STATEMENT OF WORK

Fire, Design, Project, and Senior Cognizant Systems Engineers and Technicians

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Carlsbad, New Mexico

for

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Waste Isolation Pilot Plant

Nuclear Waste Partnership LLC

An AECOM-led partnership with BWXT and AREVA

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1.0 INTRODUCTION AND BACKGROUND

NWP is seeking the professional services of experienced facility system engineers (Electrical, Mechanical, Structural, Nuclear, Fire Protection, I&C, and etc.) to assist in the development and implementation of the Cognizant System Engineer (CSE) program as required by DOE Order 420.1C, Facility Safety. The activities under this scope of work will include both the performance of the CSE duties, and the coaching/mentoring of CSEs.

NWP is seeking staff augmentation professional and technical services of experienced design and project engineers to assist in the execution of design and project engineering functions in support of the WIPP mission. Engineers will execute engineering responsibility for conduct of one or more projects applying standard problem-solving techniques and engineering principles, concepts, theories, and methods over Plant Systems. Disciplines needed include Mechanical, Electrical, Structural, and Instrumentation & Controls, Instrument & Controls computer hardware/software, Mechanical Mining Equipment, Civil, Nuclear, Project Engineers, Senior Project Engineer, and Fire Protection Engineers and Technicians and potentially a small number combined from among materials engineer, welding engineer, procurement engineer, quality engineer, procedure writers, nuclear engineer, nuclear safety analyses engineer, chemical engineer, as well as one or two multi-disciplined (proficient in a range of engineering disciplines and in addition are leaders broadly experienced in Operations, Engineering, and Maintenance) principle, senior principle, consulting, or senior consulting engineers from among the previously listed engineering discipline areas.

2.0 DESCRIPTION OF WORK

2.1.1 The Subcontractor shall provide staff augmentation personnel to perform as design, project, and senior cognizant system engineers through on-going operations.

2.1.2 Subcontractor personnel shall execute engineering responsibilities for their respective discipline/project area of responsibility to deliver engineering products to support project definition, specification, design, construction/installation, and commissioning.

2.1.3 Subcontract personnel shall apply standard problem-solving techniques and engineering principles, concepts, theories, and methods over plant systems and equipment. Subcontract personnel shall prepare calculations and installation drawings and documents as needed in accordance with WIPP Conduct of Engineering procedures.

2.1.4 The Subcontractor shall develop engineering evaluations, determinations and technical positions. Subcontractor personnel shall support the daily execution of activities during project delivery, and may provide some off schedule (back shift, weekend) project design coverage during times of critical evolutions.

3.0 APPLICABLE DOCUMENTS

3.1 Applicable Codes, Specifications, and Standards

3.1.1 At the time of performance, the current revision or edition of codes, specifications, and standards will be utilized, unless otherwise specified. Time of performance is defined as the NWP Purchase Order (PO) or applicable Release Order date.

ASME NQA-1-1989	QA Requirements for Nuclear Facility Applications
Title 10 CFR 830	Quality Assurance Requirements
DOE Order 420.1C	Facility Safety
NFPA Codes	National Fire Protection Codes
DOE/WIPP 07-3372, REV. 5b	Waste Isolation Pilot Plant Documented Safety Analysis

3.2 Applicable Site Procedures and Documents

The following WIPP procedures and documents are applicable.

WIPP Site procedures	Subcontractor will adhere to all applicable WIPP Site procedures
	WIPP Recovery Project Performance Measurement Baseline
NWP Independent SMP Review Evaluation Number: SMP-14-002	One and Two Engineering Programs and Design Control Process Review, Phase, June 2014
	Nuclear Waste Partnership, Engineering Performance Improvement Plan, May 30, 2014
WP 09	Conduct of Engineering
WP 09-10	*WIPP Preparation Guide for System Design Description Documents*
WP 09-11	*WIPP NWP Configuration Management Plan*

WP 09-CN3025	*Annual System Health/Walkdown/Requalification*
WP 09-CN3031	*Engineering Calculations*
WP 02-EC.12	Site Users and Tenants Guides
WP 12-IS.01-6	ISP – Visitor, Vendor, User, Tenant, and Subcontractor Safety Controls
WP 12-FP.01	WIPP Fire Protection Program
WP 13-1	Quality Assurance Program Description
WP 15-PC3041	Approval/Variation Request Processing
EA09DC01-1-0	Request for Information Form
EA15PC3041-2-0	Approval/Variation Request Form
	Design Drawings
	System Health Report

4.0 TECHNICAL TASKS

4.1 General Requirements

4.1.1 Tasks to be performed by the Subcontractor include, but are not limited to preparation of design, installation, construction, and maintenance documents within an established configuration management program.

4.1.2 For assigned systems, the Subcontractor shall ensure that an established configuration management program is in place to address:

A. System design documentation

B. System assessments

C. Control of maintenance

D. Change control

E. Obsolescence

4.1.3 For assigned systems, the Subcontractor shall ensure that design documentation includes:

A. System requirements and performance criteria essential to performance of the system's safety functions,

B. The basis for system requirements,

C. A description of how the current system configuration satisfies the requirements and performance criteria.

4.1.4 For assigned systems, the Subcontractor shall conduct system assessments to include periodic reviews of system operability, reliability, and material condition, assess the system for:

A. The ability to perform design and safety functions
B. Physical configuration as compared to system documentation,
C. System and component performance in comparison to established performance criteria.

4.1.5 Qualification of augmented personnel: The subcontractor of augmented personnel warrants to NWP that the augmented personnel provided to NWP under the various labor categories listed below were interviewed and qualified by the subcontractor to meet or exceed the requirements of Section 4.0.

4.1.6 The Subcontractor shall obtain and use secondary developed references for all offered candidates and provide NWP the references. NWP will also spot check references and expect that the references' responses will be indicative of qualified candidates.

4.1.7 Staff Augmentation Personnel Categories:

In the event that the Subcontractor substitutes augmented personnel currently providing augmented service to NWP for another augmented individual, the Subcontractor will ensure that the substitute personnel is of equal qualifications or higher and, if feasible, overlap the substitute personnel in order to ensure a smooth transition of job duties. All Design and Project Engineers will spend a disproportionate percentage of their time upgrading, modifying, refurbishing, and replacing current systems and the associated design processes and in support of project processes that must be implemented in order to achieve those outcomes on cost and on schedule.

4.2 **Special Requirements**

4.2.1 The Subcontractor's provided personnel shall have the following qualifications:

A. DOE experience preferred.
B. Sound communication skills to effectively interface with internal and external customers.
C. Able to work well in the field and take ownership of assigned system equipment mechanical and electrical control systems.
D. Able to work with groups to provide overlapping support to other engineers while possibly working on several assigned tasks.
E. Able to clearly communicate technical information to non-technical personnel both verbally as well as in writing.
F. Able to expand skill set beyond own discipline to include understanding of control systems, interfaces with other electrical, mechanical, and structural systems.

4.3 **Fire Protection Engineer**

4.3.1 General: Greater than 10 years of Department of Energy Fire Protection Program experience is required. National Institute for Certification in Engineering Technologies certification is a plus.

4.3.2 Education requirements: Bachelor of Engineering or Bachelor of Science in fire science engineering or fire protection technologies. A Bachelor's degree in related field with an emphasis in specialty areas is preferred. Specialty areas include:

A. Fire Suppression Systems (suppression, detection and water supply)
B. Evaluation of existing fire protection program elements
C. Evaluation of Staff qualification and training for adequacy and recommendations,
D. Troubleshooting existing impairments,
E. System tests and walkdown/inspections,
F. Development of Fire Protection Engineer/Cognizant System Engineer training/qualification processes
G. Evaluation and improvement of current facility and system conditions

Knowledge shall include an understanding of engineering principles, theories, and concepts and microcomputer applications; ability to deliver oral presentations to convey technical findings and recommendations; ability to write clear, concise, and organized memos and reports.

4.3.3 Duties may include: provide continuity in experienced expertise personnel to provide guidance and oversight to the current Fire Protection Engineering and support staff, assisting in troubleshooting existing impairments, system tests and walkdown/inspections, development of Fire Protection Engineer/Cognizant System Engineer training/qualification processes and evaluation and improvement of current facility and system conditions. Technician scope may include evaluation of the existing fire protection program elements and implementing procedures including fire protection systems (suppression, detection and water supply), and staff qualification and training for adequacy and recommendations. Evaluation of current test, inspection and maintenance practices including compliance with NFPA codes, DOE requirements and any addition regulatory requirements and development of new or revise procedures, and development of model work orders and practices to expedite repairs and enhance system operability/availability. Scope will also include assisting in troubleshooting existing impairments, system tests and walk down/inspections.

4.4 **Fire Protection Technician Qualifications**

4.4.1 General: Greater than 10 years of Department of Energy Fire Protection Program experience and a National Institute for Certification in Engineering Technologies is required.

4.4.2 Education requirements: Fire Protection Technology Certificate is required. A Bachelor's degree in related field with an emphasis in specialty areas is preferred. Specialty areas include:

A. Fire Suppression Systems (suppression, detection and water supply)

B. Evaluation of existing fire protection program elements

C. Evaluation of Staff qualification and training for adequacy and recommendations,

D. Assist with troubleshooting existing impairments,

E. System tests and walkdown/inspections,

F. Evaluation and improvement of current facility and system conditions

4.4.3 Knowledge shall include an understanding of fire protection principles, , and concepts and microcomputer applications; ability to deliver oral presentations to convey technical findings and recommendations; ability to write clear, concise, and organized memos and reports.

4.4.4 Duties may include: provide continuity in experienced expertise personnel to provide guidance and oversight to the current Fire Protection Engineering and support staff, assisting in troubleshooting existing impairments, system tests and walkdown/inspections, development of Fire Protection Engineer/Cognizant System Engineer training/qualification processes and evaluation and improvement of current facility and system conditions. Technician scope may include evaluation of the existing fire protection program elements and implementing procedures including fire protection systems (suppression, detection and water supply), and staff qualification and training for adequacy and recommendations. Evaluation of current test, inspection and maintenance practices including compliance with NFPA codes, DOE requirements and any addition regulatory requirements and development of new or revise procedures, and development of model work orders and practices to expedite repairs and enhance system operability/availability. Scope will also include assisting in troubleshooting existing impairments, system tests and walk down/inspections.

4.5 **Mechanical Engineer Qualifications**

4.5.1 General: 10 years of mechanical engineering experience in design, systems, or programs engineering. Personnel with 6-9 years' experience will also be considered if individual has basic engineering skills and education and engineering application experience. PE license preferred. All systems shall be engineered with functional and operational features to protect worker and public health and safety and protect the environment.

4.5.2 Education requirements: Bachelor of Engineering, Bachelor of Science in Engineering (Mechanical) or Bachelor of Science in related discipline with work experience in mechanical engineering. A Bachelor's degree in related field with an emphasis in specialty areas is preferred. Specialty areas include:

A. Domestic Water Systems
B. HVAC systems for buildings
C. Underground Mine Ventilation Systems
D. Underground Mine Mechanical Equipment and Bulkheads
E. Substantial equipment replacements and refurbishments
F. Roads
G. Plumbing Systems
H. Building structural and Architectural work
I. Roofing
J. Building replacement and refurbishment
K. High pressure air systems
L. Air Operated controllers for large components
M. Temperature, pressure, flow, and other process parameter measurement and control systems
N. Materials engineering
O. Welding engineering
P. Chemical engineering
Q. Filed engineering
R. Nuclear engineering
S. Nuclear safety analyses engineering
T. Coatings engineering

4.5.3 Knowledge shall include an understanding of engineering principles, theories, and concepts and microcomputer applications; ability to deliver oral presentations to convey technical findings and recommendations; ability to write clear, concise, and organized memos and reports.

4.5.4 Duties may include: assume responsibility for completion of detail phases of assigned projects under direction of project/and cognizant engineering; provide detailed solutions to assigned engineering problems; make engineering and design calculations applying basic engineering principles, theories and concepts; prepare technical reports and other technical documents such as procedures and operation and maintenance manuals; prepare cost estimates related to assigned technical projects; prepare

engineered work packages under supervision for construction or modification of equipment and facilities; analyze specific equipment or system failures of limited scope and recommend repairs, modifications, or appropriate corrective actions through application of basic engineering principles; provide general functional requirements to perform basic design of new equipment/systems or modification of existing equipment/systems; provide engineering support to other groups; make technical presentations.

4.6 **Design Engineers Qualifications**

4.6.1 Electrical Engineer

4.6.1.1 General: 10 years of experience in design, systems, or programs engineering related to their discipline. Personnel with 6-9 years' experience will also be considered if individual has basic engineering skills and education and engineering application experience. Professional Engineers (PE) license preferred. Specialty areas include

A. Electrical Distribution (13KV, 4 KV, 480 V)

B. Electrical transformers (13KV, 4 KV, 480V)

C. Rotating Equipment (Fans, Conveyors, self-propelled equipment, pumps, etc.)

D. Motor control centers

E. Controls systems and schemes (PLC, and other)

F. Communication systems (IC, announcing, alarming, etc.)

G. Substantial equipment replacements and refurbishments

4.6.1.2 Education requirements: Bachelor of Engineering or Bachelor of Science in Engineering (Electrical) or Bachelor of Science in related engineering discipline with work experience in Electrical engineering. A Bachelor's degree in related field with an emphasis in specialty areas is preferred.

4.6.1.3 Duties may include: assume responsibility for completion of detail phases of assigned projects under direction of project/and cognizant engineering; provide detailed solutions to assigned engineering problems; make engineering and design calculations applying basic engineering principles, theories and concepts; prepare technical reports and other technical documents such as procedures and operation and maintenance manuals; prepare cost estimates related to assigned technical projects; prepare engineered work packages under supervision for construction or modification of equipment and facilities; analyze specific equipment or system failures of limited scope and recommend repairs, modifications, or appropriate corrective actions through application of basic engineering principles; provide general functional requirements to perform basic design of new equipment/systems or modification of existing

equipment/systems; provide engineering support to other groups; make technical presentations.

4.6.1.4 Knowledge shall include an understanding of engineering principles, theories, and concepts and microcomputer applications; ability to deliver oral presentations to convey technical findings and recommendations; ability to write clear, concise, and organized memos and reports.

4.6.2 **Instrumentation & Controls (I&C) Engineer**

4.6.2.1 General: 10 years of experience in design, systems, or programs engineering related to their discipline. Personnel with 6-9 years' experience will also be considered if individual has basic engineering skills and education and engineering application experience. PE license preferred. Specialty areas include:

1) Process Computer
2) Process Controls
3) Data Acquisition
4) Nuclear instrumentation
5) Control Room Displays
6) Control room distributed controls systems
7) Instrumentation Calibrations and refurbishments
8) Substantial equipment replacements and refurbishments

4.6.2.2 Education requirements: Bachelor of Engineering (Instrumentation, Control and Automation) or Bachelor science degree in engineering or a related engineering discipline with work experience in I&C. A Bachelor's degree in related field with an emphasis in specialty areas is preferred.

4.6.2.3 Duties may include: assume responsibility for completion of detail phases of assigned projects under direction of project/and cognizant engineering; provide detailed solutions to assigned engineering problems; make engineering and design calculations applying basic engineering principles, theories and concepts; prepare technical reports and other technical documents such as procedures and operation and maintenance manuals; prepare cost estimates related to assigned technical projects; prepare engineered work packages under supervision for construction or modification of equipment and facilities; analyze specific equipment or system failures of limited scope and recommend repairs, modifications, or appropriate corrective actions through application of basic engineering principles; provide general functional requirements to perform basic design of new equipment/systems or modification of existing equipment/systems; provide engineering support to other groups; make technical presentations.

4.6.2.4 Knowledge shall include an understanding of engineering principles, theories, and concepts and microcomputer applications; ability to deliver oral presentations to convey technical findings and recommendations; ability to write clear, concise, and organized memos and reports.

4.6.3 **Instrument & Controls Computer Hardware/Software Engineer**

4.6.3.1 General: 10 years of experience in design, systems, or programs engineering related to their discipline. Personnel with 6-9 years' experience will also be considered if individual has basic engineering skills and education and engineering application experience. PE license preferred. Specialty areas include:

1) Process Computer
2) Process Controls
3) Data Acquisition
4) Nuclear instrumentation
5) Control Room Displays
6) Control room distributed controls systems
7) Instrumentation Calibrations and refurbishments
8) Substantial equipment replacements and refurbishments

4.6.3.2 Education requirements: Bachelor of Engineering (Instrumentation, Control and Automation) or Bachelor science degree in engineering or related engineering discipline with work experience in I&C hardware and software engineering. A Bachelor's degree in related field with an emphasis in specialty areas is preferred.

4.6.3.3 Duties may include: assume responsibility for completion of detail phases of assigned projects under direction of project/and cognizant engineering; provide detailed solutions to assigned engineering problems; make engineering and design calculations applying basic engineering principles, theories and concepts; prepare technical reports and other technical documents such as procedures and operation and maintenance manuals; prepare cost estimates related to assigned technical projects; prepare engineered work packages under supervision for construction or modification of equipment and facilities; analyze specific equipment or system failures of limited scope and recommend repairs, modifications, or appropriate corrective actions through application of basic engineering principles; provide general functional requirements to perform basic design of new equipment/systems or modification of existing equipment/systems; provide engineering support to other groups; make technical presentations.

4.6.3.4 Knowledge shall include an understanding of engineering principles, theories, and concepts and microcomputer applications; ability to deliver oral

presentations to convey technical findings and recommendations; ability to write clear, concise, and organized memos and reports.

4.6.4 **Mechanical Mining Equipment Engineer**

4.6.4.1 General: 10 years of experience in design, systems, or programs engineering related to their discipline. Personnel with 6-9 years' experience will also be considered if individual has basic engineering skills and education and engineering application experience. PE license preferred. Specialty areas include:

4.6.4.2 Education requirements: Bachelor of Mechanical and Mining Engineering or Bachelor of Science in Engineering, or in a related engineering discipline with work experience in mechanical mining engineering. A Bachelor's degree in related field with an emphasis in specialty areas is preferred.

4.6.4.3 Duties may include: assume responsibility for completion of detail phases of assigned projects under direction of project/and cognizant engineering; provide detailed solutions to assigned engineering problems; make engineering and design calculations applying basic engineering principles, theories and concepts; prepare technical reports and other technical documents such as procedures and operation and maintenance manuals; prepare cost estimates related to assigned technical projects; prepare engineered work packages under supervision for construction or modification of equipment and facilities; analyze specific equipment or system failures of limited scope and recommend repairs, modifications, or appropriate corrective actions through application of basic engineering principles; provide general functional requirements to perform basic design of new equipment/systems or modification of existing equipment/systems; provide engineering support to other groups; make technical presentations.

4.6.4.4 Knowledge shall include an understanding of engineering principles, theories, and concepts and microcomputer applications; ability to deliver oral presentations to convey technical findings and recommendations; ability to write clear, concise, and organized memos and reports.

4.6.5 **Civil Engineer**

4.6.5.1 General: 10 years of experience in design, systems, or programs engineering related to their discipline. Personnel with 6-9 years' experience will also be considered if individual has basic engineering skills and education and engineering application experience. PE license preferred.

4.6.5.2 Education requirements: Bachelor of Engineering or Bachelor of Science in Engineering (Civil) or Bachelor of Science in related engineering discipline with work experience in civil engineering. A Bachelor's degree in related field with an emphasis in specialty areas is preferred.

4.6.5.3 Duties may include: assume responsibility for completion of detail phases of assigned projects under direction of project/and cognizant engineering; provide detailed solutions to assigned engineering problems; make engineering and design calculations applying basic engineering principles, theories and concepts; prepare technical reports and other technical documents such as procedures and operation and maintenance manuals; prepare cost estimates related to assigned technical projects; prepare engineered work packages under supervision for construction or modification of equipment and facilities; analyze specific equipment or system failures of limited scope and recommend repairs, modifications, or appropriate corrective actions through application of basic engineering principles; provide general functional requirements to perform basic design of new equipment/systems or modification of existing equipment/systems; provide engineering support to other groups; make technical presentations.

4.6.5.4 Knowledge shall include an understanding of engineering principles, theories, and concepts and microcomputer applications; ability to deliver oral presentations to convey technical findings and recommendations; ability to write clear, concise, and organized memos and reports.

4.6.6 **Nuclear Engineer**

4.6.6.1 General: 10 years of experience in design, systems, or programs engineering related to their discipline. Personnel with 6-9 years' experience will also be considered if individual has basic engineering skills and education and engineering application experience: PE license preferred.

4.6.6.2 Education requirements: Bachelor of Engineering or Bachelor of Science in Engineering (Nuclear) or Bachelor of Science in related engineering discipline with work experience in nuclear engineering. A Bachelor's degree in related field with an emphasis in specialty areas is preferred.

4.6.6.3 Duties may include: assume responsibility for completion of detail phases of assigned projects under direction of project/and cognizant engineering; provide detailed solutions to assigned engineering problems; make engineering and design calculations applying basic engineering principles, theories and concepts; prepare technical reports and other technical documents such as procedures and operation and maintenance manuals; prepare cost estimates related to assigned technical projects; prepare engineered work packages under supervision for construction or modification of equipment and facilities; analyze specific equipment or system failures of limited scope and recommend repairs, modifications, or appropriate corrective actions through application of basic engineering principles; provide general functional requirements to perform basic design of new equipment/systems or modification of existing equipment/systems; provide engineering support to other groups; make technical presentations.

4.6.6.4 Knowledge shall include an understanding of engineering principles, theories, and concepts and microcomputer applications; ability to deliver oral presentations to convey technical findings and recommendations; ability to write clear, concise, and organized memos and reports.

4.7 **Project Engineer Qualifications**

4.7.1 In addition to the respective design, systems, or programs engineering discipline qualifications stated above, a Project Engineer shall possess the following qualifications:

1) 10 or more years professional experience including Construction Engineering, Project Engineering, and Project Management in the Nuclear Industry
2) Engineering experience at both construction projects and operating nuclear facilities
3) Project Engineering experience with both mid to small size projects
4) Knowledge and experience with delivery of engineering basis documents and detailed engineering specifications and drawings, including the full range of documents for equipment procurements.
5) Demonstrated experience leading and managing a large engineering workforce, including matrixed resources or Architect Engineering firms.

4.7.2 General duties for a project engineer include:

1) Promote a nuclear safety culture; personally exhibits safe behaviors; understands safety requirements and ensures their incorporation into project plans
2) Develop project scope
3) Perform project planning
4) Prepare cost estimates
5) Develop schedule
6) Assist Project Engineering Manager or Senior Project Engineer with maintaining project schedule by monitoring schedule progress, coordinating engineering activities to support the schedule, identifying issues to management and recommending actions; actively participates in problem solving
7) Assist the Project Engineering Manager in controlling project costs by identifying any potential changes to scope, schedule, or cost; evaluates changes and recommends actions to mitigate impacts; reviews proposed

changes for adherence to project plan requirements; and, seeks management's approval before implementing changes

8) Assist the Project Engineering Manager with maintaining a high level of quality by adherence to procedures
9) Confirm project deliverables meet requirements through design review, testing and inspection
10) Maintain project records and data
11) Represent project team at meetings and in interfacing with other organizations

4.8 Senior Project Engineer Qualifications

4.8.1 In addition to the respective engineering discipline stated above, the Senior Project Engineer shall possess the following qualifications:

1) 20 or more year's professional experience including Construction Engineering, Project Engineering, and Project Management in the Nuclear Industry
2) Engineering experience at both construction projects and operating nuclear facilities
3) Project Engineering experience with both large and smaller projects
4) Knowledge and experience with delivery of engineering basis documents and detailed engineering specifications and drawings, including the full range of documents for equipment procurements.
5) Demonstrated experience leading and managing a large engineering workforce, including matrixed resources or Architect Engineering firms.

4.8.2 General duties for a Senior Project Engineer may include:

1) Promote a nuclear safety culture; personally exhibits safe behaviors; understands safety requirements and ensures their incorporation into project plans
2) Develop project scope
3) Perform project planning
4) Prepare cost estimates
5) Develop schedules related to projects assigned
6) Assist Project Engineering Manager with maintaining project schedule by monitoring schedule progresses, coordinating engineering activities to

support the schedule, identifying issues to management and recommending actions; actively participates in problem solving

7) Assist the Project Engineering Manager in controlling project costs by identifying any potential changes to scope, schedule, or cost; evaluates changes and recommends actions to mitigate impacts; reviews proposed changes for adherence to project plan requirements; and, seeks management's approval before implementing changes
8) Assist the Project Engineering Manager with maintaining a high level of quality by adherence to procedures
9) Confirm project deliverables meet requirements through design review, testing and inspection
10) Maintain project records and data
11) Represent project team at meetings and in interfacing with other organizations

4.8.2 Other / Special Considerations

1) Personnel shall have 10 years of experience in design, systems, or programs engineering related to their discipline: PE license preferred.
2) Experience with DOE, and commercial nuclear industries are desired.
3) Bachelor of Science in engineering, Bachelors in engineering, or Bachelor of Science, in a related engineering discipline.
4) Experience with Nuclear Quality Assurance programs and Configuration Management programs.
5) Experience with field walkdowns for design efforts.

4.9 **Principal Engineer, Senior Principal Engineer, Consulting Engineer, and Senior Consulting Engineer Qualifications**

a. All of the positions would normally be conferred only upon an individual based upon a defined need in the department or site and an accumulated combination of several of the following experiences and degrees: has a PE license, or MS, or PhD, or Post PhD studies in engineering, and/or extended technical and leadership experiences in three or more departments (e.g. Operations, Maintenance, Radiation Protection, Quality Assurance), and/or has demonstrated significant leadership ability while serving as an senior engineer or lower, as well as in roles outside of engineering, and/or is wide respected in the industry as demonstrated through multiple leadership positions in multiple companies, and/or wide distributed and referenced papers written and presented at technical conferences, and/or served on code committee at the national level for multiple

years, and/or has served as a chief engineer in a company of more than 500 employees, and/or other roles.

b. For the positions of Principal Engineer and Senior Principal Engineer the minimum requirements above that must be fulfilled are: An MS degree in engineering reduces the minimum total experience required by 2 years and a PhD reduces the total experience required by three years, required experiences in multiple (at least one outside of engineering and one in engineering) departments one or more of which should have been in a designated leadership position, and 12 years of total experience for the Principal Engineer role or 16 years of total experience for the Senior Principal Engineer role.

c. For the positions of Consulting Engineer and Senior Consulting Engineer the minimum requirements above that must be fulfilled are: (To meet many or all of the requirements noted above simultaneously but as a minimum) an MS degree in engineering reduces the minimum total experience required by 2 years and a PhD reduces the total experience required by three years, required experiences in multiple (at least two extended job experiences outside of engineering and at least two in engineering) departments two or more of which should have been in designated leadership positions, one of more of those positions should have been as a chief engineer for a major technical department or as an executive outside of engineering. In the case of the Senior Consulting Engineer role, there should have been an assignment as a chief engineer, or as a senior engineering manager as well as one prior role in engineering and executive assignments in two or more roles outside of engineering (extended service as a member on a code committee or code subcommittee or presentation of a long series of technical papers at national conferences over a period of years, either one (or some national level technical activity similar to either of these two) could substitute for one of the leadership positions inside or outside of engineering); and a minimum of 20 years of experience for the Consulting Engineer role or a minimum of 24 years of experience for the Senior Consulting Engineer role.

4.10 Technical Point of Contact

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