Part I
Engineering Management for Loss Prevention Engineering

Handbook of Loss Prevention Engineering, First Edition. Edited by J. M. Haight.

1
Management Systems – Loss Prevention Engineering Programs and Policy

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1.1
Introduction – Understanding the Need for Management Systems

Several industries around the world apply a multifaceted health, environmental, and safety (HES) program approach in reducing occupational HES incidents. Arguably, it is conventional wisdom within most industries that not a single safety or environmental or health process or tool has been proven to act independently to reduce or eliminate workplace incidents directly. To ensure that workplace incident prevention is achieved and sustained, an optimal mix of HES tools and processes needs to be implemented and managed (Shakioye and Haight, 2010). Regulatory requirements, company policies/procedures, and the sheer size of activities that support the operations across industries in the modern world introduce a degree of complexity. Such complexity requires a systemic management of implemented HES programs to ensure that the programs are sustained and continuous improvements in the form of learnings are captured and incorporated into existing practices.

Taking a look at the oil and gas industry for illustration purposes, statistics within the industry across the globe clearly show a consistent decline of total recordable incident rate (TRIR) from 2002 to 2009. Figure 1.1 represents the data across 102 countries where member companies have operations (OGP, 2010).

The data in Figure 1.1 represent what can be termed people/personal safety incidents – incidents that have as a primary consequence impact(s) on workforce personnel resulting in injury. While the industry can say that there has been a reduction in people/safety-type incidents over time, the process industry at large is still learning to achieve similar success in keeping the ''plant'' safe to avoid failures that result in catastrophic events.

To have an appreciation of loss prevention engineering management systems, a look at some relevant historical events that have helped shape the approach of industries to loss prevention is necessary. The 1984 Union Carbide Bhopal gas leak disaster (at a pesticide plant in India) remains one of the major industrial catastrophes that have played a role in looking beyond loss prevention from a mere occupational health and safety perspective. A process failure in this incident resulted in a leak of methyl isocyanate gas and other chemicals from the

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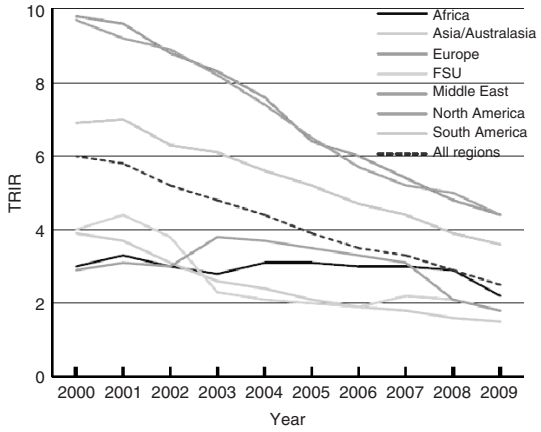


Figure 1.1 TRIR 5 year rolling average, per million hours worked. (Adapted from the OGP Safety Performance Indicator Report (OGP, 2010).)

plant, causing undue exposure of thousands of people (Jackson Browning Report; Browning, 1993). Another major process-related incident was the March 2005 British Petroleum Texas City Refinery explosion, which was caused by the ignition of a hydrocarbon vapor cloud. The vapor cloud was created from a series of system malfunctions that eventually led to liquid hydrocarbon overfilling the blowdown drum and stack, then spilling over to the ground, creating the flammable vapor (The Baker Panel, 2007). This explosion resulted in 15 employee fatalities and 170 other injuries. More recently, the April 2010 British Petroleum Deepwater blowout incident (Macondo well incident) was largely due to a succession of interrelated well design, construction, and temporary abandonment decisions that compromised the integrity of the well and compounded the risk of its failure (Transocean, 2010). This incident resulted in an explosion with 11 fatalities and an environmental disaster off the Gulf Coast of the United States. From several investigation reviews, and if history is anything to go by, the common theme of the root causes in the majority of these incidents was management system-related deficiencies, particularly in the area of process safety.

Process safety incident occurrences go far beyond all of the above-mentioned incidents and other similar high-profile process safety incidents well known to the public. It is important to remember that process safety incidents include the release of hazardous materials from leaks within systems, spills, equipment malfunctions that result from exceeding design temperatures and pressures, system integrity issues that include corrosion, metal fatigue, and other similar conditions. In essence, several less severe process safety incidents occur every day across the industry with less media attention.

Reacting to process safety incidents, the US government put in place laws that led to the creation of the Risk Management Program (RMP) in 1999, being managed by the United States Environmental Protection Agency (EPA). This program required process industries to log their facility information and incident history, incident

consequences, and preventive programs that have been introduced as a result of the incidents. The RMP database held all these very useful historical data that could be analyzed. A decision was made by the government to restrict access to the data for national security reasons, the main reason being that the RMP database contains details of potential consequences of hypothetical worst-case scenarios of accidental releases. With the agreement of the EPA, the Wharton School (University of Pennsylvania) conducted a preliminary analysis of historical process-related incident data from the RMP (non-security sensitive data). The Whartson School analyzed 10 years of process safety data, and identified only small improvements which may have been due to changes in the reporting attitude of companies rather than actual performance (Kleindorfer *et al.*, 2007).

Similarly to the above, the European Union also maintains a database for all process-related incidents – the Major Accident Reporting System (MARS) database (Nivolianitou, Konstandinidou, and Michalis, 2006). A report prepared by Pitblado in 2004 indicated that the outcome of the DNV Energy examination of the data in the MARS database showed no trends; however, the data set showed a steady average level of incident severity. Based on Lord Cullens recommendation, a leak database was created in the United Kingdom to record the count of leaks of process fluids (Pitblado, 2011). Figure 1.2 shows a plot of the analysis of the leak database, which shows a slight decline in major leaks whereas trends for other minor leaks do not clearly show a decline.

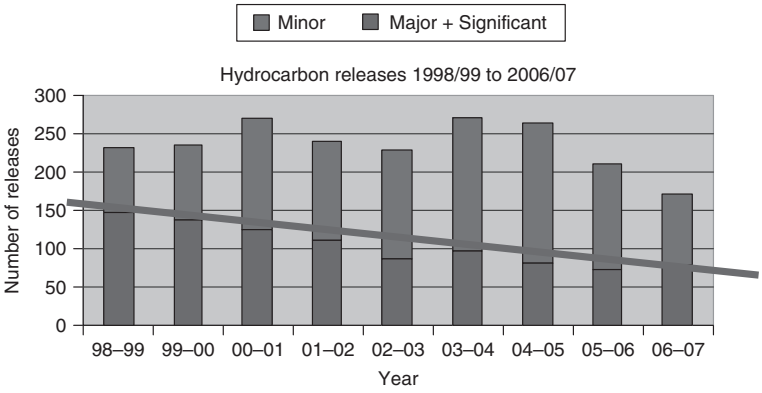


Figure 1.2 UK sector major leak frequency – Health and Safety Executive data. (Adapted from Pitblado, 2011.)

Considering past incident occurrences and the outcome of the analysis of historical data indifferent studies, there is still a great need for industries to continue to work at initiatives that will guarantee the success achieved in the occupational safety, health, and environment field. Engineering processes and controls to keep the plants inherently safe will be an area for continuous improvement and focus to steer industry along this path.

Similarly to conventional HES focus areas, there are several established process safety processes/procedures in support of regulatory requirements and lessons

learned that were derived from outcomes of investigations from past process safety incidents by several bodies, including European Union law (Seveso II Directive), US Chemical Safety Board, the US Occupational Safety and Health Administration (OSHA), and the Baker Panel Report (The Baker Panel, 2007), among an extensive list. Process safety programs specifically focus on the design and engineering of facilities, hazard assessments, management of change, inspection, testing, and maintenance of equipment, effective alarms, effective process control, procedures, training of personnel, and human factors. Having said this; we need to understand that to reach an incident and injury-free state, personal safety, process safety, and environmental issues need to be well understood. Management systems that support processes, based on facts and not just mere intuition, need to be put in place.

1.2 Management Systems – Definitions

Based on the author's experience, the term ''management systems'' in a broader sense implies a methodical and historically tested approach to managing the interactions/implementation of policies, processes, practices, and applicable regulations, all aimed at delivering an outcome that supports established vision and set objectives. This becomes more critical to the success of enterprises that have large/integrated operations. Management systems ensure that leadership has the needed framework to cascade their vision across the enterprise and it also establishes a platform for accountability at different strata of the organizational hierarchy. Having said this, a management system is incomplete without having the robustness to allow for continuous improvement of the organization's policies, procedures, and processes.

The generic definition of a basic management system ''refers to what the organization does to manage its processes, or activities, so that its products or services meet the objectives it has set itself, such as:

- satisfying the customer's quality requirements,
- complying with regulations, or
- meeting environmental objectives'' (ISO, 2011).

A schematic of the basic management system standards of the International Organization for Standardization (ISO) is shown in Figure 1.3. ISO's definitions of each quadrant of the ''Plan–Do–Check–Act'' scheme are as follows:

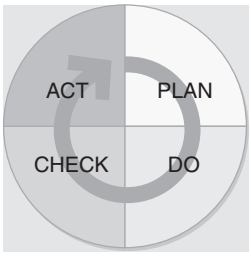


Figure 1.3 ISO management system. (Adapted from ISO, 2011.)

- **Plan** – Establish objectives and make plans (analyze your organization's situation, establish your overall objectives, and set your interim targets, and develop plans to achieve them).
- **Do** – Implement your plans (do what you planned to).
- **Check** – Measure your results (measure/monitor how far your actual achievements meet your planned objectives).
- **Act** – Correct and improve your plans and how you put them into practice (correct and learn from your mistakes to improve your plans in order to achieve better results next time).

Within any establishment, the HES function with support of the executive leadership will need to define and establish a fit-for-purpose management system that is based on the basic model discussed above.

1.3
Loss Prevention Engineering – Considerations

Engineering in loose terms will be the utilization of mathematical, socioeconomic, practicability, and scientific expertise to design and build functional structures that allow for the enhancement of quality of life. With this in mind, it becomes counterproductive if the design process/construction/operation fail to consider the immediate and long-term impacts of possible exposure of life to hazards. To ensure inherently safe design, construction, and operation, consideration of an engineering approach certainly offers the most logical course of action.

Loss prevention engineering involves the employment of engineering tools to minimize to a reasonable extent or eliminate the probability of occurrence of incidents that may result in personal injury/illness, environmental degradation, property/equipment damage, loss of productivity, and financial losses due to other incidents such as litigation and brand perception by the public. Loss prevention focuses on being proactive rather than reactive. Once our loss prevention system fails, then it becomes a case of loss control which may be out of range however planned for during the design phase.

Considering the industry at large, there are huge upsides to having functional loss prevention management systems in place; this allows companies to understand their risks and proactively mitigate their exposures. The reward for having such systems backed up with data showing its success is passed back to the company in the form of cost savings from reduced incidents and by insurers offering lower premiums.

Regarding cost savings, as a case study for illustration purposes, we can refer to a publication by the US National Highway Traffic Safety Administration (NHTSA), an arm of the US Department of Transportation, on the topic "The Economic Burden of Traffic Crashes on Employers" (NHTSA, 2003). The report concludes that in 2000 alone, employers spent $7.7 billion on medical care resulting from motor vehicle accidents and $8.6 million on sick leave and life and disability claims for motor vehicle crash victims. Not included in these figures are the losses due

to company property damage. The root causes of the crashes reported in the study were primarily driving under the influence of alcohol and unrestrained driving (primarily non-use of seatbelts).

The NHTSA estimated that the potential savings for employers could be up to $15 billion annually if these two root causes of crashes are eliminated. This could be achieved by implementing motor vehicle safety programs that include ''drug and alcohol policies'' forbidding operation of vehicles while under the influence, and a policy governing the proper use of seat belts by employees during commuting. Installation of vehicle monitoring systems on company-owned vehicles to manage drivers' attitude on the roads will add some value to motor vehicle safety in addition to helping with accountability. These solutions may sound simplistic; the challenge to the safety policies is the implementation, which can only be achieved by the managers leading by example and holding employees accountable.

We now change gear to focus on the insurance industry and their perception of a customer with adequate safety training being less of a liability, hence reducing insurance premiums. A study by Huang *et al.* (2008) at the University of Connecticut entitled ''Modeling motorcycle insurance rate reduction due to mandatory safety courses'' looked at the insurance rates in relation to safety courses for motorcycle drivers. Table 1.1 is a direct extract from the study, showing a market survey of some major insurance players in the United States.

Table 1.1 Current motorcycle insurance discount rates for taking a safety course[a].

Insurance company	Discount rate	Details[a]
Progressive	NA[b]	Safety course – completing an approved safety course could earn you a discount
GEICO	10%	10% discount for completing a motorcycle safety foundation or military safety course
Allstate	5%	Save 5% if you have voluntarily passed a motorcycle safe driving course in the past 36 months
USAA	5%	Approved safety course within the last 3 years
Foremost	NA	Motorcycle safety course discount
Nationwide	Up to 5%	Save up to 5% on your motorcycle insurance when you complete an approved safety course
MARKEL	NA	Safety course discount
Dairyland	NA	Motorcycle safety course completion
Rider	No discount	—

[a] From official web sites of insurance companies.
[b] NA means the specific value for the discount rate is not disclosed directly on the web site. Customers need to consult the agent case by case.
Adapted from Huang *et al.* (2008).

As indicated by the sample size involved, all but one insurance company offers a discount of one form or another whether or not a specific percentage was stipulated.

This is not an uncommon practice in the insurance industry beyond motorcycle or motor vehicle insurance. The general theory is that insurance premiums are significantly higher for clients who show operationally higher risks which may introduce some level of ambiguity to the probability of an event occurring than those with inherently safer operations (Kunreuther *et al.*, 1995).

Regardless of the industry, it should be clear at this point that having a functional loss prevention engineering program could influence the bottom line of a company by minimizing financial losses.

1.4
Management Systems – Loss Prevention Engineering

Considering the range and complexity of loss prevention engineering processes and tools, it becomes an exceptional candidate for the implementation of management systems to deliver success. In line with industry practice, management systems for loss prevention will be made up of the overarching cycle of defined stages, hinged around leadership commitment as the most important factor.

A schematic diagram that shows the six basic stages of the loss prevention engineering management system cycle is presented in Figure 1.4. Note that the periodic audit is targeted at the four steps within the shaded arch.

Figure 1.4 Schematic diagram of a loss prevention management system (self-developed).

Figure 1.4 depicts a system with a scope that goes beyond traditional loss prevention engineering which focuses more on the technical part of HES. It will be implemented with equal consideration to building a safety culture within the enterprise that believes that all incidents are preventable. Personal safety needs to be given commensurate attention; understanding the human element is the most complex, difficult to predict, and critical part of any operation; hence engineering solutions cannot be solely relied upon. We rely on the human element

for design, preventive maintenance, following standard operating procedures while incorporating safe work practices, reacting and responding to emergencies, and so on – the list can be endless. The schematic forms the basis for outlining HES strategies, developing/implementing plans, building schedules around the cycle, and putting in place the necessary controls to run the organization with HES interwoven into regular operations. It is crucial that for loss prevention planning to be managed successfully, outcomes from each stage (of the schematic) have to be integrated into the enterprise's business planning cycle; ''experienced owners and managers of closely held businesses know that business plans can also be an indispensable management tool'' (Ernst & Young LLP, 1997).

1.4.1
Leadership Commitment

Leadership commitment forms the core of the management system. Management systems have been known to fail for lack of leadership support and the absence of providing visibility to the system by leadership. Leaders must take full ownership and set the expectations by demonstrating commitment through providing the right level of support and resources adequate for its full implementation. Leaders must lead by example. For illustration, in a study conducted by Yang *et al.* (2009), who carried out mathematical research on leadership and safety culture in relation to performance in the health industry (sampling 195 questionnaires across industry), it was concluded that the ''analysis data results show that leadership behavior affects safety culture and safety performance in the healthcare industry,'' which could also be said for other industries.

It is imperative to understand the broadness of leadership within this context. While recognizing the different degrees of responsibility and influence of individuals who make up the strata of leadership within any enterprise, every leader ranging from executives to front-line supervisors have unique roles to play in running the management system. The idea is to orchestrate the interactions of people with people and also the interactions of people with machines and the environment, ensuring alignment with incident-free strategic visions and objectives set by the corporate executives. Vision must be communicated to the workforce using all avenues by leaders, including written statements and personal communications for the workforce to be convinced and hence buy in (Kouzes and Posner, 1987).

1.4.2
Vision and Objectives

Executives and top leadership managerial teams are responsible for setting precise HES visions that offer clarity. The HES vision should support the company's philosophy and be written such that every employee could be held accountable for its execution at every level. Public perception and confidence need to be considered

in the HES vision statement considering the potential for the company's interaction with the public during the life of the operation.

Corporate HES objectives that support the set HES vision will also be established. This will be needed to break the vision further into more executable and measurable umbrella statements that summarizes all pillars that support the vision. To ensure adequate coverage, establish HES objectives that reflect on ''Health,'' ''Environment,'' ''People Safety,'' ''Process Safety,'' and ''Operational Performance.'' Below are sample objectives that may serve as starters:

- Prevent injury and illness and pursue improvements in safety and health to achieve industry leadership.
- Achieve zero non-conformance by complying with all relevant statutory requirements.
- Attain industry leadership in environmental stewardship; operate with minimal environmental footprint.

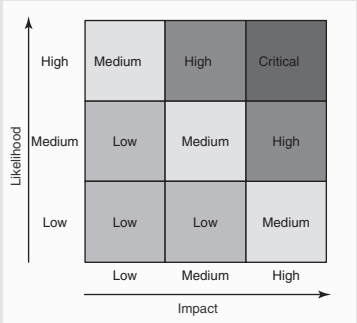
The set HES vision and objectives will form the foundation for all other tools and processes. Depending on the industry of interest, a benchmarking exercise will be very beneficial in establishing existing industry approaches, checking the industry pulse, and projected future direction prior to setting a vision. In a book by Codling (1995), Xerox Corporation was identified as the pioneer of using benchmarking techniques for establishing management practices; Xerox was said to define this technique as ''the search for industry best practices which lead to superior performance.'' Understanding the industry and identifying specific performers and regulatory trends provide leverage in strategic HES planning. Corporate visions of many companies are publicly available for reference, especially on the Internet; this certainly provides an opportunity to understand what minimum goals you need to set.

Visions typically do not change over the long term as they are futuristic in nature; Kouzes and Posner (1987) defined vision as ''an ideal and unique image of the future.'' It is very important that once crafted, the vision and objectives are cascaded down through the entire enterprise. All leaders will always use the vision as a primer for discussions or workforce engagements to ensure that the workforce understands that these expressed values are important to their leadership. This enables management to tap into the energy of the conversional thought of ''what is important to the boss is important to me.''

1.4.3
Resources / Policy / Processes / Procedure / Regulations

Set HES objectives are only as good as the available enabling tools, supporting processes, and competent workforce for implementation. Success relies on leadership demonstrating commitment by providing adequate resources to support the loss prevention management system. A summary of some HES processes is provided in Table 1.2 for reference.

Table 1.2 Loss prevention management system support: example processes by category.

People (health) and Safety/Culture/Environment Processes	Process Safety[a] Processes/ Procedures	HES Risk Management Processes/Procedure
Training		
Emergency management/ Response		
	Process hazard	Existing and new facilities risk classification process
Analysis management of change		HES Risk Assessment/ mgt process using risk matrix of event "likelihood versus impact" (projects and existing facilities); considering Health, Environment and Safety
Mechanical integrity		
Incident investigation		
	Process safety information	
Safe work practices		
	Pre startup safety review	
Operating procedures		
Contractor HES		
Behavior based safety		
Motor vehicle safety		
Managing safe work		
Environmental impact assessment		
Environmental management		
Fitness for duty		
Occupational hygiene		
Marine safety		
Aviation safety		
Regulatory compliance / compliance assurance		
Ergonomics		
		
		Identify risk mitigation for all high and critical risk activities
		Additional Risk Assessment Process/ Procedures – Engineering approach (needed beyond nominal risk reduction above) • Facility citing studies • Quantitative risk assessment • Blast analysis and blast resistance design • Emergency evacuation systems • Fire analysis • Gas dispersion evaluation • Noise and vibration analysis • Fire fighting/ suppression systems design • Safety system integrity Risk reduction plan implementation
		HES Risk Assessment periodic validation

[a] Modeled around OSHA recommendations (OSHA, 2002).

1.4.3.1 **Resources**

Resourcing personnel with HES expertise within each identified functional area of HES (i.e., Health, Environment, People Safety, and Process Safety functions) will be brought onboard to support and identify relevant policies/processes (see Table 1.2 sample of process listings) for development based on priority/risk ranking. The questions to ask in order to test criticality of any HES process is ''What impact will the absence of the process have on meeting set HES objectives?'' Depending on

the immediate need of the organization, processes should be ranked according to their criticality to the success of the business objectives; ranked high, medium, or low risk. Personnel support can then be appropriated accordingly depending on availability, with priority given to the high and medium risk processes.

The HES career path will have to be defined within the enterprise, up to a position that has a seat at the table at the topmost leadership level; see the sample organogram in Figure 1.5. The HES defined positions along with the support of Subject Matter Experts (SMEs) will support process implementation (Table 1.2) and manage HES human resources and workforce HES competency development down the chain.

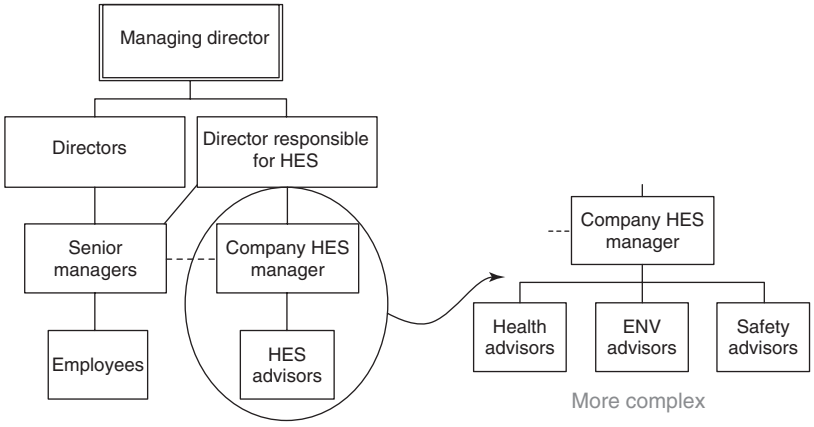


Figure 1.5 Generic organogram showing HES positions. (Modeled on Bachy Soletanche Health and Safety Policy, *http://www.bacsol.co.uk/index.php/policies/health_and_safety_policy/*.)

The above organizational structure is generic enough and HES positions can go from simple to more complex, as shown in the schematic on the right in Figure 1.5, depending on the needs of the organization (which may even be much more complex if needed). As the operational needs become more complex, it becomes a driver to provide dedicated resources to the "H – Health," "E – Environment," and "S – Safety" functions within HES.

Even for much larger operations, resources and ownership are provided at the process level depending on criticality. For example, if a company is heavy on motor vehicle transportation as a major part of its business coupled with an assumed risk associated with transportation, there may be a need to have a resource dedicated to managing the company's "motor vehicle safety process" (resulting in many advisors under, e.g., safety function alone). Such an owner will have direct accountability for implementation of and sustaining such processes. Additional information is given in Section 1.4.3.4. Consideration also has to be given to some cross-functional team support. For illustration, Information Technology may work closely to support documentation (help implement real-time remote monitoring of a fleet to understand drivers' driving habits, information management for sensitive

HES data), the Legal Department may need to provide support for regulations interpretation, Human Resources for interfacing with workforce fitness for duty, HES process, disability management, and the list of possible cross-functional support goes on depending on the size and complexity of an operation.

1.4.3.2 **Policy**

Company management will develop and endorse HES policies relevant to HES for publication within the company. The company workforce and companies providing third-party services (contractor companies or individual contractors) will abide and live by these established policies. A good cue could be taken form the US National School Boards Association (NSBA) ''Policy Development Steps,'' which include 12 steps to create and implement policies (*http://www.nsba.org/sbot/toolkit/PolSteps.html*). Below is a summarized list:

1) **Define the opportunities or issues**, for example, operations that include the use of heavy machinery or drug and alcohol exposure may be a potential issue that needs to be addressed; hence there may be a strong need to develop a policy that governs usage or non-usage of intoxicants depending on the safety sensitivity of each position. Other policies may include personal protective equipment policy, security policies that govern use or non-use of firearms in operations areas, preventive maintenance polices, and travel policies that stipulate journey management requirements from a safety perspective.
2) **Gather relevant information on the opportunities** (gathering information from similar operations elsewhere). Understand regulatory requirements by government agencies, for example, the OSHA in the United States, the Canadian Centre for Occupational Health and Safety (CCOHS) or the European Agency for Safety and Health at Work. Depending on the operations location, all relevant gathered information will influence writing policies.
3) **Deliberate over the information at management level**, ensuring that the right people who have the right subject matter expertise are involved.
4) **Draft policy**: the outcome of management decisions from the deliberations is put it writing, documented, endorsed by management, and publicized across the enterprise for implementation. Appendix 1.A is a generic draft of a drug and alcohol policy as a starter taken from the BCN – NSHE (Business Center North – Nevada System of Higher Education).

1.4.3.3 **Regulatory Consideration**

In developing policies, processes, and procedures, all regulations within the jurisdiction of operation will have to be considered. The convention will be that the company policies are at the minimum on a par with government requirements. There is a need to dedicate resources for tracking regulatory requirements and changes by law makers that may affect how the operation is being run. Having operations that span across countries or continents adds some complexity to incorporating regulatory requirements into policies and procedures. To ensure that operations keep up with the diverse regulatory regimes in different locations,

an appropriate process implementation philosophy will have to be developed. The philosophy will clearly support the local regulations, superseding the company processes in cases where the local regulations are found to be more stringent.

Liberty to a certain extent will also have to be given to local divisions of the enterprise to modify company-wide processes to meet local specific needs; such modifications to company processes/procedures will have to follow a defined methodology. For illustration purposes, the International Marine Organization (IMO) has implemented the standard International Convention for the Prevention of Pollution from Ships (MARPOL) as the international governing regulation for maritime operations. There are 170 member states in the IMO implying a wide global reach of the regulation. There are particular situations where some member states have more stringent requirements; for example, in Canada. The Canadian Arctic Pollution Prevention regulation states a zero discharge of oily water into the Arctic whereas MARPOL allows 15 ppm to be discharged 12 nautical miles offshore. In this classic example, enterprise policies and procedures relating to marine waste management will have to allow for the more stringent regulations to prevail for operating locally in Canadian waters even though enterprise global practice may have been designed using MARPOL as a framework.

1.4.3.4 **Processes**

Whereas company policies are crafted with the expectation that company employees, contractor individuals, or other companies will comply, processes may have a different implementation strategy to them. Company HES processes will be put in place to address the entire scope of HES from contracting, facility design, and construction to operation and divestment. Specific to implementing HES processes, there are foreseeable challenges with companies that are dependent on third-party companies for a reasonable percentage of work or in the event of being involved in partnership(s). This is because such a company remains in a position of influence only and does not have direct control of the operating processes in such a scenario. A methodology within established processes will have to define clearly the applicability of each process to joint operations depending on the amount of influence available within such an operation. Also for contractor dependency management, HES processes will have to be written such that they are interwoven with the company's contracting philosophy. A good way to achieve this is by ensuring that the HES performance of prospective contractors forms part of the contractor selection criteria and this should also include reviews of core HES practices submitted during tender to test for alignment with company practices at a minimum. A list of processes to consider is given in Table 1.2 with generic titles.

1.4.3.5 **HES Processes Approach and Structure**

Understanding that although there are similarities in the approaches between the European Union and the United States to regulating and managing safety in the process industries, some fundamental differences exist. Historically, and based on reaction to industry incidents, the European regulations were for the most part based on risk assessment whereas the US regulations focused more on process

safety management (Pitblado, 2011). More recently, there has been a shift towards the middle ground from lessons learned by both sides. Historical process-related major incidents that occurred in these regions have certainly influenced both regions for better integrated approaches in seeking solutions. Examples of generic processes are listed in Table 1.2; as part of building a corporate culture within an organization, a standard approach may be employed in building contents and structure for each of the processes. As an example, the State government of Arkansas in the United States, in an attempt to encourage public stakeholders (citizens) to use official documentation online, implemented a ''Common Look and Feel Standard (CLF)'' approach for presentation of information across all agency web sites under the State umbrella (*http://portal.arkansas.gov/Pages/clf.aspx*). The State government understands that it is important for citizens to be able to find efficiently from the web site sufficient needed information for them to want to return to the site in the future if necessary. The CLF standards help predictability on the government web sites regarding where certain information may be, regardless of what agency web site is being visited under the State of Arkansas, hence supporting standardization. The ability to attract the public to the State web sites as a medium for official information transfer will certainly assist in creating the desired culture of interfacing with State processes, procedures, policies, and so on, through the web sites.

Understanding that there may be several ways to standardize the structuring of processes to ensure the advantages of maintaining the same look and feel of all processes are captured, below is a sample structure to follow (four points) Figure 1.6:

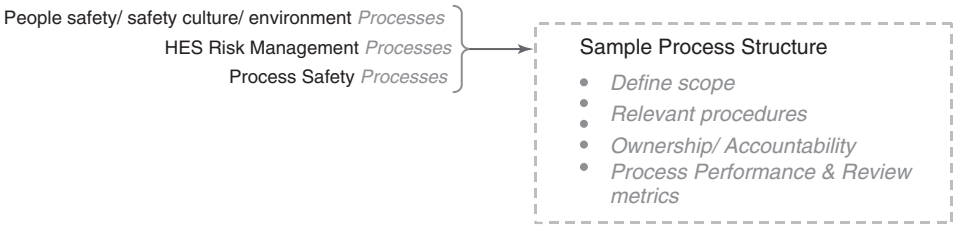


Figure 1.6 Generic loss prevention process structure (author's suggestion).

- *A clearly defined scope* should be the first section, stating the applicability of the specific process to different scenarios. It is important for each process to start with a clear definition of who the target stakeholders are and what is within and outside the scope for the specific process. Typically, the driver for what is inside the scope depends on the amount of influence the company has on the operation for implementing its processes or, more importantly, the decision to have control of the operation. Let us use Table 1.2 and take one of the processes, ''behavior-based safety process (BBS),'' for sake of discussion (see Appendix 1.B for a sample of BBS supporting field tools). The scope section of the process document will include information such as, *''the scope of this process includes office*

workers, field workers, company motor vehicle users (driving), and company marine owned fleet. BBS shall be implemented at all company owned and operated sites only; however, for non-operated partnerships, operating partner(s) will be influenced to align with company BBS process. The process is designed to identify and provide feedback safe behaviors and at-risk behaviors, then generate actions to close gaps or reinforce positive behavior as needed.''

- *The procedure(s)* that support the process could be embedded in the process or make reference within the process that links the procedure if stored differently. The procedure will have the line-by-line sequence of activities needed to complete the intended task that supports the process. The involvement of identified subject matter experts is critical in developing the technical details of the procedures. Equally important is the language employed to ensure clarity and practicability of use by the end users, who may be the personnel in the field. Following the use of the BBS as defined above for illustration, relevant supporting procedures detailed in the process may include specific employee and contractor BBS training procedures and requirements (including refresher requirements), procedures on supporting tools (electronic/paper) for capturing information, coaching, and communication procedures, that is, administrative BBS data collation and reporting for the entire enterprise. Another process from Table 1.2 that could be used to illustrate this point is the incident investigation process; relevant procedures for this process may include incident classification procedure, investigation procedure (loss causation model, why tree method, TapRooT® or five-why methods), notification procedure, and lessons sharing procedure.
- *Process ownership/accountability* for every division of the enterprise needs to be identified and documented in the process. This entails spelling out roles and responsibilities of all stakeholders involved with the specific process, which may be cross-functional as needed. Capturing these roles in detail makes accountability possible. It may be beneficial to assign leadership personnel as patron roles for processes while the bulk of the actual ownership and implementation roles go to an assigned HES person for each process (an HES Director can be assigned as patron for high-risk processes – see Figure 1.5). Depending on workload, available resources, and size of operations, one HES professional can have the ownership of more than one process. It is important to have the right amount of workload to ensure adequate support for the processes. Having a patron role ensures that someone within the company's leadership is engaged (one for each process); this guarantees visibility for the process and ensures that adequate resources are provided for the successful implementation and sustenance of the process.
- *A process performance and review metrics section* will be built into each process to highlight all relevant performance metrics to be collected, that is, peculiar to the process in question. The process owner and SMEs will identify these leading metrics during the development of each process such that the metrics relate to the objectives of the process. Metrics should be unambiguous and measurable with the ability to indicate clearly process implementation status and performance out in the field. For illustration purposes, considering a process such as incident

investigation from Table 1.2, a performance metric to have in place and track may be ''percentage of the number of investigations conducted through the year versus the number of incidents that occurred and required investigations as defined by the process,'' or ''percentage of action items generated from investigations that were closed off by set due dates (expressed as a percentage).'' Other metrics that may be collected to test for the health/performance of the incident investigation procedure include ''the number of significant incidents with similar root causes.'' A mechanism to collate and report metrics back into the organization must be established and a timeline for the associated activities for metrics collation must be defined. All process performance metrics will be stored for use during periodic reviews by process owners within the local management. An annual review of each process will be a reasonable timeline to evaluate implementation status. The key objective for the annual process review is to check process performance and implementation in the field in comparison with process objectives. For example, the objective of the incident investigation could well be to reduce incidents by learning from prior incidents. If the sample data from one of the sample metrics indicated above signify that incidents with similar root causes are recurrent in the organization, this may be an indicator that a gap may exist in implementing learnings learned from past investigations into the organization's operations. Written processes and corresponding procedures could be redesigned or implementation strategies could be changed to close identified gaps. This may range from awareness campaigns to having sectional heads/leaders accountable for cascading learnings, and so on. This concept of process review for continuous improvement is applicable to all processes in Table 1.2.

Overall, for HES processes to be successfully implemented, managers and frontline supervisors within other functions outside of HES will have to take ownership in identifying opportunities to fit the HES processes into their daily business by involving the HES function early in operations and project decisions. In practice, project teams typically are first in line to know about new projects (especially relatively smaller projects), hence the project teams will have to be relied upon to pull in HES expertise early enough as part of the team during project planning stages. The HES function will provide subject matter expertise rather than just assuming ownership for implementation of the processes in totality. This implies that the processes need to become integrated into the business and operational model of the enterprise and not as stand-alone efforts parallel to the day-to-day business. Table 1.2 details the baseline list of processes that need to be developed at the minimum to satisfy the three categories of processes depicted in Figure 1.6.

1.4.4 Business Planning (HES)

Depending on the size and complexity of the organizational structure, business planning could be an involved process. The loss prevention action plans generated

from the management system, like any other functional departmental plans (Operations, Projects, Information Technology, Human Resources, etc.), will have to be rolled into the main business plan of the enterprise. The business plan structure in line with convention changes from year to year, hence it is a perfect fit for managing action plans that come out of the loss prevention annual process review/assessment for continuous improvement. Similarly to other functional inputs into the business plan, not all loss prevention process gap actions or new initiatives will make it into the business planning document. Only agreed upon high-impact items that require such a level of visibility to have significant financial implications or other tangible impacts on the business will be included; such items will be planned for by the enterprise for improved future operations. The business plan is a good tool also to establish accountability across the enterprise for the action plan once it is published. Business plans are recommended to be designed in two tiers: short-term (annual) and long-term plans, both to be updated annually. In the same fashion, the loss prevention section of the business plan will be developed such that it mirrors these two tiers with the long term being more strategic and the short term being more specific and focused for achievement in the following year. Below is a list of general loss prevention items that may get rolled into the enterprise business plan:

- prioritized action plans
- loss prevention information technology projects
- loss prevention process resource needs
- establishing/deployment of new metrics to conform to new regulations/industry
- setting future targets for existing performance metrics.

Annual performance metrics target setting is an essential part of the loss prevention section of the business plan. For starters, without much history, benchmarking with similarly sized companies within the industry may help provide guidance as to what order of magnitude sounds reasonable for each metric. The performance metrics identified and published in the business plan are the overall performance metrics that support the company's loss prevention objectives, which should reflect the adequacy of the entire system and not be a long list of performance metrics identified from each of the processes. For example, targets could be set on the following:

- lost work day cases (normalized based on hours)
- motor vehicle crashes (normalized based on mileage)
- percentage of equipment availability (efficiency measurement)
- total property damage from fire
- citations from regulatory bodies for non-conformance (the target for this should be zero).

The set targets should reflect continuous improvement on the previous year's performance and ensure it performs on a par with or beyond industry trends. Industry trends could be obtained by benchmarking using industry data from industry organizations such the Association of Oil and Gas Producers (OGP)

within the oil and gas industry or the European Automobile Industry Association for the automobile industry as examples. Lastly, the review section of the processes has to be scheduled such that the outcome can be ready ahead of the timeline established in the main business planning cycle for collation of information across functional areas.

1.4.5 Implementation

Considering the loss prevention management system management cycle, once the planning stage is completed, well documented, and approved by management, the next action is to come up with an implementation strategy to activate the HES planned actions similarly to all other business plan activities. The cycle for implementation of the HES section of the enterprise plan has to align with the remainder of the functional areas and must be given the same if not more visibility by management to show commitment to loss prevention initiatives.

Between approving and implementing the plan, there has to be a clear understanding of what resources have been provided by management (personnel/funding for enabling tools) and the prioritization of the plan to ensure optimizing the implementation cycle. It is imperative at this point that even though we talk about prioritization of the plan, the expectation is that all business plan activities will be implemented as planned within the cycle, typically the calendar year for which the plan is approved.

The implementation plan/strategy document is built by the HES leadership or management team. The strategy document will be a high-level document that shows the roadmap to achieving the identified HES business plan initiatives. The document, similarly to a project plan, should show the timelines for achieving all plan items based on optimizing the available resources through the implementation cycle. The critical part of the shaping plan is to assign ownership and accountability for the planned items; at this level, such actions are assigned to relevant manager(s) of the working sub-departments or groups within the HES function. Further down the hierarchy; at the group level, the expectation will be for a more detailed action plan to be established and implemented. This translates into the day-to-day work load of individual team members, having in mind the interactions that occur within groups, external to other HES groups and cross-functional departments as needed for full implementation of the HES business plan.

During the implementation phase, a mechanism to ensure lessons learned and best practices acquired by the enterprise over periods of operation are incorporated into the implementation of the plan must be put in place. Part of this mechanism will also ensure that plan implementation is monitored at very frequent intervals and adjustments can be made as needed to meet set objectives. The implementation stage of the management system is also an opportunity to implement newly surfaced value-adding actions that may not have been part of the business plan. This is not encouraged, however, as the norm is sometimes needed in the course of the business year to react to changes within the company, industry, or regulatory

requirements. For example, the have been more stringent requirements introduced in the Gulf of Mexico for obtaining drilling permits since the Macondo incident (Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE)).

1.4.6 Evaluation of Management System for Improvement

The last stage in the loss prevention engineering management system cycle may be an annual/periodic (frequency determined as appropriate) self-appraisal of the company loss prevention management system to review its performance. This is the opportunity to revisit the set goals and objectives and the business plan goals, using them as benchmarks to evaluate company's actual performance. As a part of the evaluation of the management system, ''process performance and review metrics'' identified for HES processes implemented in the organization should be assessed to test for process(s) performance as described in Section 1.4.3.5. All gaps identified may be prioritized and as deemed required and may be managed through the enterprise business plan or as part of the evaluation cycle.

This review checks for the effectiveness of the entire management system process and how much progress has been made using the current system, then seeking opportunities for continuous improvement by making adjustments as needed.

Revisiting Figure 1.4 (loss prevention management schematic), this stage is an integral part of and feeds off the periodic and continuous audits all through the cycle. Using audit as part of the evaluation process ensures feedback from within the organization and also external audits are captured and identified gaps are bridged to add value to the system.

1.4.7 Periodic Corporation Audit

Conventional knowledge dictates that periodically, an unbiased evaluation of an organization's conformance with internal and external requirements is needed for continuous improvement and survival of the management structure.

With reference to Figure 1.4, conducting audits is a continuous stage that is interwoven with the following stages of the loss prevention management system:

- leadership commitment
- resources/policies/regulations/processes
- business planning (HES)
- implementation.

1.4.8 Enterprise Audit Plan

There are many variables and sometimes unexpected drivers that drive the need for performing audits. However, as part of the management system there is a

need to establish a recurring audit plan for auditing the different parts of the management system. A minimum recurring timeline for conducting audits for individual stages itemized above must be established and such expectation shared by management. As part of the plan, an audit protocol must be developed along with a guidance document and tools to ensure standardization across all audit teams.

Particularly for the ''resources/policies/regulations/processes'' stage of the cycle, there has to be an elaborate plan for which all processes (see Table 1.2) are prioritized in line with their importance/impact on performance. The most critical/high-risk processes must be audited more frequently, maybe annually. For medium or lower risk processes, depending on available resources, they can be spread out over several years. Ultimately, the audit plan of a sizable establishment should ensure that over a period of 5 years the formal internal audit of the entire system is completed.

1.4.9
Audits Levels and Continuous Improvement

Audits can be performed internally by independent audit groups within an establishment (corporate office group) or externally by licensed auditors. Understanding that there are different levels of audits, the key focus is to incorporate the feedback from such audits into the effort to improve the management system continuously. The honeycomb continuum analogy (Figure 1.7) in concept represents the feedback gathering idea regardless of the audit level or type as a source. Continuum in this case refers to a series of identical structures (feedbacks) that seamlessly bond through interfaces and interact to form the solid main structure (honeycomb). The interaction and feedback base should continue to grow gradually as the system becomes even more mature into a more robust continuous improvement mechanism. This cycle is continuous and tied to the life and existence of the company.

The following are the general levels of audits that may be considered for implementation to check the pulse/health of the management system:

- **Level 1: simple audit** – This is the more routine form of audit, basically the use of checklists for inspections. This is usually internal to an organization and conducted by an individual during walkthroughs (see Appendix 1.C for a sample inspection checklist). Typically, there are several checklists designed to cover different focus areas within the operation. The cumulative feedback from several checklists gives an indication of where to focus for systemic failures.
- **Level 2: independent internal audit** – This form of audit is more formalized and conducted internally by a dedicated corporate audit group or in the form of internal self-assessments conducted by the HES department (involving cross functional expertise for balance to avoid bias) to check for the effectiveness of the loss prevention management system across the enterprise. Level 2 audits will examine processes and how they have been structured and check for implementation in the field and the effectiveness in achieving HES objectives.

This type of audit generates a formal report and, again, the feedback is extracted and used to drive continuous improvement through the management system.

- **Level 3 – external audit** – A level 3 audit is conducted by a third-party service provider clearly independent of the company. Level 3 audits could be conducted for insurance reasons to set a premium, they could be done for certification purposes (ISO) or for accreditation by an industry body or on request by the company itself, which may be in the form of a risk-based audit to understand their business better in specific priority high-risk areas. Similarly to levels 1 and 2 above, the gaps identified in the feedback are closed out.

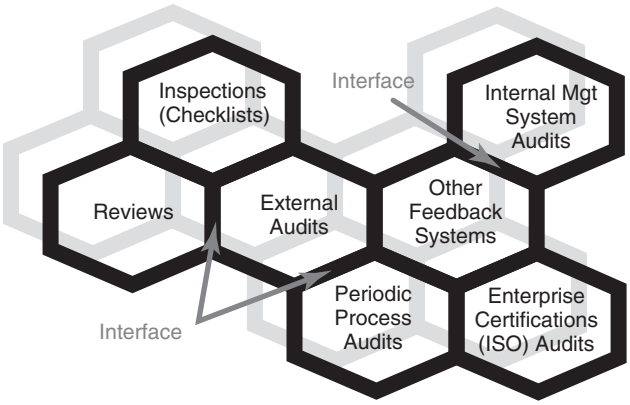


Figure 1.7 Audit plan/feedback honeycomb continuum analogy (self-developed).

Beyond gathering feedback from conducting the various audits as outlined, a critical next step is to ensure that the gaps identified in the feedback are managed appropriately. Depending on the risk prioritization of the gap, the appropriate visibility must be given to ensure that top management is aware of and understands the exposure as needed.

Assigning accountability and timeline to closing the gaps is essential to achieve the full benefit of audits. A recommendation is to have a dedicated system to track prioritized audit actions with owners assigned and an opportunity for a secondary layer of control to have a superior person validate the completeness of high-risk actions before they are closed out. This tracking system must be designed to function as an integral part of the loss prevention engineering management system.

Loss prevention engineering management systems should be viewed as frameworks that provide the needed foundation to manage and sustain HES performance within companies. For the management system to be successful, it cannot be over-emphasized that leadership commitment and ownership are critical. Once the desired loss prevention engineering culture is built and commitment of the workforce is apparent, the focus should shift to maintaining the momentum that guarantees continuous improvement of the system. Holding all employees accountable to ''Safety, Health, and Environment'' as an integral part of their

daily operations regardless of core function (engineering supervisors, operations supervisors, human resource's supervisors, etc.) is important as HES interfaces in one way or another with all functions. Not holding every employee accountable to their individual roles could result in a phenomenon (according to psychology) called deferral of responsibility, which has been referred to as a behavior by which during emergencies people are likely to assume that, because others see what they see, somebody else will take action (Bickman, 1972). The outcome to such an assumption is that no individual feels compelled to own and act on the situation; hence making sure that people are clear about their roles and are held accountable is important for the success of implementing a management system that will perform and stand the test of time.

Appendix 1.A: BCN – NSHE Sample Drug and Alcohol Policy

POLICY STATEMENT: Alcohol/Drug-Free Workplace

Alcohol and drug abuse and the use of alcohol and drugs in the workplace are issues of concern to the State of Nevada. It is the policy of this State to ensure that its employees do not report for work in an impaired condition resulting from the use of alcohol or drugs, consume alcohol while on duty, or unlawfully possess or consume any drugs while on duty, at a work site or on State property. Any employee who violates this policy is subject to disciplinary action. The specifics of the policy are as follows:

1) As provided by statute, any State employee who is under the influence of alcohol or drugs while on duty or who applies for a position approved by the Personnel Commission as affecting public safety is subject to a screening test for alcohol, drugs, or both.
2) Emphasis will be on rehabilitation and referral to an employee assistance program when an employee is under the influence of alcohol or drugs while on duty. The appointing authority shall, however, take into consideration the circumstances and actions of the employee in determining appropriate disciplinary action.
3) Any State employee who is convicted of violating a Federal or State law prohibiting the sale of a controlled substance must be terminated as required by NRS 193.105, regardless of where the incident occurred.
4) Any State employee who is convicted of driving under the influence in violation of NRS 484.379 or of any other offense for which driving under the influence is an element of the offense is subject to discipline up to and including termination if the offense occurred while he/she was driving a State vehicle or a privately owned vehicle on State business.
5) The unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in the workplace is prohibited. Any State employee who is convicted of unlawfully giving or transferring a controlled substance to another person or who is convicted of unlawfully manufacturing or using a controlled

substance while on duty or on the premises of a State agency will be subject to discipline up to and including termination.

6) The term "controlled substance" means any drug defined as such under the regulations adopted pursuant to NRS 453.146. Many of these drugs have a high potential for abuse. Such drugs include, but are not limited to, heroin, marijuana, cocaine, PCP (phencyclidine), and "crack." They also include "legal drugs" which are not prescribed by a licensed physician.
7) Each State employee is required to inform his or her employer in writing within 5 days after he or she is convicted for violation of any Federal or State criminal drug statute when such violation occurred while on duty or on the employer's premises.
8) Any agency receiving a Federal contract or grant must notify the Federal agency which authorized the contract or grant within 10 days after receiving notice that an employee of the agency was convicted within the meaning used in point 7, above.

This policy is applicable to all classified and unclassified employees of agencies in State government. Specific Federal guidelines, statutory provisions, and regulations applicable to this policy are set down in the Drug Free Workplace Act and Chapter 284 of the Nevada Revised Statutes and Nevada Administrative Code.

The policy does not restrict agencies from augmenting the provisions of this policy with additional policies and procedures which are necessary to carry out the regulatory requirements of the Drug Free Workplace Act.

In accordance with the Governor's Alcohol and Drug-Free Workplace Policy, all new employees must receive a copy of this policy. They are required to sign a form (see below) acknowledging receipt of the policy for inclusion in their personnel file. A copy of the Governor's Alcohol and Drug-Free Workplace Policy should be posted at the employee's worksite.

Acknowledgment

I hereby certify that I have received a copy of the State's policy regarding the maintenance of an alcohol/drug-free workplace and I acknowledge this policy as a condition of employment with the State of Nevada.

_____ _____

Department Division

_____ _____

Name (*Print*) **Date**

_____

Signature

Witness's **Signature** (*Required if employee refuses to sign*) **Title of Witness**:

Acknowledging the employee received the alcohol/drug-free workplace policy and employee refuses to sign.

Appendix 1.B: Behavior-Based Safety Supporting Tool

Date: _____ Time: AM_____ PM_____ Company Observed_____

Observer: _____ Work Location/Area: _____

Categories	Safe (Check)	At-Risk (Check)	Observation (include engagement with Person(s) observed) for categoried being evaluated
1.0 Personal Protective equipment			
1.1 Head Protection			
1.2 Eye and Face Protection			
1.3 Hand protection			
1.4 Foot Protection			
1.5 Protective Clothing/ Life vest			
1.6 Hearing Protection			
1.7 Respiration			
1.8 Fall Protection			
2.0 Physical Exposure			
2.1 Line of Fire/Caught Between			
2.2 Lifting/Work Posture/Push-Pull			
2.3 Slips,Trips and Falls			
3.0 Procedures			
3.1 Hazard Communication/chemicals/waste			
3.2 Work Permits/JHA/Conf. Space/Excavation Lock-out Tag-Out			
4.0 Task Location			
4.1 Housekeeping/access-egress/storage			
4.2 Barricade/Signage			
5.0 Equipment			
5.1 Tool -Condition & Proper Use			
5.2 Scaffold/Ladders			
5.3 Heavy & Mobile Equipment			
5.4 Lifting – Rigging - Hoisting			
5.5 Emergency Equipment-Preparation			
6.0 Other / Misc.			
6.1 Spills/Releases			
6.2 Sanitation			
6.3 Other			

Additional comments: _____

Appendix 1.C: Sample Internal Simple Inspection Checklist

Date:	Project Location
Contractor/ Group:	Inspected By:

	ITEM	NO	YES	N/A	N/O
1	**General Safety Practices**				
1.1	Jobsite Postings Posted (Safety & HH, SG, etc.)				
1.2	Jobsite Security / Theft Prevention				
1.3	Protection of the Public				
1.4	Designated Parking				
1.5	First-Aid Kits				
1.6	Emergency & Utility Numbers Posted				
1.7	Traffic Control Procedures Followed				
2	**Permits JHA**				
2.1	Applicable permits, JHA posted				
2.2	Pre-talk JHA reviews held				
2.3	Permits, JHA conditions are being met				
2.4	All approval signatures in place				
2.5	Details specified and correct, all workers put signatures on the Authorized Worker List				
2.6	Permits, JHA completed in all languages of employees involved the activity				
3	**Personal Protective Equipment**				
3.1	Hard Hat				
3.2	Eye Protection				
3.3	Hearing Protection				
3.4	Hand Protection				
3.5	Foot Protection				
3.6	High visibility vest				
3.7	Life Jacket				
3.8	Respiratory Protection				
4	**Housekeeping**				
4.1	Project work areas are clean and free of excess trash, debris				
4.2	Walkways and passageways clear				
4.3	Material or equipment properly stored				
4.4	Electrical cords, hoses, welding leads, etc. elevated or protected to prevent trip hazards				
4.5	Scrap timber free of protruding nails or other puncture hazards				
4.6	Trash receptacles are provided for work areas & trash segregated properly				
4.7	Barricades and/or rebar caps installed and maintained				
5	**Fall Protection**				
5.1	Proper Access Walkways & Ramps				
5.2	Static Lines Installed Properly				
5.3	100% Tie-off Practiced above 6-feet				
5.4	Handrails & Perimeter Guards Installed				
5.5	Scaffolding Installed & Inspected				
5.6	Rebar Protection Installed				
5.7	Ladders Installed Properly & Tied-Off				
5.8	Aerial Lifts – Tie-Off – Inspected Daily				
5.9	Slips Trips Falls – walkways, work surfaces				

	ITEM	NO	YES	N/A	N/O
6	**Hoisting and Lifting**				
6.1	Lifting operations checklist in place				
6.2	Proper certification of cranes, crane operator & riggers				
6.3	Slings, chain falls, shackles, hooks in good condition with current inspection				
6.4	Softeners used as required				
6.5	Work & swinging area of the crane properly barricaded & non-essential personnel evacuated				
6.6	Tag lines fitted to loads				
6.7	Outriggers are fully extended, footpads are placed on hard stable ground				
6.8	Weather conditions are suitable for rigging				
6.9	Crane alarm warning devices installed and working (e.g. anti-two-blocking device)				
6.10	Over head power lines, danger zones located and warning signs are installed				
7	**Excavation & Trenching**				
7.1	Proper Sloping / Soil Retention				
7.2	Proper Access Every 25-Feet				
7.3	Spoil Piles 1m from Excavation Edge				
7.4	Barricades & excavation tag in place				
7.5	Accumulating water removed as required				
8	**Utilities**				
8.1	Overhead Powerlines Identified				
8.2	Underground Utilities Identified				
9	**Scaffolds and Ladders**				
9.1	Built per specification				
9.2	Adequate access and egress provided.				
9.3	Inspected each shift and tagged correctly				
9.4	Scaffold boards/decks secured				
9.5	Proper ladder for the job performed / properly secured				
9.6	Proper angle and exceed the landing 1m.				
10	**Confined Space Entry**				
10.1	Adequate access / egress provided				
10.2	Standby Person or Fire watcher available				
10.3	Confined space isolated				
10.4	Breathing apparatus required / provided				
10.5	Ventilation satisfactory				
10.6	Lighting correct voltage, satisfactory				
10.7	Rescue plan available				

	ITEM	NO	YES	N/A	N/O
11	**Fire Protection & Hot Work**				
11.1	Flammables stored properly, containers labeled as to content				
11.2	Competent firewatcher present as required				
11.3	Fire extinguishers properly located and inspected				
11.4	Sparks and slag contained				
11.5	Compressed gas cylinders properly maintained				
11.6	Oxygen and combustibles separated				
11.7	Flash arrestors installed				
11.8	Regulator gauges properly attached and maintained				
12	**Tools and Equipment**				
12.1	Power tools, electrical cords - condition				
12.2	Wood handles in good condition, wedge in place as needed for securing tool head				
12.3	Proper tools used, properly carried and stored for the job performed				
12.4	Pneumatic / hydraulic hose connections properly secured				
12.5	Safe guards installed where necessary				
12.6	Safety signs posted and mechanical guards installed on rotating equipment				
13	**Equipment – Cranes, Loaders, Forklifts, etc.**				
13.1	Inspected Daily & Documented				
13.2	In Overall Safe Operating Condition				
13.3	Window Guards Available				
13.4	Slings, Cranes, & Chokers Inspected				
13.5	Equipped with a Fire Extinguisher				
13.6	Backup Alarms Operable				
13.7	Seatbelts Used at All Times				
14	**Over Water Work**				
14.1	Life Ring & boat available				
14.2	Life jackets used when over water or when in water				
14.3	Crane Tied Down to Barge				

	ITEM	NO	YES	N/A	N/O
15.1	**Environment**				
15.1.1	General Site Condition				
15.1.2	Dust plume extent and direction				
15.1.3	Discharge to WTP within target				
15.1.4	Noise management measures being implemented where necessary				
15.2	**Hazardous Material Storage**				
15.2.1	All hazardous material not in use are stored within hazmat area				
15.2.2	MSDS information is up to date				
15.2.3	All spills reported and logged				
15.2.4	Spill kits, safety equipment and PPE in place and being used				
15.2.5	Storage and containment arrangement are adequate				
15.2.6	Risk assessments completed				
15.3	**Management, identification and notification of contaminated land**				
15.3.1	Location of potentially contaminated land has been identified and reported				
15.4	**Refueling and vehicle/plant maintenance**				
15.4.1	Spill kits and drip trays in place and being used				
15.4.2	PPE being used				
15.4.3	Refueling SOP being followed				
15.4.4	Other Observations				
15.5	**Waste Handling**				
15.5.1	Waste stored securely				
15.5.2	Waste segregated				
15.5.3	Offsite disposal transfer notes completed				
15.5.4	Hazardous waste identified, logged and stored appropriately in bonded area				

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