



SUB-COMMITTEE ON STANDARDS OF
TRAINING AND WATCHKEEPING
33rd session
Agenda item 3

STW 33/3
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VALIDATION OF MODEL TRAINING COURSES

Model courses to be validated

Note by the Secretariat

SUMMARY

<i>Executive summary:</i>	This document provides information on the model courses that have been updated which are to be validated by the Sub-Committee
<i>Action to be taken:</i>	Paragraph 6
<i>Related documents:</i>	STW 30/3

1 The 1995 Conference of Parties to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) adopted resolution 13 "Revision of model courses published by the International Maritime Organization" inviting the Organization to take steps to revise and update those model courses which provide guidance on the implementation of the training and assessment provisions of the STCW Convention, as amended.

2 At its thirtieth session, the Sub-Committee agreed to consider in detail only new courses and those subject to major revision. At its last session, the Sub-Committee validated one existing model course that had been revised and updated to meet the requirements of the revised STCW Convention and considered in detail and validated two new model courses that had been developed.

3 Consequently, the Secretariat has identified the following STCW-related courses for revision and updating:

- .1 Ship Simulator and Bridge Teamwork (1.22);
- .2 Cargo and Ballast Handling Simulator (2.06); and
- .3 Engine Room Simulator (2.07).

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4 Expressions of interest in revising these model courses were sought from a number of contractors worldwide and the work assigned on the basis of available expertise and cost. Drafts of these model courses have been forwarded to members of the validation panel for their comments. The revision of these model courses has been chiefly a re-arranging of the text in line with the functions and levels in the revised STCW Convention and an update of references. Comments on the drafts revised model courses have been received from the validation panel. The draft model courses attached at annex include the validating panel's comments, as appropriate.

5 The Secretariat wishes to express its gratitude to the Government of Norway for providing the funds for the revision of these courses.

Action requested of the Sub-Committee

6 The Sub-Committee is invited to consider the above information and decide as appropriate.

Model Course 2.06

Cargo and Ballast Handling Simulator



ACKNOWLEDGEMENTS

This course on cargo and ballast handling simulation is based
on material developed for IMO, under contract, by
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Contents

	<i>Page</i>
Foreword	4
Introduction	5
Part 1: Course Framework	9
Part 2: Course Outline and Timetable	14
Part 3: Detailed Teaching Syllabus	17
Part 4: Instructor Manual	35
Appendix: Cargo Handling Simulator Sample Exercise Scenarios	
Exercise # 1-VLCC	49
Exercise # 2-VLCC	50
Exercise # 3-VLCC	51
Exercise # 4-VLCC	53
Exercise # 5-VLCC	54
Exercise # 6-PC	60
Exercise # 7-PC	62
Exercise # 8-PC	64
Exercise # 9-PC	66
Exercise # 10-PC	67

Attachment: Guidance on the implementation of IMO model courses

Foreword

Introduction

■ Purpose of the model courses

The purpose of the IMO model courses is to assist maritime training institutes and their teaching staff in organizing and introducing new training courses, or in enhancing, updating or supplementing existing training material where the quality and effectiveness of the training courses may thereby be improved.

It is not the intention of the model course programme to present instructors with a rigid "leaching package" which they are expected to "follow blindly". Nor is it the intention to substitute audio-visual or "programmed" material for the instructor's presence. As in all training endeavours, the knowledge, skills and dedication of the instructor are the key components in the transfer of knowledge and skills to those being trained through IMO model course material.

Because educational systems and the cultural backgrounds of trainees in maritime subjects vary considerably from country to country, the model course material has been designed to identify the basic entry requirements and trainee target group for each course in universally applicable terms, and to specify clearly the technical content and levels of knowledge and skill necessary to meet the technical intent of IMO conventions and related recommendations.

This is the first major revision to this model course. In order to keep the training programme up to date in the future, it is essential that users provide feedback. New information will provide better training in safety at sea and protection of the marine environment. Information, comments and suggestions should be sent to the Head of the STCW and Human Element Section at IMO, London.

■ Use of the model course

To use the model course the instructor should review the course outline and detailed syllabus, taking into account the information provided under the entry standards specified in the course framework. The actual level of knowledge and skills and prior technical education of the trainees should be kept in mind during this review, and any areas within the detailed syllabus which may cause difficulties because of differences between the actual trainee entry level and that assumed by the course designer should be identified. To compensate for such differences, the instructor is expected to delete from the course, or reduce the emphasis on, items dealing with knowledge or skills already attained by the trainees. He should also identify any academic knowledge, skills or technical training which they may not have acquired.

Adjustment of the course objective, scope and content may also be necessary if in your maritime industry the trainees completing the course are to undertake duties which differ from the course objectives specified in the model course.

Within the course plan the course designers have indicated their assessment of the time which should be allotted to each area of learning. However, it must be appreciated that these allocations are arbitrary and assume that the trainees have fully met all entry requirements of the course. The instructor should therefore review these assessments and may need to reallocate the time required to achieve each specific learning objective or training outcome.

By analysing the detailed syllabus and the academic knowledge required to allow training in the technical area to proceed, the instructor can design an appropriate pre-entry course or, alternatively, insert the elements of academic knowledge required to support the technical training elements concerned at appropriate points within the technical course.

Adjustment of the course objectives, scope and content may also be necessary if in your maritime industry the trainees completing the course are to undertake duties which differ from the objectives specified.

Within the course outline, Part 2, the course designers have indicated their assessment of the time which should be allotted to each subject area. However, it must be appreciated that these allocations are arbitrary and assume that the trainees have fully met all the entry requirements of the course. The instructor should therefore review these assessments and may need to reallocate the time required to achieve each specific learning objective.

■ **Lesson plans**

Having adjusted the course content to suit the trainee intake and any revision of the course objectives, the instructor should draw up lesson plans based on the detailed syllabus. The detailed syllabus contains specific references to the textbooks or teaching material proposed to be used in the course. An example of a lesson plan is included in the instructor manual in most model courses, but in this course, the exercise scenarios supplied as an appendix to the instructor manual serve this purpose. Where no adjustment has been found necessary in the learning objectives of the detailed syllabus, the lesson plans may simply consist of the detailed syllabus with keywords or other reminders added to assist the instructor in making his presentation of the material.

■ **Presentation**

The presentation of concepts and methodologies must be repeated in various ways until the instructor is satisfied, by testing and evaluating the trainee's performance and achievements, that the trainee has attained each specific learning objective. The syllabus is laid out in learning-objective format and each objective specifies what the trainee must be able to do as the learning outcome. Taken as a whole, these objectives aim to meet the knowledge, understanding and proficiency specified in the appropriate tables of the STCW Code.

■ **Evaluation or assessment of trainee progress**

The nature of this course involves all the trainees and the instructors in an ongoing process of individual and group evaluation.

■ **Implementation**

For the course to run smoothly and to be effective, considerable attention must be paid to the availability and use of:

- properly qualified instructors;
- support staff,
- rooms and other spaces;
- equipment,
- textbooks, technical papers; and
- other reference material

Thorough preparation is the key to successful implementation of the course. IMO has produced a booklet entitled "Guidance on the implementation of IMO model courses", which deals with this aspect in greater detail. A copy of this booklet is included as an attachment to this course.

■ **Training and the STCW 1995 Convention**

The standards of competence that have to be met by seafarers are defined in Part A of the STCW Code in the Standards of Training, Certification and Watchkeeping for Seafarers Convention, as amended in 1995. This IMO model course has been revised and updated to cover the competences in STCW 1995. It sets out the education and training to achieve those standards.

For ease of reference, the course is divided into separate sections.

Part 1 provides the framework for the course with its aims and objectives and notes on the suggested teaching facilities and equipment. A list of useful teaching aids, IMO references and textbooks is also included.

Part 2 provides an outline of lectures, demonstrations and exercises for the course, together with a suggested sequence and timetable. From the teaching and learning point of view, it is more important that the trainee achieves the minimum standard of competence defined in the STCW Code than that a strict timetable for each topic is followed.

Depending on their experience and ability, some students will naturally take longer to become proficient in some topics than in others.

Part 3 gives the Detailed Teaching Syllabus. This is based on the theoretical and practical knowledge specified in the STCW Code. It is presented in a logical sequence, starting with basic knowledge and information on petroleum and its hazards, safety and pollution prevention, and concluding with inert gas systems and crude oil washing operations. Each subject area is covered by a series of *required performances*, in other words what the trainee is expected to be able to do as a result of the teaching and training. In this way the overall required performance of knowledge, understanding and proficiency is met. IMO references, textbook references and suggested teaching aids are included to assist the teacher in designing lessons.

Part 4 contains an Instructor Manual with additional explanations, an example lesson plan and simulator exercise for instructors that may have access to a liquid-cargo-handling simulator.

The Convention defines the minimum standards to be maintained in Part A of the STCW Code. Mandatory provisions concerning Training and Assessment are given in section A-1/6 of the STCW Code. These provisions cover: qualification of instructors; supervisors as assessors; in-service training; assessment of competence; and training and assessment within an institution. A corresponding Part B of the STCW Code contains non-mandatory guidance on training and assessment.

A separate IMO model course addresses Examination and Assessment of Competence. This course explains the use of various methods for demonstrating competence and criteria for evaluating competence as tabulated in the STCW Code and may be helpful in developing any necessary assessments.

Part 1

Course Framework

■ Aims

The course is essentially a practical one and consists of a series of exercises structured around the operation of the cargo and ballast installation of an oil tanker and carried out in conjunction with a simulator.

The exercises are controlled by an instructor and, initially, allow the trainees to become familiar with the layout of the cargo, ballast and slop tanks forming the system and the instrumentation and controls that are used.

The exercises continue with the simulation of the normal procedures and operations for the loading and discharging of cargo, the use of inert gas, crude oil washing, tank cleaning, ballasting and deballasting, tank purging and gas freeing, and, where the simulator design incorporates it, bunkering.

The importance of loading and discharging so as to avoid undue stressing of the hull and the use of 'load on top' procedures to minimize pollution are introduced at appropriate points of the simulator programme.

Each simulator exercise is preceded by a briefing lecture and followed up by a group discussion during which the actions and decisions of the trainees are analysed.

During the series of exercises the trainees will assume specific roles in the cargo or other operation that is being simulated, with one trainee taking the role of the officer in charge of the particular operation being simulated.

Note: Officers and ratings who are to serve aboard oil tankers are required by paragraphs 1 and 2 of Regulation V/1 of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (as amended in 1995) to have appropriate experience aboard operational oil tankers and to have completed approved shore-based specialized training related to oil tanker operations.

It is not claimed that this course, using simulation of oil tanker cargo and ballast operations, meets the requirements of paragraphs 1 and 2 of Regulation V/1 of STCW 1995 in respect of service aboard ship and shore-based training.

The IMO Model Courses 1.01 and 1.02 have been designed to meet the requirements of Regulation V/1 of STCW 1978, as amended in 1995 in respect of shore-based training; this course, using simulation, would provide them with relevant support.

■ **Objective**

The trainees who successfully complete the course will make a safer and more effective contribution to the operation and control of the cargo and ballast installation of an oil tanker, which will improve ship safety and provide greater protection of the environment.

In particular, there will be:

- familiarization with the equipment, instrumentation and controls used for cargo handling on an oil tanker
- a greater awareness of the need for proper pre-planning, the use of checklists and the time scales involved in the various cargo handling operations
- an enhanced awareness to apply proper and safe procedures at all times when carrying out the various operations on board an oil tanker
- an acquisition of experience in identifying operational problems and solving them
- an improvement in the ability to make decisions which promote safety and protect the environment.

■ **Entry standards**

Entry to the course is open to merchant navy officers who wish to improve their knowledge and understanding of the operation and control of cargo and ballast operations, and other related operations on oil tankers. The course will provide a more formalized training to consolidate and enhance experience gained from service aboard an oil tanker.

■ **Course certificate, diploma or document**

On successful completion of this course, a document should be issued confirming that the holder has completed a short course on oil tanker cargo and ballast handling using a simulator. Administrations, which approve such training as satisfying any part of the requirements of Regulation V/I of STCW 1995, should make an appropriate endorsement to the document.

■ **Course intake limitations**

The number of trainees who can utilize the simulator for any given activity regulates the course intake. For this reason the maximum number of trainees should normally be twelve. When circumstances demand it, the trainees can be split into two sub-groups of up to six in each group.

■ **Staff requirements**

The instructor shall have appropriate training in instructional techniques and training methods (STCW Code section A-I/6)

It is recommended that the instructor in charge of the course should hold an unrestricted senior officer merchant navy certificate of competency, and should have experience in the operation and control of cargo-handling operations on an oil tanker, including the use of inert gas and crude oil washing, with training and use of a simulator as a training aid. To operate the course successfully, at least one other instructor is required, preferably with similar qualifications and experience as the instructor-in-charge.

■ **Use of simulators**

The revised STCW Convention sets standards regarding the performance and use of simulators for mandatory training, assessment or demonstration of competence.

The general performance standards for simulators used in training and simulators used in assessment of competence are given in section A-I/12. Section B-I/12 provides guidance on the use of simulators in these activities.

Simulator-based training and assessments is not a mandatory requirement for oil tanker training programme. However, it is widely recognized that well-designed lessons and exercises can improve the effectiveness of training and shorten training times compared to traditional methods.

When using simulator-based training, instructors should ensure that aims and objectives of these sessions are defined within the overall training programme and that tasks are selected so as to relate as closely as possible to shipboard tasks and practices. Instructors should refer to STCW Code, section A-I/12, part 2.

■ **Teaching facilities and equipment**

The cargo-handling system being simulated by the training installation should be modelled on an authentic cargo-handling system of a modern oil tanker, including its equipment, instrumentation and centralized cargo operations control centre, taking into account national, international and other requirements relating to safety and pollution prevention.

The simulator complex should comprise a "cargo control centre", an "instructor unit", and a separate space for briefing and debriefing, with tables and chairs, a blackboard and, where such audio-visual aids are to be used, an overhead projector.

The simulator unit should be based on a general-purpose minicomputer with real-time operating programs connected to the cargo control centre and the instructor unit. Information print-out machines and visual display units should be incorporated into the system for trainees and instructors.

The cargo control centre should contain a number of consoles covering the cargo and related systems, each with its own mimic diagram showing the system layout. The consoles will cover pumps, valves, instrumentation, communication, alarms etc. Various operations such as loading, discharging, ballasting, inert gas production, cargo tank inerting and washing will be set up and controlled from the centre.

The instructor unit should, preferably, be separate from the control centre and fitted with a window for observing and monitoring the trainee activity and progress.

The instructor unit will have an appropriate console for monitoring the various processes and operations being simulated, and be capable of introducing commands and specific malfunctions in accordance with the training programme.

■ **Teaching aids (A)**

A1 Instructor manual and its appendix (Part 4 of the course).

A2 CBT modules:
CD # 12: Tanker Operations I
CD # 13: Tanker Operations II
CD # 38: Oil Tanker Training System
CD # 07: Inert Gas generator
CD # 08: Flue Gas plant
CD # 54: Crude Oil Washing (COW)
CD # 48: Gas Measurement
CD # 06: OPA-90

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■ **Bibliography (B)**

- B1 ICS/OCIFM/IAPH, *International Safety Guide for Oil Tankers and Terminals*. 4th edn. [London, Whiterby and Co. Ltd (32/36 Aylesbury Street, London, EC1R 0ET, UK.) 1996] (ISBN 1-85609-081-7)
- B2 Captain C. Baptist, *Tanker Handbook for Deck Officers*. 7th edition (Glasgow, Brown, Son and Ferguson Ltd., 1993) (ISBN 0-85174-587-3)
- B3 INTERTANKO, *Intact Stability in Double Hull Tankers*, 1996
- B4 INTERTANKO, *Measures to Prevent Accidental Pollution*, 1990
- B5 INTERTANKO, *Effective Crude Oil Washing*, 1995

■ **IMO references (R)**

- R1 International Convention on Standards of Training, Certification and Watch keeping for Seafarers, 1995 (IMO Sales No. 945).
- R2 MARPOL 73/78 Consolidated Edition 1997 and 1999 Amendments. (IMO-520E).
- R2.1 International Convention for the Prevention of Pollution from Ships, 1973 and Protocol of 1978 relating to the international Convention for the Prevention of Pollution from ships, 1973
- R2.2 Annex I of MARPOL 73/78: Regulations for the Prevention of pollution by Oil
- R2.3 Unified Interpretations of the Provisions of Annex I
- R3 SOLAS, Consolidated Edition 1997.
- R4 Crude Oil Washing Systems 4th edition(IMO-617E).
- R5 Inert Gas Systems (IMO-860E)
- R6 Crude Oil Washing Systems (IMO-617E)
- R7 Dedicated Clean Ballast Tanks (IMO-619E)
- R8 Oily-water Separators and Monitoring Equipment (IMO-608E)

- Details of distributions of IMO publications that maintain a permanent stock of all IMO publications may be found on the IMO web site at <http://www.imo.org>

- **Textbooks (T)**

No specific textbook has been identified for use in structuring this course.

Part 2

Course Outline and Timetable

Course outline		Approximate time (hours)
Subject area		Lectures, demonstrations and practical work
1	Familiarization	
1.1	Tank arrangement	0.5
1.2	Pipeline arrangement	0.5
1.3	Pipe system control valves	0.5
1.4	Pumps	1.5
1.5	Instrumentation	0.5
1.6	Controls	1.0
1.7	Basic operations and procedures	1.5
		6.0
2	Special operations and Procedures	
2.1	Tank atmosphere evaluation	1.5
2.2	Use of inert gas	1.0
2.3	Cleaning of cargo tanks	1.0
2.4	Crude oil washing (COW)	2.0
2.5	Draining and stripping procedures	1.0
2.6	Use of slop tanks	1.0
2.7	Gas freeing	1.5
2.8	Load on top (LOT) procedure	1.0
		10.0
3	Ballast operation	
3.1	General provisions	1.0
3.2	Ballasting	1.5
3.3	Deballasting	1.5
		4.0
4	Cargo Operations	
4.1	General provisions	1.0
4.2	Loading cargo	2.5
4.3	Discharging cargo	2.5
		6.0
5	Operational Problems	
5.1	Cargo and related operations – normal working	1.0
5.2	Introduction of system faults, malfunctions and accidents	1.5
5.3	Remedial actions	1.5
		4.0
TOTAL		30.0

Course Timetable – example

Day	Period 1 (1.5 hours)	Period 2 (1.5 hours)	Lunch break	Period 3 (1.5 hours)	Period 4 (1.5 hours)
1	1. Familiarization	1. Familiarization		1. Familiarization	1. Familiarization
2	2. Special Operations	2. Special Operations		2. Special Operations	2. Special Operations
3	2. Special Operations	2. Special Operation		2. Special Operations 3. Ballast Operations	3. Ballast Operations (contd.)
4	3. Ballast Operations (contd.)	3. Ballast Operations (contd.) 4. Cargo Operations		4. Cargo Operations (contd.)	4. Cargo Operations (contd.)
5	4. Cargo Operations (contd.)	4. Cargo Operations (contd.) 5. Operational Problems		5. Operational Problems	5. Operational Problems

Note

Teaching staff should note that time tables are suggestions only as regards sequence and length of time allocated to each objective. These factors may be adapted by lectures to suit individual groups of trainees depending on their experience and ability and on the equipment and staff available for training.

Part 3

Detailed Training Syllabus

The detailed teaching syllabus is presented as a series of learning objectives. The objective, therefore, describes what the trainee must do to demonstrate that the specified knowledge or skill has been transferred and competence achieved.

Thus each training objective is supported by a number of related performance elements in which the trainee is expected to be proficient. The teaching syllabus shows the required performance required of the trainee in the tables that follow.

In order to assist the instructor, references are shown against the learning objective to indicate IMO references and publications, textbooks and teaching aids, which the instructor may wish to use when preparing and presenting course material.

The material listed in the course framework has been used to structure the detailed teaching syllabus; in particular,

- Teaching aids (indicated by A),
- Bibliography (indicated by B),
- IMO references (indicated by R)

will provide valuable information to instructors. The abbreviations used are:

- App.: appendix
- Ex.: exercise
- P.: page
- Reg.: regulation.

The following is an example of the use of references:

“A1” refers to the Instructor Manual in part 4 of this model course

“RI - Reg. V/1” refers to regulation V/1 of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1995 (STCW 1995).

Note

Throughout the course, safe working practices are to be clearly defined and emphasized with reference to current international requirements and regulations . It is expected that the national institution implementing the course will insert references to national requirements and regulations as necessary.

Competence

The competences required by candidates may be expressed in terms of the Convention as follows.

- 1.1 Plan and ensure safe loading, care during the voyage and unloading of oil cargoes
- 1.2 Safely and efficiently perform the carriage of dangerous cargoes
- 1.3 Control trim, stability and stress
- 1.4 Monitor and control compliance with legislative requirements and measures to ensure safety of life and protection of the marine environment

Training outcome (as stated in Table A-II/2)

The standard of knowledge, understanding and proficiency associated with the above competences is therefore considered to be tabulated below.

- 1.1.1 Demonstrate knowledge of and ability to apply relevant international regulations, codes and standards concerning the safe handling and transport of oil cargoes
- 1.1.2 Plan and execute oil tanker loading and unloading operations
- 1.1.3 Demonstrate a practical knowledge of oil tankers and oil tankers operations
- 1.1.4 Demonstrate a knowledge of the carriage of dangerous, hazardous and harmful cargoes; the precautions during loading and unloading and care during the voyage
- 1.1.5 Demonstrate an understanding of the factors affecting trim, stability and stress as applicable to oil tankers
- 1.1.6 Demonstrate a knowledge of maritime law embodied in international agreements and conventions, with special regard to:
 - responsibilities under the relevant requirements of the International Convention for Safety of Life at Sea;
 - responsibilities under the International Convention for the prevention of Pollution from ships as applicable to oil tankers; and
 - methods and aids to prevent pollution of the marine environment by oil tankers.

Knowledge, understanding and proficiency	IMO Reference	Textbooks, Bibliography	Teaching Aid
1 Familiarization (6 hours)			
1.1 Tank arrangement of the simulated oil tanker	R1- Reg.V/1	B2	A1 App. – Ex.1
.1 lists the tanks as: - cargo tanks - ballast tanks - slop tanks	R2 R2 – R7		A2 CD.12-13-38
.2 shows the tank arrangement on a simple line diagram			
.3 describes the features of a double hull-tanker			
1.2 Pipeline arrangement	R1- Sec. A-V/1 Pa. 10	B2	A1 App. Ex.1
.1 shows the pipelines of the simulated system on a simple line diagram			A2 CD.
.2 compares the line diagram with the simulator mimic diagram			12,13,38
1.3 Pipe system control valves	R1- Sec. A-V/1 Pa. 10	B2	A1 App. EX 1
.1 shows on the line diagram developed for 1.2 the control valves and states their functions			
.2 describes the control valves used in the systems and explains how they functions			
1.4 Pumps	R1- Sec. A-V/1 Pa. 10	B2	A1 App. Ex.1,5
.1 lists the pumps used in the system in terms of: - centrifugal pumps - screw displacement pumps - reciprocating pumps			A2 CD. 12, 13, 38
.2 describes in simple terms, using line sketches where appropriate, the operation of the pumps used in the system			
.3 describes an eductor and explains how it functions			
1.5 Instrumentation	R1- Sec. A-V/1 Pa. 10		A1 App. Ex.1,5
.1 lists and briefly describes the instrumentation used in the simulated system of: - liquid level in tanks - quantity in tanks - liquid temperature - liquid pressure - rate of liquid flow			
1.6 Controls			
.1 lists the controls in the simulated system for: - valve actuator - cargo heating - pump start and stop	R1- Sec. A-V/1 Pa. 10	B2	A1 App. Ex.1,10