

# Position Classification Standard for Mining Engineering Series, GS-0880

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## **SERIES DEFINITION**

This series includes positions that require primarily the application of professional knowledge of mining engineering. The work requires the ability to apply the principles of mathematics, chemistry, geology, physics, and engineering to mining technology. It also requires general knowledge of construction and excavation methods, materials handling, and the processes involved in preparing mined materials for use. Mining engineer positions are concerned with the search for, efficient removal, and transportation of ore to the point of use; conservation and development of mineral lands, materials, and deposits; and the health and safety of mine workers.

This standard supersedes the standard for the Mining Engineering Series, GS-0880, issued in August 1947 under the series code P-870.

## **BACKGROUND**

Our civilization is greatly dependent upon metals, minerals, and solid fuels. The function of mining engineering is to remove these raw materials from the earth. As high grade deposits of these materials become depleted, production problems become more complex.

The field of mining engineering is broad in scope. It includes metal ores of all kinds, nonmetallic minerals, and solid fuels and energy sources such as coal and nuclear materials. It encompasses the various kinds of mining systems such as underground mining, strip mining, and placer mining. In addition to traditional mining activities, there is much mining engineering work being done in the heavy construction industry, involving rock excavation, and support for highways, tunnels, and underground chambers. Mining engineering efforts also involve exploration and development of mineral deposits located under large bodies of water.

Mining engineers in the Federal service are concerned primarily with:

- the discovery and efficient extraction from the earth of metallic ores, nonmetallic minerals, and solid fuels;
- the development, improvement, and use of safe, efficient, nonwasteful mining methods, and equipment;
- the conservation of our Nation's mineral and natural resources;
- the health and safety of mine workers; and
- the health and safety of the public through mine waste disposal and related activities.

Generally, mining engineers engage in one of several different types of activities. These activities tend to overlap and are intermingled.

*Advisory-regulatory activities*

Many mining engineers are engaged in administering laws regulating mining, and the leasing of public, Indian, national forest, and acquired lands containing mineral deposits. They do these kinds of things:

- Examine lands to determine their mineral character for classification purposes.
- Investigate mining claims to determine if they meet requirements of the mining laws.
- Appraise mineral deposits, mining claims, and mineral lands to determine their fair-market value.
- Investigate lease applications and review and revise accompanying mining plans.
- Plan and/or participate in exploration projects.
- Present factual data and expert opinions at hearings and legal proceedings on the validity of mining claims, the character of land, the value of mineral deposits, mine health and safety issues, etc.
- Review, advise, inspect and make recommendations concerning plans and work on reclamation of surface mining and surface-mined lands under mineral leases and contracts.
- Perform professional mine inspection regulatory duties.
- Prepare comprehensive technical reports containing study findings and recommendations.

*Resources development activities*

Many mining engineers are engaged in studies and investigations to promote development and effective utilization of mineral deposits. They do these kinds of things:

- Investigate and study mining engineering problems related to mineral resource and development projects.
- Assist mineral industries by providing advice and guidance in the use of efficient mining methods and equipment.
- Investigate and gather data regarding the production, movement, and demand for mineral raw materials.
- Conduct mineral resources studies within a designated geographical area, to determine the number, size, grade, fair-market value, and costs of exploitation of mineral deposits.

- Investigate conflicts in land-use involving mineral deposits, and assess the economic impact and the increased costs incurred through loss of such deposits.
- Prepare comprehensive technical reports containing study findings and recommendations.

### *Research activities*

Many mining engineers are engaged in basic and applied research for conservation, development, and health and safety purposes. Research is directed to overall improvement of mining systems and components, as in:

- Rock disintegration which includes drilling, blasting, mechanical mining, leaching, and solution;
- Materials handling which includes loading and mine transportation of broken material;
- Ground control which involves controlling or stabilizing the voids created through removal of the mineral;
- Environmental control which involves water control and drainage, and control of mine atmosphere (including methane gas), temperature, and humidity; and
- Rapid excavation (tunneling).

Research efforts are not restricted to development and improvement of surface and underground mining systems. Such efforts are also directed to problems of discovery, extraction, and materials handling of minerals in deposits located under the seas and other large bodies of water (marine mining); and to lunar and possibly other mining systems and techniques (extraterrestrial mining).

## **EXCLUSIONS**

Positions involving responsibility primarily for discovering mineral deposits by application of professional knowledge of geology, geophysics, mineralogy, etc., are classifiable to the [Geology Series, GS-1350](#), or the [Geophysics Series, GS-1313](#).

Engineering positions involving responsibility primarily for exploration and development of oil and natural gas fields and for the evaluation and conservation of these resources are classifiable to the [Petroleum Engineering Series, GS-0881](#).

Engineering positions engaged primarily in mineral preparation and processing activities (such as separating metals, minerals, and solid fuels from waste rock; refining, purifying, and preparing minerals for use), and designing, developing, improving, and operating industrial processes and equipment utilizing minerals, are classifiable (as appropriate) to the [Materials](#)

[Engineering Series, GS-0806](#); [Ceramic Engineering Series, GS-0892](#); [Chemical Engineering Series, GS-0893](#); [Metallurgy Series, GS-1321](#); or similar series.

Engineering positions involving responsibility primarily for design, modification, and installation of electrical and mechanical equipment and systems used in mines, such as materials handling systems for transporting mined materials, lighting systems, or ventilating or air-conditioning systems are classifiable to the appropriate engineering series; for example, the Mechanical [Engineering Series, GS-0830](#), or the [Electrical Engineering Series, GS-0850](#).

Positions involving responsibility primarily for performing coal mine inspection duties, requiring the application of practical knowledge and experience in mining, are classifiable to the [Coal Mine Inspection Series, GS-1822](#).

Positions which involve nonprofessional technical work in mining (other than coal mine inspection) requiring the application of a practical knowledge of engineering are classifiable to the [Engineering Technician Series, GS-0802](#).

## TITLES

The approved titles for positions classifiable to this series are *Mining Engineer* and *Supervisory Mining Engineer*.

## EVALUATION CRITERIA

Two factors are used in this standard to determine the grade levels of mining engineering positions. These are *assignment characteristics* and *level of responsibility*.

### *Assignment characteristics*

Work assignments at the lowest grade level provide training experiences in which the employee is required to apply theoretical knowledge in solving practical problems. At the higher grade levels, assignments involve analysis, evaluation, and interpretation of engineering data, and management of engineering programs.

Generally, guidelines affect level of responsibility. However, due to the nature of this occupation, guidelines as a factor is being treated primarily under assignment characteristics. The difficulty level of assignments is affected by the presence or absence of guidelines and pertinent data, and the judgment required to apply and interpret guidelines and the data secured. Guidelines are generally composed of legislation and implementing administrative rules, regulations, technical guides, precedent cases, and manuals. To acquire pertinent data may necessitate visits to courthouses, and to remote and difficult to reach mining locations and may require going underground.

The ability to communicate effectively, orally and in writing, with mine owners, mine officials, mine workers, and State and local officials, is important. At times, mining engineers are required to serve as expert witnesses in legal proceedings.

Mining engineers tend to specialize in a given type of mining, such as coal mining; hard rock mining; underground mining; strip mining; or placer mining. For the purposes of this standard, neither the type of mining nor the mineral commodity involved plays a significant role in determining the difficulty level of a given position.

### *Level of responsibility*

At the lower grade levels, the supervisor closely controls work assignments. Instructions are detailed, the supervisor provides advice and aid while work is in progress. Completed work is subject to intensive review.

At the higher grade levels, mining engineers are expected to operate with considerable freedom. Mining engineers spend a significant amount of their working time in the field, physically removed from their immediate supervisor. At times, important decisions must be made in the field without checking with the next level of supervision.

Recommendations made by mining engineers may have a significant impact on the health and safety of mine employees, and on the economy of a mine, a community, or an industry.

## **QUALIFICATIONS REQUIRED**

Mining engineers must possess professional knowledge of the principles and theories of engineering, mathematics, physics, chemistry, and geology. A degree of mining engineering or geological engineering is preferred. Mining engineers must have a general knowledge of the methods of construction and excavation, materials handling, and of the processes involved in preparing minerals, metals, and solid fuels for use. Knowledge of economics is important for some positions. For many positions, mining engineers must have had previous experience working in a mine or must acquire such experience working on the job.

At times, the work imposes severe physical demands upon the mining engineer as he performs his duties. Working under hazardous conditions is normal for this occupation.

The qualifications required factor is covered implicitly under assignment characteristics and level of responsibility at the various grade levels.

## **EVALUATION NOTES**

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

Positions engaged primarily in determining the fair-market value of mining claims, mines, mineral lands, and/or mineral deposits, etc., should be evaluated by reference to the [Valuation Engineering Grade-Evaluation Guide](#), issued June 1965.

Supervisory positions should be evaluated by reference to the [General Schedule Supervisory Guide](#).

Nonsupervisory mining engineering positions beyond GS-12 are rare. Hence, it is not economical to provide criteria for evaluating such positions above the GS-12 level. Positions at GS-13 and above may be evaluated by extension of criteria presented in this standard, by application of evaluation criteria in the [GS-0800, General Grade-Level Standards for Nonsupervisory Professional Engineering Positions](#), and/or by criteria in the appropriate guides listed above.

## GRADE DESCRIPTION LEVELS

### MINING ENGINEER, GS-0880-05

#### *Assignment characteristics*

Assignments are of limited scope. Some tasks assigned may resemble those performed by nonprofessional employees; tasks are selected to provide training and experience needed to perform at higher professional levels. They are designed to orient the GS-5 mining engineer in the application of academic theory to the solution of practical engineering problems. Standard guidelines cover all work performed. Guidelines are readily available and are directly applicable.

#### *Level of responsibility*

Mining Engineers GS-5 receive detailed supervision over all aspects of the work. Instructions are specific as to results expected, references to be consulted, equipment and procedures to be used. Work is checked in progress for adherence to instructions. Completed work is reviewed closely for compliance with instructions, technical accuracy, and proper application of mining engineering principles.

## **MINING ENGINEER, GS-0880-07**

### *Assignment characteristics*

GS-7 mining engineers perform work designed to provide advanced training and experience in mining engineering. Assignments are screened to eliminate the difficult and unusual problems. They are relatively uncomplicated individual projects, or the less demanding parts of larger projects.

Standard guidelines are available and generally are directly applicable. Some minor interpretation may be required in applying guides to particular problems.

Person-to-person relationships in the field may involve contacts with mine officials and mine employees. The purpose of such contacts is to gather factual data.

Assignments require the application of standard engineering principles and techniques, together with increasing knowledge of mining and mineral industries.

Typically, a GS-7 mining engineer may assist an engineer of higher grade in examining unpatented mining claims (title still rests with the Federal Government) to determine validity; or, he may assist an engineer in conducting a minerals resource study. In carrying out such studies, the GS-7 mining engineer performs duties such as these:

- Studies public and private records to discover the geology and mineral history of a geographical area;
- Collects and analyzes production statistics;
- Selects representative samples at a mine or claim site for analysis;
- Assists in preparing inventories and appraisals of the worth of mineral deposits;
- Prepares written reports of findings, including tentative recommendations.

### *Level of responsibility*

GS-7 assignments are well detailed. Work methods are prescribed. Some minor latitude is permitted in choosing and applying standard guides. Assignments of recurring nature are executed with a degree of independence. Assignments involving procedures and techniques with which the employee is unfamiliar are closely supervised.

Work efforts may result in preparation of tentative recommendations. Completed work is reviewed for compliance with instructions, technical accuracy, and for application of mining engineering principles.



## **MINING ENGINEER, GS-0880-09**

### *Assignment characteristics*

GS-9 assignments are characterized by independent performance in carrying a small project or a phase of a larger more complex project to completion. Assignments involve performance and integration of a variety of tasks and data into a completed study report.

The problems involved in the assignments and the equipment employed are conventional. Unusual operating difficulties are not typically encountered.

Standard guidelines are available, but unlike GS-7 are not directly or fully applicable. Exercise of judgment in the selection, adaptation, interpretation, and application of standard guides is required.

Person-to-person contacts with mine owners, mining officials, mine employees and employees of other governmental jurisdictions occur with greater frequency than at the GS-7 level. The purpose is primarily to gather factual information and gain cooperation. GS-9 mining engineers may in turn provide general information on agency programs and regulations.

Representative assignments are given below.

- A. Mining Engineers GS-9 engaged in advisory-regulatory activities perform a combination of duties in conducting investigations of minerals cases of limited difficulty, or in assisting an engineer of higher grade on more difficult cases. GS-9 employees inspect mining operations or lands proposed for mining operations, and make determinations such as these:
- whether the mineral values present are sufficient to satisfy requirements of the mining laws;
  - whether sufficient development work has been done; and
  - whether the applicant has met all of the legal requirements involved in justifying a claim.

GS-9 mining engineers appraise the value of mineral deposits, and determine the economic feasibility of developing deposits through use of standard mining evaluation processes. They prepare comprehensive reports including recommendations to allow or deny granting of title.

- B. Mining Engineers GS-9 engaged in resources development activities assist in the conduct of mineral surveys of a specified geographical area. For example, a GS-9 mining engineer may make a study of trucking and transportation costs as part of a larger study of the sand and gravel industry. Responsibility for the larger study rests with a mining

engineer of higher grade. The GS-9 mining engineer visits mineral industries to gather production statistics and other factual data for presentation in agency publications.

### *Level of responsibility*

GS-9 mining engineers work under general supervision, as contrasted to the close supervision exercised at GS-7. Assignment instructions include information on the purpose and scope of the study and guidance on general approach, alternate methods, etc. The engineer generally plans his own work, determines applicable methods and guides, and adapts them to the problems encountered. The unusual and more difficult problems are referred to the supervisor.

Completed assignments contain conclusions and recommendations which are reviewed for consistency with objectives, and soundness of technical engineering judgment.

## **MINING ENGINEER, GS-0880-11**

### *Assignment characteristics*

GS-11 assignments typically involve responsibility for independently planning and carrying out intensive investigations into complex but conventional problems of mining engineering.

GS-11 assignments require a thorough knowledge of mining engineering and proven professional experience and ability in applying the principles in the area of activity. Although the work is usually of a conventional nature, it requires exercise of considerable judgment in selecting from among several alternative approaches or solutions to problems, to arrive at the best treatment from a technical standpoint. At times the work requires substantial adaptation of standard guides and criteria.

GS-11 mining engineers have frequent person-to-person contacts. The importance of these contacts with mine owners, officials of local and State governments, and attorneys exceeds those at the GS-9 level, going beyond the fact-gathering function found at lower grade levels.

GS-11 mining engineers give interpretations of provisions of mining laws, rules, and regulations. They seek cooperation and compliance with mining laws and/or the use of more efficient mining methods and techniques. They assist attorneys in appeal cases, and may serve as expert witnesses.

Representative assignments are given below.

- A. Mining Engineers GS-11 engaged in *advisory-regulatory activities* perform a combination of duties such as the following:
  - Evaluate the adequacy of proposed mining plans to meet requirements for efficient and nonwasteful extraction procedures and for the prevention of injury, and protection of the health and safety of mine workers. (Consideration is given to the

- location and direction of shafts, drifts, and tunnels; design of headframes, pump plants, haulage systems, ventilation systems, etc.)
- Modify, redesign, or design mining engineering plans and prepare specifications to meet required standards of efficiency and safety.
  - Recommend lease provisions and royalty rates.

B. Mining Engineers GS-11 engaged in *resources development activities*, conduct studies of the mineral industry. Generally, these studies involve determining: the industrial and commercial outlook for minerals; the relationship of mineral supply and technology to the economy; and/or more efficient methods and techniques for mining minerals. Studies involve gathering production statistics; appraising the magnitude of measured reserves, potential resources, and minability of known deposits; analyzing mining and processing costs; and analyzing the market for mineral products.

In carrying out such studies, the mining engineer:

- Conducts plant surveys of mining operations in a specified geographical area, to accumulate data on engineering projects (including construction costs) and to set up criteria for estimating capital required for various types of mining and mineral processing plants.
- Investigates the mineral characteristics of public lands designated or proposed to be designated as wilderness or primitive areas, involving library and office research, field investigation of existing mines and other mineral exposures, and evaluation of the engineering and economic aspects of exploiting such exposures.

#### *Level of responsibility*

GS-11 mining engineers independently plan and carry out assigned investigations. The supervisor indicates scope and objectives, and major problem areas anticipated. The employee is responsible for developing approaches and solving problems. The supervisor provides guidance on novel problems and controversial issues. Completed work is expected of the trained engineer and is reviewed for engineering judgments, accomplishment of objectives, and consistency with policy.

Unlike GS-9 engineers, Mining Engineers GS-11 have authority to conduct preliminary negotiations for contracts and to take positive action to enforce contract provisions, including lease terms of mines privately operated under Government contracts. Technical recommendations and advice are depended upon by private property owners in the development and operation of mines. Published reports may be disseminated to industry and the general public, outlining new or improved methods of operation, or suggesting the adoption or modification of health and safety standards. These reports may have a significant impact upon the mining industry.

## **MINING ENGINEER, GS-0880-12**

### *Assignment characteristics*

GS-12 assignments deal with advanced technical problems in an area of specialized mining or resources development work. Projects assigned are more complex and broader in scope than those at GS-11 in that they involve planning and coordinating several phases of a large complex project, integrating the several parts into a completed study report. Engineering principles are typically applied in new ways in solving novel, nonconventional problems. Engineering techniques used seldom follow established guides and standards.

GS-12 mining engineers are recognized as being mature professionals, equipped by training and experience to apply intense and highly specialized knowledge of mining engineering and related fields to complex problems of the mining and mineral industries. Mining Engineers GS-12 differ from those at GS-11 in that they are required to exercise a high level of originality, initiative, and judgment in planning and conducting work assignments; in interpreting and applying regulations and procedures; in obtaining, analyzing, and presenting data; and in preparing conclusions and recommendations.

Generally, GS-12 mining engineers initiate and maintain more frequent contacts with employees of the agency, officials of mining and mineral industries, and officials of local and State governments than do engineers at GS-11. Contacts at the GS-12 level exceed in importance those at the GS-11 level due, in part, to the complexity of the problems encountered. For example, the GS-12 mining engineer provides professional advisory services to the mining and mineral industry on efficient mining methods, techniques and new developments in the field. He conducts negotiations to require compliance with mining laws. He may commit his agency, within prescribed limits, in cooperative efforts with other governmental jurisdictions.

Representative assignments at the GS-12 level include: identifying technical problems of importance to a substantial or significant portion of the mining industry; outlining study proposals; and planning and conducting mining engineering surveys and studies for solving such problems. Studies of this type may involve:

- (1) developing information from obscure and conflicting data, evaluating data for validity and significance, oftentimes reaching unforeseen or previously unproven conclusions;
- (2) modifying and adapting established mining techniques to new uses; or
- (3) developing and experimentally applying new mining methods.

Generally, studies of this type involve team effort. The GS-12 mining engineer coordinates the work of other mining engineers who are responsible for subordinate parts of the study, correlates findings, and prepares a comprehensive report of observations and conclusions.

The GS-12 mining engineer may plan and conduct complex engineering studies and investigations into the marketing, economic, and technological aspects of specific mineral industries on a regional basis. In broad studies of this type, the GS-12 engineer applies intensive knowledge of mining engineering and specialized knowledge of the mineral commodities of the region. Duties involve interpretation of economic and technical data and related information concerning distribution patterns of mineral producing sites; production and consumption trends; potential of undeveloped deposits; and the economic implications of technological developments within the industry on the regional area. Factual data developed from the various phases of such a study form the most complete record of the domestic mineral economy and are published for use by industry and the public. The engineer responsible for a study of this type coordinates the subordinate parts in executing a completed study.

*Level of responsibility*

GS-12 assignments are given in terms of broad, general objectives, and priorities. The scope and limits of the study are indicated in the approved project design. Incumbents independently plan and execute assignments, selecting methods and approaches to solve complex problems. Frequently, the assignments are those previously suggested and justified by the incumbents.

GS-12 mining engineers speak with greater authority than do engineers at the GS-11 level. Incumbents at the GS-12 level conduct negotiations, provide professional advisory services, discuss problems and reconcile differences, explain agency programs and objectives, and commit the agency to a course of action within prescribed limits. However, GS-12 mining engineers do not make policy determinations.

The supervisor is kept informed on the general trend of the work (rather than on details), and is consulted on problems that are especially difficult or controversial, and on actions that may have an effect on policy. In matters of policy, the GS-12 engineer typically recommends a course of action, supported by factual data and the rationale for his recommendation.

Conclusions and recommendations are especially important at this level in that they may result in final settlement of a case, precipitate administrative or legal review proceedings, have a significant impact on the economy of a mining company, a community, or an entire industry. A high degree of reliance is placed upon the recommendations and conclusions reached by GS-12 mining engineers in solving complex problems, reflecting position and status within the agency, and professional reputation in the field. By comparison, the reliance placed upon GS-11 engineers usually relates to the more routine, conventional problems.

Completed work is reviewed for adequacy in terms of meeting broad objectives. Matters affecting policy are reviewed more closely.