CHAPTER 33 - FOURTH-CLASS ENGINEER, MOTOR SHIP, AND FOURTH-CLASS ENGINEER, STEAMSHIP

PART I - GENERAL REQUIREMENTS OF APPLICANTS

33.1 (1) Every applicant for a certificate as a Fourth-Class Engineer, Steamship or Motor Ship, shall:

(a) obtain a medical certificate prescribed by the Crewing Regulations;

(b) obtain a certificate of completion for each of the following courses from a school listed in TP 10655:

(i) Marine Emergency Duties Courses, set out in TP 4957, for:

(A) Basic Safety (A1);
(B) Survival Craft (B1);
(C) Marine Fire Fighting (B2); and
(D) Officer Certification (C);

(ii) Propulsion Plant Simulator Course Level I, set out in TP 10935;

(iii) Marine First Aid Advanced Certificate, set out in TP 13008; and

(iv) Skills Training Course.

(2) Notwithstanding section 33.15 complete the following service:

1. obtain a certificate of completion for the course, set out in TP 8911, at a school listed in TP 10655; or

2. 36 months service as follows:

(a) subject to section 33.3, a minimum of six months sea service

(i) as engineer on watch, engine-room rating on watch, engine-room assistant on watch or assistant engineer officer on a steamship of not less than 225 kW propulsion power where the applicant applies for a certificate as a Fourth-Class Engineer, Steamship; or

(ii) as engineer, engine-room rating, engine-room assistant on watch or assistant engineer officer on a motor ship or MODU of not less than 225 kW propulsion power where the applicant applies for a certificate as a fourth class engineer, motor ship;

(b) a credit of six months for completion of the Skills Training Course set out in TP 13720 from a school listed in TP 10655; and

(c) (i) the remaining time of any combination of service from the following categories, namely:

(A) fitting, erecting or repairing machinery for a maximum of 12 months;

(B) metal turning to a maximum of 12 months;

(C) brass finishing to a maximum of nine months;

(D) pattern making to a maximum of nine months;

(E) planing, slotting, shaping, milling to a maximum of nine months;

(F) tool room to a maximum of nine months;

(G) smith work to a maximum of four months;

(H) welding to a maximum of four months;

(I) working in a drawing office as mechanical or electrical draughtsman engaged on arrangement, detail or design drawings to a maximum of 12 months;

(J) a certificate of completion for a three-year diploma course in mechanical or electrical engineering from a school listed in TP 10655, which gives equivalent of 24 months of service;

(K) the equivalent of three months of service for each course in applied mechanics, thermodynamics, machine design, electrotechnology, chemistry, or naval architecture successfully completed from a school listed in TP 10655;

(L) engineer or assistant engineer officer at sea on day work, to a maximum of 24 months;

(M) engineer, assistant engineer officer, engine-room watch rating, engineer assistant or electrician during the fitting out or laying up of a ship to a maximum of six weeks in any one year of fitting-out or laying-up time, to a maximum of six months;

(N) engineer, engine-room watch rating or assistant engineer officer on watch on a non-propelled motor dredge, drill rig, floating elevator or similar ship, the main engine of which is not less than 375 kW power, to a maximum of 24 months;

(O) pumpman on an oil tanker, to a maximum of 24 months;

(P) water tender on a ship having three or more boilers, to a maximum of 18 months;

(Q) engineer, engine-room watch rating, assistant engineer or engineer assistant on watch on a non-propelled steam dredge, drill rig, floating elevator or similar ship, the main engine of which is not less than 375 kW power, or the boiler of which has a total heating surface of no less than 92.9 m^2, to a maximum of 24 months;

(R) engine-room watch rating or engineer assistant on watch on a towed barge or similar ship, the boilers of which have a total heating surface of not less than 92.9 m^2, to a maximum of 24 months;

(S) tunnelman on a self-unloading bulk cargo ship, to a maximum of nine months;

(T) electrician on watch in an engine room of an electrically-propelled ship, to a maximum of 24 months;

(U) electrician on watch or on day work during the maintenance and repair of the electrical machinery of a ship having a rated generator capacity of not less than 300 kW power, to a maximum of 24 months; and

(V) time spent at the marine department of a school listed in TP 10655, to be credited in the ratio of one day for every three days of attendance to a maximum of three months.

33.2 The sea service referred to in paragraph 33.1(2)2.(a) is demonstrated by completion of an approved Training Record Book conforming to TP 13721.

Steam Certificate and Motor Certificate

33.3 For a Fourth-Class Steam Certificate and Fourth-Class Motor Certificate, an applicant shall complete the service required by section 33.1(2) 1. or 33.1(2) 2. provided that not less than six months of the total sea service was performed in a steamship of not less than 225 kilowatt propulsion power, and that not less than six months of the total sea service was performed in a motor ship of not less than 225 kilowatt propulsion power.

33.4 (1) For a Fourth-Class Motor with a Steam Certificate of a higher grade, an applicant shall have served on watch in the engine room of a motor ship of not less than 225 kilowatt propulsion power for not less than six months as an engineer or an engine-room assistant or engine-room rating.

(2) For a Fourth-Class Steam with a Motor Certificate of a higher grade, an applicant shall have served on watch in the engine room of a steamship of not less than 225 kW propulsion power for not less than six months as an engineer or an engine-room assistant or engine-room rating.

(3) For an Electrical Certificate with a Fourth-Class or Third-Class Steam, Motor or Combined Certificate, an applicant shall have served not less than six months at sea as an engineer or electrician in a ship having a rated generator capacity of not less than 300 kilowatt.

Second Engineer Certificate

33.5 An applicant for a Second Engineer Endorsement on a Fourth-Class Certificate shall have served for not less than 12 months as an engineer officer or assistant engineer officer on watch of a steamship or motor ship, as appropriate, of not less than 750 kilowatt propulsion power, and no further examination is required for the Second Engineer.

PART II - EXAMINATIONS

33.6 (1) The following table lists the written and oral examinations for the Fourth-Class Engineer Certificate, the qualifying service required before each may be attempted, and other requirements:

Steam Certificate

EXAMINATION	QUALIFYING SERVICE	OTHER REQUIREMENTS
Engineering Knowledge, General	36 months	MED B & C PPS Level I, Skills Training, TRB.
Engineering Knowledge, Steam	36 months	MED B & C Pass Engineering Knowledge, General
Oral Examination	-	Pass Engineering Knowledge, General and Steam

Motor Certificate

EXAMINATION	QUALIFYING SERVICE	OTHER REQUIREMENTS
Engineering Knowledge, General	36 months	MED B & C PPS Level I, Skills Training, TRB.
Engineering Knowledge, Motor	36 months	MED B & C Pass Engineering Knowledge, General
Oral Examination	-	Pass Engineering Knowledge, General and Motor

Motor with a Steam Certificate

EXAMINATION	QUALIFYING SERVICE	OTHER REQUIREMENTS
Engineering Knowledge, Motor	Six months	Fourth class Steam Certificate
Oral Examination	-	Pass Engineering Knowledge, Motor

Steam with a Motor Certificate

EXAMINATION	QUALIFYING SERVICE	OTHER REQUIREMENTS
Engineering Knowledge, Steam	Six months	Fourth class Motor Certificate
Oral Examination	-	Pass Engineering Knowledge, Steam

Fourth Class with Electrical Certificate

EXAMINATION	QUALIFYING SERVICE	OTHER REQUIREMENTS
Engineering Knowledge, Electrotechnology	Six months 300 kW	Fourth Class Steam or Motor
Oral Examination	-	Pass Engineering Knowledge, Electrotechnology

Second Engineer Certificate

EXAMINATION	QUALIFYING SERVICE	OTHER REQUIREMENTS
No Examination	12 months 750 kW	Fourth Class Steam or Motor Certificate

33.6 (2) An applicant shall be allowed three and a half hours to complete the paper for each subject referred to in subsection (1).

(3) The written examination for a certificate or an endorsement other than an electrical endorsement shall be an examination in which the applicant attempts to select, from a number of given alternatives, the correct answer to each question.

(4) In the written examination there shall be a number of multiple choice type questions to test the candidates knowledge in General Engineering Knowledge, and Engineering Knowledge, Steam and Motor:

33.7 (1) The knowledge to be shown by an applicant for a Fourth-Class Certificate or for an endorsement on a certificate shall be sufficient to ensure the safe and efficient operation, surveillance and running maintenance of ships' machinery.

MANDATORY QUESTION

(2) Every applicant for a Fourth-Class Motor, Steam or Combined Certificate is required to prove to the satisfaction of the examiner that he/she is capable of checking, by a safe method, the water level in boilers that are being prepared to raise steam, under pressure, or in the process of being shut down.

PART III - VALIDITY OF CERTIFICATE

33.8 The certificate as a Marine Engineer, Fourth-Class, is valid as:

(1) watchkeeping engineer, without restriction; and

(2) second engineer on a non-passenger ship of not over 2000 kW propulsion power.

Note: Must hold Fourth-Class Certificate for 12 months before sailing as second engineer.

PART IV - SYLLABUSES OF EXAMINATIONS

33.9 Engineering Knowledge, General

ITEM	COLUMN
1.	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.
2.	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.
3.	Materials of Construction Materials and the ability to distinguish between the following common types: steel, cast iron, copper, zinc, brass, aluminium, plastics, resins.
4.	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, rotormeter, float, venturi), speed meters (tachogenerator, mechanical counter), torque meter.
5.	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.
6.	Identification and Maintenance 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.
7.	Preventive Maintenance Lifeboat engines, lifeboats, davits and winches.
8.	Safe Working Practices Work procedures and precautions necessary to prevent hazards; maintenance of safe working conditions; rigging, slinging and handling of heavy machinery parts.
9.	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.

10.	Pumps The construction, operation and maintenance of reciprocating pumps, centrifugal pumps, screw-displacement gear pumps, injectors, ejectors.
11.	Piping The 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.
12.	Power Transmissions Thrust with respect to intermediate and propeller shafts, thrust with respect to intermediate and propeller shaft bearing alignment, couplings, gear types, gear trains.
13.	Steering Gears: Mechanical and hydraulic steering gears, emergency steering arrangements, starting power steering gears, routine checks of steering gears, operation of steering gears.
14.	Underwater Fittings Rudders; fixed, variable and controllable-pitch propellers, stern glands; sea suction and discharge valves; mounting items on the hull.
15.	Deck Machinery Windlass, capstan, winch.
16.	Fuels, Auxiliary Machinery All types of fuels used on ships; storage, transfer, heating filtration and purification of fuels.
17.	Lubricants The storage, transfer, heating, cooling, filtration, purification and disposal of lubricants; types of lubricants; application of lubricants.
18.	Electricity and Magnetism Fundamentals: definitions of current, voltage, resistance and power; direct and alternating current; conductors; insulators; wet and dry cells; identification of simple circuits. Measurement and protective devices: voltmeter, ammeter, ohmmeter, ground lights, fuses, circuit breakers. Generators, alternators and motors: construction and operation of direct-current machines; construction and operation of alternating-current machines; basic maintenance procedures. Electric circuits: alarm circuits, navigation-light circuits, main- and emergency-light and power circuits, basic maintenance procedures.
19.	Hydraulic Systems Pumps, motors, piping, fittings, control devices, hydraulic fluids, packings, seals.
20.	Pneumatic Systems Compressors, air receivers, heat exchangers, filters, piping, fittings, control devices; precautions and safeguards necessary to prevent fires and explosions.
21.	Refrigeration Types, properties and hazards of refrigerants; construction and operation of refrigeration systems.

22.	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 traps.
23.	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.
24.	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 accident 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.

Note: This is a written multiple-choice question examination.

33.10 Engineering Knowledge, Motor

ITEM	COLUMN
1.	Compression Ignition Engines Methods of supercharging, turbocharging 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.
2.	Lubrication Systems The construction, operation and maintenance of purifiers; lubricants and lubricant additives; pumps; piping; heat exchangers; filters.
3.	Cooling Systems Air and liquid cooling, pumps, piping and heat exchangers, temperature control and expansion arrangements.
4.	Fuel Types of fuels and fuel additives; heating of fuels; filtration and purification of fuels; piping of fuels; fuel injection pumps and fuel injectors.
5.	Governors General principles, construction, operation and maintenance of mechanical, hydraulic, electronic and pneumatic governors.
6.	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).

Note: This is a written multiple-choice question examination.

33.11 Engineering Knowledge, Steam

ITEM	COLUMN
1.	Fire-Tube 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, 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.
2.	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.
3.	Reciprocating Engines The construction, operation and maintenance of different types of reciprocating engines, their governors and lubricating systems.
4.	Steam Turbines The principles of construction, operation and maintenance of different types of turbines, power transmission systems (including couplings, gears and turbo-electric installations) and governors.
5.	Lubrication Systems The construction, operation and maintenance of purifiers, pumps, piping, heat exchangers and filters.

Note: This is a written multiple-choice question examination.

33.12 Oral Examination

ITEM	COLUMN
1.	General The subject matter of any of the questions contained in the examinations set out in sections 33.9, 33.10 and 33.11 of the regulations written by the applicant; checking by safe method the water level and boilers that are being prepared to raise steam, under pressure, or in the process of being shut down.
2.	Laws Parts II and VIII of the *Canada Shipping Act*; Safe Working Practices Regulations; Oil Pollution Prevention Regulations; Boat and Fire Drill Regulations; Crewing Regulations; *Canada Labour Code-Part II and Marine Occupational Safety and Health Regulations*; *Criminal Code* as it relates to the operation of a ship.

SKILLS TRAINING

33.13 Skills Training Course outline is contained in TP 13720.

33.14 Proof of completion of the required skills training may be in the form of diplomas from approved schools or certificates of apprenticeship. Each submission of alternate proof of completion will be evaluated by the Board on its own merits, bearing in mind the Subject Items of 33.13.

PART V

Special Agreement

33.15 Following agreement was reached with marine industry to give special consideration to persons who have gained pre-requisite skills in work shops of an engine manufacturer by giving it equivalency to shore-based qualifying service, as set out in the Marine Certification Regulations.

Requirements

(1) For equivalent service, applicants must have served at least 30 months as a mechanic in a work shop of a marine engine manufacturer engaged in the building or re-building of diesel engines, such as agents for Caterpillar Corporation, General Motors Corporation, Cummins Corporation, MAK Corporation, etc.

(2) Applicants must meet the requirements of Marine Emergency Duties, Medical Examination Standard, Propulsion Plant Simulator Course and successful passing of the examinations.

Administration

(1) Upon completion of the requirements in 33.15 (1) and 33.15 (2), an Examiner's certificate may be issued that would entitle the holder to act as a watchkeeping engineer or assistant engineer under supervision of a senior/second or chief engineer of a ship engaged on local voyages.

(2) The Examiner's certificate will be marked as not valid for ships on foreign-going and home-trade I voyages.

(3) STCW Certificate will not be issued.

(4) Upon completion of six months sea service, a permanent Fourth-Class Certificate is to be issued with an STCW Certificate, and no further examination will be required.

(5) The Examiner's certificate in (2) will become invalid upon completion of six months sea service.

(6) All sea service is to be submitted in the form of a testimonial.