

NAVY DEPARTMENT
OFFICE OF THE CHIEF OF NAVAL OPERATIONS

Washington, D. C.

31 January 1947

MEMORANDUM FOR CAPTAIN RHODES

I am forwarding copies of the Navy's proposed qualifications for the cryptographer series for professional and sub-professional grades. At the present time these papers are in the Secretary's Office being studied by the civilian personnel section and have not yet gone to Civil Service, as I incorrectly informed you they had.

I have advised the Secretary's Office that the War Department is preparing similar qualifications to fill its needs and that it would be advisable for the two Departments to reconcile any differences and submit their recommendations to the Civil Service Commission simultaneously.

These papers are spare copies and need not be returned. Hope they will be of some assistance to you.

/s/ L. F. Safford
L. F. SAFFORD
Captain, U.S.N.

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TAB A



Minimum Qualifications for Cryptographer Series.

P-1. Three years of progressively responsible experience of the types listed below, which demonstrates ability to assemble, analyze, and interpret data in the field of cryptographic research, and indicates familiarity with techniques of cryptography.

The applicant's total experience must have been of a type and quality to demonstrate his ability to perform the duties of the position.

P-2	4 years' experience (as described above)
P-3	5 years' experience
P-4	6 years' experience
P-5	7 years' experience
P-6	8 years' experience

Substitution.

Study in a college or university of recognized standing with major work in mathematics, electrical engineering, electronic engineering, or mechanical engineering may be substituted for not more than 5 years of the required experience at the rate of one year of education for nine months' experience. The full five years will be allowed only when the applicant holds a PhD degree.

Examples of Qualifying Experience.

1. Experience in the code room of the Navy Department or another large message center during World War II.
2. Technical duties in a shop devoted to the maintenance and repair of cryptographic equipment.
3. Experience in the design, development, and test of cryptographic equipment during World War II.

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4. Experience in the preparation of cryptographic aids during World War II.
5. Experience in cryptographic research during World War II.
6. Experience in the solution of the military or diplomatic codes and ciphers used by Germany, Japan, or Italy during World War II.

(NOTE: Similar to "Research Analyst" in Civil Service Department Circular letters - #549, Supplement #1, dtd 8 February 1946)



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Cryptographer - P-1

Grade 1.

400-D. Duties and Responsibilities

Under immediate supervision and with little opportunity for independent or unreviewed action or decision:

- (1) To perform elementary professional and scientific work in the cryptanalytical investigation of codes and ciphers, such work involving experimentation, tests, or observations and requiring the simpler processes of a special technique; preliminary searches of the cryptographic problems, and the preliminary presentation of results; and to perform related work as assigned.
- (2) To perform elementary professional and scientific work in the field of cryptographic engineering, such work involving the design and construction of mechanical and electrical cryptographic devices, including the design and adaptation of ciphering devices to work in conjunction with printing telegraph (teletype) systems, requiring a basic knowledge of electrical or mechanical engineering; preliminary research in the development of new cryptographic devices, and preliminary presentation of diagrammatic results; and to perform related work as assigned.
- (3) To perform elementary professional and scientific work in the field of cryptography, such work involving the compilation of codes and ciphers, including in the latter category both electro-mechanical cryptographic systems, and those of a non-electrical and non-mechanical nature; the preparation of cipher tables for the foregoing systems, requiring a basic knowledge of the science

of cryptography; the testing of code and cipher systems in order to determine whether specifications are met; and to perform such related tasks as are assigned.

Examples of Work Performed.

Under immediate supervision:

- (1) To investigate cipher systems cryptanalytically, including cipher devices used in conjunction with printing telegraph (teletype) systems; to perform technical work in the preparation of various tables, frequency counts, etc.; and to test and operate machines and equipment as directed.
- (2) To design and construct mechanical and electrical cryptographic equipment; to perform technical work in the preparation of various sketches and diagrams; and to test new cryptographic devices.
- (3) To prepare codes and cipher tables to meet certain predetermined requirements; to perform technical work in the preparation of various cipher alphabets and key lists; and to test ciphers and codes for usability.

Cryptographer - P-2

Grade 2.

400-D - Duties and Responsibilities.

Under general supervision, with limited latitude for independent or unreviewed action or decision, individually, or with trained assistants:

- (1) To perform important routine professional and scientific work in the cryptanalytical investigation of codes and ciphers, and in the testing and operation of code and cipher equipment, such work requiring the processes of a special technique, understanding of basic cryptographic principles, and an intelligent presentation of results; and to perform related work as assigned.
- (2) To perform important routine professional and scientific work in cryptographic engineering, such work involving the design and construction of mechanical and electrical cryptographic devices, including the design and adaptation of ciphering devices to work in conjunction with printing telegraph (teletype) systems, requiring a knowledge of electrical and mechanical engineering; to conduct research in the development of new cryptographic devices, and to present results in the form of diagrams; and to perform related work as assigned.
- (3) To perform important routine professional and scientific work in the field of cryptography, such work involving the compilation of codes and ciphers including ⁱⁿ the latter category both electro-mechanical cryptographic systems and those of a non-electrical and non-mechanical nature; the preparation of classi-

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wired wiring diagrams and cipher tables for the foregoing systems,

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requiring a knowledge of the science of cryptography; the testing of code and cipher systems in order to determine whether specifications are met; and to perform such related tasks as are assigned.

Examples of Work Performed.

Under general supervision:

- (1) To investigate cipher systems cryptanalytically, including cipher devices used in conjunction with printing telegraph (teletype) systems, analyze the problems, and present the results to his immediate superior; to test and operate cipher machines; and to demonstrate ability to do productive research work and to apply effectively the results of research.
- (2) To design and construct mechanical and electrical cryptographic equipment, including the design and adaptation of ciphering devices to work in conjunction with printing telegraph (teletype) systems; to perform technical work in the preparation of various sketches and diagrams; and to modify and improve present cryptographic devices.
- (3) To prepare codes and cipher tables to meet certain predetermined requirements; to perform technical work in the preparation of wiring diagrams and cam contour diagrams for employment in certain electrical and mechanical cipher devices; to make minor modifications in the form and content of existing codes and ciphers.

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Cryptographer - P-3

Grade 3.

400-D - Duties and Responsibilities

Under general supervision, with considerable latitude for independent or unreviewed action or decision, individually or with trained assistants:

- (1) To perform responsible professional^{al} and scientific work of moderate difficulty and importance in the cryptanalytical investigation of codes and ciphers, including cipher devices used in conjunction with printing telegraph (teletype) systems; or to have charge of and develop an ordinary cryptographic project or several minor projects; and to perform related work as assigned.
- (2) To perform responsible professional and scientific work of moderate difficulty and importance in the design and construction of mechanical and electrical cryptographic devices, including the design and adaptation of ciphering devices to work in conjunction with printing telegraph (teletype) systems; or to have charge of and develop an ordinary project in the construction of cryptographic equipment; and to perform related work as assigned.
- (3) To perform responsible professional and scientific work of moderate difficulty and importance in the compilation of codes and ciphers including in the latter category both electro-mechanical systems and systems of a non-electrical and non-mechanical nature; the preparation of classified wiring diagrams and cipher tables for the foregoing systems requiring a thorough

knowledge of the science of cryptography; the study of the

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general characteristics of certain cipher systems as a guide to future planning of systems of the type studied; to supervise personnel engaged in the compilation of codes and ciphers; and to perform related tasks as assigned.

Examples of Work Performed.

Under general supervision:

- (1) The cryptanalytical investigation, development, and test of cryptographic systems, particularly modern machine ciphers, including cipher devices used in conjunction with printing telegraph (teletype), with a view to their inherent security and suitability for Naval use; the investigation of principles of cipher solution with a view to devising means by which such attacks can be blocked; and the demonstration of ability to do productive research and to apply effectively the results of research.
- (2) To investigate, design, construct, and develop electrical and mechanical cryptographic devices, including the design and adaptation of ciphering devices to work in conjunction with printing telegraph (teletype) systems; to conduct tests of cryptographic devices presented to the U. S. Navy by private inventors; and to modify and improve present cryptographic equipment.
- (3) To prepare codes and ciphers to meet predetermined requirements, and to devise methods for such preparation; to perform technical work in the examination of new cryptographic systems in order to determine their points of strength and weakness; to modify existing codes and ciphers in order to enhance their value both from the point of view of practicability and security.



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Cryptographer - P-4

Grade 5

400-D - Duties and Responsibilities.

Under general supervision, with wide latitude for independent or unreviewed action or decision, individually or with trained assistants:

(1) To perform difficult and responsible professional and scientific work in the cryptanalytical investigation of codes and ciphers, including cipher devices used in conjunction with printing telegraph (teletype) systems; or to have responsible charge of and develop a scientific project of importance; or to serve as the principal assistant to a Grade 5 or Grade 6 scientist in charge of a section, with responsibility for sharing with him the direction and control of the scientific and administrative work of the unit and for assuming his full duties in his absence; and to perform related work as assigned.

(2) To perform difficult and responsible professional and scientific work in the field of cryptographic engineering, including the design and adaptation of ciphering devices to work in conjunction with printing telegraph (teletype) systems; or to have responsible charge of and develop a scientific project of importance; or to serve as principal assistant to a Grade 5 or Grade 6 scientist in charge of a section, with responsibility for sharing with him the direction and control of the scientific and administrative work of the unit, and for assuming his full duties in his absence; and to perform related work as assigned.



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(3) To perform difficult and responsible professional and scientific work in the field of cryptography, including the origination of methods for the compilation of codes and ciphers, the latter category including both electro-mechanical systems and those of a non-electrical and non-mechanical nature; the origination and formulation of procedures for the preparation of all types of code and cipher systems in present use and those which will be devised in the future, requiring an expert knowledge of the science of cryptography; the supervision of a sub-section involved in the preparation of codes and ciphers; or to serve as the principal assistant to a Grade 5 or Grade 6 scientist in charge of a section, with responsibility for sharing with him the direction and control of both scientific and administrative work of the section and capable of relieving him in his absence; and to perform related work as assigned.

Examples of Work Performed.

Under general supervision, with wide latitude for independent or unreviewed action:

(1) To investigate, develop, and test, cryptanalytically, code and cipher systems (particularly, machine ciphers), including cipher devices used in conjunction with printing telegraph (teletype) systems, with a view to their inherent security and suitability for Naval use; to investigate principles of cipher solution with a view to devising means by which such attacks can be blocked; to train and supervise personnel; to be qualified to



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state to higher authority, when the security of our Naval cipher systems is questioned, whether the alleged deficiencies are real or imaginary, and to present methods of overcoming any real deficiencies; to be in charge of the sub-section with responsibility for direction and control of that unit.

(2) To design and construct electrical and mechanical cryptographic devices, including the design and adaptation of ciphering devices to work in conjunction with printing telegraph (teletype) systems; to modify and improve current cryptographic equipment; to conduct research and tests in the development of new cryptographic devices; to conduct tests of cryptographic devices presented to the U. S. Navy by private inventors; to keep up with all cryptographic developments, principles and methods; to be in charge of the sub-section with responsibility for direction and control of that unit.

(3) To supervise and direct a sub-section involved in the processes of compilation of codes and ciphers; to originate and perfect new methods for the preparation of existing cryptographic systems; to design methods for performance of the cryptographic processes involved in the preparation of newly developed cryptographic systems.

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Cryptographer - P-5

Grade 5.

400-D - Duties and Responsibilities.

Under general administrative supervision, with wide latitude for independent or unreviewed action or decision, to plan, and individually or with trained assistants:

(1) To carry out and report upon unusually difficult, important and responsible professional and scientific work in the field of cryptographic research, including cipher devices used in conjunction with printing telegraph (teletype) systems; or to have responsible charge of and develop a scientific project of considerable importance; or to serve as scientific and administrative head of a sub-section in cryptographic research; or to serve as principal assistant to a Grade 6 scientist with responsibility for sharing with him the direction and control of the scientific and administrative work of the unit and for assuming his full duties in his absence; or to furnish for final executive action, highly expert critical advice on highly important scientific problems or policies; and to perform related work as assigned.

(2) To carry out and report upon unusually difficult, important and responsible professional and scientific work in the field of cryptography, including the origination of new cryptographic methods and the formulation of methods and procedures for the preparation of cipher systems employing these methods; or to have



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Responsible charge of a section involved in the preparation of cryptographic aids; or to serve as the principal assistant to a Grade 6 scientist with responsibility for sharing with him direction and control of the scientific and administrative work of the unit and for assuming his full duties and responsibilities in his absence, or to furnish for final executive action highly expert critical advice on important problems or policies in the field of cryptography.

Examples of Work Performed.

(1) To investigate, develop, originate, and test electrical and mechanical cryptographic devices required to meet U. S. Naval requirements, including cipher devices used in conjunction with printing telegraph (teletype) systems; to investigate crypt-analytical principles involving the preparation, solution, and study of test problems and evaluation of U. S. Naval cryptographic systems in terms of the facts disclosed; to study and investigate proposed cryptographic systems or those which come to the knowledge of the U. S. Navy and determine their inherent security and practicability for Naval use; to conduct research and tests for the development of new cryptographic devices; and to supervise assigned cryptanalysts and cryptographic engineers.

(2) To take full charge of a section involved in the preparation of cryptographic aids for use by the U. S. Navy, including the design of cryptographic systems to meet requirements specified by the operating forces; and to direct the operation of field offices engaged in the reproduction of cryptographic aids origin-

ated by his section.

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Cryptographer - P-6

Grade 6.

400-D - Duties and Responsibilities.

Under administrative direction, with wide latitude for independent or unreviewed action or decision, individually or with trained assistants:

(1) To plan, carry out and report upon highly difficult, important and responsible professional and scientific work in the construction of codes and ciphers, and in the design, construction, inspection, testing, operation, and maintenance of code and cipher equipment; and to perform related work as assigned.

(2) To plan, carry out and report upon highly difficult, important and responsible professional and scientific work in the field of cryptography including the complete responsible charge of a section and field offices engaged in the origination of new cryptographic methods, the preparation, reproduction and dissemination of cryptographic systems and the direction of their use within the Naval Service.

Examples of Work Performed.

(1) To originate, investigate, develop, and test electrical and mechanical devices required to meet U. S. Naval communication requirements, including cipher devices used in conjunction with printing telegraph (teletype) systems; to investigate cryptanalytical principles, involving the preparation, solution, and study of test

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problems and evaluation of U. S. Naval cryptographic systems, in terms of the facts disclosed; to study and investigate proposed cryptographic systems, or those which come to the knowledge of the U. S. Navy, and determine their inherent security and practicability for Naval use; to conduct research and tests for the development of new cryptographic devices; to assist and advise other branches of the Federal Government in matters relating to cryptographic communications; and to supervise assigned cryptographers.

(Note: There is no objection to the Cryptographer P-6 job description on page 177 of "Preliminary Class Specifications of Positions in the Field Service." The examples of work performed as stated above are more in keeping with the present Cryptographer P-6's position).

(2) To have complete responsible charge of the section and its field offices which originates, compiles and reproduces cryptographic aids for the Naval Service and which prepares and disseminates directions for the use of Naval Codes and Ciphers and which controls allowances, distribution, supersession and destruction of all cryptographic aids used within the Naval Service.



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Cryptographic Aide - SP-4.**Duties and Responsibilities.**

Under immediate supervision, with limited latitude for somewhat independent work in carrying out the more routine details, to perform sub-professional work of average difficulty in the cryptanalytical investigation of cipher systems; or to perform the duties of an electrician or machinist in the construction and maintenance of cryptographic equipment; and to perform related work as assigned.

Examples of Work Performed.

(1) In the cryptanalytical investigation of cipher systems, to perform the more routine technical work in the preparation of various tables, frequency counts, etc., to type reports, and to operate cipher machines for specific tests.

Or
(2) Under immediate instruction to perform the duties of an electrician or machinist in the construction, maintenance, and testing of cryptographic equipment, and to prepare to scale the less difficult drawings of machinery by following drawings or sketches previously prepared.

Minimum Qualifications.

(1) Training equivalent to that represented by graduation from high school, with one year's experience in office work, demonstrating accuracy, alertness, and adaptability.

Or

(2) Training equivalent to that represented by graduation from high school, with one year's experience of an electrician or



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machinist, demonstrating an ability to use hand tools and an understanding of the basic principles of electricity.



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Cryptographic Aide - SF-5**Duties and Responsibilities.**

Under general supervision, with some latitude for independent work in carrying out the details involved in prescribed or standard methods, to perform somewhat difficult and responsible sub-professional work in the cryptanalytical investigation of cipher systems; or to perform the duties of an electrician or machinist in the construction and maintenance of cryptographic equipment; and to perform related work as assigned.

Examples of Work Performed.

(1) In the cryptanalytical investigation of cipher systems, to perform somewhat difficult and responsible technical work in the preparation and initial analyses of various tables, frequency counts, etc., to type reports, and to operate cipher machines for tests.

Or

(2) to perform the duties of an electrician or machinist in the construction, maintenance, and testing of cryptographic equipment; to perform technical work in the preparation of simple sketches and diagrams; and to test new cryptographic devices.

Minimum Qualifications

(1) Two years' experience in the field of cryptography, or one year's experience in cryptography and one year's experience in office work, demonstrating facility in the technique of cryptography, accuracy, alertness, and adaptability; and ability to type reports accurately.



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or

(2) Two years' experience as an electrician or machinist, with an ability to construct electrical and mechanical cryptographic equipment from general instructions; and an ability to prepare simple sketches and diagrams accurately.



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Cryptographic Aide - SF-6**Duties and Responsibilities.**

Under general supervision, with considerable latitude for independent work in carrying out the details involved in prescribed or standard methods, to perform difficult and responsible sub-professional work in the cryptanalytical investigation of cipher systems, or in the design, construction, and maintenance of cryptographic equipment, involving the application of a working knowledge of cryptographic principles and requiring a considerable degree of technique; and to perform related work as assigned.

Examples of Work Performed.

(1) In the cryptanalytical investigation of cipher systems, to perform difficult and responsible technical work in the preparation and initial analyses of various tables, frequency counts, etc., in the solution of cryptographic problems; to type reports, and to operate cipher machines for tests.

Or

(2) To perform the duties of an electrician or machinist in the construction, maintenance, and testing of cryptographic equipment; to perform technical work in the preparation of various sketches and diagrams; and to test new cryptographic devices.

Minimum Qualifications.

(1) Training equivalent to that represented by graduation from high school, with three years' experience in the field of cryptography, or two years' experience in cryptography and one year's



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experience in office work, demonstrating facility in the technique of cryptography, accuracy, alertness, and adaptability; and ability to type reports accurately.

Or
(2) Training equivalent to that represented by graduation from high school, with three years' experience as an electrician or machinist with an ability to construct electrical and mechanical cryptographic equipment; and an ability to prepare sketches and diagrams accurately.

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