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POSITION CLASSIFICATION STANDARD FOR NUCLEAR ENGINEERING SERIES, GS-0840

Workforce Compensation and Performance Service

Theodore Roosevelt Building 1900 E Street, NW Washington, DC 20415-8330 Classification Programs Division

Nuclear Engineering Series

GS-0840

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SERIES DEFINITION

This series includes positions that involve professional engineering work which is concerned primarily with the engineering principles and considerations relating to the atomic nucleus and the systems, processes, and materials required for the generation, controlled release, and utilization of nuclear energy. Nuclear engineering work requires the application of professional engineering knowledge in the research, development, design, construction, testing, installation, monitoring, operation and maintenance of nuclear reactors (fission or fusion) and other nuclear systems and immediate auxiliary or ancillary systems and equipment.

This standard supersedes the Position-Classification standard for the Nuclear Engineering Series, GS-840, published in June 1967.

NOTE: The qualification requirements for this occupation are included in the Qualification Standard for All Professional Engineering Series, GS-0800, in the OPM Operating Manual: Qualification Standards for General Schedule Positions.

SERIES COVERAGE

Some operating nuclear engineering work covered by this series includes positions involved in the performance of various tests, analyses, and other professional work that does not require research or experimental development approaches. In general, research positions involve a search for new principles and theories or the extension of established principles and theories with a view toward applying the findings to a general or specific problem. Development positions typically involve the continuous exploitation of basic scientific knowledge to create new or substantially improved equipment, systems, materials, processes, techniques and procedures. Some engineering positions covered by this series are involved in carrying out procedures, tests, and modifying components, methods, or systems, to provide answers as to the operating efficiency and safety of a nuclear reactor system. In differentiating research and development positions from operating or regional and headquarters staff level positions, it may be helpful to consider: (1) the purpose for which the position is established; and (2) the results expected from the work of the nuclear engineer. Many positions are located at research and development installations such as the national laboratories which are operated by private contractors. In most instances, the actual research and development experiments are carried out by contractor engineers. For further discussion please refer to the Research Grade-Evaluation Guide and the Equipment Development Grade-Evaluation Guide.

EXCLUSIONS

Excluded from this series are the following classes of positions:

1. Positions which involve similar but nonprofessional engineering-type work. (See the Introduction to Engineering Group, GS-0800; the Engineering Technician Series, GS-0802; and other appropriate series.)

2. Engineering positions which are located in a nuclear environment, and primarily require the application of nonnuclear engineering knowledge and experience, should be classified to the appropriate series in the Engineering and Architecture Group, GS-0800. For example, engineering positions which require primarily the application of mechanical, electrical, or chemical engineering knowledge and abilities and require only a general familiarity with the nuclear environment or nuclear effects should be classified in the appropriate engineering field such as Mechanical, Electrical, or Chemical Engineering and not the Nuclear Engineering Series, GS-0840.

3. Positions concerned with the application of knowledge and theoretical concepts characteristic of the field of physics, where the work requires primarily, competence as a physicist. These positions are classified to the Physics Series, GS-1310.

4. Positions which involve only the identification and evaluation of radiological hazards with emphasis on the protection of personnel are classified to the Health Physics Series, GS-1306. Mixed positions involving nuclear engineering and radiological control responsibilities may be classified in the Nuclear Engineering Series, GS-0840, when the work consistently requires application of intensive professional nuclear engineering knowledge and competence which increase in depth in relation to the grade level.

5. Positions which involve the identification of conditions affecting the health and efficiency of employees, the elimination of occupational disease hazards and the promotion of an industrial health program directed toward prevention as well as correction of employees' health hazards are classified to the Industrial Hygiene Series, GS-0690.

6. Positions which involve the nonprofessional technical work of accomplishing the containment and control of radioactivity on personnel and equipment, during maintenance work processes (such as repair, overhaul, refueling, testing, and modification) on nuclear power reactors, propulsion systems, plants, and associated areas, environment, and equipment. These positions are classified to the Physical Science Technician Series, GS-1311.

OCCUPATIONAL INFORMATION

Nuclear engineering has been referred to as that branch of engineering which requires such education and experience as is necessary to apply the principles of nuclear physics to the engineering utilization of the nuclear phenomena. It is also concerned with the protection of the public from the potential hazards of radiation and radioactive materials. Nuclear engineering is primarily concerned with the interaction of radiation and nuclear particles with matter. Nuclear engineering requires the application of specialized knowledge of the mathematical and physical sciences, together with the principles and methods of engineering design and nuclear analysis to specify, predict, and evaluate the behavior of systems involving nuclear reactions, and to ensure the safe efficient operation of these systems, their nuclear products and by-products. Nuclear engineering encompasses, but is not limited to, the planning and design of the specialized equipment and process systems of nuclear reactor facilities and the protection of the public from

any hazardous radiation produced in the entire nuclear reaction process. These activities include all aspects of the manufacture, transportation, and use of radioactive materials.

Nuclear engineers in the Federal Service are involved in a variety of professional engineering projects and programs such as: (1) reactor operations, (2) fuel cycle management program, (3) fuel and fuel rod development, (4) control of manufacturing, repair, or maintenance processes, (5) licensing, safety, inspection and incident analysis, (6) compliance with standards or contract provisions, (7) design, instrumentation, and test operations, (8) transportation and storage of radioactive materials and waste, and (9) engineering staff or program responsibilities carried out in a research and development organization. In certain higher level nonsupervisory nuclear engineering positions there are nonengineering considerations which must be addressed. These considerations, in addition to the technical demands, general policies regarding budgetary, and scheduling limitations involve political and social implications which in some instances contribute additional constraints and judgmental demands upon some nuclear engineers.
A nuclear reactor system, used for power or propulsion, includes a number of components similar to those found in nonnuclear power facilities or in other industrial operations, e.g., the chemical industry. Such components as heat exchangers, turbo-generators, switch-gear, coolant systems and water purification systems do not involve the application of significantly different engineering principles, although they do, however, require special attention to certain aspects for nuclear applications due to radiation effects.

A power reactor consists of three essential components, namely, the fuel, the moderator (if the neutrons are to be thermalized), and the coolant. These special engineering features involve consideration of very complex project areas such as establishment of reactor design criteria, fuel-element characteristics, biological shielding systems and reactor coolant systems.

Nuclear engineers because of the interrelationship to other engineering disciplines may receive assignments, over a period of time which involve several engineering fields, such as mechanical, chemical, and electrical. Although some work assignments may involve other engineering disciplines, the work typically and consistently requires application of intensive professional nuclear engineering knowledge and skills. Special engineering features must be provided in the mechanical systems such as the measures taken in refueling operations to prevent exposure to the radiation from spent fuel elements after removal from the reactor. This means that many phases of operation, instrumentation, and maintenance must be performed by remote control. The various remote-control engineering operations, in general, involve the use of established mechanical and electrical principles, but the problems encountered frequently are somewhat unusual in character due to the radioactive environment.

Another unique engineering consideration is the fact that the physical and performance characteristics of some materials and equipment are changed by exposure to radiation. In addition, different engineering considerations must be provided due to the tremendous energies involved in nuclear reaction in comparison to the energies involved in chemical reactions or utilization of fossil fuels. For example, a pound of uranium has the potential energy of 2,600,000 pounds of coal. For these reasons, nuclear engineering principles and technologies, especially those involving the reactor core and the reactor primary and secondary systems,

including all backup emergency safety systems, are governed by procedures, requirements and controls that differ significantly from similar systems not in proximity to radiation effects.

For example, nuclear engineers must:

-- Implement more stringent requirements, closer tolerances, etc., on sealing, welding, purification, and component and system performance;

-- Insure that the materials, components, lubricants, etc., selected will not malfunction, rupture, or deteriorate prematurely under irradiation because removal or repair of items or systems is far more difficult, costly, and time consuming when located within a high radiation environment;

-- Provide appropriate reactor safeguards and shielding not only for the reactor but also for the coolant system and its components;

-- Provide more frequent close on-the-work site engineering direction, consultation, and guidance than in other engineering fields to assure the above exacting standards are applied;

-- Provide detailed engineering procedures that cover all parts of the reactor system and the overall system, minimize the possibility of accidents either as a result of human or mechanical failure, and deal with the anticipated consequences should an incident occur during normal operation.

Most positions covered by the grade-level criteria in this standard are located in naval shipyards, in department and agency headquarters, or in field offices located near national laboratories, and other field installations operated under contract. In the Federal Service, most nuclear engineers are engaged in functions or activities associated with one or a combination of the following:

-- Designing and determining reactor core fuel loadings, fuel enrichments, power and neutron flux distributions in the core, control requirements, behavior with fuel burn-up. Also involved is the determination of fuel temperatures, temperature distributions and instrumentation requirements for safe and efficient operation. In addition to power reactor applications, this function also includes the engineering design of that equipment in facilities utilizing radioactive materials which is unique to the radioactive process or that relates directly to the fission or fusion process to ensure its safe and efficient operation.

-- Analysis and evaluation of the safety and reliability of a plant or process, in particular a nuclear reactor, utilizing radioactive material to ensure its safe operation, the protection of the public and the environment and conformance with all specifications, regulations, and laws. This function also includes the analysis of potential incidents with radioactive materials so that the consequences can be evaluated and procedures developed to prevent or mitigate the occurrence of the incident. Also included are the design of biological and

thermal shields to isolate radioactive material from the environment and the analysis and design of critically safe containers for fissionable material.

-- Research and/or development involving the calculative and theoretical methods to predict and control the fission and fusion process in a safe, efficient manner, the development of alternate processes to utilize nuclear energy to benefit mankind and the selection and evaluation of specific materials of specialized use in the fission and fusion process.

-- Studies of the nuclear fuel cycle aimed at the optimum use of fissionable resources, within engineering design and other constraints, for energy production, as well as the selection and placement of specific fuel materials in a reactor core. This function also includes the storage, handling, transportation and disposal of radioactive waste products in an optimum fashion as to protect the public.

-- Operation, testing, or engineering monitoring of the nuclear related portions of a facility, such as a power reactor utilizing radioactive materials, and the design, performance, and evaluation of tests of the nuclear portion of such facilities to ensure operation within their engineered limits.

-- Consultations to and/or the direction of design groups responsible for the nuclear engineering, safety and evaluation of facilities utilizing radioactive materials, particularly in terms of making technical decisions. This function also involves providing technical advice to engineering groups with regard to any of the functional areas described herein.

-- Planning and overseeing the construction, overhaul, maintenance, repair, modification, operational tests, or refueling of nuclear power systems for vessels.

-- Providing professional nuclear engineering coordination and control over the operation and maintenance of research fission or fusion reactors which are used for investigation of the effects of various types and doses of radiation upon materials, equipment, systems, plants, animals, etc., or for other experiments. This includes providing assistance and services to experimenters and/or providing advice on performing engineering functions involved in maintaining, modifying, and refueling the reactor.

-- Developing new or substantially improved nuclear processes, systems, and techniques which advance the state-of-the-art, e.g., space applications. Managing or monitoring the engineering efforts of contractors and government establishments to produce a new end item e.g., a nuclear power plant, an experimental fusion reactor.

-- Performing certain confirmatory research, licensing, inspection, and regulation of reactor plants and fuel-cycle plants under the cognizance of the Nuclear Regulatory Commission to provide assurance of safety to the public are duties performed by nuclear engineers of the Nuclear Regulatory Commission. (Specific grade-level criteria or benchmarks for these positions are not provided because the Nuclear Regulatory Commission is able to

use the authority of section 161.d of the Atomic Energy Act of 1954, as amended 42 USC 2201 (d), to exempt their employees from the competitive service and the General Schedule classification and pay system.)

Note: The nuclear engineering specialties as used in this standard refers to areas of responsibility which require engineering knowledge and skills in a specialized area. Examples are refueling, reactor operational tests, reactor physics and chemistry, shielding and structural, steam generator systems, developing detailed engineering inspections criteria, primary systems, secondary systems. This listing is not exhaustive.

AUTHORIZED TITLES

"Nuclear Engineer" is the basic title authorized for all positions in this series. Parenthetical specialty titles will not be used. Positions which meet or exceed the criteria of the General Schedule Supervisory Guide for evaluation as a supervisor are titled "Supervisory Nuclear Engineer."

GRADING POSITIONS

The factor level descriptions as provided in this standard may be used to classify nonsupervisory nuclear engineering positions at grades GS-5 through GS-15 in functional areas for which there are no separate grade evaluation guides. Benchmarks as provided in this standard cover nonsupervisory nuclear engineering positions at grades GS-5 through GS-15. Two types of work specifically covered by this standard are:

-- Professional work which is accomplished primarily by application of, modification of, adaptation of, or compromise with standard guides, precedents, methods, and techniques.

-- Professional work which involves staff assignments as technical consultants and advisers and/or program coordinator-reviewers in engineering organizations engaged in or concerned with the preceding type work.

Excluded from the coverage of the grade level criteria in this standard are the following functional areas or categories of positions in the Nuclear Engineering Series, GS-840:

-- Policy analysis positions should be evaluated by reference to the Policy Analysis Grade Evaluation Guide.

-- Valuation: Positions of nuclear engineers who determine the valuation of property, natural resources, or of facilities and costs related to providing services should be evaluated by reference to the GS-0800, Valuation Engineering Grade-Evaluation Guide.

-- Production engineering positions should be evaluated by reference to the GS-0800, Grade-Evaluation Guide for Positions Concerned with Production and by consulting the GS-840 classification standard.

-- Test and Evaluation: Positions limited primarily to planning, performing, evaluating, and reporting of the test of equipment should be evaluated by reference to the Test and Evaluation Engineering Grade-Level Guide, GS 0800.

-- Research positions should be evaluated by reference to the Research Grade-Evaluation Guide. The guide may also be used to evaluate the research portion of mixed positions.

-- Supervisory positions should be evaluated by reference to the General Schedule Supervisory Guide.

-- Positions of nuclear engineers engaged solely in education or training activities should be evaluated by the Grade-Evaluation Guide for Instructor and Specialist Positions Involving Education and Training Work.

-- Development engineering positions, or the development portion of mixed positions, should be evaluated by reference to the Equipment Development Grade-Evaluation Guide and by consulting the GS-0840 classification standard.

EVALUATION NOTES

Nonsupervisory nuclear engineering positions should be evaluated on a factor-by-factor basis, using one or more of the comparable benchmarks or Factor Level Descriptions for the Nuclear Engineering Series, or both, as provided in this standard. Only the designated point values may be used. Total points for the nine factors of a position are converted to a grade by using the following Grade Conversion Table.

All users of this standard should follow the basic rules, procedures, and policies for grading positions found in the Introduction to the Position Classification Standards, Section VII titled, Instructions for the Factor Evaluation System.

A number of professionally qualified nuclear engineers are currently assigned to positions covered by BMK's 9-1 and 12-2. A position that consists of work similar to that described in either of them and filled by an employee possessing less than full professional qualifications is classifiable to the appropriate nonprofessional series.

The following considerations should be helpful in determining whether classification to a professional or a nonprofessional series is appropriate.

The position is classifiable to the Nuclear Engineering Series, GS-840, when the following apply in combination:

a. the position is filled by a professional engineer, and
b. responsible management has indicated that it requires the work to be performed on the basis of professional knowledge of and insight into the physical phenomena and

relationships underlying consideration of the various engineering factors and methods, and

c. the nature of the work permits it to be performed on this basis, and
d. the employing agency's policy or institutionalized practice indicates that the position is to serve as one of the agency's mechanisms for maintaining a pool of professionally qualified nuclear engineers to serve as an important source for higher level, clearly professional nuclear engineering positions, and

e. the position's duties, responsibilities and requirements for knowledge, skills, abilities and other characteristics are those reflected in BMK's 9-1 and 12-2.

GRADE CONVERSION TABLE

Total points on all evaluation factors are converted to GS grade as follows:

GS Grade	Point Range
5	855-1100
6	1105-1350
7	1355-1600
8	1605-1850
9	1855-2100
10	2105-2350
11	2355-2750
12	2755-3150
13	3155-3600
14	3605-4050
15	4055- up

NOTE: The following list of terms commonly used and accepted in the nuclear engineering field is provided to assist users in the correct application of this position classification standard.

GLOSSARY OF NUCLEAR TERMS

FISSION: The process by which energy is released (heat) when a nucleus is divided (fissioned) into two or more parts and the binding energy per nucleon of the parts is higher than that of the original nucleus.

FUSION: The process by which energy is released (heat) when a heavier nucleus is formed by joining two lighter ones and the binding energy per nucleon of the new nucleus is higher than that of original two pieces.

BACKGROUND RADIATION: Radiation unrelated to a specific experiment from terrestrial and extraterrestrial sources such as naturally occurring radioactive elements and cosmic rays.

BREEDER REACTOR: A reactor that produces fissionable fuel as well as consuming it, especially one that creates more than it consumes. The new fissionable material is created by capture in fertile material of neutrons from fission. The process by which this occurs is known as breeding.

The liquid sodium cooled reactor is a type of breeder reactor which uses a mixture of enriched uranium and plutonium oxides in fuel rods to create a chain reaction in the core. Surrounding the fuel rods in each core assembly is a blanket of rods containing enrichment plant tailings or natural uranium and the blanket contains a greater amount of potential fuel material than the fuel in the core. In this type breeder reactor, neutrons move relatively unimpeded in the liquid sodium coolant and bombard the breeding blanket, transforming some of the material into plutonium and other fissionable isotopes that can be reprocessed to make more fuel than is consumed to generate heat.

CERENKOV RADIATION: Light emitted when charged particles pass through a transparent material at a velocity greater than that of light in the material. It can be seen, for example, as a blue glow in the water around the fuel elements of pool reactors.

CHAIN REACTION: A reaction that stimulates its own repetition. In fission chain reactions, a fissionable nucleus absorbs a neutron and fissions, releasing additional neutrons. These, in turn, can be absorbed by other fissionable nuclei, releasing still more neutrons. A fission chain reaction is self-sustaining when the number of neutrons released in a given time equals or exceeds the number of neutrons lost by absorption in nonfissioning material or by escape from the system.

CONTROL ROD: A rod, plate, or tube containing a material that readily absorbs neutrons (hafnium, boron, etc.), used to control the power of a nuclear reactor. By absorbing neutrons, a control rod prevents the neutrons from causing further fission.

CORE: The central portion of a nuclear reactor containing the fuel elements and usually the moderator, but not the reflector.

CRITICALITY: The state of a nuclear reactor when it is sustaining a chain reaction.

FUEL CYCLE: The series of steps involved in supplying fuel for nuclear power reactors. It includes mining, refining, the original fabrication of fuel elements, their use in a reactor, chemical processing to recover the fissionable material remaining in the spent fuel, reenrichment of the fuel material, and refabrication into new fuel elements.

GAMMA RAYS: High-energy, short-wave length electromagnetic radiation. Gamma radiation frequently accompanies alpha and beta emissions and always accompanies fission. Gamma rays are very penetrating and are best stopped or shielded against by dense materials, such as lead or depleted uranium. Gamma rays are essentially similar to X-rays, but are usually more energetic, and are nuclear in origin.

MODERATOR: A material, such as ordinary water, heavy water or graphite, used in a reactor to slow down high-velocity neutrons, thus increasing the likelihood of further fission.

NUCLEAR RADIATION: That which is emitted from atomic nuclei in various nuclear reactions, including alpha particles, beta particles and gamma radiation and neutrons.

NUCLEAR REACTOR: A device in which a fission chain reaction can be initiated, maintained, and controlled. Its essential component is a core with fissionable fuel. It usually has a moderator, a reflector, shielding, coolant, and control mechanisms. Sometimes called an atomic "furnace", it is the basic machine of nuclear energy.

NUCLEON: A constituent of an atomic nucleus, that is, a proton or a neutron.

PARTICLE: A minute constituent of matter, generally one with a measurable mass. The primary particles involved in radioactivity are alpha particles, beta particles, neutrons, and protons.

PRESSURIZED WATER REACTOR: A power reactor in which heat is transferred from the core to a heat exchanger by water kept under high pressure to achieve high temperature without boiling in the primary system. Steam is generated in a secondary circuit. Many reactors producing electric power are pressurized water reactors.

RADIOACTIVITY: The spontaneous decay or disintegration of an unstable atomic nucleus, usually accompanied by the emission of ionizing radiation.

REFLECTOR: A layer of material immediately surrounding a reactor core which scatters back or reflects into the core many neutrons that would otherwise escape. The returned neutrons can then cause more fissions and improve the neutron economy of the reactor. Common reflector materials are graphite, beryllium, and natural uranium.

REM: An acronym for Roentgen Equivalent Man, a measure of radiation exposure that indicates the potential impact on human cells.

SCRAM: The sudden shutdown of a nuclear reactor, usually by the rapid insertion of the control rods. Emergencies or deviations from normal reactor operation causes the reactor operator or automatic control equipment to insert the control rods into the core.

SPENT FUEL: Nuclear reactor fuel that has been irradiated (used) to the extent that it can no longer effectively sustain a chain reaction.

TRANSURANIC ELEMENT: An element above uranium in the periodic table; that is, with an atomic number greater than 92. All 11 known transuranic elements are radioactive and produced artificially. Examples: curium, lawrencium, plutonium.

WASTE, RADIOACTIVE: Equipment and materials (from nuclear operations) which are radioactive and for which there is no further use. Wastes are generally classified as high-level (having radioactivity concentrations of hundreds to thousands of curies per gallon or cubic foot), low-level (in the range of 1 microcurie per gallon or cubic foot), or intermediate (between these extremes).

FACTOR LEVEL DESCRIPTIONS

FACTOR 1, KNOWLEDGE REQUIRED BY THE POSITION

This factor measures the nature and extent of information or facts which the engineer must understand to do acceptable work (e.g., steps, procedures, practices, rules, policies, theories, principles, and concepts) and the nature and extent of skills necessary to apply these knowledge. The knowledge and skills of a nuclear engineer involve reactor theory and the fundamental engineering principles used in dealing with the radioactive environment. There are a great variety of highly specialized nuclear engineer positions, and many are one-of-a-kind staff positions. Some nuclear engineering positions require knowledge of both fission and fusion reactions. To be used as a basis for selecting a level under this factor, a knowledge must be required and applied.

Level 1-5 -- 750 Points

A basic foundation of the professional concepts and principles of nuclear engineering, including specialized knowledge of both fission and fusion reactions or a basic foundation in other engineering disciplines which are utilized in work involving nuclear systems, the nuclear environment, or nuclear effect, sufficient to accomplish basic engineering assignments. These knowledge typically are acquired through a bachelor's degree program in nuclear engineering or

other related engineering disciplines which provide general engineering and scientific knowledge sufficient to accomplish basic engineering assignments.

OR

Equivalent knowledge and skill.

Level 1-6 -- 950 Points

Professional knowledge of conventional methods and techniques of one or more specialty areas of nuclear engineering which would enable the engineer to independently perform assignments of moderate difficulty, i.e., those which do not require significant deviation from established methods and precedents. Assignments at this level are limited and are characterized by such features as:

-- General familiarity with the practices of related engineering disciplines (e.g., mechanical or electrical) as they apply to the specialty area;

-- The problem is straightforward, or has been singled out of a larger investigation or project;

-- Unknown factors or relationships such as recording data and observing operations are primarily matters of a factual nature or the mechanisms involved are fairly well-understood;

-- The recording of data and observing operations are performed by use of established analytical and investigative methods and techniques with minor modifications and adaptations that can be worked out by conventional procedures; or

-- The objectives to be reached are clearly identified and are realizable by occasional minor adaptation of precedents and established practice.

OR

Equivalent knowledge and skill.

Illustrations:

-- Knowledge and skill sufficient to prepare instructions and guidelines which are used for the assembly and installation of test equipment. The instructions prepared consist of step-by-step procedures involved.

-- Knowledge and skill sufficient to make limited modifications of established techniques and methods to meet the needs of the assignment.

-- Knowledge and skill sufficient to perform projects of limited size and complexity which can be accomplished by application of well established engineering methods, e.g., a component system described in the reactor plant test program preparation documents.

-- Knowledge and skill sufficient to review test authorizations and other documentation which provides for planned deviation from normal operation or repairs and modifications to determine that the proposed operations will not jeopardize reactor operating safety or be outside of existing standards and requirements.

-- Knowledge and skill sufficient to conduct surveys of the operation and maintenance of reactors and other nuclear facilities for overall adequacy of reactor and nuclear criticality safety performance and adherence to procedures by assigned personnel.

Level 1-7 -- 1250 Points

Professional knowledge applicable to a wide range of duties in one or more specialty areas and the skill sufficient to:

-- Modify standard practices and adapt equipment or techniques to solve a variety of nuclear engineering problems;

-- Plan and conduct work requiring judgment in the evaluation, selection, and adaptation of precedents and modification of procedures and criteria; and

-- Apply the standard practices of other engineering disciplines as they relate to nuclear engineering.

OR

Equivalent knowledge and skill.

Illustrations:

-- Knowledge of reactor operations and principles of reactor theory sufficient to evaluate contractor performance in assigned areas of test reactors, e.g., advanced test reactors, materials test reactors, and engineering test reactors.

-- Knowledge and skill sufficient to conduct nuclear reactor plant quality control inspections and to provide guidance to engineering specialists working in shipyard operations. The assignments require the knowledge necessary to conduct quality engineering studies, investigations and projects to ensure compliance with desired specifications or requirements, such as, physical, chemical, dimensional, alignment, surfaces, welding, and casting, for a wide range of materials, equipment and machinery of a nuclear reactor system.

-- Knowledge sufficient to provide technical guidance for work related to reactor refueling operations which includes the preparation of technical manual procedures for use at nuclear naval shipyards and writing detailed engineering instructions for work associated with refueling.

-- Knowledge of reactor fuel processing methods, techniques and requirements to include, for example, principles and theories applied to transport, receipt, storage, regulatory requirements, and packaging development.

-- Knowledge of reactor plant systems and their interrelation with components and equipment installed therein sufficient to analyze problems associated with installation, repair, or replacement of these components and equipment and to formulate engineering solutions to these problems.

-- Knowledge of nuclear plant design and reactor theory sufficient to evaluate unexpected occurrences in refueling or testing operations and formulate corrective actions to place the reactor plant in a safe condition.

-- Knowledge and skill sufficient to prepare progress and technical reports on assigned programs or projects involving the design, development, and demonstration of reactor technology, e.g., prototype propulsion plants, core assembly design, measurement and protection instrumentation, research fusion power technology, and fission reactor designs, such as the gas cooled fast reactor and the liquid metal fast reactor.

-- Knowledge and skill sufficient to prepare instructions for the inspection, calibration, and testing of system components associated with the overhaul and modification of reactor control and instrumentation systems.

-- Knowledge sufficient to perform or review a variety of engineering calculations required in the design of temporary fluid and mechanical systems. Calculations involve, for example, analysis of fluid flow to ensure proper pipe sizing and sufficient coolant, analysis of installed piping stress, and fastener stress analysis.

-- Knowledge sufficient to prepare engineering instructions for the overhaul and repair of nuclear reactor plant systems and mechanical components, e.g., valves, motors, pumps, steam generators, and heat exchangers.

Level 1-8 -- 1550 Points

Mastery of one or more specialty fields to the extent that the engineer is capable of applying experimental theories, new developments, and experienced judgment to solve the more difficult problems not susceptible to treatment by accepted methods and the skill sufficient to:

-- extend and modify existing techniques; and
-- develop new approaches for use by other engineering specialists in solving a variety of engineering problems.

Typically, the engineer is a recognized expert in a specialty field.

OR

Equivalent knowledge and skill.

Illustrations:

-- Knowledge and skill sufficient to serve as a technical authority of a major organization of an agency or department, having responsibility for the regional or national aspects of analyzing and evaluating contractor(s) activities in technology development for the movement or storage of radioactive wastes resulting from the production and reprocessing of nuclear reactor fuel, e.g., research, development, design of processes, criticality safety, chemical separations, facilities design, and nuclear material packaging and shipment of radioactive and fissile materials.

-- Knowledge and skill sufficient to coordinate and review engineering project activities as a project engineer concerned with all phases of shipyard work on reactor plants to include project planning functions relating to the refueling, alteration, repair, maintenance, and testing of nuclear reactor plants.

-- Knowledge and skill sufficient to review and evaluate the work of nuclear engineers in field offices and activities who participate in the formulation of program plans and objectives, problem identification, timing and magnitude of research and development requirements involved in nuclear technology development in a major project of such magnitude as to require multidiscipliary management.

-- Knowledge and skill sufficient to provide staff advisory, consulting, and reviewing services within a centralized engineering office of an agency with responsibility for reviewing and coordinating all work in a specialty area.

-- Knowledge and skill sufficient to develop and revise agency nuclear engineering technical manuals and specifications and agency regulations, policies, procedures and guidelines which are issued for the guidance of agency nuclear engineers on a wide basis, and to furnish advice on the use and interpretation of assigned technical guides.

-- Knowledge and skill sufficient to coordinate, review, and evaluate broad programs of an agency headquarters and field offices which are concerned with the design, construction, and operation of facilities, e.g., field site evaluations prepared by contract agents, feasibility of projects, adequacy of contractor findings, preliminary construction specifications and assessment of impact of nuclear license requirements on facility cost and schedules.

-- Knowledge and skill sufficient to direct operations of a reactor used for a variety of complex experiments to include operations such as startup, power increments, insertion and removal of fuel, irradiated material removal, power reduction, and shutdown.

Level 1-9 -- 1850 Points

Mastery of one or more specialty fields and recognized skill in generating new hypotheses, developing new concepts, and planning and evaluating long range programs and projects; or skill sufficient to function as a nationally recognized consultant and expert in the field of nuclear engineering.

OR

Equivalent knowledge and skill.

Illustrations:

-- Knowledge and skill sufficient to serve as a recognized expert consultant to a department or agency having responsibility for: (1) the resolution of nuclear energy policy problems or projects that are of unusual size or complexity; and (2) evaluating, advising on and reporting on technological problems such as short and long-term management of nuclear wastes; availability, cost, and assurance of nuclear fuel supplies; nuclear plant safety and reliability; policies regarding commercialization and industrial base development; formulation and planning nuclear engineering and technological investigations and their extension to state-of-the-art reactor design and construction techniques of either fission or fusion design. The engineer at this level contributes new designs or techniques which are of material significance in the solution of problems that are national or worldwide in magnitude.

-- Knowledge and skill sufficient to serve as a recognized technical expert in resolving controversial or novel problems of unusual size or complexity, involving projects such as: establishing original design concepts; planning or directing a first-of-a-kind operation; and/or implementing state-of-the-art technology as they affect the nation's ability to safely and expeditiously deploy nuclear-powered submarines in support of national defense, national objectives, and international commitments or as they do not compromise the safety or health of the nation.

FACTOR 2, SUPERVISORY CONTROLS

This factor covers the nature and extent of direct or indirect controls exercised by the supervisor, the engineer's responsibility, and the review of completed work.

-- Controls are exercised by the supervisor in the way assignments are made, instructions are given to the engineer, priorities and deadlines are set, and objectives and boundaries are defined;

-- The engineer's responsibility depends on the extent to which the engineer is expected to develop the sequence and timing of various aspects of the work, to modify or recommend modification of instructions, and to participate in establishing priorities and defining objectives;

-- The review of completed work depends upon the nature and extent of the review, e.g., close and detailed review of each phase of the assignment; detailed review of the finished assignment; spot check of finished work for accuracy; or review only for adherence to policy.

Level 2-1 -- 25 Points

For both one-of-a-kind and repetitive tasks the supervisor makes specific assignments that are accompanied by clear, detailed, and specific instructions. The supervisor reviews assignments for unusual or difficult problems and instructs the engineer on techniques and procedures to be applied on nonroutine work.

The engineer works as instructed and consults with the supervisor as needed on all matters not specifically covered in the original instructions and guidelines.

The work is closely reviewed. The review may include checking progress as well as reviewing completed work for accuracy, adequacy, and adherence to instructions and established procedures.

Level 2-2 -- 125 Points

The supervisor makes continuing or individual assignment and indicates generally what is to be done, limitations, quality and quantity to be expected, complex features, possible solutions, deadlines, and priority of assignments. The supervisor provides additional, specific instructions

for new, difficult, or unusual assignments including suggested work methods or advice on source material available.

The engineer uses initiative in carrying out recurring assignments independently without specific instructions but refers deviations, problems, and unfamiliar situations not covered by instructions to the supervisor for decision or help.

The supervisor assures that finished work and methods used are technically accurate and in compliance with previous instructions or established procedures. Review of work increases with more difficult assignments if the engineer has not previously performed similar assignments.

Level 2-3 -- 275 Points

The supervisor makes assignments by defining objectives, priorities, and deadlines and assists the engineer with unusual situations which do not have clear precedents.

The engineer plans and carries out the successive steps and handles problems and deviations in the work assignments in accordance with instructions, policies, previous training, or accepted engineering practices.

Completed work is usually evaluated for technical soundness, appropriateness, and conformity to policy and requirements. The methods used in arriving at the end-results usually are not reviewed in detail.

Level 2-4 -- 450 Points

The supervisor sets the overall objectives and resources available. The engineer and supervisor in consultation, review the critical issues, new concepts, and policy matters and develop the deadlines, projects, and work to be done.

The engineer, having developed expertise in the specialty area, is responsible for planning and carrying out the assignment; resolving most of the conflicts which arise; coordinating the work with others as necessary; and interpreting policy on own initiative in terms of established objectives. In some assignments, the engineer also determines the approach to be taken and the methodology to be used. The engineer keeps the supervisor informed of progress, potentially controversial matters, or far-reaching implications.

Completed work is reviewed only from an overall standpoint in terms of feasibility, compatibility with other work, or effectiveness in meeting requirements or expected results.

Level 2-5 -- 650 Points

The supervisor provides essentially administrative direction with assignments given in terms of broadly defined missions or functions.

The engineer has responsibility for planning, designing, and carrying out programs, projects, studies, or other work independently.

Results of the work are considered as technically authoritative and are normally accepted without significant change. If the work is reviewed, the review typically is concentrated on such matters as fulfillment of program objectives, effect of advice and influence on the overall program, or contributions to the advancement of technology. Recommendations for new projects and alteration of objectives are usually evaluated for such considerations as availability of funds and other resources, broad program goals, or national priorities.

FACTOR 3, GUIDELINES

This factor covers the nature of guidelines for performing the work and the judgment needed to apply the guidelines or develop new guides. Since individual assignments vary in the specificity, applicability, and availability of guidelines, the constraints and judgmental demands placed upon the engineer also vary. The existence of specific instructions, procedures, and policies may limit the opportunity of the engineer to make or recommend decisions or actions; however,, in the absence of procedures or under broadly stated objectives, the engineer may use considerable judgment in researching literature and developing new methods.

For this factor, guidelines refer to standard guides, precedent, methods, and techniques including:

-- agency manuals of instructions and operations;
-- standard text books;
-- manufacturers' catalogs and handbooks;
-- standard designs developed and prescribed by the central engineering staff of the agency;
-- master or guide specifications developed and prescribed by the central engineering staff of the agency;
-- files of previous agency projects undertaken by the agency;
-- standard work practices in the area of application as taught in engineering courses or generally accepted by engineers as a result of experience;
-- codes and standards published by recognized engineering societies and organizations including regulatory and enforcement agencies; and
-- governing policies and procedures of the agency.

Level 3-1 -- 25 Points

The engineer, generally a trainee, is provided specific guidelines such as technical manuals, instructions, and criteria that are detailed and directly applicable. The supervisor authorizes any deviations.

Level 3-2 -- 125 Points

The engineer is provided detailed and directly applicable guidelines such as standard instructions, literature, precedents, and practices in the area of assignment or specialization. Judgment is required in locating and selecting the most appropriate guidelines and references. Established procedures and standard practices and techniques are used to perform the work, but the engineer may exercise discretion in selecting from among alternative approaches. The engineer may, on
an irregular or intermittent basis, make minor deviations to adapt guidelines to specific cases. Situations requiring significant deviations from existing guidelines are referred to the supervisor for assistance.

Level 3-3 -- 275 Points

Guidelines include standard instructions, technical literature, agency policies and regulations, manufacturers' catalogs and handbooks, precedents and standard practices in the area of assignment or specialization. The engineer independently selects, interprets and applies the guides, modifying, adapting, and making compromises to meet the requirements of the assignment. However, technical guidance is provided on unusual or complex problems by the supervisor or a higher graded engineer. In addition, the engineer must exercise judgment in applying standard engineering practices to new situations and in relating new work situations to precedent ones.

Level 3-4 -- 450 Points

Guidelines are often inadequate in dealing with the more complex or unusual problems encountered in the assignment. The engineer is required to use resourcefulness, initiative, and judgment based on experience to deviate from or extend traditional engineering methods and practices in developing solutions to problems where precedents are not applicable. This level also includes responsibility for the development of material to supplement and explain agency headquarter's guidelines.

Level 3-5 -- 650 Points

Working chiefly under broad and general policy statements, regulations, and laws, the engineer exercises considerable judgment and ingenuity in interpreting and adapting guides that exist and in developing new and improved hypotheses, approaches, or concepts not previously tested or reported in the literature of the field. Available guides are generally very limited or lacking due to the novel characteristics of some projects. Frequently, the engineer is recognized as a technical authority in the specialty area and has responsibility for the development of policies as well as nationwide standards, procedures, and instructions to guide operating personnel.

FACTOR 4, COMPLEXITY

"Complexity" covers the nature and variety of tasks, steps, processes, methods or activities in the work performed; and the degree to which the engineer must vary the work, discern inter-relationships and deviations, or develop new techniques, criteria, or information. The basic unit of measuring this factor is the "complex feature." A complex feature is an individual engineering problem, broadly defined, which requires: (1) modification or adaptation of, or compromise with standard guides, precedents, methods, or techniques; or (2) special considerations of planning, scheduling, and coordination. In crediting a complex feature to a position, the following conditions must be met:

-- The duties and responsibilities of the position involve a specific, difficult problem requiring substantial analysis and evaluation of alternatives;

-- The engineer in the position solves the problem although it may be subject to preliminary discussion of background and possible approaches, and the solution may be reviewed for technical adequacy as well as for conformance with policy by the supervisor or others;

-- The solution of the problem involves: (a) substantial modification or adaptation of, or compromise with, standard guides, precedents, methods, and techniques; or (b) difficult or unusual planning, scheduling, negotiating, or coordination;

-- The engineer applies a thorough knowledge of a variety of standard guides, precedents, methods, techniques, and practices in solving the problem.

Variations in the relative difficulty of work involving complex features are reflected below by the number of complex features and by their occurrence in combination. The interaction of complex features in combination is particularly significant in considering the relative intensity of all of the complex features in an assignment.

A complex feature can be concerned with technical engineering work or socioeconomic, administrative, or other aspects of engineering work as illustrated in the following examples of complex features:

-- It is necessary to analyze and choose from among two or more standard methods from the standpoint of economy and engineering feasibility, when each approach contains advantages and disadvantages which do not readily or clearly out-weigh those of the others. For example, cost considerations may dictate a compromise between a theoretically ideal method and a more economical but technically less satisfactory one. In like manner, there may be social, ecological, or other environmental considerations that make it necessary to analyze and weigh alternatives.

-- Standard material normally used by the agency in a given type of design is unavailable or is not suitable because of unfavorable local conditions. It is necessary to engage in an extensive literature search to arrive at a satisfactory substitute.

-- In making modifications and alternations to existing facilities it is necessary to: (a) modify the design for loads and stresses not anticipated when the facility was originally designed; (b) keep changes and costs to a minimum while achieving objectives; and (c) modify standards and specifications to meet limitations of existing facilities.

-- Previous tests are not directly applicable in all phases because conditions to be simulated are different from those previously tested. It is necessary to devise departures from previous test methods and techniques to achieve the objectives of the test.

-- Special planning and scheduling is necessary to integrate completion dates for phases of Government work with phases to be performed by contractors, and as necessary, to provide for continuing use of existing facilities.

-- When proposed work infringes on state or municipal structures or requires approval of such authorities, the engineer coordinates with state and local civil authorities.

-- The engineer presents special written analysis and justification to higher organizational entities regarding the economic, social, ecological, and other benefits that the general public will derive from the proposed work in comparison with estimated cost of such work.

Level 4-2 -- 75 Points

Assignments usually consist of specific, often unrelated, tasks that are designed to orient a trainee engineer in the practical application of theory and basic principles, to ascertain the engineer's interest and attitude and to relieve experienced engineers of detailed and simple work. Problems are readily solved by application of basic principles, elementary theories, and established practices.

Work often consists of such detailed tasks as making calculations using standard formulas; preparation of graphs, curves, and tables; recording factual data in tests or from observation studies; drafting or minor detail design; and searching technical reports for information. At this level, tasks may be similar to those of nonprofessional employees, but are assigned primarily for training or development purposes.

Level 4-3 -- 150 Points

Assignments may consist of minor phases of a broader assignment of a higher-grade engineer which typically have been screened to eliminate complex features, or they may be similar to those previously encountered by the organization in which complex features occur infrequently or in isolated, single units. Assignments are carried out without substantial adaptation or modification of precedents, except for minor deviations such as sizes, dimensions, and relationships of details which can be resolved by engineering calculations typical of the specialization or area of assignment.

Level 4-4 -- 225 Points

Assignments typically contain combinations (e.g., two to five) of complex features. Work at this level typically involves the application of standard engineering practices to new situations and relating new work situations to precedent ones and, in addition, the modification or adaptation of and making compromises with standard guidelines.

Level 4-5 -- 325 Points

Assignments are of such breadth, diversity, and intensity that they involve many, varied complex features. The work requires that engineers be especially versatile and innovative in adapting, modifying, or making compromises with standard guides and methods or originating new techniques or criteria. Individual assignments typically contain a combination of complex features, generally seven or more, which involve serious or difficult-to-resolve conflicts between engineering and management requirements.

Level 4-6 -- 450 Points

Assignments: (a) concentrate on the limitations of proven concepts and practices of a broad and complex subject-matter field or functional area where issues and factors to be considered are largely undefined and require extensive probing and analysis to determine the nature and scope of the problems; and (b) are characterized by unusual demands that are frequently due to extraordinary emergency, public interest, or economic restraints which require the engineer to solve critical problems when timely and effective decisions are necessary to balance performance and deadline requirements against costs and other resource concerns. As a technical expert, the engineer is sometimes called upon to determine whether a desired end item is feasible in relation to its current distance beyond the state-of-the-art in a related engineering field, such as mechanical, electrical, thermal, chemical, or hydraulic.

Analysis, as envisioned at this level is carried to the point where either a solution is delivered on various problems or alternative further projects (pursued concurrently or sequentially with the support of others within or outside the organization) are initiated to alter standard concepts or theories, objectives, and/or previously formulated requirements and criteria.

FACTOR 5, SCOPE AND EFFECT

This factor covers the relationship between the nature of the work, i.e., the purpose, breadth, and depth of the assignment, and the effect of work products or services both within and outside the organization.

Effect measures such things as whether the work output facilitates the work of others, provides timely services of a personal nature, or impacts on the adequacy of research conclusions. The concept of effect alone does not provide sufficient information to properly understand and evaluate the impact of the position. The scope of the work completes the picture, allowing consistent evaluations.

Only the effect of properly performed work is to be considered.

Level 5-1 -- 25 Points

The purpose of the work is to orient the engineer in the practical application of academic theory and basic principles. Work tasks are specific and limited and are primarily for training purposes to equip the engineer to assume more responsible engineering duties. The work's effect is to facilitate the work of the other engineers within the immediate organizational unit.

Level 5-2 -- 75 Points

The purpose of the work is primarily to provide assistance to experienced engineers by relieving them of detailed and routine work. Work efforts have an effect on the accuracy and reliability, as well as the timeliness, of the projects being performed by higher level engineers.

Level 5-3 -- 150 Points

The purpose of the work is to investigate and analyze any of a variety of problems or conditions and to provide or recommend ways of dealing with them. The engineering determinations affect the design or operation of equipment or facilities, with regard to economy, efficiency, and safety of the systems involved.

Level 5-4 -- 225 Points

The purpose of the work is to provide expertise as a specialist in a particular specialty field by furnishing advisory, planning, or reviewing services on specific problems, projects, programs, and functions. The work may include the development of criteria, procedures, or instructions for major agency activities. Work products impact on a wide range of the agency's engineering program.

Level 5-5 -- 325 Points

The purpose of the work is to resolve critical problems or to develop new approaches or methods for use by other engineering specialists. Often serving as consultant or project coordinator, the engineer provides expert advice and guidance to officials, managers, and other engineers within or outside the agency, covering a broad range of engineering activities. Result of the efforts affect the work of other engineering experts both within and outside the agency or the development of major aspects of agency engineering programs.

Level 5-6 -- 450 Points

The purpose of the work is to plan and conduct vital engineering programs for the agency, which are often of national or international scope and impact. The engineer's recommendations and decisions on highly complex technical and policy areas frequently establish the agency's position, create agency precedents, and guide field installations on matters of major engineering significance. The engineer's actions affect the agency's engineering program on a long-term and continuing basis and often influence the programs of other agencies and outside organizations.

FACTOR 6, PERSONAL CONTACTS

This factor includes contacts which are made in person or by telephone or radio conversation with persons not in the supervisory chain.

NOTE: Personal contacts with the supervisor are covered under Factor 2, Supervisory Controls.

Levels described under this factor are based on what is required to make the initial contact, the difficulty of communicating with those contacted, and the setting in which the contact takes place, e.g., the degree to which the employee and those contacted recognize their relative roles and authorities.

Above the lowest level, points should be credited under this factor only for contacts which are essential for successful performance of the work and which have a demonstrable impact on the difficulty and responsibility of the work performed.

The relationship of Factors 6 and 7 presumes that the same contacts will be evaluated for both factors. Therefore, use the personal contacts which serve as the basis for the level selected for Factor 7 as the basis for selecting a level for Factor 6.

Level 6-1 -- 10 Points

Personal contacts are primarily with higher grade engineers or engineering technicians within the immediate office or related units within the agency.

Level 6-2 -- 25 Points

Personal contacts are with employees in the agency, but outside the immediate office, such as engineers and engineering technicians in other disciplines, architects, field personnel, radiological control personnel, shop employees, ship's officers, and contractor technical representatives.

Level 6-3 -- 60 Points

Personal contacts include a variety of officials, managers, professionals, or executives of other agencies and outside organizations. Typical of these contacts are manufacturers' representatives, private architect-engineer firms, specialists at contractor plants, and engineers and architects from other federal agencies, state and local government officials, local or regional members of the media and public action groups.

Level 6-4 -- 110 Points

Personal contacts are with high ranking officials from outside the agency, including key officials and top engineering and scientific personnel of other agencies, state and local governments, private industry, public action groups, nationally recognized representatives of the media, and may involve contacts with leading members of foreign governments. The engineer may participate, as technical expert, in committees and seminars of national or international importance regarding nuclear programs or complex and varied features typical of new advanced nuclear components, equipment, devices, or systems utilized in nuclear facilities.

FACTOR 7, PURPOSE OF CONTRACTS

Purpose of personal contacts range from factual exchange of information to situations involving significant or controversial issues and differing viewpoints, goals or objectives. The personal contacts which serve for the level selected for this factor must be the same as the contacts which are the basis for the level selected for Factor 6.

Level 7-1 -- 20 Points

Contact are primarily, if not solely, for the purpose of exchanging information.

Level 7-2 -- 50 Points

Purpose of contacts is to plan and coordinate work efforts with co-workers, discuss technical requirements of equipment with manufacturers and resolve any problems concerning use, resolve questions of field personnel, discuss contract requirements, and generally clarify problems and reach agreement on overall plans and schedules. The persons contacted are usually working toward a common goal and generally are cooperative.

Level 7-3 -- 120 Points

Purpose of contacts is to influence or persuade other engineers to adopt technical points and methods about which there are conflicts, to negotiate agreements with agencies and contractors where there are conflicting interests and opinions among organizations or among individuals who are also experts in the field, or to justify the feasibility and desirability of work proposals to top agency officials.

Level 7-4 -- 220 Points

Purpose of contacts is to justify, defend, negotiate or settle highly significant or controversial engineering matters. Engineers often represent their agencies in professional conferences, meetings, hearings, or on committees involving technical problems or to plan extensive and long-range engineering programs which culminate in the resolution of critical problems, revision of current approaches and concepts and/or achieve goals and objectives. Contacts are to obtain diverse viewpoints, goals, and internal priorities which require the engineer to achieve a common understanding of the problem(s) and insure program requirements are met.

FACTOR 8, PHYSICAL DEMANDS

This factor covers the requirements and physical demands placed on the engineer by the work assignment. This includes physical characteristics and abilities (e.g., specific agility and dexterity requirements) and physical exertion involved in the work, e.g., climbing, lifting, pushing, balancing, stooping, kneeling, crawling, or reaching. To some extent, the frequency or intensity of physical exertion is also considered, e.g., a job requiring prolonged standing involves more physical exertion than a job requiring intermittent standing.

Level 8-1 -- 5 Points

The work is principally sedentary, although there may be some walking or bending involved in activities such as inspections of installed equipment or construction of field site visits.

Level 8-2 -- 20 Points

The work involves construction or field inspections, investigations, or surveys in which the work requires regular and recurring standing for long periods and walking, stooping, bending, and climbing on construction projects or at naval shipyard facilities.

Level 8-3 -- 50 Points

The work requires regular and recurring physical exertion to: climb vertical ladders and scaffolding; and, crouch, bend, and move in physically restrictive areas where the engineer must be alert to maintain secure footing, e.g., naval vessels undergoing construction or overhaul and repair or construction projects of nuclear energy facilities.

FACTOR 9, WORK ENVIRONMENT

The "Work Environment" factor considers the risks and discomforts in the engineer's physical surroundings or the nature of the work assigned and the safety regulations required. Although the use of safety precautions can practically eliminate a certain danger or discomfort, such situations typically place additional demands upon the engineer in carrying out safety regulations and techniques.

Level 9-1 -- 5 Points

Work is usually performed in an office setting, although there may be occasional exposure to industrial hazards in a variety of nuclear facilities including contractor's plants or buildings under construction.

Level 9-2 -- 20 Points

There is regular and recurring exposure to moderate discomforts and unpleasantness occasioned by utilizing protective clothing in high temperatures. Work is performed in close proximity to disassembled heavy equipment, parts, and other large metal components which in some instances are machine-hoisted overhead and offer hazardous conditions.

OPM BENCHMARK DESCRIPTIONS

NUCLEAR ENGINEER GS-0840-05, BMK #1

Duties

As a trainee engineer, performs a variety of duties which provide the opportunity to apply nuclear engineering skills previously acquired through the study of academic theories of engineering and an orientation to agency policies and procedures. Some assignments are similar to those assigned to nonprofessional employees but are performed primarily for training purposes and in some instances, to relieve higher grade engineers of routine work.

- receives formal and on-the-job instruction and training designed to provide familiarization with worksite environments, reactor plant systems, radiological control procedures, plant operations, safety requirements, increase familiarity of reactor theory, and the administrative requirements for systems operational test programs.

- Assists higher grade engineers, individually or as a team member, in the preparation for the accomplishment of reactor plant testing by performing such tasks as:

    1. Researching plan and operating manuals to determine system isolation requirements.

    2. Preparing detailed reports on completed installation of test equipment.

    3. Performing system lineup checks.

    4. Preparing technical work instructions for the assembly and installation of test equipment.

Factor 1, Knowledge Required by the Position -- Level 1-5 -- 750 Points

Professional knowledge of engineering concepts and principles as would typically be acquired through a bachelor's degree program in nuclear engineering or a related discipline and would enable the engineer to perform trainee-level duties.

Factor 2, Supervisory Controls -- Level 2-1 -- 25 Points

Supervisor assigns work with specific and detailed instructions as to what is required and guidance as to the written test procedures to be used and probable results. Work is carried out under close supervision of the supervisor and a higher grade engineer frequently monitors the progress of the trainee engineer. Work is reviewed in progress and on completion for conformance to instructions and to ensure technical accuracy and strict conformance to objectives.

Factor 3, Guidelines -- Level 3-1 -- 25 Points

Guidelines include technical manuals, directive, instructions, and criteria which are detailed and directly applicable. The trainee works in strict adherence to the guidelines, consulting the supervisor or higher grade engineer for authorization on any deviations.

Factor 4, Complexity -- Level 4-2 -- 75 Points

Assignments consist of specific, often unrelated tasks, designed to orient the trainee in the practical application of theory and basic principles of nuclear engineering. These tasks are usually the routine and detailed work involved in projects of higher grade engineers.

Factor 5, Scope and Effect -- Level 5-1 -- 25 Points

The purpose of the work is to orient the trainee in the practical application of academic theory and basic principles of nuclear engineering. The effect of the work is to facilitate the work of higher grade engineers within the immediate office.

Factor 6, Personal Contacts -- Level 6-1 -- 10 Points

Contacts are with higher grade engineers, engineering technicians, and other co-workers within the immediate office or installation.

Factor 7, Purpose of Contacts -- Level 7-1 -- 20 Points

Contacts are for the purpose of obtaining technical direction, receiving advice, and reporting on findings.

Factor 8, Physical Demands -- Level 8-2 -- 20 Points

The work requires regular and recurring physical exertion while on shipboard such as bending, stooping, reaching, and climbing high ladders. Agility and dexterity is required.

Factor 9, Work Environment -- Level 9-2 -- 20 Points

Uncomfortably warm temperatures are encountered on a regular and recurring basis. Protective clothing such as safety shoes, safety glasses, and a protective hardhat, frequently is required.

TOTAL POINTS -- 970

NUCLEAR ENGINEER GS-0840-07, BMK #1

Duties

Performs a variety of nuclear engineering assignments which are specified portions or minor phases of large assignments dealing with the technical direction of shipyard nuclear work in activities such as plans, schedules, inspection, fabrication, ship construction, overhaul, reactor refueling, or reactor plant testing. Assignments typically are screened to eliminate difficult or unusual problems and generally consist of routine and uncomplicated task assignments, or small portions of projects which require consideration of the effects of the nuclear environment on conventional equipment, components and systems.

-- Studies engineering plans, operating manuals, and other technical material to obtain information on materials, equipment, and pertinent data to be used by higher level nuclear engineers.

-- Records test data, makes personal observations of conditions remote from the test control station, observes plant operators for proper performance, and recommends solutions of problems encountered to a higher level nuclear engineer.

-- Prepares detailed work procedures, task sequences, instructions, and designs for such projects as standardized prefabricated containment facilities, installation of temporary lead shielding, and decontamination of tools, components, and conventional facilities.

-- Inspects completed installation of test equipment to assure the equipment will safely perform the intended function and is satisfactory from an operational standpoint.

-- Identifies questionable technical concerns to a higher level nuclear engineer.

-- Investigates routine reports of malfunction of varied equipment and components of a nuclear propulsion system.

-- Determines, obtains, and analyzes required engineering data and recommends remedies.

-- Prepares related detailed sequences and procedures for removal, disassembly, inspection, assembly and reinstallation of equipment such as steam generators or pumps. Ensures that nuclear environmental effects are fully considered.

Factor 1, Knowledge Required by the Position -- Level 1-6 -- 950 Points

-- Knowledge of professional nuclear engineering principles and concepts as well as the skill to apply standard engineering practices, methods, and techniques to perform relatively limited phases of assignments dealing with the technical direction of shipyard nuclear work in areas such as the evaluation of radiation shielding, reactor plant fluid systems and components, reactor plant instrumentation and control systems and reactor plant test program preparation.

-- Familiarity with related engineering disciplines, particularly mechanical and electrical.

Factor 2, Supervisory Controls -- Level 2-2 -- 125 Points

Supervisor makes assignments and provides specific instructions as to the objectives, scope and procedures to be used. The engineer works independently on repetitive features of assigned portion or minor phases of a larger assignment. The engineer frequently contacts the supervisor or the higher grade engineer responsible for the larger assignment to obtain guidance or decisions on any deviations, unanticipated problems, or unusual situations. Completed work is reviewed for accuracy and adherence to instructions and standard practices. Review of work increases with more difficult assignments when they differ from those previously performed by the engineer.

Factor 3, Guidelines -- Level 3-2 -- 125 Points

Guidelines include technical manuals, directives, engineering texts, ship engineering specifications, shipyard instructions, technical journals, and contractor documents. Such guidelines are detailed and are usually directly applicable to individual assignments. The engineer at this level exercises some judgment in selecting appropriate guidelines and deciding among alternative approaches. Situations where existing guidelines are inadequate are referred to the supervisor or higher grade engineer for advice and assistance.

Factor 4, Complexity -- Level 4-3 -- 150 Points

Assignments consist of varied projects which are intended to provide diversified experience as a foundation for future project responsibility of greater scope, difficulty, or magnitude. Assignments are typically screened to eliminate difficult or unusual problems. Assignments require familiarity with and use of standard engineering principles, methods, and practices to solve relatively limited professional problems.

Factor 5, Scope and Effect -- Level 5-2 -- 75 Points

The purpose of the position is to perform engineering tasks of a relatively routine nature and provide support to higher grade nuclear engineers. The assignments involve work such as review of test procedures for technical adequacy, preparation of work instructions, and inspection of test work where standard equipment and procedures are involved. Work efforts have an impact in planning, coordinating, and controlling the shipyard's work relative to nuclear reactor propulsion plant test program objectives and relieve higher grade engineers of the more routine work.

Factor 6, Personal Contacts -- Level 6-2 -- 25 Points

Personal contacts generally are with other engineers and engineering technicians within the immediate office, ship's engineering personnel, and shipyard production personnel.

Factor 7, Purpose of Contacts -- Level 7-1 -- 20 Points

Contacts are established to obtain advice and direction and report on findings involving specific assignments.

Factor 8, Physical Demands -- Level 8-2 -- 20 Points

Some work is sedentary. However, work accomplished aboard ship requires climbing ladders and long periods of standing, stooping, and crouching on a regular and recurring basis.

Factor 9, Work Environment -- Level 9-2 -- 20 Points

The work is conducted in waterfront industrial areas, e.g., ships, submarines, drydocks, piers, shops, and office facilities. In some work areas the engineer is subject to dust, fumes, noise, radiation, and radioactive contaminators. The engineer is required to utilize a variety of

protective devices such as hardhats, goggles or safety eye glasses, safety shoes on a regular and recurring basis and occasionally anticontamination clothing, masks, and respirators. There are periods of uncomfortably warm temperatures, sometimes greater than 110 degrees F.

TOTAL POINTS -- 1510

NUCLEAR ENGINEER GS-0840-09, BMK #1

Duties

Performs assignments in the preparation for and accomplishment of reactor plant testing such as determining system isolation requirements by researching plans and operating manuals, inspecting completed installations of test equipment, and performing system lineup checks in conjunction with ship's force. The engineer personally observes conditions remote from the test control station and has authority to make "on-the-spot" corrections of minor and routine problems. The engineer performs portions of large complex projects under the direction of a higher grade engineer. Work assignments require the application of nuclear engineering theory and knowledge. Positions similar to the following BMK are classifiable to the Nuclear Engineering Series, GS-840, when they meet all five (a through e) of the conditions identified in the introductory material in this standard under the heading "Evaluation Notes."

-- Reviews documents and specifications which are used to accomplish scheduled plant operations or testing.

-- Inspects completed installation of test equipment to assure the equipment will safely perform the intended function.

-- Researches plans and operating manuals, and determines system isolation requirements for accomplishing work on reactor plant components.

-- Performs system lineup checks in conjunction with ship's force. Reports all major problems to higher grade engineer.

-- Prepares technical written instructions for the assembly and installation of conventional (nonnuclear) equipment.

-- Prepares detailed test procedures for standard test operation to include detailed operational steps, prerequisites, precautions, acceptance criteria and inprocess and/or documentation of results.

-- Directs selected tests under the immediate guidance of a higher grade engineer.

Factor 1, Knowledge Required by the Position -- Level 1-6 -- 950 Points

-- Professional knowledge of nuclear engineering concepts and principles and a practical knowledge of test methods and practices sufficient to perform relatively routine test projects of nuclear and conventional components of systems.

-- Familiarity with related engineering fields such as mechanical and electrical.

-- Knowledge of test methods and practices sufficient to prepare or make minor modifications of standard test procedures or test equipment work instructions involving reactor theory, reactor plant systems, radiological control fundamentals, plant operations, safety requirements, and administrative procedures for the test program as could be acquired by a bachelor's degree in nuclear engineering or related engineering degree and supplemented by experience in the specialty field.

Factor 2, Supervisory Controls -- Level 2-3 -- 275 Points

Supervisor assigns complete projects of moderate scope or parts of more complex projects with instructions as the intent and scope of the test documents to be prepared and provides guidance as to any unusual test conditions required. The engineer plans and carries out successive engineering steps and resolves technical problems which are accomplished by standard practices and techniques, referring unusual or especially difficult problems together with a recommended course of action to the supervisor or higher grade engineer for clarification or appropriate procedure. Work is reviewed upon completion for technical adequacy and conformance with objectives. Work which deviates from accepted engineering methods is reviewed more closely while in progress and upon completion.

Factor 3, Guidelines -- Level 3-3 -- 275 Points

Established precedents, procedures, approaches, and techniques exist. Extensive written guidelines such as agency technical manuals, procedures, textbooks, manufacturers' catalogs, and agency policy and program directives are utilized to assure exact technical control. The engineer studies, evaluates, and selects available reference information and uses judgment in interpreting and applying precedents and experience to new situations. Where significant deviations are required, the engineer will refer the problem to the supervisor or higher grade engineer along with proposed solutions and recommended changes.

Factor 4, Complexity -- Level 4-3 -- 150 Points

Tests are conducted on fluid, high pressure air and electrical systems, many of which have direct effects or are dependent on other systems. These assignments typically involve projects which are routine, moderate in scope, and pertain to conventional systems.

Assignments may also include assisting higher grade engineers on large, complex projects. The work requires the application of a variety of established engineering practices.

Factor 5, Scope and Effect -- Level 5-3 -- 150 Points

The test documents prepared by the engineer, describe established engineering practices. Judgments made are normally reviewed by higher grade engineers. Preparation of test procedures involve engineering determinations which impact the safety, economy, efficiency, and types and sizes of systems to be installed.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

Regular contacts are with co-workers, ship's personnel including the ship's engineer officer, production personnel, quality assurance personnel, radiological control personnel. Other contacts, which usually are not established on a routine basis, are with manufacturers' representatives.

Factor 7, Purpose of Contacts -- Level 7-2 -- 50 Points

Contacts are established to request or exchange information, coordinate projects, provide advice, obtain information on equipment, and resolve minor conflicts concerning scheduling and sequencing work.

Factor 8, Physical Demands -- Level 8-2 -- 20 Points

The work is partly sedentary but requires aboard ship inspections in which there is a considerable amount of walking, stooping, bending, crawling, and climbing vertical high ladders on a regular and recurring basis.

Factor 9, Work Environment -- Level 9-2 -- 20 Points

Test work is accomplished aboard ship with the resultant exposure to noise and industrial hazards typical of shipyards. Some work areas are subject to dust, fumes, radiation, and radioactive contaminators. The engineer is required to utilize a variety of protective devices

such as hardhats, goggles or safety eye glasses, safety shoes on a regular and recurring basis and occasionally anticontamination clothing, masks, and respirators. Periods of uncomfortably warm temperatures may exceed 110 degrees F.

TOTAL POINTS -- 1950

NUCLEAR ENGINEER GS-0840-11, BMK #1

Duties

Serves as a nuclear engineer on the staff of a departmental headquarters component charged with responsibility for fusion systems engineering, environment and safety, and fusion energy applications. Assignments include: (1) systems studies to assess technological requirements and timing for overall fusion power activities; (2) reviews of conceptual designs of near-term major fusion devices; (3) demonstrations of subsystem technologies through experiments and prototype tests performed by contractor engineers: (4) identification and evaluation of potential fusion reactor hazards; (5) reviews of appropriate safety technology and design criteria developed by vendor or contractor engineers; (6) evaluations of nonelectric applications of fusion energy such as fissile or synthetic fuel production.

-- Determines the nature and requirements of research and development efforts for assigned program activities and provides input in the development of technical reviews and evaluations.

-- Researches status, progress, and technical reports on assigned program/projects. In addition, gathers, evaluates and assembles technical information for use by management regarding the design, development, and demonstration of fusion reactor technology.

-- Maintains technical cognizance of ongoing contractor planned research and development programs/projects to provide on a timely basis to agency management current and accurate assessments of overall program capabilities, activities, and objectives.

-- Maintains liaison with field offices and contractors regarding program activities to provide supervisor and higher management with a concise and accurate evaluation of contractor performance with regard to assigned work areas.

Factor 1, Knowledge Required by the Position -- Level 1-7 -- 1250 Points

-- Professional knowledge of nuclear engineering concepts, principles, and practices applicable to the full range of engineering duties concerned with fission and fusion reactor operations.

-- Familiarity with related engineering fields, such as mechanical, chemical, metallurgical, electrical engineering, and plasma physics.

-- Knowledge of fusion reactor operating principles sufficient to review system adequacies, safety and environmental effects, reliability, and maintenance capability.

-- Knowledge of nuclear reactor design sufficient to perform independent reviews and evaluations of plant concepts.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

Supervisor assigns work in terms of broad assignment objectives, deadlines, unique limitations, and restrictions.

The engineer determines the methods and approaches to be used and independently plans and carries out the work assignment according to accepted engineering practices.

The engineer's work is reviewed mainly to assure achievement of objectives. Those aspects of the work involving novel or unique approaches, as well as work products involving serious consequences of error considerations, are reviewed for technical soundness.

Factor 3, Guidelines -- Level 3-3 -- 275 Points

Guidelines include departmental directives, interim management directives, office policies and project requirements, operating contractors' directives, engineering texts and technical reports, and established practices. Projects require the engineer to be thoroughly familiar with such guidelines and to provide technical interpretations and judgments on all but the most complex and/or controversial tasks involved in the assignment. The available guides apply to most situations, however, the resolution of some problems require the engineer to exercise judgment in their selection, interpretation, and application to specific problems, for example, magnetic confinement of heavy hydrogen plasma and the equilibrium, stability, and heating of the plasma.

Factor 4, Complexity -- Level 4-4 -- 225 Points

Assignments involve the analysis and evaluation of highly specialized scientific and technical material. The engineer independently selects, adapts and applies varied engineering principles while participating and contributing to systems studies to assess technological requirements and timing for overall fusion power activities. Assigned work covers technological state-of-the-art material.

Factor 5, Scope and Effect -- Level 5-3 -- 150 Points

The purpose of this position is to plan, analyze, evaluate, and provide professional engineering judgment to program managers in the scientific and technical area relating to fusion reactor systems engineering applications and safety programs. The fusion energy tasks are primarily devoted to evaluation of nonelectric applications of fusion energy, such as fissile or synthetic fuel
production. In addition, the engineer's recommendations and decisions contribute in the area of development of appropriate safety technology and design criteria and for formal assessment of environmental impacts.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

Personal contacts are with members of the technical staff of the immediate office, other departmental staff offices, and occasional contacts with contractor representatives.

Factor 7, Purpose of Contacts -- Level 7-2 -- 50 Points

The purpose of the contacts with other departmental engineering personnel are to give and receive information; to coordinate work efforts and resolve technical problems. Contacts with contractor representatives are made to assess technological requirements and timing for fusion power activities.

Factor 8, Physical Demands -- Level 8-1 -- 5 Points

The work is primarily sedentary with some walking or bending required during occasional visits to reactor sites.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

The work is usually performed in an office setting. Occasional travel to reactor facilities involves minimal exposure to normal industrial hazards. Occasional travel may be necessary to attend meetings.

TOTAL POINTS -- 2470

NUCLEAR ENGINEER GS-0840-11, BMK #2

Duties

Serves in a naval shipyard as a nuclear engineer performing engineering work related to nuclear reactor servicing operations. Assignments typically include: (1) planning for refueling operations; (2) preparing engineering procedures; (3) reviewing engineering work done by other groups in the shipyard and by other organizations involved with refueling operations; (4) providing engineering follow-up of reactor servicing work; and (5) providing for coordination and technical control of all shipyard work related to reactor servicing operations.

-- Provides technical guidance for work related to reactor refueling operations. Guidance includes preparation of technical manual procedures for use at the shipyard.

-- Prepares technical instructions for the conduct of radiation surveys of reactor secondary shielding to determine its effectiveness, and organizes and directs or participates in such surveys.

-- Reviews new or revised naval headquarters approved technical requirements relating to refueling, reactor servicing equipment and ensures that these requirements are properly implemented at the shipyard.

-- Identifies potential job related problems or holdups and takes positive action to prevent their occurrence by modifying procedures or recommending changes or innovations to improve work schedules, decrease cost, or reduce roentgen equivalent man (manrem) to shipyard personnel. (NOTE: manrem is a measure of radiation exposure that indicates the potential impact on human cells.)

-- Provides engineering advice and assistance to ship's force personnel during reactor plant refuelings, overhauls, and testing.

-- Using exacting standards required for nuclear power installations, monitors dockside shop work as well as work performed on shipboard to ensure that engineering procedures prepared by cognizant engineers are followed.

Factor 1, Knowledge Required by the Position -- Level 1-7 -- 1250 Points

-- Professional knowledge of nuclear engineering principles and practices applicable to the full range of engineering duties concerned with the reactor refueling operations, including

planning for refueling, preparation of engineering procedures, and review of engineering work done by shipyard tradesmen and dockside shops.

-- Familiarity with related engineering fields, such as mechanical and electrical engineering and engineering mechanics.

-- Knowledge of a complete nuclear reactor system sufficient to identify or predict in advance potential job problems which could result in an incident and take positive engineering action to prevent these problems by changing procedures or recommending innovations.

These knowledge are such as could be acquired through a bachelor's degree program in nuclear engineering, supplemented by several years experience in engineering operations related to nuclear reactor refueling and reactor servicing.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

Supervisor assigns projects in terms of scope, general objectives, and time limitations. The engineer plans and carries out the work, but the supervisor is consulted on controversial or novel matters. Completed work is reviewed for attainment of objectives, priorities, and deadlines. The supervisor is kept informed of work progress by the engineer.

Factor 3, Guidelines -- Level 3-3 -- 275 Points

Guidelines include naval technical manuals and instructions, textbooks, engineering standards, technical handbooks and established practices. Guidelines covering refueling operations generally cover most, if not all, procedures encountered. However, the possibility exists for equipment malfunction which requires the engineer to independently select an appropriate course of action to maintain the refueling operation in a safe condition.

Factor 4, Complexity -- Level 4-4 -- 225 Points

Assignments involve a number of task areas which are typically found in exercising shipyard technical control of nuclear refueling operations. In addition to refueling work, the engineer is required to provide technical advice and assistance to all departments of the shipyard on matters such as secure areas affecting nuclear reactor plant repair procedures. However, most work involves state-of-the-art responsibilities for engineering planning, coordinating, and exercising technical control of all shipyard work pertaining to the refueling and refurbishing aspects of nuclear reactors and components. The engineer recommends different approaches or innovations to accomplish improved schedules, decrease cost, or reduce manrem to shipyard personnel.

Factor 5, Scope and Effect -- Level 5-3 -- 150 Points

The purpose of the position is to ensure that all engineering work associated with nuclear reactor refueling and other reactor servicing operations conforms with prescribed rules and regulations. The engineer's work has an impact on the safety and efficiency of the reactor overhaul work conducted aboard ships.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

Contacts are with other shipyard engineers, technicians, ship's personnel including the ship's engineer officer, trades shop personnel, quality assurance personnel, radiological control personnel and contacts with manufacturers' representatives who are usually contacted on an unscheduled bases as necessary.

Factor 7, Purpose of Contacts -- Level 7-3 -- 120 Points

Contacts are to request or exchange information, render technical decisions, provide technical advice, resolve conflicts concerning reactor refueling and refurbishing operations to include the scheduling/sequencing of the reactor plant work.

Factor 8, Physical Demands -- Level 8-2 -- 20 Points

Some of the work is sedentary, but there are aboard ship visits which involves walking, stooping, bending, crawling, and climbing vertical high ladders to monitor reactor refueling work in progress on a regular and recurring basis.

Factor 9, Work Environment -- Level 9-2 -- 20 Points

Reactor refueling work is accomplished aboard ship with the resultant exposure to noise and industrial safety hazards. Work areas are subject to dust, fumes, radiation, and radioactive contaminators. The engineer is required to utilize a variety of protective devices such as hardhats, goggles or safety eye glasses, safety shoes on a regular and recurring basis and occasionally anticontamination clothing, masks, and respirators. Periods of uncomfortably warm temperature may exceed 110 degrees F.

TOTAL POINTS -- 2570

NUCLEAR ENGINEER GS-0840-11, BMK #3

Duties

Serves as a nuclear engineer on the staff of a large field installation of a department with responsibility for analyzing, evaluating, and assisting in the administration of the contractor operation of nuclear reactors and associated facilities. Assignments involve: (1) monitoring operations to determine that production commitments are accomplished; (2) monitoring reactor systems to determine that plant operations are being performed in a safe manner using proper procedures and limits; and (3) reviewing operating procedures for completeness, adequacy, latitude of application and interpretation, and compliance with technical specifications and standards.

-- Inspects reactor facilities to observe actual operations and gather facts to evaluate efficiency of operations and make determinations as to the accomplishment of production commitments.

-- Reviews large production reactor systems to determine if adequate means are being utilized to assure that operations stay within specified performance limits and also within technical specifications and standards. The engineer takes action to coordinate the correction of a reactor systems problem or if deemed necessary, personally directs action to place the plant in a safe operating mode.

-- Monitors plant operations and reviews proposed modification or new construction of facilities and operations to assure reactor safety requirements are being met.

-- Reviews proposed test procedures to determine: (1) if the proposed operations involve safety considerations not included in applicable hazards summary reports; (2) the effect the proposed changes will have on safety; and (3) if the proposed changes exceed technical specification limits.

Factor 1, Knowledge Required by the Position -- Level 1-7 -- 1250 Points

-- Professional knowledge of nuclear engineering concepts, principles and practices applicable to the full range of engineering duties concerned with reactor operation and isotope production.

-- Familiarity with related engineering fields, such as chemical and mechanical.

-- Knowledge of the principles, theories, and techniques in the field of nuclear safety sufficient to maintain safe operating standards.

-- Knowledge of the nuclear engineering characteristics of large production reactors and the numerous operations which afford technical support to the production reactors.

Factor 2, Supervisory Controls -- Level 2-3 -- 275 Points

Supervisor assigns work in terms of project objectives and priorities. The engineer determines the methods and approaches to be used and independently plans and carries out the work assignment according to accepted engineering practices. The engineer's findings and recommendations on routine assignments are normally accepted as technically accurate, but may be checked or verified to assure strict adherence to engineering specifications. Completed work is also reviewed for conformance with policies and objectives.

Factor 3, Guidelines -- Level 3-4 -- 450 Points

Guidelines include agency directives and instructions on nuclear engineering, including local office policies and project requirements, operating contractors' directives, nuclear engineering texts, technical handbooks, and established practices. The engineer adapts and extends these guidelines for unusual situations and exercises judgment in their selection and application to specific problems. For example, in reviewing proposed construction of new facilities or modifications to existing facilities, the engineer must research and review all available guidelines to determine adequacy and completeness of reactor safety considerations. Adaptation of guidelines is necessary in project several approaches to provide acceptable engineering solutions.

Factor 4, Complexity -- Level 4-4 -- 225 Points

Assignments involve: (1) conducting surveys, evaluations, and analyzing highly specialized technical material; (2) state-of-the-art aspects of nuclear engineering concerning operations which are maintained and operated by contractor personnel; (3) coordinating production and technical development activities of large nuclear reactors; and (4) providing staff assistance in the administration of contractor activities. Projects are generally of a standard nature, but on occasion, the engineer must evaluate complex problems and provide solutions by applying a variety of approaches to the analysis of reactor operation and safety questions.

Factor 5, Scope and Effect -- Level 5-3 -- 150 Points

The purpose of the work is to provide compliance evaluation and technical direction for programs and subprograms in the contractor operation of nuclear reactor production facilities. The engineer's work efforts have a significant impact on the conduct of programs, operations, and safety.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

Contacts are with other engineers and management officials within the field location, the department headquarters, and contractor's organization. Occasional contacts are with engineers and other professionals in vendor organizations and other agencies.

Factor 7, Purpose of Contacts -- Level 7-2 -- 50 Points

Purpose of contacts is to plan for and coordinate individual inspections of large industrial type plants, to influence or persuade other engineers and program managers to agree to technical and programmatic points about which there is disagreement, to exchange technical and program guidance and coordinate work efforts, and to discuss and resolve conflicts concerning future work efforts. Contacts with agency headquarters are to assure that guidance received is coordinated so that program requirements are met.

Factor 8, Physical Demands -- Level 8-1 -- 5 Points

Work is principally sedentary with some walking or bending required during reactor area visits and inspections.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

Work is usually performed in an office setting. Visits to reactor areas and facilities involve some exposure to low level radiation and normal industrial hazards. Occasional travel may be necessary to attend meetings and conferences.

TOTAL POINTS -- 2470

NUCLEAR ENGINEER GS-0840-11, BMK #4

Duties

As a nuclear engineer on the staff of a major command of a military department, performs nuclear engineering duties associated with the design, specification, construction, and inspection of the naval nuclear core manufacturing processes, to ensure that the manufacturing operations will not degrade the capability of the reactor to meet the specific core design performance objectives. This includes review of the technical requirements for new core contracts.

-- Reviews and recommends approval of naval core manufacturing processes and specifications submitted by naval reactor laboratories.

-- Makes field surveys to ensure that manufacturing operations will not degrade the capability of the reactor to perform up to design specifications.

-- Reviews design engineer's working drawings of reactor core design modifications to assure that they meet established technical requirements.

-- Analyzes reactor core procurement contracts between the Government and private core manufacturing contractors; includes the review of technical requirements for new core contracts and evaluation of costs outlined in the contracts.

-- Maintains frequent contact with engineers and management personnel of Federal Government laboratories and core contractors to review production or quality assurance problems.

-- Reviews manufacturing and development programs conducted at Federal Government laboratories including a variety of programs to improve the nuclear, thermal, mechanical and metallurgical performance of nuclear reactor cores.

-- Makes field surveys to investigate core manufacturing processes and existing equipment layout and conditions to determine that design specifications are met.

-- Provides technical direction of Government inspections of nuclear reactor cores: includes review and approval of revisions to documents that contain specific Government inspection requirements.

Factor 1, Knowledge Required by the Position -- Level 1-7 -- 1250 Points

-- Professional knowledge of nuclear engineering principles and practices applicable to the full range of engineering duties concerned with the design and manufacturing processes of nuclear reactor core production and the effects of specific processes on core material properties.

-- Familiarity with related engineering fields, such as mechanical and metallurgical engineering.

-- Knowledge of the design characteristics of nuclear reactor cores which includes calculations based on reactor physics, metallurgy, reactor materials, heat transfer, hydraulics, stress analysis, mechanical design, and quality control methods and principles.

These knowledge are such as could be acquired through a bachelor's degree program in nuclear engineering, supplemented by several years experience in the design of reactor core and the manufacturing processes and the effects of specific processes on core material properties.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

Supervisor assigns projects in terms of scope, general objectives, and time limitations. The engineer independently plans and carries out the work, but the supervisor is available for consultation on novel design features. The engineer's findings and recommendations on routine assignments are normally accepted as technically accurate, but may be checked or verified to assure strict adherence to engineering specifications.

Factor 3, Guidelines -- Level 3-3 -- 275 Points

Guidelines include contract plans and specifications. Other guidelines include agency technical manuals and instructions, textbooks, engineering standards, technical handbooks, and established practices. Although guides generally apply to most situations, the engineer independently selects, adapts and applies the guides and engineering methods and techniques in dealing with the specialized requirements of the manufacturing processes of nuclear reactor core production.

Factor 4, Complexity -- Level 4-4 -- 225 Points

The work covers a number of essentially different nuclear and mechanical systems found in a reactor core and closely affiliated components in the reactor vessel. The engineer typically is required to deal with different design criteria relating to the projects assigned. The work of reviewing the manufacturing processes of nuclear reactor core production requires recognition of

the relationship of problems and practices of related engineering fields such as mechanical, electrical, and fluidics engineering.

Factor 5, Scope and Effect -- Level 5-3 -- 150 Points

The purpose of the position is to ensure that: (1) the naval nuclear core manufacturing processes and specifications submitted by naval reactors laboratories meet technical requirements; and (2) the actual manufacturing operations will not degrade the capability of the reactor to meet all of the specific core design performance objectives. The work has a significant impact on the reactor power capability and the safety of the systems to be installed aboard ship.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

The engineer has extensive contacts with engineers and management officials of naval reactors laboratories and management personnel of the prime contractor for core manufacturing.

Factor 7, Purpose of Contacts -- Level 7-3 -- 120 Points

Contacts are to coordinate the work involved in core manufacturing operations, to discuss technical requirements for new core contracts, and generally to monitor the programs to improve nuclear, thermal, mechanical, and metallurgical performance of nuclear reactor cores. Contacts with contractors often involve serious differences that require persuasion and diplomacy in order to reach agreement.

Factor 8, Physical Demands -- Level 8-1 -- 5 Points

The work is normally sedentary. However, occasional physical activity is required including walking, bending, or stooping during field visits to contractors' plant operations or the inspection of the installed equipment.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

Work is normally performed in an office setting. Some work is performed on navy ships and submarines, in shipyards, and at contractors' plants. Additional travel may be necessary to attend meetings.

TOTAL POINTS -- 2540

NUCLEAR ENGINEER GS-0840-12, BMK #1

Duties

Serves as a nuclear engineer on the staff of a departmental field office which coordinates and monitors activities of a large national laboratory operated by a private contractor. Typical assignments are in one or more of the following areas: (1) performing analytical analysis of departmental operations involved in the production of source and special nuclear materials; (2) analyzing various isotope separation technologies for enriching uranium; (3) conducting studies of processing stages in order to determine requirements for enriched uranium; (4) reviewing production plans for supplying enriching services; (5) monitoring and coordinating the interrelationship of the isotope separations plant with other production facilities, operations, and activities.

-- Formulates and develops management plans and policy guidelines related to the national laboratory programmatic planning to achieve efficient and effective accomplishment of department goals and objectives in the production of source and special nuclear materials.

-- Identifies and analyzes enrichment plant demand to establish long-range department enrichment plans and options to assure that requirements for enriching services will be satisfied. Develops or expands new or existing methods for measuring the impact of the various multi-product requirements on the supply and demand of enriched uranium.

-- Performs engineering studies and analyses of Federal Government requirements of enriched uranium to determine the effect of specific program options on the enrichment plant operations.

-- Reviews reports, operating plans, and proposals, furnished by the operating contractor and prepares recommendations and plans to improve the efficiency and quality of the submitted documents based on own independent analysis.

-- Performs special studies pertaining to the nuclear fuel cycle as a whole, and related evaluation in terms of their impact on the enrichment process as an entity within the fuel cycle. Such studies may include the analysis of minor uranium isotopes, highly enriched uranium requirements and the reprocessing cycle. Included is the development of specific answers to highly technical inquiries from within and external to the department.

-- Analyzes new enrichment plant scheduling, utilizing existing and advanced isotope separation technologies, as it relates to projected demands. Evaluates the impact of various projected activities on department contingency stockpiles of uranium.

-- Performs special studies of alternate fuel cycles as they relate to resource requirements and commercialization. Such studies may include proliferation resistance, economics, timing, and technology status.

Factor 1, Knowledge Required by the Position -- Level 1-7 -- 1250 Points

-- Knowledge of professional nuclear engineering theories, principles, and techniques sufficient to enable the engineer to evaluate operating plans of nuclear reactors and isotope separation plants and to determine their interrelationship with other production facilities.

-- Knowledge of nuclear fuel production methods including gaseous diffusion, centrifuge, advanced isotope separation methods, feed processing, and other strategic materials processes sufficient to devise appropriate mathematical models simulating plant operations.

-- Familiarity with related engineering disciplines such as mechanical, chemical, and electrical engineering.

-- Knowledge of the techniques and principles of commercial power reactor fuel cycle management and specific knowledge of the department's fuel enriching contracts and policies sufficient to evaluate the impact of civilian nuclear power developments on the department operations, costs, and revenues.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

Supervisor makes assignments in terms of specific problems or projects which are largely dependent on program options dealing with highly enriched uranium requirements and their impact on contractor plant operations. Priorities and deadlines for the completion of such assignments are established: (1) by the engineer in consultation with the supervisor; and (2) by the engineer recommending to the supervisor subsequent refinement or extension of current work projects. Assignments are performed independently with considerable latitude to exercise judgement in organizing, analyzing, and developing solutions for assignment objectives. Completed work is reviewed in terms of effectiveness in meeting requirements and to assure compatibility with related work performed by others.

Factor 3, Guidelines -- Level 3-3 -- 275 Points

Guidelines include manuals, engineering regulations such as established design criteria, federal codes and standards, contractors publications, established procedures, policy statements, and terms of contracts. The engineer is expected to be thoroughly familiar with pertinent guidelines and to use judgement, initiative, and originality in developing new methods as to deal with rapidly changing technological innovations or in more demanding assignments where present guidelines are lacking, inadequate, or inappropriate.

Factor 4, Complexity -- Level 4-5 -- 325 Points

Assignments involve use of advanced techniques to examine and evaluate complex questions which encompass varied complex features especially in the engineering processes involving the nuclear enrichment techniques. Individual assignments require the engineer to recognize the relationship of many varied technical problems and use scientific methods in an innovative manner. The engineer must exercise creativity and experienced judgment in extending traditional techniques or developing new ones to keep pace with changing programs, rapidly changing technological developments, or obscure analytical problems.

Factor 5, Scope and Effect -- Level 5-5 -- 325 Points

Assignments involve engineering aspects of the enrichment and fuel cycle operations. The engineer proposes a variety of analytical approaches to assess different operating plans under various constraints. The engineer evaluates advanced isotope separation methods against several factors such as economic proliferation and technology requirements. Work projects are a major input to enrichment operations planning and preparation of management decision packages. They also impact on the department's nuclear fuel responsibilities and in contractual provisions negotiated with the private contractor. The engineer's judgments affect the safety of the various production crews who work in the fuel cycle operating plants.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

Personal contacts usually involve the middle management levels within the national laboratory and occasional contacts with top management levels within the laboratory. Frequent contacts are established with middle management levels of contractor organizations and middle management levels of other department offices, including department headquarters, and other Government agencies. Occasional contacts also are established with middle management levels in private industry.

Factor 7, Purpose of Contacts -- Level 7-3 -- 120 Points

Contacts are established to advise, recommend, or otherwise assist in the technical and economic aspects of operational programs involving enrichment plant demands and technologies to meet those demands. Such contacts are to provide information and status regarding the review of the technical and economic phases of contractor operational, planning, and research and development programs. The engineer must be persuasive in these contacts to demonstrate the accuracy of conclusions and verify that the department's objectives are being met. Contacts also are established to obtain information for the assessment of future enrichment needs and to assist in the development of technologies and plans to assure that these needs are efficiently and effectively satisfied.

Factor 8, Physical Demands -- Level 8-1 -- 5 Points

The work is mostly sedentary. However, there may be some walking, standing, and bending when visiting the contractor plant facilities.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

Most of the work is in an office setting, although there may be occasional travel to attend conferences and meetings.

TOTAL POINTS -- 2815

NUCLEAR ENGINEER GS-0840-12, BMK #2

Duties

Serves in a naval shipyard as a nuclear engineer responsible for: (1) reactor operations during a specific shift; and (2) the reactor plant test program for assigned operational tests which are also carried out during a work shift. The engineer is responsible for proper operational procedures being used during conduct of tests in progress. Assignments typically include: (1) determining exact reactor plant status at the start of the work shift; (2) formally briefing ship's force personnel on planned reactor plant operations and tests; (3) coordination with other shipyard organizations to provide the support necessary for the conduct of test or operations, e.g., installation of special test equipment, installation of containments for radiological control considerations, inspection of systems and completed work; (4) serving as the single shipyard authority for determining that all necessary preparations are complete; and (5) providing final approval for commencement of the operational test. The engineer assures the safety of the reactor plant at all times during the assigned shift. The engineer does this by (1) perceiving errors in the test procedures before authorizing their implementation, and getting them changed and/or safely backing out of the test as the engineer judges necessary; and (2) deciding on and directing any action the engineer judges necessary to keep the reactor plant safe. (Positions similar to the following BMK are classifiable to the Nuclear Engineering Series, GS-0840, when they meet all five (a through e) of the conditions identified in the introductory material in this standard under the heading "Evaluation Notes.")

-- Directs reactor plant operations related to the conduct of acceptance tests or dynamic changes to the plant which support overhaul work.

-- Ensures safe operation of the reactor plant by assuring all operations are performed in accordance with approved procedures and expected plant responses as indicated by instrumentation or reports from watch standers are obtained.

-- Determines appropriateness of plant responses to systems operations by evaluating the parameters and determining the likely cause(s) of the monitored condition and the advisability of continuing the test sequence.

-- Conducts formal detailed briefings for all shipyard and ship's force personnel involved in a reactor test operation. By reviewing formal reports from participating personnel, assures that all required preparations are completed, inspected, and the required certifications have been obtained.

-- Directs a "dry run" or the actual operation in step-by-step manner in accordance with detailed operating procedures; searches out possible problems; monitors plant responses for verification of proper operation or indication of a problem; reviews data required to be recorded to determine whether it is satisfactory; and ensures safe operation of the reactor plant.

-- In the event plant response is not as predicted, evaluates situation, formulates corrective actions, and directs operations to promptly place the plant in a safe condition.

-- Evaluates all requests to perform maintenance, repair or overhaul work on reactor plant components (mechanical, electrical, structural). Assures that work has been approved by authorized representatives of all required specialties and that it is scheduled for that time, place, and work environment. Decides whether the work can be done without endangering the reactor, and directs any changes to systems status required or which the engineer judges necessary to support the work or maintain the safety of the reactor. Provides final shipyard approval for the commencement of each work item.

-- Directs assigned lower grade engineers and plans and coordinates their work during reactor test operations; monitors plant operations during test progress to assure proper sequence and schedule issued by engineer in charge of overall project; reviews daily turnover instructions from previous work shifts; provides direction to correct problems or cause increased support to be provided by other shipyard organizations directly involved haul and explains procedures or problem areas to other engineering personnel or outside representatives concerning matters pertaining to assigned responsibilities.

-- Determines the need for and prepares detailed instructions or changes to technical instructions for: (1) the assembly and installation of test equipment; (2) procedures used to accomplish tests or operations; and (3) daily schedules which sequence work, tests, and plant operations.

Factor 1, Knowledge Required by the Position -- Level 1-7 -- 1250 Points

-- Professional knowledge of nuclear engineering concepts and principles to include areas such as (1) theory of design and operation of pressurized water reactor plants; (2) reactor theory (reactor physics, materials, thermal, and hydraulic) design principles; (3) chemistry, corrosion, basic nuclear physics as it applies to radiation and radiological control; (4) operational theory of electrical instrumentation and control equipment systems; (5) design and operational theory of fluid system equipment; and (6) nuclear plant safety and overall plant operation theory.

-- Familiarity with related engineering fields such as mechanical and electrical.

-- Knowledge of nuclear plant operations to be conducted sufficient to identify possible hazards that might be encountered and take appropriate corrective action, evaluate equipment problems and their relative significance and determine the plant status necessary for accomplishment of each of the many work items accomplished on the reactor plant.

-- Knowledge and skill sufficient to assign, monitor, review, and evaluate the work of assigned shift team members, assure diligent and productive use of their time and effort and resolve technical or administrative problems encountered.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

Supervisor makes assignments by providing overall objectives and in consultation with the engineer identifies the test(s) planned and discusses any special considerations or problems. The engineer is expected to review all necessary technical documents and independently plan, coordinate, and accomplish the operational test. During the test phases, if unexpected plant responses are observed, the engineer independently takes action to place the plant in a safe condition and keeps the supervisor advised of conditions encountered, actions taken, and actions planned. Work is reviewed on an overall basis in terms of compatibility with other work and effectiveness in meeting requirements. Because of stringent engineering safety requirements, some assignments with severe consequence of error may be subject to intense peer or other review.

Factor 3, Guidelines -- Level 3-4 -- 450 Points

Because of the nature of nuclear work, extensive guidelines are utilized to assure exact technical control over work and plant operations. These instructions are in the form of technical manuals and instructions and shipyard instructions issued specifically for nuclear work. Detailed step-by-step written instruction are provided for each test or special plant operation. The engineer is expected to understand all the guidelines in detail and follow them exactly. When in the judgment of the engineer the instruction cannot or should not be followed in a specific situation, the engineer must initiate action to get the change to the instruction or a waiver to the requirement. Because of the great number of guidelines available, extensive demands are placed on the engineer to assure all those applicable are considered and followed without conflict. With respect to system and overall plant response during testing and dynamic changes in plant conditions, the engineer must be able to recognize the symptoms of potential problems and, based on formal training and engineering experience, take decisive and immediate response to place the reactor plant in a safe and stable condition. In these instances there is no time to consult guidelines or the immediate supervisor. The engineer is recognized as the technical

authority in this specialty area of plant operation and has both the authority and responsibility to act on own initiative and engineering judgment in response to unusual problems where precedent is not applicable.

Factor 4, Complexity -- Level 4-5 -- 325 Points

The work involves a variety of interrelated mechanical, electrical, and electronic systems and equipment with some operating in a high temperature, high pressure, high radiation environment. Decisions involving isolated technical problems may have significant effects on plant operation because of the interdependency of equipment and operating safety requirements. The work requires innovative judgment due to the extensive technical requirements necessary during tests. These requirements vary from simple hydrostatic tests to plantwide tests involving critical operation of the reactor with the reactor and ancillary equipment operating at full power. Problems encountered generally fall within the state-of-the-art, but they also involve: (1) many checks or inspections for possible operating problems; (2) monitoring plant responses for verification of proper operation or indication of a problem during the course of a criticality operation; and (3) determining if all systems function properly.

Factor 5, Scope and Effect -- Level 5-5 -- 325 Points

The purpose of the position is to assure that the reactor plant is safe by authorizing implementation of each test procedure in an evolutionary or step-by-step process; by monitoring and reviewing onsite the test procedures; by authorizing and monitoring all overhaul work that could affect the reactor plant; and by heading off incidents or placing the reactor plant in a safe condition should an incident occur. These tests have a direct effect on the ship overhaul schedule and resultant costs. The engineer's recommendations affect the progress of the test program. Actual tests are performed by work teams from the various production shops. The engineer's responsibility includes the safe operation of all tests which impact on the safety of the ship's force, civilian workers, and the water front area and requires the engineer to take immediate action to place the plant in a safe condition in the event of an abnormal situation. The engineer's advice and guidance is routinely sought by other officials including ship force officers, production trade supervisors and shift engineers from other shipyard departments.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

Contacts are with other engineers, technicians, ship's personnel, including the ship's engineer officer, trades shop personnel, quality assurance personnel, radiological control personnel, and manufacturers' representatives who are usually contacted on an "as needed" basis.

Factor 7, Purpose of Contacts -- Level 7-3 -- 120 Points

Contacts are established to request or exchange information, render technical decisions, provide technical advice, resolve conflicts concerning reactor plant operations, and to test and schedule/sequence reactor plant work. The engineer does not have line authority over the shop workers who perform the actual test procedures. The engineer must deal with members of shop work teams who have a wide range of backgrounds and levels of technical understanding. The engineer also must obtain the cooperation of different work teams, so that desired test results will be produced.

Factor 8, Physical Demands -- Level 8-2 -- 20 Points

The work is partly sedentary, but requires aboard ship inspections which involves regular and recurring walking, stooping, bending, crawling, and climbing vertical high ladders.

Factor 9, Work Environment -- Level 9-2 -- 20 Points

Test work is accomplished aboard ship with resultant exposure to regular and recurring noise and industrial hazards typical of shipyards. Work areas are subject to dust, fumes, radiation, and radioactive contaminators. The engineer is required to utilize a variety of protective devices such as hardhats, goggles or safety eye glasses, safety shoes, and occasionally anticontamination clothing, masks, and respirators. Periods of uncomfortably warm temperatures may exceed 110F.

TOTAL POINTS -- 3020

NUCLEAR ENGINEER GS-0840-12, BMK #3

Duties

The engineer is responsible for developing plans and providing technical direction in the areas of design, development, construction, and test of the main and auxiliary sea water systems, the engine room fresh water systems, the gland seal and exhaust systems and the reactor plant systems for a nuclear reactor propulsion plant utilized on naval surface ships and submarines.

-- Develops integrated operating and casualty procedures and instructions for the steam and electric plant and reactor plant manuals which will be used in operating submarine and surface vessels.

-- Coordinates and directs the efforts of technical personnel in naval field installations, other Federal laboratories and many private subcontractors who are directly involved in the design, fabrication, installation, and modification of such systems.

-- Reviews contractor and laboratory proposed plans and specifications and resolves technical conflicts by ensuring compatibility of design, materials and fabrication and installation techniques.

-- Resolves schedule or scheduling and contractual problems and expedites the work performed by laboratories and subcontractors.

Factor 1, Knowledge Required by the Position -- Level 1-7 -- 1250 Points

-- Professional knowledge of the theory, principles, techniques, and practices of nuclear engineering including recently introduced methods and techniques in the use of reactor materials, metallurgy, reactor physics, heat transfer, hydraulics, stress analysis, and mathematics.

-- Knowledge of the current and proposed functions and objectives of the nuclear power program of the department.

-- Knowledge sufficient to coordinate and direct the work of technical personnel in naval field installations, national laboratories of other departments, and many private subcontractors.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

The supervisor makes assignments in terms of problems or projects and indicates priorities and overall objectives. Supervision typically consists of general guidance concerning overall assignment parameters, and the relationship of the assignment to the work of other engineering components which have responsibilities for other program areas. The engineer plans own work, coordinates it with other engineers or technicians, resolves technical or administrative problems, and carries assignments through to completion. The engineer provides advice and assistance independently. Completed work and technical decisions or recommendations are reviewed for conformance with policy and program objectives, budgetary considerations, and compatibility with the work of other engineers serving other areas of program responsibility.

Factor 3, Guidelines -- Level 3-4 -- 450 Points

Guidelines include parent department and other department's directives pertaining to nuclear power propulsion systems development. The engineer uses initiative and judgment in selecting, adapting, and applying pertinent guidelines. In addition, the engineer uses ingenuity and resourcefulness in deviating from or extending established methods or techniques in those situations where guidelines are not completely applicable due to the evolving technologies in the nuclear energy field. The engineer also exercises judgment in direct technical consultation with field personnel in the areas of component research and development, implementing new design features or modifications and recommending the design and development of new special maintenance tools and techniques.

Factor 4, Complexity -- Level 4-5 -- 325 Points

Assignments typically involve new designs, design modifications, requirement definitions, and engineering evaluations. The engineer resolves unusual nuclear engineering problems and provides or exchanges authoritative information and opinions with other knowledgeable engineers and technical personnel. The engineer must combine existing nuclear propulsion plant technology with the various aspects of arrangements, operating requirements, and components design capabilities in new designed submarines. The engineer is responsible for including in these designs any changes resulting from new developments at department's national laboratories or other contractors' facilities. The work also requires recognition of the relationship of the problems and practices of related engineering fields either to solve engineering problems or refer these problems to the appropriate source for resolution.

Factor 5, Scope and Effect -- Level 5-5 -- 325 Points

The purpose of the work is to ensure that program objectives are properly accomplished and includes providing design parameters and other technical guidance to headquarters and field personnel, technical representatives, and other consulting engineers. The engineer acts as coordinator for all assigned program activities and furnishes technical advice to other nuclear engineers on specific design problems. The work impacts the safety and effective operations of nuclear powered surface and submarine vessels.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

Personal contacts are with members of the technical staff of the immediate office, higher naval command headquarters, the naval ship engineering central office, naval shipyards, another department and contractor representatives.

Factor 7, Purpose of Contacts -- Level 7-3 -- 120 Points

Contacts are established to advise on and discuss problems involving the area of assignment. Contacts with contractor personnel are established to provide technical monitoring of their work and to provide guidance. The engineer also takes part in conferences with other engineers and technicians, contractor representatives, and other department for the purpose of exchanging information and to reach mutual technical decisions involving the assigned system.

Factor 8, Physical Demands -- Level 8-1 -- 5 Points

The work is normally sedentary, but requires occasional travel and moving about navy ships, in shipyards, and at contractors' plants.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

The work is normally performed in an office setting. Some work is performed on navy ships.

TOTAL POINTS -- 2990

NUCLEAR ENGINEER GS-0840-12, BMK #4

Duties

Serves in a naval shipyard as a nuclear engineer responsible for developing the work instructions and procedures necessary for the overhaul, testing, repair and modification of nuclear components and systems (e.g. electrical, fluid, and mechanical) on board naval surface ships and submarines and/or in production shop work areas. In addition, the engineer provides technical direction and control for the resolution of nonroutine engineering problems which require expertise in nuclear and related engineering specializations.

-- Develops and writes the technical work instructions and procedures to be followed by shipyard technical and production personnel in the repair and modification of individual nuclear systems, components, and related items.

-- Develops and writes the test or operating procedures to be followed by shipyard technical and production personnel or reactor plant operator personnel in the testing and operations associated with the repair and modification of nuclear systems, components, or related items.

-- Formulates testing requirements for production shops and develops test equipment and rigs required to support the testing program.

-- Evaluates proposals for changes and modifications to methods, components, and equipment for facilitating and improving the repair process. Evaluates the adequacy and practicability of the proposed change or design in terms of cost and personnel radiation exposure as well as evaluating from an engineering standpoint in terms of mechanical and physical feasibility. Makes determination regarding the compliance of proposals to nuclear requirements and standards.

-- Serves as trouble shooter by making visits on board submarines, surface ships, and production shops to investigate problems and develop possible solutions as well as decisions regarding any changes or modifications deemed appropriate.

-- Interprets policies, regulations and engineering criteria as established by headquarters and local requirements and provides such information to production personnel.

-- Using exacting standards required for nuclear power installations, monitors dockside shop work as well as work performed on board ships to ensure that engineering procedures prepared by cognizant engineers are followed.

-- Determines need for alteration and modification to existing systems prior to or during actual work phase. Directs necessary changes and furnishes assistance required.

Factor 1, Knowledge Required by the Position -- Level 1-7 -- 1250 Points

-- Professional knowledge of the concepts, principles, techniques, and practices of nuclear engineering such as reactor materials, metallurgy, reactor physics, heat transfer, hydraulics, stress analysis, and mathematics.

-- Knowledge of design and operational theory of nuclear reactor fluid and instrumentation and control equipment and systems.

-- Knowledge of parent department and another department's directives and of local office policies pertinent to the work.

-- Knowledge of the functions and objectives of the nuclear power program of the department.

-- Knowledge of advanced nuclear engineering work being done for the department in other Government laboratories and contractors' plants.

-- Professional knowledge of the theory, principles, techniques, and practices of nuclear engineering that enables the engineer to serve as the technical consultant on projects relating to the overhaul, repair, and testing of nuclear, fluid, mechanical, and electrical systems and components.

-- Knowledge and skill sufficient to develop engineering instructions and procedures for the accomplishment of reactor plant overhaul and repair work, including ability to develop new approaches and modify standard practices, techniques, or procedures.

-- Knowledge of related engineering fields such as structural, mechanical, industrial, metallurgy, hydraulics, chemical, and electrical.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

Supervisor makes assignments in terms of specific projects. The supervisor sets the overall objectives and resources available. Assignments are defined in terms of broad, general objectives, priorities, deadlines, and anticipated complex problem areas.

The engineer plans own work, coordinates it with other engineers or technicians, resolves most technical or administrative problems or conflicts and carries assignments through to a successful completion. The engineer provides advice and assistance independently but keeps the supervisor informed on major controversial issues encountered.

The engineer is responsible for reviewing all necessary technical documents, for planning and carrying out the assignment and for making engineering interpretations, judgments, and decisions on matters without clear precedents. The supervisor generally is available for consultation on unusually complex, controversial or novel matters. Completed work and technical decisions or recommendations are normally accepted as technically accurate and are reviewed for conformance to policy and for accomplishment of overall assigned objectives.

Factor 3, Guidelines -- Level 3-4 -- 450 Points

Guidelines include departmental regulations and policies, equipment and systems technical manuals, shipyard instructions, and manufacturers' handbooks and catalogs. The engineer uses initiative and judgment in selecting, adapting, and applying pertinent guidelines. In addition, the engineer uses ingenuity and resourcefulness in extending established methods or techniques in those situations where guidelines are not completely applicable due to the evolving technologies

in the nuclear energy field. The engineer also exercises judgment in the direct technical consultation with field personnel in the areas of component research and development, implementing new design features or modifications, and recommending the design and development of new special maintenance tools and techniques.

Factor 4, Complexity -- Level 4-5 -- 325 Points

The engineer is responsible for developing the procedures and methods to be used by others in accomplishing and documenting required quality of the scheduled nuclear work. The work involves a variety of interrelated mechanical, electrical, and electronic systems and equipment with some operating in a high temperature, high pressure, high radiation environment. Decisions involving isolated technical problems may have significant effects on plant operation because of the interdependency of equipment and operating safety requirements. The work requires innovative judgment due to the extensive technical requirements involved or encountered during tests.

Assignments typically involve new designs, design modifications, requirement definitions, and engineering evaluations. The engineer resolves unusual nuclear engineering problems and provides or exchanges authoritative information and opinions with other knowledgeable engineers and technical personnel. The engineer combines existing nuclear propulsion plant technology with the various aspects of arrangements, operating requirements, and components design capabilities in naval nuclear propulsion plants. The engineer anticipates problems and determines need for alteration and modification to existing systems to correct structural, operational and physical deficiencies.

It is often necessary to analyze and choose among conflicting standards and methods from the standpoint of economy, safety and engineering feasibility which may necessitate change in established policies and procedures in order to resolve the problem.

The engineer must take actions on problems on the spot and which if not resolved early could result in production delays and affect reactor plant safety and performance reliability.

Factor 5, Scope and Effect -- Level 5-4 -- 225 Points

The purpose of this work is to provide technical expertise as a specialist in the field of nuclear systems and provide advisory and planning services on specific problems and projects. The engineer develops the criteria, procedures, quality assurance, or instructions necessary for accomplishing the work or conducting the testing and inspection programs. The engineer

monitors work performed dockside and on board ships to assure strict adherence to engineering procedures. The engineering determinations affect the design or operation of equipment with regard to economy, efficiency and safety of the systems involved. This work affects the effectiveness and efficiency of the total production effort.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

Contacts are with various levels of managers and supervisors, other shipyards, headquarters, engineers, technicians, trade shop personnel, quality assurance personnel, and manufacturers' representatives who may be contacted as necessary.

Factor 7, Purpose of Contacts -- Level 7-3 -- 120 Points

Contacts are established to provide and clarify information and to advise on and discuss problems involving the area of assignment. Contacts are also established with headquarters, another department, and reactor plant design representatives to exchange information or persuade and obtain agreement to modify or waive requirements or to accept and adopt other criteria and methods.

Factor 8, Physical Demands -- Level 8-2 -- 20 Points

The work involves field inspections or surveys in which the work requires regular and recurring standing for long periods and walking, stooping, bending, and climbing in areas of shipyard overhaul and repair activities.

Factor 9, Work Environment -- Level 9-2 -- 20 Points
Work is performed in an office as well as on board ship and in shop areas where there is regular and recurring exposure to heavy industrial equipment, high temperatures, and radiation sources and other potentially hazardous conditions.

TOTAL POINTS -- 2920

NUCLEAR ENGINEER GS-0840-12, BMK #5

Duties

Serves as a nuclear engineer on the staff of an agency field office which reviews, analyzes and evaluates activities of a large government laboratory operated by a private contractor for the department. The assignment consists of: (1) providing technical advice relative to research, development, design, construction, test, and operation of nuclear power plants, and facilities; (2) reviewing and analyzing the prime contractors' efforts in design reliability and the advancement

of corrosion technology in reactor plant systems and components; (3) appraising prime contractor reactor safety programs, fire and industrial safety, and environmental protection activities at operating contractor facilities; (4) evaluating prime contractor technical and management activities to ensure program objectives are accomplished; (5) coordinating field office activities with other organizations, including shipyards, other field offices, and cognizant headquarters personnel as necessary to provide department support for various activities conducted by the prime contractor in assigned areas of responsibility.

- Maintains technical, operational and administrative cognizance of assigned laboratory activities through review and inspection of prime contractors' work programs and facilities to resolve technical problems, avoid cost over-runs, resolve schedule slippage, and improve contractor performance and reliability; and ensure that work is performed in accordance with program objectives. Assessment of progress and identification of problem areas is accomplished by direct discussions with contractor technical management, frequent visits to laboratory work areas, attending contractor's internally scheduled meetings, and constant review of contractor technical and administrative reports.
- Coordinates and provides guidance to prime contractors in the areas of conceptual design, selection of materials, manufacturing, fabrication, and installation techniques and procedures.
- Reviews prime contractor staffing and budget estimates and identifies problem areas.
- Reviews and endorses laboratory test procedures, specifications, engineering field changes, servicing procedures, revisions, and change notices.

Factor 1, Knowledge Required by the Position -- Level 1-7 -- 1250 Points

-- Professional knowledge of principles, theories, and techniques of nuclear engineering and related fields of experience sufficient to enable the engineer to review, evaluate, and coordinate prime contractor activities in reactor design, development, testing, and operation of nuclear propulsion plants.

-- Knowledge of corrosion engineering and metallurgical technology sufficient to evaluate new methods, techniques, and approaches in corrosion resistance.

-- Knowledge of headquarters and other Federal policies, bulletins and publications, as well as the principal theories and practices of the engineering disciplines sufficient to evaluate contractor work programs, identify technical deficiencies in assigned areas of responsibilities, and take or initiate appropriate corrective action when necessary.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

Assignments, priorities, and deadlines are established through consultation with the supervisor. Work is accomplished independently with considerable latitude in planning the assignment, coordinating the work with other offices as necessary, and developing solutions to accomplish technical objectives, improve contractor performance, and ensure technical progress. Technical guidance is usually provided by the supervisor in situations involving controversial questions and significant programmatic issues. Matters affecting budgets, manning, and other administrative features are referred to the supervisor in the form of recommendations. Completed work assignments are reviewed primarily for reasons of policy, compatibility with overall objectives, and budgeting considerations. Otherwise, little or no technical guidance is given.

Factor 3, Guidelines -- Level 3-4 -- 450 Points

Guidelines consist of agency headquarters publications and regulations, technical manuals, engineering principles, established design criteria, Federal codes and standards, contractor publications, policy statements, and terms of contracts. The engineer is expected to be innovative in adapting, recommending improvement in, and making compromises with standard guides and operating policies as necessary to resolve unusual situations and specific problems which are without precedent.

Factor 4, Complexity -- Level 4-4 -- 255 Points

Assignments cover diverse programs and areas within the assigned projects, and often require the resolution of a combination of complex features which involve serious conflicts between engineering and management objectives (e.g., schedule vs. design considerations). The engineer must be versatile in recommending new approaches to technical problems and in modifying or adapting standard guidelines to new work situations.

Factor 5, Scope and Effect -- Level 5-4 -- 255 Points

The purpose of the work is to ensure that the operating contractor successfully accomplishes program objectives in a timely and effective manner, and at minimum costs. The engineer provides both administrative and technical guidance and assistance to contractor engineers and technical management on specific design programs impacted by technical reliability, manufacturing and material costs, and schedule demands. The engineer acts as the agency representative in all assigned project activities. The work, through the engineer's findings, impacts the contractor's research and design efforts at the laboratory and consequently upon the department's nuclear powered surface and submarine vessels.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

Contacts are with field officer personnel in technical and administrative positions at all levels including the manager, senior technical field representative, division directors and project officers, and with agency headquarters personnel and prime contractor cognizant engineers and management personnel.

Factor 7, Purpose of Contacts -- Level 7-3 -- 120 Points

Contacts are established to coordinate review of contractors' current and proposed activities and to advise on and discuss problems relating to design and other technical deficiencies. Conferences with contractor and headquarters technical management are held to discuss proposed solutions and determine appropriate course of action. All contacts require tact and diplomacy to obtain or convey accurate information concerning methods, techniques, or practices in the resolution of problems. The engineer influences or persuades contractor management to adopt agency technical and administrative viewpoints in matters where there may be substantial disagreement.

Factor 8, Physical Demands -- Level 8-1 -- 5 Points

Principally sedentary; however, in conducting inspection tours, the engineer may be required to expend effort in climbing or walking.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

Work is performed primarily under normal office conditions. However, frequent visits are made to laboratory environments, and occasional visits are made to reactor prototype and construction locations. In the laboratory and prototype locations, industrial type hazards (such as construction equipment, high temperature and pressure water or steam, machine tools, and high voltage equipment) may be encountered.

TOTAL POINTS -- 2790

NUCLEAR ENGINEER GS-0840-13, BMK #1

Duties

Serves as a nuclear engineer with project management responsibility for the nuclear engineering department of a naval shipyard performing nuclear engineering work. The engineer has full technical and management responsibility for assigned project work in connection with refueling,

alteration, repair, maintenance, and testing of nuclear reactor plants for the assigned availability of an assigned submarine or ship undertaken by the shipyard. Assigned engineering projects cover all phases of shipyard work on reactor plants. The duties of the nuclear project engineer include extensive coordination across organizational lines within the nuclear engineering department and with the production controllers and various contractor representatives. The engineer coordinates the nuclear engineering department work package development which requires the integration of many different work phases in the overhaul, testing, maintenance, modification, and refueling of nuclear reactor plants. The engineer also (1) resolves conflicts occurring during development of the work package, such as those caused by overlapping functions; (2) provides advice and recommendations for design changes; and (3) ensures strict adherence to schedules. The project engineer typically is assigned responsibility for the availability of a ship's or submarine's complete nuclear propulsion systems.

-- Identifies requirements, manages, and acts for the nuclear engineering manager representative for shipyard reactor plant work.

-- Provides management guidance and coordinates work projects between the individual divisions of the nuclear engineering department and between other shipyard departments and divisions.

-- Provides project coordination of engineering and planning functions to include a complete and thorough engineering review of all approved work entering the department on an individually assigned project. This includes assigning cognizant technical codes, determining adequacy of software schedules for all major project assignments, assuring proper manning and timely completion and budgetary control involving the overhaul or conversion of the reactor plants for nuclear powered submarines and surface ships.

-- Prepares or directs development of comprehensive project reports to top management.

-- Identifies requirements and approves key operations including startup, power increments, insertion and removal of fuel elements, irradiated material removal, power reductions and shutdowns and determines impact on schedule completions.

-- Identifies need for, initiates engineering support for, and assures resolution of problems concerning the repair of major components and extensive portions of the reactor plant's primary and secondary systems.

-- Develops or provides technical direction for the preparation and review of the ship's overhaul schedules based on analysis of nuclear engineering and other work to be performed (e.g., installation of shielding for reactor plant, removal of fuel elements, repairs to primary reactor plant systems and secondary systems) which reflects the mandatory technical sequences of all supporting production engineering shops or facilities.

Factor 1, Knowledge Required by the Position -- Level 1-8 -- 1550 Points

-- Mastery of concepts, principles, and practices of nuclear engineering that enables the engineer to serve as a technical authority on projects relating to the overhaul or conversion of reactor plants for nuclear powered naval vessels.

-- Knowledge and skill sufficient to apply the latest developments in nuclear engineering to solve problems in the specialty area that are not readily treatable by accepted methods.

-- Knowledge of related engineering fields such as mechanical and electrical.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

The supervisor provides overall requirements of assignments and consults with the engineer as requested on highly unusual or highly controversial matters having far-reaching effect on the overall program. The engineer and supervisor work together in developing priorities and timetables for accomplishing the work. As a technical expert in the specialty area, the engineer has full technical and management authority to independently carry out all assigned project work including resolving most engineering work problems. Completed work is reviewed only to ensure effectiveness in administering assigned programs and in providing consultative services to various assigned activities.

Factor 3, Guidelines -- Level 3-4 -- 450 Points

Guidelines include parent department and another department's directives pertaining to nuclear power propulsion systems as well as policies and regulations, standard textbooks, manufacturers' catalogs and handbooks, standard designs and guide specifications developed by the department's central nuclear propulsion engineering staff and established practices. As a project engineer, the engineer must review and evaluate the latest technical developments in reactor plant technology to ensure that programs, planning, approaches, findings, and decisions reflect the latest engineering concepts in the nuclear field.

The engineer must exercise resourcefulness and judgment in providing recommendations on solving problems of unusual design or controversy for which guidelines may require modification. The engineer is responsible for development of instructions and explanatory material to supplement guidelines issued at the agency headquarters level.

Factor 4, Complexity -- Level 4-5 -- 325 Points

Assignments involve the full range of nuclear engineering projects associated with nuclear ship management. The engineer is responsible for reviewing, coordinating, and advising on nuclear engineering activities and providing technical direction in support of the production work on highly technical and unusual problems and policies associated with work conducted on reactor plants. As the project manager, the engineer must anticipate and take actions on problems that, if not resolved early, could lead to serious consequences from the standpoint of safety and performance reliability. Problems of this magnitude generally necessitate changes in established policies and procedures and require the development of new approaches and the direction of engineering support into novel and controversial problem areas involving repairs to major components or extensive portions of reactor plant primary and secondary systems.

Factor 5, Scope and Effect -- Level 5-5 -- 325 Points

The purpose of the position is to assure adequacy of the management control and review of engineering activities connected with all phases of shipyard work on reactor plants of assigned submarines and ships. The engineer: (1) plans and coordinates the various phases of work, establishes priorities, and determines the amount of available resources to devote to each phase; (2) provides supervisors and others with authoritative determinations not in conflict with policies and basic standards; (3) serves as the technical expert on the limitation of proven concepts and practices of nuclear engineering. Judgments made by the engineer involve taking positive action on problems which, if not identified in their earlier stages, would likely lead to serious administrative, technical or health and safety consequences, e.g., problems involving safety, relationships of organizational components and contractors, resource limitations, or performance reliability.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

Personal contacts are with members of the technical staff of the immediate office, higher command headquarters, the naval ship engineering office, another Federal department, other shipyards, as well as Government and private industry laboratories, contractors' plants, and servicing facilities.

Factor 7, Purpose of Contacts -- Level 7-3 -- 120 Points

Contacts are established for the purpose of exchanging information, coordinating work efforts, and providing technical direction and guidance to nuclear engineers, technicians, mechanics, and other workers. Contacts also are established for: (1) monitoring and approving operations involving startup, power increments, insertion and removal of fuel elements, irradiated material removal, power reductions and shutdowns; (2) determining the impact on schedule completions; (3) advising top management of critical situations; and (4) resolving conflicts and overlapping functions involving technical problems of unusual degree or controversy. The engineer must use good technical judgment and tactful persuasiveness to identify and correct problems and resolve conflicting opinions or forestall counterproductive options proposed by others.

Factor 8, Physical Demands -- Level 8-2 -- 20 Points

The work is partly sedentary, but requires aboard ship inspections which involve regular and recurring walking, stooping, bending, crawling, and climbing high vertical ladders.

Factor 9, Work Environment -- Level 9-2 -- 20 Points

Work is performed in an office environment, but frequent onsite work inspections are accomplished aboard ship with the resultant exposure to regular and recurring noise and industrial safety hazards. Shipboard work areas are subject to dust, fumes, radiation, and radioactive contaminators. The engineer is required on a regular and recurring basis to utilize a variety of protective devices such as hardhats, goggles or safety eye glasses, safety shoes, and occasionally anticontamination clothing, masks, and respirators. Periods of uncomfortably warm temperatures may exceed 110 degrees F.

TOTAL POINTS -- 3320

NUCLEAR ENGINEER GS-0840-13, BMK #2

Duties

As a technical authority in nuclear engineering for a large department or major field organization, accomplishes projects or assignments typified by one or more of the following: (1) providing integrated program planning relating to nuclear power; (2) analyzing programs relating to availability and pricing of nuclear fuel and enrichment services; (3) reviewing the planning and construction of nuclear facilities; (4) reviewing the continuing development and use of the light water reactor fuel cycle; and (5) monitoring the development of alternative fuel cycles and reactor designs. As a technical authority within the office, provides advice in the specific areas

concerning: (1) engineering analysis of light water reactor systems; and (2) assessment of the financial and economic implications of nuclear policies, based on engineering/technical analysis of nuclear systems.

-- Reviews technical literature and publications, evaluates technological reports and policy issues in the area of nuclear power, and recommends the developmental policies to be formulated and implemented.

-- Analyzes and evaluates complex projects or proposed policy issues, such as those concerned with the short-term and long-term management of nuclear wastes; presents alternative policy choices and recommends management solutions based upon technological, social, and economic considerations.

-- Reviews proposed programs concerned with the availability, cost, and assurance of nuclear fuel supplies and recommends appropriate systems and policies to be formulated and/or implemented.

-- Develops proposed solutions to problems concerning nuclear plant safety and reliability and recommends policies or alternatives to be formulated and/or implemented.

-- Reviews technological problems concerned with the development of alternative nuclear systems and recommends policies for implementation for programs such as commercialization and industrial base development, transition from the light water reactor economy, and the ore-to-waste system.

-- Provides consultative engineering services and coordinates engineering policy matters with other offices or agencies such as Federal agencies, State and local government representatives, private industry, public groups, universities, and research institutes.

Factor 1, Knowledge Required by the Position -- Level 1-8 -- 1550 Points

-- Mastery of concepts, principles, and practices of nuclear engineering that enables the engineer to serve as a technical authority in the specialty areas of engineering analysis of light water reactor systems and the assessment of departmental nuclear policies based on engineering/technical analysis.

-- Knowledge and skill sufficient to evaluate the most recent technological developments of nuclear power systems and the judgment to present alternative policy options and recommendations which are used by top management to develop departmentwide technical guidelines.

-- Knowledge of related engineering fields such as structural, mechanical, and electrical.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

Supervisor assigns work in terms of overall objectives and areas of special interest. The engineer has wide latitude for independent judgment in attaining objectives. The supervisor may be consulted on unusual problems for advice as to general policies which may be applicable. The engineer provides advice independently but keeps supervisor informed of any major or controversial issues encountered. Completed work is evaluated in terms of effectiveness of the engineering guidance provided and the resourcefulness used in formulating findings and recommendations.

Factor 3, Guidelines -- Level 3-4 -- 450 Points

Guidelines include departmental regulations and policy statements concerning nuclear energy systems, other Federal agency guidelines, manufacturers' handbooks and design criteria, textbooks, and established practices. The engineer exercises judgment in establishing new or revised specifications or criteria to incorporate the most recent technological advances in nuclear fuel cycle and reactor engineering concepts. The engineer reviews and evaluates nuclear program guidelines as they pertain to overall systems within an assigned area of responsibility and uses these guidelines to develop policy initiatives and engineering guidance.

Factor 4, Complexity -- Level 4-5 -- 325 Points

Assignments involve the entire range of nuclear engineering policy analysis projects relating to policy development and programs of alternative fuel cycles and reactor designs. As a technical authority or lead analyst, the engineer reviews and evaluates complex nuclear programs as they pertain to overall systems within an assigned area of concern and determines and recommends new policy initiatives that should be formulated. The engineer frequently is confronted with novel and obscure problems which require the extension of existing methods and the development of new approaches. For example, a proposed policy issue concerning the short-term and long-term management of nuclear wastes presents alternative policy choices, and requires that the engineer recommend the best choice based upon technological, social, economic, and/or practical considerations.

Of considerable impact and significance are assignments that involve the development of technical guidelines for use by headquarters and field activities of the department, other Federal agencies and contractors involved in new construction or major component improvement or redesign work.

Factor 5, Scope and Effect -- Level 5-5 -- 325 Points

The purpose of the work is to perform engineering and technical analyses of nuclear systems and provide program direction and expert technical advice in the area of evaluating technological advances affecting nuclear policy issues. The engineer coordinates policy development matters with other Federal and State Government offices, private industries and research institutes. The policy or guidelines developed by the engineer affect the work of other engineers in the same department and engineers of other Federal agencies, local governments, and private industry.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

Personal contacts are with engineers and other subject-matter specialists of headquarters and field activities within the department, officials and professionals of other Government agencies, industry representatives, and members of national societies. The engineer participates in various meetings, seminars, and conferences as an agency representative.

Factor 7, Purpose of Contacts -- Level 7-3 -- 120 Points

Contacts are established for the purpose of exchanging information, coordinating work efforts and providing technical guidance to nuclear engineers and other specialists and to coordinate policy development matters. Contacts are also for the purpose of providing assistance to determine policy initiatives that should be formulated. The engineer influences or persuades other engineers to adopt new or different approaches when they are confronted with conflicting or controversial issues.

Factor 8, Physical Demands -- Level 8-1 -- 5 Points

The work is sedentary in nature.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

Work is performed primarily in an office setting. There is some travel to visit field activities and to attend meetings and conferences.

TOTAL POINTS -- 3290

NUCLEAR ENGINEER GS-0840-13, BMK #3

Duties

Serves as a nuclear engineer with project officer responsibilities for a major program at a large laboratory operated by a private contractor for a large department. The project officer is responsible for a prime contractor's major programmatic activities such as research of different types of nuclear cores, core manufacturing, and materials development. The assignment consists of (1) providing technical expertise and oversight of contractor activities in areas of assigned responsibilities; (2) reviewing, analyzing, and approving technical requirements for contractor procurements for reactor core and core related items; (3) appraising and initiating improvements in contractor technical and management controls, overall aspects of project/components research, design, testing, operation, and budgeting; and (4) evaluating contractor's reactor and nuclear technology (experimental and test) programs to include such areas as safety, radiation effects, reactor physics, and fuel element technology. The engineer coordinates all project activities and appraises headquarters counterparts of the integrated work phases involved in accomplishing objectives.

-- Provides direction to prime contractor through the day-to-day surveillance review, evaluation, and approval of technical and management actions taken within the project(s) assigned.

-- Ensures that a complete and thorough engineering review has been accomplished of all work including the manufacturing, modification, and repair of reactor components and associated nuclear core systems.

-- Provides technical, financial, and scheduling methods to achieve satisfactory completion of work programs in a timely manner, at acceptable quality, and at maximum economy.

-- Develops staffing and budgetary parameters necessary to accomplish program objectives.

-- Analyzes capital equipment requests and develops alternatives for investigation by the contractor to minimize needs for purchase of costly equipment.

-- Reviews and endorses test procedures, engineering field changes, servicing procedures, revisions, and advance change notices.

Factor 1, Knowledge Required by the Position -- Level 1-8 -- 1550 Points

-- Proficient in the principles and practices of nuclear engineering sufficient to enable the engineer to serve as a project officer on management programs related to the research, development, design, and testing of nuclear reactor plant equipment and systems. Expertise gained by advanced education and experience in areas of reactor theory and metallurgy of special nuclear materials including uranium, zirconium, and hafnium sufficient to evaluate and approve actions taken by the prime contractor in materials development.

-- Knowledge of state-of-the-art developments in installation, modification, and/or repair of nuclear core components and reactor systems sufficient to evaluate and endorse contractor actions in these areas.

-- Knowledge of related engineering field such as mechanical and electrical.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

Receives general supervision from the technical representative onsite. Assignments, priorities, and deadlines are discussed between the supervisor and engineer. As an authority in the specialty field, the engineer works independently in planning, carrying out new work programs and projects and, as such, ensures that schedules are maintained and maximum economy is achieved. The engineer is responsible for all actions taken within the scope of the assignment. Technical decisions by the engineer are usually accepted without significant change. The engineer's performance is evaluated based upon fulfillment of program objectives and improvement of contractor performance. Management and technical guidance is provided to the engineer only on major programmatic or policy matters.

Factor 3, Guidelines -- Level 3-4 -- 450 Points

Guidelines are departmental policies and design criteria, manual instructions, policy letters, technical reports, Federal codes and regulations, as well as nuclear engineering principles, theories, and practices, and theories and practices of the various engineering disciplines.

The engineer must exercise a high degree of initiative in providing recommendations to resolve problems of a critical or controversial nature which occur within projects. The engineer is responsible for development of instructions, procedures, and engineering guidance necessary to preclude and avoid operating problems and ensuring effectiveness in technical and administrative management by the operating contractor.

Factor 4, Complexity -- Level 4-5 -- 325 Points

Work covers diverse contractor programs and several research and design efforts ranging from the basic research and design of nuclear power plants, to their fabrication, testing, and operation in ships in the nuclear fleet.

As a project officer, the engineer must anticipate and take quick action to avoid or resolve technical problems that, if not resolved at an early stage, could lead to serious consequences from the standpoint of performance reliability, cost over-runs, and schedule slippage. Problems of this magnitude are frequently encountered and require originality in assisting the prime contractor in developing standards, procedures, and instructions necessary to repair major core components or extensive portions of reactor plant equipment.

Factor 5, Scope and Effect -- Level 5-5 -- 325 Points

The purpose of the work is to administer, coordinate, and provide program evaluation and analysis of the contractor's work effort in order to improve contractor operation and performance. This is accomplished through the daily review, appraisal, and inspection of contractor work programs assigned.

Through the resolution of research and design problems at an early stage, the laboratory develops higher-level technology in a more timely manner, which in turn improves the effective operations of the nuclear powered surface ships and submarines.

Factor 6, Personal Contacts -- Level 6-3 -- 60 Points

Frequent contacts are with personnel in technical and administrative management positions at all levels including the department's technical representative onsite, division directors and project officers, and with department's headquarters personnel and prime contractor cognizant engineers and management personnel at middle and upper management levels. Contacts are often made with shipyard representatives and/or technical representatives of other field offices.

Factor 7, Purpose of Contacts -- Level 7-2 -- 120 Points

Contacts are established for the purpose of discussing and exchanging technical information relating to design and program problems, progress, schedules and cost, coordinating contractor work programs, and providing direction and guidance in assigned areas of responsibility.

Since contacts generally involve issues of a programmatic basis, brevity, tact and diplomacy are required to obtain or convey accurate information concerning methods, techniques, or practices in the resolution of problems. Contacts require persuasion of other project engineers in contractor and technical organizations, who may have adverse opinions on technically controversial matters.

Factor 8, Physical Demands -- Level 8-1 -- 5 Points

Principally normal office-based effort; however, in conducting inspection tours, engineer may be required to expend considerable effort in climbing and walking.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

Work is performed primarily under normal office conditions. However, frequent visits are made to laboratory environments, and occasional visits are made to reactor prototype and construction locations. In the laboratory and prototype locations, industrial type hazards such as construction equipment, high temperature and high pressure water or steam, machine tools, and high voltage equipment may be encountered.

TOTAL POINTS -- 3290

NUCLEAR ENGINEER GS-0840-14, BMK #1

Duties

Serves as one of several technical advisors and experts on the staff of a large department. The department has specific responsibility for managing the development and testing of major nuclear reactor and reactor plant components, including the resolution of complex problems of critical importance which have extensive impact on the success of national nuclear options. Coordinates these programs with managers and other engineers and scientists as to the performance, reliability, safety, and cost effectiveness of nuclear reactors for future nationwide energy requirements.

-- Plans, develops, evaluates, and directly participates in the management of nuclear component development programs including those for liquid metal heat exchangers and steam generators, reactor core support and restraint, radioactive gas seals, and fuel handling equipment. The assigned work encompasses a broad area of effort which typically lacks engineering precedents.

-- Serves as a recognized expert and advisor in the design and development of nuclear reactor components.

-- Defines the nature and scope of technical management requirements governing assigned nuclear component development programs, including the determination of program goals, the review of progress, the assessment of results, recommendations for additions, deletions or termination of programs, and the initiation of new programs as the need arises.

-- Provides independent leadership, guidance, and advice to other segments of the department in connection with the performance and reliability of reactor plant components and their integration into nuclear plant systems.

-- Manages the design, development, and testing programs by national laboratories and industrial contractors for major reactor and reactor plant components within the framework of performance objectives and requirements and varying budgetary limitations. Provides leadership, guidance, advice and consultation to other offices of the department in areas such as the performance and reliability of reactor plant components and their interrelationships in nuclear reactor plant systems.

-- Reviews and coordinates ongoing reactor and reactor plant component development programs and provides recommendations to higher management for the modification or termination of such programs.

-- Obtains reviews and opinions from knowledgeable experts, and provides recommendations and justifications for the initiation of new development programs. Identifies areas which may require additional development.

– Evaluates, monitors, and coordinates existing development programs with other ongoing activities, both domestic and foreign, to eliminate duplication and misdirection of effort in the development of nuclear reactor components and maintains current information concerning program status, schedules, budgets, and plans.

-- Identifies and defines future requirements for reactor plant components in coordination with overall organizational goals and translates such future requirements into proposals for new or revised component design and development programs.

-- Initiates plans and recommendations for advanced research and development that will establish the feasibility of new and improved reactor plant component concepts with regard to overall cost, performance and reliability goals.

-- Serves as a technical consultant and provides direction to field offices when problems arise relative to administered programs. Conducts periodic and special visits to the field to review and provide onsite advice relative to personnel assigned to ongoing development programs.

-- Participates in special task force reviews and provides expert advice and consultation for the solution of critical problems in the design, development, and testing of nuclear reactor components.

Factor 1, Knowledge Required by the Position -- Level 1-8 -- 1550

-- Mastery of advanced engineering concepts, practices, and principles of nuclear engineering sufficient to provide consultative service to the management of major development programs in the design and development of nuclear powered reactor systems and components.

-- Knowledge of nuclear engineering sufficient to serve as a recognized consultant and expert on the operation of nuclear reactor plant systems and components.

-- Knowledge of nuclear engineering sufficient to apply new concepts, developments, and experienced judgment sufficient to solve a variety of highly complex technical problems.

-- Working knowledge of related fields such as mechanical, electrical, or chemical engineering and physics sufficient to evaluate nuclear power reactor design and development projects from a broad perspective.

-- Knowledge of and skill in the application of the methods and procedures involved in the compilation of technical findings presented and in determining the acceptability of procedures of specific standards being challenged in court.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

The supervisor sets the overall objectives and resources available. The engineer and supervisor, in consultation, develop priorities and timetables for accomplishing the work. The engineer plans and accomplishes work assignments in accordance with policies and accepted practices and resolves most conflicts which arise. The engineer coordinates the work of the engineering experts working for contractors with other agency expert engineers and interprets agency policy for those

experts as the need arises. Specific work assignments and deadlines are occasionally dictated by judicial decision. Keeps the supervisor informed of progress, potentially controversial matters, or far-reaching implications of the work. Completed work is reviewed only from an overall standpoint of effectiveness in providing guidance, consultation, and effectiveness in meeting other requirements in assigned program areas.

Factor 3, Guidelines -- Level 3-5 -- 650 Points

Guidelines include departmental regulations and policies, broad authoritative technical references in the field of nuclear engineering, and the general policies regarding the administration of contracts. Other guidelines consist of professional manuals and publications both domestic and foreign in the field of nuclear engineering, established business practices for managing large research, development, and engineering projects, and internal office policies and procedures. The engineer is recognized as a technical authority in the development of new technical guidelines for nuclear components and systems. The engineer uses considerable judgment and ingenuity in interpreting and adapting guides that exist and in developing new and improved hypotheses, approaches, or concepts not previously tested or reported in the literature of the field.

Factor 4, Complexity -- Level 4-6 -- 450 Points

Assignments involve a broad range of engineering activities including the development of highly specialized and unique systems analysis techniques. The engineer is responsible for taking independent actions and making decisions to solve highly technical problems that involve the complex and varied features typical of new or advanced components and systems. The engineer is, therefore, working with complex problems of a technical nature but also involving sociopolitical problems since the application of nuclear systems impinges on institutional arrangements between Federal, state, and local entities.

Factor 5, Scope and Effect -- Level 5-6 -- 450 Points

The purpose of the work is to provide expertise in the planning and direction of nuclear component development projects which have a significant impact on the future direction of nuclear systems development and the effort to meet national energy needs. The scope of the engineering projects consists of broad programs which involve several Federal Government agencies and many contractor and manufacturing firms that are engaged in: (1) the design, development, and testing of major nuclear reactor and reactor plant components; (2) the resolution of complex problems of critical importance having extensive impact on the success of the national effort to develop a variety of nuclear reactor options; and (3) the coordination of integration of these programs with national objectives for the performance, reliability, safety, and cost effectiveness of nuclear reactors for future national energy requirements.

Factor 6, Personal Contacts -- Level 6-4 -- 110 Points

Personal contacts are with engineering and scientific experts and management officials of the department, experts from contractor engineering and manufacturing firms and counterpart engineers and scientists in other Federal agencies, including site and field office personnel. The engineer participates in interagency meetings or conferences as an authority in nuclear component development programs.

Factor 7, Purpose of Contacts -- Level 7-4 -- 220 Points

The purpose of the contacts is to provide technical expertise on matters within the program area and to coordinate joint programs covering a broad spectrum of technical interests in nuclear systems analyses and applications. Assignments include participation in high level conferences, negotiations, and meetings where there is broad and major interest in establishing the feasibility of component development programs. When budgetary issues are to be resolved, the engineer contributes to the interaction between technical needs and funding restraints and assists in their resolution.

Factor 8, Physical Demands -- Level 8-1 -- 5 Points

Work is primarily sedentary. There are occasional site visits to private or Government-owned facilities which require some walking and bending.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

Work is performed in an office setting, except for occasional travel to attend meetings or to visit field test programs or contractor facilities.

TOTAL POINTS -- 3890

NUCLEAR ENGINEER GS-0840-14, BMK #2

Duties

Serves as a technical adviser and expert of a large department. The engineer is responsible for a broad program of design, development, procurement, construction, testing, evaluation, and operational maintenance and safety features of newly developed or installed reactor plant valves. The specific assigned valves include all departmentwide reactor plant gate valves, all reactor plant hydraulically operated valves and for stock support of these valves installed in the departments nuclear propulsion plants of submarines, surface ships, land based prototypes and a

major nuclear power plant. In addition, the engineer coordinates the department program to develop and standardize the material and quality control requirements applied to the design and manufacture of all reactor plant valves. Oversees all technical aspects associated with the procurement of spare reactor plant canopy seal rings to support reactor plant equipment. These programs encompass responsibility for:

-- Review and evaluation of proposed design requirements, performance and reliability standards, and specifications to be used by the Government prime contractors and vendors in designing, manufacturing and quality conformance testing of reactor plant valves. These specifications impose rigid standards for environmental operating conditions, functional performance, structural integrity, and accelerated life testing to achieve a greater degree of suitability for installation aboard ships. The engineer's responsibilities include evaluating Government prime contractor proposals, approving, modifying, or rejecting them, or directing changes of approach as necessary.

-- Revision and evaluation of design proposals from equipment prime contractors and furnishing guidance for new valve designs, resolving problems which arise during design, testing, and operation of valves, and approving changes which are necessary or desirable to correct design deficiencies or improve valve safety and reliability.

-- Review and evaluate technical requirements used in the procurement of spare reactor plant canopy seal rings and ensuring that technical problems arising therefrom are resolved in an expeditious manner in support of the stock system readiness.

-- Overseeing the administration of valve design, manufacturing and testing contracts between Government prime contractors and their vendors. This includes ensuring that cost, delivery, contract options, and warranty provisions are fair, reasonable, and in the best interest of the Government; that vendor technical exceptions are resolved; and that shipboard need date schedules and technical requirements are satisfied.

-- Continuously reviewing the technical quality of the work done by prime contractor organizations, and the emphasis and direction being given to the accomplishment of program objectives by prime contractor managers and their subordinate managers. The engineer directs the efforts of these organizations as necessary to ensure the quality, rate of accomplishment, and emphasis of the work remain satisfactory.

Factor 1, Knowledge Required by the Position -- Level 1-8 -- 1550 Points

-- Knowledge of the design and development of nuclear reactor components and systems to provide expert advice and guidance on reactor plant valve systems and configurations.

-- Mastery of advanced engineering concepts, practices, and principles of nuclear and related engineering disciplines such as marine and mechanical engineering, naval architecture, and ship construction sufficient to: foresee and resolve complex fluid systems and valve problems which require application of experimental theories; and, provide consultative service to the management of these major development programs.

-- Knowledge of advanced developments and techniques in valve manufacturing to apply state-of-the-art components to reactor plant systems.

-- Knowledge of nuclear safety regulations, policies, and procedures to ensure that health and safety features and precautions are considered in recommendations regarding the full range of valve development.

-- Skill in managing technical programs and the ability to resolve technical problems necessary to ensure the timely and successful completion of programs.

-- Knowledge of and ability to apply fiscal and administrative policies, procedures, and practices sufficient to manage or assist in the management of technical programs.

Factor 2, Supervisory Controls -- Level 2-4 -- 450 Points

Reports to the program director of the headquarters division who provides overall objectives and resources.

The engineer independently plans and carries out project activities, resolves most conflicts which arise, and coordinates the work with contractors, laboratory experts, shipyards, etc. Controversial or novel problems are discussed with the supervisor.

The supervisor reviews actions of the engineer for compliance with broad directives and policy and for compatibility to other work. Most recommendations to higher authority are considered as authoritative and are accepted without significant change. The engineer keeps the program director advised of major program objectives and developments, fulfillment of projects, and shares in the formulation of program policy.

Factor 3, Guidelines -- Level 3-5 -- 650 Points

Guidelines include departmentwide nuclear power instructions, engineering design standards, and broad authoritative technical references. The engineer must use judgment and ingenuity in interpreting available guidance materials and exercises a high degree of initiative and judgment in devising and designing new theoretical treatments, and procedures for testing and solving

problems, which are recognized as being technically authoritative and are used in guiding others in this field.

Factor 4, Complexity -- Level 4-5 -- 325 Points

Work involves lead responsibility in directing, reviewing, and performing the full range of nuclear engineering tasks relating to the design, production, modification, maintenance and control of reactor plant valves. Monitors and coordinates a broad range of activities containing a variety of complex features (including operational procedures, layout designs, specification, equipment array, etc.) performed sequentially or in parallel by engineering and technical personnel at headquarters, laboratory sites and shipyards.

The engineer must take actions and make decisions in solving highly complex, technical, administrative, and fiscal problems involved in installing, modifying, and assessing new and existing valve systems. There are uncertainties in establishing approaches to resolving problems because of changes in technological developments, program direction, and potential unknown phenomena.

Work involves development of new techniques, methods, and criteria to achieve objectives. This new information will be used in resolving future problems and to minimize the degree or scope of seemingly unyielding problems.

Factor 5, Scope and Effect -- Level 5-5 -- 325 Points

The work involves overall technical project management for the planning design, development, construction, modification and testing, and operation of reactor plant valves which affects the work and programs of officials, managers, and other engineers within and outside the organization. This encompasses development, dissemination and updating of inspection, operation, and maintenance instructions for reactor plant valves which ensure safe and reliable propulsion plant operation. The engineer's efforts have a significant impact on the parent department's nuclear submarine fleet both present and future, since successful completion of this work will result in improved ship preparedness, plant performance, and safe operation.

Factor 6, Personal Contacts -- Level 6-4 -- 110 Points

Personal contacts are with engineering and technical personnel at headquarters, and with high ranking personnel outside the organization (laboratory, management and scientific personnel at shipyards, private contractors, and the fleet). The engineer participates, as a technical expert, in committees and meetings in areas of responsibility.

Factor 7, Purpose of Contacts -- Level 7-4 -- 220 Points

Contacts are for the purpose of providing technical expertise on matters relating to reactor plant valves and systems involving the departmentwide effort for the design, engineering, manufacture, and maintenance of these components. The purpose of contacts are to resolve problems or issues of considerable consequence and cover a broad spectrum of technical interest in that contacts and coordination for these components involve staff of the employing department, officials from other departments, private contractors, and national laboratories.

Factor 8, Physical Demands -- Level 8-1 -- 5 Points

Work is mostly sedentary. Some walking and standing is involved when visiting field activities such as shipyards, laboratory contractors, and manufacturing sites.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

Work is performed primarily in an office environment, with frequent travel to visit shipyards, laboratory contractors, and manufacturer sites.

TOTAL POINTS -- 3640

NUCLEAR ENGINEER GS-0840-15, BMK #1

Duties

Serves as the expert staff consultant responsible for a broad program involving the overhaul, maintenance, and refueling of submarine reactor plants and the coordination of the design, development, budgeting, scheduling, installation, and testing of all modifications and repairs to department's commissioned submarine nuclear propulsion plant systems. Responsibilities encompass directing and coordinating support, maintenance, refueling, and overhaul of nuclear submarine propulsion plants in all commissioned ballistic missile submarines worldwide. Responsibilities include:

-- Coordinates the efforts of the support personnel in the headquarters, shipyards, shipyard lead design agents, and prime contractor's, in accomplishing urgent repairs, maintenance, overhaul, and refueling of nuclear propulsion plants installed in ballistic missile submarines. This responsibility includes directing the efforts of shipyard representatives, corrective actions to ensure the timely completion of propulsion plant overhaul, maintenance, and refueling. In this coordinating endeavor, the engineer, acting as the recognized expert for nuclear propulsion plants utilized aboard commissioned ballistic missile submarines, has authority to commit the department to agreements and makes final

decisions or participates with the head of the activity in final decisions which have a direct effect on the accomplishment of the mission.

-- Coordinates the revision and interpretation of policy manuals and instructions affecting nuclear submarine propulsion plant work. The engineer is the technical coordinator and editor of the manual that specifies the requirements and procedures applicable to the design, planning, and performance of reactor plant alteration, repair, and maintenance work. This manual is the primary policy document governing all maintenance and repair document governing all maintenance and repair work conducted in work conducted in commissioned nuclear submarine reactor plants. As the editor, the engineer makes final decisions on the technical writing or modifications to the manual. The engineer revises the instructions governing: (1) preparation, distribution, revision, and maintenance of all reactor plant operational and component technical manuals, (2) requirements for reactor plant shipyard inspections during overhaul and refueling availabilities, and (3) requirements for verification signatures for all nuclear work performed in shipyards.

-- Provides technical guidance to Government sponsored laboratories and contractors involved in the design, development and modification of ballistic missile submarine nuclear reactor plants. This involves continuous technical evaluation of information obtained during overhaul, refueling, and repair cost proposals.

-- Represents headquarters at weekly briefings on the status of all ballistic missile submarine shipyard overhauls. This briefing involves senior military and civilian representatives. Represents the agency in interagency or national meetings or course of action.

Factor 1, Knowledge Required by the Position -- Level 1-9 -- 1850 Points

-- This position requires a thorough understanding of the most advanced principles of nuclear engineering including reactor materials, metallurgy, nuclear physics, heat transfer, mechanical and electrical design, hydraulics, and naval architecture. The position also requires a detailed knowledge of the application of nuclear propulsion to ship design and application of this knowledge to the repair, maintenance, and refueling of naval reactor plants so as to provide expert advice and critical direction to first-of-a-kind nuclear submarine propulsion plants.

-- Skill to manage major technical programs; to resolve any technical problems encountered; and to ensure the timely and successful completion of programs.

-- Knowledge of and ability to apply fiscal, contracting and administrative policies, procedures, and practices necessary to manage and to determine the economic feasibility of major technical programs.

-- Knowledge of various organizations and functional capabilities to direct the timely and safe completion of submarine overhauls, modifications, testing, etc., under all types of conditions.

-- Functional knowledge of policy manual formulation, presentation, revision, and coordination to ensure that nuclear propulsion plant work meets mission objectives.

-- Ability to serve as a recognized consultant and expert on the overall nuclear propulsion plant system.

-- Knowledge of several engineering fields in addition to nuclear, such as mechanical, electrical, and chemical sufficient to make substantive decisions.

-- Knowledge of agency nuclear safety regulations, practices, and procedures to ensure that health and safety features and precautions are considered as an integral part of the system and its use.

Factor 2, Supervisory Controls -- Level 2-5 -- 650 Points

Supervisor provides guidance primarily in the form of general policy directives and staff, time, and budget constraints. The engineer typically initiates, plans, designs, and carries out programs and other work independently. The engineer is the principal advisor to and collaborator with the supervisor on issues involving nuclear propulsion systems of commissioned ballistic missile submarines and in this respect may assume the supervisor's duties during the supervisor's absence.

Recommendations to higher authority on modification of objectives are normally evaluated for such considerations as safety of personnel and the environment and broad program goals. Decisions, recommendations, and findings are considered technically authoritative and are accepted without significant change. Completed work is generally reviewed for adherence to policy and for assurance that broad technical objectives are fulfilled.

Factor 3, Guidelines -- Level 3-5 -- 650 Points

Guidelines include agency instructions and regulations and broad technical references. These guidelines are rarely adequate for solving the complex and unique problems which face the engineer. Because much of the work is performed under time pressures and involves unique considerations, a high degree of originality and technical judgment is exercised to develop techniques and processes to direct timely completion of shipyard efforts. These techniques and processes are recognized as technically authoritative and are used in guiding others in their field.

Factor 4, Complexity -- Level 4-6 -- 450 Points

Work involves directing, reviewing, advising, and performing, the full range of broad nuclear engineering tasks related to nuclear power plant modification and associated shipyard work. Work also requires extensive probing and analysis in determining the nature and scope of conflicting problems. Assignments are complex and demanding involving continuing effort in the development of new techniques and performance criteria and to assure that each task undertaken will further the objectives of the Navy's nationwide naval reactor plant programs and systems. Actions and direction provided by the engineer directly impact fleet readiness and national defense. Assignments frequently require the engineer to conceive, initiate, and evaluate programs and projects dealing with matters on which there is little "state of the art" precedent or guidance.

Factor 5, Scope and Effect -- Level 5-6 -- 450 Points

The purpose of the work is to provide expertise in the direction, tracking, and integration of vital work efforts in the maintenance, overhaul, and refueling of all fleet ballistic missile submarines. The position requires a high degree of initiative, originality, foresight, and judgment to assure the resolution of problems which may be encountered during these efforts so that corrective actions can be taken in advance of any problem impacting on ship readiness and national defense.

Factor 6, Personal Contacts -- Level 6-4 -- 110 Points

Personal contacts are with high level officials within the agency and with high ranking personnel outside the organization, e.g., laboratory, scientific, design, maintenance, and engineering personnel in commercial and governmental organizations, numerous equipment vendors, and department shipyards.

Participates, as a technical expert, in interagency or national meetings or conferences as an authority on submarine nuclear propulsion plant systems and programs which involve Federal Government/private industry commitments dealing with sensitive matters of public interest.

Factor 7, Purpose of Contacts -- Level 7-4 -- 220 Points

Contacts are for the purpose of review and coordination of the various work efforts and disciplines required to support all commissioned ballistic missile submarines worldwide (includes overseas maintenance facilities) and to provide expert technical advice and consultation on critical ship problems. Contact relationships also involve justifying, defending, negotiating, or settling highly controversial or significant engineering issues as they arise. The purpose and nature of the contacts require the engineer to represent the department, as the expert in nuclear propulsion systems of commissioned ballistic missile submarines in interagency planning or decision making sessions.

Factor 8, Physical Demands -- Level 8-1 -- 5 Points

Work is mostly sedentary.

Factor 9, Work Environment -- Level 9-1 -- 5 Points

Most work is performed in an office setting, although there is some travel to shipyards, land-based prototype sites, and equipment vendors' plants and laboratories.

TOTAL POINTS -- 4390