Mechanical Engineer, GS-0830-12

Standard Position Description Number: REN1100

Introduction

This position is located in an operating office (Office) within the Bureau of Reclamation (Reclamation) within the Department of the Interior (Department). This position serves as an experienced engineer providing mechanical engineering mentorship and expertise for a variety of complex projects and activities throughout the Office which typically include a variety of geographic locations, complex features, and unusual needs or special demands. Mechanical engineering assignments may specialize in one or more specialties: Design, Construction Management, and Operations and Maintenance (O&M). Complex features/facilities include hydroelectric generating powerplants; pumping plants; buildings; and multipurpose water conveyance, and storage systems such as dams, canals, pipelines, tunnels, desalination, and related appurtenant systems. Mechanical systems include piping systems, heating ventilation and air conditioning (HVAC), fire protection, water treatment process systems, large gates, fish handling equipment, cranes, hoists, elevators, turbines, and pumps.

This SPD may be used in conjunction with the other BOR Mechanical Engineer SPDs for developmental purposes, or may be used as a stand-alone GS-12.

Major Duties

Performs the first three major duties (Technical Consultation and Guidance; Reviewing; and Engineering Analysis) on a regular and recurring basis with Engineering Analysis being performed a minimum of 25% of the work time.

Technical Consultation and Guidance

Completes and/or reviews engineering analyses, drafts recommendations, and study conclusions. Assists management in developing engineering policies, technical guidelines and standards, and/or project or study objectives. Participates on technical teams, providing support with technical procedures and practices for the teams. Provides technical mentorship, guidance, training, and advice to engineers and technicians and other internal and external stakeholders.

Provides technical collaboration on teams external to the organization, including external stakeholders and partners. Remains current with agency and national standards; drafts, coordinates, and contributes to agency and/or national standards which may include serving on national standards committees in the mechanical engineering industry (e.g., American Society of Mechanical Engineers (ASME), National Fire Protection Association (NFPA), Centre for Energy Advancement through Technological Innovation (CEATI)).

Reviewing

Assists with providing technical reviews, peer reviews, and checking of designs, drawings, engineering analysis, technical documents, specifications, cost estimates, and contract correspondence, ensuring documents are accurate and quality assurance processes were followed. Reviews may be outside of the organization or designed by others. Ensure documents are ready for technical approval/acceptance in accordance with Reclamation and Department policies, directives, and standards.

Engineering Analysis (minimum 25% of work time)

- Conducts, plans, develops, and prepares procedures, and/or protocols for mechanical engineering studies and special projects that require advanced engineering analysis that may extend or modify theories, concepts, and assumptions or resolve unique or novel problems, conditions, or issues. Participates in programs or projects which are innovative and original. Helps develop methods and procedures which may become the established precedent. Engineering analysis may result in significant alteration of standard practices, processes, devices, equipment, and known techniques. Studies

and projects include technical planning activities; data collection; modeling and data analyses; analyses of site location and/or conditions; risk estimation and analyses; and analyses of instrumentation data. Engineering analysis advances engineering methods, practices, and procedures; conclusions, recommendations and/or decisions are based on this high-level analysis. As senior level in a mechanical engineering role by participating in and reviewing advanced engineering designs, construction management, and/or O&M procedures and approaches that involve significant depth and complexity that have industry-wide influence to include:

- May direct, plan conduct and/or participate in engineering studies or evaluations such as preliminary, appraisal, feasibility, final design, and value planning/value engineering, and contractor designs;
- Performing, reviewing, checking, and/or modeling engineering designs, contractor submittals and transmittals, including performing analytical calculations and computer-aided design and drafting;
- Reviewing design criteria, procedures, instructions, and material specifications;
- Selecting and applying professional engineering procedures for the design and modifications of new and existing complex features/facilities;
- Performing field acceptance testing and/or design, installation, commissioning, and testing instrumentation to provide engineering data for analysis and/or operational decision support; and/or
- Preparing and/or reviewing the development and adequacy of multi-layered construction cost estimates for planning, final design, and procurement (e.g., Independent Government Cost Estimates (IGCE) and contract modifications) for the construction of significant projects with complex features representing an important segment of the Department's operating programs or affecting the welfare of the public and/or the sustainability of natural resources and the environment;
- Performs diagnostics testing and analysis of power generation or water delivery components including rotating machines, penstocks, piping systems, fire protection systems, and heating, ventilation, and air conditioning systems including the commissioning, maintenance, troubleshooting, and emergency repair necessary to bring equipment back to service;
- Develop with SME testing procedures to address unique operational constraints including the design and fabrication of custom test equipment necessary to safely and effectively address non-typical issues;
- Provides training to both engineers and crafts to ensure safety of employees and effectiveness of testing while reducing overall costs associated with maintenance activities;

Documentation and Presentation

Assists in developing project job plans, guidelines, protocols, and procedures that are specific to the project and may develop new methods and criteria. Participates on teams that propose or develop potential modifications or changes to policies, standards, and power technical documents (e.g., Facilities Instructions, Standards and Techniques (FIST), power equipment bulletins (PEB), power reliability compliance bulletins (PRCB)). Prepares for final review or action of technical documentation such as technical memorandums and reports, engineering analyses and results (e.g., basis of turbine hill chart relative to intake elevation and rough zones), correspondence, publications, design criteria, calculations, design summaries, design standards, designer's operating criteria, drawings, job plans, forecasted capital budget plans, operating procedures, evaluation and oversight reports, value studies reports, inspection and assessment reviews, impact assessments, permit applications, emergency action plans and exercises, construction plans and reports, quantity estimate worksheets, specifications, constructability reviews, solicitation packages, required planning, final design, and/or procurement construction cost estimates such as IGCE and contract correspondence including responses to submittals and Request for Information (RFI).

Investigations, Assessments, and/or Inspections

Plans, schedules, coordinates, and conducts mechanical engineering facility examinations, reviews, and/or inspections which include conducting condition assessments and construction and transfer inspections; identifying and addressing deficiencies relative to design criteria, applicable codes and standards, or state or Federal statutes or regulations; calculating preliminary estimates for repairs; coordinating with internal and external partners;

documenting and presenting results; conducting root cause analyses; conducting accident and incident investigations; identifying future needs for the asset investment such as extraordinary maintenance and rehabilitation.

Other Duties (non-grade controlling/non-series controlling work)

- **Project Management**: Develops, monitors, and manages project plans that outline the scope, schedule, and budget of assigned projects. This includes: coordinating and communicating with other groups and offices throughout the organization such as program and project managers, engineering, finance, maintenance, permit compliance, and acquisition; managing changes to the project plans with external stakeholders, transmission owners, tribes, and regulatory authorities; identifying and addressing issues prior to adverse impacts to the schedule and budget; and participating on and/or leading technical teams.
- **Contracting Officer's Representative (COR)/Grants Officer's Technical Representative (GOTR)**: Works with Contracting Officer/Grants Officer to implement and administer a variety of assigned contracts, including construction contracts, service contracts, P.L. 93-638 Indian Self Determination and Education Assistance Act as amended contracts/agreements, interagency agreements, and financial assistance agreements. Initiates timely actions and technically monitors the contract/agreement to ensure that they are carried out to completion as outlined in the contract/agreement. Researches the background on problems, identifies and devises courses of action in coordination with the Contracting Officer or Grants Officer as appropriate, and prepares recommendations for decision by management. Certain projects and activities require certification as a Contracting Officer's Representative (COR) and/or Grants Officer's Technical Representative (GOTR).
- **Technical Working Groups**: Participates on and/or leads technical work groups or teams. May provide technical organizational representation and collaboration on teams external to the organization, including external stakeholders and partners.

Performs other related duties as assigned.

Factors

Factor 1. Knowledge Required by the Position (Level 1-7 1250 pts)

Broad professional knowledge of, and skill in applying, a wide range of mechanical engineering theories, concepts, principles, standards, methods, and practices sufficient to provide advisory services in engineering analyses, documentation, and investigations, and in the planning and/or design process; and to provide engineering design, analyses, review, inspection, and/or documentation for a wide range of mechanical engineering assignments involving combinations of complex features which require adaptation of precedents and existing strategies to meet the unusual or special demands of the specific assignment.

Knowledge of, and skill in applying, the principles and practical concepts and processes of other related engineering and technical disciplines in order to direct, advise, coordinate, or oversee combined efforts involving multiple disciplines and ensure connection, contribution, or inclusion of the multiple disciplines involved in mechanical engineering assignments.

Familiarity with the principles and practical concepts and processes of other related engineering and physical and biological/environmental science disciplines in order to ensure connection, contribution, or inclusion of the multiple disciplines involved in mechanical engineering assignments.

Skill in identifying, conceptualizing, and developing solutions to engineering problems or needs, and skill in independently planning and conducting studies and reviews and developing technical documents such as site reviews, feasibility through final designs, and associated guidance criteria, procedures, and instructions. Ability to

develop new insights into situations and knowledge of new and emerging engineering methods and technology to apply when addressing engineering problems and needs.

Knowledge of engineering data collection methods. Knowledge of and skill in evaluating data sources within Reclamation and industry. Skill in identifying and assessing the data needed for design development and mechanical engineering assignments.

Knowledge of automated engineering systems and applications in order to effectively and efficiently plan, gather the appropriate data for input into the system, and assess, interpret, and analyze the validity of the generated results. Skill in using computers, software applications, databases, and automated systems to accomplish engineering assignments which may include programming, scripting, and/or coding.

Skill in effectively conveying information to individuals or groups, taking into account the nature of the information (e.g., technical, sensitive). Skill in writing in a clear, concise, organized, and convincing manner for the intended audience. Skill in establishing collaborative working relationships with stakeholders to ensure that their needs are heard and addressed; identifying and analyzing problems; distinguishing between relevant and irrelevant information to make logical decisions and develop solutions and communicating effectively with all levels and types of organizations and audiences. Skill in using partnerships to achieve collaborative solutions and resolve complex problems; utilizing project management, conflict management, and/or team building tools to achieve results in a collaborative spirit; and analyzing diverse viewpoints to make planning decisions and solve work problems.

Knowledge of the principles and concepts of thermodynamics and fluid mechanics; and/or knowledge of mechanical engineering aspects of hydro-generation equipment and the associated controls, and/or auxiliary systems.

Knowledge of Reclamation and Office mission, structure, projects, and facilities. Knowledge of project benefits, authorities, stakeholders, and their governing laws, statutes, regulations, compacts, and treaties. Knowledge of asset criticality and risk assessment methodology and processes.

Knowledge of and skill in applying cost estimating practices and principles to develop and/or review construction cost estimates for the planning, final design, and procurement (e.g., IGCE and contract modifications) of complex features.

Knowledge of and skill in applying qualitative and quantitative analytical techniques and project management principles, methods, tools, and techniques in order to direct, develop, schedule, coordinate, monitor, and manage projects and resources which are significant to the Department’s and Reclamation’s mission and operating programs. Project management certification may be required for specific assignments.

Knowledge of administrative activities associated with contracting and agreement actions, procedures, and options, and working knowledge of the associated documents and contract and agreement actions in order to assist the Contracting Officer/Grants Officer in performing contract administration functions. COR or GOTR responsibilities may require specific training and/or certification.

Knowledge of and skill in applying Federal Acquisition Regulation (FAR) requirements and Construction Specifications Institute (CSI) guidelines for drafting contract documents.

Factor 2. Supervisory Controls (Level 2-4 450 pts)

The supervisor outlines overall objectives and available resources and the incumbent and supervisor, in consultation, discuss scope of the assignment, methods, and time frames. The incumbent independently plans and carries out projects and assignments, resolves conflicts, and coordinates and collaborates with stakeholders to accomplish the work. The incumbent interprets policy and regulatory requirements in terms of established objectives and keeps the supervisor informed of progress and potentially controversial problems, concerns, issues, or other matters. Throughout the project or activity, the incumbent develops changes to plans and/or methodology and provides developed, viable solutions and recommendations for improvements in order to meet program/project objectives. The supervisor reviews completed work for soundness and quality of overall approach, effectiveness in meeting requirements or producing expected results, the feasibility of recommendations, and adherence to requirements.

Factor 3. Guidelines (Level 3-4 450 pts)

Guidelines include applicable Reclamation and Department instructions, policies, and procedures; national and state codes, standards, regulations, ethics, and compliance standards for mechanical engineering; manufacturers' literature; precedents for similar situations; applicable Federal, state, and tribal resource laws and regulations; and applicable construction management regulations/guidelines such as the FAR, applicable Code of Federal Regulations (CFR), National Society of Professional Engineers, Code of Ethics for Engineers, and Construction Specifications Institute (CSI). Such guidelines are often insufficient, inapplicable to the engineering projects or assignments, or have significant gaps in specificity thus requiring considerable interpretation and adaptation for the unique and novel issues and problems encountered. The incumbent uses experienced judgement, initiative, and resourcefulness in applying and adapting advanced mechanical engineering practices and departing from established practices and precedents as required to solve unique and novel problems for which precedents are not directly applicable due to complexity and scope of the engineering assignments. Furthermore, the incumbent must develop project job plans, guidelines, protocols, and procedures that are specific to the project and leads or participates on teams that propose or drafts new policies, standards, and practices for Reclamation, Department, or industry.

Factor 4. Complexity (Level 4-4 225 pts)

Engineering projects and activities involve the following complicating factors: design data is not readily available or there is a large amount of data to work through when determining the most relevant data to work with for the specific project; the need to develop representative and accurate cost estimates when mechanical engineering data and scope may not be well defined or mature; diversity of the design and review activities - the nature of the engineering assignment can vary significantly; integrating many systems into one project; high profile projects and projects that involve operational losses; balancing creativity and engineering judgment to best address the needs of the activity and stakeholders; the need to stay informed regarding the latest technology and/or methodologies and how it can be incorporated into specific engineering solutions; aging infrastructure and dealing with existing footprints often require unique and well formulated engineering solutions and designs that incorporate existing conditions; incorporating accessibility, cultural resource or environmental considerations; addressing unanticipated problems due to unusual local conditions and combinations of unusual features; managing changes to the project scope, budget, and schedules. The incumbent must ensure application of sound engineering judgment and principles while addressing these complexities without compromising the engineering integrity of existing features and associated systems. The incumbent must recognize the complex relationships of the systems involved and exercise judgment, resourcefulness, and originality to ensure the design or engineering solutions and recommendations can be integrated into the existing systems. Some assignments may involve interpretation of engineering aspects of Federal and state laws, regulations, or policy for engineering support in compliance assignments. Additional complexities include collaborating with multiple stakeholders with competing interests, goals, and objectives; coordinating projects for/with Federal, state, tribal governments, and/or local entities with overlapping roles and authorities; and balancing complex multi-purpose approaches necessitating significant stakeholder involvement and modification and refinement of existing applications, processes, precedents, and techniques

Factor 5. Scope and Effect (Level 5-4 225 pts)

This position serves as an experienced engineer providing mechanical engineering mentorship and expertise for a variety of complex projects and activities throughout the office which typically include a variety of geographic locations, complex features, and unusual needs or special demands. Assignments include assessing project and program effectiveness; investigating, evaluating, advising on, and resolving unusual problems, issues, and conditions; developing criteria, procedures, or instructions. Mechanical engineering projects and activities have significant effect upon the operations of Reclamation projects, as well as Reclamation's ability to meet its program goals. Engineering activities impact the overall operational efficiency and effectiveness of the facilities in delivering power to the Bulk Electric System and water to the stakeholders. Mechanical engineering assignments impact the efficiency, feasibility, integrity, accuracy, adequacy, and safety of a wide range of Reclamation activities, or the activities of organizations within a regional or equivalent geographic area. Engineering assignments impact the life, health, and property of the general public and impacts the Department's and Reclamation's credibility with internal and external customers.

Factors 6. & 7. Personal Contacts and Purpose of Contacts (Level 6-3 and 7C 180 pts)

Personal contacts include counterparts and employees within the immediate Office and other offices throughout Reclamation, as well as other Federal agencies. Contacts also include representatives from other local, state, tribal governments, water districts and commissions and from industry such as architecture and engineering firms, transmission owners, manufacturers' representatives, and contractors. Contacts may also include peers from colleges and universities and professional organizations, as well as public stakeholders. Contacts are for the purpose of obtaining, clarifying, and exchanging information and data as part of engineering activities, as well as exchanging professional expertise and experience; planning, coordinating, and advising on work efforts; and leading, guiding, and/or participating on teams. Requires collaboration skill and skill in dealing with individuals with differing views.

Factors 8. Physical Demands (Level 8-1 5 pts or Level 8-2 20 pts)

- (Level 8-1) The work is typically performed in an office setting with no special physical demands. However, work may also be performed in the field which involves periods of moving about worksites, bending, climbing, or driving motor vehicles to worksites.
- (Level 8-2) The work regularly combines both office and field assignments. Field work requires physical exertion, such as long periods of standing, or recurring and considerable walking, stooping, bending, crouching, crawling, and climbing such as in regular and periodic construction activities and field inspections. Work may also include frequent lifting of moderately heavy items weighing less than 50 pounds. Field assignments may involve driving motor vehicles to work sites in remote locations requiring overnight stays.

Factor 9. Work Environment (Level 9-1 5 pts or Level 9-2 20 pts)

- (Level 9-1) The work is usually performed in an office setting. However, work time may also be spent periodically visiting field sites. Field site visits are typically performed in either an outdoor setting subject to weather changes, diverse terrain, and safety hazards associated with working around complex features and/or construction, or an industrial setting subject to noise, fumes, and moving machinery. Both settings may require the use of personal protective equipment. The work may also involve some overnight travel for training, meetings, and site visits. Safety precautions and protocols are observed at all times and the incumbent complies with safety instructions and regulations and ensures individual and others' safety by promptly reporting unsafe acts, unsafe conditions, and accidents to the supervisor.
- (Level 9-2) The work involves regular and recurring exposure to moderate risks, discomforts, and unpleasantness such as: high noise levels, infectious materials, or toxic or irritating chemicals; travel in safety approved small aircraft and watercraft; high winds and low or high temperatures; infestation of dangerous reptiles or poisonous plants, snakes, or insects; adverse weather conditions; noxious fumes; flammable liquids; or radiation. The work involves performing tasks in close proximity to rotating heavy mechanical and electrical machinery and may involve working within

confined spaces for extensive periods of time. Special safety precautions such as protective clothing and gear are necessary. Safety precautions and protocols are observed at all times and the incumbent complies with safety instructions and regulations and ensures individual and others' safety by promptly reporting unsafe acts, unsafe conditions, and accidents to the supervisor.

Total Points and Grade Conversion

Total Points = 2790 (low) 2820 (high)
Point Range = 2755-3150
Grade = GS-12

Other Significant Facts

Functional Classification (FC): Completed by servicing human resources office and annotated on PD Cover Page.

Registration: Registration as a Professional Engineer may be required as articulated by specific Reclamation policy and practices and as annotated on the PD Cover Page.

Certification: Certification and/or training to serve as a Federal Acquisition Certification (FAC) COR or GOTR may be required as articulated in Department and/or Reclamation policies. Federal Acquisition Certification for Program and Project Manager (FAC-P/PM) may be required as articulated in Department and/or Reclamation policies.
Other certifications may be required as a condition of employment, as articulated by Department and/or Reclamation policies and practices, and as annotated on the PD Cover Page.