SECTION J

APPENDIX F

CRITICAL STAFF

Subject Matter Expert		Subject Matter
		Canister Transfer Machine Engineering
		Waste Package Transfer Trolley Engineering
		Transport and Emplacement Vehicle Engineering
		Cask Transfer Trolley Engineering
		Criticality and Nuclear Engineering
		Subsurface Thermal Management Engineering
		Pre-closure Safety Analysis Specialist
		Waste Package and Drip Shields Engineering
		Waste Package Closure System Engineering
		NOG-1 Cranes Engineering
		Subsurface Design Engineering
		Structural Seismic Design Engineering
		Transport, Aging, and Disposal (TAD) interface with repository systems

Note: The Contractor shall identify names of at least one individual which shall function in each of the subject matter areas identified above. Qualification requirements for these individuals are identified on the following pages (J-F-2 et seq.). Any deviation from these qualification requirements will be at the Contracting Officer's discretion. Within 180 days of contract award, these names shall be identified and submitted to the Contracting Officer for approval.

The OCRWM or the Contractor may modify this list identifying additional subject matter areas subject to this requirement.

POSITION DESCRIPTIONS

CRITICAL STAFF

1. Mechanical Handling Engineer –

This description will cover the following staff positions:

- Canister Transfer Machine Engineer
- Waste Package Transfer Trolley Engineer
- Transport and Emplacement Vehicle Engineer
- Cask Transfer Trolley Engineer
- NOG-1 Crane Engineer

a. Definition: Mechanical Handling Engineers are involved in the application of principles of physics for analysis, design, manufacturing, and maintenance of mechanical equipment handling systems. It requires a solid understanding of key concepts including mechanics, kinematics, thermodynamics and energy. Mechanical handling engineers use these principles and others in the design and analysis of industrial equipment and machinery, cranes, lifting devices, and more.

b. Education/ Experience: Must have an advanced degree from an accredited institution and 10 years experience in mechanical engineering or equivalent with emphasis in the area of cranes, lifting devices, and materials handling equipment related to nuclear facility design and licensing. A bachelor's degree and 15 years of related experience may be substituted for an advance degree and 10 years of experience. Must show design leadership skills of a team on a major project within the discipline.

c. Registration: Registered Professional Engineer in one of the fifty states of the United States.

2. Radiation or Criticality Engineer –

This description will cover the following staff position:

- Criticality Engineer

a. Definition: Radiation or Criticality Engineers deal with radioactive decay which is the process where an unstable atomic nucleus loses energy by emitting radiation in the form of particles or electromagnetic waves. Radiation engineering analyzes nuclear material which consists of materials used in nuclear reactors. Most commonly this refers to special nuclear material (SNM) as defined in the United States Atomic Energy Act. SNMs are plutonium, uranium-233 and enriched uranium-235.

b. Education/ Experience: Must have an advanced degree from an accredited institution and 10 years experience in Nuclear Engineering or equivalent with major project design, development, and implementation work related to nuclear facility design and licensing. A bachelor's degree and 15 years of related

experience may be substituted for an advance degree and 10 years of experience. Must show design leadership skills of a team on a major project within the discipline.

c. Registration: Registered Professional Engineer in one of the fifty states of the United States.

3. Thermal Stress Engineer –

This description will cover the following staff position:

- Subsurface Thermal Management Engineer

a. Definition: Thermal Stress Engineers deal with a branch of physics that studies the effects of changes in temperature, pressure, and volume on physical systems at the macroscopic scale by analyzing the collective motion of their particles using statistics. Roughly, heat means "energy in transit" and dynamics relates to "movement"; thus, in essence thermal analysis or thermodynamics studies the movement of energy and how energy instills movement. Properties can be combined to express internal energy and thermodynamic potentials, which are useful for determining conditions for equilibrium and spontaneous processes. With these tools, thermodynamics describes how systems respond to changes in their surroundings.

b. Education/ Experience: Must have an advanced degree from an accredited institution and 10 years experience in Chemical or Mechanical Engineering or equivalent with major project design, development, and implementation work related to materials. A bachelor's degree and 15 years of related experience may be substituted for an advance degree and 10 years of experience. Must show design leadership skills of a team on a major project within the discipline.

c. Registration: Registered Professional Engineer in one of the fifty states of the United States.

4. Pre-closure Safety Analysis (PCSA) Specialist –

This description will cover the following staff position:

- PCSA Specialist

a. Definition: PCSA Specialist uses an applied science strongly related to safety or systems engineering and is a subset of System Safety Engineering. Safety engineering assures that a life-critical system behaves as needed even when pieces fail. Failure to identify risks to safety, and the according inability to address or "control" these risks, can result in massive costs, both human and economic. Safety engineers distinguish different extents of defective operation: A failure is "the inability of a system or component to perform its required functions within specified performance requirements," while a fault is "a defect in a device or component, for example: a short circuit or a broken wire". System-level failures are caused by lower-level faults, which are ultimately caused by basic component faults. The unexpected failure of a device that was operating within its design

limits is a primary failure, while the expected failure of a component stressed beyond its design limits is a secondary failure. There are different modes of safe operation: a probabilistically safe system has no single point of failure, and enough redundant sensors, computers and effectors so that it is very unlikely to cause harm (usually "very unlikely" means, on average, less than one human life lost in a billion hours of operation). An inherently safe system is a clever mechanical arrangement that cannot be made to cause harm – obviously the best arrangement, but this is not always possible. A fail-safe system is one that cannot cause harm when it fails. A fault-tolerant system can continue to operate with faults, though its operation may be degraded in some fashion. These terms combine to describe the safety needed by systems.

b. Education/ Experience: Must have an advanced degree from an accredited institution and 10 years experience in Safety or System Engineering or equivalent with major project design, development, and implementation work related to nuclear facility safety basis design. A bachelor's degree and 15 years of related experience may be substituted for an advance degree and 10 years of experience. Must show analysis leadership skills of a team on a major project within the discipline.

c. Registration: Registered Professional Engineer in one of the fifty states of the United States.

5. Materials Engineer –

This description will cover the following staff positions:

- Waste Package and Drip Shields Engineer
- Waste Package Closure System Engineer

a. Definition: Materials engineers get involved with the properties of matter and its applications to various areas of science and engineering. This discipline investigates the relationship between the structure of materials and their properties. It includes elements of applied physics and chemistry, as well as chemical, mechanical, civil and electrical engineering.

b. Education/ Experience: Must have an advanced degree from an accredited institution and 10 years experience in civil engineering or equivalent with specialization in the area of materials and their science with major project design, development, and implementation work related to materials engineering for nuclear waste systems (or similar). A bachelor's degree and 15 years of related experience may be substituted for an advance degree and 10 years of experience. Must show design leadership skills of a team on a major project within the discipline.

c. Registration: Registered Professional Engineer in one of the fifty states of the United States.

6. Mining Engineer/Tunneling Engineer –

This description will cover the following staff position:

- Subsurface Design Engineer

a. Definition: Mining Engineers are involved with many of the other engineering disciplines as applied to extracting and processing minerals from a naturally occurring environment. Tunneling engineers are involved with other engineering disciplines for the effective development of underground tunnels for non-mineral processing purposes. Modern mining engineers and tunneling engineers must be concerned not only with the production and processing, but also with the mitigation of damage or changes to an environment as a result of that production and processing.

b. Education/ Experience: Must have an advanced degree from an accredited institution and 10 years experience in mining engineering or civil engineering or equivalent with major project design, development, and implementation work related to nuclear facility design and licensing. A bachelor's degree and 15 years of related experience may be substituted for an advance degree and 10 years of experience. Must show design leadership skills of a team on a major project within the discipline.

c. Registration: Registered Professional Engineer in one of the fifty states of the United States.

7. Seismic Engineer –

This description will cover the following staff position:

- Structural Seismic Design Engineer

a. Definition: Seismic Analysis or Earthquake Engineers are a subset of structural analysis engineering and include the calculation of the response of a building (or non-building) structure to earthquakes. This is part of the process of structural design or structural assessment and retrofit in regions where earthquakes are prevalent. Earthquake engineering has developed complex designs and now use special energy absorbing elements either just in the foundation (base isolation) or distributed throughout the structure.

b. Education/ Experience: Must have an advanced degree from an accredited institution and 10 years experience in civil engineering with specialized areas dealing with finite element analysis, structures, and physics of earthquakes related to nuclear facility design and licensing. A bachelor's degree and 15 years of related experience may be substituted for an advance degree and 10 years of experience. Must show design leadership skills of a team on a major project within the discipline.

c. Registration: Registered Professional Engineer in one of the fifty states of the United States.

8. Mechanical Engineer / Structural Engineer /Nuclear Engineer –
This description will cover the following staff position:

- Transport, Aging and Disposal Interface with Repository Systems

a. Definition: Mechanical Engineers are involved in the application of principles of physics for analysis, design, manufacturing, and maintenance of mechanical systems. It requires a solid understanding of key concepts, including mechanics, kinematics, thermodynamics and energy. Mechanical engineers use these principles and others in the design and analysis of automobiles, aircraft, heating & cooling systems, manufacturing plants, industrial equipment and machinery, medical devices, and more.

Definition: Structural engineers deal with the design of structural systems with the purpose of supporting and resisting various loads. Though other disciplines touch on this field, a physical object or system is truly considered a part of structural engineering, regardless of its central scientific or industrial application, if its main function is designed to resist loads and dissipate energy. Structural engineering is usually considered a specialty discipline within civil engineering, but also plays an essential role in designing machinery where structural integrity of the design item impacts safety and reliability. Structural engineers ensure that their designs satisfy a given "design intent," predicated on safety or serviceability.

Definition: Nuclear engineers deal with the application of the breakdown of atomic nuclei and/or other sub-atomic physics, based on the principles of nuclear physics. This includes, but is not limited to, the interaction and maintenance of nuclear fission systems and components— specifically, nuclear reactors, nuclear power plants, and/or nuclear weapons. The field may also include the study of nuclear fusion, medical and other applications of (generally ionizing) radiation, nuclear safety, heat/thermodynamics transport, nuclear fuel and/or other related (e.g., waste disposal) technology, nuclear proliferation, and the effect of radioactive waste or radioactivity in the environment.

b. Education/ Experience: Must have an advanced degree from an accredited institution and 10 years experience in mechanical/structural/nuclear engineering or equivalent, with major project design development and implementation work related to nuclear facility, equipment design, and licensing. A bachelor’s degree and 15 years of related experience may be substituted for an advance degree and 10 years of experience. Must show design leadership skills of a team on a major project within the discipline.

c. Registration: Registered Professional Engineer in one of the fifty states of the United States.