Position Classification Standard for Industrial Engineering Series, GS-0896

Table of Contents

SERIES DEFINITION

This series includes positions that involve professional work in industrial engineering. Industrial engineering is that branch of engineering concerned with the planning, design, analysis, improvement, and installation of integrated systems of employees, materials, and equipment to produce a product or render a service. The work requires application of specialized professional knowledge and skill in the mathematical, physical, and social sciences together with the principles and methods of engineering analysis and design to specify, predict, and evaluate the results to be obtained from such systems.

DISTINGUISHING CHARACTERISTICS OF INDUSTRIAL ENGINEERING POSITIONS

There are two factors which in combination characterize industrial engineering and serve to differentiate industrial engineering from other occupations. These are (1) the kind of work or function performed, and (2) the qualifications required for the work. These factors are set forth in the series definition and are both governed by the more general criteria which apply to all professional engineering series. (See Introductory Material for Engineering and Architecture Group, GS-0800)

Industrial engineering positions are characterized by the application of scientific and mathematical methods to evaluate or predict the resources -- employees, materials, and equipment -- to produce a product or render a service. This concern with such integrated systems of employees, materials, and equipment is essential to the classification of positions in the Industrial Engineering Series. It should be noted, however, that many industrial engineering positions also involve additional related functions and responsibilities.

For purposes of this standard, integrated systems of employees, materials, and equipment may be found in an industrial plant or service-type facility engaged in fabrication, assembly, repair, or overhaul; in warehousing or similar operations involving mechanized materials-handling equipment and related processes for loading, unloading, moving, sorting, processing, packing, and storing items; in managerial, clerical, data processing, or other office-type activities; or in other service functions.

The nature of the function performed is such that the industrial engineer must have broad and intensive knowledge, theoretical and practical, of the characteristics, potentials, and limitations of: (1) The components of the system -- employees, materials, and equipment; (2) the processes, methods, techniques, and procedures applied in the planning, design, analysis, improvement, and installation of such systems.

The basic means of preparing an employee for professional work in industrial engineering is through completion of a full four- or five-year accredited curriculum in industrial engineering. The curricula vary to some extent depending upon the phases of industrial engineering which a college or university emphasizes. However, industrial engineering curricula accredited by the

Engineer's Council for Professional Development require: (1) Courses common to all branches of engineering -- physics, chemistry, mathematics through differential equations, and engineering sciences such as statics, dynamics, strength of materials, thermodynamics, and fluid mechanics; (2) humanistic-social studies; and (3) specialized subjects characteristic of industrial engineering such as organization planning, safety engineering, work measurement, facilities planning and layout, materials handling, production planning and control, principles of administration, human engineering, cost accounting, engineering economy, systems and procedures analysis, computer sciences, quality control, operations research, and applied statistics.

Positions included in the Industrial Engineering Series are thus characterized by application of knowledge of the subjects listed above.

While industrial engineering involves emphasis on the social sciences and industrial management, it also shares the large common core of knowledge that characterizes all branches of engineering. The work of the industrial engineer typically differs from that of other engineers in the relative intensity of application of basic knowledge of those physical and engineering sciences which are common to all branches of engineering; it does not differ in terms of required basic knowledge and understanding of such sciences. For example, industrial engineering work may involve the utilization of professional engineering knowledge in establishing performance requirements, and in reviewing and analyzing the designs of engineers in specialized fields of engineering, with a view toward the successful incorporation of these designs into an integrated system. The industrial engineer, in establishing requirements and analyzing the designs of engineers in specialized fields of engineering, applies professional knowledge of engineering fundamentals and practice.

Illustrative of industrial engineering objectives, and the use of various mathematical disciplines and engineering techniques and methodologies for the solution of problems are: (1) Developing programs for the optimum utilization of resources by evaluating, specifying, and integrating the processes, and the adjuncts to the process through the use of human engineering systems analyses, mathematical interpretations, statistical analyses, and other specialized techniques; (2) providing management with the information required to make decisions by designing, evaluating, and improving management information systems and by conducting engineering economy and value analysis studies of alternative courses of action; and (3) improving the efficiency and effectiveness of the organization by various approaches such as developing organizational, administrative, operating, and production procedures; designing tools, equipment, work processes, and methods; developing performance standards, work measurement systems, and other management controls; and designing long range planning programs, as may be appropriate to the nature of the organization served.

INDUSTRIAL ENGINEERING FUNCTIONS

1. *Management and operations*. -- This broad grouping of functions covers work performed by industrial engineers in planning and advising management and production officials on the most effective type and form of organization, and on basic standards, methods, and systems and procedures to be used within those organizations. Generally, industrial engineers propose improvements in the form of alternatives with predictions of the results which can be expected to be achieved from adoption of different courses of action. Economy and effectiveness of operations are prime considerations.

Since industrial engineers work with the total system, they are necessarily responsible for the integration of the production worker into that system. Industrial engineers are concerned with factors which govern work performance to a greater extent that are most other professional engineers. Typically, they are required to be familiar with and apply progressive methods in industrial management and industrial psychology.

Industrial engineers advise management and production officials on such matters as establishing organizational patterns and systems and procedures, planning flow of work, establishing work controls, planning and controlling quality of a process or product, establishing cost and budgetary controls, and measuring the overall effectiveness of the organization, methods, systems, and procedures. They identify the need for changes in the organization and procedures, and develop plans for the reorganization of facilities. They investigate and evaluate factors affecting performance of men, materials, equipment, and integrated systems. They make or review the result of work measurement and work simplification studies, and analyze factors leading to operator fatigue, or affecting operator safety.

Because of their broad understanding of the basic activity areas of management, and their engineering approach to management problems, industrial engineers are frequently used as a staff advisor to top management on nonengineering problems of a high management level as well as on problems which are characteristic of industrial engineering work per se.

2. *Facilities layout*. -- Facilities layout involves planning or improving the arrangement of machines, equipment, processes, and service areas into a system for achieving the most efficient and economical operation. In making a facilities layout, industrial engineers may plan the arrangement, or rearrangement, of systems of machinery, equipment, and processes within an individual department or unit, or they may plan for several departments or units comprising an entire operating facility of plant with auxiliary administrative offices.

A facility layout project may involve an investigation and analysis of one process in a facility such as the receipt and storage of incoming materials; methods of packing completed materials; or manufacturing operations, such as metal casting, forging, machining, and the like. An office layout may involve physical placement of personnel and office equipment for optimum space utilization and proper flow to improve office operation effectiveness. On the other hand, the project may lead to an analysis of all processes carried out in the facility to produce one or more end items or provide a service.

3. *Plant design and location.* -- Plant design involves the functional design of new buildings or the alteration of existing buildings to provide for introduction of new processes or functions or improvement of existing processes or functions. Typically, plant design is performed by industrial engineers in conjunction with facility layout work and it may be considered a part of the facility layout phase.

Industrial engineers generally specify plant design requirements based upon a facility layout developed for an article to be produced or service to be rendered and for the activity or volume of production that is anticipated. The request for a design may originate from a need recognized by the industrial engineer as a result of analysis of existing production facilities.

Preliminary to plant design, industrial engineers may perform plant or office location work. In evaluating proposed sites for industrial plants or offices, industrial engineers generally analyze such factors as available labor supply; available facilities for transportation of raw materials and finished products; accessibility of fuel, power, and water supply; availability of sanitary and waste disposal facilities; fire protection facilities; topographic features of the site; relative cost of land and buildings; and defense or security considerations (e.g., whether plant is in potential target area).

4. *Industrial production planning.* -- This activity involves investigating and evaluating current or mobilization requirements for items to be produced, evaluating and advising on production capability of contractors and Government-owned facilities, and planning production. The production requirements may call for large quantities of products, or for single or small quantities of unique and complex products such as prototype components, developmental models, or test facilities or devices. This activity may be compared with the facility layout phases in that comparable professional knowledge are required of production systems, machinery, equipment, products, work methods, and procedures. For example, a knowledge of industrial engineering comparable to that present in facility layout work may be required to make a decision on capability of a prospective contractor to produce, when the required item is substantially different from items currently being produced by the prospective contractor (or other contractors in the commodity field) and extensive conversion in plant facilities is required for production.

DISTINCTIONS BETWEEN INDUSTRIAL ENGINEERING AND RELATED FIELDS

1. *Mechanical engineering.* -- Industrial engineering is a very dynamic field covering an area of engineering activity which is constantly growing and changing in emphasis. Industrial engineering curricula generally developed initially as options in mechanical engineering curricula. Thus there is a very close relationship between industrial and mechanical engineering and many positions involve mixtures of these two fields.
In a situation involving design of an industrial plant, industrial engineers make recommendations for utilities and service facilities such as water mains, drains, sewers, sprinklers, air lines, heating and ventilating equipment, and air conditioning equipment. These recommendations may be

specified in terms of minimum standards required to meet the needs of the production plant and worker health, safety, and comfort, with plans being made by mechanical engineers in another organization, or they may be made in the form of preliminary plans and specifications. In either case, for a position to be classifiable to the Industrial Engineering Series, it is necessary for the design of the utilities and service facilities to be accomplished as part of the overall plant design.

Industrial engineers specializing in the application of materials handling equipment, for example, may make preliminary plans and develop specifications for an industrial facility in some detail. They investigate and furnish advice to production officials on materials handling procedures, methods, and systems.

As a result of surveys, industrial engineers determine the need for, plan, and lay out new or improved systems of materials handling equipment at the industrial plant. These facilities include mechanized equipment of a specialized nature such as hoists, conveyor systems, automatic loading and unloading devices, and industrial lift truck and pallet systems. A position of this type differs from that of a mechanical engineer in a related situation in that typically the latter is concerned primarily with the design of individual items of mechanical equipment, usually on the basis of performance criteria or specifications. Industrial engineers make recommendations as a result of a study of the entire production facilities where the materials handling equipment will be installed. Findings typically include an analysis of the methods and organization for handling materials (the human factors) as well as an analysis of the mechanical features of the equipment. The industrial engineers determine the optimum characteristics of the materials handling equipment, prepare cost analyses and justifications, select and adapt commercial equipment, prepare plans and specifications for procurement or local manufacture, and may design simple items of equipment not available commercially (detailed designs are generally made by mechanical or electrical engineers from performance requirements specified by the industrial engineer).

Positions involving entirely or chiefly the application of mechanical engineering principles and practices to design, development, control of quality, etc., for machines, equipment, instruments, and devices which generate, transmit, measure, or utilize heat or mechanical power are classifiable to the Mechanical Engineering Series, GS-0830. However, positions which involve professional engineering design as an integral part of professional work in facilities layout or the planning of production processes are classifiable in the Industrial Engineering Series.

2. *Chemical engineering*. -- Positions involving professional work in the design or layout of chemical processing plants, chemical processing equipment, chemical production processes, work methods, and procedures are classifiable to the Chemical Engineering Series, GS-0893, when the design or layout work is based predominantly upon a professional knowledge of the chemical reactions occurring in the materials being produced.

3. *Operations research*. -- Industrial engineers utilize the mathematical techniques and methods of operations research, e.g., linear programming to provide a basis for making the most efficient use of resources. However, the work performed by industrial engineers differs from that of operations research analysts in that industrial engineers are required to utilize professional engineering knowledge and techniques as well as mathematical techniques in planning

production processes, work methods, and procedures. See Operations Research Series, GS-1515.

4. *Technician positions*. -- Considered separately, many techniques used by industrial engineers in analyzing organizations, work methods, and procedures are similar to those used by persons in other fields. For example, technicians in positions in the Industrial Engineering Technician Series, GS-0895, or the Management and Program Clerical and Assistance Series, GS-0344, make work measurement studies and work simplification studies similar to those made by industrial engineers. Therefore, a position cannot be identified as a professional industrial engineering position solely on the basis of techniques applied in analyzing organizations, work methods, and procedures. These techniques may be likened to part of the tools which industrial engineers and others use in accomplishing a total analytical process.

The similar nonprofessional positions differ from those of industrial engineers in that work performed by the former is based upon a limited and specialized knowledge of production organization, processes, or facilities. This knowledge is normally of the type obtained by virtue of work experience as contrasted to the full and complete knowledge of the industrial engineer which includes not only practical work experience but also basic and specialized theories and principles in the mathematical, physical, engineering, and social sciences.

Some technicians function as counterparts to industrial engineers. The general relationships between professional engineering occupations and technician occupations are discussed in some detail in the Introduction to the Engineering and Architecture Group, GS-0800. That material should be read carefully and regarded as an essential part of these standards for industrial engineering positions.

Some technician positions in the Industrial Engineering Technician Series, GS-0895, or the Production Control Series, GS-1152 can be distinguished from industrial engineer positions on the basis that the former involve responsibility for only one or a limited number of phases of work present in professional industrial engineering positions. Typical of positions in this category are those of technicians who make work measurement studies of production jobs; technicians who estimate costs of specific production processes based upon standardized techniques selected for use by others; technicians responsible for phases of production control such as scheduling and expediting production; and technicians who make machine layouts or machine utilization studies by following standardized procedures and/or instructions furnished by an industrial engineer.

5. *Industrial Specialist positions*. -- Some positions in the Industrial Specialist Series, GS-1150, differ from industrial engineer positions in the type and intensity of engineering knowledge applied in the work. As an example, some specialists commonly perform work in investigating and evaluating industrial plants to determine capability of contractors to meet current or mobilization requirements. Industrial engineers sometimes make similar investigations and evaluations. An industrial engineer, for example, may be required to perform work in investigating and evaluating an industrial plant when decisions are required on capability of a contractor to produce new and complex items different from those produced previously by private contractors. Typically, extensive conversion of plant facilities would be required to

produce these items, and the decisions concerning systems and equipment design and specification made by the industrial engineer would be of such scope and complexity as to require professional engineering competence.

6. *Management analysis*. -- Management analysts make systems analyses and other studies of broad scope concerning organizations and operations or which deal with broad management problems that do not involve application of engineering principles and practice. The work requires primarily a high order of analytical ability combined with a comprehensive knowledge of (a) the functions, processes, and principles of management; and (b) methods used to gather, analyze, and evaluate information concerning the management process.

For positions in nonindustrial and other organizations where the work requires primarily knowledge and skill in the principle and techniques of management analysis without an unequivocal requirement for professional engineering competence, there is a great deal of overlap between the work of the management analyst and the industrial engineer. Distinguishing between the two on the basis of tasks performed during any given assignment may not be feasible.

- -- Both occupations use many of the same analytical tools and fact-finding techniques including mathematical and statistical methodology.
- -- Both occupations may exist in the same organization and be concerned with the same general range of management problems.
- -- Both occupations involve a similar range of levels of difficulty and responsibility extending from training levels to top levels in the General Schedule system.

In staffing such organizations that have as their objective the improvement of management effectiveness, agencies may elect to fill their positions with management analysts, with industrial engineers, or with both. Thus, such positions may be classified as industrial engineers or as management analysts on the basis of the qualifications required by recruitment sources, career ladders, and staffing patterns established by agency management rather than on the basis of tasks performed or work environment. See standard for the Management and Program Analysis Series, GS-0343.

EXPLANATORY NOTES

Two titles are established for positions in this series -- Industrial Engineer and Supervisory Industrial Engineer. The supervisory title should be used for industrial engineering positions involving supervisory duties and responsibilities which are of such significance as to require supervisory qualifications.

These standards do not include subject-matter or functional specializations. All positions above the entrance level require application of varying degrees of specialized knowledge relating to the specific work performed. However, these specialized knowledge typically are subordinate to those applied in performing the industrial engineering work which characterizes this series. When the knowledge required of the characteristics of a particular product becomes more

important in a position than the knowledge applied in adapting the product to production, the position is not considered to be classifiable in the Industrial Engineering Series.

The qualifications required for all industrial engineering positions are discussed under *Distinguishing Characteristics of Industrial Engineering Positions*. Additional qualifications required for the work at each grade level are not discussed separately but are reflected in the nature and variety of work and other pertinent factors.

The grade level criteria cover nonsupervisory positions only.

GRADE LEVEL CRITERIA

INDUSTRIAL ENGINEER, GS-0896-05

Nature and variety of work. -- This is the beginning engineer level. Assignments usually consist of unrelated specific tasks that are selected with a view toward orienting beginning engineers in the practical application of theory and basic principles; toward ascertaining interests and attitudes; and toward relieving experienced engineers of detailed and simple work. The beginning engineers are expected to know and apply basic principles and elementary theories, and to utilize readily available data. Assignments are not complicated technically by conflicting ideas, principles, or theories; they can be solved readily by application of basic principles and practices.

Nature of available guidelines for performance of work. -- Written guides such as technical and engineering tables, handbooks, manuals, textbooks, manufacturers' catalogs, bulletins and reports, standard criteria, plans, specifications, exhibits, and regulations are usually fully applicable to specific assignments. Situations not covered by the beginning engineers' basic knowledge of industrial engineering principles, written guides, or initial instructions are referred to others.

Nature of supervisory control exercised over the work. -- Industrial Engineers GS-5 are under the close supervisory control of a higher-grade engineer. The supervisor makes work assignments, furnishing detailed information and giving specific instructions as to methods of accomplishing the assignments, but encourages the use of the beginner's basic engineering knowledge. The supervisor advises on any problems encountered and checks work during process of accomplishment. Completed work is reviewed in detail for technical accuracy, adherence to sound engineering practices, and conformance to instructions. As experience is gained and progress is demonstrated, the supervision received becomes progressively less; however, all engineering conclusions are carefully reviewed prior to official acceptance.
Mental demands. -- Engineers at this level are encouraged to work out and suggest solutions to problems assigned, within the limits of guidelines and work methods suggested by higher-grade engineers with whom they are working.

Purpose and nature of person-to-person work relationships. -- Personal work contacts are made primarily to gather facts or information of a routine nature necessary for completion of a specific

project. Contacts with supervisory personnel and workers throughout the organization are for the purpose of becoming familiar with local systems and procedures.

Nature and scope of recommendations, decisions, commitments, and conclusions. -- Industrial Engineers GS-5 are not expected to make decisions or commitments.

INDUSTRIAL ENGINEER, GS-0896-07

Nature and variety of work. -- Industrial Engineers GS-7 work on specific and somewhat limited work assignments or projects normally forming minor phases of a broader assignment which is the responsibility of a higher-grade engineer. Assignments are typically screened to eliminate difficult or unusual problems. Familiarity with and use of a number of individual standard engineering principles, methods, and practices are necessary in order that GS-7 industrial engineers can adapt practices and techniques to specific situations, can adjust and correlate data to convert them into valid or standard results, and can follow an operation through a series of related detailed steps or processes in carrying out the work assignments. They make tentative and preliminary selections and adaptations of engineering alternatives and, after approval of them by supervisor, carry out the sequence of details.

Nature of available guidelines for performance of work. -- The same specific and complete guides are available as were indicated for Industrial Engineers GS-5. Industrial engineers at this level are expected to have acquired a working knowledge of pertinent policies and procedures, and to have learned to relate these with and make practical application of basic professional industrial engineering principles and techniques. Required guidelines and background reference material are either directly applicable or supplemented by instructions and guidance in their application.

Nature of supervisory control exercised over the work. -- Industrial Engineers GS-7 are under general supervision of an engineer of higher grade when engaged in day-to-day repetitive type assignments, which are usually covered by specific and detailed procedures. On receipt of assignments of this type, GS-7 industrial engineers are expected to proceed independently with the investigation and analysis of the problem involved, apply established methods and procedures appropriate for a satisfactory solution, secure approval for any deviations there from, and present findings, designs, and conclusions in comparatively completed form. Whenever they encounter procedural or technical difficulties in the accomplishment of an assignment, they discuss them with the supervisor or engineers of higher grade to secure advice or a different viewpoint from which to approach the problem. Completed projects are reviewed by the supervisor, who may require further investigation of the problem, question the accuracy and adequacy of engineering data and conclusions presented, indicate changes in proposed designs or specifications prepared, or suggest exploration of an alternative course of action.
When assisting higher-grade engineers by accomplishing subordinate segments of engineering projects for which the latter are responsible, Industrial Engineers, GS-7 are ordinarily under closer supervisory control. In these instances they are given assignments which are typically screened to remove unusual or difficult problems and usually receive specific instructions as to lines of approach and work sequences to follow. Problem matters arising, such as choice between alternative methods, are referred to the supervisor and discussed with him to get further

explanation and advice or approval to proceed. Any need to deviate from established procedures requires the supervisor's prior approval. Work operations involving new processes, procedures, or lines of approach are reviewed during various stages of accomplishment to assure proper application of methods and techniques.

Mental demands. -- The requirement for original thinking is limited at this level by the nature and explicitness of assignments or by the presence of close supervisory control. Even so, some judgment is required in selecting the most appropriate guides. Some resourcefulness is required in relating a working knowledge of pertinent policies and procedures to their own basic training in the professional field of industrial engineering. Also, some initiative is required in independently planning the details to accomplish assignments governed by established, specially applicable procedures.

Purpose and nature of person-to-person work relationships. -- Most of the personal work contacts are with personnel in the various using organizations and contractor representatives for the purpose of getting or giving factual engineering information in connection with specific projects. For example, Industrial Engineers GS-7 secure data concerning operating requirements of facilities or data on which to base engineering determinations. Occasionally, they contact commercial firms for such information as current cost of materials, equipment, and labor. For training purposes, they may accompany higher-grade industrial engineers to conferences or visit manufacturers' plants with them to obtain data relative to engineering assignments, particularly with respect to projects of a developmental nature.

Nature and scope of recommendations, decisions, commitments, and conclusions. -- Duties performed by Industrial Engineers GS-7 do not include making commitments. Usually any recommendations, decisions, or conclusions made by them are subject to review for accuracy, adequacy, adherence to standard methods, formulas, and practices, and conformance with established policies and procedures. In some instances their calculations and other detailed conclusions derived by applying standard formulas or procedures are accepted without close check.

INDUSTRIAL ENGINEER, GS-0896-09

Nature and variety of work. -- Work performed by Industrial Engineers GS-9 is characterized by the independent adaptation and application of standard practices, criteria, regulations, procedures, techniques, and methods to the solution of assigned problems. Assignments may be composed of several phases, each requiring individual and independent analysis and solution, in sequence or simultaneously, but all results must be integrated for final solution. In addition, assignments at this level require a good understanding of the effect that recommendations or other results of the assignments may have on an entire project.

Assignments usually constitute blocks of work which may be either complete projects or project segments. If phases or segments of projects are assigned, they may require consideration of numerous precedents and some deviation or adaptation in previous plans or techniques for application to the subject assignment. In such instances industrial engineers receive assistance from supervisors who provide information, methods, and procedures for the application of new or unconventional criteria and techniques.

Industrial Engineers GS-9 have responsibility for the less difficult industrial engineering projects. These assignments usually relate to the efficient utilization of existing facilities and resources, and are identified by one or more of the following characteristics:

A. The projects involve surveys of operations or processes which are relatively complete in themselves, where changes would result in only limited effect on other activities being accomplished at the facility or plant, e.g., a project for improving efficiency in a central packing operation where material for shipment is packaged, boxed, and crated. Such a project may involve, for example, detailed time and motion studies of an operation to detect weaknesses such as bottlenecks in flowing material, unnecessary paperwork, duplication of work, poor manpower and equipment utilization, and any other malfunctioning part of the operation. Taking the above factors into consideration and in conjunction with workload requirements, the industrial engineer designs mechanized conveyor and materials handling layouts with proper capacities and speeds to process peak workloads, develops floor plans and equipment layouts, and makes drawings to indicate location of equipment and facilities.

In assignments of this type industrial engineers typically do not perform detailed mechanical and structural design of equipment covering factors such as size and capacities of gear trains, power requirements, gear ratios, stress analysis, strength of materials, etc. (Note: The ability to perform such work as required and to evaluate such design work performed by others is an essential element of professional competence in industrial engineering.)

B. The projects are accomplished in a facility where major improvements in production processes or methods usually are introduced as a result of studies made by industrial engineers assigned to a higher headquarters. The GS-9 industrial engineer follows well-established methods in determining the appropriate procedures and techniques to be used and the sequence to be followed in implementing the plans originating with higher headquarters.

C. The projects usually can be completed by eliminating individual steps in work operations or substituting other steps, and usually do not require introduction of new production processes, e.g., a work simplification study of metal finishing or welding operations not requiring introduction of a different process for metal finishing or welding.

D. Some projects require the introduction of new machinery and equipment to improve production efficiency. The GS-9 project engineer determines whether production can be improved through use of new machinery and equipment, furnishes justification for cost involved, determines the availability and recommends the selection of appropriate commercial machinery and equipment, and follows well-established engineering principles in preparing plans and specifications for machinery and equipment to be fabricated locally or adapted from commercial models.

E. Research projects are of limited scope such as a study (1) to determine the least expensive work methods of moving packages into, within, and out of warehouses; (2) to develop and test improved work methods for performing these operations; and (3) to develop and test modified equipment and devices required for the improved work methods.

F. Some studies cover well-established maintenance operations for the purpose of increasing efficiency through simplification of methods and processes, balancing workload, timing interrelated operations, improving material flow, and otherwise increasing utilization of personnel, space, equipment, and facilities.

Nature of available guidelines for performance of the work. -- Guidelines available to engineers in positions in this class consist of pertinent regulatory material, established criteria, engineering manuals, technical directives, drawings on file, manufacturers' catalogs, and precedent situations. Industrial Engineers GS-9 are expected to demonstrate that they possess a good knowledge and understanding of these. They select and relate them to the work to plan independently their course of action. Significant deviations from the guides and usual methods typically require prior approval of supervisors.

Nature of supervisory control exercised over the work. -- Industrial Engineers GS-9 receive general supervision when performing work assignments which can be accomplished by applying standard engineering practices and established policies and procedures. The supervisor assigns the work outlines requirements, and furnishes general instructions as to the scope of engineering activities. These instructions usually include objectives of assignments, information on related work being performed (if any), approximate time limitations, priorities and similar data. The supervisor encourages and expects Industrial Engineers GS-9 to use their initiative in planning the methods or means of accomplishing assignments within the limitations of established policies and procedures and their training and experience in the use of standard engineering principles and practices. When performing work phases which exceed these limitations, they are under closer supervisory control. Supervisor is readily available for advice; makes decisions on questionable points or deviations; gives detailed instructions when new criteria or new techniques are involved; and observes work for progress and coordination with other related designs, engineering and equipment features, and completion schedules. Completed work is

reviewed for accuracy, adequacy, and conformance with established policies, precedents, and sound engineering concepts.

Mental demands. -- There is opportunity for initiative and original thinking in applying standard engineering practices and drawing on previous experience to solve problems. Judgment is required in selecting the best of several possible methods to gain desired objectives. Ingenuity is required to visualize items to meet specific needs and combine these concepts with existing factors. Judgment is used in selecting the most economical materials or processes.
Purpose and nature of person-to-person work relationships. -- Personal contacts include those with other engineers to develop and coordinate industrial engineering features with related engineering aspects, such as mechanical, electrical, civil, and architectural. Personal and telephone contacts are also maintained with operating officials, foremen and shop personnel, sales representatives, contractors, and others for the exchange of information, explanation of layouts and facilities and materials required, and similar matters. Industrial Engineers GS-9 have contacts with contractors relative to industrial engineering features to advise them as to discrepancies noted in meeting contract specifications, to make recommendations for acceptable substitutes, and on similar matters. They have contacts with engineers and technical representatives of manufactures or contractors in regard to procurement, design, testing problems, or deviations required in manufacturing. They also maintain contacts with personnel of other activities and installations to discuss and monitor development progress, interpret requirements and specifications, witness tests of equipment, and discuss problems and difficulties arising in connection with development of facilities and equipment pertinent to assigned projects. They visit manufacturers' plants and test laboratories to discuss pertinent projects and observe production processes.

Nature and scope of recommendations, decisions, commitments, and conclusions. -- Industrial Engineers GS-9 make decisions in independently applying established policies and procedures, pertinent precedents, and standard engineering practices, methods, and techniques to accomplish typical assignments. Using these standard guides, they make decisions relative to the selection and application of techniques and the approach to be followed, choosing between alternative methods. When problem situations arise not covered by standard guides, they recommend deviations. They make recommendations in the form of their engineering conclusions; for example, working plans, designs, and specifications are the basis for action by higher authority after review and approval. In some instances, they make recommendations on a variety of industrial engineering matters such as feasibility of equipment and facilities, modifications to layout plans, material requirements and award of contracts. They make recommendations on acceptance of contractors' methods and techniques, allowable deviations, approval of materials, workmanship, and installation of layout facilities and equipment. Usually Industrial Engineers GS-9 have no direct responsibility for making commitments. Any commitment they might make would be in relation to details of assigned projects governed by established procedures or precedents.

INDUSTRIAL ENGINEER, GS-0896-11

Nature and variety of work. -- Industrial Engineers GS-11 plan and accomplish complete projects or studies of a conventional nature requiring the independent adaptation of a general fund of background data and information and the interpretation and use of precedents. They are typically confronted with complex problems which require the exercise of considerable judgment in making sound engineering determinations and decisions. Other related interests must often be considered, entailing frequent coordinative action with personnel in the fields covered, and requiring understanding of the responsibilities of other activities involved in the systems studies.

Typical assignments usually involve the application of established engineering practice to significant changes in production facilities, methods, and techniques, such as --

A. Planning for mechanization of a process or system that has been accomplished principally by manual methods.

This may involve, for example, a survey of methods, procedures, equipment, and systems for distribution of data recorded centrally to several distant points where data are required, such as the distribution of information relative to catalog changes, additions, deletions, etc. The assignment requires substantial adaptation and modification of guidelines in performing such duties as making a completed study of electrical recording and transmission equipment capabilities and requirements; determining and justifying need for electrical recording and transmission equipment; preparing plans, specifications, and layouts for such equipment, including plans and specifications for special equipment and accessories not available commercially; and estimating and justifying costs for the proposed improvements.

B. Planning for a production process or system significantly different from one accomplished previously in the plant.

This may involve, for example, planning to provide for introduction of a new process or production system for machining metals, repairing aircraft engines, or repairing aircraft controls. Typically the work involves analyzing such factors as anticipated volume of production and differences in former and proposed methods of accomplishing the production processes; deciding if additional space is required to accommodate the new process; determining effect of changes on other production processes; planning work flow, work stations, and process standards; determining additional machinery and equipment required and usability of existing machinery and equipment; determining personnel requirements; and estimating and justifying the cost of the proposed project.

C. Planning for changes in production processes because of failure of products to meet acceptable standards through existing process methods.

This may involve, for example, a complete study of a production process in order to correct defects in metal parts produced in an industrial plant. The assignment consists of making a survey of production methods, process standards and specifications, inspection findings, and laboratory reports in order to determine the causes for the defects and to recommend changes which will result in production of acceptable parts. Before developing final flow charts and process standards to incorporate the necessary improvements, the industrial engineer usually

plans and observes production test runs to insure that acceptable parts can be produced by the new methods.

D. Planning for future expansions, reorganizations, and realignments in production activities, involving studies of changes required in production facilities to accommodate these changes.

This may involve, for example, planning for future changes in production facilities, including buildings, shops, and processes. The industrial engineer develops and analyzes data relating to anticipated volume of production; technological changes in terms of new production machinery, equipment, and processes which may increase production efficiency; new construction and alterations which may be required in plant buildings and shops; and additions, conversions, and replacements which may be necessary for existing machinery and equipment. He interprets this information and incorporates it into plans, layouts, and reports containing his recommendations for changes which will be necessary in plant facilities.

E. Planning for production to meet mobilization requirements, involving extensive changes in plant layouts and production processes.

This may involve, for example, work performed in an industrial mobilization planning office to locate potential contractors and make surveys of contractors' plants to determine capability of contractors to produce critical articles required by an agency. Typically, the articles to be produced cover the full range of articles assigned the planning office, exclusive of those extremely complex articles described at the GS-12 level for which the industrial engineer works directly with research and development organizations in applying prototype designs to industrial production. Articles assigned to the GS-11 industrial engineer, however, usually are not available commercially, or are not available in sufficient quantities to meet mobilization requirements. To provide for initial or expanded production, the GS-11 industrial engineer is required to plan for changes in production facilities that are comparable in complexity to the other changes described at this grade level.

F. Planning for other changes in facilities where substantial adaptation, modification, or compromise must be made with standard guides, techniques, methods, or criteria, such as changes required (a) because of the structural characteristics of the building(s); (b) because of serious space limitations; or (c) because of the nature of the products being produced, e.g., unusually hazardous materials.

G. Research on the development of more efficient work methods, equipment, and facilities for handling, storing, order selection, packing, and distributing supplies on an agency-wide basis.

This may involve, for example, (1) measuring the relative efficiency of various types and combinations of types of equipment, including innovations, used in materials handling, layout, storing, order selection, packing, and distributive operations in stores depots under variable conditions; (2) developing and testing improved methods for using various types and combinations of types of equipment for performing these operations; (3) developing plans for and testing prototypes of new types of equipment; (4) determining the personnel and equipment of various types needed by stores depots of various ranges in size and function; and (5)

translating data from studies of materials handling, storing, packing, and distributive operations into improved facility layouts.

Nature of available guidelines for performance of work. -- Substantially the same guidelines are available at this level as are used by industrial engineers in lower grades but the guidelines are less fully applicable to problems encountered. Industrial Engineers GS-11 are expected to have a thorough knowledge and understanding of governing policies, procedures, and regulatory material, including engineering theories and concepts pertaining to several engineering fields, e.g., mechanical, electrical, and structural. They are expected to interpret the guides and select and apply appropriate precedents. They are expected to adapt these precedents and draw on their own experience when situations are encountered which are not covered by specific guides.

Nature of supervisory control exercised over the work. -- Positions in this class are typically under the general supervision of engineers of higher grade who indicate the major objectives to be attained in engineering assignments. The supervisors may provide background information and any pertinent data available, point out unusual aspects of the assignments, and suggest ways of overcoming problems, but Industrial Engineers GS-11 are allowed considerable freedom in planning and carrying out assignments from initiation to completion. Their decisions relative to detailed project planning, work methods, and procedures are unreviewed. They are expected to use their previous engineering experience to adapt established procedures and techniques and to make appropriate modifications or engineering deviations when standard guides are only partially applicable. Supervisory assistance seldom is required unless difficulties are encountered involving interpretation of technical project requirements or policy matters. Then problems are discussed with the supervisor as to procedure to be followed. Management problems relating to deadlines, priorities, funds, and equipment required are usually discussed with the supervisor.

Progress of assignments is periodically reported to the supervisor and future plans discussed with him. Contacts with contractors and other engineering personnel regarding engineering problems are accomplished without supervision. Completed work is reviewed for results obtained, soundness of engineering conclusions and recommendations, and accuracy of important design computations and critical elements.

When Industrial Engineers GS-11 are engaged in engineering work in connection with novel types of projects or layouts, they normally work under closer supervision and direction of a higher-grade engineer who supplements the gaps in data or criteria with instructions and, explanations upon making assignments, closely observes work in progress to offer advice or make decisions, and reviews in detail critical phases upon completion. In fact these critical phases are also usually the subject of further scrutiny of higher authorities or parallel groups before final decisions are made.

Mental demands. -- This factor is more pronounced than at the GS-9 level, since the assignments are of broader scope, and available guidelines may require interpretation, adaptations, or supplementation. Greater judgment is required in correlating theories of industrial engineering and in arriving at sound engineering determinations. Industrial Engineers GS-11 are expected to plan and accomplish the engineering activities characteristic of their

assignments with increased freedom from supervisory control. Initiative is essential in initiating, coordinating, and performing project work from inception through completion. Sound judgment is required to analyze and evaluate engineering design work of others, such as contractors, architect-engineer firms, and engineering personnel in specialized fields. Creative thinking is required in devising and recommending new ways of accomplishing objectives.
Purpose and nature of person-to-person work relationships. -- Personal contacts and their purpose are similar to those described at the GS-9 level. The variety and scope of contacts at this level are usually more extensive because of the nature of the engineering assignments and the increased freedom of action.

Nature and scope of recommendations, decisions, commitments, and conclusions. -- In addition to the recommendations, decisions, commitments, and conclusions cited at the GS-9 level, this factor is characterized at the GS-11 level by individual responsibility for interpreting guidelines, adapting established procedures and techniques, and making engineering deviations in planning and accomplishing the broader engineering assignments typical of this level. As an example, Industrial Engineers GS-11 in staff positions make decisions and recommendations, within authorized limitations, which result in adequate and economical facilities and serve as guides to industrial engineering personnel at operating levels for the better preparation and execution of projects. They make decisions effecting revisions to projects which often result in major savings to the Government without altering functional requirements or life expectancy of industrial facilities.

INDUSTRIAL ENGINEER, GS-0896-12

Nature and variety of work. -- Industrial Engineers GS-12 serving as project engineers differ from those in GS-11 in that they generally receive more complex assignments, many of a unique nature. The assignments are more difficult in that (1) precedents and guidelines are often not available, or are conflicting and controversial, necessitating skillful improvisations, deviations, and difficult engineering determinations, and (2) the engineering solutions independently evolved have an important impact on the program in the area concerned. At the lower level there is some opportunity for improvisation and deviation, but usually on an occasional rather than frequently recurring basis, subject to supervisory guidance, and generally with reference to projects of lesser scope and significance.

Typical assignments involve:

A. Projects to plan methods, techniques, and practices for production of novel, complex equipment, such as major assembly for a ballistic missile or guided missile such as the nose cone, aft section, or container unit consisting of center section and tail; or complete missile launching and handling equipment of comparable complexity. Industrial engineers in this category are also concerned with effecting a transition from designs developed by research and development groups to products which can be produced on a pilot line and production basis.

Usually the work is performed by reviewing prototype designs and planning the layouts, processes, and methods to be used in producing the products on a pilot line and production line

basis. The products may be produced in a Government-owned industrial plant and/or in a plant operated by a private contractor. The following duties are typical of these work assignments:

(1) Making recommendations as to whether components should be produced in a Government-operated industrial plant or by private contractor based upon knowledge of existing production facilities; investigating and evaluating capability of contractors to produce products.
(2) Making determinations on machinery and equipment required for production such as machine tools, fixtures, jigs, dies, etc.

(3) Determining the methods, processes, and sequence of operations to be followed in producing the products; establishing process standards for production.

(4) Establishing and maintaining controls to insure that production is accomplished according to schedule; working with production personnel to resolve problems occurring during production.

In conjunction with these production planning duties, the industrial engineer may perform design analysis to determine whether: (a) the product as designed can be produced by available production processes and methods; (b) other materials can be substituted for critical materials specified in the design; (c) the tolerances specified can be adapted to production processes and methods; (d) standard parts or components can be substituted for nonstandard parts specified in the design; and (e) other changes can be made in the design so that the product can be produced more efficiently and economically.

B. Serving as staff advisors in industrial engineering to heads of industrial plants (and/or to heads of production divisions) in situations where individual projects being developed are of the type described at the GS-9 and GS-11 grade levels. The workload is such that the GS-12 industrial engineer can accomplish this function individually or with a small staff of subordinate engineers and technicians.

The industrial engineer with such assignments:

(1) Furnishes advice to the head of the industrial plant and/or to the head of the production division leading to the efficient utilization of the industrial plant, including production systems, machinery, equipment, and personnel. He provides guidance for making changes in these facilities as a result of reorganizations, expansions, realignments in plant missions, and broad instructions received from higher headquarters.
(2) Develops or selects appropriate techniques for measuring the efficiency of production activities and for insuring maximum utilization of production machinery, equipment, and personnel.
(3) Identifies any deficiencies in production activities, advises management of those deficiencies, furnishes recommendations to correct the deficiencies, and makes any proposals that may be necessary to promote acceptance of improvements by production personnel.

(4) Serves as the technical authority at the industrial plant in his functional area; coordinates the industrial engineering function with other related activities such as line production organizations, other engineering functions, inspection or quality control, plant maintenance, safety, storage, etc.; resolves controversial questions resulting from the planning for and utilization of plant facilities.

C. Performing advisory, planning, and reviewing duties in a headquarters office, with respect to problems, projects, programs, and functions of conventional nature at a number of installations engaged in similar activities such as warehousing or plant maintenance.

The industrial engineer with such assignments involving standard engineering practice:

(1) Develops standards and instructions in areas such as facilities layout, data and material handling systems, methods engineering, and management control systems to serve as guides for industrial engineering and other personnel at field installations.

(2) Selects methods to be used in setting work standards, develops appropriate reporting systems, trains employees from field installations in the development and use of work standards, and follows up to assure proper applications of principles.
(3) Visits field installations to provide advice and guidance on industrial engineering projects and in problem situations which can be resolved by application of industrial engineering techniques, principles, and practices. Analyzes and evaluates facility layouts, operating conditions, and work methods. Devises means for improving efficiency and assists officials of the field installation in their implementation.
(4) Reviews and evaluates project proposals and suggestions submitted by field installations and recommends appropriate action.

Nature of available guidelines for performance of work. -- The same guidelines used by industrial engineers in lower grades are also available at this level. Project engineers apply these guides to more routine phases of their work, but a major portion of their work requires the use of initiative, ingenuity, and judgment in adapting new product designs to production methods without the benefit of precedents or guidelines. Industrial engineers in staff advisory positions serve as authoritative sources of information in the industrial plant as to the location, availability, and adequacy of technical guides, precedents, methods, and techniques in their specialty. They use originality in selecting, modifying, and adapting these guidelines to the solution of specific problems occurring at the plant.

Nature of supervisory control exercised over the work. -- Assignments are given GS-12 project engineers in terms of broad general objectives and relative priority for completing the work. These engineers establish working plans and methods, and decide which issues are of such an unusual or controversial nature as to require the advice of their supervisors. Completed work is reviewed largely for adequacy of results, for general consistency with other projects undertaken by the agency, and for conformance with administrative policies and regulations. Supervision received by staff advisors typically is administrative in nature. Since engineers in positions of this type are relied upon as authoritative sources of information and advice within the organization concerning their specialty, little or no technical guidance is provided to them by

supervisors, except on critical or controversial issues. They make recommendations to supervisors on matters affecting budget, public relations, or other administrative features.
Mental demands. -- A high degree of technical judgment, originality, and resourcefulness is required at this level to (1) apply training and experience in industrial engineering to develop and execute specific plans of action for extensive and complex project assignments with only broad objectives outlined by the supervisor, (2) recognize possible new directions of approach and devise new or improved techniques and methods for obtaining effective results, (3)overcome difficult and unusual problems where guides and precedents are lacking, (4) anticipate future requirements and trends, (5) visualize the value of new discoveries and apply the latest technological advances, (6) analyze and evaluate designs, proposals, and ideas submitted by others, (7) recognize critical issues that should be referred to the supervisor or others, and (8) coordinate industrial engineering aspects with those of other engineering fields concerned.

Purpose and nature of person-to-person work relationships. -- Contacts are frequent and are largely with key professional and engineering personnel at the employing activity, using organizations, higher authority, various staff agencies, other Government organizations, and private industry. These contacts are for consultations, exchange of engineering data, information, and opinions as required for the establishment, coordination, and execution of projects and programs. They require negotiation, tactfulness, and conference handling ability to obtain adoption of technical points to reach ultimate engineering objectives.

Nature and scope of recommendations, decisions, commitments, and conclusions. -- This factor is very significant at this level in view of the planning and coordinating responsibilities vested in these positions with respect to the increased scope of operations involved and/or the continuing necessity for skillful improvisation, deviation, and important engineering compromise. Industrial Engineers GS-12 provide engineering advice, typically on complex problems with policy implications, which is given considerable credence because of the reliance placed on their technical competence. They render decisions in giving interpretations and making technical reviews and evaluations, and take final action on industrial engineering matters. They represent the organization in conferences and meetings and often make decisions in conferences with respect to industrial engineering aspects which bind the organization to a course of action.

As an example of the foregoing, industrial engineers in staff positions at top level echelons make recommendations concerning the preparation of regulations, policies, and procedures to serve as overall guides to subordinate echelons and take final review action on projects which exceed approving authorities of the latter. Industrial engineers in staff positions at major review echelons take action to implement and adapt the overall guides and make technical decisions in carrying out the review authorities delegated for the jurisdictional area.

Industrial engineers concerned with project assignments take actions and make recommendations and decisions which strongly influence the successful completion of the difficult assignments characteristic of this level.

INDUSTRIAL ENGINEER, GS-0896-13

Nature and variety of work. -- Assignments at this level are concerned with solving unique or controversial problems with respect to industrial engineering activities which directly affect programs of extensive importance. A versatile background in engineering theory and precedent application and ability to design, modify, or develop a variety of different types of complex and novel layouts, facilities and systems are necessary. GS-13 industrial engineers are generally considered as technical experts or specialists and function as the advisory authority relative to industrial engineering and management phases. Their actions and the technical details of their decisions are for the most part unreviewed and they have full responsibility for end results.

A. Illustrative of staff advisory positions is a specialist who provides consultative assistance on industrial engineering policies and technology and major manufacturing problems which have developed through improper planning, design, tooling, or lack of attention to normal production engineering details on the part of contractors; and makes regular trips to major facilities as a part of a source selection survey review, or on own initiative, for the purpose of either trouble-shooting, or developing information for policy formulation.

B. Also typical is a position in an industrial engineering office of a bureau, or comparable organization, with responsibility as a staff advisor for planning, development, review, and inspection of a narrow or limited specialty area of an extensive industrial engineering program. Illustrative is responsibility for materials handling systems and operations in a bureau with extensive procurement, production, and storage activities.

The industrial engineer with such assignments:

(1) Develops standards, criteria, policies, and overall plans for the specialty area throughout the organization.

(2) Coordinates, reviews, and evaluates the work performed by industrial and other engineers at field installations.

(3) Provides advice and assistance in particularly complex and novel problems in the specialty area.

(4) Reviews and evaluates the status of current methods, techniques, and systems in the specialty area. Undertakes studies and provides leadership directed toward their improvement and adoption of new methods.

Nature of available guidelines for performance of the work. -- The structure of broad technical policy and planning formulated at higher levels of management serves as the basic guideline at this level. Within these policy considerations the solutions or end results are accomplished. Occupants of these positions base their determinations and decisions largely on their own well-grounded background in theory and precedent application, familiarity with overall policies and procedures, knowledge of latest technological advances in the industrial engineering field, and expert evaluation of all pertinent factors including conditions and circumstances.

Nature of supervisory control exercised over the work. -- Industrial Engineers GS-13 work under very general administrative direction. The supervisors typically make broad assignments including general technical requirements to be attained. Occupants of these positions discuss with these supervisors broad phases and progress of the work and administrative and budgetary matters, but receive little or no technical guidance. Project plans and technical proposals developed are seldom subject to a technical review, but rather for their feasibility in relation to requirements and conformance with overall policy.

Mental demands. -- Originality of thinking is of extreme importance at this level since the assignments are characterized by unique or controversial problems which have a direct impact on extensive and important engineering programs. As experts or technical specialists, Industrial Engineers GS-13 exercise initiative, originality, and judgment in applying and adapting their broad knowledge of industrial engineering theories, practices, and precedents to best effect problem solution. They exercise technical judgment in isolating essential features of the problem, adapting or extending any guides or precedents and developing new techniques in performing work, and as required, making compromise decisions. They show ingenuity in developing criteria for physical shop layouts, equipment and facilities for particularly novel and complex industrial engineering features, and display critical judgment in evaluating their suitability. They keep abreast of latest technological advances in industrial engineering field and show judgment in recognizing the need for and recommending initiation of special studies or research projects. They exercise judgment, initiative, originality, and creativeness in analyzing proposals of others and, as appropriate, modifying them to make them feasible. They use judgment in maintaining effective working relationships, especially to insure appropriate coordination and to make technical contributions on important industrial engineering matters at high-level conferences and meetings.

Purpose and nature of person-to-person work relationships. -- Personal work relationships are similar to those described for GS-12 positions. In addition, decisions, advice, and consultation usually carry more weight, since GS-13 engineers are concerned with engineering matters of increased scope and importance and are recognized as technical experts in areas of specialization. They maintain effective working relationships to insure appropriate coordination and to make technical contributions on important industrial engineering matters at high-level conferences and meetings.

Nature and scope of recommendations, decisions, commitments, and conclusions. -- Industrial Engineers GS-13 have complete responsibility for interpreting, organizing, executing, and coordinating the unique and complex assignments characteristic of this level. They give expert technical information and advice concerning the industrial problem at hand, serve as the authority thereon for the organization in high-level conferences and meetings, and prepare technical and authoritative reports and papers. Within the broad framework of technical policy and planning formulated at higher levels of engineering management, they make major decisions and substantial commitments which do not require referral as long as they remain within this outline.

These decisions and commitments often involve large expenditures of manpower, time, funds, resources, or materials and have a strong impact on extensive and important engineering programs. Industrial Engineers GS-13 make recommendations concerning important issues

which are accepted without technical review, such as recommending initiation or expansion of major projects, or action to be taken on controversial technical matters. Their conclusions are considered final in the absence of conflicting findings or policy considerations and often modify established techniques and procedures, influence the expenditures of vast sums of money, and the like.

INDUSTRIAL ENGINEER, GS-0896-14

Nature and variety of work. -- Typical assignments consist of serving as staff advisors in the planning, development, review, and inspection of one or more broad phases or functions of an extensive industrial engineering program for an agency, command, or bureau. For example, a typical GS-14 industrial engineer may be in charge of industrial mobilization planning for a bureau which has responsibility for directing the procurement and production of complex products containing many intricate parts and components, e.g., a variety of aircraft and components including airframes mechanical components, electronic equipment, power plants, and other support equipment. The following duties and responsibilities are typical of this type of assignment:

(1) Recommends allocation of aircraft production among Government industrial plants and/or commercial manufacturing plants based upon evaluation of broad agency plans relating to industrial mobilization requirements. These plans usually contain general information relating to military operations and logistical requirements which the industrial engineer must convert into schedules for production of specific models of aircraft, components, and equipment.
(2) Makes decisions as to practicability of established mobilization requirements and determines when adjustments are necessary to obtain realistic production schedules.
(3) Analyzes information relating to current progress in aircraft research and development, current aircraft production processes and methods, and current aircraft plant facilities in order to determine the potential rate of expansion and the adjustments that would be required for expansion of plant facilities for mobilization.
(4) Maintains close contacts with aircraft manufacturers and subcontractors and advises them on broad aspects of industrial mobilization planning as well as on technical details of matters which might be encountered in converting their plant to mobilization production. These technical matters may involve, for example, development of manufacturing and production plans, including plans for plant layouts; development of manufacturing methods; development of plans for standardizing production processes or components; development of plans for eliminating critical materials.
(5) Makes special industrial engineering studies of the aircraft industry, for example, to develop favorable production patterns or to determine the amount of subcontracting facilities required for emergency expansion.
(6) Furnishes advice to other organizations within the agency, command, or bureau on such matters as how and where contracts should be placed to insure adequate development of individual aircraft firms and broaden the base of aircraft production; and recommends changes in procurement policies when current procurement policies and schedules conflict with industrial mobilization policies or procedures.

Nature of available guidelines for performance of the work. -- Industrial Engineers GS-14 are essentially guided by general overall directives outlining technical objectives, their own analysis and interpretation of broad policies and regulations, their knowledge of technological advances, a broad technical background and experience in the area of specialization, and their evaluation of conditions and circumstances relating to work performed. They develop and establish guidelines for others to follow.

Nature of supervisory control exercised over the work. -- Industrial Engineers GS-14 are under general administrative control only, since they typically function as consultants and are recognized as a technical authority concerning the area of specialization. They may discuss broad program implications with their supervisor, but all technical aspects are worked out independently. Work is not subject to technical review other than for conformance with broad directives and policy, and from the standpoint of evaluating attainment of objectives.

Mental demands. -- An exceptionally high degree of originality, skill, and professional competence is necessary at this level. Technical judgment is needed to interpret and convert general overall objectives and policies into specific activities which will produce desired data upon which highly important actions and engineering decisions will be based. Creativeness is a significant requirement in evaluating problems in relation to overall objectives; in judging the direction, extent, and significance of trends and developments; and in adjusting the broad activities carried out to the latest advances in technology and to the needs of the industries, military programs, or other groups served, as these needs are modified by changing conditions. Originality is also required in overcoming difficult problems which typically necessitate complex adaptation of precedents, and in visualizing and coordinating all the individual aspects and the many inter-relationships of the important programs with which they are concerned.

Purpose and nature of person-to-person work relationships. -- The extensive scope of the program and the effect of the high-level determinations made by GS-14 industrial engineers necessitate extensive contacts with key officials and top engineering personnel of the same or other establishments, other Government agencies, and private industry. These contacts are frequently made in conferences held to exchange engineering information and negotiate mutually satisfactory solutions to important issues. For example, in presenting technical judgments and decisions which are generally given top consideration, occupants of these positions (1) supply information strongly influencing action, (2) advise on policies and procedures, (3) discuss and influence the establishment of long-range programs affecting future engineering work, (4) coordinate and conclude technical phases of established programs, and (5) render technical consulting service. They represent their employing activities in committees of national and even international importance, and participate actively in the development and execution of major issues.

Nature and scope of recommendations, decisions, commitments, and conclusions. -- GS-14 industrial engineers make final determinations on technical matters with respect to industrial engineering aspects of important engineering programs having national significance. As representatives of their agencies they reach agreements with other groups. Recommendations, decisions, and conclusions made by them are considered as authoritative and are seldom subject

to technical review. Final acceptance may, of course, be dependent upon action of higher authority or concurrence of other affected groups.

INDUSTRIAL ENGINEER, GS-0896-15

Nature and variety of work. -- Typical assignments consist of serving as staff advisors in the planning, development, review, and inspection of all phases and functions of an industrial engineering program conducted by an agency, command, or bureau. The program for which a GS-15 industrial engineer has staff responsibility is of such breadth and intensity that it involves coordination of a group of phases and functions which considered separately would require GS-14 industrial engineers for their administration. The industrial engineer at this level, for example, may exercise staff responsibility over a program established to improve efficiency in production methods, systems, plant layouts, processes, machinery and equipment throughout a bureau which operates manufacturing plants, test stations, and depots engaged in the manufacture, storage, renovation, and distribution of a wide variety of material.

Nature of supervisory control exercised over the work. -- Industrial Engineers GS-15 are recognized as technical authorities in their areas of specialization and receive administrative controls only. Supervisory control involves evaluation of fulfillment of project objectives, of the effect of their advice and influence on the program of the organization, and of their overall contributions.

Mental demands. -- Outstanding originality and resourcefulness are required in conceiving and developing original and fruitful programs, projects, and ideas.

Purpose and nature of person-to-person work relationships. -- There are extensive contacts with key administrative and technical officials of agencies to explain the need for new programs or changes in existing programs and the advice on far-reaching questions of policy and program formulations. As recognized authorities, GS-15 engineers serve on panels and committees concerned with planning interagency programs and collaboration.

Nature and scope of recommendations, decisions, commitments, and conclusions. -- Recommendations and conclusions are considered authoritative and are not reviewed technically. They typically have a far-reaching effect on the work and programs of extensive engineering activities.