



THE EXAMINATION AND CERTIFICATION OF SEAFARERS

REVISION 8
NOV 2021



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General

1.1 Reference to Act and Regulations

- 1) The *Marine Personnel Regulations* were made by the Governor in Council under section 100 of the *Canada Shipping Act, 2001*, in order to specify the crewing and certification requirements on board vessels.
- 2) Section 16 of the Act provides for the Minister to specify the manner Canadian Maritime Documents (including certificates of competency) are issued, and to set the examinations a person must undergo in order to obtain such a certificate. Section 17 provides for the Minister to specify the period of validity of every maritime document.

1.2 Purpose

The purpose of this publication is therefore to define the conditions set for issuance of certificates of competency and other measures taken by the Minister under sections 16 and 17 of the Act. It also contains tables to summarize some points of the regulations, for use as a quick reference. It is not intended as a substitute to any other document, and must be consulted in conjunction with the Act and the Regulations. In case of doubt or apparent inconsistency, the Act and the Regulations always prevail.

1.3 Related reference material

International Marine Organization STCW Convention and STCW Code.

1.4 Period of validity of certificates

- 1) Pursuant to Section 17 of the Act, the Minister has established the following periods of validity:
 - a) five years from the date of issue in the case of certificates or endorsements referred to in the *Marine Personnel Regulations*, paragraphs 100(a) to (ff), (jj), (kk), (nn) to (qq), (yy) to (eee); 102(1)(c) to (g);
 - b) two years from the date of issue for the certificates referred to in the *Marine Personnel Regulations*, paragraphs 100(rr) and (ss),
 - c) unlimited in the case of certificates or endorsements referred to in the *Marine Personnel Regulations*, paragraphs 100(gg) to (ii), (tt) to (xx); 102 (1)(h) to (s).
 - d) unlimited in the case of certificates or endorsements referred to in the *Marine Personnel Regulations*, paragraphs 100(ll) and (mm); 102(1)(a) and (b) when they are issued to a rating;
 - e) five years from the date of issue in the case of endorsements referred to in the *Marine Personnel Regulations*, paragraphs 102(1)(a) and (b) when they are issued to a deck officer or to an engineer officer;
 - f) a maximum of two years from the date of issue in the case of a medical certificate, except where the seafarer is less than 18 years of age, in which case the maximum period of validity is one year.
- 2) Pursuant to Section 273 of the Act, Canadian maritime documents issued under Part II, III or V of the *Canada Shipping Act*, chapter S-9 of the Revised Statutes of Canada, 1985, remain in force for the purpose for which they were issued.

1.5 Application for examination

- 1) Under section 110 of the Marine Personnel Regulations, the examiner may postpone the examination an applicant seeks to take if the applicant does not provide the examiner with an application and the required documentation at least two weeks before the date set for the examination.
- 2) Where a document submitted in support of an application appears to have been falsified or tampered with, the examiner will retain the document pending proof of its authenticity. If the applicant cannot obtain or provide proof of authenticity, the Minister may refuse to issue a certificate of competency, pursuant to section 16 of the Act.
- 3) Where, for any reason, an examiner refuses a person admittance to an examination, the examiner will notify the applicant by letter and report the matter to the Director, *Marine Personnel Standards and Pilotage* in Ottawa.

1.6 Replacement of documents

- 1) If a certificate has been lost, stolen or damaged, application for a replacement may be made to any Marine Safety examination centre. The applicant must fill the application form and pay the appropriate fee as per section 122 of the Regulations.
- 2) Where the lawful holder of a certificate legally changes his name, he must make an application for a certificate in the new name to a Marine Safety examination centre and pay the appropriate fee.

1.7 Forms

- 1) With reference to section 92 of the Canada Shipping Act, 2001, the certificate of discharge to be provided by the authorized representative is normally in the form of a record of sea service (discharge book), however when the seafarer does not hold such a record, the form *Certificate or testimonial of sea service* may be used.
- 2) With reference to Schedules 3, 4 and 5 to part 1 of the *Marine Personnel Regulations*, (testimonials of service) the following forms have been prepared for the convenience of applicants and may be obtained from the Transport Canada web site or from a Marine safety office or from the below mentioned URLs . In the absence of these forms, any other format may be used, as long as it contains all the information and, where applicable, the declarations specified in the Regulations' schedules.
 - i) TC Form 82-0546: Testimonial of Sea Service – Deck Department:
https://wwwapps.tc.gc.ca/Corp-Serv-Gen/5/forms-formulaires/download/82-0546_BO_PD
 - ii) TC Form 82-0666: Testimonial of Sea Service – Engine Department:
https://wwwapps.tc.gc.ca/Corp-Serv-Gen/5/forms-formulaires/download/82-0666_BO_PD
 - iii) TC Form 82-0545: https://wwwapps.tc.gc.ca/Corp-Serv-Gen/5/forms-formulaires/download/82-0545_BO_PD

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1.8 Inquiries

Requests for information concerning the Examination and Certification of Seafarers may be directed to a Marine Safety examination centre. Details of Marine Safety exam centres can be accessed at URL: <http://www.tc.gc.ca/eng/regions.htm>

Career as a Ship's Officer

1.9 How to become a deck officer

1) Good physical fitness is necessary for a career as a ship's officer in the deck department. The first step should be a medical examination, including eyesight and hearing, as stated in the *Marine Personnel Regulations*.

2) Applicants must produce a proof of Canadian citizenship or landed immigrant status under the *Immigration Act* before a certificate of competency or an endorsement can be issued.

3) Two career paths are open to aspiring mates and masters.

b) An approved cadet Cooperative Training Program:

Application should be made to one of the Recognized Institutions listed in TP-10655 offering this type of program. Entrance qualifications and financial support vary from school to school.

All existing, approved courses last from 36 to 42 months, and include studies ashore and on board ships.

During periods on board ship, the cadet must complete assignments set by the institution and keep a record of work and studies. This will be scrutinized by a school's instructor after each sea period and by the examiner when the cadet first applies for a certificate of competency.

These periods at sea are intended to expose the cadet to the full range of master and mate responsibilities. A cadet must be prepared to perform all types of manual labor, as well as navigation and executive tasks.

The trainee is sometimes relatively poorly paid, but this route puts the graduate in the most favorable position to obtain the highest qualifications.

c) Part-time study combined with service as deck rating:

The prospective officer must first obtain employment in the deck department. The seafarer is eligible to be examined for a certificate after completing the sea service specified for that certificate in the *Marine Personnel Regulations*.

The method of study is optional except for prescribed courses in first aid, marine emergency duties, simulated electronic navigation and electronic chart display and information systems. Several nautical schools offer short upgrading courses to assist part-time students in reaching certification standards (refer to TP-10655).

When employment has been secured, a Discharge Book should be obtained from a Marine Safety office. Thereafter, an accurately documented record of all discharges and testimonials referred to in section 1.7 must be maintained.

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- 4) The *Marine Personnel Standards and Pilotage* Directorate of Marine Safety issues certificates on behalf of the Minister of Transport. Examinations for deck rating and deck officer certificates are held at Marine Safety examination centres across Canada.

1.10 How to become an engineer officer

- 1) Good physical fitness, including hearing and normal eyesight, are necessary for a career as a ship's officer in the engineering department. The first step, therefore, should be a medical examination including sight and hearing tests conducted to standards as stated in the *Marine Personnel Regulations*. While success in the medical examination is no guarantee that difficulties will not be encountered at later stages, it will assure the new entrant that an insurmountable problem does not exist at the outset.
- 2) Applicants must produce a proof of Canadian citizenship or landed immigrant status under the *Immigration Act* before a certificate of competency or an endorsement can be issued.
- 3) Two routes are open to the aspiring marine engineer.

- a) An approved training program in marine engineering:

Application should be made to one of the Recognized Institutions listed in TP-10655 offering this type of program. Entrance qualifications and financial support vary from school to school.

All existing, approved programs last from 36 to 45 months, and include studies ashore and on board ship.

During periods on board ship, the trainee must complete assignments set by the institution and keep a record of the work and studies. This will be scrutinized by a school's instructor after each sea period and by the examiner when the cadet first applies for a certificate of competency as a marine engineer.

These periods at sea are intended to expose the cadet to the full range of the marine engineer's responsibilities, shipboard systems and personal relationships. For this reason, the trainee must be prepared to perform all types of manual labor as well as skilled tasks. The trainee is normally not expected to engage in repetitive work without further educational value.

The trainee is sometimes relatively poorly paid, but this route puts the graduate in the most favorable position to obtain the highest qualifications.

- b) Part-time study combined with service as engine room rating:

The prospective engineer must first obtain employment in the engine department or in a related field. Then, after completing three years of service and related training, the trainee will become eligible to be examined for the Fourth-class engineer certificate.

The three years of service must include the successful completion of a *Practical Skills for Marine Engineers training course* at a recognized institution (refer to TP 10655), which will be considered as the equivalent of six months of service. The service must also include the satisfactory completion of a Marine Safety approved *Training Record Book for Applicants to the Fourth-class Engineer Certificate* before being examined for the STCW-endorsed fourth-class engineer certificate. Applicants who do not complete the above training and record book will be eligible to receive a restricted certificate, valid on near coastal voyages.

The STCW-endorsed fourth-class certificate is a prerequisite to the third- and second-class certificates. The second-class certificate is a prerequisite to the

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first-class certificate, and the 18-month qualifying service must be acquired while holding a second-class certificate.

Method of study is optional except for the prescribed courses in first aid, marine emergency duties and propulsive plant simulator training. Nautical schools offer short upgrading courses to assist part-time students in reaching certification standards (refer to TP 10655).

When employment has been secured, a Discharge Book should be obtained from any Transport Canada, Marine Safety office. Thereafter, the applicant must keep an accurately documented record of all discharges, including testimonials of sea service, which outline the service, hours of work or watch, and particulars of the ship on board which the service was performed.

- 4) The *Marine Personnel Standards and Pilotage* Directorate of Marine Safety issues certificates on behalf of the Minister of Transport. Examinations for engine-room rating and marine engineer officer certificates are held at Marine Safety examination centres across Canada

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Application for Examination

2.1 Reference to regulations

Before applying for an examination, applicants should refer to sections 110 and 111 of the *Marine Personnel Regulations* in order to become familiar with the general conditions of eligibility.

2.2 General

- 1) Certain training courses may have a limited period of validity, as provided in section 103 of the *Marine Personnel Regulations*.
- 2) In order to avoid delays, applicants should ensure that their sea service testimonial and discharge book are duly completed before leaving their vessel. The dates on all documents used to authenticate sea service must coincide.
- 3) An application should be made as early as possible to allow time for checking and assessing documents that are submitted in support of the application.

Provisions for Direct Examination

2.3 Certificates issued by an authority other than the Minister

- 1) Section 119 of the *Marine Personnel Regulations* describes the process of direct examination, whereby a Canadian citizen or permanent resident within the meaning of subsection 2(1) of the *Immigration and Refugee Protection Act* will be assessed on the basis of the qualifications described in section 119 for the purpose of obtaining a Canadian certificate issued under the Regulations.
- 2) A certificate of service issued by the Minister, or a certificate of competency issued by a foreign government or by a Canadian authority other than the Minister, has no direct equivalency expressly provided for under the *Canada Shipping Act, 2001*. Applicants holding such a certificate must apply under section 119 of the *Marine Personnel Regulations* and produce all the documents listed in subsection (2) of section 2.5.
- 3) On the basis of the provisions of the *Marine Personnel Regulations* that apply to the certificate sought, the Director, Marine Personnel Standards and Pilotage (AMSP), determines the level at which a lawful holder of one of the certificates referred to in subsection (2) will be accepted for direct examination.

2.4 Conditions of eligibility

- 1) An applicant must meet the requirements of section 2.7 or 2.8, depending on whether the certificate applied for is a nautical or an engineering certificate, and:
 - a) hold one of the certificates referred to in section 119 of the *Marine Personnel Regulations*;
 - b) have qualifying service not less than that required for the certificate for which the application is being made.
- 2) An applicant who meets the conditions listed in subsection (1) may choose to be examined at any certificate level in a given discipline, up to the level at which acceptance was initially granted under subsection (3) of section 2.3.

2.5 Assessment process

- 1) The onus is on the applicant to provide the required documentation in English or French. If an original document is not in English or French, the original of a certified translation into one of these languages must be provided.
- 2) The applicant must submit:
 - a) a completed application for a certificate (Form EXN-3);
 - b) the original certificate of competency;
 - c) proof of citizenship or permanent resident status;
 - d) a completed record of sea service (Form EXN-2);
 - e) proof of qualifying service ashore, if any; and
 - f) transcripts of pertinent academic training.
- 3) The examiner will calculate the applicant's sea service and forward a photocopy of the documents to AMSP for verification and assessment under the Regulations.
- 4) AMSP will verify the authenticity and validity of the certificate by contacting the issuing foreign government or Canadian authority.
- 5) To evaluate credits towards academic subjects, the number of hours of instruction in a particular subject will be compared with the Canadian standard set out in the TP applicable to that subject.
- 6) Exemptions from examination may be granted only up to the level of the certificate held by the applicant at the time of application, even if he/she has acquired sufficient qualifying service to write examinations at a higher level.
- 7) AMSP will determine the highest certification level for which the applicant is eligible, identify any exemption from examination in accordance with section 2.7 or 2.8, and inform the examiner accordingly.
- 8) The examiner will issue a letter to the applicant indicating the level of acceptance and any exemptions, for the period of validity referred to in subsection 110 (3) of the *Marine Personnel Regulations*.
- 9) Once the eligibility of an applicant has been determined and the applicant subsequently obtains a Canadian certificate of competency, he/she is considered to be in the Canadian system and will not be assessed again for additional exemptions unless it was stated at the time that the assessment was temporary, pending submission of supplementary documentation.
- 10) After obtaining a Canadian certificate of competency, an applicant who obtains a higher-ranking certificate from an authority in another country will not be granted exemptions based on examinations passed in that country.
- 11) An applicant who has failed an examination cannot be considered for an exemption in that subject, regardless of any diploma he may submit thereafter.

2.6 Regulatory requirements

- 1) Unless otherwise specified in the sections that follow, no exemption from a regulatory requirement to take an examination or to successfully complete an approved training course will be granted to an applicant for completing a course that has not been approved by Transport Canada, or for possessing a qualification that has no equivalent under the *Marine Personnel Regulations*.
- 2) Any exemption from a requirement to take an examination or to successfully complete an approved course may be granted only on the basis of original transcripts or original authenticated communications from the authority or government that issued a certificate, testimonial, transcript or other document.

2.7 Nautical certificates

- 1) An applicant must meet the following requirements in order to be eligible for direct examination:
- a) the eligibility criteria set out in Table I;
 - b) the qualifying service requirements set out in Table II; and
 - c) the examinations, training courses and ancillary certificates set out in Table III and IV.

Table I – Eligibility for Direct Examination

Certificate applied for	An applicant holding a non restricted STCW endorsed certificate in this column may apply for direct examination for the certificate indicated to its left, or a lower-ranking certificate
Master Mariner	STCW II/2, Master
Master Near Coastal	STCW II/2, Master
Master 3000 Gross Tonnage	STCW II/2, Master 3000 Gross Tonnage
Master 3000 Gross Tonnage Near Coastal	STCW II/2, Master 3000 Gross Tonnage
Master 500 Gross Tonnage	STCW II/2, Master 500 Gross Tonnage
Master 500 Gross Tonnage Near Coastal	STCW II/2, Master 500 Gross Tonnage
Chief Mate	STCW II/2, Chief Mate
Chief Mate Near Coastal	STCW II/2, Chief Mate
Watchkeeping Mate	STCW II/1, OOW on ships of 500 gross tonnage or more
Watchkeeping Mate Near Coastal	STCW II/1, OOW on ships of 500 gross tonnage or more
Fishing Master, First Class	Master, Fishing vessel
Fishing Master, Second Class	Officer, Fishing vessel

Table II – Qualifying Service Requirements

Certificate applied for	Regulatory requirement
Master Mariner	Refer to subsection 123 (2) of the <i>Marine Personnel Regulations</i>
Master, Near Coastal	Refer to subsection 124 (2) of the <i>Marine Personnel Regulations</i>
Master 3000 Gross Tonnage	To be determined
Master 3000 Gross Tonnage, Near Coastal	Refer to subsection 125 (2) of the <i>Marine Personnel Regulations</i>
Master 500 Gross Tonnage	To be determined
Master 500 Gross Tonnage, Near Coastal	Refer to subsection 126 (1) of the <i>Marine Personnel Regulations</i>
Chief Mate	Refer to subsection 132 (2) of the <i>Marine Personnel Regulations</i>
Chief Mate Near Coastal	Refer to section 133 of the <i>Marine Personnel Regulations</i>
Watchkeeping Mate and Watchkeeping Mate, Near Coastal	Refer to subsection 134 (2) of the <i>Marine Personnel Regulations</i>
Fishing Master, First Class	Refer to section 139 of the <i>Marine Personnel Regulations</i>
Fishing Master, Second Class	Refer to section 140 of the <i>Marine Personnel Regulations</i>

Table III – Required Examinations

Certificate	Ship Management Exam	General Seamanship (Oral including NSCM)	SIM Exam (See Note)
Master Mariner (MM)	SM 4	MM-O	SIM II or SIM M
Master Near Coastal (M-NC)	SM 4	M-NC-O	SIM II or SIM M
Master 3000 (M-3000)	SM 3	M3000-NC-O	SIM II or SIM M
Master 3000 Near Coastal (M3000-NC)	SM 3	M3000-NC-O	SIM II or SIM M
Master 500 (M-500)	SM 3	M500-NC-O	SIM II or SIM M
Master 500 NC (M500-NC)	SM 3	M500-NC-O	SIM II or SIM M
Chief Mate (CM)	SM 3	CM-O	SIM II or SIM M
Chief Mate Near Coastal (CM-NC)	SM 3	CM-NC-O	SIM II or SIM M
Officer Of the Watch (OOW)	-	OOW-O	SIM I or SIM O
Officer of Watch Near Coastal (OOW-NC)	-	OOW-NC-O	SIM I or SIM O
Fishing Master, First Class (FM 1)	SM 1	FM 1-O	SIM II or SIM M
Fishing Master, Second Class (FM 2)	SM 1	FM 2-O	SIM I or SIM O

SM Ship Management examination

SIM Simulated Electronic Navigation examination

General Seamanship This includes applicable Oral examination and a written exam for NSCM (Navigation Safety written examination based on Canadian Modifications)

Note:

Newcomers to Canada who have received the TCMSS official letter of equivalency under the Direct Entry process:

- (a) Will be entitled to challenge directly the applicable SIM examination once, without attending the related training;
- (b) If successful, they will receive the related examination credit;
- (c) If unsuccessful, they will have to attend the entire applicable SEN training, followed by the applicable SIM examination.
- (d) For these particular cases only – the Candidate shall be examined by:
 - i. One TCMSS Nautical Examiner and
 - ii. Two simulator instructors appointed by the college;
- (e) The three Commission members have to agree entirely that the candidate is competent in order to be granted the applicable SIM exam credit.

Table IV – Required STCW compliant Training Courses

(These will be credited, after verification, if these were credited by STCW approved administration of the concerned foreign country and these are valid at the time of passing applicable Oral examination as stated in Table III)

Master Mariner	Chief Mate	Watchkeeping Mate	Fishing Master, First Class	Fishing Master, Second Class
STCW BS	STCW BS	STCW BS	STCW BS	STCW BS
PSC	PSC	PSC	PSC	PSC
AFF	AFF	AFF	AFF	AFF
SEN II or SEN M (see Note on this page)	SEN II or SEN M (see Note on this page)	SEN I (A & B) or SEN O (see Note on this page)	SEN II or SEN M (see Note on this page)	SEN 1B or SEN O (see Note on this page)
ECDIS	ECDIS	ECDIS		
GMDSS or ROC-MC	GMDSS or ROC-MC	GMDSS or ROC-MC	GMDSS or ROC-MC	GMDSS or ROC-MC
MAFA	MAFA	MAFA	MAFA	MAFA
LMS	LMS	LTW		

- ROC-MC Restricted Operator’s Certificate (Commercial Maritime) issued under the Radiocommunication Act
- SEN Simulated Electronic Navigation training certificate
- ECDIS Electronic Chart Display and Information System training certificate
- STCW BS STCW Basic Safety training certificate (STCW table A-VI/1-1, 2, 3, 4)
- PSC Training certificate for proficiency in survival craft and rescue boats other than fast rescue boats (STCW table A-VI/2-1)
- AFF Advanced Fire Fighting training certificate (STCW table A-VI/3)
- MAFA Marine Advanced First Aid training certificate (STCW table A-VI/4-1)
- LMS Leadership and Management Skills training certificate
- LTW Leadership and Teamwork Skills training certificate

- 2) An applicant who holds a qualification issued by the Department of National Defence will receive exemptions which will need to be determined or as follows:
- A. All members who had completed the naval environmental training program (NETP) program of the Royal Canadian Navy at Damage Control School at CFB Esquimalt, BC or CFB Halifax, NS would get full credit for the following:
1. STCW Basic Safety (sea survival training would be consider as a “refresher”) as set out in TableA- VI/1-1, VI/1-2, VI/1-3, VI/1-2 of the STCW Code;
 2. Advanced Fire Fighting, as set out in Table A-VI-3 of the STCW Code; and
 3. Steering Testimonial
- 3) An applicant who holds a Canadian Coast Guard Watchkeeping or Command Certificate will receive the exemptions listed in Table V. The applicant must produce appropriate certificates and a graduation diploma indicating year of graduation.

Table V – Exemptions for Canadian Coast Guard (Fleet) Qualifications

By virtue of graduation or certificate held	Year of Graduation from the Canadian Coast Guard College		
	A. 1969-1982	B. 1983-1987	C. 1989 -1998 (There were no graduates in 1988)
1. Upon Graduation	MET 1, MET 2, SCS 4, EK 1 and EK 2 Exemptions are not subject to limitations on their period of validity	COM 1, ASTRO 2, MET 1, MET 2, SCS 4 and EK 2 Passes credited are not subject to limitations on their period of validity	COM 1, ASTRO 2, MET 1, MET 2, SCS 4, EK 1 and EK 2 Exemptions are not subject to limitations on their period of validity
2. MOT Watchkeeping Mate (issued between 1983 and 1997), or MOT Watchkeeping Mate, Ship (first issued 1998)		Exemptions in cell 1.B and C/P 2, NS 1, CG 2, GSK 3, SIM I and Oral OOW (if examinations were passed) (Exemptions and passes credited are not subject to limitations on their period of validity, unless the MOT Watchkeeping Mate with a Fleet Systems Operations Endorsement was not completed within 30 months of graduation)	Exemptions in cell 1.C and C/P 2, NS 1, CG 2, GSK 3, SIM 1 and Oral OOW (if examinations were passed) (Note that for these years of graduation, the CCG Fleet Systems endorsement is not a Marine Safety requirement and is therefore not required to obtain the exemptions)
3. Coast Guard (Fleet) Watchkeeping	Exemptions in cell 1.A and COM 1, C/P 2, NS 1 and SIM I		
4. Coast Guard (Fleet) Command completed in the year stated in this row	A. 1972 - 1976: Exemptions in cells 1.A and 3.A and ASTRO 2 and SCS 5 1977 - 1979: Credits in cells 1.A and 3.A and SIM II, ASTRO 2, NS/I and SCS 5 1980 - 1982: Credits in cells 1.A and 3.A and SIM II, ASTRO 2, NS/I, SM 3, SM 4 and SCS 5		B. Other MOT examinations passed after 1982 have been recorded in the usual manner in MOT records on an individual applicant basis, and are therefore not part of this table of exemptions

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2.8 Engineering certificates

- 1) An applicant must meet the following requirements in order to be eligible for direct examination:
 - a) complete marine emergency duties training courses appropriate to the certificate applied for; and
 - b) complete propulsion plant simulator training at the appropriate level for the certificate applied for.
- 2) Regardless of section 2.5, no exemptions will be allowed for examinations in general engineering knowledge, engineering knowledge of motor vessels, engineering knowledge of steamships, or general engineering knowledge of small vessels, or for the written examination on the duties of an engine-room rating or for oral examinations.
- 3) Credit will be given, in accordance with Table VI, to Canadian Armed Forces (CAF) naval personnel who apply for a marine engineer certificate. CAF personnel applying for a marine engineer examination must supply the following information, substantiated with the proper documentation (Reference: Forms CFP-245 and CF-1110):
 - a) Date of joining and leaving the CAF;
 - b) Technical certificates issued and their dates of issue; and
 - c) Sea service testimonials, giving details of the vessels' main propulsion machinery, the nature of the duties performed by the applicant and the number of days spent at sea.

Table VI

CAF Certificate	Credit
Certificate 1	Remission of 15 months' qualifying service toward Fourth-Class Engineer certificate, Motor Ship or Steamship. Also qualifies as having completed the requirements of TP-13721 (Training Record Book Requirements for Applicants to the Fourth-Class Engineer Certificate)
Certificate 1 and 21 months' sea service while holding Certificate 1	Qualifies to write examinations for Fourth-Class Engineer certificate, Motor Ship or Steamship, depending on sea service
Certificate 1 and 24 months' sea service while holding Certificate 1	Qualifies to write examinations for Fourth-Class Engineer certificate, Motor Ship and Steamship (4M-4S), provided that a minimum of three months' sea service was acquired on a motor vessel and three months' service on a steamship
Certificate 2A	Qualifies to write examinations for Fourth-Class Engineer, Steamship certificate
Certificate 2B or 2C or 2D or 2E	Qualifies to write examinations for Fourth-Class Engineer, Motor Ship certificate
Certificate 2A and 12 months' sea service on a steamship while holding Certificate 2A	Qualifies to write examinations for Third-Class Engineer, Steamship certificate
Certificate 2B or 2C or 2D or 2E, and 12 months' sea service on a motor vessel or gas turbine vessel while holding any of these certificates	Qualifies to write examinations for Third-Class Engineer, Motor Ship certificate
Certificate 2A and 2B, 2C, 2D or 2E, and 15 months' sea service while holding any of these certificates	Qualifies to write examinations for Third-Class Engineer certificate, Motor Ship or Steamship, provided a minimum of six months' sea service was acquired on a motor or gas turbine vessel and six months' service on a steamship

CAF Certificate	Credit
Certificate 3A	Qualifies to write examinations for Third-Class Engineer, Steamship certificate
Certificate 3B or 3C or 3D or 3E	Qualifies to write examinations for Third-Class Engineer, Motor Ship certificate
Certificate 3A and 12 months' sea service on a steamship while holding Certificate 3A	Qualifies to write examinations for Second-Class Engineer, Steamship certificate
Certificate 3B or 3C or 3D or 3E and 12 months' sea service on a motor or gas turbine ship while holding any of these certificates	Qualifies to write examinations for Second-Class Engineer, Motor Ship certificate
Certificate 3A and 3B or 3C or 3D or 3E and 15 months' sea service while holding these certificates	Qualifies to write examinations for Second-Class Engineer certificate, Motor Ship or Steamship, provided a minimum of six months' sea service was acquired on a motor or gas turbine vessel and six months' service on a steamship
Certificate 4	Qualifies to write examinations for Second-Class Engineer certificate, Motor Ship or Steamship, provided a minimum of six months' sea service was acquired on a motor or gas turbine vessel and six months' service on a steamship

- Certificate 1 Auxiliary Machinery Operator
- Certificate 2A Boiler Room Watchkeeper
- Certificate 2B Diesel Engine Room Watchkeeper
- Certificate 2C Submarine Engine Room Watchkeeper (Diesel Electric Propulsion)
- Certificate 2D Combined Gas and Gas Turbine (COGOG) Control Console Watchkeeper
- Certificate 2E Combined Diesel and Gas Turbine (CODOG) Control Console Watchkeeper
- Certificate 3A Steam Turbine Watchkeeper
- Certificate 3C Submarine Machinery Certificate (Diesel Electric Propulsion)
- Certificate 3D Combined Gas and Gas Turbine (COGOG) Watchkeeper
- Certificate 3E Combined Diesel and Gas Turbine (CODOG) Watchkeeper
- Certificate 4 Marine Engineer Certificate

- 4) Applicants from the CAF may be exempted from certain examination subjects required for the purpose of obtaining a certificate on the basis of their qualification level in the following Marine Engineering Technician and Marine Engineering Artificer occupations: 312 (Apprentice), 313 (Journeyman), and 314 (Supervisor/Manager) (Ref. Forms CFP-245 and CF1110). The exemptions are shown on Table VII.

Table VII

Qualification Level	Exempted from
Occupational Qualification QL-5 or Occupational Qualification QL-6	Applied Mathematics, Applied Mechanics, Thermodynamics and Electrotechnology examinations at the third-class engineer level; Applied Mechanics, Thermodynamics and Electrotechnology examinations at the second-class engineer level
Occupational Qualification QL-7	Applied Mathematics, Applied Mechanics, Thermodynamics and Electrotechnology examinations at the third-class engineer level; Applied Mechanics, Thermodynamics, Electrotechnology and Naval Architecture examinations at the second-class engineer level

Note 1 – The above CAF Naval qualifications do not exempt any applicant from the Technical Drawing examination at the second-class engineer level.

Note 2 – Exemption from the second-class engineer examination in Naval Architecture is granted only to holders of the QL-7 qualification.

Note 3 – Applicants who have a CAF certificate of qualification at level 2, or can prove successful completion of the QL-5 academic training program and the workshop skills application course, are exempt from the training requirement set out in section 147 of the *Marine Personnel Regulations* and described in TP-13720 (Practical Skills for Marine Engineers Training Course)

- 5) Applicants who were commissioned engineering officers of the CAF (former Royal Canadian Navy division) must submit full documentation regarding qualifying service ashore and at sea as well as transcripts of marks obtained in naval examination subjects. All such documentation will be forwarded to headquarters in Ottawa, which will be responsible for assessing it and ruling on the basis of the general criteria set out in this chapter for the assessment of other service, and the current requirements set out in the *Marine Personnel Regulations*. Each case will be treated on its own merits.
- 6) Applicants from the Reserve or Regular Forces who do not have any of the certificates listed in CFP-245 will not be granted any credit for their training in the CAF, and the assessment of their qualifying service will be carried out in accordance with the general provisions of the *Marine Personnel Regulations*.

Form CFP-245

Statement of Qualification as a Marine Engineering Technician 313 and Marine Engineering Artificer 314 in the Canadian Armed Forces				
1	SIN:	Surname:	Given Names:	
2	Date of Enrollment			
3	Date of Release (if applicable)			
4	Qualification Level Attained to Date			
5	Number of Months' Sea Service in the Trade, Steam (S) /Diesel (D)			
6	Marine Engineering Certificates Held			
	a) Certificate 1	Yes	No	Date of Issue
	b) Certificate 2A	Yes	No	Date of Issue
	c) Certificate 2B	Yes	No	Date of Issue
	d) Certificate 2C	Yes	No	Date of Issue
	e) Certificate 2D	Yes	No	Date of Issue
	f) Certificate 2E	Yes	No	Date of Issue
	g) Certificate 3A	Yes	No	Date of Issue
	h) Certificate 3C	Yes	No	Date of Issue
	i) Certificate 3D	Yes	No	Date of Issue
	j) Certificate 3E	Yes	No	Date of Issue
	k) Certificate 4	Yes	No	Date of Issue
7	Number of months served in submarines subsequent to issue of Certificate 2C (answer only if highest certificate held is/was Certificate 2C or equivalent):			
8	Signature of Applicant (for identification purposes):			
9	Remarks of Signing Officer (including category of release):			

(Commanding Officer or NDNQ/DPGPCOR)

Note: This form may be reproduced locally



Marine Engineering Technicians Certificate
Certificat de mécanicien de marine

Instructions:

Submit in triplicate in accordance with CFTO C-03-005-033/AA-000 (Naval Engineering Manual Vol 1, Part 3 - Marine Engineering Certificates) at least one week prior to examination. Attach service certificate (or certified copy) and unit employment record.

Instructions:

À présenter en triple exemplaire au moins une semaine avant l'examen, conformément à l'ITFC C-03-005-033/AA-000 (Manuel des services techniques de la marine, Vol. 1, partie 3 - Certificat de mécanicien de marine. Annexer le certificat de service (ou une copie conforme) ainsi que le dossier des emplois à l'unité.

Part/Partie 1A: Application – Demande

Name (in full) Nom et prénoms	Rank – Grade	SN – NS
Base/Ship/Unit Base/Navire/Unité	Date	

Part/Partie 1B: Recommendation – Recommandation

Candidate has served in HMCS
Le candidat a servi à bord du NCSM

With (type of engine) Muni d'un moteur (genre de moteur)	For Pour	months mois
---	-------------	----------------

And in accordance with CFTO C-03-005-033/AA-000 (Naval Engineering Manual Vol 1, Part 3 - Marine Engineering Certificates) is considered capable of* *Item No. – N° de l'item* Et, ayant réuni les conditions prévues dans le CFTO C-03-005-033/AA-000 (Manuel des services techniques de la marine, Vol. 1, partie 3 - Certificat de mécanicien de marine) est jugé apte à* :

- | | |
|--|---|
| <ul style="list-style-type: none"> (i) Operating a ship's auxiliary machinery (Certificate One). (ii) Taking charge of a watch of the operation of a ship's main boiler when steaming at full power (Certificate 2A). (iii) Taking charge of a watch of the operation of main propulsion diesel engines or main diesel electric propulsion machinery in a surface ship or submarine (Certificate 2B or 2C or 2V). (iv) Taking charge of a watch of the operation and control of the main machinery console of a gas turbine propelled ship in all modes of operation (Certificate 2D). (v) Taking charge of the operation of the machinery in the engine room of a steam turbine propelled ship (Certificate 3A). (vi) Taking charge of the operation of main diesel electric propulsion machinery in a submarine (Certificate 3C or 3V). (vii) Taking charge of the operation of the main machinery of a gas turbine propelled ship (Certificate 3D). (viii) Taking charge of a watch of the operation and maintenance of the machinery plant of a ship or submarine (Certificate 4). (ix) Taking charge of a watch of the operation and control of the machinery control console of a combined gas turbine or diesel ship (Certificate 2E). (x) Taking charge of the operation of the main machinery of a combined gas turbine and diesel ship (Certificate 3E). | <ul style="list-style-type: none"> (i) Faire fonctionner les machines auxiliaires du navire (certificat 1). (ii) Prendre en charge la conduite de la chaudière principale d'un navire fonctionnant à plein régime (certificat 2A). (iii) Prendre en charge la conduite des propulseurs diesel principaux à bord d'un navire ou d'un sous-marin (certificat 2B ou 2C ou 2V). (iv) Prendre en charge la conduite et la commande du pupitre principal de command des machines d'un navire propulsé par turbine à gaz, à tous les modes (certificat 2D). (v) Prendre en charge la conduite des installations mécaniques à bord d'un navire propulsé par turbine à vapeur (certificat 3A). (vi) Prendre en charge la salle des machines et la machinerie extérieure d'un sous-marin (certificat 3C ou 3V). (vii) Prendre en charge la conduite de la machinerie principale d'un navire propulsé par turbine à gaz (certificat 3D). (viii) Prendre en charge la conduite et l'entretien continu des installations mécaniques à bord d'un navire ou d'un sous-marin (certificat 4). (ix) Prendre en charge de l'opération et contrôle de la machinerie principale de la turbine à gaz combinée avec propulsion diesel du navire à tous les différents modes d'opération (certificat 2E). (x) Prendre en charge de l'opération de la machinerie principale de la turbine à gaz combinée avec propulsion diesel du navire (certificat 3E). |
|--|---|

Engineering Officer – Ingénieur mécanicien

Part/Partie 1C: Application Approval – Approbation de la demande

The candidate has served the requisite period of time, he is fully eligible for examination, and has the required recommendation.
Le candidat a servi en mer le minimum de temps; il est admissible à l'examen et a fait l'objet des recommandations nécessaires.

Commanding Officer – Commandant

Part/Partie 2: Examination Results – Résultats de l'examen

<input type="checkbox"/> Passed and qualified A réussi et s'est qualifié <input type="checkbox"/> Failed (list deficiencies) A échoué (donner les raisons de l'échec)	Deficiencies – Raisons de l'échec
--	-----------------------------------

Signature / Ranks of examining officers Signatures et grades des officiers examinateurs	Dated on board HMCS – Signé à bord du NCSM	Date
1. Rank – Grade	Candidate's Signature – Signature du candidat	
2. Rank – Grade		
3. Rank – Grade		
4. Rank – Grade		
5. Rank – Grade		

Part/Partie 3 – Certification

The necessary action has been taken to give the original certificate to the candidate. – Les dispositions nécessaires ont été prises pour remettre l'original du certificat au candidat.
HMCS – NCSM

Date Commanding Officer – Commandant

Distribution: Original – Candidate Duplicate – NDHQ Career Manager Triplicate – Unit Personal File
Diffusion: Original – Candidat Duplicata – Directeur de carrière au QGDN Triplicata – Dossier personnel à l'unité

Administration of Examinations

2.9 Punctuality

- 1) Applicants must appear at the examination centre on time. In order to provide quiet for all applicants who are writing an examination at the same time, an applicant who is more than 30 minutes late will not be admitted to the examination room.
- 2) The fees paid by an applicant to whom access to the examination room was refused under (1) above will not be reimbursed. However, the examination will not be recorded as a failure and the applicant may apply without penalty for the next scheduled examination, as set out in Chapter 4.

2.10 Rules

- 1) Any books, notes, dictionaries or other documents that an applicant brings to the examination must be handed to the examiner for inspection upon entering the examination room.
- 2) An applicant using books or information other than what is supplied or permitted by the examiner during the examination will be failed.
- 3) An applicant who receives information from or gives information to another applicant, or communicates with another applicant in any way while the examination is in progress will be failed.
- 4) An applicant who is failed for not observing rule 2 or 3 will not be allowed to sit for examination again for a period of six months.
- 5) Silence is to be observed during the examination.
- 6) Each problem must be worked out on a separate page. The question need not be copied, but the question number must be given.
- 7) Applicants must return all examination booklets to the examiner.
- 8) Applicants must not take away from the examination room any question papers, work sheets or other notes.
- 9) The question cards or papers must not be marked or defaced.
- 10) Applicants must not leave the examination room without the examiner's permission.
- 11) Electronic means of communication (cell phone, pager or other similar devices) are prohibited in the examination room.
- 12) Except for an examination in applied mathematics, applicants may use a non-programmable calculator to answer mathematical questions. However, all mathematical operations and formulae used are to be clearly shown, as well as the values substituted for variables in such formulae. If none of the steps of a solution are shown, the answer will receive a mark of zero.
- 13) The number of questions to be answered will be stated on each question paper.
- 14) Mathematical tables, engineering formulae and steam tables will be supplied for engineering examinations when required.
- 15) With the exception of multiple-choice examinations, applicants writing an engineering examination must answer six (6) out of the nine (9) questions given.
- 16) If more than the required number of questions is answered, all the answers will be marked and those awarded the lowest marks, up to the required number, will be used to determine the overall result.
- 17) Examination problems may be solved by any method provided it is correct in principle and all steps are shown in the answer.
- 18) All work must be shown in the examination booklet provided by the examiner. No work whatsoever may be done on waste paper or blotting paper.
- 19) The applicant must clearly identify the answer for each subpart of each question.

2.11 Oral examination

- 1) The oral examination is an important part of the overall assessment of competence. Its purpose is to:
 - a) Measure the applicant's suitability by presenting practical situations to determine whether a level of competency has been attained that is acceptable for the grade and type of certificate applied for; and
 - b) Measure the applicant's ability to communicate ideas, commands and actions and to understand the spoken language used at sea and on board vessels.
- 2) Oral examination questions concentrate on the practical nature of duties the applicant is expected to perform and the applicable regulations, with due attention to the certificate for which the applicant is being examined and any weaknesses apparent from the written examinations.
- 3) The subjects to be covered during the oral examination are established using the syllabus for the certificate in question, as set out in the present TP.
- 4) An individual question sheet, with an assigned number of marks for each subject, will be prepared for each applicant.
- 5) Questions and answers will be noted down in a form that is understandable by a third party.
- 6) For Virtual Oral examination please follow the below guideline:

A) At least 24 hours prior to examination:

The Transport Canada Marine Safety Examiner will:

1. Establish and confirm the date and time of the virtual oral exam;
2. Establish with the candidate that MS TEAMS will be the video conferencing tool; and
3. Invite the candidate to the MS TEAMS session at the designated time of the examination.

The Candidate needs to:

1. Arrange for a reliable computer and internet connection. It is not recommended to use a cellular internet connection to take the exam;
2. Install the MS TEAMS application on their device; and
3. Become familiar with the software well in advance of the commencement of the exam.

B) Before the start of the examination:

The Transport Canada Marine Safety Examiner will clearly inform the candidate of the following conditions and requirements:

1. That their image, voice and screen activity may be recorded throughout the duration of the examination and will only be viewed by authorized personnel;
2. That they must answer questions to confirm their identity (i.e. CDN#, DOB, place of residency);
3. That they must present on-screen valid government-issued identification, either provincially or federally issued that contains a picture (such as driver license, passport, health card, etc.);
4. That they will be responsible for ensuring appropriate, properly functioning technology (webcam, a microphone, Internet Browser and a reliable internet connection);
5. They will need a relatively quiet place within which to take the exam;
6. In the event that video and/or audio interferes with the conduct of the exam, the test will be rescheduled; and
7. The candidate is required to keep the video conference connection open unmuted at all times.

To ensure the appropriateness of the candidate's exam room, the examiner will visually scan the area to ensure the examination room is secure.

If there is a suspicion of the implementation of a system to cheat on the exam, the examiner may:

1. Ask the candidate to provide a 360-degree view or close-ups of the environment; and

- Request to see the underside of the desk or table.

The Candidate must:

- Have access to a desktop or laptop computer with monitor and webcam that fulfills the technical requirements of the video software used;
- Be seated in the testing area at the time that the examination is scheduled to begin;
- Have a cleared desk or tabletop;
- If feasible, situate the camera facing the door to the room throughout the examination.
- Ensure the walls immediately behind or in front of where the candidate will be seated are clear;
- Ensure the computer is plugged in for the duration of the examination;
- Ensure adequate lighting and the room is at a comfortable temperature;
- Ensure household members have been informed of the examination date and time and will remain quiet during the examination and not enter the examination room;
- Ensure landlines, non-required electronics, and any security or recording devices in the room are turned off; and
- Ensure no one should enter the examination room during the examination.

It is also recommended that the candidate:

- Limit noise from outside of the examination room (e.g., TV, conversation, music) that would interfere with the candidates ability to do the examination or the ability of the examiner to monitor the examination; and
- Place a sign on the door of the examination room to remind everyone when the examination is in progress.

C) During the examination:

The Transport Canada Marine Safety Examiner is advised to:

- Terminate the exam if the video and/or audio becomes unreliable, the line is muted or the video conferencing connection crashes.

The Transport Canada Marine Safety Examiner is advised to **not**:

- Allow students too much time. The exam should be timed and only allow enough time for students who know the material to answer the questions (he should not have time to search for answers online or in his notes).

The Candidate:

- Must ensure throughout the exam that the testing environment is comfortable, quiet, and free of distractions at the desk or table.

2.12 Waiting period to retake an examination

Where an applicant fails to pass a written examination, the waiting period to retake the examination in the same subject and at the same level will be as shown on Table VIII or Table IX, pursuant to paragraph 16(2)(b) of the *Canada Shipping Act, 2001*.

Table VIII – Waiting Period, examinations requiring a 70% pass mark

Mark obtained	From 61% to 69%	From 51% to 60%	From 41% to 50%	From 31% to 40%	From 21% to 30%	From 10% to 20%	Less than 10%
Waiting Period	None	1 Month	2 Months	3 Months	4 Months	5 Months	6 Months

Table IX – Waiting Period, examinations requiring a 60% pass mark

Mark obtained	From 51% to 59%	From 41% to 50%	From 31% to 40%	From 21% to 30%	From 11% to 20%	From 5% to 10%	Less than 5%
Waiting Period	None	1 Month	2 Months	3 Months	4 Months	5 Months	6 Months

2.13 Request for review

Within five days of receiving the results of an examination, applicants may request a review by the examiner who marked it and a meeting with the examiner. For this purpose the applicant fills out the Request for Review form provided with the examination paper.

2.14 Appeals

If, after meeting with the examiner, the applicant is still not satisfied, a formal written appeal may be submitted to the Director, Marine Personnel Standards and Pilotage, Ottawa. The examination will then be marked independently by two reviewing examiners at Headquarters, neither of whom is the original examiner. An average of the two marks will be taken, and the Director will inform the applicant in writing of the result.

Chapter 3 - Assessment of Qualifying Service

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General

3.1 Reference to regulations

- 1) The conditions for granting certification to a seafarer encompass training, experience and examinations. The experience component is measured by qualifying service. Qualifying service is assessed in terms of the amount of service acquired and, for service on board vessels (i.e. sea service), the types of vessel on which the seafarer has served and the types of voyage made. Qualifying service is as important to the certification process as the assessment of training and the marking of examinations. The amount and type of qualifying service required for a particular certificate is set out in the *Marine Personnel Regulations*; it represents the time which is judged, in consultation with industry, to be sufficient to acquire the experience needed for the certificate in question.
- 2) For the purpose of calculating service, seafarers must refer to the *Marine Personnel Regulations*, section 1, definition of “qualifying service” and “sea service” and sections 115 to 118.

3.2 Nature of sea service

- 1) Sea service is assessed on its technical merits. To establish the nature of any period of service, the examiner may (in case of doubt) check the articles of agreement, the official logbooks and the seafarer’s discharge book.
- 2) Service performed on foreign vessels is acceptable in the same manner as service on a Canadian vessel. Service acquired while a foreigner is acceptable in the same manner as service while a Canadian resident. All foreign-issued documents evidencing service which are in languages other than English or French must be translated into English or French, and evidence of authenticity must be provided in respect of these documents.

Calculation

3.3 Calculation of sea service

- 1) Time on articles is calculated from the date of engagement to the date of discharge.
- 2) Periods of sea service cannot overlap. A service day counted on one voyage or vessel cannot be counted on another voyage or vessel.
- 3) Sea service on more than one vessel will be calculated as in (2).
- 4) The day an applicant signs on and the day he signs off may be credited as no more than one day in total, unless the actual hours of work for those days justify otherwise and are confirmed by the authorized representative.
- 5) The time during which an applicant works in addition to his regularly scheduled hours of work (overtime) does not count for the purpose of calculating sea service.
- 6) Sea service claimed at twelve hours per day will be recognized only with substantiation in the form of testimonials, with the exception of a request from an applicant serving as a “Cadet” capacity.

3.4 Absence from vessel

Where shore leave is taken or where a seafarer is otherwise absent during a period of engagement (i.e. while he is on the vessel’s articles), only the days worked aboard the vessel are accepted as sea service.

3.5 Service on shifts

- 1) Where service is performed on regular shifts, only service on board the vessel is accepted as sea service. If the examiner is satisfied by a testimonial, signed by the vessel’s master or by the chief engineer or by the authorized representative, that service has been performed under the terms of a contract providing for regular shifts exceeding eight working hours but not more than twelve working hours per shift worked on a day-on-day-off or equivalent basis, then the days worked on board the vessel are calculated as a ratio of hours regularly worked to eight hours.

- 2) Where service is performed on a self-propelled mobile offshore unit (MOU) in transit, the time spent on board the MOU is to be counted as full time. Time on an MOU which is on station for the purpose of petroleum exploration or production will be calculated in accordance with sections 3.20 to 3.22.

3.6 Mixed service

Where sea service is performed in more than one capacity, on more than one class of vessel, or on more than one class of voyage, proportionate allowance will be made for each kind of service in accordance with the provisions of this chapter.

3.7 Calculating service using days spent at sea

- 1) With regard to section 116 of the *Marine Personnel Regulations*, sea service is calculated in accordance with section 3.3 of this chapter. When an applicant acquires sea service on a vessel (including an MOU, subject to sections 3.20 and 3.21) that is engaged in commercial activities other than the carriage of passengers or the handling of cargo, or that spends a period in dry-dock or under repairs, the sea service will be calculated based on the number of days during which the vessel is under way as follows:
 - a) Where a watchkeeping routine consists of a watch of eight hours a day, service will be credited at the rate of one and a half times the number of days during which the vessel is under way, without exceeding the total number of days served on board.
 - b) Where a watchkeeping routine consists of a watch of twelve hours a day, service will be credited at a rate of two and a quarter times the number of days during which the vessel is under way, without exceeding one and a half times the total number of days served on board.
 - c) Table 1 may be used to calculate the service referred to in a) and b).

Table I

Julian date sign-off (+365 if year is later than sign-on year)	_____ (i)
Julian date sign-on	- _____ (ii)
Total number of days signed on (i) minus (ii)	_____ (A)
Total number of days underway (from testimonials)	_____ (B)
For 8 hours per day	
(B) _____ x 1.5 =	_____ (C)
Select the lesser of (A) or (C) Total credit	_____
For 12 hours per day	
(A) _____ x 1.5 =	_____ (D)
(B) _____ x 2.25 =	_____ (E)
Select the lesser of (D) and (E) Total credit	_____

Provisions Concerning Voyages

3.8 Sea service in sheltered waters

- 1) Service acquired entirely within sheltered waters will be accepted for the following master and deck officer certificates:
 - a) Master 500 Gross Tonnage, Domestic;
 - b) Master 150 Gross Tonnage, Domestic;
 - c) Master, Limited;
 - d) Chief Mate 500 Gross Tonnage, Domestic;
 - e) Chief Mate 150 Gross Tonnage, Domestic;
 - f) Chief Mate, Limited;
 - g) Fishing Master, Fourth Class.
- 2) Any other master or deck officer certificate requires experience beyond the limits of sheltered waters. Applicants should refer to the relevant section of the *Marine Personnel Regulations* in order to determine how much service in sheltered waters is acceptable for other certificates.
- 3) Where any doubt exists, a testimonial indicating the extreme ports of call or the geographical limits of the voyage on which the applicant served must be presented to the examiner.

3.9 Service classed according to voyages made

In all cases, the class of voyage is to be determined in accordance with the geographical limits within which the vessel operated during the applicant's period of service on board that vessel. Where any doubt exists, a testimonial must clearly establish the facts of the case.

Service Agreements

3.10 Certificates of discharge

Where any certificate of discharge or other proof of sea service appears to have been tampered with, the examiner will retain all documents pertaining to the case until the applicant has validated the submission by presenting other documents or testimonials proving the sea service in question.

3.11 Service on vessels not maintaining agreements with the crew

Where service has been performed on vessels where no agreements with the crew were maintained, a satisfactory testimonial of service must be produced, signed by the master, the chief engineer or the authorized representative of the vessel and certified by a credible person who has knowledge of the facts to be established.

3.12 Evidence of service on foreign vessels

Testimonials of service for seafarers serving on vessels registered abroad may have to be confirmed by the appropriate government or by some other recognized authority of the country in which the vessel is registered, or the testimony of some credible person who has knowledge of the facts to be established. Such testimonials may be certificates of discharge authenticated by a consul or other official before whom the seafarer was discharged, or by letters from the authorized representative of the vessel.

Positions Held during Sea Service

3.13 Service performed to obtain nautical certificate

Except as stated in the sections that follow, sea service must have been performed in the deck department.

3.14 Rank or rating

- 1) The rank or rating held by an applicant during a voyage will always be taken as that appearing in the agreement with the crew for that voyage.
- 2) If service has been performed on a vessel where there is no agreement with the crew, the rank or rating will be established on the same evidentiary basis as that described in section 3.12.

3.15 Promotion of cadets

If a cadet engaged in an approved program, whether bound by indentures or not, is promoted to un-certificated junior officer, then the service in the capacity of junior officer will be accepted as cadet service.

3.16 Service as pilot

Two thirds of the time served on board a vessel as a pilot will be accepted as watchkeeping service but only up to a maximum of three months for any one certificate.

Service in the Canadian Armed Forces (CAF)

3.17 Nautical certificates

- 1) Time served on board CAF vessels as an officer or a rating will be accepted for nautical certificates if the time was spent on upper-deck duties, on the following conditions:
 - a) The statement of service is authenticated by Canadian Forces Headquarters, Ottawa, and specifies days at sea during the period served.
 - b) The applicant produces a testimonial signed by his/her commanding officer or naval officer-in-charge attesting to the proportion of time generally spent each day performing regular deck duties in addition to other duties.
 - c) Where application is being made to take an examination for a certificate requiring watchkeeping service, a watchkeeping certificate is produced, signed by the commanding officer if the service was performed on a vessel with a complement of at least 150 persons, or by the naval officer-in-charge or commanding officer of a flotilla or parent vessel if the service was performed on a small craft, classified as such by the CAF. In addition, evidence is produced to show that the service was performed while holding the required certificate.
- 2) If an applicant was not employed in bridge or seamanship duties, service will be credited to the applicant in accordance with the provisions of this chapter. In the case of applicants employed in trades with a percentage of time spent on deck duties, information provided by the Department of National Defence will be used to assess the service that can be accepted for nautical certificates.
- 3) The following table II indicates the proportion of time spent on upper deck duties by ratings in the various trades in the Canadian Navy. This rate is to be applied to the applicant's qualifying service for a deck certificate.

Table II

Trade	Rate
Airboatswain	Nil
Boatswain	100%
Clearance Diver	75%
Firecontrolman	75%
Hull Technician/Mechanic	25%
Meteorological Technician	50%
Radar Plotter	75%
Radioman Sea	30%
Ships duties – Administrative	25%
Ships duties – Pay	25%
Signalmen	90%
Sonar Man	75%
Storesmen – Victualling	25%
Storesmen – Naval	25%
Weaponman, Surface	75%
Weaponman, Underwater	75%

3.18 Engineering certificates

An applicant from the CAF applying for an engineer certificate must meet the examination requirements set out in section 2.8 of the present TP.

Service in the Offshore Resource Industry

3.19 Service for MOU certificates

Service on mobile offshore units (MOUs) is accepted in full for the purpose of obtaining a certificate specific to MOUs, subject to the rule applicable to watches of other than eight hours in a calendar day, set out in subsection 110(2) of the *Marine Personnel Regulations*, and limitations with regard to the type of MOU, set out in sections 177 to 183 of those Regulations. For the purpose of interpretation of IMO Resolution A.891 (21), MOUs also include floating production, storage and offloading (FPSO) units and floating storage offloading (FSO) units.

3.20 Service for nautical certificates

- 1) Those serving on self-propelled mobile offshore units (MOUs), including mobile offshore drilling units (MODUs) and floating production, storage and offloading units (FPSOs), either in transit or maintaining position by means of thrusters or dynamic positioning, will accrue sea service at the same rate as the one applicable for vessels other than MOUs. In these cases, conventional descriptions of the position in which the applicant has served will be relied on.
- 2) Service on surface MOUs not maintaining position by means of dynamic positioning, or on non self-propelled units, will be assessed in accordance with Table III.

Table III

Certificate Applied for	Position served in	Qualifying Service Rate	Maximum Qualifying Service
Bridge Watch Rating or Able Seafarer	Deckhand, Roustabout, Roughneck, Crane Operator, Crane Operator Assistant or any position listed below that is applicable to a Watchkeeping Mate certificate	Full	No limit
Watchkeeping Mate or Watchkeeping Mate, Near Coastal	Toolpusher, Nightpusher, Driller, Assistant Driller, Derrickman, Derrickman Assistant, Crane Operator, Crane Operator Assistant, Deckhand, Roughneck, Roustabout, Ballast Control Operator, Radio Operator, Dynamic Positioning System Operator, Tourpusher, Ice Observer	2/3	30 months
Master, 500 Gross Tonnage, Near Coastal	The following watchkeeping officers: Ballast Control Operator, Dynamic Positioning System Operator or Stability Technician, while holding a Watchkeeping Mate or a Watchkeeping Mate, Near Coastal, or a Master, 3000 Gross Tonnage, Domestic, or a Master, 500 Gross Tonnage, Domestic certificate	2/3	6 months
Chief Mate or Chief Mate, Near Coastal	The following watchkeeping officers: Ballast Control Operator, Dynamic Positioning System Operator or Stability Technician, while holding a Watchkeeping Mate or a Watchkeeping Mate, Near Coastal certificate	2/3	6 months
Master Mariner, Master, Near Coastal; or Master 3000 Gross Tonnage, Near Coastal	The following watchkeeping officers: Ballast Control Operator, Dynamic Positioning System Operator, Barge Supervisor or Stability Technician, while holding a Watchkeeping Mate or a Watchkeeping Mate, Near Coastal certificate	2/3	30 months

3) Service on self-elevating units will be assessed in accordance with Table IV.

Table IV

Certificate Applied for	Position served in	Qualifying Service Rate	Maximum Qualifying Service
Bridge Watch Rating or Able seafarer	Deckhand, Roustabout, Roughneck, Crane Operator, Crane Operator Assistant or any position listed below, applicable to the Watchkeeping Mate certificate	Full	No limit
Watchkeeping Mate or Watchkeeping Mate, Near Coastal	Toolpusher, Nightpusher, Derrickman, Derrickman Assistant, Crane Operator, Crane Operator Assistant, Deckhand, Roughneck, Roustabout, Radio Operator, Driller, Assistant Driller, Barge Supervisor Trainee, Tourpusher	2/3	12 months
Watchkeeping Mate or Watchkeeping Mate, Near Coastal	Barge Supervisor	2/3	18 months

3.21 Service for engineering certificates

- 1) Those serving on self-propelled MOUs which are in transit, or MOUs maintaining position by means of thrusters or dynamic positioning, or in stand-by mode, will accrue sea service in accordance with Table V. In these cases, conventional descriptions of the position in which the applicant has served will be relied on.

Table V

Certificate Applied for	Position served in	Qualifying Service Rate	Maximum Qualifying Service
Engine Room Rating	Motorman, Oiler	Full	No limit
Engine Room Rating	Electrician/Electrical Technician, Roustabout, Mechanic, Wiper, Mechanical technician	Full	3 months or, in the case of the holder of an ERR training certificate, 4 months
Fourth-Class Engineer, Motor Ship	Roustabout, Roughneck, Crane Operator	Full	12 months
Fourth-Class Engineer, Motor Ship	Motorman, Oiler, Assistant Engineer, Engineer	Full	No Limit
Fourth-Class Engineer, Motor Ship	Sub-Sea engineer, Assistant Sub-Sea Engineer, Electrician/Electrical Technician, Mechanic, Mechanical Technician	Full	24 months
Third-Class Engineer, Motor Ship	Engineer in charge of the watch while holding a Fourth-Class Certificate	Full	No limit
Third-Class Engineer, Motor Ship	Motorman/Oiler/Engine Room Rating performing watchkeeping duties in an engine room while holding a Fourth-Class Certificate	1/3	6 months
Second-Class Engineer, Motor Ship	Engineer in charge of the watch or the machinery while holding a Fourth-Class Certificate or Third-Class Certificate	Full	No limit
First-Class Engineer, Motor Ship	Engineer in charge of the watch or the machinery while holding a Second-Class Certificate	Full	No limit

- 2) Service acquired on Stationary MOUs, self-elevating MOUs or surface MOUs with no form of propulsion where the unit is functioning on location will be assessed in accordance with Table VI.

Table VI

Certificate Applied For	Position Served In	Qualifying Service Rate	Maximum Qualifying Service
Engine Room Rating	Motorman, Mechanic, Oiler, Wiper, Electrician/Electrical Technician, Roustabout, Mechanical Technician	Full	3 months or, in the case of the holder of an ERR training certificate, 4 months
Fourth-Class Engineer, Motor Ship	Roustabout, Roughneck, Crane Operator	Full	12 months
Fourth-Class Engineer, Motor Ship	Electrician/Electrical Technician, Mechanic, Hydraulic Technician, Mechanical Technician	Full	24 months
Fourth-Class Engineer, Motor ship	Motorman/ Oiler/ Assistant Engineer/ Engineer	Full	No limit
Third-Class Engineer, Motor Ship	Engineer in charge of the watch while holding a Fourth-Class Certificate (except in the case of a Motorman or Engine-room Rating performing watchkeeping duties in an engine room while holding a Fourth-Class Certificate, for whom the qualifying service rate will be 1/3)	1/2	6 months
Second-Class Engineer, Motor Ship	Engineer in charge of the watch while holding a Fourth-Class Certificate	1/2	12 months
Second-Class Engineer, Motor Ship	Engineer in charge of the watch or the machinery while holding a Third-Class Certificate	1/2	6 months
First-Class Engineer, Motor Ship	Engineer in charge of the watch or the machinery while holding a Second-Class Certificate	1/2	6 months

Other Service

3.22 Approved training programs

- 1) The lesser qualifying service requirements set out in Part 1 of the Regulations, on the various tables concerning certificates of competency, apply only to those who have completed the approved training program. Where a program has been only partially completed, the assessment of the applicant's qualifications is carried out in accordance with the general provisions of the *Marine Personnel Regulations*.
- 2) In the case of an approved cadet training program, an applicant who leaves the program before completion is credited for qualifying service prorated to the part of the program he successfully completed. Furthermore, if at the time he left the program he had successfully completed courses that replace examinations, he is credited for these examinations. In all cases, an attestation from the recognized institution must be provided to the examiner.

3.23 Service on pleasure yachts

Sea service acquired on a pleasure yacht is not recognized as qualifying service for the purpose of obtaining a certificate of competency, except in the case where the tonnage of the yacht meets the tonnage requirements for the certificate sought and the service is performed as member of the complement on board a private yacht, where the authorized representative hires a paid crew under a crew agreement. In the case of a master or deck officer certificate, the voyages must be of the class required for the certificate sought. Service is then calculated according to the number of days spent underway, as specified in section 3.7.

3.24 Service on ACVs

- 1) Sea service on an ACV must be recorded in the seafarer's discharge book, certified pilot logbook or a testimonial signed by the executive officer of the company or ACV unit who has full knowledge of the service. The applicant must submit those documents, along with the *Statement of Qualifying Service* form, when claiming sea service.
- 2) Service will be accepted subject to the following conditions:
 - a) When the certificate sought is a Watchkeeping Mate or Watchkeeping Mate, Near Coastal certificate, the service must have been completed on an ACV of not less than 7,000 kg all-up weight.
 - b) When the sea service is claimed as watchkeeping service, it must have been completed on an ACV of not less than 10,000 kg all-up weight.
- 3) The area of operation of the ACV determines whether its voyages are classed as sheltered or near coastal waters voyages.

3.25 Nondescript vessels

Service on dredges other than self-propelled sea-going dredges, and service on lightships, barges, scows and similar nondescript and non self-propelled craft cannot be accepted as sea service for a deck certificate

Watchkeeping Service**3.26 Service as Master or Chief Officer**

- 1) Service as master, while holding the required certificate, is accepted as watchkeeping service.
- 2) Service as non-watchkeeping chief officer, as staff captain or in a similar capacity (equivalent titles sometimes used on foreign vessels or within a company), while holding the required certificate, is accepted as watchkeeping service provided that:
 - a) the applicant participated in the actual manoeuvring of the vessel;
 - b) the applicant supervised a watch for a total of at least 30 hours a month, including periods of difficult navigation;
 - c) a statement signed by the master to the above effect is produced covering the entire period of service claimed and sight books, satisfactory to the examiner, are produced where deep-sea service is claimed.

3.27 Service as Chief Engineer or Second Engineer

- 1) Service as chief engineer, while holding the required certificate, is accepted as watchkeeping service.
- 2) Service as first assistant engineer, as senior engineer (titles equivalent to second engineer sometimes used on foreign vessels or within a company), or as second engineer on day work, while holding the required certificate, is accepted as watchkeeping service provided that the engineer supervised a watch for a total of at least 30 hours a month in the engine room, including time while the vessel was manoeuvring. A testimonial signed by the chief engineer to this effect must be presented to the examiner.

Chapter 4 - Examination Schedules and Passing Grades***Table of Contents***

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General

4.1 Reference to regulations

- 1) The examinations that must be written for a particular certificate and the prerequisites to attempt a particular examination are specified in the *Marine Personnel Regulations*. Tables I to VI below summarize the list of examinations for each certificate of competency.
- 2) For the purpose of establishing eligibility, applicants must also refer to Chapters 1, 2 and 3 of this TP.

4.2 Order of examinations

For the purpose of establishing the order of taking examinations, applicants must refer to the specific requirements set out in the Regulations for each certificate; where no order is prescribed, the applicant may take the examinations in any order.

4.3 Passing grades

- 1) The passing grade for each of the following nautical written examinations is 70 per cent:
 - a) Navigation safety, levels 1 and 2;
 - b) Celestial navigation, levels 1 and 2;
 - c) Navigation systems and instruments;
 - d) Ship management, levels 1 to 4;
 - e) Ship construction and stability, levels 1 to 5;
 - f) Cargo, levels 1 to 3;
 - g) Engineering knowledge, levels 1 and 2;
 - h) Meteorology, level 1 and level 2;
 - i) Simulated electronic navigation (SIM), level 1 and level 2;
 - j) Chartwork and pilotage, level 1 and level 2;
 - k) General ship knowledge, level 1 to level 3;
 - l) General seamanship.
- 2) The passing grade for the part of the communications examination, level 2, that evaluates knowledge and skills with respect to receiving information is 90 per cent and the cumulative passing grade for the written part and the part that evaluates knowledge and skills with respect to sending information is 70 per cent. The passing grade for the part on English language and Standard Marine Navigational Vocabulary is 70 per cent. An applicant must successfully read a Morse code light at a speed of four words per minute.
- 3) The passing grade for any examination other than those referred above is 60 per cent.

Subject	Communications (COM)		Chartwork & Pilotage (C/P)	Celestial Navigation (ASTRO)	Navigation System & Instruments (NS/I)	Navigation Safety (NS)	Meteorology (MET)	Ship Management (SM)	Ship Construction & Stability (SCS)	Cargo (CG)	Engineering Knowledge (EK)	General Ship Knowledge (GSK)	Simulated Electronic Navigation (SIM)	General Seamanship (ORAL)	
	Certificate														
Chief Mate 150T, Domestic			x			x									x

Note 1: Not required if the applicant has passed Stability exam 113 and Ship Construction and cargo exam 122 for a certificate obtained under the previous *Marine Certification Regulations* or *Masters and Mates Regulations*.
 Note 2: Not required if the applicant has passed Ship construction and cargo exam 122 for a certificate obtained under the previous *Marine Certification Regulations* or *Masters and Mates Regulations*.

Table II – Master and Chief Mate, Limited, Examinations

SUBJECT	CHARTWORK & PILOTAGE	NAVIGATION SAFETY	SHIP MANAGEMENT	SHIP CONSTRUCTION & STABILITY		MASTER (WRITTEN)		FIRST MATE (WRITTEN)		ORAL AND/OR PRACTICAL (MASTER)		ORAL AND/OR PRACTICAL (CHIEF MATE)	
				C/P	NS	SM	SCS		CLW		1MLW		CLO
CERTIFICATE				3	4	≥ 60 GT	< 60 GT	≥ 60 GT	< 60 GT	≥ 60 GT	< 60 GT	≥ 60 GT	< 60 GT
Master Vessel ≥ 60 GT	x	x	x	x* (tug or cargo)	x* (Ro-Ro passenger)	x				x			
Master Vessel < 60 GT							x				x		
Chief Mate Vessel ≥ 60 GT	x	x	x	x* (tug or cargo)	x* (Ro-Ro passenger)			x				x	
Chief Mate Vessel < 60 GT									x				x

* If applicable to the vessel and area of operation

Table III – Fishing Master Certificates Examinations

SUBJECT CERTIFICATE	COMMUNICATIONS		CHARTWORK & PILOTAGE		CELESTIAL NAVIGATION	NAVIGATION SAFETY			METEOROLOGY		SHIP CONSTRUCTION & STABILITY		SHIP MANAGEMENT		GENERAL SHIP KNOWLEDGE		SIMULATED ELECTRONIC NAVIGATION		GENERAL SEAMANSHIP
	COM		C/P		ASTR ₀	NS			MET		SCS		SM		GSK		SIM		ORAL
	1	2	1	2	1	1	2	D	1	2	1	2	1	2	1	2	1	2	
Master, First-class	X	X			X		X			X		X	X			X		X	X
Master, Second-class	X								X			X	X		X		X		X
Master, Third-class	X			X		X			X			X			X				X
Master, Fourth-class			X			X		X			X								X

Note: Master, Fourth Class has the option to choose between NS1 or NS D, See more details in section 12.4 of chapter 12.

Table IV – Engineering Certificates Examinations

SUBJECT CERTIFICATE	PROPULSION SIMULATOR	APPLIED MATHEMATICS	APPLIED MECHANICS	THERMODYNAMICS	TECHNICAL DRAWING	ELECTROTECHNOLOGY	NAVAL ARCHITECTURE	GENERAL ENGINEERING KNOWLEDGE	ENGINEERING KNOWLEDGE OF MOTOR VESSELS	ENGINEERING KNOWLEDGE OF STEAMSHIPS	PRACTICAL	ORALS
	First-class Motor	2		X	X		X	X	X	X		
First-class Steam	2		X	X		X	X	X		X		X
Second-class Motor	2		X	X	X	X	X	X	X			X
Second-class Steam	2		X	X	X	X	X	X		X		X
Third-class Motor	1	X	X	X		X		X	X			X
Third-class Steam	1	X	X	X		X		X		X		X
Fourth-class Motor	1							X	X			X
Fourth-class Steam	1							X		X		X
Chief Engineer endorsement, Motor or Steam	2											
Second Engineer endorsement, Motor or Steam	1											
Watchkeeping Eng. MDFV	1							X	X			X
Small Vessel Machinery Operator								X			X Vessel specific	X
ACV Class 1								X				
ACV Class 2								X				

Table V – Ratings & Specialized Personnel Examinations

SUBJECT CERTIFICATE	WRITTEN EXAMINATION	PRATICAL EXAMINATION	ORAL EXAMINATION
Restricted Proficiency in Survival Craft		Ship’s specific lifesaving apparatus, appliances and equipment	
High Speed Craft Type Rating	The examination set out in section 18.3.3 of the HSC Code for the craft and route (if available)	The examination set out in section 18.3.3 of the HSC Code for the craft and route	The examination set out in section 18.3.3 of the HSC Code for the craft and route (if written not available)
Air cushion Vehicle Type Rating	General Knowledge of ACV’s and ACV and route (if available)	The examination set out in section 18.3.3 of the HSC Code for the ACV and route	The examination set out in section 18.3.3 of the HSC Code for the ACV and route (if written not available)
Able Seafarer	General seamanship W-AS	General seamanship O-AS	
Bridge Watch rating	General seamanship BWR		
Engine-room Rating	Duties of an engine-room rating (ERR-W) or oral		Duties of an engine-room rating (ERR) or written
Ship’s Cook	Duties of a ship’s cook	Duties of a ship’s cook*	
* Except for an applicant who has successfully completed an approved cooking course or who holds a cook certificate recognized by a province			

Table VI – MOU Certificates Examinations

SUBJECT CERTIFICATE	Technical Drawing		APPLIED MECHANICS	THERMODYNAMICS	LECTROTECHNOLOGY	NAVAL ARCHITECTURE	PROPULSION SIMULATOR	GENERAL ENGINEERING KNOWLEDGE	ENGINEERING KNOWLEDGE OF MOTOR VESSELS	METEOROLOGY, LEVEL 2	NAVIGATION SAFETY, LEVEL 1	ORAL
	Offshore Installation Manager MOU/surface										X *	X
Offshore Installation Manager MOU/self-elevating										X *	X	General Seamanship MOU/self-elevating
Barge Supervisor, MOU/surface												General Seamanship MOU/surface
Barge Supervisor, MOU/self-elevating										X *	X	General Seamanship MOU/self-elevating
Maintenance Supervisor, MOU/surface	2 nd Class	1 st Class	1 st Class	1 st Class	1 st Class	2	1 st Class	1 st Class				MOU/surface
Maintenance Supervisor, MOU/self-elevating				3 rd Class			3 rd Class	3 rd Class				MOU/self-elevating
* Examination may be substituted with an approved training course												

Table VII – Nautical Examinations

	Month												
	January	February	March	April	May	June	July	August	September	October	November	December	
	Week of the month												
BLOCK A COM 1, C/P 1, CG 1, CG 3, EK 1, EK 2, GSK 3, GSK 3D, MET 1, NS 1, NS D, NS/I, SCS 3, SCS 5, SM 2, SM 4	2	1 and 3	1 and 3	1	2	2	2	X	2	2	2	2	
BLOCK A	Examination								Code				
First business day of the week	A.M.	Cargo, level 1 Chartwork & Pilotage, level 1								CG 1 C/P 1			
	P.M.	Ship Management, level 4 Meteorology, level 1								SM 4 MET 1			
Second business day of the week	A.M.	Ship Construction & Stability, level 3 Ship Construction & stability, level 5								SCS 3 SCS 5			
	P.M.	Cargo, level 3 Ship Management, level 2								CG 3 SM 2			
Third business day of the week	A.M.	Engineering Knowledge, level 2 Navigation Systems & Instruments, level 1								EK 2 NS/I			
	P.M.	Engineering Knowledge, level 1 General Ship Knowledge, level 3 General Ship Knowledge, level 3 Domestic								EK 1 GSK 3 GSK 3D			
Fourth business day of the week	A.M.	Navigation Safety, level 1 Navigation Safety, Domesic								NS 1 NS D			
	P.M.	Communications, level 1								COM 1			
	Month												
	January	February	March	April	May	June	July	August	September	October	November	December	
	Week of the month												
BLOCK B ASTRO 1, ASTRO 2, C/P 2, CG 2, GSK 1, GSK 2, MET 2, NS 2, SCS 1, SCS 2, SCS 4, SM 1, SM 3	4	2 and 4	2 and 4	2	4	4	4	X	4	4	4	3	
BLOCK B	Examination								Code				
First business day of the week	A.M.	Chartwork & Pilotage, level 2 General Ship Knowledge, level 2 Ship Management, level 3								C/P 2 GSK 2 SM 3			
	P.M.	Meteorology, level 2								MET 2			
Second business day of the week	A.M.	Ship Construction & Stability, level 2 Ship Construction & Stability, level 4								SCS 2 SCS 4			
	P.M.	Cargo, level 2								CG 2			
Third business day of the week	A.M.	Celestial Navigation, level 1 Celestial Navigation, level 2 General Ship Knowledge, level 1								ASTRO 1 ASTRO 2 GSK 1			
	P.M.	Ship Management, level 1								SM 1			
Fourth business day of the week	A.M.	Navigation Safety, level 2								NS 2			
	P.M.	Ship Construction & Stability, level 1								SCS 1			
IMLW, CLW, and all others such as Able seafarer (AS-W), Bridge watch rating (BWR), Ship’s cook and Type rating endorsements are held only on appointment with the examiner. Fishing Master examinations are held on appointment only when the examiner is travelling to a location to administer the examinations.													

Table VIII – Engineering Examinations

Day	Morning	Afternoon
<u>First-class</u>		
Monday		General engineering knowledge
Tuesday	Engineering knowledge of motor ships	Engineering knowledge of steamships
Wednesday	Applied Mechanics	Thermodynamics
Thursday	Naval Architecture	Electrotechnology
<u>Second-class</u>		
Monday		General engineering knowledge
Tuesday	Engineering knowledge of motor ships	Engineering knowledge of steamships
Wednesday	Applied Mechanics	Thermodynamics
Thursday	Naval Architecture	Electrotechnology
Friday	Technical Drawing	
<u>Third-class</u>		
Monday	Applied Mathematics	General engineering knowledge
Tuesday	Engineering knowledge of motor ships	Engineering knowledge of steamships
Wednesday		Thermodynamics
Thursday		Electrotechnology
<u>Fourth-class</u>		
Monday		General engineering knowledge
Tuesday	Engineering knowledge of motor ships	Engineering knowledge of steamships
<u>Watchkeeping Engineer, Motor-driven Fishing Vessel</u>		
Wednesday	General engineering knowledge	Engineering knowledge of MDFV's
<u>Small Vessel Machinery Operator</u>		
Wednesday	Engineering knowledge of small vessels	
Examinations for all other certificates or endorsements such as Engine-room rating and Type rating endorsements are held only on appointment with the examiner.		

4.5 Oral, practical and simulator-based examinations

The oral examinations and the following practical and simulator-based examinations are held only on appointment with the examiner. An applicant who does not appear for examination at the appointed time will forfeit the examination fee.

- a) On-board practical examination (Master and Chief Mate, limited);
- b) Examination on lifesaving apparatus and equipment (restricted proficiency in survival craft);
- c) Examinations for ACV and HSC Type rating certificates;
- d) General seamanship (Able seafarer);
- e) Duties of a ship's cook;
- f) Simulated electronic navigation, SIM level 1 and level 2;
- g) Propulsion plant simulator, management and watchkeeping practices;
- h) Engineering knowledge of small vessels,

4.6 Specimen examination papers

Specimen examination papers, when available, can be obtained from a Marine Safety examination center.

4.7 Examinations passed before the coming into force of the Regulations

An applicant who passed an examination before the coming into force of the *Marine Personnel Regulations* and whose passing grade is still valid under Section 113 of the Regulations receives for this examination a credit indicated in table IX.

Table IX – Nautical Examinations Equivalency

Examination passed	Credit
011	COM 1
012	COM 1 and COM 2
040	C/P 1
041	C/P 1 and C/P 2
050	ASTRO 1
051	ASTRO 1 and ASTRO 2
023 and 052-A	NS/I
052-B	DEV
061	NS 1 *
062	NS 2 *
072	MET 1
073	MET 1 and MET 2
099	SM 1
090	SM 2
092	SM 2 and SM 3
093	SM 4
110	SCS 3
111	SCS 2
112	SCS 2 and SCS 3
113 and 122	SCS 3 and SCS 4
114 and 133	SCS 5
122	CG 1 and CG 2
123	CG 1, CG 2 and CG 3
134	EK1 and EK 2
157	GSK 1
158	GSK 2

* Credits for NS 1 (061) and NS 2 (062) are conditional to the examination having been written after March 1983.

4.8 Table X- Nautical Certificates exams – Level of substitution

Subject	Level 1	Level 2	Level 3	Level 4	Level 5
Communications (COM)	1	2			
Chartwork and pilotage (C&P)	1 (or 2)	2			
Celestial navigation (ASTRO)	1 (or 2)	2			
Navigation systems and instruments (NS&I)	N/A				
Deviastope (DEV)	N/A				
Navigation safety (NS)	1	2			
Meteorology (MET)	1 (or 2)	2			
Ship management (SM)	1	2 (or 3)	3	4	
Ship construction and stability (SCS)	1 (or 2)	2	3 (or 4)	4	5
Cargo (CG)	1 (or 2, or 3)	2	3		
Engineering knowledge (EK)	1 (or 2)	2			
General ship knowledge (GSK)	1	2	3		
Simulated electronic navigation (SIM)	1	2			
General seamanship (ORAL)	N/A				

Note: Level shown in the bracket can substitute for the level stated outside the bracket for the specific exam. For e.g., SCS 4 can substitute for SCS 3 but it cannot substitute for SCS2 or SCS1.

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5.6	Navigation Systems and Instruments (Examination Code: NS/I)	52
5.7	Navigation Safety – Level 2 (Examination Code: NS 2)	57
5.8	Meteorology – Level 2 (Examination Code: MET 2)	57
5.9	Ship Management – level 3 (Examination Code: SM 3).....	61
5.10	Ship Management – level 4 (Examination Code: SM 4).....	67
5.11	Ship Construction and Stability – Level 4 (Examination Code: SCS 4)	73
5.12	Ship Construction and Stability – Level 5 (Examination Code: SCS 5)	81
5.13	Cargo – Level 3 (Examination Code: CG 3)	89
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General

5.1 General requirements

The general requirements for a certificate as Master Mariner are listed in section 123 of the *Marine Personnel Regulations*.

5.2 Validity of certificates

The holder of this certificate may act as Master of a vessel of any tonnage engaged on an unlimited, a near coastal or sheltered waters voyage.

Syllabuses of Examinations

5.3 Communications – Level 1 (Examination Code: COM 1)

- 1) The examination consists of multiple-choice questions and is subdivided in Part 1 and Part 2.
- 2) For Part 1, the following publications are provided:
 - a) International Code of Signals;
 - b) Radio Aids to Marine Navigation;
 - c) Annual Edition of Notices to Mariners.
- 3) No publications is permitted for Part 2.
- 4) The examination of Part 1 is of an one hour duration and the examination of Part 2 is of an one hour duration.
- 5) The examinations are based upon:

Subject	Knowledge required
Competence:	Transmit and receive information by visual signaling
Ability to use the International Code of Signals	<p>International Code flags</p> <p>Recognition of the International Code flags and pendants, substitutes flags and answering pendants; Action to take when signals are not understood; How the end of a signal is indicated; The use of identity signals; How to signal azimuth or bearing, course, date, latitude, longitude, distance, speed, time.</p> <p>The significance of the arrangement of the Code into:</p> <ol style="list-style-type: none"> (a) single-letter signals; (b) two letter signals; (c) three-letter signals beginning with “M” for the Medical Section <p>The uses of complements and tables of complements; How to signal depths; The significance of text in brackets; The meanings of single-letter signals; Single-letter signals for use between an ice-breaker and assisted vessels; How time of origin may be included; Ability to code and decode messages, using the General sections; Ability to code and decode messages, using the Medical Sections and complements; The International Code Signal of distress.</p>
Ability to use publications	Use of <i>Radio Aids to Marine Navigation</i> for ascertaining facilities and services; Use of Annual Edition of Notices to Mariners.

5.4 Communications - Level 2 (COM 2)

- 1) **Knowledge and skills stated below are evaluated during the applicable oral examination and therefore there is no separate exam for COM 2.**

Subject	Knowledge/skills required
Competence:	Transmit and receive information by visual signaling
Ability to transmit and receive signals	Sending and receiving of SOS in Morse at a rate of 15 characters per minute and also the Visual Signaling of single letters/numbers.
Competence:	Use the standard Marine Navigational Vocabulary as replaced by the IMO Standard Marine Communication Phrases and use of English in written and oral form
Adequate knowledge and understanding of the English language, including the ability to use and understand the Standard Marine Navigational Vocabulary as replaced by the IMO Standard Marine Communication Phrases	<p>English language (Not applicable for candidates giving all their exams in English)</p> <p>Use English in written and oral form to:</p> <ul style="list-style-type: none"> a) Use charts and other nautical publications; b) Understanding meteorological information and messages concerning ship’s safety and operation; c) Communicate with other ships and coast stations; d) Perform the officer’s duties also with a multi-lingual crew. <p>Standard Marine Navigational Vocabulary</p> <p>Use standard Marine Navigational Vocabulary, as replaced by the IMO Standard Marine Communication Phrases.</p>

5.5 Celestial Navigation – Level 2 (Examination Code: ASTRO 2)

- 1) The examination consists of multiple-choice questions on basic principles and practical navigation calculations.
- 2) The examination is of a three hours duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
Knowledge of basic nautical astronomy	<p>Solar system Composition and dimensions of the solar system; Ability to identify planets useful for navigation; The earth’s elliptical orbit; The eccentricity of the earth’s orbit; The inclination of the earth’s axis to the plane of the orbit and the stability of the axis and how it causes seasons; The dates of the solstices and equinoxes; The concept of the earth’s axial rotation giving day and night; The varying length of daylight through the year; Daylight and darkness conditions in various latitudes at the solstices and equinoxes; The significance of the tropics of Cancer and Capricorn of the Arctic and Antarctic circles</p> <p>Celestial sphere and equinoctial system of co-ordinates Definition of the celestial sphere; The apparent annual motion of the sun and the concept of the ecliptic; Definition of celestial poles, celestial meridians, equinoctial and the obliquity of the ecliptic; The equinoctial as a fixed reference plane and the direction of the First Point of Aries as a reference direction; The equinoctial system of co-ordinates and definition of sidereal hour angle, declination and polar distance; Ability to extract information from the star diagrams in the Nautical Almanac.</p> <p>Hour angle The concept of the earth’s axial rotation causing change in the hour angle of bodies; Definition of Greenwich Hour Angle (GHA), Local Hour Angle (LHA) and longitude, and ability to explain their relationship; The rate of change of GHA of the sun and Aries; The tabulation of SHA, GHA and declination (and “d” and “v” corrections) in the Nautical Almanac for all celestial bodies; Ability to determine the geographical position of a body for any given GMT.</p> <p>Daily motion and horizontal system of co-ordinates Definition of rational horizon, zenith, and nadir; Definition of vertical circle and prime vertical circle; Definition of elevated pole and depressed pole; Ability to prove that the altitude of the elevated pole is equal to the observer’s altitude; Definition of the observer’s upper and lower celestial meridian; Ability to identify the apparent daily path of all bodies; Definition of true altitude, azimuth and true zenith distance; The relationship between azimuth, quadrantal bearings and 360° notation bearing; Ability to recognize rising and setting points and definition of amplitude; The meaning of the term circumpolar, and the conditions necessary for a body to be circumpolar; The condition necessary for a body to cross the prime vertical; The parts of the PZX triangle; Ability to draw figures on the plane of the rational horizon and of the observer’s celestial meridian, using the equidistant projection to illustrate navigational problems and principles</p>

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
Ability to use celestial bodies to determine the ship's position	<p>Sextant and altitude corrections</p> <p>Definition of sextant altitude; Ability to demonstrate how to use a sextant; Ability to correct a sextant into which has been introduced one or more of error of perpendicularity, side error or index error; Ability to find the index error of the sextant by the horizon; How to find the index error of the sextant by the sun and stars; Ability to use the sextant for taking vertical and horizontal angles; The purpose of altitude correction; Definition of visible, sensible and rational horizon; Definition of observed latitude and true altitude; Definition of dip, refraction, semi-diameter and parallax and explain their causes; Apply index error; Apply the corrections for the items listed in the above objectives and explain the factors determining their magnitude; Ability to illustrate the effect of terrestrial refraction on the dip and distance of the sea horizon; Correct an altitude using tables in the Nautical Almanac, including reference to critical tables, interpolation tables and low-altitude correction tables; Obtain the true zenith distance from the true altitude of the body.</p> <p>Amplitudes</p> <p>Ability to determine the observed altitude of the sun when the true altitude is zero; The effect of latitude on the accuracy of amplitude observations; Ability to calculate the LAT and LMT on the theoretical and visible rising and setting of the sun; Ability to extract the information from the tabulation of the rising and setting of the sun in the Nautical Almanac.</p> <p>Time and equation of time</p> <p>Definition of the apparent solar day and what is the relationship between LHA (sun) and LAT; Definition of the sidereal day and what is a fixed interval; The reasons for the sun's irregular rate of change of SHA and the necessity to adopt the astronomical mean sun for timekeeping purposes; Definition of the equation of time (ET) and its components; Ability to determine the ET from the Almanac and its sign of application; Definition of GMT, LMT and longitude; Definition of zone times and standard times; How to alter the ship's time during a passage with increasing or decreasing longitude; The use of time signals;</p> <p>Nautical Almanac</p> <p>The information contained in general in the Nautical Almanac and in detail in the daily pages; Ability to use the tables of corrections and incremental corrections in the Nautical Almanac; Ability to find the LHA of a body, given the date, GMT and longitude of the observer; The importance of the First Point of Aries; Ability to find the LHA of Aries, given the date, GMT and longitude of the observer; What is meant by the sidereal hour angle of a star and obtain it from the Nautical Almanac; Derive the LHA of a star from the LHA of Aries and the SHA of the star; Ability to use the information in the Nautical Almanac to obtain the LMT of the meridian passage of a body to the nearest minute and interpolates for the observer's longitude when necessary.</p> <p>Latitude by meridian altitude</p> <p>Ability to apply the true zenith distance of a body when it is on the observer's meridian to the declination of the body, to obtain the observer's latitude; Apply these correctly when the declination and latitude have the same names or have different names; The relationship between the altitude of the elevated pole and the latitude of the observer; What is meant by a circumpolar star, and the terms upper and lower transit; Ability to find the value of the polar distance of the body, using declination; Ability to apply the polar distance to the true altitude of a body at a lower transit to find the altitude of the elevated pole and the latitude; Ability to calculate the direction of the position line and the latitude of the observer by meridian altitude.</p>

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
Ability to use celestial bodies to determine the ship's position	<p>Pole star observations</p> <p>Ability to identify certain major stellar constellations and navigational stars describe their movement relative to Polaris and the movement of Polaris with change of latitude; Ability to identify Polaris; Ability to identify major constellations; Ability to describe the motion of the stars about Polaris; The relationship between the altitude of Polaris and the observer's latitude;</p> <p>Deduce from the above objective that the true altitude of Polaris can be used to find the latitude of the observer; Obtain the corrections, -1°, $+a_0$, $+a_1$, $+a_2$, from Pole Star tables in the Nautical Almanac and apply them to the altitude of Polaris to find the latitude of the observer; Ability to find the true azimuth of Polaris from the tables and the direction of the position line.</p> <p>Position fixing</p> <p>Combine the equinoctial and horizon system of co-ordinates to determine the centre and radius of a position circle and its direction in the vicinity of a selected position; Apply the principles of a method of enabling the navigator to draw a small part of the position circle in his vicinity to at a practical problem; Ability to determine the direction of a position line through an observer and a position through which it passes; Ability to define and evaluate the co-latitude, polar distance and zenith distance and use them as the side of the PZX triangle; Ability to solve the PZX triangle to find the calculated zenith distance of the body when it is out of the meridian; Apply this calculated zenith distance to the true zenith distance of the body to find the intercept and the intercept terminal point through which to draw the position line (Marcq St. Hilaire method); Ability to determine the true azimuth of the body from tables and determine the direction of the position line; Ability to find the position of the observer at the time of the final observation, given two or more position lines with the courses and distances run between the observations</p>
Determine position and the accuracy of resultant position fix by any means	<p>Classify stars by apparent magnitude; Recognize stellar constellations as seen from earth; Kepler's laws; Determine the hour angle and declination of the planets; Determine the time of visible rising and setting of the sun by use of the nautical Almanac; Determine the azimuth and hour angle of true rising and setting of the sun; Civil, nautical and astronomical twilights; The influence of latitude on the duration of twilight, including the conditions necessary for twilight all night, continuous daylight and continuous darkness; Ability to calculate the time of meridian altitude of the planets and stars; Altitude corrections for the planets and stars; The relation between time and longitude and between time and hour angle; Ability to calculate position lines by means of all the celestial bodies in any position; Ability to choose stars suitable for observation in the twilight period; Ability to identify stars by means of a star chart, a star finder and by calculations.</p>

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
Ability to determine the Ship's position by Parallel, Plane and Mercator sailing	<p>Sailings</p> <p>Parallel sailing; Plane sailing; By Mercator sailing, ability to calculate course and distance between two positions; By Mercator sailing, ability to calculate the final position, given the initial position, course and distance; Why a navigation problem should be solved by using a Mercator sailing in preference to plane sailing because of the distance involved; How errors may occur in position fixing, and explains how to minimise the probability of errors; Demonstrate how erroneous position lines influence the positions.</p>
Ability to determine the Ship's position by Great Circle sailing	<p>Great circle sailing</p> <p>Ability to determine great circles tracks; Calculates initial course and distance of great circle track; Position of the vertex; Intermediate positions on the great circle and the course at these points; Ability to calculate the distance and time to sail 1 degree change of course; Composite sailing; The use of gnomonic charts for plotting the great circle between two points; Transfer the great circle to a Mercator chart; Find and apply the half convergency correction to a great-circle bearing to obtain the Mercator bearing to plot; The curve of constant bearing and calculates the direction of the position line in the vicinity of the D.R. position.</p>

5.6 Navigation Systems and Instruments (Examination Code: NS/I)

- 1) The examination consists of a written test comprising descriptive questions.
- 2) The examination is of a three hours duration.
- 3) The candidate should recognize the fallibility of all electronic aids, and the importance of combining different methods and possessing a continuing ability and preparedness to fall back on basic, non-electronic navigation methods at any time.
- 4) The examination is based upon:

Subject	Knowledge required
Competence:	Determine position and the accuracy of resultant position fix by any means
Using modern electronic navigational aids, with specific knowledge of their operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction to obtain accurate position fixing	<p>Shipborne navigational equipment and systems</p> <p>Thorough knowledge of the regulatory, physical, operational and operator requirements of marine electronic navigation systems including bridge design and visibility, electromagnetic compatibility of equipments on or in the vicinity of the bridge, equipments approval and maintenance of equipments.</p> <p>Global Navigation Satellite Systems (GNSS):</p> <p>Knowledge of the principle on which the American GPS, the Russian Federation GLONASS and the European Union GALILEO (when in service) Global Navigation Satellite Systems (GNSS) operate; the concepts of combined GPS/GLONASS receivers; The principles of operation, precision and limitations of Differential GPS (DGPS), Wide Area Augmentation System (WAAS) and DGLONASS; Describe the receiver equipment; general knowledge of the performance standards; knowledge of the failure warnings and status indications required by IMO;</p>

Subject	Knowledge required
Competence:	Determine position and the accuracy of resultant position fix by any means
<p>Using modern electronic navigational aids, with specific knowledge of their operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction to obtain accurate position fixing</p>	<p>Global Navigation Satellite Systems (GNSS) (cont'd): The configuration of satellite orbits in space; the control of satellites from ground Control Stations; Describe briefly the codes which are transmitted; the frequency band used; How pseudo-ranges are measured by matching the received code with the same locally generated code; Why the measurement is not a true range; Simultaneous pseudo-ranges to three SVs are sufficient to fix the position of the earth's surface and determine the receiver clock error from GPS time but four are required to obtain height; List and describe the main sources of error in the determined position; Accuracy with the abolishment of the NAVSTAR selective availability; Measured Doppler shifts can be processed to provide speed and direction outputs</p> <p>Global Coordinates and World Geodetic System (WGS) Knowledge of coordinate system data in use by electronic position fixing systems; relationship between coordinate systems and the effect of coordinate system choices on positional data</p> <p>Loran-C System: The principles of time difference used in the Loran-C system; How ambiguity occurs when two radio stations are transmitting signals simultaneously; How ambiguity can be removed by application of a time delay; The pulsing system and cycle matching used in the Loran-C system; The possibility of sky wave interference and use of extended mode; The approximate accuracy and explain how it varies; how propagation delays affect Loran C; accuracy in inshore zones; Explain a coverage diagram for a Loran-C chain; The limitations of the system and the reason for frequent checking; The areas of the world covered by the Loran-C system.</p> <p>Electronic Charting and Voyage Management Systems Knowledge of the primary function, principles, practical application and operation of electronic chart and display systems (ECDIS) and electronic chart systems (ECS); the difference between ECDIS and ECS; Knowledge of the principles, practical application and operation of voyage management systems.</p> <p>Depth measuring systems Knowledge of the functions, principles, practical application and operation of Echo sounding devices and Sonar; Description, with aid of block diagrams, of a typical navigational echo-sounding system indicating functions and characteristics of units; visual indicators and recorders, phased scales, transmitters and receivers; sounding repetition rates, accuracy of soundings, maximum and minimum depths in navigational sounders; interference on display; internal and water noises.</p> <p>Automatic Identification System (AIS) Knowledge of the functions, principles, practical application and operation of the Automatic Identification System (AIS), including the operating modes, the required capabilities and information that AIS should provide.</p>

Subject	Knowledge required
Competence:	Determine position and the accuracy of resultant position fix by any means
<p>Using modern electronic navigational aids, with specific knowledge of their operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction to obtain accurate position fixing</p>	<p>Speed and distance measuring devices Knowledge of the functions, principles, practical application and operation of Speed and distance measuring devices; the different requirements to provide as a minimum information on the distance run and the forward speed of the ship through the water or over the ground, device capable of providing speed through the water in the fore and aft direction for radar plotting aids/track control equipment and device to indicate speed and distance over the ground in the forward and athwartships direction for large vessel; knowledge of information is transmitted to other navigation instruments; Doppler, its use in distance and velocity measurement.</p> <p>Sound reception systems Knowledge of the functions, principles, practical application and operation of sound reception systems required on a totally enclosed bridge, including functional requirements, method of presentation and installation requirements</p> <p>Integrated Bridge Systems Ability to assess the benefits of integrated systems of navigation to particular vessel operations and identify the integrity of the information provided from the data inputs available, with particular reference to data requirements and quality.</p> <p>High-Precision Position-Fixing Systems General knowledge of principles and practical application of high-precision position-fixing systems, including Trisponder, Mini-Ranger, Decca Hi -Fix/6, Syledis B, Raydist, Argo, MRD-1, and Trident III.</p> <p>Dynamic Positioning Systems General knowledge of the principles, practical application and operations of dynamic positioning using taut wire, acoustic, heading reference, radar, HPNS, INS and GPS methods.</p> <p>Voyage data recorder (VDR): Knowledge of the purpose, application, operational requirements and data items to be stored by a voyage data recorder (VDR).</p> <p>Time. Knowledge of the nature of time measurement systems in use by electronic position fixing systems; relationship between time measurement systems and the effect of the measurement systems used on positional data.</p>
<p>Navigating in high latitudes</p>	<p>Knowledge of the special considerations to be applied when navigating in high latitudes due to rapidly changing weather conditions, low and ice-masked coast lines; rapid convergence of meridians; extreme refraction and false horizons; low horizontal intensity of the earth's magnetic field; chart projections, including non-triangulated chart and lack of detail; loss of accuracy in plotting; gyro compass limitations; extended twilight; majority of observations being low altitude; decreasing importance of error in time; front and back altitudes to offset refraction; slow rate of change of altitude in relation to azimuth; maintaining track and estimated position; determination of the most suitable heavenly bodies; approximate setting on a sextant to observe any heavenly body; calculation of EP in heavy weather</p>
<p>Determine accuracy of lines of position and fixes</p>	<p>The theory of errors Knowledge of the concept of the most probable position; the analyse of uncertainties when using lines of position; errors in position lines; the constant error; the random error; the mistakes.</p>
<p>Electricity</p>	<p>Correct identification of faults and knowledge of precautions to guard against the hazards associated with electrical equipment.</p>

Subject	Knowledge required
Competence:	Determine and allow for compass errors
Knowledge of the principles of gyro-compasses and transmitting heading devices and ability to determine and allow for errors of the gyro-compasses	Gyro-compasses Properties of the free gyroscope; Relationship between applied force and precession; Effects of the earth's rotation on a free gyroscope; Drift and tilt; Errors associated with gyro compasses; Latitude, course and speed error, ballistic deflection, rolling error; Latitude, course and speed correction; Fundamental classes of gyro compass according to control and dampening, operation of common modern types of gyro-compasses, including Digital and Fiber-Optic; Principles of operation of repeaters systems; Performance standards for gyro-compasses. Transmitting heading devices (THD) Knowledge of the functions, principles, operational requirements and use of Transmitting heading devices (THD)
An understanding of systems under the control of the master gyro and a knowledge of the operation and care of the main types of gyro-compasses in use at sea	Heading control systems / Automatic pilots Knowledge of the functions, principles, operational requirements, alarms, indicators and fall-back arrangements required of Heading control systems / Auto-Pilot systems; the differences between Heading control systems and Auto-Pilot systems. Rate of turn indicators Knowledge of the functions, principles and operational requirements of rate of turn indicators.
Knowledge of the principles of magnetic compasses, electromagnetic compasses and marine transmitting magnetic heading devices and ability to determine and allow for errors of the magnetic compasses	Magnetic compasses The laws of magnetism; Terrestrial magnetism and the magnetic elements of the earth's field; Construction of the magnetic compass and binnacle; Effect of the ship's magnetic field on a magnetic compass; The permanent components P, Q and R, the induced components, their separate effects and their application to compensation of a ship's magnetic field; Methods of obtaining a table of deviations; General principle of compass correction and methods of correcting ; Cause and effect of retentive magnetism and Gaussin error; Siting of compasses, with emphasis on the proximity of magnetic material and appliances; Causes, effects and corrections of heeling error; Effects of heeling error magnets on soft-iron correctors; Requirements for the carriage of magnetic compasses as set out in SOLAS; Performance standards for magnetic compasses; The importance of keeping a record of observed deviations. Electromagnetic Compasses and Marine Transmitting Magnetic Heading devices (TMHDs) Knowledge of the principles, operational requirements and use of Electromagnetic Compasses and Marine Transmitting Magnetic Heading devices (TMHDs) Track control systems: Knowledge of the functions, principles, operational requirements, alarms, indicators and fall-back arrangements required of track control systems Maintenance of gyro-compasses: Refer to manufacturers manuals to determine necessary maintenance tasks.

Subject	Knowledge required
Competence:	Use radio-communication equipment
Knowledge of the fundamentals of electromagnetic signal generation and transmission and use of radio equipments	<p>Signal Manipulation Knowledge of the techniques used to generate, modulate, detect and amplify radio frequency electromagnetic signals; the effect of modulation technique, band and band width on signal quality and detectability; the need for and characteristics of common marine antenna types.</p> <p>Radio-Communication Equipment Knowledge of specific principles, practical application and operation of typical radio-communication equipment in current service.</p> <p>Radio-Communication Systems Thorough knowledge of the regulatory requirements for marine radio-communications systems; VTS and distress and safety systems; organization and operating protocols of satellite and terrestrial marine communication systems for ship stations, satellite systems and terrestrial systems.</p>

5.7 Navigation Safety – Level 2 (Examination Code: NS 2)

- 1) The examination consists of multiple-choice questions.
- 2) The examination is of three hours duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence:	Establish watchkeeping arrangements and procedures
Thorough knowledge of content, application and intent of the International Regulations for Preventing Collisions at sea, 1972, with Canadian modifications 1983	Practical application of Regulations for the Prevention of Collisions with Canadian Modifications rules from an interpretation in multi-ship navigational situations; multi-ship or multi-factor navigational situations involving more than one rule, more than one factor of radar annex; Ship Routeing Regulations; inconsistencies between regulations, ordinary practices of seafarer; Ability to identify the lights, shapes and sound signals by any type of vessel and their meaning, including the additional signals for fishing vessels fishing in close proximity;
Thorough knowledge of the content, application and intent of the Principles to be observed in keeping a navigational watch	Knowledge of the content and application of Part II of the Marine Personnel Regulations regarding the hour of rest and the composition of the watch on the bridge; Factors to be taken into account when deciding the composition of the watch on the bridge; Write standing orders for a deck watch at anchor and a navigational watch underway; Thorough knowledge of the content, application and intent of the STCW Code section A-VIII/2 and Canadian Notices to Mariners – Annual Edition.

5.8 Meteorology – Level 2 (Examination Code: MET 2)

- 1) The examination consists of a written test comprising multiple-choice questions.
- 2) The examination is of a three hours duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence:	Forecast weather and oceanographic conditions
Ability to understand and interpret a synoptic chart and to forecast area weather, taking into account local weather conditions and information received by weather fax	<p>The planetary system of wind and pressure Global systems circulation, seasonal modification and permanent pressure systems; The characteristics and location of the doldrums, ITCZ, Trade winds, Sub tropical oceanic highs, westerlies and polar easterlies; Monsoons, theory of monsoons formation, land and sea breezes compared to monsoons, pressure and weather characteristics associated with, monsoons in the Indian Ocean, the China sea, North coast of Australia and West coast of Africa; The monsoon type weather along the North east coast of Brazil</p> <p>The weather associated with the principal air mass types Formation of air mass; The significance of a Source region; Identification; Characteristics; Modification; Seasonal movement (North America and offshore); Types, continental arctic, continental polar, continental tropical, maritime arctic, maritime polar, maritime tropical, equatorial; Modification of an air mass by the nature of the surface over which it travels; Stable and unstable air masses; Synoptic patterns associated with air mass types The weather associated with air mass types</p>

Subject	Knowledge required
Competence:	Forecast weather and oceanographic conditions
<p>Ability to understand and interpret a synoptic chart and to forecast area weather, taking into account local weather conditions and information received by weather fax</p>	<p>Synoptic and prognostic charts and forecasts from any source Synoptic charts, surface and upper air; Recognition of isobaric distribution patterns; Ability to determine the geostrophic and approximate surface wind speeds from the chart by use of the geostrophic wind scale; Ability to determine the weather associated with specific places within the plots; The rules governing the movement of pressure systems, as given in Meteorology for Mariners to forecast the weather at specific places; The use of prognostic charts; Ability to evaluate the information given in shipping forecasts.</p> <p>The Maritime Forecast Code and the range of information available through fax transmissions Knowledge of information available on weatherfax in Canada and Worldwide; Forecast 12-24 hours, pressure, wind, sea state, visibility, clouds, weather changes; Knowledge of services available; Radio Aids to navigation, Atlantic and Great Lakes, Pacific; Ability to locate marine weather forecast areas; Understanding weather forecasts for the Great Lakes, ability to use MAFOR code; Assorted weatherfax in weather, satellite, sea state and ice charts; Understanding of synoptic surface analysis charts; Understanding of surface progs; Understanding of wave charts, analysis, forecast; Understanding of ice charts.</p> <p>The main types of floating ice, their origins and movements Freezing of fresh and salt water; Formation of land ice; Greenland and Antarctic ice caps, glaciers; Ice types and egg code; Type of ice, new, frazil, grease, slush, shuga, nilas, pancake, young, grey, grey-white, first year, second-year, multi-year, fast ice, pack ice, ice of land origin, forms of floating ice (floe sizes); Ice fields and their movement, icebergs and drift, iceberg routes, limits, seasons, reasons for variation in numbers, difference between northern and southern hemisphere icebergs; Presence of icebergs in North Pacific, North Atlantic lane routes, International Ice Patrol.</p> <p>The guiding principles relating to the Safety of Navigation in the vicinity of ice The signs which may indicate the proximity of ice on clear days and nights; The ranges at which observers may expect to detect ice visually in varying conditions of visibility; The limitations of radar as a means of detecting ice; The precautions to be taken when navigating near ice, and when ice is suspected in vicinity; Avoidance, shelter, warmer water, alteration of course and speed; Thorough knowledge of the content and application of the Canadian Coastguard publication 'Ice Navigation in Canadian Waters'; Thorough knowledge and ability to use the Canadian Annual Notices to Mariners (Ice navigation section).</p> <p>Conditions leading to ice accretion on ship's superstructures, dangers and the remedies available Icing of superstructures, causes, fog, freezing drizzle, freezing rain, freezing spray; Action to be taken in the case of serious accumulation of ice;; Ability to use the Mariner's Handbook, for estimating the rate of ice accretion; Methods of avoiding or reducing ice accretion; Reports to be made under International Conventions when ice is encountered; The information to be given in radio messages reporting dangerous ice; The iceberg nomenclature in use by the International Ice Patrol; The information to be given in radio messages reporting conditions leading to severe ice accretion on ship's superstructures.</p>
<p>Knowledge of the characteristics of various weather systems, including tropical revolving storms and avoidance of storm centres and the dangerous quadrants</p>	<p>The formation, structure and weather associated with the principal frontal systems Definitions; Types, stationary, cold, warm, occluded; Movement; Sequence of weather associated with fronts, pressure, wind, temperature, cloud, weather, visibility; Squall lines, definition, association with cold fronts, weather experienced with squall lines, pressure, wind, temperature, cloud, weather, visibility; Areas of occurrence; Local names (e.g., pampero, southerly, buster).</p>

Subject	Knowledge required
Competence:	Forecast weather and oceanographic conditions
<p>Knowledge of the characteristics of various weather systems, including tropical revolving storms and avoidance of storm centres and the dangerous quadrants</p>	<p>The formation of, and weather associated with, frontal and non-frontal depressions Families of depressions: Formation between two air masses, life cycle and movement cross section, associated weather; Frontogenesis; Frontolysis; Secondary depressions; Warm and cold occlusions.</p> <p>The formation and weather characteristics of non-frontal weather systems Definition of “through of low pressure”, both frontal and non-frontal; Ability to draw a synoptic pattern of frontal and non-frontal troughs, for both northern and southern hemispheres, showing isobars, wind circulation and, if applicable, front; Identify a through of low pressure on a surface synoptic or prognostic chart; The weather associated with the passage of a trough of low pressure; Definition of anticyclone; Ability to draw a synoptic pattern of an anticyclone, for both northern and southern hemispheres, showing isobars and wind circulation; Identify an anticyclone on a surface synoptic or prognostic chart; The general characteristics of an anticyclone; The formation of warm and cold anticyclones; The weather associated with an anticyclone, in summer and winter; Definition of ridge of high pressure; Ability to draw a synoptic pattern of a ridge which is an extension of an anticyclone, showing isobars and wind circulation for northern and southern hemispheres; Ability to draw a synoptic pattern of a ridge contained between two lows, showing isobars and wind circulation, for northern and southern hemispheres; Identify a ridge of high pressure on a surface synoptic or prognostic chart; The weather associated with both types of ridge of high pressure; Definition of col; Ability to draw a synoptic pattern of a col showing isobars and wind circulation; The weather associated with a col; Ability to draw synoptic patterns showing combination of various isobaric systems.</p> <p>Tropical revolving storms Definition of path, track, vertex or cod, vortex or eye, trough line, angle of indraught, dangerous semi-circle, dangerous quadrant, navigable semi-circle; Features distinguishing it from extra-tropical cyclone, small diameter, steeper pressure gradient, winds tangent to central isobars, eye absence of fronts; Warnings, radio messages, projected track, unusual swell, appearance of the sky, unusual changes in wind strength and direction, corrected drop in barometric pressure; Weather associated with tropical revolving storms; Sources of energy; Seasonal distribution; Practical rules for avoidance; Hurricane and typhoon anchorages; Mandatory reporting; Name and season for tropical storms in the following areas: The North Atlantic, the western North Pacific, eastern North Pacific, South Pacific, Bay of Bengal, Arabian Sea, western Indian Ocean, eastern Indian Ocean.</p>

Subject	Knowledge required
Competence:	Forecast weather and oceanographic conditions
Knowledge of ocean current systems	<p>Surface water circulation of the ocean and principal adjoining seas Definition of set and drift, wind-drift currents, gradient currents, complex currents (including stream currents), Coriolis effect and Ekman's spiral, upwelling, permanent currents, seasonal currents; General surface circulation and offshoots in North American waters, geographical limits, seasonal variations, direction, strength; Effect of currents on climate, warm, cold; Knowledge of the various currents of the world.</p> <p>Voyage planning principles with respect to weather conditions and wave height Ability to use the data from Ocean Passages of the world; Climatological routeing; Definition of Significant wave height; The factors affecting wave height and direction; The methods employed in forecasting wave heights; Optimum (Least time) routeing; The forms of routeing; The methods of constructing a least time track; The merits of ship and shore based routeing, and their limitations; The construction of ships performance curves; The use on monthly Routeing Charts; The construction and use of a Baillie wind rose; Demonstrate familiarity with the forms of climatological, meteorological and current data presented in the Sailing Directions (Pilot Books) and in the Mariner's Handbook.</p> <p>The formation of sea waves and swell waves Difference between seas and swells, definitions of period, height, length, speed, steepness, fetch; Wave groups, waves in shallow water, ground swell, breakers and surf; Swells in forecasting tropical revolving storms; Effect of coast, wind, currents, tide; Storm surge; Effect of ice on waves, ice crystals, pack ice; Tsunamis and tidal waves, description, epicentre, dangers, tsunami warning system, true tidal waves and tidal bores; Seiche.</p>
Ability to calculate tidal conditions	<p>Apply the relevant weather conditions to tidal calculations The effect of high or low atmospheric pressure on tide levels; The effect of persistent winds on tide levels and tidal times; The effect of abrupt changes of weather conditions on tidal levels; The origin and areas of prevalence of seismic waves.</p>
Use all appropriate navigational publications on tides and currents	<p>Apply tide and current data from nautical publications and charts Ability to use tidal height calculations in passage planning, with regard to limiting draughts and times of available depth of water; Ability to use tidal stream information in passage planning, with regard to effect on course made good, and effect on speed, timing of events; Ability to use current information in passage planning, with regard to effect on course made good, and effect on speed, timing of events.</p>

5.9 Ship Management – level 3 (Examination Code: SM 3)

- 1) The examination consists of a written test comprising descriptive questions.
- 2) The following open-book resources will be allowed in the examination room:
 - a) Administrative Monetary Penalties Regulations;
 - b) Arctic Waters Pollution Prevention Act;
 - c) Arctic Shipping Safety and Pollution Prevention Regulations;
 - d) Ballast Water Control and Management Regulations;
 - e) Canada Labour Code;
 - f) Canada Shipping Act-2001;
 - g) Cargo, Fumigation and Tackle Regulations;
 - h) Fire and Boat Drills Regulations;
 - i) International Convention for the Control and Management of Ships Ballast Water and Sediments, 2004;
 - j) International Convention for the Prevention of Pollution from ships, 1973, as modified by the 1978 and 1997 Protocols(MARPOL);
 - k) International Convention for the Safety of Life at Sea, 1974 (SOLAS), as amended;
 - l) International Convention on Load Lines, 1966, as amended;
 - m) International Ship and Shore Facility Security (ISPS) Code
 - n) Load Line Regulations;
 - o) Marine Personnel Regulations;
 - p) Marine Transportation Security Act;
 - q) Marine Transportation Security Regulations;
 - r) Maritime Labour Convention,2006
 - s) Maritime Occupational Safety and Health Regulations
 - t) Merchant Seamen’s Compensation Act;
 - u) Pilotage Act;
 - v) Potable Water on Board Trains, Vessels, Aircraft and Buses Regulations;
 - w) Safety Management Regulations;
 - x) Shipping Casualty Reporting Regulations;
 - y) The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, including 2010 Manila Amendments (STCW 2010);
 - z) The International Safety Management (ISM) Code;
 - aa) The Occupational Safety and Health (Dock work) Convention, 1979.
 - bb)Transportation Safety Board Regulations;
 - cc) Vessel Certificates Regulations;
 - dd)Vessel Clearance Regulations;
 - ee) Vessel Registration and Tonnage Regulations; and
 - ff) Vessel Pollution and Dangerous Chemicals Regulations;
- 3) The examination is of a three hours duration.

The examination is based upon:

Subject	Knowledge required
Competence:	Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment
<p>Knowledge of international maritime law embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions</p>	<p>Certificates and other documents required to be carried on board ships by International Conventions</p> <p>Certificates and other documents required to be carried on board ships by International Conventions and their period of validity; List of certificates and documents required to be carried on board ship is published by the IMO, how can the list may be obtained; How each of the certificates and documents required to be carried on board ships are obtained; Knowledge of harmonized system of survey and certification; Certificates and documents required to be carried on board domestic vessels and their periods of validity; Knowledge of the enhanced diagramme of inspections during surveys of bulk carriers and of oil tankers.</p> <p>Responsibilities under the relevant requirements of the International Convention for the Safety of Life at Sea (SOLAS)</p> <p>Obligations of the master concerning the sending of danger messages relating to dangerous ice, a dangerous delerict, other dangers to navigation, tropical storms, sub-freezing air temperature with gale force winds causing severe ice accretion or winds of force 10 or above for which no storm warning has been received; The information required in danger messages; The obligations of the master of a ship at sea on receiving a signal from any source that a ship or aircraft or a survival craft thereof is in distress; The rights of the master of a ship in distress to requisition one or more ships which have answered his call for assistance; When the master of a ship is released from the obligation to render assistance; The requirements for the carriage of navigational equipment; Manning of a vessel; Manning is subject to Port State Control inspection; The content of the minimum safe manning document referred to in Assembly resolution A481(XII), Principles of safe manning; The procedures for the testing of the ship’s steering gear before departure; The requirements for the display of operating instructions and change-over procedures for remote steering gear control and steering gear power units; The requirements for emergency steering drills; The entries which should be made in the log-book regarding the checks and tests of the steering gear and the holding of emergency drills; Ships are to carry adequate and up-to-date charts, sailing directions, list of lights, notices to mariners, tide tables and other nautical publications necessary for the voyage; Which ships should carry the International Code of Signals.</p> <p>Responsibilities under the relevant requirements of the international convention on Load Line 1966</p> <p>The general requirements of the Conditions of Assignment to be met before any vessel can be assigned a loadline; The factors that determine the freeboards assigned to a vessel; The requirements and coverage of initial, renewal and annual surveys; The contents of the record of particulars which should be supplied to the ship; The documentation and records that must be maintained on the ship in terms of: certificates, record of particulars, record of freeboards and information relating to the stability and loading of the ship; The preparation required for renewal and annual loadline surveys; The treatment of a port lying on the boundary between two zones or areas; The circumstances in which an International Load Line Certificate (1966) would be cancelled by the Administration.</p> <p>Marine Personnel and Watchkeeping</p>

Subject	Knowledge required
Competence:	Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment
	<i>STCW Convention: Knowledge of the International Convention on Standards of Training, Certification and watchkeeping for Seafarers 1978 as amended (STCW Convention) and</i>
Knowledge of international maritime law embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions	<p>Marine Personnel and Watchkeeping (cont'd...)</p> <p>STCW Code; The principles underlying the STCW Convention; The content and application of the STCW Convention; How to implement the regulations for ensuring fitness for duty; Shipboard familiarisation; What tasks or duties elementary basic Safety familiarization involves for a watchkeeping officer; How to organize ship board training and how to maintain records; Penalties for breaches of STCW Convention; IMO audits.</p> <p><i>Marine Personnel Regulations:</i> Knowledge of Part 2 of the <i>Marine Personnel Regulations</i> relating to the crewing requirements for Canadian vessels, in particular the training and familiarization required, the minimum complement, the safe manning documents, the validity of certificates and endorsements, the deck watch, the engineering watch, the radio watch and the medical examination of seafarers.</p> <p>Pollution prevention</p> <p>Responsibilities under the <i>International Convention for the Prevention of Pollution from Ships, 1973, the Protocol of 1978 and 1997</i> relating thereto (MARPOL 73/78) and their Annexes as modified from time to time; The prevention of pollution by Oil (Annex I), by Noxious Liquid Substances in Bulk (Annex II), by Harmful substances carried by sea in packaged forms (Annex III), by Sewage from ships (Annex IV), by Garbage from ships (Annex V) and the prevention of Air pollution (Annex VI); Anti-fouling system on ships, 2001; The <i>Arctic Waters Pollution Prevention Act</i>; The <i>Arctic Shipping Safety and Pollution Prevention Regulations</i>; <i>Vessel Pollution and Dangerous Chemicals Regulations</i>.</p> <p>Control and Management of Ship's Ballast</p> <p>Knowledge of <i>International Convention for the Control and Management of Ships Ballast Water and Sediments, 2004</i>; Knowledge of the <i>Ballast Water Control and Management Regulations</i>.</p> <p>Management for the safe operation of ships</p> <p>Knowledge of SOLAS Chapter IX (Management for the safe operation of ships); the <i>International Safety (ISM) Code</i> and the <i>Safety Management Regulations</i>; The principles underlying the ISM Code; The content and application of the ISM Code.</p> <p>Maritime Security</p> <p>Knowledge of SOLAS Chapter XI-2 (Special measures to enhance maritime security); the <i>International Ship and Port Facility Security (ISPS) Code</i>; and the <i>Marine Transportation Security Act and Regulations</i>.</p> <p>Maritime Labour Convention (MLC 2006)</p> <p>Working knowledge of the <i>Maritime Labour Convention, 2006</i> provisions relating to the management of personnel on board ship, with particular reference to:</p> <ul style="list-style-type: none"> - Engagement of crew; - Employment conditions; - Crew entitlements and repatriation; - Medical requirements.

Subject	Knowledge required
Competence:	Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment
Knowledge of international maritime law embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions	<p>Maritime Labour Convention (MLC 2006) (cont'd...)</p> <p>Advantages for ships of ratifying countries; What does the MLC 2006 aims to establish; Ability to identify the certificates required by MLC 2006 to be carried on board; Validity of certificates.</p> <p><i>Marine Personnel Regulations:</i></p> <p>Knowledge of Part 3, of the <i>Marine Personnel Regulations</i> relating to Maritime Labour Standards, in particular the requirements regarding age, seafarer recruitment and placement, conditions of employment, the hours of work and hours of rest, food and water, on board complaint procedures and log books.</p> <p>ILO Convention</p> <p>General knowledge of <i>International Labour Organization (ILO) Conventions</i>; Ability to outline the requirements of ILO Convention 152, the <i>Occupational Safety and Health (Dock work) Convention, 1979</i>, which apply to ships.</p> <p>Charter Parties</p> <p>Definition of a charter party and voyage charter party; Knowledge of charter parties, including interpretation of various agreements; How contracts are drawn up; The tendering of notice of readiness at the loading port; If a ship is not ready to receive cargo by the cancellation date, what would be the consequences; What is meant by laytime and the terms “running days/hours”, “Sundays and Holidays excepted”, and weather working days; The consequences if cargo work is not completed within the permitted laytime; On-hire and off-hire procedures; common-law warranties; Demurrage and dispatch; Freight; Deviation; disputes and claims as they relate to laytime and demurrage.</p> <p>Procedures for receiving, and delivering cargo</p> <p>The period for which the ship is deemed responsible for the cargo under conventions for the carriage of goods and under typical carriage contracts evidenced by bills of lading or charter parties; Steps taken to ensure the damage is recorded and endorsed where appropriate on the bill of lading; The importance of endorsing mate’s receipts for the condition of goods and packages; The endorsements of mate’s receipts and/or bills of lading for goods in dispute; The endorsement of mate’s receipt and/or bills of lading for cargoes where the weight and quality are not known; The actions to take when a clean mate’s receipt or bill of lading is demanded for cargo which is not in apparent good condition; Why letters of indemnity offered in return for clean bills of lading should be refused; The documentation which should accompany dangerous goods and is required before loading; the importance of containers having their seals and locks in place when loaded; If damage to cargo is suspected, the importance of noting protest before commencing discharging; The procedures for noting protest and extending protest; The importance that an independent cargo survey is arranged when cargo damage is suspected or found on opening hatches; How to deal with empty bags or packages, sweepings and other loose goods; The procedure for claiming for damage done to the ship during loading and discharging; To whom cargo should be delivered; The potential consequences of delivering cargo to the incorrect party or under a letter of indemnity; The procedures that should be adopted when requested to deliver cargo against a letter of indemnity. The elements to be considered by the master when accepting cargo units or vehicles for shipment.</p>
Knowledge of international maritime law	Cargo

Subject	Knowledge required
Competence:	Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment
embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions	<p><i>International Convention for the Unification of Certain Rules of Law relating to Bills of Lading, as amended by the Protocol of 1968 (Hague-Visby Rules); definition of: carrier, contract of carriage, goods, ship and carriage of goods; Duties of the carrier to make the ship seaworthy and fit for the carriage of cargo; Describe the carrier’s duty to care for the cargo; Describe the duty of the carder, master or agent of the carrier to issue a bill of lading; List of information which should be shown in a bill of lading; Bill of lading is prima facie evidence of the receipt by the carrier of the goods; The importance of accuracy of marks, number, quantity and weight; Duty of the carrier, master or agent to issue a “shipped” bill of lading after the goods are loaded; Mandatory domain of the Hague-Visby Rules; The carrier’s liability for loss or damage arising or resulting from unseaworthiness; Exceptions to the carriers responsibility for loss or damage; The shippers responsibility for loss or damage sustained by the carrier or ship; The right to deviate for the purpose of saving life or property; The limitation of liability for loss or damage and the circumstances in which benefit of limitation is lost; The provisions regarding goods of an inflammable, explosive or dangerous nature; The liability of the carrier’s servants (Himalaya clause).</i></p> <p>Noting and Extending Protest</p> <p>What is a note of protest; Knowledge of the master’s obligations, and circumstances when it is advisable to note and extent protest.</p> <p>Letter of protest</p> <p>What is a letter of protest; Difference with a letter of protest and a protest note.</p> <p>Ship’s Agents and Agency</p> <p>Functions of agents, including their appointment, authority and duties; Different type of agents.</p> <p>Port of Refuge procedures</p> <p>Definition of port of refuge; Business aspects of putting into port with damaged ship or cargo; justifiable deviation; Rule X for expenses at port of refuge provided in the York-Antwerp Rules; Difference between a port or place where a vessel seeks temporary shelter and a port of refuge; What is a “common maritime adventure”; Declaration of general average; Procedures for any particular port or place of refuge in general to be followed; Ability to outline the evidence required at port of refuge.</p> <p>The master/pilot relationship</p> <p>Definition of maritime pilot; IMO Assembly Resolution A,960(23), “Recommendations on Training and Certification and Operational Procedures for Maritime Pilots other than Deep Sea Pilots’; Legal aspects of compulsory and non-compulsory pilotage; Knowledge of the <i>Pilotage Act</i>; Pilot’s responsibility to master; Master relieving pilot; When a pilot shall not pilot; Pilotage exemption or waiver as per Administrative Regulations; License and certificate as per the <i>General Pilotage Regulations</i>; Ship Owner liability for the consequences of negligent navigation whilts the ship is under pilotage; Transit through major canals such as Suez and Panama, including boarding arrangements.</p>
Knowledge of international maritime law embodied in	<p>Port State Control</p> <p>The aim of Port State Control; Awareness of the different Memorandum of Understanding (MOU) on Port State Control such as the Paris, Tokyo and other MOU; Ability to identify how to ascertain which port state agreement a particular port state might be party to and any areas of</p>

Subject	Knowledge required
Competence:	Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment
international agreements and conventions and National Legislation for Implementing International Agreements and Conventions	particular focus that may currently be in place; Appreciation of the scope of authority of Port State Control and recognition of the right of national administrations to inspect and detain vessels for non-conformities; List of certificates and documents which are checked during the inspection; Definition of “Clear ground”; “Clear ground” to conduct a more detailed inspection; Records of port state control inspections; What is “Equasis”.
Canadian Legislation and Regulations	<p>Canada Shipping Act (CSA) 2001</p> <p>Knowledge of <i>Canada Shipping Act-2001</i> relating to Registrations, listing and recording; Personnel; Safety; Navigation Services; Incidents, accidents and casualties; Wreck; Pollution prevention and response – Department of fisheries and oceans; Pollution Prevention – Department of Transport; and Enforcement; Minister’s right to cancel or suspend certificate of competency; Knowledge of offences and legal consequences.</p> <p>Canada Labour Code</p> <p>Awareness of the <i>Canada Labour Code</i> as it relates to vessel operation and safety; Knowledge of the application of the <i>Canada Labour Code</i> to shipping; knowledge of the <i>Maritime Occupational Safety and Health Regulations</i>; the Workplace Hazardous Materials Information System (WHMIS); Knowledge of offences and legal consequences.</p> <p>Canadian Regulations</p> <p>Knowledge of <i>Shipping Casualty Reporting Regulations</i>; <i>Potable Water on board Trains, Vessels, Aircraft and Buses Regulations</i>; <i>Vessel Certificates Regulations</i>; <i>Vessel Pollution and Dangerous Chemicals Regulations</i>; <i>Marine Transportation Security Regulations</i>; <i>Load Line Regulations</i>; <i>Administrative Monetary Penalties Regulations</i>; <i>Fire and Boat Drills Regulations</i>.</p> <p>Legislation affecting vessel operation</p> <p>Knowledge of the <i>Canadian Navigable Waters Act</i>; <i>Canadian Environmental Protection Act</i>; <i>Merchant Seamen Compensation Act</i>; <i>Marine Transportation Security Act</i>; <i>Merchant Seaman Compensation Order 1992</i>.</p> <p>Legislation Concerning Controlled Substances</p> <p>Knowledge of employee assistance program; employee rights and testing process; pre-employment testing; documentation of medical treatment and administration of controlled medication.</p>
Knowledge of master’s responsibilities in different events	<p>Marine Occurrence</p> <p>Obligations and responsibilities in event of emergencies such as accident, incident, collision, fire, distress, search and rescue; the mandatory reporting of a marine/hazardous occurrence under the provisions of the <i>Transportation Safety Board Regulations</i>; the <i>Canada Shipping Act, 2001</i> and the <i>Canada Labour Code Part II</i>; casualty investigation and reports.</p>

5.10 Ship Management – level 4 (Examination Code: SM 4)

- 1) The examination consists of a written test comprising descriptive questions.
- 2) The following open-book resources will be allowed in the examination room:
 - a) Bill of Lading Act;
 - b) Canada labour Code;
 - c) Canada Marine Act;
 - d) Canada Shipping Act, 2001;
 - e) Canadian Transportation Accident Investigation and Safety Board Act;
 - f) Coasting Trade Act;
 - g) Convention of the prevention of marine pollution by dumping of wastes and other matter (London Dumping Convention) (LDC);
 - h) Convention on Facilitation of International Maritime Traffic, 1965, as amended (FAL 1965);
 - i) Convention on Limitation of Liability For Maritime Claims, 1976 (LLMC 1976);
 - j) Criminal Code;
 - k) International Convention for the Control and Management of Ships Ballast Water and Sediments, 2004;
 - l) International Convention on Civil Liability for Oil Pollution Damage, 1969 (CLC 1969);
 - m) International Convention on Salvage, 1989;
 - n) International Health Regulations (2005);
 - o) International Convention relating to Intervention on the High Seas in cases of Oil Pollution Casualties, 1969;
 - p) Marine Insurance Act;
 - q) Marine Liability Act;
 - r) Memorandum D03-5-1 of Canada Border Services Agency;
 - s) Memorandum D-3-5-7 of Canada Border Services Agency;
 - t) Port Authorities Operations Regulations;
 - u) Protocol relating to Intervention on the High Seas in cases of Pollution by Substances other than Oil, 1973;
 - v) Public ports and public port facilities Regulations;
 - w) Quarantine Act;
 - x) Quarantine Regulations;
 - y) Shipping Conferences Exemption Act;
 - z) Transportation Appeal Tribunal of Canada Act; and
 - aa) United Nations Convention of the Law of the Sea (UNCLOS).
- 3) The examination is of a three hours duration.
- 4) The examination is based upon:

Subject	Knowledge required
Competence:	Monitor and Control Compliance with Legislative requirements
Carriage of goods by sea	<p>Marine Insurance and Liability</p> <p>The purpose of marine insurance; What is meant by and insurable interest; How insurance is arranged through brokers; Extended knowledge of marine insurance and its inter-relationship with charter parties, bills of lading and the <i>Marine Liability Act</i> ; awareness of the <i>Convention on Limitation of Liability for Maritime Claims, 1976</i>; limitation of liability; knowledge of the <i>Marine insurance Act</i>; definitions and other terms used in marine policies; Ability to describe voyage policies, time policies and floating policies; The principle of “utmost good faith”; The effect of misrepresentation or non-disclosure of material circumstances known to the assured; What is “warranty” and the effect on a marine insurance policy of breach of warranty; What is meant by deviation and how the insurer is discharged from liability from the moment a ship deviates under a voyage policy; Permitted deviations;</p>

	<p>The perils usually covered in a marine insurance policy; The use of “Institute Clauses”; What is the “duty of assured’ clause; Partial loss, total loss and constructive total loss; What is meant by “particular average”; The doctrine of subrogation; The function of Protection and Indemnity Associations; Risks, liabilities and expenses covered by P & I Clubs.</p> <p>General and Particular Average Extended knowledge of general average, particular average and York Antwerp rules, 1974; port of refuge, including justifiable deviation; responsibility of master in case of deviation; differences between particular average and general average.</p> <p>Hamburg Rules Maritime Legislation The effect of charges where goods are carried under Hamburg Rules; Carrier’s extended liability for loss or damage of goods; Ability to explain reductions to exception to liability, inward and outward bills of lading, Live animals and deck cargo; The need to inform P & I Club where goods are carried under Hamburg Rules.</p>
<p>International and National organizations</p>	<p>Knowledge of the functions and Jurisdiction of specialized agencies of the United Nations such as the International Maritime Organization (IMO), International Labour Organization (ILO); International Hydrographic Organization (IHO); Awareness of their structure; committees and sub-committees; convention procedures; Signatory requirements; Examples of international conventions; Outline of SOLAS; Awareness of world Health Organization (WHO); Canadian Marine Advisory Council (CMAC) and its functions.</p>
<p>Knowledge of international maritime law embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions</p>	<p>Collision Knowledge of the <i>International Convention for the Unification of certain rules of Law with respect to Collision between vessels (Collision, 1910)</i>; Application; The damages are born by whom; The apportionment of liability when two or more vessels are in fault; The duties of the master after a collision.</p> <p>Assistance and Salvage Knowledge of the <i>International Convention on Salvage, 1989</i>; Definition of “salvage operation”, “vessel “and “property”; The “no cure – no pay” principle; The duties of the salvors, of the owner and of the master; The rights of salvors; The criteria for assessing Special Compensation; The reasons for the court to set aside the agreed remuneration in whole or in part (salvor’s fault, neglect, fraud or dishonesty); The rights of salvors of human life who have taken part in the salvage operations; The provision of security by the owner and the application of the salvor’s maritime lien.</p>

Subject	Knowledge required
Competence:	Monitor and Control Compliance with Legislative requirements
<p>Knowledge of international maritime law embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions</p>	<p>Lloyd’s Standard Form of Salvage Agreement</p> <p>When it should be used; The Contractor’s agreed endeavours to salve the ship and/or cargo, bunkers and stores and while performing the salvage services to prevent or minimize damage to the environment; LOF 2000 form; The exception of the “no cure – no pay” principle; What is the English Law; The obligation of the owner, their servants and agents to co-operate with the salvors; The Contractor’s duty immediately after the termination of the services to notify the Council of Lloyd’s and where practicable the owners of the amount for which he requires security; How claims for arbitration are decided; The provisions for special compensation set out in Convention Article.</p> <p>Maritime declarations of Health and the requirements of the International Health Regulations</p> <p>Arrival documents and procedures; <i>International Health Regulations (2005)</i>; The measures which the health authority of a port may take with respect to departing travelers; The measures which may be applied to a ship which passes through a canal or waterway in a territory of a State on its way to a port in the territory of another State; The actions open to a ship which is unwilling to submit to the measures required by the health authority of a port; The measures concerning cargo and goods; The measures concerning baggage. Knowledge of the <i>Quarantine Act</i>, including purpose and application of <i>Quarantine Regulations</i> to shipping; Part 2 of <i>Cargo, Fumigation and Tackle Regulations on fumigation</i>; Need for and precautions for vessel fumigation; role of Agriculture Canada; De-Rat Certificate and De-Rat Exemption Certificate.</p> <p><u>Plague</u></p> <p>Incubation period of plague; Vaccination against plague; Precautions to be taken on a ship in port infected by plague; The requirements for the issue of a Ship Sanitation Control Certificate or a Ship Sanitation Control Exemption Certificate and their periods of validity; Measures which may be applied by a health authority on the arrival of an infected or suspected ship.</p> <p><u>Cholera</u></p> <p>The measures which may be applied by a health authority on the arrival of a healthy ship from an infected area states; Incubation period of cholera; Measures to be taken by the health authority if a case of cholera is discovered upon arrival or a case has occurred on board.</p> <p><u>Yellow Fever</u></p> <p>Incubation period of yellow fever; Vaccination against yellow fever; Every member of the crew of a ship using a port in an infected area must be in possession of a valid certificate of vaccination against yellow fever; Conditions in which a ship on arrival is to be regarded as infected, suspected or healthy; The measures which may be applied by a health authority on the arrival of an infected or suspected ship.</p> <p><u>Documents</u></p> <p>The master’s obligations concerning a Maritime Declaration of Health.</p>

Subject	Knowledge required
Competence:	Monitor and Control Compliance with Legislative requirements
<p>Knowledge of international maritime law embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions</p>	<p>Convention on Facilitation of International Maritime Traffic, 1965, as amended (FAL 1965)</p> <p>Purpose of the convention; Standards and recommended practices regarding documentation and procedures for facilitating international maritime traffic; List of documents required by public authorities for the retention on arrival, or departure of vessels to which the convention applies; IMO standards forms for: general declaration, cargo declaration, ship’s effects declaration, crew list, passenger list and dangerous good manifest; How the arrival procedures may be expedited.</p> <p>United Nations Convention of the Law of the Sea (UNCLOS)</p> <p>What is UNCLOS; What does UNCLOS define; Entry into force; Width of the territorial sea; Definition of innocent passage and transit passage through international straits; Definition of archipelagic states; Exclusive economic zones; Definition of continental shelf; Responsibility for enforcement of regulations; Duties of the flag state; Enforcement by flag states; Port State jurisdiction; Coastal State jurisdiction as applied in relation to pollution provisions; Violation of laws and regulations in accordance with UNCLOS; Violation of pollution laws in an exclusive economic zone; Territorial sea additional navigational restraints; Coastal States and ports additional pollution regulations.</p> <p>Special Compensation P & I Club (SCOPIC) Clause</p> <p>What is SCOPIC clause; When the contractor have the option to invoke the SCOPIC clause; What does the SCOPIC clause determine; What is SCOPIC remuneration; When does the assessment of SCOPIC remuneration commence; What is “Initial Security”; Termination of SCOPIC clause under which circumstances; Explain “Special Representatives; What is a Casualty representative; Dispute arising out of the SCOPIC clause.</p> <p>Convention on Limitation of Liability For Maritime Claims, 1976 (LLMC 1976)</p> <p>Scope of application of the convention; Persons entitled to limit liability; Claims subject to limitation of liability; Claims exempted from limitation; Circumstances in which limitation will be barred; What is the calculation of limits of liability is based on; Ability to describe the constitution of a limitation fund.</p> <p>Classification Societies</p> <p>Reasons for having a vessel classed with a classification society; The role of Classification Society; Ability to explain the different periodical surveys (annual survey, docking survey, intermediate survey and special survey);What is an occasional survey.</p> <p>International Convention for the Control and Management of Ships Ballast Water and Sediments, 2004</p> <p>Definition of ballast water , ballast water management and sediments; The application of this Convention; The conditions where the application of this convention may be exempted; The management and control requirement based on Section B Regulations B1 to B6; Ability to briefly described the Annex – Section A, B, C, D and E; The standards that need to be observed in ballast water exchange; Regulation B-4 Ballast Water Exchange; Ballast Water Management Plan; Records of the operation is to be recorded.</p>

Subject	Knowledge required
Competence:	Monitor and Control Compliance with Legislative requirements
Knowledge of international maritime law embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions	<p>Methods and Aids to prevent pollution of the marine environment by ships</p> <p>Convention of the prevention of marine pollution by dumping of wastes and other matter: (London Dumping Convention) (LDC): Explain the aim of the Convention; Definition of dumping, wastes or other matter, special permit and general permit; Dumping of wastes or other matter as listed in Annex 1 is prohibited. Dumping of wastes or other matter as listed in Annex II requires a prior special permit; Dumping of all other wastes or other matter requires a prior general permit; Cases of force majeure; Incineration of wastes at sea.</p> <p>International Convention relating to Intervention on the High Seas in cases of Oil Pollution Casualties, 1969</p> <p>The rights of Parties to the Convention on the high seas following a maritime casualty; Definition of maritime casualty, ship, oil and related interests for the purpose of the convention; Provisions which a coastal state should apply when exercising the right to take measures in accordance with Article 1.</p> <p>Protocol relating to Intervention on the High Seas in cases of Pollution by Substances other than Oil, 1973</p> <p>The rights of Parties to the Protocol to intervene on the high seas following a maritime casualty; Definition of “substances other than oil”; Protocol extension.</p>
Knowledge of international maritime law embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions	<p>International Convention on Civil Liability for Oil Pollution Damage, 1969 (CLC 1969)</p> <p>Awareness of the <i>International Convention on Civil Liability for Oil Pollution Damage, 1969 (CLC 1969)</i>.</p> <p>National legislation for implementing international agreements and conventions</p> <p>The process by which international agreements and conventions are ratified and implemented into national legislation.</p>

Subject	Knowledge required
Competence:	Monitor and Control Compliance with Legislative requirements
Ship management	<p>Customs house and immigration</p> <p>Knowledge of customs house and immigration procedures and required documentation at arrival and departure, including: inward report; general declaration; non duty paid goods; short landed or overloaded merchandise; crew’s effects declaration; crew list; passenger list; cargo declaration forms; outward report; Memorandum D03-5-1 of Canada Border Services Agency; producing certificates of competency; Passports, visas and their use in foreign ports; <i>Vessel Clearance Regulations</i>; <i>Convention on facilitation of International Maritime Traffic, 1965, as amended (FAL 1965)</i>; <i>Quarantine Regulations</i>.</p> <p>Labour Relations</p> <p>Appreciation of the collective bargaining process for unions and associations as per the <i>Canada Labour Code</i>; Ability to observe/interpret collective agreements; Awareness of right and/or limitation of access of unions and associations to vessel within or without collective agreements; appreciation of the effective expedition of a progressive disciplinary procedure and the associated documentation; awareness of the <i>Canadian Charter of Rights and Freedom</i> and the <i>Canadian Bill of rights</i>; Procurement of an attorney.</p> <p>Ship’s Agents and Agency</p> <p>Definition of “shipping agent”; The authority of the agency and where it may be actual authority or apparent authority; Express authority and Implied authority; Different types of agent and agency; What is a General agents and Special agent; The agent duties; Appointment of different agents; Scope of services provided; Sub-agent and delegation of authority. Code of professional conduct given in United Nations Conference on Trade and Development, UNCTAD Minimum Standards for Shipping Agent.</p> <p>Stowaways</p> <p>Definition of a stowaway as per IMO guidelines; High risk areas for stowaways as per P & I Clubs; Safeguards to be observed to ensure that stowaways do not board; IMO guidelines on stowaway matters; What are the nine basic principles which can be applied generally with respect to stowaway cases; Responsibilities of the master in stowaway cases; The procedures to be adopted, in general, on the discovery at sea of stowaways.</p>

Subject	Knowledge required
Competence:	Monitor and Control Compliance with Legislative requirements
National legislations	<p>Coasting Trade Act</p> <p>Understanding of the <i>Coasting Trade Act</i> and an appreciation of procedures for a vessel purchased abroad, flagged to Canada and operated in the Canadian coasting trade; the use of foreign ships and non-duty paid ships in the coasting trade; Memorandum D-3-5-7 of Canada Border Services Agency; <i>Shipping Conferences Exemption Act 1987</i>; Understanding of the role of the Canadian Transportation Agency.</p> <p>Ports and Harbours</p> <p>Awareness of the <i>Canada Marine Act</i> and of the following regulations: <i>Port Authorities Operations Regulations</i>; <i>Public Ports and Public Port Facilities Regulations</i>; Practices and procedures for public ports and recognition of port by-laws as they relate to vessel operation.</p> <p>Functions of Consular Offices</p> <p>Working knowledge of the purpose and functions of consular offices; services provided by consul abroad; appreciation of the conduct of a vessel under a foreign jurisdiction including infractions, convictions, liens, vessel detention and arrest, and procurement of legal advice.</p> <p>Transportation Appeal Tribunal of Canada (TATC)</p> <p>Knowledge of the <i>Transportation Appeal Tribunal of Canada Act</i>; the Tribunal jurisdiction in respect of reviews and appeals as expressly provided for under the <i>Canada Shipping Act, 2001</i>; Hearings related to the competency and conduct of officers, suspension or cancellation of certificate, cases of medical incapacity and administrative penalties.</p> <p>Transportation Safety Board (TSB)</p> <p>Knowledge of the <i>Canadian Transportation Accident Investigation and Safety Board Act</i> in respect of marine occurrences; Mandate, powers and authority of the Transportation Safety Board (TSB); Knowledge of offences and legal consequences.</p> <p>Criminal Code</p> <p>Awareness of the Canadian <i>Criminal Code</i> as it relates to vessel operation and safety.</p> <p>Delegated Statutory Inspection Program (DSIP)</p> <p>Practice, procedure and awareness of enrolment in the DSIP program; Knowledge of the role of the classification society regarding the DSIP program.</p> <p>Change of Flag/Ownership</p> <p>Knowledge of implications and procedures associated with change of flag and/or ownership; Knowledge of the role of the classification society during the change of Flag/Ownership; Practices and procedures for the issuance of the vessel statutory/class certificates.</p>

5.11 Ship Construction and Stability – Level 4 (Examination Code: SCS 4)

- 1) The examination consists of multiple-choice, simple drawing and descriptive questions and practical calculations based on the vessel's stability data booklets.
- 2) The following open-book resources will be allowed in the examination room:
 - a) Part 1 of the International Convention on Load Lines, 1966 of the Load Line Convention, consolidated 2005;

- b) International Load Line Zones - World Map;
 - c) International Convention for the Safety of Life at Sea, 1974 (SOLAS), as amended;
 - d) MV Gypsum Centennial, Ship Stability Booklet-Book 1 of 2; and
 - e) MV Atlantic Vision, Ship Stability Booklet.
- 3) The examination is of three hours duration.
- 4) The examination is based upon:

Subject	Knowledge required
Competence:	Maintain seaworthiness of the ship (Stability, Trim and Stress Tables)
Working knowledge and application of stability, trim and stress tables, diagrams and stress-calculating equipment	<p>Displacement Definition of displacement;</p> <p>Given a displacement/draught curve or table find:</p> <ul style="list-style-type: none"> a) Displacement for given mean draughts; b) Mean draught for given displacements; c) The change in mean draught when given masses are loaded or discharged; d) The mass of cargo to be loaded or discharged to produce a required change of draught. <p>Definition of light displacement and load displacement; Definition of deadweight and “displacement tonnage”; Ability to use a deadweight scale to find the deadweight and displacement of a ship at various draughts in seawater; Definition of tonnes per centimetre immersion; Why TPC varies with different draughts; Ability to use a deadweight scale to obtain TPC at given draughts;</p>

Subject	Knowledge required
Competence:	Maintain seaworthiness of the ship (Stability, Trim and Stress Tables)
<p>Working knowledge and application of stability, trim and stress tables, diagrams and stress-calculating equipment</p>	<p>Displacement (cont'd) Ability to use TPC obtained from a deadweight to find: a) The change of mean draught when given masses are loaded or discharged; b) The mass of cargo to be loaded or discharged to produce a required change of draught.</p> <p>Definition of block coefficient (CB); Ability to calculate CB from given displacement and dimensions; Ability to calculate displacement from given CB and dimensions.</p> <p>Buoyancy Meaning of buoyancy; Definition of force of buoyancy; What is meant by reserve buoyancy; Explain the importance of reserve buoyancy; Explain the purpose of load lines; Explain the requirement for maintaining water tight integrity; Ability to demonstrate an understanding of damage stability requirements for certain vessels; The reasons for damage stability requirements. Ability to identify damage stability requirements for Type A vessels, Type (B-60) and Type (B-100) vessels; Identify equilibrium condition after flooding for Type A, and all Type B vessels; Identify damage stability requirements for passenger vessels.</p> <p>Fresh Water Allowance Why the draught of a ship decreases when it passes from fresh water to seawater and vice versa; Given the FWA and TPC for fresh water, ability to calculate the amount which can be loaded after reaching the summer load line when loading in fresh water before sailing into seawater; Ability to use a hydrometer to find the density of dock water; The effect of changes of tide and rain on dock water density; How to obtain the correct dock water density; Given the density of dock water and TPC for seawater, ability to calculate the TPC for dock water; Given the density of dock water and FWA, ability to calculate the amount by which the appropriate load line may be submerged; Given the present draught amidships and the density of dock water, ability to calculate the amount to load to bring the ship to the appropriate load line in seawater.</p> <p>Statical stability Definition of centre of gravity (G); Definition of centre of buoyancy (B); Definition of the lever GZ; how variations in displacement and GZ affect the stability of the ship; Ability to draw a diagram of a heeled ship, showing: a) The forces B and G; b) The lever GZ.</p> <p>Initial stability Definition of the transverse metacentre (M); Ability to draw a diagram of a ship heeled to a small angle and indicate G, B, Z and M; Definition of GM; Ability to show that for small angles of heel (θ), $GZ = GM \times \sin \theta$; Ability to describe the effect on a ship's behaviour of: a) A large GM (stiff ship); b) A small GM (tender ship).</p>

Subject	Knowledge required
Competence:	Maintain seaworthiness of the ship
Working knowledge and application of stability, trim and stress tables, diagrams and stress-calculating equipment	<p>Ability to use hydrostatic curves to find the height of the metacentre above the keel (KM) at given draughts; Given the values of KG, ability to use the values of KM obtained from hydrostatic curves to find the metacentre height, GM. Given a ship's hydrostatic data and the disposition of cargo, fuel and water, calculate the metacentric height (GM); Ability to calculate the arrival GM from the conditions at departure and the consumption of fuel and water, including the loss of GM due to FSE; Ability to estimate the loss of GM resulting from absorption of water by deck cargo; Ability to identify when the ship will have the worst stability conditions during the passage; Ability to calculate the maximum weight which can be loaded at a given height above the keel to ensure a given minimum GM.</p> <p>Angle of Loll Ability to show that if G is raised above M, the couple formed by the weight and buoyancy force will turn the ship further from the upright; How B may move sufficiently to reduce the capsizing moment to zero at some angle of heel; Definition of angle of loll; An unstable ship may loll to either side, why this condition is potentially dangerous.</p> <p>Curves of Statical Stability Ability to identify cross curves (KN curves and MS curves); Derive the formula $GZ = MS + GM \sin\theta$; Derive the formula $GZ = KN - KG \sin\theta$; Derive GZ curves for stable and initially unstable ships from KN curves;</p> <p>From a given curve of statical stability, ability to obtain:</p> <ol style="list-style-type: none"> The maximum righting lever and the angle at which it occurs; The angle of vanishing stability; The range of stability. <p>Ability to use KN curves to construct a curve of statical stability and from it ability to read the maximum righting lever and angle of which it occurs; Ability to show how lowering the position of G increases all values of the righting lever and vice versa.</p> <p>Movement of the Centre of Gravity Ability to calculate the movement of G (GG1) from:</p> $GG1 = \frac{\text{mass added or removed} \times \text{distance of mass from G}}{\text{new displacement of the ship}}$ $GG1 = \frac{\text{mass moved} \times \text{distance mass is moved}}{\text{displacement of the ship}}$ <p>Perform calculations as in the above objective to find the vertical and horizontal shifts of the centre of gravity resulting from adding, removing, moving or suspending masses; Ability to calculate, by using moments about the keel, the position of G after loading or discharging given masses at stated positions.</p> <p>Ability to calculate the change in KG during a passage resulting from:</p> <ol style="list-style-type: none"> Consumption of fuel and stores; Absorption of water by a deck cargo; Accretion of ice on decks and superstructures given the masses and their positions.

Subject	Knowledge required
Competence:	Maintain seaworthiness of the ship
<p>Working knowledge and application of stability, trim and stress tables, diagrams and stress-calculating equipment</p>	<p>List and its correction Ability to show on a diagram the forces which cause a ship to list when G is to one side of the centre line; Ability to show on a diagram that the angle of list (θ) is given by:</p> $\tan \theta = \frac{GG1}{GM}$ <p>Where GG1 is the transverse shift of G from the centre line.</p> <p>Given the displacement, KM and KG of a ship, ability to calculate the angle of list resulting from loading or discharging a given mass at a stated position, or from moving a mass through a given transverse distance; With reference to moments about the centre line, ability to explain how the list may be removed; Given the displacement, GM and the angle of list of a ship, ability to calculate the mass to load or discharge at a given position to bring the ship upright; Given the displacement, GM and angle of list of a ship, ability to calculate the mass to move through a given transverse distance to bring the ship upright; Given the draught, beam and rise of the floor, ability to calculate the increase in draught resulting from a stated angle of list; Ability to determine the expected maximum heel during the loading or discharging of a heavy lift with the ship's gear; Ability to calculate the increased draught resulting from the heel.</p> <p>Effect of slack tanks Ability to show by means of diagrams how the centre of gravity of the liquid in a partly filled tank moves during rolling.</p> <p>Effect of wind and effect of water on deck Understanding the effect of severe wind and rolling in associated sea conditions, especially in following seas; Effect of water on deck including free surface effect. Ability to plan the use of fuel and water to keep free surface effects to a minimum.</p> <p>Trim Definition of trim; Definition of centre of flotation (CF); Ability to use hydrostatic data to find the position of the centre of flotation (CF) for various draughts; Definition of a trimming moment; Definition of the moment to change trim by 1 cm (MCT 1 cm); Ability to use hydrostatic curves/tables or deadweight scale to find the MCT 1 cm for various draughts; Given the value of MCT 1 cm, masses moved and the distances moved forward or aft, ability to calculate the change in trim; Given the value of MCT 1 cm, the position of the centre of flotation, masses added or removed and their distances forward of or abaft the centre of flotation, ability to calculate the change of trim; Given initial draughts and the position of the centre of flotation, ability to extend the calculation in the above objective to find the new</p>

Subject	Knowledge required
Competence:	Maintain seaworthiness of the ship
Working knowledge and application of stability, trim and stress tables, diagrams and stress-calculating equipment	<p>Trim (cont'd) draughts; Given initial draughts and TPC, ability to extend the calculation in the above objective to find the new draughts; Given initial draughts and TPC, ability to extend the calculation to find the new draughts; Ability to use a trimming table or trimming curves to determine changes in draughts resulting from loading, discharging or moving weights; Ability to calculate how to divide a given mass between two given locations to produce a required trim or maximum draught after loading; Ability to calculate the locations at which to load a given mass so as to leave the after draught unchanged; Ability to calculate final draughts and trim for a planned loading by considering changes to a similar previous loading.</p> <p>Stability versus construction Knowledge of effects on stability associated with different types of ships construction.</p>
Understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy	Knowledge that flooding should be countered by prompt closing of watertight doors, valves and any other openings which could lead to flooding or other compartments; Knowledge that cross-flooding arrangements, where they exist, should be put into operation immediately to limit the resulting list; Knowledge that any action, which could stop or reduce the inflow of water, should be taken.
Understanding of the fundamentals of watertight integrity	Understanding of the fundamentals of watertight integrity.
Stability on sailing vessels	a) Stability under sails b) Effect of wind and sail c) Center of effort, Centre of lateral resistance, Bernoulli's Principle, Venturi Effect, sail balance, sail shape and trim, lee helm, weather helm. d) Aerodynamic e) Compliance with the stability criteria indicated in the sailing vessel stability booklet against capsizing f) Sail setting as per prevailing conditions, amount of sail carried with regard to wind conditions, special care with a strong stern wind, in the event of the vessel broaching or a gust on the beam.

Subject	Knowledge required
Competence:	Maintain seaworthiness of the ship
Understanding of the stress tables and stress calculating equipment (Loadicator)	Vessels required to carry a loading manual; Basic knowledge and use of a stress tables; Basic knowledge and use of a stress calculating equipment (loadicator); The information available from loadicator; The likelihood of overstressing the hull structure when loading certain bulk cargoes.
Competence:	Maintain seaworthiness of the ship (The principal structural members of a ship)
General knowledge of the principal structural members of a ship and the proper names for the various parts	<p>Ship dimensions and form General arrangement of different types of ship; Ability to reproduce an elevation of the principal ship types, showing holds, engine room, peak tanks, double bottom tanks, hatchways, tween deck and position of bulkheads; Ability to reproduce an elevation of a typical crude oil carrier, showing bulkheads, cofferdams, pump-room, engine-room, bunker and peak tanks, cargo tanks, slop tank and permanent ballast tanks; Ability to reproduce a plan view of a tanker, showing the arrangement of cargo and ballast tanks; Definitions of the different dimensions and forms.</p> <p>Ship stresses Describe in qualitative terms shear force and bending moments; What is meant by hogging and sagging; Ability to describe the loading conditions which give rise to hogging and sagging stresses; How hogging and sagging stresses are caused by the sea state; How hogging and sagging stresses result in tensile or compressive forces in the deck and bottom structure; Describe water pressure loads on the ship's hull; Describe liquid pressure loading on the tank structures; Ability to calculate the pressure at any depth below the liquid surface, given the density of the liquid; Describe the stresses set up by liquid sloshing in a partly filled tank; Describe racking stress and its causes; What is meant by panting and which part of the ship is affected; What is meant by pounding or slamming and which part of the ship is affected; Describe the stress caused by localized loading; Describe corrosion; Describe the cause of corrosion on board; Various methods being used to minimize the effect of corrosion; Ability to demonstrate understanding of modern methods of determining the effects of different loading and ballasting on the ship's structure; Ability to use modern computer software for determining stress; Have a working knowledge of the stress tables; How output data from ship stress finding system may be used; Torsion stress particularly with reference to container ship loading; Ability to analyze the stress areas created by bending moments and shearing forces derived by a stress indicator; Analyze the causes and effects of shearing forces and bending moments on ship's structures; Definition of bending moment; Definition of Shearing forces; Ability to extract information from shear force and bending moment diagrams; Describe the constructional features, which compensate for stress.</p>

Subject	Knowledge required
Competence:	Maintain seaworthiness of the ship (The principal structural members of a ship)
<p>General knowledge of the principal structural members of a ship and the proper names for the various parts</p>	<p>Hull structure</p> <p>Ability to identify structural components on ship's plans and drawings:</p> <ol style="list-style-type: none"> Frames, floor, transverse frames, deck beams, knees, brackets; Shell plating, decks, tank top, stringers; Bulkheads and stiffeners, pillars; Hatch girders and beams, coamings, bulwarks; Bow and stern framing, cant beams, breasthooks. <p>Types of materials that are used in the construction of a ship.</p> <p>Ability to describe and illustrate standard steel sections:</p> <ol style="list-style-type: none"> Flat plate; Offset bulb plate; Equal angle; Unequal angle; Channel; Tee. <p>Ability to describe with the aid of sketches the longitudinal, transverse and combined systems of framing on transverse sections of the ships; Ability to sketch the arrangement of frames, webs and transverse members for each system; Ability to illustrate double-bottom structure for longitudinal and transverse framing; Ability to illustrate hold drainage systems and related structure; Ability to illustrate a duct keel; Ability to sketch the deck edge, showing attachment of sheer strake and stringer plate; Ability to sketch a radiused sheer strake and attached structure; Describe the stress concentration in the deck round hatch openings; Explain compensation for loss of strength at hatch openings; Ability to sketch a transverse section through a hatch coaming, showing the arrangement of coamings and deep webs; Ability to sketch a hatch corner in plan view, showing the structural arrangements; Ability to sketch deck-freeing arrangements, scuppers, freeing ports, open rails; Ability to illustrate the connection of superstructures to the hull at the ship's side; Ability to sketch a plane bulkhead, showing connections to deck, sides and double bottom and the arrangement of stiffeners; Ability to sketch a corrugated bulkhead; Why transverse bulkheads have vertical corrugations and for-and-aft bulkheads have horizontal ones; Ability to describe the purpose of bilge keels and how they are attached to the ship's side.</p> <p>Bow and Stern</p> <p>Describe the provisions of additional structural strength to withstand pounding; Describe and illustrate the structural arrangements forward to withstand panting; Describe the function of the sternframe; Describe and sketch a sternframe for a single-screw ship; Describe and illustrate the construction of a transom stern, showing the connections to the sternframe.</p> <p>Fittings</p> <p>Describe and sketch an arrangement of modern weather-deck mechanical steel hatches; How watertightness is achieved at the coamings and cross joints; Describe the cleating arrangements for the hatch covers; Ability to sketch an oil tight hatchcover; Describe roller, multi-angle, pedestal and panama fairleads; Ability to sketch mooring bitts, showing their attachments to the deck; Ability to sketch typical forecastle mooring and anchoring arrangements, showing the leads of moorings; Describe the construction and attachment to the deck of tension winches and explain how they are used; Describe the anchor handling</p>

Subject	Knowledge required
Competence:	Maintain seaworthiness of the ship (The principal structural members of a ship)
<p>General knowledge of the principal structural members of a ship and the proper names for the various parts</p>	<p>arrangements from hawse pipe to spurling pipe; Describe the construction of chain lockers and how the bitter-ends are secured in the lockers. How to secure anchors and make spurling pipes watertight in preparation for a sea passage; Describe the construction and use of a cable stopper; Describe the construction of masts and Sampson posts and how they are supported at the base; Describe the construction of derricks and deck cranes; Describe the bilge piping system of a cargo ship; Describe and sketch a bilge strum box; Describe a ballast system in a cargo ship; Describe the arrangement of a fire main; Describe the provision of sounding pipes and sketch a sounding pipe arrangement; Describe the fitting of air pipes to ballast tanks or fuel oil tanks; Describe the arrangement of fittings and lashings for the carriage of containers on deck.</p> <p>Rudder and propellers Ability to describe the action of the rudder in steering a ship; Drawing of modern rudders: semi balanced, balanced and spade; Explain the purpose of the rudder carrier and pintles; How the weight of the rudder is supported by the rudder carrier; Ability to describe a rudder trunk; Ability to describe the arrangement of a watertight gland round the rudder stock; The principle of screw propulsion; Describe a propeller and define boss, rake, skew, face, back, tip, radius, pitch; cavitations; Ability to describe new type of propulsion system such as electric podded propulsion, Voith Schneider, azimuthing drive propulsion. Compare fixed-pitch with controllable-pitch propellers; Ability to sketch the arrangement of an oil lubricated sterntube and tailshaft; Ability to sketch a cross-section of a shaft tunnel for water cooled and oil cooled types; Why the shaft tunnel must be of watertight construction and how water is prevented from entering the engine-room if the tunnel becomes flooded.</p> <p>Load lines and draught marks Explain where the deck line is marked; Definition of freeboard; What is meant by assigned summer freeboard; Ability to distinguished between ships of Type A and Type B for the purposes of computation of freeboard; Ability to draw to scale the load line mark and the load lines for a ship given summer moulded draught, displacement and tonnes per centimetre immersion in salt water; Ability to use the chart of zones and seasonal areas to determine the load lines which apply for a particular passage; Given the ship's hydrostatic data and the daily consumption of fuel and water, ability to determine the minimum departure freeboard and quantity to load, taking into account the zones, seasonal zones and areas through which the ship will pass; Ability to calculate the maximum quantity to load, taking account of loading, discharging and bunkering at an intermediate port or ports, so as to comply throughout with the load line regulations; Demonstrate how to read draughts; List of items in the conditions of assignment of freeboard; Why the height of sill of openings varies between different type of vessels based on Load Line Rules.</p>

5.12 Ship Construction and Stability – Level 5 (Examination Code: SCS 5)

- 1) The examination consists of simple drawing and descriptive questions and practical calculations based on the vessel's stability data booklets.
- 2) The following open-book resources will be allowed in the examination room:
 - a) Part 1 of the International Convention on Load Lines, 1966 of the Load Line Convention, consolidated 2005;
 - b) International Load Line Zones - World Map;
 - c) International Convention for the Safety of Life at Sea, 1974 (SOLAS), as amended;
 - d) MV Gypsum Centennial, Ship Stability Booklet-Book 1 of 2;and
 - e) MV Atlantic Vision, Ship Stability Booklet.
- 3) The examination is of three hours duration.
- 4) The examination is based upon:

Subject	Knowledge required
Competence:	Control trim, stability and stress
<p>Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability</p>	<p>Shipbuilding Materials Different types of steel; What is meant by: tensile strength, ductility, hardness, toughness; Strain as extension divided by original length; Ability to sketch a stress-strain curve for mild steel; Ability to explain yield point, ultimate tensile stress and modulus of elasticity; Brittle fracture; Stress fracture; Examples where castings or forgings are used in ship construction; Advantages of the use of aluminum alloys in the construction of superstructures; How strength is preserved in aluminum superstructures in the event of fire; Special precautions against corrosion that are needed where aluminum alloy is connected to steelwork.</p> <p>Welding The process of manual electric arc welding; The purpose of flux during welding; Description of the automatic welding processes, electro-slag, TIG and MIG; Description of butt, lap, fillet welds; The various preparations of a plate edge for welding; Ability to explain what is meant by a full-penetration fillet weld; Ability to explain what is meant by single pass, multi-pass and back run; Ability to explain how welding can give rise to distortion and describe measures which are taken to minimize it; The use of tack welding; Ability to describe weld faults: lack of fusion, no inter-run penetration, lack of reinforcement, lack of root penetration, slag inclusion, porosity, overlap and undercut; Gas cutting of metals; Electrode type and process of welding high tensile steels; Gas cutting of metals; Testing of welds: a) visual; b) radiographic; c) ultrasonic; d) magnetic particle and e) dye penetrant.</p> <p>Bulkheads The use of transverse bulkheads; Differences between watertight, non-watertight and oil-tight or tank bulkheads; Definitions of margin line, bulkhead deck and weather tight; Collision bulkhead; After peak bulkhead; Bulkhead at each end of the machinery space; Additional bulkheads; Construction of a watertight bulkhead and its attachments to sides, deck and tank top; How water tightness is maintained where bulkheads are pierced by longitudinal, beams or pipes; The rules regarding penetrations of the collision bulkhead; How bulkheads are tested for tightness; Examples of non-watertight bulkheads; The purpose of washing bulkheads in cargo tanks or deep tanks; Importance of subdivision: transverse bulkhead and longitudinal bulkhead; Cofferdam, Flat plate and Corrugated bulkhead construction; The use of cross ties in tanker construction.</p>

Subject	Knowledge required
Competence:	Control trim, stability and stress
<p>Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability</p>	<p>Watertight and Weather tight doors Openings in watertight bulkheads; Number of openings in watertight bulkheads of passenger ships; Watertight doors: Class 1 – hinged doors, class 2 – hand-opened sliding doors, class 3 – sliding doors which are power-operated as well as hand opened; All types of watertight doors should be capable of being closed with the ship listed to 15 degrees either way; Ability to describe with sketches the arrangement of a power-operated sliding watertight door; Ability to describe with sketches a hinged watertight door, showing the means of securing it; Characteristic of a hinged watertight door; Frequency of the drills for the operating of watertight doors.</p> <p><u>Cargo vessels:</u> Ability to distinguish between ships of Type “A” and Type “B” for the purpose of computation of freeboard; What is considered a “one-compartment ship”; Requirements for survivability of Type “B” ships with reduced freeboard assigned.</p> <p><u>All ships</u> Openings in watertight bulkheads; Requirements for watertight openings to be closed at sea; procedures for ensuring that all watertight doors are closed; Frequency of operation of all watertight doors in main transverse bulkheads, in use at sea; Frequency of inspection of watertight doors and their mechanisms and indicators, all valves the closing of which is necessary to make a compartment watertight and all valves for damage-control cross-connections; Records of drills and inspections.</p> <p>Corrosion and its prevention What is meant by corrosion; What is meant by erosion of metals; Ability to describe the formation of a corrosion cell and to define anode, cathode and electrolyte; The galvanic series of metals in seawater; Given the galvanic series which of two metals will form the anode in a corrosion cell; Ability to explain the differences in surface condition or in stress concentration can give rise to corrosion cells between two areas of the same metal; By what corrosion can be controlled; Ability to explain that cathodic protection can only be used to protect the underwater hull or ballasted tank; Ability to explain what mill scale is; Ability to describe the treatment of steel in a shipyard and the use of holding primers; List common paint vehicles as: drying oils, oleo-resins, alkyd resins, polymerizing chemicals and bitumen. What is the suitability of each various applications; The action of anti-fouling paint; The use of self-polishing anti-fouling paint and the proposed banning of Tributyltin; The ban on harmful types of antifouling paint; Ability to describe typical paint schemes for: underwater areas, boot topping, topsides, weather decks, superstructures and tank interiors; The safety precautions when using paint; Ability to describe the system of cathodic protection using sacrificial anodes; The metals and alloys which may be used as anodes; Why anodes of magnesium and of magnesium alloy are not permitted in cargo/ballast tanks and in adjacent tanks in tankers; Why the anodes are insulated from the hull; Ability to describe the impressed-current system of hull protection; Ability to explain as the underwater paintwork deteriorates, higher currents are required for protection; What is the result of a too high current.</p>

Subject	Knowledge required
Competence:	Control trim, stability and stress
<p>Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability</p>	<p>Surveys and Dry-docking The frequency of classification society surveys; Possibility of extending the intervals between dry-dockings; Hull survey; Special surveys; Harmonized system of ship survey and certification; Condition Assessment Scheme (CAS) for oil tankers and Condition Assessment programme (CAP); Ability to list the items inspected at annual survey; Ability to list the items to examine in dry-dock; Ability to describe the examinations to be made of the items listed above; Ability to describe the cleaning, preparation and painting of the hull in dry-dock; Ability to calculate paint quantities.</p> <p>Inclining Experiment Purpose of the experiment; practical details of the procedure and resulting calculations; precautions to be observed to ensure a reliable and accurate result.</p> <p>Stability Approximate Calculation of areas and volumes; Effects of density; Stability at moderate and large angles of heel: Simplified Stability Data: Trim and List; Dynamical Stability; Definition and understanding of the relationship between dynamical and static stability; the development of Moseley's formula for dynamical stability and calculations of dynamical stability at a specified angle of inclination by using the stability curve; Approximate GM by means of rolling period tests; The Intact Stability Code; Intact stability requirements for the Carriage of grain; Rolling of ships; Dry-docking and grounding; Shear Force, bending moments and torsional stress.</p> <p>Effect of Beam and Freeboard on Stability Effect of increase or decrease of beam, considered in isolation, on initial value, maximum value, range and shape of the stability curve; effect of increase or decrease of freeboard, considered in isolation, on initial value, maximum value, range and shape of stability curve; effect of beam, block coefficient and speed on squat.</p> <p>Pressure in Liquids Calculation of total pressure on an immersed plane surface of a regular geometric form that is oriented parallel to, vertical to, or at an angle to the surface of the liquid; and the development of the formula locating the centre of pressure of the surface, with related calculations.</p>

Subject	Knowledge required
Competence:	Control trim, stability and stress
<p>Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and countermeasures to be taken</p>	<p>Effect of flooding on transverse stability and trim</p> <p><i>Passenger vessel</i> What is meant by “floodable length”; Definition of margin line, bulkhead deck and permeability of a space; What is meant by “permissible length of compartments” in passenger ships; Significance of the Criterion of Service Numeral; The significance of the factor of subdivision; With reference to the factor of subdivision, the extent damage which a passenger ship should withstand; The provisions for dealing with asymmetrical flooding; The minimum residual stability requirements in the damaged condition with the required number of compartments flooded; The use of the damaged stability information required to be provided to the master of a passenger vessel.</p> <p><i>Cargo ships</i> The extent of damage that a Type A ship over 150 m in length should be able to withstand; The equilibrium conditions regarded as satisfactory after flooding; Damage to compartments may cause a ship to sink as a result of what.</p> <p>Calculation of vessel condition after flooding Calculate the permeability of cargo, given its density and its stowage factor; Calculate the increase in mean draught of a ship, given the TPC and the dimensions of the flooded space, using:</p> <p><i>Increase in draught = volume of lost buoyancy/Area of intact waterplane</i> To explain why the BM of a ship is generally less when bilged than when intact, Use the formula $BM = I/V$.</p> <p>Explain why the GM usually decreases where:</p> <ol style="list-style-type: none"> 1. there is a large loss of intact waterplane; 2. there is intact buoyancy below the flooded space; 3. the flooded surface has a high permeability. <p>Explain why the bilging of empty double bottom tanks or of deep tanks that are wholly below the waterline leads to an increase in GM.</p>

Subject	Knowledge required
Competence:	Control trim, stability and stress
<p>Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and countermeasures to be taken</p>	<p>Calculation of vessel condition after flooding (cont'd) Calculate the reduction in BM resulting from lost area of the waterplane, given the following corrections:</p> <p>a) second moment of lost area about its centroid/displaced volume; for a rectangular surface $LB^3/12V$</p> <p>where:</p> <p>L is length of the lost area b is breath of the lost area V is displaced volume = displacement/density of water</p> <p>b) $(\text{original waterplane area/intact waterplane area}) \times \text{lost area} \times (\text{distance from centerline})^2/\text{displaced volume}$</p> <p>this is: $(\text{original waterplane area/intact waterplane area}) \times Lbd^2/V$</p> <p>c) for a rectangular surface, where d is the distance of the centre of the area from the centerline</p> <p>Calculate the shift (F) of the centre of flotation (CF) from the centerline, using: $F = (a \times d/A - a)$</p> <p>where: a is the lost area of waterplane A is the original waterplane area d is the distance of the centre of lost area of waterplane from the centerline.</p> <p>Show that the heeling arm is given by:</p> <p><i>heeling arm = (lost buoyancy (tonnes)/displacement) X transverse distance from new CF</i></p> <p>Construct a GZ curve for the estimated GM and superimposes the heeling arm curve to determine the approximate angle of heel; Use wall sided formula to determine GZ values; Use Wall Sided formula to calculate angle of heel; Explain how lost area of waterplane affects the position of the centre of flotation.</p>

Subject	Knowledge required
Competence:	Control trim, stability and stress
<p>Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and countermeasures to be taken</p>	<p>Effect of flooding on trim Calculate the movement of the centre of flotation (CF) given: <i>Movement of CF = moment of lost area about original CF/intact waterplane area</i></p> <p>Explain how the deduction in intact waterplane reduces the MCT 1 cm; Calculate the reduction of BML, given the following corrections: a) second moment of lost area about its centroid/displaced volume; where: L is length of lost area B is breadth of lost area V is displaced volume = displacement density of water</p> <p>This is $bL^3/12V$ for a rectangular surface</p> <p>b) $(\text{original waterplane area/intact waterplane area}) \times \text{lost area} \times ((\text{distance from CF})^2/\text{displaced volume})$</p> <p>this is $(\text{original waterplane area/intact waterplane area}) \times bld^2/v$</p> <p>c) for a rectangular surface, where d is the distance of the center of area from the original centre of flotation.</p> <p>Calculate the reduction of MCT 1 cm, given, reduction of MCT 1 cm = $(\text{displacement} \times \text{reduction of GM}/100 \times \text{ship's length})$.</p> <p>Given the dimensions of a bilged space and the ship's hydrostatic data, calculate the draughts in the damaged conditions; describe measure which may be taken to improve the stability or trim of a damaged ship.</p> <p>Theories affecting Trim and stability</p> <p>The static and dynamic effects on stability of liquids with a free surface; Ability to identify free surface moments and show its application to dead-weight moment curves; Ability to interpret changes in stability which take place during a voyage; Effect on stability of ice formation on super structure; The effect of water absorption by deck cargo and retention of water on deck; Stability requirements for dry docking.</p> <p>Understanding of angle of loll; Precautions to be observed in correction of angle of loll; The dangers to a vessel at an angle of loll; Effects of wind and waves on ships stability; Virtual gravity and virtual upright and their relationship to true gravity and upright; The main factors which affect the rolling period of a vessel; Synchronous and parametric rolling and the dangers associated with it; The actions that can be taken to stop synchronous and parametric effects.</p>
<p>Knowledge of IMO recommendations concerning ship stability</p>	<p>Responsibilities under the International Conventions and Codes Minimum stability requirements required by Load Line Rules 1966; The minimum stability requirements and recommendations of the <i>Intact Stability Code</i>; Correct use of IMO Grain Regulations; How grain heeling moment information is used; The requirements for passenger ship stability after damage.</p>

Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
Stability and trim diagrams and stress calculating equipment	<p>Shear forces, bending moments and torsional moments The use of typical cargo loading instruments and the information obtainable from them; Ability to interpret the information regarding stress limits provided to the ship; Maximum permissible values of shear force and bending moment in harbour and at sea; Maximum torsional moments; Ability to plan the loading and discharge of ship to ensure that maximum allowable stress limits are not exceeded.</p> <p>Compliance with the minimum freeboard requirements of the Load Line Regulations Ability to use the chart of zones and seasonal areas to determine the load lines which apply for all stages of a particular passage; Ability to plan the loading, discharge, and consumption of deadweights items to determine the minimum departure freeboards and maximum quantities to load in one or more loading ports to ensure that the vessel is not overloaded at any stage of a voyage through multiple loading zones and seasonal zones.</p> <p>Use of Automatic Data Based (ADB) equipment Provide an understanding of information obtained from ship stress indicators and loading programmes; Use of stress indicators and loading programmes in planning for the safe carriage of dry and liquid cargoes; Advantages and limitations of analogue and digital stability and loading programmes.</p>
Effect of trim and stability of cargoes and cargo operations	<p>Draught, Trim and Stability Given the draughts forward, aft and amidships, ability to calculate the draught to use with the deadweight scale, making allowance for trim, deflection and density of the water; Given a ship's hydrostatic data, the weight and the intended disposition of cargo, stores, fuel and water, ability to calculate the draughts, allowing for trim, deflection and water density; Ability to calculate the changes of draught resulting from change in distribution of masses; Ability to calculate changes of draughts resulting from change in water density; Ability to calculate the quantity of cargo to move between locations to produce a required trim or maximum draught after loading; Ability to calculate how to divide a given mass between two given locations to produce a required trim or maximum draught after loading; Ability to calculate the locations at which to load a given mass so as to leave the after draught unchanged; Given a ship's hydrostatic data and the disposition of cargo, fuel and water, ability to calculate the metacentric height(GM); Ability to calculate the arrival GM from the conditions at departure and the consumption of fuel and water; Ability to identify when the ship will have the worst stability conditions during the passage; Ability to calculate the maximum weight which can be loaded at a given height above the keel to ensure a given minimum GM; Ability to construct a GZ curve for a given displacement and KG and check that the ship meet the minimum intact stability requirements; Ability to determine the list resulting from a change in distribution of masses; Ability to determine the expected maximum heel during the loading or discharging of a heavy lift with the ship's gear; Ability to calculate the increased draught resulting from the heel; Ability to plan the loading and movement of cargo and other deadweight items to achieve specified draughts and/or stability conditions in terms of required statical and dynamic stability.</p>

Subject	Knowledge required
Competence:	Assess reported defects and damage to cargo spaces, hatch covers and ballast tanks and take appropriate action
Limitation on strength of the vital constructional parts of a standard bulk carrier and interpret given figures for bending moments and shear forces	<p>Hull girder stress; Causes of the longitudinal bending; Ship's torsional strength; Upper deck plating; Transverse bulkheads; Types of cracking in the upper deck; High cyclical stress; Damage to hatch covers; Causes of corrosion; Visual inspection; Cargo hold inspection; The common damage/defects that may occur on watertight transverse bulkheads situated at the ends of dry cargo holds of a bulk carrier; Fractures that may occur in the deck plating at hatches and in connected comings; Causes of cracking in way of no. 1 cargo hold;</p> <p>The damages caused by cargoes in cargo holds, especially to tanktop plating and side:</p> <ul style="list-style-type: none"> - at loading and unloading ports for coal or iron ore, large grab buckets, high-capacity cargo; - loaders, bulldozers and pneumatic hammers may be employed for cargo-handling operations; - large grab buckets may cause considerable damage to tank top plating when being dropped to grab cargo; - use of bulldozers and pneumatic hammers may also be harmful to cargo hold structures and may result in damage to tank tops, bilge hoppers, hold frames and end brackets; - lumber cargoes may also cause damage to the cargo hold structures of smaller bulkers that are employed in the carriage of light bulk cargoes and lumbers. <p>Cracking on large bulk carriers; Ballast tanks. Ability to interpret given figures for bending moments and shear forces.</p>
Methods to avoid the detrimental effects on bulk carriers of corrosion, fatigue and inadequate cargo handling	<p>Principal factor in the loss of many bulk carriers; Corrosive effects of cargoes; Causes of improper cleaning during hold cleaning; Causes of corrosion due to ballast exchange; Prevention of corrosion; Vulnerable aspects of a bulk carrier operation; Damages to bow plating; Causes of hatch cover dislodgment; Metal fatigue; What can weaken the vessel's structural capacity; Areas that are prone to fatigue cracks in the cargo holds; Causes of carriage of high density cargoes; Damages to side shell.</p>
Stability on sailing vessels	<p>a) Stability under sails</p> <p>b) Effect of wind and sail</p> <p>c) Center of effort, Centre of lateral resistance, Bernoulli's Principle, Venturi Effect, sail balance, sail shape and trim, lee helm, weather helm.</p> <p>d) Aerodynamic</p> <p>e) Compliance with the stability criteria indicated in the sailing vessel stability booklet against capsizing</p> <p>f) Sail setting as per prevailing conditions, amount of sail carried with regard to wind conditions, special care with a strong stern wind, in the event of the vessel broaching or a gust on the beam.</p>

5.13 Cargo – Level 3 (Examination Code: CG 3)

- 1) The examination consists of a written test comprising descriptive and calculation questions.

- 2) The following open-book resources will be allowed in the examination room:
- a) BCH Code - Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk;
 - b) BLU Code - Code of Practice for the Safe Loading and Unloading of Bulk Carriers, including BLU Manual;
 - c) Canada Shipping Act, 2001;
 - d) Cargo, Fumigation and Tackle Regulations;
 - e) Code of Safe Practice for Cargo Stowage and Securing;
 - f) Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 199, IMO Resolution A.715(17);
 - g) MV CRANE ISLAND-Grain-Loading-Plan-Stability-Booklet 1;
 - h) MV GYPSUM CENTENNIAL -Ship Stability Booklet- Grain;
 - i) IBC Code – International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk;
 - j) IGC Code – International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk;
 - k) IMDG Code – International Maritime Dangerous Goods Code, Volumes 1 & 2 and Supplement;
 - l) IMSBC Code – International Maritime Solid Bulk Cargoes Code and supplement;
 - m) International Code for the Safe Carriage of Grain in Bulk;
 - n) International Convention for the Safety of Life at Sea, 1974 (SOLAS), as amended;
 - o) International Convention on Load Lines, 1966, as amended;
 - p) International Convention for the Prevention of Pollution from ships, 1973, as modified by the 1978 and 1997 Protocols(MARPOL);
 - q) Load Line Regulations;
 - r) TP 215 – Instructions to Masters of vessels loading grain in Canada;
 - s) TP 2534 -Canadian Code of Safe Practice for ships carrying timber deck cargoes;
 - t) Transportation of Dangerous Goods Act;
 - u) Transportation of Dangerous Goods Regulations;
 - v) Vessel Pollution and Dangerous Chemicals Regulations; and
 - w) World Chart of Seasonal Zones, for Load Line Convention.
2. The examination is of three hours duration.
3. The examination is based upon:

Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
Knowledge of and ability to apply relevant international regulations, codes and standards concerning the safe handling, stowage, securing and transport of cargoes	<p>Plans and Actions Conform with International Regulations</p> <p>Ability to plan loading to comply with <i>Load Line Convention</i> in term of:</p> <ul style="list-style-type: none"> a) freeboard; b) seasonal restrictions; c) zones; d) statical and dynamic stability requirements; e) bunker requirements, and consider; f) expected weather patterns. <p>Ability to plan loading to comply with the IMO <i>Intact Stability Code</i>; Ability to plan cargo stowage and carriage in compliance with the <i>Code of Safe Practice for cargo stowage and securing</i>; Knowledge of content and application of the <i>Cargo Securing Manual</i>; Ability to use data from the cargo securing manual to plan a range of cargo types.</p>

Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
Knowledge of loading cargoes and ballasting in order to keep hull stress within acceptable limits	<p>Knowledge of loading cargoes and ballasting in order to keep hull stress within acceptable limits</p> <p>The importance of devising a cargo stowage plan and loading / unloading plan; The stages of development of a safe cargo loading or unloading plan; The reason to keep the hull stress levels below the permissible limits by the greatest possible margin; When making a plan for cargo operations, the officer in charge must consider the ballasting operation, to ensure what; The importance to know the exact pumping rates achieved on board their ship to ascertain and ensure the plan are devised and modified accordingly; Ability to plan loading/de-ballasting operations with acceptable stress parameters; Ability to plan discharging/ballasting operations with acceptable stress parameters.</p>
Stowage and securing of cargoes on board ships, including cargo-handling gear and securing and lashing equipment	<p>Timber deck cargoes</p> <p>Knowledge of the content of the <i>Code of Safe Practice for ships carrying timber deck cargoes</i> with respect to:</p> <ul style="list-style-type: none"> - stowage of sawn timber, logs, cants and wood pulp; - fitting of uprights; - lashings and the arrangements for tightening them, including the use of a wiggle wire. <p>The dangers of heavy seas breaking aboard and how to minimize that risk; The action to take if cargo is lost overboard or jettisoned; The maximum height of cargo permitted on deck in a seasonal winter zone in winter; The controlling factors for height of cargo at other times; The requirements for fencing, for provision of walk-ways and for access to the top of the cargo; Preparation, stowage and securing of vessel to load timber cargoes including logs, pit props, sawn lumber (loose or packaged) below deck, on deck and on deck of vessel having timber loadlines; The requirements when loading to timber load lines; The stability information that should be available to the master; When the worst stability conditions during a voyage are likely to occur; The rolling period test for the approximate determination of a ship's stability and the limitations of the method; The actions to be taken in the event of the ship developing an angle of loll; Ability to plan the loading and securing of a timber deck cargo; Understanding and application of the <i>Cargo, Fumigation and Tackle Regulations</i> and the <i>Canadian Code of Safe Practice for ships carrying timber deck cargoes</i> for the safe stowage, stability, securing and carriage of timber, height of cargo, protection of the crew, and safe practices; Lashings, their tests, markings and certifications; Water absorption and ice accretion.</p> <p>Refrigerated cargo</p> <p>Trading patterns and use of specialized refrigerated ships, general cargo ships fitted with refrigerated lockers; Refrigerated containers and other modes; Special carriage requirements of various refrigerated cargoes and separation of non-compatible cargoes; Preparation and inspection procedure of compartments, loading, carriage and discharging arrangements, stowage principles and safe carriage requirements; Special trade and commodity requirements, shipper's instructions and joint deck and engine department responsibilities for safe carriage; Need for maintenance of accurate records of compartment temperature at all times; Palletised and unitised refrigerated cargoes; Conditions for loading, stowage, carriage and discharging arrangements, malpractice in handling refrigerated cargoes; Care and preparation of refrigerated compartments after discharge; Types of refrigeration systems used and advantages and disadvantages of each.</p>

Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
<p>Stowage and securing of cargoes on board ships, including cargo-handling gear and securing and lashing equipment</p>	<p>Care of cargo during carriage Ability to plan the loading and stowage of a hold or holds using a cargo list and reference books to take into account of the carriage requirements of the various cargoes; The precautions to avoid crushing and chafing damage and which cargoes are most liable to be affected; How cargo may be damaged by residues of previous cargo, dirty dunnage or leaking fuel oil tanks; How cargo can be damaged by dust and the precautions to take when carrying commodities giving rise to dust; Which cargo are particularly liable to damage by ship or cargo sweat and how to minimize the risk of sweat damage; Any goods containing liquids are liable to leak, ability to describe the stowage required to prevent any leakage damaging other goods; Goods spoiled by extremes temperatures; When does overheating can occur; How to protect cargoes which must be kept from freezing; The measures to take to prevent pilferage of cargo during loading, discharging and carriage; The damage to cargo which can result from the use of fork-lift trucks and similar machinery in cargo spaces and methods of preventing it.</p> <p>Requirements applicable to cargo-handling gear Definitions of: competent person, responsible person, authorized person, lifting appliance and loose gear; The requirements for guarding dangerous parts of machinery; The Requirements for the marking of beams and portable hatch covers; The requirements for fencing of openings; The requirements for the testing of lifting appliances and loose gear before they are used for the first time; The requirements for periodic thorough examination and inspection of lifting appliances and loose gear; What is meant by thorough examination; The records and certificates which should be kept in respect of tests, thorough examinations and inspections of lifting appliances and loose gear; The marking of safe working loads required on lifting appliances and loose gear; Rigging plan.</p> <p>Maintenance of cargo gear Ability to prepare plans for the inspection of cargo gear; Ability to undertake inspections of cargo gear so that any safety issues associated with machinery, structure, running and standing rigging and associated equipment is identified and addressed before use; Ability to maintain the records and plans required for the cargo gear; Ability to develop maintenance plans and procedures for the maintenance of machinery, structure, running and standing rigging and associated equipment of cargo gear, including blocks, shackles, wire and fibre ropes; Ability to provide instruction to crew and ability to manage the maintenance of cargo gear; The requirements for the annealing of wrought iron loose gear; The precautions to be taken when working aloft for the overhaul of cargo gear.</p> <p>Maintenance of hatch covers Trackways; Adjustments of draw chains; Lubrication of wheels, gears, racks and pinions and other moving parts; Side cleats and cross joint wedge mechanisms; Hydraulic systems; Drainage channels and drainage holes; How to check that compression bars are making complete contact with sealing gaskets; How to check for weather tightness; Ability to prepare plans and procedures for the inspection and maintenance of hatch covers.</p>

Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
Loading and unloading operations, with special regard to the transport of cargoes identified in the Code of Safe Practice for Cargo Stowage and Securing	<p>Loading stowage and discharge of heavy weights Ability to describe the correct procedure for handling heavy weights and precautions to be taken; How a load should be spread over an area of deck or tank top by the use of dunnage to avoid heavy point loading between beams and floors; The use of shoring in a tween-deck to spread the load over a larger part of the ship's structure; Why double bottom tanks should be full or empty and the ship upright before starting to load or to discharge; The rigging of a heavy-lift derrick; Methods of securing heavy lifts in the hold or on deck.</p> <p>Care of cargo during carriage Ability to outline the content of the <i>Code of Safe Practice for Cargo Stowage and Securing</i>; How to stow and secure containers on deck on vessels which are not specially designed and fitted for the purpose of carrying containers; The stowage and securing of containers and other cargo units in ships other than cellular container ships; The contents of the cargo-securing manual and its use; The stowage and securing of road vehicles on ro-ro ships; Recommended methods for the safe stowage and securing of: portable tanks, portable receptacles, wheel-based (rolling) cargoes, Coiled sheet steel, heavy metal products, anchor chains, metal scrap in bulk, flexible intermediate bulk container and unit loads; Actions which may be taken in heavy weather to reduce stresses on securing arrangements induced by excessive accelerations; Actions, which may be taken once cargo, has shifted.</p> <p>Methods and safeguards when fumigating holds The reasons for the control of pests; The methods for the prevention of insect infestation; How contact insecticides in the form of sprays, smokes or lacquers may be used by the crew for dealing with local infestation; The information about the fumigation which should be supplied to the master; Precautions to be taken before, during and on completion of fumigation; The precautions to be taken if essential crew members are permitted to return before aeration of the ship; The precautions to be taken if entry to spaces under fumigation is imperative.</p> <p>Knowledge of the content of Part II – Fumigation of the <i>Cargo, Fumigation and Tackle Regulations</i>; Precautions to be taken for fumigation in transit; The training which the designated representatives should have; The items which the ship should carry; The procedures for the fumigation and the handling over of responsibility from the fumigator in charge to the master; The safety checks on gas concentration that should be made throughout the voyage, records in the log books; The procedures to follow prior to and on arrival at the discharging port; The precautions to be taken during the discharge of cargo until the ship is certified free of fumigants; The procedures for the carriage of fumigated freight containers, barges and transport units that are loaded after fumigation without ventilation; The methods which may be used for the control of rodents; The use of baits by the ship's crew and the precautions to observe; The use of pesticides is regulated by Governments, and their use may be limited by the regulations and requirements of: the country where the cargo is loaded or treated, the country of destination, the country of registration of the ship; The use of pesticides by the ship's crew and the precaution to observe; The measures to be taken if clothing becomes contaminated; The actions to be taken in the event of exposure to insecticides resulting in illness.</p>

Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
General knowledge of tankers and tanker operations	<p>Terms and definitions Definition of petroleum; Saturated vapour-pressure; Vapour/temperature relationship; Boiling point, influence of pressure on boiling point temperature; Reid vapour pressure ; Why the pressure in a tank is not necessarily the same as the Reid Vapour Pressure of the oil it contains, even at the standard temperature; Flashpoint; Why flashpoint cannot be used as an absolute measure safety; Definition of flammable; Flammable range, upper and lower flammable limit; Definition of auto-ignition temperature; Relationship between flash point, and lower flammable limit; Viscosity of a fluid; Definition of pour point; Ability to calculate the volume of dry residue as a uniform layer on the tank bottom; Ability to calculate the volume of liquid residues as a wedge on the tank bottom; Know the limitation of application of wedge calculation.</p> <p>Contents and application of the International Safety Guide for Oil tankers and Terminals (ISGOTT) Contents of ISGOTT; Terminal, local and national application; The general precautions to be taken on tankers regarding:</p> <ul style="list-style-type: none"> - smoking, matches and cigarette lighters; - Naked lights; - The galley; - Electrical equipment; - Use of tools; - Entry to enclosed spaces and pump-rooms. <p>The information which should be exchanged between the ship and the terminal before arrival; Safety procedures between the tanker and the terminal; Firefighting equipment required; Safety measures against pollution and actions to take in case of an accident are agreed before transfer or cargo commences; The use of inert gas plant; The hold and tank arrangements of combination carriers; The safety aspects relating to the operation of double hull tankers; Change over from oil to dry bulk cargo and from dry bulk cargo to oil; Procedures of disposal with the oil residues in the slop tank; What is load-on-top procedures; Ship's oil record book; Definition of gas-freeing; Why inert gas is used to purge the tanks of hydrocarbon vapors before introducing air on suitably equipped ships; What checks are made during gas-freeing; Precautions to take when person working in tanks; Cargo calculation; Density of oil versus temperature; Petroleum Measurements Tables for Crude Oils, products and Lubricating oils; Difference between mass and weight.</p> <p>Oil tanker operations and related pollution-prevention regulations Definition of "segregated ballast", "clean ballast", "dirty ballast", "slop tank"; Ability to describe an inert gas system and ability to sketch the distribution of inert gas to tanks; Reasons for ballasting; weather conditions/additional ballast; Why a ship may have only clean or segregated ballast on board upon arrival at a loading port; Criteria for the discharge of oil from cargo-tanks areas of oil tankers; Procedures for changing ballast at sea; How to dispose of dirty ballast; How to decant the water contents of the slop tank;</p>

Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
General knowledge of tankers and tanker operations	<p>Oil tanker operations and related pollution-prevention regulations (cont`d...) How to proceed for the final flushing of cargo pumps and lines to be used for discharge of clean ballast; At which distance from shore the operation of discharging dirty ballast, decanting the slop tanks and flushing lines can be done; the reasons for tank cleaning; Ability to describe the use of fixed and portable machines for tank cleaning; Ability to describe the use of slop tanks during tank cleaning; Describe crude oil washing and the reasons for requiring it in crude oil tankers of 20000dwt and above.</p> <p>Chemical tankers Definition of a chemical tanker; What is dedicated service; What is a chemical tanker engaged in parcel trade; The most important of the rules governing chemical tankers; IMO Conventions covering the carriage of chemicals in bulk; The most important Codes and Standards covering the transport of liquid chemicals; Reasons for the Liquid products listed in Chapter 17 of the IBC Code; What may be a safety hazards; Personnel safety equipment, clothing and personal protection during loading and discharging operations; Cargoes requiring respiratory and eye-protection equipment; Equipment for evaluation of atmosphere in tanks; How to use an absorption tube gas detector for measuring the concentration of a gas; What is meant by “the threshold limit value (TLV) of a product” and “the odour threshold); The importance of information about cargoes to be handled; Where to found the information for products; What information is necessary for the safe carriage of a cargo; First Aid procedures, including the use of specific antidotes for poisons; With the aid of a simple drawing, ability to explain how cargo is routed from the manifold to tanks on a chemical tanker with separate lines for each tank; With the aid of a simple drawing ability to explain a “closed circuit” loading operation using a vapour-return line; What measures are taken during loading for the purposes of quality control; Visual and audible high level alarms and tank overflow control system; Before discharging, procedures taken to verify if the product has been contaminated on board during passage; With the aid of a drawing, ability to explain how cargo is routed from tank to the manifold on a tanker with deepwell pumps and separate lines from each tank.</p> <p>Tank cleaning and control of pollution in chemical tankers Different tank-cleaning procedures; Phases in a tank-cleaning operation; The use of slop tanks to hold cargo residues and tank washings; With the aid of a simple drawing, ability to explain the cycle of a tank-washing system from the seawater inlet to the slop tank; Content of Annex II of the MARPOL 73/78 Convention; The new four category pollution category system for noxious liquid substances (X,Y,Z and OD); Certificate of fitness; Procedures and Arrangements Manual ; Pollution-prevention procedures during cargo transfer; Entries to be made in the Cargo Record Book.</p>

Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
General knowledge of tankers and tanker operations	<p>Gas tankers Definition of liquefied gas; Liquefied gas products transported by gas tankers are listed in Chapter 19 of the IGC Code; Four groups of gas cargoes; What is LNG; What is LPG; Which surveys are required for the issue of an International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk; Content of certificate of fitness;</p> <p>Definition of the following terms used in the IGC Code:</p> <ul style="list-style-type: none"> a) boiling point; b) cargo area; c) cargo containment system; d) gas carrier; e) gas-dangerous space or zone; f) gas-safe space; g) hold space; h) interbarrier space; i) MAR VS; j) primary barrier; k) secondary barrier tank dome. <p>Four types of ships in IGC; What is the difference between these four types of ships; What is the division into ship types is based on; Ability to describe “integral tank”, “membrane tank”, “semi-membrane tank”, “independant tank”, and “internally insulated tank”;</p> <p>Ability to explain the division of independant tanks into:</p> <ul style="list-style-type: none"> a) Type A, generally a self-supporting prismatic tank; b) Type B, generally a self-supporting spherical tank; c) Type C, generally a self-supporting cylindrical pressure tank. <p>Location of shut off valves; Operation of the emergency shutdown valves (ESD); Pressure relief system; Type of cargo pumps; The uses of cargo heaters and vaporizers; The effect of transfer of heat to the cargo on cargo temperature and tank pressure; How is controlled the cargo in pressure tanks; Ability to describe the single-stage direct liquefaction cycle; The uses of inert gas; How is measured the liquid level in cargo tanks; How to prevent overflow; How cargo leakage through the primary barrier can be detected; Ability to describe briefly the arrangements for fire fighting on deck in the cargo area and describe the water-spray system for ships carrying flammable or toxic products.</p>
Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes

<p>General knowledge of tankers and tanker operations</p>	<p>Cargo Operations in Gas Tankers</p> <p>Where the information for each product can be found; Information needed before loading; Personnel safety equipment, clothing and personal protection; Communication between the ship and the terminal;</p> <p>Ability to describe briefly the following cargo operations:</p> <ul style="list-style-type: none">a) drying;b) inerting;c) purging;d) cooling down;e) loading;f) cargo conditioning on passage;g) discharging;h) changing cargoes;i) gas-freeing; andj) preparing for tank inspection. <p>Gas cargoes subject to the Regulations of ANNEX II of MARPOL 73/78; International Pollution Prevention Certificate for the carriage of noxious liquid substances in bulk (NLS certificate); Procedures and Arrangements Manual; Ability to calculate the vapour mass.</p>
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Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
Knowledge of the operational and design limitations of bulk carriers	<p>Operational and design limitations of bulk carriers</p> <p>The problems that are generally considered to be associated with bulk carriers includes, but is not limited to:</p> <ul style="list-style-type: none"> - high density cargoes, leading to loss of buoyancy or structural failure, if holds are flooded in the loaded condition; - high loading rate, leading to possible loss of control of load condition; with consequent high stresses; - vulnerability to internal damage during cargo loading and discharging operations, leading to protective coating damage, accelerated corrosion, and local structural failure; - low freeboard, leading to high green sea loads on deck structures; - vulnerability to flooding of forward holds; - rapid corrosion caused by corrosive cargo. <p>The minor damage to single sided ship structures or hatch covers can lead to hold flooding; Nature of bulk cargoes can give rise to a number of problems; Ability to explain that cargoes such as coal produces gas and acidic conditions, high density cargoes produce large void spaces, and other cargoes can produce stability problems due to shifting or liquefaction; The effect of a single hold flooding on a bulk carrier; Corrosive effects of some cargoes; Danger aspects of hold cleaning, ballasting at sea and ballast exchange carried out at sea; Result of improper cleaning; Why at shallow drafts ships in ballast are vulnerable to slamming with the consequent risk of bottom damage; Why loading operation of a bulk carrier has been identified as an area of operations that can have immediate and long term effects on the structural integrity of the ship; Causes of high local stresses; The importance of good coordination at the time of discharge and ballasting of the ship; The reason why maintenance and inspection play an important part in the safety of bulk carriers; Static stresses in the hull structure; Why there is an urgent need for action if a ship takes on an unusual trim or heel, or if her motions become changed; The vulnerability of the bulkhead in bulk carriers between number 1 and 2 holds identified by IACS and IMO and the potential consequences of this failing.</p>

Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
Knowledge of the operational and design limitations of bulk carriers	<p>SOLAS Chapter XII Additional Safety Measures for Bulk Carriers Knowledge of the regulations provided as additional safety measures for bulk carriers in Chapter XII of the SOLAS convention which apply to bulk carriers of 150 m in length and upwards, carrying high density dry bulk cargoes, including:</p> <ul style="list-style-type: none"> - Damage stability and flotation; - Structure of bulkheads and double bottoms; - Overall longitudinal strength in the flooded state; - Strength and flooding requirements for carrying cargoes with densities of 1000kg/m³ or greater; - The bulkhead strength requirements for carrying cargoes of 1780kg/m³ or greater; - Hold loading; - Cargo density declarations; - Provision of a loading instrument; hold, ballast and dry space water ingress alarms; - Availability of pumping systems; - Restrictions from sailing with any hold empty. <p>The imposition of restrictions on loading higher density cargoes and homogenous loading in adjacent holds, including the endorsement of loading information and marking of the ship; Surveys required for bulk carriers over ten years old for the carrying high density bulk cargo.</p> <p>CSR Bulk What is IACS Common Structural Rules; The content of IACS Common Structural Rules; The reasons for implementing these rules; The critical areas of weakness identified in bulk carrier and tanker structure and the requirements for enhanced inspection identified in these rules.</p>

Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
Loading, care and unloading of bulk cargoes	<p>Application of all available shipboard data related to loading, care and unloading of bulk cargoes Relevant information to be appraised prior planning of loading a bulk cargo; outlines the relevant publications, IMO codes and recommendations that should be referred to prior loading a bulk cargo:</p> <ul style="list-style-type: none"> - SOLAS regulation VI/7 and the related <i>Code of practice for the safe loading and unloading of bulk carriers</i> (BLU Code); - <i>International Maritime Solid Bulk Cargoes</i> (IMSBC); - <i>International Code for the Safe Carriage of Grain in Bulk</i>; - <i>Code of Safe Practice for Cargo Stowage and Securing</i>. <p>The procedure for loading a bulk cargo in detail; Ability to prepare cargo stowage plans after carefully considering and assessing information such as seasonal load line zones, port restrictions, shipboard limits, e.g. draft, cargo capacity, stability, stresses and loading rates; The information that the shipper should declare prior to loading bulk cargo; The content of the loading manual; Loading rate, the de-ballasting capacity of the vessel; applicable strength and draught limitations; Ability to plan the loading, care and unloading of bulk cargoes using the ship's approved loading manual and the typical information provided; The action that should be taken if the Master does not believe they have been provided with the required or correct information relating to the cargo to be loaded; The requirements for the carriage of loading instruments; The typical information that can be obtained from a loading instrument; the certification, testing and use of a loading instrument; Ability to utilize a typical loading instrument to plan and monitor bulk carrier loading, ballast exchange and discharge operations.</p> <p>Code of practice for the safe loading and unloading of bulk carriers (BLU code) The contents of the <i>Code of Practice for the Safe Loading and Unloading of Bulk Carriers</i> (BLU code) in relation to:</p> <ul style="list-style-type: none"> - planning the sequence of operation; - communications and coordination between ship and terminal; - allocation of ships to appropriate terminals; - condition of ships and terminal equipment; - training of ship and terminal personnel; - requirement to be familiar with and comply with local regulations; - use of safety checklists; - responsibility of the Master; - additional considerations in relation to dangerous cargoes; - the use of the BLU Manual by terminal staff ; - the impact of arrival and departure condition on manoeuvrability; - actions to minimize hull and local stress; - actions to take where acceptable hull and local stress levels may be exceeded.

Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
Safe cargo handling in accordance with the provisions of the relevant instruments	<p>Establish procedures for safe cargo handling in accordance with the provisions of the relevant instruments such as;</p> <ul style="list-style-type: none"> - IMDG Code - IMSBC Code - MARPOL 1973, as modified by the 1978 and 1997 Protocols -Annexes III and V <ul style="list-style-type: none"> - The procedures that should be followed for accepting solid bulk cargoes, packaged dangerous goods and marine pollutants for shipment in terms of: <ul style="list-style-type: none"> - the required documentation; - ensuring that the condition and labelling of the goods are fit for carriage; - ensuring that the vessel is able to safely stow the cargo in terms of vessel certification, the ability to achieve separation and segregation requirements and the availability of any particular safety equipment that might be required. <p>Ability to develop stowage plans for cargoes that contain multiple packaged dangerous goods and ensure that separation and segregation requirements of IMDG, IMSBC and MARPOL are achieved; Ability to prepare dangerous goods manifests and stowage plans in accordance with IMDG requirements;</p> <p>The preparations and precautions that should be taken prior to the handling of bulk cargoes, packaged dangerous goods and marine pollutants in terms of:</p> <ul style="list-style-type: none"> - preparation of space; - mooring of the ship; - Information exchange and communication with port and regulatory authorities; flag and light signals; - provision of emergency, fire and protective equipment. <p>The appropriate action to take in case of general and medical emergencies involving packaged dangerous goods using the EMS and MFAG guidance of the IMDG Code; The risks that might be created by undeclared dangerous goods or goods that are not packaged or separated/segregated in accordance with the IMDG Code; The loading and discharge of dangerous goods, bulk cargoes and marine pollutants may be subject to port and national regulations in loading and discharge ports in addition to the requirements of the IMO codes.</p> <p>Procedures in the safety management system for the reporting of incidents involving the loss, or likely loss of harmful substances; Location of goods as per MARPOL Annex III/4 (3); Special list of manifest compliant with section 5.4.3 of the IMDG Code as per MARPOL Annex III/4 (3); Marine pollutant and any other dangerous goods are stowed as required by Chapter 7.1, Section 7.1.4 of the IMDG Code in order to comply with MARPOL Annex III/5; Disposal of dry bulk cargo residues; Meaning of cargo-associated waste; Meaning of operational wastes; Garbage Management plan; Garbage Record Book; How cargo residues are created; How to control spillage of cargo during transfer operations; MARPOL Annex V.</p>

Subject	Knowledge required
Competence:	Plan and ensure safe loading stowage, securing, care during the voyage and unloading of cargoes
Effective communications between ship and terminal personnel	<p>Basic principles for establishing effective communications and improving working relationship between ship and terminal personnel</p> <p>The necessity for effective communication and working relationships between ship and terminal;</p> <p>The information that should be exchanged between the ship and terminal:</p> <ul style="list-style-type: none"> - prior to ship's arrival; - when arriving in a part loaded condition or with residues; - for combination carriers (OBO or O/O); - in relation to the readiness of holds to load cargo; - in ensuring that the plan and understanding of the operation is up to date and shared by both the ship and terminal; - ensuring that the cargo declaration as required by chapter VI of SOLAS 1974 is completed; - provisions for changing loading or unloading plans. <p>Loading plans should be kept by the ship and terminal for a period of six months.</p>
Competence:	Carriage of dangerous goods
International regulations, standards, codes and recommendations on the carriage of dangerous cargoes, including the the Code of Safe Practice for Solid Bulk Cargoes (BC Code) and the the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code)	<p>International Regulations and Codes</p> <p>Understand and ability to apply the content of International Regulations Standards, Codes and Recommendations on the carriage of dangerous cargoes, including the <i>International Maritime Dangerous Goods (IMDG) Code</i>, the <i>International Maritime Solid Bulk Cargoes (IMSBC) Code</i>, <i>International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code)</i>, <i>International Code for the construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code)</i>.</p>

Subject	Knowledge required
Competence:	Carriage of dangerous goods
<p>Carriage of dangerous, hazardous and harmful cargoes; precautions during loading and unloading and care during the voyage</p>	<p>Dangerous Goods in packages Knowledge of the requirements of SOLAS chapter VII on the carriage of dangerous goods; Knowledge of the content and application of the <i>International Maritime Dangerous Goods (IMDG) Code</i>; Knowledge of the content of the <i>Transportation of Dangerous Goods Act and Regulations</i>; Knowledge of the content of the <i>Cargo, Fumigation and Tackles Regulations</i> concerning the transportation of dangerous goods; The content of the shipper's declaration of dangerous goods; The marking and labelling required on packages or cargo units; Actions to take when documentation packaging, labelling or the condition of packages does not meet the requirements of the IMDG Code; Ability to describe the information given for individual substances; Knowledge of the content of the IMO Emergency procedures for ship's carrying dangerous goods (Ems), the IMO Medical first aid guide for use in accidents involving dangerous goods (MFGA) and the International Medical Guide for Ships (IMGS); The requirement for a dangerous goods manifest or stowage plan and the ability to describe how they should be prepared; Ability to plan loading, stowage and segregation in accordance with the IMDG Code The explosives which may be carried on passenger ships; The information given in an emergency schedule; Given a loading list of dangerous goods, ability to use the IMDG Code to plan a stow and segregation and extracts the relevant references to EmS and MFGA; Definitions of dangerous substances, port authority, regulatory authority, designated port officer, and responsible person as used in the Recommendations on the Safe Transport, Handling and Storage of Dangerous substances in port areas; The inspections which may be made by a port authority; Communications with the port authority; The requirements regarding mooring a ship carrying dangerous substances;</p> <p>The measures which should be taken by the responsible person in connection with:</p> <ol style="list-style-type: none"> a) the weather; b) lighting; c) protective clothing; and equipment; d) intoxicated persons; e) fire and other emergency procedures; f) reporting of incidents and safety precautions. <p>The handling precautions which should be observed regarding:</p> <ol style="list-style-type: none"> a) Avoidance of damage to packages; b) Access to handling areas; c) Lifting goods over dangerous goods stowed on deck; d) Escape of a dangerous substance from a package; e) Entry into enclosed spaces. <p>Special precautions for loading or unloading explosives.</p>

Subject	Knowledge required
Competence:	Carriage of dangerous goods
<p>Carriage of dangerous, hazardous and harmful cargoes; precautions during loading and unloading and care during the voyage</p>	<p>Solid Bulk Cargoes Knowledge of the content of the <i>International Maritime Solid Bulk Cargoes Code (IMSBC)</i>; The main hazards associated with the shipment of bulk solids; Information which should be supplied by the shipper to the master before loading; How to distribute a high density cargo between holds when detailed information is not available; Understanding and application of Division 2 of the <i>Cargo, Fumigation and Tackle Regulations</i> on solid bulk cargo other than grain cargo. Safety aspects of shipment conditions; Handling, safe stowage and carriage of bulk cargoes including ores, concentrates and materials as stated in <i>Code of safe practice for bulk cargoes</i>; Definitions, precautions, hazards, tests, specifications, contamination, corrosion; Hazards of improper weight distribution resulting in structural damage; Improper stability or reduction of stability during voyage; Angle of repose, moisture migration, saturated ores and spontaneous heating; General precautions relating to stability; Effects of high density bulk cargo; Hold Preparation, including bilges, pipes and service lines; Ventilation systems, dust intakes; Moisture content, transportable moisture limit, sampling conditions; Description of tests, certificates and questionnaire; Preparation of proposed loading plan; Stowage plan and loading sequence to be submitted to port warden for approval prior to loading; Clearance from Port Warden on completion of loading and before sailing. Precautions to take before, during and after loading of bulk cargo; Precautions to take to minimise the effect of dust on deck machinery, navigational aids and living quarters; The health hazards which may be associated with bulk materials; How to trim cargoes having an angle of repos; of less than or equal to 35 degrees and greater than 35 degrees; How to stow material which flows freely like grain; The IMSBC Code method for determining the approximate angle of repose on board ship; The types of cargo which may liquefy during carriage; Precautions to be taken to keep liquids out of holds where such cargoes are carried and the danger of using water to cool a shipment of these materials; The test for approximately determining the possibility of flow which may be carried out on board ship; IMSBC Code group of cargoes; The content and use of the BLU Code, BLU manual, MSC/Circ. 908 – Uniform Method of Measurement of the Density of Bulk Cargoes, MSC/Circ. 1146 – Lists of Solid Bulk Cargoes for which a Fixed Gas Fire-Extinguishing System may be exempted or for which a Fixed Gas Fire-Extinguishing System is ineffective, Res. A. 864(20) – Recommendations for entering Enclosed Spaces Aboard Ship, MSC.1/Circ. 1264 – Recommendations on the Safe use of Pesticides in Ships Applicable to the Fumigation of Cargo Holds, and BC.1/Circ.66 – Contact names and Addresses of the Offices of Designated National Competent Authorities Responsible for the Safe Carriage of Grain and Solid Bulk Cargoes; List of materials possessing chemical hazards; The uses of tables for segregation between incompatible bulk materials and between bulk materials and dangerous goods in packaged form; Ability to use the IMSBC Code to extract all necessary information for the safe carriage in bulk of a stated cargo.</p>

Subject	Knowledge required
Competence:	Carriage of dangerous goods
Carriage of dangerous, hazardous and harmful cargoes; precautions during loading and unloading and care during the voyage	<p>International Code for the Safe carriage of grain in bulk Understanding and application of Division 3 of the <i>Cargo, Fumigation and Tackle Regulations</i>, of Part C of Chapter VI of SOLAS 1974 (amended 2004) and of the <i>International Code for the safe carriage of grain in bulk</i> (International Grain Code) ; The Code requirements for minimum stability in terms of initial meta centric height, angle of heel due to assumed grain shift and residual dynamic stability; Preparation of vessel for Department of Agriculture authorization to commence loading; The method of verifying that the loading of a vessel supplied with a Document of Authorization meets stability requirements using volumetric heeling moments, cargo details and maximum deadweight heeling moments; The conditions which must be met before a ship without a document of authorization may load grain; Presentation to Port Warden; Ability to draw up a proposed loading plan and complete the stability calculation form for ocean and sheltered waters voyages for port warden’s approval prior to commencement of loading; The use of physical precautions to reduce cargo movement:</p> <ul style="list-style-type: none"> - The use and fitting of longitudinal divisions in both filled and partly filled compartments; - The use of Part C of the Code to determine the scantlings for uprights and shifting boards; - The construction of a saucer as an alternative to a longitudinal division in a hatchway; - The use of bagged grain or other suitable cargo stowed in the wings and ends of a compartment to reduce the heeling effects of a grain shift; - Methods of securing the free grain surface in partly filled compartment. <p>Given a ship’s data and details of consumption of fuel and of fresh water for an intended voyage, ability to prepare a stowage plan for a cargo of bulk grain and performs the calculations to check that the proposed stowage complies, at all stages of the voyage, with the stability criteria set out in Chapter VI of SOLAS 1974.</p>

5.14 Engineering Knowledge (Examination Code: EK 2)

- 1) The examination consists of a written test comprising descriptive questions.
- 2) The examination is of three hours duration.

3) The examination is based upon:

Subject	Knowledge required
Competence:	General knowledge of remote controls of Propulsion Plant and Engineering Systems and Services
Operating principles of marine power plants	<p>Diesel engines 2-stroke diesel cycle; 4-stroke diesel cycle; Advantages and disadvantages of a slow speed diesel engine; The cause of scavenge fires and how they are dealt with; Methods of supercharging; The fuel oil system from bunker tank to injection; The lubrication system; Engine cooling water system; The advantages and disadvantages of a medium speed diesel; The need for gearing with medium-speed diesels; The arrangement of clutch and gears; Preparing diesel engine for stand-by; The method of starting and reversing a diesel engine.</p> <p>Steam turbine systems Knowledge of impulse and reaction turbines; Requirements, precautions and procedures for warming through; Application for impulse and reaction turbines; Axial thrust, including how axial thrust is taken in reaction turbines; Material used for the major components of steam turbines; Purposes of nozzles used in steam turbines.</p> <p>Gas turbines Knowledge of principles of operation of a gas turbines; Materials used in the major components of a gas turbine; Marine-based applications of the gas turbines.</p> <p>Propeller and propeller shaft Knowledge of construction and arrangement of a water-lubricated and oil-lubricated type stern tube; Major components of transmission systems; Construction and working principles of a thrust block; Construction and working principles of a shaft bearing; Arrangement of intermediate shafts; Construction and fitting arrangement of a fixed propeller to the tail shaft; Working principles of a controllable pitch propeller. Knowledge of the method of checking the pitch of a propeller; How the propeller transfers shaft power into thrust; Relationship between pitch and power; Operation of a typical CPP system.</p> <p>Bridge control Knowledge of the sequence of operation of bridge control for the main engine, including control from bridge, machinery control room, engine control local and changeover controls; Imposed conditions and essentials for critical speed and reversing of main engines; Essentials elements of a control system with reference to proportional action, integral action, derivative action, and multiple-term controllers; Arrangements for a manual override; Indicators and alarms provided with bridge control; Arrangement and operations of lateral thrusters; Bridge control and indicators for lateral thrusters.</p>

Subject	Knowledge required
Competence:	General knowledge of remote controls of Propulsion Plant and Engineering Systems and Services
Ships' auxiliary machinery	<p>Boilers Ability to distinguish between water-tube and fire tube boilers; Describe auxiliary boilers; Describe a waste-heat boiler; Describe exhaust-gas heat exchangers; Describe steam to steam generators and explain where and why they are used; Describe a boiler fuel oil supply system; Describe the effect of dissolved salts in the feed water and how it is treated; What is meant by priming.</p> <p>Distillation and Fresh-water Systems Distillation system; Operation of a flash evaporator; Treatment of fresh water intended for drinking; Domestic water system.</p> <p>Pumps and pumping system Knowledge of the principles of operation and application of centrifugal, positive displacement, gear, screw and reciprocating-piston type pumps in the machinery space or pump room of a modern ship; Knowledge of bilge systems, ballast systems, cargo piping systems and oily water separators.</p> <p>Steering gear Ram-type hydraulic steering gear; Rotary-vane steering gear; How hydraulic power is provided by variable-delivery pumps; IMO requirements for auxiliary steering gear and how they are met by ram-type and rotary-vane steering gear; Telemotor control system; Electric steering control; How the change from remote to local control in the steering gear compartment is made; The requirement for power supplies to electric and electrohydraulic steering gear; The requirements for emergency control of the steering gear; IMO requirements for testing steering gear and for drills.</p> <p>Generators, Alternators and Electrical distribution Operation of a D.C. generator; Functioning of shunt- and compound-wound D.C. motors; Operation of an alternator; Functioning of induction motors; The relative advantages and disadvantages of generation and distribution of D.C. and A.C.; D.C. and A.C. distribution systems; The use of circuit breakers and fuses; Ability to draw and describe a navigation light circuit with indicators and alarm, showing an alternative power supply; The use of rectifiers; The characteristics of lead-acid batteries and of alkaline batteries; The maintenance of batteries; Safety precautions; The safety precautions to be observed for battery compartments – outlining the starting requirements for emergency generating sets; The starting requirements for emergency generating sets; The services to be supplied from the emergency generator; The supplementary emergency lighting for ro-ro passenger ships; Knowledge of Uninterruptable Power Supply (UPS) for computer and control system, operation and preventive maintenance.</p>

Subject	Knowledge required
Competence:	General knowledge of remote controls of Propulsion Plant and Engineering Systems and Services
Ships' auxiliary machinery	<p>Refrigeration, Air-conditioning and ventilation Vapour-compression-cycle refrigeration plant; Properties of refrigerant; The use of secondary refrigerants for cooling compartments; The co-efficient of performance of a refrigeration plant; Air-conditioning plant; Ventilation system for accommodation; Mechanical ventilation systems for ship's holds.</p> <p>Stabilizers Construction and operation of different type of stabilizers, such as fin stabilizer and flume tanks.</p> <p>Sewage Treatment Plants Operation of a chemical sewage treatment plant; Operation of a biological sewage treatment plant.</p> <p>Oily-water separators and oil filtering equipment The construction and operation of an oily-water separator (producing effluent that contains less than 100 ppm of oil); Construction and operation of oil filtering equipment (producing effluent that contains not more than 15 ppm of oil); Why oily-water separators, even if well maintained and correctly operated, may not function properly; How an oil-content meter functions; Oil discharge monitoring and control system.</p> <p>Incinerators The functioning of a waste incinerator.</p> <p>Deck machinery Knowledge of general arrangement of deck machinery, main drivers used on deck auxiliaries, anchor handling equipment, windlass arrangement, automatic and manual mooring winches; Cargo handling arrangements including derrick rig systems, heavy lifting system, deck cranes, cargo cranes, grabbing cranes, self-unloading systems, hatches including types of mechanically-operated hatch covers; Lifeboat davits.</p>
Ships' auxiliary machinery	<p>Maintenance of hatch covers Maintenance of trackways, wheels, gears, racks, pinions, side cleats, cross joint wedge mechanisms, drainage channels, drainage holes; Adjustments of the tension of draw chains; Maintenance and inspection of the hydraulic systems; How to check that compression bars are making complete contact with sealing gaskets; Water tightness test on hatch covers.</p> <p>Hydraulic systems Distinguish between open- and closed-loop systems; Ability to describe a live-line circuit supplied by a centralized hydraulic power system; Radial-piston and axial-piston variable-stroke pumps; How the variable-stroke pump can act as controller and power supply; Ability to sketch and describe a simple spool valve with shutoff and control of flow direction; Ram and rotary-vane actuators; Hydraulic accumulator and its purpose.</p> <p>Air receivers: Knowledge of the function, limitations and purpose of air receivers and fittings; Dangers associated with and precautions that must be taken when using an air receiver.</p>

Subject	Knowledge required
Competence:	General knowledge of remote controls of Propulsion Plant and Engineering Systems and Services
Ships' auxiliary machinery	<p>Fire Detection and extinguishing system Knowledge of smoke and heat detectors; Fire extinguishing systems; Inert-gas smothering system; Self-contained inert-gas generator; Inert-gas system taken from boiler uptake; CO₂ as a fire smothering agent, rules and regulations for operation of CO₂ system, CO₂ flooding system for cargo holds, CO₂ total flooding system for machinery space, CO₂ activation alarm system, bulk CO₂ system under refrigeration; Fire extinguishing mediums, when and how to use them; Fire alarms, manually operated, fire alarm switches, shut off machinery spaces, remote stations; Emergency shut off device on fuel tanks; Main fire pumps, emergency fire pumps; Fire mains, valve used on a hydrant; Purpose of international shore connection; Hydrants and hoses; Reasons why hoses are tested.</p> <p>Depth measuring instruments Knowledge of pneumatic gauge, float tank gauge, distant reading tank float gauge; Effects of trim and heel; Limitations of each gauge when measuring tank depth or draught measuring.</p> <p>Self-Unloading vessel Knowledge of cargo-handling tunnels; Gate structure types; Self-unloading booms; Advantages and disadvantages of each type; Belt/bucket system; Attachments to booms, precautions for safe operation.</p> <p>Vessels operating in ice Knowledge of machinery operation considerations when navigating in ice; Methods of freeing a vessel from ice utilizing pumping of tanks or flume system.</p>
General knowledge of marine engineering	<p>Engineering terms and fuel consumption Ability to use engineering terms when describing and explaining the operation of the machinery and equipment mentioned above; Definition of mass, force, work, power, energy, pressure, stress, strain, and heat; Units in which each is measured; What is meant by the efficiency of machine; Description of an indicator diagram and the information obtainable from it; Definition of indicated power, shaft power, propeller power and thrust; Definition of the Admiralty coefficient, fuel coefficient; Fuel oil calculations using provided information to calculate consumption, most economic speed, estimating fuel consumption to complete a voyage, slip percentage; How the condition of the hull affects the fuel coefficient and the fuel consumption.</p> <p>Vibration Knowledge of major sources of vibration in ships; Natural vibration, forced vibration and resonance; Generation of harmonic motion and details of their compensation; Effects of draft and speed; Vibration monitors; Critical speed and techniques used to counter critical speed in rotating machinery.</p> <p>Materials Knowledge of effects of temperature on metals; Principles of galvanic corrosion on a vessel; Method of cathodic protection; Method of impressed current system; How design and maintenance can alleviate considerable corrosion on marine vessels.</p>

5.15 Simulated Electronic Navigation - Management Level (Examination Code: SIM II or SIM M)

Refer TP 4958 for details regarding SIM II or SIM M.

5.16 Oral examination on General Seamanship (Examination Code: MM-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Master Mariner certificate, as set out in section 5.2 of this chapter.
- 2) The examination is of an unlimited duration.

3) The examination is based upon:

Subject	Knowledge required
Competence:	Plan and conduct safe navigation
Routeing in accordance with the General Principles on Ships' Routeing and weather routeing	The use of pilot charts and other nautical publications such as Sailing Directions, Notices to Mariners and the like to select an optimum route, taking into account distance, wind, sea states, currents, ice, icebergs, bad visibility, the nature of the cargo, load lines, crew agreements, etc; The principles of Weather Routeing; The practical use of weather forecasts before undertaking a voyage and for decision making during the voyage; The interpretation of a synoptic chart to forecast local area weather; The characteristics of various weather systems.
Establish and maintain a Safe Navigational Watch	Principles to be observed in keeping a navigational watch as set out in the STCW Code, section A-VIII/2, including under pilotage, and watchkeeping at anchor and in port; A thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at sea, 1972 with Canadian Modifications 1983.
Competence:	Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment
Knowledge of international maritime law embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions	<p>Certificates and other documents</p> <p>Certificates and other documents required to be carried on board ships by International Conventions and their period of validity; Certificates and documents required to be carried on board domestic vessels and their periods of validity.</p> <p>International conventions</p> <p>Major elements covered by international conventions such as the International Convention for the Safety of Life at Sea (SOLAS), the International Convention for the Prevention of Pollution from Ships (MARPOL), the International Convention for the Control and Management of Ships Ballast Water and Sediments, the Maritime labour Convention and the International Convention on Standards of Training, Certification and watchkeeping for Seafarers 1978 as amended (STCW Convention) and STCW Code; Purpose and application of the International Safety Management (ISM) Code Purpose of Flag State and Port State control.</p>
Monitor compliance with legislative requirements and measures to ensure safety of life at sea	Knowledge of master's / ship's responsibilities under the Marine Personnel Regulations; the validity of certificates of competency and endorsements; knowledge and application of the Marine Occupational Safety and Health Regulations; the requirements of the CSA and Marine Personnel Regulations concerning crew agreements, the official log book and compulsory entries, inspection of living quarters and storerooms, complaints procedure; The master's obligation with regard to initial and subsequent reports to be made in case of a marine occurrence; Load-line marks – entries and reports in respect of freeboard, draft and allowances; The requirements of the regulations concerning life-saving and fire-fighting appliances; Application of hours of work and rest legislation; Navigation Safety Regulations relating to danger messages; A knowledge of the master's obligations with respect to pilotage.
Competence:	Ensure compliance with pollution-prevention requirements
Ensure compliance with pollution-prevention requirements	Precautions to be taken to prevent pollution of the marine environment as required by the MARPOL convention, including Restricted Areas and the disposal of pollutants; Take appropriate action in response to pollution incidents onboard and found at sea; Knowledge of the contents of the SOPEP manual, Garbage Management Plans and anti-pollution equipment; Master's duties, obligations and liabilities, including the keeping of records.

Subject	Knowledge required
Competence:	Manoeuvre and handle a ship in all conditions
Manoeuvre and handle a ship in all conditions including:	<p>Factors affecting safe manoeuvring and handling</p> <p>Ability to determine the manoeuvring and propulsion characteristics of common types of ships with special reference to stopping distances and turning circles at various draughts and speeds; The effects of deadweight, draught, trim, speed and under keel clearance on turning circles and stopping distances; Knowledge of the effects of wind and current on ship handling; Behaviour of the ship when engines are put astern; Behaviour of a ship when moving ahead or stopped with a wind from various directions; Propeller and rudder effects on steering, including wake current, transverse thrust and screw race when going ahead and astern.</p> <p>Confined and shallow waters</p> <p>Manoeuvres when approaching pilot stations and embarking or disembarking pilots, with due regard to weather, tide, headreach and stopping distances; Handling ship in rivers, estuaries and restricted waters, having regard to the effects of current, wind and restricted water on helm response; Definition of shallow water, squat, blockage factor; Manoeuvring in shallow water, including the reduction in under keel clearance caused by squat, rolling and pitching; Interaction between passing ships and between own ship and nearby banks (canal effect); Effect of bank suction and bank cushion in restricted waters; Importance of navigating at reduced speed to avoid damage caused by own ship's bow wave and stern wave.</p> <p>Berthing and unberthing</p> <p>Use of propulsion and manoeuvring systems; Practical berthing and unberthing under various conditions of wind, tide and current with and without tugs; Ship and tug interaction; How to make fast tugs on towing hawsers or lashed up alongside; Turning a vessel short round; Preparation to be made for berthing alongside, including head ropes, stern ropes, breast ropes, springs, stopper, heaving lines, winches, self-tensioning winches, capstan, windlass, wire rope; Making fast on-shore bollards being used by another ship; Use of mooring on the bight and doubling up; Methods of mooring to a buoy.</p>

Subject	Knowledge required
Competence:	Manoeuvre and handle a ship in all conditions
Manoeuvre and handle a ship in all conditions including:	<p>Anchoring Choice of and approach to an anchorage; Anchoring with one or two anchors in limited anchorages and factors involved in determining the length of anchor cable to be used; Anchoring to a stern anchor; Method of letting go; Anchoring in water too deep to let the anchor go on the brake; Preparation and procedures during heaving up; Dragging anchor; clearing fouled anchors.</p> <p>Dry-docking Preparation for and manoeuvres for dry-docking, both with and without damage.</p> <p>Heavy weather and rescue operations 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; precautions in manoeuvring to launch rescue boats or survival craft in bad weather; methods of taking on board survivors from rescue boats and survival craft; handling a disabled ship</p> <p>Ice navigation Practical measures to be taken when navigating in or near ice or in conditions of ice accumulation on board; Procedures in ice, alone or in convoy, and movements to be expected by an ice breaker with reference to Transport Canada publication Ice Navigation in Canadian Waters; Methods of freeing a vessel from ice utilizing pumping of tanks or flume system.</p> <p>Seaway, canal navigation and locks Locking and unlocking a vessel; Use of lines in securing a vessel and in warping alongside a berth; Use of lines in a lock or lay-by; Seaway Practices and Procedures contained in the Seaway Handbook.</p>
Normal and emergency towing operations	<p>Practical knowledge of normal and emergency towing and in particular of the following elements: Taking and being taken in tow; Cables used for towing and the required length; The towing point; Towing bitts and hooks; How to approach a vessel to be towed and pass the first connection by line-throwing apparatus or other methods; How to pay out the towing wire under control; Methods of securing the towing wire at the towing ship; How the towing wire should be protected from chafing at fairleads; How to take the weight of the tow; How the towing speed should be decided; The effect of the towing cable on the centre of gravity of the tug and on its stability; Events that may result in the capsizing of the tug; The different ways to instantly release the towing cable in an urgent situation; The use of an emergency tow line; How to disconnect the tow on arrival at the destination.</p>
Competence:	Respond to navigational emergencies
Precautions when beaching a ship	The circumstances in which a vessel may be beached; Compare the relative advantages of beaching broadside-on and at right-angles to the beach; Measures which can be taken to prevent the ship driving further ashore and to assist with subsequent refloating.
Action to be taken if grounding is imminent, and after grounding	An action to be taken if grounding is imminent; Duties of the master following a grounding; Actions to be taken following grounding.

Subject	Knowledge required
Refloating a grounded ship with and without assistance	Measures which can be taken to prevent further damage to the ship and to assist with subsequent refloating; How ballast or other weights may be moved, taken on or discharged to assist refloating; how a ship can be stabilized to prevent movement during unloading operations; The use of ground tackle for hauling off; Ways in which tugs may be used to assist in refloating; The use of the main engine in attempting to refloat and the danger of building up silt from its use.
Action to be taken if collision is imminent and following a collision or impairment of the watertight integrity of the hull by any cause	Action to be taken if collision is imminent; Duties of the master following a collision; actions to be taken following a collision or impairment of the watertight integrity of the hull by any cause.
Competence:	Respond to navigational emergencies
Assessment of damage control	Ability to determine damage to own ship; Measures to attempt to limit damage and save own ship.
Emergency steering	Arrangements of auxiliary steering gear; How the auxiliary steering gear is brought into action; How to change from bridge control to local control in the steering gear compartment; Possible course of action which may be taken by a disabled ship; Methods of securing the rudder in the event of a broken rudder stock; Jury steering arrangement using materials normally found aboard ship; Means of constructing a jury rudder, where practicable.
Emergency towing arrangements and towing procedures	How to approach a disabled vessel and pass the first connection by line-throwing apparatus or other methods; How to pay out the towing wire under control; Methods of securing the towing wire at the towing ship; Preparation made by the disabled ship; How to take the weight of the tow; How the towing wire should be protected from chafing at fairleads; How the towing speed should be decided; How to disconnect the tow on arrival at the destination; Describe the emerging towing arrangements for all tankers of not less than 20,000 dwt.
Competence:	Assess reported defects and damages to cargo spaces, hatch covers and ballast tanks and take appropriate action
Bulk Carriers	Knowledge of the limitations on strength of the vital constructional parts of a standard bulk carrier and ability to interpret given figures for bending moments and shear forces. Ability to explain how to avoid the detrimental effects on bulk carriers of corrosion, fatigue and inadequate cargo handling.
Competence:	Organize and manage the crew
A knowledge of personnel management, organization and training on board ship	<p>Taking command All aspects involved in taking command of a vessel, or changing over command of a vessel.</p> <p>Personnel Management Principles of controlling subordinates and maintaining good relationships; Staff attitudes; Exercise of authority Group behaviour; Conditions of employment.</p> <p>Organization of staff Manning arrangements; Analysis of work; Allocation of staff; Organizing for safety and emergencies; Organizing for staff duties; Organizing for maintenance; Ship's records; Organizing communication on the ship; Meeting techniques.</p> <p>Training on board ships Training methods; Emergency drills.</p>

Subject	Knowledge required
<p>Effective bridge teamwork procedures</p>	<p>Bridge Teamwork Procedures:</p> <p>Master/Pilot Relationship</p> <p>Why the Master and pilot should agree on plans and procedures for the intended voyage; Any special conditions of weather, tidal currents, depth or marine traffic which may be expected should be discussed;</p> <p>The Master should provide the pilot with the pilot card and make available the manoeuvring booklet or, in their absence, provide him details of the ship's particulars and manoeuvring characteristics, including information on the ship's response to wind forces; special characteristics related to squat should be discussed;</p> <p>The Master should inform the pilot of any unusual handling characteristics, machinery difficulties or problems with navigational equipment which could affect the operation, handling of safe manoeuvring of the ship; The pilot should give information on the intended use of tugs, if any; The Master and pilot should discuss, if applicable, special consideration concerning passing or overtaking of other vessels in narrow channels.</p> <p>Bridge Team Management</p> <p>The benefits of effective disposition of manpower on the bridge; How error chains can be avoided;</p> <p>Contingency plans for routine manoeuvres; The importance of effective internal and external communication; The needs for adequate information flow between team members; Failure to monitor the ship's position and communicate effectively has led to casualties.</p> <p>Teamwork</p> <p>The need for effective planning including:</p> <ul style="list-style-type: none"> time constraints required navigational route need to monitor external communications makes allowance for traffic density makes provision for integrating the pilot into the bridge team prevailing weather conditions <p>Effective management of resources includes personnel, equipment and time; The importance of correctly handling the communication between members of the bridge team including the pilot; Ability to recognise the risk factors involved with a planned passage; The need for effective flow of information.</p>
<p>Competence:</p>	<p>Organize and manage the provision of medical care on board</p>
<p>A thorough knowledge of the use and contents of the following publications:</p> <p><i>International Medical Guide for Ships or equivalent national publications</i></p> <p><i>Medical section of the International Code of Signals</i></p> <p><i>Medical First Aid Guide for Use in Accidents Involving Dangerous Goods</i></p>	<p>International Medical Guide for Ships</p> <p>Ability to describe the content and application of the publication; Ability to extract and apply information for given situation.</p> <p>International Code of Signals (Medical Section)</p> <p>Ability to describe the content and application of the publication; Ability to construct and interpret messages.</p> <p>Medical First Aid Guide for use in Accidents involving Dangerous Goods</p> <p>Ability to describe the content and application of the publication; Ability to extract and apply information for given situations.</p>
<p>Competence:</p>	<p>Co-ordinate search and rescue operations</p>

Subject	Knowledge required
<p>A thorough knowledge of and ability to apply the procedures contained in the IMO <i>International Aeronautical and Maritime Search and Rescue manual (IAMSAR)</i></p>	<p>Demonstrate a knowledge and understanding of the procedures contained in IMO <i>International Aeronautical and Maritime Search and Rescue manual (IAMSAR)</i>.</p>
<p>Competence:</p>	<p>Maintain safety and security of the ship's crew and passengers</p>
<p>Actions to be taken to protect and safeguard all persons on board in emergencies</p>	<p>Crew members will be assigned specific duties for mustering and control of passengers, list those duties; Rescue of persons from a vessel in distress or from a wreck; Man-overboard procedures.</p>
<p>Actions to limit damage and save the ship following a fire, explosion, collision or grounding</p>	<p>Means of limiting damage and salvaging the ship following a fire or explosion; Procedure for abandoning ship.</p>

Subject	Knowledge required
Competence:	Develop emergency and damage control plans and handle emergency situations
Preparation of contingency plans for response to emergencies	<p>Contingency plans for response to emergencies</p> <p>Ability to draw up a muster list and emergency instructions for a given crew and type of ship;</p> <p>Ability to assign duties for the operation of remote controls; The division of the crew into a command team, an emergency team, a back-up emergency team and an engine-room emergency team; Ability to designate muster positions for the command team and emergency team, both at sea and in port; Ability to draw up plans to deal with fire in specific areas, rescue of victims of a gassing accident in an enclosed space, heavy weather damage, rescue of survivors from another ship or from the sea, leakages and spills of dangerous cargo, stranding and abandoning ship; The role of a shipboard safety committee in contingency planning; As per the approved training course in STCW BS, PSC and AFF.</p> <p>Actions to be taken when emergencies arise in port</p> <p>Actions to take in the event of fire on own ship; Action which should be taken when fire occurs on nearby ship or an adjacent port facility; The circumstances in which a ship should put to sea for reasons of safety; The actions which can be taken to avoid a ship dragging anchor towards own ship in an anchorage; The actions and precautions to take when a submarine cable is lifted by the anchor; How to buoy and slip an anchor; How an anchor can be recovered when no power is available at the windlass.</p>
Ship construction, including damage control	<p>Flooding of compartments</p> <p>The extent of damage which a passenger ship should withstand; The provisions for dealing with asymmetrical flooding; The possible effects of sustaining damage when in a less favourable condition; The extent of damage which a Type A ship of over 150 metres length should withstand; The requirements for survivability of Type B ships with reduced freeboard assigned; The equilibrium conditions regarded as satisfactory after flooding.</p>
Competence:	Cargo Handling and Stowage
Cargo Handling, Stowage, Securing and Care	The safe working practices and procedures in relation to Cargo Handling, Stowage, Securing and Care.

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General**6.1 General requirements**

The general requirements for a certificate as Master, near coastal, are listed in section 124 of the *Marine Personnel Regulations*.

6.2 Validity of certificates

The holder of this certificate may act as Master of a vessel of any tonnage engaged on a near coastal or sheltered waters voyage.

Syllabuses of Examinations**6.3 Communications, level 1 (Examination Code: COM 1)**

Refer to section 5.3, Chapter 5 of this TP.

6.4 Communications, level 2 (Examination Code: COM 2)

Refer to section 5.4, Chapter 5 of this TP.

6.5 Navigation systems and instruments (Examination Code: NS/I)

Refer to section 5.6, Chapter 5 of this TP.

6.6 Navigation Safety, level 2 (Examination Code: NS 2)

Refer to section 5.7, Chapter 5 of this TP.

6.7 Meteorology, level 2 (Examination Code: MET 2)

Refer to section 5.8, Chapter 5 of this TP.

6.8 Ship Management, level 3 (Examination Code: SM 3)

Refer to section 5.9, Chapter 5 of this TP.

6.9 Ship Management, level 4 (Examination Code: SM 4)

Refer to section 5.10, Chapter 5 of this TP.

6.10 Ship Construction and stability, level 4 (Examination Code: SCS 4)

Refer to section 5.11, Chapter 5 of this TP.

6.11 Ship Construction and stability, level 5 (Examination Code: SCS 5)

Refer to section 5.12, Chapter 5 of this TP.

6.12 Cargo, level 3 (Examination Code: CG 3)

Refer to section 5.13, Chapter 5 of this TP.

6.13 Engineering Knowledge, level 2 (Examination Code: EK 2)

Refer to section 5.14, Chapter 5 of this TP.

6.14 Simulated electronic navigation – Management level (Examination Code: SIM II or SIM M)

Refer to section 5.15, Chapter 5 of this TP.

6.15 Oral examination on General Seamanship (Examination Code: MNC-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Master Near Coastal certificate, as set out in section 6.2 of this chapter.
- 2) The examination is of an unlimited duration.
- 3) The examination is based upon the oral examination syllabus of section 5.17, Chapter 5 of this TP

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General**7.1 General requirements**

The general requirements for a certificate as Master 3000 gross tonnage, near coastal, are listed in section 125 of the *Marine Personnel Regulations*.

7.2 Validity of certificates

The holder of this certificate may act as Master on board a vessel of not more than 3000 gross tonnage engaged on a near coastal voyage and as Master of a vessel of any tonnage engaged on a sheltered waters voyage.

Syllabuses of Examinations**7.3 Communications, level 1 (examination code: COM 1)**

Refer to section 5.3, Chapter 5 of this TP.

7.4 Communications, level 2 (examination code: COM 2)

Refer to section 5.4, Chapter 5 of this TP.

7.5 Navigation Safety, level 2 (examination code: NS 2)

Refer to section 5.7, Chapter 5 of this TP.

7.6 Meteorology, level 2 (examination code: MET 2)

Refer to section 5.8, Chapter 5 of this TP.

7.7 Ship Management, level 3 (examination code: SM 3)

Refer to section 5.9, Chapter 5 of this TP.

7.8 Ship Construction and stability, level 4 (examination code: SCS 4)

Refer to section 5.11, Chapter 5 of this TP.

7.9 Cargo, level 2 (examination code: CG 2)

- 1) The examination consists of a section of descriptive, calculation and simple drawing exercises and a section of multiple-choice questions.
- 2) The following open-book resources will be allowed in the examination room:
 - a) BLU Code - Code of practice for the safe loading and unloading of Bulk carriers;
 - b) Cargo, Fumigation and Tackle Regulations;
 - c) Code of Safe Practice for Cargo Stowage and Securing;
 - d) Code of Safe Working Practices for Self-unloading Vessels;
 - e) International Maritime Dangerous Goods Code (IMDG Code) Vol.1&2 and Supplement;
 - f) The International Maritime Solid Bulk Cargoes Code (IMSBC Code);
 - g) International Convention for the Safety of Life at Sea, 1974 as amended (SOLAS);
 - h) Safe Container Convention Regulations;
 - i) Safe Working Practices Regulations;
 - j) TP 10944 - Notice to Shipmasters Loading Coal;
 - k) Transportation of Dangerous Goods Act;
 - l) Transportation and Dangerous Goods Regulations; and
 - m) Vessel Pollution and Dangerous Chemicals Regulations;
- 3) The examination is of three hours duration.
- 4) The examination is based upon:

Subject	Knowledge required
Competence:	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes.
Knowledge of the effect of cargo including heavy lifts on the seaworthiness and stability of the ship	<p>Securing Cargoes Methods of securing and stowing of all cargoes, cargo liable to slide, heavy loads, heavy lifts, vehicles, trailers, containers, portable tanks; Methods of blocking, lashing, shoring, chocking and tumbing cargo; Methods of securing cargo faces resulting from part discharge before making a sea passage; Methods of securing heavy loads and heavy lifts; Methods of stowing and securing vehicles and trailers; Methods of securing containers, trailers, portable tanks and other cargo units in accordance with the ship’s cargo securing arrangements manual; Basic knowledge of the content, application and ability to use the <i>Code of Safe Practice for Cargo Stowage and Securing</i>; Basic knowledge of the content of the Guidelines for packing of Cargo Transport Units (CTUs).</p> <p>Deck cargo Cargoes other than in containers, commonly carried on deck are:</p> <ul style="list-style-type: none"> a) dangerous goods not permitted below decks; b) large units; c) difficult or impossible to stow below deck, which can safely be exposed to the elements; d) cargoes which can be exposed to the weather and which would occupy a very large space below decks; e) livestocks in limited numbers. <p>Why efficient securing of cargoes is essential for the safety of the ship as well as the cargo; Adequate stowage and securing of deck cargo for the worst conditions which could be experienced; Hatches securely closed and cleated before loading on them;</p> <p>Stowage should leave safe access to essential equipment and spaces needed to navigate and operate the ship such as:</p> <ul style="list-style-type: none"> a) sounding pipes to tanks and bilges; b) devices for the remote operation of valves; c) mooring arrangements; d) fire-fighting and life-saving equipment; e) crew accommodation and working spaces f) protection for the crew.

Subject	Knowledge required
Competence:	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes.
Knowledge of the effect of cargo including heavy lifts on the seaworthiness and stability of the ship	<p>Deck cargo (cont'd) Deck cargo should not obstruct the view from the navigating bridge or overside at the bow; The weight of deck cargo should not exceed the maximum permissible load on the deck or hatches; How the effects of a concentrated load can be spread over a wider area by the use of dunnage and deck shoring taking into consideration the positioning of girders, transverses and longitudinals under the tank top; Effects of deck cargo on stability with reference to:</p> <ul style="list-style-type: none"> a) its vertical moment about the keel; b) the absorption of water or accretion of ice; c) the clearing of water from the deck in heavy weather; d) increased reserve buoyancy of a timber deck cargo. <p>The recommendations on the stowage and lashing of timber deck cargoes as set out in the <i>IMO Code of Safe Practice for Ships Carrying Timber Deck Cargoes</i>; Basic knowledge of the content, application and ability to use Part 1, Section 4 – Timber deck cargoes of the <i>Cargo, Fumigation and Tackle Regulations</i>; Ability to use the <i>Canadian Code of Safe Practice for ships carrying timber deck cargoes</i>; Guard lines or rails to be provided at the sides of a deck stow and at openings in the stow; Provision of means of safe access between the deck and the top of the stow; Method of safe stowage and securing of containers on deck on vessels not specially designed for the carriage of containers; Safe loading/discharging of Ro-Ro cargoes.</p> <p>Container cargo: Arrangements of a container ship; Sequence of operations during discharging and loading at a terminal; The factors involved in planning a container stow; Methods of safe stowage and securing of containers on deck; The types and sizes of container in use; Operational knowledge of the <i>Safe Container Convention Regulations</i>.</p> <p>Bulk Cargo (Other than grain) Basic knowledge of the content, application and ability to use Part 1, Section 2 – Solid bulk cargoes other than grain of the <i>Cargo, Fumigation and Tackle Regulations</i>; Basic knowledge of the contents, application and intent of the <i>IMO International Maritime Solid Bulk Cargoes Code (IMBSC)</i>; Basic knowledge of the content, application and ability to use the <i>Code of practice for the safe loading and unloading of Bulk Carriers (BLU Code)</i>; Ability to identify the loading, stowage and leveling requirements for various bulk cargoes; Knowledge of the content, application and ability to use TP 10944 – <i>Notice to Shipmasters Loading Coal</i>; Precautions to take during loading, transportation and discharging coal; Hazards associated with coal cargoes; Importance of monitoring the temperature of the holds associated with carriage of coal cargoes; Ventilation of coal; Transportations of concentrate cargoes; Definitions of angle of repose, cargoes which may liquefy, flow moisture point, flow state, transportable moisture limit; Inspection and preparation of cargo holds prior to loading bulk cargoes; Separation between certain bulk cargoes and other than bulk cargoes is required; Some bulk cargoes may deplete the oxygen content of holds or produce toxic gases, precautions to be taken before entry of holds.</p>

Subject	Knowledge required
Competence:	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes.
Knowledge of the effect of cargo including heavy lifts on the seaworthiness and stability of the ship	<p>Bulk Grain Cargo Ability to use Part 1, Section 3 – Grain cargoes and Part II – Fumigation of the <i>Cargo, Fumigation and Tackle Regulations</i>; Basic knowledge of the <i>International Code for the safe carriage of grain in bulk</i>; Definitions of grain, filled compartment and partly filled compartment; Cleaning and preparation of holds and decks for the carriage of grain; Importance of trimming: Trimming of filled and partly filled compartments; How the surface of a partly filled compartment is secured against movement; How to separate two different bulk grain cargoes loaded into the same compartment; Role of Agriculture Canada regarding the carriage of grain; Insect or rodent infestation; Dangers associated with using insecticide in cargo holds.</p> <p>Cargo Care <i>Inspection and preparation of holds:</i></p> <p>Reasons for a general inspection of holds; List of items to be inspected; The importance of cleaning holds before loading; How to clean holds after discharge of a general cargo; The reasons for using dunnage; The types and sizes of material used for dunnage; The methods of dunnaging a hold for various cargoes and how to dispose of old dunnage; Effect of dirty dunnage on cargo; The fitting or spar ceiling and its purpose; Importance of drain wells cleanliness; How bilge suction should be checked for efficient working scuppers and sounding pipes; How limbers and drain well covers should be treated to prevent suction being blocked by small debris, but ensuring free drainage to the suction.</p> <p><i>Segregation and separation of cargoes:</i></p> <p>The need for the segregation of different cargoes with reference to: dangerous goods, dry cargo, wet cargo, clean cargo, dirty cargo, delicate cargo and valuable cargo; How the cargoes in the previous objective can be segregated; Methods of separating adjacent parcels of cargo; The use of port marking to segregate parcels for discharge at different ports.</p> <p><i>Ventilation and control:</i></p> <p>List of factors involved in the control of sweat by ventilation; Ability to distinguish between ship's sweat and cargo sweat and the conditions in which each is experienced; The system of natural ventilation and how it should be controlled to minimize the formation of sweat; Forced ventilation and humidity control for cargo holds and the properties measured and recorded at the control panel; How to operate the ventilation system described in the previous objective; Required ventilation for the removal of heat, gases and odours; Cargoes requiring special ventilation.</p>

Subject	Knowledge required
Competence:	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes.
<p>Knowledge of safe handling, stowage and securing of cargoes including dangerous, hazardous and harmful cargoes and their effect on the safety of life and of the ship</p>	<p><i>Refrigerated Cargo:</i> How holds and lockers are prepared for loading; The need for the pre-cooling of spaces and dunnage to be used; The dunnaging requirements for refrigerated cargo; Examples of commodities carried chilled; Examples of frozen cargo; Lists of inspections of cargo which should be made before and during the loading; The use of brine traps in compartment drains before this stage; The purpose of compartment temperature recording.</p> <p>Dangerous, Hazardous and Harmful Cargoes The different types of containment covered by the term “packaged form”; The classification of dangerous goods in the <i>International Maritime Dangerous Goods (IMDG) Code</i>; The properties, characteristics and physical state of the different substances, materials and articles covered by the 9 classes of the IMDG Code; The marking, labelling and placarding of dangerous goods as required by the IMDG Code and DG’s in limited quantities, e.g. schedule 18; Information that the duty officer should have on hand; Special measures to be taken when a certain dangerous cargo is handled; Measures to be taken in the event of an incident or accident; Knowledge of where to look for damage and defects most commonly encountered due to: loading and discharging, corrosion, and severe weather conditions; Actions to be taken are laid down in the <i>IMO Emergency Procedures for Ships Carrying Dangerous Goods (EmS)</i>, the <i>IMO Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG)</i> and the <i>International Medical Guide for Ships (IMGS)</i>; Procedures to be taken when any accident or incident occur during the handling of dangerous goods; Fire precautions to be taken when carrying dangerous goods; Precautions which should be taken while loading or discharging explosives;</p> <p>With the aid of a diagram, indicate the meaning of the following stowage and segregation requirements for the different types of ships:</p> <ul style="list-style-type: none"> a) on deck only; b) on deck or under deck; c) away from; d) separated from; e) separated by a complete compartment or hold from; f) separated longitudinally by an intervening complete compartment or hold. <p>Basic knowledge of the content, application and ability to use the <i>Transportation of Dangerous Goods Act and Regulations</i>; Knowledge of the content, application and ability to use Part 1, Section 5 – Dangerous goods (packaged) of the <i>Cargo, Fumigation and Tackle Regulations</i>.</p>

Subject	Knowledge required
Competence:	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes.
<p>Knowledge of safe handling, stowage and securing of cargoes including dangerous, hazardous and harmful cargoes and their effect on the safety of life and of the ship</p>	<p>Cargo Handling Equipment Care and maintenance of: a) Standing rigging; b) topping lifts, cargo runners, guys and preventers – cargo blocks and topping lift blocks; c) derrick heel fittings; The rigging of derricks for loading and discharging cargo: a) using married falls and b) by single swinging derrick; How to set up guys and preventers for working with married falls; Ship’s rigging plan; Limitations and effect of angles between runners; How to change the rig from single runners to gun tackles; How to top and lower derricks safely; Means of securing derricks for sea; The precautions to take when lifting bales with hooks in the bale bands and damage caused by hooks generally; The handling of common unitized and pre-slung loads; Advantages and disadvantages of ship’s cranes and derricks for handling cargo – types of derricks – Hallen, Stullen, Thompson, Velle etc.; Precautions to be taken when fork-lift trucks or similar devices are used in the tween-decks or holds.</p> <p>Cargo Handling Safety Visual inspections required before the start of cargo operations each day and the frequent inspections of gear while in use for cargo operations; The importance of having a Safe Working Load (SWL) for the cargo gear; Ropes and wires certificates; Frequency of ropes, wires, blocks and loose gear inspections while in use for cargo operations; How to determine when a cargo runner needs replacing; Basic knowledge of the content, application and ability to use the <i>Safe Working Practices Regulations</i>; The need for accident prevention and precautions to be taken in ship operation; Hatch covers safety precautions; The provision of adequate lighting for working spaces, portable lights and precaution with dangerous cargoes; Importance of maintaining close communication with the shore during the loading and unloading stage; Information that should be agreed between ship and shore before any loading or unloading operation; Awareness of the content of the <i>Code of Safe Working Practices for Self-Unloading Vessels</i>; Knowledge of Part III – Tackle of the <i>Cargo, Fumigation and Tackle Regulations</i> and associated documentations.</p> <p>Oil tanker Piping and Pumping Arrangements <i>Tanker Arrangement:</i></p> <p>Ability to describe the crude carriers and product tankers arrangements of:</p> <ul style="list-style-type: none"> a) cargo tanks; b) pump-rooms; c) segregated ballast tanks; d) slop tanks; e) cofferdams – peak tanks - deep tanks; f) accommodation; and g) ventilators leading to accommodation and machinery spaces. <p><i>Cargo piping system:</i></p> <p>The direct pipeline arrangement in crude carriers; The ring-main system in a product tanker; the piping arrangements in a pump-room; The system of individual deep-well pumps for a product tanker;</p>

Subject	Knowledge required
Competence:	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes.
<p>Knowledge of safe handling, stowage and securing of cargoes including dangerous, hazardous and harmful cargoes and their effect on the safety of life and of the ship</p>	<p>Oil tanker Piping and Pumping Arrangements (cont'd) The arrangement and use of:</p> <ul style="list-style-type: none"> a) deck lines; b) drop lines; c) stripping lines; d) crossovers; e) bypasses; f) master valves; g) tank suction valves; h) sea suction valves. <p><i>Cargo pumps:</i> The main operating features of centrifugal pumps; Why most cargo pumps are of centrifugal type; The main operating features of the reciprocating and screw positive-displacement pumps; The applications for which positive-displacement pumps are most suitable; How eductors work; Examples of eductors use; The conditions for which the pumps are being used such as stripping; The safe handling of chemical cargoes; The safe handling of liquefied gas cargoes; The use of ship/shore checklist; The importance of setting the right pumping rate during the loading and unloading operation.</p> <p>Precautions before entering enclosed or contaminated spaces List of potentially dangerous spaces, including: cargo spaces, cargo, fuel and ballast tanks, pump-rooms, cofferdams, duct keels, peak tanks and double bottom tanks; Procedures and precautions for entry into enclosed spaces; Authorizations required; Risk assessment before the entry into enclosed spaces, with reference to T70; Gas monitoring equipment, fixed and portable; Personnel safety equipment, clothing and personal protection; Shipboard emergency plan; Check list to obtain a permit to enter; Items on checklists; Validity of permit; Why periodical tests of the atmosphere should be made by persons working in an enclosed space; Safety checks to be repeated before re-entering a space after a break; Ventilation; Definition of TLV, TWA and STEL.</p> <p>Cargo calculations and Cargo plans: Bale capacity and grain capacity; Stowage factor, broken stowage; Maximum height to which cargo of stated stowage factor can be loaded; Ullage; Use tank calibration tables and given cargo density to calculate the weight in a tank; Use tank calibration tables and given weights and densities of cargo to determine the ullages required; Determine the ullage to leave to produce a given minimum ullage after allowing for expansion of cargo; Corrects densities for temperature; Extracts information from cargo plans of general cargo ships or container ships; Draw up a cargo plan from given information; Uses a hold capacity plan to estimate the depth of cargo in a hold or the area of tween-deck required for a given cargo; Uses a capacity plan to estimate the quantity of cargo, which can be loaded in part of a tween-deck.</p>
Ability to establish and maintain effective communications during loading and unloading	Basic knowledge of the exchange of information and communications required between the ship and terminal under the <i>Code of practice for the safe loading and unloading of Bulk Carriers</i> (BLU code); The communication requirements under the <i>Vessel Pollution and Dangerous Chemicals Regulations</i> .
Subject	Knowledge required
Competence:	Inspect and report defects and damage to cargo spaces, hatch covers and ballast tanks.
Basic knowledge of the	Chapter VI - Carriage of Cargoes

<p>content and application of SOLAS chapters VI, VII and XII</p>	<p>Part A – General provisions;</p> <p>Part B – Special provisions for bulk cargoes other than grain;</p> <p>Part C – Carriage of grain.</p> <p>Chapter VII – Carriage of Dangerous Goods</p> <p>Part A – Carriage of dangerous goods in packaged form;</p> <p>Part A-1 – Carriage of dangerous goods in solid form in bulk;</p> <p>Part B – Construction and equipment of ships carrying dangerous liquid chemicals in bulk;</p> <p>Part C – Construction and equipment of ships carrying liquefied gases in bulk;</p> <p>Part D – Special requirements for the carriage of packaged irradiated nuclear fuel, plutonium and high-level radioactive wastes on board ships.</p> <p>Chapter XII – Additional safety measures for bulk carriers.</p>
<p>Inspect and report defects and damage to cargo spaces, hatch covers and ballast tanks</p>	<p>Cargo spaces inspections Possible causes of damage to the cargo space during cargo operation; General layout of a cargo space for a bulk carrier; General layout of the cargo space for an oil tanker; General layout of the cargo space for a container vessel ; General layout of a general cargo ship; Defects that could arise due to the nature of cargo carried; The corrosion effect that could arise due to structural stress, uneven distribution of cargo, chemical reactions on the ship structure; Methods in use to prevent the occurrence of corrosion in cargo spaces; The damage to cargo space due to severe weather condition; Ability to identify structural or parts to be inspected each time in order to cover all parts within a given period of time; The safety procedures before entry into the cargo tank for inspection.</p> <p>Hatch covers inspection The working principles of a hatch cover; The construction of a hatch cover; The difference between watertight and weathertight; The critical components of the hatch cover that contribute to weathertightness; The critical components of the hatch cover that contribute to watertightness; The structural components of a hatch cover which are most likely to experience corrosion; The testing methods for a hatch cover.</p> <p>Ballast tanks inspection The purpose of ballast tanks; The construction sketch of a ballast tank; The parts in the ballast tanks which are most likely to experience corrosion; The period of interval for the inspection of ballast tanks ; The corrosion prevention methods for ballast tanks.</p> <p>Damage report The items that need to be taken into account where preparing a damage report; The evidence that needs to be collected in assisting the preparation of a damage report.</p> <p>Enhanced Survey Programme The guidelines on the Enhanced Programme of Inspections during surveys of Bulk Carriers; The guidelines on the Enhanced Programme of Inspections during surveys of Oil Tankers.</p>

7.10 Engineering Knowledge, level 1 (examination code: EK 1)

- 1) The examination consists of a written test comprising multiple-choice, descriptive and drawing questions.
- 2) The examination is of two hours duration.

- 3) The EK 2 may be substituted for EK 1 at the applicant’s request.
- 4) The examination is based upon:

Subject	Knowledge required
Competence:	Operate small ship power plants
The operation of small ship power plants and auxiliaries	<p>Operating principles of Marine power plants:</p> <p>Diesel engines 2-stroke diesel cycle; 4-stroke diesel cycle; The cause of scavenge fires and how they are dealt with; Methods of supercharging; The fuel oil system from bunker tank to injection; The lubrication system; Engine cooling water system; The advantages and disadvantages of a medium speed diesel; The need for gearing with medium-speed diesels; The arrangement of clutch and gears; Preparing diesel engine for stand-by; The method of starting and reversing a diesel engine.</p> <p>Propeller and propeller shaft Knowledge of construction and arrangement of a water-lubricated and oil-lubricated type stern tube; Major components of transmission systems; Construction and working principles of a thrust block; Construction and working principles of a shaft bearing; Arrangement of intermediate shafts; Construction and fitting arrangement of a fixed propeller to the tail shaft; Working principles of a controllable pitch propeller. Knowledge of the method of checking the pitch of a propeller; How the propeller transfers shaft power into thrust; Relationship between pitch and power; Operation of a typical CPP system.</p> <p>Bridge control Knowledge of the sequence of operation of bridge control for the main engine; Imposed conditions and essentials for critical speed and reversing of main engines; Essential elements of a control system; Arrangements for a manual override; Indicators and alarms provided with bridge control; Arrangement and operations of lateral thrusters; Bridge control and indicators for lateral thrusters.</p> <p>Ship’s auxiliary machinery:</p> <p>Boilers Ability to distinguish between water-tube and fire tube boilers; Describe auxiliary boilers; Describe a waste-heat boiler; Describe exhaust-gas heat exchangers; Describe steam to steam generators and explain where and why they are used; Describe a boiler fuel oil supply system; Describe the effect of dissolved salts in the feed water and how it is treated; What is meant by priming.</p> <p>Distillation and Fresh-water Systems: Distillation system; Treatment of fresh water intended for drinking; Domestic water system.</p>

Subject	Knowledge required
Competence:	Operate small ship power plants
The operation of small ship power plants and auxiliaries	<p>Pumps and pumping system Knowledge of the principles of operation and application of centrifugal, positive displacement, gear, screw and reciprocating-piston type pumps in the machinery space or pump room of a modern ship; Knowledge of bilge systems, ballast systems, cargo piping systems and oily water separators.</p> <p>Steering gear Ram-type hydraulic steering gear; Rotary-vane steering gear; IMO requirements for auxiliary steering gear and how they are met by ram-type and rotary-vane steering gear; Telemotor control system; How the change from remote to local control in the steering gear compartment is made; The requirement for power supplies to electric and electrohydraulic steering gear; IMO requirements for testing steering gear and for drills. Knowledge of the requirements of the steering appliances and equipment regulations.</p> <p>Generators, Alternators and Electrical distribution Operation of an alternator; Functioning of induction motors; The relative advantages and disadvantages of generation and distribution of D.C. and A.C.; D.C. and A.C. distribution systems; The use of circuit breakers and fuses; Ability to draw and describe a navigation light circuit with indicators and alarm, showing an alternative power supply; The use of rectifiers; The characteristics of lead-acid batteries and of alkaline batteries; The maintenance of batteries; Safety precautions; The safety precautions to be observed for battery compartments; The services to be supplied from the emergency generator; Knowledge of Uninterruptible Power Supply (UPS) for computer and control system, operation and preventive maintenance.</p> <p>Stabilizers Construction and operation of different type of stabilizers, such as fin stabilizer and flume tanks.</p> <p>Sewage Treatment Plants Operation of a chemical sewage treatment plant; Operation of a biological sewage treatment plant.</p> <p>Oily-water separators and oil filtering equipment Construction and operation of oil filtering equipment (producing effluent that contains not more than 15 ppm / 5 ppm of oil); How an oil-content meter functions; Oil discharge monitoring and control system.</p> <p>Deck machinery Knowledge of general arrangement of deck machinery, main drivers used on deck auxiliaries, anchor handling equipment, windlass arrangement, automatic and manual mooring winches.</p> <p>Cargo handling arrangements including derrick, heavy lifting system, deck cranes, cargo cranes, grabbing cranes, self-unloading systems, hatches including types of mechanically-operated hatch covers; Lifeboat davits.</p>

Subject	Knowledge required
Competence:	Operate small ship power plants
The operation of small ship power plants and auxiliaries	<p>Hydraulic systems Distinguish between open- and closed-loop systems; Ability to describe a live-line circuit supplied by a centralized hydraulic power system; Radial-piston and axial-piston variable-stroke pumps. How the variable-stroke pump can act as controller and power supply; Ability to sketch and describe a simple spool valve with shutoff and control of flow direction; Ram and rotary-vane actuators; Hydraulic accumulator and its purpose.</p> <p>Air receivers Knowledge of the function, limitations and purpose of air receivers and fittings; Dangers associated with and precautions that must be taken when using an air receiver.</p> <p>Fire Detection and extinguishing system Knowledge of smoke and heat detectors; Fire extinguishing systems; Inert-gas smothering system; CO₂ as a fire smothering agent, rules and regulations for operation of CO₂ system, CO₂ flooding system for cargo holds, CO₂ total flooding system for machinery space, CO₂ activation alarm system, bulk CO₂ system under refrigeration; Fire extinguishing mediums, when and how to use them; Fire alarms, manually operated, fire alarm switches, shut off machinery spaces, remote stations; Emergency shut off device on fuel tanks; Main fire pumps, emergency fire pumps; Fire mains, valve used on a hydrant; Purpose of international shore connection; Hydrants and hoses; Reasons why hoses are tested.</p> <p>Depth measuring instruments Knowledge of pneumatic gauge, float tank gauge, distant reading tank float gauge; Effects of trim and heel.</p> <p>Vessels operating in ice Knowledge of machinery operation considerations when navigating in ice and in cold temperatures below freezing point.</p> <p>General Knowledge:</p> <p>Engineering terms Ability to use engineering terms when describing and explaining the operation of the machinery and equipment mentioned above; Definition of mass, force, work, power, energy, pressure, stress, strain, and heat; Units in which each is measured; What is meant by the efficiency of machine.</p> <p>Vibration Knowledge of major sources of vibration in ships; Natural vibration, forced vibration and resonance.</p> <p>Materials Knowledge of effects of temperature on metals; Principles of galvanic corrosion on a vessel; Method of cathodic protection; how design and maintenance can alleviate considerable corrosion on marine vessels.</p>

7.11 Simulated electronic navigation - Management level (examination code: SIM II or SIM M)

Refer to section 5.15, Chapter 5 of this TP.

7.12 Oral examination on General Seamanship (examination code: M3000NCO or M3000-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by the appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Master - Near Coastal – Ships under 3000 gross tonnage as set out in section 7.2 of this chapter.
- 2) The examination is of an unlimited duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence:	Plan and conduct safe navigation
Routeing in accordance with the General Principles on Ships' Routeing and weather routeing	The use of pilot charts and other nautical publications such as Sailing Directions, Notices to Mariners and the like to select an optimum route, taking into account distance, wind, sea states, currents, ice, icebergs, bad visibility, the nature of the cargo, load lines, crew agreements, etc; The principles of Weather Routeing; The practical use of weather forecasts before undertaking a voyage and for decision making during the voyage; The interpretation of a synoptic chart to forecast local area weather; The characteristics of various weather systems.
Establish and maintain a Safe Navigational Watch	Principles to be observed in keeping a navigational watch as set out in the STCW Code, section A-VIII/2, including under pilotage, and watchkeeping at anchor and in port; A thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at sea, 1972 with Canadian Modifications 1983; Knowledge of the Canadian System of buoyage; ability to determine magnetic compass error and care of magnetic compass.
Competence:	Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment
Knowledge of international maritime law embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions	<p style="text-align: center;">Certificates and other documents</p> <p>Certificates and other documents required to be carried on board ships by International Conventions and their period of validity; Certificates and documents required to be carried on board domestic vessels and their periods of validity.</p> <p style="text-align: center;">International conventions</p> <p>Major elements covered by international conventions such as the International Convention for the Safety of Life at Sea (SOLAS), the International Convention for the Prevention of Pollution from Ships (MARPOL), the International Convention for the Control and Management of Ships Ballast Water and Sediments, the Maritime labour Convention and the International Convention on Standards of Training, Certification and watchkeeping for Seafarers 1978 as amended (STCW Convention) and STCW Code; Purpose and application of the International Safety Management (ISM) Code Purpose of Flag State and Port State control.</p>

Subject	Knowledge required
Competence:	Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment
Monitor compliance with legislative requirements and measures to ensure safety of life at sea	<p>All aspects involved in taking command of a vessel, or changing over command of a vessel; Preparation of the vessel for inspection and surveys; Knowledge of master's / ship's responsibilities under the Marine Personnel Regulations; the validity of certificates of competency and endorsements; knowledge and application of the Marine Occupational Safety and Health Regulations;</p> <p>The requirements of the CSA and Marine Personnel Regulations concerning crew agreements, the official log book and compulsory entries, inspection of living quarters and storerooms, complaints procedure; The master's obligation with regard to initial and subsequent reports to be made in case of a marine occurrence; Load-line marks – entries and reports in respect of freeboard, draft and allowances; The requirements of the regulations concerning life-saving and fire-fighting appliances; Application of hours of work and rest legislation; Navigation Safety Regulations relating to danger messages; A knowledge of the master's obligations with respect to pilotage.</p>
Competence:	Manoeuvre and handle a ship in all conditions
Manoeuvre and handle a ship in all conditions including:	<p>Factors affecting safe manoeuvring and handling</p> <p>Ability to determine the manoeuvring and propulsion characteristics of common types of ships with special reference to stopping distances and turning circles at various draughts and speeds; The effects of deadweight, draught, trim, speed and under keel clearance on turning circles and stopping distances; Knowledge of the effects of wind and current on ship handling; Behaviour of the ship when engines are put astern; Behaviour of a ship when moving ahead or stopped with a wind from various directions; Propeller and rudder effects on steering, including wake current, transverse thrust and screw race when going ahead and astern.</p> <p>Confined and shallow waters</p> <p>Manoeuvres when approaching pilot stations and embarking or disembarking pilots, with due regard to weather, tide, headreach and stopping distances; Handling ship in rivers, estuaries and restricted waters, having regard to the effects of current, wind and restricted water on helm response; Definition of shallow water, squat, blockage factor; Manoeuvring in shallow water, including the reduction in under keel clearance caused by squat, rolling and pitching; Interaction between passing ships and between own ship and nearby banks (canal effect); Effect of bank suction and bank cushion in restricted waters; Importance of navigating at reduced speed to avoid damage caused by own ship's bow wave and stern wave.</p> <p>Berthing and unberthing</p> <p>Use of propulsion and manoeuvring systems; Practical berthing and unberthing under various conditions of wind, tide and current with and without tugs; Ship and tug interaction; How to make fast tugs on towing hawsers or lashed up alongside; Turning a vessel short round;</p> <p>Preparation to be made for berthing alongside, including head ropes, stern ropes, breast ropes, springs, stopper, heaving lines, winches, self-tensioning winches, capstan, windlass, wire rope; Making fast on-shore bollards being used by another ship; Use of mooring on the bight and doubling up; Methods of mooring to a buoying on board survivors from rescue boats and survival craft; handling a disabled ship</p>

Subject	Knowledge required
Competence:	Manoeuvre and handle a ship in all conditions
Manoeuvre and handle a ship in all conditions including:	<p>Anchoring Choice of and approach to an anchorage; Anchoring with one or two anchors in limited anchorages and factors involved in determining the length of anchor cable to be used; Anchoring to a stern anchor; Method of letting go; Anchoring in water too deep to let the anchor go on the brake; Preparation and procedures during heaving up; Dragging anchor; clearing fouled anchors.</p> <p>Dry-docking Preparation for and manoeuvres for dry-docking, both with and without damage.</p> <p>Heavy weather and rescue operations 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; precautions in manoeuvring to launch rescue boats or survival craft in bad weather; methods of taking on board survivors from rescue boats and survival craft; handling a disabled ship.</p> <p>Ice navigation Practical measures to be taken when navigating in or near ice or in conditions of ice accumulation on board; Procedures in ice, alone or in convoy, and movements to be expected by an ice breaker with reference to Transport Canada publication <i>Ice Navigation in Canadian Waters</i>; Methods of freeing a vessel from ice utilizing pumping of tanks or flume system.</p> <p>Seaway, canal navigation and locks Locking and unlocking a vessel; Use of lines in securing a vessel and in warping alongside a berth; Use of lines in a lock or lay-by; Seaway Practices and Procedures contained in the Seaway Handbook.</p>
Normal and emergency towing operations	<p>Practical knowledge of normal and emergency towing and in particular of the following elements: Taking and being taken in tow; Cables used for towing and the required length; The towing point; Towing bits and hooks; How to approach a vessel to be towed and pass the first connection by line-throwing apparatus or other methods; How to pay out the towing wire under control; Methods of securing the towing wire at the towing ship; How the towing wire should be protected from chafing at fairleads; How to take the weight of the tow; How the towing speed should be decided; The effect of the towing cable on the centre of gravity of the tug and on its stability; Events that may result in the capsizing of the tug; The different ways to instantly release the towing cable in an urgent situation; The use of an emergency tow line; How to disconnect the tow on arrival at the destination.</p>
Competence:	Respond to navigational emergencies
Action to be taken if grounding is imminent, and after grounding	<p>Actions to be taken if grounding is imminent; Duties of the master following a grounding; Actions to be taken following grounding.</p>
Refloating a grounded ship with and without assistance	<p>Measures which can be taken to prevent further damage to the ship and to assist with subsequent refloating; How ballast or other weights may be moved, taken on or discharged to assist refloating; how a ship can be stabilized to prevent movement during unloading operations; The use of ground tackle for hauling off; Ways in which tugs may be used to assist in refloating; The use of the main engine in attempting to refloat and the danger of building up silt from its use.</p>

Subject	Knowledge required
Competence:	Respond to navigational emergencies
Action to be taken if collision is imminent and following a collision or impairment of the watertight integrity of the hull by any cause	Action to be taken if collision is imminent; Duties of the master following a collision; actions to be taken following a collision or impairment of the watertight integrity of the hull by any cause.
Assessment of damage control	Ability to determine damage to own ship; Measures to attempt to limit damage and save own ship.
Emergency steering	Arrangements of auxiliary steering gear; How the auxiliary steering gear is brought into action; How to change from bridge control to local control in the steering gear compartment; Possible course of action which may be taken by a disabled ship; Methods of securing the rudder in the event of a broken rudder stock; Jury steering arrangement using materials normally found aboard ship; Means of constructing a jury rudder, where practicable.
Competence:	Ensure compliance with pollution-prevention requirements
Ensure compliance with pollution-prevention requirements	Precautions to be taken to prevent pollution of the marine environment as required by the MARPOL convention, including Restricted Areas and the disposal of pollutants; Take appropriate action in response to pollution incidents onboard and found at sea; Knowledge of the contents of the SOPEP manual, Garbage Management Plans and anti-pollution equipment; Master's duties, obligations and liabilities, including the keeping of records.
Competence:	Organize and manage the provision of medical care on board
A thorough knowledge of the use and contents of the following publications: <i>International Medical Guide for Ships</i> or equivalent national publications Medical section of the International Code of Signals <i>Medical First Aid Guide for Use in Accidents Involving Dangerous Goods</i>	International Medical Guide for Ships Ability to describe the content and application of the publication; Ability to extract and apply information for given situation. International Code of Signals (Medical Section) Ability to describe the content and application of the publication; Ability to construct and interpret messages. Medical First Aid Guide for use in Accidents involving Dangerous Goods Ability to describe the content and application of the publication; Ability to extract and apply information for given situations.
Competence:	Co-ordinate search and rescue operations
A thorough knowledge of and ability to apply the procedures contained in the IMO International Aeronautical and Maritime Search and Rescue manual (IAMSAR)	Demonstrate a knowledge and understanding of the procedures contained in IMO <i>International Aeronautical and Maritime Search and Rescue manual (IAMSAR)</i> .

Subject	Knowledge required
Competence:	Co-ordinate search and rescue operations
Actions to be taken to protect and safeguard all persons on board in emergencies	Crew members will be assigned specific duties for mustering and control of passengers, list those duties; Rescue of persons from a vessel in distress or from a wreck; Man-overboard procedures.
Actions to limit damage and save the ship following a fire, explosion, collision or grounding	Means of limiting damage and salvaging the ship following a fire or explosion; Procedure for abandoning ship.
Competence:	Develop emergency and damage control plans and handle emergency situations
Preparation of contingency plans for response to emergencies	<p>Contingency plans for response to emergencies</p> <p>Ability to draw up a muster list and emergency instructions for a given crew and type of ship; Ability to assign duties for the operation of remote controls; The division of the crew into a command team, an emergency team, a back-up emergency team and an engine-room emergency team; Ability to designate muster positions for the command team and emergency team, both at sea and in port; Ability to draw up plans to deal with fire in specific areas, rescue of victims of a gassing accident in an enclosed space, heavy weather damage, rescue of survivors from another ship or from the sea, leakages and spills of dangerous cargo, stranding and abandoning ship.</p> <p>Actions to be taken when emergencies arise in port</p> <p>Actions to take in the event of fire on own ship; Action which should be taken when fire occurs on nearby ship or an adjacent port facility; The circumstances in which a ship should put to sea for reasons of safety; The actions which can be taken to avoid a ship dragging anchor towards own ship in an anchorage; The actions and precautions to take when a submarine cable is lifted by the anchor; How to buoy and slip an anchor; How an anchor can be recovered when no power is available at the windlass</p>
Competence:	Cargo Handling and Stowage
Cargo Handling, Stowage, Securing and Care	The safe working practices and procedures in relation to Cargo Handling, Stowage, Securing and Care.

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General**8.1 General requirements**

The general requirements for a certificate as Master 500 gross tonnage, Near Coastal, are listed in section 126 of the *Marine Personnel Regulations*.

8.2 Validity of certificates

The holder of this certificate may act as Master on board a vessel of not more than 500 gross tonnage engaged on a near coastal voyage, as Chief Mate on board a vessel of not more than 3000 gross tonnage engaged on a near coastal voyage and as Master of a vessel of any tonnage engaged on a sheltered waters voyage.

Syllabuses of Examinations**8.3 Communications, level 1 (Examination Code: COM 1)**

Refer to section 5.3, Chapter 5 of this TP.

8.4 Communications, level 2 (Examination Code: COM 2)

Refer to section 5.4, Chapter 5 of this TP.

8.5 Meteorology, level 1 (Examination Code MET 1)

- 1) The examination consists of a written test comprising multiple-choice questions.
- 2) The examination is of three hours duration.
- 3) The MET 2 may be substituted for MET 1 at the applicant's request.
- 4) The examination is based upon:

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
Ability to use and interpret information obtained from shipborne meteorological instruments	Shipborne Meteorological instruments Mercurial barometer; Aneroid barometer; Thermometer; Function of a hygrometer; Basic principles of wind sensors; The basic principles of wind sensors, take and log readings of wind speed.
Knowledge of the characteristics of the various weather systems, reporting procedures and recording system	The Atmosphere, its composition and physical properties The composition of the earth's atmosphere, mentioning dry air and its constituents, water vapour and aerosols; Ability to draw and label a typical vertical temperature profile through the lower 100 km of the earth's atmosphere; Definition of troposphere, tropopause, stratosphere, stratopause, mesosphere, mesopause and thermosphere; Ability to describe the main features of the troposphere; The nature of solar radiation, (scattering, reflection and absorption); The effect on insolation of a variation in latitude; The effect on insolation of a variation in the sun's declination; The effect on insolation of a variation in the length of daylight; Definition of water vapour; The properties of water vapour in the atmosphere; Definition of evaporation, condensation, latent heat of vaporization; Definition of saturated air; The processes of mixing, cooling and the evaporation of water vapour, by which a sample of air may be brought to saturation; Definition of dewpoint, absolute humidity, relative humidity, vapour pressure. Atmospheric pressure Knowledge of pressure equals force per unit area; Knowledge of the atmosphere exerts a pressure on any surface within it; Knowledge of the atmosphere pressure on a unit area of a surface is equal to the weight of the air column extending from that surface to the outer fringes of the atmosphere; Ability to explain that atmospheric pressure decreases with height above sea level; Knowledge of atmospheric pressure acts in all directions; What is the basic unit of pressure; What is the average pressure at sea level; Ability to explain that the surface pressure rises if air is added to the column above the surface, and vice versa; Define isobar.

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
Knowledge of the characteristics of the various weather systems, reporting procedures and recording system	<p>Wind Definition of wind; The Beaufort scale of wind force; The pressure gradient force; The coriolis force; The surface wind circulation around high and low pressure centres; Buys-Ballot's law; The method of estimating the strength of the wind and direction from the appearance of the sea surface, using the Beaufort wind scale; The difference between apparent and true wind; Ability to determine the true wind velocity by using a vector diagram, given the apparent wind and the ship's course and speed; The use of a geostrophic wind scale.</p> <p>Cloud and precipitation How does clouds form; What does a cloud can consist of; The need for and the definition of condensation nuclei; Ability to name and describe the ten basic cloud types; The probable base heights of the ten principal cloud types; Definition of precipitation, rain, drizzle, hail, snow and sleet; Theory of formation of thunderstorms and lightnings; Associated clouds, conditions within the clouds; Times, seasons and localities of occurrence.</p> <p>Visibility: Definition of fog, mist, haze; Ability to apply the concept of processes leading to supersaturation to a classification of fogs as mixing, cooling or evaporation fogs; The formation of radiation fog; The effect of pollution on the formation of radiation fog; The formation of advection fog; The conditions leading to the formation of sea smoke, and typical areas where sea smoke may be encountered; Methods of estimating the visibility at sea, by day and by night, and the difficulties involved.</p> <p>The wind and pressure systems over the oceans Ability to sketch the circulation cells which would exist on a rotating earth, not inclined to its orbit of rotation around the sun, and with a homogeneous surface; Ability to draw the mean surface pressure and wind distribution over the earth's surface in January and July; The characteristics and location of the doldrums, intertropical convergence zone, trade winds, sub-tropical oceanic highs, westerlies and polar easterlies; Ability to describe a monsoon regime; Areas which experience a true monsoon regime; The causes of monsoon regimes; Ability to apply the concept of horizontal temperature differences to the explanation of the formation of land and sea breezes; The formation of anabatic and katabatic winds; The regions of occurrence of anabatic and katabatic winds; Examples of local winds.</p> <p>Structure of depressions Definition of air mass; The formation of air mass; Definition of Source region; The characteristics required of a source region; The source-region characteristics of arctic, polar, tropical and equatorial air-mass types; Definition of warm front and cold front; Recognise the symbols for warm and cold fronts; With the aid of a diagram, ability to describe the weather experienced during the passage of an idealized warm front; With the aid of a diagram, ability to describe the weather experienced during the passage of an idealized cold front; Definition of depression; Ability to identify a depression on a surface synoptic or prognostic chart;</p> <p>The stages in the life cycle of a polar front depression; Family of depressions; Ability to draw a diagram of a polar front depression, for both northern and southern hemispheres, showing isobars, warm and cold fronts, with circulation and warm sector; Ability to draw a cross-section through a polar front depression, on the poleward and equatorial side of the centre, showing fronts, cloud and precipitation areas; The usual movement of a polar front depression; The weather changes experienced when a frontal depression passes with its centre on the poleward side of an observer in the northern hemisphere and in the southern hemisphere; The process leading to the occlusion of a polar front depression; Ability to identify a trough of low pressure on a surface synoptic or prognostic chart; The weather associated with the passage of a trough.</p>

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
Knowledge of the characteristics of the various weather systems, reporting procedures and recording system	<p>Anticyclones and other pressure system Definition of anticyclone; Ability to draw a synoptic pattern of an anticyclone, for both northern and southern hemispheres, showing isobars and wind circulation; Ability to identify an anticyclone on a surface synoptic or prognostic chart; The weather associated with anticyclones; Definition of a ridge of high pressure; Ability to draw a synoptic pattern for a ridge, showing isobars and wind directions; Describe a typical weather sequence during the passage of a ridge between depressions across the observer's position; Definition of col; Ability to draw a synoptic pattern for a col, showing isobars and wind directions; The weather associated with a col; Ability to identify ridges and cols on a surface synoptic or prognostic chart.</p> <p>Weather services for shipping The organization, functions and objectives of the World Meteorological Organization; The sources of weather information available to shipping; The information flow between merchant ships and Meteorological Offices; The services provided for shipping by Meteorological offices; The appropriate weather bulletin and the contents of each of its sections; The types of information received by facsimile machine; The services provided for storm warnings.</p> <p>Recording and reporting weather observations The need for meteorological codes; Uses the Ship's Code and Decode book to code a ship's full report; Uses the Ship's Code and Decode book to decode a ship's full report; Uses the Ship's Code and Decode Book to decode a reduced report from a shore station; Uses Beaufort letter abbreviations for present and past weather and total cloud amount; Interprets a ship or shore station plot.</p>
Ability to apply the meteorological information available	<p>Weather Forecasting Applies previous concepts to the interpretation of symbols and isobaric patterns on weather charts and facsimile charts; Applies previous concepts to the interpretation of synoptic and prognostic charts to ascertain wind directions, areas of strong winds, cloud and precipitation areas, fog areas, ice and areas of fine weather; Explain how weather observations at a ship can be used to improve the forecast derived from synoptic and prognostic charts.</p>

8.6 Ship Management, level 2 (Examination Code: SM 2)

- 1) The examination consists of a written test comprising multiple-choice and descriptive questions.
- 2) The following open-book resources will be allowed in the examination room:
 - a) Canada Labour Code;
 - b) Canada Shipping Act-2001;
 - c) Load Line Regulations;
 - d) Marine Personnel Regulations;
 - e) Marine Transportation Security Act;
 - f) Marine Transportation Security Regulations;
 - g) Merchant Seamen Compensation Order 1992.
 - h) Merchant Seamen's Compensation Act;
 - i) Pilotage Act;
 - j) Potable Water on Board Trains, Vessels, Aircraft and Buses Regulations;
 - k) Quarantine Regulations;
 - l) Shipping Casualty Reporting Regulations; and
 - m) Vessel Certificates Regulations;
 - n) Vessel Pollution and Dangerous Chemicals Regulations;
- 3) The examination is of a three hours duration.

- 4) The SM 3 may be substituted for SM 2 at the applicant's request
- 5) The examination is based upon

Subject	Knowledge required
Competence:	Monitor compliance with legislative requirements
Knowledge of the Canada Shipping Act-2001, Marine Personnel Regulations, Pilotage Act and Canada Labour Code, Part II	<p>Canada Shipping Act (CSA): Knowledge of Canada Shipping Act-2001 relating to Registrations, listing and recording; Personnel; Safety; Navigation Services; Incidents, accidents and casualties; Wreck; Pollution prevention and response – Department of fisheries and oceans; Pollution Prevention – Department of Transport; and Enforcement.</p> <p>Marine Personnel Regulations: Knowledge of Part 2 of the Marine Personnel Regulations relating to the crewing requirements for Canadian vessels, in particular the training and familiarization required, the minimum complement, the safe manning documents, the validity of certificates and endorsements, the deck watch, the radio watch and the medical examination of seafarers. Knowledge of Part 3, of the Marine Personnel Regulations relating to Maritime Labour Standards, in particular the requirements regarding age, seafarer recruitment and placement, conditions of employment, the hours of work and hours of rest, food and water, on board complaint procedures and log books.</p> <p>Pilotage Act: Knowledge of the Pilotage Act, including compulsory pilotage; Pilot's responsibility to master; Master relieving pilot; When a pilot shall not pilot; Pilotage exemption or waiver;</p> <p>Canada Labour Code: Knowledge of the application of the Canada Labour Code to shipping.</p>
Ship's business	Knowledge of custom house and immigration procedures; Quarantine Regulations; De-rat certificates; Tonnage certificates ; Charter parties and bills of lading ; Noting protest and right to extend; Marine insurance contract and its relationship to master's responsibility to owners and underwriters.
Canadian Regulations	Knowledge of <i>Shipping Casualty Reporting Regulations; Potable Water on Board Trains, Vessels, Aircraft and Buses Regulations; Vessel Certificates Regulations; Vessel Pollution and Dangerous Chemicals Regulations; Marine Transportation Security Act and Regulations; Load Line Regulations; Merchant Seamen's Compensation Act and Merchant Seamen Compensation Order 1992.</i>
Knowledge of master's responsibilities in different events	Knowledge of master's responsibilities in event of salvage and salvage agreements; Obligations and responsibilities in event of emergencies, collision, distress, search and rescue; Vessel reporting systems; Legal consequences of infractions of regulations; Functions of agents; Business aspects of putting into port with damaged ship or cargo.

8.7 Ship Construction & Stability, level 3 (Examination Code: SCS 3)

- 1) The examination consists of multiple-choice, descriptive questions and practical calculations based on a vessel's stability data booklet.
- 2) The following open-book resources will be allowed in the examination room:
 - a) *Canadian Load Line Regulations*;
 - b) *TP 1332- Construction Standards for Small vessels*; and
 - c) *MV Sept- îles, Ship Stability data Booklet*.
- 3) The examination is of three hours duration.
- 4) The SCS 4 may substitute for SCS 3 at the applicant's request.
- 5) The examination is based upon:

Subject	Knowledge required
Competence:	Maintain vessel stability
Understanding stability basic terminology	<p>Terms Meaning of displacement, deadweight, lightship weight, load displacement; Meaning of list, heel, loll; Meaning of gravity, centre of gravity (G), height of centre of gravity above keel/baseline (KG); Meaning of buoyancy, centre of buoyancy (B), reserve buoyancy; Meaning of righting lever (GZ) when the vessel is heeled, metacentre (M), metacentric height (GM) and roll period as an indication of initial stability; Meaning of centre of flotation (F) and trim; Meaning of draft, freeboard, deck edge immersion and downflooding.</p>
Understanding transverse stability principles	<p>Understanding of: Effect of water density on draft and freeboard and Fresh Water Allowance (FWA); Ability to explain using a sketch of a heeled vessel, how the centre of gravity (G) and the centre of buoyancy (B) are acting to create a righting lever (GZ); Effect on stability of adding, removing, transferring and suspending weights; Stable equilibrium, unstable equilibrium, neutral equilibrium; Correcting unstable and neutral equilibrium and angle of loll; Stiff and tender ships; Negative GM and angle of loll; Free surface effect of liquids on stability and the danger of slack tanks; Moment of statical stability; Effects of reduction in freeboard on stability and the dangers of overloading and capsizing.</p>
Practical use of stability data supplied in typical vessels and tugs	<p>Use of displacement and ton per inch / tonne per centimetre (TPI/TPC) scales to determine displacement from draft and vice versa; Understanding of data found in typical vessels and tugs stability booklets; Use of pre-calculated operating conditions to ascertain adequate stability; Recognize situations where the vessel does not meet the pre-calculated operating conditions and ability to rectify the situation; Interpreting curves of statical stability; Effects of reduction in freeboard on stability and the dangers of overloading and capsizing.</p>

Subject	Knowledge required
Competence:	Maintain seaworthiness of the ship
Transverse stability and trim calculations	<p>Using supplied stability booklet or information, ability to: Calculate final metacentric height (GM) after adding, removing, transferring or suspending weights; Calculate final displacement; Determine the free surface effect and by how much it will affect the metacentric height (GM); Determine the righting lever (GZ) for a given angle of heel; Evaluate the area under the statical stability curve for a given angle of heel; Determine the final trim and final drafts; Determine if calculated data meets established stability criteria; Calculate weight to be loaded, unloaded, transferred in order to achieve the desired trim; Existence of transverse moment exerted on the towing hook; Determine the final list.</p>
Effect of environmental conditions on vessel's stability	Understanding the effect of severe wind and rolling in associated sea conditions, especially in following seas; Effect of water on deck including free surface effect; The effect of ice accretion on stability.
Knowledge of the Canadian Loadline Regulations	Knowledge of the <i>Canadian Loadline Regulations</i> .
Understanding basic construction terminology	<p>Terms: Meaning of length overall, length between perpendiculars, breadth, depth, moulded dimensions, baseline, gross tonnage and net tonnage; Meaning of open and closed construction; Meaning of weathertight and watertight; Knowledge of the principal structural members of a vessel and the proper names for the various parts; Ability to identify structural components on ship's plan and drawings.</p>
Maintain integrity of the hull and superstructures and prevent water flooding	<p>Basic knowledge of: How watertight and weatherhight integrity is maintained; Purpose and maintenance of water-freeing arrangements and freeing ports in bulwarks How the minimum size and number of freeing ports required is determined; The construction of doors, door sills, windows, portholes and access openings; The construction of ventilators and air pipes; Sounding devices; Crew protection by bulwarks, rails and guards; How water ingress is prevented through hull openings (valves) & shaft.</p>
Survivability of the vessel in case of flooding and damage control	<p>Understand the construction and importance of bulkheads as strength members and their watertight integrity to prevent total flooding, in particular the collision bulkhead; The functions and construction of bilge and pump systems and water level detectors.</p> <p>Identify damage control techniques for various flooding scenarios as: Small and large hull breach, damaged through hull fittings, split piping, chafed hose, packing gland, etc.</p>
Protection against fires	<p>The purpose and operation of: Quick closing valves on fuel tanks; Fire dampers on ventilators; Fire extinguishing systems.</p>

Subject	Knowledge required
Competence:	Maintain seaworthiness of the ship
Vessel inspection and maintenance	<p>Awareness of the normal maintenance to ensure: Compliance with standards and regulations; Hull, machinery and all equipments remain in good operational order; Corrosion and cathodic protection.</p> <p>Awareness of the Transport Canada Marine Safety and Security inspection regime concerning: Initial inspection and periodic inspection.</p>
Stability on sailing vessels	<p>a) Stability under sails</p> <p>b) Effect of wind and sail</p> <p>c) Center of effort, Centre of lateral resistance, Bernoulli's Principle, Venturi Effect, sail balance, sail shape and trim, lee helm, weather helm.</p> <p>d) Aerodynamic</p> <p>e) Compliance with the stability criteria indicated in the sailing vessel stability booklet against capsizing</p> <p>f) Sail setting as per prevailing conditions, amount of sail carried with regard to wind conditions, special care with a strong stern wind, in the event of the vessel broaching or a gust on the beam.</p>

8.8 Cargo, level 1 (Examination Code: CG 1)

- 1) The examination consists of a section of descriptive, calculation and simple drawing questions and a section of multiple-choice questions.
- 2) The following open-book resources will be allowed in the examination room:
 - a) *Cargo, Fumigation and Tackle Regulations;*
 - b) *International Maritime Dangerous Goods (IMDG) Code Volume 1&2 and Supplement;*
 - c) *Safe Working Practices Regulations;*
 - d) *Transportation of Dangerous Goods Act;*
 - e) *Transportation of Dangerous Goods Regulations;*
- 3) The examination is of three hours duration.
- 4) The CG 3 or CG 2 may be substituted for CG 1 at the applicant's request.

5) The examination is based upon:

Subject	Knowledge required
Competence:	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes.
Knowledge of the effect of cargo including heavy lifts on the seaworthiness and stability of the ship	<p>Securing Cargoes Basic knowledge of the content, application and ability to use the <i>Code of Safe Practice for Cargo Stowage and Securing</i>.</p>
Knowledge of safe handling, stowage and securing of cargoes including dangerous, hazardous and harmful cargoes and their effect on the safety of life and of the ship	<p>Cargo Care <i>Inspection and preparation of holds:</i> Reasons for a general inspection of holds; List of items to be inspected; The importance of cleaning holds before loading; How to clean holds after discharge of a general cargo; The reasons for using dunnage; The types and sizes of material used for dunnage; The methods of dunnaging a hold for various cargoes and how to dispose of old dunnage; Effect of dirty dunnage on cargo; The fitting or spar ceiling and its purpose; Importance of drain wells cleanliness; How bilge suctions should be checked for efficient working scuppers and sounding pipes; How limbers and drain well covers should be treated to prevent suctions being blocked by small debris, but ensuring free drainage to the suctions.</p> <p><i>Segregation and separation of cargoes:</i> The need for the segregation of different cargoes with reference to: dangerous goods, dry cargo, wet cargo, clean cargo, dirty cargo, delicate cargo and valuable cargo; How the cargoes in the previous objective can be segregated; Methods of separating adjacent parcels of cargo; The use of port marking to segregate parcels for discharge at different ports.</p> <p><i>Ventilation and control:</i> List of factors involved in the control of sweat by ventilation; Ability to distinguish between ship's sweat and cargo sweat and the conditions in which each is experienced; The system of natural ventilation and how it should be controlled to minimize the formation of sweat; Forced ventilation and humidity control for cargo holds and the properties measured and recorded at the control panel; How to operate the ventilation system described in the previous objective; Required ventilation for the removal of heat, gases and odours; Cargoes requiring special ventilation.</p>

Subject	Knowledge required
Competence:	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes.
<p>Knowledge of safe handling, stowage and securing of cargoes including dangerous, hazardous and harmful cargoes and their effect on the safety of life and of the ship</p>	<p>Dangerous, Hazardous and Harmful Cargoes The different types of containment covered by the term “packaged form”; The classification of dangerous goods in the <i>International Maritime Dangerous Goods (IMDG) Code</i>; The properties, characteristics and physical state of the different substances, materials and articles covered by the 9 classes of the IMDG Code; The marking, labelling and placarding of dangerous goods as required by the IMDG Code and DG’s in limited quantities, e.g. schedule 18; Information that the duty officer should have on hand; Special measures to be taken when a certain dangerous cargo is handled; Measures to be taken in the event of an incident or accident; Knowledge of where to look for damage and defects most commonly encountered due to: loading and discharging, corrosion, and severe weather conditions; Actions to be taken are laid down in the <i>IMO Emergency Procedures for Ships Carrying Dangerous Goods (EmS)</i>, the <i>IMO Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG)</i> and the <i>International Medical Guide for Ships (IMGS)</i>; Procedures to be taken when any accident or incident occur during the handling of dangerous goods; Fire precautions to be taken when carrying dangerous goods; Precautions which should be taken while loading or discharging explosives; With the aid of a diagram, indicate the meaning of the following stowage and segregation requirements for the different types of ships:</p> <ol style="list-style-type: none"> a) on deck only; b) on deck or under deck; c) away from; d) separated from; e) separated by a complete compartment or hold from; f) separated longitudinally by an intervening complete compartment or hold. <p>Basic knowledge of the content, application and ability to use the <i>Transportation of Dangerous Goods Act and Regulations</i>; Knowledge of the content, application and ability to use Part 1, Section 5 – Dangerous goods (packaged) of the <i>Cargo, Fumigation and Tackle Regulations</i>.</p> <p>Cargo Handling Equipment and Safety Care and maintenance of: a) Standing rigging; b) topping lifts, cargo runners, guys and preventers – cargo blocks and topping lift blocks; c) derrick heel fittings; The rigging of derricks for loading and discharging cargo: a) using married falls and b) by single swinging derrick; How to set up guys and preventers for working with married falls; Ship’s rigging plan; Limitations and effect of angles between runners; How to change the rig from single runners to gun tackles; How to top and lower derricks safely; Means of securing derricks for sea; The precautions to take when lifting bales with hooks in the bale bands and damage caused by hooks generally; The handling of common unitized and pre-slung loads; Advantages and disadvantages of ship’s cranes and derricks for handling cargo – types of derricks – Hallen, Stullen, Thompson, Velle etc.; Precautions to be taken when fork-lift trucks or similar devices are used in the tween-decks or holds.</p>

Subject	Knowledge required
Competence:	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes.
Knowledge of safe handling, stowage and securing of cargoes including dangerous, hazardous and harmful cargoes and their effect on the safety of life and of the ship	<p>Oil tanker Piping and Pumping Arrangements</p> <p><i>Tanker Arrangement:</i> Ability to describe the crude carriers and product tankers arrangements of: a) cargo tanks; b) pump-rooms; c) segregated ballast tanks; d) slop tanks; e) cofferdams – peak tanks - deep tanks; f) accommodation; and g) ventilators leading to accommodation and machinery spaces.</p> <p><i>Cargo piping system:</i> The direct pipeline arrangement in crude carriers; The ring-main system in a product tanker; the piping arrangements in a pump-room; The system of individual deep-well pumps for a product tanker; The arrangement and use of: a) deck lines; b) drop lines; c) stripping lines; d) crossovers; e) bypasses; f) master valves; g) tank suction valves; h) sea suction valves.</p> <p><i>Cargo pumps:</i> The main operating features of centrifugal pumps; Why most cargo pumps are of centrifugal type; The main operating features of the reciprocating and screw positive-displacement pumps; The applications for which positive-displacement pumps are most suitable; How eductors work; Examples of eductors use; The conditions for which the pumps are being used such as stripping; The safe handling of chemical cargoes; The safe handling of liquefied gas cargoes; The use of ship/shore checklist; The importance of setting the right pumping rate during the loading and unloading operation.</p> <p>Precautions before entering enclosed or contaminated spaces List of potentially dangerous spaces, including: cargo spaces, cargo, fuel and ballast tanks, pump-rooms, cofferdams, duct keels, peak tanks and double bottom tanks; Procedures and precautions for entry into enclosed spaces; Authorizations required; Risk assessment before the entry into enclosed spaces, with reference to T70; Gas monitoring equipment, fixed and portable; Personnel safety equipment, clothing and personal protection; Shipboard emergency plan; Check list to obtain a permit to enter; Items on checklists; Validity of permit; Why periodical tests of the atmosphere should be made by persons working in an enclosed space; Safety checks to be repeated before re-entering a space after a break; Ventilation; Definition of TLV, TWA and STEL.</p> <p>Cargo calculations and Cargo plans Bale capacity and grain capacity; Stowage factor, broken stowage; Maximum height to which cargo of stated stowage factor can be loaded; Ullage; Use tank calibration tables and given cargo density to calculate the weight in a tank; Use tank calibration tables and given weights and densities of cargo to determine the ullages required; Determine the ullage to leave to produce a given minimum ullage after allowing for expansion of cargo; Corrects densities for temperature; Extracts information from cargo plans of general cargo ships or container ships; Draw up a cargo plan from given information; Uses a hold capacity plan to estimate the depth of cargo in a hold or the area of tween-deck required for a given cargo; Uses a capacity plan to estimate the quantity of cargo, which can be loaded in part of a tween-deck.</p>

8.9 Engineering Knowledge, level 1 (Examination Code: EK 1)

Refer to section 7.10, Chapter 7 of this TP.

8.10 Simulated Electronic Navigation – Management Level (Examination Code: SIM 2 or SIM M)

Refer to section 5.15, Chapter 5 of this TP.

8.11 Oral examination on General Seamanship (Examination Code: M500NC-O or M500-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by the appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Master 500 Gross Tonnage, Near Coastal certificate, as set out in section 8.2 of this chapter.
- 2) The examination is of an unlimited duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence:	Plan and conduct safe navigation
Routeing in accordance with the General Principles on Ships' Routeing and weather routeing	The use of pilot charts and other nautical publications such as Sailing Directions, Notices to Mariners and the like to select an optimum route, taking into account distance, wind, sea states, currents, ice, icebergs, bad visibility, the nature of the cargo, load lines, crew agreements, etc; The principles of Weather Routeing; The practical use of weather forecasts before undertaking a voyage and for decision making during the voyage; The interpretation of a synoptic chart to forecast local area weather; The characteristics of various weather systems.
Establish and maintain a Safe Navigational Watch	Principles to be observed in keeping a navigational watch as set out in the STCW Code, section A-VIII/2, including under pilotage, and watchkeeping at anchor and in port; A thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at sea, 1972 with Canadian Modifications 1983; Knowledge of the Canadian System of buoyage; ability to determine magnetic compass error and care of magnetic compass.
Competence:	Manoeuvre the ship
Knowledge of factors affecting safe manoeuvring and handling	<p>The effects of deadweight, draught, trim, speed and under keel clearance on turning circles and stopping distances:</p> <p>General manoeuvring characteristics of merchant vessels of all types; Definitions of terms: turning circle, advance, transfer, drift angle, tactical diameter, track reach, head reach and side reach; Turning circles of a ship in the loaded and ballast conditions, at different speeds; Accelerating turn and decelerating turn; Stopping distances in loaded and ballast conditions; The effect of shallow or deep water on the turning circle; Directional stability.</p> <p>Knowledge of the effects of wind and current on ship handling:</p> <p>Behaviour of the ship when engines are put astern; the pivoting point when manoeuvring with headway and with sternway; Behaviour of a ship when moving ahead or stopped with a wind from various directions; Effects of wind when making large turns, on a disabled vessel, when the ship is slowed, when making sternway; Creating a lee; The effect of current on the motion of a ship, when in rivers and narrow channels, when turning in a channel; Use of an anchor to dredge down with a current;</p>

Subject	Knowledge required
Competence:	Manoeuvre the ship
Knowledge of factors affecting safe manoeuvring and handling	<p>Knowledge of squat, shallow water and similar effects: Definition of shallow water, squat, blockage factor; Shallow water effects as: increased directional stability, a large increase in turning radius, the ship carrying her way longer and responding slowly to changes in engine speed, speed falling less during turns, squat increasing, trim changing; Effect of squat on manoeuvrability; Effect of bank suction and bank cushion in restricted waters; The squat and other shallow water effects increase as the blockage factor increase; Propeller and rudder effects on steering, including wake current, transverse thrust and screw race when going ahead and astern.</p>
Ship-Handling in various berthing, anchoring, locking situations and ice navigation	<p>The use of Fixed or controlled pitch propellers; practical berthing and unberthing of a vessel in different wind conditions and with different current prevailing; manoeuvring of twin screws; Anchoring to a single-bower anchor; anchoring to a stern anchor, mooring to two anchors; mooring to a buoy; turning a vessel short round; The use of tugs in manoeuvring; Locking and unlocking a vessel; Awareness of the Seaway Practices and Procedures contained in the Seaway Handbook; handling a disabled ship; Procedures in ice, alone or in convoy, and movements to be expected by an ice breaker with reference to Transport Canada publication <i>Ice Navigation in Canadian Waters</i>. Methods of freeing a vessel from ice utilizing pumping of tanks or flume system.</p>
Proper procedures for anchoring and mooring	<p>Preparation of anchors to be ready for use; The approach to an anchorage; The use of anchor buoys; Safety measures to be taken by the anchor party; Method of letting go; Fittings and cable markings; Communication with the bridge; Anchoring in water too deep to let the anchor go on the brake; Securing of anchors on the completion of anchoring; Preparation and procedures during heaving up; Securing anchor gear in preparation for sea passage; Use, care and stowage of mooring lines, types of line used for mooring and their characteristics; Names of the various mooring lines and orders; Preparation to be made for berthing alongside, including head ropes, stern ropes, breast ropes, springs, stopper, heaving lines, winches, self-tensioning winches, capstan, windlass, wire rope; Making fast on-shore bollards being used by another ship; Use of mooring on the bight and doubling up; Use, handling and securing of towing wires; Handling and securing of insurance wires; Use of lines in securing a vessel and in warping alongside a berth; Use of lines in a lock or lay-by; How to make fast tugs on towing hawsers or lashed up alongside; Methods of mooring to a buoy; Use of a messenger to pass on a wire or chain to a buoy;</p>
Normal and emergency towing operations	<p>Practical knowledge of normal and emergency towing and in particular of the following elements: Taking and being taken in tow; Cables used for towing and the required length; The towing point; Towing bits and hooks; How to approach a vessel to be towed and pass the first connection by line-throwing apparatus or other methods; How to pay out the towing wire under control; Methods of securing the towing wire at the towing ship; How the towing wire should be protected from chafing at fairleads; How to take the weight of the tow; How the towing speed should be decided; The effect of the towing cable on the centre of gravity of the tug and on its stability; Events that may result in the capsizing of the tug; The different ways to instantly release the towing cable in an urgent situation; The use of an emergency tow line; How to disconnect the tow on arrival at the destination.</p>

Subject	Knowledge required
Competence:	Response to emergencies
Knowledge and understanding of the precautions for the protection and safety of passengers in emergency situations	<p>Contingency plans for response to emergencies</p> <p>Knowledge of the content of a muster list and emergency instructions; Division of the crew into command team, an emergency team, a back-up emergency team and an engine-room emergency team; Knowledge of the composition of emergency teams; Good communications between the command team and the emergency team are essential; Duties of the crew members not assigned to emergency teams; Action to be taken to deal with fire in specific areas, rescue of victims of a gassing accident in an enclosed space, heavy weather damage, rescue of survivors from another ship or the sea, leakage and spills of dangerous cargo, stranding and abandon ship; The importance of drills and practices.</p>
Knowledge and understanding of the initial action to be taken following a collision or grounding: initial damage assessment and control	<p>Protection and safety of passengers</p> <p>Familiarization of Crew members with their specific duties for the mustering and control of passengers; Knowledge of the specific duties to assign to crew members; Content of the pre-departure safety briefing to passengers; the need to communicate effectively with passengers during an emergency.</p> <p>Precautions to be taken when beaching; Actions to be taken on stranding; Actions to be taken following a collision; Actions to be taken after an accidental flooding; Means of limiting damage and salvaging the ship following a fire or explosion; Procedures for abandoning ship.</p>
Respond to a distress signal at sea and procedures to be followed for rescuing persons from the sea, assisting a ship in distress, responding to emergencies which arise in port	<p>Rescue of persons from a vessel in distress from a wreck or from the sea; Measures for assisting a vessel in distress; sources of medical assistance and information.</p> <p>Emergencies in port</p> <p>Actions, which can be taken when emergencies arise in port; action on discovery of fire aboard or ashore, fire alarms ashore; precautions when taking on or transferring fuel, water or stores; action to be taken in event of excessive ranging, parted moorings, burst oil lines, tank overflows, striking by another vessel, taking bottom, leakage and spills of dangerous cargo</p>
Emergency steering	<p>Arrangements of auxiliary steering gear; How the auxiliary steering gear is brought into action; How to change from bridge control to local control in the steering gear compartment; Possible course of action which may be taken by a disabled ship; Methods of securing the rudder in the event of a broken rudder stock; Jury steering arrangement using materials normally found aboard ship; Means of constructing a jury rudder, where practicable.</p>
Competence:	Respond to a distress signal at sea
Knowledge of the contents of the IMO International Aeronautical and Maritime Search and Rescue manual (IAMSAR)	<p>Search and Rescue</p> <p>Knowledge and understanding of the content and application of the <i>IMO International Aeronautical and Maritime Search and Rescue manual (IAMSAR)</i>.</p>
Competence:	Ensure compliance with pollution-prevention requirements
Ensure compliance with pollution-prevention requirements	<p>Precautions to be taken to prevent pollution of the marine environment as required by the MARPOL convention, including Restricted Areas and the disposal of pollutants; Take appropriate action in response to pollution incidents onboard and found at sea; Knowledge of the contents of the SOPEP manual, Garbage Management Plans and anti-pollution equipment; Master's duties, obligations and liabilities, including the keeping of records.</p>

Subject	Knowledge required
Competence:	Maintain seaworthiness of the ship
Seaworthiness of the ship	Precautions to be taken before the onset of heavy weather, management of small ships in heavy weather; Understand the fundamentals of watertight integrity; Preparation for dry-docking and undocking, with and without cargo / damage – general procedure and precautions to be observed; Working knowledge of stability and trim information.
Competence:	Monitor compliance with legislative requirements
Monitor compliance with legislative requirements and measures to ensure safety of life at sea	Master's duties on taking over and relinquishing command; Preparation of the vessel for inspection and surveys; Knowledge of master's / ship's responsibilities under the Marine Personnel Regulations; knowledge and application of the Marine Occupational Safety and Health Regulations; Basic Knowledge of the international convention on safety of life at sea (SOLAS); the requirements of the CSA and Marine Personnel Regulations concerning crew agreements, the official log book and compulsory entries, inspection of living quarters and storerooms, complaints procedure; The master's obligation with regard to initial and subsequent reports to be made in case of a marine occurrence; The requirements of the regulations concerning life-saving and fire-fighting appliances; Application of hours of work and rest legislation; Navigation Safety Regulations relating to danger messages; A knowledge of the master's obligations with respect to pilotage; Purpose and application of the International Safety Management (ISM) Code; Purpose of Flag State and Port State control.

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General

9.1 General requirements

The general requirements for a certificate as Master 3000 gross tonnage, domestic, are listed in section 127 of the *Marine Personnel Regulations*.

9.2 Validity of certificates

The holder of this certificate may act as Master on board a vessel of not more than 3000 gross tonnage engaged on a limited voyage, contiguous waters, as Master on board a vessel of not more than 3000 gross tonnage engaged on a near coastal, class 2 voyage and as Master of a vessel of any tonnage engaged on a sheltered waters voyage.

Syllabuses of Examinations

9.3 Communications, level 1 (Examination Code: COM 1)

Refer to section 5.3, Chapter 5 of this TP.

9.4 Communications, level 2 (Examination Code: COM 2)

Refer to section 5.4, Chapter 5 of this TP.

9.5 Navigation Safety, level 2 (Examination Code: NS 2)

Refer to section 5.7, Chapter 5 of this TP.

9.6 Meteorology, level 2 (Examination Code: MET 2)

Refer to section 5.8, Chapter 5 of this TP.

9.7 Ship Management, level 3 (Examination Code: SM 3)

Refer to section 5.9, Chapter 5 of this TP.

9.8 Ship Construction and stability, level 4 (Examination Code: SCS 4)

Refer to section 5.11, Chapter 5 of this TP.

9.9 Cargo, level 2 (Examination Code: CG 2)

Refer to section 7.9, Chapter 7 of this TP.

9.10 Engineering Knowledge, level 1 (Examination Code: EK 1)

Refer to section 7.10, Chapter 7 of this TP.

9.11 Simulated Electronic Navigation – Management level (Examination Code: SIM II or SIM M)

Refer to section 5.15, Chapter 5 of this TP.

9.12 Oral examination on General Seamanship (Examination Code: M3000D-O) (Also, please refer section 2.11 of Chapter 2) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by the appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Master 3000 gross tonnage, Domestic as set out in section 9.2 of this chapter.
- 2) The examination is of an unlimited duration.
- 3) The M3000NCO may be substituted for M3000D-O at the applicant's request.

4) The examination is based upon:

Subject	Knowledge required
Competence:	Plan and conduct safe navigation
Routeing in accordance with the General Principles on Ships' Routeing and weather routeing	The use of pilot charts and other nautical publications such as Sailing Directions, Notices to Mariners and the like to select an optimum route, taking into account distance, wind, sea states, currents, ice, icebergs, bad visibility, the nature of the cargo, load lines, crew agreements, etc; The principles of Weather Routeing; The practical use of weather forecasts before undertaking a voyage and for decision making during the voyage; The interpretation of a synoptic chart to forecast local area weather; The characteristics of various weather systems.
Establish and maintain a Safe Navigational Watch	Principles to be observed in keeping a navigational watch as set out in the STCW Code, section A-VIII/2, including under pilotage, and watchkeeping at anchor and in port; A thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at sea, 1972 with Canadian Modifications 1983; Knowledge of the Canadian System of buoyage; ability to determine magnetic compass error and care of magnetic compass.
Competence:	Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment
Knowledge of international maritime law embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions	Certificates and other documents Certificates and other documents required to be carried on board ships by International Conventions and their period of validity; Certificates and documents required to be carried on board domestic vessels and their periods of validity.
Monitor compliance with legislative requirements and measures to ensure safety of life at sea	All aspects involved in taking command of a vessel, or changing over command of a vessel; Preparation of the vessel for inspection and surveys; Knowledge of master's / ship's responsibilities under the Marine Personnel Regulations; the validity of certificates of competency and endorsements; knowledge and application of the Marine Occupational Safety and Health Regulations; the requirements of the CSA and Marine Personnel Regulations concerning crew agreements, the official log book and compulsory entries, inspection of living quarters and storerooms, complaints procedure; The master's obligation with regard to initial and subsequent reports to be made in case of a marine occurrence; The requirements of the regulations concerning life-saving and fire-fighting appliances; Application of hours of work and rest legislation; Navigation Safety Regulations relating to danger messages; A knowledge of the master's obligations with respect to pilotage.
Competence:	Manoeuvre and handle a ship in all conditions
Manoeuvre and handle a ship in all conditions including: Normal and emergency towing operations	Factors affecting safe manoeuvring and handling Ability to determine the manoeuvring and propulsion characteristics of common types of ships with special reference to stopping distances and turning circles at various draughts and speeds; The effects of deadweight, draught, trim, speed and under keel clearance on turning circles and stopping distances; Knowledge of the effects of wind and current on ship handling; Behaviour of the ship when engines are put astern; Behaviour of a ship when moving ahead or stopped with a wind from various directions; Propeller and rudder effects on steering, including wake current, transverse thrust and screw race when going ahead and astern.
Competence:	Manoeuvre and handle a ship in all conditions

Subject	Knowledge required
<p>Manoeuvre and handle a ship in all conditions including:</p> <p>Normal and emergency towing operations</p>	<p>Confined and shallow waters</p> <p>Manoeuvres when approaching pilot stations and embarking or disembarking pilots, with due regard to weather, tide, headreach and stopping distances; Handling ship in rivers, estuaries and restricted waters, having regard to the effects of current, wind and restricted water on helm response; Definition of shallow water, squat, blockage factor; Manoeuvring in shallow water, including the reduction in under keel clearance caused by squat, rolling and pitching; Interaction between passing ships and between own ship and nearby banks (canal effect); Effect of bank suction and bank cushion in restricted waters; Importance of navigating at reduced speed to avoid damage caused by own ship's bow wave and stern wave.</p> <p>Berthing and unberthing</p> <p>Use of propulsion and manoeuvring systems; Practical berthing and unberthing under various conditions of wind, tide and current with and without tugs; Ship and tug interaction; How to make fast tugs on towing hawsers or lashed up alongside; Turning a vessel short round; Preparation to be made for berthing alongside, including head ropes, stern ropes, breast ropes, springs, stopper, heaving lines, winches, self-tensioning winches, capstan, windlass, wire rope; Making fast on-shore bollards being used by another ship; Use of mooring on the bight and doubling up; Methods of mooring to a buoy.</p> <p>Anchoring</p> <p>Choice of and approach to an anchorage; Anchoring with one or two anchors in limited anchorages and factors involved in determining the length of anchor cable to be used; Anchoring to a stern anchor; Method of letting go; Anchoring in water too deep to let the anchor go on the brake; Preparation and procedures during heaving up; Dragging anchor; clearing fouled anchors.</p> <p>Dry-docking: Preparation for and manoeuvres for dry-docking, both with and without damage.</p> <p>Heavy weather and rescue operations</p> <p>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; precautions in manoeuvring to launch rescue boats or survival craft in bad weather; methods of taking on board survivors from rescue boats and survival craft; handling a disabled ship.</p> <p>Ice navigation</p> <p>Practical measures to be taken when navigating in or near ice or in conditions of ice accumulation on board; Procedures in ice, alone or in convoy, and movements to be expected by an ice breaker with reference to Transport Canada publication <i>Ice Navigation in Canadian Waters</i>; Methods of freeing a vessel from ice utilizing pumping of tanks or flume system.</p>

Subject	Knowledge required
Competence:	Manoeuvre and handle a ship in all conditions
Normal and emergency towing operations	<p>Seaway, canal navigation and locks</p> <p>Locking and unlocking a vessel; Use of lines in securing a vessel and in warping alongside a berth; Use of lines in a lock or lay-by; Seaway Practices and Procedures contained in the Seaway Handbook</p> <p>Practical knowledge of normal and emergency towing and in particular of the following elements:</p> <p>Taking and being taken in tow; Cables used for towing and the required length; The towing point; Towing bits and hooks; How to approach a vessel to be towed and pass the first connection by line-throwing apparatus or other methods; How to pay out the towing wire under control; Methods of securing the towing wire at the towing ship; How the towing wire should be protected from chafing at fairleads; How to take the weight of the tow; How the towing speed should be decided; The effect of the towing cable on the centre of gravity of the tug and on its stability; Events that may result in the capsizing of the tug; The different ways to instantly release the towing cable in an urgent situation; The use of an emergency tow line; How to disconnect the tow on arrival at the destination.</p>
Competence:	Respond to navigational emergencies
Action to be taken if grounding is imminent, and after grounding	Actions to be taken if grounding is imminent; Duties of the master following a grounding; Actions to be taken following grounding.
Refloating a grounded ship with and without assistance	Measures which can be taken to prevent further damage to the ship and to assist with subsequent refloating; How ballast or other weights may be moved, taken on or discharged to assist refloating; how a ship can be stabilized to prevent movement during unloading operations; The use of ground tackle for hauling off; Ways in which tugs may be used to assist in refloating; The use of the main engine in attempting to refloat and the danger of building up silt from its use.
Action to be taken if collision is imminent and following a collision or impairment of the watertight integrity of the hull by any cause	Action to be taken if collision is imminent; Duties of the master following a collision; actions to be taken following a collision or impairment of the watertight integrity of the hull by any cause.
Assessment of damage control	Ability to determine damage to own ship; Measures to attempt to limit damage and salvage own ship.
Emergency steering	<p>Arrangements of auxiliary steering gear; How the auxiliary steering gear is brought into action;</p> <p>How to change from bridge control to local control in the steering gear compartment;</p> <p>Possible course of action which may be taken by a disabled ship; Methods of securing the rudder in the event of a broken rudder stock; Jury steering arrangement using materials normally found aboard ship; Means of constructing a jury rudder, where practicable.</p>

Subject	Knowledge required
Competence:	Ensure compliance with pollution-prevention requirements
Ensure compliance with pollution-prevention requirements	Precautions to be taken to prevent pollution of the marine environment as required by the MARPOL convention, including Restricted Areas and the disposal of pollutants; Take appropriate action in response to pollution incidents onboard and found at sea; Knowledge of the contents of the SOPEP manual, Garbage Management Plans and anti-pollution equipment; Master's duties, obligations and liabilities, including the keeping of records.
Competence:	Organize and manage the provision of medical care on board
<p>A thorough knowledge of the use and contents of the following publications:</p> <p><i>International Medical Guide for Ships</i> or equivalent national publications</p> <p>Medical section of the International Code of Signals</p> <p><i>Medical First Aid Guide for Use in Accidents Involving Dangerous Goods</i></p>	<p>International Medical Guide for Ships Ability to describe the content and application of the publication; Ability to extract and apply information for given situation.</p> <p>International Code of Signals (Medical Section) Ability to describe the content and application of the publication; Ability to construct and interpret messages.</p> <p>Medical First Aid Guide for use in Accidents involving Dangerous Goods Ability to describe the content and application of the publication; Ability to extract and apply information for given situations.</p>
Competence:	Co-ordinate search and rescue operations
<p>A thorough knowledge of and ability to apply the procedures contained in the IMO International Aeronautical and Maritime Search and Rescue manual (IAMSAR)</p>	<p>Demonstrate a knowledge and understanding of the procedures contained in IMO <i>International Aeronautical and Maritime Search and Rescue manual (IAMSAR)</i>.</p>
Competence:	Maintain safety and security of the ship's crew and passengers
<p>Actions to be taken to protect and safeguard all persons on board in emergencies</p>	<p>Crew members will be assigned specific duties for mustering and control of passengers, list those duties; Rescue of persons from a vessel in distress or from a wreck; Man-overboard procedures.</p>
<p>Actions to limit damage and save the ship following a fire, explosion, collision or grounding</p>	<p>Means of limiting damage and salvaging the ship following a fire or explosion; Procedure for abandoning ship.</p>

Subject	Knowledge required
Competence:	Develop emergency and damage control plans and handle emergency situations
Preparation of contingency plans for response to emergencies	<p>Contingency plans for response to emergencies</p> <p>Ability to draw up a muster list and emergency instructions for a given crew and type of ship;</p> <p>Ability to assign duties for the operation of remote controls; The division of the crew into a command team, an emergency team, a back-up emergency team and an engine-room emergency team; Ability to designate muster positions for the command team and emergency team, both at sea and in port; Ability to draw up plans to deal with fire in specific areas, rescue of victims of a gassing accident in an enclosed space, heavy weather damage, rescue of survivors from another ship or from the sea, leakages and spills of dangerous cargo, stranding and abandoning ship.</p> <p>Actions to be taken when emergencies arise in port</p> <p>Actions to take in the event of fire on own ship; Action which should be taken when fire occurs on nearby ship or an adjacent port facility; The circumstances in which a ship should put to sea for reasons of safety; The actions which can be taken to avoid a ship dragging anchor towards own ship in an anchorage; The actions and precautions to take when a submarine cable is lifted by the anchor; How to buoy and slip an anchor; How an anchor can be recovered when no power is available at the windlass.</p>
Competence:	Cargo Handling and Stowage
Cargo Handling, Stowage, Securing and Care	The safe working practices and procedures in relation to Cargo Handling, Stowage, Securing and Care.

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General**10.1 General requirements**

The general requirements for a certificate as Master 500 gross tonnage, Domestic, are listed in section 128 of the *Marine Personnel Regulations*.

10.2 Validity of certificates

- 1) The holder of this certificate may act as Master on board a vessel of not more than 500 gross tonnage engaged on a near coastal voyage, Class 2, as Chief Mate on board a vessel of not more than 3000 gross tonnage engaged on a near coastal voyage, Class 2 and as Master on board a vessel of not more than 3000 gross tonnage engaged on a sheltered waters voyage.
- 2) In addition, the holder of this certificate may act as:
 - a) Master on board a vessel of not more than 500 gross tonnage and as Chief Mate on board a vessel of not more than 3000 gross tonnage, engaged on a limited voyage, contiguous waters, if endorsed as such.
 - b) To obtain the limited voyage, contiguous waters endorsement in respect to the Master 500 gross tonnage, Domestic certificate, the holder must meet the requirements of section 128 (2) of the *Marine Personnel Regulations*.

Syllabuses of Examinations**10.3 Communications, level 1 (Examination Code: COM 1)**

Refer to section 5.3, Chapter 5 of this TP.

10.4 Meteorology, level 1 (Examination Code: MET 1)

Refer to section 8.5, Chapter 8 of this TP.

10.5 Ship Management, level 2 (Examination Code: SM 2)

Refer to section 8.6, Chapter 8 of this TP.

10.6 Ship Construction and Stability, level 3 (Examination Code SCS 3)

Refer to section 8.7, Chapter 8 of this TP.

10.7 Cargo, level 1 (Examination Code: CG 1)

Refer to section 8.8, Chapter 8 of this TP.

10.8 Engineering Knowledge, level 1 (Examination Code: EK 1)

Refer to section 7.10, Chapter 7 of this TP.

10.9 Simulated Electronic Navigation – Management Level (Examination Code: SIM II or SIM M)

Refer to section 5.15, Chapter 5 of this TP.

10.10 Oral examination on General Seamanship (Examination Code: M500D-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by the appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Master 500 Gross Tonnage, Domestic certificate, as set out in section 10.2 of this chapter.
- 2) The examination is of an unlimited duration.
- 3) The M500NC-O may be substituted for M500D-O at the applicant's request.

4) The examination is based upon:

Subject	Knowledge required
Competence:	Plan and conduct safe navigation
Routeing in accordance with the General Principles on Ships' Routeing and weather routeing	Select an optimum route, taking into account distance, wind, sea states, currents, ice, icebergs, bad visibility, the nature of the cargo, etc; The principles of Weather Routeing; The practical use of weather forecasts before undertaking a voyage and for decision making during the voyage.
Establish and maintain a Safe Navigational Watch	Principles to be observed in keeping a navigational watch as set out in the STCW Code, section A-VIII/2, including under pilotage, and watchkeeping at anchor and in port; A thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at sea, 1972 with Canadian Modifications 1983; Knowledge of the Canadian System of buoyage; ability to determine magnetic compass error and care of magnetic compass.
Competence:	Manoeuvre the ship
Knowledge of factors affecting safe manoeuvring and handling	<p>The effects of deadweight, draught, trim, speed and under keel clearance on turning circles and stopping distances:</p> <p>General manoeuvring characteristics of merchant vessels of all types; Definitions of terms: turning circle, advance, transfer, drift angle, tactical diameter, track reach, head reach and side reach; Turning circles of a ship in the loaded and ballast conditions, at different speeds; Accelerating turn and decelerating turn; Stopping distances in loaded and ballast conditions; The effect of shallow or deep water on the turning circle; Directional stability.</p> <p>Knowledge of the effects of wind and current on ship handling:</p> <p>Behaviour of the ship when engines are put astern; the pivoting point when manoeuvring with headway and with sternway; Behaviour of a ship when moving ahead or stopped with a wind from various directions; Effects of wind when making large turns, on a disabled vessel, when the ship is slowed, when making sternway; Creating a lee; The effect of current on the motion of a ship, when in rivers and narrow channels, when turning in a channel; Use of an anchor to dredge down with a current.</p> <p>Knowledge of squat, shallow water and similar effects:</p> <p>Definition of shallow water, squat, blockage factor; Shallow water effects as: increased directional stability, a large increase in turning radius, the ship carrying her way longer and responding slowly to changes in engine speed, speed falling less during turns, squat increasing, trim changing; Effect of squat on manoeuvrability; Effect of bank suction and bank cushion in restricted waters; The squat and other shallow water effects increase as the blockage factor increase; Propeller and rudder effects on steering, including wake current, transverse thrust and screw race when going ahead and astern.</p>
Ship-Handling in various berthing, anchoring, locking situations and ice navigation	The use of Fixed or controlled pitch propellers; practical berthing and unberthing of a vessel in different wind conditions and with different current prevailing; manoeuvring of twin screws; Anchoring to a single-bower anchor; anchoring to a stern anchor, mooring to two anchors; mooring to a buoy; turning a vessel short round; The use of tugs in manoeuvring; Locking and unlocking a vessel; Awareness of the Seaway Practices and Procedures contained in the Seaway Handbook; handling a disabled ship; Procedures in ice, alone or in convoy, and movements to be expected by an ice breaker with reference to Transport Canada publication Ice Navigation in Canadian Waters; Methods of freeing a vessel from ice utilizing pumping of tanks or flume system.

Subject	Knowledge required
Competence:	Manoeuvre the ship
Proper procedures for anchoring and mooring	Preparation of anchors to be ready for use; The approach to an anchorage; The use of anchor buoys; Safety measures to be taken by the anchor party; Method of letting go; Fittings and cable markings; Communication with the bridge; Anchoring in water too deep to let the anchor go on the brake; Securing of anchors on the completion of anchoring; Preparation and procedures during heaving up; Securing anchor gear in preparation for sea passage; Use, care and stowage of mooring lines, types of line used for mooring and their characteristics; Names of the various mooring lines and orders; Preparation to be made for berthing alongside, including head ropes, stern ropes, breast ropes, springs, stopper, heaving lines, winches, self-tensioning winches, capstan, windlass, wire rope; Making fast on-shore bollards being used by another ship; Use of mooring on the bight and doubling up; Use, handling and securing of towing wires; Handling and securing of insurance wires; Use of lines in securing a vessel and in warping alongside a berth; Use of lines in a lock or lay-by; How to make fast tugs on towing hawsers or lashed up alongside; Methods of mooring to a buoy; Use of a messenger to pass on a wire or chain to a buoy.
Normal and emergency towing operations	Practical knowledge of normal and emergency towing and in particular of the following elements: Taking and being taken in tow; Cables used for towing and the required length; The towing point; Towing bits and hooks; How to approach a vessel to be towed and pass the first connection by line-throwing apparatus or other methods; How to pay out the towing wire under control; Methods of securing the towing wire at the towing ship; How the towing wire should be protected from chafing at fairleads; How to take the weight of the tow; How the towing speed should be decided; The effect of the towing cable on the centre of gravity of the tug and on its stability; Events that may result in the capsizing of the tug; The different ways to instantly release the towing cable in an urgent situation; The use of an emergency tow line; How to disconnect the tow on arrival at the destination.
Competence:	Response to emergencies
Knowledge and understanding of the precautions for the protection and safety of passengers in emergency situations	Contingency plans for response to emergencies Knowledge of the content of a muster list and emergency instructions; Division of the crew into command team, an emergency team, a back-up emergency team and an engine-room emergency team; Knowledge of the composition of emergency teams; Good communications between the command team and the emergency team are essential; Duties of the crew members not assigned to emergency teams; Action to be taken to deal with fire in specific areas, rescue of victims of a gassing accident in an enclosed space, heavy weather damage, rescue of survivors from another ship or the sea, leakage and spills of dangerous cargo, stranding and abandon ship; The importance of drills and practices. Protection and safety of passengers Familiarization of Crew members with their specific duties for the mustering and control of passengers; Knowledge of the specific duties to assign to crew members; Content of the pre-departure safety briefing to passengers; the need to communicate effectively with passengers during an emergency.

Subject	Knowledge required
Competence:	Response to emergencies
Knowledge and understanding of the initial action to be taken following a collision or grounding; initial damage assessment and control	Precautions to be taken when beaching; Actions to be taken on stranding; Actions to be taken following a collision; Actions to be taken after an accidental flooding; Means of limiting damage and salvaging the ship following a fire or explosion; Procedures for abandoning ship.
Respond to a distress signal at sea and procedures to be followed for rescuing persons from the sea, assisting a ship in distress, responding to emergencies which arise in port	Rescue of persons from a vessel in distress, from a wreck or from the sea; Measures for assisting a vessel in distress; sources of medical assistance and information. Emergencies in port Actions, which can be taken when emergencies arise in port; action on discovery of fire aboard or ashore, fire alarms ashore; precautions when taking on or transferring fuel, water or stores; action to be taken in event of excessive ranging, parted moorings, burst oil lines, tank overflows, striking by another vessel, taking bottom, leakage and spills of dangerous cargo.
Emergency steering	Arrangements of auxiliary steering gear; How the auxiliary steering gear is brought into action; How to change from bridge control to local control in the steering gear compartment; Possible course of action which may be taken by a disabled ship; Methods of securing the rudder in the event of a broken rudder stock; Jury steering arrangement using materials normally found aboard ship; Means of constructing a jury rudder, where practicable.
Competence:	Respond to a distress signal at sea
Knowledge of the contents of the IMO International Aeronautical and Maritime Search and Rescue manual (IAMSAR)	Search and Rescue Knowledge and understanding of the content and application of the IMO <i>International Aeronautical and Maritime Search and Rescue manual (IAMSAR)</i> .
Competence:	Ensure compliance with pollution-prevention requirements
Ensure compliance with pollution-prevention requirements	Precautions to be taken to prevent pollution of the marine environment; Take appropriate action in response to pollution incidents onboard and found at sea; Knowledge of the contents of the SOPEP manual and anti-pollution equipment; Master's duties, obligations and liabilities, including the keeping of records.
Competence:	Maintain Seaworthiness of the ship
Seaworthiness of the ship	Precautions to be taken before the onset of heavy weather, management of small ships in heavy weather; Understand the fundamentals of watertight integrity; Preparation for dry-docking and undocking, with and without cargo / damage – general procedure and precautions to be observed; Working knowledge of stability and trim information.

Subject	Knowledge required
Competence:	Monitor compliance with legislative requirements
Monitor compliance with legislative requirements and measures to ensure safety of life at sea	Master's duties on taking over and relinquishing command; Preparation of the vessel for inspection and surveys; Knowledge of master's / ship's responsibilities under the Marine Personnel Regulations; knowledge and application of the Marine Occupational Safety and Health Regulations; Basic Knowledge of the requirements of the CSA and Marine Personnel Regulations concerning crew agreements, the official log book and compulsory entries, inspection of living quarters and storerooms, complaints procedure; The master's obligation with regard to initial and subsequent reports to be made in case of a marine occurrence; The requirements of the regulations concerning life-saving and fire-fighting appliances; Application of hours of work and rest legislation; Navigation Safety Regulations relating to danger messages; A knowledge of the master's obligations with respect to pilotage.

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General

11.1 General requirements

The general requirements for a certificate as Master 150 gross tonnage, Domestic, are listed in section 129 of the *Marine Personnel Regulations*.

11.2 Validity of certificates

- 1) The holder of this certificate may act as Master on board a vessel of not more than 150 gross tonnage engaged on a near coastal voyage, Class 2 and as Master on board a vessel of not more than 500 gross tonnage engaged on a sheltered waters voyage.
- 2) In addition, the holder of this certificate may act as Master on board a vessel of not more than 150 gross tonnage engaged on a limited voyage, contiguous waters, if endorsed as such.
- 3) To obtain a limited voyage, contiguous waters endorsement in respect to the Master 150 gross tonnage, Domestic certificate, the holder must meet the requirements of section 129 (2) of the *Marine Personnel Regulations*.

Syllabuses of Examinations

11.3 Chartwork & Pilotage, level 2 (Examination Code: C/P 2)

- 1) The examination consists of:
 - a) A practical chartwork paper; and
 - b) A multiple-choice examination.
- 2) The examination is of a three hours duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
Ability to determine the ship's position by use of: landmarks; aids to navigation, including lighthouses, beacons and buoys; dead reckoning, taking into account winds, tides, currents and estimated speed	<p>Definitions and Datums – Earth</p> <p>Definition of great circles, small circle, spherical angle, spherical triangle, poles of a great circle;</p> <p>Definition of earth's poles, equator and meridians; Definition of latitude and parallels of latitude, prime meridian and longitude; Definition of difference of latitude, and difference of longitude;</p> <p>Definition of international nautical mile, cable and knot; The earth as an ellipsoid; Definition of compression, and state its value; Definition of directions on the earth's surface; The direction of the ship's head on a gyro-compass (gyro course); The direction of the ship's head on a magnetic compass (compass course); The North American Datum of 1983 (NAD83) and the Geodetic Reference System of 1980.</p>

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
<p>Ability to determine the ship's position by use of: landmarks; aids to navigation, including lighthouses, beacons and buoys; dead reckoning, taking into account winds, tides, currents and estimated speed</p>	<p>Position lines and position fixing Definition of position; Ability to fix the ship's position by means at the disposal of the OOW, including electronic navigational aids; Considerations to be taken into account, including errors and limitations of equipment; the correction and plotting of bearings taken visually or by radar and the limitations of accuracy inherent in each of these methods; Given the radar distance of a charted object, ability to plot the position circle on a chart; Ability to plot a position on the chart from simultaneous cross bearings and from a bearing and distance off; Definition of dead reckoning position (DR), estimated position and fixed position; Ability to plot a dead reckoning position on the chart; Ability to plot an estimated position on the chart; Ability to plot position lines – straight line, circle, hyperbola; Ability to find a position line by bearing, horizontal angle, vertical sextant angle, transit line and radio aids; Ability to determine a position by a combination of bearing distance and the methods in the above objective; Ability to find a position by simultaneous bearings of two objects; Ability to find the distance that the ship will pass off a given point when abeam; Ability to construct a position line to clear a navigational danger by a given distance.</p> <p>Courses and distances Definition of course and distance; Ability to convert true courses laid-off to magnetic courses, including determination of variation at any place; conversion of true courses to gyro, magnetic and compass courses and vice versa; determining the up-to-date value of variation and interpolating for variation at a given locality from isogonic lines or compass roses; use of transit lines, azimuth and amplitude to determine compass error; Ability to lay off true course between two positions; Ability to find the distance between two positions; Knowledge of distance measurement on nautical chart.</p> <p>Effect of wind and current Ability to calculate the speed between two positions; Definition of set, rates, drift and leeway due to wind; Definition of ship's speed, effective speed, course and distance made good, applied leeway; The allowing for effects of wind and tide; the problem of combining vectors of wind, current, tidal effect and course to steer to arrive at course made good; Ability to find the course and distance made good with a tidal stream or current; Ability to find the course to steer, allowing for tidal stream or current; Ability to find the set and rate of tidal stream or current; Ability to find the set and rate of tidal current that may be expected at a given point from information given in tide and current table or on the chart and awareness of the possibly of a significant effect of weather on the reliability of the information so obtained ; Explain the term running fix and use the method to plot a position; Ability to find positions by running fix in a tidal stream or current</p> <p>Theory of Tides. Definition of tidal terms in common use in CHS and United States tide tables as spring tide, neap tide, height of tide, high water, low water, mean high water springs, mean high water neaps, mean low water springs, mean low water neaps, range, chart datum; General understanding of tidal phenomena necessary for the comprehension of tidal terms; The methods of predicting tides; The non-astronomical component of sea level; Other irregularities of the tide.</p>

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
Knowledge of principles of construction of the different types of charts and their use	<p>Charts construction and projections Basic knowledge of chart projections; Definition of natural scale of a chart; large scale charts show a small area in greater detail than small-scale charts; numbering and mode of presentation of information on charts; the cause of chart distortion; The requirements for a chart appropriate for marine navigation; The principles of construction, properties and limitations of the Mercator chart; Ability to classify chart projections by construction methods, properties and characteristics; The values, limitations and purposes in practical navigation of conformal (orthomorphic), Gnomonic, Polyconic, Mercator, Transverse Mercator projections and the Universal Transverse Mercator System; Reliability of charts; indications by which reliability may be judged (e.g., date of original survey and possibility of subsequent surveys, adequacy of recorded soundings, with corrections having been made to date); ECDIS and other electronic chart systems meeting IMO performance standards may substitute for traditional charts.</p>
Thorough knowledge of and ability to use navigational charts	<p>Chart Usage Ability to use charts of various projections in common use and produced by the Canadian Hydrographic Service, including Mercator, Polyconic and gnomonic charts; the use of charts in the practice of coastal navigation and on ocean passages; the transfer of positions from a chart of one projection to another of a different projection; care and upkeep of charts; Ability to make chart corrections; The replacement of superseded editions; possessing and using latest available charts and publications, including large-scale charts of the pilotage area duly corrected to date; chart catalogues and numbering.</p> <p>Information from charts Ability to recognize and to demonstrate the use of the symbols and abbreviations on a chart, especially lighthouses, buoys, beacons, radio beacons and other navigational marks; Ability to identify the characteristics and range of lights; Ability to recognize coastlines, coast and radar-responsive targets; Ability to interpret coastline contours, bottom topography, depths and nature of bottom; Ability to use the tidal information given on a chart; Ability to recognize traffic lanes and separation zones; Ability to recognize the different type of charts overlaid with lattice charts; Ability to use lattice charts; The danger of placing implicit reliance upon floating navigational aids; The danger of approaching navigational aids too closely; Demonstrate simple passage planning and execution; The use of clearing marks and horizontal and vertical danger angles; Ability to recognize suitable passages, approaches and anchorages in clear weather and thick weather, using radar-responsive targets.</p>
Keeping a log	<p>Knowledge of the record of navigational activities and incidents to be kept in accordance with the SOLAS Convention and the Navigation Safety Regulations; common practice regarding keeping a log; Knowledge of the proper keeping of different kinds of log during ocean passages, coastal navigation and in port; the duty of the OOW to maintain an accurate log.</p>

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
<p>Thorough knowledge of and ability to use up-to-date publications</p>	<p>Sailing directions Familiarity with the contents of preface to Sailing Directions, the important general navigational information contained in the preamble and opening chapter of these volumes.</p> <p>Tide tables Ability to calculate tides and heights and low water at reference and secondary ports, and the calculation of depth of water at those times; Use of the calculated depth of water at high and low water to determine the height of water at a given charted position; Ability to determine the predicted time for a given tide level; Ability to estimate set and rate of tidal currents by reference to tidal current tables and by actual observation; The tentative nature of tabulated tidal current values and the need for caution in using them; The use of tidal stream charts; The zero level of the charts.</p> <p>Charts and Nautical Publications Regulations General knowledge of the Charts and Nautical Publications Regulations.</p> <p>Monthly Notices to Mariners and Annual Edition of Notices to Mariners: Familiarity with the contents; Correction of charts and publications; The importance of chart corrections being kept up to date.</p> <p>Symbols, abbreviations and terms (Chart no.1): Familiarity with chart symbols and abbreviations published in the Canadian Hydrographic Service Chart No. 1.</p> <p>Radio aids to marine navigation: Nature of content.</p> <p>List of lights: Familiarity with light characteristics, colours and sound signals used as aids to navigation; Use of Lists of lights, buoys and fog signals; the terms used to define the power of lights; (e.g., geographical range, luminous range, charted range computed range, nominal range, computed visibility; use of a luminous range diagram); Knowledge of factors controlling the range of visibility; The effect of abnormal refraction fog signals of different types, anomalies of sound propagation in fog, notices regarding lights, lighthouses and buoys; Ability to calculate the distances of sighting lights and dipping distances.</p> <p>Ice navigation in Canadian waters: Nature of content</p>
<p>Ability to navigate in confined waters</p>	<p>Altering course; transits; leading marks and bearings; Recording the vessel's progress; Making allowance for height of tide; Preparatory details to be attended to in entering confined waters (e.g., a review of the relevant sections of the sailing directions, ready availability of large-scale charts of the area with proposed track drawn to indicate distances, courses and near dangers noted); Navigational aids with their characteristics to be identified, clearing lines, marks and bearings to be used during the passage to be drawn in, pre-calculation of tidal heights where critical depths of water may be encountered; The maintenance of a record of the vessel's progress on both charts in logbook, including times of passing successive points, course's compass error, speed, weather; Fixing the vessel's position by relative and true bearings, transits; Dead reckoning position, estimated position and observed position.</p>

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
Knowledge of the use of navigational aids in pilotage situations	Pilotage Thorough knowledge regarding preparations for pilotage; possessing and using latest available charts and publications, including large-scale charts of the pilotage area duly corrected to date, latest sailing directions, Notices to Mariners, Lists of Lights, Traffic Zone Regulations (as applicable), tide tables, copy of Charts and Publications Regulations, Radio Aids to Marine Navigation and chart catalogue; Familiarity with bridge practices and procedures in pilotage situations; the requirement to continue the practice of good navigation procedures by the OOW and ship's personnel generally, and the realization that the presence of a pilot on the bridge does not absolve the ship's personnel from their continuing responsibility for the safe navigation of the ship; The duty of the officer of the watch to ensure that the pilot's advice is understood and effectively carried out; The extent to which reliance is placed on buoys.
Thorough knowledge of the Canadian system of buoyage	Knowledge of the Canadian System of Buoyage in detail; Difference between lateral and cardinal systems; Use of Sailing Directions for determining other buoyage systems in use; Principles and rules of the International Association of Lighthouse Authorities Maritime Buoyage System, Systems "A" and "B"; Understanding of the basic principles employed in the lateral and the cardinal buoyage systems; The importance of consulting the applicable volume of Sailing Directions for details of buoyage system in-force locally prior to entering unfamiliar waters of other countries; Aids to navigation.

11.4 Navigation Safety, level 1 (Examination Code: NS 1)

- 1) The examination consists of a multiple-choice test.
- 2) The examination is of three hours duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence:	Maintain a Safe Navigational Watch
Thorough knowledge of the content application and intent of the International Regulations for Preventing Collisions at Sea with Canadian Modifications 1983	Knowledge and application of the content and intent of the <i>Collision Regulations</i> with Canadian Modifications as amended from time to time, including distress signals.
Thorough knowledge of the Principles to be observed in keeping a navigational watch regarding watchkeeping at sea and watchkeeping in different circumstances including vessel at anchor and watchkeeping in port	Principles to be observed in keeping a navigational watch as set out in the STCW Code, section A-VIII/2 regarding; <ul style="list-style-type: none"> - Navigation; - Navigational equipment; - Navigational duties and responsibilities; - Handling over and taking over the watch; - Look-out; - Navigation with a pilot embarked; - Protection of the marine environment; - Bridge Navigational Watch Alarm System; - Blind pilotage technique - General principles for ship reporting systems and with VTS procedures.

	<p>Recommendations on operational guidance for officers in charge of a navigational watch as set out in Chapter VIII, Section A-VIII/2 of the International Conference on Training and Certification of Seafarers, 1978 as amended:</p> <ul style="list-style-type: none"> - Maintenance of an efficient look-out; - The use of engines and sound signaling apparatus; - Taking over the navigational watch; - Periodic checks of navigational equipment - Compliance with SOLAS V/19 regarding the use of the automatic pilot and the change-over to manual steering and vice-versa; - Electronic navigational aids; - The use of radar; - Navigation in coastal waters; - Conduct of the watch in clear weather; - Actions to take in restricted visibility; - The circumstances in which the officer of the watch should call the master;
<p>Thorough knowledge of the Principles to be observed in keeping a navigational watch regarding watchkeeping at sea and watchkeeping in different circumstances including vessel at anchor and watchkeeping in port</p>	<p>Recommendations on operational guidance for officers in charge of a navigational watch as set out in Chapter VIII, Section A-VIII/2 of the International Conference on Training and Certification of Seafarers, 1978 as amended:</p> <ul style="list-style-type: none"> - Navigation with pilot embarked; - Briefing of watchkeeping personnel. <p>Keeping a safe navigational watch at anchor Duties of the officer of the watch while at anchor. Entries that should be made in the log-book. Keeping an effective deck watch in port under normal circumstances Principles to be observed in keeping a watch in port: Arrangements for keeping watch in port should:</p> <ul style="list-style-type: none"> - ensure the safety of life, ship, cargo and port - observe international, national and local rules - maintain order and the normal routine of the ship <p>Taking over the watch and lists the information which the officer being relieved should pass to the relieving officer; Matters on which the relieving officer should satisfy themselves himself before assuming charge of the watch; How the watch should be kept and lists the points to which attention should be paid; Actions to take on receiving a storm warning or in an emergency threatening the safety of the ship; Entries which should be made in the log-book. Keeping a safe deck watch in port when carrying hazardous cargo</p> <p>Definition of 'hazardous cargo; Importance that sufficient personnel should be readily available on board when carrying hazardous cargo in bulk; Indicate special requirements that may be necessary for special types of ships or cargo, particularly with respect to:</p> <ul style="list-style-type: none"> - the number of crew required on board - the state of readiness of fire-fighting appliances and other safety equipment - special port regulations

	<ul style="list-style-type: none"> - communications with the shore in the event of an emergency arising - special precautions to prevent pollution of the environment
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11.5 Meteorology, level 1 (Examination Code : MET 1)

Refer to section 8.5, Chapter 8 of this TP.

11.6 Ship Construction and Stability, level 3 (Examination Code SCS 3)

Refer to section 8.7, Chapter 8 of this TP.

11.7 General Ship Knowledge, level 3 Domestic/ level 3 (Examination Code: GSK 3 D/ GSK 3)

- 1) The examination consists of multiple-choice questions.
- 2) The following open-book resources will be allowed in the examination room for **GSK3-Domestic & GSK3**:
 - a) Arctic Shipping Safety and Pollution Prevention Regulations;
 - b) Canada Labour Code;
 - c) Canada Shipping Act-2001;
 - d) Fire and Boat Drills Regulations;
 - e) Life-Saving Equipment Regulations;
 - f) Marine Personnel Regulations;
 - g) Maritime Occupational Safety and Health Regulations;
 - h) Policy Committees, Work Place Committees and Health and Safety Representatives Regulations
 - i) Shipping Safety Control Zones Order;
 - j) Vessel Certificates Regulations;
 - k) Vessel Fire Safety Regulations; and
 - l) Vessel Pollution and Dangerous Chemicals Regulations;
- 3) Additionally, following open-book resources will be allowed in the examination room for **GSK3**:
 - m) Athens Convention relating to the Carriage of Passengers and their Luggage by sea 1974;
 - n) Ballast Water Control and Management Regulations;
 - o) International Convention for the Safety of Life at Sea, 1974, (SOLAS), as amended;
 - p) International Convention on Load Lines, 1966, as amended;
 - q) International Convention for the Prevention of Pollution from ships, 1973, as modified by the 1978 and 1997 Protocols(MARPOL);
 - r) International Convention on Tonnage Measurements of Ships, 1969;
 - s) International Ship and Shore Facility Security (ISPS) Code;
 - t) Protocol and Rules on space Requirements for Special Trade Passenger Ships 1973;
 - u) Special Trade Passenger Ships Agreement, 1971, and rules, 1971
 - v) The International Convention on Standards of Training, Certification and Watch-keeping for Seafarers, 2010 (STCW 2010);
 - w) The International Safety Management (ISM) Code;
 - i. The examination is of three hours duration.
 - ii. The examination is based upon:

Subject	Applicable for	Knowledge required
Competence:		Ensure compliance with pollution-prevention requirements
Knowledge of the precautions to be taken to prevent pollution of the marine environment	GSK 3-D & GSK 3	Knowledge of precautions to be taken during fueling or oil transfer; Precautions to be taken to prevent pollution of the marine environment by oil, sewage, garbage, antifouling system or other pollutant and air pollution; Take appropriate action in response to pollution incidents onboard and found at sea; Importance of proactive measures to protect the marine environment.
Anti-pollution procedures and all associated equipment	GSK 3-D & GSK 3	Basic knowledge of anti-pollution equipment required by Canadian regulations;
	Additionally for GSK 3	Ability to describe the content and key points in a typical shipboard oil pollution emergency plan (SOPEP); Basic knowledge of anti-pollution equipment required by MARPOL Convention; Basic knowledge of Garbage management plans.
Knowledge of the pollution prevention requirements as contained in the Canadian Regulations	GSK 3-D & GSK 3	Basic knowledge of the content, application and ability to use the following Canadian Regulations: <i>Vessel Pollution and Dangerous Chemicals Regulations</i> ; <i>Arctic Shipping Safety and Pollution Prevention Regulations</i> ; <i>Shipping Safety Control Zones Order</i> ;
	Additionally for GSK 3	<i>Ballast Water Control and Management Regulations.</i>
Competence:		Monitor compliance with legislative requirements
Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment	GSK 3-D & GSK 3	Introduction to maritime Law How public maritime law is enforced through: survey, inspection, and certification, penal sanctions and administrative procedures; The importance of keeping up to date with developments in new and amended legislation.
Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment	Additionally for GSK3	Introduction to maritime Law List of main originators of international conventions concerned with maritime law; Describe flag state jurisdiction, coastal State jurisdiction and port State jurisdiction; The significance of the “no more favorable treatment” clause in the SOLAS, MARPOL, STCW and ILO Minimum Standards in Merchant Ships Conventions; Ability to distinguish between private and public international law; Awareness of the layout, application and content and basic working knowledge of the following conventions and codes: <i>International Convention for the Prevention of Pollution from ships, 1973, as modified by the 1978 and 1997 Protocols(MARPOL) and its Annexes; International Convention on Load Lines, 1966 as amended; International Convention for the Safety of Life at Sea, 1974 as amended (SOLAS);</i> <i>International Ship and Shore Facility Security (ISPS) Code;</i>

Subject	Applicable for	Knowledge required
Competence:		Monitor compliance with legislative requirements
<p>Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment</p>	<p>Additionally for GSK3</p>	<p>Awareness of the layout, application and content and basic working knowledge of the following conventions and codes (cont'd)</p> <p><i>The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 2010 (STCW 2010);</i></p> <p><i>Special Trade Passenger Ships Agreement, 1971, and rules, 1971;</i></p> <p><i>Protocol and Rules on space Requirements for Special Trade Passenger Ships 1973;</i></p> <p><i>Athens Convention relating to the Carriage of Passengers and their Luggage by sea 1974;</i></p> <p><i>Code of Safe Working Practices for Merchant Seaman.</i></p> <p><i>(For further details regarding the above Conventions and Codes, refer to IMO Model Course No. 7.03).</i></p> <p>Convention of the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Dumping Convention) (LDC)</p> <p>The aims of the Convention; Definition, for the purpose of Convention: a) dumping; b) wastes or other matter; c) special permit; d) general permit; Prohibited dumping; Special permit required for dumping of wastes listed in Annex II; Dumping of all other wastes requires a prior general permit; Application of Article IV; Dumping in case of force majeure; <i>Regulations on the incineration of wastes at sea</i>; The appropriate authority of a Contracting Party should issue prior special or general permits in respect of matter intended for dumping: loaded in its territory, loaded by a vessel flying its flag when the loading occurs in the territory of a State not party to the Convention.</p> <p>International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969</p> <p>The rights of Parties to the Convention to intervene on the high seas following a maritime casualty.</p> <p>International Convention on Civil Liability for Oil Pollution Damage, 1969</p> <p>Definition, for the purpose of the Convention: Ship, owner, oil, pollution damage, preventive measures and incident; The occurrences to which the Convention applies; Liability; List of exceptions to liability.</p> <p>International Convention on Tonnage Measurements of Ships, 1969</p> <p>Knowledge of the <i>International Convention on Tonnage Measurement of Ships, 1969</i>; knowledge of the <i>Vessel Registration and Tonnage Regulations</i>; requirement of tonnage certificate for registering a vessel; requirement for Panama and Suez tonnage measurements. TP 13430 - <i>Standards for the Tonnage Measurements of Ships.</i></p>

Subject	Applicable for	Knowledge required
Competence:		Monitor compliance with legislative requirements
<p>Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment</p>	<p>Additionally for GSK3</p>	<p>International Convention for the Control and Management of Ship's Ballast Water and Sediments, 2004</p> <p>Definition of ballast water, ballast water management and sediments; The conditions where the application of this Convention may be exempted; The application of the convention; The management and control requirement based on section B regulation B1-B6; The Annex – Section A, B, C, D and F; The various methods of ballast exchange; The standards that need to be observed in ballast water exchange.</p> <p>International Convention on the Control of Harmful Anti-fouling Systems on Ship's, 2001</p> <p>Definition of anti-fouling system; The control of waste material in Annex 1 of the Convention.</p> <p>Guidelines on the enhanced Programmed of Inspections During Surveys of Bulk Carriers and Oil Tankers</p> <p>The application of the guidelines; Definition of: overall survey, close-up survey, substantial corrosion, corrosion prevention system, critical structure areas and intermediate enhanced survey; The requirements for enhanced survey carried out during periodical survey; The requirement for enhanced survey carried out during annual survey; The intermediate enhanced survey; The preparation for survey.</p> <p>Anti-Pollution procedures and all associated equipment</p> <p>Control of discharge of oil</p> <p>The control of discharge of oil as stated in Regulation 9 of MARPOL, <i>as modified by the 1978 and 1997 Protocols</i>; Particularly Sensitive Sea Areas; Methods for prevention of oil pollution and discharge provisions for oil and oily waste from machinery spaces outside special areas and within special areas; Bilge water holding tank; Oily water separator; Oil discharge monitoring and control system and oil filtering equipment as stated in Regulation 16 of MARPOL, <i>as modified by the 1978 and 1997 Protocols</i>; The prevention of oil pollution as stated in Regulation 13F in the event of collision or stranding and Regulation 13G in the event of collision or stranding measures for existing tankers of MARPOL, <i>as modified by the 1978 and 1997 Protocols</i>; the retention of oil on board as stated in Regulation 15 of MARPOL, <i>as modified by the 1978 and 1997 Protocols</i>.</p> <p>Oil Record Book (Part I machinery space operations and Part II – Cargo/Ballast operations)</p> <p>The requirements for the provision of Oil record books; The various operation when the Oil record book has to be completed; The various entries that needs to be made in the Oil record book with respect to above for following operations: a) for machinery space operations (all ships); b) for cargo/ballast operations (oil tankers); The entries required for accidental or other exceptional discharge of oil.</p>

Subject	Applicable for	Knowledge required
Competence:		Monitor compliance with legislative requirements
Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment	GSK 3-D & GSK 3	<p>Proactive measures to protect the marine environment</p> <p>Garbage Management Plan</p> <p>The content of the Garbage Management Plan; Which vessels are required to carry garbage Management Plan.</p> <p>Garbage Record Book</p> <p>Which vessels are to be provided with a Garbage Record Book; The various operation when the Garbage Record Book has to be completed; The various entries that needs to be made in the Garbage Record Book; The disposal criteria for cargo residues/cargo hold washing water residues.</p> <p>Importance of proactive measures to protect the marine environment</p> <p>The need for taking proactive measures to protect the marine environment; The proactive measures that can be taken on board the ships to protect the marine environment for shipboard operations, including: a) bunkering; b) loading / discharging oil, chemicals and hazardous cargoes; c) tank cleaning; d) cargo hold washing; e) pumping out bilges (hold in engine room); f) ballast water exchange; g) purging and gas freeing; h) disposal of other garbage; I) discharge of sewage.</p>
Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment	Additionally for GSK3	<p>Shipboard Oil Pollution Emergency Plan (SOPEP) including Shipboard Marine Pollution Emergency Plans (SMPEP) for oil and/or Noxious Liquid Substances and Vessel Response Plan (VRP)</p> <p>What is a Shipboard Oil Pollution Emergency Plan; Content of a SOPEP; Which vessels must carry a SOPEP; Guidelines for the Development of a Shipboard Oil Pollution Emergency Plan; Link to IOPP certificate.</p> <p>Shipboard Marine Pollution Emergency Plan (SMPEP)</p> <p>Vessels required to carry a SMPE); Content of SMPEP.</p> <p>Vessel Response Plan (VRP)</p> <p>What is a Vessel Response Plan; Vessels required to carry a VRP.</p> <p>Overview of anti-pollution equipment, Sewage plant, Incinerator, comminutor, ballast water treatment plant</p> <p>The operating procedures of anti-pollution equipment such as: sewage plant, incinerator, comminutor and ballast water treatment plant.</p> <p>Volatile Organic Compound (VOV) Management Plan, Garbage Management System, Anti-fouling systems, Ballast Water Management and their discharge criteria</p>

Subject	Applicable for	Knowledge required
Competence:		Monitor compliance with legislative requirements
Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment	Additionally for GSK3	<p>Volatile Organic Compound Management Plan</p> <p>What is Volatile Organic Compounds; When VOC emissions from the fuel/petroleum industry sources occur; When VOC emissions from ships occurs; How to control the emission; The aim of the VOC Management Plan.</p> <p>Proactive measures to protect the marine environment</p> <p>Anti-fouling systems</p> <p>Basic knowledge of the IMO <i>International Convention on the Control of Harmful Anti-Fouling Systems</i>; When did it came into force.</p>
Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment	GSK 3-D & GSK 3	<p>Laws of the sea</p> <p>Territorial Sea and the Contiguous Zone</p> <p>Legal status of the territorial sea and its breadth, Definition of internal waters; The legal status of road steeds; The right of innocence passage; Definition of “passage” and “innocent passage”; Matters on which coastal State laws or regulations may affect innocent passage; The obligations during innocent passage in a territorial sea; The use of sea lanes and traffic separation schemes in the territorial sea; The obligations of nuclear-powered ships and ships carrying dangerous or noxious substances; The additional rights of a coastal State regarding ships proceeding to internal waters or calling at a port facility; The charges which may be levied on ships passing through a territorial sea; The criminal jurisdiction of a coastal State on board foreign ship passing through the territorial sea;</p> <p>Exclusive Economic Zone and Continental Shelf</p> <p>Definition of the exclusive economic zone and states its breadth; Definition of continental shelf; The coastal State’s jurisdiction over artificial islands, installations and structures within its exclusive economic zone; The establishment of safety zones around artificial islands, installations and structures and the breadth of those zones; The obligations of ships regarding safety zones.</p> <p>High seas</p> <p>Documents issued when a State granted the right to fly its flag; The status of ships regarding nationality; The duties of the flag State with respect to ships flying its flag; Who may withdraw a master’s certificate or a certificate of competency or a license.</p> <p>Protection and Preservation of the Marine Environment</p> <p>The rights of coastal states to adopt laws and regulations for the prevention, reduction and control of pollution in respect of their exclusive economic zones; The enforcement by flag States of measures for the prevention, reduction and control of pollution from ships;</p>

Subject	Applicable for	Knowledge required
Competence:		Monitor compliance with legislative requirements
Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment	GSK 3-D & GSK 3	<p>Protection and Preservation of the Marine Environment (Cont'd)</p> <p>The enforcement by port States of measures of measures for the prevention, reduction and control of pollution from ships; The measures relating to seaworthiness of vessels to avoid pollution; The enforcements by coastal States of measures for the prevention, reduction and control of pollution from ships; Definition of maritime casualty.</p>
Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment	Additionally for GSK3	<p>Laws of the sea</p> <p>Conventions on the Law of the sea</p> <p>The legal status of UNCLOS; The legal status of the Geneva Conventions; The pollution of the marine environment; Definition of dumping and force majeure.</p> <p>Territorial Sea and the Contiguous Zone</p> <p>The coastal State's obligation to facilitate contact between consular authority of the flag state and the ship's crew when taking measures to arrest a ship; The civil jurisdiction of a coastal State on board a foreign vessel passing through the territorial sea; The extent of the contiguous zone and the control a coastal State may exercise therein.</p> <p>International straits</p> <p>The legal status of waters forming straits used for international navigation; The right of transit passage; definition of transit passage; the duties of ships in transit passage; The meaning of "generally accepted international regulations, procedures and practices"; The duty of ships in transit passage regarding sea lanes and TSS; Matters on which coastal State laws or regulations may affect transit passage; The obligations of ships during transit passage; The application of innocent passage to straits used for international navigation; Definition of Archipelago and archipelagic state; The right of innocent passage through archipelagic waters; How sea lanes should be defined and how ships should follow them; Archipelagic State may designate TSS for any sea lanes; Ships must respect established sea lanes and TSS.</p> <p>High seas</p> <p>The freedom of the high seas; The nationality of ships;</p>
Knowledge of the Canada Shipping Act-2001	GSK 3-D & GSK 3	<p>Canada Shipping Act, 2001 (CSA):</p> <p>Basic knowledge of the content, application and ability to use the <i>Canada Shipping Act-2001</i>, Part 1 to 6, 7 and 8.</p>

Subject	Applicable for	Knowledge required
Competence:		Monitor compliance with legislative requirements
Knowledge of Canadian Regulations and vessels documentation	GSK 3-D & GSK 3	<p>Basic knowledge of the content, application and ability to use the following Regulations:</p> <p><i>Fire and Boat Drills Regulations;</i></p> <p><i>Life-Saving Equipment Regulations;</i></p> <p><i>Vessel Fire Safety Regulations;</i></p> <p><i>Vessel Certificates Regulations;</i></p> <p><i>Marine Personnel Regulations.</i></p>
Knowledge of management of personnel	GSK 3-D & GSK 3	<p>Knowledge of the basic safety and familiarization training required for all members of the complement; Knowledge of the organization and training of crews for emergencies and related drills; Emergency procedure plans and station bills for tankers, passengers and cargo vessels; Practical knowledge of organization and training of the crew for routine operations and maintenance;</p> <p>Ability to apply task and workload management including:</p> <ul style="list-style-type: none"> a) Planning and coordination; b) Personnel assignment; c) Time and resource constraints; d) Prioritization. <p>Knowledge and ability to apply effective resource management:</p> <ul style="list-style-type: none"> a) Allocation, assignment, and prioritization of resources; b) Effective communication onboard and ashore; c) Decision reflect consideration of team experience; d) Assertiveness and leadership including motivation; e) Obtaining and maintaining situational awareness. <p>Knowledge and ability to apply decision making techniques:</p> <ul style="list-style-type: none"> a) Situation and risk assessment; b) Identify and consider generated options; c) Selecting course of action; <p>Evaluation of outcome effectiveness.</p>
Comply with Canada Labour Code legislation	GSK 3-D & GSK 3	<p>Canada Labor Code</p> <p>Basic knowledge of the content, application and ability to use the <i>Canada Labor Code</i>, the <i>Maritime Occupational Safety and Health Regulations</i> and the <i>Policy Committees, Work Place Committees and Health and Safety Representatives Regulations.</i></p>

11.8 Oral examination on General Seamanship (Examination Code: M150D-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the

perspective of the duties and responsibilities associated to the validity of the Master 150 gross tonnage, Domestic certificate, as set out in section 11.2 of this chapter.

- 2) The examination is of an unlimited duration
- 3) The examination is based upon:

Subject	Knowledge required
Competence:	Communications
Lifesaving and distress signals	Recognition and knowledge of the meanings of distress signals contained in the Collision regulations; Recognition and knowledge of the meanings of the lifesaving and distress signals contained in the International Code of Signals.
Competence:	Plan and conduct safe navigation
Routeing in accordance with the General Principles on Ships' Routeing and weather routeing	Demonstrate an ability to undertake voyage planning, taking into consideration the requirements set out in section A-VIII/2, Part 2 of the STCW Code; Knowledge of the importance of weather forecasts; Ability to consult weather forecasts; Take into account weather forecast when making voyage planning; Take into account actual and forecasted weather before undertaking a voyage and for decision making during the voyage; Awareness of Environment Canada weather warnings and how they are transmitted.
Competence:	Maintain a Safe Navigational Watch
Establish and maintain a Safe Navigational Watch	Principles to be observed in keeping a navigational watch as set out in the STCW Code, section A-VIII/2, including watchkeeping at anchor and in port; A thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at sea, 1972 with Canadian Modifications 1983; Knowledge of the Canadian System of buoyage; ability to determine magnetic compass error and care of magnetic compass.
Competence:	Manoeuvre the ship and operate small ship power plants
Ship-Handling in various conditions	Basic knowledge of manoeuvring and handling a small vessel; The pivoting point and effects when the propulsion system is used in the ahead and astern direction; Practical manoeuvres for berthing, unberthing, when navigating and for anchoring; effect of wind, tide and current on manoeuvres.
Operate small ship plants	Basic knowledge of the operation of small ship power plants and auxiliaries, such as the engine, the propulsion system, the fuel, lubrication and cooling systems of the engine, electrical systems, steering gear, bilge pumps, quick shut-off valves, fire dampers; Basic knowledge of engine surveillance systems and measures to be taken in case of alarm of failure.
Competence:	Manoeuvre the ship and operate small ship power plants
Proper procedures for anchoring and mooring	Preparation of anchors to be ready for use; Safety measures to be taken; Method of letting go; Fittings and cable markings; Preparation and procedures during heaving up;
Towing operations	Basic knowledge of towing and in particular of the following elements: Taking and being taken in tow; Cables used for towing and the required length; The towing point; Towing bits and hooks; How to approach a vessel to be towed and pass the first connection by line-throwing apparatus or other methods; How to pay out the towing wire under control; Methods of securing the towing wire at the towing ship; How the towing wire should be protected from chafing at fairleads; How to take the weight of the tow; How the towing speed should be decided; The effect of the towing cable on the centre of gravity of the tug and on its stability; Events that may result in the capsizing of the tug; The different ways to instantly release the towing cable in an urgent situation; The use of an emergency tow line; How to disconnect the tow on arrival at the destination.

Subject	Knowledge required
Competence:	Response to emergencies
Knowledge and understanding of the precautions for the protection and safety of passengers in emergency situations	<p>Contingency plans for response to emergencies Knowledge of evacuation plans required on passenger vessels; Knowledge of the content of a muster list and emergency instructions; The concept of dividing the crew into teams; Knowledge of the composition of emergency teams; Communication links between emergency teams; The importance of drills and training and practical organization of drills.</p> <p>Protection and safety of passengers Familiarization of Crew members with their specific duties for the mustering and control of passengers; Knowledge of the specific duties to assign to crew members; Content of the pre-departure safety briefing to passengers; the need to communicate effectively with passengers during an emergency.</p>
Knowledge and understanding of the actions to be taken following different emergency situations	<p>Actions to be taken following emergencies such as fire onboard, collision, accidental flooding, grounding, person overboard, etc ; Passengers management during an emergency; Procedures for vessel's evacuation; Rescuing persons and assisting vessel in distress.</p>
Emergency steering	<p>Arrangements of auxiliary steering gear; How the auxiliary steering gear is brought into action; How to change from bridge control to local control in the steering gear compartment; Possible course of action which may be taken by a disabled ship.</p>
Competence:	Respond to a distress signal at sea
Knowledge of the contents of the IMO <i>International Aeronautical and Maritime Search and Rescue manual (IAMSAR)</i>	<p>Search and Rescue Knowledge and understanding of the content and application of the IMO <i>International Aeronautical and Maritime Search and Rescue manual (IAMSAR)</i>.</p>
Competence:	Ensure compliance with pollution-prevention requirements
Prevent pollution	<p>Knowledge of the precautions to be taken during fueling; Knowledge of the statutory requirements to report pollution incidents; Precautions to be taken to prevent pollution of the marine environment by oil, garbage or other pollutant; Take appropriate action in response to pollution incidents onboard and found at sea.</p>

Subject	Knowledge required
Competence:	Maintain Seaworthiness of the ship
Seaworthiness of the ship	<p>Watertight integrity and adverse weather</p> <p>Understand the fundamentals of watertight integrity; Precautions to be taken before the onset of heavy weather such as closing and securing of watertight hatches, manholes, doors and portholes, lowering and securing weights onboard, ensuring that freeing arrangements are functional, etc; Necessary monitoring on a vessel caught in heavy weather, such as water detection in compartments; Actions to be taken in case of water ingress or vessel becoming disabled; Practical considerations of boat handling in heavy weather; How to prevent ice accretion; Actions to be taken if ice starts to accumulate on a vessel.</p> <p>Stability</p> <p>Working knowledge of stability and damaged stability data supplied to small vessels; Effect on stability of passengers gathering on one side of the vessel; Understanding of ship's plans and specifications; an appreciation of the meaning and characteristics of stiff and tender ships; effects of reduction in freeboard on stability and seaworthiness.</p>
Competence:	Monitor compliance with legislative requirements
Responsibilities and duties	<p>Appreciate master's overall responsibilities; Responsibilities and duties of a chief mate, including when joining a vessel; Duties and responsibilities of the master of a small vessel as required by the Canada Shipping Act; Master's duties on taking over and relinquishing command; Preparation of the vessel for inspection and surveys; Knowledge of master's responsibilities under part 2 and 3 of the Marine Personnel Regulations; Vessels required to have articles of agreements and an official log book; Basic knowledge of the regulations concerning life-saving and fire-fighting appliances; Precautions and requirements for safe embarkation of passengers on a vessel. Initial and subsequent reports to be made in case of a marine occurrence.</p>
Competence:	Seamanship
Mooring Lines	<p>Names, types, use and care of mooring lines and their characteristics; Making fast on-shore bollards being used by another ship; Use of moorings on the bight and doubling up; Preparation to be made for berthing.</p>

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General

12.1 General requirements

- 1) The general requirements for a Master, Limited certificate for a vessel of 60 gross tonnage or more, are set out in section 130 of the *Marine Personnel Regulations*.
- 2) The general requirements for a Master, Limited certificate for a vessel of less than 60 gross tonnage, are set out in section 131 of the *Marine Personnel Regulations*.

12.2 Examinations

The examinations are based on the syllabus as modified in accordance with the criteria set out in section 12.11, as appropriate to the area of operation, the vessel, and the equipment carried on board the vessel for which the certificate is to be valid.

Syllabuses of Examinations

12.3 Chartwork & Pilotage, level 1 (Examination Code: C/P 1)

- 1) The examination consists of a practical chartwork and multiple-choice questions.
- 2) The examination is of an unlimited duration.
- 3) The C/P 2 may be substituted for C/P 1 at the applicant's request
- 4) The examination is based upon:

Subject	Knowledge required
Competence:	Plan and conduct safe navigation
Knowledge of principles of construction of the different types of charts and their use	The chart, its nature and function as an aid to navigation; Practical effects of projection distortion, numbering and the presentation of information; factors affecting reliability of charts; Ability to use Mercator and polyconic charts.
Thorough knowledge of and ability to use publications	Light characteristics and colors and sound signals used as aids to navigation; List of lights, Buoys and Fog Signals; Tide tables, radio aids to marine navigation, sailing directions; Canadian buoyage System and its use; Use and purpose of <i>Notices to Shipping</i> and <i>Notices to Mariners</i> and chart corrections; Charts symbols and abbreviations as published in Canadian Hydrographic Service Chart No.1.
Ability to determine the ship's position by use of: 1. landmarks 2. aids to navigation, including lighthouses, beacons and buoys 3. dead reckoning, taking into account winds, tides, currents and estimated speed	Chartwork Exercises Locating a vessel's position on the chart by simultaneous true bearings or true bearing and distance; Locating a vessel's position by two or more simultaneous distances; Determining the latitude and longitude of a given position; Locating a position by its latitude and longitude, and its true bearing and distance from a given point; Laying off a course between given positions; Measuring the true direction of a course laid-off on the chart; Measuring distance on chart; Finding the DR position, given course, speed and time elapsed from the last observed position by plotting on a chart or by other acceptable method of the applicant's choice; Demonstrating an appreciation that current or wind may affect the vessel's course and speed over the ground; Determining speed over the ground between observed positions; Determining the true course made good between observed positions.
Keeping a log book and a record of compass errors	Appreciation of the need to keep an accurate record of the vessel's progress, and the keeping of this record; Care of dividers and parallel rules; Periodic operator checks and determination of compass error by comparison with true terrestrial bearings or headings; Determining and recording compass deviation; Use of the magnetic compass to determine accuracy of the gyro compass by comparison; Correcting courses and bearings for compass error, magnetic variation and deviation; Use of table of deviations.

12.4 Navigation Safety, level 1 or domestic (Examination Code: NS 1 or NS D)

For NS 1, refer to section 11.4, Chapter 11 of this TP. The syllabus for NS D is same as NS 1 except that it does not include Canadian Modifications.

Note:

This NS D is available only for applicants for a Fishing Master, Fourth Class certificate and for applicants for a Master or Chief Mate, Limited certificate for a vessel of less than 60 gross tonnage. However, under the following conditions:

- 1) The candidate will have the choice to challenge either NS 1 or NS D;
- 2) NS D will be only credited for Fishing Master, Fourth Class and Master or Chief Mate Limited less than 60;
- 3) A holder of a Fishing Master, Fourth Class or a Master or Chief Mate Limited less than 60 wishing to obtain a higher Certificate of Competency will be requested to challenge NS 1;
- 4) The candidate is allowed 3 hrs. to write NS D; and
- 5) Seafarers failing NS D, may re-schedule within 2 weeks (no penalty and this apply to all exams for Fishing Master, Fourth Class and Masters or Chief Mate limited of less than 60).

Remarks: #1 Applicants choosing to challenge NS D will be Issued an applicable Certificate for Fishing Master, Fourth Class or Master or Chief Mate, Limited less than 60 gross tonnage with the following limitation: Not valid in the waters of the Great Lakes Basin.

#2 HQ will provide an appropriate exam for applicants for a Fishing Master, Fourth Class and for applicants for a Master or Chief Mate, Limited less than 60 gross tonnage that operate in the waters of the Great Lakes Basin upon request from Regional offices with 15 days notice.

12.5 Ship Construction & Stability, level 3 (Examination Code: SCS 3)

Refer to section 8.7, Chapter 8 of this TP.

12.6 Ship Construction and Stability, level 4 (Examination Code: SCS 4)

Refer to section 5.11, Chapter 5 of this TP.

12.7 General ship knowledge – less than 60 gross tonnage (Examination Code: CLW < 60T)

- 1) The knowledge required for this examination is included in the table to this chapter, subject to the remarks in section 12.11.
- 2) The examination consists of multiple-choice and essay type questions, and may also contain practical chartwork (see paragraph 12.11 (2) (e)).
- 3) The examination is of three hours duration.

12.8 General ship knowledge – 60 gross tonnage or more (Examination Code: CLW ≥ 60T)

- 1) The knowledge required for this examination is included in the table to this chapter, subject to the remarks in section 12.11.
- 2) The examination consists of multiple-choice and essay type questions.
- 3) The examination is of three hours duration.

**12.9 General seamanship – less than 60 gross tonnage (Examination Code: CLO < 60T)
(Also, please refer section 2.11 of Chapter 2)**

- 1) The knowledge required for this examination is included in the table to this chapter, subject to the remarks in section 12.11.
- 2) The examination is oral and practical.
- 3) The examination is of an unlimited duration.

**12.10 General seamanship – 60 gross tonnage or more (Examination Code:
CLO ≥ 60T) (Also, please refer section 2.11 of Chapter 2)**

- 1) The knowledge required for this examination is included in the table to this chapter, subject to the remarks in section 12.11.
- 2) The examination is oral.
- 3) The examination is of an unlimited duration.

12.11 Minimum standard of competence

- 1) The first column of the table below contains 18 fields of competence that could be applicable to the candidates depending on the type, gross tonnage (GT) and area of operation of the vessel or vessels to which the certificate sought by the applicant would apply. The second column specifies knowledge, understanding and proficiency that the candidates must possess to be considered competent in each of the corresponding fields. The third and fourth column set out, according to whether the vessel is $>$ or \leq than 60 GT, the method of evaluation that will be used to verify the competence. The last column gives, as a rough guide, the references that can be of use for the preparation of examinations.
- 2) The examination program is adapted to the type and gross tonnage of the vessel or vessels to which the certificate sought by the applicant would apply and the area of operation of the vessel or vessels. An evaluation of each case will be carried out and the examiner will determine the scope of the examination according to the following criteria:
 - a) Items 1 to 8: will be covered in every case.
 - b) Item 9: Questions on survival craft and liferafts will not be included in the examination for vessels that do not carry such equipment.
 - c) Item 10: Questions on inspection certificates will be omitted for vessels that are not required to have such a certificate.
 - d) Item 11: Questions on the *Collision Regulations* will be omitted if the vessel operates only in an isolated area, where there is no chance that another vessel be met, but the examiner will make sure that the candidate knows what lights their vessel has to carry.
 - e) Item 12: This section will not be included if there are no marine charts for the area where the vessel will operate.
 - f) Item 13: Questions on the magnetic compass will be omitted if the vessel is less than 5 gross tonnage and is not equipped with a compass.
 - g) Item 14: Questions on the buoyage system will be omitted if no official buoyage system exists in the area of operation of the vessel.
 - h) Item 15: Competence relative to radar will be omitted if the vessel does not have a radar.
 - i) Item 16: The electronic navigating instruments enumerated in section 16 that are not installed on the vessel will be omitted during the examination.
 - j) Item 17: Competence 17 will be omitted if the vessel is not required to have a VHF radio and does not carry one, except for the knowledge of the use of sailing plans.
 - k) Item 18: Competence 18 applies only if the vessel engages in towing operations.

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Specification of minimum standard of competence for a Master, Limited certificate

Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
1.	Demonstrate a good knowledge of the area for which the certificate will be valid	<p>Ability to demonstrate that intended route is safe</p> <ul style="list-style-type: none"> – Knowledge of the places where the depth of water is sufficient for the vessel – Knowledge of sea conditions that may be met in the area of operation and actions to be taken if conditions become too severe – Knowledge of local currents and the effect of tides, if applicable, for the area of operation – Knowledge of the importance of weather forecasts and ability to consult them – Knowledge of the geographical limits of sheltered waters and near coastal waters 	CLO < 60T	CLO ≥ 60T	<ul style="list-style-type: none"> – Practical experience – Training courses – Marine chart of the sector – Canadian Tide and Current Tables – Sailing directions
2.	Manoeuvre the vessel	<ul style="list-style-type: none"> – Capacity to manoeuvre the vessel for berthing, departure from the dock, navigation and anchoring – Manoeuvre to recuperate a person overboard – As applicable, the effect of propellers, rudders, jets and outboard engines when moving ahead and astern and when manoeuvring – Effect of winds and currents when manoeuvring 	CLO < 60T	CLO ≥ 60T	<ul style="list-style-type: none"> – Practical experience – Training courses – Publications on the subject
3.	Operate the propulsion system and all other systems and devices on the vessel	<ul style="list-style-type: none"> – Knowledge of the principle of operation of the engine and the propulsion system – Knowledge of the use of the propulsion system – Knowledge of the vessel arrangement and of the functioning of all the systems and devices on board, such as the fuel system, lubrication and cooling of the engine, electrical systems, steering gear, bilge pumps, through-hull and drains of cockpit if applicable, quick shut-off valves, fire dampers in ventilation systems – Engine and system monitoring and measures to be taken in case of alarm of failure 	CLW < 60T and CLO < 60T	CLW ≥ 60T and CLO ≥ 60T	<ul style="list-style-type: none"> – Practical experience – Training courses – Publications on the subject

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
4.	Deal with emergency situations	<ul style="list-style-type: none"> - Be able to identify measures to be taken in emergency situations such as: <ul style="list-style-type: none"> a) Collision b) Grounding c) Flooding d) Fire e) Injured person or person overboard f) Release of a polluting substance or liquid - Measures to be taken to ensure protection and safety of crew members and passengers in emergency situations - The master's obligation with regard to initial and subsequent reports to be made in case of a marine occurrence - Knowledge and meaning of distress signals as prescribed by appendix IV of the <i>Collision Regulations</i> - Measures to be taken to assist a vessel in distress 	CLW < 60T and CLO < 60T	CLW < 60T and CLO < 60T	<ul style="list-style-type: none"> - <i>Collision Regulations</i> (TP 10739) or Chap. 1416 - <i>Transportation Safety Board Regulations – Reportable Marine Accidents and Incidents</i> - <i>Shipping Casualties Reporting Regulations</i> (SOR / 85-514) - Form of a marine occurrence report - Training courses - Practical experience
5.	Prevent and fight fires	<ul style="list-style-type: none"> - Knowledge of precautions to be taken to prevent fires - Knowledge of precautions to be taken during fuelling - Knowledge of fire-fighting and fire detection equipments - To be able to use all the fire-fighting equipment on the vessel 	CLW < 60T and CLO < 60T	CLW < 60T and CLO < 60T	<ul style="list-style-type: none"> - (Vessel < 15GT) <i>Construction Standards for Small Vessels</i> (TP-1332) and <i>Small Vessel Regulations</i> (Chap 1487) - (Vessel > 15GT and < 150GT) <i>Standards for the Construction and Inspection of Small Passenger Vessels</i> (TP-11717) - (Vessel > 150GT) <i>Hull Construction Regulations</i> (Chap. 1431) and <i>Fire Safety Regulations</i> - <i>Safe Boating Guide</i> (TP-511) - MED courses

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
6.	Moor the vessel and perform related seamanship work	<ul style="list-style-type: none"> - Knowledge and use of mooring ropes and their use - Knowledge of the various ropes and their uses - Knowledge of the various knots and their uses - Ability to make knots 	CLW < 60T and a practical demonstration	CLW ≥ 60T and CLO ≥ 60T	<ul style="list-style-type: none"> - Practical experience - Training courses - Seamanship manuals
7.	Prevent pollution	<ul style="list-style-type: none"> - Knowledge of the precautions to be taken during fuelling - Requirements regarding the <i>Oil Record Book</i> - Knowledge of the statutory requirements to report pollution incidents - Knowledge of <i>Division 5 – Garbage of the Vessel Pollution and Dangerous Chemicals Regulations</i> 	CLW < 60T and CLO < 60T	CLW ≥ 60T and CLO ≥ 60T	<ul style="list-style-type: none"> - <i>Small Vessel Regulations (Chap on 1487)</i> - <i>Vessel Pollution and Dangerous Chemicals Regulations</i>

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
8.	Maintain the vessel's stability	<p>Vessel < 60GT</p> <ul style="list-style-type: none"> - Knowledge of the basic principles of stability - Practical application of stability principles to a vessel - Free surface effect <p>Vessel ≥ 60GT</p> <ul style="list-style-type: none"> - Understanding basic stability terminology - Knowledge of the basic principles of stability - Knowledge of KG, GM and righting lever GZ - Ability to explain using a sketch of a heeled vessel, how the centre of gravity (G) and the centre of buoyancy (B) are acting to create a righting lever (GZ) - Effect on stability of adding, removing, transferring and suspending weights - Stable equilibrium, unstable equilibrium, neutral equilibrium - Maintain watertight integrity - Free surface effect - Practical use of the vessel's stability booklet, in order to evaluate stability in different operating conditions of intact and damaged stability if applicable <p>Tug or Ro-Ro passenger vessel ≥ 60GT</p> <ul style="list-style-type: none"> - In the case of a tug, refer to SCS 3 exam syllabus at section 8.6, Chapter 8 of this TP - In the case of a Ro-Ro passenger vessel, refer to SCS 4 exam syllabus at section 5.11, Chapter 5 of this TP 	<p>CLW < 60T and CLO < 60T</p>	<p>CLW ≥ 60T or SCS 3 examination if the vessel is a tug, or SCS 4 examination if the vessel is a Ro-Ro passenger vessel, and CLO ≥ 60T</p>	<ul style="list-style-type: none"> - <i>Small Fishing Vessel Safety Manual (TP-10038)</i> - Vessel stability booklets - Stability publications - Training courses

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
9.	Ensure the safety of passengers and use safety and lifesaving equipment	<ul style="list-style-type: none"> - Knowledge of all the safety and lifesaving equipment on the vessel, such as lifeboats and liferafts, life jackets, lifebuoys, oars, bailers, pumps, anchors and distress flares - Ability to use all the safety and lifesaving equipment on the vessel - Knowledge of the master's and first mate's responsibilities with regard to the safety of crew members and passengers - Ability to conduct boat and fire drills - Understanding of the importance of lifesaving equipment demonstrations and safety instructions given to passengers before sailing - Familiarization of new crew members with the vessel's equipment and safety procedures - Required training before being assigned to any duty on a vessel - Ability to deal with crisis situations and control crowds if applicable - Knowledge of the requirements for gangways 	CLW < 60T and CLO < 60T	CLW ≥ 60T and CLO ≥ 60T	<ul style="list-style-type: none"> - (Vessel < 15GT) <i>Construction Standards for Small Vessels</i> (TP-1332) and <i>Small Vessel Regulations</i> (Chap 1487) - (Vessel > 15GT and < 150GT) <i>Standards for the Construction and Inspection of Small Passenger Vessels</i> (TP-11717) - (Vessel > 150GT) <i>Life Saving Equipment Regulations</i> (Chap. 1436) and <i>Fire and Boat Drills Regulations</i> - <i>Small Fishing Vessel Safety Manual</i> (TP-10038) - <i>Safe Boating Guide</i> (TP-511) - Ship Safety Bulletins 4/95, 2/96 and 12/98 - Personal experience - MED courses

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
10.	Carry out necessary checks and inspections and make sure that the vessel has all required certificates and documents	<p>Vessels subject or not subject to regulatory inspections</p> <ul style="list-style-type: none"> – Knowledge of the principal structural members of a vessel and the proper names for the various parts – Checks to be made before departure <p>In addition, for vessels subject to regulatory inspections</p> <ul style="list-style-type: none"> – Preparation for a regulatory inspection – Knowledge of statutory requirements with respect to crewing, inspection of the vessel and required equipment – Knowledge of required documents and certificates, their limits and their validity – Knowledge of requirements for the agreement with the crew, if applicable – Knowledge of record-keeping requirements 	CLW < 60T and CLO < 60T	CLW ≥ 60T) and CLO ≥ 60T	<ul style="list-style-type: none"> - <i>Canada Shipping Act, 2001</i> - Regulations applicable to the vessel - <i>Standards for the Construction and Inspection of Small Passenger Vessels (TP-11717)</i> - <i>Safe Boating Guide (TP-511)</i> - Marine Safety Inspection Record (SIRS print out) - Model certificates
11.	Ensure safe navigation and prevent collisions	<p>Vessel < 60GT</p> <ul style="list-style-type: none"> – Knowledge of the <i>Collision Regulations</i>, in particular regarding: <ul style="list-style-type: none"> Steering and sailing rules Lights and shapes Sound and light signals <p>In addition, for vessel ≥ 60GT</p> <ul style="list-style-type: none"> – Thorough knowledge of content, application and intention of the <i>Collision Regulations</i> – Knowledge of the principles to be observed in keeping a navigational watch 	CLW < 60T and CLO < 60T	CLW ≥ 60T or, if applicable to the vessel or area of operation, NS 1 and CLO ≥ 60T	<ul style="list-style-type: none"> - <i>Collision Regulations (TP-10739)</i> or Chap. 1416 - <i>STCW Code</i>, Chap. VIII

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
12.	Use marine charts and nautical publications to plan and execute a voyage	<ul style="list-style-type: none"> - Knowledge of and ability to use marine charts, especially with regard to: <ul style="list-style-type: none"> a) Abbreviations and symbols b) Geographic coordinates <ul style="list-style-type: none"> (1) Use latitude and longitude to fix a position on the chart (2) Extract the latitude and longitude of a given position on the chart c) The use of magnetic deviation and variation to convert compass bearings into true bearings and to calculate compass courses to be steered to follow a true course d) Determining the position of the vessel on a chart by various means including: <ul style="list-style-type: none"> (1) Compass bearings (2) Visual ranges (3) Estimated position of the vessel according to its course and speed e) Planning and charting a course to follow a given route f) Determining the direction of a course drawn on a chart g) Properly measure distances on a chart h) The course to steer to counteract the effect of winds and currents - Ability to use and knowledge of the following marine publications: <ul style="list-style-type: none"> a) Annual edition of notices to mariners b) Tide tables c) Radio aids to marine navigation d) List of lights, buoys and fog signals <p>In addition, for a vessel ≥ 60T Knowledge of principles for constructing the various types of charts and their uses</p>	CLW < 60T and a practical exercise on a marine chart	CLW ≥ 60T or, if applicable to the vessel or area of operation, C/P 1	<ul style="list-style-type: none"> - Coastal navigation manuals - Chart # 1 of the Hydrographic Service - The following nautical publications: <ul style="list-style-type: none"> a) Annual edition of Notices to Mariners b) Tide Tables c) Radio Aids to Marine Navigation d) List of Lights, Buoys and Fog Signals e) Sailing Directions

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
13.	Use the magnetic compass for taking bearings and for steering	<ul style="list-style-type: none"> - Knowledge of basic magnetic properties in relation to compasses and the Earth's magnetic field - Ability to steer using the compass - Ability to take compass bearings - Ability to use a deviation card or curve - Ability to find the compass deviation <p>In addition, for a vessel ≥ 60T Ability to determine errors of the compass using terrestrial means, and to allow for such errors</p>	CLW < 60T and CLO < 60T	CLW ≥ 60T or, if applicable to the vessel or area of operation, C/P 1	<ul style="list-style-type: none"> - Navigation manuals - Practical experience
14.	Use the Canadian Buoyage System	<ul style="list-style-type: none"> - Knowledge of the Canadian buoyage system and ability to: Identify buoys Situate buoys in the lateral and cardinal system Recognize the various buoy lights 	CLW < 60T	CLW ≥ 60T or, if applicable to the vessel or area of operation, C/P 1	<ul style="list-style-type: none"> - <i>Canadian Coastguard Publication- Canadian Aids to Navigation System 2011</i> - <i>Safe Boating Guide (TP-511)</i>
15.	Use radar for navigation safety	<ul style="list-style-type: none"> - Knowledge of the basic principle of radar and its functioning: <ul style="list-style-type: none"> a) Start-up procedure b) Function and effect of main commands c) Interpretation of the radar image - Ability to use radar for positioning: <ul style="list-style-type: none"> a) Identification of radar marks useful for navigation b) Bearing-taking and distance measurement by radar - Ability to use radar as an anti-collision device: <ul style="list-style-type: none"> a) Evaluation of the risk of collision by observing radar bearings b) Determining the approximate closest distance of approach c) Effect of a change of heading or speed or both on the closest distance of approach 	CLW < 60T and CLO < 60T	Training certificate from the SEN Limited course	<ul style="list-style-type: none"> - Radar manuals - Instruction manuals - Practical experience - SEN Limited course

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
16.	Determine the position of the vessel using electronic navigation aids	<ul style="list-style-type: none"> - Ability to correctly use all of the following instruments: <p>GPS:</p> <ul style="list-style-type: none"> a) Starting procedure and functioning of the device b) Correct use of data supplied by the instrument c) Recognizing possible errors, lack of reliability and the need to double check <p>Loran C:</p> <ul style="list-style-type: none"> a) Starting procedure and functioning of the device b) Correct use of data supplied by the instrument c) Recognizing possible errors, lack of reliability and the need to double check <p>Echo sounder:</p> <ul style="list-style-type: none"> a) Starting procedure and functioning of the device d) Correct use of data supplied by the instrument 	CLW < 60T and CLO < 60T	Training certificate from the SEN Limited course	<ul style="list-style-type: none"> - Electronic navigation manuals - Equipment instruction manuals - Radio Aids to Marine Navigation - Practical experience
17.	Carry on radio communications	<ul style="list-style-type: none"> - Knowledge of the categories of vessels on which a VHF transmitter-receiver is required - Knowledge of Coast Guard radio stations and the services they provide - Identify vessels required to report to the various Vessel Traffic Centres - Knowledge of the publication <i>Radio Aids to Marine Navigation</i> - The functioning and use of EPIRBs, if applicable - Understanding of the use of MMSI number, if applicable - Use of sailing plans 	CLW < 60T and CLO < 60T	CLW ≥ 60T and CLO ≥ 60T	<ul style="list-style-type: none"> - <i>Ship Station (Radio) Regulations 1999</i> - <i>Radio Aids to Marine Navigation</i> - Annual edition of <i>Notices to Mariners</i> - <i>Ship Safety Bulletin #4/95</i> - Coast guard pamphlets

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
18.	Carry out towing operations	<ul style="list-style-type: none"> - Practical knowledge of towing, in particular: <ul style="list-style-type: none"> a) Cables used for towing and their required length b) The towing point c) Towing bitts and hooks d) The effect of the towing cable on the centre of gravity of the tug and on its stability e) Events that may result in the capsizing of the tug f) Different ways to instantly release the towing cable in an emergency g) Taking and letting go the tow h) The use of an emergency tow line 	CLW < 60T and CLO < 60T	CLW ≥ 60T and SCS 3 and CLO ≥ 60T	- Practical experience

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General**13.1 General requirements**

The general requirements for a certificate as Chief Mate, are listed in section 132 of the *Marine Personnel Regulations*.

13.2 Validity of certificates

The holder of this certificate may act as Chief Mate on board a vessel of any tonnage engaged on an unlimited, a near coastal or sheltered waters voyage, as Master on board a vessel of not more than 500 gross tonnage, engaged on a near coastal voyage and as Master of a vessel of any tonnage engaged on a sheltered waters voyage.

Syllabuses of Examinations**13.3 Celestial Navigation, level 2 (Examination Code: ASTRO 2)**

Refer to section 5.5, Chapter 5 of this TP.

13.4 Navigation Systems and Instruments (Examination Code: NS/I)

Refer to section 5.6, Chapter 5 of this TP.

13.5 Navigation Safety, level 2 (Examination Code: NS 2)

Refer to section 5.7, Chapter 5 of this TP.

13.6 Meteorology, level 2 (Examination Code: MET 2)

Refer to section 5.8, Chapter 5 of this TP.

13.7 Ship Management, level 3 (Examination Code: SM 3)

Refer to section 5.9, Chapter 5 of this TP.

13.8 Ship Construction and Stability, level 4 (Examination Code: SCS 4)

Refer to section 5.11, Chapter 5 of this TP.

13.9 Cargo, level 3 (Examination Code: CG 3)

Refer to section 5.13, Chapter 5 of this TP.

13.10 Engineering Knowledge, level 1 (Examination Code: EK 1)

Refer to section 7.10, Chapter 7 of this TP.

13.11 Simulated Electronic Navigation – Management level (Examination Code: SIM II or SIM M)

Refer to section 5.15, Chapter 5 of this TP.

13.12 Oral examination on General Seamanship (Examination Code: CM-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Chief Mate certificate, as set out in section 13.2 of this chapter.
- 2) The examination is of an unlimited duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence:	Plan and conduct safe navigation
Establish and maintain a Safe Navigational Watch	Principles to be observed in keeping a navigational watch as set out in the STCW Code, section A-VIII/2, including under pilotage, and watchkeeping at anchor and in port; A thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at sea, 1972 with Canadian Modifications 1983
Competence:	Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment
Establish and maintain a Safe Navigational Watch	<p>Certificates and other documents</p> <p>Certificates and other documents required to be carried on board ships by International Conventions and their period of validity; Certificates and documents required to be carried on board domestic vessels and their periods of validity.</p> <p>International conventions</p> <p>Major elements covered by international conventions such as the International Convention for the Safety of Life at Sea (SOLAS), the International Convention for the Prevention of Pollution from Ships (MARPOL), the International Convention for the Control and Management of Ships Ballast Water and Sediments, the Maritime labour Convention and the International Convention on Standards of Training, Certification and watchkeeping for Seafarers 1978 as amended (STCW Convention) and STCW Code; Purpose and application of the International Safety Management (ISM) Code Purpose of Flag State and Port State control.</p>
Monitor compliance with legislative requirements and measures to ensure safety of life at sea	Knowledge of master's / ship's responsibilities under the Marine Personnel Regulations; the validity of certificates of competency and endorsements; knowledge and application of the Marine Occupational Safety and Health Regulations; the requirements of the CSA and Marine Personnel Regulations concerning crew agreements, the official log book and compulsory entries, inspection of living quarters and storerooms, complaints procedure; The obligation with regard to initial and subsequent reports to be made in case of a marine occurrence; Load-line marks – entries and reports in respect of freeboard, draft and allowances; The requirements of the regulations concerning life-saving and fire-fighting appliances; Application of hours of work and rest legislation.

Subject	Knowledge required
Competence:	Manoeuvre and handle a ship in all conditions
Manoeuvre and handle a ship in all conditions including:	<p>Factors affecting safe manoeuvring and handling Ability to determine the manoeuvring and propulsion characteristics of common types of ships with special reference to stopping distances and turning circles at various draughts and speeds; The effects of deadweight, draught, trim, speed and under keel clearance on turning circles and stopping distances; Knowledge of the effects of wind and current on ship handling; Behaviour of the ship when engines are put astern; Behaviour of a ship when moving ahead or stopped with a wind from various directions; Propeller and rudder effects on steering, including wake current, transverse thrust and screw race when going ahead and astern.</p> <p>Confined and shallow waters Manoeuvres when approaching pilot stations and embarking or disembarking pilots, with due regard to weather, tide, headreach and stopping distances; Handling ship in rivers, estuaries and restricted waters, having regard to the effects of current, wind and restricted water on helm response; Definition of shallow water, squat, blockage factor; Manoeuvring in shallow water, including the reduction in under keel clearance caused by squat, rolling and pitching; Interaction between passing ships and between own ship and nearby banks (canal effect); Effect of bank suction and bank cushion in restricted waters; Importance of navigating at reduced speed to avoid damage caused by own ship's bow wave and stern wave.</p> <p>Berthing and unberthing Use of propulsion and manoeuvring systems; Practical berthing and unberthing under various conditions of wind, tide and current with and without tugs; Ship and tug interaction; How to make fast tugs on towing hawsers or lashed up alongside; Turning a vessel short round; Preparation to be made for berthing alongside, including head ropes, stern ropes, breast ropes, springs, stopper, heaving lines, winches, self-tensioning winches, capstan, windlass, wire rope; Making fast on-shore bollards being used by another ship; Use of mooring on the bight and doubling up; Methods of mooring to a buoy.</p> <p>Anchoring Choice of and approach to an anchorage; Anchoring with one or two anchors in limited anchorages and factors involved in determining the length of anchor cable to be used; Anchoring to a stern anchor; Method of letting go; Anchoring in water too deep to let the anchor go on the brake; Preparation and procedures during heaving up; Dragging anchor; clearing fouled anchors.</p> <p>Heavy weather and rescue operations 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; precautions in manoeuvring to launch rescue boats or survival craft in bad weather; methods of taking on board survivors from rescue boats and survival craft; handling a disabled ship.</p> <p>Ice navigation Practical measures to be taken when navigating in or near ice or in conditions of ice accumulation on board; Procedures in ice, alone or in convoy, and movements to be expected by an ice breaker with reference to Transport Canada publication <i>Ice Navigation in Canadian Waters</i>; Methods of freeing a vessel from ice utilizing pumping of tanks or flume system.</p> <p>Seaway, canal navigation and locks Locking and unlocking a vessel; Use of lines in securing a vessel and in warping alongside a berth; Use of lines in a lock or lay-by; Seaway Practices and Procedures contained in the Seaway Handbook.</p>

Subject	Knowledge required
Competence:	Manoeuvre and handle a ship in all conditions
Normal and emergency towing operations	<p>Practical knowledge of normal and emergency towing and in particular of the following elements:</p> <p>Taking and being taken in tow; Cables used for towing and the required length; The towing point; Towing bitts and hooks; How to approach a vessel to be towed and pass the first connection by line-throwing apparatus or other methods; How to pay out the towing wire under control; Methods of securing the towing wire at the towing ship; How the towing wire should be protected from chafing at fairleads; How to take the weight of the tow; How the towing speed should be decided; The effect of the towing cable on the centre of gravity of the tug and on its stability; Events that may result in the capsizing of the tug; The different ways to instantly release the towing cable in an urgent situation; The use of an emergency tow line; How to disconnect the tow on arrival at the destination.</p>
Competence:	Cargo Handling and Stowage
Cargo Handling, Stowage, Securing and Care	<p>Practical knowledge of the safe working practices and procedures in relation to handling, stowage, securing and care of packaged, solid or liquid bulk, hazardous and grain cargoes; mate's responsibilities when preparing the ship for cargo operations; Practical preparation of a vessel for loading various dry cargoes; inspections of holds including structure, cleanliness, electrical systems, air and sounding pipes, ladders, ventilators, hatch covers, etc before loading; testing suction and drainage arrangements before loading; inspection of refrigerated compartments before loading; derrick riggings, types and uses for loading and/or discharging; arrangements and working of heavy lifts by ship or shore equipment, and lifts that cannot be handled by a single runner; overhaul, inspections, certification and documentation required for cargo handling gear; Working of liquid bulk cargoes, mate's duties and responsibilities when preparing the ship for liquid bulk cargoes; inspections and testing of tanks, valves and lines before loading, discharging or transferring liquid bulk cargoes; handling cargo hoses at shore-side or sea-line terminals; cleaning and gas-freeing tanks and lines (Butterworth and Sellers equipment); use of explosimeters; purpose and operation of pressure vacuum valves and flame traps; pressure-testing of lines, valves and heating coils; Safety precautions, terminal check lists and interface with terminals.</p>
Competence:	Respond to navigational emergencies
Refloating a grounded ship with and without assistance	<p>Measures which can be taken to prevent further damage to the ship and to assist with subsequent refloating; How ballast or other weights may be moved, taken on or discharged to assist refloating; how a ship can be stabilized to prevent movement during unloading operations; The use of ground tackle for hauling off; Ways in which tugs may be used to assist in refloating; The use of the main engine in attempting to refloat and the danger of building up silt from its use.</p>
Assessment of damage control	<p>Ability to determine damage to own ship; Measures to attempt to limit damage and save own ship.</p>
Emergency steering	<p>Arrangements of auxiliary steering gear; How the auxiliary steering gear is brought into action;</p> <p>How to change from bridge control to local control in the steering gear compartment;</p> <p>Possible course of action which may be taken by a disabled ship; Methods of securing the rudder in the event of a broken rudder stock; Jury steering arrangement using materials normally found aboard ship; Means of constructing a jury rudder, where practicable.</p>

Subject	Knowledge required
Competence:	Ensure compliance with pollution-prevention requirements
Ensure compliance with pollution-prevention requirements	Precautions to be taken to prevent pollution of the marine environment as required by the MARPOL convention, including Restricted Areas and the disposal of pollutants; Take appropriate action in response to pollution incidents onboard and found at sea; Knowledge of the contents of the SOPEP manual, Garbage Management Plans and anti-pollution equipment.
Competence:	Assess reported defects and damages to cargo spaces, hatch covers and ballast tanks and take appropriate action
Bulk Carriers	Knowledge of the limitations on strength of the vital constructional parts of a standard bulk carrier and ability to interpret given figures for bending moments and shear forces. Ability to explain how to avoid the detrimental effects on bulk carriers of corrosion, fatigue and inadequate cargo handling.
Competence:	Organize and manage the crew
A knowledge of personnel management, organization and training on board ship	<p>Personnel Management Principles of controlling subordinates and maintaining good relationships; Staff attitudes; Exercise of authority Group behaviour; Conditions of employment.</p> <p>Organization of staff Manning arrangements; Analysis of work; Allocation of staff; Organizing for safety and emergencies; Organizing for staff duties; Organizing for maintenance; Ship's records; Organizing communication on the ship; Meeting techniques.</p> <p>Training on board ships Training methods; Emergency drills.</p>
Effective bridge teamwork procedures	<p>Bridge Teamwork Procedures:</p> <p>Master/Pilot Relationship Why the Master and pilot should agree on plans and procedures for the intended voyage; Any special conditions of weather, tidal currents, depth or marine traffic which may be expected should be discussed; The Master should provide the pilot with the pilot card and make available the manoeuvring booklet or, in their absence, provide him details of the ship's particulars and manoeuvring characteristics, including information on the ship's response to wind forces; special characteristics related to squat should be discussed; The Master should inform the pilot of any unusual handling characteristics, machinery difficulties or problems with navigational equipment which could affect the operation, handling of safe manoeuvring of the ship; The pilot should give information on the intended use of tugs, if any; The Master and pilot should discuss, if applicable, special consideration concerning passing or overtaking of other vessels in narrow channels.</p> <p>Bridge Team Management The benefits of effective disposition of manpower on the bridge; How error chains can be avoided; Contingency plans for routine manoeuvres; The importance of effective internal and external communication; The needs for adequate information flow between team members; Failure to monitor the ship's position and communicate effectively has led to casualties.</p>

Subject	Knowledge required
Competence:	Organize and manage the crew
Effective bridge teamwork procedures	Teamwork The need for effective planning including: <ul style="list-style-type: none"> a) time constraints b) required navigational route c) need to monitor external communications d) makes allowance for traffic density e) makes provision for integrating the pilot into the bridge team f) prevailing weather conditions Effective management of resources includes personnel, equipment and time; The importance of correctly handling the conn between members of the bridge team including the pilot; Ability to recognise the risk factors involved with a planned passage; The need for effective flow of information.
Competence:	Organize and manage the provision of medical care on board
A thorough knowledge of the use and contents of the following publications: <i>International Medical Guide for Ships or equivalent national publications</i> <i>Medical section of the International Code of Signals</i> <i>Medical First Aid Guide for Use in Accidents Involving Dangerous Goods</i>	International Medical Guide for Ships Ability to describe the content and application of the publication; Ability to extract and apply information for given situation. International Code of Signals (Medical Section) Ability to describe the content and application of the publication; Ability to construct and interpret messages. Medical First Aid Guide for use in Accidents involving Dangerous Goods Ability to describe the content and application of the publication; Ability to extract and apply information for given situations.
Competence:	Co-ordinate search and rescue operations
A thorough knowledge of and ability to apply the procedures contained in the IMO International Aeronautical and Maritime Search and Rescue manual (IAMSAR)	Demonstrate a knowledge and understanding of the procedures contained in IMO International Aeronautical and Maritime Search and Rescue manual (IAMSAR).
Competence:	Maintain safety and security of the ship's crew and passengers
Actions to be taken to protect and safeguard all persons on board in emergencies	Crew members will be assigned specific duties for mustering and control of passengers, list those duties; Rescue of persons from a vessel in distress or from a wreck; Man-overboard procedures.

Subject	Knowledge required
Competence:	Maintain safety and security of the ship's crew and passengers
Actions to limit damage and save the ship following a fire, explosion, collision or grounding	Means of limiting damage and salvaging the ship following a fire or explosion; Procedure for abandoning ship.
Competence:	Develop emergency and damage control plans and handle emergency situations
Preparation of contingency plans for response to emergencies	<p>Contingency plans for response to emergencies</p> <p>Ability to draw up a muster list and emergency instructions for a given crew and type of ship;</p> <p>Ability to assign duties for the operation of remote controls; The division of the crew into a command team, an emergency team, a back-up emergency team and an engine-room emergency team; Ability to designate muster positions for the command team and emergency team, both at sea and in port; Ability to draw up plans to deal with fire in specific areas, rescue of victims of a gassing accident in an enclosed space, heavy weather damage, rescue of survivors from another ship or from the sea, leakages and spills of dangerous cargo, stranding and abandoning ship; The role of a shipboard safety committee in contingency planning; As per the approved training course in STCW BS, PSC and AFF.</p> <p>Actions to be taken when emergencies arise in port</p> <p>Actions to take in the event of fire on own ship; Action which should be taken when fire occurs on nearby ship or an adjacent port facility; The circumstances in which a ship should put to sea for reasons of safety; The actions which can be taken to avoid a ship dragging anchor towards own ship in an anchorage; The actions and precautions to take when a submarine cable is lifted by the anchor; How to buoy and slip an anchor; How an anchor can be recovered when no power is available at the windlass.</p>
Ship construction, including damage control	<p>Flooding of compartments</p> <p>The extent of damage which a passenger ship should withstand; The provisions for dealing with asymmetrical flooding; The possible effects of sustaining damage when in a less favourable condition; The extent of damage which a Type A ship of over 150 metres length should withstand; The requirements for survivability of Type B ships with reduced freeboard assigned; The equilibrium conditions regarded as satisfactory after flooding.</p>

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General**14.1 General requirements**

The general requirements for a certificate as Chief Mate, near coastal, are listed in section 133 of the *Marine Personnel Regulations*.

14.2 Validity of certificates

The holder of this certificate may act as Chief Mate on board a vessel of any tonnage engaged on a near coastal voyage, as Master on board a vessel of not more than 500 gross tonnage, engaged on a near coastal voyage and as Master on board a vessel of any tonnage engaged on a sheltered waters voyage.

Syllabuses of Examinations**14.3 Navigation Systems and Instruments (Examination Code : NS/I)**

Refer to section 5.6, Chapter 5 of this TP.

14.4 Navigation Safety, level 2 (Examination Code: NS 2)

Refer to section 5.7, Chapter 5 of this TP.

14.5 Meteorology, level 2 (Examination Code: MET 2)

Refer to section 5.8, Chapter 5 of this TP

14.6 Ship Management, level 3 (Examination Code: SM 3)

Refer to section 5.9, Chapter 5 of this TP.

14.7 Ship Construction and Stability, level 4 (Examination Code: SCS 4)

Refer to section 5.11, Chapter 5 of this TP.

14.8 Cargo, level 3 (Examination Code: CG 3)

Refer to section 5.13, Chapter 5 of this TP.

14.9 Engineering Knowledge, level 1 (Examination Code: EK 1)

Refer to section 7.10, Chapter 7 of this TP.

14.10 Simulated Electronic Navigation – Management level (Examination Code: SIM II or SIM M)

Refer to section 5.15, Chapter 5 of this TP.

14.11 Oral examination on General Seamanship (Examination Code: CMNC-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Chief Mate, Near Coastal certificate, as set out in section 14.2 of this chapter.
- 2) The examination is of an unlimited duration.
- 3) The examination is based upon the oral examination syllabus of section 13.13, Chapter 13 of this TP.

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General**15.1 General requirements**

The general requirements for a certificate as Watchkeeping Mate, are listed in section 134 of the *Marine Personnel Regulations*.

15.2 Validity of certificates

The holder of this certificate may act as Officer in charge of the watch on board a vessel of any tonnage, engaged on an unlimited or a near coastal voyage, as Chief Mate on board a vessel of not more than 3000 GT engaged on an unlimited or a near coastal voyage and as Chief mate on board a vessel of any tonnage engaged on a sheltered waters voyage.

Syllabuses of Examinations**15.3 Communications, level 1 (Examination Code: COM 1)**

Refer to section 5.3, Chapter 5 of this T.P.

15.4 Communications, level 2 (Examination Code: COM 2)

Refer to section 5.4, Chapter 5 of this T.P.

15.5 Chartwork & Pilotage, level 2 (Examination Code: C/P 2)

Refer to section 11.3, Chapter 11 of this T.P.

15.6 Celestial navigation, level 2 (Examination Code: ASTRO 2)

Refer to section 5.5, Chapter 5 of this T.P.

15.7 Navigation Safety, level 1 (Examination Code: NS 1)

Refer to section 11.4, Chapter 11 of this T.P.

15.8 Meteorology, level 1 (Examination Code: MET 1)

Refer to section 8.5, Chapter 8 of this TP.

15.9 Ship Construction and Stability, level 4 (Examination Code: SCS 4)

Refer to section 5.11, Chapter 5 of this T.P.

15.10 Cargo, level 2 (Examination Code: CG 2)

Refer to section 7.9, Chapter 7 of this T.P.

15.11 General Ship Knowledge, level 3 (Examination Code: GSK 3)

Refer to section 11.7, Chapter 11 of this T.P.

15.12 Simulated Electronic Navigation – Operational level (Examination Code: SIM I or SIM O)

Refer details of SIM I or SIM O in TP 4958

15.13 Oral examination on General Seamanship (Examination Code: OOW-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Watchkeeping Mate certificate, as set out in section 15.2 of this chapter.

- 2) The examination is of an unlimited duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence:	Plan and conduct a passage and determine position
Plan and conduct a passage and determine position	Knowledge of the voyage planning requirements set out in section A-VIII/2 of the STCW Code.
Competence:	Maintain a Safe Navigational Watch
Maintain a Safe Navigational Watch	<p>Bridge procedures</p> <p>The responsibilities and duties of the officer for watchkeeping at sea, at anchor or in port; Watchkeeping arrangements and principles to be observed for watchkeeping at sea under different conditions and in different areas as set out in the STCW Code, section A-VIII/2, including under pilotage, and watchkeeping at anchor and in port; The responsibilities and duties of the officer for keeping a safe deck watch in port when carrying hazardous cargo; purpose, necessity and general content of standing orders, night orders, bridge or movement book, ship's logbook and similar material; knowledge of steering orders and responses; the purpose of maintaining a proper lookout; knowledge of the IALA systems of maritime buoyage.</p> <p>Collision regulations</p> <p>A thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at sea, 1972 with Canadian Modifications 1983.</p> <p>Steering control systems</p> <p>Knowledge of steering control systems, including pre-departure and pre-arrival tests, automatic pilot, operational procedures and change-over from manual to automatic control and vice-versa – adjustment of controls for optimum performance; emergency steering gear procedures and use.</p>
Competence:	Manoeuvre the ship
Knowledge of the effects of deadweight, draught, trim, speed and under keel clearance on turning circles and stopping distances	General manoeuvring characteristics of merchant vessels of all types; Definitions of terms: turning circle, advance, transfer, drift angle, tactical diameter, track reach, head reach and side reach; Turning circles of a ship in the loaded and ballast conditions, at different speeds; Accelerating turn and decelerating turn; Stopping distances in loaded and ballast conditions; The effect of shallow or deep water on the turning circle; Directional stability.
Knowledge of the effects of wind and current on ship handling	Behaviour of the ship when engines are put astern, the pivoting point; Behaviour of a ship moving ahead with a wind from various directions; Effects of wind when making large turns, on a disabled vessel, when the ship is slowed, when making sternway; Creating a lee; The effect of current on the motion of a ship, when in rivers and narrow channels, when turning in a channel; Use of an anchor to dredge down with a current.

Subject	Knowledge required
Competence:	Manoeuvre the ship
Knowledge of manoeuvres and procedures for the rescue of person overboard	Distinguish between immediate action, delayed action and person missing situations; Manoeuvres required in a man overboard situation; Single turn, Williamson turn and Scharnow turn manoeuvres; Situations in which each turn is appropriate; The sequence of action to take when a person is seen to fall overboard; The action to take when a man-overboard report is received on the bridge.
Knowledge of squat, shallow water and similar effects	Definition of shallow water, squat, blockage factor; Shallow water effects as: increased directional stability, a large increase in turning radius, the ship carrying her way longer and responding slowly to changes in engine speed, speed falling less during turns, squat increasing, trim changing; Effect of squat on manoeuvrability; Effect of bank suction and bank cushion in restricted waters; The squat and other shallow water effects increase as the blockage factor increase; Propeller and rudder effects on steering, including wake current, transverse thrust and screw race when going ahead and astern.
Knowledge of proper procedures for anchoring and mooring	Preparation of anchors to be ready for use; The approach to an anchorage; The use of anchor buoys; Safety measures to be taken by the anchor party; Method of letting go; Fittings and cable markings; Communication with the bridge; Anchoring in water too deep to let the anchor go on the brake; Securing of anchors on the completion of anchoring; Preparation and procedures during heaving up; Securing anchor gear in preparation for sea passage; Use, care and stowage of mooring lines, types of line used for mooring and their characteristics; Names of the various mooring lines and orders; Preparation to be made for berthing alongside, including head ropes, stern ropes, breast ropes, springs, stopper, heaving lines, winches, self-tensioning winches, capstan, windlass, wire rope; Making fast on-shore bollards being used by another ship; Use of mooring on the bight and doubling up; Use, handling and securing of towing wires; Handling and securing of insurance wires; Use of lines in securing a vessel and in warping alongside a berth; Use of lines in a lock or lay-by; How to make fast tugs on towing hawsers or lashed up alongside; Methods of mooring to a buoy; Use of a messenger to pass on a wire or chain to a buoy; Preparation, use, handling and securing of a pilot ladder.
Transit on the St-Lawrence Seaway	Seaway Handbook Awareness of Part I – Condition of ships and Part III – Seaway navigation of the Seaway Handbook.
Competence:	Cargo Handling and Stowage
Loading and unloading of cargoes	Safety of operations The responsibilities, duties and tasks of the OOW during cargo handling, stowage and securing; the proper use of derricks, cranes and other cargo gear; the surveillance of cargo handling operations to ensure compliance with safe working practices and regulations; protection of crew members and stevedores; the significance of SWL inscriptions on derricks, cranes and cargo gear; Basic knowledge of the dangerous goods handling, stowage, securing and carriage requirements as indicated in the IMDG Code.
Competence:	Response to emergencies
Precautions for the protection and safety of passengers or crew in emergency situations	Contingency plans for response to emergencies; Awareness of contingency plans for response to various emergencies; Knowledge of the content of a muster list and emergency instructions; The concept of dividing the crew into teams; Knowledge of the composition of emergency teams; Communication links between emergency teams; The importance of drills and crew training. Protection and safety of passengers; Knowledge of specific duties assigned to officers and crew members for the mustering, control and rescue of passengers.

Subject	Knowledge required
Competence:	Response to emergencies
Initial action to be taken following a collision or grounding or other emergencies: initial damage assessment and control	The OOW initial actions to be taken following a collision, running aground, discovery of fire, sighting of derelicts, sighting or receiving distress signals, breakdown of aids or equipment, power failure, capsize of tugs when under tow or manoeuvring, collapse of crew member in tank or other confined space, accidents to any person on board, ship; Procedures for abandoning ship.
Procedures to be followed for rescuing persons from the sea, assisting a ship in distress, responding to emergencies which arise in port	Measures for assisting a vessel in distress; Rescue of persons from a vessel in distress, from a wreck, or from the sea. Emergencies in port The OOW actions, which can be taken when emergencies arise in port; action on discovery of fire aboard or ashore, fire alarms ashore; precautions when taking on or transferring fuel, water or stores; action to be taken in event of excessive ranging, parted moorings, burst oil lines, tank overflows, striking by another vessel, taking bottom, leakage and spills of dangerous cargo.
Competence:	Respond to a distress signal at sea
Knowledge of the contents of the IMO International Aeronautical and Maritime Search and Rescue manual (IAMSAR)	Search and Rescue Knowledge and understanding of the content and application of the IMO <i>International Aeronautical and Maritime Search and Rescue manual (IAMSAR)</i> .
Competence:	Communicate effectively and in emergencies
Normal and emergency communications	Recognition and knowledge of the meaning and use of distress signals contained in the <i>Collision regulations</i> ; Recognition and knowledge of the meaning and use of the lifesaving, emergency and distress signals contained in the International Code of Signals; Emergency communications within the GMDSS regulations; understanding and use of the IMO standard Marine Communication Phrases.
Competence:	Inspect and report defects and damage to cargo spaces, hatch covers and ballast tanks
Inspect and report defects and damage to cargo spaces, hatch covers and ballast tanks	Knowledge and ability to explain where to look for damage and defects most commonly encountered due to Loading and unloading operations, corrosion, severe weather conditions; Identify those elements of the ship structure, which are critical to the safety of the ship; Understanding of the purpose of the “enhanced survey program”
Competence:	Maintain Seaworthiness of the ship
Maintain Seaworthiness of the ship	Understand fundamentals of watertight integrity, and the closing of all openings including hatch covers, access hatches and watertight doors; Preparations of a vessel for heavy weather.

Subject	Knowledge required
Competence:	Monitor compliance with legislative requirements
Basic working knowledge of the relevant IMO conventions concerning the safety of life at sea and the protection of the marine environment	Basic working knowledge of the SOLAS and MARPOL conventions; Purpose and application of the international Safety Management (ISM) and International Ship and Shore Facility Security (ISPS) Codes; Purpose of Flag State and Port State control.
Canadian legislation and regulations and vessels documentation	Basic knowledge and application of the Canada Labour Code and the Marine Occupational Safety and Health Regulations; Practical knowledge of the rights and privileges of the various certificates of competency and endorsements required on board ship and issued by Transport Canada; Basic knowledge of ship's documentation, inspection certificates, loadline certificates, manning certificates, tackle book, oil record book.
Competence:	Seamanship
Mooring Lines	Use, care and stowage of mooring lines, types of line used for mooring and their characteristics; Names of the various mooring lines and orders; Making fast on-shore bollards being used by another ship; Use of moorings on the bight and doubling up; Use, handling and securing of lines to make fast a harbour tug; Use, handling and securing towing wires; Use, handling and securing of insurance wires; Use of lines in securing a vessel and in warping alongside a berth, lock or lay-by; Use of mooring wire-ropes reels; Types of fairleads, their construction, naming and use; Use of rat guards.
Deck Machinery	Practical use and care in the use of : electric and hydraulic winches (ordinary and self-tensioning), windlasses and capstans; Electric and hydraulic derrick winches and deck cranes; Elevators and hatch opening systems.
Knots and Splicing	Basic knotting, gripping and splicing with reference to current practice, seizings, rackings, frappings, and stoppers.
Rigging	Practical knowledge of the rigging of ships, comprising the names, purpose, and construction of standing and running rigging; Reeving of blocks and purchases; Rigging of stages and chairs; Rigging of booms for single or doubled up operations; Names, purposes and construction of the various parts of a boom; Stresses on the various parts of a boom system during operation.

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General**16.1 General requirements**

The general requirements for a certificate as Watchkeeping Mate, Near Coastal are listed in section 134 of the *Marine Personnel Regulations*.

16.2 Validity of certificates

The holder of this certificate may act as Officer in charge of the watch on board a vessel of any tonnage, engaged on a near coastal voyage, as Chief Mate on board a vessel of not more than 3000 GT engaged on a near coastal voyage and as Chief mate on board a vessel of any tonnage engaged on a sheltered waters voyage.

Syllabuses of Examinations**16.3 Communications, level 1 (Examination Code: COM 1)**

Refer to section 5.3, Chapter 5 of this T.P.

16.4 Communications, level 2 (Examination Code: COM 2)

Refer to section 5.4, Chapter 5 of this T.P.

16.5 Chartwork & Pilotage, level 2 (Examination Code: C/P 2)

Refer to section 11.3, Chapter 11 of this T.P.

16.6 Navigation Safety, level 1 (Examination Code: NS 1)

Refer to section 11.4, Chapter 11 of this T.P.

16.7 Meteorology, level 1 (Examination Code: MET 1)

Refer to section 8.5, Chapter 8 of this TP.

16.8 Ship Construction and Stability, level 4 (Examination Code: SCS 4)

Refer to section 5.11, Chapter 5 of this T.P.

16.9 Cargo, level 2 (Examination Code: CG 2)

Refer to section 7.9, Chapter 7 of this T.P.

16.10 General Ship Knowledge, level 3 (Examination Code: GSK 3)

Refer to section 11.7, Chapter 11 of this T.P.

16.11 Simulated Electronic Navigation – Operational level (Examination Code: SIM I or SIM O)

Refer to section 15.12, chapter 15 of this TP.

16.12 Oral examination on General Seamanship (Examination Code: OOWNC-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Watchkeeping Mate, Near Coastal certificate, as set out in section 16.2 of this chapter.
- 2) The examination is of an unlimited duration.
- 3) The examination is based upon the oral examination syllabus of section 15.13, Chapter 15 of this TP.

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General

17.1 General requirements

The general requirements for a certificate as Chief Mate 500 gross tonnage, Domestic, are listed in section 135 of the *Marine Personnel Regulations*.

17.2 Validity of certificates

- 1) The holder of this certificate may act as Chief Mate on board a vessel of not more than 500 gross tonnage engaged on a near coastal voyage, Class 2, as officer in charge of the watch on board a vessel of not more than 3000 gross tonnage engaged on a near coastal voyage, Class 2 and as Chief Mate on board a vessel of not more than 3000 gross tonnage engaged on a sheltered waters voyage.
- 2) In addition, the holder of this certificate may act as a Chief Mate on board a vessel of not more than 500 gross tonnage engaged on a limited voyage, contiguous waters if endorsed as such.
- 3) To obtain a limited voyage, contiguous waters endorsement in respect to the Chief mate 500, Gross tonnage, Domestic certificate, the holder must meet the requirements of section 135 (2) of the *Marine Personnel Regulations*.

Syllabuses of Examinations

17.3 Communications, level 1 (Examination Code: COM 1)

Refer to section 5.3, Chapter 5 of this TP.

17.4 Chartwork & Pilotage, level 2 (Examination Code: C/P 2)

Refer to section 11.3, Chapter 11 of this TP.

17.5 Navigation Safety, level 1 (Examination Code: NS 1)

Refer to section 11.4, Chapter 11 of this TP.

17.6 Ship Construction and Stability, level 3 (Examination Code SCS 3)

Refer to section 8.7, Chapter 8 of this TP.

17.7 General Ship Knowledge, level 3 (Examination Code: GSK 3)

Refer to section 11.7, Chapter 11 of this TP.

17.8 Simulated Electronic Navigation – Operational Level (Examination Code: SIM I or SIM O)

Refer to section 15.12, Chapter 15 of this TP.

17.9 Oral examination on General Seamanship (Examination Code: CM500D-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Chief Mate 500 gross tonnage, Domestic certificate, as set out in section 17.2 of this chapter.
- 2) The examination is of an unlimited duration.
- 3) The examination is based upon the oral examination syllabus of section 11.8, Chapter 11 of this TP.

Chapter 18 – Chief Mate 150 Gross Tonnage, Domestic

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General**18.1 General requirements**

The general requirements for a certificate as Chief Mate 150 gross tonnage, Domestic, are listed in section 136 of the *Marine Personnel Regulations*.

18.2 Validity of certificates

- 1) The holder of this certificate may act as Chief Mate on board a vessel of not more than 150 gross tonnage engaged on a near coastal voyage, Class 2 and as Chief Mate on board a vessel of not more than 500 gross tonnage engaged on a sheltered waters voyage.
- 2) In addition, the holder of this certificate may act as Chief Mate on board a vessel of not more than 150 gross tonnage engaged on a limited voyage, contiguous waters if endorsed as such.
- 3) To obtain a limited voyage, contiguous waters endorsement in respect to the Chief mate 150, Gross tonnage, Domestic certificate, the holder must meet the requirements of section 136 (2) of the *Marine Personnel Regulations*.

Syllabuses of Examinations**18.3 Chartwork & Pilotage, level 1 (Examination Code: C/P 1)**

Refer to section 12.3, Chapter 12 of this TP.

18.4 Navigation Safety, level 1 (Examination Code: NS 1)

Refer to section 11.4, Chapter 11 of this TP.

18.5 Oral examination on General Seamanship (Examination Code: CM150D-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Chief Mate 150 gross tonnage, Domestic certificate, as set out in section 18.2 of this chapter.
- 2) The examination is of an unlimited duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence:	Communications
Lifesaving and distress signals	Recognition and knowledge of the meanings of distress signals contained in the Collision regulations, Recognition and knowledge of the meanings of the lifesaving and distress signals contained in the International Code of Signals.
Competence:	Plan and conduct safe navigation
Routeing in accordance with the General Principles on Ships' Routeing and weather routeing	Demonstrate an ability to undertake voyage planning, taking into consideration the requirements set out in section A-VIII/2, Part 2 of the STCW Code; Knowledge of the importance of weather forecasts; Ability to consult weather forecasts; Take into account weather forecast when making voyage planning; Take into account actual and forecasted weather before undertaking a voyage and for decision making during the voyage; Awareness of Environment Canada weather warnings and how they are transmitted.

Subject	Knowledge required
Competence:	Maintain a Safe Navigational Watch
Establish and maintain a Safe Navigational Watch	Principles to be observed in keeping a navigational watch as set out in the STCW Code, section A-VIII/2, including watchkeeping at anchor and in port; A thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at sea, 1972 with Canadian Modifications 1983; Knowledge of the Canadian System of buoyage; ability to determine magnetic compass error and care of magnetic compass.
Competence:	Manoeuvre the ship
Ship-Handling in various conditions	Basic knowledge of manoeuvring and handling a small vessel; The pivoting point and effects when the propulsion system is used in the ahead and astern direction; Practical manoeuvres for berthing, unberthing, when navigating and for anchoring; effect of wind, tide and current on manoeuvres.
Proper procedures for anchoring and mooring	Preparation of anchors to be ready for use; Safety measures to be taken; Method of letting go; Fittings and cable markings; Preparation and procedures during heaving up;
Competence:	Manoeuvre the ship
Knowledge and understanding of the precautions for the protection and safety of passengers in emergency situations	<p>Contingency plans for response to emergencies</p> <p>Knowledge of evacuation plans required on passenger vessels; Knowledge of the content of a muster list and emergency instructions; The concept of dividing the crew into teams; Knowledge of the composition of emergency teams; Communication links between emergency teams; The importance of drills and training and practical organization of drills.</p> <p>Protection and safety of passengers</p> <p>Familiarization of Crew members with their specific duties for the mustering and control of passengers; Knowledge of the specific duties to assign to crew members; Content of the pre-departure safety briefing to passengers; the need to communicate effectively with passengers during an emergency.</p>
Competence:	Response to emergencies
Knowledge and understanding of the actions to be taken following different emergency situations	Actions to be taken following emergencies such as fire onboard, collision, accidental flooding, grounding, person overboard, etc ; Passengers management during an emergency; Procedures for vessel's evacuation; Rescuing persons and assisting vessel in distress.
Emergency steering	Arrangements of auxiliary steering gear; How the auxiliary steering gear is brought into action; Possible course of action which may be taken by a disabled ship.
Competence:	Ensure compliance with pollution-prevention requirements
Prevent pollution	Knowledge of the precautions to be taken during fueling; Knowledge of the statutory requirements to report pollution incidents; Precautions to be taken to prevent pollution of the marine environment by oil, garbage or other pollutant; Take appropriate action in response to pollution incidents onboard and found at sea.

Subject	Knowledge required
Competence:	Maintain Seaworthiness of the ship
Seaworthiness of the ship	<p>Watertight integrity and adverse weather</p> <p>Understand the fundamentals of watertight integrity; Precautions to be taken before the onset of heavy weather such as closing and securing of watertight hatches, manholes, doors and portholes, lowering and securing weights onboard, ensuring that freeing arrangements are functional, etc; Necessary monitoring on a vessel caught in heavy weather, such as water detection in compartments; Actions to be taken in case of water ingress or vessel becoming disabled; Practical considerations of boat handling in heavy weather; How to prevent ice accretion; Actions to be taken if ice starts to accumulate on a vessel.</p> <p>Stability: Working knowledge of stability and damaged stability data supplied to small vessels; Effect on stability of passengers gathering on one side of the vessel; Understanding of ship's plans and specifications; an appreciation of the meaning and characteristics of stiff and tender ships; effects of reduction in freeboard on stability and seaworthiness.</p>
Competence:	Monitor compliance with legislative requirements
Responsibilities and duties	<p>Responsibilities and duties of a chief mate, including when joining a vessel; Knowledge of master's responsibilities under part 2 and 3 of the Marine Personnel Regulations; Basic knowledge of the regulations concerning life-saving and fire-fighting appliances; Precautions and requirements for safe embarkation of passengers on a vessel.</p>
Competence:	Seamanship
Mooring Lines	<p>Names, types, use and care of mooring lines and their characteristics; Making fast on-shore bollards being used by another ship; Use of moorings on the bight and doubling up; Preparation to be made for berthing.</p>

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General**19.1 General requirements**

- 1) The general requirements for a Chief Mate, Limited certificate for a vessel of 60 gross tonnage or more are set out in section 137 of the *Marine Personnel Regulations*.
- 2) The general requirements for a Chief Mate, Limited certificate for a vessel of less than 60 gross tonnage are set out in section 138 of the *Marine Personnel Regulations*.

19.2 Examinations

The examinations are based on the syllabus as modified in accordance with the criteria set out in section 19.11, as appropriate to the area of operation, the vessel, and the equipment carried on board the vessel for which the certificate is to be valid.

Syllabuses of Examinations**19.3 Chartwork and Pilotage, level 1 (Examination Code: C/P 1)**

Refer to section 12.3, Chapter 12 of this TP.

19.4 Navigation Safety, level 1 or domestic (Examination Code: NS 1 or NS D)

Refer to section 12.4, Chapter 12 of this TP.

19.5 Ship Construction and Stability, level 3 (Examination Code: SCS 3)

Refer to section 8.7, Chapter 8 of this TP.

19.6 Ship Construction and Stability, level 4 (Examination Code: SCS 4)

Refer to section 5.11, Chapter 5 of this TP.

19.7 General ship knowledge – less than 60 gross tonnage (Examination Code: 1MLW < 60T)

- 1) The knowledge required for this examination is shown on the table found in this chapter, subject to the remarks in section 19.11.
- 2) The examination consists of multiple-choice and essay type questions, and may also contain practical chartwork (see paragraph 19.11 (2) (e)).
- 3) The examination is of a three hours duration.

19.8 General ship knowledge – 60 gross tonnage or more (Examination Code: 1MLW ≥ 60T)

- 1) The knowledge required for this examination is shown on the table found in this chapter, subject to the remarks in section 19.11.
- 2) The examination consists of multiple-choice and essay type questions.
- 3) The examination is of a three hours duration.

19.9 General seamanship – less than 60 gross tonnage (Examination Code: 1MLO < 60T) (Also, please refer section 2.11 of Chapter 2)

- 1) The knowledge required for this examination is shown on the table found in this chapter, subject to the remarks in section 19.11.
- 2) The examination is oral and practical.
- 3) The examination is of an unlimited duration.

19.10 General seamanship – 60 gross tonnage or more (Examination Code: 1MLO ≥ 60T) (Also, please refer section 2.11 of Chapter 2)

- 1) The knowledge required for this examination is shown on the table found in this chapter, subject to the remarks in section 19.11.

- 2) The examination is oral.
- 3) The examination is of an unlimited duration.

19.11 Minimum standard of competence

- 1) The first column of the table below contains 18 fields of competence that may be applicable to a candidate depending on the type, gross tonnage (GT) and area of operation of the vessel or vessels to which the certificate sought by the candidate would apply. The second column specifies knowledge, understanding and proficiency that the candidate must possess to be considered competent in each of the corresponding fields. The third and fourth columns set out the method of evaluation that will be used to check the competence, depending on whether the vessel is <60 GT or ≥ 60 GT. The last column gives, as a rough guide, the references that may be of use in preparing for examinations.
- 2) The examinations will be adapted to the type and gross tonnage of the vessel or vessels to which the certificate sought by the candidate would apply and the area of operation of the vessel or vessels. An evaluation of each case will be carried out and the examiner will determine the scope of the examination in accordance with the following criteria:
 - a) Items 1 to 8: Items 1 to 8 will be covered in every case.
 - b) Item 9: Questions on survival craft and liferafts will not be included in the examination for vessels that do not carry such equipment.
 - c) Item 10: Questions on inspection certificate issuance will be omitted for vessels that are not required to have such a certificate.
 - d) Item 11: Questions on the *Collision Regulations* will be omitted if the vessel operates only in an isolated area, where there is no chance that another vessel would be met, but the examiner will make sure that the candidate knows which lights the vessel has to carry.
 - e) Item 12: This section will not be included if there are no marine charts for the area where the vessel will operate.
 - f) Item 13: Questions on the magnetic compass will be omitted if the vessel is less than 5 gross tonnage and is not equipped with a compass.
 - g) Item 14: Questions on the buoyage system will be omitted if no official buoyage system exists in the area of operation of the vessel.
 - h) Item 15: Competence in radar will be omitted if the vessel does not have radar.
 - i) Item 16: The electronic navigating instruments enumerated in section 16 that are not installed on the vessel will be omitted.
 - j) Item 17: Competence 17 will be omitted if the vessel is not required to have a VHF radio and does not carry one, except for the knowledge of the use of sailing plans.
 - k) Item 18: Competence 18 applies only if the vessel engages in towing operations.

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Specification of minimum standard of competence for a Chief Mate, Limited certificate

Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
1.	Demonstrate a good knowledge of the area for which the certificate will be valid	<ul style="list-style-type: none"> – Ability to demonstrate that intended route is safe – Knowledge of the places where the depth of water is sufficient for the vessel – Knowledge of sea conditions that may be met in the area of operation and actions to be taken if conditions become too severe – Knowledge of local currents and the effect of tides, if applicable, for the area of operation – Knowledge of the importance of weather forecasts and ability to consult them – Knowledge of the geographical limits of sheltered waters and near coastal waters 	1MLO < 60T	1MLO ≥ 60T	<ul style="list-style-type: none"> Practical experience Training courses Marine chart of the sector Canadian Tide and Current Tables Sailing directions
2.	Manoeuvre the vessel	<ul style="list-style-type: none"> – Capacity to manoeuvre the vessel for berthing, departure from the dock, navigation and anchoring – Manoeuvre to recuperate a person overboard – As applicable, the effect of propellers, rudders, jets and outboard engines when moving ahead and astern and when manoeuvring – Effect of winds and currents when manoeuvring 	1MLO < 60T	1MLO ≥ 60T	<ul style="list-style-type: none"> Practical experience Training courses Publications on the subject
3.	Operate the propulsion system and use of all other systems or devices of the vessel	<ul style="list-style-type: none"> – Knowledge of the principle of operation of the engine and the propulsion system – Knowledge of the use of the propulsion system – Knowledge of the vessel arrangement and of the functioning of all the systems and devices on board, such as the fuel system, lubrication and cooling of the engine, electrical systems, steering gear, bilge pumps, through-hull and drains of cockpit if applicable, quick shut-off valves, fire dampers in ventilation systems – Engine and system monitoring and measures to be taken in case of alarm of failure 	1MLW < 60T and 1MLO < 60T	1MLW ≥ 60T and 1MLO ≥ 60T	<ul style="list-style-type: none"> Practical experience Training courses Publications on the subject

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
4.	Dealing with emergency situations	<ul style="list-style-type: none"> – Be able to identify measures to be taken in emergency situations such as: <ul style="list-style-type: none"> a) Collision b) Grounding c) Flooding d) Fire e) Injured person or person overboard f) Release of a polluting substance or liquid – Measures to be taken to ensure protection and safety of crew members and passengers in emergency situations – The master’s obligation with regard to initial and subsequent reports to be made in case of a marine occurrence – Knowledge and meaning of distress signals as prescribed by appendix IV of the <i>Collision Regulations</i> <p>Measures to be taken to assist a vessel in distress</p>	1MLW < 60T and 1MLO < 60T	1MLW < 60T and 1MLO < 60T	<p><i>Collision Regulations</i> (TP 10739) or Chap. 1416</p> <p><i>Transportation Safety Board Regulations – Reportable Marine Accidents and Incidents Shipping Casualties Reporting Regulations</i> (SOR / 85-514)</p> <p>Form of a marine occurrence report</p> <p>Training courses</p> <p>Practical experience</p>
5.	Prevent and fight fires	<ul style="list-style-type: none"> – Knowledge of precautions to be taken to prevent fires – Knowledge of precautions to be taken during fuelling – Knowledge of fire-fighting and fire detection equipments – To be able to use all the fire-fighting equipment on the vessel 	1MLW < 60T and 1MLO < 60T	1MLW < 60T and 1MLO < 60T	<p>(Vessel < 15GT) <i>Construction Standards for Small Vessels</i> (TP-1332) and <i>Small Vessel Regulations</i> (Chap 1487)</p> <p>(Vessel > 15GT and < 150GT) <i>Standards for the Construction and Inspection of Small Passenger Vessels</i> (TP-11717)</p> <p>(Vessel > 150GT) <i>Hull Construction Regulations</i> (Chap. 1431) and <i>Vessel Fire Safety Regulations</i></p> <p><i>Safe Boating Guide</i> (TP-511)</p> <p>MED courses</p>
6.	Moor the vessel and perform related seamanship work	<ul style="list-style-type: none"> – Knowledge and use of mooring ropes and their use – Knowledge of the various ropes and their uses – Knowledge of the various knots and their uses – Ability to make knots 	1MLW < 60T and a practical demonstration	1MLW ≥ 60T and CLO ≥ 60T	<p>Practical experience</p> <p>Training courses</p> <p>Seamanship manuals</p>

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
7.	Prevent pollution	<ul style="list-style-type: none"> – Knowledge of the precautions to be taken during fuelling – Requirements regarding the <i>Oil Record Book</i> – Knowledge of the statutory requirements to report pollution incidents – Knowledge of the <i>Division 5- Garbage</i> of the <i>Prevention of Pollution from Ships and for Dangerous Chemicals Regulations</i> 	1MLW < 60T and 1MLO < 60T	1MLW ≥ 60T and 1MLO ≥ 60T	<i>Small Vessel Regulations</i> (Chap on 1487) <i>Prevention of Pollution from Ships and for Dangerous Chemicals Regulations.</i>
8.	Maintain the vessel's stability	<p>Vessel < 60GT</p> <ul style="list-style-type: none"> – Knowledge of the basic principles of stability – Practical application of stability principles to a vessel – Free surface effect <p>Vessel ≥ 60GT</p> <ul style="list-style-type: none"> – Understanding basic stability terminology – Knowledge of the basic principles of stability – Knowledge of KG, GM and righting lever GZ – Ability to explain using a sketch of a heeled vessel, how the centre of gravity (G) and the centre of buoyancy (B) are acting to create a righting lever (GZ) – Effect on stability of adding, removing, transferring and suspending weights – Stable equilibrium, unstable equilibrium, neutral equilibrium – Maintain watertight integrity – Free surface effect <p>Practical use of the vessel's stability booklet, in order to evaluate stability in different operating conditions of intact and damaged stability if applicable</p> <p>Tug or Ro-Ro passenger vessel ≥ 60GT</p> <p>In the case of a tug, refer to SCS 3 exam syllabus at section 8.6, Chapter 8 of this TP</p> <p>In the case of a Ro-Ro passenger vessel, refer to SCS 4 exam syllabus at section 5.11, Chapter 5 of this TP</p>	1MLW < 60T and 1MLO < 60T	1MLW ≥ 60T or SCS 3 examination if the vessel is a tug, or SCS 4 examination if the vessel is a Ro-Ro passenger vessel, and 1MLO ≥ 60T	<i>Small Fishing Vessel Safety Manual</i> (TP-10038) Vessel stability booklets Stability publications Training courses

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
9.	Ensure the safety of passengers and use safety and lifesaving equipment	<ul style="list-style-type: none"> – Knowledge of all the safety and lifesaving equipment on the vessel, such as lifeboats and liferafts, life jackets, lifebuoys, oars, bailers, pumps, anchors and distress flares – Ability to use all the safety and lifesaving equipment on the vessel – Knowledge of the master’s and first mate’s responsibilities with regard to the safety of crew members and passengers – Ability to conduct boat and fire drills – Understanding of the importance of lifesaving equipment demonstrations and safety instructions given to passengers before sailing – Familiarization of new crew members with the vessel’s equipment and safety procedures – Required training before being assigned to any duty on a vessel – Ability to deal with crisis situations and control crowds if applicable – Knowledge of the requirements for gangways 	1MLW < 60T and 1MLO < 60T	1MLW ≥ 60T) and 1MLO ≥ 60T	(Vessel < 15GT) <i>Construction Standards for Small Vessels</i> (TP-1332) and <i>Small Vessel Regulations</i> (Chap 1487) (Vessel > 15GT and < 150GT) <i>Standards for the Construction and Inspection of Small Passenger Vessels</i> (TP-11717) (Vessel > 150GT) <i>Life Saving Equipment Regulations</i> (Chap. 1436) and <i>Fire and Boat Drill Regulations Small Fishing Vessel Safety Manual</i> (TP-10038) <i>Safe Boating Guide</i> (TP-511) Ship Safety Bulletins 4/95, 2/96 and 12/98 Personal experience MED courses
10.	Carry out necessary checks and inspections and make sure that the vessel has all required certificates and documents	<p>Vessels subject or not subject to regulatory inspections</p> <ul style="list-style-type: none"> – Knowledge of the principal structural members of a vessel and the proper names for the various parts – Checks to be made before departure <p>In addition, for vessels subject to regulatory inspections</p> <ul style="list-style-type: none"> – Preparation for a regulatory inspection – Knowledge of statutory requirements with respect to crewing, inspection of the vessel and required equipment – Knowledge of required documents and certificates, their limits and their validity – Knowledge of requirements for the agreement with the crew, if applicable – Knowledge of record-keeping requirements 	1MLW < 60T and 1MLO < 60T	1MLW ≥ 60T) and 1MLO ≥ 60T	<i>Canada Shipping Act, 2001</i> Regulations applicable to the vessel <i>Standards for the Construction and Inspection of Small Passenger Vessels</i> (TP-11717) <i>Safe Boating Guide</i> (TP-511) Marine Safety Inspection Record (SIRS print out) Model certificates

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
11.	Ensure safe navigation and prevent collisions	<p>Vessel < 60GT</p> <ul style="list-style-type: none"> – Knowledge of the <i>Collision Regulations</i>, in particular regarding: <ul style="list-style-type: none"> a) Steering and sailing rules b) Lights and shapes c) Sound and light signals <p>In addition, for vessel ≥ 60GT</p> <ul style="list-style-type: none"> – Thorough knowledge of content, application and intention of the <i>Collision Regulations</i> – Knowledge of the principles to be observed in keeping a navigational watch 	IMLW < 60T and IMLO < 60T	IMLW ≥ 60T or, if applicable to the vessel or area of operation, NS 1 and IMLO ≥ 60T	<i>Collision Regulations</i> (TP-10739) or Chap. 1416 <i>STCW Code</i> , Chap. VIII
12.	Use marine charts and nautical publications to plan and execute a voyage	<ul style="list-style-type: none"> – Knowledge of and ability to use marine charts, especially with regard to: <ul style="list-style-type: none"> a) Abbreviations and symbols b) Geographic coordinates <ul style="list-style-type: none"> (1) Use latitude and longitude to fix a position on the chart (2) Extract the latitude and longitude of a given position on the chart c) The use of magnetic deviation and variation to convert compass bearings into true bearings and to calculate compass courses to be steered to follow a true course d) Determining the position of the vessel on a chart by various means including: <ul style="list-style-type: none"> (1) Compass bearings (2) Visual ranges (3) Estimated position of the vessel according to its course and speed e) Planning an charting a course to follow a given route 	IMLW < 60T and a practical exercise on a marine chart	IMLW ≥ 60T or, if applicable to the vessel or area of operation, C/P 1	Coastal navigation manuals Chart # 1 of the Hydrographic Service The following nautical publications: Annual edition of Notices to Mariners Tide Tables Radio Aids to Marine Navigation List of Lights, Buoys and Fog Signals Sailing Directions

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
		<ul style="list-style-type: none"> f) Determining the direction of a course drawn on a chart g) Properly measure distances on a chart h) The course to steer to counteract the effect of winds and currents <ul style="list-style-type: none"> – Ability to use and knowledge of the following marine publications: <ul style="list-style-type: none"> a) Annual edition of notices to mariners b) Tide tables c) Radio aids to marine navigation d) List of lights, buoys and fog signals <p>In addition, for a vessel ≥ 60T</p> <ul style="list-style-type: none"> – Knowledge of principles for constructing the various types of charts and their uses 			
13.	Use the magnetic compass for taking bearings and for steering	<ul style="list-style-type: none"> – Knowledge of basic magnetic properties in relation to compasses and the Earth's magnetic field – Ability to steer using the compass – Ability to take compass bearings – Ability to use a deviation card or curve – Ability to find the compass deviation <p>In addition, for a vessel ≥ 60T</p> <ul style="list-style-type: none"> – Ability to determine errors of the compass using terrestrial means, and to allow for such errors 	IMLW < 60T and IMLO < 60T	IMLW ≥ 60T or, if applicable to the vessel or area of operation, C/P 1	Navigation manuals Practical experience
14.	Use the Canadian Buoyage System	<ul style="list-style-type: none"> – Knowledge of the Canadian buoyage system and ability to: <ul style="list-style-type: none"> a) Identify buoys b) Situate buoys in the lateral and cardinal system c) Recognize the various buoy lights 	IMLW < 60T	IMLW ≥ 60T or, if applicable to the vessel or area of operation, C/P 1	- <i>Canadian Coastguard Publication- Canadian Aids to Navigation System 2011</i> <i>Safe Boating Guide (TP-511)</i>

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
15.	Use radar for navigation safety	<ul style="list-style-type: none"> – Knowledge of the basic principle of radar and its functioning: <ul style="list-style-type: none"> a) Start-up procedure b) Function and effect of main commands c) Interpretation of the radar image – Ability to use radar for positioning: <ul style="list-style-type: none"> a) Identification of radar marks useful for navigation b) Bearing-taking and distance measurement by radar – Ability to use radar as an anti-collision device: <ul style="list-style-type: none"> a) Evaluation of the risk of collision by observing radar bearings b) Determining the approximate closest distance of approach c) Effect of a change of heading or speed or both on the closest distance of approach 	IMLW < 60T and 1MLO < 60T	Training certificate from the SEN Limited course	Radar manuals Instruction manuals Practical experience SEN Limited course
16.	Determine the position of the vessel using electronic navigation aids	<ul style="list-style-type: none"> – Ability to correctly use all of the following instruments: <ul style="list-style-type: none"> GPS: <ul style="list-style-type: none"> a) Starting procedure and functioning of the device b) Correct use of data supplied by the instrument c) Recognizing possible errors, lack of reliability and the need to double check Loran C: <ul style="list-style-type: none"> a) Starting procedure and functioning of the device b) Correct use of data supplied by the instrument c) Recognizing possible errors, lack of reliability and the need to double check Echo sounder: <ul style="list-style-type: none"> a) Starting procedure and functioning of the device b) Correct use of data supplied by the instrument 	1MLW < 60T and 1MLO < 60T	Training certificate from the SEN Limited course	Electronic navigation manuals Equipment instruction manuals Radio Aids to Marine Navigation Practical experience

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Item	Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence		References
			Vessel < 60GT	Vessel ≥ 60GT	
17.	Carry on radio communications	<ul style="list-style-type: none"> – Knowledge of the categories of vessels on which a VHF transmitter-receiver is required – Knowledge of Coast Guard radio stations and the services they provide – Identify vessels required to report to the various Vessel Traffic Centres – Knowledge of the publication <i>Radio Aids to Marine Navigation</i> – The functioning and use of EPIRBs, if applicable – Understanding of the use of MMSI number, if applicable Use of sailing plans	1MLW < 60T and 1MLO < 60T	1MLW ≥ 60T and 1MLO ≥ 60T	<i>Ship Station (Radio) Regulations 1999</i> <i>Radio Aids to Marine Navigation</i> Annual edition of <i>Notices to Mariners</i> <i>Ship Safety Bulletin #4/95</i> Coast guard pamphlets
18.	Carry out towing operations	<ul style="list-style-type: none"> – Practical knowledge of towing, in particular: <ul style="list-style-type: none"> a) Cables used for towing and their required length b) The towing point c) Towing bitts and hooks d) The effect of the towing cable on the centre of gravity of the tug and on its stability e) Events that may result in the capsizing of the tug f) Different ways to instantly release the towing cable in an emergency g) Taking and letting go the tow h) The use of an emergency tow line 	1MLW < 60T and 1MLO < 60T	1MLW ≥ 60T and SCS 3 and 1MLO ≥ 60T	Practical experience Publications on the subject

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General**20.1 General requirements**

The general requirements for a certificate as Fishing Master, First Class are listed in section 139 of the *Marine Personnel Regulations*.

20.2 Validity of certificates

The holder of this certificate may act as Master of a fishing vessel of any tonnage engaged on an unlimited, near coastal or sheltered waters voyage.

Syllabuses of Examinations**20.3 Communications, level 1 (Examination Code: COM 1)**

Refer to section 5.3, Chapter 5 of this TP.

20.4 Communications, level 2 (Examination Code: COM 2)

Refer to section 5.4, Chapter 5 of this TP.

20.5 Celestial Navigation, Level 1 (Examination Code : ASTRO 1)

- 1) The examination consists of multiple-choice questions on basic principles and practical navigation calculations.
- 2) The ASTRO 2 may be substituted for ASTRO 1 at the applicant's request
- 3) The examination is of a three hours duration.
- 4) The examination is based upon:

Subject	Knowledge required
Competence:	Apply celestial body observation for position fixing and navigation
Knowledge of basic nautical astronomy	<p>Solar system Composition and dimensions of the solar system; Ability to identify planets useful for navigation; The earth's elliptical orbit; The eccentricity of the earth's orbit; The inclination of the earth's axis to the plane of the orbit and the stability of the axis and how it causes seasons; The dates of the solstices and equinoxes; The concept of the earth's axial rotation giving day and night; The varying length of daylight through the year; Daylight and darkness conditions in various latitudes at the solstices and equinoxes; The significance of the tropics of Cancer and Capricorn of the Arctic and Antarctic circles.</p> <p>Celestial sphere and equinoctial system of co-ordinates Definition of the celestial sphere; The apparent annual motion of the sun and the concept of the ecliptic; Definition of celestial poles, celestial meridians, equinoctial and the obliquity of the ecliptic; The equinoctial as a fixed reference plane and the direction of the First Point of Aries as a reference direction; The equinoctial system of co-ordinates and definition of sidereal hour angle, declination and polar distance; Ability to extract information from the star diagrams in the Nautical Almanac.</p> <p>Hour angle The concept of the earth's axial rotation causing change in the hour angle of bodies; Definition of Greenwich Hour Angle (GHA), Local Hour Angle (LHA) and longitude, and ability to explain their relationship; The rate of change of GHA of the sun and Aries; The tabulation of SHA, GHA and declination (and "d" and "v" corrections) in the Nautical Almanac for all celestial bodies; Ability to determine the geographical position of a body for any given GMT.</p>

Subject	Knowledge required
Competence:	Apply celestial body observation for position fixing and navigation
Knowledge of basic nautical astronomy	<p>Daily motion and horizontal system of co-ordinates Definition of rational horizon, zenith, and nadir; Definition of vertical circle and prime vertical circle; Definition of elevated pole and depressed pole; Ability to prove that the altitude of the elevated pole is equal to the observer's altitude; Definition of the observer's upper and lower celestial meridian; Ability to identify the apparent daily path of all bodies; Definition of true altitude, azimuth and true zenith distance; The relationship between azimuth, quadrantal bearings and 360° notation bearing; Ability to recognize rising and setting points and definition of amplitude; The meaning of the term circumpolar, and the conditions necessary for a body to be circumpolar; The condition necessary for a body to cross the prime vertical; The parts of the PZX triangle; Ability to draw figures on the plane of the rational horizon and of the observer's celestial meridian, using the equidistant projection to illustrate navigational problems and principles.</p> <p>Time and equation of time Definition of the apparent solar day and what is the relationship between LHA (sun) and LAT; Definition of the sidereal day and what is a fixed interval; The reasons for the sun's irregular rate of change of SHA and the necessity to adopt the astronomical mean sun for timekeeping purposes; Definition of the equation of time (ET) and its components; Ability to determine the ET from the Almanac and its sign of application; Definition of GMT, LMT and longitude; Definition of zone times and standard times; How to alter the ship's time during a passage with increasing or decreasing longitude; The use of time signals.</p> <p>Ability to determine the rising and setting of sun and twilight times Determine the time of visible rising and setting of the sun by use of the nautical Almanac; Determine the azimuth and hour angle of true rising and setting of the sun; Civil, nautical and astronomical twilights; The influence of latitude on the duration of twilight, including the conditions necessary for twilight all night, continuous daylight and continuous darkness.</p>
Use sextant	<p>Sextant and altitude corrections Definition of sextant altitude; Ability to demonstrate how to use a sextant; Ability to correct a sextant into which has been introduced one or more of error of perpendicularity, side error or index error; Ability to find the index error of the sextant by the horizon; How to find the index error of the sextant by the sun and stars; Ability to use the sextant for taking vertical and horizontal angles; The purpose of altitude correction; Definition of visible, sensible and rational horizon; Definition of observed latitude and true altitude; Definition of dip, refraction, semi-diameter and parallax and explain their causes; Apply index error; Apply the corrections for the items listed in the above objectives and explain the factors determining their magnitude; Ability to illustrate the effect of terrestrial refraction on the dip and distance of the sea horizon; Correct an altitude using tables in the Nautical Almanac, including reference to critical tables, interpolation tables and low-altitude correction tables; Obtain the true zenith distance from the true altitude of the body.</p> <p>Nautical Almanac The information contained in general in the Nautical Almanac and in detail in the daily pages; Ability to use the tables of corrections and incremental corrections in the Nautical Almanac; Ability to find the LHA of a body, given the date, GMT and longitude of the observer; The importance of the First Point of Aries; Ability to find the LHA of Aries, given the date, GMT and longitude of the observer; What is meant by the sidereal hour angle of a star and obtain it from the Nautical Almanac; Derive the LHA of a star from the LHA of Aries and the SHA of the star; Ability to use the information in the Nautical Almanac to obtain the LMT of the meridian passage of a body to the nearest minute and interpolates for the observer's longitude when necessary.</p>

Subject	Knowledge required
Competence:	Apply celestial body observation for position fixing and navigation
Complete sight reduction	<p>Calculations Ability to solve the PZX triangle to determine the direction of a position line through an observer and a position through which it passes when the body is out of the meridian by any recognized method.</p>
Competence:	Navigation and position determination
Obtain and plot position lines to determine ship's position	<p>Latitude by meridian altitude Latitude by meridian altitude of sun, and stars, including Polaris; Ability to apply the true zenith distance of a body when it is on the observer's meridian to the declination of the body, to obtain the observer's latitude; Apply these correctly when the declination and latitude have the same names or have different names; Ability to calculate the direction of the position line and the latitude of the observer by meridian altitude.</p> <p>Position fixing Determine position line by sun and/or stars; finding position by two observations of heavenly bodies simultaneously or separately by a run (sun and/or stars only); combination of celestial and terrestrial observations. Ability to determine the true azimuth of the body from tables and determine the direction of the position line.</p>
Navigation by Plane and Mercator sailing	Plane sailing; By Mercator sailing, ability to calculate course and distance between two positions; By Mercator sailing, ability to calculate the final position, given the initial position, course and distance; Why a navigation problem should be solved by using a Mercator sailing in preference to plane sailing because of the distance involved.
Navigation by Great Circle sailing	<p>Great circle sailing Ability to determine great circle courses and distance by calculations or by HO 229.</p>

20.6 Navigation Safety, level 2 (Examination Code: NS 2)

Refer to section 5.7, Chapter 5 of this TP.

20.7 Meteorology, level 2 (Examination Code: MET 2)

Refer to section 5.8, Chapter 5 of this TP.

20.8 Ship Management, level 1 (Examination Code: SM 1)

- 1) The examination consist of multiple-choice questions.
- 2) The following open-book resources will be allowed in the examination room:
 - a) Arctic Shipping Safety and Pollution Prevention Regulations;
 - b) Canada Shipping Act-2001;
 - c) Charts and Nautical Publication Regulations;
 - d) Fire and Boat Drill Regulations;
 - e) Fishing Vessel Safety Regulations;
 - f) Fishing Zones of Canada Order (1,2 &3)
 - g) Large Fishing Vessel Inspection Regulations;
 - h) Marine Personnel Regulations;
 - i) Navigation Safety Regulations;
 - j) Oceans Act
 - k) Quarantine Regulations
 - l) Safe Working Practices Regulations;
 - m) Shipping Casualties Reporting Regulations;
 - n) Territorial Sea Geographical Coordinates Order
 - o) Vessel Certificates Regulations.

- p) Vessel Pollution and Dangerous Chemicals Regulations;
- 3) The examination is of a two hours duration.
- 4) The examination is based upon:

Subject	Knowledge required
Competence:	Monitor compliance with legislative requirements
<p>Knowledge of international maritime law embodied in international agreements and conventions and National Legislation for Implementing International Agreements and Conventions</p>	<p>Knowledge of international maritime law as embodied in the international agreements and conventions as they affect the specific obligations and responsibilities of the master, particularly those concerning safety and the protection of the marine environment.</p> <p>Particular regards shall be paid to the following subjects:</p> <ul style="list-style-type: none"> a) Certificates and other documents required to be carried on board fishing vessels by international conventions, how they may be obtained and the period of validity; b) Responsibilities under the relevant requirements of Chapter V of the <i>International Convention for the Safety of Life at Sea, 1974</i>; c) Responsibilities under Annex 1 and Annex V of the <i>International Convention for the Prevention of Pollution from Ships, 1973</i>, as modified by the Protocol of 1978 & 1997 thereto; d) Maritime Declaration of Health and the requirements of the <i>International health regulations</i>; e) Responsibilities under the Convention on <i>International Regulations for Preventing Collisions at Sea, 1972</i>; and <p>Responsibilities under other international instruments affecting the safety of the ship and crew.</p>
Competence:	Apply national and other relevant laws, regulations and agreement
<p>Monitor compliance with legislative requirements</p>	<p>Canada Shipping Act (CSA) Knowledge of Canada Shipping Act-2001 relating to Registrations, listing and recording; Personnel; Safety; Navigation Services; Incidents, accidents and casualties; Pollution prevention and response – Department of fisheries and oceans; Pollution Prevention – Department of Transport; and Enforcement. Knowledge of offences and legal consequences, Part 11 and 12.</p> <p>Criminal Code Knowledge of the Criminal Code as it applies to ships and ship’s crews.</p> <p>Oceans Act Knowledge of the <i>Oceans Act</i> and <i>Fishing Zones of Canada Orders</i> (1,2 & 3) and <i>Territorial sea geographical coordinator orders</i>.</p>
Competence:	Apply national and other relevant laws, regulations and agreement

Subject	Knowledge required
Monitor compliance with Canadian Regulations	<p>Marine Personnel Regulations</p> <p>Knowledge of Part 2 of the Marine Personnel Regulations relating to the crewing requirements for Canadian fishing vessels, in particular the training and familiarization required, the minimum complement, the safe manning documents, the validity of certificates and endorsements, the deck watch, the radio watch and the medical examination of seafarers; Knowledge of Part 3, of the Marine Personnel Regulations relating to the minimum age, conditions of employment, the hours of work and hours of rest, food and water, on board complaint procedures and log books.</p> <p>Knowledge of master's and ship's responsibilities under the following Regulations:</p> <p>Fire and Boat Drills Regulations;</p> <p>Fishing Vessel Safety Regulations;</p> <p>Large Fishing Vessel Inspection Regulations;</p> <p>Marine Personnel Regulations;</p> <p>Navigation Safety Regulations;</p> <p>Shipping Casualties Reporting Regulations;</p> <p>Safe Working Practices Regulations;</p> <p>Arctic Shipping Safety and Pollution Prevention Regulations;</p> <p>Charts and Nautical Publication Regulations;</p> <p>Vessel Pollution and Dangerous Chemicals Regulations;</p> <p>Vessel Certificates Regulations.</p>
Competence:	Apply national and other relevant laws, regulations and agreement
Ship's business	<p>Specific Duties</p> <p>Entering and clearing foreign ports; Knowledge of custom house and immigration procedures; knowledge of the <i>Quarantine Regulations</i>; De-rat certificates; Marine insurance contract and its relationship to master's responsibility to owners and underwriters; Noting protest and right to extend.</p> <p>Management of Vessel and personnel</p> <p>Knowledge of the organization and training of crews for emergencies and related drills; Establishing watches; Safe manning of vessel; Practical knowledge of organization and training of the crew for routine operations and maintenance; Knowledge of the concepts, theories and practices of leadership, decision making, communications, goal setting; Systematic approaches to maintenance; Systematic approaches to safety and environmental protection.</p>
Knowledge of master's responsibilities in different events	<p>Obligations and responsibilities in event of emergencies, collision, distress, search and rescue; Seeing wrecks, salvage and casualties.</p>

20.9 Ship Construction and stability, level 2 (Examination Code: SCS 2)

- 1) The examination consists of multiple-choice questions and practical calculations based on the vessel's stability data booklets.

- 2) The following open-book resources will be allowed in the examination room:
 - a) FAO/ILO/IMO Code of Safety for Fishermen and fishing Vessels Part A and B;
 - b) FAO/ILO/IMO Voluntary Guidelines for the design, construction and equipment of small fishing vessels;
 - c) Large Fishing Vessel Inspection Regulations
 - d) Small Fishing Vessel Inspection Regulations; and
 - e) F/V Skate, Ship Stability Booklet;
- 3) The examination is of three hours duration.
- 4) The examination is based upon:

Subject	Knowledge required
Competence:	Maintain vessel stability
Understanding stability basic terminology	<p>Terms Meaning of displacement, deadweight, lightship weight, load displacement; Meaning of list, heel, loll; Meaning of gravity, centre of gravity (G), height of centre of gravity above keel/baseline (KG); Meaning of buoyancy, centre of buoyancy (B), reserve buoyancy; Meaning of righting lever (GZ) when the vessel is heeled, metacentre (M), metacentric height (GM) and roll period as an indication of initial stability; Meaning of centre of flotation (F) and trim; Meaning of draft, freeboard, deck edge immersion and downflooding.</p>

Subject	Knowledge required
Competence:	Maintain vessel stability
Understanding transverse stability principles	<p>Understanding of: Effect of water density on draft and freeboard and Fresh Water Allowance (FWA); Ability to explain using a sketch of a heeled vessel, how the centre of gravity (G) and the centre of buoyancy (B) are acting to create a righting lever (GZ); Effect on stability of adding, removing, transferring and suspending weights; Stable equilibrium, unstable equilibrium, neutral equilibrium; Correcting unstable and neutral equilibrium and angle of loll; Stiff and tender ships; Negative GM and angle of loll; Free surface effect of liquids on stability and the danger of slack tanks; Moment of statical stability; Effects of reduction in freeboard on stability and the dangers of overloading.</p>
Practical use of stability data supplied to fishing vessels	Use of displacement and ton per inch / tonne per centimetre (TPI/TPC) scales to determine displacement from draft and vice versa; Understanding of data found in fishing vessels stability booklets; Use of pre-calculated operating conditions to ascertain adequate stability; Recognize situations where the vessel does not meet the pre-calculated operating conditions and ability to rectify the situation; Identify fish loading limits according to fuel, water, crew and provisions carried; Interpreting curves of statical stability; Effects of reduction in freeboard on stability and the dangers of overloading.
Transverse stability and trim calculations	<p>Using supplied stability booklet or information, ability to: Calculate final metacentric height (GM) after adding, removing, transferring or suspending weights; Calculate final displacement; Determine the free surface effect and by how much it will affect the metacentric height (GM); Determine the righting lever (GZ) for a given angle of heel; Evaluate the area under the statical stability curve for a given angle of heel; Determine if calculated data meets established stability criteria; Calculate weight to be loaded, unloaded, transferred in order to achieve the desired trim; Determine the final list.</p>
Effect of vessel's operations including catch handling	<p>Fishing operations The operational difference between active and passive fishing gear; The effect of deploying and embarking fishing gear; The dangerous effect of external forces from fishing gear and other gear when catching obstructions on the sea bed or when gear is acting on a high point in the vessel; Effect of adding, removing, transferring, raising, lowering or suspending weights on draft, list and trim, allowing for the free surface effect of tanks; The change of stability during the voyage.</p> <p>Catch handling and stowage method Strength and purpose of division bulkheads in fish holds; Effect of carrying fish in bulk; Effect of carrying fish in bulk instead of subdivided holds or individual containers; The dangerous effects of carrying fish on deck; Danger of overloading, including excessive trim by the stern.</p> <p>Understanding the use, effect and risks of anti-rolling devices such as: Paravane stabilizers; Anti-rolling tanks.</p>
Effect of environmental conditions on vessel's stability	Understanding the effect of severe wind and rolling in associated sea conditions, especially in following seas; Effect of water on deck including free surface effect; The effect of ice accretion on stability.
Effect of vessels and gear modifications on vessel's stability	<p>Understanding of how stability is affected by: Gear or fishing gear modifications; Vessel hull or superstructure construction modifications; Holds converted from dry to wet stowage.</p>

Subject	Knowledge required
Competence:	Maintain vessel stability
Estimating the metacentric height of a vessel and the height of the vessel's centre of gravity	A general understanding of the methods used to estimate or determine the metacentric height of a vessel (GM) and the height of the vessel's centre of gravity (KG) by: a) Inclining test; b) Rolling test.
Competence:	Maintain seaworthiness of the vessel (construction)
Understanding basic construction terminology as it applies to fishing vessels	Terms: Meaning of length overall, length between perpendiculars, breadth, depth, moulded dimensions, baseline, gross tonnage and net tonnage; Meaning of open and closed construction; Meaning of weathertight and watertight; Identify the principal structural members of a fishing vessel; Identify the proper names of the various parts.
Fishing vessels types and construction methods	Basic knowledge of methods of construction of: Wooden hull vessels; Fiber reinforced plastic hull vessels; Steel hull vessels; Aluminum hull vessels. Basic knowledge of construction and design variations of: Traps vessels, stern and side trawlers, seine vessels, long line vessels, gill net vessels, dredge fishing vessels, etc.
Maintain integrity of the hull and superstructures and prevent water flooding	Basic knowledge of: How watertight and weatherhight integrity is maintained; Purpose and maintenance of water-freeing arrangements and freeing ports in bulwarks How the minimum size and number of freeing ports required is determined; The construction of doors, door sills, windows, portholes and access openings; The construction of ventilators and air pipes; Cargo and fish hold hatchway closures and fish scuttles covers; Sounding devices; Crew protection by bulwarks, rails and guards; How water ingress is prevented through hull openings (valves) & shaft.
Survivability of the vessel in case of flooding and damage control	Understand the construction and importance of bulkheads as strength members and their watertight integrity to prevent total flooding, in particular the collision bulkhead; The functions and construction of bilge and pump systems and water level detectors. Identify damage control techniques for various flooding scenarios as: Small and large hull breach, damaged through hull fittings, split piping, chafed hose, packing gland, etc.
Protection against fires	The purpose and operation of: Quick closing valves on fuel tanks; Fire dampers on ventilators; Fire extinguishing systems.
Competence:	Maintain seaworthiness of the vessel (construction)
Vessel inspection and maintenance	Awareness of the normal maintenance to ensure: Compliance with standards and regulations; Hull, machinery and all equipments remain in good operational order; Corrosion and cathodic protection. Awareness of the Transport Canada Marine Safety and Security inspection regime concerning: Construction and installation inspection, initial inspection, periodic inspection, random inspection, annual self-inspection and targeted inspection.

20.10 General Ship Knowledge, level 2 (Examination Code: GSK 2)

- 1) The examination consists of multiple-choice questions.
- 2) The following open-book resources will be allowed in the examination room:
 - a) FAO/ILO/IMO Code of safety for fishermen and fishing vessels;
 - b) TP 127- Ships Electrical Standards.
- 3) The examination is of two hours duration.
- 4) The examination is based upon:

Subject	Knowledge required
Competence:	Marine Occupational Safety and Health
Ensure safe operations	Knowledge of the FAO/ILO/IMO <i>Code of safety for Fishermen and Fishing vessels</i> .
Competence:	Operate fishing vessel power plants
The operation of fishing vessel power plants and auxiliaries	<p>Fishing vessel machinery</p> <p>Knowledge of the operating principles and functioning of engines and gearing; Main propulsion shafts, bearings and glands; Propellers; Steering and rudder system; Machinery controls.</p> <p>Ship's auxiliary machinery</p> <p>General pumping arrangements, bilge, ballast and water holds, valves, pumps, manifolds, bulkhead valves, strum boxes, ship side valves, sea inlets, bilge ejection valves; Compressed air systems; Fresh and sea water systems; Liquid fuel systems; Lubricating oil and hydraulic power oil systems; Ventilation air systems; Fuel tanks; Non-structural fuel tanks; Small portable reserve fuel containers; Ozone generators; Refrigeration systems; Liquefied petroleum gas fuel systems; the danger of propane and the proper installation of Propane tanks.</p>

Subject	Knowledge required
Competence:	Operate fishing vessel power plants
The operation of fishing vessel power plants and auxiliaries	<p>General Knowledge of marine engineering terms</p> <p>Ability to use engineering terms when describing and explaining the operation of the machinery and equipment mentioned above; Definition of mass, force, work, power, energy, pressure, stress, strain, and heat; Units in which each is measured; What is meant by the efficiency of machine.</p> <p>Vessel electrical systems</p> <p>Knowledge of vessel's electrical systems less than 50 volts; Knowledge of vessel's electrical systems of 50 volts and over as per TP 127 – <i>Ships Electrical Standards (2008)</i>; Understand good practices in reference to electrical systems; Recognize wrong practices; The use of adequate wiring and equipments; Circuits protection; Personnel protection.</p>
Competence:	Maintenance and repairs
Arrange for maintenance and repairs	Understanding of ship's plans, data and specifications; Ability to prepare a specification for minor repairs; Prepare a fishing vessel for dry-docking; Procedures applicable in dry-dock.
Competence:	Catch handling and stowage
Stowage & securing of the catch & fishing gear	Knowledge of safe practices for stowage and securing of the catch and of various fishing gear.
Loading & discharging operations	<p>Loading and discharging operations, with special regard to heeling moments from gear and catch.</p> <p>Rigging</p> <p>The functioning and care of deck machinery; Standing and running gear pertaining to fishing vessel; Purposes and construction of the various parts of a boom; Stresses on the various parts of a boom system during operation; Top, lower boom safely, securing boom for sea; Safe use of all gears; Understanding of Safe working load.</p>

20.11 Simulated Electronic Navigation, Management level (Examination Code: SIM II or SIM M)

Refer to section 5.15, Chapter 5 of this TP.

20.12 Oral examination on General Seamanship (Examination Code: FM 1-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Fishing Master, First Class certificate, as set out in section 20.2 of this chapter.
- 2) The examination is of an unlimited duration.

3) The examination is based upon:

Subject	Knowledge required
Competence:	Communications
Lifesaving and distress signals	Recognition and knowledge of the meanings of distress signals contained in the <i>Collision regulations</i> ; Recognition and knowledge of the meanings of the lifesaving and distress signals contained in the International Code of Signals.
Competence:	Manoeuvre the vessel
Ship-Handling in various conditions	Basic knowledge of manoeuvring and handling a fishing vessel; Practical manoeuvres for berthing, unberthing, during fishing operations; Effect of wind, tide and current; Towing and being towed, grounding, bilging, damaged condition, manoeuvring in channels, rivers and confined waters, anchoring and weighing anchor, manoeuvring in close proximity to other ships.
Competence:	Meteorology
Weather forecasts & Meteorological warning systems	Knowledge of the importance of weather forecasts; Ability to consult weather forecasts; Take into account weather forecast when making voyage planning; Take into account actual and forecasted weather to pursue or interrupt fishing activities and to return to home port or seek shelter; Awareness of Environment Canada weather warnings and how they are transmitted.
Meteorology	Weather reports and their use; knowledge of weather systems, high and low pressure areas and frontals.
Competence:	Ensure safety and response to emergencies
Safe working practices	Practical knowledge of safe working practices aboard fishing vessels; Knowledge of the Code of Safe Working Practices as it applies to fishing vessels; Awareness of the content and practices described in the FAO/ILO/IMO Code of safety for Fishermen and Fishing vessels; Awareness of the content and practices described in the Small Fishing Vessel Safety Manual (TP 10038);
Maintain seaworthiness in heavy weather	Precautions to be taken before the onset of heavy weather such as closing and securing of watertight hatches, fish scuttles, doors and portholes, lowering and securing weights onboard, ensuring that freeing arrangements are functional, etc; How to prevent water ingress and flooding; Necessary monitoring on a vessel caught in heavy weather, such as water detection in compartments; Actions to be taken in case of water ingress or vessel becoming disabled; Practical considerations of boat handling in heavy weather; How to prevent ice accretion; Actions to be taken if ice starts to accumulate on a vessel.

Subject	Knowledge required
Competence:	Ensure safety and response to emergencies
Respond to emergencies	Master's responsibilities in emergencies such as fire, collision, flooding, grounding, man overboard, vessel's evacuation, etc; Rescuing persons and assisting vessel & aircraft in distress.
Competence:	Maintain an adequate stability
Practical stability and use of stability information	Practical use of stability data supplied to fishing vessels; Understanding of ship's plans and specifications; Effect of adding, removing, transferring, raising, lowering or suspending weights on stability; the free surface effect in tanks; The change of stability during the voyage; an appreciation of the meaning and characteristics of stiff and tender ships; effects of reduction in freeboard on stability and seaworthiness.
Maintain stability during fishing operations, and in adverse weather	<p>Fishing operations and stowage method</p> <p>The dangerous effect of external forces from fishing gear and other gear when catching obstructions on the sea bed or when gear is acting on a high point in the vessel; The use of division bulkheads in fish holds; Effect of carrying fish in bulk; The dangerous effects of carrying fish on deck; Danger of overloading.</p> <p>Adverse weather</p> <p>Effect of water on deck including free surface effect; The effect of ice accretion on stability; Understanding the use, effect and risks of anti-rolling devices such as paravane stabilizers and anti-rolling tanks.</p>
Competence:	Ensure compliance with pollution-prevention requirements
Prevent pollution	Knowledge of the precautions to be taken during fueling; Knowledge of the statutory requirements to report pollution incidents; Precautions to be taken to prevent pollution of the marine environment by oil, garbage or other pollutant; Take appropriate action in response to pollution incidents onboard and found at sea.
Competence:	Conduct safe navigation
Responsibilities and duties	<p>Appreciate master's overall responsibilities; Duties and responsibilities of the master of a small vessel as required by the <i>Canada Shipping Act</i>; Master's duties on taking over and relinquishing command; Preparation of the vessel for inspection and surveys.</p> <p>Maintenance</p> <p>Maintenance of deck gear and structure (not including nets and other gear specific to a particular type of ship); preparing a vessel for dry-dock; procedure in dry-dock.</p>
Maintain a safe navigational watch	Knowledge of the watchkeeping arrangements and principles to be observed for certification, voyage planning, watch keeping at sea under different conditions and in different areas and watchkeeping in port as set out in Section A-VIII/2 of the STCW Code; Knowledge of the <i>Collision regulations</i> .

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General**21.1 General requirements**

The general requirements for a certificate as Fishing Master, Second Class are listed in section 140 of the *Marine Personnel Regulations*.

21.2 Validity of certificates

The holder of this certificate may act as Master of a fishing vessel of any tonnage engaged on a near coastal or sheltered waters voyage and as Chief Mate of a fishing vessel of any tonnage engaged on an unlimited voyage.

Syllabuses of Examinations**21.3 Communications, level 1 (Examination Code: COM 1)**

Refer to section 5.3, Chapter 5 of this TP.

21.4 Meteorology, level 1 (Examination Code : MET 1)

Refer to section 8.5, Chapter 8 of this TP.

21.5 Ship Management, level 1 (Examination Code: SM 1)

Refer to section 20.8, Chapter 20 of this TP.

21.6 Ship Construction and Stability, level 2 (Examination Code: SCS 2)

Refer to section 20.9, Chapter 20 of this TP.

21.7 General Ship Knowledge, level 1 (Examination Code: GSK 1)

- 1) The examination consists of multiple-choice questions.
- 2) The following open-book resources will be allowed in the examination room:
 - a) FAO/ILO/IMO Code of safety for fishermen and fishing vessels;
 - b) Marine Personnel Regulations;
 - c) Safe Working Practices Regulations;
 - d) TP 127- Ships Electrical Standards; and
 - e) Vessel Pollution and Dangerous Chemicals Regulations;
- 3) The examination is of two hours duration.

4) The examination is based upon:

Subject	Knowledge required
Competence:	Ensure safety
Prevent accident	<p>Safe working practices</p> <p>Need for accident prevention, those aspect not covered by applicable Marine Emergency Duty course; Ability to use the <i>FAO/ILO/IMO Code of safety for Fishermen and Fishing vessels</i>; Knowledge of the <i>Safe Working Practice Regulations</i>, as applied to fishing vessels; Safety procedures for confined and enclosed spaces; Safety procedures for hazardous materials.</p> <p>Safety for specific types of fishing</p> <p>Precautions to be taken for fishing operations; Trawling and Dragging safety; Trolling safety; Packing safety; Trap fishing safety; Seining Safety; Gillnetting safety; Dive fishing safety.</p> <p>Provide familiarization and training</p> <p>Ability to conduct boat and fire drills; To be aware of the captain’s responsibilities concerning the safety of the crew members; Onboard familiarization and safety training of new crew members with vessel’s equipment and safety procedures as required by the <i>Marine Personnel Regulations</i>; knowledge of MED requirements for crew members of fishing vessels.</p>
Competence:	Ensure compliance with pollution-prevention requirements
Prevent pollution	<p>Knowledge of the precautions to be taken during fueling; Knowledge of the statutory requirements to report pollution incidents; Precautions to be taken to prevent pollution of the marine environment by oil, garbage or other pollutant; Take appropriate action in response to pollution incidents onboard and found at sea; Ability to use the <i>Vessel Pollution and Dangerous Chemicals Regulations</i>.</p>
Competence:	Fishing vessel power plants
Machinery and engineering	<p>Basic knowledge of operating principles of marine power plants and vessel’s auxiliary machinery; General knowledge of marine engineering terms.</p>
Vessel Electrical systems	<p>Basic knowledge of electrical systems less than 50 volts and electrical systems of 50 volts and over as per TP 127 – <i>Ships Electrical Standards (2008)</i>.</p>
Competence:	Catch handling and stowage
Stowage & securing of the catch & fishing gear	<p>Knowledge of safe practices for stowage and securing of the catch and of various fishing gear.</p>
Loading & discharging operations	<p>Rigging</p> <p>The functioning and care of deck machinery; Standing and running gear pertaining to fishing vessel; Purposes and construction of the various parts of a boom; Stresses on the various parts of a boom system during operation; Top, lower boom safely, securing boom for sea; Safe use of all gears; Understanding of Safe working load.</p>

Subject	Knowledge required
Competence:	Comply with regulatory requirements
Certificates and documents	Understanding of ship's plans and specifications; Knowledge of documents and required certificates on a fishing vessel, their limits and their validity; Knowledge of records keeping requirements; Knowledge of statutory requirements touching the crewing, the inspection of the vessel and the required equipment; preparation of the vessel for inspection and surveys; Established procedures on board the vessel.

21.8 Simulated Electronic Navigation, Operation level (Examination Code: SIM I or SIM O)

Refer to section 15.12, Chapter 15 of this TP.

21.9 Oral examination on General Seamanship (Examination Code: FM 2-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Fishing Master, Second Class certificate, as set out in section 21.2 of this chapter.
- 2) The examination is of an unlimited duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence:	Communications
Lifesaving and distress signals	Recognition and knowledge of the meanings of distress signals contained in the <i>Collision regulations</i> ; Recognition and knowledge of the meanings of the lifesaving and distress signals contained in the International Code of Signals.
Competence:	Manoeuvre the vessel
Ship-Handling in various conditions	Basic knowledge of manoeuvring and handling a fishing vessel; Practical manoeuvres for berthing, unberthing, during fishing operations; Effect of wind, tide and current; Towing and being towed, grounding, bilging, damaged condition, manoeuvring in channels, rivers and confined waters, anchoring and weighing anchor, manoeuvring in close proximity to other ships.
Competence:	Meteorology
Weather forecasts & Meteorological warning systems	Knowledge of the importance of weather forecasts; Ability to consult weather forecasts; Take into account weather forecast when making voyage planning; Take into account actual and forecasted weather to pursue or interrupt fishing activities and to return to home port or seek shelter; Awareness of Environment Canada weather warnings and how they are transmitted.
Meteorology	Weather reports and their use; elementary knowledge of weather systems, high and low pressure areas and frontals.

Subject	Knowledge required
Competence:	Ensure safety and response to emergencies
Safe working practices	Practical knowledge of safe working practices aboard fishing vessels; Knowledge of the Code of Safe Working Practices as it applies to fishing vessels; Awareness of the content and practices described in the Small Fishing Vessel Safety Manual (TP 10038);
Maintain seaworthiness in heavy weather	Precautions to be taken before the onset of heavy weather such as closing and securing of watertight hatches, fish scuttles, doors and portholes, lowering and securing weights onboard, ensuring that freeing arrangements are functional, etc; How to prevent water ingress and flooding; Necessary monitoring on a vessel caught in heavy weather, such as water detection in compartments; Actions to be taken in case of water ingress or vessel becoming disabled; Practical considerations of boat handling in heavy weather; How to prevent ice accretion; Actions to be taken if ice starts to accumulate on a vessel.
Respond to emergencies	Master's responsibilities in emergencies such as fire, collision, flooding, grounding, man overboard, vessel's evacuation, etc; Rescuing persons and assisting vessel & aircraft in distress.
Competence:	Maintain an adequate stability
Practical stability and use of stability information	Practical use of stability data supplied to fishing vessels; Understanding of ship's plans and specifications; Effect of adding, removing, transferring, raising, lowering or suspending weights on stability; the free surface effect in tanks; The change of stability during the voyage; an appreciation of the meaning and characteristics of stiff and tender ships; effects of reduction in freeboard on stability and seaworthiness.
Maintain stability during fishing operations, and in adverse weather	<p>Fishing operations and stowage method</p> <p>The dangerous effect of external forces from fishing gear and other gear when catching obstructions on the sea bed or when gear is acting on a high point in the vessel; The use of division bulkheads in fish holds; Effect of carrying fish in bulk; The dangerous effects of carrying fish on deck; Danger of overloading.</p> <p>Adverse weather</p> <p>Effect of water on deck including free surface effect; The effect of ice accretion on stability; Understanding the use, effect and risks of anti-rolling devices such as paravane stabilizers and anti-rolling tanks.</p>
Competence:	Ensure compliance with pollution-prevention requirements
Prevent pollution	Knowledge of the precautions to be taken during fueling; Knowledge of the statutory requirements to report pollution incidents; Precautions to be taken to prevent pollution of the marine environment by oil, garbage or other pollutant; Take appropriate action in response to pollution incidents onboard and found at sea.
Competence:	Conduct safe navigation
Responsibilities and duties	<p>Appreciate master's overall responsibilities; Duties and responsibilities of the master of a small vessel as required by the <i>Canada Shipping Act</i>; Master's duties on taking over and relinquishing command; Preparation of the vessel for inspection and surveys.</p> <p>Maintenance</p> <p>Maintenance of deck gear and structure (not including nets and other gear specific to a particular type of ship).</p>

Subject	Knowledge required
Competence:	Conduct safe navigation
Maintain a safe navigational watch	OOW responsibilities, duties and related tasks; Action of the officer of the watch in emergencies at sea and in port; Maintenance of a proper deck log concerning navigation progress, electronic instrument use and unusual occurrences; Common steering procedures, their purpose and how to put them into effect; use of azimuth circle, pelorus or any selected method of taking a bearing; Familiarity with changing over between automatic and hand steering, emergency steering (referring to operator's manual); reading bearings and headings; Principles to be observed in keeping a navigational watch; Knowledge of the <i>Collision regulations</i> .

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General**22.1 General requirements**

The general requirements for a certificate as Fishing Master, Third Class are listed in section 141 of the *Marine Personnel Regulations*.

22.2 Validity of certificates

The holder of this certificate may act as Master of a fishing vessel of any tonnage engaged on a near coastal or sheltered waters voyage and as Officer in charge of the watch of a fishing vessel of any tonnage engaged on an unlimited voyage.

Syllabuses of Examinations**22.3 Communications, level 1 (Examination Code: COM 1)**

Refer to section 5.3, Chapter 5 of this TP.

22.4 Chartwork and Pilotage, level 2 (Examination Code: C/P 2)

Refer to section 11.3, Chapter 11 of this TP.

22.5 Navigation Safety, level 1 (Examination Code: NS 1)

Refer to section 11.4, Chapter 11 of this TP.

22.6 Meteorology, level 1 (Examination Code : MET 1)

Refer to section 8.5, Chapter 8 of this TP.

22.7 Ship Construction and Stability, level 2 (Examination Code: SCS 2)

Refer to section 20.9, Chapter 20 of this TP.

22.8 General Ship Knowledge, level 1 (Examination Code: GSK 1)

Refer to section 21.7, Chapter 21 of this TP.

22.9 Oral examination on General Seamanship (Examination Code: FM 3-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the duties and responsibilities associated to the validity of the Fishing Master, Third Class certificate, as set out in section 22.2 of this chapter.
- 2) The examination is of an unlimited duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence	Communications
Lifesaving and distress signals	Recognition and knowledge of the meanings of distress signals contained in the <i>Collision regulations</i> ; Recognition and knowledge of the meanings of the lifesaving and distress signals contained in the International Code of Signals.
Competence	Manoeuvre the vessel
Ship-Handling in various conditions	Basic knowledge of manoeuvring and handling a fishing vessel; Practical manoeuvres for berthing, unberthing, during fishing operations; effect of wind, tide and current.
Competence	Meteorology
Weather forecasts & Meteorological warning systems	Knowledge of the importance of weather forecasts; Ability to consult weather forecasts; Take into account weather forecast when making voyage planning; Take into account actual and forecasted weather to pursue or interrupt fishing activities and to return to home port or seek shelter; Awareness of Environment Canada weather warnings and how they are transmitted.
Meteorology	Weather reports and their use; elementary knowledge of weather systems, high and low pressure areas and frontals.
Competence	Ensure safety and response to emergencies
Safe working practices	Practical knowledge of safe working practices aboard fishing vessels; knowledge of the Code of Safe Working Practices as it applies to fishing vessels; awareness of the content and practices described in the Small Fishing Vessel Safety Manual (TP 10038);
Maintain seaworthiness in heavy weather	Precautions to be taken before the onset of heavy weather such as closing and securing of watertight hatches, fish scuttles, doors and portholes, lowering and securing weights onboard, ensuring that freeing arrangements are functional, etc; How to prevent water ingress and flooding; Necessary monitoring on a vessel caught in heavy weather, such as water detection in compartments; Actions to be taken in case of water ingress or vessel becoming disabled; Practical considerations of boat handling in heavy weather; How to prevent ice accretion; Actions to be taken if ice starts to accumulate on a vessel.
Respond to emergencies	Master's responsibilities in emergencies such as fire, collision, flooding, grounding, man overboard, vessel's evacuation, etc; rescuing persons and assisting vessel & aircraft in distress.
Competence	Maintain an adequate stability
Practical stability and use of stability information	Practical use of stability data supplied to fishing vessels; Understanding of ship's plans and specifications; Effect of adding, removing, transferring, raising, lowering or suspending weights on stability; the free surface effect in tanks; The change of stability during the voyage; an appreciation of the meaning and characteristics of stiff and tender ships; effects of reduction in freeboard on stability and seaworthiness.

Subject	Knowledge required
Competence	Maintain an adequate stability
Maintain stability during fishing operations, and in adverse weather	<p>Fishing operations and stowage method</p> <p>The dangerous effect of external forces from fishing gear and other gear when catching obstructions on the sea bed or when gear is acting on a high point in the vessel; The use of division bulkheads in fish holds; Effect of carrying fish in bulk; The dangerous effects of carrying fish on deck; Danger of overloading.</p> <p>Adverse weather</p> <p>Effect of water on deck including free surface effect; The effect of ice accretion on stability; Understanding the use, effect and risks of anti-rolling devices such as paravane stabilizers and anti-rolling tanks.</p>
Competence	Ensure compliance with pollution-prevention requirements
Prevent pollution	<p>Knowledge of the precautions to be taken during fueling; Knowledge of the statutory requirements to report pollution incidents; Precautions to be taken to prevent pollution of the marine environment by oil, garbage or other pollutant; Take appropriate action in response to pollution incidents onboard and found at sea.</p>
Competence	Conduct safe navigation
Responsibilities and duties	<p>Appreciate master's overall responsibilities; duties and responsibilities of the master of a small vessel as required by the <i>Canada Shipping Act</i>; master's duties on taking over and relinquishing command; preparation of the vessel for inspection and surveys.</p>
Maintain a safe navigational watch	<p>OOW responsibilities, duties and related tasks; action of the officer of the watch in emergencies at sea and in port; maintenance of a proper deck log concerning navigation progress, electronic instrument use and unusual occurrences; common steering procedures, their purpose and how to put them into effect; use of azimuth circle, pelorus or any selected method of taking a bearing; familiarity with changing over between automatic and hand steering, emergency steering (referring to operator's manual); reading bearings and headings; Principles to be observed in keeping a navigational watch; Knowledge of the <i>Collision regulations</i>.</p>

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General**23.1 General requirements**

The general requirements for a certificate as Fishing Master, Fourth Class are listed in section 142 of the *Marine Personnel Regulations*.

23.2 Validity of certificates

The holder of this certificate may act as Master on board a fishing vessel of not more than 100 gross tonnage engaged on a near coastal or sheltered waters voyage and as Officer in charge of the watch of a fishing vessel of any tonnage engaged on near coastal and sheltered waters voyage.

Syllabuses of Examinations**23.3 Chartwork & Pilotage, level 1 (Examination code: C/P 1)**

Refer to section 12.3, Chapter 12 of this TP.

23.4 Navigation Safety, level 1 or domestic.(Examination code: NS 1 or NS D)

Refer to section 12.4, Chapter 12 of this TP

23.5 Ship Construction and Stability, level 1 (Examination code: SCS 1)

- 1) The examination consists of multiple-choice and practical calculation questions based on a vessel's stability data booklet.
- 2) The following open-book resources will be allowed in the examination room:
 - a) FAO/ILO/IMO Code of Safety for Fishermen and fishing Vessels Part A and B;
 - b) FAO/ILO/IMO Voluntary Guidelines for the design, construction and equipment of small fishing vessels;
 - c) Large Fishing Vessel Inspection Regulations.
 - d) Small Fishing Vessel Inspection Regulations; and
 - e) F/V Skate, Ship Stability Booklet;
- 3) The examination is of three hours duration.
- 4) The SCS 2 may be substituted for SCS 1 at the applicant's request.
- 5) The examination is based upon:

Subject	Knowledge required
Competence	Maintain vessel stability
Understanding stability basic terminology	<p>Terms</p> <p>Meaning of displacement, deadweight, lightship weight, load displacement; Meaning of list, heel, loll; Meaning of gravity, centre of gravity (G), height of centre of gravity above keel/baseline (KG); Meaning of buoyancy, centre of buoyancy (B), reserve buoyancy; Meaning of righting lever (GZ) when the vessel is heeled, metacentre (M), metacentric height (GM) and roll period as an indication of initial stability; Meaning of centre of flotation (F) and trim; Meaning of draft, freeboard, deck edge immersion and downflooding.</p>
Subject	Knowledge required

Competence	Maintain vessel stability
<p>Understanding transverse stability principles</p>	<p>Understanding of: Effect of water density on draft and freeboard and Fresh Water Allowance (FWA); Ability to explain using a sketch of a heeled vessel, how the centre of gravity (G) and the centre of buoyancy (B) are acting to create a righting lever (GZ); Effect on stability of adding, removing, transferring and suspending weights; Stable equilibrium, unstable equilibrium, neutral equilibrium; Correcting unstable and neutral equilibrium and angle of loll; Stiff and tender ships; Negative GM and angle of loll; Free surface effect of liquids on stability and the danger of slack tanks; Moment of statical stability; Effects of reduction in freeboard on stability and the dangers of overloading.</p>
<p>Practical use of stability data supplied to fishing vessels</p>	<p>Use of displacement and ton per inch / tonne per centimetre (TPI/TPC) scales to determine displacement from draft and vice versa; Understanding of data found in fishing vessels stability booklets; Use of pre-calculated operating conditions to ascertain adequate stability; Recognize situations where the vessel does not meet the pre-calculated operating conditions and ability to rectify the situation; Identify fish loading limits according to fuel, water, crew and provisions carried; Interpreting curves of statical stability; Effects of reduction in freeboard on stability and the dangers of overloading.</p>
<p>Effect of vessel's operations including catch handling</p>	<p>Fishing operations The operational difference between active and passive fishing gear; The effect of deploying and embarking fishing gear; The dangerous effect of external forces from fishing gear and other gear when catching obstructions on the sea bed or when gear is acting on a high point in the vessel; Effect of adding, removing, transferring, raising, lowering or suspending weights on draft, list and trim, allowing for the free surface effect of tanks; The change of stability during the voyage.</p> <p>Catch handling and stowage method Strength and purpose of division bulkheads in fish holds; Effect of carrying fish in bulk; Effect of carrying fish in bulk instead of subdivided holds or individual containers; The dangerous effects of carrying fish on deck; Danger of overloading, including excessive trim by the stern.</p> <p>Understanding the use, effect and risks of anti-rolling devices such as: Paravane stabilizers; Anti-rolling tanks.</p>
<p>Effect of environmental conditions on vessel's stability</p>	<p>Understanding the effect of severe wind and rolling in associated sea conditions, especially in following seas; Effect of water on deck including free surface effect; The effect of ice accretion on stability.</p>
<p>Effect of vessels and gear modifications on vessel's stability</p>	<p>Understanding of how stability is affected by: Gear or fishing gear modifications; Vessel hull or superstructure construction modifications; Holds converted from dry to wet stowage.</p>
<p>Estimating the metacentric height of a vessel and the height of the vessel's centre of gravity</p>	<p>A general understanding of the methods used to estimate or determine the metacentric height of a vessel (GM) and the height of the vessel's centre of gravity (KG) by: Inclining test; Rolling test.</p>

Subject	Knowledge required
Competence	Maintain seaworthiness of the vessel (construction)
Understanding basic construction terminology as it applies to fishing vessels	<p>Terms: Meaning of length overall, length between perpendiculars, breadth, depth, moulded dimensions, baseline, gross tonnage and net tonnage; Meaning of open and closed construction; Meaning of weathertight and watertight; Identify the principal structural members of a fishing vessel; Identify the proper names of the various parts.</p>
Fishing vessels types and construction methods	<p>Basic knowledge of methods of construction of: Wooden hull vessels; Fibre-reinforced plastic hull vessels; Steel hull vessels; Aluminum hull vessels.</p> <p>Basic knowledge of construction and design variations of: Traps vessels, stern and side trawlers, seine vessels, long line vessels, gill net vessels, dredge fishing vessels, etc.</p>
Maintain integrity of the hull and superstructures and prevent water flooding	<p>Basic knowledge of: How watertight and weather-tight integrity is maintained; Purpose and maintenance of water-freeing arrangements and freeing ports in bulwarks How the minimum size and number of freeing ports required is determined; The construction of doors, door sills, windows, portholes and access openings; The construction of ventilators and air pipes; Cargo and fish hold hatchway closures and fish scuttles covers; Sounding devices; Crew protection by bulwarks, rails and guards; How water ingress is prevented through hull openings (valves) & shaft.</p>
Survivability of the vessel in case of flooding and damage control	<p>Understand the construction and importance of bulkheads as strength members and their watertight integrity to prevent total flooding, in particular the collision bulkhead; The functions and construction of bilge and pump systems and water level detectors.</p> <p>Identify damage control techniques for various flooding scenarios as: Small and large hull breach, damaged through hull fittings, split piping, chafed hose, packing gland, etc.</p>
Protection against fires	<p>The purpose and operation of: Quick closing valves on fuel tanks; Fire dampers on ventilators; Fire extinguishing systems.</p>
Vessel inspection and maintenance	<p>Awareness of the normal maintenance to ensure: Compliance with standards and regulations; Hull, machinery and all equipments remain in good operational order; Corrosion and cathodic protection.</p> <p>Awareness of the Transport Canada Marine Safety and Security inspection regime concerning: Construction and installation inspection, initial inspection, periodic inspection, random inspection, annual self-inspection and targeted inspection.</p>

23.6 Oral examination on General Seamanship (Examination Code: FM 4-O) (Also, please refer section 2.11 of Chapter 2)

- 1) Candidates should demonstrate the ability to apply the knowledge outlined in this oral examination syllabus by appropriate responses, anticipations and reactions to a range of routine, non-routine and contingency scenarios as presented by the examiner, from the perspective of the

duties and responsibilities associated to the validity of the Fishing Master, Fourth Class certificate, as set out in section 23.2 of this chapter.

- 2) The examination is of an unlimited duration.
- 3) The examination is based upon:

Subject	Knowledge required
Competence	Communications
Lifesaving and distress signals	Recognition and knowledge of the meanings of distress signals contained in the <i>Collision regulations</i> ; Recognition and knowledge of the meanings of the lifesaving and distress signals contained in the International Code of Signals.
Competence	Manoeuvre the vessel
Ship-Handling in various conditions	Basic knowledge of manoeuvring and handling a fishing vessel; Practical manoeuvres for berthing, unberthing, during fishing operations; effect of wind, tide and current.
Competence	Meteorology
Weather forecasts & Meteorological warning systems	Knowledge of the importance of weather forecasts; Ability to consult weather forecasts; Take into account weather forecast when making voyage planning; Take into account actual and forecasted weather to pursue or interrupt fishing activities and to return to home port or seek shelter; Awareness of Environment Canada weather warnings and how they are transmitted.
Competence	Ensure safety and response to emergencies
Safe working practices	Practical knowledge of safe working practices aboard fishing vessels; knowledge of the Code of Safe Working Practices as it applies to fishing vessels; awareness of the content and practices described in the Small Fishing Vessel Safety Manual (TP 10038).
Maintain seaworthiness in heavy weather	Precautions to be taken before the onset of heavy weather such as closing and securing of watertight hatches, fish scuttles, doors and portholes, lowering and securing weights onboard, ensuring that freeing arrangements are functional, etc; How to prevent water ingress and flooding; Necessary monitoring on a vessel caught in heavy weather, such as water detection in compartments; Actions to be taken in case of water ingress or vessel becoming disabled; Practical considerations of boat handling in heavy weather; How to prevent ice accretion; Actions to be taken if ice starts to accumulate on a vessel.
Respond to emergencies	Master's responsibilities in emergencies such as fire, collision, flooding, grounding, man overboard, vessel's evacuation, etc; rescuing persons and assisting vessel & aircraft in distress.

Subject	Knowledge required
Competence	Maintain an adequate stability
Practical stability and use of stability information	Practical use of stability data supplied to fishing vessels; Understanding of ship's plans and specifications; Effect of adding, removing, transferring, raising, lowering or suspending weights on stability; the free surface effect in tanks; The change of stability during the voyage; an appreciation of the meaning and characteristics of stiff and tender ships; effects of reduction in freeboard on stability and seaworthiness.
Maintain stability during fishing operations, and in adverse weather	<p>Fishing operations and stowage method</p> <p>The dangerous effect of external forces from fishing gear and other gear when catching obstructions on the sea bed or when gear is acting on a high point in the vessel; The use of division bulkheads in fish holds; Effect of carrying fish in bulk; The dangerous effects of carrying fish on deck; Danger of overloading.</p> <p>Adverse weather</p> <p>Effect of water on deck including free surface effect; The effect of ice accretion on stability; Understanding the use, effect and risks of anti-rolling devices such as paravane stabilizers and anti-rolling tanks.</p>
Competence	Ensure compliance with pollution-prevention requirements
Prevent pollution	Knowledge of the precautions to be taken during fuelling; Knowledge of the statutory requirements to report pollution incidents; Precautions to be taken to prevent pollution of the marine environment by oil, garbage or other pollutant; Take appropriate action in response to pollution incidents onboard and found at sea.
Competence	Conduct safe navigation
Responsibilities and duties	Appreciate master's overall responsibilities; duties and responsibilities of the master of a small vessel as required by the <i>Canada Shipping Act</i> .
Maintain a safe navigational watch	OOW responsibilities, duties and related tasks; Principles to be observed in keeping a navigational watch; Knowledge of the <i>Collision regulations</i> .

Chapter 24 - Certificate of service as Master of a fishing vessel of less than 60 Gross Tonnage

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General

24.1 General requirements

The general requirements for a Certificate of Service as Master of a fishing vessel of less than 60 gross tonnage are listed in section 143 of the *Marine Personnel Regulations*.

24.2 Validity of certificates

The holder of this certificate may act as Master on board a fishing vessel of not more than 60 gross tonnage engaged on an unlimited, a near coastal, class 1 or 2 or a sheltered waters voyage, according to the voyages on which the qualifying service for the certificate has been acquired. The validity will be specified on the certificate.

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General

25.1 General requirements

The general requirements for a certificate as First-class Engineer, Motor Ship or Steamship, are listed in section 144 of the *Marine Personnel Regulations*.

25.2 Validity of certificates

The holder of this certificate may act as chief engineer, second engineer or engineer in charge of the watch on any type of vessel other than an ACV, subject to the propulsion type specified on the certificate, without voyage limitation or propulsive power restriction.

Syllabuses of Examinations

25.3 Ship management practices (examination code: PPSSIM2)

- 1) The examination consists of a practical scenario, using a propulsive plant simulator, and includes a written report.
 - a) This report must be submitted to the examiner before the end of the training session. The candidate must prepare individually a written report in which he outlines a problem or situation that a plant manager might have to deal with under normal circumstances. This report helps the assessor to evaluate the candidate's ability to recommend appropriate solutions to ship owners or other authorities. Among the items to be outlined in the report are costs, fuel consumption, cause of the problem or situation and actions to resolve the problem or situation.
 - b) The written report accounts for 20% of the examination mark.
- 2) The examination is of 3½ hours' duration (practical scenario).

Subject	Required knowledge
Start-up and shut-down main propulsion and auxiliary machinery, including associated systems	Method of preparing the start-up and of making available fuels, lubricants, cooling water and air; checks of pressures, temperatures and speed during start-up and warm-up, in accordance with technical specifications and agreed work plans; surveillance of main propulsion plant and auxiliary systems is sufficient to maintain safe operations; methods of preparing the shut-down and of supervising the cooling down of the engine.
Operate, monitor and evaluate engine performance and capacity	Methods of measuring the load capacity of the engines, in accordance with technical specifications; performance checked against bridge orders; performance levels in accordance with technical specifications.
Maintain safety of engine equipment, systems and services	Operation and maintenance of marine diesel engines and of auxiliary machinery, including pumping and piping systems and auxiliary boiler plant; operation, testing and maintenance of control systems.
Manage fuel and ballast operations	Operation and maintenance of machinery, including pumps and piping systems.
Detect and identify the cause of machinery malfunctions and correct faults	Detection of machinery malfunction, location of faults and action to prevent damage.
Maintain safety and security of the vessel, crew and passengers	Actions to limit damage and save the ship following fire, explosion, collision and grounding.

Subject	Required knowledge
Manœuvres	General ability to keep the operation of the propulsion plant under control during any situation; specific ability to respond to bridge manoeuvres at any time; general ability to keep the switchboard parameters at a normal value and to keep electrical power available for ship and bow-thruster uses, during any situation; ability to operate different pumping systems, during any situation; ability to inform the bridge or a superior officer of any abnormal situations; ability to prepare the main and auxiliary machinery for manoeuvres; ability to manage boiler operation during manoeuvring; ability to determine order of priority among problems encountered; ability to resolve problems in an orderly manner; ability to make records in a logbook and notice unusual readings; ability to write appropriate entries in the Oil Record Book; ability to manually bring the electrical power system back to working order after a power failure; ability to bring the propulsion system back on line after a power failure; ability to transfer controls from bridge to engine room.

25.4 Applied Mechanics (examination code: 1APM)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of problem-solving questions and the applicant answers 6 out of 9 questions.

Subject	Required knowledge
Statics	Laws of equilibrium; moments and couples; polygon of forces; Rapson's slide.
Friction	Law of dry friction; friction angle; friction clutches; friction on inclined plane; friction on threads; work done against friction.
Kinematics	Linear and angular motion with constant acceleration; gravitational acceleration; velocity-time graphs; cams.
Relative velocity and acceleration	Effect of a current on the velocity and course of a ship; relative velocity between bodies moving in different planes.
Dynamics	Newton's law of motion; the force equation; Atwood machines; acceleration of connected bodies; effect of simple air resistance on motion under the effect of gravity; the torque equation; conservation of momentum; kinetic energy of translation and of rotation; flywheels; energy; conservation of energy; impulsive forces; centrifugal force; Porter governor with sleeve friction; simple harmonic motion; simple pendulum; simple vibrations; dynamic balancing of masses rotating in one plane; basic dynamics of the engine mechanism; use of piston velocity and acceleration formulae; derivation of piston displacement formulae.
Machines	Velocity ratio; mechanical advantage; efficiency.
Stress and strain	Direct stress and strain and modulus of elasticity; shear stress and strain and modulus of rigidity; stresses on oblique planes; strength of simple connections such as cottered or screwed joints; resilience due to direct stress; suddenly-applied loads.
Compound bars	Effects of direct loading and temperature changes.
Beams	Shear force and bending moments diagram for cantilevers and simply-supported beams; stresses in beams of simple section; use of simple deflection formulae.
Torsion	Torsion equations for solid and hollow round shafts; torsion of shaft fitted with liner; horsepower transmitted; close-coiled helical spring.
Struts	Eccentric loading of short columns; use of strut formulae.
Thin shells	Stresses in thin shells; design of riveted joints; use of boiler shell design formulae.

Subject	Required knowledge
Hydrostatics	Flotation in two liquids of different specific gravities; total force and centre of pressure on immersed surfaces such as tanks and bulkheads.
Hydraulics	Bernoulli's equation applied to simple flow problems; venturi meter; flow through orifices under constant head; force exerted by a jet on a flat surface perpendicular to the jet; blade-angle diagrams for a centrifugal pump; simple flow problems relating to automated control circuits.

25.5 Thermodynamics (examination code: 1H-H)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of problem-solving questions and the applicant answers 6 out of 9 questions.

Subject	Required knowledge
Elements	Expansion of solids and liquids, including coefficient of apparent cubical expansion; first and second laws of thermodynamics and their application to steady flow conditions; formulae for work done associated with the formula $PV^n = C$.
Heat transfer	Conduction (use of log mean temperature difference); radiation; Stefan-Boltzmann law.
Properties of steam	Enthalpy; internal energy; volume; use of steam tables and entropy charts.
Mixtures	Heat and temperature problems involving two or more substances; throttling and separating calorimeters.
Gases	Boyle's law; Charles' law; characteristic equation; relations between P, V and T when $PV^n = C$; determination of n from graph connecting P and V; proof of the formula $C_p - C_v = R$; calculations for expansions and compressions in air compressors, internal combustion engines, rotary compressors, vane and blade types, air pumps and air storage; simple applications of Dalton's law of partial pressures.
Gas cycles	Use of entropy charts; constant volume cycle; diesel cycle; open and closed cycles for gas turbines; indicated and brake thermal efficiencies; mechanical efficiency; overall efficiency; Morse test.
Expansion of steam	Throttling; hypothetical PV diagrams; work done; m.e.p.; diagram factor, including effect of clearance; compounding; mean referred pressure; total power; combined diagrams.
Steam cycle	Use of entropy charts; basic Rankine cycle; heat loss in reciprocating engines and turbines; effect on thermal efficiency of such modifications as superheating, exhaust turbine and regenerative feed heating; equivalent of evaporation; efficiencies.
Density and scale	Basic calculations on the effect of condenser leakage and impure feed on the density and scale in boilers; basic calculations on evaporator performance.

25.6 Electrotechnology (examination code: 1ELC)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of problem-solving and essay-type questions and the applicant answers 6 out of 9 questions.

Subject	Required knowledge
The electric circuit	Superposition and Thevenin's theorems in network problems; circuits involving non-linear elements.

Subject	Required knowledge
Electromagnetism	Electromagnetic induction, magnetic circuit, mutual inductance; energy stored in an electric field; treatment of voltage and current changes in an electric circuit involving inductance and resistance; time constants, B/H and B/Ampere turns-per-metre curves and their effect on simple magnetic circuits involving an air gap; qualitative treatment of hysteresis.
Electrostatics	Types of capacitors; simple series and parallel circuits involving capacitors; electric force and electric flux density; relative permittivity; charging and discharging currents of a capacitor connected in series with a resistor across a DC supply; energy stored in a capacitor; generation of static electricity.
Electronics	Characteristics of junction transistors; effect of voltage feedback on amplifier gain; input-output impedances; equivalent circuits; rectification; simple treatment of thyristors and zener diodes.
Alternating current	Theory for three-phase systems; current and voltage relationships; current, voltage, power and power factor applied to RLC circuits; the impedance triangle; power-factor improvement; resonance; star and delta systems.
DC Machines	Armature reaction; speed control; efficiency; application to a Ward Leonard system; suitability of DC motors for various types of work; motor starters, automatic, relay and solid state types; calculations on starters.
AC Machines	The principles, constructional details and protection of salient pole, cylindrical and brushless alternators; EMF equation and automatic voltage regulation for alternators; production of rotating magnetic fields; relation between frequency, number of poles and speed of a machine; principles, construction details and protection of induction motors; slip, rotor EMF and frequency; torque/speed curves; wound, slip-ring, cage and double-wound types; starting methods; principles and construction details of single-phase transformers; EMF equation and efficiency; auto and current transformers; magnetic amplifiers, static and rotating; motor starters.
Propulsion	Types using DC and AC machines; electric drives, starting methods; speed control; advantages and disadvantages of electrical propulsion; effects of stalling propulsion motors in ice; static and rotating control using pulse modulation and magnetic amplifiers.

25.7 Naval Architecture (examination code: 1NAR)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of problem-solving questions and the applicant answers 6 out of 9 questions.

Subject	Required knowledge
General	Wetted surface formulae; Simpson's rules applied to second moments of areas, centroids and centres of pressure; shearing force and bending moment of loaded ship in still water.
Transverse stability	Moment of statical stability; GZ curves; cross curves of stability; hydrostatic curves commonly supplied to ship; effect of free liquid surface and subdivision of tanks; dangers due to water accumulation during firefighting; practical requirements to ensure stability at sea; theory of free surface stabilization.
Longitudinal stability	Longitudinal BM and GM and statical stability; centre of flotation and its calculation; moment to change trim by one centimetre; stability during grounding, ice breaking and dry-docking.
Draught, trim and heel	Changes due to adding or removing fuel, ballast or cargo; changes due to alteration in density of water; changes due to bilging of compartments, using the lost-buoyancy and added-mass methods; forces on rudder and stress in rudder stock; heel when turning, including effect of centrifugal force and force on rudder.
Resistance and propulsion	Derivation of admiralty and fuel coefficient; law of corresponding speeds; Froude's law of comparison; simple problems on the prediction of full-scale resistance from model experiments; problems on propellers involving the use of wake factor, ep, dp, QPC, thrust and power; qualitative treatment of cavitation.
Ship construction	Forces on ship under various conditions, including the effect of panting and pounding; construction of all parts of steel ships; use of high-tensile steel and aluminium; structural fire-protection arrangements; dry-docking; design features of ships for general and specialized trades; design features for operating in ice.
Ship tonnage measurement and classification	Meaning of classed and unclassed ships; common terms used in measurement of modern steel ships; common terms used in tonnage measurements (e.g., gross tonnage, net tonnage, propelling space allowance).
Loadline	Common terms, markings and main criteria used in assignment of freeboards; maintenance of conditions of assignment.
Damage control	Counter ballasting; temporary patching; structural reinforcing; temporary and semi-permanent shoring.

25.8 General engineering knowledge (examination code: 1EKG)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of essay-type questions and the applicant answers 6 out of 9 questions; he may be required to illustrate his answers by means of freehand sketches.

Subject	Required knowledge
Material treatment	The general effects of various heat treatments on the physical properties of materials commonly used in the construction of marine engines and boilers, and the physical tests to which these materials are normally subjected.
Heat and combustion	Physical and chemical properties of steam, fuel, lubricants and other liquids, gases and vapours used in machinery on board ship.
Instrumentation	Use, constructional details and operational principles involved in the action of the pressure gauge, thermometer, pyrometer, barometer, salinometer, hydrometer and other meters commonly used in remote monitoring of systems by engineers on board ship.
Corrosion	Causes, effects and usual remedies for encrustation and corrosion; feed-water densities and electrolysis.
Marine engines	Constructional details and operational principles of marine engines; methods of determining their propulsion power output; principles of working and methods of calibration of dynamometers and torsion meters.
Machinery management	The methods of dealing with wear and tear of machinery and boilers; alignment of machinery parts; correction of defects due to flaws in material or accident; temporary or permanent repairs in the event of derangement or total breakdown.
Pump systems	Constructional details and principles of action of pumps fitted in ships; general requirements concerning feed, fuel, bilge and ballast pumping systems.
Steering gears and auxiliary machinery	The constructional arrangement, operational details and working of steering engines and gears; refrigerating machinery; hydraulic and other auxiliary machinery; such steam and internal combustion engines used for emergency and auxiliary machinery on board ship.
Power balance	Application of the indicator; calculation of mean pressure and kilowatt propulsion power; variation of pressure in the cylinder as shown by indicator diagrams; the recognition of irregularities in the running of engines from indicator diagrams; the rectification of these irregularities; illustration, by means of sketches, of the change produced in the diagram due to an alteration in the setting or working of the valves or any other factors.
Fire prevention	Precautions against fire or explosions due to oil or gas; flash point; explosive properties of gas or vapour given off by fuel or lubricating oils when mixed with a quantity of air; the danger of leakage from oil tanks, pipes, gas producers and vaporizers, particularly in bilges and other unventilated spaces; the action of wire-gauze mesh and the places where such devices must be fitted.
Hazards of coal	Spontaneous combustion of coal; explosive properties of gas given off by coal.
Fire detection	Maintenance of fixed methods of dealing with fire; chemical and physical action, maintenance of fire extinguishers and other firefighting appliances, respirators and safety lamps; detection meters.
Toxic Materials	Toxic and other dangerous properties of substances used in marine practices; maintenance of plant and equipment associated with the carriage of dangerous goods.
Management	Administrative duties of a chief engineer; organization of his staff for emergency duties and the use of safety equipment; organization of repairs and surveys; training of staff for both normal and emergency duties, including first aid relative to machinery space injuries; functions and use of lifesaving appliances and the supervision of staff in the absence of ideal safe working conditions.

Subject	Required knowledge
Fundamentals of automation and instrumentation	Periodically unattended machinery spaces; techniques and work practices; bridge control; monitoring systems.

25.9 Engineering knowledge of motor vessels (examination code: 1EKM)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of essay-type questions and the applicant answers 6 out of 9 questions; he may be required to illustrate his answers by means of freehand sketches.

Subject	Required knowledge
Marine engines	Principles underlying the working of internal combustion engines; the differences between various types of engines; constructional details of internal combustion engines in general use.
Oil, fuel and lubrication	Nature and properties of the fuel and lubricating oils generally used in internal combustion engines; the supply of air and fuels to cylinders of engines of different types; the constructional details of apparatus for carburetting or atomizing the fuel; the means of cooling the cylinders and pistons; constructional details and working of air compressors.
Construction of engines	Methods of constructing marine internal-combustion engines; the processes to which the several parts are submitted or which are incidental to their manufacture; methods employed in fitting the machinery on board ship.
Starting and reversing	Arrangements and the various operations connected therewith.
Machinery management	The attention required for the operation and maintenance of the various parts of machinery; the use and management of valves, pipes, connections and safety devices employed.
Corrective maintenance	Enumeration and description of defects arising from working of machinery; the remedy for such defects.
Construction of auxiliaries	Constructional details and management of auxiliary steam boilers, their fittings and mountings, with special reference to water gauges and safety valves; construction details and management of auxiliary machinery; draught, combustion equipment, oil fuel equipment.
Fundamentals of automated controls	Monitoring and recording devices, pneumatic and industrial electronics, and the use of Boolean algebra in control circuits.

25.10 Engineering knowledge of steamships (examination code: 1EKS)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of essay-type questions and the applicant answers 6 out of 9 questions; he may be required to illustrate his answers by means of freehand sketches.

Subject	Required knowledge
Steam engines	Methods of constructing marine steam engines and boilers; processes to which the several parts are submitted or which are incidental to their manufacture; methods employed in fitting the machinery on board ship.
Auxiliary machinery	Various types of propelling and auxiliary machinery in use; functions of each important part and the attention required by the different parts of the machinery on board ship.
Setting valves	The methods of testing and altering the setting of the steam admission and exhaust valves; effect produced in the working of the engine by definite alterations in the settings of the valves.
Water treatment	Constructional details and working of evaporators, feed-water heaters and feed-water filters.
Marine boilers	Various modern designs; the prevention of movement of boilers when vessels are pitching or rolling; the determination by calculation of suitable working pressure for boilers of given dimensions.
Boiler mountings	Use and management of boiler fittings and mountings, with special reference to water gauges and safety valves; precautions necessary when raising steam and operating stop valves, with particular reference to the danger arising from water-hammer action.
Combustion control	Constructional details, operation and maintenance of installations generally employed for assisting draught, superheating steam and burning coal or oil fuel.
Fundamentals of automated boiler control	Monitoring and recording devices, pneumatic and industrial electronics and the use of Boolean algebra in control circuits.

25.11 Oral examination (examination code: 1ORM or 1ORS) (Also, please refer section 2.11 of Chapter 2)

- 1) The examination is of an unlimited duration.
- 2) The oral examination will be based on:

Subject	Required knowledge
Plan and schedule operations	Planning and preparation of operations suited to the design parameters of the power installation and to the requirement of the voyage.
Start up and shut down Main propulsion and Auxiliary machinery, including associated systems	Method of preparing the start-up and of making available fuels, lubricants, cooling water and air; checks of pressures, temperatures and speed during start-up and warm-up, in accordance with technical specifications and agreed work plans; surveillance of main propulsion plant and auxiliary systems is sufficient to maintain safe operations; methods of preparing the shut-down and of supervising the cooling down of the engine.

Subject	Required knowledge
Operate, monitor and evaluate engine performance and capacity	Methods of measuring the load capacity of the engines, in accordance with technical specifications; performance checked against bridge orders; performance levels in accordance with technical specifications.
Maintain safety of engine equipment, systems and services	Arrangements for ensuring the safe and efficient operation and condition of the machinery installation, suitable for all modes of operation.
Manage fuel and ballast operations	Fuel and Ballast operations meeting operational requirements and carried out so as to prevent pollution of the marine environment; operation and maintenance of machinery, including pumps and piping system.
Internal communication system	Operation of all internal communication system on board; transmission and reception of messages are consistently successful; communication records complete, accurate and in compliance with statutory requirements.
Operate electrical and electronic control equipment	Operation of equipment and system is in accordance with operating manuals; performance levels in accordance with technical specifications.
Test, detect faults, maintain and restore electrical and electronic control equipment to operating condition	Maintenance activities are correctly planned in accordance with technical, legislative, safety, and procedural specification; effect of malfunction on associated plant and systems accurately identified; ship's technical drawings correctly interpreted; measuring and calibrating instruments correctly used; actions taken are justified.
Organize safe maintenance and repair procedure	Maintenance activities correctly planned in accordance with technical, legislative, safety, and procedural specification; appropriate plans, specification, materials and equipment available for maintenance and repair; action taken leads to restoration of plant by most suitable method.
Detect and identify the cause of machinery malfunction and correct faults	Detection of machinery malfunction, location of faults and action to prevent damage; methods of comparing operating conditions, in accordance with recommended practices and procedures; action and decisions in accordance with recommended operating specifications and limitations.
Ensure safe working practices	Working practices in accordance with legislative requirements, codes of practice, permits to work and environmental concerns.
Control trim, stability and stress	Understanding of fundamental principle of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability; stability and stress conditions are maintained within safety limits at all times; knowledge of the effect on trim and stability in the event of damage to and consequent flooding of a compartment and countermeasures to be taken
Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and protection of the environment	Knowledge of relevant international maritime laws embodied in international agreements and conventions; certificates and others documents required to be carried on board ships by international conventions, how they may be obtained and their period of validity; requirements for renewal and extension of certificates to ensure continued validity of survey items and equipment; responsibilities under relevant requirements of the International Convention on Load lines, International Convention for the Safety of Life at Sea, and International Convention for the Prevention of Pollution from Ships.

Subject	Required knowledge
Maintain safety and security of the vessel, crew and passengers and the operational condition of life-saving, fire-fighting and other safety systems	Thorough knowledge of life-saving appliances regulations; organization of fire and abandon ship drills; maintenance of operational condition of life-saving, fire-fighting and other safety systems; actions to be taken to protect and safeguard all persons on board in emergencies; actions to limit damage and save the ship following fire, explosion, collision or grounding; procedures for monitoring fire-detection and safety systems, ensuring that all alarms are detected promptly and acted upon in accordance with established emergency procedures.
Develop emergency and damage control plans and handle emergency situations	Emergency procedures in accordance with the established plans for emergency situations.
Organize and manage the crew	Crew allocated duties and informed of expected standards of work and behaviour in a manner appropriate to individuals concerned; training objectives and activities based on an assessment of current competence and capabilities and operational requirements.
Regulations and ship's business	<p>Knowledge of national and international maritime laws embodied in agreements and conventions as they affect the specific obligations and responsibilities of the engineering department, particularly those concerning safety and the protection of the marine environment; knowledge of the general organization of ship management, including: IMO, ILO and the SOLAS conventions, including articles, regulations and resolutions.</p> <p>Knowledge of the Canada Shipping Act, 2001 relating to:</p> <p>Steamship inspections, marine machinery inspection, hull construction and inspection, registration of ships, steering appliances and equipment; life saving equipment, boat and fire drills, fire detection and extinguishing equipment; dangerous goods shipping, oil pollution prevention, sewage pollution prevention, garbage pollution prevention, pollutant discharge reporting; safe working practices, shipping casualties reporting, tackle; crewing, engagement and discharge of seafarers in and/or out of Canada, rights of seafarers, maintenance of discipline, distressed seafarers, provisions, health and accommodation.</p> <p>Knowledge of the <i>Canada Labour Code</i>, as applicable to shipping and relating to the occupational health and safety.</p>

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General**26.1 General requirements**

The general requirements for a certificate as Second-class Engineer, Motor Ship or Steamship, are listed in section 145 of the *Marine Personnel Regulations*.

26.2 Validity of certificates

- 1) The holder of this certificate may act:
 - a) as second engineer and watchkeeping engineer on all types of vessels other than ACVs, subject to the propulsion type specified on the certificate, without voyage limitations or propulsive power restrictions; and
 - b) as chief engineer, subject to the propulsion type specified on the certificate, and to the voyage limitations and propulsive power restrictions specified in Table I.

Table I

Voyage Type of Vessel	Unlimited voyage and near coastal voyage, class 1, not limited to Canadian ports	Near coastal voyage, class 1, between Canadian ports	Near coastal voyage, in the Gulf of St. Lawrence and the Great Lakes Basin	Near coastal voyage, class 2	Sheltered waters voyage or limited near coastal voyage, class 2
Passenger	Not more than 3000 kW	Not more than 4000 kW	Not more than 4000 kW	Not more than 7000 kW	Not more than 7000 kW
Cargo	Not more than 3000 kW	Not more than 5000 kW	Not more than 7000 kW	Not more than 7000 kW	No limit
Tug	Not more than 3000 kW	Not more than 6000 kW	Not more than 6000 kW	Not more than 7000 kW	No limit
Fishing	Not more than 5000 kW	Not more than 5000 kW	No limit	No limit	No limit

Syllabuses of Examinations**26.3 Ship management practices (examination code: PPSSIM2)**

Refer to Chapter 25 of this TP.

26.4 Applied Mechanics (examination code: 2APM)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of problem-solving questions and the applicant answers 6 out of 9 questions.

Subject	Required knowledge
Statics and forces	Force as a vector; triangle and polygon forces; resultant and equilibrant of a system of concurrent coplanar forces; equilibrium of three coplanar forces; moment of a force; couples; moments of areas and volumes; centroids and centres of gravity (limited to geometrical shapes); conditions of equilibrium of solids; necessary force applied parallel to an inclined plane to pull body up or down the plane or to hold it stationary (including effect of friction); work done at uniform speed up the plane.
Friction	Coefficient of friction; friction angle; energy and power loss due to friction in simple bearings.
Kinematics	Linear motion; graphs and equations for displacement, speed, velocity and uniform acceleration; velocity as a vector; relative velocities in one plane only; angular motion; equations for displacement, velocity and uniform acceleration.
Dynamics	Work and power; problems with constant force or force with linear variation; energy; potential energy; kinetic energy of translation; Newton's laws of motion; conservation of momentum; centrifugal force and its application to conical pendulum, unloaded governor, curved tracks and machine parts; stress in thin rim due to centrifugal action.
Machines	Simple lifting machine; graphs of load effort and load efficiency; linear law; velocity ratio, mechanical advantage and efficiency of the following machines: wheel and axle, differential wheel and axle, rope-pulley blocks, differential-pulley blocks, screw jack, Warwick screw, hydraulic jack, worm-driven chain blocks and single- and double-purchase crab winches; reduction gearing.
Stress and strain	Direct stress and strain; modulus of elasticity; shear stress and strain; modulus of rigidity; factor of safety; stress due to restricted expansion or contraction of single members.
Beams	Shearing force and bending moment diagrams for cantilevers and simple supported beams with concentrated or uniformly-distributed loads; stress due to bending.
Torsion	Strength and stiffness of solid or hollow shafts; stress due to torsion; power transmitted by shafts and coupling bolts.
Thin shells	Circumferential and longitudinal stress in thin cylindrical shells subject to internal pressure.
Hydrostatics	Equilibrium of floating bodies; variation of fluid pressure with depth; total force due to liquid pressure on immersed plane surfaces, horizontal or vertical; centre of pressure on a rectangular vertical plane surface or triangular plane surface, both with one edge parallel to the surface of the liquid.
Hydraulics	Full-bore flow of liquid through pipes under constant head; flow through orifice; coefficients of velocity, contraction of area and discharge.

26.5 Thermodynamics (examination code: 2H-H)

- 1) The duration of the examination is 3½ hours.

- 2) The examination consists of problem-solving questions and the applicant answers 6 out of 9 questions.

Subject	Required knowledge
Heat	Temperature and its measurement; absolute temperature; specific heat capacity; specific enthalpy of evaporation and fusion; problems involving changes of phase and not more than three substances; linear, superficial and volumetric expansion due to temperature changes; coefficients and the relationship between them.
Basic thermodynamic principles	Properties of working substances and the first law of thermodynamics; flow and non-flow processes and their application to steady-flow and non-flow processes.
Heat transfer	Qualitative treatment of heat transfer by conduction, convection and radiation; laws of conduction and thermal conductance and applications to problems.
Gases laws	Boyle's and Charles' laws for perfect gases; characteristic equation; constant R and its use in simple problems; isothermal, adiabatic and polytropic processes; relationships between pressure, temperature and volume; work done; change in internal energy; specific heat C_p and C_v and the relationship between them.
Ideal gas cycles	Constant volume cycles; diesel cycle; dual cycle; air standard efficiency.
IC engines	Elementary principles and cycles of operation; actual indicator diagrams; mean effective pressure; work done; power developed; indicated and brake thermal efficiencies; mechanical efficiency; overall efficiency; fuel consumption; energy balance chart.
Air compressors	Elementary principles and cycles of operation; calculation of work done; indicator diagrams, reciprocating and rotating machines.
Properties of steam	Dryness fraction; superheated steam; internal energy; enthalpy; specific volume; steam tables; throttling; separating and throttling calorimeters; use of steam tables and charts.
Steam plant	Advantages of using steam expansively; thermal, mechanical and overall efficiencies of prime movers; boiler efficiency; heat balance for engine and boiler trials; change in dissolved solids in boilers and evaporators due to contaminated feed and effect of blowing down; elementary principles of steam turbines, including simple velocity diagrams for impulse and reaction turbines; force and work done on turbine blades.
Combustion	Solid and liquid fuels; calorific value; chemical equations for complete combustion; theoretical minimum air required; excess air effect.
Refrigeration	Vapour-compression cycle; refrigerating effect; cooling load; use of tables of properties of refrigerants; coefficient of performance.

26.6 Electrotechnology (examination code: 2ELC)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of problem-solving and essay-type questions and the applicant answers 6 out of 9 questions.

Subject	Required knowledge
The electric circuit	Units (ampere, ohm, volt); difference between electromotive force and potential difference; Ohm's law; Kirchoff's laws; simple-series and parallel circuits involving EMF current and resistances; non-linear resistors in parallel with constant value resistors; power and energy; specific resistance; temperature coefficient of resistance; conductor resistance, effect of length, area, material and temperature; DC 2 wire distribution system; types of insulation; Wheatstone network bridge, slide-wire bridge; applications to steering gears, resistance pyrometers, strain gauges etc.
Electrolytic action and secondary cells	Theory of electrolytic dissociation applied to common solutions; uses of electrolysis; secondary cells (acid or alkaline), construction and principles, maintenance, charging; watt-hour and ampere-hour efficiencies.
Electromagnetism	Electromagnetic induction; simple magnetic circuit; simple magnetic theory; magnetic field; lines of force; field strength; field intensity; magnetic fields due to current in straight conductors, loops, coils and solenoids; relative directions of current and field; Faraday's and Lenz's laws; magnitude and direction of induced EMF; force produced on a current-carrying conductor; flux density; effect of iron; magneto motive-force; permeability; reluctance; simple magnetic circuit; typical B/H and u/B curves.
Electronics	Qualitative treatment of atomic structure and bonding; semi-conductors; junction diodes, junction transistors and their operating characteristics; simple transistor circuits; conduction in gases, insulators, semi-conductors and conductors; photo-electric effect.
Alternating-current theory	Simple continuous periodic waves: frequency, amplitude, instantaneous, maximum r.m.s. and average values, form factor; phasor representation of AC quantities; phase difference; the inductor; inductance and its effect on the circuit; the capacitor, capacitance and its effect on the circuit; simple- series and parallel circuits; relationship between resistance, reactance and impedance; simple treatment of power factor; power in single-phase AC circuit.
Instruments	Qualitative treatment of the principles and functions of AC and DC, indicating instruments and relays; uses of shunts and series resistances to increase the range; rectifiers and transducers.
Distribution systems	Systems for AC and DC shipboard installations; protective devices such as fuses, circuit breakers, earth lamps; cable material and installation; connection of shore supply; operation and testing by standard methods; maintenance of additional and control equipment to be observed during testing, and evaluation of test results.
DC Machines	The principles, constructional details and protection of DC-series, shunt and compound-wound motors and generators; self-excitation, EMF and load-voltage equations; load characteristics; methods of voltage control; paralleling procedures and load sharing for generators; need for and types of starter; speed and torque equations; speed control of DC motors.
AC Machines	Simple explanation of the principles, constructional details and protection of alternators, squirrel-cage induction motors and single-phase transformers; parallel running and synchronising theory.
Propulsion	Principles and operation of electric propulsion; construction details; control of excitation; killer circuits; connection of armatures; monitoring and control of field current; basic circuitry.

26.7 Naval Architecture (examination code: 2NAR)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of problem-solving questions and the applicant answers 6 out of 9 questions.

Subject	Required knowledge
General	Displacement, wetted surface, block, mid-section, prismatic and water plane area coefficient; tonne per centimetre immersion; application of Simpson's rules to areas, moment of area, volumes and moment of volume.
Draught and buoyancy	Alteration of mean draught due to change in density of water; buoyancy and reserve buoyancy; effect of bilging amidship compartments.
Transverse stability	Centre of gravity; centre of buoyancy; metacentre; shift of centre of gravity due to addition or removal of mass, transverse movement of mass, suspended mass; stability at small angles of heel (given the second moment of area of the water plane or formulae); the inclining experiment; hydrostatic curves and stability curves.
Resistance and propulsion	Comparison of skin frictional resistance of hull with model at different speeds; $R^f = f.S.V^n$ and residual resistance; admiralty and fuel coefficients; relation between speed of vessel and fuel consumption with constant displacement and assuming that resistance varies as (speed) zYn ; elementary treatment of propeller and simple problems on pitch, pitch ratio, apparent slip, real slip, wake, thrust and power.
Structural strength	Simple problems on strength of structural members to resist liquid pressure; loading due to head of liquid.
Ship construction	Common terms used in the measurement of steel ships (e.g., length between perpendiculars, breadth overall, moulded depth, draught and freeboard); definitions of shipbuilding terms in general use; descriptions and sketches of structural members in ordinary types of steel ships; water-tight doors, hatches, rudders, bow thrusters, propellers, watertight bulk-heads, double bottoms, anchors and cables; descriptive treatment of effect of free surface of liquids on stability; arrangements for the carriage of dangerous goods in bulk; strengthening of vessels for navigation in ice; welding in steel ships.
Ventilation arrangements	Natural and mechanical ventilation for pump rooms in tankers and for holds and oil fuel tanks, accommodation and machinery spaces.
Tanks	Fore and aft peak tanks, double bottom and deep tank filling and pumping arrangements; compartmental drainage; levelling arrangements for damaged side compartments.
Inspection	Underwater parts of a ship in dry-dock; provision of fire protection; security arrangements.

26.8 Technical drawing (examination code: 2D)

- 1) The examination is of 6 hours' duration.
- 2) The examination consists of a test to produce a general assembly drawing.

Subject	Required knowledge
General	The Drawing paper consists of a test of the applicant's ability to produce a satisfactory general-assembly drawing embodying the principles of projection and displaying his knowledge of marine engineering. Applicants will be asked to draw a plan, elevation, section or combination of these views of a piece of marine machinery from information supplied in the form of a dimensional pictorial drawing of individual components. All the required information for the completion of the drawing will be given in the question paper.
Engineering knowledge	The assembled machinery must be able to perform the intended function with respect to size shape and material employed; parts shown must be capable of being removed, and proper clearances, valve lifts etc. duly allowed for.
Proper use of paper	Choice of suitable scale and view positions, so as to make optimum use of the paper.
Proper use of types of lines	Thickness and types of lines to indicate: visible outlines, dimension, projections, extension, hatching and leader lines; lines showing hidden details, portions to be removed; centre lines, pitch circles; cutting or viewing planes lines; lines showing irregular boundaries; short breaks and long break lines.
Printing	Major and functional dimensions in millimetres: valve lift, working clearances or other relevant functional dimensions, neat figures and printing readable without having to turn to the finished drawing.
Views and view projection	Views drawn as instructed and complete; relative position of views, first- and third-angle projection.
Drawing	Drawn correctly, according to information; scale used and stated; sectioned as required; materials; title block.

26.9 General engineering knowledge (examination code: 2EKG)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of essay-type questions and the applicant answers 6 out of 9 questions; he may be required to illustrate his answers by means of freehand sketches.

Subject	Required knowledge
Materials	General effects of various treatments on the physical and chemical properties of materials commonly used in the construction of marine engines and boilers, and the physical tests to which these materials are normally subjected.
Heat and combustion	Properties of steam, fuel, lubricants and other liquids, gases and vapours in machinery on board ship.
Instruments	Use, construction details and principles involved in the action of the pressure gauge, thermometer, pyrometer, barometer, salinometer, hydrometer and other meters commonly used by engineers on board ship.
Water treatment	Causes, effects and usual remedies for encrustation and corrosion; feed-water, blow densities and electrolysis.
Principles of marine engines	Constructional details and working principles of marine engines; methods of determining their kilowatt power; the principles of working and methods of calibration of dynamometers and torsion meters mounted on ships.
Practice	Methods of dealing with wear and tear of machinery and boilers; alignment of machinery parts; correction of defects due to flaws in material or accident; temporary or permanent repairs in the event of derangement or total breakdown; detection of machinery malfunction; location of faults and actions to prevent damage.
Pumps and systems	Constructional details and principles of action of pumps fitted in ships; general requirements concerning feed, fuel, bilge and ballast pumping systems.
Auxiliary machinery	Constructional arrangement, operation and maintenance of steering engines and gears, refrigerating machinery, hydraulic and other auxiliary machinery, and such steam and internal combustion engines as are used for emergency and auxiliary machinery on board ship; deck machinery and cargo-handling machines.
Power transmission	Construction details, alignment, lubrication, expansion, clearances and wear allowances of thrust blocks, shafting, bearings, stern tubes, propellers, nozzles, thrusters and ship side fittings.
Prevention	Precautions against fire or explosions due to oil or gas; flash point; explosive properties of gas or vapour given off by fuel or lubricating oils when mixed with a quantity of air; the danger of leakage from oil tanks, pipes, gas producers and vaporizers, particularly in bilges and other unventilated spaces; vaporizers, particularly in bilges and other unventilated spaces; the action of wire-gauze diaphragms and the places where such devices should be fitted.
Coal fuel	Spontaneous combustion of coal; explosive properties of gas given off by coal dust.
Fire detection	Methods of dealing with fire; action and maintenance of mechanical and chemical fire extinguishers and other firefighting appliances; respirators and safety lamps; smoke and heat detectors; sprinkler systems, wet and dry valves; permanently-fixed gas-smothering systems and methods of activating; dangers of smothering gas to life.
Safe working practices	Mechanical safety in overhauling work shops; protective equipment; lifting-tackle safety and tests; precautions and tests when entering tanks; first aid related to injuries that may be expected in machinery spaces, use of first aid equipment and methods of obtaining second aid.

Subject	Required knowledge
Cold weather practices	Special arrangements for operation in waters with ice; lay out and operation of ice-related shipboard systems; cold weather lay-up.
Control systems	Automation and instrumentation in block diagrams; periodically unattended machinery spaces, techniques and work practices; bridge control, remote-control stations, system monitoring.
Pollution prevention	Devices to prevent pollution from oil, sewage, air; regulations to be observed regarding pollution.
Maintenance	Routine maintenance; prevention of damage to machinery; preventive maintenance; corrective maintenance; planned maintenance; record keeping relating to maintenance; deployment of human resources for effective maintenance and repair.
Lifesaving appliances	Operation and maintenance of lifesaving appliances, launching and retrieval machinery.
Damage control	Methods of damage control, with specific reference to action to be taken in the event of flooding of seawater into the machinery spaces.
Electrical safety	Safe operation and maintenance of electrical and control equipment; precautions to be observed to prevent injury to personnel and machine; methods of cleaning and drying of equipment, particularly equipment flooded by seawater.
Non-destructive testing	An awareness of non-destructive testing, to include: magna flux, dye penetrant, ultrasonic and nuclear; vibration analysis; spectronic oil analysis for wear indication; x-ray and thermographs.

26.10 Engineering knowledge of motor vessels (examination code: 2EKM)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of essay-type questions and the applicant answers 6 out of 9 questions; he may be required to illustrate his answers by means of freehand sketches.

Subject	Required knowledge
Construction of marine machinery	Design considerations and operation of internal combustion engines; differences between various types of engines; constructional details of internal combustion engines in general use.
Internal combustion engine systems	Nature and properties of the fuel and lubricating oils generally used in internal combustion engines; supply of air and fuel to cylinders of engines of different types; means of cooling the cylinders and pistons; constructional details and working of air compressors.
Construction of internal combustion engines	Methods of constructing marine internal combustion engines; processes to which the several parts are submitted or which are incidental to their manufacture; methods employed in fitting the machinery on board ship.
Starting and reversing systems	Starting and reversing arrangements and the various operations connected therewith.
Operation and maintenance	Attention required for the operation and maintenance of the various parts of machinery; use and management of valves, pipes, connections and safety devices employed.
Defects and remedies	Enumeration and description of defects arising from working of machinery; the remedy for such defects.
Auxiliary boilers	Operation and maintenance of auxiliary steam boilers, their fittings and mountings, with special reference to water gauges, safety valves and programmers; constructional details and management of auxiliary machinery; draught, combustion equipment, oil fuel equipment.
Compressed air systems	Care and maintenance of air compressors, receivers and coolers.
Power transmission	Operation and maintenance of reduction gears, reverse gearing, thrust systems, lubrication, clutching, and evaluation of visible signs of deterioration.
Lubricating systems	Operation and maintenance of closed lubrication systems, testing for contamination, factors leading to over consumption, symptoms and remedies.

26.11 Engineering knowledge of steamships (examination code: 2EKS)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of essay-type questions and the applicant answers 6 out of 9 questions; he may be required to illustrate his answers by means of freehand sketches.

Subject	Required knowledge
Construction of steam engines	Methods of constructing marine steam-engines and boilers; processes and tests to which the several parts are submitted or which are incidental to their manufacture; methods employed in fitting the machinery on board ship.
Types of engines	Various types of propelling and auxiliary machinery in use; functions of each important part and the attention required by the different parts of the machinery on board ship.
Steam pumps	Operation and maintenance of simplex, duplex and multi-stage centrifugal pumps.
Feed-water systems	Constructional details and working of evaporators, feed-water heaters and feed-water filters; contamination from lube oil and fuel oil.
Marine boilers	Marine boilers of various modern designs; the prevention of movement of boilers when vessels are pitching or rolling; determination by calculation of suitable working pressure for boilers of given dimensions.
Boiler fittings	Functions and maintenance of boiler fittings and mountings, with special reference to water gauges, safety valves, and programmers; precautions necessary when raising steam and operating stop valves, with particular reference to the danger arising from water-hammer action.
Combustion	Constructional details, operation and maintenance of installations generally employed for assisting draught, superheating steam and burning coal or oil fuel.
Power Transmission	Construction details, operation and maintenance of reduction gearing, thrust systems and lubricating systems, inspection, evaluation of visible signs of deterioration of wearing surfaces.

26.12 Oral examination (examination code: 2ORM or 2ORS) (Also, please refer section 2.11 of Chapter 2)

- 1) The examination is of an unlimited duration.
- 2) Bearing in mind that a second engineer officer must be in a position to assume the responsibilities of the chief engineer officer at any time, assessment in these subjects will be designed to test the applicant's ability to assimilate all available information that affects the safe operation of the ship's machinery and the protection of the marine environment.
- 3) The oral examination is based on:

Subject	Competence
Plan and schedule operations	Planning and preparation of operations suited to the design parameters of the power installation and to the requirement of the voyage.
Start up and shut down main propulsion and auxiliary machinery, including associated system	Method of preparing the start-up and of making available fuels, lubricants, cooling water and air; check of pressures, temperatures and speed during start-up and warm-up, in accordance with technical specifications and agreed work plans; surveillance of main propulsion plant and auxiliary systems, sufficient to maintain safe operations; methods of preparing the shutdown and of supervising the cooling down of the engine.
Operate, monitor and evaluate engine performance and capacity	Methods of measuring the load capacity of the engines, in accordance with technical specifications; performance checked against bridge orders; performance levels in accordance with technical specifications.
Maintain safety of engine equipment, systems, and services	Arrangements for ensuring the safe and efficient operation and condition of the machinery installation, suitable for all modes of operation.
Manage fuel and ballast operation	Fuel and ballast operations meet operational requirements and carried out so as to prevent pollution of the marine environment; operation and maintenance of machinery including pumps and piping system.
Internal communication system	Operation of all internal communication systems on board; transmission and reception of messages consistently successful; communication records complete, accurate and in accordance with statutory requirements.
Operate electrical and electronic control equipment	Operation of equipment and system is in accordance with operating manuals; performance levels in accordance with technical specifications.
Test, detect faults, maintain and restore electrical and electronic control equipment to operating condition	Maintenance activities correctly planned in accordance with technical, legislative, safety, and procedural specifications; effect of malfunctions on associate plant and systems accurately identified; ship's technical drawings correctly interpreted; measuring and calibrating instruments correctly used; actions taken are justified.
Organize safe maintenance and repair procedures	Maintenance activities correctly planned, in accordance with technical, legislative, safety, and procedural specifications; appropriate plans, specification, materials and equipment available for maintenance an repair; action taken leads to restoration of plant by most suitable method.
Detect and identify the cause of machinery malfunction and correct faults	Detection of machinery malfunction, location of faults and action to prevent damage; methods of comparing operating conditions, in accordance with recommended practices and procedure; actions and decisions in accordance with recommended operating specifications and limitations.
Ensure safe working practices	Working practices are in accordance with legislative requirements, codes of practice, permits to work and environmental concerns.

Subject	Competence
Control trim, stability and stress	Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability; stability and stress conditions maintained within safety limits at all times; knowledge of the effect on trim and stability in the event of damage to and consequent flooding of compartment and countermeasures to be taken.
Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and protection of the environment	Knowledge of relevant international maritime laws embodied in international agreements and conventions; certificates and other documents required to be carried on board ships by international conventions, how they may be obtained and their period of validity; requirements for renewal and extension of certificates to ensure continued validity of survey items and equipment; responsibilities under relevant requirements of the international Convention on Load lines, the International Convention for the Safety of Life at Sea, and the International Convention for the Prevention of Pollution from Ships.
Maintain safety and security of the vessel, crew and passengers and the operational condition of life-saving, fire-fighting and other safety systems	Thorough knowledge of life-saving appliance regulations; organization of fire and abandon ship drills; maintenance of operational condition of life-saving, fire-fighting and other safety systems; actions to be taken to protect and safeguard all persons on board in emergencies; actions to limit damage and salve the ship following fire, explosion, collision or grounding; procedures for monitoring fire-detection and safety systems, ensuring that all alarms are detected promptly and acted upon in accordance with established emergency procedures.
Develop emergency and damage control plans and handle emergency situations	Emergency procedures in accordance with the established plans for emergency situations.
Organize and manage the crew	Crew allocated duties and informed of expected standards of work and behaviour in manner of appropriate to individuals concerned; training objectives and activities based on an assessment of current competence and capabilities and operational requirements.
Regulations and ship's business	<p>Knowledge of national and international maritime law embodied in agreements and conventions as they affect the specific obligations and responsibilities of the engineering department, particularly those concerning safety and the protection of the marine environment; knowledge of the functions and jurisdiction of IMO, ILO, and the SOLAS Convention, including articles, regulations and resolutions.</p> <p>Knowledge of the <i>Canada Shipping Act 2001</i> relating to: Ship inspections, Marine Machinery Inspection, Hull Construction, Hull Inspection, Vessel registration, Steering Appliances and Equipment; Life Saving Equipment, Boat and Fire Drill, Fire Detection and Extinguishing Equipment; Dangerous Goods Shipping, Oil Pollution Prevention, Sewage Pollution Prevention, Garbage Pollution Prevention, Pollutant Discharge Reporting; Safe Working Practices, Shipping Casualties Reporting, Tackle; Crewing, engagement and discharge of seafarers, in and out of Canada, rights of seafarers, maintenance of discipline, distressed seafarers, provisions, health and accommodation;</p> <p>Knowledge of the <i>Canada Labour Cod</i>, as applicable to shipping industry in relation occupational health and safety.</p>

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General**27.1 General requirements**

The general requirements for a certificate as Third-Class Engineer, Motor Ship or Steamship, are listed in section 146 of the *Marine Personnel Regulations*.

27.2 Validity of certificates

- 1) The holder of this certificate may act as:
 - a) watchkeeping engineer on any type of vessel other than ACV's, subject to the propulsion type specified on the certificate, without voyage limitation or propulsive power restriction;
 - b) second engineer, subject to the propulsion type specified on the certificate and to the voyage limitation and propulsive power restriction specified in Table I;
 - c) chief engineer, subject to the propulsion type specified on the certificate and to the voyage limitation and propulsive power restriction specified in Table II.

Table I – Second Engineer

Voyage Type of Vessel	Unlimited voyage and near coastal voyage, class 1, not limited to Canadian ports	Near coastal voyage, class 1, between Canadian ports	Near coastal voyage, in the Gulf of St. Lawrence and the Great Lakes Basin	Near coastal voyage, class 2	Sheltered waters voyage or limited near coastal voyage, class 2
Passenger	Not more than 3000 kW*	Not more than 4000 kW	Not more than 4000 kW	Not more than 7000 kW	No limit
Cargo	Not more than 3000 kW*	Not more than 5000 kW	Not more than 7000 kW	No limit	No limit
Tug	Not more than 3000 kW*	Not more than 6000 kW	Not more than 6000 kW	No limit	No limit
Fishing	Not more than 5000 kW	Not more than 5000 kW	Not more than 5000 kW	No limit	No limit

* Note: These provisions do not apply to the holder of a certificate issued before January 3rd, 1994, that has not been upgraded in accordance with regulation III/3 of the STCW Convention (the holder has not passed the Thermodynamics and Electrotechnology examinations).

Table II – Chief Engineer

Voyage Type of Vessel	Unlimited voyage and near coastal voyage, class 1, not limited to Canadian ports	Near coastal voyage, class 1, between Canadian ports	Near coastal voyage, in the Gulf of St. Lawrence and the Great Lakes Basin	Near coastal voyage, class 2	Sheltered waters voyage or limited near coastal voyage, class 2
Passenger	N/A	N/A	N/A	Less than 3000 kW	Less than 3000 kW
Cargo	N/A	Less than 2000 kW	Less than 2000 kW	Less than 3000 kW	Not more than 4000 kW
Tug	N/A	Less than 3000 kW	Less than 3000 kW	Less than 4000 kW	Not more than 5000 kW
Fishing	Less than 2000 kW	Less than 2000 kW	Less than 2000 kW	Not more than 5000 kW	Not more than 5000 kW

Syllabuses of Examinations**27.3 Validity**

- 1) An applicant who has completed the ship management practices taught using a propulsive plant simulator (simulator level 2) course and passed the examination at that level will not be required to pass the Ship Watchkeeping Practices (simulator level 1) examination.
- 2) An applicant who has passed the Applied Mechanics examination at the second-class level will not be required to write that examination at the third-class level.
- 3) An applicant who has passed the Electrotechnology examination at the second-class level will not be required to write that examination at the third-class level.
- 4) An applicant who has passed the Thermodynamics examination at the second-class level need will not be required to write that examination at the third-class level.
- 5) Refer to Chapters 25 and 26 for the syllabi of the higher-level examinations.

27.4 Ship watchkeeping practices (examination code: PPSSIM1)

- 1) The examination consists of a practical scenario using a propulsive plant simulator
- 2) The examination is of 3½ hours' duration (practical scenario).

Subject	Required knowledge
Maintain a safe engineering watch	Take over and accept a watch; undertake routine duties during a watch; maintain the machinery space logbook and understand the significance of the reading taken; change-over from remote/automatic to local control of all systems in relation to safety and emergency procedures; observe safety precautions during a watch and take immediate action in the event of fire and accident.
Operate main and auxiliary machinery and associated control systems	Prepare the main and auxiliary machinery for operation; operate steam boilers; locate common faults in machinery and plant in engine room and take actions to prevent damage
Operate pumping systems and associated control systems	Perform routine pumping operations; operate bilge and ballast pumping systems
Operate alternators and control systems	Locate common faults and act to prevent damage; prepare, start, couple and change over alternators; locate common faults in the control system and act to prevent damage.
Ensure compliance with pollution-prevention requirements	Know anti-pollution procedures and all associated equipment
Maintain seaworthiness of the ship	Understand the fundamental actions to be taken in the event of partial loss of intact buoyancy.
Official languages	Have sufficient knowledge of one of the official languages to perform engineering duties.
Manœuvres	General ability to keep the operation of the propulsion plant under control during any situation; specific ability to respond to bridge manoeuvres at any time; general ability to keep the switchboard parameters at a normal value and to keep electrical power available for ship and bow-thruster uses, during any situation; ability to operate different pumping systems, during any situation; ability to inform the bridge or a superior officer of any abnormal situations; ability to prepare the main and auxiliary machinery for manoeuvring operations; ability to manage boiler operation during manoeuvring; ability to determine order of priority among problems encountered; ability to resolve problems in an orderly manner; ability to write appropriate entries in a log book and notice unusual readings; ability to write appropriate entries in the Oil Record Book; ability to manually bring the electrical power system back to working order after a power failure; ability to bring the propulsion system back on line after a power failure; ability to transfer controls from bridge to engine room.

27.5 Applied mechanics (examination code: 3APM)

- 1) The duration of the examination is 3½ hours.

- 2) The examination consists of problem-solving questions and the applicant answers 6 out of 9 questions.

Subject	Required knowledge
Vectors	Vector representation of forces; triangle of forces; resultant and equilibrant of a system of concurrent co-planar forces; couples.
Moments and centroids	The principle of moments, application to simply-supported beams and levers; centre of area; centre of gravity.
Displacement	Displacement, time, speed, velocity and acceleration.
Forces	Moment of force, torque, work, energy and power.
Simple machines	Velocity ratio, mechanical advantage and efficiency.
Friction	Laws for dry surfaces, coefficient of friction (horizontal plane only).
Stress and strain	Direct stress and strain; Hooke's law; modulus of elasticity; elastic limit; UTS; yield stress; limit of proportionality; safety factor; shear stress.
Density and pressure	Relative density; variation of fluid pressure with depth; Archimedes' principle.
Elementary stability	Elementary treatment of transverse stability: centre of buoyancy, centre of gravity and metacentre (box shape only); transverse movement of masses across deck.

27.6 Thermodynamics (examination code: 3H-H)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of problem-solving questions and the applicant answers 6 out of 9 questions.

Subject	Required knowledge
Introduction	S. I., Metric and Imperial units; conversion of units from one system to another; temperature and its measurement; scales; significance of absolute temperature; heat as energy; first law of thermodynamics and mechanical equivalent of heat (conservation of energy applied to heat and work); fuels, calorific value and flashpoint.
Thermal properties	Expansion and contraction of solids, liquids and gases; change of phase; specific enthalpy of fusion and evaporation; properties of working fluids: air, steam and freon.
Perfect gas laws	Compression and expansion of gases; gas laws; Boyle's law; Charles' law.
Heat transfer	Specific heat capacity; heat transfer by conduction, convection and radiation; effect of insulation.
Thermal relations	The indicator diagram; power developed, fuel consumption including understanding of principles of combustion; insufficient, minimum and excess air.

27.7 Electrotechnology (examination code: 3ELC)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of problem-solving and essay-type questions and the applicant answers 6 out of 9 questions.

Subject	Required knowledge
Introduction	Simple electric circuit; chemical, magnetic and thermal effects of electric current; Ohm's Law; series and parallel circuits; electromotive force, voltage; units of current, resistance, voltage, energy; simple AC circuit; Wheatstone bridge.
Properties of conductors	Distribution of current in circuits; resistance of conductor, variation with dimensions, material and temperature; temperature coefficient of resistance; insulators.
Storage cells	Secondary cells (acid and alkaline); construction; capacity, ampere-hour.
Switchboards	Construction and operation of switchboards.
Introduction to electronics	P-N junction, rectifiers, switching.
Instruments	Moving coil, moving iron (repulsion type).
Magnetism	Magnetic field, lines of force; field due to current in a straight conductor; motor and generator principles, commutation; speed control of motors; AC and DC starters; alternators and AC motors.

27.8 Applied mathematics (examination code: 3MA)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of problem-solving questions and the applicant answers 6 out of 9 questions.

Subject	Required knowledge
General	Setting out of calculations; extraction and cancellation of common factor; significant figures; degree of accuracy.
Arithmetic	Averages; percentages; ratio; proportions; variation, direct and inverse.
Logarithms	Use of tables; square roots; reciprocals; use of logarithms for multiplication, division, powers and roots.
Algebra	Indices, including fractional and negative types; use of common logarithms for multiplication, division, powers and roots; use of Napierian logarithms; simplification and division of algebraic functions; re-arrangement of formulae; factorisation; algebraic fractions; squares and cubes of polynomials such as $(a + b)^2$ and $(a + b)^3$; simple equations; quadratic equations and solution by factorisation or by completing the square, proof of general formula for solution; simultaneous equations; complex quantities, their representation on Argand diagrams.
Graphics	Graphical work; the graph $y = ax + b$, either from calculated values or from experimental results; calculation of constants from graphs; graphical solution of simple simultaneous equations involving two unknowns; graph of $y = ax^2 + bx + c$ and graphical solution of equation $ax^2 + bx + c = 0$.
Geometry	Properties of triangles; Pythagorean theorem; sum of the angles; relation between exterior and interior angles; isosceles and equilateral triangles; similar and congruent triangles.
Trigonometry	Measurement of angles in degrees and radians; complementary and supplementary angles; sine, cosine and tangent of angles up to 360 degrees; sine and cosine rules and their application to the solution of triangles; solution of simple trigonometric equations; expansion of $\sin(A + B)$ and $\cos(A + B)$; graphs of $\sin \theta$, $\cos \theta$ and $a \sin \theta + b \cos \theta$.

Subject	Required knowledge
Measurements	Areas of triangle, polygon, parallelogram, trapezium, circle; properties of chords and tangents; angles in the same segment; angles at centre and circumference, sector and segment of a circle and ellipse; areas of oblique sections of regular solids of uniform cross section; area and mean height by mid-ordinate rule and by Simpson's rule.
Ratios and volumes	Ratio of areas of similar figures; volumes and surface areas of prisms, pyramids, frustums, spheres, cylinders and cones; ratio of masses and volumes of similar solids; solids of revolution.

27.9 General engineering knowledge (examination code: 3EKG)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of essay-type questions and the applicant answers 6 out of 9 questions; he may be required to illustrate his answers by means of freehand sketches.

Subject	Required knowledge
Communications	Ability to transmit information relating to machinery components by means of simple drawings with supplementary notes and specifications.
Manufacturing processes	Knowledge of the methods or manufacture of the various machinery components and the effects of various treatments on the physical properties of the materials commonly used.
Boilers	Constructional details and management of auxiliary boilers, including firing arrangements and boiler mountings; boiler water testing and treatment.
Steering gear	Construction, arrangement and working of steering gears and telemotors.
Pumps	Constructional details and principles of action of pumps; general requirements for pumping systems.
Fire-fighting equipment	Fire prevention and detection; fire-fighting equipment, its use, construction and maintenance.
Safe working practices	Safe working practices in machinery rooms and other enclosed spaces.
Management of electrical equipment	Safe and efficient operation and maintenance of electrical equipment.
Propeller shaft system	Constructional details of shafting, stern tubes, stern bushings and methods of securing them; constructional details of controllable pitch and fixed pitch propellers, and propeller shafts.
Rudders	Methods of supporting the rudder; constructional details of rudder and pintles.
Hydraulic systems	Principles of operation and maintenance of pneumatic, hydraulic and electronic governors.
Refrigeration systems	Working principles of operation and maintenance of refrigeration systems.
Ship construction	Elementary knowledge of ship construction and terminology used.

Subject	Required knowledge
Deck Machinery	Operations and maintenance of cargo handling equipment and deck machinery.

27.10 Engineering knowledge of motor vessels (examination code: 3EKM)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of essay-type questions and the applicant answers 6 out of 9 questions; he may be required to illustrate his answers by means of freehand sketches.

Subject	Required knowledge
Principles and construction of internal combustion engines	Working principles and constructional details of marine diesel engines, gears, clutches and associated equipment and their seating.
Cooling systems	Cooling systems for diesel engines and their protection from damage by freezing and corrosion.
Lube oil and fuel	Fuel and lubricating oil systems; properties of fuels and lubricating oils used in diesel engines.
Compressed air systems	Constructional details and working principles of compressed air systems; starting and reversing systems for diesel engines.
Control system	Diesel engine controls, protective devices and remote sensing and monitoring.
Management of Diesel engines	Operation and maintenance of diesel engines; determination of engine power.
Power balance	Adjusting of fuel pumps, injectors, valves and power balancing of diesel engines.
Automation and alarms	General understanding of the basic operation of automatic controls and alarms, particularly with regard to definitions.

27.11 Engineering knowledge of steamships (examination code: 3EKS)

- 1) The duration of the examination is 3½ hours.
- 2) The examination consists of essay-type questions and the applicant answers 6 out of 9 questions; he may be required to illustrate his answers by means of freehand sketches.

Subject	Required knowledge
Principles and construction of boilers	Working principles and constructional details of water-tube and fire-tube boilers and their mountings.
Fuel and fuel systems	Fuel systems operation and maintenance; properties of fuel used in marine boilers.
Boiler feed-water	Feed systems and water treatment.
Construction of steam engines	Construction and operation of steam reciprocating engines and turbines and associated equipment and systems.
Lubrication	Properties of lubricating oils used in reciprocating steam engines and turbines.
Management of steam engines	Operation and maintenance of reciprocating steam engines and turbines; determination of engine power.
Automation and alarms	General understanding of the basic operation of automatic controls and alarms, particularly with regard to definitions.
Faults and prevention	Location of common faults of machinery and plant in machinery spaces, and action necessary to prevent damage.

27.12 Oral examination (examination code: 3ORM or 3ORS) (Also, please refer section 2.11 of Chapter 2)

- 1) The examination is of an unlimited duration.
- 2) The oral examination is based on:

Subject	Required knowledge
Use appropriate tools for fabrication and repair operations typically performed on ships	Identification of important parameters for fabrication of typical ship-related components; selection of material; fabrication to designated tolerances; use of equipment and machine tools.
Use hand tools and measuring equipment for dismantling, maintenance, repair and reassembly of shipboard equipment	Safety procedures; selection of tools and spare gear; dismantling, inspecting, repairing and reassembling equipment in accordance with manuals and good marine practices; re-commissioning and performance testing in accordance with manuals and good practice.

Subject	Required knowledge
Use hand tools, electrical and electronic measuring and test equipment for fault-finding, maintenance and repair operations	Implementation of safety procedures; selection and use of testing equipment and interpretation of results; selection of procedures for the conduct of repair and maintenance in accordance with manuals and good practices; commissioning and performance testing of equipment and systems brought back into service after repair in accordance with manuals and good practice.
Maintain a safe engineering watch	Duties associate with taking over and handing over a watch: the conduct, handover and relief of the watch conform to accepted principles and procedures; routine duties undertaken during a watch: the frequency and extent of monitoring of engineering equipment and systems conform to manufacturer's recommendations and accepted principles and procedures; maintenance of the machinery space logbook and the significance of the reading taken, proper record is maintained of the movements and activities relating to the ship's engineering systems; safety and emergency procedures: changeover from remote/automatic to local control of all systems; safety precautions to be observed during a watch and immediate actions to be taken in the event of a fire or accident, with particular reference to oil systems.
Official languages	Sufficient knowledge of one of the official languages to enable the officer to use engineering publications and to perform engineering duties; Ability to communicate clearly and understand others.
Operate main and auxiliary machinery and associated control systems	Preparation of main and auxiliary machinery for operation: operations planned and carried out in accordance with established rules and procedures to ensure safety of operations and avoid pollution of marine environment; the output of plant and engineering systems consistently meets requirements, including bridge orders relating to changes in speed and direction; location of common faults in machinery and plant in engine and boiler rooms and action necessary to prevent damage: the causes of machinery malfunctions are promptly identified and actions are designed to ensure the overall safety of the ship and the plant, having regard to the prevailing circumstances and conditions; operation of steam boilers, including combustion system, methods of checking water level in steam boilers and action necessary if water level is abnormal.
Operate pumping systems and associated control systems	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations and avoid pollution of marine environment; routine pumping operations: operation of bilge, ballast and cargo pumping systems.
Operate alternators, generators and control systems	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations; appropriate basic electrical knowledge and skills; preparing starting, coupling and changing over alternators or generators; location of common faults and actions to prevent damage.
Maintain marine engineering systems, including control systems	Appropriate basic mechanical and knowledge and skills; safe isolation of electrical and other types of plant and equipment required before personnel are permitted to work on such plant or equipment.
Ensure compliance with pollution prevention requirements	Knowledge of the precautions to be taken to prevent pollution of the marine environment; procedures for monitoring shipboard operations and ensuring compliance with MARPOL.

Subject	Required knowledge
Maintain seaworthiness of the ship	Working knowledge and application of stability, trim and stress tables, diagrams and stress calculating equipment; understanding the fundamentals of watertight integrity; understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy; general knowledge of principal structural members of a ship and the proper names for the various parts.
Prevent, control and fight fire on board	Knowledge of fire prevention, ability to organize fire drills, knowledge of class and chemistry of fire, knowledge of fire-fighting systems; actions to be taken in the event of fire, including fire involving oil systems, identify type and scale of the problem, initiate actions conform to the emergency procedures and contingency plans for the ship, the order of priority, and the levels and time scales of making reports and informing personnel on board, are relevant to the nature of the emergency and reflect the urgency of the problem; evacuation, emergency shutdown and isolation procedures are appropriate to the nature of the emergency and are implemented promptly.
Operate lifesaving appliances	Ability to organize abandon ship drills and knowledge of the operation of survival craft and rescue boats, their launching appliances and arrangements, and their equipment, including radio appliances, EPIRB's, SART's, immersion suits and thermal protective aids; knowledge of survival at sea techniques; actions in responding to abandon ship and survival situations are appropriate to the prevailing circumstances and conditions and comply with accepted safety practices and standards.
Apply medical first aid onboard of ship	Practical application of medical guides and advice by radio, including the ability to take effective action based on such knowledge in case of accidents or illnesses that are likely to occurred on board ship; identification of probable cause, nature and extent of injuries or conditions is prompt and treatment minimizes immediate threat to life.
Regulations and ship's business	<p>Basic knowledge of the IMO, ILO and the SOLAS conventions, particularly with regard to safety and the protection of the marine environment;</p> <p>Knowledge of the <i>Canada Shipping Act, 2001</i> relating to:</p> <ul style="list-style-type: none"> –Ship inspections, Marine Machinery Inspection, Hull Construction, Hull Inspection, registration of ships, Steering Appliances and Equipment; –Life Saving Equipment, Boat and Fire Drills, Fire Detection and Extinguishing Equipment. –Dangerous Goods shipping, Oil Pollution Prevention, Sewage Pollution Prevention, Garbage Pollution Prevention, Pollutant Discharge Reporting. –Safe Working Practices, Shipping Casualties Reporting, Tackle; –Crewing, engagement and discharge of seafarers, in and out of Canada, rights of seafarers, maintenance of discipline, distressed seafarers, provisions, health and accommodation. <p>Knowledge of the <i>Canada Labour Code</i>, as applicable to shipping industry in relation occupational health and safety.</p>

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General**28.1 General requirements**

The general requirements for a certificate as Fourth-class Engineer, Motor Ship or Steamship, are listed in section 147 of the *Marine Personnel Regulations*.

28.2 Validity of Certificates

- a. The holder of a Fourth-class Engineer certificate with STCW endorsement may act as:
- watchkeeping engineer on any type of vessel, subject to the propulsion type specified on the certificate, without voyage limitation or propulsive power restriction;
 - second engineer, subject to the propulsion type specified on the certificate and to the voyage limitation and propulsive power restriction specified in Table I;
 - chief engineer, subject to the propulsion type specified on the certificate and to the voyage limitation and propulsive power restriction specified in Table II.

Table I – Second Engineer (STCW)

Voyage Type of Vessel	Unlimited voyage and near coastal voyage, class 1, not limited to Canadian ports	Near coastal voyage, class 1, between Canadian ports	Near coastal voyage, in the Gulf of St. Lawrence and the Great Lakes Basin	Near coastal voyage, class 2	Sheltered waters voyage or limited near coastal voyage, class 2
Passenger	N/A	Not more than 4000 kW	Not more than 4000 kW	Not more than 7000 kW	Not more than 7000 kW
Cargo	N/A	Not more than 5000 kW	Not more than 7000 kW	Not more than 7000 kW	No limit
Tug	N/A	Not more than 6000 kW	Not more than 6000 kW	Not more than 7000 kW	No limit
Fishing	Not more than 5000 kW	Not more than 5000 kW	Not more than 5000 kW	No limit	No limit

Table II – Chief Engineer

Voyage Type of Vessel	Near coastal voyage, class 2	Sheltered waters voyage or limited near coastal voyage, class 2
Passenger	Less than 1000 kW	Less than 1500 kW
Cargo	Less than 1500 kW	Less than 2000 kW
Tug	Less than 2000 kW	Less than 3000 kW
Fishing	Not more than 5000 kW	Not more than 5000 kW

- b. The holder of a Fourth-class Engineer certificate without STCW endorsement may act as:
- watchkeeping engineer on any type of vessel, subject to the propulsion type specified on the certificate, in a sheltered waters voyage, a near coastal voyage, class 2, or a near coastal voyage in the Gulf of St. Lawrence and the Great Lakes Basin;
 - watchkeeping engineer on a specific vessel, subject to the propulsion type specified on the certificate, engaged on a “limited, contiguous waters voyage”;
 - second engineer, subject to the propulsion type specified on the certificate and to the voyage limitation and propulsive power restriction specified in Table III;
 - chief engineer, subject to the propulsion type specified on the certificate and to the voyage limitation and propulsive power restriction specified in Table II.

Table III – Second Engineer (non-STCW)

Voyage Type of Vessel	Unlimited voyage and near coastal voyage, class 1, not limited to Canadian ports	Near coastal voyage, class 1, between Canadian ports	Near coastal voyage, in the Gulf of St. Lawrence and the Great Lakes Basin	Near coastal voyage, class 2	Sheltered waters voyage or limited near coastal voyage, class 2
Passenger	N/A	Not more than 4000 kW	Not more than 4000 kW	Not more than 7000 kW	Not more than 7000 kW
Cargo	N/A	Not more than 5000 kW	Not more than 7000 kW	Not more than 7000 kW	No limit
Tug	N/A	Not more than 6000 kW	Not more than 6000 kW	Not more than 7000 kW	No limit
Fishing	Not more than 5000 kW	Not more than 5000 kW	Not more than 5000 kW	No limit	No limit

Syllabuses of Examinations**28.3 Ship watchkeeping practices (examination code: PPSSIM1)**

Refer to Chapter 27 of this TP.

28.4 General engineering knowledge (examination code: 4EKG)

- 1) The examination consists of 150 multiple-choice questions.
- 2) The duration of the examination is 3½ hours.

Subject	Required knowledge
Construction and safe use of hand tools	Including hammers, screwdrivers, wrenches, drift punches, chisels, hand saws and blades, files, hand shears and snips, twist drills, reamers, countersinks, taps and dies, layout tools, portable power grinders, portable power chippers.
Construction and safe use of power tools	Including drill press, fixed grinder, metal turning lathe, simple milling machine, surface grinder, cut-off saw, valve grinder, gas welding equipment, electric welding equipment.
Materials of construction	Materials and the ability to distinguish between the following common types: steel, cast iron, copper, zinc, brass, aluminium, plastics, resins.
Physical sciences	Mathematics: fundamental arithmetical operations and percentages, measurement by gauge and standard international units of length, mass, area, volume, pressure and temperature; Mechanics: force, friction, energy, power, the use of a level wheel and axle; Principles, construction and operation of instruments and equipment for measuring and testing: bi-metallic thermometer, thermo-couple, liquid in glass container, resistance thermometer, thermistor (thermally sensitive resistor), manometer, barometer (mercury and aneroid), pressure gauge (bourdon, scheffer, differential), piezoelectric sensor transducer, strain gauge, level gauge (float, sight, glass, probe, remote, pneumatic), flow meters (mechanical, rotometer, float, venturi), speed meters (tachogenerator, mechanical counter), torque meter.
Recognition of fire hazards	Storage and handling of flammable liquids used for testing, cleaning, painting; lubrication additives and fuel additives; storage and handling of flammable solids used for jointing, cleaning and shoring.

Subject	Required knowledge
Identification and maintenance of firefighting and lifesaving equipment	Portable fire extinguishers, fire hydrants, hoses and nozzles, fire doors, water-tight doors, ventilation closures; detection devices, alarms, alarm systems; fire pumps; breathing apparatus, sprinkler and smothering systems.
Preventive maintenance	Lifeboat engines, lifeboats, lifeboat davits and winches.
Safe working practices	Work procedures and precautions necessary to prevent hazards; maintenance of safe working conditions; rigging, slinging and handling of heavy machinery parts.
Pollution prevention	Basic principles of pollution-prevention laws and regulations applicable to Canadian ships; pollution-prevention procedures, including bunkering operations, the discharge of bilge and ballast water, and the operation of oily-water separators.
Pumps	Construction, operation and maintenance of reciprocating pumps, centrifugal pumps, screw-displacement gear pumps, injectors, ejectors.
Piping	Construction, operation and maintenance of steam and feed-water systems, bilge and ballast systems, fuel lubricating oil systems, valves, drains, traps and other fittings; precautions to be observed in the operation of piping systems with regard to pipe expansion, water hammer, cross connections, venting and overflow; routine pumping operations.
Power transmission	Thrust with respect to intermediate and propeller shafts; intermediate and propeller shaft bearing alignment; types of couplings; gear trains.
Steering gears	Mechanical and hydraulic steering gears; emergency steering arrangements; starting power steering gears; routine checks and operation of steering gears.
Underwater fittings	Rudders; fixed, variable and controllable-pitch propellers; stern glands; sea suction and discharge valves; mounting items on the hull.
Deck machinery	Windlass, capstan, winch.
Fuels, auxiliary machinery	All types of fuels used on ships; storage, transfer, heating, filtration and purification of fuels.
Lubricants	Storage, transfer, heating, cooling, filtration, purification and disposal of lubricants; types of lubricants; application of lubricants.
Electricity and magnetism	<p>Fundamentals: definitions of current, voltage, resistance and power; direct and alternating current; conductors; insulators; wet and dry cells; identification of simple circuits.</p> <p>Measurement and protective devices: voltmeter, ammeter, ohmmeter, ground lights, fuses, circuit breakers.</p> <p>Generators, alternators and motors: construction and operation of direct-current machines; construction and operation of alternating-current machines; basic maintenance procedures.</p> <p>Electric circuits: alarm circuits, navigation-light circuits, main- and emergency-light and power circuits, basic maintenance procedures.</p>

Subject	Required knowledge
Hydraulic systems	Pumps, motors, piping, fittings, control devices, hydraulic fluids, packing, seals.
Pneumatic systems	Compressors, air receivers, heat exchangers, filters, piping, fittings, control devices; precautions and safeguards necessary to prevent fires and explosions.
Refrigeration	Types, properties and hazards of refrigerants; construction and operation of refrigeration systems.
Auxiliary boilers and equipment	Types and construction of boilers; safety and operating procedures; mountings, fittings, fuel system, feed system, heat exchangers, filters, feed pumps and steam traps.
Auxiliary internal combustion engines	Fuel systems, including fuel pumps, injectors and carburettors; basic construction and operating procedures; cooling and lubricating systems; starting devices and ignition systems; recognition and correction of malfunctions; precautions and safeguards necessary to prevent crankcase explosions.
Watchkeeping procedures	Routine associated with taking over and accepting a watch; recording of significant gauge readings and understanding their importance to routine duties during a watch; recording of accidents to machinery and hull; duties when handing over a watch; recording and calculation of ship's fuel supply; routine starting and stopping of machinery, emergency stopping of machinery.

28.5 Engineering knowledge of motor vessels (examination code: 4EKM)

- 1) The examination consists of 75 multiple-choice questions.
- 2) The duration of the examination is 3½ hours.

Subject	Required knowledge
Compression ignition engines	Methods of supercharging, turbo-charging and scavenging; general principles of construction and operation of two-stroke and four-stroke cycle engines; methods of starting and reversing; power transmission systems, including couplings and clutches on gears; applications of the compression ignition system in a single- and multiple-engine and diesel electric installation.
Lubrication systems	The construction, operation and maintenance of purifiers; lubricants and lubricant additives; pumps; piping; heat exchangers; filters.
Cooling systems	Air and liquid cooling; pumps; piping; heat exchangers; temperature control; expansion arrangements.
Fuel	Types of fuels and fuel additives; heating of fuels; filtration and purification of fuels; piping of fuels; fuel injection pumps and fuel injectors.
Governors	General principles, construction, operation and maintenance of mechanical, hydraulic, electronic and pneumatic governors.
Maintenance	Overhaul, repair, adjustment, lay up, preventive maintenance (including running repairs recognition and correction of malfunctions) of engines, transmissions and interrelated systems (including lubrication, cooling, fuel, compressed air and exhaust systems).

28.6 Engineering knowledge of steam vessels (examination code: 4EKS)

- 1) The examination consists of 75 multiple-choice questions.

- 2) The duration of the examination is 3½ hours.

Subject	Required knowledge
Fire-tube boilers and water-tube boilers	Construction: method of joining parts by riveting, welding, threading and bolting, staying and expanding parts of the boiler; insulating and brickwork; Mountings: safety valves, water gauges, main and auxiliary steam and feed-water valves, blowdown valves, connections for valves, fittings for gauges and regulating devices; Air pre-heaters: types, construction, operation and maintenance; Economizers: types, construction, operation, maintenance; Superheaters: types, construction, operation, maintenance; Operation and maintenance: opening up, cleaning and preparation for inspection and lay up; raising steam; steaming; blowing down; scumming; shutdown; water-gauge readings and testing for accuracy; high and low water levels; priming and foaming; combustion of fuels; oil fuel burners and controls, precautions to be observed; basic principles of boiler and feed-water treatment.
Steam plant ancillary equipment	Construction, operation and maintenance of oil fuel pumps, feed-water pumps, injectors, combustion air fans, blowers, steam separators, steam traps, feed-water heaters and filters, cooling and circulating water pumps, condensers, air pumps, air ejectors, evaporators, distillers.
Reciprocating engines	The construction, operation and maintenance of different types of reciprocating engines, their governors and lubricating systems.
Steam turbines	The principles of construction, operation and maintenance of different types of turbines; power transmission systems (including couplings and gears); governors.
Lubrication systems	The construction, operation and maintenance of purifiers, pumps, piping, heat exchangers and filters.

28.7 Oral examination (examination code: 4ORM or 4ORS) (Also, please refer section 2.11 of Chapter 2)

- 1) The examination is of indefinite duration.
2) The examination is based on:

Subject	Required knowledge
Use appropriate tools for fabrication and repair operations typically performed on ships	Identification of important parameters for fabrication of typical ship- related components; selection of material; fabrication to designated tolerances; use of equipment and machine tools.
Use hand tools and measuring equipment for dismantling, maintenance, repair and reassembly of shipboard plant and equipment	Safety procedures; selection of tools and spare gear; dismantling, inspecting, repairing and reassembling equipment in accordance with manuals and good practice; re-commissioning and performance testing in accordance with manuals and good practice.

Subject	Required knowledge
Use hand tools, electrical and electronic measuring and test equipment for fault-finding, maintenance and repair operation	Implementation of safety procedures; selection and use of testing equipment and interpretation of results; selection of procedures for the conduct of repair and maintenance in accordance with manuals and good practice; commissioning and performance testing of equipment and systems brought back into service after repair in accordance with manuals and good practice.
Maintain a safe engineering watch	Duties associated with taking over and handing over a watch: the conduct, handover and relief of the watch conform to accepted principles and procedures; routine duties undertaken during a watch: the frequency and extent of monitoring of engineering equipment and systems conform to manufacturer's recommendations and accepted principles and procedures; maintenance of the machinery space logbook and the significance of the reading taken, proper record is maintained of the movements and activities relating to the ship's engineering systems; safety and emergency procedures: changeover from remote/automatic to local control of all systems; safety precautions to be observed during a watch and immediate actions to be taken in the event of a fire or accident, with particular reference to oil systems.
Official languages	Sufficient knowledge of one of the official languages to enable the officer to use engineering publications and to perform engineering duties; Ability to communicate clearly and understand others.
Operate main and auxiliary machinery and associated control systems	Preparation of main and auxiliary machinery for operation: operations planned and carried out in accordance with established rules and procedures to ensure safety of operations and avoid pollution of marine environment; the output of plant and engineering systems consistently meets requirements, including bridge orders relating to changes in speed and direction; location of common faults in machinery and plant in engine and boiler rooms and action necessary to prevent damage: the causes of machinery malfunctions are promptly identified and actions are designed to ensure the overall safety of the ship and the plant, having regard to the prevailing circumstances and conditions; operation of steam boilers, including combustion system, methods of checking water level in steam boilers and action necessary if water level is abnormal.
Operate pumping systems and associated control systems	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations and avoid pollution of marine environment; routine pumping operations: operation of bilge, ballast and cargo pumping systems.
Operate alternators, generators and control systems	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations; appropriate basic electrical knowledge and skills; preparing starting, coupling and changing over alternators or generators; location of common faults and actions to prevent damage.
Maintain marine engineering systems, including control systems	Appropriate basic mechanical and knowledge and skills; safe isolation of electrical and other types of plant and equipment required before personnel are permitted to work on such plant or equipment.
Ensure compliance with pollution prevention requirements	Knowledge of the precautions to be taken to prevent pollution of the marine environment; procedures for monitoring shipboard operations and ensuring compliance with MARPOL.

Subject	Required knowledge
Maintain seaworthiness of the ship	Working knowledge and application of stability, trim and stress tables, diagrams and stress calculating equipment; understanding the fundamentals of watertight integrity; understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy; general knowledge of principal structural members of a ship and the proper names for the various parts.
Prevent, control and fight fire on board	Knowledge of fire prevention, ability to organize fire drills, knowledge of class and chemistry of fire, knowledge of fire-fighting systems; actions to be taken in the event of fire, including fire involving oil systems, identify type and scale of the problem, initiate actions conform to the emergency procedures and contingency plans for the ship, the order of priority, and the levels and time scales of making reports and informing personnel on board, are relevant to the nature of the emergency and reflect the urgency of the problem; evacuation, emergency shutdown and isolation procedures are appropriate to the nature of the emergency and are implemented promptly.
Operate lifesaving appliances	Ability to organize abandon ship drills and knowledge of the operation of survival craft and rescue boats, their launching appliances and arrangements, and their equipment, including radio appliances, EPIRB's, SART's, immersion suits and thermal protective aids; knowledge of survival at sea techniques; actions in responding to abandon ship and survival situations are appropriate to the prevailing circumstances and conditions and comply with accepted safety practices and standards.
Apply medical first aid onboard of ship	Practical application of medical guides and advice by radio, including the ability to take effective action based on such knowledge in case of accidents or illnesses that are likely to occurred on board ship; identification of probable cause, nature and extent of injuries or conditions is prompt and treatment minimizes immediate threat to life.
Regulations and ship's business	Basic knowledge of the IMO, ILO and the SOLAS conventions, particularly with regard to safety and the protection of the marine environment; Knowledge of the <i>Canada Shipping Act, 2001</i> relating to: –Ship inspections, Marine Machinery Inspection, Hull Construction, Hull Inspection, registration of ships, Steering Appliances and Equipment; –Life Saving Equipment, Boat and Fire Drills, Fire Detection and Extinguishing Equipment. –Dangerous Goods shipping, Oil Pollution Prevention, Sewage Pollution Prevention, Garbage Pollution Prevention, Pollutant Discharge Reporting. –Safe Working Practices, Shipping Casualties Reporting, Tackle; –Crewing, engagement and discharge of seafarers, in and out of Canada, rights of seafarers, maintenance of discipline, distressed seafarers, provisions, health and accommodation. Knowledge of the <i>Canada Labour Code</i> , as applicable to shipping industry in relation occupational health and safety.

Chapter 29 – Chief Engineer, Motor Ship and Steamship Endorsements

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General

29.1 General requirements

The general requirements for a Chief Engineer, Motor Ship or Steamship endorsement are listed in section 148 of the *Marine Personnel Regulations*.

29.2 Validity of endorsements

The holder of a Chief Engineer endorsement has all the privileges of a Third-class engineer and may also act, subject to the propulsion type specified on the endorsement, as Chief Engineer on a cargo vessel or a tug having a propulsive power less than 2000 kW, without voyage limitations.

Chapter 30 – Second Engineer, Motor Ship and Steamship Endorsements

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General**30.1 General requirements**

The general requirements for a Second Engineer, Motor Ship or Steamship endorsement are listed in section 149 of the *Marine Personnel Regulations*.

30.2 Validity of endorsements

The holder of a Second Engineer endorsement has all the privileges of a Fourth-class engineer and may also act, subject to the propulsion type specified on the endorsement, as second engineer on a cargo vessel or a tug having a propulsive power less than 2000 kW, without voyage limitations.

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General**31.1 General Requirements**

The general requirements for a certificate as Watchkeeping Engineer, Motor-driven Fishing Vessel, are listed in section 150 of the *Marine Personnel Regulations*.

31.2 Validity of Certificates

The holder of this certificate may act as engineer in charge of the watch on a motor-driven fishing vessel of not more than 2000 kW, without voyage limitations. He also has all the privileges attached to the Small Vessel Machinery Operator certificate.

Syllabuses of Examinations**31.3 Ship watchkeeping practices (examination code: PPSSIM1)**

Refer to Chapter 27 of this TP.

31.4 General engineering knowledge (examination code: WKEMDFVG)

- 1) The examination consists of 60 multiple-choice questions.
- 2) The examination is of 3½ hours' duration.

Subject	Required knowledge
Hand tools	Construction and safe use of the following hand tools: hammers; screwdrivers; wrenches; drift punches; chisels; hand saws and blades; files; hand shears and snips; twist drill; reamers and countersinks; taps and dies; layout tools; portable power tools, drills, grinders and chippers.
Power tools	Construction and safe operation of the following power tools: drill press; fixed grinder; metal turning lathe; simple milling machine; surface grinder; cut-off saw; valve grinder; welding equipment, gas and electric.
Materials of construction	The use of materials and the ability to distinguish between the following common types: steel; cast iron; copper; zinc; brass; aluminium; plastics and resins.
Physical sciences	<i>Mathematics:</i> fundamental arithmetical operations and percentages; measurement of length, mass, area, volume, and of pressure and temperature, in SI units. <i>Mechanics:</i> force, friction, energy, power; simple machines (lever, wheel and axle). Principles, construction and operation of the more usual instruments employed for the control and operation of ship's machinery: measuring temperature, pressure, mass, length and thickness; measuring voltage, current and resistance; testing for contamination of oil and water; testing combustion products.
Recognition of fire hazards	Storage and handling of flammable liquids used for testing, cleaning, painting; lubrication additives and fuel additives; storage and handling of flammable solids used for jointing, cleaning and shoring.
Identification and maintenance of fire fighting and lifesaving equipment	Portable fire extinguishers, fire hydrants, hoses and nozzles, fire doors, water-tight doors, ventilation closures; detection devices, alarms, alarm systems; fire pumps; breathing apparatus, sprinkler and smothering systems.
Lifesaving	The use of life jackets, lifeboats, inflatable life rafts, and distress signals; emergency duties, stations and drills.
Apply medical first aid onboard ship	Practical application of medical guides and advice by radio, including the ability to the effective action based on such knowledge in case of accidents or illnesses that are likely to occurred on board of ship; identification of probable cause nature and extent of injuries or conditions is prompt and treatment minimizes immediate threat to life.

Subject	Required knowledge
Safe working practices	Work procedures and precautions necessary to prevent hazards and maintain safe working conditions.
Pollution prevention	Basic principles of pollution-prevention laws and regulations applicable to Canadian ships; pollution-prevention procedures, including bunkering operations, the discharge of bilge and ballast water, and the operation of oily-water separators.
Pumps and piping	Construction, operation and maintenance of reciprocating pumps, centrifugal pumps, screw-displacement and gear pumps, injectors and ejectors; piping systems, including steam and feed-water system (auxiliary boilers), bilge and ballast systems, fuel and lubricating oil systems, valves, drains, traps and other fittings; precautions to be observed in the operation of piping systems with regard to pipe expansion, water hammer, cross connections, venting and overflow, and routine pumping operations.
Power Transmission	Thrust, intermediate and propeller shafts; thrust, intermediate and propeller shaft bearings; alignment; couplings; gear types and systems.
Steering gear	Common types of steering gear; emergency steering arrangements; starting, checks and operation.
Underwater fittings	Rudders; fixed, variable and controllable-pitch propellers; stern glands; sea suction and discharge valves; mountings on the hull.
Deck machinery	Windlass, capstan and winch.
Fuels	Types of fuel; storage, transfer, heating, cooling, filtration, and purification of fuels.
Lubricants	Types and application of lubricants; storage, transfer, heating, cooling, filtration, purification and disposal of lubricants.
Electricity and magnetism	Fundamentals: direct and alternating current; definitions of current, voltage, resistance, and power; conductors and insulators; wet and dry cells; identification of simple circuits. Measurement and protective devices: voltmeter, ammeter, ohmmeter; ground lights, fuses and circuit breakers. Generators, alternators and motors: construction and operation of AC machines; basic maintenance procedures. Electric circuits: alarm circuits, navigation light circuits, main and emergency light and power circuits, and basic maintenance procedures.
Hydraulic systems	Pumps, motors, piping, fittings and control devices; hydraulic fluids; packing and seals.
Pneumatic systems	Compressors, air receivers, heat exchangers, filters, piping, fittings and control devices; precautions and safeguards necessary to prevent fires and explosions.
Refrigeration	Construction and operation of refrigeration systems; types, properties and hazards of refrigerants; systems, including quick freeze, coolers, direct and indirect.
Auxiliary boilers and equipment	Types and construction of boilers; operating and safety procedures; mountings and fittings; fuel system; feed system; heat exchangers.
Auxiliary Internal Combustion Engines	Basic construction and operating procedures; cooling and lubrication systems; fuel system, including fuel pumps, injectors and carburettor; starting devices and ignition systems; recognition and correction of malfunctions; and precautions and safeguards necessary to prevent crankcase explosions.
Watchkeeping Procedures	Routine associated with taking over and accepting a watch; recording of significant gauge readings and understanding their importance; routine duties during a watch; recording of accidents to machinery and hull; duties when handing over a watch; recording and calculation of ship's fuel supply; routine starting and stopping of machinery; and emergency stopping of machinery.

31.5 Engineering knowledge of motor vessels (examination code: WKEMDFVM)

- 1) The examination consists of 60 multiple-choice questions.
- 2) The examination is of 3½ hours' duration.

Subject	Required knowledge
Compression ignition engines	General principles of construction and operation of two stroke and four stroke cycle engines; methods of supercharging, turbocharging and scavenging; methods of starting and reversing; power transmission systems, including couplings, clutches and gears; applications of the compression ignition engine in a single- and multiple engine installation.
Lubrication systems	Lubricants and lubricant additives; pumps, piping, heat exchangers and filters; the construction, operation and maintenance of purifiers.
Cooling systems	Air and liquid cooling; pumps, piping and heat exchangers; temperature control and expansion arrangements.
Fuel	Fuels and fuel additives; heating, filtration and purification; piping; injection pumps and injectors.
Governors	General principles, construction, operation, and maintenance of mechanical, hydraulic, electronic and pneumatic governors.
Maintenance	Overhaul, repair, adjustment and lay-up of engines, transmission and interrelated systems, including lubrication, cooling, fuel, compressed air and exhaust systems; preventive maintenance, including running repairs and recognition and correction of malfunctions.

31.6 Oral examination (examination code: WKEMDFVO) (Also, please refer section 2.11 of Chapter 2)

- 1) The examination is of an unlimited duration.
- 2) The oral examination will be based upon:

Subject	Required knowledge
Use appropriate tools for fabrication and repair operations typically perform on ship	Identification of important parameters for fabrication of typical ship related components; selection of material; fabrication to designated tolerance; use of equipment and machine tools.
Use hand tools and measuring equipment for dismantling maintenance, repair and reassembly of shipboard plant and equipment	Safety procedures; selection of tools and spare gear; dismantling, Inspecting, repairing and reassembling equipment in accordance with manuals and good practice; re-commissioning and performance testing in accordance with manuals and good practice.
Use hand tools, electrical and electronic measuring and test equipment for fault-finding, maintenance and repair operations	Implementation of safety procedures; selection and use of testing equipments and interpretation of results; selection of procedure for the conduct of repair sand maintenance in accordance with manuals and good practice; commissioning and performance testing of equipment and systems brought back into service after repair in accordance with manuals and good practice.
Maintain a safe engineering watch	Duties associated with taking over and handing over a watch, the conduct, handover and relief of the watch, are conform to accepted principles and procedures; routine duties undertaken during a watch, the frequency and extend of monitoring engineering equipment, and systems, are conform to manufacturers recommendations and accepted principles and procedures; maintenance of the machinery space logbook and the significance of the reading taken; proper record of the movement and activities relating to the ship engineering systems; safety and emergency procedures: change –over of remote/automatic to local control of all systems; safety precaution to be observed during a watch and immediate actions to be taken in the event of a fire or accident, with particular reference ti oil system.
Official languages	Sufficient knowledge of one of the official languages to enable the officer to use engineering publications and to perform engineering duties; Ability to communicate clearly and understand others.
Operate main and auxiliary machinery and associated control systems	Preparation of main and auxiliary machinery for operation: operations planned and carried out in accordance with established rules and procedures to ensure safety of operations and avoid pollution of marine environment; the output of plant and engineering systems consistently meets requirements, including bridge orders relating to changes in speed and direction; location of common faults in machinery and plant in engine and boiler rooms and action necessary to prevent damage: the causes of machinery malfunctions are promptly identified and actions are designed to ensure the overall safety of the ship and the plant, having regard to the prevailing circumstances and conditions; operation of steam boilers, including combustion system, methods of checking water level in steam boilers and action necessary if water level is abnormal.

Subject	Required knowledge
Operate pumping systems and associated control systems	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations and avoid pollution of marine environment; routine pumping operations: operation of bilge, ballast and cargo pumping systems.
Operate alternators, generators and control systems	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations; appropriate basic electrical knowledge and skills; preparing starting, coupling and changing over alternators or generators; location of common faults and actions to prevent damage.
Maintain marine engineering systems, including control systems	Appropriate basic mechanical and knowledge and skills; safe isolation of electrical and other types of plant and equipment required before personnel are permitted to work on such plant or equipment.
Ensure compliance with pollution prevention requirements	Knowledge of the precautions to be taken to prevent pollution of the marine environment; procedures for monitoring shipboard operations and ensuring compliance with MARPOL.
Maintain seaworthiness of the ship	Working knowledge and application of stability, trim and stress tables, diagrams and stress calculating equipment; understanding the fundamentals of watertight integrity; understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy; general knowledge of principal structural members of a ship and the proper names for the various parts.
Prevent, control and fight fire on board	Knowledge of fire prevention, ability to organize fire drills, knowledge of class and chemistry of fire, knowledge of fire-fighting systems; actions to be taken in the event of fire, including fire involving oil systems, identify type and scale of the problem, initiate actions conform to the emergency procedures and contingency plans for the ship, the order of priority, and the levels and time scales of making reports and informing personnel on board, are relevant to the nature of the emergency and reflect the urgency of the problem; evacuation, emergency shutdown and isolation procedures are appropriate to the nature of the emergency and are implemented promptly.
Operate lifesaving appliances	Ability to organize abandon ship drills and knowledge of the operation of survival craft and rescue boats, their launching appliances and arrangements, and their equipment, including radio appliances, EPIRB's, SART's, immersion suits and thermal protective aids; knowledge of survival at sea techniques; actions in responding to abandon ship and survival situations are appropriate to the prevailing circumstances and conditions and comply with accepted safety practices and standards.
Monitor compliance with legislative requirements	Basic knowledge of the <i>Canada Shipping Act 2001</i> relating to: <ul style="list-style-type: none"> – Fishing Vessel inspections, Marine Machinery Inspection, Hull Inspection, Steering Appliances and Equipment; – Life Saving Equipment, Fire-Fighting Equipment, Boat and Fire Drill; – Oil Pollution Prevention, Sewage Pollution Prevention, Garbage Pollution Prevention, Pollutant Discharge Reporting; – Safe Working Practices, Shipping Casualties Reporting; – Crewing requirement, engagement and discharge of seafarers, in and/or out of Canada, rights of seafarers, maintenance of discipline, distressed seafarers, provisions, health and accommodation.

Chapter 32 – Small Vessel Machinery Operator

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General**32.1 General Requirements**

The general requirements for a certificate as Small Vessel Machinery Operator are listed in section 151 of the *Marine Personnel Regulations*.

32.2 Validity of certificates

- 1) The holder of a certificate issued under subsection 151(1) may act as chief engineer or watchkeeping engineer on a motor vessel, with the restrictions described in Table 1.

Table I

Voyage Type of Vessel	Sheltered waters and limited Near Coastal class 2	Sheltered waters and limited Near Coastal class 2, less than 6 hours duration	No more than five nautical miles from a sheltered dock
Passenger	Less than 750 kW	Less than 1500 kW See note 1	N/A
Cargo	N/A	Less than 2000 kW See note 2	N/A
Tug	N/A	Less than 3000 kW See note 3	Tug less than 500 GRT See note 4

Note 1. Subject to conditions set out in the *Marine Personnel Regulations*, subsection 219 (2).

Note 2. Subject to conditions set out in the *Marine Personnel Regulations*, subsection 220 (2).

Note 3. Subject to conditions set out in the *Marine Personnel Regulations*, subsection 221 (2).

Note 4. Subject to conditions set out in the *Marine Personnel Regulations*, subsection 221 (3).

- 2) The holder of a certificate issued under subsection 151(2) may act as chief engineer or watchkeeping engineer only on a motor-driven vessel that carries a passenger, that is specified on the certificate and that has a propulsive power of less than 750 kW.

Syllabuses of Examinations**32.3 General engineering knowledge of small vessels (examination code: SVM0-G)**

- 1) The examination consists of 60 multiple-choice questions.
- 2) The examination is of 2 hours' duration.

Subject	Required knowledge
Construction materials	Materials and the ability to distinguish between the following common types: steel, cast iron, copper, zinc, brass, aluminium, plastics, and resins.
Recognition of fire hazards	Storage and handling of various flammable liquids and solids.
Safety and fire equipment	Identification and operation of: fire doors, water-tight doors, ventilation closures, detection devices; alarms, alarm systems, engine-room alarm systems and the ability to distinguish between various alarms (with special reference to fire extinguishing gas alarms); fire pumps, sprinkler and smothering systems; escape routes from machinery spaces; location and operation of external emergency machinery stops, fuel valve extensions; sprinkler and smothering release systems.
Safe working practices	Work procedures and precautions necessary to prevent hazards and maintain safe working conditions.
Pollution prevention	Basic principles of pollution-prevention laws and regulations applicable to Canadian ships; pollution-prevention procedures, including fuelling operations, discharge of bilge and ballast water, and operation of oily-water separators.

Subject	Required knowledge
Pumps	Identification and operation of reciprocating pumps, centrifugal pumps, screw pumps and displacement gear pumps.
Piping	Identification and operation of bilge and ballast systems, fuel and lubricating oil systems, valves, drains, traps and other fittings; precautions to be observed in the operation of piping systems with regard to pipe expansion, water hammer, cross connections, venting and overflow, and routine pumping operations.
Power transmission	Identify intermediate and propeller shafts, shaft bearings, couplings, gear types and gear trains.
Steering gears	Identification, operation and routine checks of mechanical and hydraulic steering gears, and emergency steering arrangements.
Underwater fittings	Identification of: rudders, fixed and variable pitch propellers, stern glands, sea suction and discharge valves and mounting points on the hull.
Deck machinery	Identification and operation of windlasses, capstans, and winches.
Fuels	All types of fuels used on ships: storage, transfer, heating, filtration and purification of fuels.
Lubricants	Storage, transfer, heating, cooling, filtration, purification and disposal of lubricants; types of lubricants and their application.
Cooling systems	Identification and operation of air and liquid cooling systems.
Electricity	Identification of measurement and protective devices: voltmeter, ammeter, ohmmeter, earth lamps, fuses, circuit breakers; generators, alternators and motors; electric circuits: alarm circuits, navigation-light circuits, light circuits, main and emergency light and power circuits, battery circuits, and precautions.
Hydraulic systems	Identification and operation of pumps, motors, piping, fittings, control devices and hydraulic fluids.
Pneumatic systems	Identification and operation of compressors, air receivers, heat exchangers, filters, piping, fittings, control devices; precautions and safeguards necessary to prevent fires and explosions.
Internal combustion engines	Basic construction of internal combustion engines; identification of fuel systems, including fuel injection pumps, fuel injectors and carburettors; cooling and lubricating systems; starting devices and ignition systems; recognition and correction of malfunctions; precautions and safeguards necessary to prevent crankcase explosions.
Watchkeeping procedures	Routine duties associated with a watch, recording of significant readings and understanding of their importance; routine duties carried out during a watch; recording accidents to machinery and hull; recording and calculating a ship's fuel supply; routine starting and stopping of machinery, and emergency stopping of machinery.

32.4 Oral examination (examination code: SVMO-O) (Also, please refer section 2.11 of Chapter 2)

- 1) The examination is of indefinite duration; it applies to applicants to the certificate issued under subsection 151(2).
- 2) The oral examination is based on:

Subject	Required knowledge
Use of official language	Adequate knowledge of one of the official languages to enable the operator to perform watch duties and report on machinery operation; ability to communicate clearly and understand others.
Watchkeeping procedures and related routine duties	Procedure for conducting a watch; terms used in machinery spaces and names of machinery and equipment; routine duties carried out during a watch; recording of movements and activities related to engine-room machinery; recording of significant readings and understanding of their importance; use of appropriate internal communication systems.
Safe working practices	Work procedures and precautions necessary to prevent hazards and maintain safe working conditions; safe working practices as related to engine-room operations; recognition of hazards; precautions before entering enclosed spaces.
Safety and emergency procedures	Safety precautions to be observed during a watch; immediate action to be taken in the event of an emergency; knowledge of the emergency procedure to follow in case of systems failure; engine-room alarm systems and ability to distinguish between various alarms.
Prevent, control and fight fire on board	Knowledge of fire prevention measures; ability to participate in fire drills; knowledge of class of fire and chemistry of fires; knowledge of fire-fighting systems; action to be taken in the event of a fire, including oil system fires.
Operate lifesaving appliance	Ability to participate in abandon ship drills and knowledge of the operation of survival craft and rescue boats, their launching devices and equipment; action in response to abandon ship and survival situations appropriate to the prevailing circumstances and conditions and complies with accepted safety practices and standards.
Fire equipment	Identification and operation of fire doors, water-tight doors, ventilation closures, detection devices; alarms, alarm systems, engine-room alarm systems and the ability to distinguish between various alarms (with special reference to fire extinguishing gas alarms); fire pumps, sprinkler and smothering systems; escape routes from machinery spaces; location and operation of external emergency machinery stops and fuel valve extensions; trigger mechanisms of fire extinguishing systems.
Pollution prevention	Basic principles of pollution prevention laws and regulations applicable to Canadian ships; pollution prevention procedures, including fuelling operations, discharge of bilge and ballast water; knowledge of the precautions to be taken to prevent pollution of marine environment; procedure for monitoring shipboard operations and ensuring compliance with requirements.
Internal combustion engines	Basic knowledge of an internal combustion engines construction; identification of elements: cylinder head, liner, crankcase, rocker arm, valves, fuel systems including fuel pumps and injectors; cooling and lubricating systems; starting devices and ignition systems; precautions and safeguards necessary to prevent crankcase explosions.
Main and auxiliary machinery and associated control systems	Preparation of main and auxiliary machinery for operation: operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations and prevent pollution of marine environment; the output of machinery and systems consistently meets requirements, including bridge order relating to change in speed and direction; location of common engine room machinery malfunctions, and action necessary to prevent damage.
Pumping systems and associated control systems	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operation and avoid pollution of marine environment; routine pumping operations; operation of bilge, ballast and cargo pumping systems.

Subject	Required knowledge
Alternators, generators and control systems	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operation; appropriate basic electrotechnical knowledge and skills; preparation of starting, coupling and changing over alternators; location of common faults and action to prevent damage to generating plant or control systems; power failure and emergency power procedure.
Fuels	Basic knowledge of fuels used on ships; type of fuel, storage, transfer, heating, filtration and purification.
Lubricants	Basic knowledge of lubricants used on ships; types of lubricant, storage, transfer, heating, cooling, filtration, purification and disposal of lubricants.
Cooling systems	Identification and operation of air and liquid cooling systems.
Hydraulic systems	Identification and operation of pumps, motors, piping, fittings, control devices and hydraulic fluids.
Electricity	Identification of measurement and protective devices: voltmeter, ammeter, ohmmeter, earth lamps, fuses, circuit breakers; generators, alternators and motors; electric circuits: alarm circuits, navigation-light circuits, main and emergency power and light circuits; battery-powered circuits, and precautions.
Pneumatic systems	Basic knowledge, identification and operation of compressors, air receivers, heat exchangers, filters, piping, fittings, control devices; precautions and safeguards necessary to prevent fires and explosions.
Compliance with legislative requirement.	Basic knowledge of the Canada Shipping Act 2001 relating to: <ul style="list-style-type: none"> – Steering appliances and equipment; – Life Saving Equipment, Fire-Fighting Equipment, Boat and Fire Drill, Fire Detection and Extinguishing Equipment; – Dangerous Goods, Oil Pollution Prevention, Sewage Pollution Prevention, Garbage Pollution Prevention, Pollutant Discharge Reporting; – Safe Working Practices, Shipping Casualties Reporting; – Crewing requirements.

32.5 Practical examination (examination code: SVM0-P)

- 1) The practical examination takes place on board the vessel and is of indefinite duration; it is based on the same syllabus as the oral examination, but is limited to the vessel's specific equipment. This examination applies to applicants to the certificate issued under subsection 151(2).

Chapter 33 - Air Cushion Vehicle Engineer - Class I and Class II

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Air Cushion Vehicle Engineer - Class I**33.1 General requirements**

- 1) The general requirements for a certificate as Air Cushion Vehicle Engineer Class I are listed in section 152 of the *Marine Personnel Regulations*.
- 2) An Air Cushion Vehicle Engineer Class I certificate shall be associated with an Air Cushion Vehicle Type Rating certificate set out in Section 169 of the *Marine Personnel Regulations*.

33.2 Validity of certificate

The holder of this certificate may act as an engineer of all type of Air Cushion Vehicle without any voyage limitation and “all up weight” restriction.

Syllabus of Examination**33.3 General knowledge and maintenance of air cushion vessels (Examination code: ACV1)**

- 1) The examination consists of 60 multiple-choice questions.
- 2) The examination is of 3.5 hours duration.

Subject	Required knowledge
Use of an official language.	Adequate knowledge of one of the official languages to enable the rating to perform watch duties and report on machinery operation; ability to communicate clearly and understand others.
Safe working practices	Work procedures and precautions necessary to prevent hazards and maintain safe working conditions. Safe working practices as related to ACV operations. Recognition of hazards. Precaution before entering a Close Space.
Safety and emergency procedures	Safety precautions to be observed during a watch. Immediate action to be taken in the event of an emergency. Emergency procedure to take over various systems, in case of their failure. Engine-room alarm systems and ability to distinguish between various alarms.
Pollution prevention	Basic principles of pollution prevention laws and regulations applicable to Canadian ships; pollution prevention procedures, including fuelling operations, discharge of bilge and ballast water. Knowledge of the precautions to be taken to prevent pollution of marine environment; procedure for monitoring shipboard operations and ensuring compliance with requirements.
Watchkeeping procedures and related routine duties	Procedure for conducting a watch; terms used on ACV and names of machinery and equipment; routine duties carried out during a watch or a pre departure inspection or procedure; recording of movements and activities related to ACV machinery; recording of significant readings and understanding of their importance; use of appropriate internal communication systems.
Main and auxiliary machinery and associated control systems	Monitoring of main and auxiliary machinery is planned and carried out in accordance with established rules and procedures to ensure safety of operation and avoid pollution of marine environment. Preparation for start-up. Identification of common faults and action necessary to prevent damage; the causes of machinery malfunctions are promptly identified and actions are designed to ensure the overall safety of the ship and the plant, having regard to the prevailing circumstances and conditions.

Subject	Required knowledge
Pumping systems and associated control systems	Monitoring of pumping systems is planned and carried out in accordance with established rules and procedures to ensure safety of operation and avoid pollution of marine environment. Routine pumping operations; operation of bilge, ballast and cargo pumping systems. Emergency procedures related to pumping activity. Cause of Water Hammer.
Alternators, generators and control systems	Monitoring is planned and carried out in accordance with established rules and procedures to ensure safety of operation; preparation for start-up; Identification of common faults and action to prevent damage to generating plant or control systems. The causes of machinery malfunctions are promptly identified and actions are designed to ensure the overall safety of the ship and the plant, having regard to the prevailing circumstances and conditions. Power Failure and emergency power procedure.
Fuels	Basic knowledge of fuels used on ACV; type of fuel, storage, transfer, heating, filtration and purification.
Lubricants	Basic knowledge of lubricants used on ACV; types of lubricant, storage, transfer, heating, cooling, filtration, purification and disposal of lubricants.

Air Cushion Vehicle Engineer - Class II

33.4 General requirements

- 1) The general requirements for a certificate as Air Cushion Vehicle Engineer Class II are listed in section 152 of the *Marine Personnel Regulations*.
- 2) An Air Cushion Vehicle Engineer Class II certificate shall be associated with an Air Cushion Vehicle Type Rating certificate set out in Section 169 of the *Marine Personnel Regulations*

33.5 Validity of certificate

The holder of this certificate may act as an engineer of an Air Cushion Vehicle less than 10 000 kg all up weight that is not carrying a passenger, or that is certified to carry 50 or fewer passengers, without any voyage limitation.

Syllabus of Examination**33.6 General knowledge and maintenance of air cushion vessels (Examination code: ACV2)**

- 1) The examination consists of 60 multiple-choice questions.
- 2) The examination is of 3.5 hours duration.

Subject	Required knowledge
Use of an official language.	Adequate knowledge of one of the official languages to enable the rating to perform watch duties and report on machinery operation; ability to communicate clearly and understand others.
Safe working practices	Work procedures and precautions necessary to prevent hazards and maintain safe working conditions. Safe working practices as related to ACV operations. Recognition of hazards. Precaution before entering a Close Space.
Safety and emergency procedures	Safety precautions to be observed during a watch. Immediate action to be taken in the event of an emergency. Emergency procedure to take over various systems, in case of their failure. Engine-room alarm systems and ability to distinguish between various alarms.
Pollution prevention	Basic principles of pollution prevention laws and regulations applicable to Canadian ships; pollution prevention procedures, including fuelling operations, discharge of bilge and ballast water. Knowledge of the precautions to be taken to prevent pollution of marine environment; procedure for monitoring shipboard operations and ensuring compliance with requirements.
Watchkeeping procedures and related routine duties	Procedure for conducting a watch; terms used on ACV and names of machinery and equipment; routine duties carried out during a watch or a pre departure inspection or procedure; recording of movements and activities related to ACV machinery; recording of significant readings and understanding of their importance; use of appropriate internal communication systems.
Main and auxiliary machinery and associated control systems	Monitoring of main and auxiliary machinery is planned and carried out in accordance with established rules and procedures to ensure safety of operation and avoid pollution of marine environment. Preparation for start-up. Identification of common faults and action necessary to prevent damage; the causes of machinery malfunctions are promptly identified and actions are designed to ensure the overall safety of the ship and the plant, having regard to the prevailing circumstances and conditions.
Pumping systems and associated control systems	Monitoring of pumping systems is planned and carried out in accordance with established rules and procedures to ensure safety of operation and avoid pollution of marine environment. Routine pumping operations; operation of bilge, ballast and cargo pumping systems. Emergency procedures related to pumping activity. Cause of Water Hammer.
Alternators, generators and control systems	Monitoring is planned and carried out in accordance with established rules and procedures to ensure safety of operation; preparation for start-up; Identification of common faults and action to prevent damage to generating plant or control systems. The causes of machinery malfunctions are promptly identified and actions are designed to ensure the overall safety of the ship and the plant, having regard to the prevailing circumstances and conditions. Power Failure and emergency power procedure.
Fuels	Basic knowledge of fuels used on ACV; type of fuel, storage, transfer, heating, filtration and purification.
Lubricants	Basic knowledge of lubricants used on ACV; types of lubricant, storage, transfer, heating, cooling, filtration, purification and disposal of lubricants.

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General

34.1 General requirements

The general requirements for a High-Speed Craft (HSC) Type Rating certificate are listed in section 168 of the *Marine Personnel Regulations*.

34.2 Validity of certificates

This certificate is valid on a high-speed craft other than an air cushion vessel and is required under section 258 of the *Marine Personnel Regulations* for the master and any officer having an operational role on the high-speed craft who may be called upon to operate the craft.

Chapter 35 – Air Cushion Vehicle (ACV) Type Rating

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General

35.1 General requirements

The general requirements for an Air Cushion Vehicle (ACV) Type Rating certificate are listed in section 169 of the *Marine Personnel Regulations*.

35.2 Validity of certificates

This certificate is valid on an air cushion vessel and is required under subsection 256 (3) of the *Marine Personnel Regulations* for the master and the chief mate employed on board an air cushion vessel of more than 1000 kg all up weight.

Chapter 36 – Passenger Submersible Craft Endorsement

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General

36.1 General requirements

- 1) The general requirements for a Passenger Submersible Craft Endorsement are listed in section 177 of the *Marine Personnel Regulations*.
- 2) There are no specific examinations for this endorsement.

36.2 Validity of endorsement

This endorsement is valid on board a Passenger Submersible Craft, and is required under section 263 of the *Marine Personnel Regulations* for the Master and, where applicable, the Engineer of the craft.

Chapter 37 – Offshore Installation Manager, MOU/surface

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General**37.1 General requirements**

The general requirements for an Offshore Installation Manager, MOU/surface certificate are listed in section 178 of the *Marine Personnel Regulations*.

37.2 Validity of certificates

The holders of this certificate may act as offshore installation manager on board an MOU/surface and, subject to the provisions set out in section 238 of the Regulations, as a member of the deck watch.

Syllabuses of Examinations**37.3 Meteorology, level 2 (Examination Code: MET 2)**

- 1) Refer to section 5.8, chapter 5 of this TP.
- 2) This examination may be replaced with an approved course on meteorology, level 2.

37.4 Navigation Safety, level 1 (Examination Code: NS 1)

Refer to section 11.4, chapter 11 of this TP.

37.5 Oral examination on general seamanship with respect to an MOU (Examination Code: 165C) (Also, please refer section 2.11 of Chapter 2)

Subject	Required knowledge
1. Plan and ensure safe ballasting and deballasting operations and accounting of changes in deck loads	Knowledge of, and ability to apply, relevant international and national standards concerning stability Use of loading stability information which may be contained in or derived from stability and trim diagrams, operation manual, and/or computer-based loading and stability programs
2. Operational control of trim, stability and stress	Understanding of fundamental principles of MOU construction, including principal structural members and required periodic inspections Basic knowledge of effects of welding, and effects of corrosion on the structure Understanding of fundamental principles and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability (afloat mode) Stability criteria for MOUs (static and dynamic), environmental limits and criteria for survival conditions Understanding of inclining experiment, deadweight survey, and their use Use of daily loading calculations Knowledge of the effect: 1 on trim and stability of MOU in event of damage to and consequent flooding of a compartment, and countermeasures to be taken (afloat mode),2 of loading supplies and ballasting in order to keep the unit's stresses within acceptable limits,3 of mooring systems and mooring line failure,4 of pre-loading and leg stresses on self-elevating units,5 of loss of buoyancy

Subject	Required knowledge
3. Maintain safety and security of MOU personnel and the operational condition of life-saving, fire-fighting and other safety systems	Knowledge of life-saving appliance regulations (International Convention for the Safety of Life at Sea) as applicable to MOUs Organization of fire and abandon ship drills Maintenance of operational condition of life-saving, fire-fighting and other safety systems Actions to be taken to protect and safeguard all persons on board in emergencies, including evacuation Actions to limit damage following a fire, explosion, collision, or grounding Precautions to be taken before onset of heavy weather
4. Develop emergency and damage control plans and handle emergency situations	Preparation of contingency plans for response to emergencies Ship construction, including damage control Methods and aids for fire prevention, detection and extinction Functions and use of life-saving appliances Evacuation from MOU Precautions to be taken before onset of heavy weather
5. Respond to emergencies	Knowledge of: 1 emergency procedures, 2 the effect on trim and stability of flooding due to damage, fire-fighting, loss of buoyancy or other reasons and countermeasures to be taken. Effectively communicate stability-related information
6. Maintain MOU safe for transit, station keeping, mooring and dynamic positioning conditions	Knowledge of: 1 the 1972 Collision Regulations, as amended, 2 navigation and electronic navigational aids appropriate to the type of MOU, 3 towing procedures, including recovery of tow, 4 sea-bed composition and characteristics, 5 behaviour of mooring systems and force distributions, including the effect of environmental conditions, 6 consequences of mooring system failure, 7 anchor placement and recovery, and working with anchor handling vessels, 8 principles of dynamic positioning system, including capabilities and limitations of thrusters, power systems and maximum allowable position offsets (For Dynamic Position equipped vessels only)
7. Forecast weather and oceanographic conditions	Knowledge of: 1 characteristics of weather systems, 2 ability to apply available meteorological information to ensure safety of MOU and, upon request, supply other vessels or aircraft with information, 3 sources of weather information, 4 the effects of weather on the MOU environmental limits
8. Plan and ensure safe transfer of personnel	Knowledge of: 1 precautions to be taken during transfer of personnel, 2 use of the personnel basket, 3 helicopter transfers, 4 vessel transfers, 5 effect of environmental conditions on method of personnel transfer
9. Plan and ensure safe loading, stowage, securing and handling of supplies, including dangerous goods	Knowledge of: 1 the effect on trim and stability of cargoes and cargo operations, 2 safe handling, stowage and care of equipment, supplies and dangerous goods, 3 crane and lifting equipment, and their inspections, 4 procedures for loading and discharge of helicopters and supply vessels, 5 precautions during loading, and unloading, and use of dangerous, hazardous, or harmful goods
10. Prevention of pollution	Methods and aid to prevent pollution of the environment Knowledge of: 1 pollution prevention systems and controls, 2 pollution control procedures, including the unit's MARPOL I/26 and article 3 of OPRC Convention Shipboard Oil Pollution Emergency Plan, MARPOL Annex V Waste Management Plan, and any plan dealing with dangerous/hazardous goods

Subject	Required knowledge
11. Monitor and control safe working practices	Knowledge of safe working practices, such as: 1 occupational safety, health and hygiene, 2 hazardous areas, 3 permits to work, 4 work over water, 5 work in confined spaces, Knowledge of personnel training, organization and communication Understanding and inspection of safety equipment Identify, evaluate, control new hazards through engineering controls or safe working practices
12. Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment	Knowledge of international maritime law embodied in international agreements and conventions Regard should be paid to the following subjects: .1 certificates and other documents required to be carried on board MOUs by international conventions and/or agreements .2 responsibilities under the relevant requirements of the: - International Convention on Load Lines; - International Convention for the Safety of Life at Sea; - International Convention for the Prevention of Pollution from Ships; .3 maritime declarations of health and the requirements of the International Health Regulations .4 responsibilities under international instruments affecting the safety of the MOU, visitors, crew and cargo .5 methods and aids to prevent pollution of the marine environment by MOUs .6 national legislation for implementing international agreements and conventions
13. Monitor and control industrial operations impacting maritime safety	Knowledge and appreciation of the interrelationship between marine operations and specific industrial activities including, where appropriate, the following: .1 drilling and maintenance, where appropriate, of wells .2 construction and offshore maintenance and repair .3 production .4 accommodation support .5 lifting operations .6. pipe-laying .7 diving .8 fire-fighting support

Chapter 38 – Offshore Installation Manager, MOU/self-elevating

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General**38.1 General requirements**

The general requirements for an Offshore Installation Manager, MOU/self-elevating certificate are listed in section 179 of the Regulations.

38.2 Validity of certificates

The holder of this certificate may act as offshore installation manager on board an MOU/self-elevating, subject to the provisions set out in section 238 of the Regulations, as a member of the deck watch.

Syllabuses of Examinations**38.3 Meteorology, level 2 (Examination Code: MET 2)**

- 1) Refer to section 5.8, chapter 5 of this TP.
- 2) This examination may be replaced with an approved course in meteorology, level 2.

38.4 Navigation Safety, level 1 (Examination Code: NS 1)

Refer to section 11.4, chapter 11 of this TP.

38.5 Oral examination on general seamanship with respect to an MOU (Examination Code: 165C) (Also, please refer section 2.11 of Chapter 2)

Subject	Required knowledge
1. Plan and ensure safe ballasting and deballasting operations and accounting of changes in deck loads	Knowledge of, and ability to apply, relevant international and national standards concerning stability Use of loading stability information which may be contained in or derived from stability and trim diagrams, operation manual, and/or computer-based loading and stability programs
2. Operational control of trim, stability and stress	Understanding of fundamental principles of MOU construction, including principal structural members and required periodic inspections Basic knowledge of effects of welding, and effects of corrosion on the structure Understanding of fundamental principles and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability (afloat mode) Stability criteria for MOUs (static and dynamic), environmental limits and criteria for survival conditions Understanding of inclining experiment, deadweight survey, and their use Use of daily loading calculations Knowledge of the effect: 1 on trim and stability of MOU in event of damage to and consequent flooding of a compartment, and countermeasures to be taken (afloat mode), 2 of loading supplies and ballasting in order to keep the unit's stresses within acceptable limits, 3 of mooring systems and mooring line failure, 4 of pre-loading and leg stresses on self-elevating units, 5 of loss of buoyancy.
3. Maintain safety and security of MOU personnel and the operational condition of life-saving, fire-fighting and other safety systems	Knowledge of life-saving appliance regulations (International Convention for the Safety of Life at Sea) as applicable to MOUs Organization of fire and abandon ship drills Maintenance of operational condition of life-saving, fire-fighting and other safety systems Actions to be taken to protect and safeguard all persons on board in emergencies, including evacuation Actions to limit damage following a fire, explosion, collision, or grounding Precautions to be taken before onset of heavy weather

Subject	Required knowledge
4. Develop emergency and damage control plans and handle emergency situations	Preparation of contingency plans for response to emergencies Ship construction, including damage control Methods and aids for fire prevention, detection and extinction Functions and use of life-saving appliances Evacuation from MOU Precautions to be taken before onset of heavy weather
5. Respond to emergencies	Knowledge of: 1 emergency procedures, 2 the effect on trim and stability of flooding due to damage, fire-fighting, loss of buoyancy or other reasons and countermeasures to be taken. Effectively communicate stability-related information
6. Maintain MOU safe for transit, station keeping, mooring and dynamic positioning conditions	Knowledge of: 1 the 1972 Collision Regulations, as amended, 2 navigation and electronic navigational aids appropriate to the type of MOU, 3 towing procedures, including recovery of tow, 4 sea-bed composition and characteristics, 5 behaviour of mooring systems and force distributions, including the effect of environmental conditions, 6 consequences of mooring system failure, 7 anchor placement and recovery, and working with anchor handling vessels, 8 principles of dynamic positioning system, including capabilities and limitations of thrusters, power systems and maximum allowable position offsets (For Dynamic Position equipped vessels only).
7. Forecast weather and oceanographic conditions	Knowledge of: 1 characteristics of weather systems, 2 ability to apply available meteorological information to ensure safety of MOU and, upon request, supply other vessels or aircraft with information, 3 sources of weather information, 4 the effects of weather on the MOU environmental limits.
8. Plan and ensure safe transfer of personnel	Knowledge of : 1 precautions to be taken during transfer of personnel, 2 use of the personnel basket, 3 helicopter transfers, 4 vessel transfers, 5 effect of environmental conditions on method of personnel transfer
9. Plan and ensure safe loading, stowage, securing and handling of supplies, including dangerous goods	Knowledge of: 1 the effect on trim and stability of cargoes and cargo operations, 2 safe handling, stowage and care of equipment, supplies and dangerous goods, 3 crane and lifting equipment, and their inspections. 4 procedures for loading and discharge of helicopters and supply vessels, 5 precautions during loading, and unloading, and use of dangerous, hazardous, or harmful goods.
10. Prevention of pollution	Methods and aid to prevent pollution of the environment Knowledge of: 1 pollution prevention systems and controls, 2 pollution control procedures, including the unit's MARPOL I/26 and article 3 of OPRC Convention Shipboard Oil Pollution Emergency Plan, MARPOL Annex V Waste Management Plan, and any plan dealing with dangerous/hazardous goods.
11. Monitor and control safe working practices	Knowledge of safe working practices, such as: 1 occupational safety, health and hygiene, 2 hazardous areas, 3 permits to work, 4 work over water, 5 work in confined spaces. Knowledge of personnel training, organization and communication Understanding and inspection of safety equipment Identify, evaluate, control new hazards through engineering controls or safe working practices

Subject	Required knowledge
<p>12. Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment</p>	<p>Knowledge of international maritime law embodied in international agreements and conventions Regard should be paid to the following subjects: 1 certificates and other documents required to be carried on board MOUs by international conventions and/or agreements, 2 responsibilities under the relevant requirements of the: - International Convention on Load Lines; - International Convention for the Safety of Life at Sea; - International Convention for the Prevention of Pollution from Ships; .3 maritime declarations of health and the requirements of the International Health Regulations .4 responsibilities under international instruments affecting the safety of the MOU, visitors, crew and cargo .5 methods and aids to prevent pollution of the marine environment by MOUs .6 national legislation for implementing international agreements and conventions</p>
<p>13. Monitor and control industrial operations impacting maritime safety</p>	<p>Knowledge and appreciation of the interrelationship between marine operations and specific industrial activities including, where appropriate, the following: .1 drilling and maintenance, where appropriate, of wells, 2 construction and offshore maintenance and repair, 3 production, 4 accommodation support, 5 lifting operations, 6. pipe-laying, 7 diving, 8 fire-fighting support.</p>

Chapter 39 – Barge Supervisor, MOU/surface

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General

39.1 General requirements

The general requirements for a Barge Supervisor, MOU/surface certificate, are listed in section 180 of the *Marine Personnel Regulations*.

39.2 Validity of certificates

The holder of this certificate may act as barge supervisor on a MOU/surface.

Syllabuses of Examinations

39.3 Oral examination on general seamanship with respect to an MOU (Examination Code: 165B) (Also, please refer section 2.11 of Chapter 2)

Subject	Required knowledge
1. Machinery	Use and care of electric and hydraulic winches, ordinary and self-tensioning; windlasses and capstans; main and emergency steering gears associated with MOUs; electric and hydraulic deck cranes; elevators for personnel, stores and equipment.
2. Voyage Preparation	Manoeuvring an MOU under power; preparations for getting underway; planning for a towed voyage; preparing and inspecting towing equipment; securing towing vessels; the use, handling and securing of towing units; getting underway, under tow; communicating with tug masters; authority of OIM when MOU is under tow.
3. Anchoring	Manoeuvres and cable handling involved in the use of ground tackle and ancillary equipment, including the use of anchor buoys; planning an anchor pattern; deployment of anchors with and without anchor-handling vessels; communication with anchor-handling vessels; clearing a foul anchor; hanging off an anchor; securing anchor gear in preparation for sea passage; use of anchors in emergency, to take way off; anchor and cable stowage, fittings and cable markings.
4. Mooring Lines	Use, care and stowage of mooring lines, comprising: types of line used for mooring and their characteristics; the names of the various mooring lines; making fast supply vessels; emergency cast-off procedures; the use of mooring wire-rope reels; types of fairlead, their construction, naming and use.
5. Stowage and Handling	Working of stores and equipment, comprising: mate's responsibilities in transfer of cargo, stores and personnel to and from supply vessel; inspections of holds, decks and spaces to receive goods; preparation and operation of cranes; arrangements and working of heavy lifts by ship equipment, and lifts that cannot be handled by a single runner; the overhaul and regular inspection of lifting gear.
6. Organization	MOU routine and organization, comprising: the barge supervisor's executive and organizational duties; crew watches, direction of work; drawing up emergency muster lists with appropriate duties for crew members; the organizational duties for fuelling, storing or ballasting in all conditions; the barge supervisor's duties concerning the official logbook, entries in the deck log and owner's or charter's records; the barge supervisor's duties when repair, alteration or maintenance work is being carried out; the barge supervisor's duties when preparing an MOU for sea; the barge supervisor's duties and responsibilities on joining an MOU; the necessary paperwork or documentation to encompass the foregoing items, where applicable; control room and deck discipline, organization and routine under all circumstances; steering orders and responses; maintenance of a proper lookout; duties and responsibilities of the barge supervisor, officer of the watch, ballast control and other bridge personnel (jointly and separately); the purposes, necessity and general content of standing orders, night orders, bridge or movement book, ship's logbook and similar material; anchor watch duties and responsibilities; means of assessing a tendency to drag anchors; arrangement and responsibility of departments aboard ship.
7. Pollution-Prevention Management	Duties related to loading, transfer and storage of pollution responsibilities under oil pollution-prevention regulations and MARPOL; response to a pollution incident; identification of pollutants; obligation to prevent pollution.

Subject	Required knowledge
8. Emergency Response	Emergency duties and responsibilities for equipment, comprising: organization, frequency and routing of fire patrols under routine and exceptional conditions; recognition and assessment of fire hazards; importance of cleanliness and good housekeeping; organization of realistic fire drills, training of crew for emergencies; taking charge of marine emergencies; inspections, testing and maintenance of portable and fixed firefighting equipment; organization of realistic boat and lifesaving appliance drills, training of crew in use of lifesaving appliances and man-overboard drills; stowage, inspections, testing and maintenance of lifeboats, capsules, rafts and their equipment, lifejackets, immersion suits, lifebuoys, self-igniting lights and distress signals; taking charge of the launching of boats, rafts and capsules; assessing damage and flooding in cases of collision or stranding; search and rescue procedures, including a knowledge of AMVER, MERSAR, and TC publications.
9. Personnel Documentation	Rights and privileges of certificates of competency limited to MOUs; certificated personnel required; general manning required to meet safety requirements.
10. Collision Avoidance	Collision Regulations and their intent, ship routing, MOU safety zone; <i>Notices to Mariners</i> concerning MOU locations.
11. MOU Underway	MOU handling in a seaway; transverse thrust and its effect; wind effects on a MOU; how to heave to; anchoring in a tide, current, or wind; manoeuvring characteristics of other types of vessels; stern power and its effect; the handling characteristics of tugs and problems of towing vessels; turning and manoeuvring in a channel; docking problems; close-quarters situations at anchor and underway.

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General**40.1 General requirements**

The general requirements for a Barge Supervisor, MOU/self-elevating certificate, are listed in section 181 of the Regulations.

40.2 Validity of certificates

The holder of this certificate may act as barge supervisors on an MOU/self-elevating.

Syllabuses of Examinations**40.3 Meteorology, level 2 (Examination Code: MET 2)**

- 1) Refer to section 5.8, chapter 5 of this TP.
- 2) This examination may be replaced with an approved course in meteorology, level 2.

40.4 Navigation Safety, level 1 (Examination Code: NS 1)

Refer to section 11.4, chapter 11 of this TP.

40.5 Oral examination on general seamanship with respect to an MOU (Examination Code: 165B) (Also, please refer section 2.11 of Chapter 2)

Refer to section 39.3 of chapter 39 of this TP.

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General**41.1 General requirements**

The general requirements for a Maintenance Supervisor, MOU/surface certificate, are listed in section 182 of the *Marine Personnel Regulations*.

41.2 Validity of certificates

The holder of this certificate may act as Maintenance supervisor or Engineer in charge of the watch on board an MOU/surface.

Syllabuses of Examinations**41.3 Ship management practices (Examination Code: PPSSIM2)**

Refer to chapter 25 of this TP.

41.4 Technical drawing at the second-class level (Examination Code: 2D)

Refer to chapter 26 of this TP.

41.5 Applied Mechanics at the first-class level (Examination Code: 1APM)

Refer to chapter 25 of this TP.

41.6 Thermodynamics at the first-class level (Examination Code: 1H-H)

Refer to chapter 25 of this TP.

41.7 Electrotechnology at the first-class level (Examination Code: 1ELC)

Refer to chapter 25 of this TP.

41.8 Naval Architecture at the first-class level (Examination Code: 1NAR)

Refer to chapter 25 of this TP.

41.9 General engineering knowledge at the first-class level (Examination Code: 1EKG)

Refer to chapter 25 of this TP.

41.10 Engineering knowledge of motor vessels at the first-class level (Examination Code: 1EKM)

Refer to chapter 25 of this TP.

41.11 Oral examination (Examination Code: MSMODUSO) (Also, please refer section 2.11 of Chapter 2)

The examination is of an unlimited duration and will be based on:

Subject	Required knowledge
Fabrication and Repair	Use appropriate tools for fabrication and repair operations typically performed on MOU's: Characteristics and limitations of materials used in construction and repair; characteristics and limitations of processes used for fabrication and repair; properties and parameters considered in the fabrication and repair of systems and components; application of safe working practices in the workshop environment.
Maintenance and repair of MOU	Use hand tools and measuring equipment for dismantling, maintenance, repair and re-assembly of on-board plant and equipment: Design characteristics and selection of materials in construction of equipment; interpretation of machinery drawings and hand tools; operational characteristics of equipment and systems.
Electrical Fault-finding	Use hand tools, electrical and electronic measuring and test equipment for fault-finding, maintenance and repair operations: Safety requirements for working on electrical systems; construction and operational characteristics of on-board AC and DC electrical systems and equipment; construction and operation of electrical test and measuring equipment.
Electric power Plant	Operate alternators, generators and control systems: Generating plan: Appropriate basic electrical knowledge and skills; preparing, starting, coupling and changing over alternators or generators; location of common faults and action to prevent damage. Control systems: location of common faults and action to prevent damage.
Engineering knowledge	Maintain engineering systems, including control systems: Appropriate basic mechanical knowledge and skills; safe isolation of electrical and other types of plant and equipment required before personnel are permitted to work on such plant or equipment; undertake maintenance and repair to plant and equipment.
Machinery operation	Operate, monitor and evaluate engine and machinery performance and capacity: Operation and maintenance of: engines, auxiliary machinery including pumping and piping systems and associated control systems.
Machinery malfunction	Detect and identify the cause of machinery malfunctions and correct faults: Detection of machinery malfunction and location of faults to prevent or minimize damage.
Marine engineering practice	Marine engineering practice: Organizing and carrying out safe maintenance and repair procedure.
Fire and Life Saving equipment	Operate and maintain survival craft and launching systems and systems for fire prevention, detection and extinction: Maintenance of operational condition of survival craft and launching systems and systems for fire prevention, detection and extinction; actions taken to protect the unit and its personnel and limit damage following fire, explosion, collision or grounding.
Pollution prevention	Methods and aid to prevent pollution of the environment: Knowledge of relevant international and national requirements, regard should be paid especially to: 1. certificates and other documents required by international conventions or national law, how they may be obtained, and their period of validity; 2. responsibilities under relevant international agreements.
Safe working practices	Work procedures and precautions necessary to prevent hazards; maintenance of safe working conditions.

Chapter 42 - Maintenance Supervisor, MOU/Self-elevating

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General**42.1 General requirements**

The general requirements for a certificate as Maintenance Supervisor, MOU/self-elevating, are listed in section 183 of the *Marine Personnel Regulations*.

42.2 Validity of certificates

The holder of this certificate may act as Maintenance Supervisor or watchkeeping engineer on board an MOU/self-elevating.

Syllabuses of Examinations**42.3 General engineering knowledge at the Third-class engineer level (Examination Code: 3EKG)**

Refer to chapter 27 of this TP.

42.4 Engineering knowledge of motor vessels at the Third-class engineer level (Examination Code: 3EKM)

Refer to chapter 27 of this TP.

42.5 Electrotechnology at the Third-class engineer level (Examination Code: 3ELC)

Refer to chapter 27 of this TP.

42.6 Oral examination (Examination Code: MSMODUEO) (Also, please refer section 2.11 of Chapter 2)

Refer to section 41.11 of chapter 41 of this TP.

Chapter 43 – Ballast Control Operator

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General

43.1 General requirements

- 1) The general requirements for a Ballast Control Operator certificate are listed in section 184 of the *Marine Personnel Regulations*.
- 2) There are no specific examinations for this endorsement.

43.2 Validity of endorsement

This endorsement is valid on board an MOU/surface and is required under section 234 of the *Marine Personnel Regulations* for the person in charge of ballast control.