Safety Performance Leading Indicators

Guidance for the Chemical Warehouse Sector

Version 2 – May 2018

Disclaimer

The information in the Guidance is given in good faith and belief in its accuracy at the time of publication, but it does not imply any legal liability or responsibility by the Chemical Business Association (CBA) or the UK Warehousing Association (UKWA).

Users of this Guidance should pay regard to any relevant legislation or authoritative recommendations, which may have evolved subsequent to the date of publication.

This guidance sets out what is considered to be best practice in the industry regarding the development of a Safety Performance Leading Indicator programme. The Guidance is not mandatory and employers may adopt a different approach in a particular situation, where to do so would maintain an equivalent level of safety, as would have been achieved by following this Guidance.

Chemical Business Association	UKWA
Group House Southmere Court Electra Way Crewe Business Park Crewe Cheshire CW1 6GU Tel: +44 (0) 1270 258200 www.chemical.org.uk Email: cba@chemical.org.uk	11 Gower Street London WC1E 6HB Tel: +44 (0) 20 7636 8856 www.ukwa.org.uk

Foreword

The Health and Safety Executive (HSE) was involved with the Chemical Business Association in producing this guidance. HSE endorses the guidance as it follows a sensible and proportionate approach to managing health and safety.

Health and Safety inspectors seeking to secure compliance with the law may refer to this Guidance as illustrating good practice.

CONTENTS

Introduction

1. This guide is intended for senior managers and safety professionals within organisations that wish to develop performance indicators to provide assurance that major hazard risks are under control. An appropriate number of carefully chosen indicators can monitor the status of key systems, and provide an early warning should controls deteriorate to a potentially dangerous level.

2. Although primarily aimed at major hazard organisations in scope of COMAH, the generic model for establishing a performance measurement system described in this guide can be applied equally to other enterprises requiring a high level of assurance that systems and procedures continue to operate as intended.

3. The indicators in this guidance are designed for use as part of the performance monitoring of a safety management system (SMS). It is unlikely that indicators can be deployed effectively without such a system.

Background

4. Too many organisations have relied historically on failure data (so-called lagging indicators, such as the indicators of performance in the CBA Responsible Care programme) to monitor safety performance. The consequence of this approach was that improvements or changes were only determined after something had gone wrong. Often the difference between whether a system failure resulted in a minor, or a catastrophic outcome, was purely down to chance.

5. Effective management of major hazards requires a balanced, proactive approach, using a combination of leading and lagging indicators for risk management. Information to confirm critical systems are operating as intended, is therefore essential. Giving greater emphasis to leading indicators to confirm that risk controls continue to operate is an important step forward in the management of major hazard risks.

6. Positive leadership[1] requires Directors and senior managers to monitor the effectiveness of internal controls against business risks. For major hazard installations in the chemical warehouse sector, safety risks will be a significant aspect of business risk, asset integrity, and reputation. Many organisations would benefit from acting more effectively on existing information. Discovering weaknesses in control systems by having a major incident, is too late, and too costly. Early warning of dangerous deterioration within critical systems provides an opportunity to avoid major incidents.

[1] The Texas City report

Objectives and scope

Intended scope within the chemical warehouse sector.

7. This guidance has been developed by CBA/UKWA specifically for those organisations working within the chemical warehouse sector with major hazard risks. This would include those organisations that fall within the scope of the Control of Major Accident Hazards (COMAH) Regulations 2015, as amended[2]. This guidance could also benefit other organisations that operate sites with the potential to cause significant off-site risk, at any chemical warehouse to demonstrate that hazards are controlled, and wherever it would enhance business performance.

Description of leading and lagging indicators

8. Leading indicators are designed to monitor pro-actively the effectiveness of critical risk control systems. They often measure safety performance against a tolerance level, and can therefore highlight the need for action. Leading indicators provide a routine systematic check that the safety system is working, and that key actions, or activities, are undertaken as intended.

9. Lagging indicators are designed to monitor re-actively the performance of critical risk control systems, and will include such indicators as instances of containment failure, the employee accident rate, or where there has been failure of significant control system(s). They record adverse outcomes that have already occurred. They do not indicate pro-actively whether major risks are under control. Lagging indicators are a useful measure of the impact of actions that have been taken to improve safety performance, and can measure the changes in performance over time.

How to use the guidance

10. This guidance should enable organisations within the chemical warehouse sector to establish a plan to develop a Safety Performance Leading Indicators (SPLI) programme specific to their circumstances. The guidance describes how to follow a six-step process that will lead to the establishment of an SPLI programme and the identification of appropriate leading indicators. The guidance also provides a basis for the review of existing indicators and for assessing whether improvements are required.

11. A CBA/UKWA Working Group was formed to develop a number of key leading indicators that would be relevant to this sector. The guidance contains an indicative menu of potential leading indicators, and guidance on how to select those most appropriate to individual organisations. The guidance also enables an organisation to establish indicators to measure the effectiveness of their SMS.

---

[2] The Control of Major Accident Hazards (COMAH) Regulations 2015

How to develop an SPLI programme - the six-steps

12. The focus of this guidance is on setting leading indicators. However, it is recommended that these are combined with lagging indicators, as in tandem they act as system guardians, providing dual assurance to confirm that the risk control system is operating as intended, or providing a warning that problems are starting to develop.

STEP ONE - Establish the implementation team.

Leadership

13. The pro-active control of business risks is an essential part of corporate governance. Directors and senior managers[3,4] need to understand fully the business benefits of performance measurement, and clearly see how managing safety contributes to the success and sustainability of their company. It is vital that they are committed to adopting meaningful indicators, as they have ultimate responsibility for the control of risk, and are therefore the main customer for the enhanced information. It is important that management teams, chief executives, and directors agree that the indicators chosen provide them with the right scope and level of information they need to be satisfied that safety risks are under control. Directors and senior managers need to make appropriate resources and support available for the introduction of key indicators.

14. New organisational arrangements may be needed to implement a performance measurement system. Someone will have to make the case for SPLI measurement within the company, and then drive it forward to implementation. The benefits and the costs will need to be considered carefully and the details of the exact indicators determined. A champion may be needed to:
    - promote, drive forward and co-ordinate the introduction of the new concept and system;
    - make the business case, and the link with company health, safety, environment, quality and business improvement systems;
    - communicate ideas and progress;
    - keep in touch with others working in this area, and gather information on best practice; and,
    - identify and evaluate the benefits achieved.

[3] HSE INDG 277
[4] Managing Risk: The hazards that can destroy your business

Technical knowledge and resources

15. It will usually be a competent person within an organisation who should champion the work, and steer it through to implementation. However, in large organisations this may be too much for one person to deal with alone, and it is often more appropriate to form a team to manage the introduction of safety indicators. This has the benefit of drawing in people from a range of business operations, providing the opportunity for pooling ideas, especially from employees who have direct knowledge of how systems deteriorate, or become ineffective. A steering committee may also be helpful to oversee the implementation programme and to check the indicators match current business priorities.
    For COMAH sites, the implementation team and steering group (where used) should comprise people familiar with the safety report or MAPP, as appropriate.

Timescale

16. It will be important from the outset to determine the timescale for the staged implementation of the programme. Organisations already in discussion with the regulators may have an understanding of the deadlines by which leading indicators should be identified, and when the monitoring of performance should begin.

A Warehouse Example.

17. A company stores a variety of chemical products within two separate chemical warehouses that the company declares as one lower-tier COMAH site. The company decides to apply the Safety Performance Leading Indicator (SPLI) methodology to determine how best to ensure that the hazards associated with the materials being stored, the areas where they are being stored, and the potential risks, are adequately controlled.

18. **STEP ONE - Establish the implementation team**

The Managing Director proposes the project, obtains approval from the company Board for the Safety Performance Leading Indicator (SPLI) programme to be implemented, and agrees that sufficient resources will be allocated.

The Operations Director is then appointed to oversee the project, and act as the Board representative, responsible for reporting the progress and actioning any issues that arise.

The Operations Director meets with the site manager to discuss the pertinent issues, and the site manager is asked to develop the programme further. The Operations Director sets a deadline of six months for the programme to begin to generate useful data to be reported to the company Board.

Then the site manager discusses the process with the site's safety officer, who wrote and maintains the company Major Accident Prevention Policy (MAPP), and asks him to assist him with the process.

The implementation team, “the team”, is now in place:

- Site manager
- Safety officer

STEP TWO - Decide on the scope of the SPLI Programme

19. Setting the scope is about selecting the right indicators to provide adequate information about the performance of the safety system. It is not necessary to measure every aspect of an SMS. Focusing on a few critical risk control systems will provide a sufficient overview of performance.

20. Performance can be monitored at a number of organisational levels within a company, and the information can be presented in a hierarchical manner. The nature of the indicators will vary depending upon the organisational level at which they have been set. Indicators set for the whole organisational will, by their nature, tend to be more generic, whereas those set at site level will be more focused on key activities, and give more direct feedback on the functioning of those activities. It is important that new indicators covering safety performance are integrated into, and complement, existing arrangements for monitoring business performance.

Activity, site or company level

21. Many large organisations cascade performance targets downwards through the management chain, and require performance information against such targets to be reported back upwards. Traditionally, upward reporting comprised simply of the exceptional reporting of incidents. To provide assurance, information to confirm that key systems are operating as intended, should be routinely reported upwards to Directors and senior managers.

22. Indicators may be set at activity level, to provide managers with routine information to show that specific activities are operating as intended, e.g. planned inspection and maintenance. Indicators at this level provide very specific performance information on the activities selected.

23. Indicators at site level provide an overview of critical systems operating across the whole site. Using a hierarchical approach, information from individual activities can be summarised across the whole site, e.g. managing contractors, emergency arrangements, staff competence, etc.

24. At an organisational level, a short summary of high-level indicators is needed. These may be based on corporate goals and objectives (a top-down approach), but importantly, should also feature information fed up from site level.

Identify the safety critical risks

25. For COMAH sites, the major accident hazards and the risk control systems will have been fully identified. Other sites should identify the safety risks by first defining the range of hazard scenarios associated with the business or activity being considered, e.g. how significant accidents and incidents can occur from activities such as the storage, use and transfer of hazardous substances. Companies should consider what could go wrong within each main area of the company.

26. Describing the main hazard scenarios helps companies focus on the most important activities and controls, against which indicators should be set. The scenarios form a useful crosscheck later on in Step *4*, when the critical elements of risk control systems to be monitored are determined.

27. To help decide what and how things could go wrong, it is useful to consider the immediate cause of an incident. For instance, a bulk tank failure could be due to wear; corrosion; damage; over/under pressurisation; or fire or explosion.

28. Look also at areas where there are known problems or concerns about the adequacy of risk control systems. This could be based on past incident/near-miss data, or information from audits and inspections. It is beneficial to include workforce representatives in this process, as it will address issues of most concern to them.

29. An assessment of all these factors should help establish the scope of the measurement system and ensure the focus is on critical issues.

Establish priorities.

30. Data collection and analysis is resource intensive, so arrangements for monitoring performance have to be cost effective. Even for the largest organisations, a few carefully chosen indicators, set against the main risks, will be sufficient to provide a high degree of assurance across the whole business.

A Warehouse Example.

31. **STEP TWO - Decide on the scope of the SPLI Programme**

There are two warehouses on site:

- One storing hazardous chemicals; and,
- One storing non-hazardous chemicals

The implementation team decide to treat each warehouse separately, but then will combine the information into one site-level report to the company Board.

The team review the information contained in the existing MAPP, and determine whether the safety data sheets (SDS) on file for each of the stored products are up-to-date.

The team review all the accident and incident reports from the last three years, where they note that, two years previously, a small fire had occurred amongst discarded packaging materials within the hazardous warehouse. This was attributed to vandalism.

The team perform a “walk though” of both warehouses, to verify the storage information, and to look for situations that could pose a potential hazard, such as the storage of incompatible materials in the same area, degraded/damaged packaging, damaged or overloaded racking, etc.

As a result of the “walk through” the team identify:

- that some products in the hazardous warehouse do not have an accurate inventory;
- that some products are stored in non-designated areas; and,
- instances where racking is overloaded

Upon review of the SDS and other safety information on file for the requisite substances, the team determine that there is no immediate danger, but the lack of stock-control in the hazardous warehouse suggests that there is a potential for a serious incident in the future.

Based on this information, the team agree to focus on developing SPLIs in relation to:

- hazardous materials storage/segregation; and,
- prevention of fire.

For simplicity, the remainder of this example will focus on efforts to develop SPLIs in the area of fire prevention.

STEP THREE - Identify the risk control systems in place

32. For each hazard scenario considered, identify the risk control systems already in place to prevent or mitigate the consequences of these events. There may be several interrelated, or overlapping, risk control systems aimed at prevention or mitigation, which could include: inspection and maintenance routines, instrumentation, fire detection, operating procedures, staff competence, etc.

A Warehouse Example.

33. **STEP THREE - Identify the risk control systems in place**

When the safety officer had originally prepared the MAPP, the potential causes of fire he identified were due to problems in the electrical systems or due to personnel smoking in the warehouse.

The MAPP had not been updated following the previous fire, resulting from the alleged vandalism. The team determine that more should be done regarding the overall site security provisions.

Then the team look at the existing fire detection systems in the hazardous chemical warehouse. The system consists of several “optical” smoke detectors, linked into the single site fire alarm system. The main electrical systems in the warehouse were only renewed 5 years previously, but since then, no regular checks have been recorded, although some pieces of mobile electrical equipment have been subject to regular Portable Appliance Testing (PAT testing).

Due to the change within the regulations, all smoking on site has now been banned, except for a smoking shelter located near the main site entrance.

STEP FOUR - Identify the critical elements of each risk control system

34. It is not necessary to monitor every part of a risk control system. Consider the following factors when determining which critical elements to cover:

    - Which activities or operations must be undertaken correctly on each and every occasion?
    - Which aspects of the system are liable to deterioration over time?
    - Which activities are undertaken most frequently?

35. From this, identify the elements that are critical in consistently delivering a safe operation, such as the operation of safety critical equipment, the scope and frequency of inspection, staff correctly performing critical tasks, etc.

Identify leading indicators

36. Once the critical elements to be monitored are determined, set a leading indicator against each one to show that the system is operating as intended, e.g. the percentage of safety critical equipment inspected to schedule.

37. A tolerance should then be set for each leading indicator. This represents the point at which a deviation in performance should be flagged up for the attention of senior management. For example, for a leading indicator, 'the minimum percentage of inspections where no defects were found'.

38. The management team should set the tolerance, not the person responsible for the activity. This enables management to decide at what point they wish to intervene, as performance deviates beyond an acceptable level.

A Warehouse Example.

39. **STEP FOUR - Identify the critical elements of each risk control system**

The team draw up a list of the critical elements that need to be controlled:

1. Fire detection: The inspection and testing of smoke detectors, alarms and break glasses.
2. Site security: The inspection of the site's boundary fencing.
3. Electrical systems: The visible inspection for signs of damage to the electrical system. All mobile electrical equipment to be on the list of equipment included in the PAT testing regime.
4. Smoking controls: Staff to be reminded of the smoking ban, and inspections made for signs of any smoking other than in the smoking shelter.

Then the team develop a list of SPLI for these areas, as follows:

Smoke detectors,
- Number of false alarms
- Percentage of on-time inspections and testing
- Percentage of defect-free inspections.

Sources of ignition (Electrical system, Pat testing, smoking controls),
- Percentage of on-time inspections (and testing).
- Percentage of defect-free inspections.

Site security,
- Percentage of on-time inspections
- Percentage of defect-free inspections.

The team discuss the level of tolerance and agree that at the start of this process a tolerance of 5% for all SPLI will set, but these will be reviewed after the first three months, and modified as necessary.

STEP FIVE - Establish a data collection and reporting system

40. Once the indicators have been selected and the tolerances set, it is important to establish a system for the collection, collation, formatting, and presentation of the data.

41. It may be that the information and data required to support a suite of safety indicators is already available and collected for other purposes, e.g. for quality control or business efficiency. It is important to consider the frequency of monitoring that is required.

42. Ideally, it is best to co-ordinate the performance data through one person, who will be responsible for collecting all the information, compiling reports for the management team, and highlighting if there are any deviations from set tolerances.

43. It is best to keep the presentation of performance data as simple as possible - summarised in a single sheet. It is important to show clearly any deviations from set tolerances or targets, and important trends. Graphs, charts, etc, are probably the best way to show this. Alternatively, various systems such as traffic lights (green - ok, yellow - slight deviation, red - large deviation), or 'smiley/sad faces', can be used to highlight where things are going well/badly.

44. The senior management team should regularly receive key performance information. They are the main customers for this information and will need to make decisions on corrective action. For larger organisations, there may be a hierarchy of indicators in place, each needing to be collated separately.

A Warehouse Example.

45. **STEP FIVE - Establish a data collection and reporting system**

The site manager discusses the current provisions with the site's maintenance manager regarding the:

- inspection and testing of the smoke detectors,
- the warehouse electrical system, and,
- the PAT testing regime.

It is agreed that as the safety officer already performs a fortnightly housekeeping inspection, that the inspection of the boundary fences and checking for signs of breaches of the smoking ban, will be incorporated and recorded.

The safety officer will gather all the information from all the SPLI, and will collate all this data and determine any deviations from the set tolerances.

The team will then meet monthly to review the data generated by the SPLI programme.

The site manager will produce a quarterly site report for the Operations Director, who in turn will discuss the programme findings as a permanent agenda item at all future Board meetings.

STEP SIX - Review the data.

46. Performance and any trends for each indicator should be reviewed routinely by Directors and senior managers, to ensure that the whole SMS is delivering the intended outcomes, and to provide assurance that critical risk control systems continue to operate as intended.

47. If performance is poor against a group of leading indicators, but the associated lagging indicator is satisfactory, it is likely that the leading indicators selected are too far removed from the critical control measure that delivers or maintains the desired outcome.

48. If a group of leading indicators are on target and closely linked to the risk control system, but the associated lagging indicator shows poor performance, it is likely that risk control system is ineffective in delivering the desired outcome.

49. Deviations from tolerances must be followed up. The main aim of a performance information system is to indicate where risk control systems have deteriorated, or are not delivering the intended outcome.

50. If an organisation is consistently achieving 100% compliance against its targets over a significant period of time, such as 12 months, then it should consider whether other leading indicators could be developed.

51. Periodically, the scope of the SPLI programme should be reviewed, to ensure that any changes in business activities have not introduced new safety risks not covered by the SPLI programme. This could lead to a review of the critical risk control systems and the need to amend the indicators and/or the tolerances.

A Warehouse Example.

52. **STEP SIX - Review the data.**

After six months, the team review all the data generated, to determine the viability of the programme.

They agree that, for the ongoing SPLI Programme, they should reduce the frequency of boundary inspection to monthly, but increase the frequency of inspecting mobile electrical equipment; a recent check identified a piece of electrical equipment still not brought within the PAT testing regime.

Choosing targets and indicators

53. A CBA/UKWA Working Group was formed to develop a number of key indicators that will be relevant to organisations within the chemical warehouse sector. The list of selected key indicators, presented in Annex 2, is likely to be of importance to risk control systems within the chemical warehouse sector. The indicators have been grouped together under main category headings.

54. It is important that organisations using this guidance should firstly develop an SPLI programme, as described above, to ensure that the critical elements of the risk control system have been correctly identified for their business.

55. Members of the CBA/UKWA Working Group undertook pilot trials of selected indicators. This exercise produced useful exemplars of recording and reporting systems, using different presentational styles, which have been included in Annex 3 of this guidance.

Glossary

CCTV – Closed Circuit Television.

COMAH establishments – Schedule 1 of the COMAH Regulations specify the hazard categories and qualifying quantities of dangerous substances required to be present for an establishment to come within scope of the regulations and whether they are upper-tier or lower-tier.

Competent person – someone who has sufficient training and experience or knowledge and other qualities that allow them to assess the risks arising from work activities. The level of competence required will depend on the complexity of the activities.

Hazard – an inherent property of a substance, agent, source of energy having the potential of causing undesirable consequences.

DSEAR – Dangerous Substances and Explosive Atmospheres Regulations 2002.

Leading indicators - a form of active monitoring focused on the critical elements of key risk control systems to ensure their continued effectiveness.

Lagging indicators - a form of reactive monitoring requiring the reporting and investigation of specific incidents and events to discover weaknesses in the safety system.

Major Accident Hazard – a hazard with the potential to cause a major accident.

Major Accident –this is an occurrence such as a major emission, fire or explosion resulting from uncontrolled developments in the course of the operation of an establishment, leading to serious danger to human health or the environment (whether immediate or delayed) inside or outside the establishment and, involving one or more dangerous substances

Risk – the combination of the consequence of a hazard with the probability of its occurrence.

Risk control system – the structured application of measures designed to prevent or mitigate risk.

Definitions

Activity – a significant operation performed at a site. A single site may have several activities.

Bulk tank – a fixed storage tank with a nominal capacity greater than 1,000 litres.

Fire detection – all equipment used for the purposes of fire detection and warning systems, including heat/smoke detectors, audible alarms, alarm call points, etc.

Fire suppression - all equipment used for the purposes of fire suppression, including detection and initiation equipment, whether associated with equipment or buildings.

Loading & Unloading – the process of placing packaged goods onto a vehicle, or conversely, removing packaged goods from a vehicle, and the processes directly involved with this movement.

Racking – the system of warehouse packaged goods storage, including all shelving, protection barriers, and anti-collapse systems.

Segregation – the system of categorising materials into compatible groups, and defining segregation zones within a warehouse so that incompatible materials are not stored in adjacent areas.

Substance handling – the on-site transporting, lifting, or otherwise moving of substances packaged in containers, whether by manual or mechanical means. This does not include the filling of containers, or transfer within pipes.

References

1. BP U.S. Refineries Independent Safety Review Panel, chaired by former Secretary of State James A. Baker III, January 2007.

2. Control of Major Accident Hazards Regulations 2015 SI 2015/483 The Stationery Office which implements the Seveso III Directive (2012/18/EU) in Great Britain

3.*Leadership for the major hazard industries* Leaflet INDG277(rev1) HSE Books 2004 (single copy free or priced packs of 15 ISBN 978 0 7176 2905 3)

4.*Managing Risk: The hazards that can destroy your business. A guide to leadership in process safety*. COMAH Strategic Forum June 2017. http://webcommunities.hse.gov.uk/gf2.ti/f/22306/656517.1/PDF/-/Managing_Risk_The_hazards_that_can_destroy_your_business_v1.0_20th_June_2017.pdf

Guidance

- HSE (The Health and Safety Executive)

	Publication Title	ISBN Number
HSG254	Developing Process Safety Indicators	978 0717661800
L111	A Guide To The Control Of Major Accident Hazards Regulations 2015	ISBN 978 0 7176 6605 8
HSG 65	Successful Health And Safety Management	978 0717612765
INDG163	Risk Assessment: a brief guide to controlling risks in the workplace	978 0717664634
HSG71	Chemical Warehousing – The Storage Of Packed Dangerous Substances	978 0717662371

- OECD (The Organisation for Economic Cooperation and Development (OECD)

Publication Title	Reference
Guidance on Developing Safety Performance Indicators, OECD Environmental, Health and Safety Publications, Series on Chemical accidents, No 19.	

Annex 1

The Warehouse Example.

A company stores a variety of chemical products within two separate chemical warehouses that the company declares as one lower-tier COMAH site. The company decides to apply the Safety Performance Leading Indicator (SPLI) methodology to determine how best to ensure that the hazards associated with the materials being stored, the areas where they are being stored and the potential risks, are adequately controlled.

STEP ONE - Establish the implementation team

The Managing Director proposes the project, obtains approval from the company Board for the Safety Performance Leading Indicator (SPLI) programme to be implemented, and agrees that sufficient resources will be allocated.

The Operations Director is then appointed to oversee the project, and act as the Board representative, responsible for reporting the progress and actioning any issues that arise.

The Operations Director meets with the site manager to discuss the pertinent issues, and the site manager is asked to develop the programme further. The Operations Director sets a deadline of six months for the programme to begin to generate useful data to be reported to the company Board.

Then the site manager discusses the process with the site's safety officer, who wrote and maintains the company Major Accident Prevention Policy (MAPP), and asks him to assist him with the process.

The implementation team, "the team", is now in place:

- Site manager
- Safety officer

STEP TWO - Decide on the scope of the SPLI Programme

There are two warehouses on site:

- One storing hazardous chemicals; and,
- One storing non-hazardous chemicals

The implementation team decide to treat each warehouse separately, but then will combine the information into one site-level report to the company Board.

The team review the information contained in the existing MAPP, and determine whether the safety data sheets (SDS) on file for each of the stored products are up-to-date.

The team review all the accident and incident reports from the last three years, where they note that, two years previously, a small fire had occurred amongst discarded packaging materials within the hazardous warehouse. This was attributed to vandalism.

The team perform a “walk though” of both warehouses, to verify the storage information, and to look for situations that could pose a potential hazard, such as the storage of incompatible materials in the same area, degraded/damaged packaging, damaged or overloaded racking, etc.

As a result of the “walk through” the team identify:

- that some products in the hazardous warehouse do not have an accurate inventory;
- that some products are stored in non-designated areas; and,
- instances where racking is overloaded

Upon review of the SDS and other safety information on file for the requisite substances, the team determine that there is no immediate danger, but the lack of stock-control in the hazardous warehouse suggests that there is a potential for a serious incident in the future.

Based on this information, the team agree to focus on developing SPLIs in relation to:

- hazardous materials storage/segregation; and,
- prevention of fire.

For simplicity, the remainder of this example will focus on efforts to develop SPLIs in the area of fire prevention.

STEP THREE - Identify the risk control systems in place

When the safety officer had originally prepared the MAPP, the potential causes of fire he identified were due to problems in the electrical systems or due to personnel smoking in the warehouse.

The MAPP had not been updated following the previous fire, resulting from the alleged vandalism. The team determine that more should be done regarding the overall site security provisions.

Then the team then look at the existing fire detection systems in the hazardous chemical warehouse. The system consists of several “optical” smoke detectors, linked into the single site fire alarm system. The main electrical systems in the warehouse were only renewed 5 years previously, but since then, no regular checks have been recorded, although some pieces of mobile electrical equipment have been subject to regular Portable Appliance Testing (PAT testing).

Due to the change within the regulations, all smoking on site has now been banned, except for a smoking shelter located near the main site entrance.

STEP FOUR - Identify the critical elements of each risk control system

The team draw up a list of the critical elements that need to be controlled:

1. Fire detection: The inspection and testing of smoke detectors, alarms and break glasses.
2. Site security: The inspection of the site's boundary fencing.
3. Electrical systems: The visible inspection for signs of damage to the electrical system. All mobile electrical equipment to be on the list of equipment included in the PAT testing regime.
4. Smoking controls: Staff to be reminded of the smoking ban, and inspections made for signs of any smoking other than in the smoking shelter.

Then the team develop a list of SPLI for these areas, as follows:

Smoke detectors,
- Number of false alarms
- Percentage of on-time inspections and testing
- Percentage of defect-free inspections.

Sources of ignition (Electrical system, Pat testing, smoking controls),
- Percentage of on-time inspections (and testing).
- Percentage of defect-free inspections.

Site security,
- Percentage of on-time inspections
- Percentage of defect-free inspections.

The team discuss the level of tolerance and agree that at the start of this process a tolerance of 5% for all SPLI will set, but these will be reviewed after the first three months, and modified as necessary.

STEP FIVE - Establish a data collection and reporting system

The site manager discusses the current provisions with the site's maintenance manager regarding the:

- inspection and testing of the smoke detectors,
- the warehouse electrical system, and,
- the PAT testing regime.

It is agreed that as the safety officer already performs a fortnightly housekeeping inspection, that the inspection of the boundary fences and checking for signs of breaches of the smoking ban, will be incorporated and recorded.

The safety officer will gather all the information from all the SPLI, and will collate all this data and determine any deviations from the set tolerances.

The team will then meet monthly to review the data generated by the SPLI programme.

The site manager will produce a quarterly site report for the Operations Director, who in turn will discuss the programme findings as a permanent agenda item at all future Board meetings.

STEP SIX - Review the data.

After six months, the team review all the data generated, to determine the viability of the programme.

They agree that, for the ongoing SPLI Programme, they should reduce the frequency of boundary inspection to monthly, but increase the frequency of inspecting mobile electrical equipment; a recent check identified a piece of electrical equipment still not brought within the PAT testing regime.

Annex 2.

The CBA/UKWA Working Group Key Indicators

The Prevention of Fire and Explosion

Site Security

To include the inspection of perimeter security, CCTV equipment, site entry controls, and security lighting.

a) The percentage of inspections of controls performed to schedule.

b) The percentage of inspections where no defects are detected.

Earthing

To include both lightning and static protection

a) The percentage of inspections and testing of controls performed to schedule.

b) The percentage of inspections where no defects are detected.

Sources of ignition

To include smoking materials and mobile telephones.

a) The percentage of inspections of controls performed to schedule.

b) The percentage of inspections where no defects are detected.

Fire Detection

a) The percentage of inspections and testing of controls performed to schedule.

b) The percentage of inspections where no defects are detected.

The number of false alarms would be a possible lagging indicator.

Fire Suppression

a) The percentage of inspections and testing of controls performed to schedule.

b) The percentage of inspections where no defects are detected.

The number of false activations would be a possible lagging indicator.

DSEAR

a) The percentage of inspections and testing of controls performed to schedule.

b) The percentage of inspections where no defects are detected.

c) The number of reported breaches of zoning requirements.

The number of unreported breaches of zoning requirements discovered could be a possible lagging indicator.

Storage

Substance handling

To include both manual and mechanical systems.

a) The percentage of inspections and testing of controls performed to schedule.

b) The percentage of inspections where no defects are detected.

c) The number of packaged substance handling incidents that did not result in an uncontrolled release.

The number of packaged substance handling incidents that did result in an uncontrolled release would be a possible lagging indicator.

Racking

a) The percentage of inspections of controls performed to schedule.
b) The percentage of inspections where no defects are detected.
c) The number of reported racking beam overloads

The number of racking beam failures would be a possible lagging indicator.

d) The number of reported pallet issues

To include damage, wrong style, wrong size, or failed in storage.

The number of unreported pallet issues discovered could be a possible lagging indicator.

Segregation

To include both goods inwards and goods in storage.
a) The percentage of inspections of controls performed to schedule.
b) The percentage of inspections where no defects are detected.

Containment

To include primary, secondary and tertiary containment.
a) The percentage of inspections of controls performed to schedule.
b) The percentage of inspections where no defects are detected.

Loading & Unloading

To include product, packaging and vehicles.
a) The percentage of inspections of controls performed to schedule.
b) The percentage of inspections where no defects are detected.
c) The number of breaches of requirements
d) The number of times product transfer does not occur as planned, due to incorrect/unclear operational procedures.

Equipment

To include pressure systems, effluent treatment, electrical systems, hoses, LEV, and vehicles.
a) The percentage of inspections and testing of controls performed to schedule.
b) The percentage of inspections where no defects are detected.

Other Risk Control Systems

To include risk assessment, permit to work, change management, emergency response work transportation and training.
a) The percentage of processes and procedures reviewed within the designated period.

Annex 3

Recording and Reporting Examples

The following pages reproduce the recording and reporting systems developed by members of the CBA/UKWA Working Group while undertaking pilot trials of selected SPLI. The systems use different presentational styles, which have been included in this annex to assist companies in the development of their own systems.

Annex 3a	Recording System for Leading and Lagging Indicators This document provides a checklist for regular monitoring.
Annex 3b	Recording System for Leading and Lagging Indicators This document monitors the progress of corrective actions.
Annex 3c	Reporting System for Leading Indicators This document presents information graphically.
Annex 3d	Reporting System for Leading Indicators This document enables performance to be ranked.
Annex 3e	Housekeeping and Safety Check Records This document provides a checklist for regular monitoring.
Annex 3f	Bulk Storage Integrity and Safety Check Record This document provides a checklist for regular monitoring.

Safety Performance Leading Indicators 2009

HANDLING	Criticality	% Tolerance		Jun	Jul	Aug	Sep	Oct
DSEAR	**CE**	**0**	Number of instances where R11/R12 goods handled by non-Pyroban forklift truck					
Mechanical Handling	**CE**	**5**	% of FLT daily user checks performed to schedule					
		5	% of FLT daily user checks where no defect is detected					
	CE		Statutory inspections - number of faults (A) requiring rectification within a specified timescale					
	CE		Statutory inspections - number of faults (B) requiring rectification					
	CE	**5**	% of faults rectified within specified period					
			Number of instances of undue wear / damage to operating surfaces					
Manual Handling		**5**	% of manual handling training performed to schedule					
Racking	**CE**	**5**	Number of reported racking beam overloads					
			Number of reported pallet issues - including damaged, wrong type, wrong size, inappropriate.					
Process Safety Performance Ind. Loading & Unloading			Number of reported breaches of loading / unloading requirements					
		10	% of bookings where no issue reported					
Training & Communication		**10**	% of FLT training / refreshers completed on time					
		10	% of training sessions / tool box talks completed as planned					
Management Systems			Number of relevant processes / procedures reviewed					

Safety Performance Lagging Indicators 2009

HANDLING

		Jun	Jul	Aug	Sep	Oct
Handling Incidents	Number of packages received damaged with no product release					
	Number of packages received damaged with product release					
	Number of packages damaged during handling with no product release					
	Number of packages damaged during handling with product release					
	Number of leaking packages in storage					
	Number of incidents requiring external assistance					
	Number of incidents resulting in evacuation of area					
	Number of incidents resulting in evacuation of site					
Mechanical Handling	Failure of load bearing parts leading to damage / failure of packages					
	Failure of hydraulics systems leading to damage / failure of packages					
	FLT near misses - potential loss of product					
	FLT collisions - potential loss of product					
Racking (Internal / External)	Failure / collapse of racking - no product release					
	Failure / collapse of racking - product release					
	Pallet failure with no product release					
	Pallet failure leading to product release					
	TOTAL NUMBER OF INCIDENTS					
	TOTAL TONNAGE OF GOODS HANDLED					
	% OF INCIDENTS v TONNAGE					

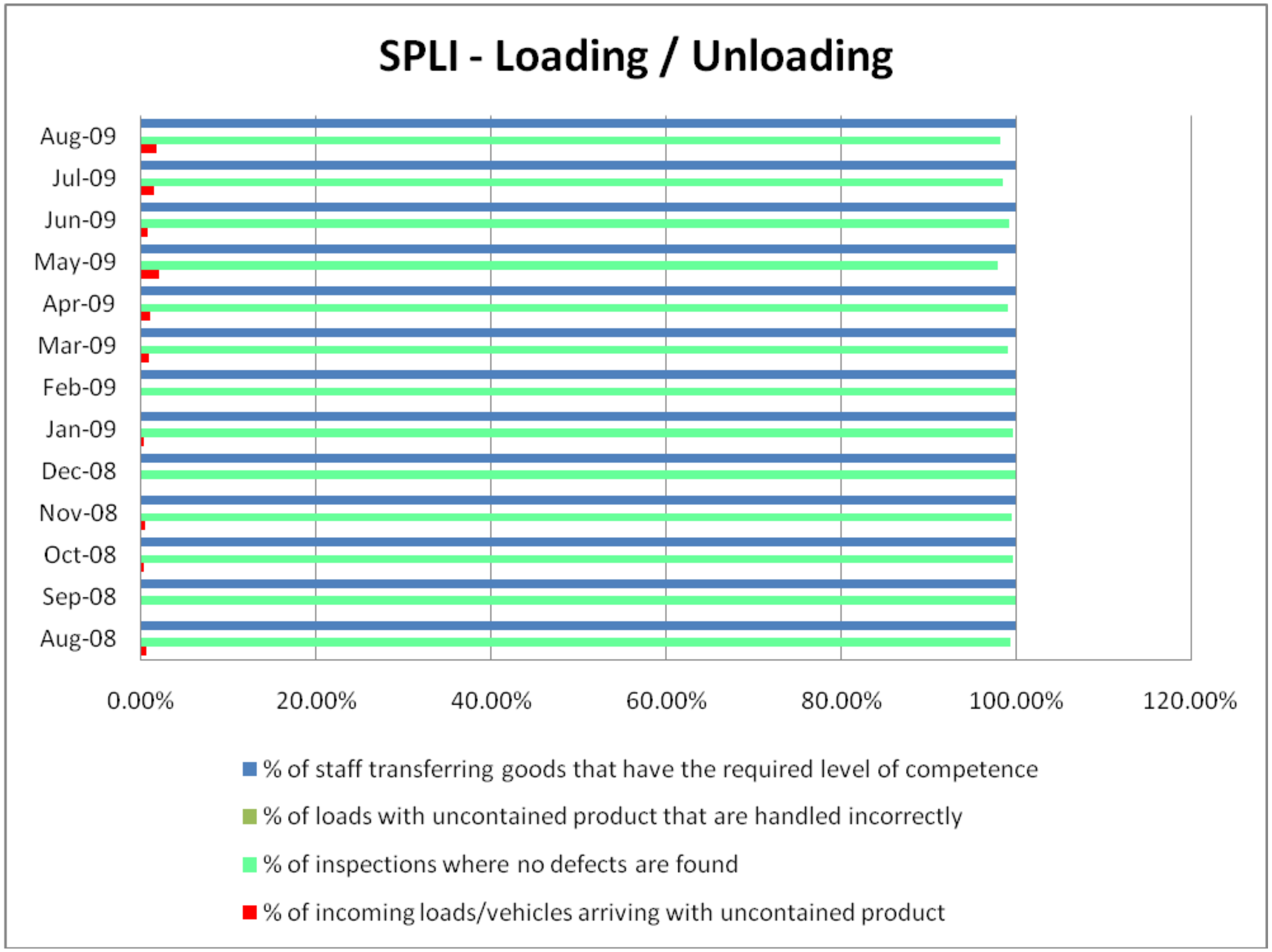
Annex 3b Recording System for Leading and Lagging Indicators

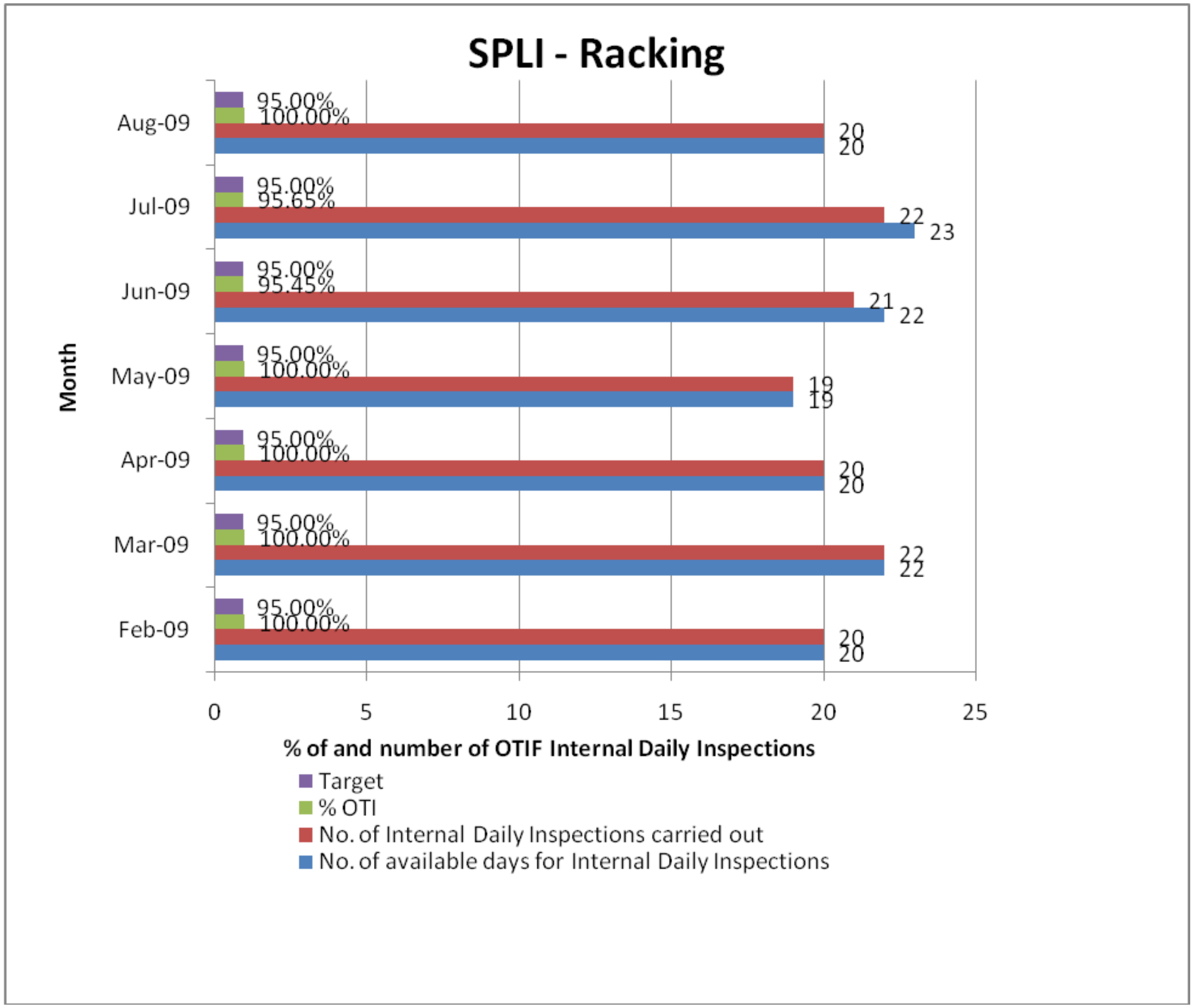
Auditor			**Date**			
Signed by General Manager			**Date**			
Month	**July**		**Operational Data**	**June**		
LAGGING INDICATORS		**(Outcome Failed)**				
Serial	**Risk Control System**		**Findings**	**Comments**	**Timescale for Action**	**Date Completed**
1a	Racking	Number of Reported Racking Incidents **RED**	NIL	N/A	N/A	30.06.2009
1b	Racking	Number of Reported Racking Incidents **AMBER**	NIL	N/A	N/A	30.06.2009
1c	Racking	Number of Unreported Damages **RED**	NIL	N/A	N/A	30.06.2009
1d	Racking	Number of Unreported Damages **AMBER**	NIL	N/A	N/A	30.06.2009
2a	Fork Lift Trucks	Number of Loss of Containment Incidents	NIL	N/A	N/A	N/A
2b	Fork Lift Trucks	Number of Code 'A' action defects raised	NIL	N/A	N/A	N/A
3a	Staff Competence	Numbers **not** meeting required Training in 5 year cycle (FLT refresher/Hazard Awareness / Spillage)	NIL	Internal audit completed 02.06.2009. Refer to NC1201 actioned 06.06.2009	N/A	06.06.2009
4a	Segregation of Products	Number of Inspections that reveal incirrectly stored or segregated material (HSG 71)	5 Inspections completed NIL issues reported	N/A	N/A	N/A
5a	Fire - Alarms	% of Failed Fire Alarms	NIL	N/A	N/A	N/A
5b	Fire - Extinguishers	Number of Fire Extinguishers not present or located correctly	NIL	N/A	N/A	N/A
6a	PTW - Control of Contractors	Number of adverse incidents / deviation from PTW / attributable to PTW	NIL	N/A	N/A	N/A
7a	Electrical	Number of Defects that give rise to Ignition	NIL	N/A	N/A	N/A
LEADING INDICATORS		**(Outcome Achieved i.e. Undertaken)**				
1e	Racking	Annual Independant External Racking Inspection		Inspection scheduled 31.07.2009	Week Ending 01.08.2009	
1f	Racking	Minimum 60% Monthly Internal Racking Inspection - **RED**	100% - 25 June 09 - 7 REDS	Racking System K04 to be reconfigured	Week Ending 08.08.2009	
1g	Racking	Minimum 60% Monthly Internal Racking Inspection - **AMBER**	100% - 25 June 09 - 14 AMBER	Racking System K04 to be reconfigured	Week Ending 08.08.2009	
1h	Racking Pallets	Number of Unreported Pallet issues discovered	NIL	N/A	N/A	N/A
2c	Fork Lift Trucks	Number of Code 'A' action defects closed	NIL	N/A	N/A	N/A
3b	Staff Competence	% of Staff involved in loading and unloading tasks who have the required level of competence (measured against initial and refresher training which is correctly record i.e. 5 year point)	100%	Refer to training matrix 2009/10	30.04.2009	

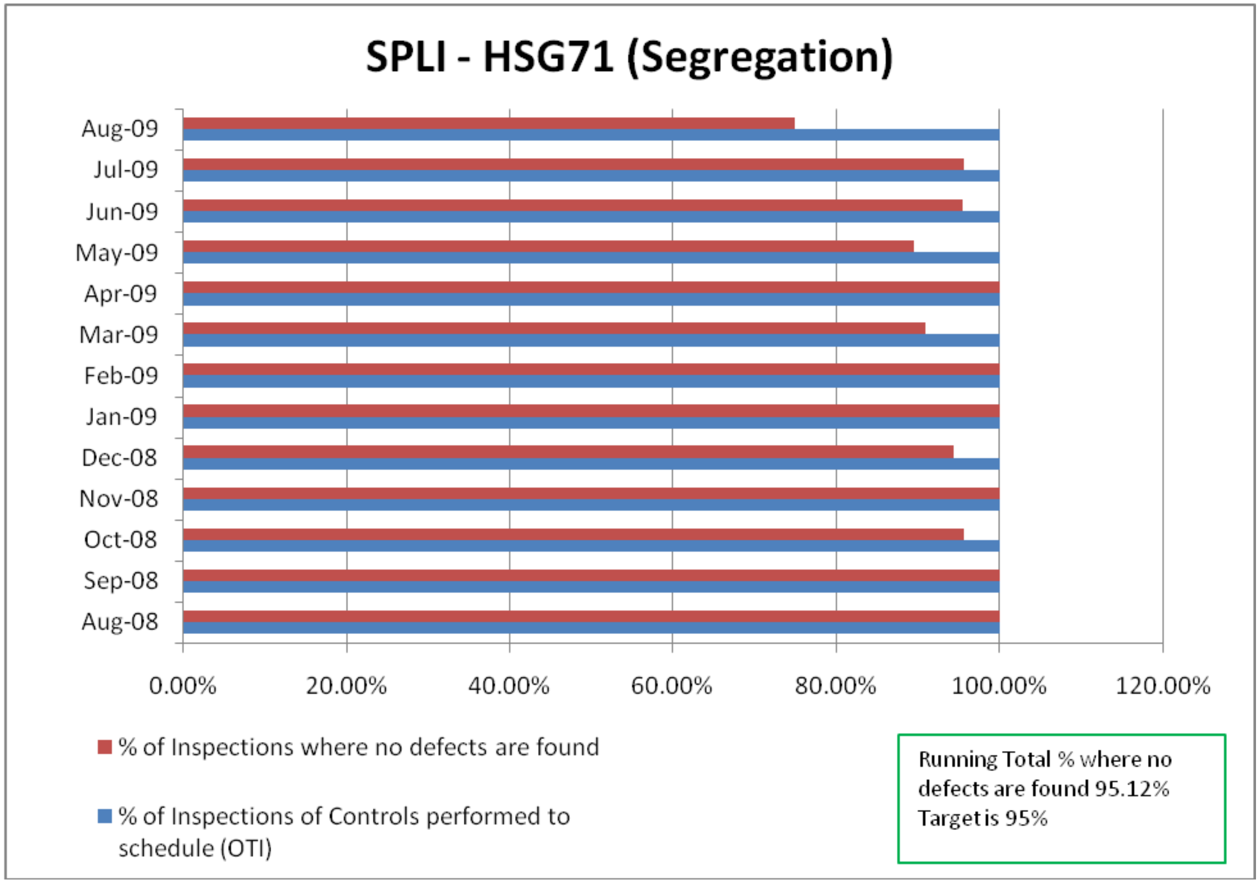
4b	Segregation of Products	Number of Inspections where no issues detected	5 Inspections completed NIL issues reported	N/A	N/A	N/A
5c	Fire - Sprinkler	Serviced as per Schedule	Annual service completed 26.05.2009	Minor faults reported to Diesel Pumps - repairs to be completed August 2009. Diesel pumps remain operational	31.08.2009	
5d	Fire - Alarms	100 % Fire Alarm Inspection	Bi-annual inspection / test completed 28.10.2008	Bi-annual inspection overdue	Week Ending 01.08.2009	
5e	Fire - Extinguishers	Serviced Annually	Annual service completed January 2009	No issues reported. Next annual service scheduled January 2010	Jan-09	Jan-09
6b	PTW - Control of Contractors	Number of times when work under a permit is checked to establish that it is being carried out in accordance with the PTW	5			
7b	Electrical	100 % Electrical Equipment Inspection (PAT)	Annual inspection / testing completed 08.04.2009	218 tests; 216 pass / 2 fail. Failed items removed from site.	08.04.2009	08.04.2009
7c	Electrical	Electrical Wiring Inspection HFL Store Yearly	N/A	N/A	N/A	N/A
7d	Electrical	Electrical Wiring Inspection COMAH Warehouses 3 Year point	Inspection completed April 2006	No issues reported. Next annual service scheduled April 2009 - overdue	Aug-09	
7e	Electrical	Electrical Wiring Inspection other Buildings 5 Year point	N/A	N/A	N/A	N/A

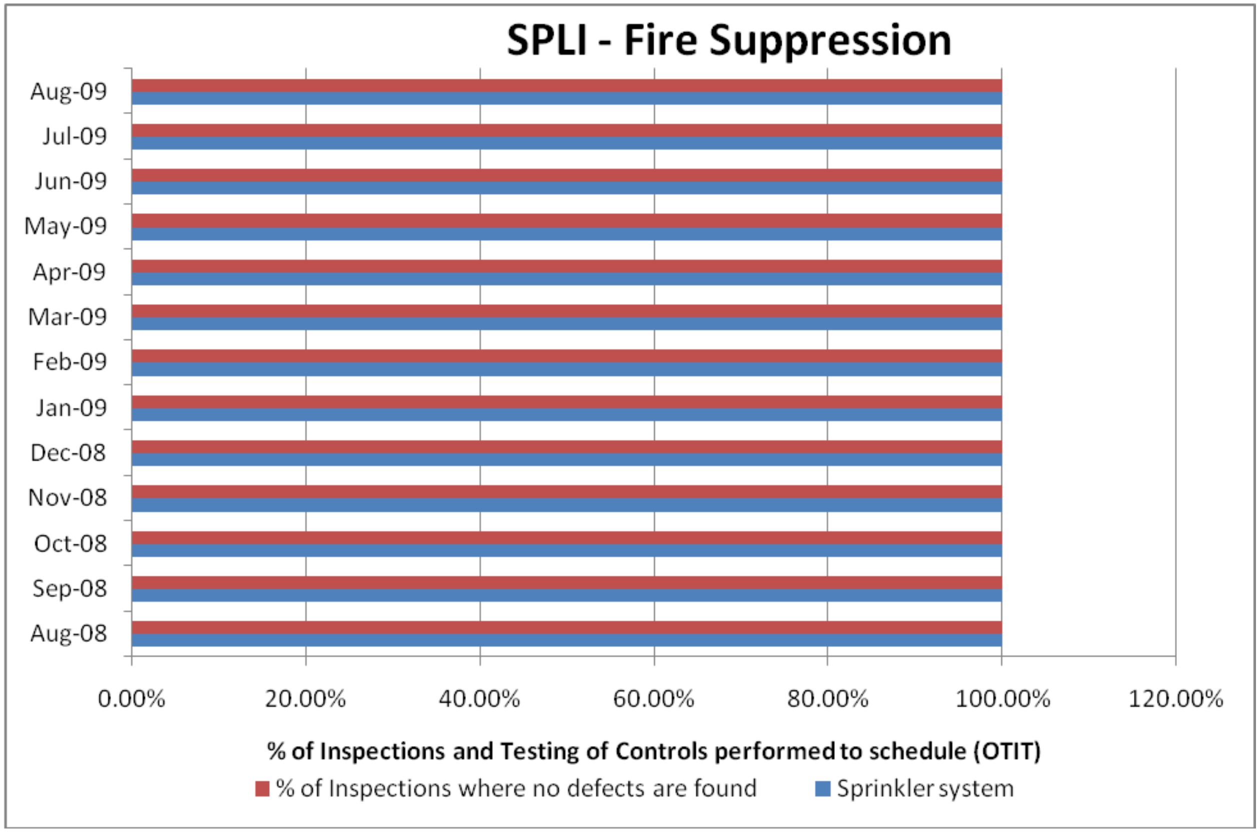
Further Action required	
Comments	
Signed by Director	
Date	

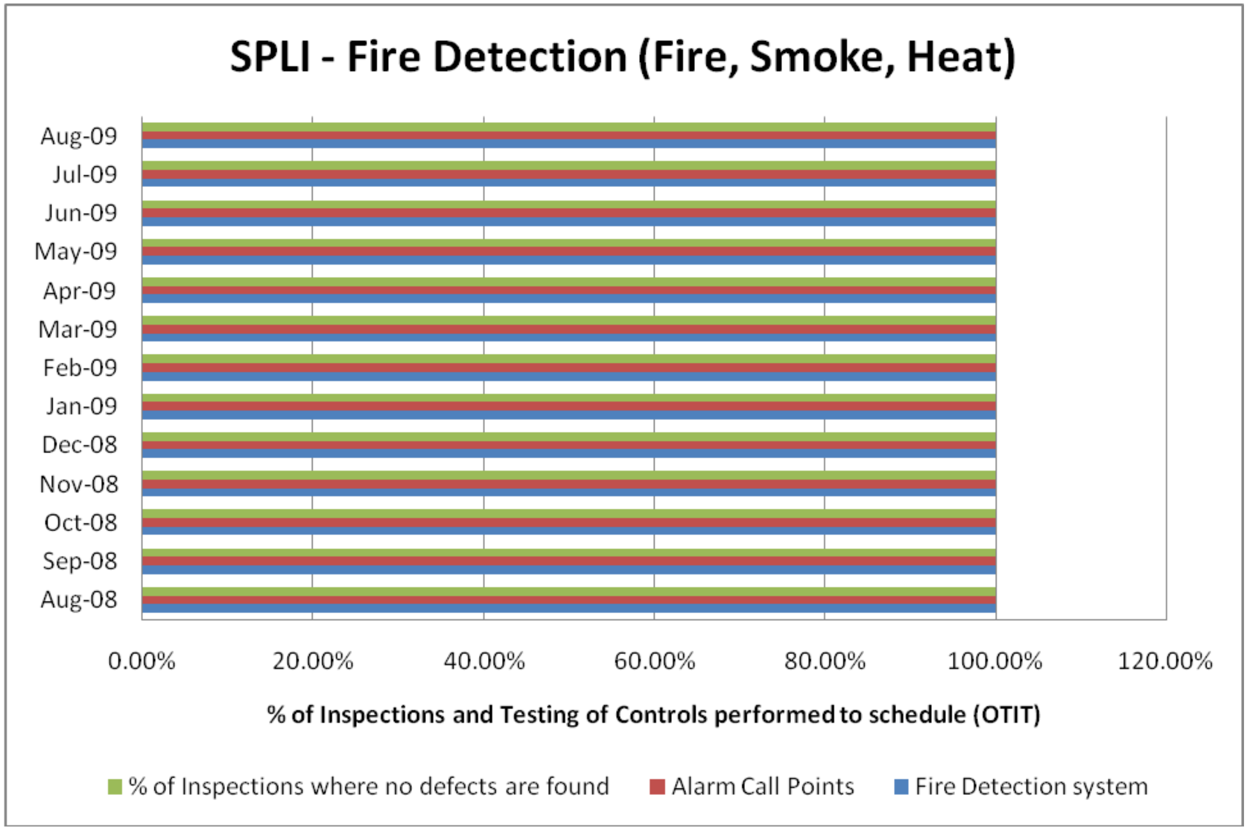
Annex 3C Reporting System for Leading Indicators




SPLI - Racking
Month
Aug-09
Jul-09
Jun-09
May-09
Apr-09
Mar-09
Feb-09
95.00%
100.00%
95.65%
95.45%
20
22
23
21
19
0
5
10
15
25
% of and number of OTIF Internal Daily Inspections
Target
% OTI
No. of Internal Daily Inspections carried out
No. of available days for Internal Daily Inspections


SPLI - HSG71 (Segregation)
Aug-09
Jul-09
Jun-09
May-09
Apr-09
Mar-09
Feb-09
Jan-09
Dec-08
Nov-08
Oct-08
Sep-08
Aug-08
0.00%
20.00%
40.00%
60.00%
80.00%
100.00%
120.00%
% of Inspections where no defects are found
% of Inspections of Controls performed to schedule (OTI)
Running Total % where no defects are found 95.12%
Target is 95%


SPLI - Fire Suppression
Aug-09
Jul-09
Jun-09
May-09
Apr-09
Mar-09
Feb-09
Jan-09
Dec-08
Nov-08
Oct-08
Sep-08
Aug-08
0.00%
20.00%
40.00%
60.00%
80.00%
100.00%
120.00%
% of Inspections and Testing of Controls performed to schedule (OTIT)
% of Inspections where no defects are found
Sprinkler system


SPLI - Fire Detection (Fire, Smoke, Heat)
Aug-09
Jul-09
Jun-09
May-09
Apr-09
Mar-09
Feb-09
Jan-09
Dec-08
Nov-08
Oct-08
Sep-08
Aug-08
0.00%
20.00%
40.00%
60.00%
80.00%
100.00%
120.00%
% of Inspections and Testing of Controls performed to schedule (OTIT)
% of Inspections where no defects are found
Alarm Call Points
Fire Detection system

Annex 3d Reporting System for Leading Indicators

Check date **Check number** **Next check date**

KPI RANK 1 EXCELLENT 2 GOOD 3 MONITOR 4 ACTION PLAN 5 IMMEDIATE ACTION

Leading Indicators		**Specifically**	**Number**	**KPI RANK**	**KPI PREVIOUS**	**RUNNING AVERAGE**	**Timescale for Action / Comments**
1	% PERIMETER FENCE CHECKS SHOWING NO ISSUES						
2	NUMBER OF DAYS FREE FROM INTRUDER						
3	% INSPECTIONS FREE FROM SEGREGATION ISSUE						
4	Segregation issues outstanding						
5	% INSPECTIONS CONTAINMENT ISSUES UNDEALT WITH						
6	% SAFETY HOUSEKEEPING CHECK RECORDS COMPLETED ON TIME						
7	Safety housekeeping checks outstanding issues						
8	% MAINTENANCE RECORDS COMPLETED ON TIME						
9	Outstanding maintenance issues						
10	BULK STORAGE INTEGRITY FORM COMPLETED ON TIME						
11	Bulk storage integrity form outstanding issues						
12	FAILURE TO FOLLOW PROCEDURE						
Auditors Comments:							

Comment/Signature and Date: .

Annex 3e Housekeeping and Safety Check Records

HOUSEKEEPING CHECK RECORD

Date	Area	Fault	Cause of Fault	Corrective Action	Supervisors Signature

SAFETY CHECK RECORD

Date	Category	Fault	Safety Critical Yes/No	Cause of Fault	Corrective Action	Supervisors Signature
	FLT					
	Machinery					
	Electrics					
	Chemical Handling Storage					
	PPE					
	Fire Precautions					
	Manual Handling					
	Access Equipment					
	Hand Tools					
	Workplace Conditions					
	Housekeeping					
	First Aid					
	Welfare Facilities					
	Effluent & Interceptor (where applicable)					
	Miscellaneous					

All areas to be checked at least fortnightly. Signature without details indicates there is no problem
Guideline items in **bold** are classified as Safety Critical.
Safety Critical items must be identified and the Corrective Actions to make safe specified.

Introduction
Below are details of the checklist overleaf

Fork Lift Trucks
Accidents cause numerous injuries and considerable damage. Check points:
- Is the operator authorised?
- Have routine checks/inspections been undertaken?
- Are pedestrians and FLT routes segregated?

Machinery
Some dangerous parts are easy to Check points:
- Are all dangerous parts guarded from any approach?
- Are the guards in good condition and properly secured?
- Are guards tested e.g. to check operation of interlocks?
- Are stop/start controls easily accessible and working?
- Have required statutory/ company inspections been undertaken?
- Is equipment under repair suitably isolated?

Electricity
Electricity is safe when systems are competently installed and regularly inspected. Check points:
- **Obvious signs of abuse or damage**
- Unnecessary use of trailing cables and adaptors
- Portable equipment in sound condition
- Control boxes, etc., suitably labelled
- Poor standards in temporary installations

Chemical/Materials Risk
These may have a short or a long term effect. Check points:
- **Is the area free of leaks, spillages, fumes?**
- **Are containers sound, clearly marked and kept closed when not in use?**
- Have safe working practices and emergency procedures been developed; do employees know them?
- **Is ventilation and LEV equipment maintained, effective and properly used?**
- Are open tanks adequately protected and bulk tanks bunded?
- Are systems for vessel entry and cleaning being followed?
- Are there any hazards for waste material?
- **Does the atmosphere seem dusty, fume filled or noxious?**
- Is effluent clear, within discharge limits and free from solvents? – If interceptor applies is it free from solvents?

Protective Equipment
Check Points:
- Is appropriate equipment available, properly used and inspected?
- Is it undamaged and a good fit?
- Are warning notices/instructions posted?
- Is emergency equipment properly located?
- Are these storage arrangements for items not in use?

Fire and Emergency Precautions
Check Points:
- Are extinguishers and hose reels properly located?
- Are fire doors operable and unobstructed?
- Have fire/smoke stop doors been wedged open?
- Has the alarm been tested in the last 3 months?
- Are there routine fire evacuation drills?
- Are ‘no smoking’ signs being observed?
- Are gas cylinders and flammable liquids correctly stored?
- Are quantities of flammables in workrooms kept to a minimum?
- Are there adequate arrangements for waste?

Manual Handling
Poor handling practices account for 25% of notifiable injuries. Cumulative strain is a common feature. Check points:
- What weights are being lifted?
- Are there features which make handling difficult, e.g. sharp edges, awkward shape, moving contents, poor floors, changes in level?
- Are established handling practices being used?
- Have employees received any training?
- Can manual effort be eliminated or reduced?
- Do the activities have a risk from repetitive movements?

Access Equipment
Check Points:
- Ladder in good order, lashed and footed?
- Scaffold towers on level ground with wheels chocked
- Handrails and scaffold boards correctly in place

Hand Tools
These are tools for which the hand provides the motive force. Accidents arise from human error, incorrect tool for job, badly maintained equipment as well as deliberate misuse. Check points:
- Are the correct tools being used?
- Is the tool in good condition, e.g. handles secure?
- Are tools being modified, e.g. extension bars to spanners?

Workplace Conditions
Defects in workplaces account for the greater proportion of accidents:

Check Points:
- Are floors and stairs clean and free from slippery substances?
- Are floors, stairs, handrails mechanically sound?
- Is there adequate space for the activities?
- Are gangways clear with tidy material storage?
- **Are racking systems sound and correctly loaded?**
- Are stillages, boxes, crates in good order
- Is there a procedure to deal with spillages?
- Is there adequate lighting?
- Are tank covers, manholes, etc., in place?
- Are there unnecessary trailing cables and services pipes?

Welfare Provisions
Check Points:
- Adequate first aid provided
- Soap, towels, hot water, barrier cream in washrooms
- Canteens and mess rooms in a clean state

Miscellaneous
This section allows comment on issues not covered

Annex 3f Bulk Storage Integrity and Safety Check Record

Date:

TANK	Product	Bund Condition	Tank Condition	Pipework & Equipment Condition	Access Equipment	Safety Critical? Yes/No	Corrective Action	Completion Date	Signature

All tanks to be checked at least fortnightly. Signature without details indicates there is no problem.
Guideline items in **bold** are classified as Safety Critical.
Safety Critical items must be identified and the Corrective Actions to make safe specified.