	Transport Canada	Issue Date: August 2004	Section 3	Ref: 2293-INF-34-1
	Marine Safety	Approved by: AMSP	Revision No: 04	Page: 1 of 7
TP 2293 E		<i>THE EXAMINATION AND CERTIFICATION OF SEAFARERS</i>		

CHAPTER 34 - CHIEF ENGINEER, MOTOR-DRIVEN FISHING VESSEL

PART I - GENERAL REQUIREMENTS OF APPLICANTS

- 34.1 (1) Every applicant for a certificate as Chief Engineer of a Motor-Driven Fishing Vessel 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) Survival Craft (B1); and
 - (B) Marine fire Fighting (B2);
 - (ii) Propulsion Plant Simulator Course Level I, set out in TP 10935; and
 - (iii) Marine First Aid Advanced Course, set out in TP 13008;
 - (c) pass a written examination in each of the following subjects:
 - (i) Mathematics
 - (ii) Applied Mechanics;
 - (iii) Thermodynamics;
 - (iv) Electrotechnology;
 - (v) Engineering Knowledge, General; and
 - (vi) Engineering Knowledge, Motor; and
 - (d) pass an oral examination.
- (2) The service required by an applicant for Chief Engineer of a Motor Driven Fishing Vessel is 48 months service as follows:
- (a) completion of service for the appropriate Fourth-Class Steam or Motor Certificate (Chapter 33);
 - (b) a minimum of six months sea service as engineer officer or engineer on the watch on a motor ship or MODU of not less than 350 kW propulsion power; and
 - (c) the remaining time made up of any combination of the following service, subject to any time limitations set out therein:
 - (i) engineer officer or engineer on day work on a ship, to a maximum of three months;
 - (ii) engineer officer or engineer fitting out, laying up or overhauling on a ship, to a maximum of six weeks in any one year, to a maximum of three months;
 - (iii) engineer officer or engineer on a non-propelled motor or steam dredge, drill rig, floating elevator or similar ship, the main engine of which is not less than 450 kW power;


- (iv) engine-room rating or engine-room assistant on watch in the engine room of a steamship or motor ship of not less than 350 kW propulsion power, to be credited one day for every three days of service; and
- (v) time spent at the marine department of a school listed in TP 10655, to be credited at the ratio of one day for every three days attendance, to a maximum of three months.

PART II - EXAMINATIONS

34.2 The following table lists the examinations for the Chief Engineer of a Motor-Driven Fishing Vessel Certificate, the qualifying service required before each may be attempted, and other requirements.

EXAMINATION	QUALIFYING SERVICE	OTHER REQUIREMENTS
Mathematics		-
Applied Mechanics		-
Thermodynamics		-
Electrotechnology		-
Engineering Knowledge, General	48 months	MED C PPS Level I
Engineering Knowledge, Motor	-	Pass Engineering Knowledge, General and Motor
Oral Examinations	-	-

- 34.3 (1) Each written examination paper shall be of a maximum duration of three and a half hours.
- (2) All papers consist of nine questions, six of which shall be attempted by the applicant.
 - (3) If more than the required number of questions are answered in any paper, all the answers shall be marked and only the required number of questions awarded the lowest marks shall be taken to determine the overall result.
 - (4) The engineering knowledge to be shown by an applicant for a certificate as a Chief Engineer of a Motor-Driven Fishing Vessel shall be sufficient to enable him/her to take charge of and operate safely the machinery and auxiliaries, including the heating boilers, that are normally found in a motor-driven fishing vessel of up to 2 000 kilowatt propulsion power operating on any voyage.

	Transport Canada	Issue Date: August 2004	Section 3	Ref: 2293-INF-34-3
	Marine Safety	Approved by: AMSP	Revision No: 04	Page: 3 of 7
TP 2293 E		THE EXAMINATION AND CERTIFICATION OF SEAFARERS		

PART III - VALIDITY OF CERTIFICATE

- 34.3 (5) The certificate of Chief Engineer of a Motor-Driven Fishing Vessel is valid as chief engineer of a motor-driven fishing vessel of not more than 2000 kilowatt propulsion power on any voyage.

PART IV - SYLLABUSES OF EXAMINATIONS

34.4 Mathematics

ITEM	COLUMN
1.	General The setting out of calculations, extraction and cancellation of common factor, significant figures, degree of accuracy.
2.	Arithmetic Averages, percentages, ratio, proportions.
3.	Logarithms Use of tables, square roots, reciprocals; use of logarithms for multiplication, division, powers and roots.
4.	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.
5.	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 $ax^2 + bx + c = 0$.
6.	Geometry Properties of triangles; Pythagorean theorem; sum of the angles; relation between exterior and interior angles; isosceles and equilateral triangles; similar and congruent triangles.
7.	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 of 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 $a \sin \theta + b \cos \theta$.
8.	Mensuration 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.
9.	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.

34.4A Applied Mechanics

ITEM	COLUMN
1.	Vectors The vector representation of forces; triangle of forces; resultant and equilibrant of a system of concurrent co-planar forces; couples.
2.	Moments and Centroids The principle of moments, application to simply-supported beams and ranked levers; centre of area; centre of gravity.
3.	Displacement Displacement, time, speed, velocity and acceleration.
4.	Forces Force, moment of force, torque, work, energy and power.
5.	Simple Machines Simple machines, velocity ratio, mechanical advantage, efficiency.
6.	Friction Friction, laws for dry surfaces, coefficient of friction (horizontal plane only).
7.	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.
8.	Density and Pressure Relative density; variation of fluid pressure with depth; Archimedes' principles.
9.	Elementary Stability Elementary treatment of transverse stability, centre of buoyancy, centre of gravity and metacentre (box shape only); transverse movement of masses across deck.

34.5 Thermodynamics

ITEM	COLUMN
1.	Introduction 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, flashpoint.
2.	Thermal Properties Expansion and contraction of solids, liquids and gases; change of phase; specific enthalpy of fusion, evaporation; properties of working fluids air, steam and freon.

3.	Perfect Gas Laws Compression and expansion of gases; gas laws; Boyle's law, Charles' Law.
4.	Heat Transfer Specific heat capacity, heat transfer by conduction, convection and radiation; effect of insulation.
5.	Thermal Relations The indicator diagram, power developed, fuel consumption including understanding of principles of combustion; insufficient, minimum and excess air.
6.	Refrigeration Vapour-compression cycle, refrigeration effect, cooling load, use of properties of refrigerants, coefficient of performance, cargo cooling and blast freezers.

34.6 Eletrotechnology

ITEM	COLUMN
1.	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.
2.	Properties of Conductors Distribution of current in circuits; resistance of conductor, variation with dimensions, material, temperature; temperature coefficient of resistance; insulators.
3.	Storage Cells Secondary cells (acid and alkali); construction; capacity, ampere hour.
4.	Switchboard Construction and operation of switchboard.
5.	Introduction to Electronics P-N junction, rectifiers, switching.
6.	Instruments Moving coil, moving iron (repulsion type).
7.	Magnetism Magnetic field; lines of force; field due to current in a straight conductor; motor and generator principle; commutation; speed control of motors; starter AC and DC; alternators and AC motors.

34.7 Engineering Knowledge, General

ITEM	COLUMN
1.	<p>Communications</p> <p>Ability to transmit information relating to machinery components by means of simple drawings with supplementary notes and specifications.</p>
2.	<p>Manufacturing Processes</p> <p>Knowledge of the methods of manufacture of the various machinery components and the effects of various treatments on the physical properties of the materials commonly used.</p>
3.	<p>Boilers</p> <p>Constructional details and management of auxiliary boilers, including firing arrangements and boiler mountings; boiler water testing and treatment.</p>
4.	<p>Steering Gears</p> <p>Construction, arrangement and working of steering gears and telemotors.</p>
5.	<p>Pumps</p> <p>Constructional details and principle of action of pumps; general requirements for pumping systems.</p>
6.	<p>Firefighting</p> <p>Fire prevention and detection; firefighting equipment, its use, construction and maintenance.</p>
7.	<p>Safe Working Practices</p> <p>Safe working practices in machinery rooms and other enclosed spaces.</p>
8.	<p>Management of Electrical Equipment</p> <p>Safe and efficient operation and maintenance of electrical equipment.</p>
9.	<p>Propeller Shaft System</p> <p>Constructional details of shafting, stern tubes, stern bushings and methods of securing them; constructional details of controllable- and fixed-pitch propellers and propeller shafts.</p>
10.	<p>Rudders</p> <p>Methods of supporting the rudder, constructional details of rudder and pintles.</p>
11.	<p>Hydraulic Systems</p> <p>Principles of operation and maintenance of pneumatic, hydraulic and electronic governors.</p>
12.	<p>Refrigeration Systems</p> <p>Working principles of operation and maintenance of refrigeration systems.</p>
13.	<p>Ship Construction</p> <p>Elementary knowledge of ship construction, stability book and terminology used.</p>
14.	<p>Deck Machinery</p> <p>Operation and maintenance of cargo handling equipment and deck machinery.</p>

34.8 Engineering Knowledge, Motor

ITEM	COLUMN
1.	Principles and Construction of ICEs Working principles and constructional details of marine diesel engines, gears, clutches and associated equipment and their seatings.
2.	Cooling Systems Cooling systems for diesel engines and their protection from damage by freezing and corrosion.
3.	Oil Fuel and Lubrication Fuel and lubricating oil systems; properties of fuel and lubricating oil used in diesel engines.
4.	Compressed Air Systems Constructional details and working principles of compressed air systems; starting and reversing systems for diesel engines.
5.	System Control Diesel engine controls, protective devices and remote sensing and monitoring.
6.	Management of Diesel Engines Operation and maintenance of diesel engines; determination of engine power.
7.	Power Balance Adjusting of fuel pumps, injectors, valves and power balancing of diesel engines.
8.	Automation and Alarms A general understanding of the basic operation of automatic controls and alarms, in particular definitions.

34.9 Oral Examination

ITEM	COLUMN
1.	General Practical knowledge, with particular reference to the applicant's answers in the written examination; may include questions on the water gauge and safe working practices.
2.	Ship's Business Subjects relating to the general aspects of regulations and ship's business, including: Oil Pollution Prevention Regulations extended to include interpretations and ship's responsibilities under them; organization of crew for emergencies, drills and routine operations and maintenance; ship's responsibilities under Boat and Fire Drill Regulations, Crewing Regulations, and Ship's Deck Watch Regulations; <i>Canada Shipping Act</i> and regulations made thereunder with respect to grades and classes of certificates of competency, rights of holders of certificates, offences relating to certificates, losses of certificates, and seafarers' rights concerning wages; official and ship's logbooks, and their entries under all conditions; <i>Canada Labour Code</i> , Occupation Health and Safety Regulations.