Using Checklists to Guarantee the Effectiveness of Safety Drills Conducted by Shipping Companies with Examples from Some Egyptian Shipping Companies

Mohye El Din Mahmoud El Ashmawy[1]

Abstract

The ISM code entrusted shipping companies with the task of conducting effective safety drills on the basis of the type of ships they operate and the most probable hazards encountered by such ships.

Considering the rationale underlying the ISM Code, which states that safety should become an inherent attitude resulting from repetitive effective safety drills, it follows that shipping companies should concentrate not only on the frequency of conducting safety drills but also on the effectiveness of safety drills. It is obvious that the effectiveness of any safety drill as a macro activity which depends on the analysis of the macro activity into its constituent micro activities, such as the fire-fighting scenario checklist developed in the west of England.

To achieve this target, IMO has issued and recommended the use of checklists for this purpose, an example of which is the checklist of the precautions that should be taken before entering any enclosed space.

This paper focuses on the development of safety checklists, together with examples from the national shipping companies.

Keywords: ISM Code, safety culture, safety drills, macro and micro activities and safety checklists.

[1] Captain, M.Sc., MET (WMU) Consultant to President for Supporting Job Opportunities and WMU Affairs Arab Academy for Science, Technology & Maritime Transport Egypt, Alexandria, P.O. Box 1029 Editorial Board Member of IAMU News and Journal E.mail: mohyldin@aast.edu, mohyldin_a@yahoo.com

1. INTRODUCTION

The International Safety Management (ISM) Code was adopted by the IMO Assembly at its eighteenth session on the 4th of November, 1993, by resolution A.741(18). The mandatory requirements of this Code, which were included in the SOLAS Convention as chapter IX in 1994, aim at assisting shipping companies in the *development of a safety management system* to meet the SOLAS provisions. In November 1995, the nineteenth IMO Assembly adopted guidelines for the implementation of the ISM Code by Administrations (resolution A.788(19). The guidelines provide information on *the survey and certification procedures* that will be applied by governments. It should be noted that the ISM requirements will be implemented through *national legislation* by flag administrations, and shipping companies should make themselves familiar with the rules and procedures that are applicable to them, in addition to the organization and conduct of *internal auditing*, which – according to Section 12 of the ISM Code – should be carried out to verify whether their safety and pollution prevention activities comply with their safety management systems. The success of the ISM Code depends on effective internal auditing by shipping companies.

2. THE OBJECTIVES OF THE ISM CODE

The objectives of the Code are to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment and to property. Therefore, the safety management objectives of the Company should:

- *provide for safe practices in ship operation and a safe working environment;*
- *establish safeguards against all identified risks; and*
- *continuously improve safety management skills of personnel ashore and aboard ships, including preparing for emergencies related both to safety and environmental protection.*

(ISM Code, 1.2, Objectives)

It is clear that identification of risks is a prerequisite to the preparation of safety drills, the success of which depends on the preparation of safety checklist.

3. Assignment of Responsibilities

A basic feature of the ISM Code is the clear assignment of responsibilities to ensure proper implementation of the ISM requirements. For example, to ensure the safe operation of each ship and to provide a link between the company and those on board, every company should designate a person or persons ashore having direct access to the highest level of management.

The master's responsibility with respect to implementing the ISM Code is clearly defined. The master is responsible for:

- *implementing the safety and environmental protection policy of the Company;*
- *motivating the crew in the observation of that policy;*
- *issuing appropriate orders and instructions in a clear and simple manner;*
- *verifying that specified requirements are observed; and*
- *reviewing the SMS and reporting its deficiencies to the shore based management.*

(ISM Code, Item 5)

The responsibilities of the shipping company are also clearly defined. A shipping company is responsible for ensuring that:

- *the master is qualified for command and fully knowledgeable of the Company's SMS;*
- *each ship is manned with qualified, certificated and medically fit seafarers in accordance with national and international requirements;*
- *procedures to ensure that new personnel and personnel transferred to new assignments related to safety and protection of the environment are given proper familiarization with their duties;*
- *all personnel involved in the Company's SMS have an adequate understanding of relevant rules, regulations, codes and guidelines;*
- *procedures for identifying any training which may be required in support of the ISM requirements are established; and that*
- *the ship's personnel are able to communicate effectively in the execution of their duties related to the SMS.*

(ISM Code, Item 6)

4. EMERGENCY PREPAREDNESS

The ISM Code stresses the importance of being prepared to face emergencies through the preparation and execution of safety drills. The Company should establish procedures for the preparation of plans and instructions for key shipboard operations concerning the safety of the ship and the prevention of pollution. The various tasks involved should be defined and assigned to qualified personnel. The ISM Code requires shipping companies to:

- establish procedures to identify, describe and respond to potential emergency shipboard situations;
- establish programmes for drills and exercises to prepare for emergency actions; and
- provide for measures ensuring that the Company's organization can respond at any time to hazards, accidents and emergency situations involving its ships.

It is clear that the ISM Code follows a systematic approach to the issue of safety which comprises (1) *identification of potential emergency situations*, (2) *preparation of effective safety drills*, and (3) *ensuring the efficacy of safety drills by using the technique of analyzing each macro hazard into its micro hazards and designing the required safety checklist*.

5. THE CONCEPT OF MACRO AND MICRO SKILLS

An important feature of the STCW95 Code is the analysis of macro skills into their constituent micro skills. In the STCW 78 macro skills were presented without further analysis. This was remedied in the STCW95 Code which presents Competency Tables containing the micro skills required to practicing a macro skill, which is the basis of preparing safety checklists. Table 1. illustrates this point:

Table 1. *The Micro Skills of Handling a Ship*

Competence	Knowledge, Understanding and Proficiency
Maneuver and handle a ship in all conditions.	Maneuvering and handling a ship in all conditions, including: 1. Maneuvers when approaching pilot stations and embarking or disembarking pilots with due regard to weather, tide, heard each and stopping distances. 2. Handling ship in rivers, estuaries and restricted waters, having regard to the effects of current, wind and restricted water on helm response. 3. Application of constant rate of turn techniques. 4. Maneuvering in shallow water, including the reduction in under- keel clearance caused by squat, rolling and pitching. 5. Interaction between passing ships and between own ship and nearby banks (canal effect).

	6. Berthing and unberthing under various conditions of wind, tide and current with and without tugs. 7. Ship and tug interaction. 8. Use of propulsion and maneuvering systems. 9. Choice of anchorage with one or two anchors in limited anchorages and factors involved in determining the length of anchor cable to be used. 10. Dragging anchor, clearing fouled anchors. 11. Dry-docking, both with and without damage. 12. Management and handling of ships in heavy weather, including assisting a ship or aircraft in distress, towing operations, means of keeping an unmanageable ship out of trough of the sea, lessening drift and use of oil. 13. Precautions in maneuvering to launch rescue boats or survival craft in bad weather. 14. Methods of taking on board survivors from rescue boats and survival craft. 15. Ability to determine the maneuvering and propulsion characteristics of common types of ships with special reference to stopping distances and turning circles at various drafts and speeds. 16. Importance of navigating at reduced speed to avoid damage caused by own ship's bow wave and stern wave. 17. Practical measures to be taken when navigating in or near ice or in conditions of ice accumulation on board. 18. Use of, and maneuvering in and near, traffic separation schemes and in vessel traffic services (VTS) areas.

(Source: STCW Code Competency Tables)

It is the analysis of a given macro activity into its micro activities which enables the designer of a safety checklist to check the performance of each micro activity. Another example of this type of analysis is the scenario of a fire exercise checklist presented in Table 2.

Table 2. *Sample Checklist Based on Micro Skills Scenario of a Fire Exercise*

#	Checklist	Check
1	Are muster lists posted conspicuously?	
2	Are muster lists full up to date?	
3	Was the fire/general emergency alarm sounded correctly?	
4	Did all the crewmembers appear to be familiar with their designated muster stations?	
5	Were all the crewmembers wearing their lifejackets?	
6	Were all lifejackets worn correctly?	
7	Were all crewmembers wearing safety helmets?	
8	Was it possible to distinguish officers from ratings?	
9	Was a roll-call held?	
10	Did the crew appear at their fire/general emergency muster stations promptly, suitably clothed?	
11	Were the checklists used during the roll-call?	
12	Were fire parties properly briefed and dispatched?	
13	Was the emergency fire pump activated without difficulty?	

14	Did the designated crewmembers appear to be familiar with the operation of the emergency fire pump?	
15	Was a satisfactory head of water pressure obtained?	
16	Were hoses and nozzles used correctly?	
17	Was the fire-fighting strategy appropriate to the situation? (e.g., sufficient hoses, boundary cooling, water walls, etc.)	
18	Were portable fire extinguishers used correctly?	
19	Were fire-flaps, remote closing appliances and other safety devices tested during the exercise?	
20	Was the breathing equipment worn correctly?	
21	Were spare cylinders available for use?	
22	Did crew members appear to be familiar with the operation of the breathing equipment?	
23	Was a lifeline attached to each crewmember using breathing equipment?	
24	Was the casualty rescued promptly and safely?	
25	Was the stretcher used correctly?	
26	Was first aid administered promptly and correctly?	
27	Did the crewmembers appear to communicate effectively?	
28	Did the crewmembers function well as a team?	

(West of England, 1995, Ship Safety Appraisal)

6. The Principles of Designing and Implementing Safety Checklists

6.1. Introduction

The objective of this section is to extract the principles of designing and implementing safety checklists by examining the published safety checklists by international organizations engaged in the field of improving safety practices in varied sectors. The National Institute of Occupational Safety and Health is one of such organizations.

6.2. The Benefits of Implementing a Safety Checklist Programme

A Safety Checklist Programme can benefit organizations, especially shipping companies, by helping them do the following:

- Improve the safety and health environment in the shipping company and its ships.
- Prevent injuries and illnesses among seafarers serving on board the Company's ships.
- Increase awareness of occupational safety and health on board ships.
- Find out the agencies which regulate safety and health in the maritime sector.
- Identify the regulations that may apply to seagoing ships.

- Set up a checklist programme in the shipping company that will help the company's personnel serving ashore and at sea analyze the possible hazards for each type of ship operated by the company. It should be noted that each checklist is designed to correspond to specific environmental, safety, and health conditions.
- Prepare for and participate in safety inspections both ashore and at sea.
- Help seafarers to learn about (1) the regulations relating to particular hazards, such as collisions at sea, (2) the benefits of using checklists to comply with these regulations.
- Detect areas that need improvement in the working environment of the shipping company both ashore and at sea.
- Find sources for more information about regulations, technical assistance, and educational materials.

6.3. Ensuring the Effectiveness of Safety Checklists Programmes

It should be noted that certain important considerations should be taken into account when designing a safety checklist. Safety checklists developers and designers should remember the following considerations:

- The occupational safety and environmental safety programme should be tailored to the needs of the shipping company.
- Considering that shipping companies operate different types of ships, and that certain hazards are associated with certain types of ships and cargoes, the first step in designing a safety checklist is to identify the hazards associated with the ships operated by the shipping company. This is emphasized in the ISM Code:

8. EMERGENCY PREPAREDNESS

8.1. The Company should establish procedures to identify, describe and respond to potential emergency shipboard situations.

8.2. The Company should establish programmes for drills and exercises to prepare for emergency actions.

8.3. The SMS should provide for measures ensuring that the Company's organization can respond at any time to hazards, accidents and emergency situations involving its ships.

(ISM Code, Item 8)

It is important that cases of non-conformity should be reported to make sure that corrective action will be taken:

9.1. The SMS should include procedures ensuring that non-conformities, accidents and hazardous situations are reported to the Company, investigated and analyzed with the objective of improving safety and pollution prevention.

9.2. The Company should establish procedures for the implementation of

corrective action

(ISM Code, Item 9)

- Top administration should issue a written policy supporting a safety checklists programme.
- Adequate financial resources should be available.
- Any safety checklists programme should be evaluated and updated periodically.
- Newsletters and bulletin boards should be used to communicate new safety procedures and assignments.
- All accidents should be investigated. Accidents report forms should have a space to answer, "What were the causes of the accident?", and "What precautions or controls could have prevented the incident?"
- Emergency response plans and procedures should be prepared when designing a safety checklist programme.
- Part of the success of a safety checklist programme is to ensure adequate maintenance of the safety equipment available. Equally important is the provision of personal protective equipment (PPT), e.g., respiratory protection equipment. Such items include welders' masks, hard hats, safety goggles, etc.
- Those in charge of developing and designing safety checklists programmes should seek expert advice when necessary. External advice is sometimes necessary.
- The development and design of a safety checklist programme should be accompanied by an effective safety training programme. Training should cover the response actions and use of the safety equipment necessary to handle a given emergency situation.

6.4. Safety Checklist Flowchart

The reader is kindly requested to refer to Appendix A to examine the safety checklist flowchart used by NIOSH. Although it is general in nature, it can be tailored by the shipping company to suit the objectives of the safety policy of the Company.

6.5. The Design Characteristics of Safety Checklists

Examining the design characteristics of the safety checklists developed and published by both NIOSH and Seton revealed the following design characteristics:

6.5.1. Guidelines

A safety checklist begins with guidelines presenting the source of the safety regulations which necessitate the preparation of a given safety checklist and the situations in which it is to be used.

Example

Guidelines: This checklist covers regulations issued by the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). It applies to fire detection and alarm systems and to fire and emergency action plans. The ideal fire and emergency action plan, however, should include all the requirements. Fire alarm and detection systems installed in full compliance with existing building codes may be upgraded to meet existing code regulations. Detailed annual testing requirements of automatic and manual fire alarm systems and fire detection systems have not be included in this checklist.

(Source: NIOSH)

6.5.2. Comments and Corrective Action

A safety checklist ends with a box for comments and the corrective action required to improve the safety checklist.

6.5.3. Using Illustrations

Using illustrations where appropriate is of great importance in clarifying the safety checklist, especially in the case of warnings and reference to safety equipment. Some illustrations extracted from Seton Compliance are listed below.

Examples

(A) Warnings associated with certain hazards.

(B) Warnings associated with protective equipment

Such illustrations reinforce the safety checklist questions.

6.5.4. The Need for Experts

A safety checklist includes remarks concerning the importance of having an expert in a given situation. A symbol is used to indicate this requirement. The following example is from NIOSH.

	Is the electrical wiring and equipment located inside the storage room especially designed to prevent possible ignition of any released flammable vapors?	Yes	No

(Source: NIOSH)

6.5.5. Branching of Checks

For perfection and comprehensiveness purposes, a safety check is sometimes branched to cover all the factors included in a given check. The following example illustrates this point:

25	Is a written fire prevention plan available that includes the following items?	Yes	No
	• Emergency escape procedures, signals, and routes.	___	___
	• Procedures for designated employees who must remain in the facility to shut down equipment before they evacuate.	___	___
	• Procedures to account for all building occupants.	___	___
	• Rescue and medical duties.	___	___
	• Preferred mechanisms for building occupants to report emergencies .	___	___
	Names and job titles of people who can be contacted for more information regarding evacuation plans	___	___

(NIOSH, Fire Prevention Safety Checklist)

6.5.6. Appendices to Provide Clarifications and Definitions

Analysis of the safety checklists published by NIOSH indicates that appendices are used to provide definitions of the terms used in the safety checklist to maintain consistency throughout the whole checklist. The following examples are extracted from NIOSH safety checklists programme.

An example of definitions

- *Dust mask: a filtering face piece type respirator.*
- *Engineering control: physical changes to equipment and operations to reduce exposure to air contaminants. Engineering controls may include: adding local exhaust ventilation, changing to better equipment that release less air contaminants and enclosing operations to prevent exposure.*
- *Filtering face piece (dust mask): a negative pressure particulate respirator*

with a filter as an integral part of the face piece or with the entire face piece composed of the filtering medium.

- *Immediately dangerous to life or health (IDLH): an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.*

(NIOSH, Appendix D)

An example of clarifications

You should do the following when using respirators:

1. *Read all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.*
2. *Choose respirators certified for use to protect against the contaminant of concern. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.*
3. *Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect against gases, vapors, or very small solid particles of fumes or smoke.*
4. *Keep track of your respirator so that you do not mistakenly use someone else's respirator.*

(NIOSH, Appendix D)

7. FIELD STUDIES

This part presents the results of comparing the collected checklists with their classical counterpart, i.e., Fire-fighting and Entry Into Enclosed Spaces. For the purpose of this study, the checklist technique was used in interviews held by the researcher in 5 Egyptian Companies.

With respect to Fire Fighting, comparing the companies' firefighting safety checklists with the classical counterpart: Table 2 gave the following indicators:

Shipping Company 1	No checks with respect to: posted muster lists, full up-to-date muster lists, familiarity of crewmembers with designated muster stations, wearing lifejackets , safely helmets, distinguishing officer from ratings, roll-call, suitably clothed, crew appearing at fire/general muster station, breathing equipment, stretcher and first aid.
Shipping Company 2	No checks with respect to: posted muster lists, full up-to-date muster lists, familiarity of crewmembers with designated muster stations, distinguishing officers from ratings, roll-calls, stretcher.

Shipping Company 3	No checks with respect to: micro skills, familiarity of crewmembers with designated muster stations, safety helmets, distinguishing officers from ratings, roll-calls, spare cylinders, providing prompt rescue services.
Shipping Company 4	No checks with respect to: Firefighting missing micro skills, availability of the following items: familiarity of crewmembers with designated muster stations, safety helmets, distinguishing officers from ratings, roll-calls, spare breathing apparatus cylinders, and rescuing casualties.
Shipping Company 5	No checks with respect to: posted muster lists, full up-to-date muster lists, wearing lifejackets, safety helmets, distinguishing officers from ratings, fire parties, breathing equipment, spare cylinders, lifeline, using breathing equipment and stretcher.

With respect to Entry Into Enclosed Spaces, comparing the companies' checklists with the classical counterpart in Appendix B gave the following indicators:

Shipping Company 1	Identical to the classical checklist.
Shipping Company 2	No checks of: Section 1: approved type of portable type, Section 2: section 1 not completed as necessary.
Shipping Company 3	Identical to the classical checklist.
Shipping Company 4	Identical to the classical checklist.
Shipping Company 5	No checks of Section 3: familiarity with breathing apparatus and testing it.

8. Conclusion

The issue of preparing and using safety checklists by Egyptian shipping companies should be given more attention.

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Appendix A

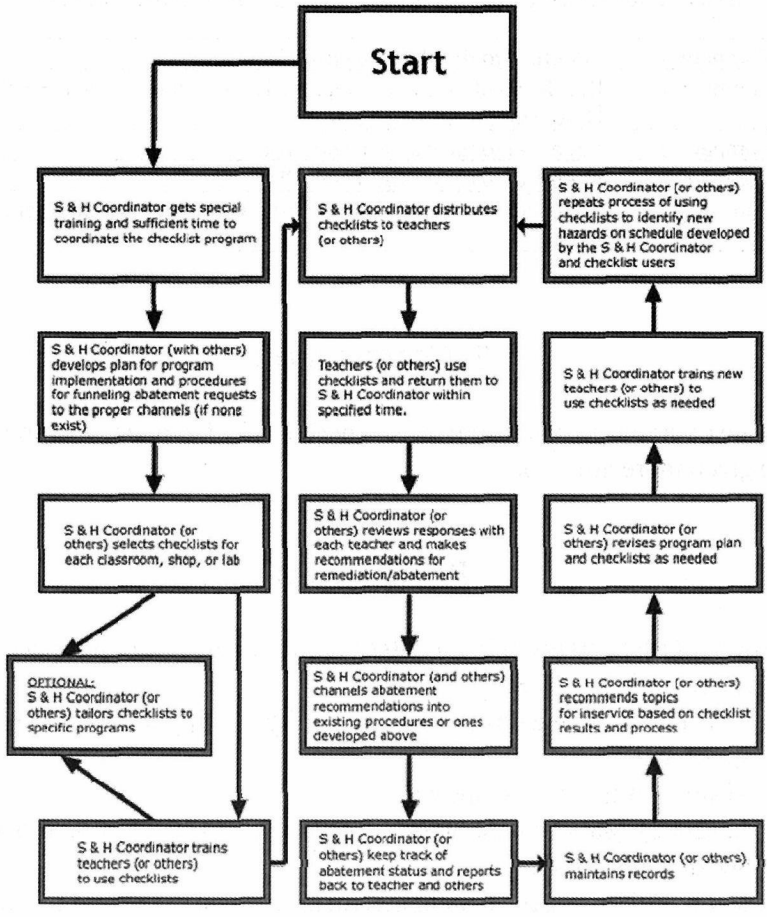

Figure 3.1 – Safety Checklist Flowchart (Source: NIOSH)

Appendix B – Safety Checklist

Recommended poster for display on board ships in accommodation or other places, as appropriate

Section 1
To be checked by the master or responsible officer
1.1 Has the space been thoroughly ventilated and where testing equipment is available, has the space been tested and found safe for entry?
1.2 Have arrangements been made to continue ventilation during occupancy of the space and at intervals during breaks?
1.3 Are rescue and resuscitation equipment available for immediate use beside the compartment entrance?
1.4 Have arrangements been made for a responsible person to be in constant attendance at the entrance to the space?
1.5 Has a system of communication between the person at the entrance and those in the space been agreed?
1.6 Are access and illumination adequate?
1.7 Are portable lights or other equipment to be used of an approved type?
When the necessary safety precautions in section 1 have been taken, this card should be handed to the person who is to enter the space for completion

Section 2
To be checked by the person who is to enter the space
2.1 Have instructions or permission been given by the master or a responsible officer to enter the enclosed tank or compartment?
2.2 Has Section 1 been completed as necessary?
2.3 Are you aware you should leave the space immediately in the event of failure of the ventilation system?
2.4 Do you understand the arrangements made for communication between yourself and the responsible person in attendance at the entrance to the space?

STOP!
Have you been through the drill?

Enclosed spaces can kill!
Do not ignore or forget it –

Before entering any enclosed space all the appropriate checks listed here must be carried out by the master or responsible officer and by the person who is to enter the space

Section 3
Where breathing apparatus is to be used, this section must be checked jointly by the responsible officer and the person who is to enter the space

3.1 Are you familiar with the apparatus to be used??
3.2 Has the apparatus been tested as follows?
(i) Gauge and capacity of air supply
(ii) Low pressure audible alarm
(iii) Face mask air supply and tightness
3.3 Has the means of communication been tested and emergency signals agreed?

(Source: IMO, (1992) Code of Safe Practice for Cargo Stowage and Securing, London.)