect to the availability of 7W(N) appear to have been misunderstood or misinterpreted leading to the use of an alternative berth.
12/12	Radiation surveys conducted in Radiologically Controlled Areas on board HMS [REDACTED] with no evidence of dosimetry having been worn when conducting these surveys thus potentially being in breach of Reg 34 of IRR 99	22 Feb 12	Personnel Related Event	C	2	The investigation concluded that as the worker was not classified and was in possession of a combined approved TLD dosimeter, there has only been a minor breach of the Ionising Radiations Regulations 1999 in relation to the individual failing to comply with the requirements of the Local Rules.

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
13/12	As a result of changes to the security arrangements in South Yard out of hours access to the DACC was not immediately available. Additionally the revised access arrangements were not adequately promulgated to NARO responders.	9 Apr 12	Work Control	D	3	Changes to the access arrangements implemented over the Easter Weekend were not particularly well published. Arrangements have subsequently been fully promulgated
14/12	It was identified that the Devonport COMCEN had been taken offline 2/4/12 for an upgrade without notifying relevant stakeholders.	4 Apr 12	Work Control	C	4	Found while attempting to stand the NARO down via signal to the Devonport COMCEN iaw BNSO Desk Instructions. Defective components prevented the COMCEN promptly resuming normal operations.
15/12	Duty NARO members' pagers are receiving standard notifications intermittently. When received the text is often corrupted and unreadable. Confidence in the nuclear emergency notification procedure utilising these pagers is called into question.	9 Apr 12	Equipment Related Event	D	2	Permanent notification procedures have been implemented
16/12	COMDEVFLOT raised ER 01/12 to cover overage [REDACTED] that have operated without valid concessions – this has included a number of periods of alongside operation.	Jan 12	Personnel Related Event & Work Control	C	2	Since Jan 12, the [REDACTED] have been overage and without concession.
17/12	Whilst conducting [REDACTED] [REDACTED] resulted in a brief period of operation in an unauthorised line up.	20 Apr 12	Equipment Related Event	D	4	[REDACTED] 03-12 (NRPA 3448) & ME OPDEF 23-12 refer

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
18/12	A radioactive stores item (CAMS) was to be returned from HMS [REDACTED] to Devonport Distribution Facility during scheduled Stores Returns. Four CAMS containing a small amount of radioactive material were found amongst other stores items on a pallet on the jetty at 4 Basin.	26 Apr 12	Personnel Related Event & Work Control	D	2	The required notification to stores personnel using a Dangerous Goods Note were not carried out and the items were left unsecured and unattended.
19/12	The designated Babcock PAG Chairman was not immediately available to authorise the use of the 1200A common AC Shore Supply procedure following a defect that prevented connection of split AC Shore Supply to HMS [REDACTED]	2 May 12	Personnel Related Event & Work Control	C	4	Duty SRC PAG Chairman was uncontactable by mobile telephone with no nominated backup. Full contact details of SRC PAG Chairman and a nominated deputy are now available
20/12	Following the planned arrival of HMS [REDACTED] at 8 W(N), [REDACTED], in accordance with NP [REDACTED], were unavailable. The [REDACTED] was authorised to reconfigure the [REDACTED]	2 May 12	Personnel Related Event & Equipment Related Event	C	3	Babcock Investigation Report accepted at XSAG 21/12
21/12	During a routine set of Jetty rounds on the TXB several anomalies were identified with the AJV located on 8 Wharf (N): 1. Lack of appropriate signage displayed on the outer tent. 2. The Local Rules posted against the AJV were out of date. 3. A carboy and debris deposited within the controlled area bund tray.	11 May 12	Personnel Related Event	D	3	This event highlighted a lack of control of AJV transfer between sites. Procedures and processes are being reviewed and all HP personnel made aware of the requirements

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
22/12	DC Shore Supply Cables routed through un-earthed scaffolding structure such that the movement of the submarine with the tide could result in the cables being damaged in a similar manner to NSER 23-11. In this case no physical damage occurred.	22 May 12	Personnel Related Event & Work Control	D	3	Failure to apply LFE from NSER 23-11. Earth bonding FP re-issued and scaffolders educated of the importance of not moving cables.
23/12	Non-compliance with a Nuclear Procedure (NP) during the release of the [REDACTED] in preparation for the fitting of Permanent Magnetic Locking Features (PMLF).	19 May 12	Personnel Related Event	D	3	[REDACTED] ER 05/12 NRPA Event Report 3454
24/12	Between 3 and 18 May 12, domestic waste water (e.g. shower/sink waste, fwd bilge water) was disposed of via transfer off-site using a conventional waste disposal route. It was subsequently found, owing to a pre-docking sampling requirement, that the waste had contained low levels of tritium.	18 May 12	Work Control	C	3	[REDACTED] ER 04/12 NRPA Event Report 3453
25/12	Post PCD disconnection HMS [REDACTED] 8 Wharf (North) 06 June 2012, a bag of potential RA arising's was left unattended on the casing overnight.	6 June 12	Personnel Related Event	C	3	The lack of SS HP coverage contributed to this event, however the lack of a questioning attitude was disappointing. SHPFO has amended RA waste transfer protocols to facilitate ease of disposal.
26/12	A Naval Merlin helicopter was reported by numerous witnesses to have over flown the Submarine Refit Complex (SRC), TXB and HMS DRAKE between 1040 and 1140 on 12 Jun 12, in contravention of EGR002 (Restricted Flying).	12 June 12	Personnel Related Event	C	2	The tasking detailed by HMS [REDACTED] gave little consideration to EGR002. the pilots modified their flight path but still, unfortunately strayed into the restricted areas.

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
27/12	As a result of OEF Event 55490 it has been identified that the Standard Discharge Nuclear Procedures 98-073 and 98-072 both tag out valve [REDACTED] but neither procedure removes the tag.	11 June 12	Work Control	D	3	Whilst the procedures have been highlighted as incorrect, submarines that have removed their respective tags from [REDACTED], without a requisite Change Notice, have not complied with procedural instructions. A number of submarines have utilised these procedures and have obviously removed their respective tags from [REDACTED] prior to CP 100 in order to facilitate low-level discharge at sea.
28/12	On two separate occasions DTO Staff made amendments to the line ups of the Temporary Sampling and Dosing (TS&D) test rig connected to the [REDACTED] without the correct Change Notice action being implemented. These amendments were non-compliant with NP [REDACTED]	27 Jun 12	Personnel Related Event & Work Control	C	4	This event occurred during the vacuum filling of the TS&D rig filter whilst the system was configured for inactive commissioning prior to its [REDACTED]
29/12	Complete loss of the Nuclear ring mains throughout the dockyard. Previously unidentified defects on the standby diesel generators prevented the immediate re-supply of services to the Tidal X-berths the SRC.	29 Jul 12	Equipment Related Event	B	4	9 dock supplies were quickly restored using the standby generator. The Nuclear ring mains were re-configured and AC shore supply restored to the SRC and tidal x-berths after approximately 90 minutes.

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
30/12	Minor spillage of bilge water, thought to potentially contain Tritium, onto the TXB jetty at 8 Wharf (N).	13 Aug 12	Equipment Related Event & Work Control	D	1	Sample results confirmed that the spill had been wholly contained within the bunded area. The sample outside the bund contained no Tritium above the limit of detection and the sample inside the bunded area showed low levels of Tritium.
31/12	A minor [REDACTED]. Two personnel were wetted and subsequent monitoring demonstrated that they were not contaminated.	19 Aug 12	Equipment Related Event	C	3	[REDACTED] ER 02/12
32/12	[REDACTED] omitted to conduct her [REDACTED]	21 Aug 12	Personnel Related Event & Equipment Related Event	D	2	Due to the events of NSER 31/12 the sampling routine was overlooked. [REDACTED] ER 03/12
33/12	Base Staff fitters on HMS [REDACTED] were non-compliant with the authorised Nuclear Procedure, NP [REDACTED], during the [REDACTED]	12 Mar 12	Work Control	D	3	This event was delayed in reporting due to a COMDEVFLOT admin error.
34/12	HMS [REDACTED] found to be passing to the [REDACTED] following the replacement of the [REDACTED] (see NSER 31-12)	23 Aug 12	Equipment Related Event	D	3	Recorded for trending purposes

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
35/12	The Transportable Radiation Monitoring System (TRaMS) monitoring [REDACTED] alarmed in the Emergency Monitoring Headquarters (EMHQ) indicating a transmission failure.	11 Aug 12	Personnel Related Event	C	3	Investigation revealed that the power supply, connected in to a 13A socket in the X-berth hut, had been disconnected by personnel manning the hut.
36/12	The electrical testing of equipment (Work Order 5903623) within Grenville Block COMCEN exceeded its Tolerance End Date of 22 Aug 12; as such the equipment continued in operation beyond its tolerance date until the maintenance was completed on 6 Sep 12.	22 Aug 12	Personnel Related Event	D	3	This has been highlighted in previous NSERs 22/11 & 04/12
37/12	Loss of the shore Diesel Generators (DG) [REDACTED] supporting HMS [REDACTED]	7 Sep 12	Personnel Related Event & Equipment Related Event	C	4	[REDACTED] ER 04/12 Babcock Investigation Report accepted at XSAG 21/12
38/12	Unauthorised transfer of primary effluent from 8W (S) Tank 2 to Nuclear Utilities Building (NUB) Effluent Treatment Plant (ETP).	5 Oct 12	Personnel Related Event	D	3	Issue to be investigated by Babcock and reported via OEF 57813. Investigation resulting from OEF 57813 will be used to populate Part 3
39/12	A contract radiographer accidentally exposed his TLD to a radiography source overnight 12 Oct 12 due to the dosimeter inadvertently falling off his overalls in the controlled area. He immediately reported to the HP(F) who locked him out of the dosimetry system until issued with a new dosimeter. His EPD reading was 1 micro sievert.	12 Oct 12	Equipment Related Event	D	4	This event to be recorded for trending purposes at the request of Senior Health Physics Radiation Protection Adviser (SHPRPA)

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
40/12	On Saturday 13th October backshift/nightshift, all Babcock Health Physics Monitoring personnel declined to provide driving cover for the Primary Response Vehicle (PRV), leaving no recognised resource to deploy the PRV in the event of a radiological incident.	13 Oct 12	Personnel Related Event	C	1	This event has revealed an internal Babcock management issue that requires resolving to ensure compliance with the Emergency Arrangements
41/12	It was identified that the SRC PAG Authorised Nuclear Procedure, NP [REDACTED] to [REDACTED] to [REDACTED] stub on HMS [REDACTED], specified an incorrect component for connecting the test rig to [REDACTED]. An alternative arrangement, subsequently fitted without appropriate authority, was non-compliant with the approved drawing.	19 Oct 12	Personnel Related Event & Equipment Related Event & Work Control	C	3	[REDACTED] ER 08/12 Similar to 25/11 & 33/12 Discussion held by BNSO with [REDACTED]
42/12	During routine rounds it was highlighted that the Active Jet Vac bowser (AJV), HP 2, on 8 Wharf (N), did not have a lock on the save all drain valve as detailed in the Radioactive Waste Operating Procedure (RWOP).	23 Oct 12	Work Control	D	3	Procedural non-compliance with RWOP
43/12	Whilst conducting a BNSO audit of the Nuclear Procedures (NPs) in force on HMS [REDACTED], a discrepancy was discovered between the authorised Nuclear Logic and a NP in force.	7 Nov 12	Personnel Related Event & Work Control	D	1	Typographic error resulted in the discrepancy which should have been noticed by the procedure co-ordinators
44/12	[REDACTED] during the process of fitting Permanent Magnetic Locking Feature (PMLFs).	4 Nov 12	Personnel Related Event & Equipment Related Event	C	4	[REDACTED] ER 04/12

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
45/12	HMS [REDACTED] failed to raise an Environmental Risk Assessment prior to conducting a cold move into the Licensed Site. This is required by NP [REDACTED] for a submarine with a nitrogen bubble in the Pressuriser.	11 Jun 12	Personnel Related Event & Work Control	C	4	Procedural non-compliance was only realised post-undocking when back on the Waterfront. [REDACTED] 09/12 -NRPA 3484
46/12	A Welding Machine and associated leads that had been used for a Nuclear Procedure within the Reactor Compartment (RC) was transferred to the jetty and subsequently to the Health Physics Group (Waterfront) (HPG(W)) without the correct controls being observed.	16 Nov 12	Personnel Related Event & Work Control	C	1	RCA to be conducted. Due to program pressures equipment was moved out with standard controls
47/12	During routine checks of the radioactive waste disposal records it was identified that there were errors associated with the disposal documentation relating to a consignment of liquid waste to DRDL undertaken on 07 Nov 12.	7 Nov 12	Personnel Related Event	C	3	a) The volume of effluent transferred was underestimated (actual was 120 litres but recorded as 12 litres) b) The activity assessment within the consignment was overestimated (by a factor of 1000) due to a transcription error (i.e. Bq value recorded as kBq value).
48/12	Gauges of the wrong range fitted to Test Rig supplied by DTO for testing [REDACTED] on HMS [REDACTED] during conduct of NP [REDACTED]. Procedure non-compliance - Gauges specified in NP were [REDACTED] but [REDACTED] gauges were supplied.	11 Nov 12	Personnel Related Event & Work Control	D	3	Event reported and investigated under OEF 58754. BNSO review identified procedural non-compliance. SRC & SFM PAG Chairman notified and OEF event re-opened and investigation initiated with the emphasis on the non-compliance issue.

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
49/12	HMS [REDACTED] Ships Staff (SS) were inspecting berth arrangements before cold move to 5BWWS on the 19 Nov 2012. A member of SS carried out insulation checks on the de-energised AC Shore Supply (ACSS) cables without procedural authority.	12 Dec 12	Personnel Related Event & Work Control	D	3	Over enthusiastic electrical rating operated out with NP controls. SSFR raised to highlight potential safety issues
50/12	It was reported to the Health Physics Group Manager (HPGM) on the morning in question that the Primary coolant Discharge connection / coping edge bund on 8 Wharf(N) had overflowed with rain water into the Hamoaze.	20 Dec 12	Work Control	D	3	Catchment around the PCD connection valve was in good order and the blue roll inside was dry - indicating no evidence of spill to the bund. There has not been a release of active material into the Hamoaze.

2012 Breakdown of Nuclear Site Events by Type

This Annex is a subjective analysis of the 2012 events in an attempt to identify areas of concern where remedial action may be required. A number of assumptions have been made:

- a. Event types have been simplified for the purposes of illustration
- b. The breakdown by Facility Operator includes common Event Owners
- c. The breakdown by location has been simplified by the location in which the event occurred, or the ownership of the procedure. Where there is some ambiguity or potential joint ownership the location has been assigned to the NSER Owner.

<u>CONTROLS</u>															
<u>RADIOLOGICAL CONTROL S</u>		<u>NUCLEAR PROCEDURES</u>		<u>CONTAMINATED WASTE CONTROL</u>		<u>PROCESS & CONTROL S</u>		<u>COMMUNICATION</u>		<u>MAINTENANCE</u>		<u>DEFECTIVE / DAMAGED EQUIPMENT</u>		<u>POSITIVE EVENT</u>	
<u>01-12</u>	<u>C2</u>	<u>02-12</u>	<u>C3</u>	<u>08-12</u>	<u>C2</u>	<u>11-12</u>	<u>D3</u>	<u>14-12</u>	<u>C4</u>	<u>04-12</u>	<u>D4</u>	<u>15-12</u>	<u>D2</u>	<u>03-12</u>	<u>C2</u>
<u>05-12</u>	<u>C4</u>	<u>06-12</u>	<u>C3</u>	<u>21-12</u>	<u>D3</u>	<u>13-12</u>	<u>D3</u>	<u>49-12</u>	<u>D3</u>	<u>07-12</u>	<u>C4</u>	<u>17-12</u>	<u>D4</u>		
<u>10-12</u>	<u>C2</u>	<u>09-12</u>	<u>C3</u>	<u>24-12</u>	<u>C3</u>	<u>16-12</u>	<u>C2</u>			<u>36-12</u>	<u>D3</u>	<u>20-12</u>	<u>C3</u>		
<u>12-12</u>	<u>C2</u>	<u>23-12</u>	<u>D3</u>	<u>25-12</u>	<u>C3</u>	<u>19-12</u>	<u>C4</u>					<u>22-12</u>	<u>D3</u>		
<u>18-12</u>	<u>D2</u>	<u>27-12</u>	<u>D3</u>			<u>26-12</u>	<u>C2</u>					■	■		
<u>46-12</u>	<u>C1</u>	<u>28-12</u>	<u>C4</u>			<u>30-12</u>	<u>D1</u>					<u>31-12</u>	<u>C3</u>		
<u>47-12</u>	<u>C3</u>	<u>33-12</u>	<u>D3</u>			<u>32-12</u>	<u>D2</u>					<u>34-12</u>	<u>D3</u>		
<u>50-12</u>	<u>D3</u>	<u>41-12</u>	<u>C3</u>			<u>35-12</u>	<u>C3</u>					<u>39-12</u>	<u>D4</u>		
		<u>43-12</u>	<u>D1</u>			<u>37-12</u>	<u>C4</u>					<u>44-12</u>	<u>C4</u>		
		<u>45-12</u>	<u>C4</u>			<u>38-12</u>	<u>D3</u>								
		<u>48-12</u>	<u>D3</u>			<u>40-12</u>	<u>C1</u>								
						<u>42-12</u>	<u>D3</u>								

2012 Breakdown of Site Nuclear Events

BNSO		COMDEV		NBRSD		SHPFO		TXB		PAG		SATCO	
09-12	C3	02-12	C3	04-12	D4	01-12	C2	05-12	C4	27-12	D3	26-12	C2
11-12	D3	16-12	C2	14-12	C4	03-12	C2	07-12	C4				
13-12	D3	17-12	D4	15-12	D2	06-12	C3	20-12	C3				
48-12	D3	18-12	D2	35-12	C3	08-12	C2	24-12	C3				
		19-12	C4	36-12	D3	10-12	C2	28-12	C4				
		22-12	D3	40-12	C1	12-12	C2	29-12	■				
		23-12	D3			21-12	D3	37-12	C4				
		30-12	D1			25-12	C3	38-12	D3				
		31-12	C3			39-12	D4	42-12	D3				
		32-12	D2			46-12	C1						
		33-12	D3			47-12	C3						
		34-12	D3			50-12	D3						
		41-12	C3										
		43-12	D1										
		44-12	C4										
		45-12	C4										
		49-12	D3										

KEY:

Radiological Controls

Nuclear Procedures

Contaminated Waste Control

Process & Controls

Communication

Maintenance

Defective / Damaged Equipment

Positive Event

2012 Breakdown of Site Nuclear Events by Location

[REDACTED]		[REDACTED]		[REDACTED]		[REDACTED]		[REDACTED]		[REDACTED]		[REDACTED]		[REDACTED]			
<u>02-12</u>	<u>C3</u>	<u>22-12</u>	<u>D3</u>	<u>31-12</u>	<u>C3</u>	<u>30-12</u>	<u>D1</u>	<u>17-12</u>	<u>D4</u>	<u>01-12</u>	<u>C2</u>	<u>05-12</u>	<u>C4</u>	<u>18-12</u>	<u>D2</u>		
		<u>23-12</u>	<u>D3</u>	<u>32-12</u>	<u>D2</u>							<u>06-12</u>	<u>C3</u>				
		<u>24-12</u>	<u>C3</u>	<u>34-12</u>	<u>D3</u>							<u>12-12</u>	<u>C2</u>				
		<u>25-12</u>	<u>C3</u>	<u>43-12</u>	<u>D1</u>							<u>28-12</u>	<u>C4</u>				
		<u>41-12</u>	<u>C3</u>	<u>44-12</u>	<u>C4</u>												
		<u>45-12</u>	<u>C4</u>	<u>49-12</u>	<u>D3</u>												
		<u>48-12</u>	<u>D3</u>														
<u>TXB</u>		<u>HPG</u>				<u>7 WHARF</u>		<u>8 WHARF (S)</u>		<u>8 WHARF (N)</u>		<u>9 WHARF</u>		<u>LICENSED SITE</u>		<u>NAVAL BASE</u>	
<u>08-12</u>	<u>C2</u>	<u>03-12</u>	<u>C2</u>			<u>35-12</u>	<u>C3</u>			<u>07-12</u>	<u>C4</u>	<u>09-12</u>	<u>C3</u>	<u>19-12</u>	<u>C4</u>	<u>04-12</u>	<u>D4</u>
<u>16-12</u>	<u>C2</u>	<u>47-12</u>	<u>C3</u>							<u>20-12</u>	<u>C3</u>	<u>10-12</u>	<u>C2</u>	<u>40-12</u>	<u>C1</u>	<u>11-12</u>	<u>D3</u>
<u>27-12</u>	<u>D3</u>									<u>21-12</u>	<u>D3</u>					<u>13-12</u>	<u>D3</u>
<u>33-12</u>	<u>D3</u>									<u>42-12</u>	<u>D3</u>					<u>14-12</u>	<u>C4</u>
<u>37-12</u>	<u>C4</u>									<u>46-12</u>	<u>C1</u>					<u>15-12</u>	<u>D2</u>
<u>38-12</u>	<u>D3</u>									<u>50-12</u>	<u>D3</u>					<u>26-12</u>	<u>C2</u>
<u>39-12</u>	<u>D4</u>															<u>29-12</u>	[REDACTED]
																<u>36-12</u>	<u>D3</u>

KEY:

RADIOLOGICAL
CONTROLS

NUCLEAR
PROCEDURES

CONTAMINATED
WASTE
CONTROLS

PROCESS &
CONTROLS

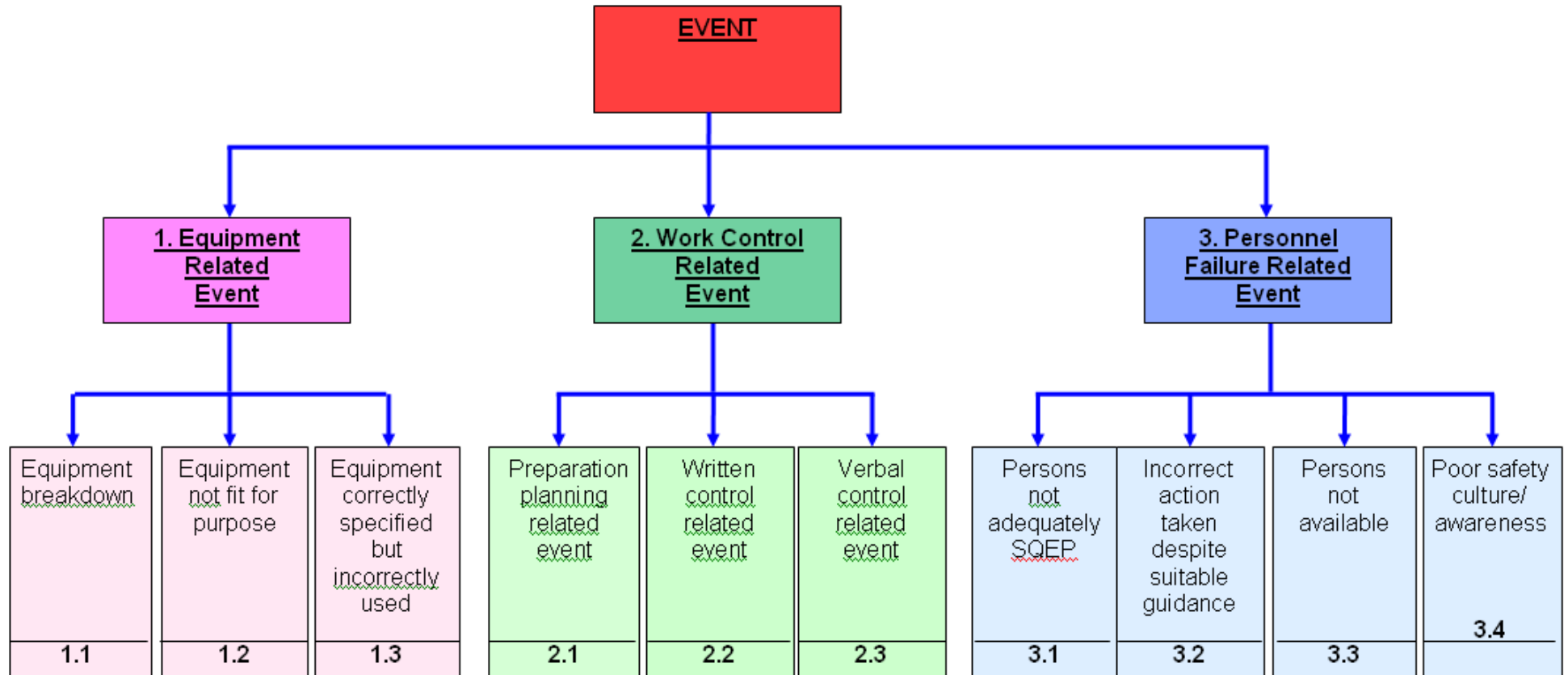
COMMUNICATION

MAINTENANCE

DEFECTIVE /
DAMAGED
EQUIPMENT

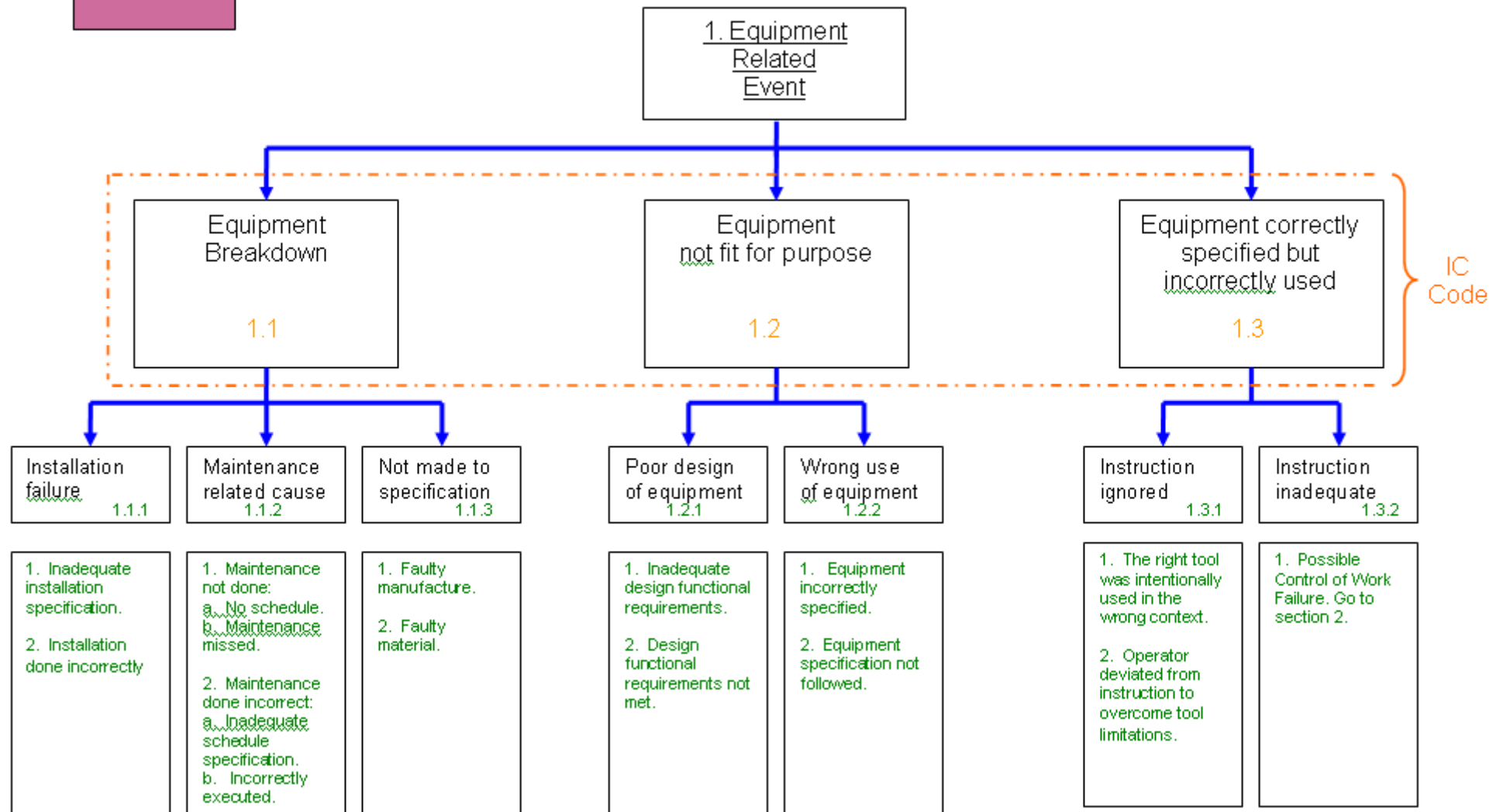
POSITIVE
EVENT

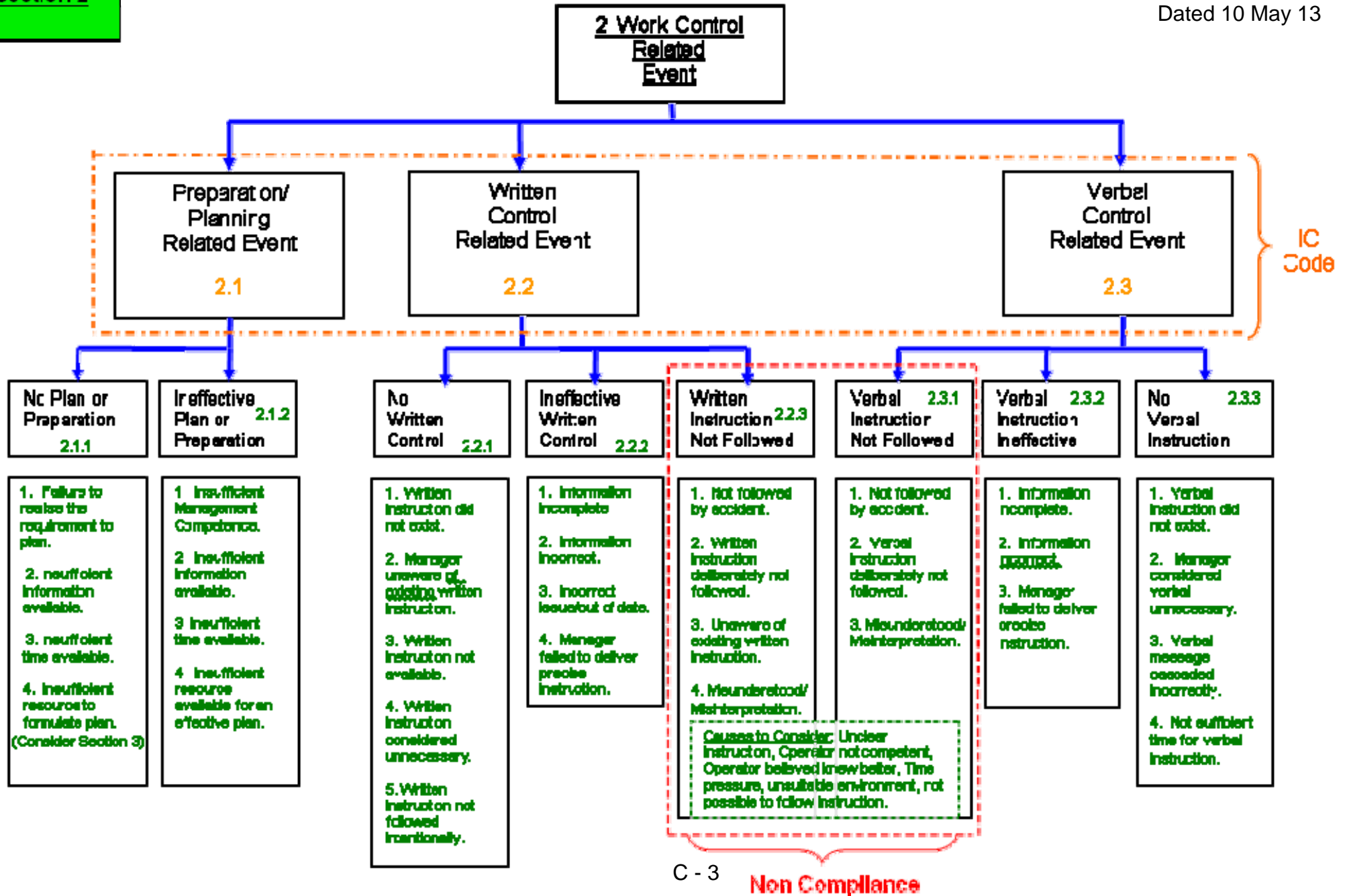
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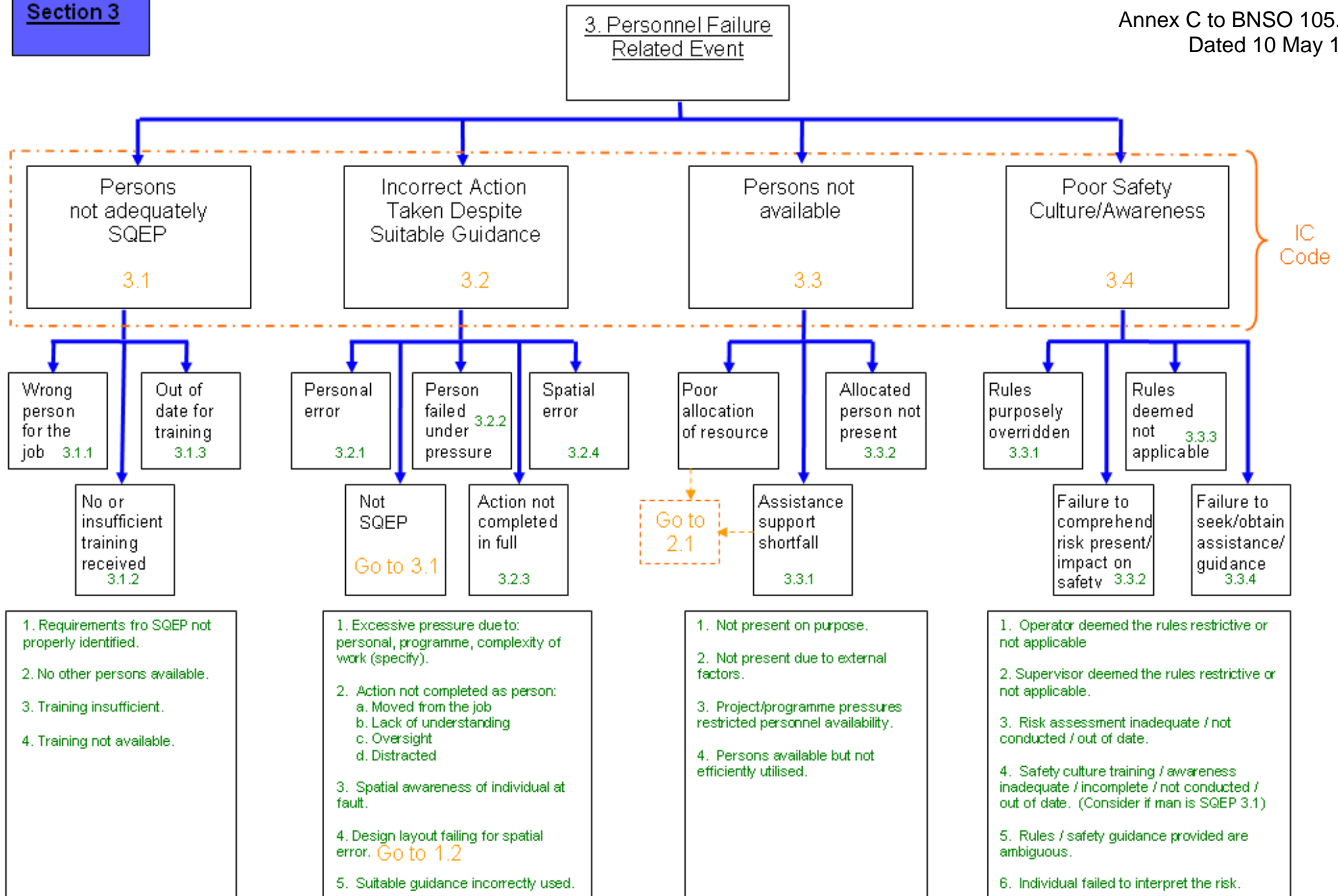


Nuclear Site Event Reporting Immediate Cause (IC) Code Determination Diagram

Section 1





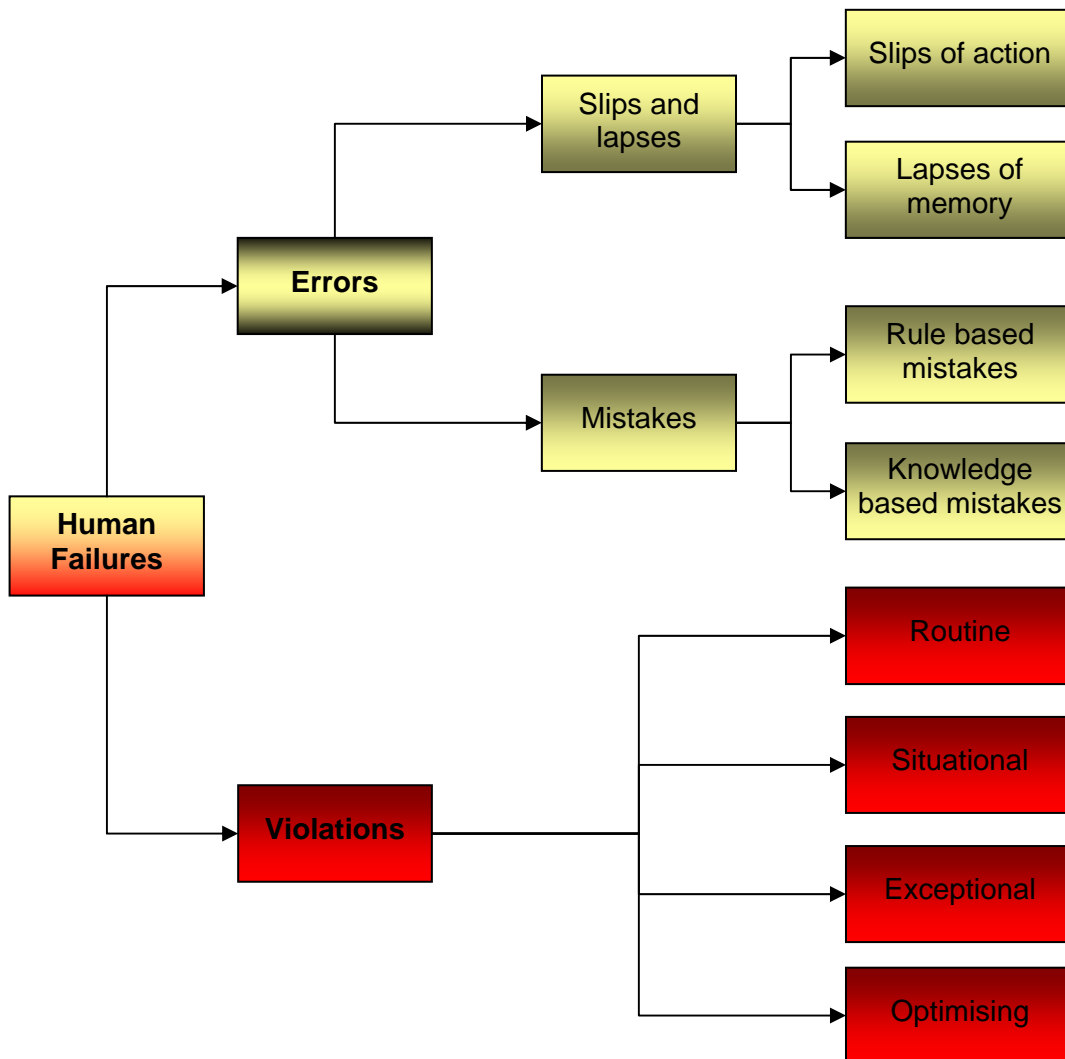


EXAMINATION OF THE HUMAN FACTORS IN NUCLEAR PROCEDURE EVENTS REPORTED DURING 2012

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
02/12	Whilst conducting [REDACTED] under NP [REDACTED], SS misread the NP and carried out steps F2, 3 and 4 concurrently. The NP does not authorise concurrent action.	9 Jan 12	Mistake-Misapplication	C	3	Ships Staff maintainer misread the NP and carried out steps concurrently, incorrectly assuring the SDS & EOOD that all work required to have been completed had been carried out prior to commencing the next step.
06/12	Whilst carrying out NP [REDACTED] - To Investigate and Repair Temporary Sampling and Dosing System, a Health Physics Monitor (HPM) was not in attendance when called upon by the NP. Additionally the Radiological Work Control Permit (RWCP) did not reflect the F Steps in the Nuclear Procedure.	8 Feb 2012	Mistake-Selectivity Optimising Violation	C	3	AHP(M), responsible for ensuring that a detailed Radiological Risk Assessment was raised and made available to the Health Physics Foreman (HPF), did not complete this task. The Radiological Work Control Permit was generated by the HPF against an earlier draft issue of the NP rather than the final issue. As a result the steps identified on the RWCP requiring HP attendance did not align with the issued NP.
09/12	Fitters were observed to use ordinary spanners to apply uncontrolled torque in an attempt to "squeeze up" on leaking PCD connection flange during air test. The procedure states that the fastenings are to be tightened, using a torque wrench, to 74Nm.	11 Mar 12	Optimising Violation	C	3	In their keenness to achieve a successful air test the Babcock Fitters used spanners to apply additional torque with the aim of achieving a successful joint.
23/12	Non-compliance with a Nuclear Procedure (NP) during the release of the [REDACTED] in preparation for the fitting of Permanent Magnetic Locking Features (PMLF).	19 May 12	Mistake-Misapplication	D	3	[REDACTED] were disconnected at the manifold end rather than the [REDACTED] end as specified in the NP. The work was conducted by 2 METOWs who, although undertaking the NP for the first time, both had reasonable levels of experience.

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
27/12	As a result of OEF Event 55490 it has been identified that the Standard Discharge Nuclear Procedures 98-073 and 98-072 both tag out valve [REDACTED] but neither procedure removes the tag.	11 June 12	Optimising Violation	D	3	Submarines that have removed their respective tags from [REDACTED], without a requisite Change Notice by procedure co-ordinators , have not complied with procedural instructions.
28/12	On two separate occasions DTO Staff made amendments to the line ups of the Temporary Sampling and Dosing (TS&D) test rig connected to the primary plant without the correct Change Notice action being implemented. These amendments were non-compliant with NP [REDACTED]	27 Jun 12	Optimising Violation	C	4	The DTO Test Engineer perceived his course of actions as minor amendments to the procedure and the decisions he made were to ensure the rig was left in the safest possible This event occurred during the vacuum filling of the TS&D rig filter whilst the system was configured for inactive commissioning prior to its connection to the NSRP.
33/12	Base Staff fitters on HMS [REDACTED] were non-compliant with the authorised Nuclear Procedure, NP [REDACTED], during the [REDACTED]	12 Mar 12	Optimising Violation	D	3	The NP required the connection of the pressure test rig to the relief valve rig at a particular test point; however the rig provider / installer (MESM) do not hold the appropriate adaptor to achieve this connection. The connection was made at the relief valve rig cap connection to [REDACTED] ([REDACTED]), not iaw controlling NP.
41/12	It was identified that the SRC PAG Authorised Nuclear Procedure, NP [REDACTED] to [REDACTED] to [REDACTED] stub on HMS [REDACTED], specified an incorrect component for connecting the test rig to [REDACTED]. An alternative arrangement, subsequently fitted without appropriate authority, was non-compliant with the approved drawing.	19 Oct 12	Optimising Violation	C	3	MESM Fitter used a composite adaptor outwith the specification of the authorised NED drawings. The error in the controlling NP was identified at the time by the MESM fitter and highlighted, correctly, to the duty NP co-ordinator.

NSER	Description of Event	Event Date	Cause	Event Code A-D	Freq Code	Remarks
43/12	Whilst conducting a BNSO audit of the Nuclear Procedures (NPs) in force on HMS [REDACTED], a discrepancy was discovered between the authorised Nuclear Logic and a NP in force.	7 Nov 12	Familiarity Slip	D	1	The typographic error that resulted in the discrepancy should have been noticed by the procedure co-ordinators
45/12	HMS [REDACTED] failed to raise an Environmental Risk Assessment prior to conducting a cold move into the Licensed Site. This is required by [REDACTED] for a submarine with a nitrogen bubble in the Pressuriser.	11 Jun 12	Memory Lapse Familiarity Slip	C	4	One of the pre-requisite steps was missed by procedure co-ordinators from the NP; the ERA was not raised prior to the Submarine's entry onto the Licensed Site. Multiple failures by procedure co-ordinators to adequately scrutinise the NP's pre-requisite steps once the "F-Steps" of the procedure had commenced.
48/12	Gauges of the wrong range fitted to Test Rig supplied by DTO for testing [REDACTED] on HMS [REDACTED] during conduct of NP [REDACTED]. Procedure non-compliance - Gauges specified in NP were [REDACTED] but [REDACTED] gauges were supplied.	11 Nov 12	Situational Violation	D	3	The DTO Test Engineer was undertaking the test under the co-ordination of Ships Staff. Although familiar with NP controlled work this is not something he did regularly. When [REDACTED] were requested from the store they were unavailable. The test engineer, without visibility of the requirement of the NP and using his engineering and testing experience made the decision that a [REDACTED] would give adequate resolution and therefore substituted the [REDACTED] alternative.



Summary of Principle Error Types¹⁸

¹⁸ Reason, J. (1997), *Managing the Risks of Organizational Accidents*. Aldershot: Ashcroft Publishing Ltd.

SLIPS & LAPSES (Failure in Action)			
SKILL BASED			
During routine and familiar tasks where resulting action is not as intended, ie., not doing what you meant to do			
Familiarity Slips	Similarity Slips	Association Slips	Memory Lapse
A simple, frequently performed action goes wrong, typically when our attention is diverted and we fail to monitor our actions.			Memory lapse; omission to execute an action as planned: Forgetting to indicate at a road junction Missing a step in a procedure
Where something familiar "takes over" a less familiar task; Missing an intended turning to continue on a well travelled route Dialling a frequently used telephone number when intending to dial a similar one	Activating the indicators instead of operating windscreen wipers Starting the wrong pump (right action, wrong object) Moving a switch up instead of down (wrong action, right object)	Making a faulty connection between two ideas, often where an external stimulus typically provokes a certain response; Reacting to one alarm as if another was going off	

MISTAKES (Failure in Planning)			
RULE BASED	KNOWLEDGE BASED		
Failure in the selection of an objective or plan believing it to be right	When improvising, failure in the selection of an objective or plan believing it to be right		
Misapplication	Availability Bias	Confirmation Bias	Selectivity
Based on remembered rules and procedures where error occurs due to misapplication of a good rule or application of a bad rule; Ignoring a real alarm, following a history of spurious alarms Misjudging an overtaking procedure in an unfamiliar, underpowered car.	Individual has no rules or routines available to handle an unusual situation: resorts to first principles and experience to solve problem; Relying on an out of date map to plan an unfamiliar route. Misdiagnosing a defect and taking inappropriate corrective action.	Interpreting ambiguous scenes to reach an explanatory model then seeking confirmation, disregarding contrary information.	Attention is directed to aspects of current problem that is perceptually salient in preference to logically important aspects

VIOLATIONS (Non compliance/Rule breaking)			
Deliberate deviation from rules, procedures, regulations etc. Knowingly taking short cuts or failing to follow procedures to save time or effort, often well meaning and sometimes encouraged by management for "getting the job done".			
Routine	Situational	Exceptional	Optimising
Normalisation of non-compliance: General acceptance that the rule no longer applies, characterised by lack of enforcement; High proportion of motorway drivers drive at 80mph.	Non-compliance dictated by situation specific factors – non-compliance may be the only perceived solution to an impossible task; Speeding to reach a meeting on time Failing to isolate machinery correctly to meet a deadline.	Attempting to solve a novel problem in highly unusual circumstances: taking a calculated risk in breaking rules; Exceeding safety limits	Personal or organisational convenience: to get the job done more conveniently or for personal thrill seeking.

Examples of Slips, Lapses, Mistakes and Violations.