RYERSON

FACULTY OF BUSINESS

STOREY ENERGY LIMITED

A case study sponsored by Project Minerva Canada

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Project Minerva Canada seeks to integrate health and safety concepts into management education at business and engineering schools

350 Victoria Street, Toronto, Ontario, Canada M5B 2K3

INTRODUCTION

It was Sunday night at 11:00 pm and George Storey had just completed another weekend's work developing the project schedule for the upcoming week. It was spring time and the Firm's activities were moving into high gear. This meant that if Storey Energy was to have another profitable year, George had to ensure that his crews provided high quality products and service in a proper manner the first time, as time would not allow room for error. He knew that his customer's loyalty was based on his reputation within the industry and that it was his biggest asset.

However, this year was turning out to be quite different for the industry. A major accident at a customer's pipeline location had repercussions throughout the energy industry. Through improper safety precautions a man almost died and several others were injured. Although this incident happen under the supervision of a competitor, George wanted to ensure that similar conditions did not happen to his employees. He knew that not only were safe work practices important to employee well-being, but that they related directly to high quality work demanded by the customer and therefore could ultimately lead to a profitable year.

Before leaving his office, George began to think about the monthly safety meeting scheduled for 7:00 am the next day. One of his young engineers Ralph Kosir would be presenting a sophisticated system to help track preventable incidents in the company. Mr. Kosir had promised that this system would result in reduced incidents for the firm. But George Storey wasn't so sure. After all, the company has never had a reported incident or near-miss. What he was looking for was a way to PREVENT dangerous incidents from happening.

STOREY ENERGY LIMITED

Storey Energy Limited was created in 1979 by George Storey, a successful Project Manager from Shaw Pipe Coatings. Having over 20 years in the project management and construction fields, George had enjoyed a successful career at Shaw but became disillusioned with the lack of advancement. In 1978 he left Shaw Pipe Coatings with several of his most trusted colleagues to form his own firm.

Storey Energy can be divided into two divisions. The Products Division offers off-the-shelf products that are used in the main pipeline transmission systems of Imperial Oil, Suncor, PetroCanada, Consumers Gas and TransCanada Pipelines. These products include 8"(20cm) to 40"(100cm) diameter mainline pipe, flow control valves of the same size, electronic flow, temperature and pressure devices complete with associated software and preassembled natural gas metering systems. The Service Division offers complete mainline pipeline construction management including project management, pipeline coating, pipeline installation, weld x-ray inspection, right-of-way maintenance and environmental clean-up. As of 1986 the installation of computerised pipeline control systems was offered as a service. In addition, the Service Division offers pipe and meter station installation for low pressure natural gas systems, during live operation.

The uniqueness offered by Storey Energy is that it will warehouse many products not normally carried by its competitors and it maintains a network of energy professionals on retainer. Therefore the response time to the customer is very quick. For example, if a customer requires pipeline welders and engineering expertise on an emergency basis, it can be provided by Storey Energy within 24 hours. In addition, George Storey has developed a network of distributors in the United States which provide him with the strategic strength to avoid stockouts. In other words, his American contacts help to ensure that any products that he does not have in his warehouse can be obtained within 7 working days (or 24 hours in an emergency). Therefore customers are willing to pay a premium for Storey's high quality products and services.

THE MANAGEMENT AT STOREY ENERGY

From the beginning George viewed his employees as his greatest asset. He said:

> **"I can't be in two places at once, so I need people who understand the importance of the customer and his needs."**

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• George believes that this is the key element in the success of Storey Energy. The company has grown from $2 million in sales in 1980 to $30 million today, surviving two serious recessions in the process (see Financial Statements in Appendix A). With 17 permanent employees, the payroll often swells to 70 people through the busy time period from April until September in order to meet the increase in customer demand for services. In accordance with pipeline regulation CSA Z662-M94, these "contract" employees are certified tradespeople (eg. pipe fitters), technical specialists (eg. electronic technologists) or retired professionals (project engineers) who bring years of relevant experience to Storey's projects. However, there is seldom safety certification or proof of safety training indicated before these temporaries are employed. This is often a concern of Mr. Storey since all of these people must operate in extremely hazardous conditions. Recognising this, George set up an autocratic hands-on management structure in which he coordinates, directs and schedules all tasks for the employees. Reviewing safety issues with each new contract employee is a management task he conducts himself.

EXISTING SAFETY SYSTEM & TRAINING AT STOREY ENERGY

George knew that the only way to ensure top quality service was to ensure safe working conditions for his workers.

"Safety is quality"

Paramount in his view are the Safety meetings on the first Monday of every month for all employees where attendance is mandatory. Storey himself attends over 85% of these meetings because in his words:

"It is imperative that the owner of the company demonstrate his commitment to safety if he wants others to take it seriously too."

The safety system at Storey Energy was loosely based on the 5 star rating system used throughout the Oil industry. It was governed on the premise that monthly safety meetings were the most important workers' meeting and therefore attendance was a condition of employment. The meetings began at 7:00 am and they were setup to discuss the scheduling of upcoming work and the safety hazards of such jobs. The minutes of these meetings were distributed to all employees, including new hires, and it was expected that each employee would use the meeting to discuss anticipated problems in future work. Any previous observance of unsafe conditions or practises were to be raised at these meetings, in order to prevent any future problems. George is quick to point out that he does not wish to find fault or assess blame among workers but to ensure any near misses do not become future incidents.

As the owner of the business, George's demonstrated commitment to safety was admirable. However, unlike the formal 5 Star rating system, there was no formal Safety committee, and no formal documentation that specific safety issues are discussed. In fact, except for formal designations brought to the job by employees, there is no documentation of formal training in the area of safe work practices. Safety training is also weak in documentation. Formal lockout procedures, safety equipment checks and other safety precautions are "learned" on-the-job. The trainer often is the crew Foreman who typically is one of the full-time employees at Storey Energy. Although this informal safety system resulted in zero accidents in the past, George knew it did not guarantee a perfect safety record in the future. He simply could not risk a high profile accident, that might damage his firm's reputation.

Another problem was becoming apparent. His autocratic management style was not always well received, particularly by the younger, higher skilled tradespeople. Often contract employees felt that they were hired for their expertise to perform the tasks in the field, installing meter stations for example, and not for "wasted time in meetings". As a result, George sought to increase the profile of safety awareness and hired a young engineer to act as a project manager in the field on some of the more dangerous assignments. It was the engineer who brought the welding accident incident to Mr. Storey's attention. George read the following Accident Description from the investigator's report.

THE WELDING ACCIDENT

Toronto's Pearson Airport receives its jet fuel from two sources, pipeline storage transfer or directly by delivery truck. The pipeline storage facility is located at the interconnection of Highways 409 and 427, roughly 3 kilometres from the airport. The storage facility receives its jet fuel deliveries from a 6" pipeline lateral, connected to the mainline transmission system at an above ground junction, 2.5 kilometres south of the main Terminal. This junction is commonly referred to as Toronto Airport Junction or TAJ (see Appendix B).

The mainline pipeline was 10" (250cm) in diameter and transported the full range of gasolines and middle distillates in batches. The liquid interface between batches is an area of contamination of fuels, such that normal pipeline operations are designed to deliver the contaminated liquid to their own storage (called contam tanks). When full, the contam tanks are emptied into fuel trucks and returned to the refinery for reprocessing. These contaminated liquids contain low flash point fuels, and thus can ignite easily.

Ballantrae Pipeline contractors had been hired by TransContinental Pipelines (TCONPL) to install a new valve subassembly at the TAJ site (Toronto Airport Junction). The purpose of the new subassembly was to allow the flow of jet fuel to be diverted into the pipeline lateral and on towards the Airport storage facility without receiving contamination from fuel located in "dead spots" in other pipelines connected to TCONPL (see Appendix B for pipeline schematic). For Ballantrae, the project was expected to be quite routine. First, they received mechanical drawings depicting pipe and conduit locations within the TAJ compound. Next, they designed and preassembled the new valve junction based on these drawings and the project assumptions provided by TCONPL. All that remained to be done was to have TCONPL shutdown and drain their main transmission system on either side of TAJ, cut open the pipe, insert clay plugs in the pipe to seal out any fuel vapours which might ignite, install concrete valve support footings, and weld in the new subassembly. Their original estimate was to have the entire job completed within 12 hours.

On the morning of August 17 at 7:00 am. the TCONPL employee confirmed that the mainline transmission system had been shutdown and drainage of the pipe was complete. Using a formal checklist, the pipeline employee proceeded to lockout all electrical switchgear operating the station's valve actuators, and mechanically locking closed all valves leading into or out of the station. He informed Ballantrae that the Pipeline Operations Delivery Department was concerned about the amount of time the pipeline would be shutdown, as it delayed an important shipment of jet fuel to the airport. The Operations Manager insisted in clear terms that the project should not be delayed unnecessarily and if any shortcuts could be taken to shorten the project, then he ordered that these shortcuts be followed. Feeling the pressure from his supervisor, the TCONPL site operator insisted that clay plugs not be used during the welding operations. After restarting the pipeline, the clay would have to be trapped and filtered at the Jet Fuel Delivery Storage site, necessitating the need to frequently shutdown the delivery and replace the filters. This would increase by 50% the time to make the jet fuel delivery. After obtaining assurances from the contractor, and completing his other tasks, the pipeline operator gave authority to Ballantrae to proceed.

Ballantrae's crew moved in, and immediately setup its pipe cutting equipment near the 10"(250cm) diameter mainline pipeline that was targeted for this project. Its first task was to weld a vent plug on the surface of the pipe at the 12 o'clock postion, to allow for a vent hole that was required to ensure that the pipe was empty. This manual task was completed in routine fashion, and indeed the pipe appeared empty of liquid. Upon confirmation of this, the crew foreman gave the permission to cut the pipe using automated oxy-acetylene cutters. The welder in charge of the cutting operation wore the necessary safety equipment, including eye and heat protection. Two workers stood nearby with fire extinguishers in the "ready" position in case of fire.

The cutting machinery completed the first cut in a normal fashion. The crew Foreman noted that there was some build-in stress in the pipe, as it "sprung" from its position and fell sideways, toward the ground. The movement of the pipe end was approximately 2 metres (6ft., 4 inches), which the foreman considered high. However, as the movement was in the direction away from the workers, the crew Chief considered the first cut a success. The equipment was then moved to the second targeted location, about 17 metres (55 ft, 3 inches) away.

The operation was then repeated but the results were drastically different. Again, the welder setup the cutting equipment and ignited the oxy-acetylene torches, simultaneously beginning cuts at the 12, 3, 6, and 9 o'clock positions. Suddenly, there was a flash of fire, towering 4 metres (13 ft) in the air, and continuing for some time. It appeared to be fed by fuel vapours from within the 10"(250cm) mainline pipe. The two workers moved quickly to extinguish the fire, but they initially ran into trouble as the fuel kept re-igniting. Finally, the fire was fully extinguished approximately 7 minutes later. The flames had produced enough heat that the welder suffered 2nd degree burns to most of his body, and was rushed to hospital. He required treatment and rehabilitation over the next 6 weeks. The two workers in charge of the extinguishers suffered burns to their hands and thighs, and the TCONPL pipeline operator suffered minor burns to his face. The project was shutdown for 6 hours until the source of the fuel was found and repaired. A mainline Gate valve located 2 km (1.25 miles) downstream of the station had been leaking. The conclusion was that fuel vapours had travelled through the drained pipe back to the work site during the initial cutting operation. As a result, clay plugs were inserted into the open ends of the pipe to ensure no vapours were present at the work site, and the subassembly was installed without further incident.

KOSIR'S SAFETY PROGRAMME

Ralph Kosir was an ambitious engineer who enjoyed getting to work by 7:00 am in order to "mix well" with the employees. He felt that if he was to get the cooperation from his crew, he must become "one of them". He certainly did not want to appear as an engineer from the Ivory Tower who never "got his hands dirty". A graduate from Queen's University, Ralph believed in the discipline of systems planning and he felt that the safety programme at Storey Energy needed an overhaul to ensure proper documentation of safety activities. It was his belief that periodic formal safety reviews and corrective action were the best way to prevent future incidents from occurring. Therefore he based his new safety programme on the PDCA Model.

The "Plan, Do, Check,Act" model was based on the concept of Continuous Improvement (see Appendix C). It was seen as a way to incorporate a safety system into the quality initiatives of the company. Kosir believed that forces from outside the company, principally from regulatory bodies at the federal and provincial levels, will exert pressure to improve safety procedures. But he also realized that most safety improvement must come from within in order for safety to be a fully integrated, natural set of tasks. In other words, Kosir wanted the worker's attitude toward his safety system to be natural, and not to be viewed as some special task or burden.

His system had three components:

1) Show in writing Management's commitment to safety
2) Relate safety and its critical measure to a defined Business Need
3) Audit worker behaviour to measure safety improvement and define corrective action.

Kosir's proposal began with the following company safety policy;

STOREY ENERGY OCCUPATIONAL HEALTH AND SAFETY POLICY

The Company places a high value on the health and safety of its employees and is guided by the following principles:

** Nothing we do is worth getting hurt*

** Health and safety can be managed*

**Injuries and occupational illnesses can be prevented.*

** Health and safety is everyone's responsibility.*

POLICY

The company insists on safe operation.

POLICY ELABORATION

The Company is committed to and site management is held accountable for providing a safe and healthy work environment, and for ensuring safe work practices.

Every employee is held accountable for working safely, for confronting unsafe acts by others and for correcting and/or reporting all unsafe conditions. Working safely is a condition of employment.

The Company is committed to meeting or exceeding the requirements of all occupational health and safety laws and regulations.

PROGRAMME

Storey Energy manages health and safety using a comprehensive Key Element Programme, based on the PDCA Continuous Improvement Model. The objective of this programme is to eliminate workplace injuries and illnesses. Details of the Programme are available from the Project Engineer or Head Office.

The Project Engineer or Site Crew Foreman is responsible for the effective implementation of all applicable risk management programmes and site safety.

The second component was a training system relating one of the Firm's defined Business Needs to the measurement and management of safety (see appendix D for flow chart). Kosir identified the need to have employees "buy-in" to the safety programme and so he utilized the IH/Safety Pyramid as a management tool to identify the cause and consequences of unsafe work conditions. He wanted to use the pyramid to change worker's attitudes towards safety. He also identified Total Incident Rate (TIR) as the main Business Need. Reduction in TIR would lead to safer working conditions, and therefore in the case of Storey Energy, would help to maintain or even improve quality levels. The main issue was how to measure TIR and how to reduce it.

This was done in the third component. Ralph did not entirely believe that there had never been an incident in the history of Storey Energy. He felt that most incidents or near misses were not reported to George Storey, partly because of the fear of his reaction. In other words nobody wanted to be the one blamed for destroying the Company's "perfect" safety record.

Kosir therefore wanted to propose the implementation of the Key Element System in the Firm. The Key Element approach had its birth on April 23, 1982 at consumer products giant Proctor & Gamble and has been adopted for use in the oil industry since the late 1980's. Examining Key Elements for health and safety was thought of as a total-quality system since it represented a proactive "before-the-fact" management systems/behaviour based approach to achieving a healthy and safe workplace, as opposed to being a reactive process.

The Key Elements are summarized below:

1. **Organizational Planning and Support**
    - Provide clear expectations
    - Ensure management and employee involvement
    - Develop goal setting and action planning
2. **Standards and Practices**
    - Standards Implementation (Lockout procedures, safety equipment, environmental protection are some examples)
    - Develop relevant safe practices (built from job safety analysis)
    - Plan for safe conditions.

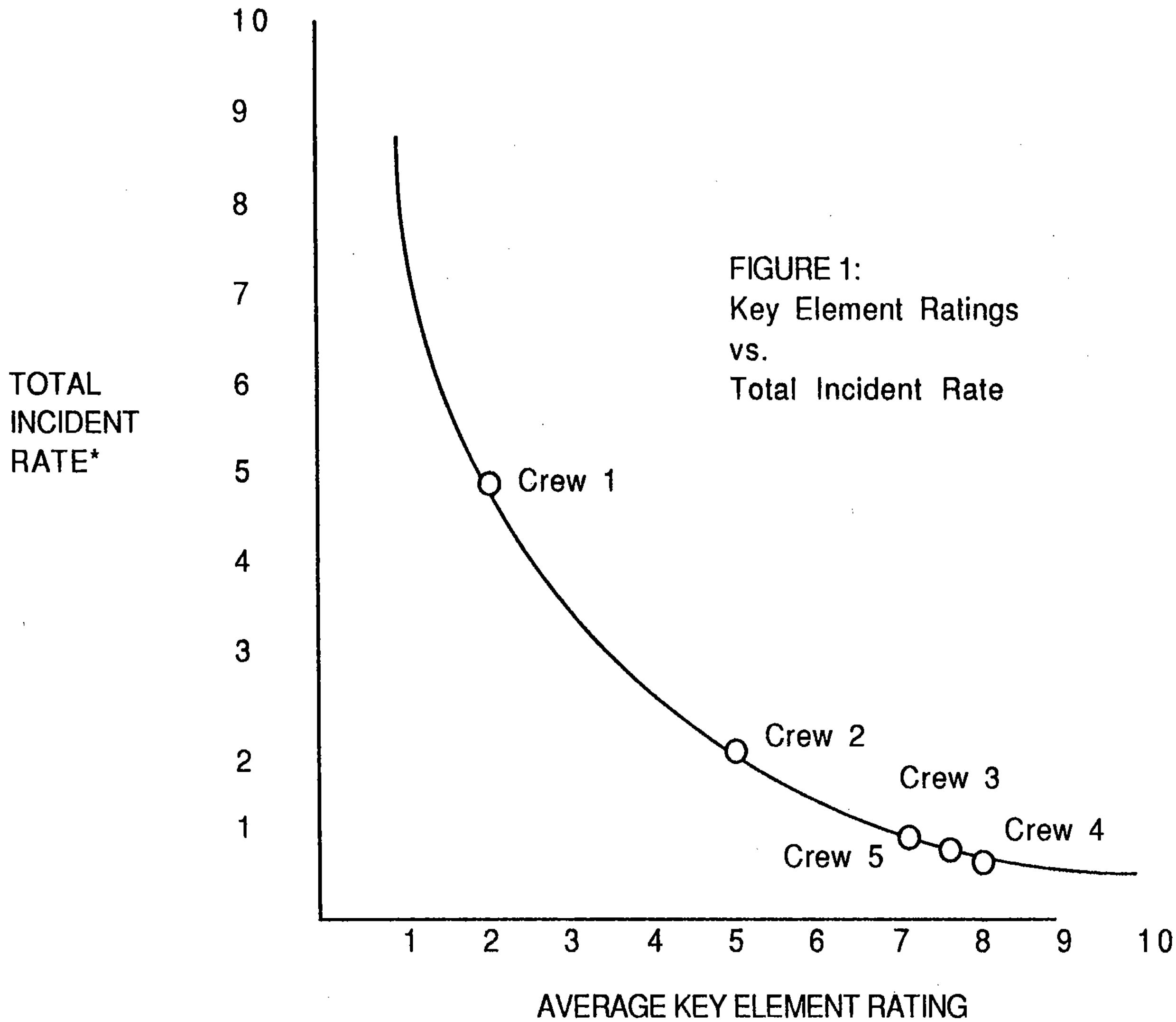
(Key Elements Continued)......

3. **Training**
    - documentation of on-the-job training
    - Upgrade Health & Safety qualifications of employees
4. **Accountability and Performance Feedback**
    - Site safety audits
    - Behaviour observation sampling
    - Statistical performance tracking.

Ratings in each of the four Key Elements result from internal staff reviews and a composite rating is developed for each crew. (An example of a Behaviour Observation System (BOS) checklist is found in Appendix E). Each Key Element receives a numerical rating from 0 to 10. This numerical rating describes the quality of the crew programmes accordingly:

- 8 or higher is satisfactorily implemented and effective
- 6 to 7 is implemented but incomplete or partially satisfactory
- less than 6 indicates a Key Element that is partially implemented.

Kosir planned to rate the Company's safety performance using a graph that shows the relationship between Key Element Ratings and Total Incident Rate (TIR). He felt this was the important documented result from his proposed safety system. To produce this graph Kosir planned to have the initial information collected and disseminated by each crew. Kosir would then analyze the results using some of his canned sophisticated software producing a result similar to Figure 1 which he believes illustrates the Firm's safety performance, and how it should improve (see next page).



Given the complexity of his proposal, Ralph Kosir asked for the entire Monday Safety meeting to make his presentation.

THE DILEMMA

George Storey closed the Investigator's report and placed it on his desk beside Kosir's proposal. He knew he was faced with a dilemma. Could he justify the cost of Kosir's new safety system, and risk alienating his employees with additional work? Can he be sure that there were no incidents in the past, and if that were true, how can he continue to prevent accidents in the future? Growth had been good for his company, but the continued use of contract employees could pose a risk if an incident similar to Ballantrae's experience were to occur at Storey Energy. George locked his office and began the long commute home. These questions would have to be answered at Kosir's presentation the next day.

APPENDIX A

STOREY ENERGY FINANCIAL STATEMENTS

RYERSON POLYTECHNIC UNIVERSITY
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BALANCE SHEET AT END OF PERIOD 8

ASSETS			
CURRENT ASSETS			
CASH	$350,216		
ACCOUNTS RECEIVABLE	422,250		
INVENTORY OF FINISHED GOODS	0		
INVENTORY OF RAW MATERIALS	78,405	850,871	
FIXED ASSETS		1,034,829	
TOTAL ASSETS			$1,885,699
LIABILITIES			
CURRENT LIABILITIES			
BANK OVERDRAFT	0		
ACCOUNTS PAYABLE	0	0	
LONG TERM LIABILITIES			
MORTGAGE LOAN		300,000	
TOTAL LIABILITIES		$300,000	
SHAREHOLDERS' EQUITY			
ISSUED CAPITAL			
600 PREFERRED SHARES	600,000		
10,000 COMMON SHARES	579,000		
	1,179,000		
RETAINED EARNINGS	406,700		
TOTAL SHAREHOLDERS' EQUITY		1,585,700	
TOTAL LIABILITIES AND SHAREHOLDERS' EQUITY			$1,885,700

CASH FLOW STATEMENT FOR PERIOD 8

RECEIPTS		
REVENUE FROM CURRENT PERIOD SALES	$422,250	
REVENUE FROM PREVIOUS PERIOD SALES	403,679	$825,929
DISBURSEMENTS		
MATERIALS PURCHASED	$158,400	
MANUFACTURING EXPENSES	382,918	
MKT., ADMIN. & OTHER OVERHEAD	149,300	
EQUIPMENT PURCHASED	33,000	
CORPORATE INCOME TAX PAID	21,215	
DIVIDENDS PAID	0	744,832
CHANGE IN CASH BALANCE		$81,097

J4/95 INCOME STATEMENT FOR PERIOD 8
JUSTRY NO. 1 CORPORATION NO. 1

INCOME

SALES REVENUE			$844,500
COST OF GOODS SOLD			
INVENTORY OF FINISHED GOODS AT START OF PERIOD		$0	
MANUFACTURING COSTS			
LABOUR COST (PER UNIT - $31.80)	$273,067		
OVERTIME PREMIUM (PER UNIT - $15.90)	0		
RAW MATERIALS (PER UNIT - $20.73)	178,002		
DEPRECIATION	30,984		
QUALITY CONTROL	50,000		
PLANT MAINTENANCE	50,000		
UTILITIES	9,851		
BAD DEBT EXPENSE	44,853		
COST OF GOODS MANUFACTURED		636,758	
VALUE OF GOODS AVAILABLE FOR SALE		636,758	
LESS INVENTORY OF FINISHED GOODS (END OF PERIOD)		0	
COST OF GOODS SOLD			636,758
GROSS PROFIT FROM OPERATIONS			$207,742
MARKETING, ADMINISTRATIVE AND OTHER OVERHEAD EXPENSES			
MARKETING		$60,000	
SALARIES, WAGES, RENT, ETC. (OFFICE, PLANT AND WAREHOUSE EXPENSES)		84,800	
BANK INTEREST		0	
MORTGAGE INTEREST		4,500	149,300
NET INCOME BEFORE TAX			$58,442
CORPORATE INCOME TAX			21,215
NET INCOME AFTER TAX			$37,228

STATEMENT OF RETAINED EARNINGS

FOR PERIOD 8

OPENING BALANCE	$369,472
PLUS: INCOME AFTER TAX	37,228
LESS: DIVIDENDS PAID	0
EQUALS CLOSING BALANCE	$406,700

APPENDIX B

PIPE SCEMATIC OF TORONTO AIRPORT JUNCTION

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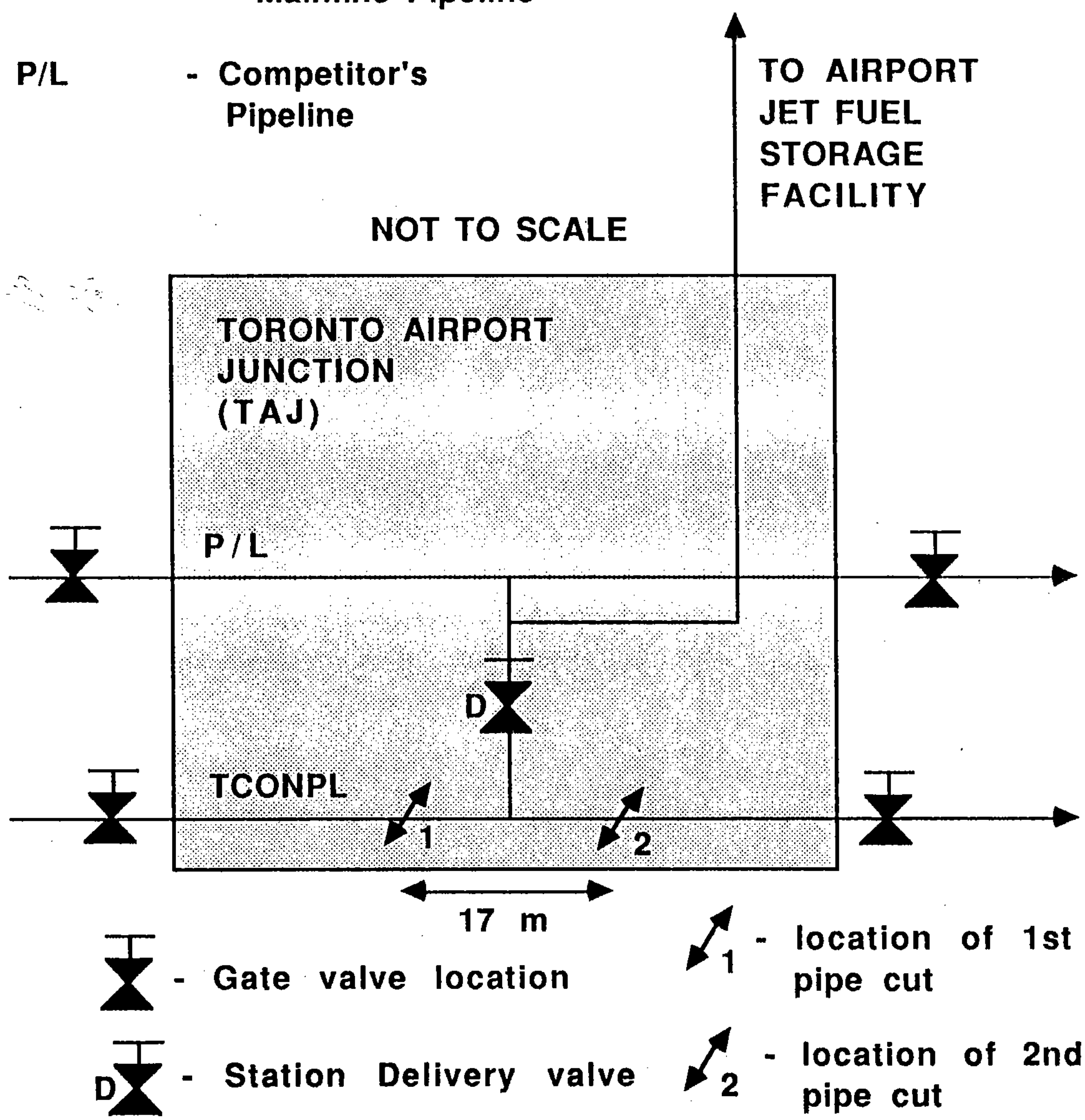
Schematic of TAJ

TCONPL - 10"(250cm) TransContinental Mainline Pipeline

P/L - Competitor's Pipeline



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APPENDIX C

THE PLAN, DO, CHECK AND ACT MODEL

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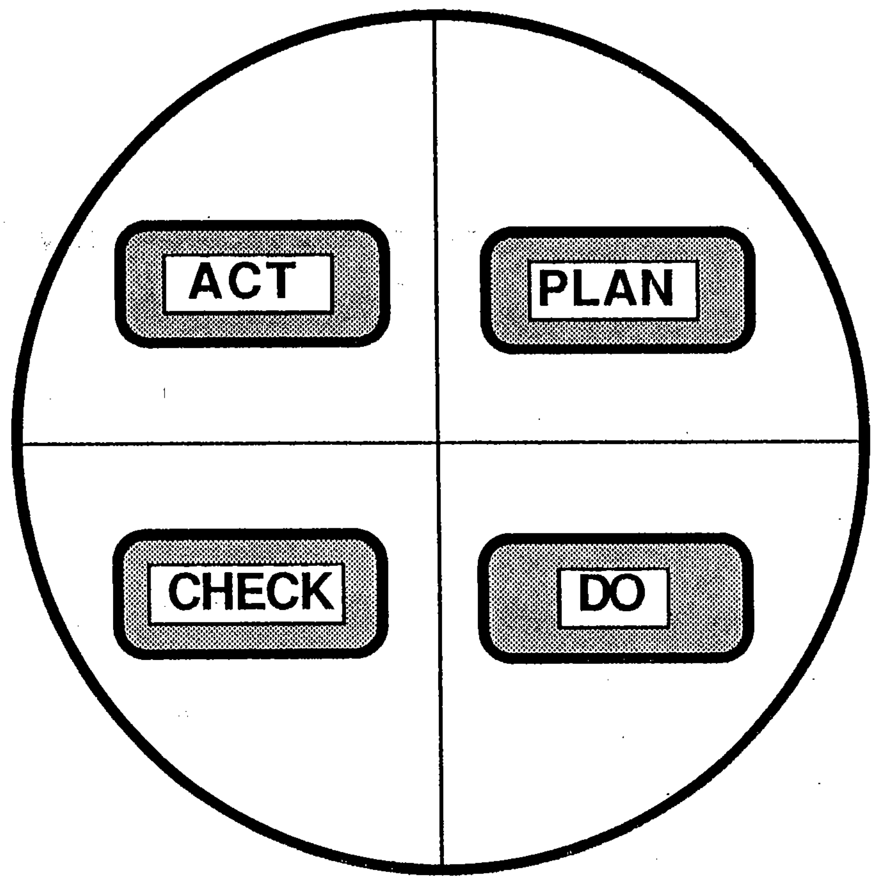
CONTINUOUS IMPROVEMENT



THE PDCA CYCLE

The Plan, Do, Check, and Act Model

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APPENDIX D

RELATING SAFETY TO BUSINESS NEEDS & THE IH SAFETY PYRAMID

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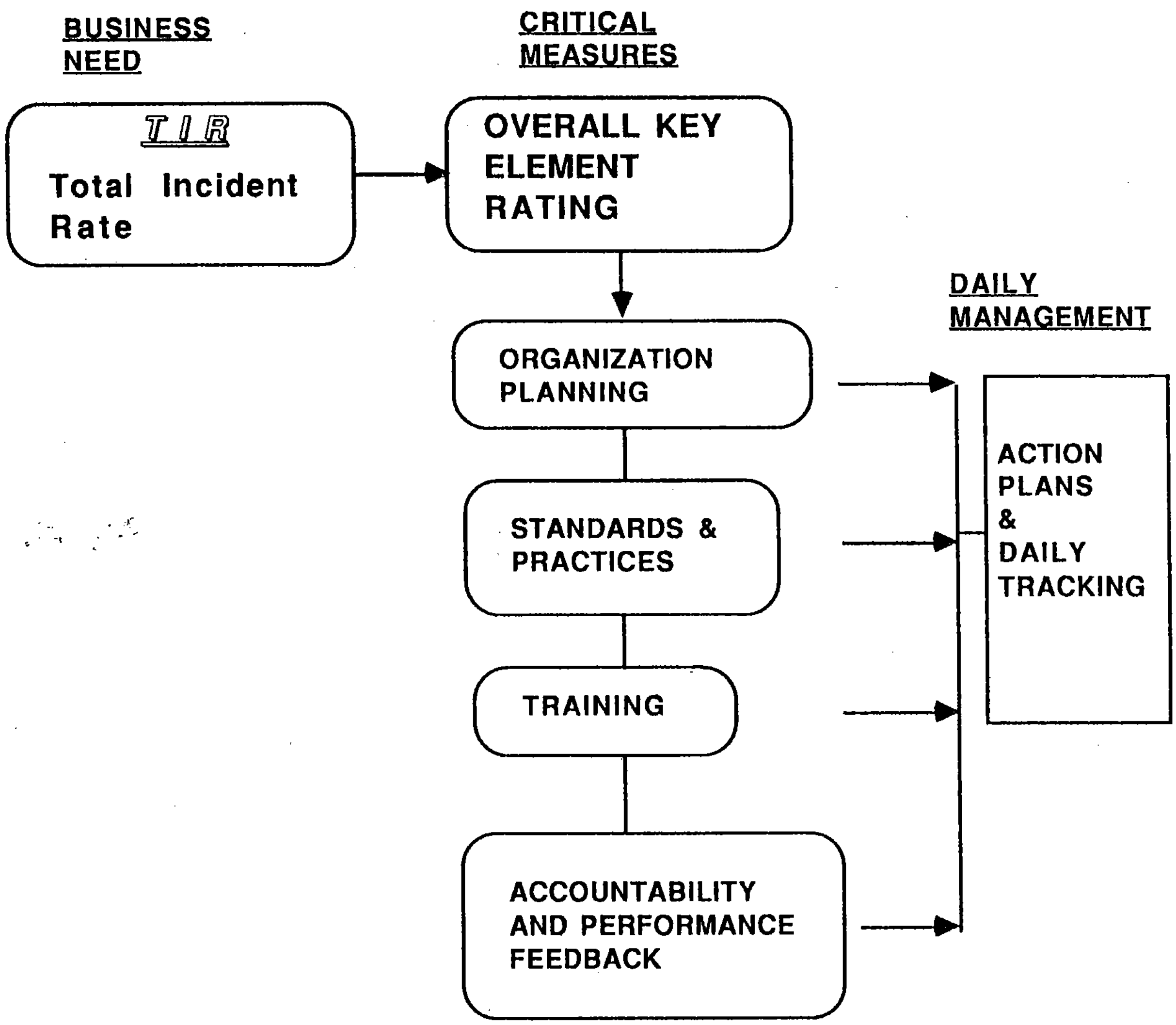
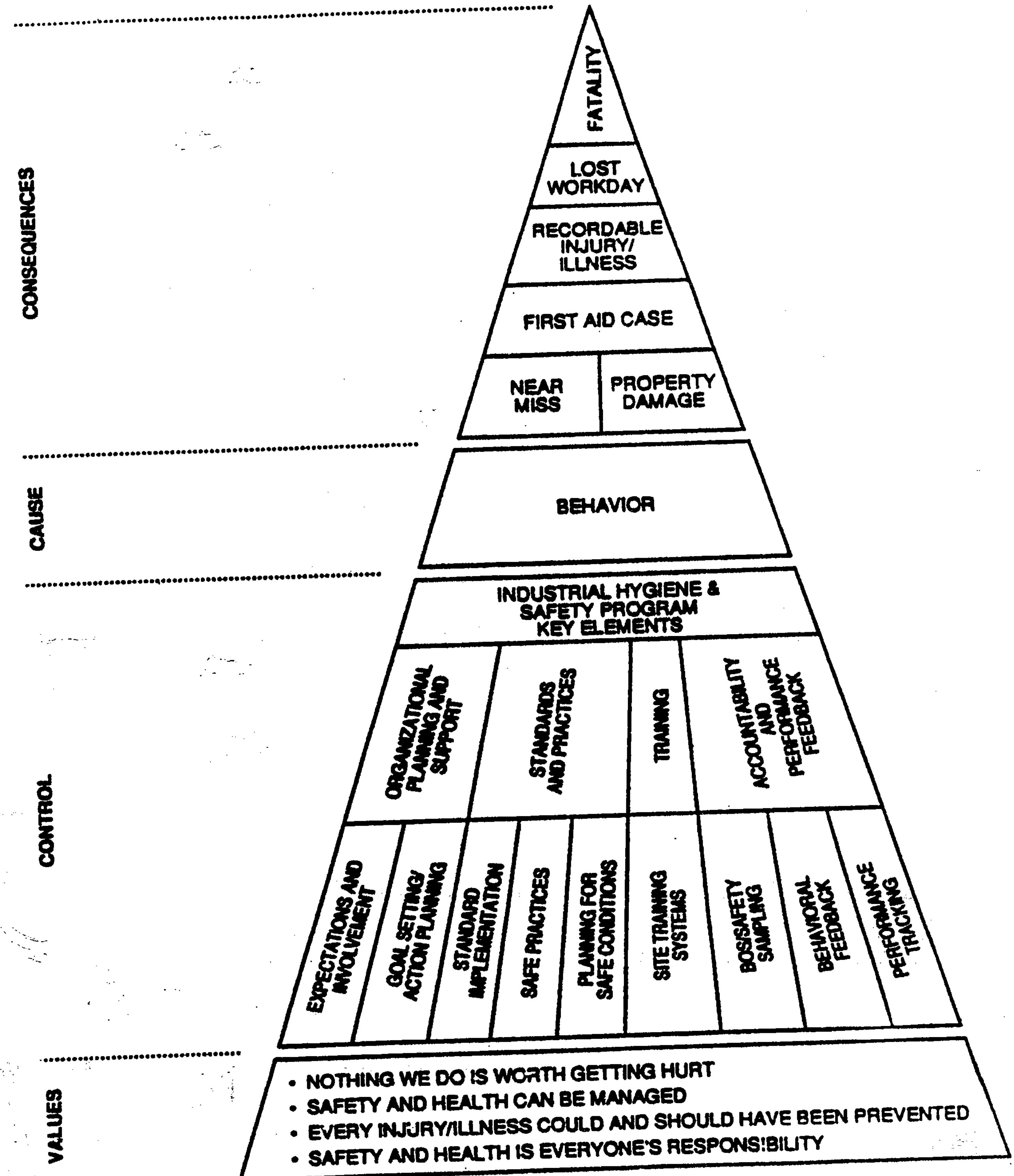
RELATING SAFETY TO BUSINESS NEEDS



IH/SAFETY MODEL



APPENDIX E

BEHAVIOUR OBSERVATION SYSTEM WORKSHEET

BOS WORKSHEET

DEPARTMENT: ____________________

DATE: JUNE 1, 1994

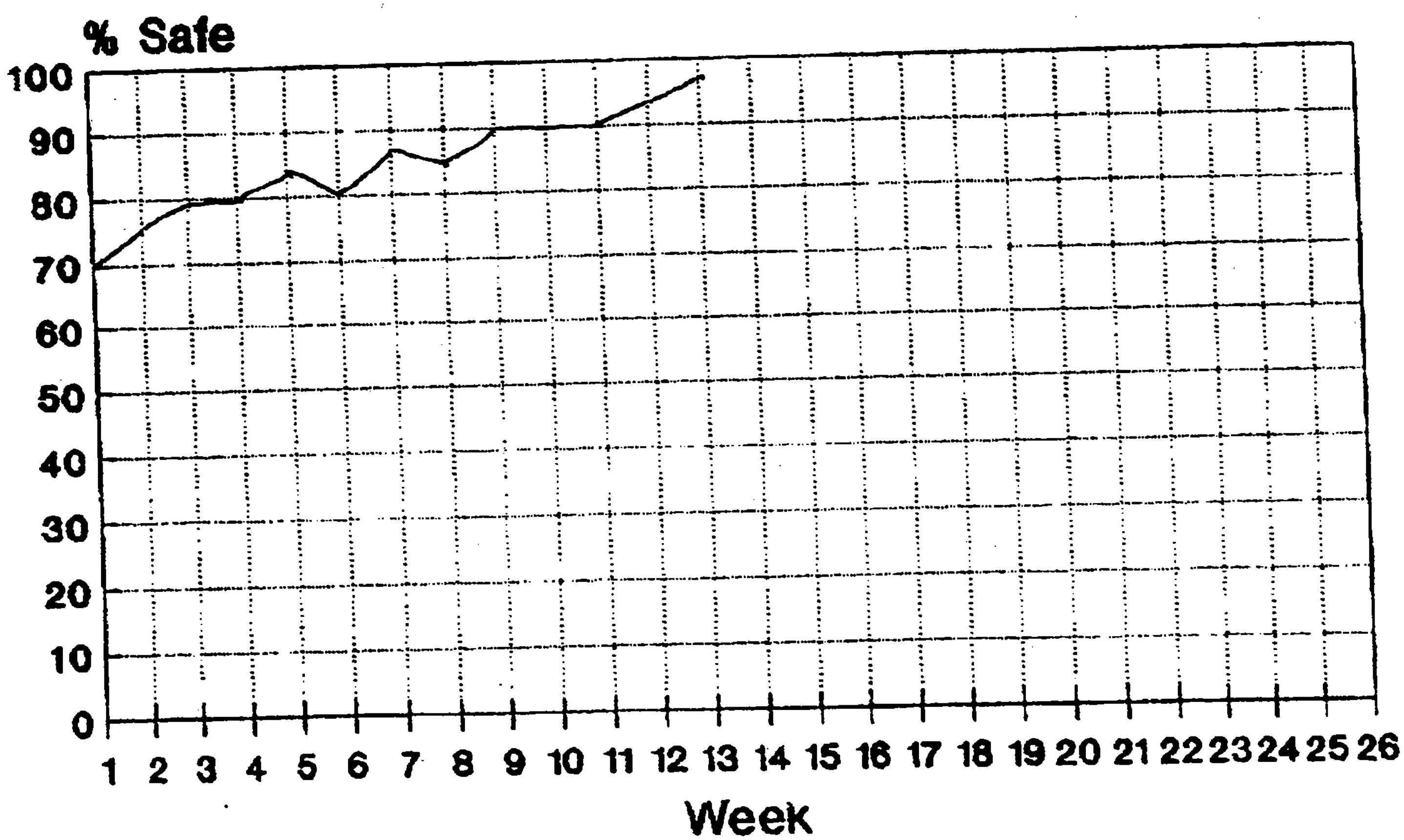
OBSERVER: DOUG __________ (All Tech's Lines 5&6)

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1) Air Samples Taken During normal operation	|||	|||		
2) Respirators/Gloves worn when required	|||	|||	|	|
3) Signs Posted Throughout The Department	||	||		
4) Aerosol System "ON"	||	||		
5) Covers & Guarding In Place (Floor Drains)	|||	|||		
6) Spills/Leaks/Rework Cleaned Immed.-No Liquid On Floors				
7) Air Samples Taken During Washout				
General Comments:	13	13	1	1

[illegible]	[illegible]
1. Organization Planning And Support I) Expectations & Involvement II) Goal Setting & Action Planning	
2. Standards & Practices I) Standards Implementation II) Safe Practices III) Planning For Safe Conditions	
3. Training I) Site Training Systems	
4. Accountability & Performance Feedback I) BOS/Safety Sampling II) Behavioural Feedback III) Performance Tracking	|

BOS Chart for RESPIRATORS / GLOVES

Dept: ____________________



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