

Training safely, Training safety

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ABSTRACT: It is the basic requirement of maritime safety education to guarantee the safety of teaching operation while training the crew's occupation safety capability. Marine Training Center of Shanghai Maritime University has undertaken the practical teaching of "marine survival" for many years and come up with the whole safety procedures of training. Based on the requirements of SOLAS convention and regulations of STCW over crew training, this paper introduces the safety allocation, utilization and maintenance of teaching equipments. Through the investigation of the safety situation of students' practical operation, the safety teaching method named "four in one" has been put forward, which includes the pre-teaching safety precaution, the whole monitor during the teaching process, the post-teaching summary evaluation, and the reset and standby of teaching facilities. Finally, during the learning and training of "marine survival", crews and students are called on to place priority on personal safety rather than acquisition of knowledge and skills. Only in this way can they be capable of self-protection and protection of others in the career of seafaring.

1 INTRODUCTION

The recent tragic accident of the Sewol Ferry in South Korea has focused the whole world's attention on the reasonable allocation and correct operation of marine life-saving equipments and the survival and lifesaving ability of crews. Meanwhile, the recent lifeboat training accident of a maritime school in our country obliged the whole industry to pay attention to the safety of crews' survival and lifesaving ability training. It is the basic requirement of maritime safety education to guarantee the safety of teaching operation while training the crew's occupation safety capability. Marine Training Center of Shanghai Maritime University has undertaken the practical teaching of "marine survival" for many years and come up with the whole safety procedures of training.

2 GROUNDS OF MARINE SURVIVAL TRAINING

According to the requirements of table A-VI/1-1 in the Manila Amendments to the STCW Convention (International Maritime Organization 2010), Seafarers employed or engaged in any capacity on board ship on the business of the ship as part of the ship's complement with designated safety or pollution-prevention duties in the operation of the ship shall receive appropriate approved basic training or instruction in personal survival techniques before being assigned to any shipboard duties. The STCW/2010 amendment requires crews to provide evidence demonstrating that maintained professional competence in training cannot be conducted on board. Methods for maintaining professional competence in these items are presented in the STCW78/10 amendment chapter VI. These items of training that

cannot be conducted on board are related to capacity of marine survival.

European Maritime Safety Agency (EMSA) carried out a comprehensive evaluation on education, training, examination and certification for seafarers in China from October 15th to 24th, 2012. Maritime education and management in our country received high evaluation from the assessment experts of EMSA, which has verified comprehensiveness and effectiveness of performance of the 1978 STCW convention and amendment. Shanghai Maritime University experienced on-site inspection, and as an important maritime education department, Marine Training Centre revealed that navigational skills education and training can completely meet EU requirements for high-level maritime education in the aspects of education facilities, management system, teaching performance and other aspects.

Based on requirements of regulation III/17-1 in the SOLAS amendment (International Maritime Organization 2014), ship shall develop "specific plans and procedures for recovery of persons from the water", which came into force on July 1st, 2014. The new rules are designed to provide master and other crew members guidance in recovery of persons from the water, minimize the risk to crewmembers on board and the persons who fell into water, and enhance safety at sea. In addition to Circular MSC/Circ.1412 approved by International Maritime Organization(2004), Maritime Safety Committee has provided guidelines for the amendment as "Guidelines for Preparation of Plans and Procedures for Recovery of Persons from the Water" (China Classification Society 2014), which provides that all existing traditional or modern life-saving equipments and other devices can be used to rescue personnel on board and lists all items of consideration for development of plans and procedures, such as risk assessment, specific criteria for recovery of persons from the water and crew's ability and skills.

As a state-certified maritime education and training department in basic safety certificate training for seafarers, Shanghai Maritime University Marine Training Center implements the Convention actively, adjusts teaching plans, improves teaching content, and strengthens crew's marine survival ability. During the process of maritime education and training in "basic safety", the awareness of "safety in training, training for safety" has been built for students to receive skills of safety training and marine survival.

3 TEACHING FACILITIES

Shanghai Maritime University has run Quality Management System for 17 years, which has received and passed Det Norske Veritas (DNV) external audit many times. After the new Marine Training Center came into service, it passed DNV external audit the first time. Marine Training Center has been visited, inspected, and highly praised by many visiting delegations of foreign maritime universities and related leaders from domestic government agencies and institutions. Those honored guests were deeply impressed by wave produce equipment, which

creates a realistic ocean wave environment. According to "The People's Republic of China Code on Seafarer's Training Management" (Ministry of Transport of the People's Republic of China 2009) implemented on October 1st, 2009, Shanghai Maritime University has developed Marine Training Center in accordance with "the standards of venues, facilities, equipments and requirements of teaching faculty for seamen basic safety training", with training venues improved, more relevant marine survival safety equipments purchased, relevant signs, marks and panels arranged, and safety management system of teaching and practical operation optimized. Through careful comparison with "guide for verification of seafarer training institutions" (Maritime Safety Administration of the People's Republic of China 2010), the Center has made up for its disadvantages. It has been highly praised by acceptance experts and passed acceptance inspection of teaching facilities organized by Shanghai Maritime Safety Administration in June 2014.

3.1 Safety allocations

The largest facility located in the training center is wave-making pool, which is also the most important equipment. Besides the pool, survival laboratory and dressing room are the supporting facilities. The training center has a lifeboat and several life rafts on 5m platform. Our students will receive training in launching lifeboat and recovering it. After putting on lifejacket or immersion suit correctly, students jump into the wave-water from 5m platform.

Surrounding the pool, functional zone and safety mark are established. The diving terminal of the pool is 5 meters deep water. Above the water, 5m platform is equipped with safety mark "Beware of Falling", and a special non-slip mat is installed on the diving board to prevent hurt from slipping and colliding. Relative to the deep water is 2 meters shallow water. To avoid any accident from jumping into shallow water without lifejacket, prohibitory sign is expressed as "Shallow Water, No Diving!" On the right side of the diving terminal is lifeboat operating zone, which is marked by yellow-black warning line. The other side is briefing corner under cover of awning.

Many safety allocations are presented everywhere all over the center, including prohibitory sign and warning mark. Your eyes will first focus on a striking prohibitory sign "Restricted Areas: without permission, no admittance!" against red background at the entrance. Another prohibitory sign is installed at the entrance of wave-maker room with many high-voltage machines, avoiding any irrelevant personnel access to the area.

It is dangerous to swim near the buffer mesh in the pool, especially when the wave-maker is running. As a result, the mark "No Swimming" is presented here. On one side of the pool, the lifeboat and its launching facilities are dangerous source to students, so the mark "No Climbing" and "Beware of Machinery Injuries" are here to give safe signals to students, nobody is allowed to be exposed to this area especially climb the lifeboat. No playing games is allowed surrounding the ground and all over the water, a big marker named "Do Not Horse Around!"

is hanging in an eye-catching position. Some other warning marks are also found around the pool, such as "Beware of Falling into the Water", "Beware of Slipping", and "Caution!".

3.2 Utilization of teaching equipments

Producing wave: The pool is controlled by a set of wave-producers, six air-blowers produce air flowing in the cyclic pipeline, the water in the pool rises and falls accordingly, as a result, the wave is produced. With the changing of working model, six style waves can be selected, and they are convex wave, cross wave, left-turn wave, surf wave, diamond wave and random wave. The program of performance is as follows: first, start the machine in the machine space below the pool, and then, two times of warning signal will be given out to draw people's attention. When the second warning signal is over, the wave will come soon. There are many options from six wave styles. If any emergency happened, emergency stop button can be used to cut off these machines.

Launching life raft: life raft operating area is set on 5m platform with warning mark on the ground. The operation of launching life raft is carried out here. The first step is to check whether the life raft and its accessory equipments are in good condition. Instructor will confirm that painter is tied somewhere securely and no obstruction is in the water. Safety fence opened, hydrostatic release unit started or raft house slip released, lifeboat will fall into the water by gravity. Inflated cylinders start meanwhile and life raft shell opens. Some capable students should be assigned to get into water and transfer the shell and fittings to shore to avoid hurting students.

Righting an inverted life raft: the righter in a lifejacket should jump into the water and pull the CO₂ cylinder side to leeward. He climbs up the bottom of the life raft from the CO₂ cylinder side, stands on the bottom side of the chamber near the CO₂ cylinders, and then pulls the righting strap steadily while leaning as backwards as possible. At that time the raft rights again under the joint effect of human body gravity, tension and wind. A steady pull is better than a jerk, and it is easier to right the raft with the help of wind. After righting raft, the righter should swim immediately away from underside of the raft side without rope-ladder, and beware of being entangled in the ladder or hit by the cylinder at the same time.

Embarking and disembarking: beneath the entrance of inflatable life raft is a rope ladder for embarking. When boarding the life raft, one hand grasps the rope ladder, the other hand grasps the cable on the floating tire, with arms bent and legs curved backward to climb the ladder. When upper body crosses the floating tire, head leans forward to throw upper body into the raft (forward roll). When leaving the raft, student should face the raft, sit on the floating tire, keep away from embarkation ladder, pinch nose and mouth and use backward roll to get into water.

3.3 Maintenance of teaching equipments

Instructors should complete the preparation of related facilities and equipments in accordance with "Shanghai Maritime University Experimental Instructor Code", and check out the reliability of related equipments. Instructors should arrive at water training center 20 minutes earlier, check out the state of equipments, start up circuit, and inflate the life raft. Regular examination and maintenance of survival equipments are necessary. Life raft needs to be timely transferred to shore after using, having water drained from valve and being dried under the awning. Timely inflation and deflation are also important in case valve may expand under high temperature, resulting in damage of weak parts and training accident. Life jackets need regular examination as well, including timely repair and replacement of broken life jackets.

4 "FOUR IN ONE" SAFETY TEACHING METHOD

4.1 The safety situation of students' practical operation

Based on continuous teaching and tracking marine survival course, students' classroom and on-site performance are basically satisfactory. Advanced wave produce system and clear water greatly cheered students when they first entered Marine Training Center. Thanks to the paramilitary management students have received, basic teaching order has been fine. Usually the "marine survival course" is opened in the first year, when students' sense of obedience has not yet seriously degraded. And practical operation course will not start until theoretical course has been conducted for some time. In theoretical course, instructors put forward relevant safety requirements and students have to abide by them. Student leaders have to bring their ability into full play in maintaining practical operation course. No personal safety accident has ever happened since Marine Training Center is under operation. Awning has been installed for students to cool themselves during training in hot summer, with the purpose of heatstroke prevention. First aid kits, stretchers and other medical equipments have also been equipped to deal with emergencies of students.

4.2 The pre-teaching safety precaution

After students enter the teaching area of practical operation, instructors explain safety precautions to them for at least half an hour. Emphasis has been laid on strict obedience of the regulations of "Shanghai Maritime University Laboratory Safety and Health Rules", and safety requirements and announcements of marine survival course have been told.

Students are arranged to check out the ground of assigned route of training program in Marine Training Center so as to eliminate rubble, glass and the like. Before the training course, students are asked to put on training suit and clothing, such as bathing suit or swimming trunks, in designated dressing room, no swimming goggles are allowed. Students are not allowed to put on underwear, watch, or any other ornaments when they are receiving diving training. They have to stay clean before they enter the

pool, and they are not allowed to litter or spit in the pool. Swimming, diving under water and playing in water are all forbidden in the pool. In training venues, no running or fighting is allowed, and as for students who take part in training, they are not allowed to do anything that is not related to training. No student is allowed to dive in non-designated diving area or reach area outside training venues. With the exception of support group and rescue team who offer assistance near the pool, no student is allowed to come within half a meter of the pool's boundary line. Wave production should be arranged at the last group of training task if necessary, and students should be notified about the time, procedure and safety precautions of wave production. Before wave produce system is started up, a careful examination is necessary to see if there is any obstacle or anyone swimming in the pool.

Students should listen to related matters carefully, and if they have any question, they should ask about it immediately and have the problem solved before they start training. During the training, students subordinate themselves to management, learn modestly, and finish training programs one by one according to the requirement of instructors. Without permission, they cannot perform other training programs or touch the equipments or goods at training place. During the process of training, they cannot leave training place without notice; in the case of special circumstances, they have to ask the instructor for a leave of absence before they can go. Finally, unrelated person cannot enter training place during training.

Students should be put into different teams; training procedures, training programs and technical essentials have to be explained to them. Students have to change clothes and get lifejacket under arrangement, and they also have to be taught the correct way of putting on lifejacket, technical essentials and safety details of other training programs.

4.3 *The safety control during the teaching process*

Instructors stand at the rear position of the diver to instruct the students. When one team of students arrive at diving platform and line up in sequence, diving procedures and matters needing attention should be emphasized again. Before diving, students should wear life jacket properly, and diving without life jacket is strictly prohibited. Instructors should check out whether students wear life jacket properly according to requirements. When they are diving, their diving posture should be strictly in accordance with the guide. That is they jump into the water with their feet down and head on, two legs straight and clamped, two eyes looking at the front horizontally, inner hand covering mouth and nose, and outer hand clasping the life jacket of upper arm. They jump into the water in this posture vertically, with deep-breathing and elimination of distractions. Any other posture is strictly prohibited.

Two whistles are used to call students' attention. At the first whistle, students should take their place, confirm their life jacket are fastened, secure rope ends, whistle and life jacket light, and make sure their

posture is correct. The second whistle is the signal to jump. Students conduct diving practical operation according to this whistle. After they fall into the water they should swim away as soon as possible. The next student should be directed to diving place to standby. The diving interval should be strictly controlled; the diving whistle shall be sent out only after the previous student is 5 meters away from where he fell. For students with a fear of heights, heart disease and other special illness, psychological counseling shall be introduced to encourage them, no style of outside forces are allowed to push or strike them to dive in order to avoid accidents. If anyone goes against the above-mentioned rules, then instructors are authorized to bring their training to a halt.

Make certain that the first diver selected is powerful, agile and good at swimming, who can swim to the life raft swiftly and right it safely. Remind them of safety action of somersault embarking and backward somersault disembarking. The assigned support team should keep the life raft at a safe position all the time in case of collision with the wall of the pool to prevent injury when they get out of the life raft; and students have to be supervised to keep the HELP posture in the whole process. Rescue team should be organized, with six students in one team, and all of them should be good at swimming. They are scattered over three sides of the pool to deal with the emergencies of cramp and drowning that can occur at any time. The next team shall not move on with training until the first team (6 to 10 people) finished, thus they can take advantage of high attitude to have a full view of all the operational programs, procedures, technical essentials and safety precautions in the water.

When it is the turn of last group, whistle is used to have all students' attention to start up wave produce system. After two alarming bells, waves are created in the pool. The last group of students conducts diving training according to the whistle. What deserves special attention is that in a waved environment, there is more resistance, which is more energy-consuming and difficult to swim away. Therefore, diving interval should be prolonged; the signal for next student to dive should not be given out until it is completely certain that there is no danger of collision. Support team should employ their techniques and skills to make the floating life raft upside down. Apart from that, they have to prevent the impact of wave from righting the life raft and pay attention to personal safety at every minute in case of drowning or injury.

Instructors instruct students in techniques of righting life raft in waves and indicate the correct and safe means of boarding life raft. They constantly remind the students of the danger of getting their feet tangled in rope handrails or rope ladder, which will result in injury. After all the students have boarded the life raft and finished the assigned program successfully, they should get out of the life raft safely and swim to the designated waters to perform the HELP posture. Instructors should always pay attention to the students in case they are washed away by waves or collided against buffer network or fence and get injured. After students finish the HELP posture, they should go ashore immediately and be mindful of the slippery floor. They have to go to

dressing room at once to change their clothes in case they might catch a bad cold.

4.4 *The post-teaching summary evaluation*

After the training, students should assemble and be counted in case individual students might be neglected in the bottom of the pool (Such incident happened in one maritime school). Instructors should summarize and evaluate the training courses. They should not only evaluate and lay emphasis on students' technical performance, but also investigate incident and near miss during the whole training process and criticize individual students who act against disciplines. Each team is required to do some self-evaluation on safety, especially a detailed retrospect of oversight or near miss during the whole process, which include not only deficiencies of individual training program, but also inadequacy of logistics safeguard, safety awareness and safety actions of the students. The performance of the first member of each team should be evaluated, with merits developed and demerits pointed out. If there is any obvious mistake, then the sequence of students diving should be adjusted accordingly. The performance of students with acrophobia shall be assessed, and psychological counseling is needed to encourage such students to standardize technical essentials and finish all the training programs. Based on multi-directional observation and students' self-evaluation, instructors should give a summary of the whole situation of training, emphasizing safety problems and proposing measures to correct. As for some individual students who boo and hoot, they should receive serious criticism and education.

The reset and standby of teaching facilities.

After completion of summary evaluation, equipments and facilities have to be checked out. The hardware malfunction found in this practical operation should be repaired or reset. Life jackets and life rafts need to be neatened and placed at designated place to dry. Timely salvage is needed if any of the accessories of life jackets or life rafts have been left in the pool, in case they may cause trouble to wave producing next time. Power supply unit of wave produce system, doors and windows need to be shut off in time. Compressed air pump and tool box should be taken back to storehouse. In a word, the Instructors must confirm that all teaching facilities are standby after class. After all the work of reset and standby, the security manager of training center need to be notified and lock the training place to prevent irrelevant personnel from coming in during extracurricular time

5 CONCLUSION AND SUGGESTION

With the guide and requirement of relevant conventions and codes for maritime education and training, Marine Training Center carries out basic safety certificate training for maritime students, not only teaching students water survival skills, but also providing safety assurance. Starting from allocation of teaching facilities, our university takes into account two aspects, one is necessary teaching facilities, the other is additional safety configurations, such as various training zone warning labels, all kinds of prohibitory signs and warning marks; utilization and maintenance of teaching facilities also follow the principles of safety and reliability.

"Four in one" has been put forward in teaching for many years in the marine survival course, which includes the pre-teaching safety precaution, the whole monitor during the teaching process, the post-teaching summary evaluation, and the reset and standby of teaching facilities. Every step of "four in one" safety teaching mode always ensures the principle of "safety first". The success of safety practice teaching is inseparable from the support from university level, the instructor's practice, logistical safeguard, and most importantly, obedience and cooperation of all trainees. Finally, during the learning and training of "marine survival", all trainees are called on to place priority on personal safety instead of acquisition of knowledge and skills. Only in this way can they be capable of self-protection and protection of others in the career of seafaring.

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