

Development of a Safety Management System in Hong Kong MTR Corporation

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Abstract:

Safety of customers, the public, contractors and staff is an absolute pre-requisite for the Hong Kong MTR Corporation. Safety management development in MTR Corporation is in three stages. In the first 10 years since the opening of the Railway in 1979, emphasis was placed on complying with statutory and Railway Inspectorate requirements, promulgating Rules and Procedures, training of staff, and enforcing discipline and compliance. After conducting a comprehensive review of its safety management, the MTR Corporation adopted, from 1992 onwards, a risk-based and proactive Safety Management System (SMS) based on modern principles and practices. The system has been refined over time based on experience and its quality and practicability has been benchmarked, internationally, as class leading. This improvement has been achieved through MTR Corporation's continuous improvement culture, which is a key component of its Safety Policy. Many innovative safety management subsystems and processes have been developed in this way and proven to be effective through implementation. The SMS includes the Safety Policy, a safety management process, safety tasks and safety modules, safety responsibility statements for individual posts, safety responsibility cards, safety critical items/systems, safety committees, staff consultation, a risk control system, and an audit system.

1. Introduction

The past 30 years witnessed an upsurge of accidents in which management and/or system factors played a major causative role. A few infamous examples involve names such as Chernobyl, Space Shuttles "Challenger" and "Columbia", King's Cross, and Three-Mile Island. Despite attention often being centred on the immediate cause(s) of an accident, many root causes are in fact attributable to management and/or system factors. These factors unfortunately are more potent and can create numerous opportunities for accidents. As a result, they have been explored intensively by safety professionals since the late 1980's. This area was identified by MTR Corporation in the late eighties as an area warranting the closest attention, notwithstanding the fact that safety performance on the Railway had been satisfactory. With the system refined over time, improvement has been achieved, by carrying out external benchmarking and external expert reviews. Innovative safety management subsystems and processes have been developed.

2. Development of Safety Management System in MTR Corporation

The Hong Kong MTR Corporation is a railway, largely underground, in Hong Kong serving the transport needs of urban commuters and airport passengers. At present, it consists of 53 stations with 5 depots, distributed along 6 commuter lines and 1 Airport Express over a total route length of 91 km. The system was opened in phases, with the first phase opened in 1979. Future extensions are either being constructed or planned. In addition, improvements are continuously being made on the existing systems and equipment. The current patronage on a weekday is over 2.4 million in average.

Safety is always a pre-requisite in design, construction, and operation of the MTR Corporation. In the first 10 years since the opening of the Railway in 1979, emphasis was placed on complying with statutory and Railway Inspectorate requirements, promulgating Rules and Procedures, training of staff, and enforcing discipline and compliance. This approach was appropriate and successful in establishing a good safety performance in the early years of operations. Toward the end of 1980's, there was doubt as to whether continuation of this management approach was adequate in coping with the increasing complexity of railway operations. Specifically, the following issues were noted:

- The tendency for safety performance to depend on the expertise of key senior operations and engineering personnel;
- Not all lower level staff fully understood the part they had to play in ensuring safe operation of the Railway;
- The concept of safety was not sufficiently integrated into daily work practices;
- Inquiries into two serious railway accidents in U.K., namely, the King's Cross fire in 1987 (Fennell, 1988) and Clapham Junction collision in 1988 (Hidden, 1989) highlighted the following desired features in modern safety management:
 - Adopting a formal and systematic approach to managing safety; and
 - Conducting safety audits to provide assurance in safety management performance.
- A comprehensive programme of risk management was crucial to safety management.

In 1991, with assistance of an external consultant, a comprehensive review of safety management of the Corporation has been conducted. It was recommended that safety management should be a corporate issue requiring a clear statement of safety management philosophy, a Safety Management System (SMS) to implement the philosophy, and a dedicated department to advise and monitor on all issues concerning safety, with line managers remaining responsible for safety performance. There should be a three-tier safety performance monitoring system, including a first level of day-to-day monitoring by line management, a second level of regular audits, and a third level of external reviews conducted by independent experts.

In 1992, MTR Corporation has adopted a risk-based approach managing and documented it in a Safety Manual for the Railway. Safety training and communications on the subject were provided to staff. The External Safety Management System Review to be carried out once every three years was introduced in 1994. When the MTR Corporation was privatised with its successful public listing in 2000, the requirement for triennial External Safety Management System Review was built into Section 5 of its Operating Agreement.

The SMS is an integral part of the Integrated Management System which adopts a total management approach integrating the requirements of various management systems and links all core business processes with the Corporation's business objectives and strategies. To strive for continuous improvement in safety management, innovative safety management subsystems and processes have been developed and reinforced, e.g. introduction of Hazards / Near-misses Control and Reporting Scheme, introduction of Behaviour-based Safety, integration of human factors into operations, etc.

3. MTR Corporation's Risk-based SMS

MTR Corporation is committed to maintaining a high degree of safety awareness and continuously employing management systems to strive for continuous improvement in safety performance. A risk-based approach is adopted for managing safety. The SMS provides a workable framework for managing safety in a systematic, proactive and consistent manner, so that the Safety Policy can be effectively implemented. It allows the Corporation to manage safety systematically like how all other critical aspects of the business are managed and reduces the need for "safety experts" as safety management then becomes line management's responsibility. Most importantly, all staff involved can talk on safety using the same language.

The SMS comprises the following key components:

1. Safety Policy;
2. Safety Tasks and Safety Modules;
3. Safety Management Process;
4. Safety Responsibility Statements/Cards;
5. Safety Audit System;
6. Risk Control System;
7. Safety Critical Items/Systems;
8. Safety Committees; and
9. Staff Consultation.

3.1 Safety Policy

The Policy sets out the high level requirement for managing safety and health risk. It declares that "Safety of our customers, the public, contractors and employees is an absolute pre-requisite." The Corporation is committed to maintaining a climate of safety awareness and employing management systems to assure Corporate safety goals for continuous improvement in safety performance in all aspects of the business. The Policy also stipulates that safety demands active involvement by all. Safety management is the line responsibility of each Director and Business Manager.

3.2 Safety Tasks and Safety Modules

To clearly define the scope of safety management, 15 Safety Tasks have been identified as most important and relevant for managing safety on the Railway. Each Safety Task has an objective to be achieved, supported by a number of Safety Modules that provide the standards to meet. The 15 Safety Tasks are as follows:

- Task 1: Information;
- Task 2: Safe Systems of Work;
- Task 3: Asset, Design and Project Management;
- Task 4: Protective Equipment;

- Task 5: Fire;
- Task 6: Human Resources;
- Task 7: Communication on Safety Matters;
- Task 8: Contractors and Visitors;
- Task 9: Emergency Preparedness and Response;
- Task 10: Accident Reporting and Investigation;
- Task 11: Safety Inspections;
- Task 12: Safety Performance Monitoring;
- Task 13: Funding for Safety;
- Task 14: Review and Audit; and
- Task 15: Security.

3.3 Safety Management Process

Having identified the Safety Tasks to be performed and the standards to meet (as Safety Modules), line managers need to manage the Safety Tasks using a familiar management process similar to managing any other important aspects of the business. This Safety Management Process, in alignment with Health & Safety Executive's guidance HSG65 Successful Health and Safety Management, comprises the following:

- **Policy:** Within the context of a department or section, this includes a structure of guidelines, procedures, and standards on safety. It should meet legal requirements and provide a framework for controlling risks to as low as reasonably practicable.
- **Organising:** This involves distinguishing the roles of line management and support staff, and establishing individual safety responsibilities.
- **Planning:** This includes setting performance targets, allocating priorities for implementing safety initiatives, and allocating funds for safety items.
- **Implementing:** This comprises leading staff to implement safety initiatives, communicating the requirements to staff, obtaining feedback, providing training, generating safety awareness, etc.
- **Monitoring:** This includes safety inspections, performance monitoring, and investigations of undesired events.
- **Review:** This involves a broader review of the safety management system of a department, section, or operation. Formal, independent safety reviews are also conducted.
- **Audit:** This involves assessment and evaluation of the adequacy, effectiveness and conformance to a set of laid down procedures and standards in a safety management system.

This management process is in line with the quality management concept of "doing the right things right." Policy and planning determine the right things to be done, and the remaining steps ensure that these things

are done right. The final two steps ensure that continuous improvement will be made in managing safety.

3.4 Safety Responsibility Statements/Cards

The SMS also includes a system of Safety Responsibility Statements (SRSs), which sets out in writing the safety responsibilities of each post, for supervisory grades and above. Individual staff member is required to understand and discharge the responsibilities stated in their own SRSs. These SRSs are being used in human resource functions such as recruitment, appraisal, and promotion. For staff who are not provided with SRSs, they are provided with a Safety Responsibility Card which gives simplified guidelines on their safety responsibilities.

3.5 Safety Audit System

The purposes of safety audits are to provide assurance on the compliance and effectiveness of safety management, assist line management in identifying opportunities for improving safety performance, identifying new hazards and raising safety awareness.

There are 4 types of independent safety audits conducted on the Railway, including system audit, activity audit, contractor audit and safety technical audit.

3.6 Risk Control System

The MTR Corporation is required to operate on prudent commercial principles. To support this, a risk-based approach to managing safety has been established which includes a systematic and proactive process for identifying hazards, registering them, estimating the associated risks, establishing standards of acceptability and tolerability, evaluating the risks, identifying and prioritising mitigation measures, and tracking the hazards and mitigation measures. A formal risk control process and organisation have been set up. Hazards are ranked according to a Risk Matrix based on their expected frequency and severity. An interactive database, named "Hazard Registration System", is in place to facilitate risk control and management.

3.7 Safety Critical Items/Systems

These are items requiring a high level of integrity because of their criticality for the safe operation of the Railway. Therefore, all aspects of the management of these items/systems from design through to operation and maintenance are subject to stringent controls. In addition to the requirements of the Safety Modules, comprehensive standards are prescribed for the design, operation, and maintenance of these items/systems.

3.8 Safety Committees

A Corporate Safety Committee is established to oversee safety governance at Corporate level. Reporting to the Corporate Safety Committee, divisional safety committees are established to support line management in discharging their safety management responsibilities. The Safety Committee for the Railway is supported by 5 sub-committees, each with their respective functions, e.g. reviewing, developing and proposing safety

standards and procedures and monitoring and reviewing the risk control performance, etc.

3.9 Staff Consultation

Safety is a standing agenda item in line management meetings at all levels and safety topics are discussed regularly at divisional level communications. Regular safety briefings and pre-work safety talks are held for different work teams. Furthermore, Staff Consultative Council (SCC) and Joint Consultative Committees (JCC) are mechanisms for consultation with staff to provide a means for management and staff to freely exchange views on safety and health matters.

In addition, large-scale educational and promotional programmes are held periodically to enhance staff's safety awareness and knowledge. For example, the programmes include a Corporate Safety Month which is an annual Corporate event enhancing staff's and contractors' safety awareness through safety seminars, exhibition and company visit. Environmental, Safety and Quality Quiz and First Aid Competition are organised to enhance staff's safety, health and first aid knowledge and skills which is useful to deliver an even higher quality service at work. In 2006, there are a number of new safety initiatives introduced, e.g. a 1-day Operations Safety Forum to bring more emphasis to Operations Division and provide opportunities for the Executive to demonstrate their commitment to Safety, Health and Environment, tailored pre-work physical exercise to warm-up their body before commencing work and a series of work/life balance activities to promote staff awareness and knowledge of physical health, mental health and healthy relationships with others, etc.

Apart from these, Accident-free Period Incentive Scheme is held to give recognition to work groups with exemplary safety performances for encouraging continuous improvement and Contractor Safety Performance Awards are presented to outstanding contractors with best safety performance, as a recognition and encouragement to contractors to achieve continuous improvement in safety performance.

In order to upkeep safety awareness of passengers on a regular basis. Annual events are held, e.g. an annual month long Safety Month Campaign held in November since 1992 to reinforce the safety awareness of passengers travelling on the Railway and a month long Escalator Safety Campaign held in June since 1995 with particular emphasis on promoting escalator safety. Moreover, special programmes are targeted for special passengers groups which address to their concerns on safety particularly. For example, Youngster Kit and Elderly Kit have been produced for school children and elderly, on-line interactive safety game and regular visits to schools and elderly/community centres to enhance their understanding on the proper and safe ways of travelling on the Railway.

4. Conclusion

The SMS is important in ensuring safety. Such system has been developed to meet our needs based on best international knowledge and practices. The initiatives taken under the SMS have led to increased safety awareness and the application of a structured, proactive approach to safety. Through external benchmarking and external safety management system review, the SMS is reinforced to strive for continuous improvement. MTR Corporation's SMS is modern, comprehensive and practical, representing a best practice model for railways application. Based on state-of-the-art knowledge, international best practices and the Corporation's own experience, MTR Corporation's SMS is continuously upgraded to meet the challenges and needs of a modern, safe mass transit railway.

5. References

Fennell, D., OBE, QC. *Investigation into the King's Cross Underground Fire*. London, United Kingdom: The Department of Transport (November 1988).

Hidden, A., QC. *Investigation into the Clapham Junction Railway Accident*. London, United Kingdom: The Department of Transport (November 1989).