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**Contractor Guide  
for  
PERFORMANCE ANALYSIS**

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## PERFORMANCE ANALYSIS

### Introduction

This document provides guidance for conducting site-level performance analysis of events, such as those reported in ORPS, and of conditions, such those found during assessments.

Performance Analysis is a systematic review data of interest to identify common causes and conditions and then to identify those with an unacceptably high frequency such that appropriate corrective actions can be developed and implemented. The goal is to prevent a more serious event or an unacceptable repeat of the events.

This methodology is used for identifying recurring events for reporting as required by ORPS and for identifying recurring conditions that may warrant additional analysis and corrective action. This document provides a methodology (including key process elements) for the successful completion and documentation of the analysis and results. This guidance meets the requirements in DOE Manual 231.1-2 *Occurrence Reporting and Processing of Operations Information*.

This methodology is also used for identifying programmatic PAAA noncompliances for reporting to the DOE OE Noncompliance Tracking System (NTS). NTS-reportable PAAA noncompliances include noncompliances that are repetitive, and noncompliances that indicate a common breakdown in a program or program area and are caused by systemic problems having a common underlying cause.

The overall process of performance analysis, from data gathering to reporting the results, is diagramed in Appendix A.

### Discussion

There are many business reasons for a site-level performance analysis process and for ensuring corrective actions are taken to correct causes and conditions and to prevent recurring events and PAAA noncompliances. These include ongoing protection of the workers, the public and the environment; improving the cost effectiveness of operations; avoiding the costs resulting from recurring or repetitive events, preventing violations and civil penalties associated with the failure to effectively correct and prevent problems, and increasing the margin of regulatory and customer confidence.

The DOE has:

- Provided a clear expectation that the contractor will perform ongoing quarterly analysis of events during a 12-month period to look for trends in DOE M 231.1-2 *Occurrence Reporting and Processing of Operations Information*.

- Required a performance analysis to evaluate occurrences of all significance categories plus non-reportable events.
- Described an acceptable approach for conducting the performance analysis as described in DOE G 231.1-1 *Occurrence Reporting And Performance Analysis Guide*, section 3.0 “Performance Analysis”.
- Add PAAA requirements
- Add 851 requirements

## **Definitions**

1. **Condition** – Any as-found state, whether or not identified by an event or assessment, that may have adverse safety, health, quality assurance, operational or environmental implications. In this guidance, the term condition can be errors in calculation, anomalies associated with design or performance, items indicating a weakness in the management process, or identified noncompliances.
2. **Cluster Analysis** – The classification of elements into uniquely defined subgroups.
3. **Event** - Something significant and real-time that happens (e.g., pipe break, valve failure, loss of power, environmental spill, earthquake, tornado, flood). Events are reported and tracked in the ORPS or in local non-ORPS reportable databases.
4. **Groupings** – Selected elements on which data searches and sorts are performed. Groupings can be made up of one or more elements.
5. **Non-ORPS Reportable Event** - An event or condition identified by the site for tracking that falls below any threshold for a reportable occurrence.
6. **NTS** – DOE Office of Enforcement’s centralized noncompliance tracking system for reporting and tracking PAAA and worker safety and health noncompliances that are repetitive and programmatic.
7. **Occurrence Reporting and Processing System (ORPS)** - An unclassified, centralized DOE database containing Occurrence Reports from the DOE community.
8. **Occurrence Report** - A documented evaluation of an event or condition that is prepared in sufficient detail to enable the reader to assess its significance, consequences, or implications, and to evaluate the actions being proposed or employed to correct the condition or to avoid recurrence. Occurrences are tracked in the DOE Occurrence Reporting and Processing System.
9. **Occurrence** – A single or recurring event or condition that adversely affect, or may adversely affect, DOE (including NNSA) or contractor personnel, the public, property, the environment, or the DOE mission. Events or conditions meeting the

criteria threshold identified in DOE M 231.1-2, or determined to be recurring through performance analysis, are occurrences.

10. **PAAA** – Price Anderson Amendments Act authorizes DOE to enforce the nuclear safety rules.
11. **Pareto Charts** – Displays the frequency of events, conditions or causes to identify those items that are most frequent and require more in-depth analysis or action to eliminate defects.
12. **Recurring occurrence** – A series of two or more events determined by performance analysis to have an unacceptably high frequency and severity.

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## **GUIDANCE FOR PERFORMING PERFORMANCE ANALYSIS**

### **1.0 Purpose**

This document establishes a systematic approach for conducting performance analysis. Performance analysis is a systematic review of events reported in ORPS and non-reportable events to identify possible recurring occurrences. Repeated events are not necessarily recurring occurrences and vice versa.

Performance analysis is also a systemic review of site-reportable PAAA noncompliances to identify NTS- reportable PAAA noncompliances.

Events may recur when the apparent cause analysis for an individual occurrence was not effective in determining the cause, or when the corrective actions taken to resolve the causes were not effective. In each case, repeated events should be reviewed to determine if they should be classified as potential recurring occurrences. If a series of two or more events with common causes or conditions is determined by performance analysis to have an unacceptably high frequency, a recurring occurrence is reported. The common causes or conditions are then analyzed such that appropriate corrective actions can be developed and implemented to prevent more serious events.

Performance analysis is the method used to identify recurring events and conditions, repetitive or programmatic PAAA noncompliances, and repetitive or programmatic 10CFR 851 noncompliances for more in-depth causal analysis. These conditions and events can be analyzed by several methods to identify the underlying cause and possible latent organizational weaknesses.

DOE requires contractors to determine and report the apparent cause of all occurrences above significant category 4. A root cause analysis is also required for occurrences at significant category OE, 1 and R.

There are many causal analysis methods that can be used to evaluate an event or condition. Apparent causes analysis is the method for analyzing occurrences that are significant category 2 or 3, which are the significant portion of all occurrences. For most occurrences, knowing the apparent cause is sufficient to determine the appropriate corrective action. A more in-depth analysis of a single event may not yield additional insight and would not change the corrective action. In addition, the apparent cause analysis method provides DOE with the capability to analyze events across the complex.

### **2.0 Performance Analysis Process**

The performance analysis process includes seven basic steps:

- (1) collecting and compiling data;
- (2) determining elements and groupings of the data for analysis;
- (3) analyzing the data based on the defined groupings;

- (4) identifying potential recurring occurrences (ORPS) or repeated noncompliances(PAAA and 851);
- (5) reviewing the results with senior management for approval.
- (6) documenting the results of the performance analysis
- (7) identify corrective actions

Although much of the data will be reviewed by personnel with expertise in analysis and the data, the overall process will likely involve many different health, safety and environmental protection specialists and managers. This, of course, will depend on the contractor's organizational structure and assigned roles and responsibilities.

### **3.1 Collect and Compile Data**

The parameters for the data should be established and used consistently to allow for comparisons between analysis results. For example, DOE Manual 231.1-2 requires analysis of all events during the previous twelve-month period, at least. This time period should remain constant for each of the quarterly analysis. If conditions from assessments are included in the analysis, then the variations caused by assessment frequencies, subjects or types need to be considered and addressed in the analysis.

DOE requires contractors to include site-specific data for non-reportable events in the analysis, as available. Examples of non-reportable events may include illness and injury reports, radiological does and events, and minor spills, emergency response logs or conditions identified by assessment results.

The analyst will need to determine the minimum set of information needed for successful analysis. Contractors may choose to establish additional internal reporting requirements in order to have the information they need to conduct the analysis. For example, the significance category 4 occurrences, the non-reportable occurrences and conditions found by assessments may not have cause codes, unless required by the contractor.

Once the data needs are identified and collected for the occurrences and the selected conditions, the data needs to be entered into a single database as it becomes available and formatted to facilitate analysis. The data will need to be reviewed to ensure it is complete, accurate, and does not include duplicate entries.

### **3.2 Determine Elements and Groupings**

The analyst will sort the data into appropriate groupings based on the elements to be analyzed. Selected groupings should include elements such as cause codes, reporting criteria, organization, time, and significance category. Analysis results will be more definitive if the groupings include comparable elements. For example, if the groupings include only Final reports, then the elements will be final elements. If the DOE Headquarter key words are available, they should be considered for grouping. The analyst may want to look at corrective actions in the analysis to identify common elements. The

contractor determines which groupings should be used based on current and previous analyses.

### **3.3 Analyze Data**

The techniques discussed below provide a framework to assist in conducting performance analysis. While the methods described below can be used to analyze event data, other site-specific processes can also be used to support this activity.

The analyst examines trends and data considering “Who”, “What”, “Where”, “When” and “How” the event occurred. The first step is to identify which events appear to be different from the other events. The analyst then determines the relationship the elements have together within the context of the subject or grouping. The count of items in itself does not yield useful results, the analyst will need to understand the occurrences and their significance.

#### **3.3.1 Pareto Charts**

In a Pareto chart, the analyst graphs the number of items (events, causes codes, facilities/operations/organizations) within a chosen grouping. Pareto charts can be used to visually display the major contributor to a grouping and help identify areas for further analysis. This analysis will include a comparison between what is found and what is expected.

The groupings should be chosen to avoid displaying what is expected and focus on identifying unexpected differences. For example, when preparing a Pareto chart on electrical shocks, it would not add value to compare the maintenance organization to other programmatic organizations, because the maintenance organization has more frequent opportunity for electrical shock. It may be valuable; however, to compare the programmatic organizations with similar expected frequencies.

Example of Pareto chart is displayed in Appendix C.

Questions to ask when reviewing Pareto charts may include:

- What is the most frequent common underlying cause for a series or group of events?
- Do related series or groups of events, having the same underlying cause, occur most frequently within a single organization, facility or operation?
- Have multiple control failures within the boundaries of a single grouping taken place indicating a common breakdown in a program or area of a program?
- Do the causal factors of a series or group of events indicate possible systemic problems?

### 3.3.2 Trend Charts

Trend charts compare the number of events over time. They can be used to measure the significance of performance in a single point of time compared to the past and to project future performance. Using a trend chart, the analyst can determine the impact of actions taken and whether corrective actions are effective. In evaluating trend charts, one must consider what variable that may affect the number of events identified. If the definition of the event is changed or an activity has been added to increase the likelihood of identification and reporting, the trend results will be affected.

An example of control chart is displayed in Appendix C.

Questions to ask when reviewing trend charts may include:

- Did the trending data for the series or group of events indicate a significant negative trend?

### 3.3.3 Control Charts

Control charts are trend charts with confidence limits. They are used to identify acceptable levels of variability, either common cause or special cause, and to alert the analysts of the occurrence of an unusual number of events. By establishing control charts, one can analyze process variability and determine when something unusual is present. The use of control charts can show if the process is in “statistical” control so that an over-reaction to events can be avoided. Process control charts can show gradual trends toward the established limits so that those in direct control of the operation can avoid an abnormal event. In the example of electrical shocks, the frequency of electrical shocks at different energy levels can be graphed and compared to an expected and acceptable limit and to an unexpected and unacceptable frequency limit.

An example of control chart is displayed in Appendix C.

Questions to ask when reviewing control charts may include:

- Is the frequency of an event or cause acceptable to the successful completion of the task or activity?
- Is there significance to the most frequent cause of an event?

### 3.3.4 Relationship Analysis

In addition to looking at events, the apparent causes of dissimilar events may be related and should be analyzed. This is the point at which the analysis results provide insight into management, operations and programs. For the most part, first level reporting is required based on the consequences of an event or the seriousness of the noncompliance. This analysis looks at underlying causes of multiple events and of multiple noncompliances. The analyst looks for indications of an ineffective or weak program, a common

underlying cause, or indications of a breakdown in management control. In cases where the cause of the problem involves human performance, it is necessary to examine the human performance cause code couplets to determine the error precursors and latent organizational weaknesses that may have contributed to the human performance problem.

Questions to ask when looking for commonality across dissimilar events may include:

- Do apparently isolated series or groups of events identified within various aspects of an overall program collectively indicate a program weakness?
- Do the apparently isolated series or groups of events indicate a series of common work process breakdowns or a series of common issues?

### **3.4 Identifying and Analyzing Potential Problems**

If a series of two or more events with common causes or conditions under the control of the contractor is determined by performance analysis to have an unacceptably high frequency, a recurring occurrence is identified.

If the data analysis results in the identification of potentially NTS reportable nuclear safety or worker safety and health non-compliances, the results are presented for review by senior managers. If a series of noncompliances are considered repetitive or if they indicate a common breakdown in a program or program area and are caused by systemic problems having a common underlying cause, a report is filed with NTS.

### **3.5 Management Review**

If the data analysis results in the identification of potential recurring occurrences or potentially NTS reportable nuclear safety or worker safety and health non-compliances, the results are presented for review by senior managers. The senior managers discuss the results of the performance analysis and validate the analysis. They may request additional investigation, as needed. Senior management collectively determines the recurring occurrences that must be categorized and reported as a Significance Category R occurrence in the ORPS.

The management review is an important element of the overall performance analysis process. Having a thorough and dynamic management review not only ensures that there are appropriate focuses and proper balances in the analysis process, but also confirms that management owns the process and the results of the process.

### **3.6 Document the Performance Analysis**

The performance analyst documents the results of the analysis including the identification of recurring events in a report. If the analysis results in potential recurring occurrences that are determined to not meet the criteria for reporting in ORPS as recurring, they are placed on a watch list.

DOE requires contractors to identify recurring occurrences and report these in ORPS and repeated non-compliances and report them in the PAAA and 851 Noncompliance Tracking system.

### **3.7 Identify Corrective Actions**

Often, the recurring issues identified through performance analysis will be at the contractor level and can only be addressed by senior management commitment (a single department cannot “solve the problem”). In addition, huge benefits of a robust management review process are the enabling opportunities for awareness of emerging trends, resulting in proactive management opportunities to possibly prevent “recurring” issues.

The recurring occurrences should be evaluated using a more in-depth causal analysis. Examples of more in-depth causal analysis include: root-cause analysis, five-whys, MORT analysis, and symptom-problem-cause analysis. The goal is to identify the latent organizational weaknesses that caused the recurrence and had not been previously identified in the apparent cause analysis.

Often when previous corrective actions have been ineffective, it is because the actions had either not been implemented or because they were not the correct ones. If the actions had not been implemented, the corrective actions should be verified as appropriate to prevent recurrence and implemented. If they were not the correct actions, new corrective actions should be developed and implemented.

In determining the corrective action, senior management may request an extent of condition review to ensure that the corrective action is applied wherever the problem exists.

When the corrective actions are identified, the manager should also determine the criteria for effectiveness that will be used for the effectiveness review(s) when the actions are completed. Refer to the EFCOG Contractor’s Guide on effectiveness reviews for more information on conducting effectiveness reviews.

## **4.0 Reporting**

## EFCOG ORPS Performance Analysis Subgroup White Paper

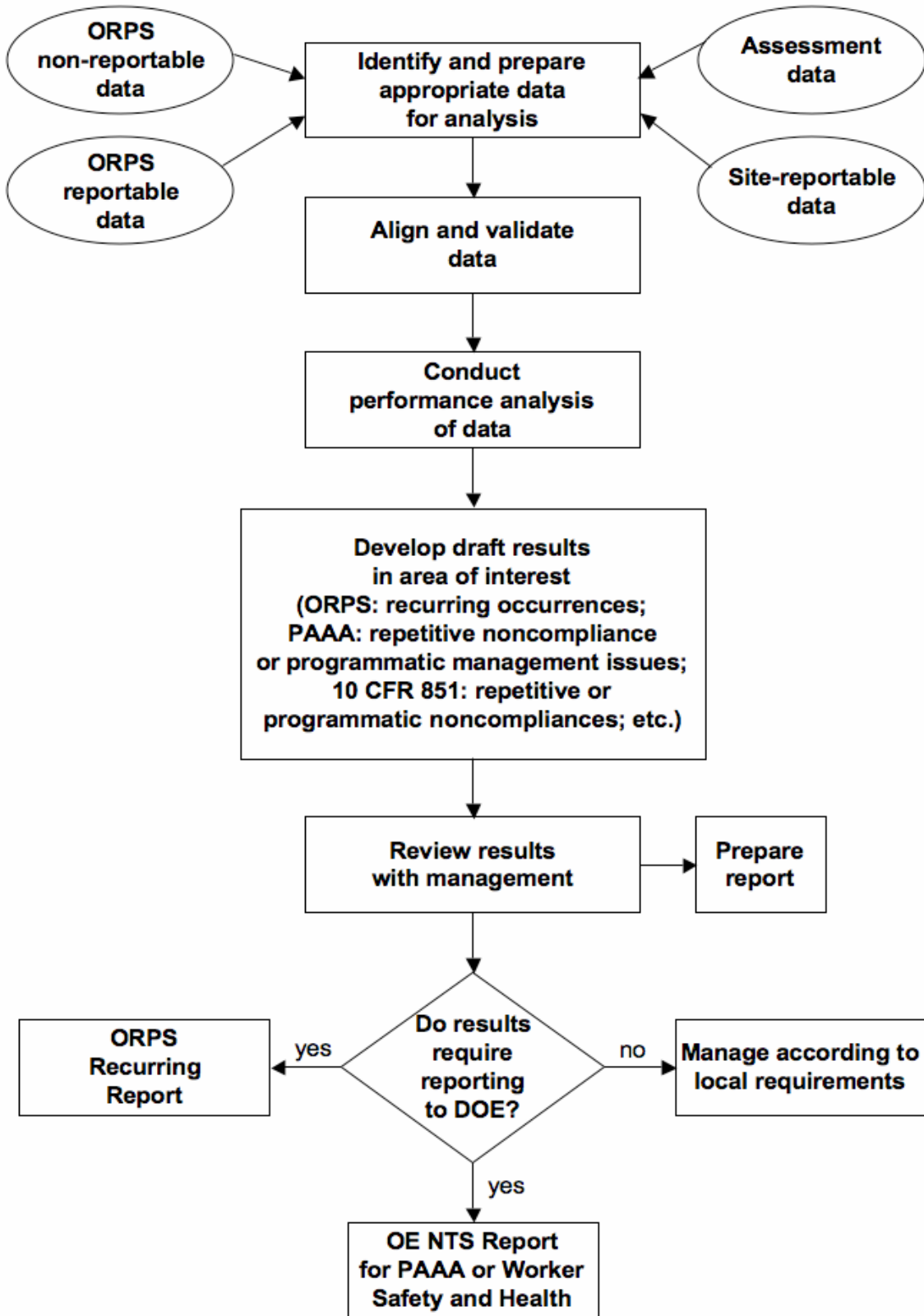
Occurrences identified as recurring should be processed according to DOE M 231.1-2, as a significance category “R” recurring event. For recurring events, the contractor should select the appropriate reporting criteria associated with the recurring issue.

Repetitive noncompliances should be reported by the contractor’s PAAA Coordinator to the DOE NTS.

### **5.0 References**

Occurrence Reporting and Processing of Operations Information, DOE M 231.1-2  
Occurrence Reporting and Performance Analysis Guide, DOE G 231.1-1  
PAAA Enforcement Guide

**Performance Analysis Process**



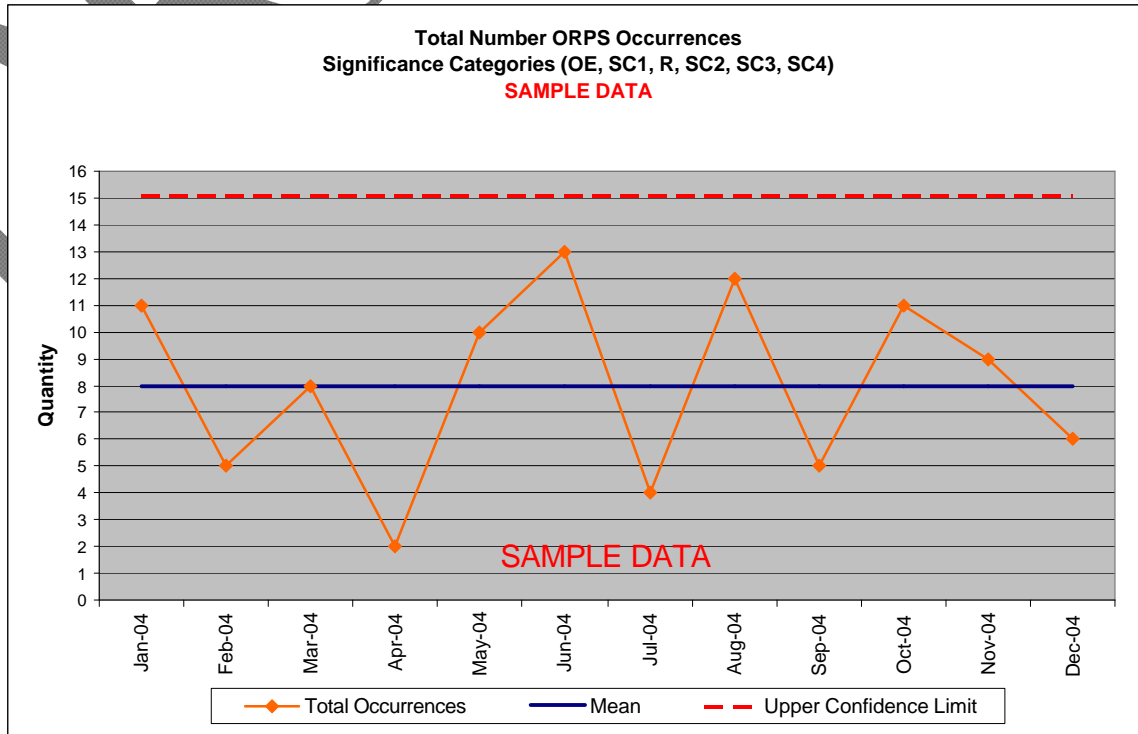
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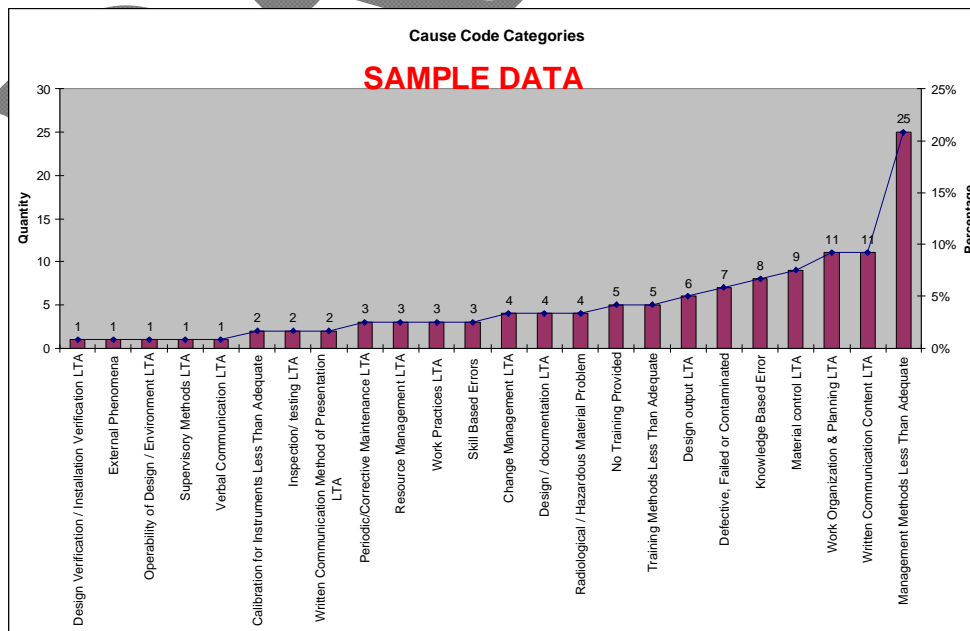
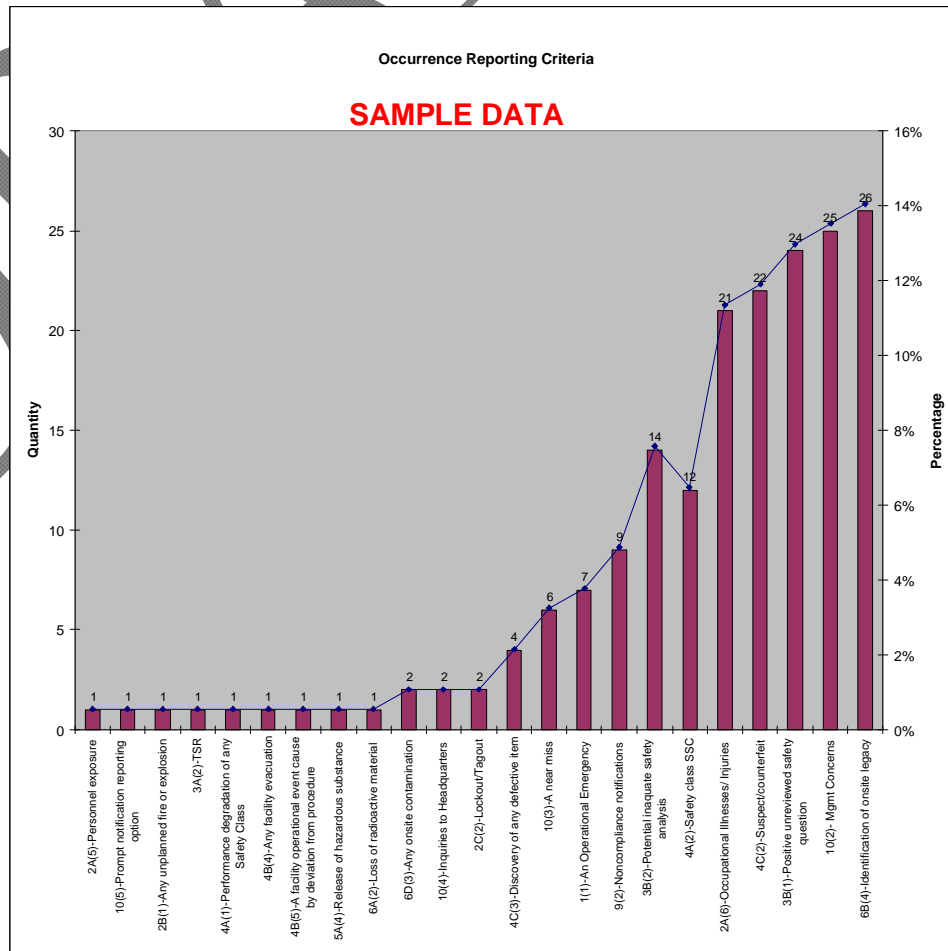
Appendix B

Statistical Charts and Matrixes

Control Chart



Pareto Charts



EFCOG ORPS Performance Analysis Subgroup White Paper

ASSOCIATED HUMAN FACTOR COUPLETS

Associated Couplet Cause Code		Human Factor A3Bx Node				Total
		B1-Skill	B2-Rule	B3-Knowledge	B4-Work Pract.	
A2-Equip/Mat'l	B2-PM	1				1
	B4-Mat'l Cont	2				2
A4-Mgmt	B1-Mthds				1	1
	B2-Res. Mgmt	6	3			9
A5-Comm	B1-Method	<b>SAMPLE DATA</b>				1
	B2-Content	1		2		3
A6-Training	B2-Training LTA	8	4	1	2	15
A7-Other	B1-External			1		1
None		2		3	2	7
<b>Total</b>		<b>21</b>	<b>7</b>	<b>7</b>	<b>5</b>	<b>40</b>

EFCOG ORPS Performance Analysis Subgroup White Paper

CROSS CUTS OF REPORTING CRITERIA AND APPARENT CAUSE CODES

**SAMPLE**

	OE	Mgmt concerns	Near Miss	Occupational Illnesses/Injuries	Fire	Lockout/Tagout	TSR	USQ/PISA	Potential LTA safety analysis	Performance degradation	Facility evacuation	Loss Rad Material	Onsite Legacy	Onsite Contamination	
CAUSE CODES	1(1)	10(2)	10(3)	2A(6)	2B(1)	2C(2)	3A(2)	3B(1)	3B(2)	4A(1)	4B(4)	6A(2)	6B(4)	6D(3)	Total
<b>A1-Design</b>															
B2-Output	1	1	1					1							4
B3-Doc LTA								1	3						4
B4-Install Verif.								1							1
<b>A2-Equip/Mat'l</b>															
B1-Calib.								1			1				2
B2-Maint.	1	2													3
B3-Insp/Test	1	1													2
B4-Mat'l Control	1			2	1										4
B6-Defect	1	2	1							1			1		6
<b>A3-Human</b>															
B1-Skill	7	9	7	9			9		6						13
B3-Knowledge	1	8	5	6			1	1	1						6
B4-Work				2		1									3
<b>A4-Mgmt</b>															
B1-Methods	1	3		1				2			1				8
B2-Resource		2						1							3
B3-Planning		1	2		1	1		1							6
B5-Change Mgmt								1				1			2
<b>A5-Comm.</b>															
B1-Methods									1						1
B2-Content	2	1	2	2	1				2						10
B4-Verbal		1													1
<b>A6-Training</b>															
B1-No Training			1	2				1							4
B2-Methods							5								5
<b>A7-Other</b>															
B1-External				1											1
B2-Rad/Hazardous													2	1	3
<b>Total</b>	<b>11</b>	<b>16</b>	<b>6</b>	<b>15</b>	<b>3</b>	<b>2</b>	<b>10</b>	<b>11</b>	<b>8</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>92</b>

**SAMPLE DATA**