STATE OF MONTANA
JOB DESCRIPTION

Montana state government is an equal opportunity employer. The State shall, upon request, provide reasonable accommodations to otherwise qualified individuals with disabilities.

Job Title: Civil Engineering Specialist Position Number: 50042, 50050, 50014, 50016, 50004, 80052, 50046

Location: Helena

Department: Transportation

Division and Bureau: Highways and Engineering/Bridge Bureau

Section and Unit: Bridge Design

Job Overview:

This position is a professional level structural design engineer. The Engineer is assigned final design work, design review work, and final bridge plan checking on a project level basis and is responsible for all work with minimal guidance and direction from the Bridge Area Engineer. The Engineer also is assigned preliminary design work. The preliminary design work may be done in conjunction with the Bridge Area Engineer or be assigned in terms of the general results expected. Since bridge design work affects the safety of the public, State law requires that the design work be done with a licensed professional engineer in responsible charge of the work. The Engineer in this position has gained the necessary judgment, skills and abilities through education and experience to be in responsible charge of the engineering work. The Engineer is fully competent in all conventional aspects of bridge design and has developed a minimum working knowledge of seismic analysis and design, and requirements of preliminary design. The Bridge Bureau requires the person in this position to be a licensed professional engineer. The professional license requirement is a part of the Bureau's effort to comply with State law and uphold the ethics of the profession.

Essential Functions (Major Duties or Responsibilities):

Final Design 55%

Perform final design for bridge projects, assist plan detailing, write specifications, and help prepare the Engineer's Estimate. This duty requires a thorough knowledge of structural design codes and MDT policies. This knowledge must include not just the content of the codes but the fundamental structural behaviors or construction limitations behind the code provisions or policies so that when conflicts or ambiguity arises, the Structural Engineer has the ability to apply professional judgment in a reasonable and safe manner to resolve the issue. This duty also requires a basic knowledge of dynamic bridge modeling and dynamic structural analysis in order to perform the earthquake analysis and design. The structural dynamic model is a mathematical computer model of the structure. It is comprised of up to several thousand simultaneous equations in an Eigen value, Eigen vector problem. The structural engineer must have a basic understanding of the significance of the various parts of the model and how they relate to the entire system so that the engineer can make judgments and seek guidance about the adequacy and accuracy of various modeling techniques. It requires a basic understanding of structural response as a system, load paths, and structural stiffness. Considerable knowledge of quality structural details and the effect of details on structural ductility. Must have some knowledge of soil-structure interaction. Must have a working knowledge of failure mechanisms, bridge ductility and brittle failure, and the concepts of over strength and safety factors. Must have a basic understanding of the effects of structural damping and how changes in the design effect damping and seismic response. This duty also requires a thorough knowledge of highway geometrics and bridge construction techniques. This knowledge is needed so that complex roadway geometrics (for example, spiraled curves with superelevation transitions) can be mathematically included in the bridge design and sufficient and logical details shown on the plans so that the bridge can be constructed easily. Due to the nature of structural design, the judgments made are not a matter of correct or incorrect but more a matter of reasonableness and require a high level of knowledge of structural behavior and design codes. The Structural Engineer must have the ability to reasonably verify complex computer analysis based on simplified hand calculations, knowledge of structural behavior, and professional judgment.

Preliminary Design 15%

Perform preliminary bridge design to determine the scope of work including the size, type and location of the bridge. Preliminary design is a highly interactive process that requires frequent contact with other designers (Road Design, Hydraulics, Geotech, etc.), environmental specialists, the district, and local public input. The Structural Engineer must develop and use a working knowledge of other fields in order to work with these areas in the preliminary design phase. The process is a balancing act of competing concerns and cost factors. For example, Bridge may want to locate a substructure unit at a particular spot for sound structural design reasons, but Environmental may feel that location is unacceptable. A balance must be arrived at that addresses the needs of both in a win-win solution through understanding of the needs and concerns of the environmental specialist. This duty requires a thorough knowledge of bridge structural design and common MDT bridge design types and limitations and MDT bridge design policy. It requires the ability to evaluate the site specific conditions that affect the project by combining knowledge of structural mechanics, geologic

processes, scour and river mechanics, and environmental concerns with and public input and desires. The ability to listen effectively in order to understand the concerns of other specialties and the ability to reasonably explain structural concerns to others that have no structural background are needed in order to achieve win-win agreements.

Check Final Bridge Plans 15%

Check final bridge plans prior to transmittal to Contract Plans for contract preparation and bidding. Perform the final plan checks, coordinate plans with other areas such as Road Design and Environmental, and prepare the special provisions for the contract and the engineer's estimate. The Structural Engineer must have the ability to review structural plans, spot potential engineering problems (typical errors are caused by omission in the design work or design conceptual errors that result in weaknesses in the bridge that must be corrected), and resolve those issues either through simplified design checks or consultation with the design engineer. This work requires a level of professional judgment and expertise that can only be gained through experience. Checking requires flexibility and maturity in engineering judgment in order to evaluate the significance of problems and appropriate solutions.

Review Designs of Others 15%

Review designs done by others for accuracy and completeness. Discuss perceived problems with the others involved and resolve concerns. Structural design is a complex process where modeling and design procedures are selected by the engineer to fit the particular situation. However, many different procedures may be used to fit the situation if used consistently and reasonably. This review requires flexibility and maturity in engineering judgment in order to understand differing design techniques and to reasonably make judgments based on the relative strengths of the different methods.

Supervision

If this incumbent supervises others, please list each employee supervised and the position number:

The number of employees supervised is: 0

The position number for each supervised employee is: n/a

Physical and Environmental Demands:

PHYSICAL

- Routine engineering work in an office environment.
- Occasional travel to review Bridge projects both during design and construction
- Navigate uneven terrain around bridge project sites.

MENTAL

- Perform Engineering work using sound reasoning and judgment.
- Meet project timelines
- Quickly assess critical structural issues and interrelations.
- Manage and balance priorities.
- Foster teamwork.
- Mentoring.
- Working in or leading diverse teams.

Knowledge, Skills and Abilities (Behaviors):

KNOWLEDGE:

This position requires a thorough knowledge of the theory, principles, methods and techniques of Civil Engineering and the associated mathematics and physical sciences, especially the methods and practices of bridge structural design. This position must be familiar with AASHTO Design Specifications and standards, Bridge design standards and policies, industry guidelines and practices, and bridge and road construction methods.

SKILLS:

The employee must have demonstrated skills at performing engineering analyses; and applying engineering concepts, techniques and procedures to a variety of situations and circumstances. The incumbent must be skilled at evaluating structural calculations and contract documents for clarity, accuracy, completeness and constructability; and identifying construction and design conflicts. This position requires skill at applying engineering judgment when interpreting design guidelines and standards. Skilled at preparing calculations, reports, and other documentation necessary to complete a design project. This position requires skill in the use of office engineering instruments including computers and hand held calculators. Effective written and verbal communication skills are also necessary for preparing plans and sharing information with designers, engineers, non-technical personnel, and the public.

Minimum Qualifications (Education and Experience):

List the required education and experience required for the first day of work, including alternative methods of acquiring minimum qualifications

The required knowledge and skills are typically acquired through a combination of education and experience equivalent to Bachelor's Degree in Engineering from an ABET accredited Engineering program that includes civil structural engineering courses in structural analysis, steel design, and reinforced concrete design, or a related field.

This position requires a minimum of 4 years of experience in structural analysis, steel design, and reinforced concrete design.

Certifications, licensure, or other credentials include: Registration as a Professional Engineer (PE) in Montana. Individuals with a valid PE registration in another State that is eligible to obtain Montana PE registration through Comity within 6 months of hire will also be considered.

Alternative qualifications include: Graduate degrees with concentrations in structural analysis and design will be evaluated on a case by case basis.

Special Requirements:

List any other special required information for this position

☐	Fingerprint check	☐	Valid driver's license
☐	Background check	☐	Other; Describe
	Union Code		Safety Responsibilities

The specific statements shown in each section of this description are not intended to be all inclusive. They represent typical elements and criteria considered necessary to perform the job successfully.

Signatures

My signature below indicates the statements in the job description are accurate and complete.

Immediate Supervisor	**Title**	**Date**

Administrative Review	**Title**	**Date**

My signature below indicates that I have read this job description.

Employee	**Title**	**Date**

Human Resources Review

Job Code Title: Professional Engineer 1 **Job Code Number: D25021** **Level: 1**

My signature below indicates that Human Resources has reviewed this job description for completeness and has made the following determinations:

☐ FLSA Exempt ☒ FLSA Non-Exempt

☐ Telework Available ☒ Telework Not Available

☒ Classification Complete ☐ Organizational Chart attached

Human Resources:

Renae Lang	Workforce Planning Manager	10/26/2018
Signature	**Title**	**Date**