Confidential Report

2 August 2001

TECHNICAL HIGH LEVEL RISK ASSESSMENT

FOR

FIRST NATIONAL BATTERY COMPANY
BENONI SOUTH, JOHANNESBURG, RSA

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Report Summary Sheet

Client:	**Client Contract No.**
First National Battery Company Benoni ,South Africa **Attention:** Mr. Charles van Aswegen **Address:** First National Battery Company (Pty) Ltd. Liverpool & Bristol Roads Benoni South Republic of South Africa	**CUA 1206**
Title of Report: Technical High Level Risk Assessment Report	
Summary: Risk Assessment of Batteries and Mining Equipment	
Keywords: First National Battery Benoni, Johannesburg Technical Risk Assessment Structured What If Technique Workshop	
Project Carried out By: Eugene Pininski	
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CONTENTS

SECTION 1

INTRODUCTION

SECTION 1

INTRODUCTION

1.1 OBJECTIVE

The objectives of this Risk Assessment was to:

- Facilitate a Risk Assessment, using the "What If" technique, for First National Battery in Benoni, Johannesburg (hereafter abbreviated as FNB), in July 2001, on a number of their manufactured equipment, which is used on the mines.

- Assist FNB in identifying possible hazards relating to the use of the equipment, and in order that the Mine Health and Safety Act, 21 of 1996 are complied with.

- Transfer knowledge to team members involved, in order that they have a better understanding of the Risk Assessment techniques and the relevant statutory requirements.

1.2 SCOPE

The scope of this assessment was confined to the following equipment:

- Motive Power Batteries and Chargers.
- Miners Cap Lamps and Charging Racks.
- Leisure Lamp and Loco Light
- Tox and Flam Alarms
- Standby Batteries

1.3 REPORTING

This particular Risk Assessment technique requires that reporting is done by exception, (Equipment discussed having **NO** risks were **NOT** recorded) and hence only equipment or articles with possible risks were recorded and have been included in this report.

1.4 ACKNOWLEDGEMENTS

IRCA is grateful for the valuable time that was made available by the FNB team for this assessment. The success of any Risk Assessment depends entirely on the correct selection and positive participation by the team members.

Secondly, appreciation is extended to FNB for arranging the facilities and refreshments for the duration of the Assessment.

1.5 TEAM MEMBERS

As per Section 13

1.6 DISCLAIMER

For each equipment one, or more, design intentions were identified. This information was contributed by the team members present at the Risk Assessment at that time and it does not necessarily indicate the only design intents, but rather the consensus opinion of the team members present at the time.

Where no hazard was identified, it does not necessarily indicate that no hazards exists. Similarly, where hazards were identified, it only reflects the opinions and experience of the team members and does not imply that no other, further hazards exist.

IRCA attempted to provide the best possible guidance to the team members in identifying possible hazards and formulating feasable recommendations, but at no stage attempted to be prescriptive.

IRCA therefore accepts no responsibility for any errors or misinterpretations that may appear in the report.

The report must be viewed as a holistic overview of possible hazards, identified by the employees themselves and contains in the recommendations only suggestions for further consideration by FNB management.

SECTION 2

EXECUTIVE SUMMARY

SECTION 2

EXECUTIVE SUMMARY

The objective of this assessment was to identify all potential hazards relating to the following FNB manufactured equipment and used on the mines.

- Motive Power Batteries and Chargers
- Miners Cap Lamps and Charging Racks
- Leisure Lamp and Loco Light
- Tox and Flam Alarms
- Standby Batteries

The purpose being, to assure that FNB defines the proper use of all equipment and that this equipment is without risk when used properly.

This executive summary contains some of the more high priority related risks, for each of the equipment, which has been extracted from the assessment database.

It is therefore recommended that these are not taken as the only risks, or are viewed in isolation, to the remainder of the report. These should be viewed in context with the other risks identified and assessed by the Risk Assessment team.

2.1 Motive Power

2.1.1 Operating and Maintenance

From the risk assessment it is recommended that the supplier Safety Rules as laid out in their Installation and Maintenance Instructions must be followed. This will help to reduce the possible risk of explosions, in particular due to the following:

- Loose connections.
- Tracking.
- Metal on connectors or terminals.
- Open flame due to welding operations etc.

It is also recommended that the FNB Installation and Maintenance and Safety Instructions to be included in each delivery of equipment. This will help to ensure users are aware of the safety rules.

2.1.2 Procedures and Standards

Only certified people are to carry out charging and changing of batteries and the charging procedures and standards are to be displayed at all times.

2.2 Charging Racks

2.2.1 Operations

For the charging of cap lamp assemblies, it is recommended that the quantity of units to be charged does not exceed the maximum charger capacity of 204 units.

2.2.2 Equipment Changes

It is recommended that the existing wooded charging racks be phased out as these can pose a physical hazard due to a wooden rack burning. This could be caused by loose connections or a poorly maintained resistor spring.

2.3 Miners Cap Lamp

2.3.1 Operations and Standards

- High risk areas and consequences in which users need to be made aware of and addressed are:
    - Lock Pin tampering
    - Switch Knob tampering
    - Lock Barrel tampering
    - Poor maintenance

2.4 Loco Light

2.4.1 Statutory Equipment

It is recommended that the manufacturer and supplier of the **Portable Loco Light** has tested this equipment to ensure compliance with the Mine Health and Safety Act, 21 of 1996 as well as the IEC Standard.

It is also recommended that Maintenance and Trouble Shooting Notes be compiled for this equipment.

2.5 Tox Alarm and Flam Alarm

2.5.1 Training (In general)

It is recommended that a training programme for the users of this equipment should address both operational and maintenance requirements and should focus on the following:

- Carry out supplier's recommended maintenance and inspection procedures.

- Use of OEM parts
- Regular retraining of users
- Daily checks on equipment as per OEM instructions

2.6 Standby Batteries

2.6.1 Maintenance Programme

Proper battery maintenance procedures and instructions must be followed and the following actions should be considered:

- Transportation and storage to comply with OSH act and Lead regulations.
- FNB to include their Installation and Maintenance and Safety in each delivery.

SECTION 3

ASSESSMENT METHODOLOGY

SECTION 3

RISK ASSESSMENT METHODOLOGY

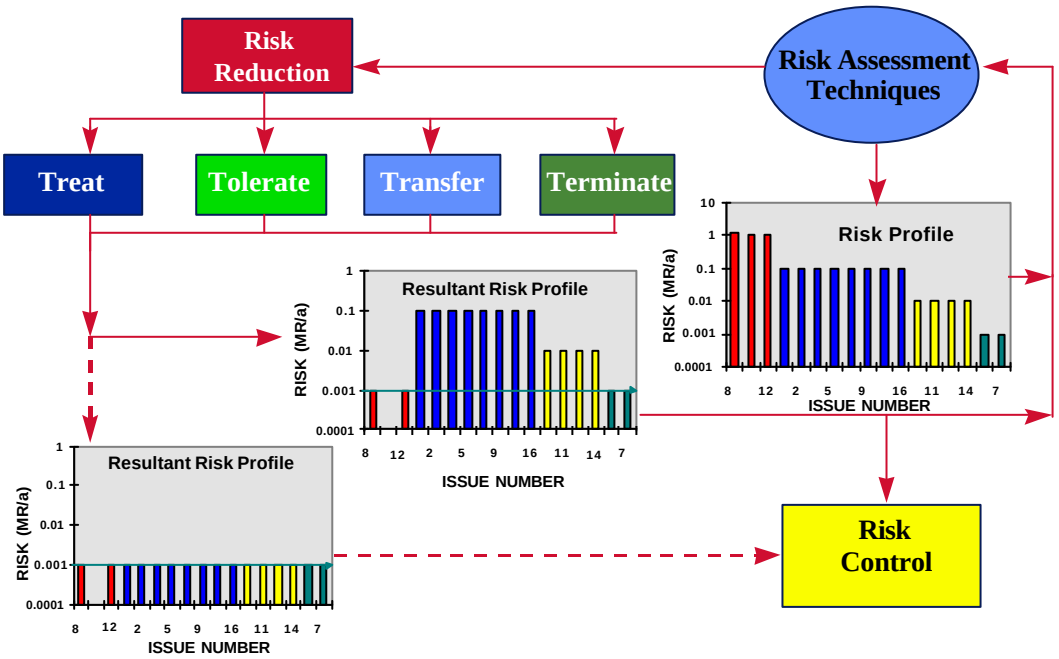
Details of the Risk Assessment methodology have been included as part of this report:

- For future reference purposes, should someone want to know exactly how and what was done for the Risk Assessment;

- To show the extent to which FNB has systematically and thoroughly reviewed the equipment. This assures that FNB has taken all "reasonably practicable steps" to identify the proper use and maintenance of the equipment available and used on the mines.

3.1 RISK ASSESSMENTS

Legislation requires that Risk Assessments be performed. This implies that organisations should identify the relevant areas of risk, quantify those risks, prioritise them, determine those, which are deemed excessive, apply suitable treatment and controls, review the resultant risk profile and repeat the process. The success of such an approach is dependent on the application of these principles. The techniques used are important, but ensuring that the process is followed to completion is the key to success. This can be demonstrated as follows:



The framework that organisations implement and the ongoing measurement of the continued application thereof should thus minimise business interruption, provide factual quantified information which can be used for decisions regarding risk management, contribute to risk reduction and provide opportunities for cost savings.

3.2 PRE ASSESSMENT REVIEW

To ensure that all possible available information was considered as part of this assessment, the following reviews were conducted.

3.2.1 STATUTORY REVIEW

The Mine Health and Safety Act, 21 of 1996 was reviewed and used in the assessment in order that relevant legal requirements were brought to the attention of the Risk Assessment team and discussed for applicability.

3.3 "WHAT IF" METHODOLOGY

The "What If" assessment technique is an effective high-level hazard identification tool. It is a thorough, systematic, team oriented analytical technique.

The "What If" is a system-oriented technique, which allows the examination of complete operations (systems) or sub operations (sub-systems). As with any Risk Assessment, the selection of, and participation by the team is vital to the outcome of the assessment.

The objective of any Risk Assessment is to methodically analyse systems and components thereof to identify potential hazards and to record them. This is an ongoing process and it is recommended that FNB do not view this What If as a "once off" assessment, as conditions (people, equipment and methods) are continuously changing.

3.3.1 ASSESSMENT PROCESS

Prior to the assessment Eugene Pininski held a familiarisation presentation with the team members, to explain the process to be used. This gave the team members a good understanding of the What If process, how hazards are identified and thereafter the risks assessed and classified.

3.3.2 SWIFT PROCESS

The Structured What If technique was used for the following reasons;

- The Structured What If Technique is good for analysing closely related equipment operations and identifying potential hazards.

- The Structured What If technique allows both equipment and sub components to be assessed.

For each equipment and sub component a design intent was defined. Section 6 details the design intent. A brainstorm session was then conducted for each equipment, to identify possible hazards. These were recorded and used as a guide, and reminder, for the duration of the assessment.

The Structured "What If" technique relies on structured questioning to determine potential risks. The questions are prompted by applying the What If question categories in turn, (see section 3.3.3 below) to each design intent, for all the equipment considered. This is a lengthy process, however if used correctly, it dramatically reduces the probability of "missing" hazards. Each hazard identified is comprehensively evaluated for causes, consequences, safeguards, risk ranking, recommendations and is recorded. The results of these records are contained in Sections 5 to 12 of this Report.

3.3.3 "WHAT IF" STRUCTURED QUESTION CATEGORIES

The Structured "What If" question categories, which were used as a basis for each equipment and design intent is as follows:

MATERIAL PROBLEMS - (MP)
Hazardous materials Availability of material Use of material Suitability of material Raw material
EXTERNAL EFFECTS OR INFLUENCES - (EE/I)
Labour unrest Civil disturbance Accidents Damage to equipment Natural causes Statutory requirements

OPERATING ERRORS AND OTHER HUMAN FACTORS - (OE & HF)
Human errors Job characteristics Communication Ergonomics Safety issues Environmental factors Quality factors
EQUIPMENT OR INSTRUMENTATION MALFUNCTION - (E/IM)
Failure modes Failure causes Failure characteristics Operator actions/non actions
PHYSICAL HAZARDS - (PH)
Slips Tripping Falling Incline Moving machinery Height/space restrictions Electricity Clearances Guarding Fire Dust
UTILITY FAILURES - (UF)
Service failure Compressed air Water Electrical power Gas supply Communication Ventilation Fuel storage Waste disposal Fire Gas storage

ANALYTICAL OR SAMPLING ERRORS (ASE)
Procedures Wrong type
PROCESS UPSETS OF UNSPECIFIED ORIGIN (PUUO)
As specified
INTEGRITY FAILURE OR LOSS OF CONTAINMENT (IFLOC)
Pressure vessels ruptured Process spillage
EMERGENCY OPERATIONS (EO)
As specified
ENVIRONMENTAL RELEASE (ER)
Pollution of ground Pollution of water Pollution of air

3.4 RISK RANKING METHODOLOGY

In order that a suitable "Level of Importance" is attached to each hazard, the hazard is allocated a "Risk Priority". The risk priority is a combination of the consequence (severity) of the event and the frequency or probability of the event (normally estimated).

3.4.1 Consequences/Severity of event

CODE	DESCRIPTION
A	Multiple Fatality and/or > R10M
B	Fatality and/or R1-10 Million
C	Reportable Injury and/or R 0.1-1 Million
D	Injury and/ or R 0.01-0.1 Million

E	Minor Injury and/or < R10 000

3.4.2 Frequency/Probability of Event

CODE	DESCRIPTION
1	Once per week
2	Once per month
3	Once per year
4	Once in 10 years
5	Once in 100 years

3.4.3 Risk Priority Ranking

CONSEQUENCE						
		A	**B**	**C**	**D**	**E**
F	**1**	**1**	**2**	**3**	**4**	**5**
R	**2**	**2**	**3**	**4**	**5**	**6**
E	**3**	**3**	**4**	**5**	**6**	**7**
Q	**4**	**4**	**5**	**6**	**7**	**8**
	5	**5**	**6**	**7**	**8**	**9**

The 9 priority codes as indicated above can further be categorised into 3 levels of criticality.

HIGHLY CRITICAL: Task/recommendation to be implemented without delay. (Priority Code 1, 2, 3).

CRITICAL: Hazards with this criticality are significant and these recommendations should be implemented as soon as practicable. (Priority Codes 4, 5, 6).

LESS CRITICAL: No major injury or financial hazards. Recommendation to be addressed when time/resources permit (Priority Codes 7, 8, 9).

3.4 RECOMMENDATION TYPE

In order that the recommendations made, are properly summarised in the report and for further follow up action, each

recommendation was categorised into one of the following recommendation types;

CODE	DESCRIPTION
A	Specify acceptance criteria
D	Design Change (capex required)
E	Engineering Change (no capex)
I	Inspection Required
L	Legal Query
M	Update Operations manual
O	Operator Training
OT	Operator and Technical Training
P	Procedure Required
Q	Equipment Change Required
R	Research Required
RA	Conduct or update Risk Assessment
S	Standard Required
T	Technical Training
W	Software Change Required

3.5 "WHAT IF" IDENTIFICATION CODES

i Systems or Operations were allocated "S" numbers for example;

S01 = Motive power

S02 = Chargers

These are detailed in Section 5 of this report.

ii System or Designs intents were allocated **"I"** numbers. The **"I"** number was re-started at 1 for each new system, for example:

S01 I01 Provide power to mobile equipment

S02 I01 To charge motive power batteries

These are detailed in Section 6 of this report.

iii Each recommendation has been allocated a unique **"R"** number e.g**. "R001"**.The complete list of recommendations are contained in sections 8, 9, 10 of this report.

SECTION 4

RISK ASSESSMENT DATA ANALYSIS

MOTIVE POWER AND CHARGERS

4.0 MOTIVE POWER AND CHARGERS

RISK ASSESSMENT DATA ANALYSIS

In this section the data contained in the Risk Assessment database has been extracted and summarised in various formats for graphical display.

GRAPH 1 - RISK PROFILE

This graph shows the total technical high level risk profile for all the issues assessed. The intent of such a profile is that FNB establishes an acceptable level of risk and then addresses all the hazards, which lie above this level down to acceptable levels. The diagram in section 3.1 depicts the Risk Management process to follow, once such a profile has been determined.
The immediate goal should be to address the top 20 to 30% of the risks identified as per the Pareto 20:80 principle.

As can be seen from this profile, the three highest risks identified are for:

- Explosions due to open flames
- Explosions due to short circuits
- Explosions due to tracking

The major focus concerning these hazards should be that the users of this equipment follow the supplier's installation and maintenance procedures and that the batteries must be covered.

GRAPH 2 - SUMMARY OF RISKS BY "WHAT IF" CATEGORY

This graph shows that the majority of hazards identified were related to operator errors or human factors (50%) as well as physical hazards (33%) in the operation and use of the equipment. This implies that the major focus must be on properly managing or engineering out the hazards that users are exposed to and ensuring that users of equipment utilise it correctly through procedures, training and task observations.

GRAPH 3 - SUMMARY OF RECOMMENDATIONS BY TYPE

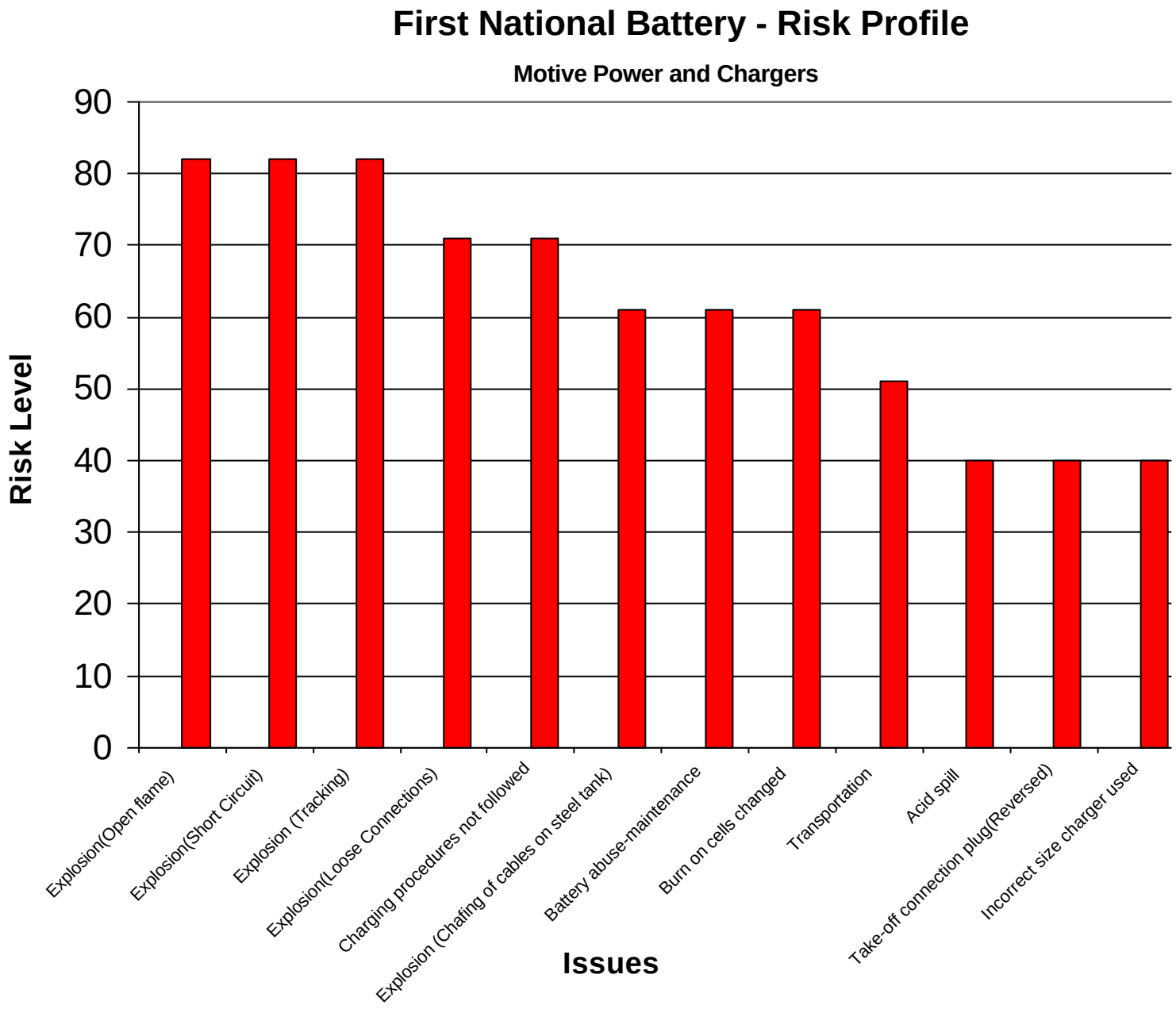
This graph indicates that the majority of recommendations are related to Standards and Procedures Required in order to ensure that the supplier's safety and installation procedures are followed. There is also the need to update Operations Manuals and to ensure that the appropriate Maintenance Manuals are current.

GRAPH 4 - SUMMARY OF RECOMMENDATIONS BY RESPONSIBILITY

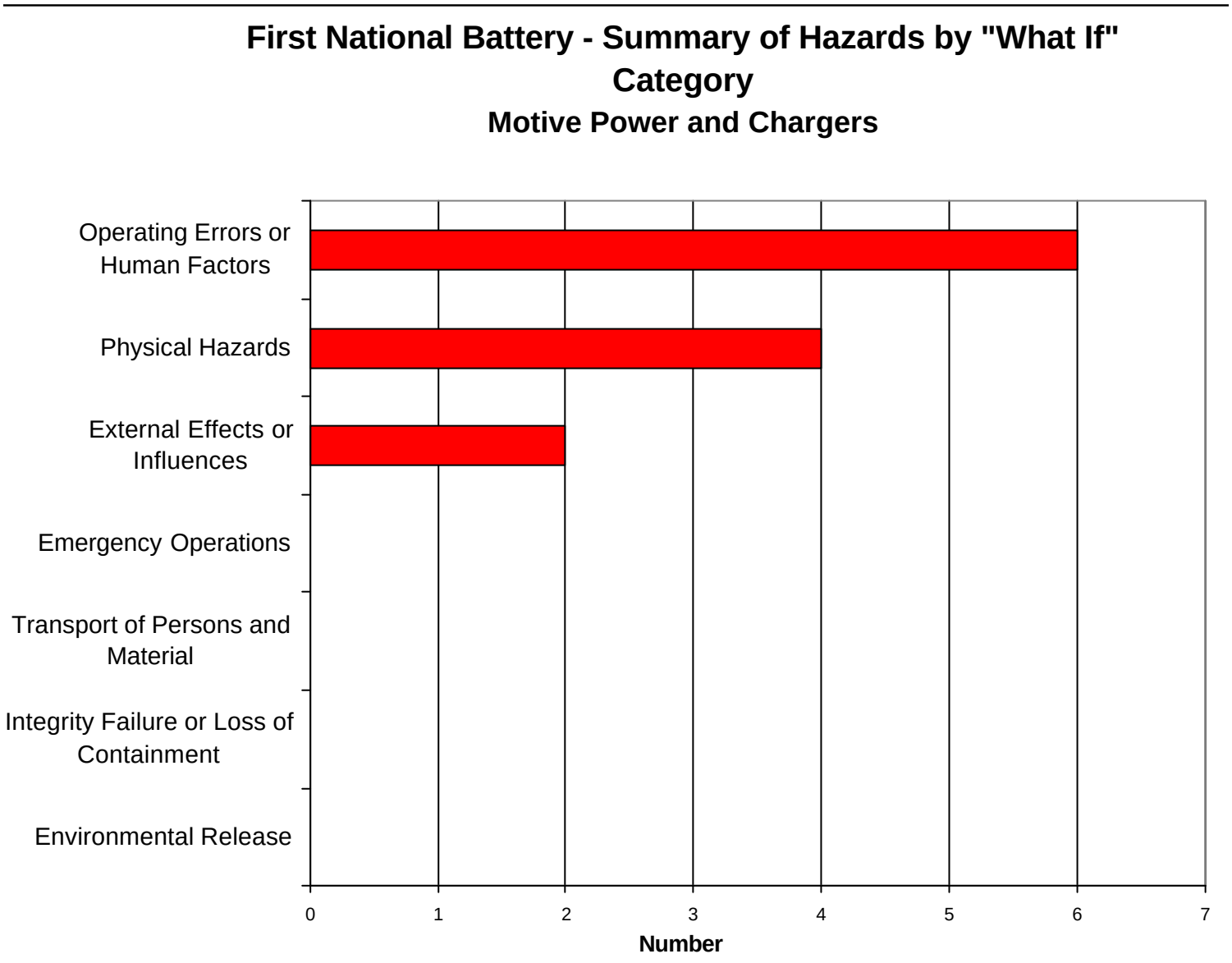
This last graph shows the recommendation responsibilities for the different managerial functions within FNB and also an indication of customer responsibilities.

The majority of responsibilities are with the customer, being the users of the equipment. There are also tasks allocated to the Technical Service Manager, which ties up with the issue that FNB needs to combine all safety rules in one paragraph in the Installation, Maintenance and Safety instructions in order for users to be made aware of hazards which could arise.

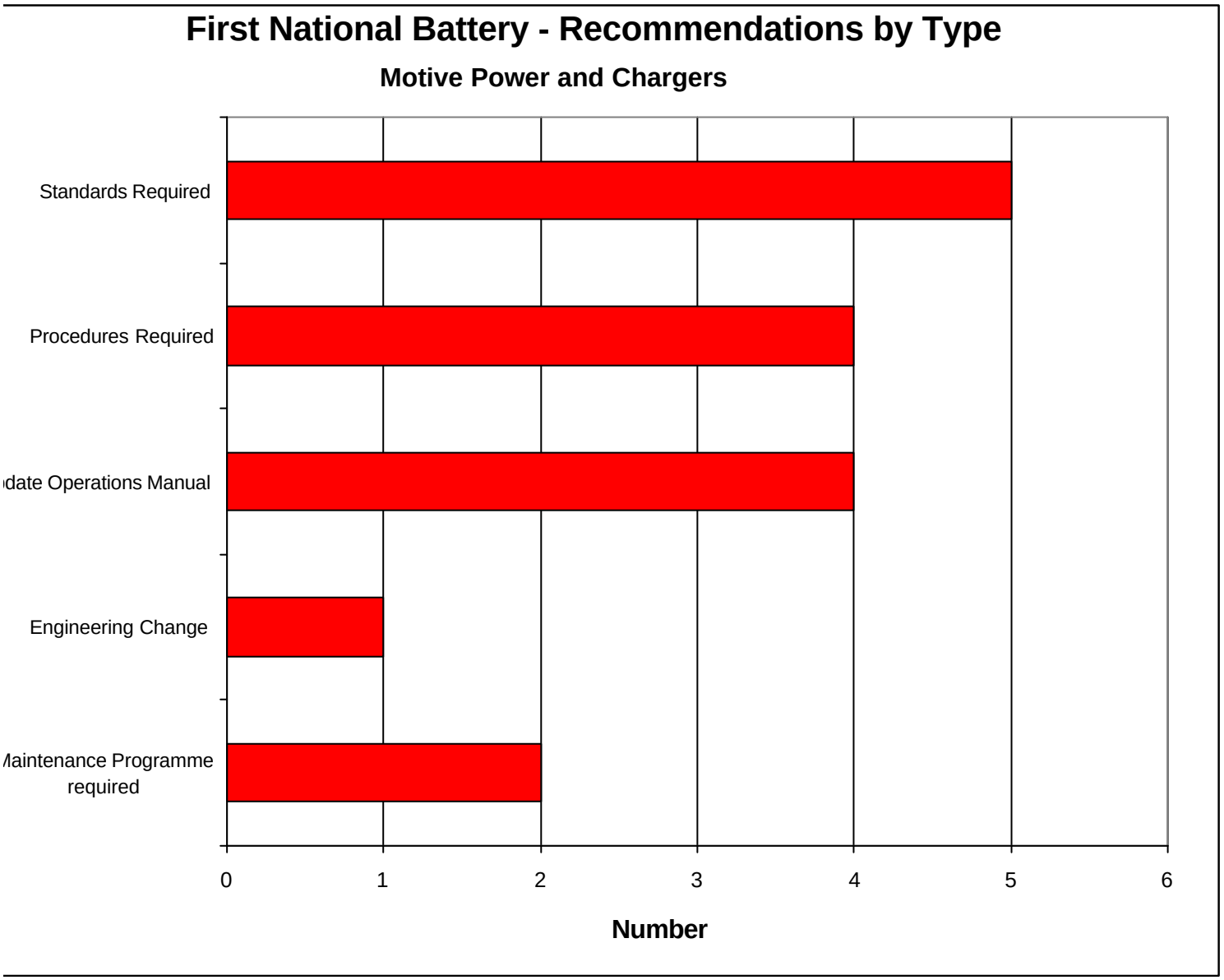
Graph 1


First National Battery - Risk Profile
Motive Power and Chargers
Risk Level
90
80
70
60
50
40
30
20
10
0
Explosion(Open flame)
Explosion(Short Circuit)
Explosion (Tracking)
Explosion(Loose Connections)
Charging procedures not followed
Explosion (Chafing of cables on steel tank)
Battery abuse-maintenance
Burn on cells changed
Transportation
Acid spill
Take-off connection plug(Reversed)
Incorrect size charger used
Issues

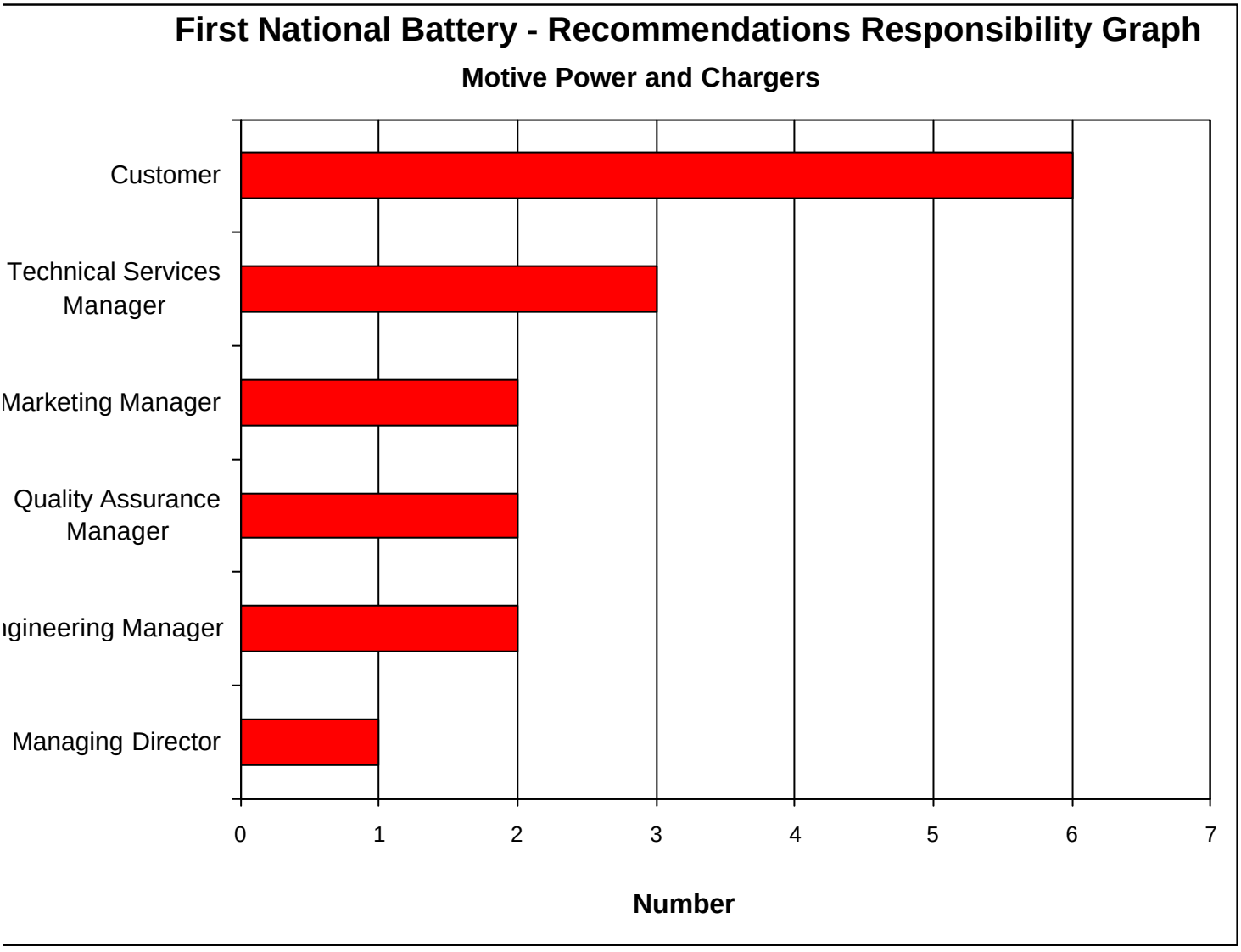
Graph 2


First National Battery - Summary of Hazards by "What If" Category
Motive Power and Chargers
Operating Errors or Human Factors
Physical Hazards
External Effects or Influences
Emergency Operations
Transport of Persons and Material
Integrity Failure or Loss of Containment
Environmental Release
0
1
2
3
4
5
6
7
Number

Graph 3


First National Battery - Recommendations by Type
Motive Power and Chargers
Standards Required
Procedures Required
date Operations Manual
Engineering Change
Maintenance Programme required
0
1
2
3
4
5
6
Number

Graph 4


First National Battery - Recommendations Responsibility Graph
Motive Power and Chargers
Customer
Technical Services Manager
Marketing Manager
Quality Assurance Manager
ıgineering Manager
Managing Director
0
1
2
3
4
5
6
7
Number

SECTION 4

RISK ASSESSMENT WORKSHEET REPORT

MOTIVE POWER AND CHARGERS

First National Battery

17 August 2001

Motive Power and Chargers

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report

S01 **Motive Power**

I01 **Provide power to mobile equipment**

Hazard **What if the take-off connection plug is connected in reverse** **Category** EEI **Freq 3 Sev D Risk Priority 6**

Cause Bad workmanship

Consq Damage to forklift

S/guard Final quality checks

Who Type

Who Type

Hazard **What if burn on cells are changed** **Category** PH **Freq 3 Sev B Risk Priority 4**

Cause Heat applied to melt the welded connection off the terminal

Consq Explosion, injuries, fatalities,damage to equipment

S/guard Procedures in place

R001 Only manufacturer replaces cell. If individual cell are sold then a safety sticker to be attached. **Who QAM Type S**

Who Type

Hazard **What if charging procedures are not followed correctly when battery is left in vehicle** **Category** OE&HF **Freq 2 Sev B Risk Priority 3**

Cause Lack of procedures and training

Consq Overheating, explosions, damage to product, injuries.

S/guard Current charging procedure and instructions and PPE's,

R002 Charging procedure and instructions must be displayed at all times and followed. **Who MM Type P**

R003 Only certified people to carry out charging and changing of batteries when there is more than one battery **Who CUS Type S**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report

Hazard **What if cells and acid are transported and/or stored** — **Category** PH **Freq** 2 **Sev** D **Risk Priority** 5

Cause Incorrect material handling

Consq Acid spillage, short circuit, toppling over

S/guard Special containers for acid. PPE's, strapping in place and uprights

		Who	Type
R004	Transportation and storage to comply with OSH act and Lead regulations (Refer to Package and Transport and Storage) also refer to installation and maintenance procedures	**EM**	**S**
R005	When transporting cells ensure that insulators are fitted to terminals	**EM**	**S**

Hazard **What if acid is spilled** — **Category** OE&HF **Freq** 3 **Sev** D **Risk Priority** 6

Cause Battery is mishandled, dropped, bumped, collisions or exploding

Consq Injuries, damaged equipment due to corrosion

S/guard Alkaline neutralizer to be used on spillage e.g.. hydrated lime

		Who	Type
R006	Follow the battery maintenance instruction and procedures in case of people involved	**CUS**	**MP**

Who **Type**

Hazard **What if there is a battery abuse-maintenance** — **Category** OE&HF **Freq** 2 **Sev** C **Risk Priority** 4

Cause Poor maintenance and improper usage

Consq Premature failure

S/guard Follow maintenance and instruction manual

		Who	Type
R007	Follow the battery maintenance instruction and procedures	**CUS**	**MP**

Who **Type**

Hazard **What if there is an explosion due to chafing of positive and negative take-off cables on steel tank.** — **Category** PH **Freq** 3 **Sev** B **Risk Priority** 4

Cause Cable insufficiently protected

Consq Short causing a fire or explosion, fatalities ,injuries and equipment loss

S/guard NIL

		Who	Type
R008	Ensure pratly compression glands are fitted and suppliers of tank to be instructed to change design of entry for cable	**MM**	**E**
R009	Bulletin to be sent out to customers and end users	**MD**	**P**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report

Hazard **What if there is an explosion due to loose connections** **Category** OE&HF **Freq** 2 **Sev** B **Risk Priority** 3

Cause Incorrect torque and vibration

Consq Explosion of battery causing fatalities and injury and equip damage

S/guard Ensure torque setting are met and regular checking

		Who	Type
R010	Add to installation and maintenance procedures that Torque to be checked Regularly	TS	M

Who **Type**

Hazard **What if there is an explosion due to tracking** **Category** PH **Freq** 1 **Sev** B **Risk Priority** 2

Cause Overfilling when topping up

Consq Explosion of battery causing fatalities and injury and equipment damage

S/guard Keep battery cell lids clean and dry

		Who	Type
R011	Follow suppliers installation and maintenance procedures	CUS	M

Who **Type**

Hazard **What if there is an explosion due to short circuit due to external sources, metal on connectors, terminals** **Category** OE&HF **Freq** 1 **Sev** B **Risk Priority** 2

Cause Material falling on batteries

Consq Explosion of battery causing fatalities and injury and equipment damage

S/guard Batteries to be covered at all times while in operation.

		Who	Type
R012	Procedures to be followed as stated in safety rules. Include in safety rules that batteries must be covered.	TS	P
R013	Make sure that insulators are fitted to all terminals and are kept in place at all times.	QAM	M

Hazard **What if there is an explosion due to an open flame, welding,** **Category** EEI **Freq** 2 **Sev** A **Risk Priority** 2

Cause Flame ignites hydrogen

Consq Explosion causing a fatality, spillage of acid, injury, material damage,

S/guard Good ventilation, procedures in place to prevent smoking ,open flames, electrical shorts or sparks, switch off circuit breaker before disconnecting plug from battery.

		Who	Type
R014	Safety rules as laid out in Installation and Maint instruction to be followed.	CUS	P
R015	Installation and Maintenance and Safety instructions to be included in each delivery. FNB to combine all safety rules in one paragraph in Installation and Maintenance and Safety instructions.	TS	M

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

S02 **Chargers**

I01 **To charge motive power batteries**

Hazard **What if incorrect size charger is used** **Category** OE&HF **Freq** 3 **Sev** D **Risk Priority** 6

Cause Ignorance, human error

Consq Battery may over/under charge. Undercharge can cause loss of production. Overcharge can cause damage to battery.

S/guard Nil

		Who	Type
R016	Use different take-off connector plugs for different batteries	**CUS**	**S**

Who	Type

End of Report

SECTION 4

WORKSHEET REPORT
(SORTED BY WORK AREA AND RISK PRIORITY)

MOTIVE POWER AND CHARGERS

First National Battery

17 August 2001

Motive Power and Chargers

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

S01 **Motive Power**

I01 **Provide power to mobile equipment**

Hazard **What if there is an explosion due to tracking** **Category** PH **Freq 1 Sev B** **Risk Priority 2**

Cause Overfilling when topping up

Consq Explosion of battery causing fatalities and injury and equipment damage

S/guard Keep battery cell lids clean and dry

	Follow suppliers installation and maintenance procedures	**Who**	**Type**
R011		**CUS**	**M**

	Who	**Type**

Hazard **What if there is an explosion due to short circuit due to external sources, metal on connectors, terminals** **Category** OE&HF **Freq 1 Sev B** **Risk Priority 2**

Cause Material falling on batteries

Consq Explosion of battery causing fatalities and injury and equipment damage

S/guard Batteries to be covered at all times while in operation.

	Procedures to be followed as stated in safety rules. Include in safety rules that batteries must be covered.	**Who**	**Type**
R012		**TS**	**P**
	Make sure that insulators are fitted to all terminals and are kept in place at all times.	**Who**	**Type**
R013		**Who**	**Type**
		QAM	**M**

Hazard **What if there is an explosion due to an open flame, welding,** **Category** EEI **Freq 2 Sev A** **Risk Priority 2**

Cause Flame ignites hydrogen

Consq Explosion causing a fatality, spillage of acid, injury, material damage,

S/guard Good ventilation, procedures in place to prevent smoking ,open flames, electrical shorts or sparks, switch off circuit breaker

	Safety rules as laid out in Installation and Maint instruction to be followed.	**Who**	**Type**
R014		**CUS**	**P**
	Installation and Maintenance and Safety instructions to be included in each delivery. FNB to combine all safety	**Who**	**Type**
R015	rules in one paragraph in Installation and Maintenance and Safety instructions.	**Who**	**Type**
		TSM	

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Provide power to mobile equipment

Hazard	**What if charging procedures are not followed correctly when battery is left in vehicle**	**Category** OE&HF	**Freq**	**2**	**Sev**	**B**	
		Risk Priority		**3**			
Cause	Lack of procedures and training						
Consq	Overheating, explosions, damage to product, injuries.						
S/guard	Current charging procedure and instructions and PPE's,						
R002	Charging procedure and instructions must be displayed at all times and followed.				**Who** MM	**Type** P	
R003	Only certified people to carry out charging and changing of batteries when there is more than one battery				**Who**	**Type**	
					Who CUS	**Type** S	

Hazard	**What if there is an explosion due to loose connections**	**Category** OE&HF	**Freq**	**2**	**Sev**	**B**	
		Risk Priority		**3**			
Cause	Incorrect torque and vibration						
Consq	Explosion of battery causing fatalities and injury and equip damage						
S/guard	Ensure torque setting are met and regular checking						
R010	Add to installation and maintenance procedures that Torque to be checked Regularly				**Who** TS	**Type** M	
					Who	**Type**	

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Provide power to mobile equipment

Hazard What if burn on cells are changed — **Category** PH — **Freq 3 Sev B** — **Risk Priority 4**

Cause Heat applied to melt the welded connection off the terminal

Consq Explosion, injuries, fatalities,damage to equipment

S/guard Procedures in place

		Who	Type
R001	Only manufacturer replaces cell. If individual cell are sold then a safety sticker to be attached.	**QAM**	**S**
		Who	**Type**

Hazard What if there is a battery abuse-maintenance — **Category** OE&HF — **Freq 2 Sev C** — **Risk Priority 4**

Cause Poor maintenance and improper usage

Consq Premature failure

S/guard Follow maintenance and instruction manual

		Who	Type
R007	Follow the battery maintenance instruction and procedures	**CUS**	**MP**
		Who	**Type**

Hazard What if there is an explosion due to chafing of positive and negative take-off cables on steel tank. — **Category** PH — **Freq 3 Sev B** — **Risk Priority 4**

Cause Cable insufficiently protected

Consq Short causing a fire or explosion, fatalities ,injuries and equipment loss

S/guard NIL

		Who	Type
R008	Ensure pratly compression glands are fitted and suppliers of tank to be instructed to change design of entry for cable	**MM**	**E**
R009	Bulletin to be sent out to customers and end users	**Who**	**Type**
		Who	**Type**
		MD	**P**

I01 Provide power to mobile equipment

Hazard What if cells and acid are transported and/or stored — **Category** PH — **Freq 2 Sev D** — **Risk Priority 5**

Cause Incorrect material handling

Consq Acid spillage, short circuit, toppling over

S/guard Special containers for acid. PPE's, strapping in place and uprights

		Who	Type
R004	Transportation and storage to comply with OSH act and Lead regulations (Refer to Package and Transport and Storage) also refer to installation and maintenance procedures		

EM		**S**
When transporting cells ensure that insulators are fitted to terminals	**Who**	**Type**
R005	**Who**	**Type**
	EM	**S**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Provide power to mobile equipment

Hazard What if the take-off connection plug is connected in reverse — **Category** EEI **Freq 3 Sev D Risk Priority 6**

Cause Bad workmanship

Consq Damage to forklift

S/guard Final quality checks

Who Type

Who Type

Hazard What if acid is spilled — **Category** OE&HF **Freq 3 Sev D Risk Priority 6**

Cause Battery is mishandled, dropped, bumped, collisions or exploding

Consq Injuries, damaged equipment due to corrosion

S/guard Alkaline neutralizer to be used on spillage e.g.. hydrated lime

Follow the battery maintenance instruction and procedures in case of people involved — **Who Type**

R006 **CUS MP**

Who Type

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

S02 **Chargers**

I01 **To charge motive power batteries**

Hazard **What if incorrect size charger is used** **Category** OE&HF **Freq** 3 **Sev** D **Risk Priority 6**

Cause Ignorance, human error

Consq Battery may over/under charge. Undercharge can cause loss of production. Overcharge can cause damage to battery.

S/guard Nil

		Who	Type
R016	Use different take-off connector plugs for different batteries	**CUS**	**S**

Who **Type**

End of Report

SECTION 5

RISK ASSESSMENT DATA ANALYSIS

CHARGING RACKS

5.0 CHARGING RACKS

RISK ASSESSMENT DATA ANALYSIS

In this section the data contained in the Risk Assessment database has been extracted and summarised in various formats for graphical display.

GRAPH 1 - RISK PROFILE

As can be seen from this profile, there are four high risks identified for:

- Chargers being tampered with
- Loose connections
- Poor maintenance on chargers
- Fire on wooden racks

The major focus concerning these hazards should be that the users of this equipment follow the supplier's installation and maintenance procedures and that it is recommended that wooden racks be phased out and replaced with metal racks.

GRAPH 2 - SUMMARY OF RISKS BY "WHAT IF" CATEGORY

Here there was a single hazard of significance which was related to operator errors or human factors (7/10). Physical hazards in the operation, use and maintenance of the equipment, as well as external effects due to poor ventilation was also identified. Also, in order to reduce the risk of equipment malfunction, qualified personnel only should work on the equipment.

GRAPH 3 - SUMMARY OF RECOMMENDATIONS BY TYPE

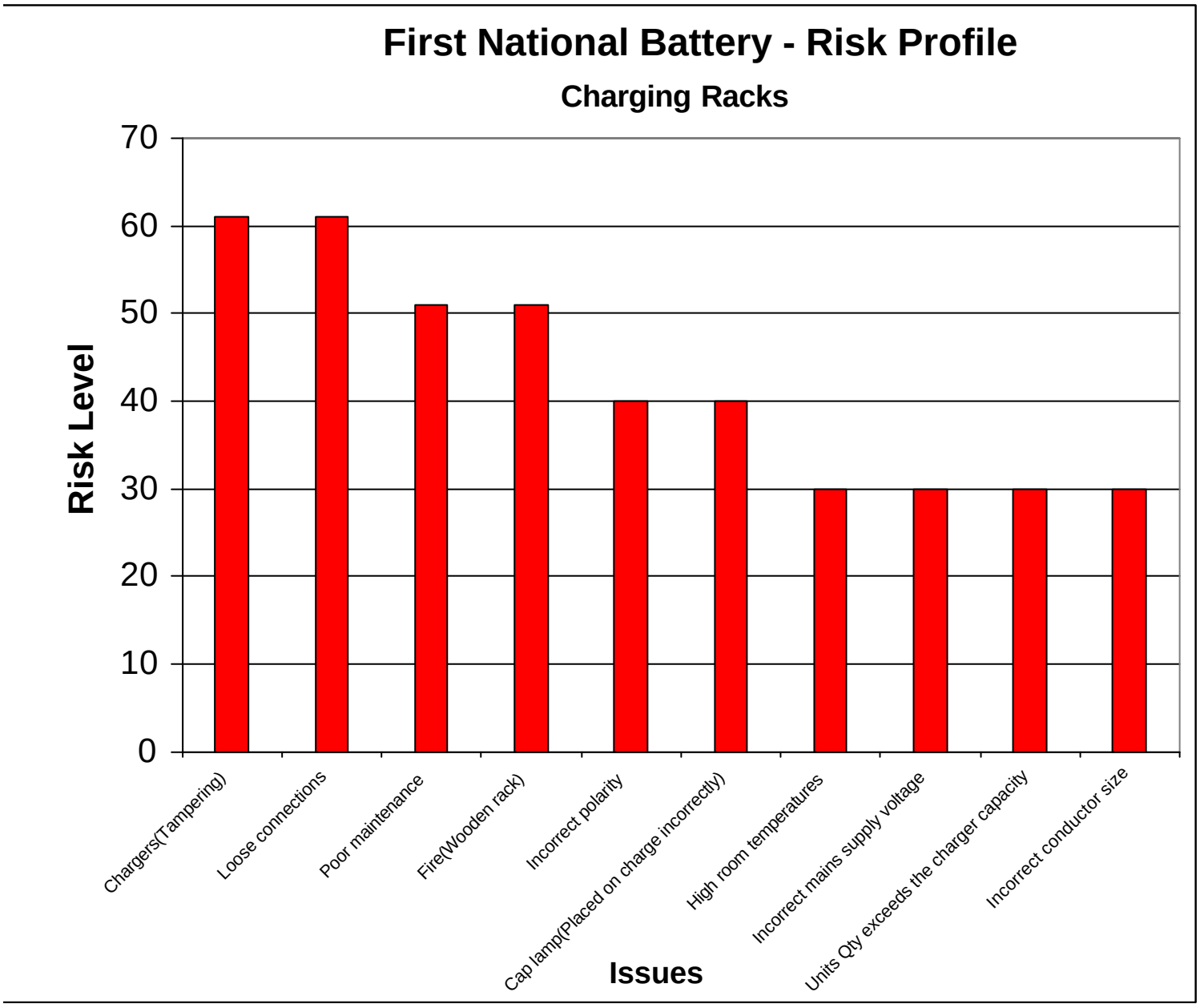
This graph indicates that the majority of recommendations are related to user standards required to ensure that the supplier's safety and installation procedures are followed. There is also the need to update Operations Manuals and to ensure that the appropriate Maintenance Programmes are in place to ensure that procedures are followed by users.

GRAPH 4 - SUMMARY OF RECOMMENDATIONS BY RESPONSIBILITY

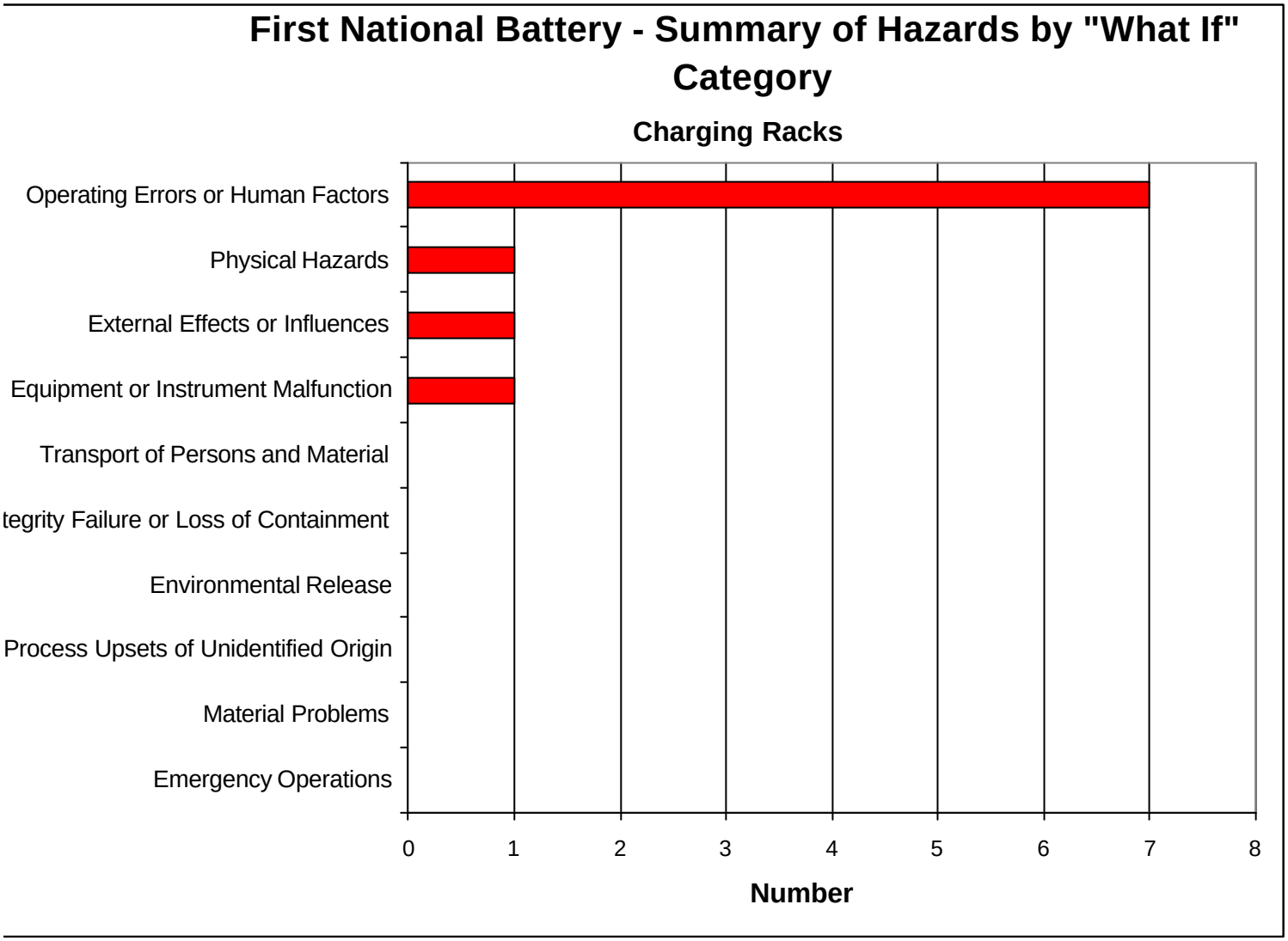
This graph shows the recommendation responsibilities for the different managerial functions within FNB and also an indication of customer responsibilities.

The majority of responsibilities are with the customer, being the users of the equipment. There are also tasks allocated to the Technical Service Manager, which ties up with the issue that FNB needs to ensure that the Miners Cap Lamp Maintenance and Troubleshooting Notes are modified.

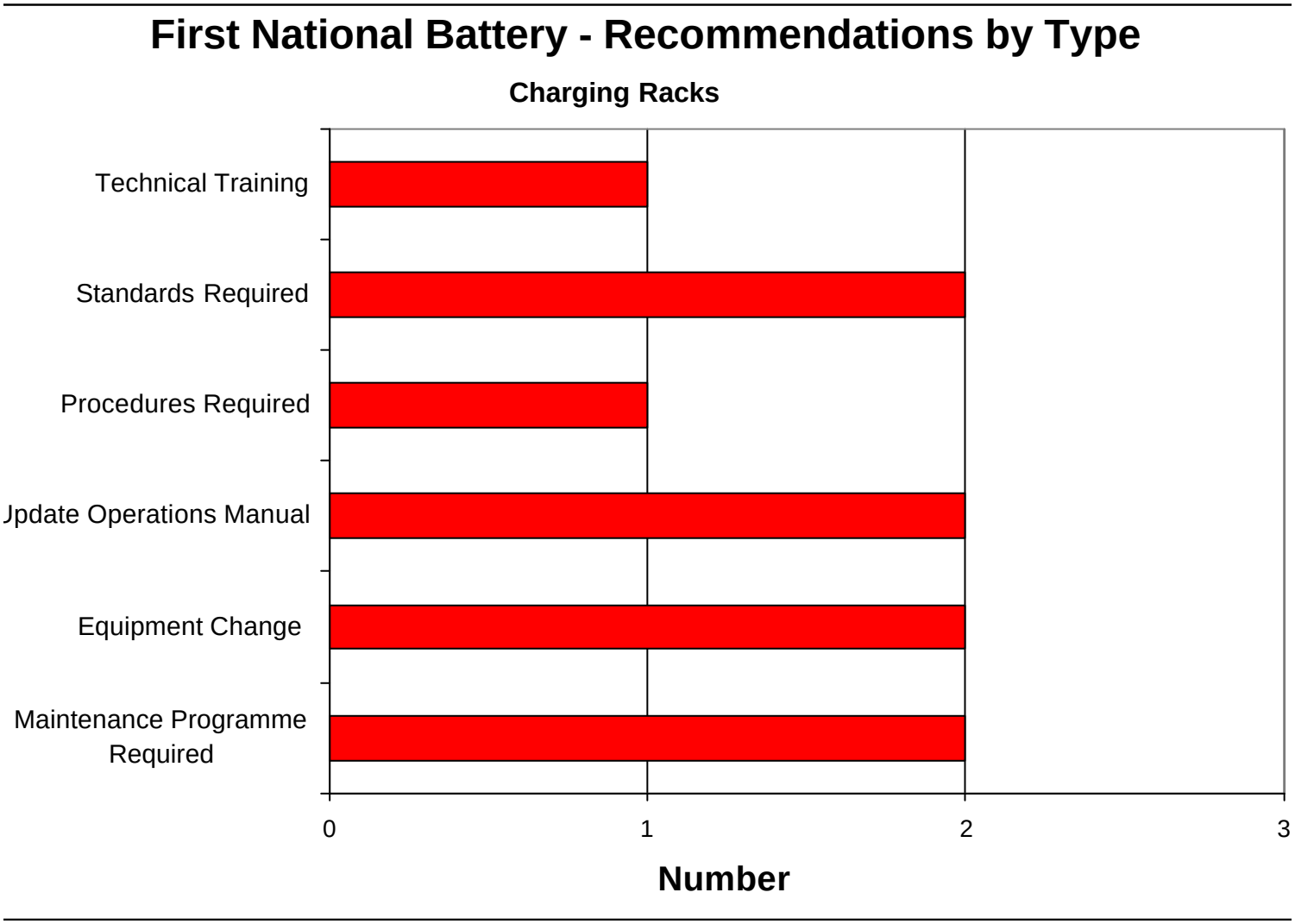
Graph 1


First National Battery - Risk Profile
Charging Racks
Risk Level
70
60
50
40
30
20
10
0
Chargers(Tampering)
Loose connections
Poor maintenance
Fire(Wooden rack)
Incorrect polarity
Cap lamp(Placed on charge incorrectly)
High room temperatures
Incorrect mains supply voltage
Units Qty exceeds the charger capacity
Incorrect conductor size
Issues

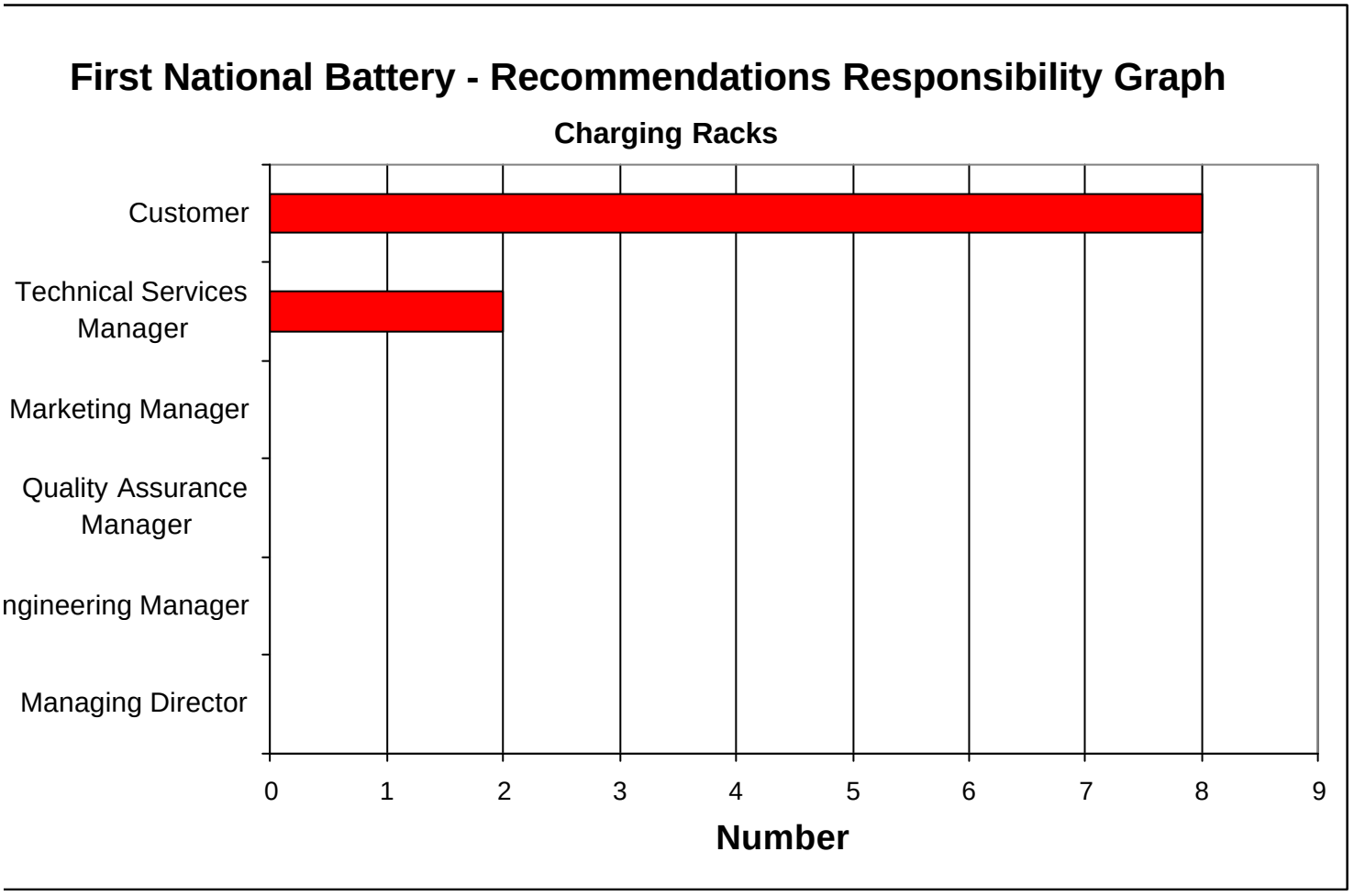
Graph 2


First National Battery - Summary of Hazards by "What If" Category
Charging Racks
Operating Errors or Human Factors
Physical Hazards
External Effects or Influences
Equipment or Instrument Malfunction
Transport of Persons and Material
tegrity Failure or Loss of Containment
Environmental Release
Process Upsets of Unidentified Origin
Material Problems
Emergency Operations
0
1
2
3
4
5
6
7
8
Number

Graph 3


First National Battery - Recommendations by Type
Charging Racks
Technical Training
Standards Required
Procedures Required
Jpdate Operations Manual
Equipment Change
Maintenance Programme Required
0
1
2
3
Number

Graph 4


First National Battery - Recommendations Responsibility Graph
Charging Racks
Customer
Technical Services Manager
Marketing Manager
Quality Assurance Manager
ngineering Manager
Managing Director
0
1
2
3
4
5
6
7
8
9
Number

SECTION 5

RISK ASSESSMENT WORKSHEET REPORT

CHARGING RACKS

First National Battery

17 August 2001

Charging Racks

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report

S01 **Charging Racks**

I01 **To recharge cap lamp assemblies**

Hazard **What if chargers are tampered with** **Category** OE&HF **Freq 3 Sev B** **Risk Priority 4**

Cause Insufficient charge amp capacity

Consq Over and under charging of lamps, conductors running hot and battery lifespan diminished

S/guard NIL

R001 Leave charger at factory set point — **Who** CUS **Type** S

Who Type

Hazard **What if there is incorrect mains supply voltage** **Category** OE&HF **Freq 4 Sev D** **Risk Priority 7**

Cause Operator fails to observe input supply specifications

Consq Under charging, damage to charger

S/guard Specification plate fitted to charger

R002 Ensure correct connection to specified electrical supply — **Who** CUS **Type** P

Who Type

Hazard **What if the quantity of units exceeds the charger capacity** **Category** OE&HF **Freq 3 Sev E** **Risk Priority 7**

Cause Insufficient number of chargers for the racks

Consq Insufficient charging rate resulting in undercharged lamps

S/guard NIL

R003 Must have one charger for max 204 charging points — **Who** CUS **Type** S

Who Type

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

Hazard **What if incorrect conductor size , length and connectors are used** **Category** OE&HF **Freq** 4 **Sev** D **Risk Priority** 7

Cause Cables replaced by incompetent people

Consq Undercharging of batteries, conductors running hot, hot connections

S/guard Procedure in place

R004 Use qualified personnel to do installations and maintenance **Who** CUS **Type** MP

Who **Type**

Hazard **What if there is incorrect polarity** **Category** E&IM **Freq** 3 **Sev** D **Risk Priority** 6

Cause Incorrect connection

Consq Reverse polarity battery charge. Battery damage

S/guard Bus bars clearly marked

R005 Charges to be fitted on top the rack. Connected by qualified personnel **Who** CUS **Type** T

Who **Type**

Hazard **What if there are high room temperatures exceeding manufacturers specifications** **Category** EEI **Freq** 4 **Sev** D **Risk Priority** 7

Cause Poor ventilation and construction

Consq Premature equipment failure

S/guard Procedures available in Miners Cap Lamp Maintenance and Troubleshooting Notes

R006 Good ventilation **Who** CUS **Type** Q

Who **Type**

Hazard **What if there are loose connections** **Category** OE&HF **Freq** 3 **Sev** B **Risk Priority** 4

Cause Poor maintenance

Consq Poor charging rate, possible fire (wooden racks)

S/guard Procedures available in Miners Cap Lamp Maintenance and Troubleshooting Notes

R007 Maint procedures for stainless steel racking to be incorporated in Miners Cap Lamp Maintenance and Troubleshooting Notes **Who** TS **Type** M

Who **Type**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

Hazard What if poor maintenance is carried out — **Category** OE&HF **Freq 2 Sev D** **Risk Priority 5**

Cause Poor supervision

Consq Cap lamp failures, loss of production, possible fires(wooden racks)

S/guard Procedures available in Miners Cap Lamp Maintenance and Troubleshooting Notes

R008 Ensure maintenance procedures are followed — **Who** CUS **Type** MP

Who Type

Hazard Can there be a fire on the wooden rack — **Category** PH **Freq 4 Sev B** **Risk Priority 5**

Cause Loose connections, poorly maintained resistor spring

Consq Fire, injuries, equipment damage, production loss

S/guard Procedures available in Miners Cap Lamp Maintenance and Troubleshooting Notes

R009 Phase out wooden racks — **Who** CUS **Type** Q

Who Type

Hazard What if the cap lamp is not placed on charge correctly on racks — **Category** OE&HF **Freq 2 Sev E** **Risk Priority 6**

Cause Insufficient training, hastiness;

Consq Failure to recharge

S/guard Physical check which gives a visual indication via instrumentation.

R010 Procedures to be added to Lamp Room Routine — **Who** TS **Type** M

Who Type

End of Report

SECTION 5

WORKSHEET REPORT
(SORTED BY WORK AREA AND RISK PRIORITY)

CHARGING RACKS

First National Battery

17 August 2001

Charging Racks

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

S01 **Charging Racks**

I01 **To recharge cap lamp assemblies**

Hazard **What if chargers are tampered with** **Category** OE&HF **Freq** **3** **Sev** **B** **Risk Priority** **4**

Cause Insufficient charge amp capacity

Consq Over and under charging of lamps, conductors running hot and battery lifespan diminished

S/guard NIL

R001 Leave charger at factory set point **Who** **CUS** **Type** **S**

Who **Type**

Hazard **What if there are loose connections** **Category** OE&HF **Freq** **3** **Sev** **B** **Risk Priority** **4**

Cause Poor maintenance

Consq Poor charging rate, possible fire (wooden racks)

S/guard Procedures available in Miners Cap Lamp Maintenance and Troubleshooting Notes

R007 Maint procedures for stainless steel racking to be incorporated in Miners Cap Lamp Maintenance and Troubleshooting Notes **Who** **TS** **Type** **M**

Who **Type**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 To recharge cap lamp assemblies

Hazard What if poor maintenance is carried out | **Category** OE&HF | **Freq 2 Sev D** | **Risk Priority5**

Cause Poor supervision

Consq Cap lamp failures, loss of production, possible fires(wooden racks)

S/guard Procedures available in Miners Cap Lamp Maintenance and Troubleshooting Notes

R008 Ensure maintenance procedures are followed — **Who** CUS **Type** MP

Who Type

Hazard Can there be a fire on the wooden rack | **Category** PH | **Freq 4 Sev B** | **Risk Priority5**

Cause Loose connections, poorly maintained resistor spring

Consq Fire, injuries, equipment damage, production loss

S/guard Procedures available in Miners Cap Lamp Maintenance and Troubleshooting Notes

R009 Phase out wooden racks — **Who** CUS **Type** Q

Who Type

I01 To recharge cap lamp assemblies

Hazard What if there is incorrect polarity | **Category** E&IM | **Freq 3 Sev D** | **Risk Priority6**

Cause Incorrect connection

Consq Reverse polarity battery charge. Battery damage

S/guard Bus bars clearly marked

R005 Charges to be fitted on top the rack. Connected by qualified personnel — **Who** CUS **Type** T

Who Type

Hazard What if the cap lamp is not placed on charge correctly on racks | **Category** OE&HF | **Freq 2 Sev E** | **Risk Priority6**

Cause Insufficient training, hastiness;

Consq Failure to recharge

S/guard Physical check which gives a visual indication via instrumentation.

R010 Procedures to be added to Lamp Room Routine — **Who** TS **Type** M

Who Type

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 To recharge cap lamp assemblies

Hazard What if there is incorrect mains supply voltage — **Category** OE&HF **Freq 4 Sev D** **Risk Priority7**

Cause Operator fails to observe input supply specifications

Consq Under charging, damage to charger

S/guard Specification plate fitted to charger

R002 Ensure correct connection to specified electrical supply — **Who Type CUS P**

Who Type

Hazard What if the quantity of units exceeds the charger capacity — **Category** OE&HF **Freq 3 Sev E** **Risk Priority7**

Cause Insufficient number of chargers for the racks

Consq Insufficient charging rate resulting in undercharged lamps

S/guard NIL

R003 Must have one charger for max 204 charging points — **Who Type CUS S**

Who Type

Hazard What if incorrect conductor size , length and connectors are used — **Category** OE&HF **Freq 4 Sev D** **Risk Priority7**

Cause Cables replaced by incompetent people

Consq Undercharging of batteries, conductors running hot, hot connections

S/guard Procedure in place

R004 Use qualified personnel to do installations and maintenance — **Who Type CUS MP**

Who Type

Hazard What if there are high room temperatures exceeding manufacturers specifications — **Category** EEI **Freq 4 Sev D** **Risk Priority7**

Cause Poor ventilation and construction

Consq Premature equipment failure

S/guard Procedures available in Miners Cap Lamp Maintenance and Troubleshooting Notes

R006 Good ventilation — **Who Type CUS Q**

Who Type

End of Report

SECTION 6

RISK ASSESSMENT DATA ANALYSIS

UNDERGROUND ILLUMINATION

6.0 UNDERGROUND ILLUMINATION

RISK ASSESSMENT DATA ANALYSIS

(Miners Cap Lamp, Leisure Lamp, Loco light, CM remote adaptor)

In this section the data contained in the Risk Assessment database has been extracted and summarised in various formats for graphical display.

GRAPH 1 - RISK PROFILE

Four of the high risks are identified as follows:

- Poor maintenance done on Cap Lamps
- Lock pin tampered with on Cap Lamps
- Inline fuse blows
- Broken exit cover, retaining clip and screws, on Cap Lamps

The major focus concerning these hazards should be that the users are aware of the hazards and dangers and also to follow the supplier's installation and maintenance procedures. Furthermore, trained and certified personnel are to work on the equipment and to use OEM equipment and supplies.

GRAPH 2 - SUMMARY OF RISKS BY "WHAT IF" CATEGORY

Three hazards, which are of significance, are related to operator errors or human factors (8/30) Physical hazards in the operation, use and maintenance of the equipment (8/30) as well as Material problems due to the various components, which may require proper maintenance. Similarly, in order to reduce the risk of equipment malfunction, qualified personnel only should work on the equipment and to report any defects after a shift.

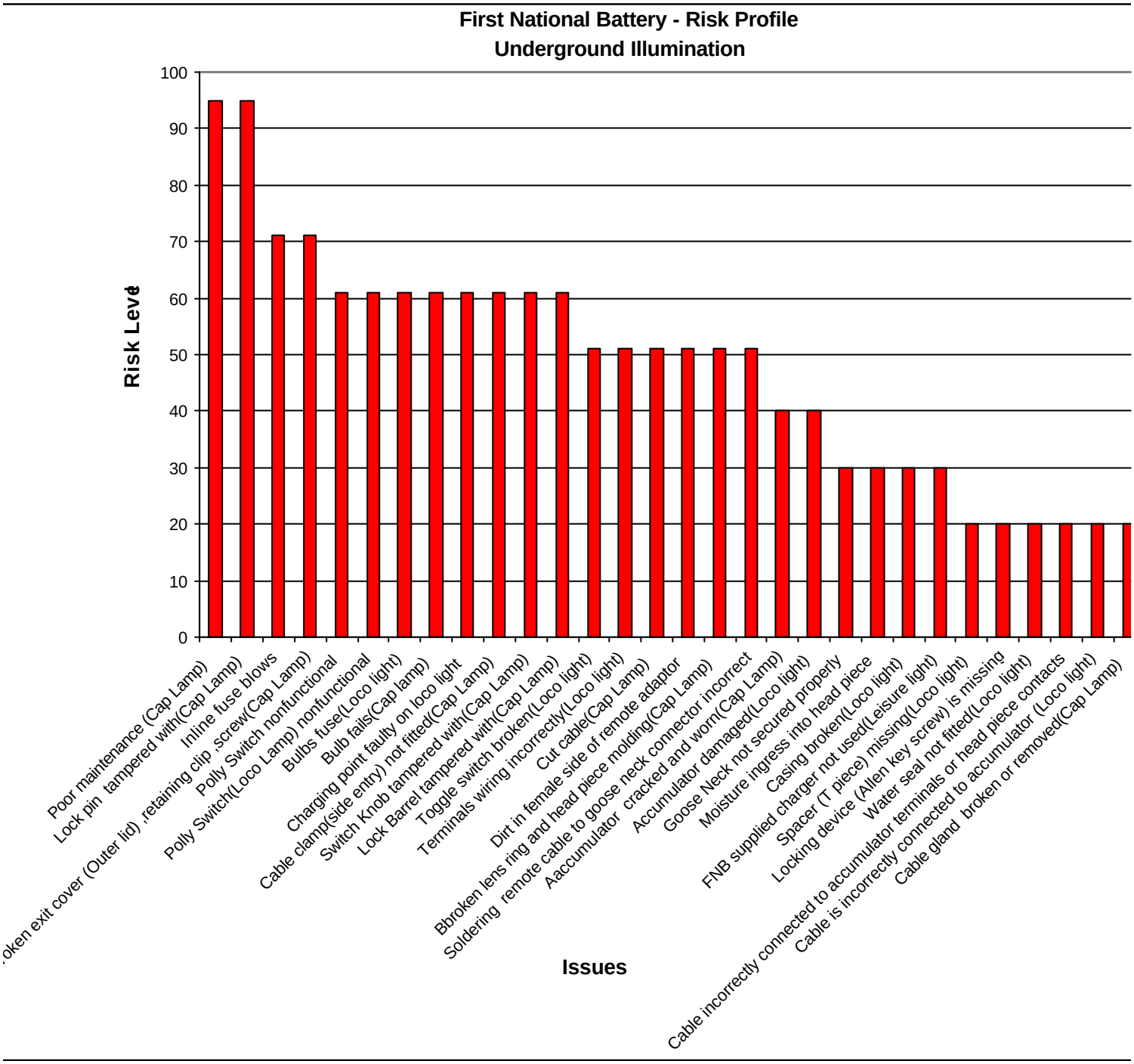
GRAPH 3 - SUMMARY OF RECOMMENDATIONS BY TYPE

This graph indicates that the majority of recommendations are related to user standards required to ensure that the supplier's safety and installation procedures are followed. There is also the need to update Operations Manuals and to ensure that the appropriate Maintenance Programmes are in place to ensure that users follow procedures.

GRAPH 4 - SUMMARY OF RECOMMENDATIONS BY RESPONSIBILITY

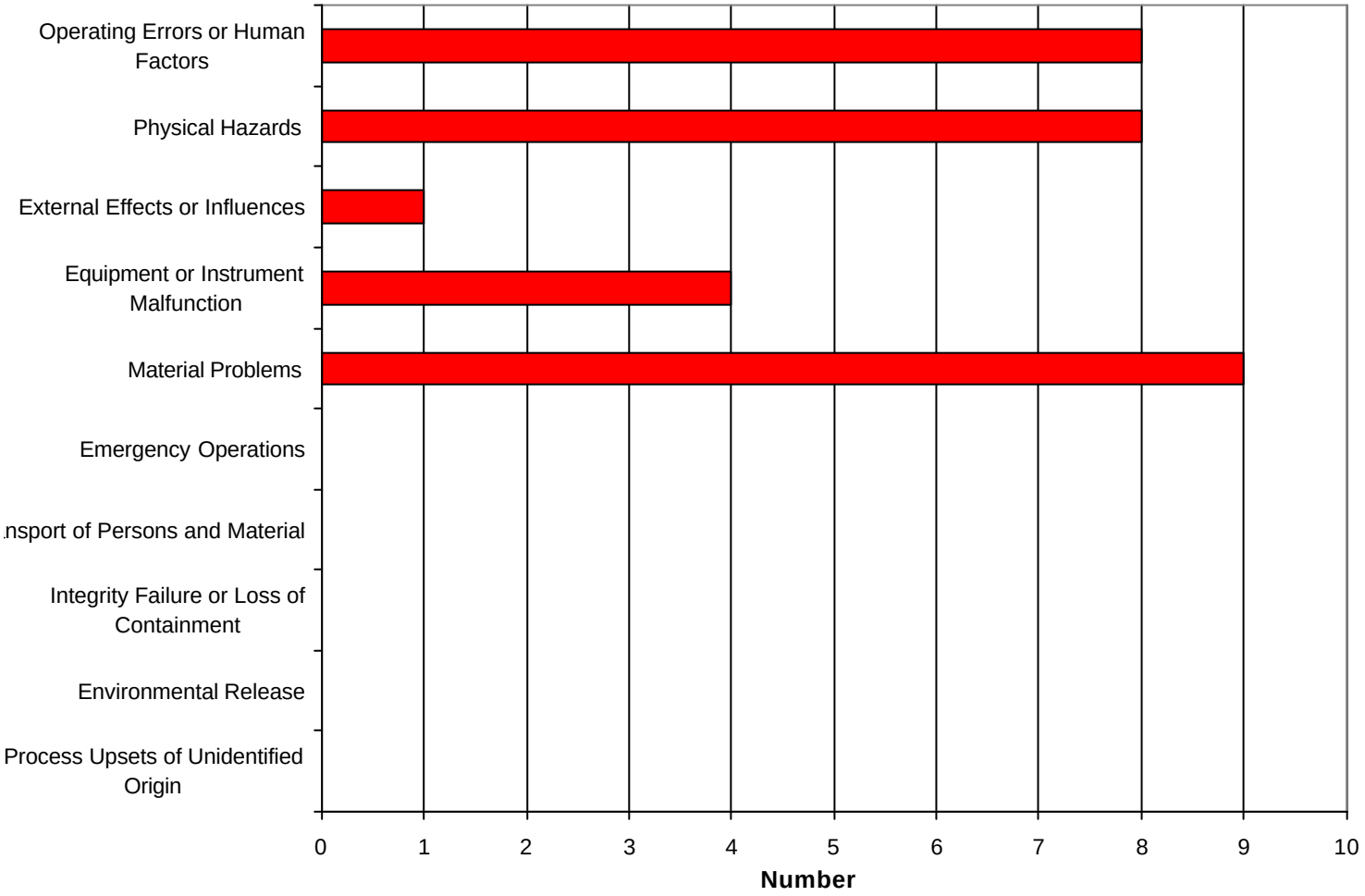
The majority of responsibilities are with the customer, being the users of the equipment. There are also tasks allocated to the Technical Service Manager, which ties up with the issue that FNB needs to ensure that the Miners Cap Lamp Maintenance and Troubleshooting Notes are modified.
Furthermore, MSA need to ensure that Maintenance and Trouble Shooting Notes for their equipment is compiled and available to the users.

Graph 1

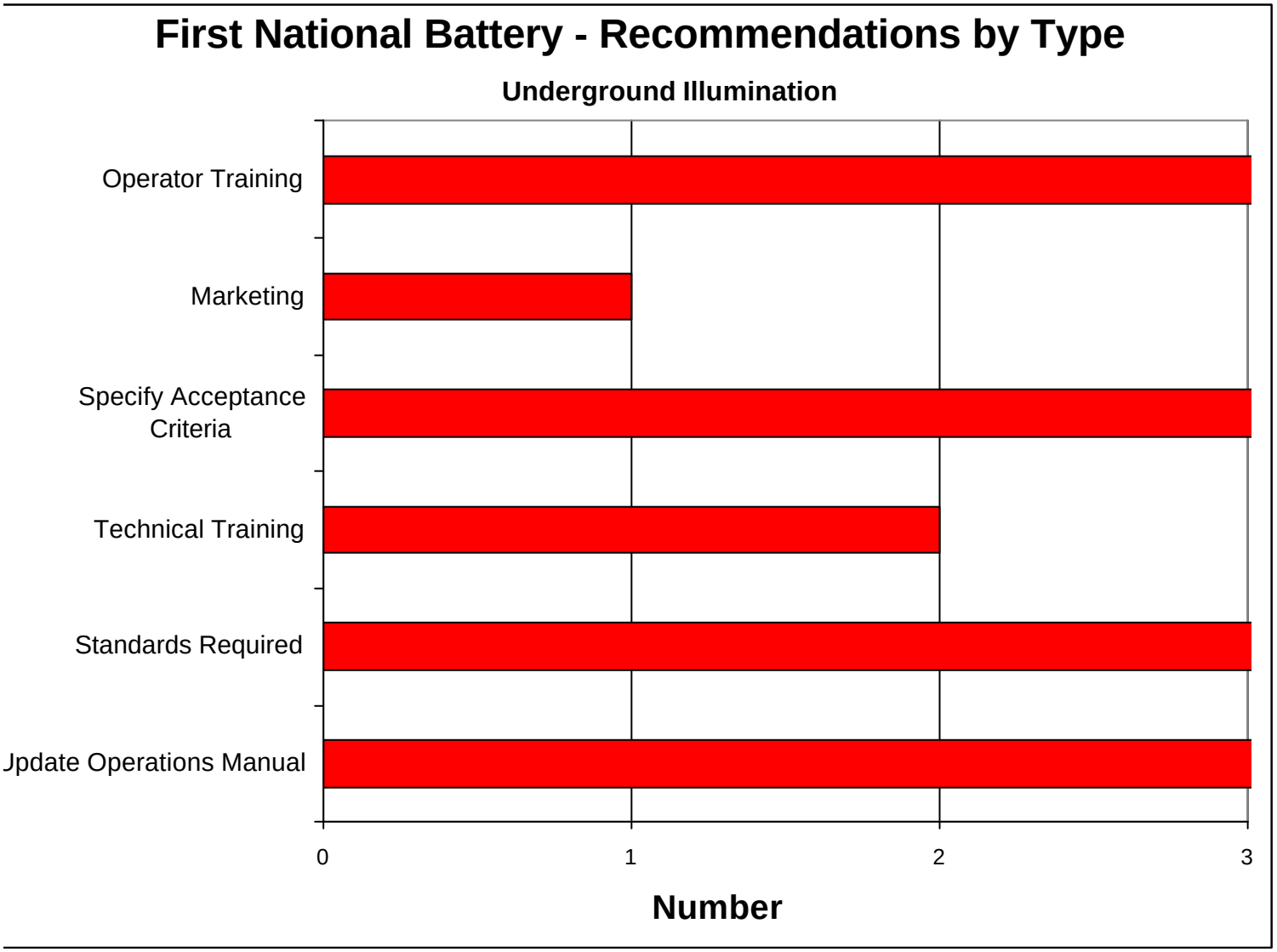

First National Battery - Risk Profile
Underground Illumination
Risk Level
100
90
80
70
60
50
40
30
20
10
0
Issues
oken exit cover (Outer lid)
Poor maintenance (Cap Lamp)
Lock pin tampered with(Cap Lamp)
Inline fuse blows
retaining clip screw(Cap Lamp)
Polly Switch nonfunctional
Polly Switch(Loco Lamp) nonfunctional
Bulbs fuse(Loco light)
Bulb fails(Cap lamp)
Charging point faulty on loco light
Cable clamp(side entry) not fitted(Cap Lamp)
Switch Knob tampered with(Cap Lamp)
Lock Barrel tampered with(Cap Lamp)
Toggle switch broken(Loco light)
Terminals wiring incorrectly(Loco light)
Cut cable(Cap Lamp)
Dirt in female side of remote adaptor
Bbroken lens ring and head piece molding(Cap Lamp)
Soldering remote cable to goose neck connector incorrect
Aaccumulator cracked and worn(Cap Lamp)
Accumulator damaged(Loco light)
Goose Neck not secured properly
Moisture ingress into head piece
Casing broken(Loco light)
FNB supplied charger not used(Leisure light)
Spacer (T piece) missing(Loco light)
Locking device (Allen key screw) is missing
Water seal not fitted(Loco light)
Cable incorrectly connected to accumulator terminals or head piece contacts
Cable is incorrectly connected to accumulator (Loco light)
Cable gland broken or removed(Cap Lamp)

Graph 2

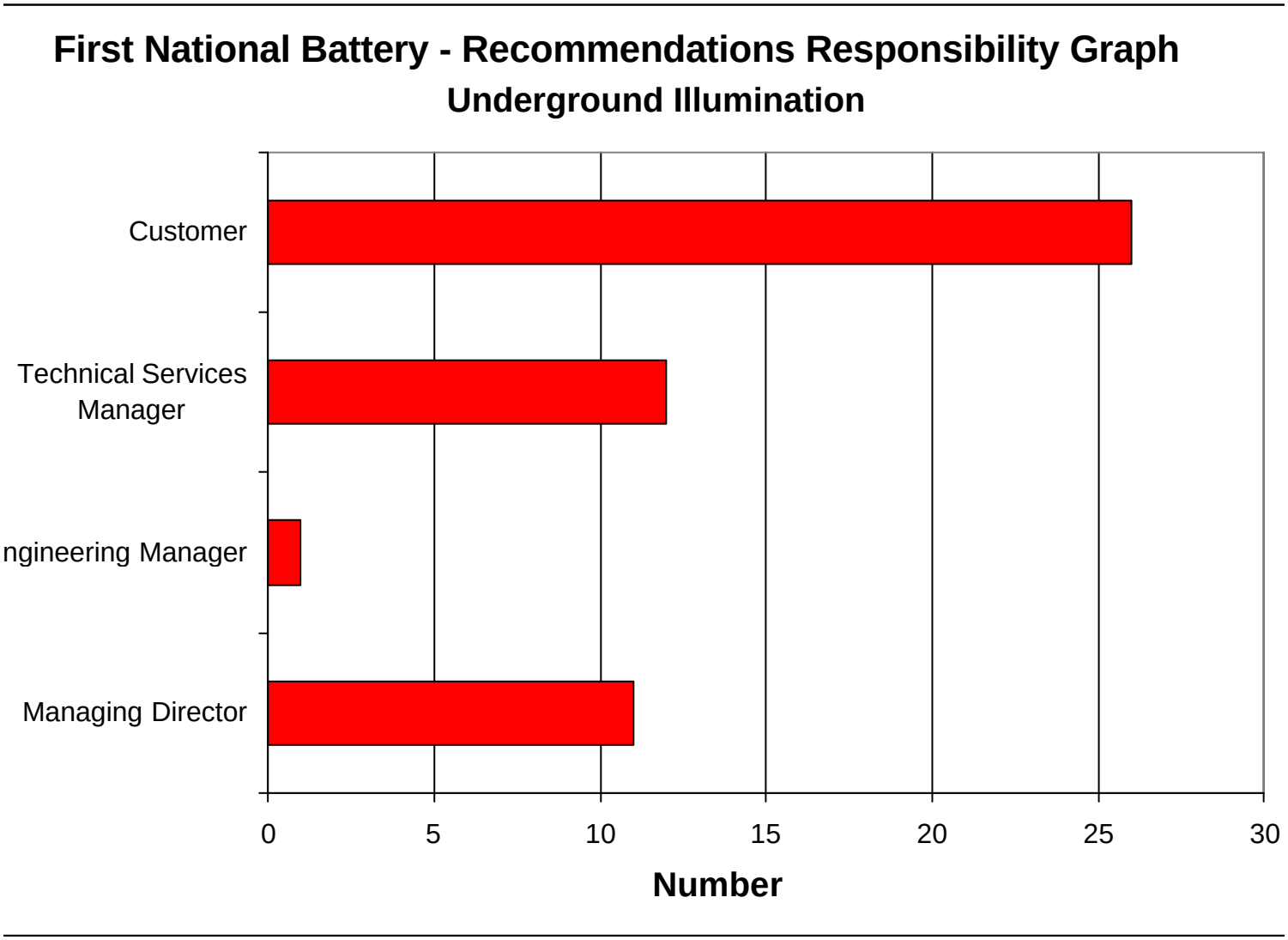
First National Battery - Summary of Hazards By "What If" Category
Underground Illumination



Graph 3


First National Battery - Recommendations by Type
Underground Illumination
Operator Training
Marketing
Specify Acceptance Criteria
Technical Training
Standards Required
Jpdate Operations Manual
0
1
2
3
Number

Graph 4


First National Battery - Recommendations Responsibility Graph
Underground Illumination
Customer
Technical Services Manager
ngineering Manager
Managing Director
0
5
10
15
20
25
30
Number

SECTION 6

SUB SYSTEM/OPERATION REPORT

UNDERGROUND ILLUMINATION

First National Battery

17 August 2001

Underground Illumination

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Sub System Description Report

Sub System No. and Description

S01	**Miners Cap Lamps**
S02	**Leisure Lamp**
S03	**Loco Light**
S04	**CM remote adaptor**

End of Report

SECTION 6

SUB SYSTEM AND DESIGN INTENT REPORT

UNDERGROUND ILLUMINATION

First National Battery

17 August 2001

Underground Illumination

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Sub System and Design Intent Report

Sub System No. and Design Intent Description

S01 Miners Cap Lamps

I01 Illumination of personal work area

S02 Leisure Lamp

I01 Provide illumination for leisure purposes

S03 Loco Light

I01 Provide illumination for underground tramming vehicles

S04 CM remote adaptor

I01 Source of power for continuous miner remote control

End of Report

SECTION 6

RISK ASSESSMENT WORKSHEET REPORT

UNDERGROUND ILLUMINATION

First National Battery

17 August 2001

Underground Illumination

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report

S01 **Miners Cap Lamps**

I01 **Illumination of personal work area**

Hazard **What if lock pin is tampered with** **Category** OE&HF **Freq 1 Sev A Risk Priority1**

Cause Illegal use of electricity supply

Consq Underground fires, explosion of flammable gas, fatalities and injuries, damage to equipment

S/guard Sealing wax to prevent tampering. Special tool required to remove lock pin

R001 Employees to be made aware of dangers and consequences **Who CUS Type S**

R002 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes **Who TS Type M**

Hazard **What if Lock Barrel is tampered with** **Category** OE&HF **Freq 4 Sev A Risk Priority4**

Cause Illegal use of electricity supply

Consq Underground fires, explosion of flammable gas, fatalities and injuries, damage to equipment

S/guard Charging key must be used

R003 Employees to be made aware of dangers and consequences **Who CUS Type S**

R004 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes **Who TS Type M**

Hazard **What if Switch Knob is tampered with** **Category** OE&HF **Freq 4 Sev A Risk Priority4**

Cause Illegal use of electricity supply

Consq Underground fires, explosion of flammable gas, fatalities and injuries, damage to equipment

S/guard Switch knob cannot be removed from outside

R005 Employees to be made aware of dangers and consequences **Who CUS Type S**

R006 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes **Who TS Type M**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

Hazard **What if the bulb fails** **Category** MP **Freq** 2 **Sev** C **Risk Priority** 4

Cause Limited life

Consq Worker has no light and can be injured

S/guard NIL

		Who	Type
R007	Worker not allowed to be on his own	**CUS**	**S**
R008	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**TS**	**M**

Hazard **What if there is a broken lens ring and head piece molding** **Category** PH **Freq** 3 **Sev** C **Risk Priority** 5

Cause Lens ring and head pieces knocked hard and abused

Consq Access to electrical supply

S/guard Robust design

		Who	Type
R009	Any defects to be reported after shift to lamp repairer	**CUS**	**O**
R010	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**TS**	**M**

Hazard **What if cable gland is broken or removed** **Category** PH **Freq** 4 **Sev** E **Risk Priority** 8

Cause Over tightening

Consq Moisture ingress, reduced lighting

S/guard Special tool required to tighten or remove

		Who	Type
R011	Any defects to be reported after shift to lamp repairer	**CUS**	**O**
R012	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**TS**	**M**

Hazard **What if there is moisture ingress into head piece** **Category** EEI **Freq** 3 **Sev** E **Risk Priority** 7

Cause Poor maintenance

Consq Poor light, failure of light

S/guard Gasket in place and O rings, robust design

		Who	Type
R013	Any defects to be reported after shift to lamp repairer	**CUS**	**O**
R014	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**TS**	**M**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

Hazard **What if there is a cut cable** **Category** PH **Freq** 2 **Sev** D **Risk Priority** 5

Cause Accidents and abuse

Consq No light, sparking

S/guard Robust material

		Who	Type
R015	Any defects to be reported after shift to lamp repairer	CUS	O
R016	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	TS	M

Hazard **What if there is a broken exit cover (Outer lid) and retaining clip and screw** **Category** PH **Freq** 2 **Sev** B **Risk Priority** 3

Cause Abuse and normal wear and tear

Consq Terminals and Polly switch exposed,fatalities,injuries

S/guard Retaining clip to prevent abuse. Improved design. Robust material(Polycarbonate).Special tool required for retaining clip

		Who	Type
R017	Any defects to be reported after shift to lamp repairer	CUS	O
R018	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	TS	M

Hazard **What if cable clamp(side entry) is not fitted** **Category** OE&HF **Freq** 3 **Sev** B **Risk Priority**4

Cause Poor maintenance

Consq Can cause loose connections, light failure, sparking

S/guard Assembly procedures available in lamp rooms

		Who	Type
R019	Any defects to be reported after shift to lamp repairer	CUS	O
R020	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	TS	M

Hazard **What if the Polly Switch does not function properly** **Category** E&IM **Freq** 4 **Sev** A **Risk Priority** 4

Cause Limited life, incorrect charging rate, poor assembly and maintenance

Consq No light(Polly switch open). If Polly switch stays closed then can have fires and/or explosions

S/guard Cable bulb and Polly switch tester available

		Who	Type
R021	Any defects to be reported after shift to lamp repairer	CUS	O
R022	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	TS	M

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report

Hazard **What if accumulator is cracked and worn** **Category** PH **Freq** 4 **Sev** C **Risk Priority** 6

Cause Abuse

Consq Injury due to acid burns

S/guard Robust design

		Who	Type
R023	Any defects to be reported after shift to lamp repairer	**CUS**	**O**
R024	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**TS**	**M**

Hazard **What if there is poor maintenance done on Cap Lamp** **Category** OE&HF **Freq** 1 **Sev** A **RiskPriority**1

Cause Not following procedures. Insufficient training

Consq Invalidation of legal requirements

S/guard Training and certification

		Who	Type
R025	User to ensure personnel are fully trained and certificated	**CUS**	**T**
R026	User to make use of OEM training	**MD**	**T**

Hazard **What if cable is incorrectly connected to accumulator terminals or head piece contacts** **Category** OE&HF **Freq** 4 **Sev** E **Risk Priority**8

Cause Negligence, insufficient training, human error

Consq Reverse polarity can result loss of capacity

S/guard Color coded cable, indications on terminals, installation instructions

		Who	Type
R027	Polarity of the head piece to be indicated on installation instructions	**TS**	**S**

Who **Type**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

S02 **Leisure Lamp**

I01 **Provide illumination for leasure purposes**

Hazard **What if the FNB supplied charger is not used** **Category** OE&HF **Freq** 3 **Sev** E **Risk Priority** 7

Cause Lost charger, charger faulty

Consq Damage to accumulator, overcharge

S/guard OEM charger supplied with kit

		Who	Type
R028	Use OEM supplied Charger and accessories	**CUS**	**MT**

Who **Type**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

S03 **Loco Light**

I01 **Provide illumination for underground tramming vehicles**

Hazard **What if charging point is faulty on loco light and/or charging rack** **Category** MP **Freq 3 Sev B Risk Priority 4**

Cause Abuse, poor maintenance.

Consq Accumulators will be undercharged and will not last shift, fatalities, loss of production

S/guard LED indication on charging rack, visual check on point

R029 Daily maintenance checks. All charging should be done in lamp room — **Who** CUS **Type** S

R030 MSA to compile Maintenance and Trouble Shooting Notes — **Who** MD **Type** A

Hazard **What if wiring to terminals is incorrectly connected** **Category** MP **Freq 2 Sev D Risk Priority 5**

Cause Untrained personnel, human error, poor maintenance.

Consq Damaged accumulators. No light. Reverse charge on accumulator

S/guard LED indication on charging rack, light will not work, Polly switch prevents short circuit

R031 Wiring diagram to be attached to T piece. — **Who** TS **Type** S

R032 MSA to compile Maintenance and Trouble Shooting Notes — **Who** MD **Type** A

Hazard **What if toggle switch is broken or missing** **Category** MP **Freq 4 Sev B Risk Priority 5**

Cause Tampering, wear and tear, poor maintenance

Consq No light,fatalities,loss of production.

S/guard Lock washer fitted on switch

R033 Lamps must be inspected everyday by responsible person — **Who** CUS **Type** S

R034 MSA to compile Maintenance and Trouble Shooting Notes — **Who** MD **Type** A

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

Hazard What if locking device (Allen key screw) is missing — **Category** MP **Freq 4 Sev E** **Risk Priority 8**

Cause Tampering, wear and tear, poor maintenance

Consq Access to terminals and accumulator, wiring exposed

S/guard Two locking devices fitted (Two Allen keys)

		Who	Type
R035	Lamps must be inspected everyday by responsible person	CUS	S
R036	MSA to compile Maintenance and Trouble Shooting Notes	MD	A

Hazard What if spacer (T piece) is missing — **Category** MP **Freq 4 Sev E** **Risk Priority 8**

Cause Poor maintenance

Consq Damage to accumulator and to reflector due to excessive movement and vibration

S/guard Secured to bottom casing by means of strapping

		Who	Type
R037	Proper maintenance	CUS	S
R038	MSA to compile Maintenance and Trouble Shooting Notes	MD	A

Hazard What if casing is broken — **Category** MP **Freq 4 Sev D** **Risk Priority 7**

Cause Accidents

Consq Wiring is exposed

S/guard Robust material

		Who	Type
R039	MSA to compile Maintenance and Trouble Shooting Notes	MD	A

Who Type

Hazard What if the Polly Switch does not function properly — **Category** E&IM **Freq 4 Sev A** **Risk Priority 4**

Cause Limited life, incorrect charging rate, poor assembly and maintenance

Consq No light(Polly switch open). If Polly switch stays closed then can have fires and/or explosions

S/guard Cable bulb and Polly switch tester available

		Who	Type
R040	Any defects to be reported after shift to lamp repairer	CUS	O
R041	MSA to compile Maintenance and Trouble Shooting Notes	MD	A

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

Hazard **What if cable is incorrectly connected to accumulator terminals or head piece contacts** — **Category** OE&HF — **Freq** 4 **Sev** E — **Risk Priority** 8

Cause Negligence, insufficient training, human error

Consq Reverse polarity can result loss of capacity

S/guard Color coded cable, indications on terminals

		Who	Type
R042	Wiring diagram to be fitted to T piece	**CUS**	**S**
R043	MSA to compile Maintenance and Trouble Shooting Notes	**MD**	**A**

Hazard **What if accumulator is damaged** — **Category** PH — **Freq** 4 **Sev** C — **Risk Priority** 6

Cause Abuse, accidents

Consq Injury due to acid burns

S/guard Robust design

		Who	Type
R044	Any defects to be reported after shift to lamp repairer	**CUS**	**O**
R045	MSA to compile Maintenance and Trouble Shooting Notes	**MD**	**A**

Hazard **What if one of the bulbs fuse** — **Category** MP — **Freq** 3 **Sev** B — **Risk Priority** 4

Cause Limited life, abuse

Consq No light, fatalities, loss of equipment and production

S/guard Nil

		Who	Type
R046	Daily maintenance checks	**CUS**	**S**
R047	MSA to compile Maintenance and Trouble Shooting Notes	**MD**	**A**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

S04 **CM remote adaptor**

I01 **Source of power for continuous miner remote control**

Hazard **What if water seal is not fitted during maintenance** **Category** MP **Freq** 4 **Sev** E **Risk Priority** 8

Cause Poor maintenance, human error

Consq Dislodge the magnet which will result in no power to the remote

S/guard Nil

		Who	Type
R048	Train personnel with regards to use. EPM to supply assembly instructions	**EM**	**S**

Who **Type**

Hazard **What if the inline fuse blows** **Category** E&IM **Freq** 2 **Sev** B **Risk Priority** 3

Cause Abuse, moisture, malfunction

Consq No power to remote control, loss of production

S/guard Nil

		Who	Type
R049	Never remove connection from remote control and always disconnect on cap lamp side. Train personnel with regards to use	**CUS**	**S**

Who **Type**

Hazard **What if goose neck connector is not secured properly** **Category** E&IM **Freq** 3 **Sev** E **Risk Priority** 7

Cause Human error

Consq No power to remote control, loss of production

S/guard Magnetic reed switch will only engage if connection is in locked position

		Who	Type
R050	Train personnel with regards to use	**CUS**	**S**

Who **Type**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

Hazard **What if dirt gets into female side of remote adaptor** **Category** PH **Freq** **2** **Sev** **D** **Risk Priority 5**

Cause Human error, abuse

Consq No power to remote control, loss of production, damage to connector

S/guard Dust cap supplied

R051 Train personnel with regards to use **Who** **CUS** **Type** **S**

Who **Type**

Hazard **What if soldering of remote cable to goose neck connector is not done correctly** **Category** PH **Freq** **2** **Sev** **D** **Risk Priority 5**

Cause Human error, lack of training

Consq No power to remote control, loss of production.

S/guard Nil

R052 Train personnel with regards to use. EPM to supply assembly instructions. **Who** **CUS** **Type** **S**

Who **Type**

End of Report

SECTION 6

RECOMMENDATIONS (ORDERED BY TYPE)

UNDERGROUND ILLUMINATION

First National Battery

17 August 2001

Underground Illumination

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Recommendations (ordered by recommendation type)

Recommendation Type A Specify acceptance criteria

S03	**I01**	**R030**	MSA to compile Maintenance and Trouble Shooting Notes	**Risk Priority 4**
S03	**I01**	**R032**	MSA to compile Maintenance and Trouble Shooting Notes	**Risk Priority 5**
S03	**I01**	**R034**	MSA to compile Maintenance and Trouble Shooting Notes	**Risk Priority 5**
S03	**I01**	**R036**	MSA to compile Maintenance and Trouble Shooting Notes	**Risk Priority 8**
S03	**I01**	**R038**	MSA to compile Maintenance and Trouble Shooting Notes	**Risk Priority 8**
S03	**I01**	**R039**	MSA to compile Maintenance and Trouble Shooting Notes	**Risk Priority 7**
S03	**I01**	**R041**	MSA to compile Maintenance and Trouble Shooting Notes	**Risk Priority 4**
S03	**I01**	**R043**	MSA to compile Maintenance and Trouble Shooting Notes	**Risk Priority 8**
S03	**I01**	**R045**	MSA to compile Maintenance and Trouble Shooting Notes	**Risk Priority 6**
S03	**I01**	**R047**	MSA to compile Maintenance and Trouble Shooting Notes	**Risk Priority 4**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Recommendations (ordered by recommendation type)

Recommendation Type M Update Operations manual

S01	**I01**	**R002**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Risk Priority 1**
S01	**I01**	**R004**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Risk Priority 4**
S01	**I01**	**R006**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Risk Priority 4**
S01	**I01**	**R008**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Risk Priority 4**
S01	**I01**	**R010**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Risk Priority 5**
S01	**I01**	**R012**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Risk Priority 8**
S01	**I01**	**R014**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Risk Priority 7**
S01	**I01**	**R016**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Risk Priority 5**
S01	**I01**	**R018**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Risk Priority 3**
S01	**I01**	**R020**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Risk Priority 4**
S01	**I01**	**R022**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Risk Priority 4**
S01	**I01**	**R024**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Risk Priority 6**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Recommendations (ordered by recommendation type)

Recommendation Type **MT** **Marketing**

Use OEM supplied Charger and accessories **Risk Priority** **7**

S02 I01 R028

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Recommendations (ordered by recommendation type)

Recommendation Type O Operator Training

S01	**I01**	**R009**	Any defects to be reported after shift to lamp repairer	**Risk Priority 5**
S01	**I01**	**R011**	Any defects to be reported after shift to lamp repairer	**Risk Priority 8**
S01	**I01**	**R013**	Any defects to be reported after shift to lamp repairer	**Risk Priority 7**
S01	**I01**	**R015**	Any defects to be reported after shift to lamp repairer	**Risk Priority 5**
S01	**I01**	**R017**	Any defects to be reported after shift to lamp repairer	**Risk Priority 3**
S01	**I01**	**R019**	Any defects to be reported after shift to lamp repairer	**Risk Priority 4**
S01	**I01**	**R021**	Any defects to be reported after shift to lamp repairer	**Risk Priority 4**
S01	**I01**	**R023**	Any defects to be reported after shift to lamp repairer	**Risk Priority 6**
S03	**I01**	**R040**	Any defects to be reported after shift to lamp repairer	**Risk Priority 4**
S03	**I01**	**R044**	Any defects to be reported after shift to lamp repairer	**Risk Priority 6**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Recommendations (ordered by recommendation type)

Recommendation Type **S** **Standard Required**

S01	**I01**	**R001**	Employees to be made aware of dangers and consequences	**Risk Priority**	**1**
S01	**I01**	**R003**	Employees to be made aware of dangers and consequences	**Risk Priority**	**4**
S01	**I01**	**R005**	Employees to be made aware of dangers and consequences	**Risk Priority**	**4**
S01	**I01**	**R007**	Worker not allowed to be on his own	**Risk Priority**	**4**
S01	**I01**	**R027**	Polarity of the head piece to be indicated on installation instructions	**Risk Priority**	**8**
S03	**I01**	**R029**	Daily maintenance checks. All charging should be done in lamp room	**Risk Priority**	**4**
S03	**I01**	**R031**	Wiring diagram to be attached to T piece.	**Risk Priority**	**5**
S03	**I01**	**R033**	Lamps must be inspected everyday by responsible person	**Risk Priority**	**5**
S03	**I01**	**R035**	Lamps must be inspected everyday by responsible person	**Risk Priority**	**8**
S03	**I01**	**R037**	Proper maintenance	**Risk Priority**	**8**
S03	**I01**	**R042**	Wiring diagram to be fitted to T piece	**Risk Priority**	**8**
S03	**I01**	**R046**	Daily maintenance checks	**Risk Priority**	**4**
S04	**I01**	**R048**	Train personnel with regards to use. EPM to supply assembly instructions	**Risk Priority**	**8**
S04	**I01**	**R049**	Never remove connection from remote control and always disconnect on cap lamp side. Train personnel with regards to use	**Risk Priority**	**3**

Train personnel with regards to use **Risk Priority** **7**

S04 I01 R050

Train personnel with regards to use **Risk Priority** **5**

S04 I01 R051

Train personnel with regards to use. EPM to supply assembly instructions. **Risk Priority** **5**

S04 I01 R052

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Recommendations (ordered by recommendation type)

Recommendation Type T Technical Training

S01	**I01**	**R025**	User to ensure personnel are fully trained and certificated	**Risk Priority 1**
S01	**I01**	**R026**	User to make use of OEM training	**Risk Priority 1**

End of Report

SECTION 6

RECOMMENDATIONS (ORDERED BY PRIORITY)

UNDERGROUND ILLUMINATION

First National Battery

17 August 2001

Underground Illumination

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Recommendations (ordered by priority)

Recommendation Priority 1

S01	**I01**	**R001**	Employees to be made aware of dangers and consequences	**Type S**
S01	**I01**	**R002**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Type M**
S01	**I01**	**R025**	User to ensure personnel are fully trained and certificated	**Type T**
S01	**I01**	**R026**	User to make use of OEM training	**Type T**

Recommendation Priority 3

S01	**I01**	**R017**	Any defects to be reported after shift to lamp repairer	**Type O**
S01	**I01**	**R018**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Type M**
S04	**I01**	**R049**	Never remove connection from remote control and always disconnect on cap lamp side. Train personnel with regards to use	**Type S**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Recommendations (ordered by priority)

Recommendation Priority 4

S01	**I01**	**R003**	Employees to be made aware of dangers and consequences	**Type S**
S01	**I01**	**R004**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Type M**
S01	**I01**	**R005**	Employees to be made aware of dangers and consequences	**Type S**
S01	**I01**	**R006**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Type M**
S01	**I01**	**R007**	Worker not allowed to be on his own	**Type S**
S01	**I01**	**R008**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Type M**
S01	**I01**	**R019**	Any defects to be reported after shift to lamp repairer	**Type O**
S01	**I01**	**R020**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Type M**
S01	**I01**	**R021**	Any defects to be reported after shift to lamp repairer	**Type O**
S01	**I01**	**R022**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Type M**
S03	**I01**	**R029**	Daily maintenance checks. All charging should be done in lamp room	**Type S**
S03	**I01**	**R030**	MSA to compile Maintenance and Trouble Shooting Notes	**Type A**
S03	**I01**	**R040**	Any defects to be reported after shift to lamp repairer	**Type O**
S03	**I01**	**R041**	MSA to compile Maintenance and Trouble Shooting Notes	**Type A**
S03	**I01**	**R046**	Daily maintenance checks	**Type S**
S03	**I01**	**R047**	MSA to compile Maintenance and Trouble Shooting Notes	**Type A**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Recommendations (ordered by priority)

Recommendation Priority 5

S01	**I01**	**R009**	Any defects to be reported after shift to lamp repairer	**Type O**
S01	**I01**	**R010**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Type M**
S01	**I01**	**R015**	Any defects to be reported after shift to lamp repairer	**Type O**
S01	**I01**	**R016**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Type M**
S03	**I01**	**R031**	Wiring diagram to be attached to T piece.	**Type S**
S03	**I01**	**R032**	MSA to compile Maintenance and Trouble Shooting Notes	**Type A**
S03	**I01**	**R033**	Lamps must be inspected everyday by responsible person	**Type S**
S03	**I01**	**R034**	MSA to compile Maintenance and Trouble Shooting Notes	**Type A**
S04	**I01**	**R051**	Train personnel with regards to use	**Type S**
S04	**I01**	**R052**	Train personnel with regards to use. EPM to supply assembly instructions.	**Type S**

Recommendation Priority 6

S01	**I01**	**R023**	Any defects to be reported after shift to lamp repairer	**Type O**
S01	**I01**	**R024**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Type M**
S03	**I01**	**R044**	Any defects to be reported after shift to lamp repairer	**Type O**
S03	**I01**	**R045**	MSA to compile Maintenance and Trouble Shooting Notes	**Type A**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Recommendations (ordered by priority)

Recommendation Priority 7

S01	**I01**	**R013**	Any defects to be reported after shift to lamp repairer	**Type O**
S01	**I01**	**R014**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Type M**
S02	**I01**	**R028**	Use OEM supplied Charger and accessories	**Type MT**
S03	**I01**	**R039**	MSA to compile Maintenance and Trouble Shooting Notes	**Type A**
S04	**I01**	**R050**	Train personnel with regards to use	**Type S**

Recommendation Priority 8

S01	**I01**	**R011**	Any defects to be reported after shift to lamp repairer	**Type O**
S01	**I01**	**R012**	Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes	**Type M**
S01	**I01**	**R027**	Polarity of the head piece to be indicated on installation instructions	**Type S**
S03	**I01**	**R035**	Lamps must be inspected everyday by responsible person	**Type S**
S03	**I01**	**R036**	MSA to compile Maintenance and Trouble Shooting Notes	**Type A**
S03	**I01**	**R037**	Proper maintenance	**Type S**
S03	**I01**	**R038**	MSA to compile Maintenance and Trouble Shooting Notes	**Type A**
S03	**I01**	**R042**	Wiring diagram to be fitted to T piece	**Type S**
S03	**I01**	**R043**	MSA to compile Maintenance and Trouble Shooting Notes	**Type A**
S04	**I01**	**R048**	Train personnel with regards to use. EPM to supply assembly instructions	**Type S**

End of Report

SECTION 6

WORKSHEET REPORT
(SORTED BY WORK AREA AND RISK PRIORITY)

UNDERGROUND ILLUMINATION

First National Battery

17 August 2001

Underground Illumination

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

S01 **Miners Cap Lamps**

I01 **Illumination of personal work area**

Hazard **What if lock pin is tampered with** **Category** OE&HF **Freq** 1 **Sev** **Risk Priority1**

Cause Illegal use of electricity supply

Consq Underground fires, explosion of flammable gas, fatalities and injuries, damage to equipment

S/guard Sealing wax to prevent tampering. Special tool required to remove lock pin

R001 Employees to be made aware of dangers and consequences **Who** **CUS**

R002 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes **Who** **Who** **TS**

Hazard **What if there is poor maintenance done on Cap Lamp** **Category** OE&HF **Freq** 1 **Sev** **Risk Priority1**

Cause Not following procedures. Insufficient training

Consq Invalidation of legal requirements

S/guard Training and certification

R025 User to ensure personnel are fully trained and certificated **Who** **CUS**

R026 User to make use of OEM training **Who** **Who** **MD**

I01 **Illumination of personal work area**

Hazard **What if there is a broken exit cover (Outer lid) and retaining clip and screw** **Category** PH **Freq** 2 **Sev** **Risk Priority 3**

Cause Abuse and normal wear and tear

Consq Terminals and Polly switch exposed,fatalities,injuries

S/guard Retaining clip to prevent abuse. Improved design. Robust material(Polycarbonate).Special tool required for retaining clip

R017 Any defects to be reported after shift to lamp repairer **Who** **CUS**

R018 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes **Who** **Who** **TS**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Illumination of personal work area

Hazard What if Lock Barrel is tampered with — **Category** OE&HF — **Freq 4 Sev Risk Priority4**

Cause Illegal use of electricity supply

Consq Underground fires, explosion of flammable gas, fatalities and injuries, damage to equipment

S/guard Charging key must be used

R003 Employees to be made aware of dangers and consequences — **Who** CUS

R004 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes — **Who** Who TS

Hazard What if Switch Knob is tampered with — **Category** OE&HF — **Freq 4 Sev Risk Priority4**

Cause Illegal use of electricity supply

Consq Underground fires, explosion of flammable gas, fatalities and injuries, damage to equipment

S/guard Switch knob cannot be removed from outside

R005 Employees to be made aware of dangers and consequences — **Who** CUS

R006 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes — **Who** Who TS

Hazard What if the bulb fails — **Category** MP — **Freq 2 Sev Risk Priority 4**

Cause Limited life

Consq Worker has no light and can be injured

S/guard NIL

R007 Worker not allowed to be on his own — **Who** CUS

R008 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes — **Who** Who TS

Hazard What if cable clamp(side entry) is not fitted — **Category** OE&HF — **Freq 3 Sev Risk Priority4**

Cause Poor maintenance

Consq Can cause loose connections, light failure, sparking

S/guard Assembly procedures available in lamp rooms

R019 Any defects to be reported after shift to lamp repairer — **Who** CUS

R020 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes — **Who** Who TS

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

Hazard **What if the Polly Switch does not function properly** **Category** E&IM **Freq 4 Sev Risk Priority 4**

Cause Limited life, incorrect charging rate, poor assembly and maintenance

Consq No light(Polly switch open). If Polly switch stays closed then can have fires and/or explosions

S/guard Cable bulb and Polly switch tester available

R021 Any defects to be reported after shift to lamp repairer **Who CUS**

R022 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes **Who Who TS**

I01 Illumination of personal work area

Hazard **What if there is a broken lens ring and head piece molding** **Category** PH **Freq 3 Sev Risk Priority 5**

Cause Lens ring and head pieces knocked hard and abused

Consq Access to electrical supply

S/guard Robust design

R009 Any defects to be reported after shift to lamp repairer **Who CUS**

R010 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes **Who Who TS**

Hazard **What if there is a cut cable** **Category** PH **Freq 2 Sev Risk Priority 5**

Cause Accidents and abuse

Consq No light, sparking

S/guard Robust material

R015 Any defects to be reported after shift to lamp repairer **Who CUS**

R016 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes **Who Who TS**

I01 Illumination of personal work area

Hazard **What if accumulator is cracked and worn** **Category** PH **Freq 4 Sev Risk Priority 6**

Cause Abuse

Consq Injury due to acid burns

S/guard Robust design

R023 Any defects to be reported after shift to lamp repairer **Who CUS**

R024 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes **Who Who TS**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Illumination of personal work area

Hazard What if there is moisture ingress into head piece — **Category** EEI — **Freq 3 Sev 7** — **Risk Priority**

Cause Poor maintenance

Consq Poor light, failure of light

S/guard Gasket in place and O rings, robust design

R013 Any defects to be reported after shift to lamp repairer — **Who** CUS

R014 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes — **Who** Who **TS**

I01 Illumination of personal work area

Hazard What if cable gland is broken or removed — **Category** PH — **Freq 4 Sev 8** — **Risk Priority**

Cause Over tightening

Consq Moisture ingress, reduced lighting

S/guard Special tool required to tighten or remove

R011 Any defects to be reported after shift to lamp repairer — **Who** CUS

R012 Safety rules to be incorporated in Miners Cap Lamp Maintenance and Trouble Shooting Notes — **Who** Who **TS**

Hazard What if cable is incorrectly connected to accumulator terminals or head piece contacts — **Category** OE&HF — **Freq 4 Sev 8** — **Risk Priority**

Cause Negligence, insufficient training, human error

Consq Reverse polarity can result loss of capacity

S/guard Color coded cable, indications on terminals, installation instructions

R027 Polarity of the head piece to be indicated on installation instructions — **Who** TS

Who

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

S02 **Leisure Lamp**

I01 **Provide illumination for leasure purposes**

Hazard **What if the FNB supplied charger is not used** **Category** OE&HF **Freq** 3 **Sev** **Risk Priority** 7

Cause Lost charger, charger faulty

Consq Damage to accumulator, overcharge

S/guard OEM charger supplied with kit

R028 Use OEM supplied Charger and accessories **Who** **CUS**

Who

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

S03 **Loco Light**

I01 **Provide illumination for underground tramming vehicles**

Hazard **What if charging point is faulty on loco light and/or charging rack** **Category** MP **Freq** 3 **Sev** **Risk Priority** 4

Cause Abuse, poor maintenance.

Consq Accumulators will be undercharged and will not last shift, fatalities, loss of production

S/guard LED indication on charging rack, visual check on point

R029 Daily maintenance checks. All charging should be done in lamp room — **Who** CUS

R030 MSA to compile Maintenance and Trouble Shooting Notes — **Who** Who MD

Hazard **What if the Polly Switch does not function properly** **Category** E&IM **Freq** 4 **Sev** **Risk Priority** 4

Cause Limited life, incorrect charging rate, poor assembly and maintenance

Consq No light(Polly switch open). If Polly switch stays closed then can have fires and/or explosions

S/guard Cable bulb and Polly switch tester available

R040 Any defects to be reported after shift to lamp repairer — **Who** CUS

R041 MSA to compile Maintenance and Trouble Shooting Notes — **Who** Who MD

Hazard **What if one of the bulbs fuse** **Category** MP **Freq** 3 **Sev** **Risk Priority** 4

Cause Limited life, abuse

Consq No light, fatalities, loss of equipment and production

S/guard Nil

R046 Daily maintenance checks — **Who** CUS

R047 MSA to compile Maintenance and Trouble Shooting Notes — **Who** Who MD

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Provide illumination for underground tramming vehicles

Hazard What if wiring to terminals is incorrectly connected — **Category** MP — **Freq 2 Sev** — **Risk Priority 5**

Cause Untrained personnel, human error, poor maintenance.

Consq Damaged accumulators. No light. Reverse charge on accumulator

S/guard LED indication on charging rack, light will not work, Polly switch prevents short circuit

R031 Wiring diagram to be attached to T piece. — **Who** TS

R032 MSA to compile Maintenance and Trouble Shooting Notes — **Who** Who MD

Hazard What if toggle switch is broken or missing — **Category** MP — **Freq 4 Sev** — **Risk Priority 5**

Cause Tampering, wear and tear, poor maintenance

Consq No light,fatalities,loss of production.

S/guard Lock washer fitted on switch

R033 Lamps must be inspected everyday by responsible person — **Who** CUS

R034 MSA to compile Maintenance and Trouble Shooting Notes — **Who** Who MD

I01 Provide illumination for underground tramming vehicles

Hazard What if accumulator is damaged — **Category** PH — **Freq 4 Sev** — **Risk Priority 6**

Cause Abuse, accidents

Consq Injury due to acid burns

S/guard Robust design

R044 Any defects to be reported after shift to lamp repairer — **Who** CUS

R045 MSA to compile Maintenance and Trouble Shooting Notes — **Who** Who MD

I01 Provide illumination for underground tramming vehicles

Hazard What if casing is broken — **Category** MP — **Freq 4 Sev** — **Risk Priority 7**

Cause Accidents

Consq Wiring is exposed

S/guard Robust material

R039 MSA to compile Maintenance and Trouble Shooting Notes — **Who** MD

Who

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Provide illumination for underground tramming vehicles

Hazard	**What if locking device (Allen key screw) is missing**	**Category** MP	**Freq 4 Sev Risk Priority 8**
Cause	Tampering, wear and tear, poor maintenance		
Consq	Access to terminals and accumulator, wiring exposed		
S/guard	Two locking devices fitted (Two Allen keys)		
R035	Lamps must be inspected everyday by responsible person		**Who CUS**
R036	MSA to compile Maintenance and Trouble Shooting Notes		**Who Who MD**

Hazard	**What if spacer (T piece) is missing**	**Category** MP	**Freq 4 Sev Risk Priority 8**
Cause	Poor maintenance		
Consq	Damage to accumulator and to reflector due to excessive movement and vibration		
S/guard	Secured to bottom casing by means of strapping		
R037	Proper maintenance		**Who CUS**
R038	MSA to compile Maintenance and Trouble Shooting Notes		**Who Who MD**

Hazard	**What if cable is incorrectly connected to accumulator terminals or head piece contacts**	**Category** OE&HF	**Freq 4 Sev Risk Priority8**
Cause	Negligence, insufficient training, human error		
Consq	Reverse polarity can result loss of capacity		
S/guard	Color coded cable, indications on terminals		
R042	Wiring diagram to be fitted to T piece		**Who CUS**
R043	MSA to compile Maintenance and Trouble Shooting Notes		**Who Who MD**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

S04 **CM remote adaptor**

I01 **Source of power for continuous miner remote control**

Hazard **What if the inline fuse blows** **Category** E&IM **Freq** **2** **Sev** **Risk Priority 3**

Cause Abuse, moisture, malfunction

Consq No power to remote control, loss of production

S/guard Nil

R049 Never remove connection from remote control and always disconnect on cap lamp side. Train personnel with regards to use **Who** **CUS** **Who**

I01 **Source of power for continuous miner remote control**

Hazard **What if dirt gets into female side of remote adaptor** **Category** PH **Freq** **2** **Sev** **Risk Priority 5**

Cause Human error, abuse

Consq No power to remote control, loss of production, damage to connector

S/guard Dust cap supplied

R051 Train personnel with regards to use **Who** **CUS** **Who**

Hazard **What if soldering of remote cable to goose neck connector is not done correctly** **Category** PH **Freq** **2** **Sev** **Risk Priority 5**

Cause Human error, lack of training

Consq No power to remote control, loss of production.

S/guard Nil

R052 Train personnel with regards to use. EPM to supply assembly instructions. **Who** **CUS** **Who**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Source of power for continuous miner remote control

Hazard What if goose neck connector is not secured properly — **Category** E&IM — **Freq 3 Sev** — **Risk Priority 7**

Cause Human error

Consq No power to remote control, loss of production

S/guard Magnetic reed switch will only engage if connection is in locked position

	Train personnel with regards to use	**Who**
R050		**CUS**
		Who

I01 Source of power for continuous miner remote control

Hazard What if water seal is not fitted during maintenance — **Category** MP — **Freq 4 Sev** — **Risk Priority 8**

Cause Poor maintenance, human error

Consq Dislodge the magnet which will result in no power to the remote

S/guard Nil

	Train personnel with regards to use. EPM to supply assembly instructions	**Who**
R048		**EM**
		Who

End of Report

SECTION 7

RISK ASSESSMENT DATA ANALYSIS

TOX AND FLAM ALARMS

7.0 TOX AND FLAM ALARMS

RISK ASSESSMENT DATA ANALYSIS

In this section the data contained in the Risk Assessment database has been extracted and summarised in various formats for graphical display.

GRAPH 1 - RISK PROFILE

Two of the higher risks are identified as follows:

- Seals left out on the Tox Alarm
- Seals left out on the Flam Alarm

The major focus concerning these hazards should be that the users carry out supplier recommended maintenance and inspection procedures and should use OEM parts. Also of significance is that regular training be carried out by the customer and that users are aware of the hazards and dangers and also to follow the supplier's installation and maintenance procedures.

GRAPH 2 - SUMMARY OF RISKS BY "WHAT IF" CATEGORY

The only two hazards identified are related to operator errors or human factors (10/17) and Physical hazards in the operation, use and maintenance of the equipment (7/17) Similarly, in order to reduce the risk of equipment malfunction procedures must be followed by users and regular training to be carried out by the customer.

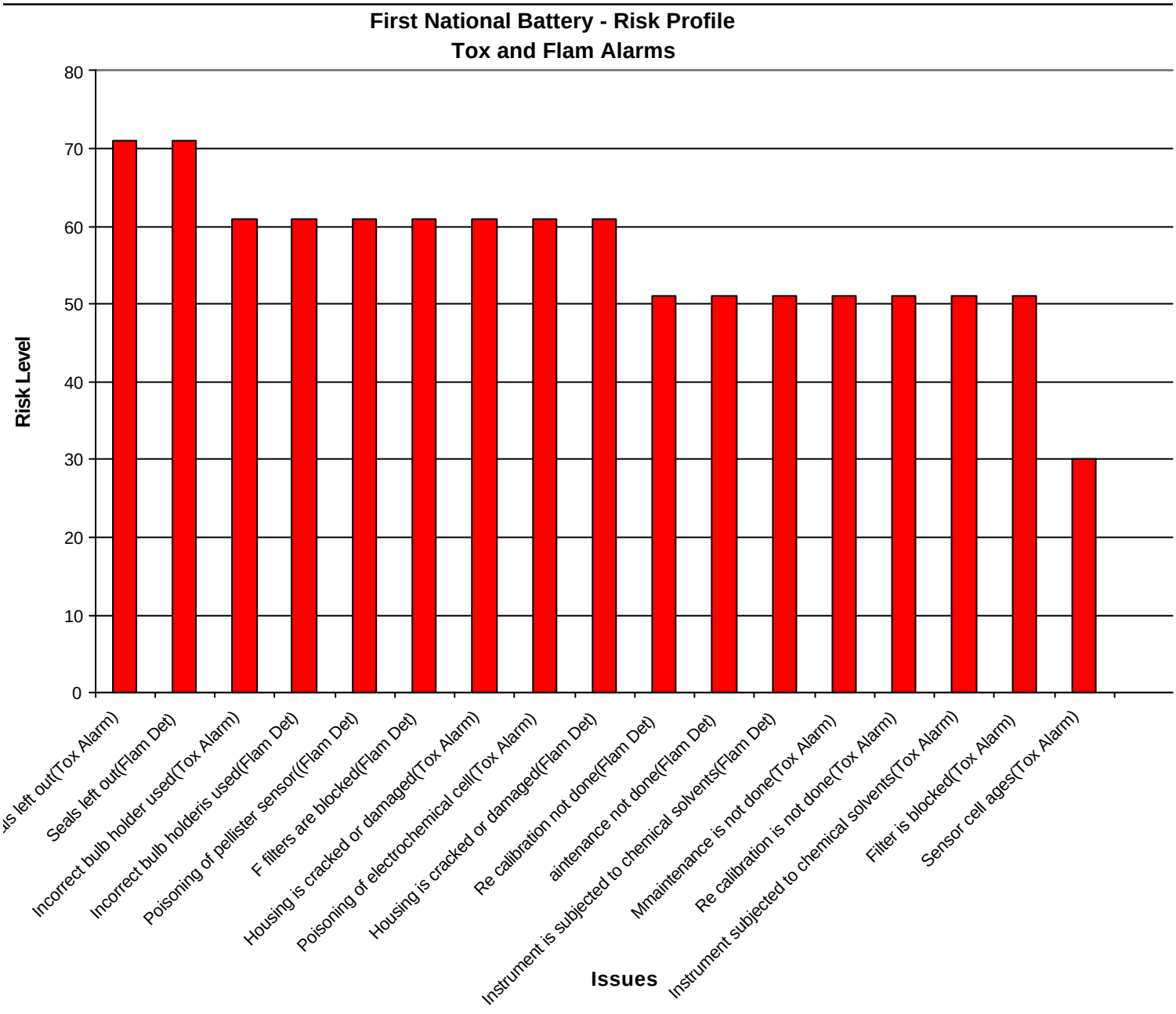
GRAPH 3 - SUMMARY OF RECOMMENDATIONS BY TYPE

This graph indicates that the majority of recommendations are also related to user standards required to ensure that the suppliers safety and installation procedures are followed as well as recommended operator training for both the Tox and Flam alarms There is also the need to ensure that the appropriate Maintenance Programmes are in place.

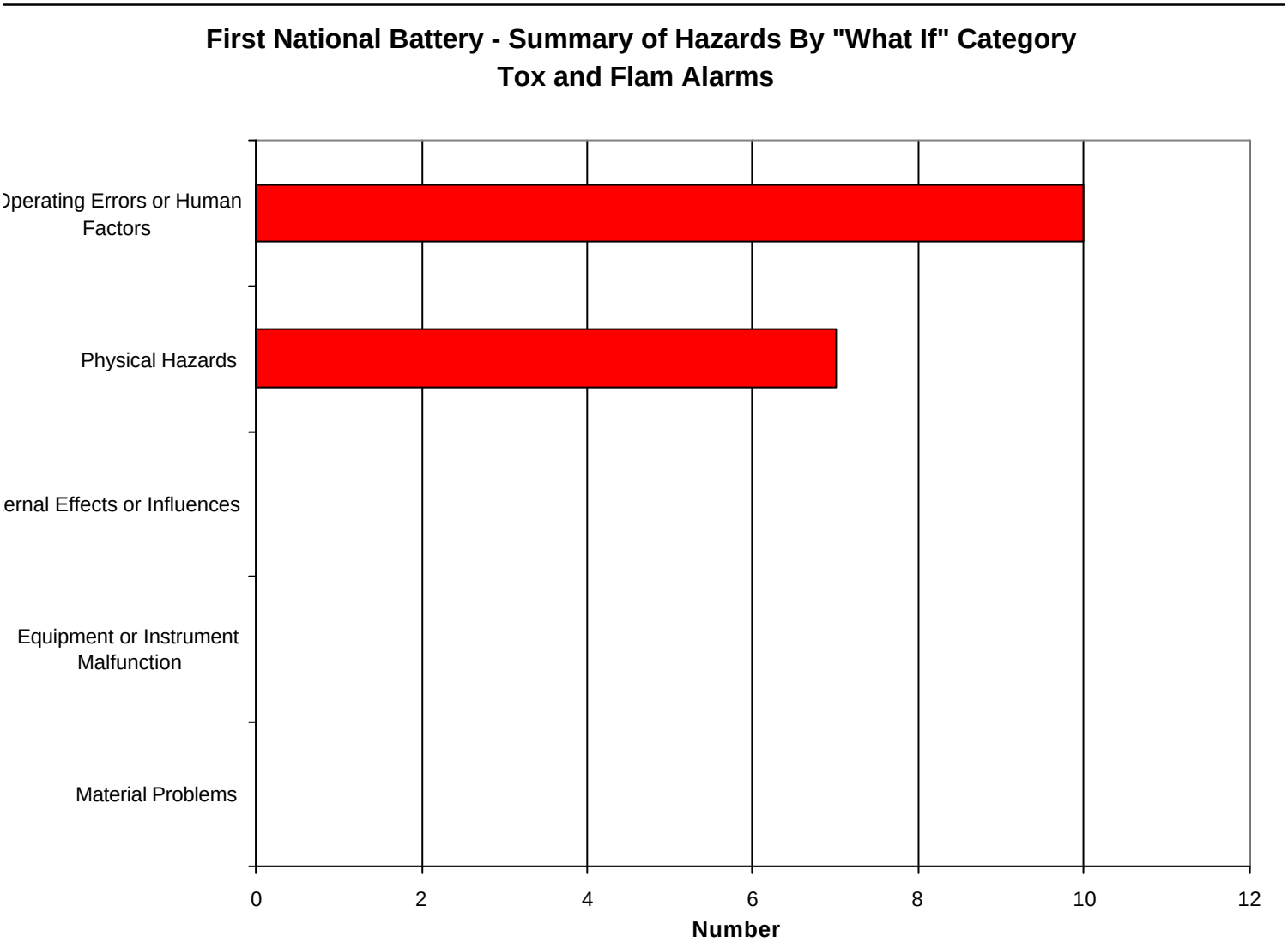
GRAPH 4 - SUMMARY OF RECOMMENDATIONS BY RESPONSIBILITY

From this analysis it is again evident that majority of responsibilities are with the customer in order to ensure that there is regular re training of users and is vital that recommended maintenance and inspection procedures are followed.

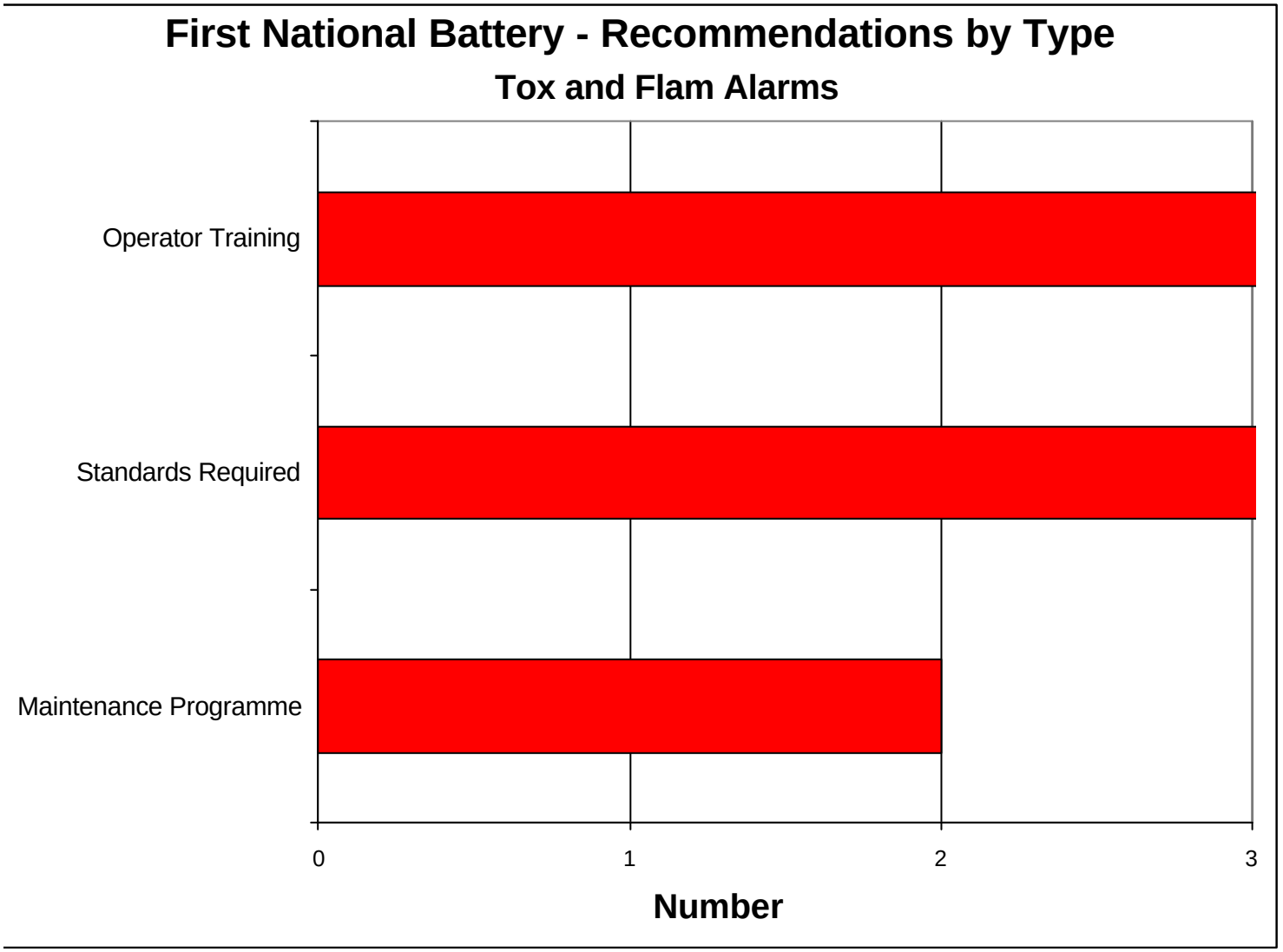
Graph 1


First National Battery - Risk Profile
Tox and Flam Alarms
Risk Level
80
70
60
50
40
30
20
10
0
Issues
ds left out(Tox Alarm)
Seals left out(Flam Det)
Incorrect bulb holder used(Tox Alarm)
Incorrect bulb holderis used(Flam Det)
Poisoning of pellister sensor((Flam Det)
F filters are blocked(Flam Det)
Housing is cracked or damaged(Tox Alarm)
Poisoning of electrochemical cell(Tox Alarm)
Housing is cracked or damaged(Flam Det)
Re calibration not done(Flam Det)
aintenance not done(Flam Det)
Instrument is subjected to chemical solvents(Flam Det)
Mmaintenance is not done(Tox Alarm)
Re calibration is not done(Tox Alarm)
Instrument subjected to chemical solvents(Tox Alarm)
Filter is blocked(Tox Alarm)
Sensor cell ages(Tox Alarm)

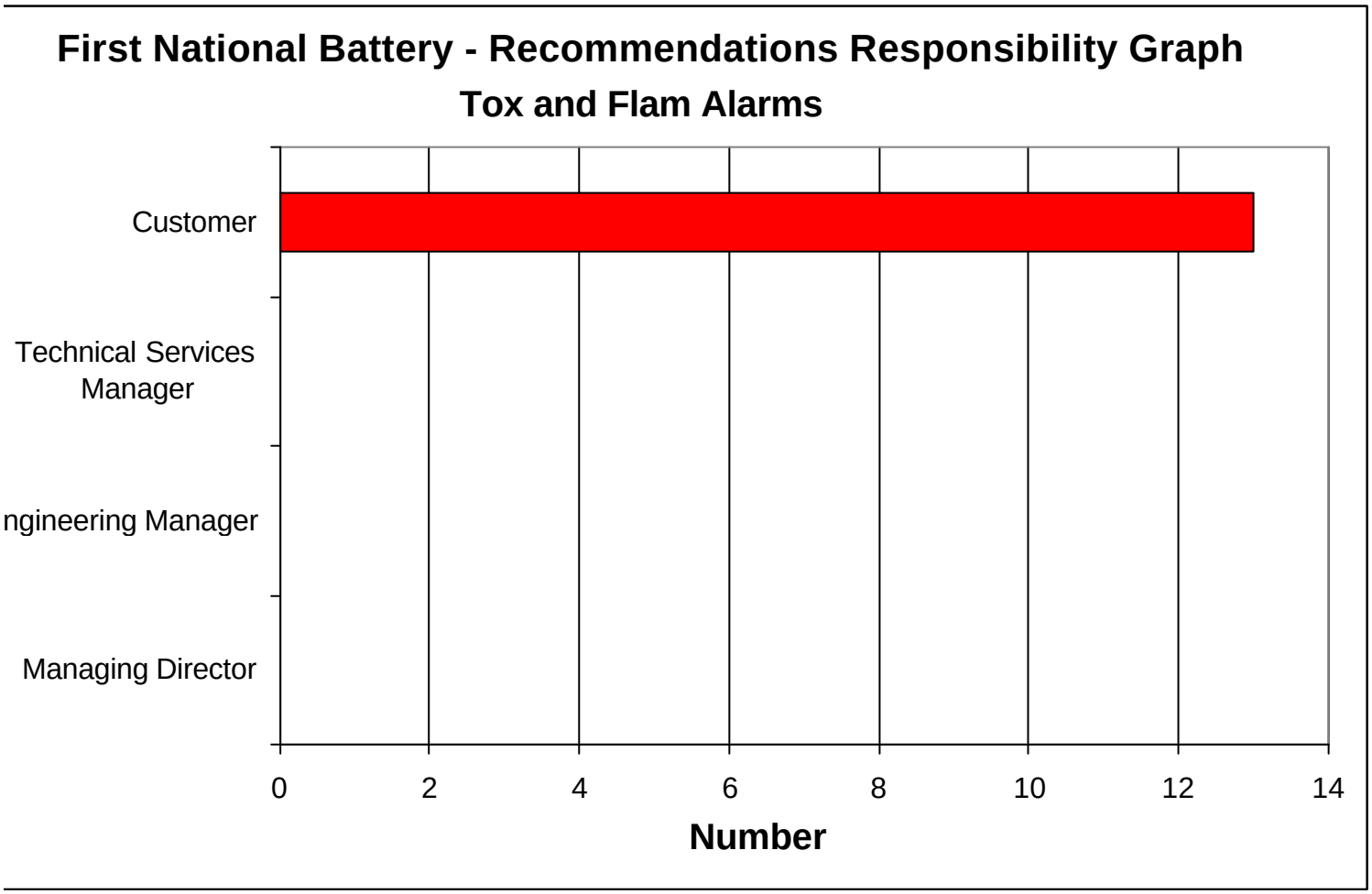
Graph 2


First National Battery - Summary of Hazards By "What If" Category
Tox and Flam Alarms
Operating Errors or Human Factors
Physical Hazards
ernal Effects or Influences
Equipment or Instrument Malfunction
Material Problems
0
2
4
6
8
10
12
Number

Graph 3


First National Battery - Recommendations by Type
Tox and Flam Alarms
Operator Training
Standards Required
Maintenance Programme
0
1
2
3
Number

Graph 4


First National Battery - Recommendations Responsibility Graph
Tox and Flam Alarms
Customer
Technical Services Manager
ngineering Manager
Managing Director
0
2
4
6
8
10
12
14
Number

SECTION 7

RISK ASSESSMENT WORKSHEET REPORT

TOX AND FLAM ALARMS

First National Battery

17 August 2001

Tox and Flam Alarms

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report

S01 **Tox Alarms**

I01 **Carbon Monoxide Detector**

Hazard **What if sensor cell ages** **Category** **Freq** **3** **Sev** **E**
PH **Risk Priority 7**

Cause Limited life of sensor cell

Consq Gradual degradation of performance

S/guard Calibration

Who **Type**

Who **Type**

Hazard **What if re calibration is not done** **Category** **Freq** **3** **Sev** **C**
OE&HF **Risk Priority5**

Cause Not following procedures

Consq Wrong reading and undetected deterioration of performance

S/guard Required safeguards are stipulated in training materials and video

Who **Type**

Who **Type**

Hazard **What if housing is cracked or damaged** **Category** **Freq** **3** **Sev** **B**
PH **Risk Priority 4**

Cause Abuse by wearer

Consq Water ingress

S/guard Robustness, wearer trained to do daily inspections, daily tests

Who **Type**

Who **Type**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

Hazard What if incorrect bulb holder is used — **Category** OE&HF **Freq 3 Sev B** **Risk Priority4**

Cause Use of incorrect spare part during maintenance

Consq Wearer would not be able to see warning signal

S/guard Daily checks as per OEM instructions

		Who	Type
R001	Regular retraining of personnel (users and lamp room personnel)	**CUS**	**O**
		Who	**Type**

Hazard What if seals are left out — **Category** OE&HF **Freq 2 Sev B** **Risk Priority3**

Cause Negligence, not following procedures, poor training

Consq Water or moisture ingress causing eventual failure

S/guard Quality control, training manuals and video

		Who	Type
R002	Use of OEM parts. Carry out recommended maintenance and inspection procedures	**CUS**	**S**
		Who	**Type**

Hazard What if the filter is blocked — **Category** PH **Freq 4 Sev B** **Risk Priority 5**

Cause Dirt, mud

Consq Progressive degradation in response time, catastrophic failure if totally covered in mud.

S/guard Design to be dust proof, operators are instructed to clean unit

		Who	Type
R003	Carry out recommended handling and inspection procedures	**CUS**	**S**
		Who	**Type**

Hazard What if there is poisoning of electrochemical cell — **Category** PH **Freq 3 Sev B** **Risk Priority 4**

Cause Incorrect cleaning procedures, abuse

Consq Failure of the sensor cell

S/guard Training manual and video

		Who	Type
R004	Ongoing training of operators	**CUS**	**O**
		Who	**Type**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

Hazard What if maintenance is not done — **Category** OE&HF **Freq 2 Sev C Risk Priority5**

Cause not following procedures as laid down by OEM

Consq failure of equipment

S/guard Required safeguards are stipulated in training materials and video

Regular (at least annually) retraining of maintenance personnel — **Who Type**
R005 — **CUS MP**

Who Type

Hazard What if the instrument is subjected to chemical solvents — **Category** OE&HF **Freq 3 Sev D Risk Priority5**

Cause Incorrect cleaning procedures

Consq Cover becomes brittle and will crack

S/guard Required safeguards are stipulated in training materials and video

Regular retraining of personnel (users and lamp room personnel) — **Who Type**
R006 — **CUS O**

Who Type

Hazard What if maintenance is not done — **Category** OE&HF **Freq 2 Sev C Risk Priority5**

Cause not following procedures as laid down by OEM

Consq failure of equipment

S/guard Required safeguards are stipulated in training materials and video

Regular (at least annually) retraining of maintenance personnel — **Who Type**
R007 — **CUS MP**

Who Type

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

S02 **Flam Alarm**

I01 **Flamable Gas Detector**

Hazard **What if re calibration is not done** **Category** OE&HF **Freq** 3 **Sev** C **Risk Priority** 5

Cause Not following procedures

Consq Wrong reading and undetected deterioration of performance

S/guard Required safeguards are stipulated in training materials and video

Who **Type**

Who **Type**

Hazard **What if incorrect bulb holder is used** **Category** OE&HF **Freq** 3 **Sev** B **Risk Priority** 4

Cause Use of incorrect spare part during maintenance

Consq Wearer would not be able to see warning signal

S/guard Daily checks as per OEM instructions

Regular retraining of personnel (users and lamp room personnel) **Who** **Type**
R008 **CUS** **O**

Who **Type**

Hazard **What if the instrument is subjected to chemical solvents** **Category** OE&HF **Freq** 3 **Sev** D **Risk Priority** 5

Cause Incorrect cleaning procedures

Consq Cover becomes brittle and will crack

S/guard Required safeguards are stipulated in training materials and video

Regular retraining of personnel (users and lamp room personnel) **Who** **Type**
R009 **CUS** **O**

Who **Type**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

Hazard What if there is poisoning of pellister sensor **Category** PH **Freq 3 Sev B** **Risk Priority 4**

Cause Incorrect cleaning procedures of flam alarm and other lamp room equipment, abuse. Exposure to inappropriate chemicals during use

Consq Failure of the pellister sensor

S/guard Training manual and video

Ongoing training of operators **Who Type**
R010 **CUS O**

Who Type

Hazard What if the filters are blocked **Category** PH **Freq 4 Sev B** **Risk Priority 4**

Cause Dirt, mud

Consq Progressive degradation in response time, catastrophic failure if totally covered in mud.

S/guard Design to be dust proof, operators are instructed to clean unit

Carry out recommended handling and inspection procedures **Who Type**
R011 **CUS S**

Who Type

Hazard What if seals are left out **Category** OE&HF **Freq 2 Sev B** **Risk Priority3**

Cause Negligence, not following procedures, poor training

Consq Water or moisture ingress causing eventual failure. The unit may no longer be explosion protected

S/guard Quality control, training manuals and video

Use of OEM parts. Carry out recommended maintenance and inspection procedures **Who Type**
R012 **CUS S**

Who Type

Hazard What if housing is cracked or damaged **Category** PH **Freq 3 Sev B** **Risk Priority 4**

Cause Abuse by wearer

Consq Water ingress and unit may no longer be explosion protected

S/guard Robustness, wearer trained to do daily inspections, daily tests

Regular re training of personnel. **Who Type**
R013 **CUS O**

Who Type

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report

End of Report

SECTION 7

RECOMMENDATIONS (ORDERED BY PRIORITY)

TOX AND FLAM ALARMS

First National Battery

17 August 2001

Tox and Flam Alarms

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Recommendations (ordered by priority)

Recommendation Priority 3

S01	**I01**	**R002**	Use of OEM parts. Carry out recommended maintenance and inspection procedures	**Type S**
S02	**I01**	**R012**	Use of OEM parts. Carry out recommended maintenance and inspection procedures	**Type S**

Recommendation Priority 4

S01	**I01**	**R001**	Regular retraining of personnel (users and lamp room personnel)	**Type O**
S01	**I01**	**R004**	Ongoing training of operators	**Type O**
S02	**I01**	**R008**	Regular retraining of personnel (users and lamp room personnel)	**Type O**
S02	**I01**	**R010**	Ongoing training of operators	**Type O**
S02	**I01**	**R011**	Carry out recommended handling and inspection procedures	**Type S**
S02	**I01**	**R013**	Regular re training of personnel.	**Type O**

Recommendation Priority 5

S01	**I01**	**R003**	Carry out recommended handling and inspection procedures	**Type S**
S01	**I01**	**R005**	Regular (at least annually) retraining of maintenance personnel	**Type MP**
S01	**I01**	**R006**	Regular retraining of personnel (users and lamp room personnel)	**Type O**
S01	**I01**	**R007**	Regular (at least annually) retraining of maintenance personnel	**Type MP**
S02	**I01**	**R009**	Regular retraining of personnel (users and lamp room personnel)	**Type O**

End of Report

SECTION 7

WORKSHEET REPORT
(SORTED BY WORK AREA AND RISK PRIORITY)

TOX AND FLAM ALARMS

First National Battery

17 August 2001

Tox and Flam Alarms

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

S01 **Tox Alarms**

I01 **Carbon Monoxide Detector or monitor**

Hazard **What if seals are left out** **Category** OE&HF **Freq** **2** **Sev** **B** **Risk Priority 3**

Cause Negligence, not following procedures, poor training

Consq Water or moisture ingress causing eventual failure

S/guard Quality control, training manuals and video

Use of OEM parts. Carry out recommended maintenance and inspection procedures **Who** **Type**

R002 **CUS** **S**

Who **Type**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Carbon Monoxide Detector or monitor

Hazard What if housing is cracked or damaged — **Category** PH **Freq 3 Sev B Risk Priority 4**

Cause Abuse by wearer

Consq Water ingress

S/guard Robustness, wearer trained to do daily inspections, daily tests

Who Type

Who Type

Hazard What if incorrect bulb holder is used — **Category** OE&HF **Freq 3 Sev B Risk Priority 4**

Cause Use of incorrect spare part during maintenance

Consq Wearer would not be able to see warning signal

S/guard Daily checks as per OEM instructions

Regular retraining of personnel (users and lamp room personnel) — **Who Type**
R001 **CUS O**

Who Type

Hazard What if there is poisoning of electrochemical cell — **Category** PH **Freq 3 Sev B Risk Priority 4**

Cause Incorrect cleaning procedures, abuse

Consq Failure of the sensor cell

S/guard Training manual and video

Ongoing training of operators — **Who Type**
R004 **CUS O**

Who Type

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Methane Detector

Hazard What if re calibration is not done — **Category** OE&HF **Freq 3 Sev C** **Risk Priority 5**

Cause Not following procedures

Consq Wrong reading and undetected deterioration of performance

S/guard Required safeguards are stipulated in training materials and video

Who Type

Who Type

Hazard What if the filter is blocked — **Category** PH **Freq 4 Sev B** **Risk Priority 5**

Cause Dirt, mud

Consq Progressive degradation in response time, catastrophic failure if totally covered in mud.

S/guard Design to be dust proof, operators are instructed to clean unit

Carry out recommended handling and inspection procedures — **Who** CUS **Type** S

R003

Who Type

Hazard What if maintenance is not done — **Category** OE&HF **Freq 2 Sev C** **Risk Priority 5**

Cause not following procedures as laid down by OEM

Consq failure of equipment

S/guard Required safeguards are stipulated in training materials and video

Regular (at least annually) retraining of maintenance personnel — **Who** CUS **Type** MP

R005

Who Type

Hazard What if the instrument is subjected to chemical solvents — **Category** OE&HF **Freq 3 Sev D** **Risk Priority 5**

Cause Incorrect cleaning procedures

Consq Cover becomes brittle and will crack

S/guard Required safeguards are stipulated in training materials and video

Regular retraining of personnel (users and lamp room personnel) — **Who** CUS **Type** O

R006

Who Type

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

Hazard **What if maintenance is not done** **Category** OE&HF **Freq** 2 **Sev** C **Risk Priority** 5

Cause not following procedures as laid down by OEM

Consq failure of equipment

S/guard Required safeguards are stipulated in training materials and video

Regular (at least annually) retraining of maintenance personnel **Who** CUS **Type** MP

R007

Who **Type**

I01 **Carbon Monoxide Detector**

Hazard **What if sensor cell ages** **Category** PH **Freq** 3 **Sev** E **Risk Priority** 7

Cause Limited life of sensor cell

Consq Gradual degradation of performance

S/guard Calibration

Who **Type**

Who **Type**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

S02 **Flam Alarm**

I01 **Flamable Gas Detector**

Hazard **What if seals are left out** **Category** OE&HF **Freq** **2** **Sev** **B** **Risk Priority 3**

Cause Negligence, not following procedures, poor training

Consq Water or moisture ingress causing eventual failure. The unit may no longer be explosion protected

S/guard Quality control, training manuals and video

Use of OEM parts. Carry out recommended maintenance and inspection procedures **Who** **Type**

R012 **CUS** **S**

Who **Type**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Flamable Gas Detector

Hazard What if incorrect bulb holder is used — **Category** OE&HF **Freq 3 Sev B Risk Priority 4**

Cause Use of incorrect spare part during maintenance

Consq Wearer would not be able to see warning signal

S/guard Daily checks as per OEM instructions

R008 Regular retraining of personnel (users and lamp room personnel) — **Who** CUS **Type** O

Who Type

Hazard What if there is poisoning of pellister sensor — **Category** PH **Freq 3 Sev B Risk Priority 4**

Cause Incorrect cleaning procedures of flam alarm and other lamp room equipment, abuse. Exposure to inappropriate chemicals during

Consq Failure of the pellister sensor

S/guard Training manual and video

R010 Ongoing training of operators — **Who** CUS **Type** O

Who Type

Hazard What if the filters are blocked — **Category** PH **Freq 4 Sev B Risk Priority 4**

Cause Dirt, mud

Consq Progressive degradation in response time, catastrophic failure if totally covered in mud.

S/guard Design to be dust proof, operators are instructed to clean unit

R011 Carry out recommended handling and inspection procedures — **Who** CUS **Type** S

Who Type

Hazard What if housing is cracked or damaged — **Category** PH **Freq 3 Sev B Risk Priority 4**

Cause Abuse by wearer

Consq Water ingress and unit may no longer be explosion protected

S/guard Robustness, wearer trained to do daily inspections, daily tests

R013 Regular re training of personnel. — **Who** CUS **Type** O

Who Type

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Flamable Gas Detector

Hazard What if re calibration is not done — **Category** OE&HF **Freq 3 Sev C Risk Priority 5**

Cause Not following procedures

Consq Wrong reading and undetected deterioration of performance

S/guard Required safeguards are stipulated in training materials and video

Who Type

Who Type

Hazard What if the instrument is subjected to chemical solvents — **Category** OE&HF **Freq 3 Sev D Risk Priority 5**

Cause Incorrect cleaning procedures

Consq Cover becomes brittle and will crack

S/guard Required safeguards are stipulated in training materials and video

Regular retraining of personnel (users and lamp room personnel) **Who Type**

R009 **CUS O**

Who Type

End of Report

SECTION 8

RISK ASSESSMENT DATA ANALYSIS

STANDBY BATTERIES

8.0 STANDBY BATTERIES

RISK ASSESSMENT DATA ANALYSIS

In this section the data contained in the Risk Assessment database has been extracte and summarised in various formats for graphical display.

GRAPH 1 - RISK PROFILE

Three of the higher risks have been identified as follows:

- Battery abuse and poor maintenance
- Battery room inadequately ventilated
- Commissioning not carried out properly

The major focus concerning these hazards should be that the users carry out supplie recommended safety, maintenance and inspection procedures and to follow supplie commissioning instructions. Also FNB is to combine all safety rules regarding th equipment under one section in their Installation and Safety Instructions. Also chargir procedures are to be followed at all times.

GRAPH 2 - SUMMARY OF RISKS BY "WHAT IF" CATEGORY

The three hazards identified are related to operator errors or human factors extern effects and physical hazards in the operation, use and maintenance of the equipment. Tl batteries need to be commissioned according to correct procedures whenever new one are installed. Also the correct handling must be carried out to ensure that acid spillage avoided and proper transportation is carried out.

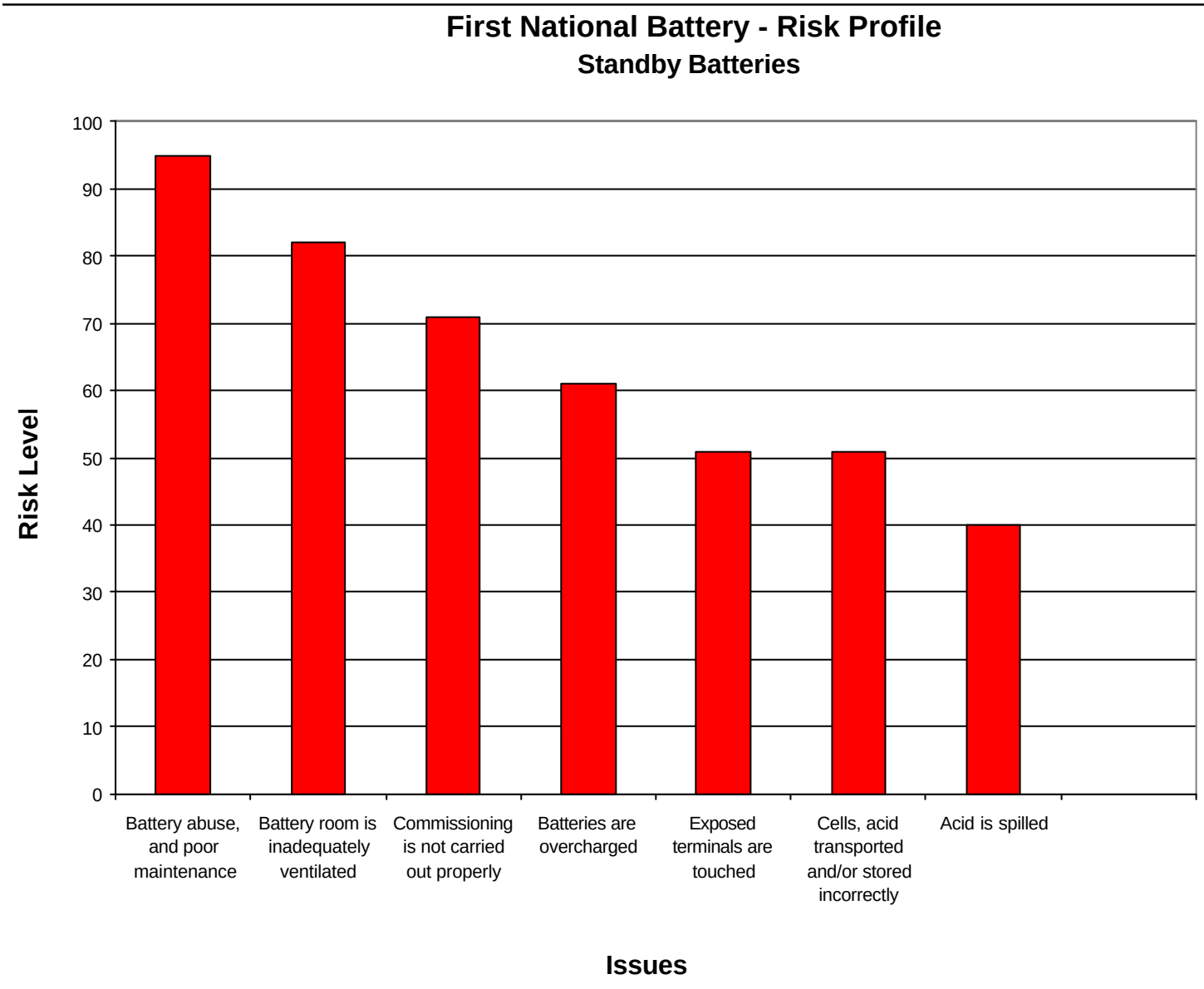
GRAPH 3 - SUMMARY OF RECOMMENDATIONS BY TYPE

This graph indicates that the majority of recommendations are related to user updatir operator manuals, standards and procedures for this type of equipment. There is also th need to ensure that the appropriate Maintenance Programmes are in place.

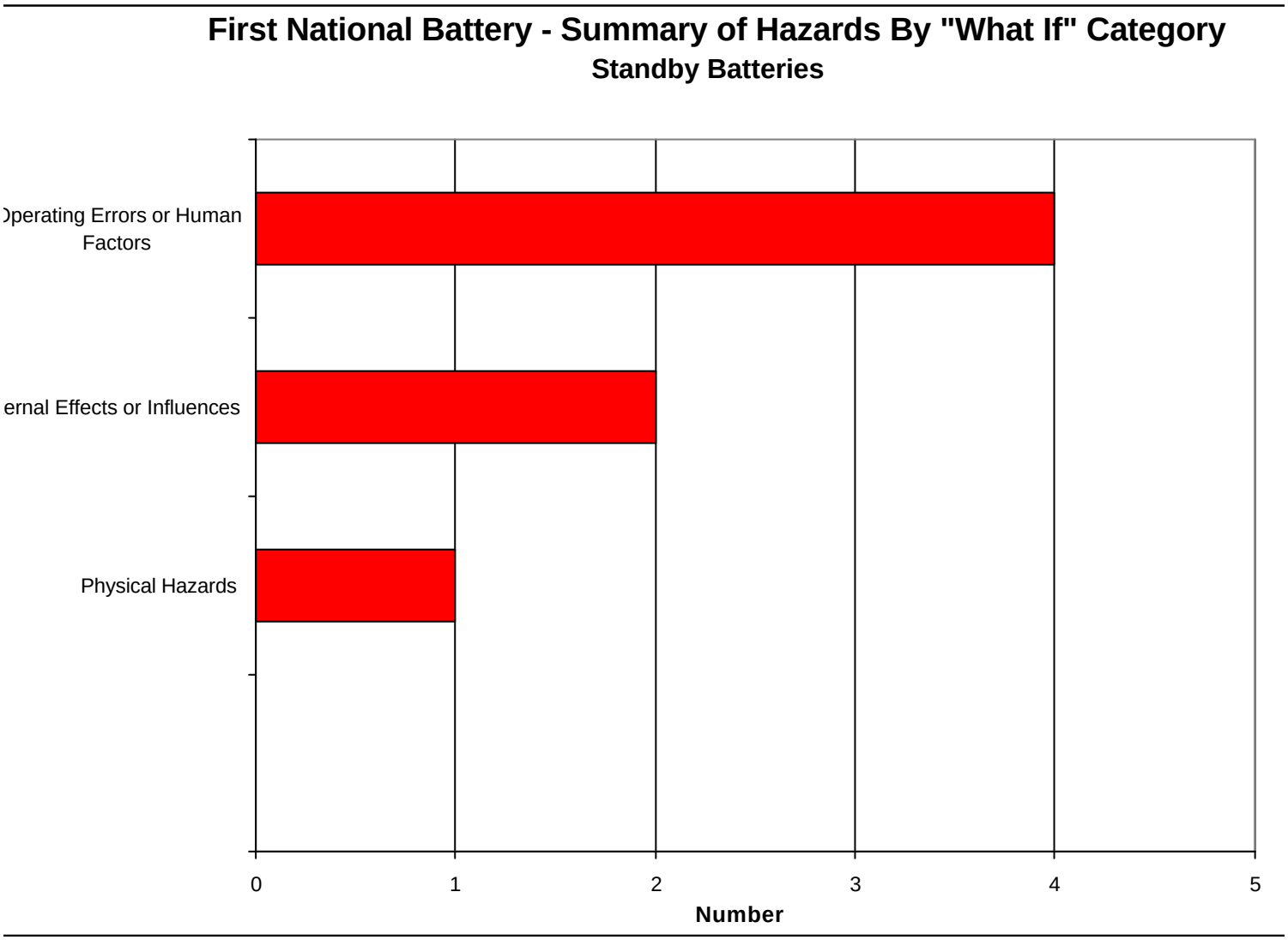
GRAPH 4 - SUMMARY OF RECOMMENDATIONS BY RESPONSIBILITY

The main responsibilities are with the customer to ensure that safety rules as laid out the supplier Installation and Maintenance instructions are adhered to. There are also tasl allocated to the FNB Technical Service Manager to ensure that the safety rules pertainir to standby batteries are incorporated in one section in their manuals.

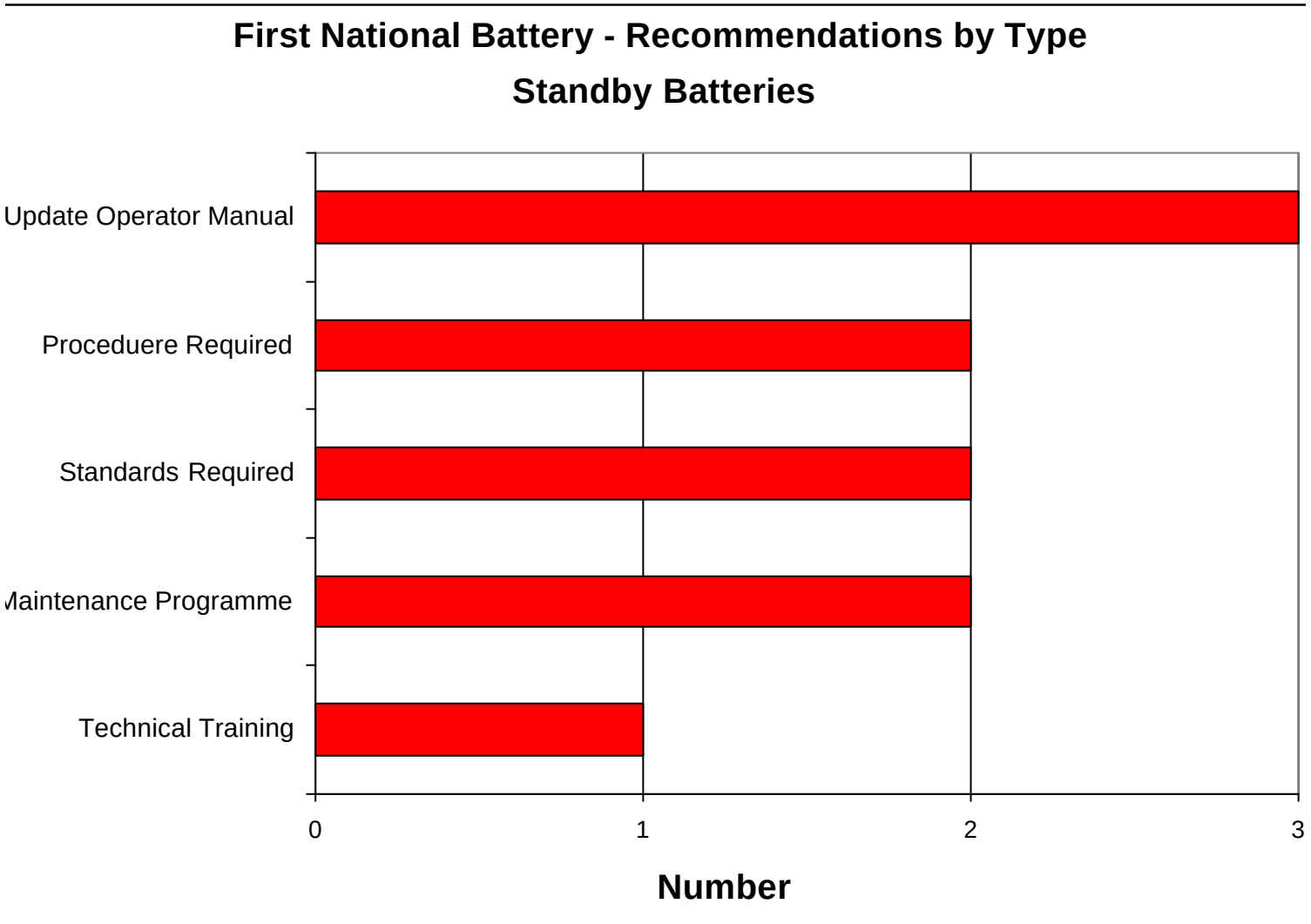
Graph 1


First National Battery - Risk Profile
Standby Batteries
Risk Level
100
90
80
70
60
50
40
30
20
10
0
Battery abuse, and poor maintenance
Battery room is inadequately ventilated
Commissioning is not carried out properly
Batteries are overcharged
Exposed terminals are touched
Cells, acid transported and/or stored incorrectly
Acid is spilled
Issues

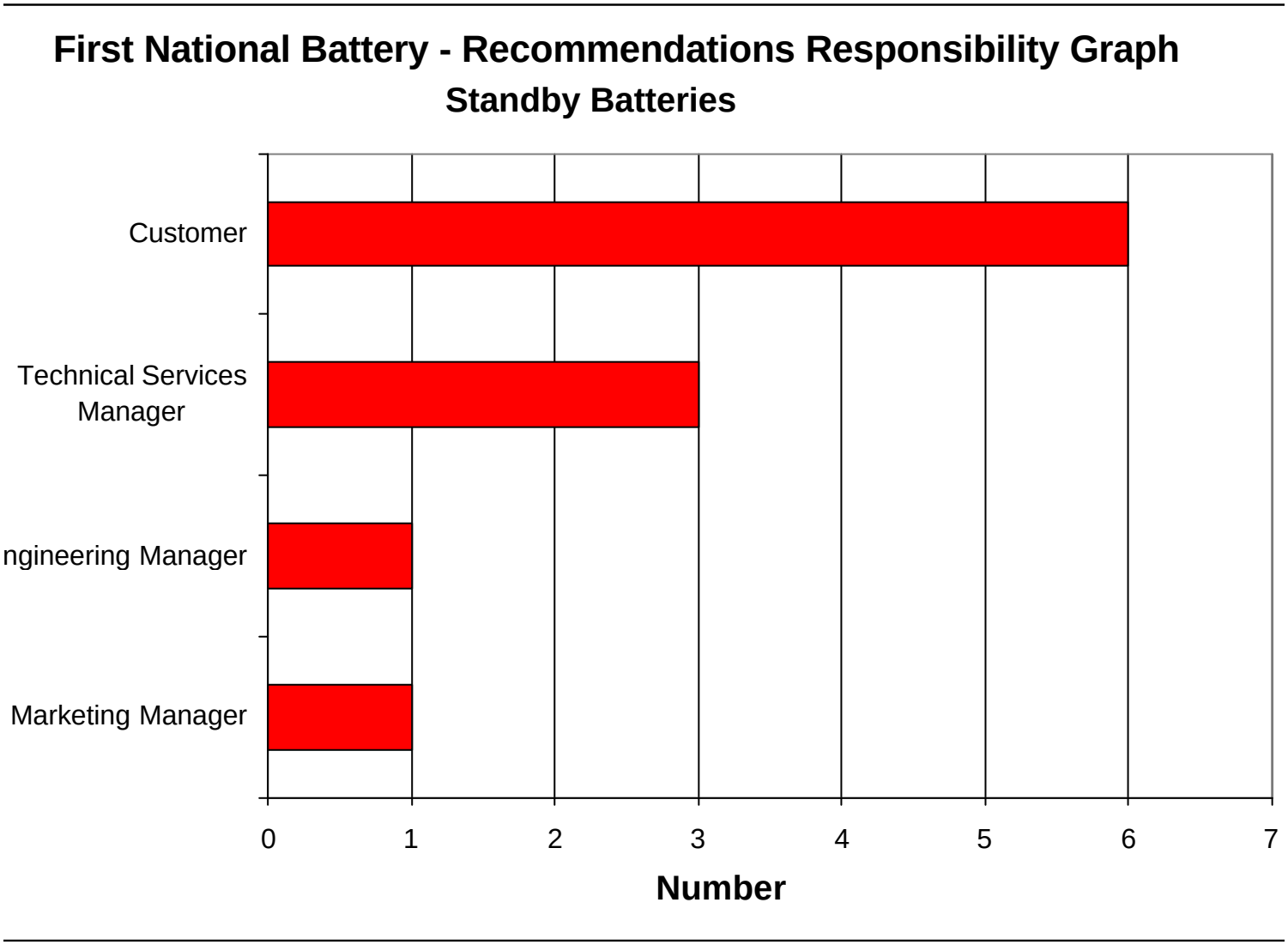
Graph 2


First National Battery - Summary of Hazards By "What If" Category
Standby Batteries
Operating Errors or Human Factors
ernal Effects or Influences
Physical Hazards
0
1
2
3
4
5
Number

Graph 3


First National Battery - Recommendations by Type
Standby Batteries
Update Operator Manual
Proceduere Required
Standards Required
Maintenance Programme
Technical Training
0
1
2
3
Number

Graph 4


First National Battery - Recommendations Responsibility Graph
Standby Batteries
Customer
Technical Services Manager
ngineering Manager
Marketing Manager
0
1
2
3
4
5
6
7
Number

SECTION 8

RISK ASSESSMENT WORKSHEET REPORT

STANDBY BATTERIES

First National Battery

17 August 2001

Standby Batteries

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report

S01 **Standby Batteries**

I01 **Provide standby power to equipment**

Hazard **What if batteries are overcharged** — **Category** OE&HF **Freq 3 Sev B** **Risk Priority4**

Cause Charger faulty or incorrectly set

Consq Overheating, damage to product.

S/guard Charging procedure and instructions

		Who	Type
R001	Charging procedure and instructions must be followed at all times	**MM**	**T**

Who Type

Hazard **What if cells and acid are transported and/or stored incorrectly** — **Category** PH **Freq 2 Sev D** **Risk Priority 5**

Cause Incorrect material handling

Consq Acid spillage, short circuit, toppling over

S/guard Special containers for acid. PPE's, strapping in place and uprights

		Who	Type
R002	Transportation and storage to comply with OSH act and Lead regulations (Refer to Package and Transport and Storage) also refer to installation and maintenance procedures	**EM**	**S**

Who Type

Hazard **What if commissioning is not carried out properly** — **Category** OE&HF **Freq 1 Sev C** **Risk Priority3**

Cause Not following commissioning procedures

Consq Reduction in battery life

S/guard Detailed commissioning procedures in FNB Installation and Maintenance Instructions.

		Who	Type
R003	Follow commissioning instructions	**CUS**	**S**
R004	Installation and Maintenance and Safety instructions to be included in each delivery. FNB to combine all safety rules in one paragraph in Installation and Maintenance and Safety instructions. Add pictorial safety rules in manual	**TS**	**M**

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS
Risk Assessment Worksheet Report

Hazard **What if exposed terminals are touched** — **Category** **Freq** 4 **Sev** B
EEI **Risk Priority** 5

Cause Unauthorized personnel working on equipment, human error

Consq Electric shock, fatality

S/guard Hazards identified in FNB Installation and Maintenance Instructions.

		Who	Type
R005	Safety rules as laid out in Installation and Maintenance instruction to be followed.	CUS	P
R006	Installation and Maintenance and Safety instructions to be included in each delivery. FNB to combine all safety rules in one paragraph in Installation and Maintenance and Safety instructions. Add pictorial safety rules in manual	TS	M

Hazard **What if acid is spilled** — **Category** **Freq** 3 **Sev** D
OE&HF **Risk Priority**6

Cause Battery is mishandled, dropped, bumped, collisions or exploding

Consq Injuries, damaged equipment due to corrosion

S/guard Alkaline neutralizer to be used on spillage e.g.. hydrated lime

		Who	Type
R007	Follow the battery maintenance instruction and procedures in case of injury	CUS	MP

Who **Type**

Hazard **What if there is a battery abuse, and poor maintenance** — **Category** **Freq** 4 **Sev** A
OE&HF **Risk Priority**1

Cause Poor maintenance and improper usage

Consq Premature failure, fatalities

S/guard Follow maintenance and instruction manual as indicated in First National Battery 'Standby Power Batteries' manual

		Who	Type
R008	Follow the battery maintenance instruction and procedures	CUS	MP

Who **Type**

Hazard **What if battery room is inadequately ventilated** — **Category** **Freq** 2 **Sev** A
EEI **Risk Priority** 2

Cause Poor design or not adhering to standard engineering practices

Consq Explosion causing a fatality, spillage of acid, injury, material damage,

S/guard Hazards identified in FNB Installation and Maintenance Instructions. Engineering note available on request

		Who	Type
R009	Safety rules as laid out in Installation and Maintenance instruction to be followed.	CUS	P
R010	Installation and Main and Safety instructions to be included in each delivery. FNB to combine all safety rules in one paragraph in Installation and Maintenance and Safety instructions. Add pictorial safety rules in manual	TS	M

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report

End of Report

SECTION 8

WORKSHEET REPORT
(SORTED BY WORK AREA AND RISK PRIORITY)

STANDBY BATTERIES

First National Battery

17 August 2001

Standby Batteries

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

S01 **Standby Batteries**

I01 **Provide standby power to equipment**

Hazard **What if there is a battery abuse, and poor maintenance** **Category** OE&HF **Freq** 4 **Sev** A **Risk Priority**

Cause Poor maintenance and improper usage

Consq Premature failure, fatalities

S/guard Follow maintenance and instruction manual as indicated in First National Battery 'Standby Power Batteries' manual

R008 Follow the battery maintenance instruction and procedures **Who** CUS

Who Type

I01 **Provide standby power to equipment**

Hazard **What if battery room is inadequately ventilated** **Category** EEI **Freq** 2 **Sev** A **Risk Priority**

Cause Poor design or not adhering to standard engineering practices

Consq Explosion causing a fatality, spillage of acid, injury, material damage,

S/guard Hazards identified in FNB Installation and Maintenance Instructions. Engineering note available on request

R009 Safety rules as laid out in Installation and Maintenance instruction to be followed. **Who** CUS

R010 Installation and Main and Safety instructions to be included in each delivery. FNB to combine all safety rules in one paragraph in Installation and Maintenance and Safety instructions. Add pictorial safety rules in manual **Who** Type **Who** Type

TS M

I01 **Provide standby power to equipment**

Hazard **What if commissioning is not carried out properly** **Category** OE&HF **Freq** 1 **Sev** C **Risk Priority**

Cause Not following commissioning procedures

Consq Reduction in battery life

S/guard Detailed commissioning procedures in FNB Installation and Maintenance Instructions.

R003 Follow commissioning instructions **Who** CUS

R004 Installation and Maintenance and Safety instructions to be included in each delivery. FNB to combine all safety rules in one paragraph in Installation and Maintenance and Safety instructions. Add pictorial safety rules in manual **Who** Type **Who** Type

TS M

RISK ASSESSMENT OF TECHNICAL / PROCESS OPERATIONS

Risk Assessment Worksheet Report sorted by Work Area and Risk Priority

I01 Provide standby power to equipment

Hazard What if batteries are overcharged — **Category** OE&HF **Freq 3 Sev** **Risk Priority**

Cause Charger faulty or incorrectly set

Consq Overheating, damage to product.

S/guard Charging procedure and instructions

R001 Charging procedure and instructions must be followed at all times — **Who** MM

Who Type

I01 Provide standby power to equipment

Hazard What if cells and acid are transported and/or stored incorrectly — **Category** PH **Freq 2 Sev** **Risk Priority**

Cause Incorrect material handling

Consq Acid spillage, short circuit, toppling over

S/guard Special containers for acid. PPE's, strapping in place and uprights

R002 Transportation and storage to comply with OSH act and Lead regulations (Refer to Package and Transport and Storage) also refer to installation and maintenance procedures — **Who** EM

Who Type

Hazard What if exposed terminals are touched — **Category** EEI **Freq 4 Sev** **Risk Priority**

Cause Unauthorized personnel working on equipment, human error

Consq Electric shock, fatality

S/guard Hazards identified in FNB Installation and Maintenance Instructions.

R005 Safety rules as laid out in Installation and Maintenance instruction to be followed. — **Who** CUS

R006 Installation and Maintenance and Safety instructions to be included in each delivery. FNB to combine all safety rules in one paragraph in Installation and Maintenance and Safety instructions. Add pictorial safety rules in manual — **Who Type** **Who Type** TS M

I01 Provide power to mobile equipment

Hazard What if acid is spilled — **Category** OE&HF **Freq 3 Sev** **Risk Priority**

Cause Battery is mishandled, dropped, bumped, collisions or exploding

Consq Injuries, damaged equipment due to corrosion

S/guard Alkaline neutralizer to be used on spillage e.g.. hydrated lime

R007 Follow the battery maintenance instruction and procedures in case of injury — **Who** CUS

Who Type

End of Report

SECTION 9

TEAM MEMBERS

First National Battery

17 August 2001

Risk Assessment Team Details

FIRST NAME	SURNAME	POSITION	DEPTARTMENT	EXP
Charles	van Aswegen	Plant Engineering Manager	Engineering	6
Jose	Pedregal	Production Manager	Production	23
Chris	Wheeler	Regional Manager	Marketing	16
Dick	Bakker	Mining	IRCA	38
Eugene	Pininski	Facilitator	IRCA	21
Hector	King	Sales Consultant	Sales	9
Johan	Prinsloo	Manager	Sybotec	13
Alan	Brodie	Engineering Manager	Spero	21

End of Report