

Bulacan State University



Effectiveness of Legislative Occupational Safety Management System in Hong Kong

A Thesis Presented to the Faculty of Graduate School
Bulacan State University
City of Malolos, Bulacan

In Partial Fulfillment
of the requirements for the Degree
Doctor of Philosophy in Business Management

By

LING KWAI SUM, SAMUEL

Acknowledgements

Dedication

Ling Kwai Sum, Samuel thanks to my supervisor, Mr. Dr. LEE Koon Keung for taking time in helping me out and give advise to this research project. Thus, I can accomplish the task in a smoother way. I thanks again to his dedication as an educator.

I am further indebted to my wife, Chung Po Yee, Bonnie who always patient to me. She give me a long quiet and stable life that I can continue my exploration of knowledge. Without her, I can never reach this far.

This is also to my life mentor, Aaron Li. If it is not him, I will not take this PhD course. Thanks!!!!

To Megan and Edith Lau, who are important in my life.

Table of Contents

<u>1</u>	Dedication	A0
<u>2</u>	Table of Contents	A1-A3
<u>3</u>	Abstract	B
<u>4</u>	Chapter 1-Introduction and Background (1-6) • Background of the Study • Statement of Research Problem • Research Questions • Scope and Delimitation of the Study • Significance of Study • Research Perspective • Outline of Study	1 1-2 3 4 4 5 6
<u>5</u>	Chapter 2-Literature Review (7-56) • Definition of Safety Management System • General Knowledge of SM • Factories and Industrial Undertakings (Safety Management) Regulations in Hong Kong and its Origin • Safety Management System in Malaysia • Safety Management System in England • Safety Management in China • Occupational Safety and Health Management System (OSHMS) • Japanese Safety Management System • Safety Management System in Taiwan • Safety Management System in Thailand • Safety Management System in Singapore • Safety Management System in Philippine • The Discovery of LOSMS Elements and the Differentiations	7-8 8-10 10-15 15-17 17-29 29-34 34-35 36-40 40-47 47-49 49-50 50-53 53-56

Table of Contents

<u>6</u>	Chapter 3-Research Methodology and Design (57-73)	
	• Grounding of Proposed Methodology • Conceptual Framework • The Problems and Background • The flow of the Research • Problems Discovered • Research Method • Questionnaire Administration • Safety Model Construction • Analysis Method	57 58-62 63 64 65 66 67 68-73
<u>7</u>	Chapter 4-Result (74-87)	
	• Introduction • Research Stage 1 (Variance and Homogeneity Assumption prior Merging) • Merging Log • Research Stage 2 (Usage of the Principle Component Analysis Method) • Research Stage 3 (MANOVA Analysis) • Multivariate Analysis of Variance Log • Research Stage 4 (Multiple Regression Analysis) • Research Stage 5 (Chi-square Analysis)	74 74 75-76 77-78 79 79 80-85 86-87
<u>8</u>	Flow Chart of Data Analysis	88
<u>9</u>	Stage 1 (Data Controlling Log-Variable Merging)	89-91
<u>10</u>	Stage 2 (Influencing Component Extraction)	92-113
<u>12</u>	Stage 3 (MANOVA Analysis)	114-119
<u>13</u>	Stage 4 (Multiple Regression Analysis)	120-154
<u>14</u>	Stage 5 (Chi-square)	155-161

Table of Contents

<u>15</u>	Chapter 5-Discussion • Introduction • Overview of Problems • Interpretation of these Significant LOSMS Elements • Interpretation of Other Variables • Overview of the Findings • Conclusion • Limitation and Recommendations for the Future Research	162-163 163 163-166 167 168-171 172-173 173
<u>16</u>	Appendix 1-Pilot Test	174-181
<u>17</u>	Appendix 2-Bibliography	182-188
<u>18</u>	Appendix 3- Data Controlling Log-Variable Merging for Insight and Reference	A1-A161
	Research Questionnaire	189-192

Abstract

The Effectiveness of Legislative Occupational Safety Management System in Hong Kong

In Hong Kong, all industrial undergoing shall conduct regulatory safety audit in half year basis. The audit scheme has been conducted since 2002. Until now, our safety professional gain their workload on running a complicated safety management system without receiving better safety performance in return. The industrial accident rate in Hong Kong has not experienced substantial decline despite the safety professionals efforts. This paper investigates whether the legislative occupational safety management system with 10 elements has its influence on safety performance, through the routine audit. There is a further understanding that how many significant elements do existed directly affecting the performance. Or, is there a suitable model to improve safety performance?

Key words: Hong Kong, safety management system

Ling Kwai Sum, Samuel
Bulacan State University
Doctor of Philosophy in Business Management

Chapter 1-Introduction and Background

Background of the Study

The Hong Kong Safety Management Regulation has promulgated 14 elements contented in the auditing scheme until 2002. After 1st April 2002, Labour Department has announced the last 4 elements are not ready for local organization in operation. It is a curious for us, the safety professional if the 10 elements are really help in promoting organizational safety performance. From this time on, safety professional has to prepared piles of paper works to deal with every half year audits. Organization has to set up complicated system for facing the auditors, but not for frontier potential hazards and problems arising out of the process. The approach has appeared to be deviated.

This study will be based on the Asian countries including England legislative system on safety aspects to summarize the most influencing elements. With those elements, a major tool to elaborate the Safety Management Regulation focusing to accident rate.

Statement of Research Problems

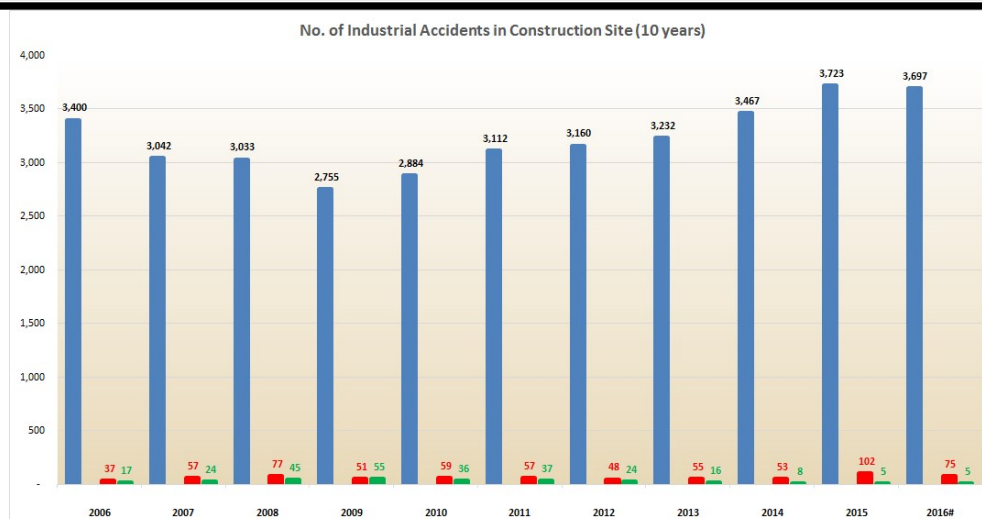


Figure 1 - Diagram source from Performance Statistics- Hong Kong Site Safety, Hong Kong Housing Authority and Housing Department (www.housingauthority.gov.hk).

The above statistics chart has shown that the accident number has its trend ascending,

from 2006 to 2016. Although our Hong Kong has regulated our construction company must have system to manage their safety performance, there is no trace that number of accidents reduced.

Summary of Occupational Safety and Health Statistics of 1st Three Quarters of 2016

	1st Three Quarters of 2015	1st Three Quarters of 2016	Percentage change in figures
	<i>No. of Cases</i>	<i>No. of Cases</i>	
(a) Industrial Accidents			
Construction	2 755 (10)	2 773 (8)	+0.7%
Food and Beverage Services	4 045	3 671	-9.2%
Manufacturing	1 283 (1)	1 111 (1)	-13.4%
Others	560 (2)	538 (3)	-3.9%
Total	8 643 (13)	8 093 (12)	-6.4%
(b) Occupational Injuries	26 867 (125)	26 859 (153)	-0.03%

Figure 2 - Source from Labour Department

The summary also show that the number of construction accidents has increased 0.7% from first three quarters of 2015 to 2016.

From the above information, there is a need to have research to insight why we have sophisticated regulation and enforced safety audit system, still high number of accident happening.

The above summary has mentioned its necessities and importance of this thesis, identify what are the most influential/determining elements within the LOSMS that can helps organization's safety performance.

The research literature has discussed the countries' legislative safety system and their development. Most of the systems are complicate and consisting different elements, in order to fulfill different audit scheme and requirement. At the same time, the result of the indigenous professional's comment of interview (pilot test) is too many audit schemes, too many elements to fulfill. There is no empirical research to substantiate which elements are critical to safety management system.

Purpose

The purpose of this research is to find out the most influencing elements/factors as a reference for legislative systems and organizations. It is hoping the discovered approach can suppress accident rate level.

Research Questions

With reference to the legislative occupational safety management system (LOSMS) over Asia can be identified as under the influential of one or not more than 16 elements on safety aspect. Some of the countries, such as China and Hong Kong, have adopted and developed the auditing system respectively. There seem not given any substantial help to enhance safety performance. This paper is arguing that the above performance measuring elements, adopted into auditing system in number of elements in different but complementary perspectives, are far too adequate for Hong Kong construction business nature. These elements should be chosen to put in force according to the countries' production nature. The fundamental and most critical elements should be differentiated out for reference, as the direction for basis constitution of safety management system. Otherwise, they will not perform well, and not affordable for local organizations. An unaffordable solution is not a solution.

Despite there come growing number of safety management literature, those elements are recognized its necessities and inter-related, safety performance related. However, there is limited information of how critical the elements LOHSMS are affecting safety performance. Even, the interaction of elements is seemed to be ignored. Upon the LOSMS elements, this paper is hoping to provide the better understanding of their importance and inter-dependence between them.

Research Questions

1. Is a company safety performance influencing the accident rate level?
2. Do company support and employee involvement affect organizational performance on safety aspect?
3. Which element(s) is/are critical to Legislative Occupational Health and Safety Management System that can be formulated as safety performance indicator?
4. Is the magnificent of the project's manpower or contract sum leading to high accident rate?

Scope and Delimitation of the Study

This study is designated for the results for local safety management system not generalized to other countries; however, the results may have implication for others countries with similar demographic and production nature. A significant limitation is the influential elements that discovered only within the legislative system. There is not an element will be discovered outside the system. On the other hand, research population is all come from local country. The assumption is those respondents are honest to give meaningful survey feedbacks.

Delimitations

This research is focusing on elements of legislative safety management system enhancing safety performance. Therefore, this study does not count for cultural factors linking to performance. The researcher has formulated the parameters for this research as follows:

1. Snowball or chain referral sampling method is conducted to pursue the professional group locally.
2. Research questionnaire is via to collect the data.
3. The scope of this research is limited to safety officers, auditors and first line supervisors involve safety matters.

Significance of the Study

There is an insufficient research on influencing elements of safety management system can be applied to diagnosing and improving safety performance. The results of the study could inform the forthcoming studies on how to formulate instruments, an effective formula evaluating safety performance, reducing accident rate level. An understanding of how the safety management system or legislative system can conclude the most demonstrative impact to safety performance, through this discovery.

Researcher's Perspective

This research paper is determining to suggest safety professional may concern to put effort on the following factors, if you do not know which way to go in the company of not having safety system about to setup:-

1. Safety Organization
2. Process Control Programme
3. Inspection Programme
4. Training Programme
5. Accident Prevention Programme

The approach is trying to discover the primary structure of safety system an organization should have. As for how sophisticated the company system should have developed, it should see what physical environment of the process the company facing. As far as the statistical research has provided the information, the model has no relationship with contract sum and manpower. These are prime elements of the safety system. The approach may have argued that the safety management system is just sub-system of the organizational management system. The statistical result indicated there is no place relationship with safety policy. The personal perspective is interpreting as the safety should have contented within organizational policy. Safety management system should be foster under the support of organization, in order to gain safety performance. The safety management itself do not possess the issues, such as strategy setting, Porter's PESTEL framework or marketing mix, a traditional organizational management system should have. Safety management system is a close system dealing with potential hazard devised from the interaction of process and physical environment. However, safety management system performance does have substantial impact on organizational performance and profit.

Of course, this is one's perspective only. There needs more researches of more evidences for further support.

Outline of the Study

The paper is based on quantitative data (questionnaire) to explore how the legislative occupational safety management system may have influence the organizational performance, and further affecting the accident rate level.

A brief summary indicate the study as follows:

1. Chapter 2, literature review provide a full of the Asian countries development on safety aspect.
2. Chapter 3, research methodology and design are introducing LOSMS 16 elements, research questions and analysis method.
3. Chapter 4, the data controlling log is used to handle data through 5 stage analysis
 - i. Individual T Test
 - ii. Principal Component Analysis
 - iii. MANOVA Analysis
 - iv. Multiple Regression Analysis
 - v. Chi-square Test
4. Chapter 5, discussion of the findings linking to the objective of the study and theory. This section has contented the suggestion of future research.

Chapter 2-Literature Review

Literature Review of Legislative Occupational & Safety Management System (LOSMS)

Definition of Safety Management System

The occupational health and safety (OHS) management system has been recognized its importance since 20s. The society of United States is firstly called out “Safety First Movement” in the late 1980s (Frick and Wren, 2000:21; Hale and Hovden, 1998: 129-131; Nielsen, 2000:104-108). At the initial promoting OHS stage, people have always asked why these measures should have done. Or, these should not have implemented. The arguments are always miserable especially to those activities that involved high potential hazards. And, the disasters itself cannot be explained the cause solely on technical fault or human error. In recent years, occupational health and safety has addressed the concern with performance of management system (Frick and Wren, 2000:21; Hale and Hovden, 1998: 129-131; Nielsen, 2000:104-108).

The industrialize countries in the era between 1970s to 1980s, like Europe, Canada, Australia, bring about regulatory reforms to change the safety legislative system from prescriptive manner to self-regulatory model. The self-regulatory model requires the organizations to afflux general duties, process oriented provisions, and performance oriented standards and documentation to prevail occupational risks systematically (Gunningham and Johnstone, 1999: 23-43 & 2000:125-127). The employers have to accept the responsibility to promote safety management system under this direction. Under this influence, the national governments are intending to adapt a new form of OHS regulations that make way to “self-regulatory model”. That means the new OHS regulations should have the ability to persuade the organizations to formulate safety management system with full response to OHS. If this is the future development of OHS management system, the future regulatory strategy, the core elements within management system should be a topic for discussion. Should there be differences of core elements possessed between small business company and giant?

As far as most of the organizations are intending to self-initiate to handle their OHS system, Asian region such as Hong Kong’s (Safety Management) Regulation that

require contractors to conduct audit in at least 10 elements. The organizations have to establish the structure that conducting elements, such as safety policy and safety committee (COPSM: section 9 and 13). A mandatory OHS management system enforce under a country's legislative system. Other countries, such as United States and Taiwan are having regulations to promote OHS management through "Voluntary Protection Program" and state-based Cooperative Compliance Program (Liz Bluff, 2003). The VPP program has suggested some elements like hazard prevention, training, worksite analysis to assess hazards for the organization to construct the OHS system. Those aforesaid elements will usually be adopted as the foundation of OHSM structural functions for the interested parties (Needleman, 2000: 75; OSHA, 1989).

In Europe, the legislative system of OHS call the *European Union Framework Directive*, that setup for the purpose of "measures to encourage the improvement of safety and health of workers at work" (European Commission, 1989; Walters and Jensen, 2000: 88; Walters, 2002). Under this Framework, the organizations have to undergo items included prevention policy, risk evaluation and preventive measures, training, health surveillance and etc. With legislative enforcing items, that can devise the establishment of the organizational OHSMS. At present, the *Framework Directive* is still remaining as a crucial legislative initiative that has not yet transposed into the national law of European Union (Liz Bluff, 2003). The *Framework Directive* is also possess core elements for formation of OHSM.

In this light, we can get common feature that a country has enforced a series of core process or elements, under legislative influence, devising the initiative to the fundamental formation of national OHMS. This paper will call this as Legislative Occupational and Safety Management System (LOSMS). The LOSMS in all countries have their varieties to suit their indigenous requirement and macro-environment. However, LOSMS can be divided into two streams; they are the prescriptive and voluntary systems.

General Knowledge of SMS

The International Labor Organization (ILO) has estimated that there are about 2 million workers get kill, on job or job related diseases every year. The economic damages are about 4% of global gross national product (Kawakami, 2001). There are wars has to be fight to reduce occupational fatality by the governments. There are much measures has to be done no matter on both regulatory and voluntary. New national policies have to be established, especially on reviewing the safety and health legislation (Soehod & Laxman, 2007). The ILO finally has declared the utmost

concern of the governments to establish clear national policies legislation and provision of routine safety inspection. Employees have to cooperate to OH&S programs (Kawakami, 2001).

A general agreement on human rights, environmental protection and occupational safety and health must be a prior, to be considered in negotiation of international trade agreements (Teh, Way and Yi, 2005). This is the crucial matter to be discussed in agreement at the eighth World Congress on Occupational Safety and Health held by International Labour Organization (ILO). The organization is acting as an agency for standard setting, research, information exchange and technical advisory services provision. In this light, worldwide enterprises must also concern environmental protection and workers' safety during business operations. The national policy today, like United States, United Kingdom and Australia, is to promote safety management system protecting employees from injury. A new document was adopted by ILO in 2001 which is called Guideline on Occupational Safety and Health Management Systems. Both United States and Taiwan have answer to this call by using voluntary protection program (VPP) to satisfy the ILO new OHSMS. The United Kingdom developed his own standard, BS8800 giving out guidelines for her home base organizations in order to improve safety standard to ILO level. In 1999, a well known OHSAS18001 has been adopted as foundation to development the indigenous safety system, and China is one example. At the same decade, Hong Kong has had her mandatory SMS on the foundation of British Legislative ego, and her own developed 14 elements system.

Wu has argued that safety management is a kind of human resource management system (W.H. Wu, 1999); He further explained the SMS consist of both hard and soft ingredients. Hardware can be said as the control elements, such as training program or safety organization structure. The software is behavioral safety of all level within the organization. The establishment of the hardware in the organization may devise the positive performance of the software within the organizations. Safety and Health management is mattering for all the personnel within the organization. (W.H. Wu, 1999). Gardener and Taylor (1975) has emphasized the important of work safety performance is crucial to both physical and emotional. Behavioral safety is influenced by safety culture.

Safety culture can be defined as a common set of values, perceptions, attitudes and patterns of behavior which related to shared meaning on safety within the organization (Beatriz, Jose & Camilo, 2005); With the help of the elements setup(such

as risk reduction program and safety policy), the safety management system can achieve accident prevention finally (Peterson, 2000). Other studies also admitted the policies or safe working programs (hardware), and practices that constituted the SMS, are precursors of how “employees’ involvement” within the organization (Dejoy et al., 2004; Hofmann, Jacobs, & Landy, 1995). Since, the safety performance is surely relying on employees properly conducting preventive measures and recommendations for environment improvement (Brown, Willis, & Prussia, 2000; Donald & Young, 1996; Eiff, 1999; O’Toole, 2002).

Factories and Industrial Undertakings (Safety Management) Regulations in Hong Kong and its Origin

The developed Hong Kong SMS is, in fact, a kind of self-regulated system based on the legislative guidance. Since, safety culture is still remaining on the pre-mature stage in the industry.

Before 1997, Hong Kong is a British colony that her legislative system has founded upon the Britain’s ego. The year 1842 when the Treaty of Nanking was signed between Sir Henry Pottinger (Britain) and , Qiying, Yilibu, Niugian (Qing representatives), the treaty change the system of foreign trade. The treaty leads to the cession of Hong Kong from China, embraced by Britain. Before the year of treaty, United Kingdom has her long history in the development of Occupational Health and Safety Legislation (Norman Selwyn, 1984), that influence her colonies nearly decades. The earliest British legislation is the “Health and Morals of Apprentices Act” in 1802. The act has been established for protecting children in cotton mills. The Factory Act, 1833 has empowered the factory inspectors to inspect, investigation and prosecution (Lee, 1991). The Factory Act has been introduced to Hong Kong in 1901. The Act has no amendments until 1948 and 1959. The legislation of protecting children, which has been empowered in Britain since 1802, has finally introduced to Hong Kong in 1922. The Industrial Employment of Children Ordinance, 1922 (No. 22 of 1922) has once existed. Here comes the Factories and Industrial Undertakings Ordinance in 1955. Then, the Health and Safety at Work Act has been constituted under the leadership Lord Robens since 1974 (Lam, Hei-choi, 2003). On the whole, Hong Kong legislative system has always followed the concept of United Kingdom.

Now, there are 33 sets of subsidiary under the Factories and Industrial Undertakings Ordinance. Those are the regulations of prescriptive nature which seem more like guidelines for relevant companies to follow. The prescriptive nature has seem to

proven its effectiveness until mid 1980s. The prescriptive legislation prime shortage is just focus on technical aspects, over sighting the human, organizational and environmental factors that may hinder the improvement of health and safety performance (Whomsley, 1996). The Hong Kong Construction Association (HKCA 1993) has introduced the safety management system in 1992. A consultation paper published on “The Review of Industrial Safety in Hong Kong” in 1995 has stated that the Hong Kong safety culture is still weak.

In 1989, the Legislation of General Duties has been promulgated, in order to enforce employers and employees themselves to initiate autonomous OH&S protection. General Duties 6A & 6B is a one large step forward to the ignite point for the establishment safety management regulation. The Factories and Industrial Undertaking (Safety Management) Regulation has finally been promulgated in April 2002. During this period, the contractors mainly adapt the CHASE system developed by Health and Safety Technology and Management Limited, contented with 14 elements. However, Hong Kong is intending to develop her indigenous safety management system which suit the local environment, that push forward the safety management system to the mandatory of self-regulated nature.

The Hong Kong legislative system and policy using in Hong Kong Special Administrative Region (HKSAR) was enacted by the National People’s Congress through Basic Law. A majority of the statutory laws enforced are indigenous established under the influence of Britain (Hong Kong is a British colony before 1997), which is noted by the Ministry of Health, of the People’s Republic of China (Function of the Organization, 2008). This is what so called Ordinance. Legislations shall be enacted through power delegation. In this light, Occupational Safety and Health Ordinance delegate the power to the Commissioner for Labour. The Commissioner for labour with this can formulate regulations and to develop the details for the law implementation (Hong Kong Labour Department, “Access to Information,” 2009). Nearly all the safety regulations in Hong Kong are provided with Code of Practice (COP). COP itself do not possess any legal power. The court may take it as criminal offence, if the failure to follow COP is discovered as critical damages cause. In general, working teams are interpreting the safety laws and regulations by following COP procedures. The OSH legislative system consist three parts as follows:

1. Boilers and Pressure Vessels Ordinance, Chapter 56
2. Factories and Industrial Undertakings Ordinance, Chapter 59
3. Occupational Safety and Health Ordinance, Chapter 509

Other legislations that safety related:

1. Employees Compensation Assistance Ordinance, Chapter 365
2. Occupational Safety and Health Council Ordinance, Chapter 398
3. Employees' Compensation Insurance Levies Ordinance, Chapter 411
4. Occupational Deafness (Compensation) Ordinance, Chapter 469
5. Builders' Lift and Tower Working Platforms (Safety) Ordinance, Chapter 470

Occupational Safety and Health Ordinance in Hong Kong is virtually governing almost all workplaces from factories, construction site to universities. There is only exclusion, such as aircraft in public place, accommodation of driver for land transport vehicles, domestic area where domestic servant employed, and place where self-employed persons work. Employers under this ordinance, shall in all time provide and maintain workplace safety. They have to ensure the workplace safety related to usage, handling, storage or transportation of plant or substances; And. Provide necessary information, instruction, training and supervision to the employees. The Commissioner for Labour has the authority to promulgate improvement notices and suspension notices if the workplace was found something unsafe.

The Factories and Industrial Undertakings Ordinance, through the issue of the general duties to proprietors and working personnel, has differentiated their safety and health duties clearly in the workplace. Beneath this Ordinance, there contented sets subsidiary regulations. The regulations can be understood as the rules and requirements of the processes and substances. The regulations are introduced as follows:

1. Construction Sites (Safety) Regulations,
2. Factories and Industrial Undertakings Regulations, Quarries (Safety) Regulations,
3. Factories and Industrial Undertakings (Abrasive Wheels) Regulations,
4. Asbestos Regulations,
5. Blasting by Abrasives Special Regulations,
6. Carcinogenic Substances Regulations,
7. Cargo and Container Handling Regulations,
8. Cartridge-Operated Fixing Tools Regulations,
9. Confined Spaces Regulation,
10. Dangerous Substances Regulations,
11. Dry Batteries Regulations,
12. Electricity Regulations,
13. Electrolytic Chromium Process Regulations,

14. Fire Precautions in Notifiable Workplaces Regulations,
15. First Aid in Notifiable Workplaces Regulations,
16. Gas Welding and Flame Cutting Regulations,
17. Goods Lifts Regulations,
18. Guarding and Operation of Machinery Regulations,
19. Lifting Appliances and Lifting Gears Regulations,
20. Load shifting Machinery Regulations,
21. Noise at Work Regulations,
22. Notification of Occupational Diseases Regulations,
23. Protection of Eyes Regulations,
24. Safety Officers and Safety Supervisors Regulations,
25. Spraying of Flammable Liquids Regulations,
26. Suspended Working Platforms Regulation,
27. Woodworking Machinery Regulations,
28. Work in Compressed Air Regulations,
29. Safety Management Regulation

Beyond the Safety Management Regulations, those above 28 sets of regulations are solely rules for the workplaces. Still, Hong Kong construction industry, a high potential risk area, becomes one major business boosting the GDP to history height and so as the accident rates. The industries find difficulties to follow those rules; it just sets of standardized process controls. So, Hong Kong Government endeavors to a new regulation that can hold the aforesaid regulations together, and levy them systematically. There comes Safety Management Regulation on 2nd November 1999. This is where indigenous system of works began.

According to the speech by the Commissioner for Labour, Mr. Matthew Cheung Kin-chung, Hong Kong construction industry has reached to an unsustainable high accident rate of 28 fatal accidents in the first quarter year 1998. This has given an impact to the government to raise quiet revolution on occupational and health at work frontier. That means The Factories and Industrial Undertakings Ordinance Chapter 59 should have increase one more regulation [CAP 59AF, Factories and Industrial Undertaking (Safety Management) Regulation]. Before that, a consultation paper on reviewing the possibility of promoting safety management in Hong Kong has been published by the government in July 1995. The consultation paper itself has informed for the affirmation of the proprietors themselves to set up safety management system. The final goal is the proprietors and their workforce can self-regulate themselves on safety. The proprietors can sustain continuous improvement in the end. The

consultation paper has proposed the government will introduce safety management system, which contained six areas as follows:

1. Company safety policy
2. Safety plan
3. Safety committee
4. Safety audit
5. General safety training
6. Special safety training

The concept has been initialized and experienced by several parties (Airport Core Project, Housing Authority and Public Works) before. Moreover, they have granted better safety performance than outside construction industries. The system has developed to 14 elements in suggested regulation. The 14 process elements are as follows:

1. Safety policy
2. Organization structure
3. Safety training
4. In house safety rule
5. Inspection program
6. Hazard control program
7. Accident /incident investigation
8. Emergency preparedness
9. Evaluation, selection and control of sub-contractors
10. Safety committees
11. Job-hazard analysis
12. Safety and health awareness
13. Accident control and hazard elimination
14. Occupational health assurance program

During the subcommittee meeting on 2nd November 1999, the members have agreed, those construction projects of 100 workers or more, as well as contract value of 100 millions or more, must undergo first 14 elements compulsory audit every six months. The last four elements the subcommittee would have understood as occupational safety issue. They would be taken time to review requirements afterwards. Those projects with the manpower of between 50 to 99 must adopt the first eight elements review audit. Furthermore, the proposing safety management system has absorbed the experience from the United Kingdom, Australia and New Zealand. The proposal has gone through almost four years consultation period. After the deliberation by the

Subcommittee on Factories and Industrial Undertakings (Safety Management) Regulation, the proposal has finally be submitted and seek for the Legislative Council approval. The Safety Management Regulation will be listed in section 7 of the Factories and Industrial Undertakings Ordinance on 11 October 1999. This is the hard time when the construction industry has suffered 28 fatal accidents in the first quarter year 1998.

At first, the Safety Management Regulation has undergone 14 elements in the regulatory auditing scheme until 2002. The labour department finally announce the last 4 elements are not yet in operation in 1st April 2002. In this sense, the future regulatory audit system will just limited to an utmost 10 elements rather than 14. Lam (2003) has concluded in his research that the general safety awareness in Hong Kong industry is weak. This is exactly the element 12 of Safety Management Regulation. The element is not a necessity.

Safety Management System in Malaysia

Basically, there is no such regulation, as in Hong Kong, having a full 14 elements, to cite of how the safety for workplace must performance. Malaysia is enforcing Act 514, Occupational Safety and Health Act 1994. Act 514 further founded and formulated the present face of The Management of Health and Safety at Work Regulations 1999. With reference to the Guidelines for Public Safety and Health at Construction Sites 1994 (1st Revision), there are several legal requirements (or elements) that shall be fulfilled in the workplace management system as follows:

1. **Safety and Health Policy:** Employer must prepare the written statement policy and with suitable revise if necessary. The policy must be acknowledged by the workers in the workplace (Section 16, Occupational Safety and Health Act). The policy shall form the safety direction of the workplace
2. **Safety and Health Committee:** A workplace, with forty or more persons, shall be established a safety committee by contractor. The committee shall include both employees and management representative. (Section 30, Occupational Safety and Health Act 1994, Occupational Safety and Health (Safety And Health Committee) Regulations 1997)
3. **Safety Management System:** A safety system shall be established under the requirement of relevant Malaysian Standard and relevant Occupational Safety and Health Management System approved by Director General.
4. **Safety Organization:** A safety organization shall be established with the

employment of basic safety personnel as follows:

- i. Safety and Health Officer when the project over 20 million ringgit Malaysia. (Section 29, Occupational Safety and Health Act 1994, Occupational Safety and Health (Safety and Health Officer) Order 1997).
- ii. Safety Supervisor with at least fifteen hours per week on safety supervision and promotion. (Reg. 25, Building Operations And Works Of Engineering Construction (Safety) Regulations, 1986)
- iii. Contractor Safety Supervisor shall be appointed by contractor besides the main contractor of the workplace. The one who spend not less than 5 hours a week on supervision and promotion of work safety. (Reg. 26, Building Operations And Works Of Engineering Construction (Safety) Regulations, 1986)

5. **Hazard Identification, Risk Assessment and Risk Control (HIRARC):** Risk Assessment should be prepared and approved after the method statement has completed. The risk assessments are for sort out the risk, minimized or remove it. The risk assessment should be able to propose the safest way of work.
6. **Emergency Response Plan:** The plan should establish a system to identify potential accidental and emergency situation. Then, the workforce can resolve them right away.
7. **Process Control:** The legal constitutional construction process as follows:
 - i. Hoarding
 - ii. Movement of Vehicular Traffic
 - iii. Disconnection of Utilities
 - iv. Demolition
 - v. Catch Platform for Demolition Operations
 - vi. During Demolition
 - vii. Blasting and Use of Explosives
 - viii. Removal of Debris
 - ix. Site Clearing
 - x. Excavation Work
 - xi. Piling
 - xii. Superstructure
 - xiii. Safety Net and Peripheral Net
 - xiv. Concrete Work
 - xv. Finishing
 - xvi. Use of Hoisting Equipment

- xvii. Erection
- xviii. Jacking
- xix. Operation
- xx. Inspection and Testing
- xxi. Maintenance and Repair
- xxii. Dismantling
- xxiii. Crane Storage

With this above captioned information, there is explicit of full Malaysia SMS scenario as basic requirement as summary below:

Nos.	Element of Safety System	Element's content	Remarks
1	Safety Policy	1. Objective on safety 2. acknowledge to workers 3. safety direction	
2	Safety Committee	1. workers and management representative	≥ 40 persons must have committee.
3	Safety System	Safety system of Malaysia standard.	
4	Safety Organization	1. Safety Officer 2. Safety Supervisor 3. Subcontractor Safety Supervisor	Over 20 million ringgit Malaysia should employ a safety officer
5	Hazard Identification, Risk Assessment and Risk Control	Risk assessment must be formulated and conducted	
6	Emergency Plan	Procedure to deal for accidental and urgency situation	
7	Process Control	List of construction process that should be management under legal requirement.	

Safety Management System in England

The founding of her health and safety law is erected from the Health and Safety at Work etc Act 1974. Until 1994, there has been a review of health and safety regulation, a change, that leading to an introduction of new guidance, code of practice and

regulation by the Health and Safety Commission (HSC). Both the employers and employees has to bring up the responsibility of general duties, the duties under the notion of ‘so far as is reasonable practicable’; Employers must take appropriate safety measure and precautions within their affordable ability. As The Management of Health and Safety at Work Regulations 1999 (the Management Regulations) that formulate a clear structural requirement an employer has to do, it also clear cut of what elements the employers must do to fulfill The Work Act. The crucial requirement is to carry out risk assessment for the working activities. Besides a little difference between their requirements, the fact that Revised Version (original version, 1993) Management Regulations has been approved nearly the same time in Hong Kong. In the other word, Britain has already founded her own management regulations six years earlier than in Hong Kong. However, the British Management Regulations is emphasizing on carry risk assessments, bring precautionary measures, employ competent person for handling information and training.

According to the British Approved Code of Practice for The Management Regulations, a complete safety management system shall content the feature of 30 regulations as following:

Regulation No.:	Title:	Remarks (Elements Related): [using HK elements as ref.]
Regulation 1:	Citation, commencement and interpretation	
Regulation 2	Misapplication of these Regulations	
Regulation 3	Risk Assessment General principles and purposes Suitable and sufficient Risk Assessment in practice Identifying hazards Identifying who to harm and how Evaluation risks from potential hazard Recording	Job Hazard Analysis Risk Assessment
	Review and revision Assessment under other regulations	
Regulation 4	Principles of prevention to be applied	Safety and health awareness

		Job Hazard Analysis Safety culture
Regulation 5	Health and safety arrangement Planning Organization Control Monitoring	Suggested BS8800 Safety Policy Safety Committees Hazard Control Programme Safety Training
	Review	Risk Assessment
Regulation 6	Health surveillance	Occupational Health Assurance programme Safety Inspection
Regulation 7	Health and safety assistance	Organizational Structure Safety Training Safety Committees
Regulation 8	Procedures for serious and imminent danger and for danger areas	Emergency Preparedness
Regulation 9	Contacts with external services Danger areas Contacts with external services	Emergency Preparedness
Regulation 10	Information for employees	Safety Training Safety Committees
Regulation 11	Co-operation and co-ordination	<u>Communication and Co-operation</u>
	Appointment of health and safety co-coordinator	
	Person in control	
Regulation 12	Persons working in host employers' or self-employed persons' undertakings	Evaluation, selection and control of sub-contractors Emergency Preparedness

Regulation 13	Capabilities and training	Safety Training
Regulation 14	Employees' duties	Safety and Health Awareness
Regulation 15	Temporary workers Fixed-duration contracts Employment businesses Self-employed	Safety Training Communication and Co-ordination
Regulation 16	Risk assessment in respect of new or expectant mothers	Risk Assessment
Regulation 17	Certificate from a registered medical practitioner in respect of new or expectant mothers	Occupational Health Assurance Programme
Regulation 18	Notification by new or expectant mothers	Occupational Health Assurance Programme
Regulation 19	Protection of young persons	Occupational Health Assurance Programme Risk Assessment Safety Training
Regulation 20	Exemption certificates	
Regulation 21	Provisions as to liability Employers' liability	
Regulation 22	Exclusion of civil liability	
Regulation 23	Extension outside Great Britain	
Regulation 24	Amendment of the Health and Safety (First-Aid) Regulation 1981	Emergency Preparedness
Regulation 25	Amendment of the Offshore Installation and	

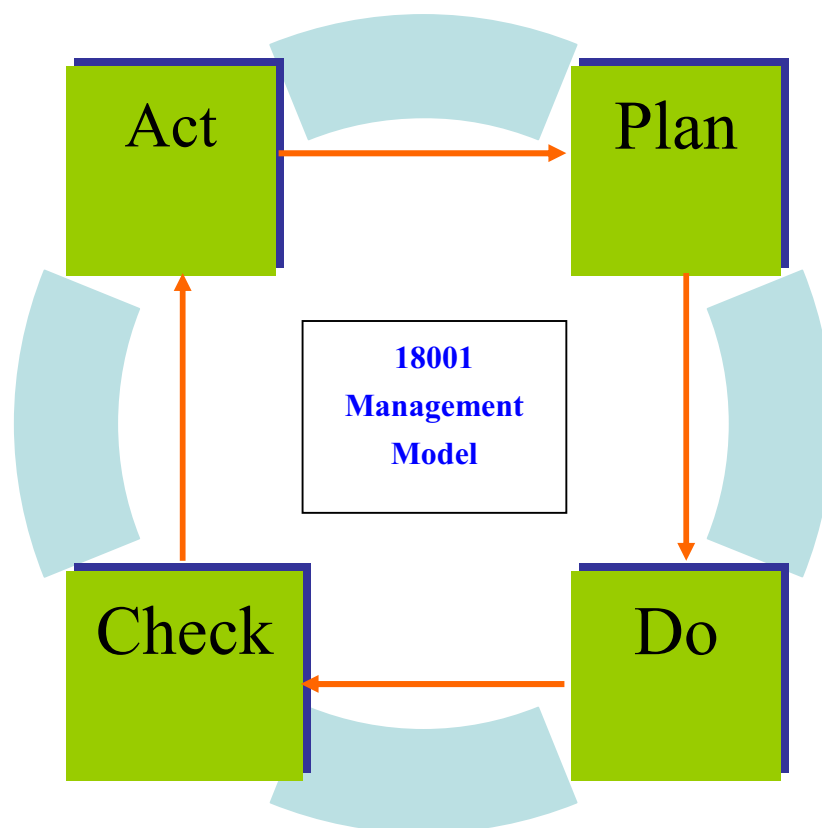
	Pipeline Works (First-Aid) Regulations 1989	
Regulation 26	Amendment of the Mines Miscellaneous Health and Safety Provisions Regulations 1995	Emergency Preparedness Safety Training
Regulation 27	Amendment of the Construction (Health, Safety and Welfare) Regulations 1996	Process Control Emergency Preparedness
Regulation 28	Regulations to have effect as health and safety regulations	
Regulation 29	Revocations and consequential amendments	
Regulation 30	Transitional provision	

The table A1 is the summary that briefly described the content of the British Legislative Safety Management System.

As the Royal Society of Chemistry, London (2014), in a paper titled “Occupational Health and Safety Management Systems (2014)”, has noted the main purpose of OHSAS18001 is to introduce a system that can fulfill the health and safety legislation. This is not a system for running the business. In the same sense, the BS8800 and ILO-OSH2001 are solely set up for this purpose. The Management of Health and Safety at Work Regulations 1999, we can see, is integrated by 30 existing British regulations together, that cannot clearly indicate what feature or requirement the safety management system should have. In other words, The Management Regulation only hinted the expected result of the functional safety management system. There needs a management system to be adopted into the organization, to satisfy the aforesaid regulatory requirement, that can be functioned at the same time. In Britain, they mostly use OHSAS 18001 or BS8800 for their system of work. The Royal & Sun Alliance Insurance, London (2014), has released a paper titled Risk Management Guidelines that claimed the OHSAS18001 and BS880 are following the similar approach; The Royal Society of Chemistry, London (2005), has already noted that those management systems are fundamentally no differences. Large amount of overlapping of their elements and common requirements were discovered. Are they based on the same model of OHSAS18001? By the way, there are six certification

bodies in UK who can launch these audits with certificates granted if successful in 1999.

The British Standard BS8800:2004, OHSAS18001 and ILO-OSH2001 are the most widely using safety management system within the country. Awwad J. Dababneh (2013) has indicated all three systems usages do not mean to absolute safety but targeted to control and continually minimize the potential risks. It is essential that the safety management systems are having purpose of accident prevention and emergency preparation. And, ILO-OSH2001 is recently adopted by the Chinese Government for developing the certificate framework. We would discuss in the later page 24 onwards. The “Occupational Health and Safety Assessment Series OHSAS18001” is a safety management system that based on the “plan-do-check-act” model is presenting as graph 1.



Graph 1 Resource from: Note on Occupational Health and Safety Management System by Royal Society of Chemistry

These four elements shall clearly indicate covered aspects that organizations can compliance with the management regulation by implementing them.

Plan aspect:

- Policy development
- Safety plan establishment and implementation

Do aspect:

- Job hazard identification
- Organization for safety
- Risk assessment

Check aspect:

- Accident investigation
- Hazard Control Programme

Act aspect:

- Safety performance review (internal or external audit)
- Accident and incident learning

OHSAS management system aspects are similar to the other two systems, explicit the overall framework. She can further differentiate into more complex items, when in operation, according to the size of the organization. Basically, the safety management system has clear requirement of hazard identification and risk control. The system includes clauses employees' contribution or participates into system assessment itself. This may arouse the employee an incentive to follow the safety requirement if they participate into the formulation of risk assessment and control. There is also clause for incident and accident investigation. In fact, all three systems (BS8800:2004, OHSAS18001 and ILO-OSH2001) have these common requirements. The systems all have indicated the similar handling procedure of incidents. The employees are required to train for their job safety prior to work commencement. And, continuous training will be provided in order to ensure their competence to do their safely and skillfully.

OHSAS has specific arrangement and requirements for non-routine tasks in order to control the unexpected risk during the specific risks. All three systems are all contented with management commitment, objectives setting, scope of works, performance evaluation, accountability and management review. As Awwad J. Dababneh (2013) has stated those items are basically founded and developed on the "plan-do-check-act" model, a differentiate table will be provided as table A2.

TableA2: Comparative Table of three safety management system (ILO2001, OHSAS18001 and BS8800)

Elements	Items	ILO2001	OHSAS18001	BS8800
Plan	Policy	H & S Policy	H&S Management System	OH & S policy
		Worker Involvement	Employees Involvement	Safety Culture
	Planning	System planning, development and implementation		Legal compliance
		Occupational objectives	Legal compliance	Occupational objectives
		Hazard identification	Hazard identification	
		Emergency Programme	Emergency Preparedness	Emergency arrangement
		Procurement		
		Contracting		Initial review
Do	Organizing and Implementation	Responsibility and accountability	Division of responsibility and Authority	Responsibility and accountability
		Competence and training	Training	Training programme
		Management system documentation	Document	Documentation
		Communication	Hazard Communication	Communication
		Risk Assessment	Risk assessment and control	Risk assessment and control
Check	Hazard Control	Performance monitoring and measurement	Performance measure	Performance measure
	Performance Evaluation	Accident and incident investigation	Accident and incident investigation	Accident and incident investigation
		Safety Audit	Safety Audit	Safety Audit

Act	Action for Improvement	Management Review	Management Review	
		Corrective action		Corrective action
		Continual improvement	Continual improvement	Continual improvement

Table A2 indicated the three safety system

Awwad J. Dababneh (2013) finally concluded that the requirements given the guideline of how to establish systems for the compliance of the management regulation. The OHSAS do not indicate on neither fulfilling the regulation nor system planning setup. The OHSAS certification is mainly relied on personnel evaluation and auditor's opinion. BS8800 do not mention the management review. However, the requirements do not give any detailed hints of how to form the safety management system. There is any OH&S performance criteria claimed.

Through the basis of the "Plan-Do-Check-Act" model, the Safety Management System (SMS) consisted of six further sectors. They are Policy, Planning, Organizing and Implementing, Hazard Control, Performance Evaluation and Action for Improvement. There are general requirement as observed as follows:

1. **Policy:**

- i. An intention of organization to control risk for the protection of employees, customers and contractors on safety aspect.
- ii. Safety will be the first priority over progress.
- iii. Continual improvement must be committed.
- iv. There must be an agreement to comply with OH&S legislation.
- v. A good communication between the organization and employees of the Health and Safety obligations.
- vi. There must routinely review of the policy.

2. **Planning:**

- i. **Hazard Identification and Risk Control Programe** should be prepared and properly documented for routine indication of hazards, and the procedure of implementing the risk control measure.
- ii. **Clear indication of scope of procedures** which contented the routine or non routine activities. There must be safety procedures that applying to all personnel makes way to the working area, such as subcontractors and visitors.

- iii. **Hazard analysis and Risk Control Program** should include facilities in the workplace.
- iv. **Risk register** should be established to list out the entire potential hazard within the workplace whereas hazard reported by manufacturers, workers. The foreseeable hazard that is discovered from accidents; Hazards come up with non-conformance of safety standards.
- v. **Systematic procedures to prepare risk assessment** that possess the factors of both severity and probability of risk.
- vi. **H&S objectives are established and founded** on the results of risk assessment. Documentation should be provided upon those updated information.
- vii. **Methodology of hazard Identification** should include scope, nature and timing the activities that arouse potential risks. There must be classification of risk and control measures. There should be methodology to indicate if facilities and training needs are provided during the activities undergoing.
- viii. **Safety Objectives** should be established which must consistence to H&S policy. The objectives should be realistic and achievable, compliance to laws and regulations. The objectives are at least provided desirable incident/accident frequency rate, accident cost, time lost due to accident.
- ix. **H&S Management Program** should accomplish the objectives; Program should have documentation the designation of the safety responsibility and scope of work. Program should be reviewed timely. Program should also address the changes of organizational activities, products, services and operating conditions.

3. **Organizing and Implementing**

- i. **Documented safety organization** that explicit the roles, responsibility and authorities of personnel, shall be defined. There should be an appointment of the top management into safety organization, with particular duty to ensure the H&S system function properly.
- ii. **Adequate resource** should be provided to ensure its necessities on implementation, control and improvement of the system.
- iii. **System specification** should be followed and maintained by the safety organization.
- iv. **Continual improvement of H&S performance** is the commitment of safety organization.

- v. **Training needs analysis and program** should be established in purposed of ensuring the competence and safety awareness of the personnel. Training program is established for the workforce awareness on, the importance of H&S policy and procedures, conformance to emergency preparedness, the importance to improve the personnel safety performance.
- vi. **Training program** will content as follows:
 - Recognition of H&S policy and management system.
 - Potential results in the consequence of breaching company safety rules.
 - Emergency Preparedness requirements.
 - Usage and selection of personal protective equipment.
- vii **H&S information** should be properly documented and can be easily perusal by the employees and other relevant parties. Employees are allowed to involve in policy review and other safety matters.
- viii **Safety Committee** should be established and properly functioned whereas the safety representatives appointed within.
- ix **Documentation** shall be formulated to its information updating and stored in suitable medium, such as electronic media or traditional media.

4. **Hazard Control**

- i. **Control measures** must be conducted to the activities, associated with potential risk, according to hazard identification program. Clear documentation must be provided for application of that measure.
- ii. **Safe working procedures** should be stipulated to deal with identified risk that oriented from goods, equipment and services purchased.
- iii. **Eliminate risk at sources can undergo** through the workplace design, process, installations, machinery usage, operating procedures.
- iv. **Isolation** of energy source by adopting and implementing procedures that can stop the potential hazardous energy, from accidentally release during maintenance or servicing activities are being performed.
- v. **Work permit program** should be adapted to risky activities, such as confined space.
- vi. **Procurement** must compliance with S&H policy and requirement, assess with reference to purchasing and leasing specification. The organization should go over national laws and her H&S requirements as reference before any procurement.

- vii. **Contracting**; the organization can adopt the H&S requirement into the contract in ensure procedures for program of subcontractors evaluation and selection are substantially implied. Contract can adopt the arrangement of the reporting of work-related accident, ill health, disease and incident to the organization. Contract should provide criteria of H&S procedure and arrangement that can be followed by subcontractors.
- viii. **Emergency Program**, such as emergency drill, shall be conducted. Such program must explicit the arrangement to handle the accident and emergency situations. The arrangement size should be in accordance with the organizational activities nature. Information and communication of emergency response services and relevant parties are to be consideration of the program. There are necessities of first aid and medical assistance to be considered in the program. And, firefighting and evacuation procedure of personnel in worksite are also considerate issue.

5. **Performance Evaluation**

- i. Monitoring program, with suitable allocation of responsibility, accountability and authority, for looking at different levels of the organizational structure, should be provided.
- ii. Performance indicators should be constituted and selected in order that the indicator can effectively measure organizational performance.
- iii. Such measurement factors are suggested to have accident rate, severity ratio, cost of lost time, and cost of legal incompliance.
- iv. Such aforesaid information will be set as a means of determining the level of the H&S policy and objectives accomplishment.
- v. Employees are required to have employee-performance-appraisal.

Program of Accident, Incident, Non-conformances, Corrective and Preventive action for taking action as follows:

- 1. Documentary procedure to manage and investigation of accident, incidents, and non-conformances.
- 2. There should be proper handling of the accident, incidents or non-conformances to mitigate its consequence.
- 3. There should be documentary procedure to investigate the accidents, and take action to conduct the safety recommendation.
- 4. There should be reviewed of the H&S risk assessment according to that

recommendation provided. The corrective actions are deemed to eliminate the causes of risk.

5. Reports produced and to be explained in the safety committee or senior management, for the easy management review and consideration of continual improvement.

Audit program for the full determination of H&S management system will be conducted by professional.

1. The audit shall assess risk assessment, last audit result.
2. The audit shall content the system performance information to be assessed. The audit itself is to analysis the fulfillment of British Management Regulation.

6. **Action for Improvement**

1. The top management shall always determines, review the management system in all aspects in order to maintain organizational suitability and effectiveness. There is a channel to allow the top management to collection the safety information for evaluation.
2. The review should cover the necessities of policy, objectives or other elements of the system in the light of continual improvement.

The Management of Health and Safety at Work Regulations 1999 (The Management Regulation) is integrated by 30 separate regulations. There is no way for the organizations to fulfill her requirements by handling one by one. There needs to adopt a kind of safety management system into the organizations in order to compliance this timely. There come the ILO-OSH2001, OHSAS18001 and BS88000 are introduced to the organizations. Those three systems are basically little differences on structure, requirements. The system tends to be developed like “Plan-Do-Check-Act” Model in the whole; they can be further differentiated into six items. Once, the organization has adopted this safety management system to her structure, she theoretically has the ability to comply this regulation timely in the light of safety audit and management review.

Safety Management in China

The National Profile Report on Occupational Safety and Health in China, by International Labour Organization, ILO (2012) has stated that the Constitution of the People’s Republic of China has adopted the legislative system of occupational safety

and health in December 4, 1982. During the Fifth Session of Fifth National People's Congress, the Legislative system has been enacted by The Constitution of People's Republic of China. This legislative system can be simply differentiated into two categories, they are work safety and coal mine safety. This legislative system is developed from the foundation of laws, administrative regulations, local regulations, departmental rules and OSH standards. Under this enacted legislative system, there comes the Occupational, Safety and Health Laws (OSH Laws) as follows:

1. Law on Work Safety
2. Law on Safety in Mines
3. Law on the Prevention and Control of Occupational Diseases
4. Labour Law
5. Labour Contract Law
6. Fire Protection Law
7. Emergency Response Law
8. Criminal Law

With regards to these aforesaid laws, regulations are promulgated; the major OSH regulations are introduced as follows:

1. Regulations on Coal Mine Safety Inspection
2. Special Regulations of the State Council on Preventing Coal Mine Accidents
3. Regulations on Safety Management in Construction Projects
4. Regulations on the Safe Administration of Hazardous Chemicals
5. Regulations on Work Safety Licenses
6. Regulations on Civil Explosive Products Safety Management
7. Regulations on Special Equipment Safety Inspection
8. Regulations on Safety Supervision and Management of Agricultural Machinery
9. Regulations on Ascertaining Administrative Responsibility in Extraordinarily Serious Safety Accidents
10. Regulations on Work Injury Insurance
11. Regulations on Reporting, Investigation and Handling of Work Safety Accidents

In fact, the current legislative system has already been constitutioned since 1949, after the formation of People's Republic of China. Tim E. Pringle and Stephen D. Frost (2003) have noted a hygiene guidelines called "*Tentative Hygiene Standards for Industrial Enterprises*" has been published, in 1956, based on the information from

former USSR. However, this guidelines has longed been neglected in no trace. Until the reform era 1979, China government has firstly developed her guideline that suited the local practice and experience. The development keep on for years, and the legislative system has currently formulated to a complicated responsibility chain, that the aforesaid regulations are controlled and implemented by different departments, such as construction and industrial safety is under the jurisdiction of Ministry of Housing and other departments. And, Supervision and management of work safety is in the area of State Administration of Work Safety (SAWS). Beyond this development and complexity of these legislation and regulations, they are straight forward to prevent potential hazard alert to the activities. In 2002, there are great review of the major OSH law, such as the Work Safety Law and the Law on the Prevention and Cure of Occupational Diseases. There would be an outlining of those laws for reference.

1. Trade Union Law of the People's Republic of China's effective on 3rd April 1992
Under this Union Law, all the trade unions in China have the obligation to improve workers technical and safety qualities, through the organizing an conduct training to workers, Article 7. Article 10 and Company Law provision, there shall be a committee in the workplace, and representative shall be elected. Those two also have the obligation to deal with safety matters.

2. Labour Law of the People's Republic of China effective on 1st January 1995
There is no labour law in China until 1995. The labour laws contented 13 chapters and 107 articles in which there laws undermined OHS requirements. OHS system that is required by the state, to establish the safety environment for the workers, to “abide by rules of safe operation” devised by Articles 53. Labors have the legal right to refuse operation if management has breached “rule and regulations” (Article 56). The companies obligate to give training, supervision and inspection, Chapter VIII and XI.

3. Law on the Prevention and Cure of Occupational Disease effective on 1st May 2002
In the light of this law, all companies have to provide environmental measurement and precaution to prevent occupational diseases. The company has responsibility to provide welfare of industrial occupational insurance, as well as providing information to the workers. The employing unit shall give the appropriate workplace up to the national standard, which can ensure the workers' occupational health, Article 4. All the workers shall be covered by industrial insurance, Article 6. The employing units shall take precaution in order to safe guard against occupational disease, Article 20.

The workers have the right to refuse work if they have substantial evidence of the occupational diseases do exist within the workplace. And, the companies have no right to lay them off. The labors have the right to that information, Article 30.

4. Work Safety Law effective on 1st November 2002

The Work Safety Law has contented 14 systems; the crucial ones as follows:

- Working group shall follow all related laws, regulations and industrial specific laws.
- Safety personnel shall be appointed by companies for the activities.
- Companies shall manage with the concern of safety aspect.
- Safety training and education shall be conducted to all staff of all levels; and assessment of their safety knowledge is necessary.
- OHS measure shall be conducted in all time bases throughout the planning to constructing/production stage.
- Potential hazards aroused from the activities shall be evaluated with register with indigenous safety inspectorate.
- Companies shall formulate safety management system.

The law also gives a clear responsibility for the employing units, state-owned and private organization. The duties are:

1. Managing well the OHS matters which through planning, organizing, supervising, controlling and coordinating.
2. Establishing the OHS systems with the responsible personnel involved to maintain the system function. He/she should maintain the OHS promotion and penalty system works.
3. Once, the stop works order conducted, and there needs the OHS system to be improved for overcoming the shortage. It is the obligation of the company to review the system prior resume of work. Otherwise, license revokes, Chapter Six.

The Safety Law has already outlined the responsibility of OHS safety officers. In the light of China's Company Law, an appointment chairman or president of board of directors is having full liability on OHS matters. On the contrary, Articles 5 of the Safety Law stated there is not a liability of the chairman, directors or senior personnel if any accidents arising out of the Safety Law violation. Besides this, the law give power to labors right of:

1. Knowing the relevant dangers and hazard arising out of the activities; having the right to prevent such dangers.

2. Personal protective equipments, of approved standard, shall be provided.
3. Not carry out orders that may violate the laws or regulations.
4. Stop work if any hazards arising that endanger life.
5. Receiving insurance compensation.

5. Regulations other than Work Safety Law

Besides those aforesaid laws, there are other regulations that will influence the companies' workplace safety. Those regulations are pinpointed to the sectors with significant accident and hazard, such as construction and mining.

- Regulations on the Protection of Women Workers
- Regulations on Industrial Accidents and Dealing with Accidents.
- Coal Safety Law
- Regulations on Labor Protection for Using Toxic Materials in the Workplace (12 May 2002)
- Regulations on the Safe Management of Dangerous Chemicals (15 March 2002)
- Regulations on Radioisotopes and the Installation of Protective Equipment Against Radiation (24 October 1989)
- Regulations on the Prevention and Cure of Pneumoconiosis (3 December 1987)

6. Regulation in the Coal Mines

Coal industry is the most hazardous business in China; However, OHS laws and regulations are full covered the area. The responsibility to handle the safety is lying on the shoulder of SAWS which indicated as follows:

- Promoting safety campaigns include meetings with safety officials in routine basis.
- Closing down coal mines that safety fail.
- Suspending works notice to the coal mines when safety inspections fail.
- Enforcing the local government to take serious concern on safety.

As Pringle and Frost (2003) have said, 'The question of where responsibility lies for implementation and monitoring the law', an organization, when she adopt the safety management system, shall have to face the difficulties that every items of the OHS system is to be controlled by different related bureaucratic departments and local governments, not only State Administration of Work Safety (SAWS). The hardship is the company must put much effort to coordinate with different governmental departments to consider their viewpoint on how to evaluate and monitor their

responsible laws and regulations. Much more of this, there is a contradiction, of where the liability lied on the company or senior personnel, when OHS accident has happened (Company Laws and Article 5 of Safety Law). Otherwise, the company's safety system cannot fully abide with variable legislative criteria and regulatory requirement. That is why there are areas of inconsistency between planning and implementations. It is a little bit exhaustive for us to understand such a complex system being managed by many official departments. With the responsibility contradict devised from different laws, there is ambiguous to outline of how the official departments to implement the current regulation and laws. The legislative system tends to be top-down approach, but the actual power to implementation is still rest on local government. Moreover, safety system investment is inadequate under such complicated regulatory environment. Companies have no ideas of adopting which safety system to conform this environment. The situation is just like the deputy director of SAWS have commented, "the absence of rigor and the failure of implementation." This is the true scenario of the OHS atmosphere in China.

Occupational Safety and Health Management System (OSHMS)

Unlike Britain, England has integrated the thirty numbers of regulations together that constituted the safety management regulation. China is running her own way that she observes the possibility of OSHMS implementation since 1996. In order to propose the accredit basis certificate system; The National Certification Guidance Committee was formulated to supervise the development of basic documents for approval, certification and OSHMS registration in July 2000. As the National Profile Report (Zhu, Yang and Wang 2012) has stated, China has issued the OSHMS standards, GB/T28001-2001). In order to standardize the safety management system all over China, companies get to know the official safety management system; the State Council has promulgated the 'Regulations on Certification and Accreditation'. Before that, SAWS has issued 'Notice on Further Strengthening Occupational Safety and Health Management System Work' that has strengthened the support to unify the safety management system, for the easy fulfillment of the complex safety legislative system. That means the organizational safety management system is in good manner, if the company get the official accredit certificate, GB/T28001-2001.

The present OSHMS GB/T28001-2011 is developed on the foundation of OHSAS18001:2007, a table will be formulated to differentiate the original 18001 and T28001 systems. We can say that the two systems are overall the same, just several items missing in 28001, see yellow shade.

TableA3: Comparative Table of two safety management system (GB/T28001, OHSAS18001)

Elements	Items	GB/T28001	OHSAS18001	
Plan	Policy	H & S Policy	H&S Management System	
		Worker Involvement	Employees Involvement	
	Planning	Initial Assessment		
		Occupational objectives	Legal compliance	
		Hazard identification	Hazard identification	
		Emergency Program	Emergency Preparedness	
		Legal Concern		
		Contracting		
Do	Organizing and Implementation	Responsibility and accountability	Division of responsibility and Authority	GB/T require safety control of chemical
		Competence and training	Training	
		Management system documentation	Document	
		Communication	Hazard Communication	
		Risk Assessment	Risk assessment and control	
Check	Hazard Control	Performance monitoring and measurement	Performance measure	
	Performance Evaluation	Accident and incident investigation Safety Audit	Accident and incident investigation Safety Audit	
Act	Action for Improvement	Management Review	Management Review	
		Corrective action		
		Continual improvement	Continual improvement	

Japanese Safety Management System

The legal system in Japan has been established at Meiji period. Under the influence of both Germany and France, European civil law system has been relocated to Japan. Japan afterward has become a country that embraced the law, jurisdiction basically refer to written and codified documents. Her legislative feature is different from UK and USA. After the Second World War, her legislative system remains intact and continues to follow continental law. The Industrial Safety and Health Law (ISH Law) still empower to deal with dangerous or hazardous work under minimum standards. The law is generally believed acceptable before the 80s. Since then, Japan has faced drastic competition with overseas market. The society change so rapid increase of temporary, part-time workers joining the workforce. Suppliated machineries and chemical substances are used during the production. There is urgency that the traditional law should be revised to abide self-regulating system, to prevail risk in workplace. The ISH Law has finally separated out from Labour Standard Laws, and named Occupational Health Laws. The Occupational Health Laws levy more compulsory stipulation of monitoring the workplace condition. Until 1988, the legislative policy has already developed to monitor both worker's health and working environment condition. Such shortcomings in the workplace will be reported to the safety professionals, who has assigned on the workplace, for further analysis. Anal sized result or measured will be given to employers for safety and health improvement.

In 1976, the Labour Standard Bureau of the Ministry of Labour has officially proposed to use the term of "safety assessment". There comes the official announcement of on enforcement of OSHMS. And, guidelines are officially disseminated to the public of how to construct the safety system through core direction from the risk assessment. The risk assessment is general accepted as fast catalyst to promote voluntary actions for occupational diseases and accident prevention (Seichi HORIE, 2010). JISHA, in 2003 has commenced their accreditation program for OSHMS. The program allow experienced inspectors to give advice for improvement, through an assessing the employer's effort for health and safety matters. There are guidelines announcement of Japan as follows:

1. Guideline for risk assessment, effective on 10th March, 2006;
2. Guideline for risk assessment related to chemicals, effective on 30th March, 2006;
3. Guideline for Occupational Safety and Health Management System (OSHMS), effective on 10th March 2006;
4. Guidelines for Material Safety Data Sheet (MSDS), effective on 25th

December 2000;

5. Guidelines for the comprehensive safety standard of machinery, effective on 31st July 2007;
6. Guideline for the safety assessment of chemical plants, effective on 21st March 2000.

The ISH Law finally admit the risk assessment is important in the OSHMS and put the wording of “shall endeavor” on 1st April 2006, Article 88 (Seichi HORIE, 2010). The risk assessment in Japan (guideline shown) is the mainframe of the safety management system of the activities, it included areas as follows:

1. By Ministry of Health, Labour and Welfare (MHLW)
 1. Building maintenance work-targeting zero accidents.
 2. Assembly Works
 3. Shape forming works
 4. Welding works
 5. Plating works
 6. Heating treating works
 7. Painting works
 8. Industrial accidents-assurance of health and safety of workers is the responsibility of company
 9. Metal process works
 10. Wood processing works
 11. Printing and bookbinding works
 12. Comprehensive safety standards of machinery
 13. Chemical substance, noise and heat in casting manufacturing industry
 14. Exemption from notification to labour standard office
 15. Chemicals
 16. Guideline for risk assessments
2. By Japan Industrial Safety and Health Association (JISHA)
 - i. Risk assessment for health supervisors, effective May 2010
 - ii. Good practices on risk assessment of chemical substances, effective March 2009
 - iii. Method for promoting risk assessment related to chemicals to prevent health impairments, effective on March 2009
 - iv. Manual on risk assessments in the building maintenance industry, effective on October, 2008
 - v. Manual on risk assessments in the waste management industry,

effective on March 2008

- vi. Manual on risk assessments in the industrial waste management industry, effective on February 2008
- vii. Risk assessments in the industrial waste management industry-targeting zero accidents, effective on November 2007 and etc.

Risk assessment is defined as a crucial tool to govern the job hazards identification, risk estimation, risk reduction and measure, human factor. Different natures of risk assessment together further constitute the Japan OSHMS (Seichi HORIE, 2010). The legislative risk assessments have been reviewed every five years, since 2005. However, there is the concern if the responsible personnel are competent to these risk assessments review. ISH Law is the criminal law on the shoulders of both individuals and organizations. Employers will face sanctions, claiming compensation and mass media criticism. On the other side, the employees have the obligations of concerning others health and safety as far as reasonable practicable. Due to this criminal law, Japanese companies have to suffer higher cost to invest on health and safety matters. Health and safety issue will be the first concern by the senior management. Or, it will bring significant business impact in all areas and make themselves a prisoner, if any little negligence arising. The harsh ISH law are prevailing the existence of small company at the same time.

The Labour Safety and Health Law has already enacted in 1972, before the separated out an individual ISH Law. These laws are still placed the central position for the contribution of occupational injuries and illnesses, but cannot keep pace with the changing industrial environment and international standards (Koji and Toru, 2002). The guidelines or risk assessment for OSHMS in Japan is just a legislative list of requirements. A top down practice for the industrial activities are being conducted without consideration of fitness for duty assessments; the hazard is different from site to site. There is no part for the employees' cooperation and communication as vital part of the OSHMS. Besides the guideline issued by ILO2001, Japan is interpreting the her own Five Management System, they are General Management, Work Environment Management, Work Management, Health Management and Occupational Health Training. The full scenario of how this traditional system to control the typical occupational illness can be understood, through "Roles of Occupational Physician" (Koji and Toru 2002):

- General Management
 - 1. Field patrol & assessment of work environment

2. Cause analysis of work-related diseases
3. Management of Information related to occupational health
4. Establishment of occupational health organization
5. Documentation of occupational health organization
6. Documentation of occupational health procedures
7. Development of occupational health plan
8. Development of health promotion plan
9. Participation in health and other related committees
10. Collaboration with safety management
11. Participation in work design and appropriate assignment
12. Contribution to introduction of new technology and machine
13. Contact with governmental authorities
14. Collaboration with outside resources
15. Budgeting and stewardships for site occupational health services
16. Trainings

- Health Management

1. Health examination and follow up
2. Illness management
3. Prevention of epidemics
4. Nutrition Management
5. First aids services
6. Health counseling
7. Health maintenance and promotion

- Work Management

1. Management of hazardous work
2. Management of personal protective equipment
3. Management of work condition
4. Management of labor condition
5. Optimization of work condition

- Work Environment Management

1. Management of hazardous work
2. Management of potential oxygen deficiency
3. Management of hazardous physical agents
4. General environmental hygiene
5. Environmental monitoring and assessment

6. Improvement of work environment
 7. Facility maintenance for better work environment
 8. Optimization of work environment
- Occupational Health Training
 1. Industrial hygiene training
 2. General health education
 3. education for health maintenance and promotion

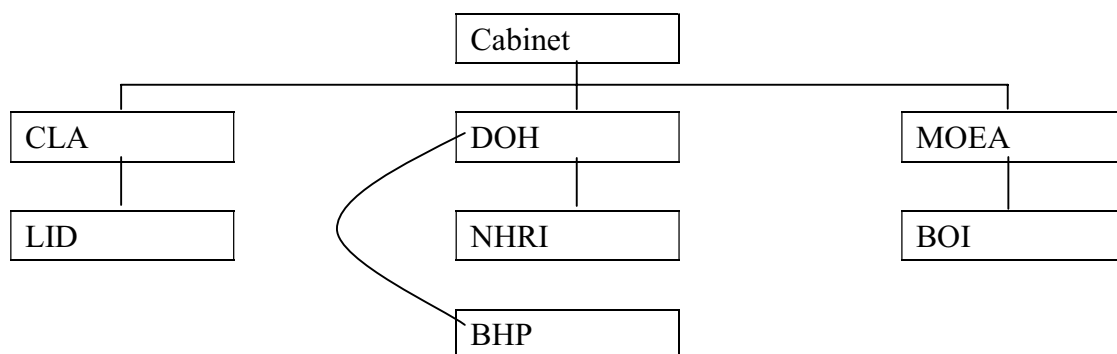
On this scope of work, there seemed to have a lot replica items, such as 'Facility maintenance for better work environment' and 'Improvement for work environment'; they can be put into one category. The other item is 'collaborate with safety management' has been put into General Management. There is no substantial definition of what safety management is, not as clear as ILO safety management system that emphasize on the promotion of PDCA (Plan/Do/Check/Act) cycle. There are other blind spots by lacking OSH policy, audit, preventive action and continual improvement. After 2005, risk assessment has been officially announced as the same importance with the five management system, in order to cover the shortage arising from these blind spot.

Safety Management System in Taiwan

Taiwan has already entered into new knowledge economy structured society, she have made so much of her prosperity by manufacturing microelectronics, computer, synthetic materials and robotics. Taiwan has already reached gross national product (GNP) up to US\$296.2 billion, and she has kept on surging to a new height each year since 2003. The workforce has already reached 3.5 millions working in high technology manufacturing sectors, and the workforce rising. Unlike Hong Kong main workforce that highly integrated on construction sector, Taiwan has her potential hazard arising out of using chemical and electronic derived from electronic production. In 1987, the Council of Labour Affairs (CLA) has established under Central Government Cabinet to deal with health and safety matters. The CLA is the highest authority to promulgate the occupational health and safety regulation, systems. There are two divisions in the CLA which named Labour Safety and Health Directorate (LSHD) and Labour Inspection Directorate (LID). They conduct routine inspection to the organizations and factories. In 1992, The Institute of Occupational Health and Safety (IOSH) were established under CLA, for analyzing the OHS development. There comes the Bureau of Health Promotion (BHP), it seem clear the bureau's purpose is for promote OHS in

workplace. National Health Research Institutes (NHRI), Division of Environmental Health and Occupational Medicine are responsible for environmental and occupational medicine. Environmental Protection Unit is responsible for OHS in universities, while Center for Environmental is responsible for OHS and environmental in general industries. The Bureau of Industry (BOI) is targeting for working conditions improvement.

Fig2: A simple governmental organization diagram of Taiwan related with safety and health affairs [source from the review article, “Occupational Health Research in Taiwan (Tung and team, 2004)"]



- CLA: Council of Labour Affairs
- LID: Labour Inspection Directorate
- DOH: Department of Health
- NHRI: National Health Research Institute
- BHP: Bureau of Health Promotion
- MOEA: Ministry of Economic Affairs
- BOI: Bureau of Industry

The Labour Safety and Health Act (LSHA) has been enacted in 1974 and revised in 3rd July, 2013, renamed as Occupational Safety and Health Act. The Act is providing protective coverage to over 4 millions labors and 27 thousands organizations away from accidents. Besides the Labour Safety and Health Act, there are Labour Inspection Act, Labour Insurance Act and Labour Standard Act. Under these Acts, there establish more than 25 regulations and rules. They can be differentiated into 11 categories as follows:

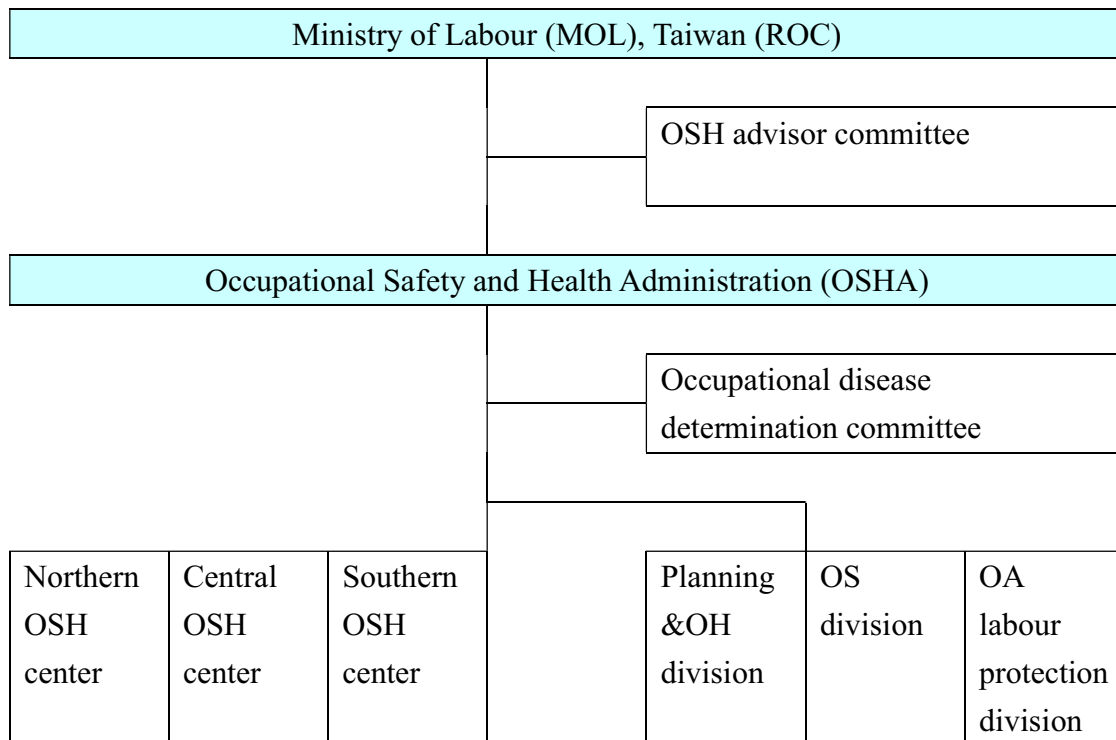
	Category	Regulations./Rules
	General occupational safety and health	• Enforcement Rules of the Labour Safety and Health Act • Regulations of occupational Safety and Health Management and Self-Inspection

	• Dust Hazard Prevention Standards • Standards for Prohibited Dangerous or Hazardous Works Involving Child or Female Worker • Enforcement Rules of the Labour Inspection Act
General workplace management	• Construction Safety and Health Installation Standards • Labour Workplace Monitoring Regulations • Hazard Communication Regulations of Dangerous and Harmful Materials • Dangerous Workplace Verification and Inspection Regulations • Mandatory Safety and Health Installations Standards of Workplace for Female Working at Night
High pressure gas	• High-Pressure Gas Rules for Labour Safety
Health Management	• Standards for Labor Work/Rest Time in High-Temperature Workplace • Hypoxia Prevention Rules • Vision Protection Standards for Labors in Precision Operations • Labour Health Protection Rules
Education and trainings	• Regulations for Labour Safety and Health Education and Trainings
Chemical substances	• Prevention Rules of Organic Solvent Intoxication. • Lead Intoxication Prevention Rules • Permissible Exposure Level Standards of Workplace Airborne Hazardous Substances • Prevention Rules of Tetra-Alkyl Lead Intoxication • Prevention Standards of Specified Chemical Substance Hazards
Mechanical safety	• Management Rule for Designated Inspection Agency of Dangerous Machinery or Equipment • Safety Rules of Boilers and High Pressure Vessels • Safety Rules of Cranes and Lifts • Safety Inspection Rules for Dangerous Machinery and Equipment

		• Type Inspection Regulations for Machinery and Tools • Safety Inspection Standards for Mobile Crane Conformation • Safety Inspection Standards for Fixed Crane Conformation • Safety Inspection Standards for Gondolas Conformation • Safety Inspection Rules for Existing Dangerous Machinery and Equipment
	Specific operations	• Hazard Prevention Standards of Abnormal Pressure Hazards
	Targeted industrial sectors	• Labour Safety and Health Installation Rules • Safety and Health Standards of Harbor Loading and Unloading • Labour Safety for Ship Tank Cleaning and Dismantling
	Occupational accident protection	• Protection Standards for Labors in Heavy Physical Operations • Protection Standards for Labors Working at Height • Health examination Rules for Occupational Disease Prevention by Labour Insurance • Regulations of Labour Body and Health examination by Assigned Medical Organizations • Regulations of Allowance and Approbated Grant for Occupational Accident Labors • Regulations of Workers with Accidents who withdraw from Insurance Program in the Medical Period Continue to Join Labour Insurance • Enforcement Rules of the Occupational Accident Labour Protection Act • Occupational Accident Prevention Subsidy Regulations • Regulations of Vocational Rehabilitation Grants for Occupational Accident Labors • Safety Inspection Standards for Lift Conformation
	Others	• Mine Health Installation Standards for Labour

Those regulations are governing the hazardous chemicals control procedures, labors' pre-employment physical examination program. The summary above is derived from the information provided by National Occupational Safety and Health Profile of Taiwan (2014), 3.3 Key OSH by-laws. The Labour Standard Laws (Tung and team,

2004) has already stated that the employers are having the duty to prevent the occupational hazards, maintain sufficient work and welfare facilities for labors. Then, Taiwan further establishes the official inspection system for the all workplaces under the control of Ministry of Labour (MOL), Taiwan (ROC):



Source: Organization chart of MOL, OSHA, Reference from National Occupational Safety and Health Profile of Taiwan

In recent years, a voluntary protection program (VPP) has been addressing the essentiality that the program has combined the resource of third professional parties. The safety professional of the third parties shall assess, under the regulatory-based guideline, to assess the worksite self-improving condition. The assessment result will be deemed as a reference for the insurance provider to set as a factor of the insurance premium payment reduction as benefit. Whenever the worksite is up to the standard, a two year certificate will be given to the relevant organization, through the Council of Labour Affairs (CLA). The VPP is being developed in Taiwan during the period 2003 to 2008. VPP is one of the important cooperative programs for Taiwan government to promote occupational health and safety, through the enterprise voluntary involvement.

The government has discovered the workplace fatality rate fluctuating in the upraise trend after 1990. However, there have been 272 officers conducting inspection to the workplace, the inspection rate is only 10%. There is a clear scenario; the governmental resource expansion can keep pace with social demand. With this limited resource, the CLA consider to activate the mandatory regulation called “Voluntary

Protection Programs Guidelines”. The industries have to carry out their self-regulated safety management system in order to compliance with those aforesaid laws, rules, Act and regulations. Since 1994, Taiwan has encourage the industries vary kind of safety management system for the VPP. CLA has finally adopted number of common elements as found from OHSAS18000 series and BS8800 into new VPP, 2001 as the regulatory safety system of work, to reply the public demand (Teh, Way and Yi, 2005) the table AZ explicated the management systems as follows:

Table AZ: The features of VPP Taiwan, OHSAS18001

New VPP items, Taiwan	OHSAS18001 clauses
1. OH&S Policy	OH&S Policy
2. Planning and management program	Planning
3. Organization	Implementation and operation Structure and responsibility
4. Operational Control	Operational Control
5. Emergency response and incidents preventive action	Emergency preparedness and response Accidents, incidents, non-conformances and corrective and preventive action
6. Performance measurement and audit	Performance measurement and monitoring
7. Management Review	Management Review

Source: An integrated approach for improving occupational health and safety management

Table AZ1: The rating scale and items number content of VPP

Elements of VPP	Items	Score
1. OH&S Policy	2	10
2. Planning and management program	8	10
3. Organization	14	10
4. Operational control	60	40
5. Emergency response and incidents preventive action	8	10
6. Performance measurement and audit	9	15
7. Management review	1	5
Total	102	100

The aforesaid table AZ1 stated the VPP has 102 items under 7 elements, resolved 11categories of more than 25 safety regulations; VPP program will be initiated and conducted by the non-government third parties. The non-government parties will

contribute resource to assist VPP applicants, granting the accredit certificates through furnishing steps as follows:

- A. Proper completion of the application document
- B. Training the VPP internal auditor
- C. Initiate on-site review
- D. Filing the related documents and management commitments
- E. Report to VPP committee

The resulted performance will be discussed in the VPP review committee. Those organizations who can score over 70 points granted the certificate. Organizations (VPP stars enterprises) over 85 scores are eligible to the competition. The competition gives the chance for organizations to take national excellence awards in two years time. The VPP certificates are valid for two years; the VPP organizations are entitled to gain merit of insurance premium reduction. However, there is the compulsory of the organizations to submit internal annual report in order to ensure their continual improvement.

Under Article 4, Labour Safety and Health Law, 2002, there shall be industrial classification of VPP organizations. The VPP in Taiwan is designated for organization of all sizes. In fact, the VPP is also adopted as official safety assessing system. There is a summary of comparison the criteria between Taiwan, USA VPP and OHSAS18001.

Table AZ2: Source: An integrated approach for improving occupational health and safety management

Steps	Taiwan VPP	USA VPP	OHSAS 18001
Initial review	Designated institute	OSHA review team	Private certification consultants
Onsite review team	2-3 experts	OSHA officer as team with a safety specialist and industrial hygienist	Evaluating experts trained with guidelines
Review process	1. Initial document review 2. Onsite review 3. Review committee	Initial meeting, walk-through, document review, interview, daily close-out meeting, closing meeting	Follow the implemented guideline

Final review	Council of Labour Affairs Review committee	Dept. of Labour, Assistant secretary	Certification association or organization
Qualification	Quantitative scores (0-100) Merit: 75, Star: 85	Injury and illness rate	Improvement and management commitment
Valid period	2 yr.	1 to 5 yr.	1 yr.
Application fee	No	No	Yes
Insurance company	Ask for participation	No	No
Continual Audit	Yearly	Star: 3yr. Merit: 1yr.	1yr

As a result, the VPP can be admitted as regulatory safety management system every Taiwan organization must have. The industries who comply with VPP yearly assessment with continual improved, can take financial benefits from the government. On the other hand, the program can reduce accidents.

Safety management system in Thailand

In nowadays Thailand has transformed herself to be industrialized society. The agricultural workforce has been declined from 82.4% to 57.9% since 1960 (T. Yingratansauk, 1998). There were 5.9 million working population who had distributed into 266,061 factories, mostly small scale industry. The industrialization leads to the concern of urban problems around the metropolitan and provinces, arising out of occupational risks. There is approximation of 3-4% working populations reported to Workmen's Compensation Fund annually during the period 1992-2001, roughly about 189,621 cases (Somkiat and Pensri, 2003). The Thailand workforce fatal accident rate is higher than other countries, when compare with Myanmar, Republic of Korea and Indonesia (ILO, 2000). As there is a need of Thailand to have free trade agreements with other countries in 2005, a set of safety standard at work has been established by the Ministry of Labour. Although the government has constituted the TIS18000 to keep pace with countries' safety management development, there is still a long way to go (U. Siruaronwong, 2006).

Thailand currently relies on the three main ministries to handle the occupational health and safety matters as follows:

1. Ministry of Industry: The ministry has the obligations to issue permit for factory construction, formulate safety standards and conduct site inspection. The ministry authority is come from the Factory Act.

2. Ministry of Labour: the governmental ministry has the obligation to enforce occupational health and safety standards. Under the ministry, there are Department of Labour Protection, Welfare, Social Security Office and Occupational Safety and Health Committee. They have the obligation to conduct safety inspection and promotion.
3. Ministry of Public Health: a governmental organization responsible for the public health in Thailand. That means the organization has to provide the occupational health and safety services. Under the organization, there is technical unit called Division of Occupational Health; The Division's main purpose is to establish:
 - i. Policy development
 - ii. Establish standard and guidelines for occupational health services
 - iii. Management development
 - iv. Develop the occupational health and safety surveillance system

In 2000, the Division of Occupational Health has promoted a propaganda called "Health Workplace" (Somkiat and Pensri, 2003). The main objectives are:

1. Promote the workers safety awareness in industries
2. Maintain continuous improvement in the workplaces
3. To develop safety and healthy working environment

Those organizations that are compliance with the requirements will receive gold, silver and bronze certificate, issued by the Department of Health. On the other hand, there is safety training for occupational physicians, health nurse and health officers. Under the Labour Act B.E. 2541, a safety officer shall be assigned in the workplace when the workforce more than 50 employees. Although occupational health and safety management system is essential for occupational and disease prevention (Kongtip, Yoosook and Chantanakul, 2007), the enterprises have generally contributed the management elements as follows:

The accomplished elements of OHSMS	Percentage of SME
A written safety policy	85.0
Assigned safety responsibility	87.1
Safety Committee	65.7
Full time safety officer	63.9
Accident report	92.1
Accident investigation	92.5
Safety budget	66.8
Job safety analysis	77.1
Safety inspection	92.9

Source from: Occupational health and safety management in small and medium-sized enterprises

The organizations (mostly in small or medium size enterprises, SME) remain in fundamental stage OHSMS development. Regards to the above table, the Thailand organizations are utmost concerned accident report, accident investigation and safety inspection as essential.

Safety Management in Singapore

The fundamental safety legislation in Singapore on construction matters is under the area of both Chapter 104 of the Factories Act and Section 68 and 77 of the Building Operations, and Work of Engineering Construction (BOWEC) Regulations. In 2006, there are 24 fatal accidents in construction sector; the concern of the public gives pressure to the government. The 104 Factory Act was refreshed to a new safety law called the Workplace Safety and Health Act. Under the new Act, the legislative safety framework has changed her focus from compulsory guideline perspective (rules and regulations) to directional perspective (principles in concept). The previous Act is a cluster of rules and compulsories for the related parties to follow; you are not breaching the law when you are not handling the potential hazards outside those rules/compulsories. Now, legislative paradigm has shifted to the new platform that built up on three principles. They are risk reduction from source, safety obligation on who create the risk, and harsher penalty on poor safety management. These three principles make companies more rely on themselves to be self-regulated on safety aspects. All members are sharing their safety responsibility within projects.

With reference to the Workplace Safety and Health Act (Chapter 354A), there contented 7 parts, which included the critical elements such as general duties at the workplaces (part IV), accident/incident investigation, S&H management (part VII)

and inspection program (part IX). Among these critical elements, the crucial S&H management (part VII) is only the explicit the requirement as follows:

1. Appointment of safety and health officer and co-ordinators
2. Workplace safety and health committees
3. Control of occupational disease
4. Control of hazardous substances
5. Dangerous Occurrence
6. Appointment of safety auditor for assessing the right performance of safety management system, risk assessment and process control and audit program.

The regulations have reviewed not only that there is the mandatory of shipyards and specific construction site shall constitute safety management system (KOGI, 2002). There is a necessities of all projects shall appoint safety auditor, and set up safety management system. However, there is not a compulsory of the audit to have approved by accredit certificate. There is also no detailed interpretation the detailed of the management system or guidelines that shall be followed in Singapore.

Safety Management System in Philippine

The Filipino workforces are in a majority of youngsters working in agriculture and services sectors. The workforce distributions are roughly 33 millions in agriculture, 4.9 industry and 15.7 services. Male and Female workers are 20 and 12.4 millions respectively. A table of the Philippine organization's workforce distribution as follows:

No. of Companies	Workforce
3000, large	More than 200
70,000, medium	10 to 199
750,000	Less than 10
Most of them are mostly low skill workers who are working in unfavorable workplace.	

Workforce distribution summary for companies

Most of the workers are working in unfavorable workplace. That workplace, within those small scale companies, undermined with high potential hazards. There are everywhere in chemical exposure, using substandard equipment and tools. There are a proportion of 5 accidents to 2 fatalities. The majority of fatalities come from constructions, mining and quarrying. The high severity accident rate has forced the government in no way but to take focus on how to improve workplace safety.

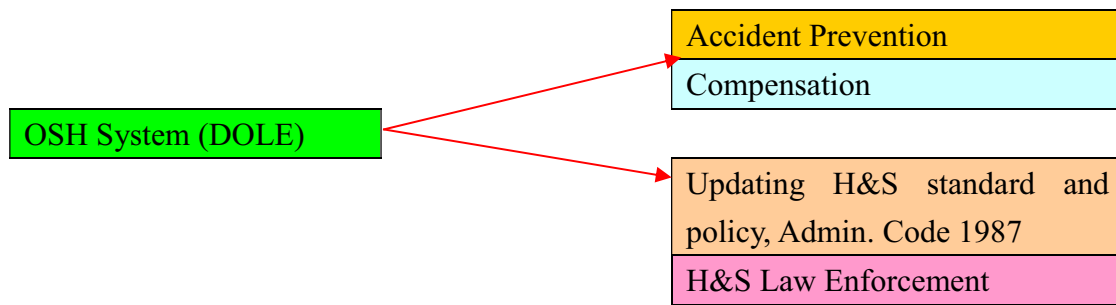
In 1987, the Philippine Constitution has initiated the OSH objective, and has called out the term “just and humane terms and condition of work” (OSHC, 2006). The Philippine Labor Code authorized the Department of Labour and Employment (DOLE) to establish a cluster of policies, hazard specific laws and programs. There are also mechanisms for legislative OSH enforcement, monitoring and evaluations. The Philippine S&H legislatives are structured by a law of wide range, they are majorities are:

1. The Philippine Constitution of 1987 which has announced the labour shall have the right to work safety and treat in humane condition.
2. The Philippine Labor Code devotes Book IV which has governed the matters of work-related injuries and illness.
3. Rules and guidelines on Occupational Safety and Health Standards have established since 1978.

And, Department of Labour and Employment (DOLE) is having the authority to OSH policy enforcement and rule making power (OSHC, 2006). She governs the laws as follows:

- Philippine Labor Code on accident prevention and compensation.
- The Administrative Code on H&S standards enforcement.
- The Occupational Safety and Health Standards (OSHS).
- Executive Order 307 on establishes the Occupational Safety and Health Center.
- Fertilizer and Pesticides Act.
- RA 6969 Toxic Substances Act

The Occupational Safety and Health Center (OSHC) have been established since 1987. Her objective is to enhance the workplaces in a safety, healthier and more productive area. Executive Order 307 mandates it as an attached DOLE agency. The OSHC is providing training for fundamental occupational safety and health course of all kind, one of the purposes is provide safety officer training course. The DOLE is established under the influence of ILO Convention’s framework for OSH. DOLE is also the mainframe for national policy and program implementation. The Philippine OSH system in this light established for laws and regulations reinforcement. DOLE is also act as cooperative agency between employers, workers’ organization and other official parties.



With reference to the Occupational Safety and Health Standards, the aforesaid OSH System (DOLE) can be differentiated into the fundamental rules to enforce as follows:

1. Rule 1010, health and safety rules
2. Rule 1030, training of personnel in occupational safety and health (accredit audit only remain on assessing the training effectiveness)
3. Rule 1040, health and safety committee
4. Rule 1050, notification and records of accident and occupational illness
5. Rule 1060, premise of establishments (workplace environment provision)
6. Rule 1070, health and environmental control
7. Rule 1080, personal protective equipment program
8. Rule 1090, hazardous materials
9. Rule 1100, gas and electric welding and cutting operations
10. Rule 1120, hazardous work process (confined space work)
11. Rule 1150, materials handling and storage
12. Rule 1160, boiler
13. Rule 1170, work under pressure
14. Rule 1200, machinery guarding
15. Rule 1210, electrical safety
16. Rule 1220, elevators and related equipment
17. Rule 1230, identification of piping system
18. Rule 1410, construction safety
19. Rule 1420, logging
20. Rule 1940, fire protection and control
21. Rule 1950, pesticides and fertilizer
22. Rule 1960, occupational health services

On this scope of rules, there seemed to have a lot of elements that involved process control, such as ‘Rule 1100, gas and electric welding and cutting operations’ and ‘Rule 1200, machinery guarding’; they can be put into one category as one audit element. The legislative system itself has no substantial definition of what safety

management is, not as clear as ILO safety management system that emphasize in other Asian countries. Furthermore, the legislative system do not explicit any scenarios of OSH policy, audit, preventive action and continual improvement.

The Discovery of LOSMS Elements and their Differentiation

Every country has her trend development industry to earn the income. Some of the countries are having long history which can trace back to the last early 19 century, such as England. She is the first country who initiates industrialization reform. Then, The Empire begins colonization. The heyday of the kingdom's colonization has been called "the empire of never sunset". The empire has her earliest legislation "Health and Morals of Apprentices Act" to protect youngsters working in cotton mill. Since, the colonization policy has brought about influence of the colony's legislative system, such as Hong Kong. The Factory Act that linking with very basic safety has been introduced to Hong Kong in 1901. That is why there can find the similar faces of Legislative Safety Management System between these two places, in recent decades. Especially, Hong Kong construction industry has significantly surged to its peak. The major sector is allocated on superstructure construction, mostly very complicated project we called intelligence model (with highly integrated electronic network possessed). Historically, major disasters always make way for distinguished legislative and regulatory reform leading to stricter and higher compliance (Jinilakodi, Grayson and Oyewole, 2012). The long history of England and recent fatality of Hong Kong has glued them together for most legislative elements requirement.

China, a socialist market economy is the second largest economical body in the world. She has adopted the safety management system GB/TB28001 in order to suit her paces on the infrastructure and superstructure development. The LOSMS itself is so complicate but never fully in implication. Taiwan is the only Asian country who voluntary protection system (VPP), may have influenced by the United States. After 1945, United States has given Taiwan administration power to Kuomintang. Kuomintang evacuated to Taiwan after 1949, has always supported by United States. Her legislative system establishment is at certain level similar to United States. Taiwan has currently made her fortune by manufacturing microelectrics, not much infrastructure development. Her LOSMS is not as complicated as both China and England contented elements as many. There is a table to show the Legislative Elements the Asian countries conducted as follows:

TableAZ03: the elements of the Legislative Elements of LOSMS in Different Asian Countries

No	Legislative Elements	Hong Kong	Malaysia	England	China	Taiwan	Thailand	Japan	Singapore	Philippine	Elements Popularity
1	Safety Policy										6/9
2	Organization										7/9
3	Training Program										3/9
4	In-house Rule and Safety Procedure										4/9
5	Inspection Program										6/9
6	Personal Protective Equipment Program										1/9
7	Accident Investigation Program										4/9
8	Emergency Program										5/9
9	Subcontractor Evaluation and Control										2/9
10	Safety Committee										7/9
11	Pro-active Hazard Control										7/9
12	Safety and Health Awareness										4/9
13	Occupational Health Awareness Program										4/9
14	Process Control										6/9
15	Performance Evaluation Program (Audit)										5/9
16	Documentary Control										3/9
Total Legislative Elements Usage		14	6	12	12	5	6	7	7	6	

By the way, Thailand is in the initial stage to industrialization society with basic infrastructure, not much high rise building projects. Philippine is agricultural country querying how many legislative elements needed. It is clear that there is a great variety between Asian countries of empowering different number of legislative elements into their safety system. It seems that there depends on production nature to chose eligible elements for the countries. From the above information, we can altogether get sixteen elements they are functioning within those countries. However, there is no substantial conclusion of how many fundamental elements needs to have, for the activities from different project nature, with the manpower variety. In Hong Kong industry, all the organizations have to undergo the former 10 legislative elements amount fourteen if