NATIONAL
ENRICHMENT
FACILITY

10 CFR 30.6
10 CFR 40.5
10 CFR 70.5

April 29, 2005

NEF#05-022

ATTN: Document Control Desk
Director
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Louisiana Energy Services, L. P.
National Enrichment Facility
NRC Docket No. 70-3103

Subject: Revision to Applications for a Material License Under 10 CFR 70, "Domestic licensing of special nuclear material," 10 CFR 40, "Domestic licensing of source material," and 10 CFR 30, "Rules of general applicability to domestic licensing of byproduct material"

References:

1. Letter NEF#03-003 dated December 12, 2003, from E. J. Ferland (Louisiana Energy Services, L. P.) to Directors, Office of Nuclear Material Safety and Safeguards and the Division of Facilities and Security (NRC) regarding "Applications for a Material License Under 10 CFR 70, Domestic licensing of special nuclear material, 10 CFR 40, Domestic licensing of source material, and 10 CFR 30, Rules of general applicability to domestic licensing of byproduct material, and for a Facility Clearance Under 10 CFR 95, Facility security clearance and safeguarding of national security information and restricted data"

2. Letter NEF#04-002 dated February 27, 2004, from R. M. Krich (Louisiana Energy Services, L. P.) to Director, Office of Nuclear Material Safety and Safeguards (NRC) regarding "Revision 1 to Applications for a Material License Under 10 CFR 70, "Domestic licensing of special nuclear material," 10 CFR 40, "Domestic licensing of source material," and 10 CFR 30, "Rules of general applicability to domestic licensing of byproduct material"

3. Letter NEF#04-029 dated July 30, 2004, from R. M. Krich (Louisiana Energy Services, L. P.) to Director, Office of Nuclear Material Safety and Safeguards (NRC) regarding "Revision to Applications for a Material License Under 10 CFR 70, "Domestic licensing of special nuclear material," 10 CFR 40, "Domestic licensing of source material," and 10 CFR 30, "Rules of general applicability to domestic licensing of byproduct material"

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TO: Tim Johnson

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4. Letter NEF#04-037 dated September 30, 2004, from R. M. Krich (Louisiana Energy Services, L. P.) to Director, Office of Nuclear Material Safety and Safeguards (NRC) regarding "Revision to Applications for a Material License Under 10 CFR 70, "Domestic licensing of special nuclear material," 10 CFR 40, "Domestic licensing of source material," and 10 CFR 30, "Rules of general applicability to domestic licensing of byproduct material"

5. Letter NEF#05-021 dated April 22, 2005, from R. M. Krich (Louisiana Energy Services, L. P.) to Director, Office of Nuclear Material Safety and Safeguards (NRC) regarding "Revision to Applications for a Material License Under 10 CFR 70, "Domestic licensing of special nuclear material," 10 CFR 40, "Domestic licensing of source material," and 10 CFR 30, "Rules of general applicability to domestic licensing of byproduct material"

By letter dated December 12, 2003 (Reference 1), E. J. Ferland of Louisiana Energy Services (LES), L. P., submitted to the NRC applications for the licenses necessary to authorize construction and operation of a gas centrifuge uranium enrichment facility. Revision 1 to these applications was submitted to the NRC by letter dated February 27, 2004 (Reference 2). Subsequent revisions (i.e., revision 2, revision 3 and revision 4) to these applications were submitted to the NRC by letters dated July 30, 2004 (Reference 3), September 30, 2004 (Reference 4), and April 22, 2005 (Reference 5), respectively.

During an April 20, 2005, conference call between representatives of LES and the NRC, the NRC requested that certain information related to commitments in the Integrated Safety Analysis (ISA) Summary be included in the Safety Analysis Report (SAR). The changes resulting from this conference call are reflected in the enclosed updated SAR pages (i.e., Revision 5). To facilitate the incorporation of the revision into SAR, page removal and insertion instructions are also enclosed. No changes are made to the ISA Summary, the Environmental Report, the Emergency Plan, the Physical Security Plan, the Safeguards Contingency Plan, the Guard Force Training and Qualification Plan, the Standard Practice Procedures Plan for the Protection of Classified Matter, or the Fundamental Nuclear Material Control Plan.

The License Application and ISA Summary, updated through Revision 5 of the SAR, continue to meet the applicable requirements of 10 CFR 70.22, "Contents of applications," 10 CFR 40.31, "Application for specific licenses," and 10 CFR 30.32, "Application for specific licenses," as described in the Reference 1 letter.

If you have any questions, please contact me at 630-657-2813.

Respectfully,

Daniel G. Green for

R. M. Krich
Vice President – Licensing, Safety, and Nuclear Engineering

Enclosure:
Updated Safety Analysis Report Pages

cc: T. C. Johnson, NRC Project Manager
M. C. Wong, NRC Environmental Project Manager

ENCLOSURE

Updated Safety Analysis Report Pages

Revision 5, May 2005
Including Page Removal and Insertion Instructions

NATIONAL ENRICHMENT FACILITY
SAFETY ANALYSIS REPORT, REVISION 5
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3.1 INTEGRATED SAFETY ANALYSIS METHODS

This section outlines the approach utilized for performing the integrated safety analysis (ISA) of the process accident sequences. The approach used for performing the ISA is consistent with Example Procedure for Accident Sequence Evaluation, Appendix A to Chapter 3 of NUREG-1520 (NRC, 2002a). This approach employs a semi-quantitative risk index method for categorizing accident sequences in terms of their likelihood of occurrence and their consequences of concern. The risk index method framework identifies which accident sequences have consequences that could exceed the performance requirements of 10 CFR 70.61 (CFR, 2003c) and, therefore, require designation of items relied on for safety (IROFS) and supporting management measures. Descriptions of these general types of higher consequence accident sequences are reported in the ISA Summary.

The ISA is a systematic analysis to identify plant and external hazards and the potential for initiating accident sequences, the potential accident sequences, the likelihood and consequences, and the IROFS.

The ISA uses a hazard analysis method to identify the hazards which are relevant for each system or facility. The ISA Team reviewed the hazard identified for the "credible worst-case" consequences. All credible high or intermediate severity consequence accident scenarios were assigned accident sequence identifiers, accident sequence descriptions, and a risk index determination was made.

The risk index method is regarded as a screening method, not as a definitive method of proving the adequacy or inadequacy of the IROFS for any particular accident.

The tabular accident summary resulting from the ISA identifies, for each sequence, which engineered or administrative IROFS must fail to allow the occurrence of consequences that exceed the levels identified in 10 CFR 70.61 (CFR, 2003c).

For this license application, two ISA Teams were formed. This was necessary because the sensitive nature of some of the facility design information related to the enrichment process required the use of personnel with the appropriate national security clearances. This team performed the ISA on the Cascade System, Contingency Dump System, Centrifuge Test System and the Centrifuge Post Mortem System. This ISA Team is referred to as the Classified ISA Team. The Non-Classified Team, referred to in the remainder of this text as the ISA Team, performed the ISA on the remainder of the facility systems and structures. In addition, the (non-classified) ISA Team performed the External Events and Fire Hazard Assessment for the entire facility.

In preparing for the ISA, the Accident Analysis in the Safety Analysis Report (LES, 1993) for the Claiborne Enrichment Center was reviewed. In addition, experienced personnel with familiarity with the gas centrifuge enrichment technology safety analysis where used on the ISA Team. This provides a good peer check of the final ISA results.

A procedure was developed to guide the conduct of the ISA. This procedure was used by both teams. In addition, there were common participants on both teams to further integrate the approaches employed by both teams. These steps were taken to ensure the consistency of the results of the two teams. A non-classified summary of the results of the Classified ISA has been prepared and incorporated into the ISA Summary.

3.1.1 Hazard Identification

The hazard and operability (HAZOP) analysis method was used for identifying the hazards for the Uranium Hexafluoride (UF_6) process systems and Technical Services Building systems. This method is consistent with the guidance provided in NUREG-1513 (NRC, 2001a) and NUREG-1520 (NRC, 2002a). The hazards identification process results in identification of physical, radiological or chemical characteristics that have the potential for causing harm to site workers, the public, or to the environment. Hazards are identified through a systematic review process that entails the use of system descriptions, piping and instrumentation diagrams, process flow diagrams, plot plans, topographic maps, utility system drawings, and specifications of major process equipment. In addition, criticality hazards identification were performed for the areas of the facility where fissile material is expected to be present. The criticality safety analyses contain information about the location and geometry of the fissile material and other materials in the process, for both normal and credible abnormal conditions. The ISA input information is included in the ISA documentation and is available to be verified as part of an on-site review.

The hazard identification process documents materials that are:

- Radioactive
- Fissile
- Flammable
- Explosive
- Toxic
- Reactive.

The hazard identification also identifies potentially hazardous process conditions. Most hazards were assessed individually for the potential impact on the discrete components of the process systems. However, for hazards from fires (external to the process system) and external events (seismic, severe weather, etc.), the hazards were assessed on a facility wide basis.

For the purpose of evaluating the impacts of fire hazards, the ISA team considered the following:

- Postulated the development of a fire occurring in in-situ combustibles from an unidentified ignition source (e.g., electrical shorting, or other source)
- Postulated the development of a fire occurring in transient combustibles from an unidentified ignition source (e.g., electrical shorting, or other source)
- Evaluated the uranic content in the space and its configuration (e.g., UF_6 solid/gas in cylinders, UF_6 gas in piping, UF_6 and/or byproducts bound on chemical traps, Uranyl Fluoride (UO_2F_2) particulate on solid waste or in solution). The appropriate configuration was considered relative to the likelihood of the target releasing its uranic content as a result of a fire in the area.

In order to assess the potential severity of a given fire and the resulting failures to critical systems, the facility Fire Hazard Analysis was consulted. However, since the design supporting the license submittal for this facility is not yet at the detailed design stage, detailed in-situ

3.1.2 Process Hazard Analysis Method

As noted above, the HAZOP method was used to identify the process hazards. The HAZOP process hazard analysis (PHA) method is consistent with the guidance provided in NUREG-1513 (NRC, 2001a). Implementation of the HAZOP method was accomplished by either validating the Urenco HAZOPs for the NEF design or performing a new HAZOP for systems where there were no existing HAZOPs. In general, new HAZOPs were performed for the Technical Services Building (TSB) systems. In cases for which there was an existing HAZOP, the ISA Team, through the validation process, developed a new HAZOP.

For the UF_6 process systems, this portion of the ISA was a validation of the HAZOPs provided by Urenco. The validation process involved workshop meetings with the ISA Team. In the workshop meeting, the ISA Team challenged the results of the Urenco HAZOPs. As necessary the HAZOPs were revised/updated to be consistent with the requirements identified in 10 CFR 70 (CFR, 2003b) and as further described in NUREG-1513 (NRC, 2001a) and NUREG-1520 (NRC, 2002a).

To validate the Urenco HAZOPs, the ISA Team performed the following tasks:

- The Urenco process engineer described the salient points of the process system covered by the HAZOP being validated.
- The ISA Team divided the process "Nodes" into reasonable functional blocks.
- The process engineer described the salient points of the items covered by the "Node" being reviewed.
- The ISA Team reviewed the "Guideword" used in the Urenco HAZOP to determine if the HAZOP is likely to identify all credible hazards. A representative list of the guidewords used by the ISA Team is provided in Table 3.1-1, HAZOP Guidewords, to ensure that a complete assessment was performed.
- The ISA Team Leader introduced each Guideword being considered in the ISA HAZOP and the team reviewed and considered the potential hazards.
- For each potential hazard, the ISA Team considered the causes, including potential interactions among materials. Then, for each cause, the ISA Team considered the consequences and consequence severity category for the consequences of interest (Criticality Events, Chemical Releases, Radiation Exposure, Environment impacts). A statement of "No Safety Issue" was noted in the system HAZOP table for consequences of no interest such as maintenance problems or industrial personnel accidents.
- For each hazard, the ISA Team considered existing safeguards designed to prevent the hazard from occurring.
- For each hazard, the ISA Team also considered any existing design features that could mitigate/reduce the consequences.
- The Urenco HAZOP was modified to reflect the ISA Team's input in the areas of hazards, causes, consequences, safeguards and mitigating features.
- For each external event hazard, the ISA Team determined if the external hazard is credible (i.e., external event initiating frequency $>10^{-6}$ per year).

- When all of the Guidewords had been considered for a particular node, the ISA Team applied the same process and guidewords to the next node until the entire process system was completed.

The same process as above was followed for the TSB systems, except that instead of using the validation process, the ISA Team developed a completely new HAZOP. This HAZOP was then used as the hazard identification input into the remainder of the process.

The results of the ISA Team workshops are summarized in the ISA HAZOP Table, which forms the basis of the hazards portion of the Hazard and Risk Determination Analysis. The HAZOP tables are contained in the ISA documentation. The format for this table, which has spaces for describing the node under consideration and the date of the workshop, is provided in Table 3.1-2, ISA HAZOP Table Sample Format. This table is divided into 7 columns:

GUIDEWORD	Identifies the Guideword under consideration.
HAZARD	Identifies any issues that are raised.
CAUSES	Lists any and all causes of the hazard noted.
CONSEQUENCES	Identifies the potential and worst case consequence and consequences severity category if the hazard goes uncontrolled.
SAFEGUARDS	Identifies the engineered and/or administrative protection designed to prevent the hazard from occurring.
MITIGATION	Identifies any protection, engineered or otherwise, that can mitigate/reduce the consequences.
COMMENTS	Notes any comments and any actions requiring resolution.

This approach was used for all of the process system hazard identifications. The "Fire" and "External Events" guidewords were handled as a facility-wide assessment and were not explicitly covered in each system hazard evaluation.

The results of the HAZOP are used directly as input to the risk matrix development.

3.1.3 Risk Matrix Development

3.1.3.1 Consequence Analysis Method

10 CFR 70.61 (CFR, 2003c) specifies two categories for accident sequence consequences: "high consequences" and "intermediate consequences." Implicitly there is a third category for accidents that produce consequences less than "intermediate." These are referred to as "low consequence" accident sequences. The primary purpose of PHA is to identify all uncontrolled and unmitigated accident sequences. These accident sequences are then categorized into one of the three consequence categories (high, intermediate, low) based on their forecast radiological, chemical, and/or environmental impacts.

For evaluating the magnitude of the accident consequences, calculations were performed using the methodology described in the ISA documentation. Because the consequences of concern are the chemotoxic exposure to hydrogen fluoride (HF) and UO_2F_2, the dispersion methodology discussed in Section 6.3.2 was used. The dose consequences for all of the accident sequences were evaluated and compared to the criteria for "high" and "intermediate" consequences. The inventory of uranic material for each accident considered was dependent on the specific accident sequence. For criticality accidents, the consequences were conservatively assumed to be high for both the public and workers.

Table 3.1-3, Consequence Severity Categories Based on 10 CFR 70.61, presents the radiological and chemical consequence severity limits of 10 CFR 70.61 (CFR, 2003c) for each of the three accident consequence categories. Table 3.1-4, Chemical Dose Information, provides information on the chemical dose limits specific to the NEF.

3.1.3.2 Likelihood Evaluation Method

10 CFR 70.61 (CFR, 2003c) also specifies the permissible likelihood of occurrence of accident sequences of different consequences. "High consequence" accident sequences must be "highly unlikely" and "intermediate consequence" accident sequences must be "unlikely." Implicitly, accidents in the "low consequence" category can have a likelihood of occurrence less than "unlikely" or simply "not unlikely." Table 3.1-5, Likelihood Categories Based on 10 CFR 70.61, shows the likelihood of occurrence limits of 10 CFR 70.61 (CFR, 2003c) for each of the three likelihood categories.

The definitions of "not unlikely" and "unlikely" are taken from NUREG-1520 (NRC, 2002a). The definition of "highly unlikely" is taken from NUREG-1520 (NRC, 2002a). Additionally, a qualitative determination of "highly unlikely" can apply to passive design component features (e.g., tanks, piping, cylinders, etc.) of the facility that do not rely on human interface to perform the criticality safety function (i.e., termed "safe-by-design"). Safe-by-design components are those components that by their physical size or arrangement have been shown to have a $k_{eff} < 0.95$. The definition of safe-by-design components encompasses two different categories of components. The first category includes those components that are safe-by-volume, safe-by-diameter or safe-by-slab thickness. A set of generic conservative criticality calculations has determined the maximum volume, diameter, or slab thickness (i.e., safe value) that would result in a $k_{eff} < 0.95$. A component in this category has a volume, diameter or slab thickness that is less than the associated safe value resulting from the generic conservative criticality calculations and therefore the k_{eff} associated with this component is < 0.95. The components in the second category require a more detailed criticality analysis (i.e., a criticality analysis of the physical arrangement of the component's design configuration) to show that k_{eff} is < 0.95. In the second category of components, the design configuration is not bounded by the results of the generic conservative criticality calculations for maximum volume, diameter, or slab thickness that would result in a $k_{eff} < 0.95$. Examples of components in this second category are the product pumps that have volumes greater than the safe-by-volume value, but are shown by specific criticality analysis to have a $k_{eff} < 0.95$.

For failure of passive safe-by-design components to be considered "highly unlikely," these components must also meet the criterion that the only potential means to effect a change that might result in a failure to function, would be to implement a design change (i.e., geometry deformation as a result of a credible process deviation or event does not adversely impact the performance of the safety function). The evaluation of the potential to adversely impact the safety function of these passive design features includes consideration of potential mechanisms to cause bulging, corrosion, and breach of confinement/leakage and subsequent accumulation of material. The evaluation further includes consideration of adequate controls to ensure that the double contingency principle is met. For each of these passive design components, it must be concluded, that there is no credible means to effect a geometry change that might result in a failure of the safety function and that significant margin exists. For components that are safe-by-volume, safe-by-diameter, or safe-by-slab thickness (i.e., first category of safe-by-design components), significant margin is defined as a margin of at least 10%, during both normal and upset conditions, between the actual design parameter value of the component and the value of the corresponding critical design attribute. For components that require a more detailed criticality analysis (i.e., second category of safe-by-design components), significant margin is defined as $k_{eff} < 0.95$, where $k_{eff} = k_{calc} + 3\sigma_{calc}$. This margin is considered acceptable since the calculation of k_{eff} also conservatively assumes the components are full of uranic breakdown material at maximum enrichment, the worst credible moderation conditions exist, and the worst credible reflection conditions exist. In addition, the configuration management system required by 10 CFR 70.72 (implemented by the NEF Configuration Management Program) ensures the maintenance of the safety function of these features and assures compliance with the double contingency principle, as well as the defense-in-depth criterion of 10 CFR 70.64(b).

The definition of "not credible" is also taken from NUREG-1520 (NRC, 2002a). If an event is not credible, IROFS are not required to prevent or mitigate the event. The fact that an event is not "credible" must not depend on any facility feature that could credibly fail to function. One cannot claim that a process does not need IROFS because it is "not credible" due to characteristics provided by IROFS. The implication of "credible" in 10 CFR 70.61 (CFR, 2003c) is that events that are not "credible" may be neglected.

Any one of the following independent acceptable sets of qualities could define an event as not credible:

a. An external event for which the frequency of occurrence can conservatively be estimated as less than once in a million years

b. A process deviation that consists of a sequence of many unlikely human actions or errors for which there is no reason or motive (In determining that there is no reason for such actions, a wide range of possible motives, short of intent to cause harm, must be considered. Necessarily, no such sequence of events can ever have actually happened in any fuel cycle facility.)

c. Process deviations for which there is a convincing argument, given physical laws that they are not possible, or are unquestionably extremely unlikely.

3.1.3.3 Risk Matrix

The three categories of consequence and likelihood can be displayed as a 3 x 3 risk index matrix. By assigning a number to each category of consequence and likelihood, a qualitative risk index can be calculated for each combination of consequence and likelihood. The risk index equals the product of the integers assigned to the respective consequence and likelihood categories. The risk index matrix, along with computed risk index values, is illustrated in Table 3.1-6, Risk Matrix with Risk Index Values. The shaded blocks identify accidents of which the consequences and likelihoods yield an unacceptable risk index and for which IROFS must be applied.

3.2 INTEGRATED SAFETY ANALYSIS TEAM

There were two ISA Teams that were employed in the ISA. The first team worked on the non-classified portions of the facility and is referred to in the text as the ISA Team. The second team, referred to as the Classified ISA Team, performed the ISA on the classified elements of the facility. Both teams were selected with credentials consistent with the requirements in 10 CFR 70.65 (CFR, 2003a) and the guidance provided in NUREG-1520 (NRC, 2002a). To facilitate consistency of results, common membership was dictated as demonstrated below (i.e., some members of the Non-Classified Team participated on the Classified Team. One of the members of the Classified Team participated in the ISA Team Leader Training, which was conducted prior to initiating the ISA. In addition, the Classified ISA Team Leader observed some of the non-classified ISA Team meetings.

The ISA was performed by a team with expertise in engineering, safety analysis and enrichment process operations. The team included personnel with experience and knowledge specific to each process or system being evaluated. The team was comprised of individuals who have experience, individually or collectively, in:

- Nuclear criticality safety
- Radiological safety
- Fire safety
- Chemical process safety
- Operations and maintenance
- ISA methods.

The ISA team leader was trained and knowledgeable in the ISA method(s) chosen for the hazard and accidents evaluations. Collectively, the team had an understanding of all process operations and hazards under evaluation.

The ISA Manager was responsible for the overall direction of the ISA. The process expertise was provided by the Urenco personnel on the team. In addition, the Team Leader has an adequate understanding of the process operations and hazards evaluated in the ISA, but is not the responsible cognizant engineer or enrichment process expert.

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3.3 COMPLIANCE ITEM COMMITMENTS

3.3.1 For accident sequences PT3-5, PB1-3, FR1-1, FR1-2, FR2-1, FR2-2, DS1-1, DS1-2, DS2-1, DS2-2, DS3-1, DS3-2, SW1-1, SW1-2, LW1-2, LW1-3, RD1-1, and EC3-1, an Initiating Event Frequency (IEF) index number of "-2" may be assigned based on evidence from the operating history of similar designed Urenco European plants. Detailed justifications for the IEF index numbers of "-2" will be developed during detailed design. If the detailed justification does not support the IEF index number of "-2," then the IEF index number assigned and the associated accident sequence(s) will be re-evaluated and revised, as necessary, consistent with overall ISA methodology.

3.3.2 For Administrative Control IROFS that involve "use of" a component or device, a Failure Probability Index Number (FPIN) of "-2" may be assigned provided the IROFS is a routine, simple, action that either: (1) involves only one or two decision points or (2) is highly detailed in the associated implementing procedure. Alternately, an FPIN of "-3" may be assigned for this type of IROFS provided the criteria specified above for an FPIN of "-2" are met and the IROFS is enhanced by requiring independent verification of the safety function. This enhancement shall meet the requirements for independent verification identified in item 3.3.5 below. If these criteria cannot be met, then the FPIN assigned to the IROFS and the associated accident sequence(s) will be re-evaluated and revised, as necessary, consistent with the overall ISA methodology.

3.3.3 For Administrative Control IROFS that involve "verification of" a state or condition, an FPIN of "-2" may be assigned provided the IROFS is a routine action performed by one person, with proceduralized, objective, acceptance criteria. Alternately, an FPIN of "-3" may be assigned for this type of IROFS provided the criteria specified above for an FPIN of "-2" are met and the IROFS is enhanced by requiring independent verification of the safety function. This enhancement shall meet the requirements for independent verification identified in item 3.3.5 below. If these criteria cannot be met, then the FPIN assigned to the IROFS and the associated accident sequence(s) will be re-evaluated and revised, as necessary, consistent with the overall ISA methodology.

3.3.4 For Administrative Control IROFS that involve " independent sampling," different samples are obtained and an FPIN of "-2" may be assigned provided at least three of the following four criteria are met.

1. Different methods/techniques are used for sample analysis.
2. Samples are obtained from different locations.
3. Samples are obtained at different times. The time period between collection of the different samples shall be sufficient to ensure results are meaningful and representative of the material sampled.
4. Samples are obtained by different personnel.

If at least three of the above criteria cannot be met, then the FPIN assigned to the IROFS and the associated accident sequence(s) will be re-evaluated and revised, as necessary, consistent with the overall ISA methodology.

3.3.5 For IROFS and IROFS with Enhanced Failure Probability Index Numbers (i.e., enhanced IROFS) that require "independent verification" of a safety function, the independent verification shall be independent with respect to personnel and personnel interface. Specifically, a second qualified individual, operating independently (e.g., not at the same time or not at the same location) of the individual assigned the responsibility to perform the required task, shall, as applicable, verify that the required task (i.e., safety function) has been performed correctly (e.g., verify a condition), or re-perform the task (i.e., safety function), and confirm acceptable results before additional action(s) can be taken which potentially negatively impact the safety function of the IROFS. The required task and independent verification shall be implemented by procedure and documented by initials or signatures of the individuals responsible for each task. In addition, the individuals performing the tasks shall be qualified to perform, for the particular system or process (as applicable) involved, the tasks required and shall possess operating knowledge of the particular system or process (as applicable) involved and its relationship to facility safety. The requirements for independent verification are consistent with the applicable guidance provided in ANSI/ANS-3.2-1994, Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants.

3.3.6 Upon completion of the design of IROFS, the IROFS boundaries will be defined. In defining the boundaries for each IROFS, Louisiana Energy Services procedure DP-ISA-1.1, "IROFS Boundary Definition," will be used. This procedure requires the identification of each support system and component necessary to ensure the IROFS is capable of performing its specified safety function.

3.3.7 The applicable guidance of the following industry standards, guidance documents and regulatory guides shall be used for the design, procurement, installation, testing, and maintenance of IROFS at the NEF.

a. Institute of Electrical and Electronics Engineers (IEEE) standard IEEE 603-1998, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations"

b. IEEE standard 384-1992, "IEEE Standard Criteria for Independence of Class IE Equipment and Circuits"

c. Branch Technical Position HICB-11, "Guidance on Application and Qualification of Isolation Devices," Revision 4, June 1977, from NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants"

d. Regulatory Guide 1.75, "Physical Independence of Electric Systems," Revision 2, September 1978

e. IEEE standard 344-1987, "IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations"

f. Regulatory Guide 1.100, "Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants," Revision 2, June 1988

g. American National Standards Institute (ANSI)/Instrumentation, Systems, and Automation Society (ISA)-S67.04-1994, Part 1, "Setpoints for Nuclear Safety-Related Instrumentation"

h. Regulatory Guide 3.17, "Earthquake Instrumentation for Fuel Reprocessing Plants," February 1974 (for IROFS26 only)

i. IEEE standard 338-1987, "IEEE Standard Criteria for Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems"

j. Branch Technical Position HICB-17, "Guidance on Self-Test and Surveillance Test Provisions," Revision 4, June 1977, from NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants"

k. Regulatory Guide 1.118, "Periodic Testing of Electric Power and Protection Systems," Revision 3, April 1995

l. IEEE standard 518-1982, "IEEE Guide for Installation of Electrical Equipment to Minimize Electrical Noise Inputs to Controllers from External Sources"

m. IEEE standard 1050-1996, "IEEE Guide for Instrumentation and Control Equipment Grounding in Generating Stations"

n. IEEE standard 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations" (for separation and isolation)

3.3.8 The actual seismic design detailed approach for NEF IROFS will be based on the DOE–STD-1020-2002 (DOE, 2002) or the ASCE Standard Seismic Design Criteria (ASCE, 2003) method and finalized prior to detailed design.

3.3.9 To support the final design of the NEF, additional soil borings will be collected from the NEF site. Laboratory testing will be performed on soil samples and additional in-situ testing will be performed to determine static and dynamic soil properties. Using the soil information obtained, the following activities will be conducted.

- The assessment of soil liquefaction potential will be performed using the applicable guidance of Regulatory Guide 1.198, Procedures and Criteria for Assessing Seismic Soil Liquefaction at Nuclear Power Plant Sites, dated November 2003 (NRC, 2003a).
- Allowable bearing pressures provided in the ISA Summary will be confirmed using the applicable methods of Naval Facilities Engineering Command Design Manual NAVFAC DM-7.02, Foundations and Earth Structures, dated 1986 (NAVFAC, 1986a); Foundation Engineering Handbook, H.F. Winterkorn and H.Y. Fang, dated 1975 (Winterkorn, 1975); and Foundation Analysis and Design, J.E. Bowles, dated 1996 (Bowles, 1996).
- Building settlement analysis will be performed using the applicable methods of NAVFAC DM-7.01, Soil Mechanics, dated 1986 (NAVFAC, 1986b); and Foundation Engineering Handbook, H.F. Winterkorn and H.Y. Fang, dated 1975 (Winterkorn, 1975). The acceptance criteria for the building settlement analysis will be based on Urenco design criteria for allowable total and differential settlement of equipment and buildings.

3.3.10 The chemical traps on the second floor of the Process Services Area contain hazardous materials and are housed in fire rated enclosures to meet the requirements of Section 6.4 of NFPA 101 (NFPA, 1997).

3.3.11 The Separations Building Modules are designed to meet the occupant and exiting requirements set by NFPA 101 (NFPA, 1997) and to meet the construction type classifications set by the New Mexico Building Code (NMBC, 1997).

3.3.12 The floors of the Cascade Halls have a floor profile quality classification of flat in accordance with ACI 117-90 (ACI, 1990a) to aid in the transport of assembled centrifuges.

3.3.13 The Technical Services Building is designed to meet the occupant and exiting requirements set by the
NFPA 101 (NFPA, 1997) and to meet the construction type classifications set by the New Mexico Building Code (NMBC, 1997).

3.3.14 The Cylinder Receipt and Dispatch Building is designed to meet the occupant and exiting requirements set by the
NFPA 101 (NFPA, 1997) and to meet the construction type classification set by the New Mexico Building Code (NMBC, 1997).

3.3.15 The Centrifuge Assembly Building (CAB) is designed to meet the occupant and exiting requirements set by NFPA 101 (NFPA, 1997) and to meet the construction type classifications set by the New Mexico Building code (NMBC, 1997) and as Type I Construction by NFPA 220 (NFPA, 1999).

3.3.16 Centrifuge assembly activities are undertaken in clean room conditions, ISO Class 5 according to ISO 14644-1:1999E (ISO, 1999), to prevent ingress of volatile contaminants which would have a detrimental effect on centrifuge performance.

3.3.17 The floors of the CAB Assembled Centrifuge Storage Area have a floor profile quality classification of flat in accordance with ACI 117-90 (ACI, 1990a) to aid in the transport of assembled centrifuges.

3.3.18 The Blending and Liquid Sampling Area is designed to meet the occupant and exiting requirements set by the NFPA 101 (NFPA, 1997) and to meet the construction type classification set by the New Mexico Building Code (NMBC, 1997).

3.3.19 The Central Utilities Building is designed to meet the occupant and exiting requirements set by the NFPA 101 (NFPA, 1997) and set by the New Mexico Building Code (NMBC, 1997).

3.3.20 The Administration Building is designed to meet the occupant and exiting requirements set by the NFPA 101 (NFPA, 1997) and by the New Mexico Building Code (NMBC, 1997).

3.3.21 These buildings are designed to meet the occupant and exiting requirements set by the NFPA 101 (NFPA, 1997) and the construction type classifications set by the New Mexico Building Code (NMBC, 1997).

3.3.22 The following codes and standards are generally applicable to the structural design of the National Enrichment Facility:

- New Mexico Building Code (NMBC, 1997)
- Uniform Building Code (UBC, 1997)
- ASCE 7-98, Minimum Design Loads for Buildings and Other Structures (ASCE, 1998)
- ACI 318-99, Building Code Requirements for Structural Concrete (ACI, 1999)

- ACI 349-90, Code Requirements for Nuclear Safety Related Concrete Structures (ACI, 1990b)
- AISC Manual of Steel Construction, Ninth Edition (AISC, 1989)
- PCI Design Handbook, Fifth Edition (PCI, 1999)
- American Society of Testing and Materials (ASTM).

3.3.23 Structural Design Loads

a. The determination of wind pressure loadings and the design for wind loads for all safety significant structures and components exposed to wind are based on the requirements of ASCE 7-98 (ASCE, 1998). The determination of wind pressure loadings and the design for wind loads for all other structures and components exposed to wind are based on the requirements of the Uniform Building Code (UBC, 1997), Chapter 16 which further refers to the wind design requirements of ASCE 7-98, Section 6.0 (ASCE, 1998).

b. For reinforced concrete targets, the formulas used to establish the missile depth of penetration (x) and scabbing thickness (t_s) are based on the Modified National Defense Research Committee Formula (NDRC) (ASCE, 1980) and the Army Corps of Engineers Formula (ACE) (ASCE, 1980) respectively.

c. Per Section C.7.2.2 of ACI 349-90 (ACI, 1990b), the concrete thickness required to resist hard missiles shall be at least 1.2 times the scabbing thickness, t_s. Punching shear is calculated and checked against the requirements of ACI 349-90 (ACI, 1990b), Section C.7.2.3.

d. For steel targets, the formula used to establish the perforation thickness is the Ballistic Research Laboratory (BRL) Formula (ASCE, 1980).

e. All buildings and structures, including such items as equipment supports, are designed to withstand the earthquake loads defined in Chapter 16, Division IV of the Uniform Building Code (UBC, 1997).

f. Snow loadings on roofs and other exposed surfaces for non-safety significant structures are determined in accordance with the Uniform Building Code (UBC, 1997), Chapter 16, Division II.

g. Load combinations for concrete structures and components for the safety significant structures are based on ACI 349-90 (ACI, 1990b). Load combinations for other concrete structures are based on ASCE 7-98 (ASCE, 1998). All concrete structures are designed using the ACI Strength Design Method (ACI, 1999).

h. Load combinations for steel structures and components for all buildings are based on ASCE 7-98 (ASCE, 1998). All structural steel is designed using the AISC Allowable Stress Method (AISC, 1989).

i. Design live loads, including impact loads, used are in accordance with Section 4.0 and Table 4-1 of ASCE 7-98 (ASCE, 1998).

j. During detailed design of specific buildings and areas, pressure loads due to postulated truck and pipeline explosions will be considered. The pressure loads will be developed in accordance with the underlying assumptions used in the explosion hazard assessments described in Sections 3.2.1.2.1 and 3.2.2.4 of the

ISA Summary. These buildings and areas include: Separations Building Modules (UF_6 Handling Area, Process Services Area and Cascade Halls), Blending and Liquid Sampling Area, Cylinder Receipt and Dispatch Building, Technical Services Building and the Centrifuge Test Facility. These buildings and areas are constructed of concrete.

3.3.24 Natural UF_6 feed is received at the NEF in Department of Transportation (DOT) 7A, Type A cylinders from a conversion plant. The cylinders are ANSI N14.1 (ANSI, applicable version), 48Y or 48X cylinders.

3.3.25 Applicable codes and standards for process systems are reflected in Tables 3.3-1 through 3.3-7.

3.3.26 Product Liquid Sampling Autoclave

a. The pressure vessel is designed and fabricated in accordance with the requirements of ASME Section VIII, Division1 (current version at the time of autoclave manufacture), with the exception that the pressure relief devices specified in Sections UG-125 through 137 are not be provided due to the potential for release of hazardous material to the environment through a pressure relief device. Instead, two independent and diverse automatic trips of the autoclave heaters and fan motor are provided to eliminate the heat input and preclude approaching the autoclave design pressure. This is considered to be acceptable due to the large margin between the autoclave design pressure 12 bar (174 psia) and the maximum allowable working pressure 1.8 bar (26 psia) and the fail-safe design of the two independent and diverse automatic trips of the autoclave heaters and fan motor. The pressure vessel is also tested and stamped to the requirements of ASME Section VIII, Division 1 rules and is registered with the National Board.

b. The autoclave is designed and tested to ensure leak tight integrity is maintained.

c. The autoclave door seal is leak tested and inspected prior to each autoclave sample sequence.

3.3.27 Separations Building Gaseous Effluent Vent System (GEVS)

a. The Separations Building GEVS provides for continuous monitoring and periodic sampling of the gaseous effluent in the exhaust stack in accordance with the guidance in Regulatory Guide 4.16 (NRC, 1985).

b. The design and in-place testing of the Separations Building GEVS will be consistent with the applicable guidance in Regulatory Guide 1.140 (NRC, 2001b), ASME AG-1-1997 (ASME, 1997), and ASME N510-1989 (ASME, 1989). The system includes potassium carbonate impregnated activated charcoal filters for HF removal. As such, the portions of Regulatory Guide 1.140 (NRC, 2001b), ASME AG-1-1997 (ASME, 1997), and ASME N510-1989 (ASME, 1989), which address activated charcoal filters for radioiodine removal are not applicable. The prefilter efficiency (85%) is based on testing in accordance with ASME AG-1-1997 (ASME, 1997). The HEPA filter efficiency (99.97%) is based on removal of 0.3 micron particles when tested in accordance with ASME-AG-1 (ASME, 1997). The impregnated charcoal filter efficiency (99%) for removal of HF is based on Urenco specifications. In-place testing and inspections of the filters will be performed in accordance with the guidance in Regulatory Guidance 1.140 (NRC, 2001b). The frequency for performance of in-place filter testing and the acceptance criteria for penetration and leakage (or bypass) will be consistent with the guidance in Regulatory Guide 1.140 (NRC, 2001b). Qualification testing, to verify HF removal efficiency, of the impregnated charcoal will be performed using ASTM D6646-03 (ASTM, 2003), modified to reflect removal of HF instead of hydrogen sulfide. Laboratory testing of the impregnated charcoal filter of charcoal samples will be performed on an annual basis. Throughout the useful life of the impregnated charcoal, the impregnate is progressively consumed. The laboratory testing will determine the impregnant content within the sample. The amount of impregnant present in the sample is indicative of the remaining life of charcoal bed for removal of HF.

3.3.28 Technical Support Building (TSB) GEVS

a. The TSB GEVS provides for continuous monitoring and periodic sampling of the gaseous effluent in the exhaust stack in accordance with the guidance in Regulatory Guide 4.16 (NRC, 1985).

b. The design and in-place testing of the TSB GEVS will be consistent with the applicable guidance in Regulatory Guide 1.140 (NRC, 2001b), ASME AG-1-1997 (ASME, 1997), and ASME N510-1989 (ASME, 1989). The system includes a potassium carbonate impregnated activated charcoal filter for HF removal. As such, the portions of Regulatory Guide 1.140 (NRC, 2001b), ASME AG-1-1997 (ASME, 1997), and ASME N510-1989 (ASME, 1989), which address activated charcoal filters for radioiodine removal are not applicable. The prefilter efficiency (85%) is based on testing in accordance with ASME AG-1-1997 (ASME, 1997). The HEPA filter efficiency (99.97%) is based on removal of 0.3 micron particles when tested in accordance with ASME-AG-1 (ASME, 1997). The impregnated charcoal filter efficiency (99%) for removal of HF is based on Urenco specifications. In-place testing and inspections of the filters will be performed in accordance with the guidance in Regulatory Guidance 1.140 (NRC, 2001b). The frequency for performance of in-place filter testing and the acceptance criteria for penetration and leakage (or bypass) will be consistent with the guidance in Regulatory Guide 1.140 (NRC, 2001b). Qualification testing, to verify HF removal efficiency, of the impregnated charcoal will be performed using ASTM D6646-03 (ASTM, 2003), modified to reflect removal of HF instead of hydrogen sulfide. Laboratory testing of the impregnated charcoal filter of charcoal samples will be performed on an annual basis. Throughout the useful life of the impregnated charcoal, the impregnate is progressively consumed. The laboratory testing will determine the impregnant content within the sample. The amount of impregnant present in the sample is indicative of the remaining life of charcoal bed for removal of HF.

3.3.29 Centrifuge Test and Post Mortem Facilities Exhaust Filtration System

a. The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System provides for continuous monitoring and periodic sampling of the gaseous effluent in the exhaust stack in accordance with the guidance in Regulatory Guide 4.16 (NRC, 1985).

b. The design and in-place testing of the Centrifuge Test and Post Mortem Facilities Exhaust Filtration System will be consistent with the applicable guidance in

Regulatory Guide 1.140 (NRC, 2001b), ASME AG-1-1997 (ASME, 1997), and ASME N510-1989 (ASME, 1989). The system includes a potassium carbonate impregnated activated charcoal filter for HF removal. As such, the portions of Regulatory Guide 1.140 (NRC, 2001b), ASME AG-1-1997 (ASME, 1997), and ASME N510-1989 (ASME, 1989), which address activated charcoal filters for radioiodine removal are not applicable. The prefilter efficiency (85%) is based on testing in accordance with ASME AG-1-1997 (ASME, 1997). The HEPA filter efficiency (99.97%) is based on removal of 0.3 micron particles when tested in accordance with ASME-AG-1 (ASME, 1997). The impregnated charcoal filter efficiency (99%) for removal of HF is based on Urenco specifications. In-place testing and inspections of the filters will be performed in accordance with the guidance in Regulatory Guidance 1.140 (NRC, 2001b). The frequency for performance of in-place filter testing and the acceptance criteria for penetration and leakage (or bypass) will be consistent with the guidance in Regulatory Guide 1.140 (NRC, 2001b). Qualification testing, to verify HF removal efficiency, of the impregnated charcoal will be performed using ASTM D6646-03 (ASTM, 2003), modified to reflect removal of HF instead of hydrogen sulfide. Laboratory testing of the impregnated charcoal filter of charcoal samples will be performed on an annual basis. Throughout the useful life of the impregnated charcoal, the impregnate is progressively consumed. The laboratory testing will determine the impregnant content within the sample. The amount of impregnant present in the sample is indicative of the remaining life of charcoal bed for removal of HF.

3.3.30 In response to Bulletin 2003-03 (NRC, 2003b), LES will not purchase UF_6 cylinders with the 1-in Hunt valves installed nor purchase any replacement 1-in valves from Hunt.

In the unlikely event that any cylinders are received at the NEF with the 1-in Hunt valves installed, the following actions will be taken.

- If the cylinder is empty, the valve will be replaced before the cylinder is used in the facility.
- If the cylinder is filled, a safety justification to support continued use of the cylinder until the valve can be replaced will be developed or the valve will be replaced in accordance with NEF procedures.

No cylinders with the 1-in Hunt valve installed will be used as UBCs.

3.3.31 The containers used for intercontinental shipping are International Organization for Standardization Series 1 freight containers that are supplied in accordance with the ISO 668:1995 (ISO, 1995) Standard.

3.3.32 In the Cylinder Preparation Room, cylinders are pressure tested using compressed air in accordance with ANSI N14-2001 (ANSI, 2001). This system is used for testing new and decontaminated empty cylinders only.

3.3.33 Applicable codes and standards for utility and support systems are reflected in Table 3.3-8.

3.3.34 Exhaust flow from the potentially contaminated rooms (i.e., Ventilated Room, Cylinder Preparation Room and Decontamination Workshop) of the TSB is filtered by a pre-filter, activated carbon filter and HEPA filter and is then released through an exhaust stack.

The exhaust stack flow is continuously monitored for alpha and HF. The stack exhaust is periodically sampled. The continuous monitoring and periodic sampling is in accordance with the guidance in Regulatory Guide 4.16 (NRC, 1985).

3.3.35 The Electrical System design complies with the following codes and standards.

- IEEE C2-2002, National Electrical Safety Code (IEEE, 2002)
- NFPA 70, National Electric Code (NFPA, 1996)
- NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces (NFPA, 2000).

3.3.36 The criticality safety for tanks that are not "geometrically safe" or "geometrically favorable" will utilize two independent IROFS for mass control, one IROFS is referred to as "bookkeeping measures" and the second IROFS is referred to as "sampled and analyzed," e.g., tank contents are sampled and analyzed before being transferred to another tank or out of the system. The "bookkeeping measures" is a process to calculate the potential mass of uranium in the tank for any batch operation to ensure that no tank holds more than a safe mass of uranium. This calculated mass of uranium is then compared to a mass limit, which is based on the double-batching limit on mass of uranium in a vessel from the criticality safety analyses. The "bookkeeping measures" process is described in further detail below.

- For NEF, the "bookkeeping measures" are only applied to tanks where the mass of uranium involved, even when double batching error is considered, is far below the safe value. Bookkeeping measures are a documented running inventory estimate of the total uranium mass in a particular tank. The mass inventory for each batch operation is calculated based on the mass of material to be transferred during each batch operation and the mass inventory in the tank prior to the addition of the material from the batch operation.

- There are two types of batch operations that are considered. The first type is liquid transfer between tanks based on moving a volume of liquid with uranic material present in the volume. The second is transferring a number of components into the tank with the uranic material contained within or on the components transferred in each batch operation. For both types of operations, the initial mass inventory is set after emptying, cleaning, and readying the tank for receipt of uranic material. For each batch operation, the amount of uranic material to be transferred during a particular batch operation is estimated. This quantity of material is then credited/debited to/from each tank as appropriate. A new mass inventory in each tank is calculated. The calculated receiving tank mass inventory is compared to the mass limit for the tank prior to the transfer.

- For the second type, a transfer of a number of facility components into an open tank during a batch operation, the mass inventory on/within the components is estimated, and that mass credited to the receiving tank. The final mass inventory in the tank is calculated and the total is compared to the mass limit for the tank prior to the transfer. Open tanks associated with this system are located in the Decontamination Workshop.

3.3.37 UF_6 cylinders with faulty valves are serviced in the Ventilated Room. In the Ventilated Room, the faulty valve is removed and the threaded connection in the cylinder is inspected. A new valve is then installed in accordance with the requirements of ANSI N-14.1 (ANSI, 2001).

3.3.38 IROFS will be designed, constructed, tested and maintained to QA Level 1. IROFS will comply with design requirements established by the ISA and the applicable codes and standards (current approved version at the time of design). IROFS components and their designs will be of proven technology for their intended application. These IROFS components and systems will be qualified to perform their required safety functions under normal and accident conditions, e.g., pressure, temperature, humidity, seismic motion, electromagnetic interference, and radio-frequency interference, as required by the ISA. IROFS components and systems will be qualified using the applicable guidance in Institute of Electrical and Electronics Engineers (IEEE) standard IEEE-323, 1983, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations" (IEEE, 1983). Furthermore, IROFS components and systems will be designed, procured, installed, tested, and maintained using the applicable guidance in Regulatory Guide 1.180, "Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems," Revision 1, dated October 2003 (NRC, 2003c). IROFS systems will be designed and maintained consistent with the reliability assumptions in the ISA. Redundant IROFS systems will be separate and independent from each other. IROFS systems will be designed to be fail-safe. In addition, IROFS systems will be designed such that process control system failures will not affect the ability of the IROFS systems to perform their required safety functions. Plant control systems will not be used to perform IROFS functions. Installation of IROFS systems will be in accordance with engineering specifications and manufacturer's recommendations. Required testing and calibration of IROFS will be consistent with the assumptions of the ISA and setpoint calculations, as applicable. For hardware IROFS involving instrumentation which provides automatic prevention or mitigation of events, setpoint calculations are performed in accordance with a setpoint methodology, which is consistent with the applicable guidance provided in Regulatory Guide 1.105, "Setpoints for Safety-Related Instrumentation," Revision 3, dated December 1999 (NRC, 1999).

3.3.39 For those IROFS requiring operator actions, a human factors engineering review of the human-system interfaces shall be conducted using the applicable guidance in NUREG-0700, "Human-System Interface Design Review Guidelines," Revision 2, dated May 2002 (NRC, 2002b), and NUREG-0711, "Human Factors Engineering Program Review Model," Revision 2, dated February 2004 (NRC, 2004).

3.4 REFERENCES

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Table 3.3-1 Cascade System Codes and Standards

The Centrifuge Machine Passive Isolation Devices is designed, constructed, tested, and maintained to QA Level 1.
Rotating equipment is designed in accordance with the appropriate industry codes and standards.
Heat transfer equipment is designed in accordance with the appropriate industry codes and standards.
All miscellaneous equipment is designed in accordance with the appropriate industry codes and standards.
All process piping in the Cascade System shall meet or exceed the requirements of American Society of Mechanical Engineers, Process Piping, ASME B31.3, current edition at the time of detail engineering.
The design of electrical systems and components in the Cascade System is in conformance with the requirements of the National Electrical Safety Code, IEEE C2, current edition in effect at detail design, and the National Fire Protection Association, National Electrical Code, NFPA 70, current edition in effect at detail engineering, and appropriate industry codes and standards.

Table 3.3-2 Product Take-off System Codes and Standards

The equipment IROFS are designed, constructed, tested, and maintained to QA Level 1.
Rotating equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 rotating equipment in the Product Take-off System.
Heat transfer equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 heat transfer equipment in the Product Take-off System.
Material handling equipment is designed in accordance with the appropriate industry codes and standards and the requirements of the Occupational Safety and Health Administration. There is no QA Level 1 material handling equipment in the Product Take-off System.
All miscellaneous equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 miscellaneous equipment in the Product Take-off System.
All process piping in the Product Take-off System shall meet or exceed the requirements of American Society of Mechanical Engineers, Process Piping, ASME B31.3, current edition at the time of detail design.
All 30-in and 48-in cylinders used in the Product Take-off System comply with the requirements of ANSI N14.1, Uranium Hexafluoride Packaging for Transport, version in effect at the time of cylinder manufacture.

Table 3.3-3 Tails Take-off System Codes and Standards

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The equipment IROFS are designed, constructed, tested, and maintained to QA Level 1.
Rotating equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 rotating equipment in the Tails Take-off System.
Heat transfer equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 heat transfer equipment in the Tails Take-off System.
Material handling equipment is designed in accordance with the appropriate industry codes and standards and the requirements of the Occupational Safety and Health Administration. There is no QA Level 1 material handling equipment in the Tails Take-off System.
All miscellaneous equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 miscellaneous equipment in the Tails Take-off System.
All process piping in the Tails Take-off System shall meet or exceed the requirements of American Society of Mechanical Engineers, Process Piping, ASME B31.3, current edition at the time of detail design.
All 48-in cylinders used in the Tails Take-off System comply with the requirements of ANSI N14.1, Uranium Hexafluoride Packaging for Transport, version in effect at the time of cylinder manufacture.

Table 3.3-4 Product Blending System Codes and Standards

The equipment IROFS are designed, constructed, tested, and maintained to QA Level 1.
Rotating equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 rotating equipment in the Product Blending System.
Heat transfer equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 heat transfer equipment in the Product Blending System.
Material handling equipment is designed in accordance with the appropriate industry codes and standards and the requirements of the Occupational Safety and Health Administration. There is no QA Level 1 material handling equipment in the Product Blending System.
All miscellaneous equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 miscellaneous equipment in the Product Blending System.
All process piping in the Product Blending System shall meet or exceed the requirements of American Society of Mechanical Engineers, Process Piping, ASME B31.3, current edition.
All 30-in and 48-in cylinders used in the Product Blending System comply with the requirements of ANSI N14.1, Uranium Hexafluoride Packaging for Transport, version in effect at the time of cylinder manufacture.

Table 3.3-5 Product Liquid Sampling System Codes and Standards

The equipment IROFS are designed, constructed, tested, and maintained to QA Level 1.
Product Liquid Sampling Autoclaves and their supports are designed to meet the requirements of the American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code, Section VIII, Division I, current edition at the time of detail design.
Rotating equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 rotating equipment in the Product Liquid Sampling System.
Heat transfer equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 heat transfer equipment in the Product Liquid Sampling System.
Material handling equipment is designed in accordance with the appropriate industry codes and standards and the requirements of the Occupational Safety and Health Administration. There is no QA Level 1 material handling equipment in the Product Liquid Sampling System.
All miscellaneous equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 miscellaneous equipment in the Product Liquid Sampling System.
All process piping in the Product Liquid Sampling System shall meet or exceed the requirements of American Society of Mechanical Engineers, Process Piping, ASME B31.3, current edition at the time of detail design.
All 1.5-in and 30-in cylinders used in the Product Liquid Sampling System comply with the requirements of ANSI N14.1, Uranium Hexafluoride Packaging for Transport, version in effect at the time of cylinder manufacture.

Table 3.3-6 Contingency Dump System Codes and Standards
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The equipment IROFS are designed, constructed, tested, and maintained to QA Level 1.
Rotating equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 rotating equipment in the Contingency Dump System.
Heat transfer equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 heat transfer equipment in the Contingency Dump System.
All miscellaneous equipment is designed in accordance with the appropriate industry codes and standards. There is no QA Level 1 miscellaneous equipment in the Contingency Dump System.
All process piping in the Contingency Dump System meets or exceeds the requirements of American Society of Mechanical Engineers, Process Piping, ASME B31.3, current edition at the time of detail design.

Table 3.3-7 Gaseous Effluent Vent System Codes and Standards

Equipment Type	Code or Standard
Air Handling Units	NFPA 90A, 1999 AMCA Pub. 99 – 1986 AMCA Pub. 261 – 1998 ARI 430 – 1980 NEMA MG – 1998 REV. 3
Fans/Motors	AMCA 210 – 1999 ASHRAE 51 – 1999 ASHRAE Systems and Equipment 2000 NEMA MG1 – 1998 REV. 3
Coils	ANSI/ARI 410 – 2001
Air Cleaning Devices	ASME AG-1-1997 ERDA 76-21 – 1976 ANSI/ASME N509 – 1989 (R1996) ANSI/ASME N510 – 1989 (R1995) ASME NQA-1 – 2001 ASTM D6646-03 ANSI/AWS-D9.1 – 2000
Dampers	UL-Building Materials Directory

Table 3.3-8 Utility and Support Systems Codes and Standards

ACI 318-99, Building Code Requirements for Structural Concrete, 1999.
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Table 3.3-8 Utility and Support Systems Codes and Standards

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NFPA 12, Carbon Dioxide Systems, 1993.
NFPA 13, Installation of Sprinkler Systems, 1996.
NFPA 14, Standpipe, Private Hydrant and Hose Systems, 1996.
NFPA 15, Water Spray Fixed Systems for Fire Protection, 1996.
NFPA 20, Installation of Stationary Pumps, 1996.
NFPA 2001, Clean Agent Fire Extinguishing Systems, 1996.
NFPA 22, Water Tanks for Private Fire Protection, 1996.
NFPA 221, Fire Walls and Fire Barrier Walls, 1997.
NFPA 24, Private Fire Service Mains and Their Appurtenances, 1995.
NFPA 25, Water Based Fire Protection Systems, 1995.
NFPA 30, Flammable and Combustible Liquids Code, 2003.
NFPA 5000, Building Construction and Safety Code, 2003.
NFPA 54, National Fuel Gas Code, 1996.
NFPA 55, Compressed & Liquefied Gases in Cylinders, 1993.
NFPA 58, Liquefied Petroleum Gas Code, 2001.
NFPA 600 Industrial Fire Brigades, 1996.
NFPA 70, National Electric Code, 1996.
NFPA 704, Standard System for the Identification of the Hazards of Materials for Emergency Response, 2001.
NFPA 72, National Fire Alarm Code, 1996.
NFPA 75, Electronic Computer/Data Processing Systems, 1995.
NFPA 780, Lightning Protection Systems, 1997.
NFPA 80, Fire Doors and Fire Windows, 1995.
NFPA 801, Fire Protection for Facilities Handling Radioactive Materials, 2003.
NFPA 80A, Exterior Fire Exposures, 1993.

Table 3.3-8 Utility and Support Systems Codes and Standards

NFPA 90A, Installation of Air Conditioning and Ventilating Systems, 1996.
NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems, 1996.
NFPA 91, Exhaust Systems for Air Conveying of Materials, 1995.
NFPA, Fire Protection Handbook, 18th Edition, Section 9, Chapter 30, Nuclear Facilities, 1997.
NFPA 110, Standard for Emergency and Standby Power Systems, 2002.
NFPA 111, Standard on Stored Electrical Energy Emergency and Standby Power Systems, 2001.
NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, 2000.
NFPA 79, Electrical Standard for Industrial Machinery, 1997.
PCI Design Handbook, Fifth Edition, 1999.
Uniform Building Code (UBC), 1997.
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