A STUDY OF THE RELATIONSHIP BETWEEN SAFETY MANAGEMENT QUALITY AND OCCUPATIONAL INJURY RATE OF STATE ENTERPRISES

WINIT LEONGSRISOOK

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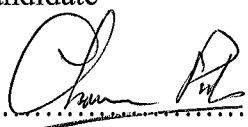

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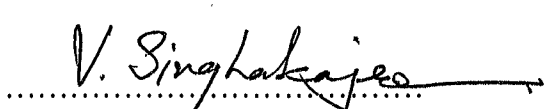

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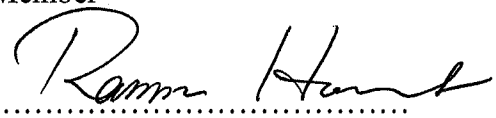

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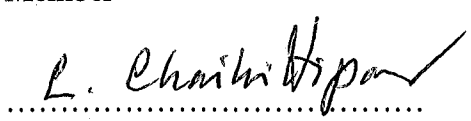

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A STUDY OF THE RELATIONSHIP BETWEEN SAFETY MANAGEMENT QUALITY AND OCCUPATIONAL INJURY RATE OF STATE ENTERPRISES

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ABSTRACT

The purpose of this study was to identify the relationship between safety management and occupational injury rate. The study disclosed that the statistics on accidents and occupational injuries in the studied state enterprises tend to be increasingly high. The average number of accidents on a yearly basis was 86.04 while the average occupational injury rate per year was 6.94.

The study on the quality of safety management in state enterprises showed that the evaluation result on safety management of six state enterprises or equivalent to 40.00% was "fair," the result of eight state enterprises, equivalent to 53.33% was "good," and the result of only one state enterprise, equivalent to 6.67% was "excellent." Among four categories of state enterprises, state enterprise category III (Production industry) received the highest score of safety management evaluation equivalent to 73.65% while state enterprise category II (Transport of goods and people), and state enterprise category IV (Other services apart from financial service) received the results of 58.86% and 68.28% respectively, making the average total evaluation result 66.93%.

When considering the detail of each sub-item of safety management evaluation, it was found that the state enterprises dealing with the transport of goods and people had ten sub-items at a "good" level, 24 sub-items at a "fair" level, and one sub-item at a "poor" level. The state enterprises dealing with production industry had 21 sub-items at a "good" level and 14 sub-items at a "fair" level. The state enterprises dealing with the other services apart from financial service had 18 sub-items at a "good" level and 17 sub-items at a "fair" level. But when considering the standard criteria of each sub-item with the evaluation result at a "good" level, 25 sub-items of the state enterprises dealing with the transport of goods and people, 14 sub-items of the state enterprises dealing with production industry, and 17 sub-items of the state enterprises dealing with the other services apart from financial service needed improvement. The hypothesized relation between safety management quality and occupational injury , was not established as the levels of correlation were low ($r = 0.049$ and $p = 0.861$.)

KEY WORDS: SAFETY MANAGEMENT QUALITY / OCCUPATIONAL INJURY RATE / CHEVRON RATING PROCESS

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การศึกษาความสัมพันธ์ระหว่างคุณภาพการบริหารงานความปลอดภัยกับอัตราการเกิดอุบัติเหตุในรัฐวิสาหกิจ

(A STUDY OF THE RELATIONSHIP BETWEEN SAFETY MANAGEMENT QUALITY AND OCCUPATIONAL INJURY RATE OF STATE ENTERPRISES)

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บทคัดย่อ

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อศึกษาความสัมพันธ์ระหว่างคุณภาพการบริหารงานความปลอดภัยกับอัตราการประสบอันตรายในรัฐวิสาหกิจ ผลการศึกษาพบว่าสถิติอุบัติเหตและอัตราการเกิดอุบัติเหตุมีแนวโน้มที่สูงขึ้นในรัฐวิสาหกิจที่ทำการศึกษา โดยค่าเฉลี่ยสถิติอุบัติเหตุต่อปี มีค่าเท่ากับ 86.04 ในขณะที่ค่าเฉลี่ยอัตราการเกิดอุบัติเหตุต่อ1, 000 คนต่อปี มีค่าเท่ากับ 6.94

การศึกษาในเรื่องคุณภาพการบริหารงานความปลอดภัยในรัฐวิสาหกิจพบว่า มีจำนวน 6 รัฐวิสาหกิจหรือคิดเป็นร้อยละ 40 มีผลการประเมินการบริหารงานความปลอดภัย เป็น “พอใช้” และจำนวน 8 รัฐวิสาหกิจหรือคิดเป็นร้อยละ 53.33 มีผลการประเมินการบริหารงานความปลอดภัยเป็น “ดี” และมีเพียง 1 รัฐวิสาหกิจหรือคิดเป็นร้อยละ 6.67 ที่มีผลการประเมินการบริหารงานความปลอดภัย เป็น “ดีมาก” ในการศึกษาครั้งนี้แบ่งรัฐวิสาหกิจออกเป็น 4 ประเภท รัฐวิสาหกิจประเภทกิจกรรมการผลิตจะมีผลการประเมินการบริหารงานสูงสุดคือคิดเป็นร้อยละ 73.65 ในขณะที่รัฐวิสาหกิจประเภทขนส่งพัสดุและประชาชน และรัฐวิสาหกิจประเภทการให้บริการที่ไม่ใช่ทางด้านการเงิน คิดเป็นร้อยละ 58.86 และ 68.28 ตามลำดับ โดยมีค่าเฉลี่ยผลการประเมินทั้งหมดคิดเป็นร้อยละ 66.93

แต่ถ้าพิจารณาในรายละเอียดของแต่ละหัวข้อของการประเมินการบริหารงานความปลอดภัย พบว่าในรัฐวิสาหกิจประเภทกิจการขนส่งสินค้าและประชาชนมีผลการประเมินเป็น “ดี” จำนวน 10 หัวข้อ “พอใช้” จำนวน 24 หัวข้อและ “ปรับปรุง” จำนวน 1 หัวข้อ รัฐวิสาหกิจประเภทกิจการการผลิตมีผลการประเมินเป็น “ดี” จำนวน 21 หัวข้อ และ “พอใช้” จำนวน 14 หัวข้อ และรัฐวิสาหกิจประเภทบริการที่ไม่ใช่การเงินมีผลการประเมิน “ดี” จำนวน 18 หัวข้อ และ “พอใช้” จำนวน 17 หัวข้อ และถ้าพิจารณาเกณฑ์มาตรฐานในแต่ละหัวข้อการประเมินเป็น “ดี” รัฐวิสาหกิจประเภทกิจการขนส่งสินค้าและประชาชนมีหัวข้อควรปรับปรุงจำนวน 25 หัวข้อ รัฐวิสาหกิจประเภทกิจการผลิตมีหัวข้อควรปรับปรุงจำนวน 14 หัวข้อ และรัฐวิสาหกิจประเภทการให้บริการที่ไม่ใช่การเงินมีหัวข้อควรปรับปรุงจำนวน 17 หัวข้อ เมื่อศึกษาความสัมพันธ์ระหว่างคุณภาพการบริหารงานความปลอดภัยกับอัตราการเกิดอุบัติเหตุตามสมมุติฐานของการศึกษาครั้งนี้พบว่าคุณภาพการบริหารงานไม่มีความสัมพันธ์กับอัตราการเกิดอุบัติเหตุด้วยการทดสอบค่าทางสถิติที่ $r = 0.049$, $p = 0.861$

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CONTENTS

CONTENTS (Cont.)

LIST OF TABLES

CHAPTER I
INTRODUCTION

1.1 Background and rationale

The government has issued the Notification of State Enterprise Relation Committee on "Occupational Safety" to enforce the safety in working condition for the state enterprise's employees, and also to enhance the effective practices of the management executives for more safety in the workplace. But the number of occupational injuries in state enterprises is still high as shown in the statistics of each state enterprise in Table 1-1. It was found that 11 out of totally 17 state enterprises own the increasingly high statistics of occupational injury. And if it is considered in the overall picture, the average occupational injury frequency rate of 2.57 per 1000 employees in the year 2000 is much higher than the rate of 2.35 in the year 1999. (Table 1-1)

It is clearly shown that although the government has developed several measures for the management executives of state enterprises to put into effect, accident reduction could not be sufficiently attained. This can be drawn to the fact that safety management has not yet been seriously practiced in state enterprises where no measure has not yet either been established to control safety practices to be in compliance with the Notification of State Enterprise Relation Committee on "Occupational Safety". Some state enterprises did not do any practice while some did but not considered it as an important measure to control working condition safety.

TABLE 1-1 Occupational injury statistics of state enterprises in the year 1999 – 2000

No.	State Enterprise	1999			2000		
		Number Of Employees	Number of the employees injured	Rate per 1000 persons	Number of Employees	Number of the employees injured	Rate per 1000 persons
1	Electricity Generating Authority of Thailand	31,958	136	4.30	31,958	91	2.88
2	Metropolitan Electricity Authority of Thailand	12,532	56	4.47	11,735	61	5.19
3	Telephone Organization of Thailand	26,085	43	1.65	24,753	55	2.22
4	Bangkok Mass Transit Authority	22,796	42	1.84	21,217	46	2.17
5	Thailand Tobacco Monopoly	6,363	31	4.87	5,698	18	3.16
6	Communications Authority of Thailand	25,133	30	1.19	23,192	28	1.2
7	The Thai Plywood Company Limited	1,058	22	20.79	886	23	26.56
8	Metropolitan Waterworks Authority of Thailand	5,946	15	2.52	5,558	7	1.26
9	Port Authority of Thailand	5,727	14	2.44	5,188	20	3.87
10	State Railway of Thailand	23,770	8	0.34	18,370	45	2.45
11	Department of Medical Science	788	7	8.88	800	2	2.6
12	Provincial Waterworks Authority	7,522	4	0.53	7,132	1	0.14
13	The Government Pharmaceutical Organization	2,307	4	1.73	2,237	3	1.34

No.	State Enterprise	1999			2000		
		Number Of Employees	Number of the employees injured	Rate per 1000 persons	Number of Employees	Number of the employees injured	Rate per 1000 persons
14	Dairy Farming Promotion Organization of Thailand	1,329	4	3.01	1,285	2	1.58
15	The Tanning Organization	610	3	4.92	519	7	13.49
16	Expressway and Rapid Transit Authority of Thailand	3,356	2	0.60	3,701	14	3.78
17	Express Transportation Organization of Thailand	3,137	2	0.64	2,546	5	1.89
	Average	180,057	423	2.35	166,435	428	2.57

Therefore, the researcher considered it useful to produce or acquire a safety management-measuring tool in order to compare the statistics of accident in state enterprises and also to demonstrate the outcome of safety management implementation of the state enterprises.

1.2 Objective

To study the relation between occupational injury rate and safety management quality in state enterprises

1.3 Hypotheses

Safety management quality in state enterprises relates to the occupational injury rate.

1.4 Scope of this study

This study was carried out in the 40 state enterprises located in Bangkok.

1.5 Variables

1.5.1 Independent variables

1.5.1.1 Management quality means safety management in different areas as follows:

- Organizational set-up and general management
- Hazard control
- Training and motivation
- Investigation and accident cause analysis
- After-work safety

1.5.2 Dependent variables

1.5.2.1 Occupational injury rate

1.6 Glossary of terms and definitions

State enterprise: means company, partnership and juristic person of whom the capital belongs to the ministry, and department.

Safety management: means operational procedure of the organization to achieve the established objective of safety management under cooperation between the executives and employees by using the existing resources to yield the utmost effectiveness.

Safety management quality: means the evaluation of effectiveness of safety management by using the instrument created by the researcher that is classified into 4 levels as follows:

1. Average score of less than or equal to 40.00% means that the safety management quality is not effective, and needs improvement.
2. Average score of between 40.01 – 70.00% means that the safety management quality is fair, but the performance is not consistent.
3. Average score of between 70.01 – 90.00% means that the safety management quality is good, and the implementation of safety management is improved.

4. Average score of between 90.01 – 100.00% means that the safety management quality is perfect.

Occupational injury rate means the rate that is used to compare the occupational injury.

$$\textbf{Occupational injury rate} = \frac{\text{Number of occupational injuries} * 1000}{\text{Total number of employees}}$$

CHAPTER II
LITERATURE REVIEW

2.1 Management-related theories (1)

Safety management means an operation process of the organization to achieve the given objective concerning the safety in collaboration with executives and employees by using existing resources most efficiently.

In practice, safety management means to control the working environment and to develop an operational unit and methods to reduce or eradicate the risk of injuries resulting from the work by brainstorming the internal and external knowledge. In addition, the responsibilities of each department in the organization are formulated and trainings are provided in order to have a clear understanding prior to application.

2.2 There are 6 basic concepts of safety management as follows: (4)

2.1.1 Safe product means the management where the product in combination with safety is considered in order to get the product without any injury or loss.

2.1.2 Prevent at source means the management where the cause of accident is reduced, eradicated or prevented as all accidents or dangers arising either from unsafe working methods of employees / laborers or unsafe working condition are caused by basic errors. If these errors are prevented from the beginning, the opportunity for accidents will be less.

2.1.3 Unique and specialized activity related to safety means the management emphasizing solving problems or planning safety activities in all departments to create an overall success.

2.1.4 Possibility of hazard prediction means the management where the incidents happened to the same organization type are analyzed to search for the causes and preventive measures.

2.1.5 Leadering diehard unsafe habits as of no consequence means the management where working environment is improved prior to improvement of individuals because several methods have been used to improve individuals e.g. training, motivation and even punishment etc., but no successful result is obtained for the management.

2.1.6 Treatment of cause as against symptoms means the management where the problem is solved on the basis of the symptoms or the findings.

2.3 Traditional Safety Management Concept (13,14)

Traditional safety management concept has been based on Heinrich's theory since 1931, which was the year of Accident Prevention in America. Heinrich formulated an original theory of accident. Actually, the accident is caused by unsafe act in combination with the other factors, and then makes a result of injury.

Heinrich named the theory of accident sequence as the domino of accident consisting of the following 5 steps.

1. Social environment
2. Fault of person
3. Unsafe act / unsafe condition
4. Accident
5. Injury

According to the said theory, each step is compared to each domino that is placed next to each other. When the first factor falls, it means the deficiency of social environment of that person, and results in the defect of that person. Then, when the second factor falls, it will affect the third factor that is unsafe act / unsafe condition. And if the third factor is available, it will result in the failure of the fourth factor that is the occurrence of accident. And of course, the falling down of the fourth factor will cause injury, which is equivalent to the last domino. And once the injury exists, the losses of the organization will follow.

The principle of accident prevention according to the Domino Theory of Accident is to draw out one of the dominos in order to prevent the falling down of the precedent domino to affect the continuous falling. And the popular practice is to eliminate the unsafe act or unsafe condition, which is equivalent to the third domino. Even though the two precedent factors are deficient, they will not lead to any accident.

Therefore, traditional safety management based on Heinrich's concept focuses on human being, as he believed that if the factor of human being's unsafe act were taken out, it would not result in the accident.

Based on the said concept, it makes the entrepreneurs' management understand that human error, human carelessness, and workers' deficiency are the cause of accident. So, they intend to make corrections on workers by concentrating on accident investigation to search for their unsafe act. The correction on individuals is difficult due to their changing behavior since their fertilization, genetics, childhood taking care, family relationship, and educational background, which further make the short-term correction more difficult. More importantly, there are the other factors including major factors, leading factors, or contributory factors that lead the workers to perform the tasks with errors, such as inappropriate management, improper design, etc. Then, from Heinrich's concept, it comes to the conclusion that the accident is mostly caused by unsafe act or human error. But the analysis of the real causes and other causes contributing to the accident is lacking.

2.4 Loss control management (3)

Frank E. Bird introduced the concept of International Safety Rating System: (ISRS) in 1969. In the past, safety management was directed at reducing and preventing accidents and injuries without taking loss control and basic cause of incident into consideration. Therefore, the Loss Causation Model was made by Frank E. Bird. Guidelines of loss control during accidents and after accidents were summarized and rated by 20 elements. To evaluate the effectiveness of the system, the following loss control program or five star rating system or ISRS is used. The scores in each element at the standard and advance level are shown in the table below:

Table 2-1 Loss control program or five star rating system or ISRS

Element	Scores	Rating level									
		S1	**S2**	**S3**	**S4**	**S5**	**A1**	**A2**	**A3**	**A4**	**A5**
1. Leadership and safety administration	1,170	*	*	*	*	*	*	*	*	*	*
2. Training provided to the executives	700								*	*	*
3. Inspection as planned	760	*	*	*	*	*	*	*	*	*	*
4. Task analysis and operational procedures	505									*	*
5. Report and investigation of accidents	680	*	*	*	*	*	*	*	*	*	*
6. Job observations	330										*
7. Emergency controlling plan	770									*	*
8. Safety rules	515	*	*	*	*	*	*	*	*	*	*
9. Accident analysis	455										*
10. Knowledge and skill training	675							*	*	*	*
11. Personal protective equipment	450	*	*	*	*	*	*	*	*	*	*
12. Health and hygiene control	645				*	*	*	*	*	*	*
13. Evaluation system	430										*

Table 2-1 Loss control program or five star rating system or ISRS (continued)

Element	Scores	Rating level									
		S1	**S2**	**S3**	**S4**	**S5**	**A1**	**A2**	**A3**	**A4**	**A5**
14. Engineering control	510										*
15. Individual communication	450								*	*	*
16. Group meetings	400									*	*
17. Safety promotion	355										*
18. Hiring and placement of employees	350								*	*	*
19. Purchasing control	400										*
20. Off-the-job safety	250										*
Compulsory elements		5	5	5	6	6	7	7	10	13	20
Alternative elements		0	0	1	1	2	3	5	5	5	0
Total rating elements		5	5	6	7	8	10	12	15	18	20
Minimum average scores		25 %	30 %	35 %	35 %	40 %	40 %	50 %	60 %	75 %	90 %
Minimum scores in each element		10 %	15 %	15 %	20 %	20 %	25 %	30 %	40 %	50 %	75 %
Minimum scores of the working area		60 %	60 %	65 %	65 %	65 %	65 %	70 %	70 %	80 %	90 %

New safety management implementation guideline

New safety management implementation guideline needs to follow the following 5 procedures

1. Identification of Work

2. Standard

3. Measurement

4. Evaluation

5. Recomendation and Correction

For the identification of work procedure, 20 programs or elements are available and each of which is correlated. If the implementation sufficiently covers all 20 programs, losses could be extremely controlled including further the increase of quality and products and cost control. All 20 programs or elements are shown in Table 2-1.

The program selection is subject to losses or accidental risk of the industry in question with 2 classified scoring criteria.

1. Optional element scoring is used to the organization of the following features.

1.1 low risk organization

1.2 deep-in-detail evaluation (vertical)

1.3 appropriate to the newly born businesses starting to take action on safety

2. Progressive audit scoring is used to the organization of the following features.

2.1 high risk organization

2.2 evaluation in all areas (horizontal)

2.3 covering various component to yield maximum benefits

2.5 Key factors of a successful Safety Management (9)

A key tool for and effective safety program: In the Electricity Generating Authority of Thailand (EGAT), worker involvement is one of the key tools for and effective safety program. Five key tools Known as “Pentagon model” has guided practitioners for their project undertaking. A tool of worker involvement which has been introduced and widely utilizes in EGAT over quality circle, safety circle, suggestion system, and house keeping system activity, This mentioned technique fully supported from management have been successful in this organization.

The key to successful in any business is policy and decision making process. Successful Organizations are usually found among those with clear and unambiguous objectives supported by a effective management program requires program the application of conventional management system and techniques. It must be seen as part of the normal management of the company, making demands on management time and competing for available resources and cash in the same way as other relevant factors such as research and development, new machinery, wages and salaries and quality control.

A successful safety program must have the backing of top management cooperation of its employees. If top management is not interested in accident prevention, It is most likely that others in the management structure will reflect that attitude. And so will the workers because the can sense and detect what's going on.

Employee safety programs are successful only when there is a genuine commitment by all of the management groups. Such commitment must filter down through the entire organization from plant manager, to the line supervisor, to the employee. More lip service, regardless of any motivational principles, will eventually undermine the program and cause it to lose effectiveness. Safety, perhaps more than any other effort, requires constant and unrelenting vigilance

2.6 Chevron's rating process (2) is an evaluation method of safety management. The evaluation is divided into the following levels: Poor, Fair, Good and Excellent. Five major topics are surveyed:

1. Organization and administration 30% (3 sub-elements)
2. Hazard control 35% (14 sub-elements)
3. Training and motivation 20% (9 sub-elements)
4. Accident investigation and cause analysis 10% (4 sub-elements)
5. Off-the-job safety 5% (2 sub-elements)

The total percentages will be rated into the following levels:

Below 40%	Poor	The management system is inefficient.
Below 40%-70%	Fair	The management system may not be efficient yet
Below 70%-90%	Good	The management system is developed.

Below 90%	Excellent	The management system is excellent.

Chevron Oil Company conducted a safety audit with the four following objectives:

1. To find weak points of the organization.
2. To evaluate the employee's attitudes concerning safety achievement.
3. To enhance the efficient safety management.
4. To serve as an indicator for the senior management to support the development of safety activities.

The researcher chooses to use the safety management evaluation method based on Chevron's Rating Process instead of International Safety Rating System (ISRS) with the following reasons.

1. Chevron's Rating Process is user friendly and able to self describe the evaluation method whereas International Safety Rating System (ISRS) requires the training of the evaluators who will use the system.

2. Chevron's Rating Process has confirmed evaluation criteria whereas evaluation criteria of International Safety Rating System (ISRS) have wide meaning of definitions.

2.7 Regulations and announcement of State Enterprise Relation Committee (5)

Article 41: State enterprises shall provide a first aid or treatment service for helping employees in case of accidents or injuries.

Article 42: State enterprises shall provide a medical check up for the employees at least once a year.

Article 43: State enterprises shall implement safety measures and provide personal protective equipment.

Announcement of State Enterprise Relation Committee Occupational Safety

Article 1: Each state enterprise with up to 100 employees shall provide at least one safety officer to be responsible for the following tasks:

1. To encourage the practice of working with safety to the employees
2. To give advice and suggestions on working with safety to the state enterprises and employees
3. To supervise and control the proper use of safety equipment and be sure that it is always in usable condition
4. To inspect the working condition and working practice of employees, and report to the state enterprises to make improvements of safety
5. To record, prepare the report, and investigate the accident and disease caused by working condition
6. To promote and support safety activities in the workplace

Article 4: Qualifications of the safety officer

1. Minimum a bachelor degree or equivalent in occupational health or other fields whose curriculum contains occupational safety.
2. Must participate in a training and test on occupational safety organized by the Department of Labour or institute certified by the Department of Labour or
3. Must perform occupational safety functions at least one year prior to the enforcement of the announcement.

Announcement of State Enterprise Relation Committee

Fire extinguishing and prevention at the workplace for occupational safety

Section 1

General requirement

Article 2: State enterprises shall provide fire prevention and control system including fire extinguishers and, store explosive and hazardous materials, dispose flammable waste, prevent lightning, install fire signals, provide a fire exit and construct buildings with fire prevention system.

Article 3: State enterprises shall prepare fire prevention and control plans including inspection, training, fire prevention campaign, fire fighting, fire drill training, as well as post-fire alleviation and rehabilitation.

Article 35: State enterprises shall provide fire drill/fire exit trainings at least once a year.

Announcement of State Enterprise Relation Committee

Occupational health, safety and environment Committee

Section 1

Article 2: State enterprises with up to 50 employees shall provide the safety committees of occupational health and environment within 30 days after the enforcement of this announcement or within 30 days after 50 employees are increased.

Article 10: State enterprises shall provide safety manuals that the employees or persons concerned can use.

Section 3: Duties of Occupational Health, Safety and Environment Committee

Article 14: The committees have the following duties:

1. To hold at least a meeting per month.
2. To conduct a survey on safety, occupational health and environment once a month.
3. To report or suggest measures or guidelines of improvement in line with safety laws and/or measures including contractors or external people entering the workplace.
4. To promote and support safety/occupational health and environment activities at the workplace.
5. To formulate safety regulations and measures and present them to the state enterprises.
6. To prepare policies, annual plans, projects and activities concerning safety, occupational health and environment including off-the-job safety in order to prevent and report the accidents, dangers or injuries arising from work to the state enterprises.
7. To design a project or training plan concerning safety, occupational health and environment including trainings on safety duties and responsibilities of the employees, management and staff at all levels and present them to the state enterprises.

8. To monitor the progress and report it to the state enterprises.
9. To prepare an annual report together with obstacles and solutions after one-year working as safety committees and submit it to the state enterprises.
10. To perform duties on safety, occupational health and environment assigned by the state enterprises.

In this study, a study instrument will be designed to cover the major issues in the regulations and announcement of State Enterprise Relation Committee because they are the major laws and used as the basis of practice.

2.8 Research-related outcome

Phorhathai Bukanasut (12) (1991) concluded that the safety management was unsuccessful because the executives overlooked the safety that causes unsuccessful operation in this regard.

This study will support the idea that all levels especially senior management must cooperate in safety management.

Chuthapanit Kranfuang (10)(1991) concluded that there was no relationship between safety management and accidents. According to priority of safety management, it is found that the companies put the staff recruitment, work change, testing and staff placement in the first priority whereas safety management concerning safety regulations, emergency plans, safety policies, organization and task assignment is in the last priority.

This study result is almost the same as that people are studying. Only samples are totally different as this study is conducted in private enterprises where the announcement of Ministry of Interior is enforced. In addition, punishments for violating are clearly formulated. On the contrary, those from state enterprises will not be punished because regulations of State Enterprise Relation Committee are enforced.

Attraporn Ratanboonyakorn (1987) studied the accident case at large-scale enterprises and found that that case was less serious than that at small-scale enterprises because the management in large scale enterprises gave more importance on safety more than small scale enterprises.

This study is likely to support that safety management is related with the size of the enterprise.

Phuangchot Sai-ngam(9) (1980) studied the attitudes of the management in private enterprises and found that:

1. The management did not realize the importance of safety.
2. The management has not understood how safety policies can reduce accidents.
3. The management has not yet accepted that the management contributes to danger.

This study shows that the management takes a role in safety management. Moreover, safety trainings/knowledge for employees is prerequisite for the management.

Anurak Unhasirikul(8) (1995) studied the application of the new concept on safety management in EGAT. Based on the study, it is found that trainings, coordination and monitoring are very important.

It is obvious that the trainings are required in safety management. Therefore, it is one of the topics for evaluation.

CHAPTER III
MATERIALS AND METHODS

This study is a cross section study with the purpose to study the occupational injury rate and safety management quality in state enterprises

3.1 Subjects

The study defines the state enterprises having the offices located in Bangkok Metropolis as the subject.

3.2 Tool of study

The instrument of study is the questionnaire applied from Chevron's Rating Process Peter Dan. It is divided into 3 parts as described below:

Part 1: General data comprising the type of state enterprises, number of employees, implementation period, safety management period, qualification of safety officers.

Part 2: Information on collected occupational injury caused by working in state enterprises including number and causes of occupational injury (classified by severity of the causes)

Part 3: Safety management data based on regulation and announcement of State Enterprise Relation Committee and Chevron's rating process. The answers to the questions will be evaluated in different levels as Poor, Fair, Good, and Excellent. The questionnaire in this part is aimed to get the details on safety management in 5 major topics as follows:

1. Organization and administration 30% (6 sub-elements) include:

1.1 Policy development

1.2 Systematic recruitment

1.3 Problem solving support and administration

1.4 Emergency response measures and safety

1.5 Safety rules and standard reference

1.6 Administration of bodies responsible for pushing forward safety activities

2. **Hazard control 35%** (14 sub-elements) includes:
   - 2.1 Workplace cleaning and keeping in order
   - 2.2 Hazard preventing shield
   - 2.3 Prevention of hazard from working environment and area plan arrangement
   - 2.4 Hazardous chemical controlling measures
   - 2.5 Personal protective equipment
   - 2.6 Fire prevention system
   - 2.7 Control of health problems probably resulting from working environment
   - 2.8 General information on hazardous chemicals
   - 2.9 Hazard indication and analysis
   - 2.10 Permission requesting system for working in the controlled area
   - 2.11 Safety equipment preparation
   - 2.12 Maintenance
   - 2.13 Waste management control
   - 2.14 Engineering control (design)
3. **Training and motivation 20%** (9 sub-elements) include:
   - 3.1Training, orientation for new employees, and rotation of duties and responsibilities
   - 3.2 Employee training
   - 3.3 Safety instruction and training
   - 3.4 Safety process / practice regulation
   - 3.5 Safety inspection and internal follow-up
   - 3.6 Group meeting
   - 3.7 Contact / communication on safety
   - 3.8 Safety recommendations
   - 3.9 Safety awareness
4. **Accident investigation and cause analysis 10%** (4 sub-elements) include:
   - 4.1 Accident investigation by task controller
   - 4.2 Accident cause analysis
   - 4.3 Investigation result monitoring and protection
   - 4.4 Systematic reporting and keeping
5. **Off-the-job safety 5%** (2 sub-elements) includes:
   - 5.1 Arrangement of responsible persons and service / administration
   - 5.2 Investigation, report, and cause analysis

Table 3-1: The evaluation criteria are as follows:

Considered items		Poor	Fair	Good	Excellent
1.	**Organization and administration**				
1.1	Establishment of policy and determination of duties and responsibilities	No written policy	- Written policy available but without application announcement - No provision in the company to establish the policy	- Written policy signed by the executives available with application announcement and communication to the employees - Clear provision to establish the policy	- Announcement of the written policy signed by the executives and communication to the employees for understanding - Clear provision to establish the policy which requires periodical review to keep up with the current situation
		0 point	8 points	14 points	20 points
1.2	Systematic new employee recruitment	No criteria for selecting employees or selection may only be based on the selector's experiences	Written criteria available for the selection of employees	Written criteria available for the selection of employees, and distributed to the employees involved	Training conducted for the selector
		0 point	4 points	7 points	10 points
1.3	Support and administration of problem solving	No budget arranged for activities on safety, occupational health and environment	Budget arrangement available but not continuously	Budget arranged continuously on yearly basis	Budget arranged continuously on yearly basis with support from the executives to efficiently solve the problems
		0 point	12 points	21 points	30 points

Table 3-1: Sub-topic of Part 3 questionnaire, the evaluation criteria (continued)

Considered items		Poor	Fair	Good	Excellent
1.4	Emergency response measures and safety	No measures for emergency response, neither safety officers	Emergency response measures available but without application announcement according to documentation system control or safety officers provided but not all through working activities	Application announcement according to documentation system control or safety officers provided all through working activities	- measures for emergency response available - regular training with some improvements in each training appropriately
		0 point	4 points	7 points	10 points
1.5	Safety rules and standard reference	No safety rules, neither standard reference in writing	Safety rules available with standard reference in writing	Safety rules available with standard reference in writing according to documentation control system	Safety rules available with standard reference in writing according to documentation control system, and communication to the employees or training continuously conducted to the employees
		0 point	4 points	7 points	10 points
1.6	Responsible body arrangement	No office of responsible persons	Responsible persons available	- Responsible persons available specifically for	- Responsible persons available specifically

Table 3-1: Sub-topic of Part 3 questionnaire, the evaluation criteria (continued)

Considered items		Poor	Fair	Good	Excellent
	and pushing forward of safety activities	specifically for safety activities	specifically for safety management, but not directly reporting to those having authority to supervise the activities	safety management, and directly reporting to those having authority to supervise the activities - Establishment of committee for safety, occupational health and environment	for safety management, and directly reporting to those having authority to supervise the activities - meeting of the committee for safety, occupational health and environment continuously organized to efficiently push forward the activities
		0 point	8 points	14 points	20 points
2.	**Hazard control**				
2.1	Workplace cleaning and keeping	No requirement for controlling the employees to specially make the cleaning	Requirement in writing for the employees to make the cleaning	Practicing of the cleaning system of Five Sor or other systems controlling sanitation of working environment	Practicing of the cleaning system of Five Sor or other systems controlling sanitation of working environment with continuous inspection and improvements
		0 point	4 points	7 points	10 points
2.2	Hazard preventing shield	No Hazard preventing shield available	Hazard preventing shield available, but inspection	Hazard preventing shield available with inspection and	Hazard preventing shield available with efficient inspection

Table 3-1: Sub-topic of Part 3 questionnaire, the evaluation criteria (continued)

Considered items		Poor	Fair	Good	Excellent
			and maintenance not efficient	maintenance identified clearly	and maintenance, i.e. preventive maintenance
		0 point	2 points	3 points	5 points
2.3	Hazard prevention from working environment and working area plan	No risk evaluation in the workplace, neither arrangement of working area plan	Risk evaluation available in the workplace with arrangement of working area plan	Risk evaluation available with appropriate risk control measures	Risk evaluation available with appropriate risk control measures according to the documentation control system
		0 point	3 points	6 points	8 points
2.4	Hazardous chemical controlling measures	No hazardous chemical controlling measure available	Hazardous chemical controlling measure available	Preparation of hazardous chemical registration and MSDS for appropriate use of the employees	Safety evaluation provided for new chemicals with appropriate controlling measures
		0 point	2 points	3 points	5 points
2.5	Personal protective equipment	Personal protective equipment not provided to the employees	Personal protective equipment provided to the employees but without efficient controlling system	Personal protective equipment provided to the employees with requisition system for use in appropriate working status	Personal protective equipment provided to the employees with requisition system for use in appropriate working status as well as with inspection of report or identification of using demand by theposition clearly
		0 point	3 points	6 points	8 points

Table 3-1: Sub-topic of Part 3 questionnaire, the evaluation criteria (continued)

Considered items		Poor	Fair	Good	Excellent
2.6	Fire prevention system	No fire prevention system	Fire extinguishing equipment installed	Available installation of fire resistant equipment, fire detection equipment, and Fire extinguishing equipment	Available inspection of readiness and repairing of fire resistant equipment , fire detection equipment and fire extinguishing equipment
		0 point	4 points	7 points	10 points
2.7	Control of health problems probably resulting from working environment	No control of health problem resulting from working environment	Medical treatment service provided	Evaluation of problems resulting from working environment with medical treatment service and annual physical check-up provided	Employees' health problem analysis with controlling measures provided
		0 point	4 points	7 points	10 points
2.8	General information on hazardous chemicals	No hazardous chemical controlling measures available	MSDS preparation for use	MSDS preparation for use, and training provided for the employees involved or communication for the employees' acknowledgement / practice	MSDS review and training provided for the employees involved or communication for the employees' acknowledgement / practice
		0 point	2 points	3 points	5 points

Table 3-1: Sub-topic of Part 3 questionnaire, the evaluation criteria (continued)

Considered items		Poor	Fair	Good	Excellent
2.9	Hazard indication and analysis	No hazard indication and analysis available 0 point	Hazard indicated from the activities 2 points	Analysis of hazard found in the indication 3 points	Determination of Measures controlling problematic hazard 5 points
2.10	Permission requesting system for working in the controlled area	No permission requesting system for working 0 point	Permission requesting system available for working in the controlled area 3 points	Permission requesting system for working in the controlled area available in the form of announcement according to documentation control system 6 points	- Permission requesting system for working in the controlled area available in the form of announcement according to documentation control system -The training or communication for acknowledgement of the employees - Instruction provided to new employees for practicing 8 points
2.11	Safety equipment preparation	No safety equipment preparation	Safety equipment prepared in compliance with hazard condition	Safety equipment prepared in compliance with hazard condition and inspected or repaired appropriately	- Safety equipment prepared in compliance with hazard condition and inspected or repaired appropriately - Report of inspection in writing available

Table 3-1: Sub-topic of Part 3 questionnaire, the evaluation criteria (continued)

Considered items		Poor	Fair	Good	Excellent
		0 point	3 points	6 points	8 points
2.12	Maintenance	No maintenance system available	Maintenance system available	Preventive maintenance system available	- Preventive maintenance system available with maintenance analysis and report in writing
		0 point	2 points	3 points	5 points
2.13	Waste management control	No special control measures available	Containers provided in case of chemical spillage with the area for body cleaning and emergency eye cleaning	Containers provided in case of chemical spillage with response plan preparation	Preparation of response plan in case of chemical spillage with regular practice drill
		0 point	2 points	3 points	5 points
2.14	Engineering control	No special control measures available	Proper and appropriate design and equipment production and repair	Proper and appropriate design and equipment production and repair under prior permission of the head of engineering work	- Proper and appropriate design and equipment production and repair under prior permission of the head of engineering work - Risk assessment techniques are used to identify appropriate controlling measures
		0 point	3 points	6 points	8 points

Table 3-1: Sub-topic of Part 3 questionnaire, the evaluation criteria (continued)

Considered items		Poor	Fair	Good	Excellent
3.	**Training and motivation**				
3.1	Training, orientation for new employees, and rotation of duties and responsibilities	No training provide for new employees 0 point	Orientation / training provided to new employees 4 points	Orientation / training provided to new employees, and instruction made to the employees with the transfer of duties and responsibilities 7 points	- Orientation / training provided to new employees, and instruction made to the employees with transfer of duties and responsibilities - Clear examinations also given to the employees 10 points
3.2	Employee training	No training provided for the employees 0 point	Training provided for the employees of each working position 6 points	Planning system of the training available 11 points	Basic training need provided for each working position with training record according to the plan 16 points
3.3	Safety instruction and training	No safety training available 0 point	Safety training provided to all current employees 8 points	Safety training provided to all current and new employees 14 points	Safety training conducted as basic training need to all employees of all working position 18 points
3.4	Safety Process / regulation	No determination of Process / regulation on safety	Process / regulation on safety available but without application announcement	Process / regulation on safety available in writing	Process / regulation on safety available in writing according to documentation control system

Table 3-1: Sub-topic of Part 3 questionnaire, the evaluation criteria (continued)

Considered items		Poor	Fair	Good	Excellent
		0 point	in writing 6 points	10 points	15 points
3.5	Safety inspection and internal follow-up	No safety inspection available	Safety inspection responsible by the office of safety	All offices required for safety inspection, or establish safety inspection committee where the office of safety joins or randomly inspects the safety	All offices required for safety inspection with the report provided in writing, and the follow-ups
		0 point	2 points	4 points	6 points
3.6	Group meeting	No group meeting to communicate about safety in each office	Safety is an issue of the meeting in the office.	All offices required to organized continuously the group meeting on safety	All offices required to organized continuously the group meeting on safety with the meeting evaluation
		0 points	2 points	4 points	6 points
3.7	Contact / communication on safety	No communication system available	Communication system available inside the company	Communication system available both inside and outside the company	Communication system available both inside and outside the company with the specification in writing according to documentation control system
		0 point	6 points	10 points	15 points
3.8	Safety Recommendations	No recommendation on safety	Recommendation on safety available and	Recommendation on safety available and	Recommendation is analyzed to evaluate the

Table 3-1: Sub-topic of Part 3 questionnaire, the evaluation criteria (continued)

Considered items		Poor	Fair	Good	Excellent
		available 0 point	notified only on hierarchy of immediate superior 4 points	notified on hierarchy of immediate superior and committee as recommended 6 points	problems and consider providing controlling measures appropriately. 8 points
3.9	Safety awareness and public relations	No measures for safety awareness and public relations available 0 point	Distribution of safety information to the employees to build up hazard awareness 2 points	Training provided to the employees to enhance safety awareness with safety information distributed 4 points	Evaluation on attitudes towards safety available with improvements 6 points
4.	**Investigation and accident cause analysis**				
4.1	Accident investigation by task controller	No report and investigation of accidents 0 point	Report and investigation of accident available in writing 14 points	Report and investigation of accident available in writing and specified as operational regulation 25 points	Report and investigation of accident available and instruction on the incidents made to new employees 35 points
4.2	Accident cause analysis	No accident cause analysis	Accident cause analysis available, but without consideration on root cause	Accident cause analysis available to search for root cause	Accident cause analysis available with report submitted to the immediate superior to consider identifying

Table 3-1: Sub-topic of Part 3 questionnaire, the evaluation criteria (continued)

Considered items		Poor	Fair	Good	Excellent
					additional measures
		0 point	12 points	21 points	30 points
4.3	Investigation result monitoring and investigation	No follow-up of the investigation result for correction / prevention	Follow-up of the investigation result for correction / prevention available inside the office section	Central unit available to collect the list of accidents with pending correction / prevention and report provided	Follow-up available for correction / prevention of the accidents on monthly basis
		0 point	6 points	10 points	15 points
4.4	Systematic reporting and storing	Keeping of accident list in writing not available	Keeping of accident list available at each office, but not at the central unit where the list of accidents collected from each office can be presented.	List of accidents totally collected at the central unit	Keeping methods available and implemented under supervision of the responsible persons with periodical review of the keeping
		0 point	8 points	14 points	20 points
5.	**After-work safety**				
5.1	Arrangement of responsible persons and service / administration	No response system available	Responsible persons available for administration / service only during normal office hours	Responsible persons available for administration / service with the contract made to the office involved to serve the case of illness	Responsible persons available for coordination all through 24 hours including the contract made to the office involved to serve the case of illness
		0 point	24 points	42 points	60 points

Table 3-1: Sub-topic of Part 3 questionnaire, the evaluation criteria (continued)

Considered items		Poor	Fair	Good	Excellent
5.2	Investigation, report, and cause analysis	No report and investigation of accidents	Accident report available in writing	Report and investigation of accidents available in writing and specified as operational regulation	Report and investigation of accidents available with follow-up for correction / prevention including accident analysis
		0 point	16 points	28 points	40 points

3.3 Data collection

The researcher drafted and sent a letter to the highest-level executive of the state enterprises to ask for their appreciated cooperation in answering the questionnaire, or their assignment of the other person who is considered appropriate to answer the questionnaire. The researcher will contact the person who gives the answers immediately to check the completion of the information received.

3.4 Statistical analysis

The data derived from the questionnaire are analyzed and divided into 3 parts

Part I: General data of state enterprises are classified as the frequency and percentage.

Part II: Occupational injury data and injury frequency rate of state enterprises' employees are classified as the average data including the comparison of injury frequency rate according to the category of state enterprises.

Part III: Safety management quality of state enterprise is classified as the average data, standard deviation, chi-square and Pearson's correlation.

CHAPTER IV
RESULTS

This research aims to study safety management of state enterprises and presents the study results in 3 parts:

Part 1 Study result and analysis of general data

Part 2 Study result and analysis of occupational injury data and rate

Part 3 Study result and analysis of safety management quality

And they are divided into 5 sectors.

- Organization arrangement and general management
- Hazard control
- Training and motivation
- Investigation and accident cause anal
- After-work safety

Part 1 Result of the general background information

Table 4-1 Number and percentage of general information of the state enterprises

Description	Number (Percent)	
	Population	Sample
Classification of state enterprises according to the business		
1. Financial service	5(12.50)	0(0.00)
2. Transport of goods and people	8(20.00)	2 (13.33)
3. Production industry	15(37.50)	10(66.67)
4. Other services apart from financial service	12(30.00)	3(20.00)
Operational period of the state enterprises (year)		
1. <30	11(27.50)	5(33.33)
2. 30-39	7(17.50)	3(20.00)
3. 40-49	9(22.50)	4(26.67)

Table 4-1 Number and percentage of general information of the state enterprises (continued)

Description	Number (Percent)	
	Population	**Sample**
4. >50	13(32.50)	3(20.00)
Average age of operation of the state enterprises	41.60	35.67

Description	Number (Percent)	
	Population	**Sample**
Number of employees		
1. ≤500	9(22.50)	1(6.67)
2. 501 – 2500	12(30.00)	4(26.67)
3. 2501 – 4500	6(15.00)	3(20.00)
4. ≥4501	13(32.50)	7(46.66)
Average number of employees of the state enterprises	5931.08	8368.33

Description	Number (Percent)	
	Population	**Sample**
State enterprises implementing safety management		
1. Available	15	50.00
2. Not available	25	50.00
Safety management implementing period (years)		
1. 1 – 10	5	33.33
2. ≥10	10	66.67
Average safety implementing period	14.13 years	
Number of professional safety officer		
1. 1 – 5	5	33.34
2. 5 – 10	1	6.66
3. >10	9	60.00
Average number of professional safety officer	34.2	

Table 4-1 Number and percentage of general information of the state enterprises (continued)

Description	Number (Percent)	
	Population	Sample
Qualification of professional safety officer		
1. Bachelor degree (safety)	21	3.85
2. With 192-hour-training	80	14.65
3. With 180-hour-training	425	77.84
4. Basic safety officer	9	1.65
5. Before the existence of laws	11	2.01

From the Table 4-1 above, it was found that the 40 surveyed state enterprises could be divided into 4 categories as follows:

1. Five state enterprises of financial service equal to 12.50% of the population, but no state enterprises of this category are found implementing safety. So, no representative of this category is in the sample group or equals to 0% in the sample group.

2. Eight state enterprises of goods and public transport equal to 20.00% of the population. 2 state enterprises of this category are the representatives in the sample group or equal to 13.33% in the sample group.

3. Fifteen state enterprises of production industry equal to 37.50% of the population. 10 state enterprises of this category are the representatives in the sample group or equal to 66.67% in the sample group.

4. twelve state enterprises of other categories apart from financial service equal to 30.00%. 3 state enterprises of this category are the representatives in the sample group or equal to 20.00% in the sample group.

In considering the establishment of the state enterprises, 11 state enterprises are less than 30 years of establishment equaling to 27.50% of the population, and 5 of which are the representatives in the sample group or equal to 33.33% of the sample group. 7 state enterprises are 30-39 years of establishment equaling to 17.50% of the population, and 3 of which are the representatives in the sample group or equal to 20.00% of the sample group. 9 state enterprises are 40-49 years of establishment equaling to 22.50% of the population, and 4 of which are the representatives in the sample group or equal to 26.67% of the sample group. 13 state enterprises are over 50 years of establishment equaling to 32.50% of the population, and 3 of which are the

representatives in the sample group or equal to 20.00% of the sample group. As a result, the average year of establishment of state enterprises in the population is 41.60 years while that of the state enterprises in the sample group is 35.67 years.

Regarding the size of state enterprises, it was found that 12 state enterprises having 501-2,500 employees are 30.00% of the population, and 4 of which are the representatives in the sample group or equal to 26.67%. 13 state enterprises having more than 4,501 employees are 32.50% of the population, and 7 of which are the representatives in the sample group or equal to 46.66% of the sample group. 9 state enterprises having less than or equal to 501 employees are 22.50% of the population, and 1 of which is the representative in the sample group or equal to 6.67% of the sample group. The 6 remaining state enterprises having between 2,501-4,500 employees are 15.00% of the population, and 3 of which are the representative in the sample group or equal to 20.00% of the sample group. Then, the average number of employees of all 40 state enterprises is 5,931.08 while the average number of employees in the sample group is 8,368.33.

Among the forty surveyed state enterprises, 15 were found implementing properly safety management and could be used as the sample for this study.

It was also noticeable that among 15 state enterprises implementing safety management, no state enterprise of financial service category was found.

Among the fifteen state enterprises implementing safety management,10 implemented after the year 1992 (after the Notification of State Enterprise Relation Committee on “Employees’ Occupational Safety” had been put into effect.) and equal to 66.67%, whereas the other 6 or equaling to 33.33% implemented before the year 1992. In overall picture, it was found that the average safety management implementing period of 15 state enterprises is 14.13 years.

As for safety officers, most of the state enterprises implementing safety management have more than 1 safety officers. There are 9 state enterprises having more than 10 safety officers equaling to 40%, whereas 5 and 1 state enterprises with 1-5 and 5-10 safety officers equal to 16.67% and 3.33% respectively. The safety officers were mostly trained. 425 safety officers with 180-hour training equal to 77.84%, whereas 80 safety officers with 190-hour-training and 9 basic safety officers equal to 14.65% and 1.65% respectively. There are 21 safety officers with Bachelor Degree in the field of occupational health equaling to 3.85%, and apart from all afore-mentioned, there are 11 safety officers available before the existence of laws equaling to 2.01%. So, the average number of safety officers of all 15 state enterprises is 34.2

Part 2 Study result and analysis of occupational injury data and rate

Table 4-2 Number and percentage of the injured in 1999-2001 in the state enterprises implementing safety management

Description		Number and Percentage		
Number of the injured (persons)		1999	2000	2001
1.	Death	13 (1.09)	14 (1.04)	17 (1.27)
2.	Disable	2 (1.07)	3 (0.22)	2 (0.15)
3.	Stop working	217 (18.25)	298 (22.19)	245 (18.28)
4.	Not stop working	957 (80.49)	1,028 (76.55)	1,076 (80.30)
	Total	1,189 (100.00)	1,343 (100.00)	1,340 (100.00)

In 15 surveyed state enterprises, 1,189 injured were found in 1999 with an increase to 1,343 and 1,340 in 2000 and 2001 respectively. The percentage of death, disable, stop working and not stop working is described in the Table 4-2.

Table 4-3 Average number and average occupational injury rate in 1999-2001

Occupational injury information	Average value		
	1999	2000	2001
Number of occupational injured Number / state enterprises implementing safety management / year	79.27	89.53	89.33
Occupational injury rate $\frac{\text{Number of the injured x 1000}}{\text{Number of employees in state enterprises}}$	6.39	7.22	7.21

From the Table 4-3 above, the average number of occupational injured in 15 state enterprises in 1999 is 79.27 persons/year, with an increase to 89.53 persons/year and 89.33 persons/year in 2000 and 2001 respectively. The occupational injury rate per 1000 persons in 1999 is 6.39, also with an increase to 7.22 and 7.21 in 2000 and 2001 respectively.

Table 4-4 Occupational injury rate per 1000 persons classified by state enterprise category

State Enterprise Category (only the state enterprises implementing safety management)	Occupational Injury Rate			
	Total	Average		
		1999	2000	2001
Category II Transport of goods and people	5.81	3.15	7.27	7.00
Category III Production industry	14.32	14.00	14.21	14.76
Category IV Other services apart from financial service	1.28	1.41	1.43	0.99

Table 4-4 above showed that , from 15 studied state enterprises , the average occupational injury rate per 1000 persons of the production industry category is high (14.32), whereas that of the transport of goods and people category is 5.81, and other services apart from financial service category has the lowest average rate, that is 1.28.

Part 3 Result of the safety management quality

Table 4-5 Average value of safety management evaluation in each item classified by the state enterprises implementing safety management

Evaluated Items	Category II	Category III	Category IV	Average Value
1. Organization arrangement and general management				
- Policy development	14(G)	17(G)	16(G)	15.67(G)
- Systematic recruitment	5.5(F)	7.9(G)	9(G)	7.46(G)
- Problem solving support and management	10.5(F)	21.9(G)	17.33(F)	16.58(F)
- Employee training	11(G)	12.4(G)	12.67(G)	12.02(G)

Table 4-5 Average value of safety management evaluation in each item classified by the state enterprises implementing safety management (continued)

Evaluated Items	Category II	Category III	Category IV	Average Value
and safety				
- Safety rules with standard reference	5.5(F)	6.7(F)	7(G)	6.4(G)
- Administration of bodies responsible for pushing forward safety activities	17(G)	16.6(G)	16(G)	16.53(G)
Average evaluation result	59.5(F)	77.7(G)	73.33(G)	70.17(G)
2. Hazard control				
- Workplace cleaning and keeping in order	6(F)	8.8(G)	10(G)	8.27(G)
- Hazard preventing shield	2.5(F)	2.9(F)	3(G)	2.8(F)
- Prevention of hazard from working environment and area plan arrangement	3(F)	5.8(F)	5.67(F)	4.82(F)
- Hazardous chemical controlling measures	1.5(P)	2.4(F)	2.33(F)	2.08(F)
- Personal protective equipment	3.5(F)	5.6(F)	5(F)	4.7(F)
- Fire prevention system	7.5(G)	9.3(G)	10(F)	8.93(G)
- Control of health problems probably resulting from working environment	4(F)	7.6(G)	6.67(F)	6.09(F)
- General information on hazardous chemicals	2(F)	3(G)	3.33(G)	2.78(F)
- Hazard indication and analysis	2(F)	3.5(G)	3.33(G)	2.94(F)
- Permission requesting system for working in the controlled area	3(F)	4.5(F)	4(F)	3.83(F)

Table 4-5 Average value of safety management evaluation in each item classified by the state enterprises implementing safety management (continued)

Evaluated Items	Category II	Category III	Category IV	Average Value
- Safety equipment preparation	4(F)	5.6(F)	5(F)	4.87(F)
- Maintenance	2(F)	3.1(G)	3.33(G)	2.81(F)
- Waste management control	2.5(F)	3.2(G)	2.67(F)	2.79(F)
- Engineering control	4(F)	4.8(F)	4.33(F)	4.38(F)
Average evaluation result	47.5(F)	70.1(G)	68.66(F)	62.09(F)
3. Training and motivation				
- Training, new employee orientation, and rotation of duties and responsibilities	5.5(F)	5.3(F)	8(G)	6.27(F)
- Employee training	11(G)	12.4(G)	12.67(G)	12.02(G)
- Safety instruction and training	14(G)	14.4(G)	13.33(F)	13.91(F)
- Safety process / practice regulation	8(F)	11.2(G)	10.33(G)	9.84(F)
- Safety inspection and internal follow-up	3(F)	4.6(G)	5.33(G)	4.31(G)
- Group meeting	2(F)	3.6(F)	2.67(F)	2.76(F)
- Contact / communication on safety	7.5(F)	11.6(G)	10.33(G)	9.81(F)
- Safety recommendations	5(F)	5.4(F)	6(G)	5.47(F)
- Safety awareness	3(F)	3.6(F)	3.33(F)	3.31(F)
Average evaluation result	59(F)	72.1(G)	71.99(G)	67.7(F)
4. Accident investigation and cause analysis				
Accident investigation by task controller	30(G)	28(G)	25(G)	27.67(G)
Accident cause analysis	25.5(G)	24.6(G)	18(G)	22.7(G)

Table 4-5 Average value of safety management evaluation in each item classified by the state enterprises implementing safety management (continued)

Evaluated Items	Category II	Category III	Category IV	Average Value
Investigation result monitoring and protection	8(F)	10.6(G)	8.67(F)	9.09(F)
Systematic reporting and storing	14(G)	15.6(G)	18(G)	15.86(G)
Average evaluation result	77.5(G)	78.8(G)	69.67(F)	75.32(G)
5. After work safety				
- Arrangement of responsible persons and service / administration	33(F)	38.4(F)	36(F)	35.8(F)
- Investigation, report, and cause analysis	28(G)	27.2(F)	24(F)	26.4(F)
Average evaluation result	61(F)	65.6(F)	60(F)	62.2(F)

The following evaluation result were found from the Table 4-5.

1. The organization arrangement and general management evaluation

3 sub-items of the state enterprise category II (Transport of goods and people) are evaluated “fair” comprising “systematic recruitment”, “problem solving support and management”, and “safety rules with standard references” while the other sub-items are of “good” level.

1 sub-item of the state enterprise category III (Production industry) is evaluated “fair”, that is “safety rules with standard references” while the other sub-items are of “good” level.

1 sub-item of the state enterprise category IV (Other services apart from financial service) is evaluated “fair”, that is “problem solving support and management” while the other sub-items are of “good” level.

In overall picture of organization arrangement and general management of each state enterprise, state enterprise category II (Transport of goods and people) is

evaluated fair while state enterprise category III (Production industry) and category IV (Other services apart from financial service) are evaluated good.

But in the overall evaluation of organization arrangement and general management, only 1 sub-item "Problem solving support and management" is of fair level while the other sub-items are of good level. In conclusion, the overall evaluation result of this item is of good level.

2. The hazard control evaluation

1 sub-item of the state enterprise category II (Transport of goods and people) is evaluated "poor", that is "Hazardous chemical controlling measures", another 1 sub-item "Fire prevention system" is "good" while the rest is "fair".

7 sub-items of the state enterprise category III (Production industry) are of "fair" level while the other 7 sub-items are of "good" level.

9 sub-items of the state enterprise category IV (Other services apart from financial service) are of "fair" level while the other 5 sub-items are of "good" level.

When considering hazard control evaluation of each state enterprise, it was found that the evaluation result of the state enterprise category III (Production industry) is "good" while that of the state enterprise category II (Transport of goods and people) and category IV (Other services apart from financial service) are "fair".

But in the evaluation of hazard control, the result is "good" for 2 sub-items "Workplace cleaning and keeping in order" and "Fire protection system" while the other sub-items are "fair". In conclusion, the overall evaluation result of this item is of "good" level.

3. The training and motivation evaluation

2 sub-items of the state enterprise category II (Transport of goods and people) comprising "Employee training" and "Safety instruction and training" are of "good" level while the other sub-items are "fair".

4 sub-items of the state enterprise category III (Production industry) are of "fair" level while the 5 other sub-items are "good".

3 sub-items of the state enterprise category IV (Other services apart from financial service) are of "fair" level while the 6 other sub-items are "good".

The overall evaluation result of training and motivation showed that the state enterprise category II (Transport of goods and people) is of "fair" level while the state enterprise category III (Production industry) and category IV (Other services apart from financial service) are of "good" level.

But in the evaluation of training and motivation, the result is “good” for 2 sub-items “Employee training” and “Safety inspection and internal follow-up” while that of the other sub-items are “fair”. In conclusion, the overall evaluation result of this item is of “fair” level.

4. The accident investigation and cause analysis evaluation

1 sub-item of the state enterprise category II (Transport of goods and people) is of “fair” level, that is “Investigation result monitoring and protection” while 3 sub-items comprising “Accident cause analysis”, “Accident investigation by task controller”, and “Systematic reporting and storing” are of “good” level.

The result of all 4 sub-items of the state enterprise category III (Production industry) is “good”.

1 sub-item of the state enterprise category IV (Other services apart from financial service) is of “fair” level while the 3 other sub-items comprising “Accident cause analysis”, “Accident investigation by task controller”, and “Systematic reporting and storing” are of “good” level.

When considering the overall evaluation of accident investigation and cause analysis of each state enterprise, it was found that the result of all state enterprises is “good”.

But in the evaluation of accident investigation and cause analysis, the result is “fair” for 1 sub-item “Investigation result monitoring and protection” while that of the other sub-items are “good”. In conclusion, the overall evaluation result of this item is of “good” level.

5. The after-work safety evaluation

All 2 sub-items of the state enterprise category II (Transport of goods and people) are of “fair” level.

Similarly, all 2 sub-items of the state enterprise category III (Production industry) and those of category IV (Other service apart from financial service) are of “fair” level.

When considering the overall evaluation of after-work safety of each state enterprise, it was found that the result of all state enterprises is “fair”.

But in the evaluation of after-work safety, the result is “fair” for all 2 sub-items. In conclusion, the overall evaluation result of this item is of “fair” level.

Table 4-6 The result of safety management quality in state enterprises

Evaluation Result	Number	Percentage
Less than 40 (improvement needed)	0	0
40.01 - 70.00 (Fair)	6	40.00
70.01 - 90.00 (Good)	8	53.33
90.00 - 100.00 (Excellent)	1	6.67

From the Table 4-6, it was shown that the evaluation result of safety management quality of 6 state enterprises equivalent to 40.00%, are "fair". 8 state enterprises equivalent to 53.33% are graded "good" whereas only 1 state enterprise is "excellent".

Table 4-7 The Average result of safety management quality according to the classification of state enterprises

Classification of state enterprises (Only the state enterprises implementing safety management)	Average value
Category II Transport of goods and people	58.86
Category III Production industry	73.65
Category IV Other services apart from financial service	68.28

Table 4-7 clearly showed that the state enterprise category III: production industry yields the maximum evaluation result 73.68, which is ranged "good" whereas the category IV: other services apart from financial service is ranged "fair" with the evaluation result 68.28, and the category II: transport of goods and passengers, with the evaluation result 58.86 is also ranged "fair".

Table 4-8 Relation between the studied variables and safety management quality in state enterprises

Studied Variables	X^2	df	r	p-value
Category of state enterprises (point)	Fisher's Exact Test			0.329
Size of state enterprises (number of employee)	-	-	0.128	0.650
Safety management implementing period (year)	-	-	0.299	>0.99
Safety officer qualification (safety officer-related certification)	-	-	0.202	0.471
Injury frequency rate	-	-	0.049	0.861

It was indicated by the study result that there is no relation between all variables (comprising the category and size of state enterprises, safety management implementing period, safety officer and injury frequency rate) and safety management quality on statistical basis.

CHAPTER V

DISCUSSION

5.1 Discussion of Study Design

In the study on relation between safety management quality and occupational injury rate in state enterprises, the researcher is well aware of errors existing in every procedure of the study and has controlled such errors by the following methods.

5.1.1 Instrument error

The researcher has used the standard evaluation criteria of Chevron Oil Company, which has been studied and widely accepted for safety management evaluation as afore-mentioned in Chapter 2 that it is suitable for this study because it is evaluation friendly due to its definite evaluation criteria. However, the researcher has viewed its disadvantage on the point scoring, that partly makes the safety management evaluation result distorted from the real fact in that the samples having similarity in the same subject will be different in detail. So, new researchers should pay more attention on this issue.

In the study procedure, the researcher has sent a letter to the top management of the state enterprises to kindly ask them to answer the questionnaire or to assign the personnel who are deemed appropriate by the top management to fill up the questionnaire. After contacting the involved officials with the purpose of getting perfect answer of the questionnaire, the researcher was aware that all state enterprises assigned their involved personnel to fill up the questionnaire. After even approaching the involved personnel, the researcher got to know that they have different level of knowledge on safety management that could lead to difference on safety management evaluation. So, new researchers should create measuring tool to test the involved personnel's knowledge for separating the sample groups.

5.1.2 Method error

The population of this study comprises 49 state enterprises, 40 of which returned the filled-up questionnaire whereas the other 9 did not even though the researcher asked for the return of it. Among the 40 state enterprises, only 15 of which have implemented safety management, resulting in less number of sample groups in comparison with the population. However, the researcher has made a statistical test of the sample group by the use of X^2 test, and found that due to the operational period and size of state enterprises, the distribution of the sample group and the targeted population are similar. Thus, the sample group is considered appropriate to represent the population for the study.

5.2 Discussion of Study Result

The result of Table 4-8 indicates that there is no relation between safety management quality and general information of the state enterprises such as its size, safety management operational period, and qualifications of safety officers.

The occupational injury statistics in Table 4-3 shows that occupational injury rate tends to be higher and more severe as shown in Table 4-4. In addition, it is indicated in Table 4-5 that the state enterprises dealing with production industry has maximum rate of occupational injury.

The study on safety management quality in state enterprises shows that the state enterprises dealing with production industry have the highest quality of safety management at 73.65% while the state enterprises dealing with the other services apart from financial service have the percentage of safety management quality at 68.28% and the state enterprises dealing with transport of goods and people at 58.86%.

Table 5-1 Safety Management Evaluation Result Separated by Items And Classified by State Enterprise Category

Evaluated Items	Category II				Category III				Category IV			
	E	G	F	P	E	G	F	P	E	G	F	P
Item 1	-	3	3	-	-	5	1	-	-	5	1	-
Item 2	-	1	12	1	-	7	7	-	-	4	10	-
Item 3	-	2	7	-	-	5	4	-	-	6	3	-
Item 4	-	3	1	-	-	4	-	-	-	3	1	-
Item 5	-	1	1	-	-	-	2	-	-	-	2	-
Total	-	10	24	1	-	21	14	-	-	18	17	-

But when consideration is made on the detail of each sub-item of safety management evaluation, it was found that the state enterprises dealing with the transport of goods and people have 10 sub-items in "good" level, 24 sub-items in "fair" level, and 1 sub-item in "poor" level. The state enterprises dealing with production industry have 21 sub-items in "good" level and 14 sub-items in "fair" level. And the state enterprises dealing with the other services apart from financial service have 18 sub-items in "good" level and 17 sub-items in "fair" level. But when consideration is made on the standard criteria of each sub-item with the evaluation result of "good" level, 25 sub-items of the state enterprises dealing with the transport of goods and people, 14 sub-items of the state enterprises dealing with production industry, and 17 sub-items of the state enterprises dealing with the other services apart from financial service need improvement.

And when it is to find the relation between safety management quality and occupational injury rate, no relation is found between these two variables with $r = 0.049$ and $p = 0.861$ as shown in Table 4-8.

It is noticeable that the state enterprises dealing with production industry gets the highest score of safety management quality evaluation or equivalent to 73.65% (Table 4-7), but own the highest rate of occupational injury with the average value of 14.32% (Table 4-4). This can be technically implied that senior management of the state enterprises dealing with production industry pay much interest in safety management because such category of state enterprises usually encounters with high risk in operation. Thus they can get the high score of safety management quality evaluation. Even though they have good safety management, the opportunity for occupational injury is still relatively high.

CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

It was found in this study that the accident statistics and occupational injury in the studied state enterprises tend to be increasingly high. The average accident statistics on yearly basis is 86.04 while the average occupational injury per 1,000 persons per year is 6.94.

The study on safety management quality in state enterprises showed that the evaluation result on safety management of 6 state enterprises or equivalent to 40.00% is "fair", the result of 8 state enterprises or equivalent to 53.33% is "good", and the result of only 1 state enterprise or equivalent to 6.67% is "excellent".

Among 4 categories of state enterprises, the state enterprise category III (Production industry) gets the highest score of safety management evaluation or equivalent to 73.65% while the state enterprise category II (Transport of goods and people), and the state enterprise category IV (Other services apart from financial service) get the result of 58.86% and 68.28% respectively, making the average of total evaluation result of 66.93%.

But when consideration is made on the detail of each sub-item of safety management evaluation, it was found that the state enterprises dealing with the transport of goods and people have 10 sub-items in "good" level, 24 sub-items in "fair" level, and 1 sub-item in "poor" level. The state enterprises dealing with production industry have 21 sub-items in "good" level and 14 sub-items in "fair" level. And the state enterprises dealing with the other services apart from financial service have 18 sub-items in "good" level and 17 sub-items in "fair" level. But when consideration is made on the standard criteria of each sub-item with the evaluation result of "good" level, 25 sub-items of the state enterprises dealing with the transport of goods and people, 14 sub-items of the state enterprises dealing with production industry, and 17 sub-items of the state enterprises dealing with the other services apart from financial service need improvement.

When the study is made on the relation between safety management quality and occupational injury as defined in the study hypothesis, it was found that safety management quality has no relation with occupational injury by means of the statistical value r = 0.049 and P = 0.861, which can be described from the collected information that the state enterprises having high scores on safety management evaluation previously had the information on high occupational injury. This can be drawn to the fact that the state enterprises giving more interests in safety management usually are the state enterprises that previously had high occupational injury. As a result, top management of the state enterprises has such obvious information on this problem and become more interested in safety management. Then undoubtedly, this matter leads to relatively high score on safety management quality.

6.2. Recommendation for the further study

1. Study on appropriate safety management model to be applied in today's business
2. Study on relation between safety management quality and accident risk
3. Study on the comparison of safety management system between state enterprises and private business in Thailand

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APPENDIX

Questionnaire of Safety Management in State Enterprises

Part 1 General Data

General Features

1. Business category_____
2. Operationalperiod_____year(s)
3. Number of employees and working period
   - 3.1 Total number of employees _____ Day time _____ Shift time _____
     Male_____ Female_____
     Number of laborers for specific job _____
   - 3.2 Normal working period _____ hours per day
   - 3.3 In case of shift working: Morning shift at _____
     Afternoon shift at _____
     Night shift at _____
4. Safety management implementing period _____year(s)
5. Number of safety officers _____
6. Appropriate number of safety officer in the organization _____
7. Qualification of safety officers
   1. Bachelor of Occupational Health
   2. Having been trained in safety officer course for 180 hours
   3. Others (specify)

Part 2 The Data of Occupational Injury of State Enter Prise's Employees for the year 1999-2001

Year	Frequency of injury	Number of Stop working Date	Number of injury	Number of injury (persons)				
				Death	Disable	Stop working	Non stop Working	Total
1999								
2000								
2001								

Part 3 Safety Management

Considered Item	Safety Management Evaluation			
	Poor	**Fair**	**Good**	**Excellent**
1. Organization arangement and general management				
- Policy development - Systematic recruitmnt - Problem solving support and management - Emergency response measure and safety - Safety rules with standard references - Administration of bodies responsible for pushing forward safety activities				
2. Hazard control				
- Workplace cleaning and keeping in order - Hazard preventing shield				

Part 3 Safety Management (continue)

Considered Item	Safety Management Evaluation			
	Poor	Fair	Good	Excellent
- Hazardous chemical controling measures - Personal protective equipment - Fire prevention system - Control of health problems probably resulting from working environment - General information on hazardous chemicals - Hazard indication and analysis - Permission requesting system for working in the control area - Safety equipment preparation - Maintenance - Waste management control - Engineering control				
3. Training and motivation				
- Training, new employee orientation, and rotation of duties and responsibilities - Employees training - Safety instruction and training - Safety process / practice regulation - Safety inspection and internal follow- up - Grouping meeting - Contact / comunication on safety - Safety recomedations - Safety awareness				
4. Accident investigation and cause analysis				
- Accident investigation by task control - Accident cause analysis				

Part 3 Safety Management (continue)

Considered Item	Safety Management Evaluation			
	Poor	**Fair**	**Good**	**Excellent**
- Investigation result monitoring and protection - Systematic reporting and storing				
5. After working				
- Arrangement of responsible persons and service / administration - Investigation, report, and cause analysis				

Sub-topic of part 3 questionnaires, the evaluation criteria are as follows:

Considered items		**Poor**	**Fair**	**Good**	**Excellent**
1.	**Organization & administration**				
1.1	Establishment of policy and determination of duties and responsibilities	No written policy	- Written policy available but without application announcement - No provision in the company to establish the policy	- Written policy signed by the executives available with application announcement and communication to the employees - Clear provision to establish the policy	-Announcement of the written policy signed by the executives and communication to the employees for understanding - Clear provision to establish the policy which requires periodical review to keep up with the current situation
1.2	Systematic new	No criteria	Written criteria	Written criteria	Training

Considered items		Poor	Fair	Good	Excellent
	employee recruitment	for selecting employees or selection may only be based on the selector's experiences	available for the selection of employees	available for the selection of employees, and distributed to the employees involved	conducted for the selector
1.3	Support and administration of problem solving	No budget arranged for activities on safety, occupational health and environment	Budget arrangement available but not continuously	Budget arranged continuously on yearly basis	Budget arranged continuously on yearly basis with support from the executives to efficiently solve the problems
1.4	Emergency response measures and safety	No measures for emergency response, neither safety officers	Emergency response measures available but without application announcement according to documentation system control or safety officers provided but not all through	Application announcement according to documentation system control or safety officers provided all through working activities	- measures for emergency response available -Regular training with some improvements in each training appropriately

Considered items		Poor	Fair	Good	Excellent
			working activities		
1.5	Safety rules and standard reference	No safety rules, neither standard reference in writing	Safety rules available with standard reference in writing	Safety rules available with standard reference in writing according to documentation control system	Safety rules available with standard reference in writing according to documentation control system, and communication to the employees or training continuously conducted to the employees
1.6	Responsible body arrangement and pushing forward of safety activities	No office of responsible persons specifically for safety activities	Responsible persons available specifically for safety management, but not directly reporting to those having authority to supervise the activities	- Responsible persons available specifically for safety management, and directly reporting to those having authority to supervise the activities - Establishment of committee for safety, occupational	- Responsible persons available specifically for safety management, and directly reporting to those having authority to supervise the activities - meeting of the committee for safety, occupational

Considered items		Poor	Fair	Good	Excellent
				health and environment	health and environment continuously organized to efficiently push forward the activities
2.	**Hazard control**				
2.1	Workplace cleaning and keeping	No requirement for controlling the employees to specially make the cleaning	Requirement in writing for the employees to make the cleaning	Practicing of the cleaning system of Five Sor or other systems controlling sanitation of working environment	Practicing of the cleaning system of Five Sor or other systems controlling sanitation of working environment with continuous inspection and improvements
2.2	Hazard preventing shield	No Hazard preventing shield available	Hazard preventing shield available, but inspection and maintenance not efficient	Hazard preventing shield available with inspection and maintenance identified clearly	Hazard preventing Shield available with efficient inspection and maintenance, i.e. preventive maintenance
2.3	Hazard prevention from working	No risk evaluation in the	Risk evaluation available in the workplace with	Risk evaluation available with appropriate risk	Risk evaluation available with appropriate risk

Considered items		Poor	Fair	Good	Excellent
	environment and working area plan	workplace, neither arrangement of working area plan	arrangement of working area plan	control measures	control measures according to the documentation control system
2.4	Hazardous chemical controlling measures	No hazardous chemical controlling measure available	Hazardous chemical controlling measure available	Preparation of hazardous chemical registration and MSDS for appropriate use of the employees	Safety evaluation provided for new chemicals with appropriate controlling measures
2.5	Personal protective equipment	Personal protective equipment not provided to the employees	Personal protective equipment provided to the employees but without efficient controlling system	Personal protective equipment provided to the employees with requisition system for use in appropriate working status	Personal protective equipment provided to the employees with requisition system for use in appropriate working status as well as with inspection of report or identification of using demand by the position clearly
2.6	Fire prevention system	No fire prevention system	Fire extinguishing equipment	Available installation of fire resistant	Available inspection of readiness and

Considered items		Poor	Fair	Good	Excellent
			installed	equipment, fire detection equipment, and Fire extinguishing equipment	repairing of fire resistant equipment, fire detection equipment and fire extinguishing equipment
2.7	Control of health problems probably resulting from working environment	No control of health problem resulting from working environment	Medical treatment service provided	Evaluation of problems resulting from working environment with medical treatment service and annual physical check-up provided	Employees' health problem analysis with controlling measures provided
2.8	General information on hazardous chemicals	No hazardous chemical controlling measures available	MSDS preparation for use	MSDS preparation for use, and training provided for the employees involved or communication for the employees' acknowledgement / practice	MSDS review and training provided for the employees involved or communication for the employees' acknowledgement / practice
2.9	Hazard indication and analysis	No hazard indication and	Hazard indicated from the activities	Analysis of hazard found in the indication	Determination of measures controlling

Considered items		Poor	Fair	Good	Excellent
		analysis available			problematic hazard
2.10	Permission requesting system for working in the controlled area	No permission requesting system for working	Permission requesting system available for working in the controlled area	Permission requesting system for working in the controlled area available in the form of announcement according to documentation control system	- Permission requesting system for working in the controlled area available in the form of announcement according to documentation control system - The training or communication for acknowledgement of the employees -Instruction provided to new employees for practicing
2.11	Safety equipment preparation	No safety equipment preparation	Safety equipment prepared in compliance with hazard condition	Safety equipment prepared in compliance with hazard condition and inspected or repaired appropriately	- Safety equipment prepared in compliance with hazard condition and inspected or repaired appropriately -Report of inspection in writing

Considered items		Poor	Fair	Good	Excellent
					available
2.12	Maintenance	No maintenance system available	Maintenance system available	Preventive maintenance system available	Preventive maintenance system available with maintenance analysis and report in writing
2.13	Waste management control	No special control measures available	Containers provided in case of chemical spillage with the area for body cleaning and emergency eye cleaning	Containers provided in case of chemical spillage with response plan preparation	Preparation of response plan in case of chemical spillage with regular practice drill
2.14	Engineering control	No special control measures available	Proper and appropriate design and equipment production and repair	Proper and appropriate design and equipment production and repair under prior permission of the head of engineering work	- Proper and appropriate design and equipment production and repair under prior permission of the head of engineering work - Risk assessment techniques are used to identify appropriate controlling measures

Considered items		Poor	Fair	Good	Excellent
3. Training and motivation					
3.1	Training, orientation for new employees, and rotation of duties and responsibilities	No training provide for new employees	Orientation / training provided to new employees	Orientation / training provided to new employees, and instruction made to the employees with the transfer of duties and responsibilities	- Orientation / training provided to new employees, and instruction made to the employees with transfer of duties and responsibilities -Clear examinations also given to the employees
3.2	Employee training	No training provided for the employees	Training provided for the employees of each working position	Planning system of the training available	Basic training need provided for each working position with training record according to the plan
3.3	Safety instruction and training	No safety training available	Safety training provided to all current employees	Safety training provided to all current and new employees	Safety training conducted as basic training need to all employees of all Working position

Considered items		Poor	Fair	Good	Excellent
3.4	Safety Process / regulation	No determination of Process / regulation on safety	Process / regulation on safety available but without application announcement in writing	Process / regulation on safety available in writing	Process / regulation on safety available in writing according to documentation control system
3.5	Safety inspection and internal follow-up	No safety inspection available	Safety inspection responsible by the office of safety	All offices required for safety inspection, or establish safety inspection committee where the office of safety joins or randomly inspects the safety	All offices required for safety inspection with the report provided in writing, and the follow-ups
3.6	Group meeting	No group meeting to communicate about safety in each office	Safety is an issue of the meeting in the office.	All offices required to organized continuously the group meeting on safety	All offices required to organized continuously the group meeting on safety with the meeting evaluation
3.7	Contact / communication on safety	No communication system available	Communication system available inside the company	Communication system available both inside and outside the company	Communication system available both inside and outside the company with

Considered items		Poor	Fair	Good	Excellent
					The specification in writing according to documentation control system
3.8	Safety Recommendations	No recommen-dation on safety available	Recommendation on safety available and notified only on hierarchy of immediate superior	Recommendation on safety available and notified on hierarchy of immediate superior and committee as recommended	Recommendation is analyzed to evaluate the problems and consider providing controlling measures appropriately.
3.9	Safety awareness and public relations	No measures for safety awareness and public relations available	Distribution of safety information to the employees to build up hazard awareness	Training provided to the employees to enhance safety awareness with safety information distributed	Evaluation on attitudes towards safety available with improvements
4.	**Investigation and accident cause analysis**				
4.1	Accident investigation by task controller	No report and investigati on of accidents	Report and investigation of accident available in writing	Report and investigation of accident available in writing and specified as operational	Report and investigation of accident available and instruction on the incidents made to new

Considered items		Poor	Fair	Good	Excellent
				regulation	employees
4.2	Accident cause analysis	No accident cause analysis	Accident cause analysis available, but without consideration on root cause	Accident cause analysis available to search for root cause	Accident cause analysis available with report submitted to the immediate superior to consider identifying additional measures
4.3	Investigation result monitoring and investigation	No follow-up of the investigation result for correction/ prevention	Follow-up of the investigation result for correction / prevention available inside the office section	Central unit available to collect the list of accidents with pending correction / prevention and report provided	Follow-up available for correction / prevention of the accidents on monthly basis
4.4	Systematic reporting and storing	Keeping of accident list in writing not available	Keeping of accident list available at each office, but not at the central unit where the list of accidents collected from each office can be presented.		Keeping methods available and implemented under supervision of the responsible persons with periodical review of the keeping
5.	**After-work safety**				

Considered items		Poor	Fair	Good	Excellent
		available	accidents collected from each office can be presented.		the responsible persons with periodical review of the keeping
5.	**After-work safety**				
Considered items		**Poor**	**Fair**	**Good**	**Excellent**
5.1	Arrangement of responsible persons and service / administration	No response system available	Responsible persons available for administration / service only during normal office hours	Responsible persons available for administration / service with the contract made to the office involved to serve the case of illness	Responsible persons available for Coordination all through 24 hours including the contract made to the office involved to serve the case of illness
5.2	Investigation, report, and cause analysis	No report and investigation of accidents	Accident report available in writing	Report and investigation of accidents available in writing and specified as operational regulation	Report and investigation of accidents available with follow-up for correction / prevention including accident analysis

BIOGRAPHY

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