



**THE MASTERS AND MATES EXAMINATION REGULATIONS
1952, AMENDMENT NO. 4**

COBHAM, Governor-General

ORDER IN COUNCIL

At the Government Buildings at Wellington this 6th day of October 1958

Present:

THE HON. C. F. SKINNER, M.C., PRESIDING IN COUNCIL

PURSUANT to the Shipping and Seamen Act 1952, His Excellency the Governor-General, acting by and with the advice and consent of the Executive Council, hereby makes the following regulations.

REGULATIONS

1. (1) These regulations may be cited as the Masters and Mates Examination Regulations 1952, Amendment No. 4, and shall be read together with and deemed part of the Masters and Mates Examination Regulations 1952* (hereinafter referred to as the principal regulations).

(2) These regulations shall come into force on the day after the date of their notification in the *Gazette*.

(3) Notwithstanding anything in these regulations, candidates who are serving in home-trade vessels in a qualifying capacity for first mate (foreign going), or master (foreign going) at the commencement of these regulations, may complete that service as if these regulations had not been made.

2. (1) Regulation 25 of the principal regulations is hereby amended by inserting, after the words "grade of certificate", the words "or endorsement".

(2) Regulation 25 of the principal regulations is hereby further amended by adding the following words:

"XII. Voluntary Examination in Compass Deviation

<i>First Day—</i>	Hours	Marks	Percent- age Pass
Magnetism and Electricity, including Magnetic Compass	4	200	50
<i>Second Day—</i>			
Magnetic Compass	3½	200	50"

*S.R. 1952/147

Amendment No. 1: S.R. 1953/110

Amendment No. 2: S.R. 1957/155

Amendment No. 3: S.R. 1958/57

3. Regulation 27 of the principal regulations is hereby amended by adding the following subclause:

“(4) Applicants for master’s (foreign-going) examination are required to show all their sea service on the application form Exn. 2, and to produce service certificates and watchkeeping certificates for all sea service subsequent to obtaining their second mate’s (foreign-going) certificate.”

4. Regulation 46 of the principal regulations is hereby revoked.

5. (1) The principal regulations are hereby amended by revoking regulation 63, and substituting the following regulations:

“SERVICE IN FOREIGN-GOING VESSELS

“63. (1) For foreign-going certificates the term ‘sea service’ means, unless otherwise stated, service performed in foreign-going vessels.

“(2) Watchkeeping service performed on a ship on foreign-going articles will be accepted in full if the vessel has proceeded outside home-trade limits during the course of the voyage.

“(3) Where a voyage has been made in the home-trade limits as a preliminary to or at the finish of the foreign-going voyage, the home-trade voyage shall be considered part of the foreign-going voyage for the purpose of calculating watchkeeping service in the case of officers who have served throughout.

“(4) Where the officer serves on the home-trade voyage but does not serve on the foreign voyage, the home-trade voyage shall be considered part of the foreign-going voyage for the purpose of calculating watchkeeping service, provided the total allowance for that voyage or those voyages does not exceed an overall maximum of three months for first mate or six months for master.

“SERVICE IN HOME-TRADE VESSELS

“63A. (1) The equivalent rates for service in the home trade for admission to certificates of competency (foreign going) are as follows:

“(a) Service in home-trade vessels of 1,600 tons gross and over shall count in full:

“(b) Service in vessels of 500 tons gross and over, but less than 1,600 tons gross, shall count in full where the most distant ports visited are at least 500 miles apart. Where the most distant ports are less than 500 miles apart, service will count at two-thirds rate:

“(c) Service in vessels less than 500 tons gross in the home trade shall count at two-thirds rate:

“(d) Service in a capacity lower than first watchkeeping officer on regular runs between near neighbouring ports which take less than two watches shall not be accepted for foreign-going certificates.

“(2) Candidates for a certificate of competency as first mate (foreign going) or master (foreign going) must have actual foreign-going service as provided for in regulations 119 and 121 respectively of these regulations.

“(3) The service indicated in paragraphs (a) to (d) of subclause (1) of this regulation shall count at full rate for home-trade certificates.”

(2) The principal regulations are hereby amended by inserting, before regulation 64, the following heading:

“DISCREPANCIES IN CERTIFICATES, AND INSUFFICIENT SERVICE”

6. The principal regulations are hereby amended by revoking regulation 67, and substituting the following regulation:

“67. Service in ships trading exclusively abroad may be accepted either in full or at two-thirds rate on the same basis as that for home trade in regulation 63A of these regulations. Ships so employed shall not normally be regarded as foreign-going ships, unless the most distant ports visited are at least 500 miles apart.”

7. The principal regulations are hereby amended by revoking regulation 70, and substituting the following heading and regulation:

“WATCHKEEPING SERVICE

“70. (1) Where watchkeeping service is required, candidates must prove by production of certificates that during the whole period claimed they have been in full charge, or in effective charge, of a watch for not less than eight hours out of every 24 hours’ service claimed.

“(2) For the purposes of subclause (1) of this regulation, the expression ‘Effective charge of a watch’ means responsibility for the watch but does not preclude occasional supervision by a senior officer, provided the senior officer does not at any time take charge of the watch. Where the senior officer does take charge, the watch is doubled and the fact should be noted for entry in the certificate of watchkeeping service.

“(3) An officer who is the junior of two officers keeping doubled watches during a voyage may count towards the qualifying service for first mate under regulation 119 (2) of these regulations and for master under regulation 121 (2) (a) of these regulations, two-thirds of the watchkeeping time so served, up to a maximum of nine months (i.e., 13½ months’ actual service). The exact nature of a candidate’s service must be clearly established by one or more certificates signed by the master in the form indicated in the Second Schedule hereto.”

8. The principal regulations are hereby amended by revoking regulation 71, and substituting the following heading and regulation:

“SERVICE WITH ADDED RESPONSIBILITY

“71. (1) Where watchkeeping service is required to be performed as equivalent to not lower than third of three watchkeeping officers on a foreign-going ship, such service may be performed in the foreign or home trade.

“(2) Candidates for master’s certificate (foreign going) whose watchkeeping service is performed in a higher capacity than second or third watchkeeping officer while holding a first mate’s (foreign-going) certificate shall have such service reckoned—

“(a) If as first watchkeeping officer next in seniority to the master, at one and a half times actual service:

“(b) If as first watchkeeping officer not next in seniority to the master, or as the second of two watchkeeping officers, at one and one-fifth times actual service.”

9. Regulation 86 of the principal regulations is hereby amended as follows:

- (a) By inserting in paragraph (a), before the words "foreign-going certificate", the words "second mate's":
- (b) By omitting from paragraph (a) the words "twenty-seven months".

10. Regulation 87 of the principal regulations is hereby amended as follows:

- (a) By omitting from paragraph (b) the words "regulation 63", and substituting the words "regulation 63A (1) (c)":
- (b) By omitting from subparagraph (i) of paragraph (b) the words "twenty-seven months".

11. Regulation 116 of the principal regulations is hereby amended by revoking subclause (2), and substituting the following subclause:

"(2) He must have served four years at sea on foreign-going ships or equivalent service as provided for in regulation 63A of these regulations."

12. The principal regulations are hereby amended by revoking regulation 119, and substituting the following regulation:

"119. (1) A candidate for a certificate as first mate of foreign-going ship must not be less than twenty-one years of age.

"(2) He must have served five years at sea on foreign-going ships or equivalent service as provided for in regulation 63A of these regulations. This period of sea service must include not less than one year on a foreign-going ship in a capacity not lower than third of three watch-keeping officers while holding a certificate as second mate (foreign going)."

13. Regulation 121 of the principal regulations is hereby amended by revoking subclause (2), and substituting the following subclause:

"(2) He must have served seven years at sea on foreign-going ships or equivalent service as provided for in regulation 63A of these regulations. This period must include—

"(a) Not less than two years on a foreign-going ship in a capacity not lower than third of three watchkeeping officers while holding a certificate not lower than second mate (foreign going); and

"(b) Not less than 18 months on a foreign-going ship in a capacity not lower than third of three watchkeeping officers while holding a certificate not lower than first mate (foreign going) or equivalent sea service as provided for in regulations 63A and 71 of these regulations."

14. The principal regulations are hereby amended by revoking regulation 151, and substituting the following regulation:

"SPECIAL REQUIREMENTS

"151. (1) A candidate must be not less than twenty-one years of age and, unless a certificate of physical fitness is produced, not more than sixty-five years of age.

“(2) He must produce proof of not less than two years’ service in a deck capacity on, or in charge of, a vessel plying at sea or on a navigable lake or in a harbour or in river limits or extended river limits.

“(3) Not less than 12 months of the qualifying service required must have been served during the 15 years preceding the date of examination.

“(4) A candidate who already holds a higher grade of certificate of competency shall be examined in the letter test portion of the eyesight test. He may also be examined in any of the subjects given in regulation 153 (b) of these regulations which are not included in the syllabus of the certificate of competency which he holds.”

15. Regulation 153 of the principal regulations is hereby amended by revoking subparagraphs (vi) to (viii), and substituting the following paragraphs:

“(vi) Knowledge and use of the mariner’s compass.

“(vii) Knowledge and use of the lifesaving appliances and fire-fighting appliances required for this class of ship.

“(viii) The use and maintenance of deck appliances and steering gear.

“(ix) Accidents: beaching, running aground, fires, leaks, handling a disabled ship, taking the ground alongside or at moorings.

“(x) Anchors and anchor work, towing and being towed. Handling ship in stormy weather.

“(xi) Knowledge of R/T distress call procedure. Care and maintenance of R/T equipment.

“(xii) Danger of free-water surfaces on the stability of a vessel.

“(xiii) Particular knowledge of the class of vessel candidate is expected to be employed in.

“(xiv) Particular knowledge of the locality in which candidate is intended to be employed, i.e., river limits, extended river limits, e.g., navigational dangers, aids to navigation, clearing marks (day and night), transit bearings. Navigating and towing in particular channels and fairways. Navigating in low visibility.

“(xv) Knowledge of the class of engines and auxiliaries in general use in ships not exceeding 10 tons register propelled by mechanical power other than steam.

“(xvi) Any question relating to the duties of the master of this class of ship which the examiners may consider necessary to ask.”

16. Regulation 168 of the principal regulations is hereby amended as follows:

(a) By omitting the words “mate of any grade”, and substituting the words “first mate”;

(b) By omitting the words “or first mate”.

17. The principal regulations are hereby amended by revoking regulation 170, and substituting the following heading and regulation:

“SYLLABUS

“170. The syllabus for the voluntary examination in compass deviation is as follows:

(a) **Written Examination**

**PAPER 1—MAGNETISM AND ELECTRICITY, INCLUDING
MAGNETIC COMPASS. (Four hours)**

(a) *Magnetism*—

(i) Magnetic properties of materials, induction, susceptibility, and permeability. Magnetic effects of electric currents, including calculations.

(ii) Terrestrial magnetism, dip, total force, horizontal force, and vertical force. Effects on the deviation of the compass accompanying changes in the value of these elements. Variation.

(iii) Ship's magnetism. Hard and soft iron. Permanent, sub-permanent, and induced magnetism. Components P, Q, R, the rods a, b, c, d, e, f, g, h, k. The approximate coefficients A, B, C, D, E. Heeling errors, λ , λ_2 and μ .

(b) *Electricity*—

(i) Electrical currents and their production. Simple cells. Polarisation, electro-motive force, resistance and current.

(ii) Ohms law. Kirchoff's laws, Lenz's law, Faraday's law.

(iii) Elementary principles of dynamos and motors.

PAPER 2—MAGNETIC COMPASS. (Three hours and a half)

(a) *Compass Design*—General principles with special reference to—

(i) Size and relative position of compass needle.

(ii) Location of soft-iron correctors, and permanent magnets, with reference to each other and to the compass needles with due regard to standard binnacles of all types, overhead compasses, and pole compasses, and the probable effects if conventional limits are not complied with.

(iii) Relative position of lubber line, card, pivot, and gimbal axes.

(iv) Types of quadrantal correctors used in Commonwealth and foreign ships; their advantages and disadvantages.

(b) The siting and lining up of compasses with due regard to the proximity of magnetic material, electrical devices, and other disturbing influences. Magnetic screening. Meaning of λ , μ , and ship's multiplier. How to find and use these quantities.

(c) *Compass Compensation*—

(i) Various methods of swinging ship to obtain a deviation table. Construction of a curve of deviations and its practical use in coefficient analysis. Constant, semi-circular, and quadrantal deviation. Analysis of a deviation book of a foreign-going ship to determine causes of irregular deviations, and suggest measures for their removal. Analysis of a table of deviations obtaining and explaining the approximate coefficients A, B, C, D, and E. General principles of compass correction and methods of finding and compensating A, B, C, D, and E types of deviation. The relation severally of the components P, Q, and R, and the rods a, b, c, d, e, f, g, h, and k, to the various coefficients and to heeling error.

(ii) Compensation by use of the Kelvin deflector. Principle of the deflector method and information which can be deduced from the readings. Limits of accuracy of the results obtained.

(iii) Rules to be followed for placing the correctors. Safe-distance information, and M.O.T. notices affecting ships' compasses.

(iv) Local attraction.

(v) Detection of errors in instruments.

(vi) The theory of degaussing in ships fitted with M coils and compass compensation by means of corrector coils, including heeling-error coils.

(vii) Knowledge of the Compass Regulations in New Zealand. The relations between a master (or pilot) and the adjuster.

(b) **Practical Examination**

(a) Candidates are required to demonstrate on a deviascope or other suitable apparatus the principle of compass adjustment. They will be required to adjust a dry-card compass or a spirit compass using the vertical-force instrument in the correction of heeling error. They will be required to have a thorough knowledge of the method of detecting faults in instruments, such as sagged needles, cracked sapphires, bent or damaged pivots, hairs on edge of dry card, faulty binnacles, spheres too high or too low, Flinders bar wrong height, bowls not free in gimbals, faulty heeling-error conditions; and how such faults should be dealt with.

(b) Candidates must be able to demonstrate how a mass of soft iron would be magnetised lying in the earth's magnetic field in different parts of the world or under the influence of permanent magnets.

(c) Candidates will be required to have a knowledge of the different methods of taking bearings and of using and testing a pelorus and an azimuth mirror.

(d) Use of the Kelvin deflector in compass adjustment. Use of the oscillating magnetometer to find lambda.

The examiner may ask any other question he consider necessary arising out of the written part of the examination or appertaining to the duties and responsibilities of a licensed compass adjuster in New Zealand."

18. Appendix I to the principal regulations is hereby amended as follows:

(a) By omitting from the part that relates to certificates as second mate (foreign going) the expression "6 H", and substituting the words "equivalent service":

(b) By omitting so much thereof as relates to certificates as first mate (foreign going), and substituting the words—

"FIRST MATE (FOREIGN GOING)

Minimum age, 21 years. Minimum sea service, 5r or equivalent service, of which 1 year must be in a capacity not lower than third of three watchkeepers in a foreign-going ship while holding a second mate's (foreign-going) certificate."

(c) By omitting from the heading to the part that relates to certificates as master or extra master (foreign going) the words "EXTRA MASTER":

- (d) By omitting from the same part the expression " $10\frac{1}{2}H$ ", and substituting the words "equivalent service, of which 2 years must be in a capacity not lower than third of three watchkeepers in a foreign-going ship while holding a certificate not lower than a second mate's (foreign-going) certificate, and in addition $1\frac{1}{2}$ years in a capacity not lower than third of three watchkeepers in a foreign-going ship or equivalent service, while holding a first mate's (foreign-going) certificate."

19. Appendix II to the principal regulations is hereby amended by adding to Part II the following specimen sets of examination papers for the voluntary examination in compass deviation:

"Voluntary Examination in Compass Deviation

MAGNETISM AND ELECTRICITY, INCLUDING MAGNETIC COMPASS

Paper 1. (Four hours)

CANDIDATES must attempt questions 1 and 2, and FIVE of the remainder.

Questions 1 and 2 carry 40 and 35 marks respectively, the remainder carry 25 marks each.

1. A ship after adjusting at N.Y. ($H = 0.166$, dip = 73°) had the following correctors in place at the standard compass: Spheres athwartships in a position to correct a coefficient D causing 3° deviation; Flinders bar on fore side of compass of sufficient length to correct an induced B causing $3\frac{1}{2}^\circ$ deviation; and athwartships magnets, red ends to port, of sufficient strength to correct a coefficient C causing 6° deviation. On swinging for residual deviation none was found on any point. It was also known that the values of coefficients A and E were negligible.

On arriving at Mollendo, South America ($H = 0.29$, dip = 0°), it was found that coefficient $-B$ had developed causing 2° deviation on east by compass. This was corrected by a permanent magnet and the Flinders bar removed. What deviation, if any, might be expected on east by compass at San Antonio ($H = 0.25$, dip = -30°)?

2. The following Kelvin deflector readings were obtained aboard a tug vessel: On N, 24.7; on E, 19.7; on S, 28.3; and on W, 30.6. The compass was previously taken ashore and deflected with a reading of 27.2. Assuming coefficients A and E to be zero, find the remaining approximate coefficients and estimate the deviation on NW. What is the approximate value of λ ?

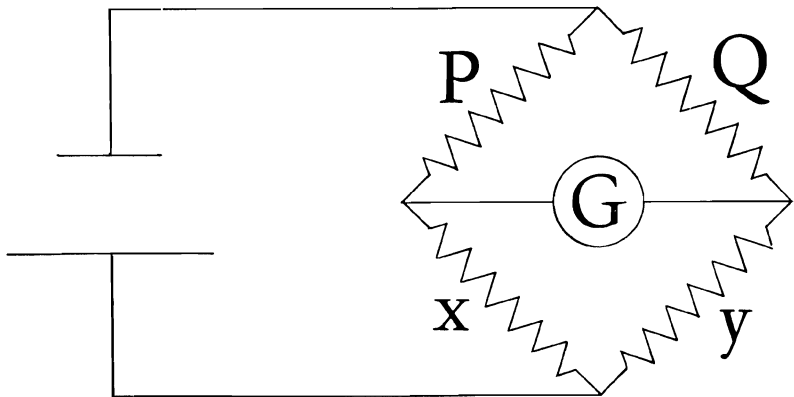
3. At place A, $H = 0.185$ oersteds, $Z = 0.447$ oersteds, the heeling error when a ship was heeled 10° to starboard and heading N 40° W was 6° W. This was compensated with a permanent magnet.

At place B, $H = 0.278$ oersteds, $Z = 0$, the heeling error when heeled 6° to starboard and heading S 10° E was found to be $1\frac{1}{2}^\circ$ W and the permanent magnet was adjusted accordingly.

What heeling error, if any, might be expected at place C, $H = 0.185$ oersteds, $Z = -0.5777$ oersteds, when heeled 8° to port heading N 30° E?

(Consider only the semicircular part of the heeling error and neglect the effect of λ .)

4. The value of λ before and after the correction of coefficient D was 0.75 and 0.80 respectively. Calculate the maximum deviation corrected by the spheres when they are correctly placed. It is known that the proper position of the spheres is athwartships.
5. A magnet of effective length 10 cm and whose moment of inertia about a vertical axis through its centre of gravity was 144 gm/cm^2 had a period of oscillation in the horizontal plane in the earth's field of 11.5 seconds. When used in a magnetometer experiment at the same place the magnet caused a mean deflection of the needle of 20° when placed end on with its mid-length point 20 cm from the needle. What was the value of the horizontal component of the earth's magnetic field at the place?
6. If the current through a coil having an inductance of 0.5 henry is reduced from 5 amp to 2 amp in 0.05 seconds, calculate the mean value of the e.m.f. induced in the coil.
7. A vertical funnel is 10 metres high, one metre in diameter, and its plating is 0.5 cm thick. Calculate the intensity of magnetisation and the magnetic moment of the funnel given $H = 0.18$ gauss, dip = 60° , susceptibility of steel = 12.
8. P and Q , the ratio arms of a Wheatstone Bridge are intended to have values of 50 and 500 ohms respectively. Q is known to be accurate but P has an error of unknown value. To overcome this in determining the value of x , two measurements are taken. In the first with the connections as shown in the figure, a balance is obtained when $y = 2,500$ ohms. In the second, with the resistors P and Q interchanged but without any other alteration to the circuit a balance is obtained when $y = 30.25$ ohms. Calculate the value of x and the actual value of P .



MAGNETIC COMPASS

Paper 2. (Three hours and a half)

CANDIDATES must attempt questions 1 and 2, and FIVE of the remainder.

Questions 1 and 2 carry 40 and 35 marks respectively, the remainder carry 25 marks each.

1. From the following data calculate the approximate coefficients and construct a suitable table of deviations:

Date at ship 3 July 1958, D.R. position $50^{\circ} 00'N$, $165^{\circ} 00'E$.

Ships Head by Standard Compass	Sun's Compass Bearing	A.T.S.
N	S 74° W	1520
NE	S 75° W	1530
E	S 74° W	1538
SE	S $81\frac{1}{2}^{\circ}$ W	1559
S	N 89° W	1611
SW	N $84\frac{3}{4}^{\circ}$ W	1626
W	N $88\frac{1}{2}^{\circ}$ W	1634
NW	N 89° W	1647

If the correctors were found to be placed as follows, what alteration, if any, should be made to the position or placing of the correctors in order to remove the deviations found?

Fore and aft magnets, red pole forward. Athwartship magnet, red pole to port. Spheres slewed 10° , port sphere forward. The spheres were known to be correcting a total quadrantal error of 12° .

2. (a) Explain how the ship's multiplier is found, and of what practical use it is.
 (b) At a position X ($H = 0.20$, $dip = 70^{\circ}$) the vertical-force instrument was levelled ashore with the sliding weight at 30 divisions from the centre. How should the weight be reset at position Y ($H = 0.15$, $dip = -50^{\circ}$) for the proper correction of heeling error on board? (Ship's multiplier = 0.8.)
3. Discuss briefly the principal sources of error when using a deflector for compass correction. (Mathematical investigation is not required.)
4. A vessel is found to require no heeling-error magnets when the standard compass is adjusted in Auckland:
 (a) Describe the changes, if any, which might be expected to take place in the heeling error on a voyage to Montreal.
 (b) If during the voyage it was found necessary to insert heeling-error magnets, state, giving reasons, which end up the magnets would probably require to be placed and what precautions should be taken due to the adjustment.
5. How may a Table of Deviations be constructed by use of the reciprocal bearing method? Give full details, including the layout of a form suitable for registering observations, and insert a number of typical entries.
6. Define coefficient lambda. What are its uses in compass work? What precautions should be taken when making observations on board to evaluate lambda? Give the method of evaluation in detail. Explain how lambda is related to coefficient D.

7. Describe how you would swing and adjust a 10,000-ton vessel of five years old, in Wellington. Give details of the statutory requirements after adjustment, and the least deviation allowed after adjustment under the Compass Regulations.
8. Explain, with the aid of sketches, how heeling and pitching errors due to a, c, k, e, and f rods are corrected at the compass position."

T. J. SHERRARD,
Clerk of the Executive Council.

Issued under the authority of the Regulations Act 1936.
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These regulations are administered in the Marine Department.