ATTACHMENT 4

Calculation 51-2400547-00,
"Assessment of Winter Precipitation Loads at NEF for ISA and Design Basis"
(first 7 pages, including cover page)

FRAMATOME ANP

ENGINEERING INFORMATION RECORD

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Title Assessment of Winter Precipitation Loads at NEF for ISA and Design Basis

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Reviewer is Independent.

Remarks:

This Engineering Information Record assesses the potential effect from winter precipitation on structures that will comprise the National Enrichment Facility (NEF) in Lea County, New Mexico. The snow load external event portion of the Integrated Safety Analysis (ISA) is also documented. The design basis snow load for critical plant areas is also defined.

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2. NRC Site Analysis Branch Position – Winter Precipitation Loads
3. American Society of Civil Engineers (ASCE), Minimum Design Loads for Buildings and Other Structures, ASCE 7-98, Revision of American National Standards Institute (ANSI)/ASCE 7-95, Figure 7-1
4. Hydrometeorological Report No. 33, Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Durations of 6, 12, 24 and 48 Hours, U.S. Department of Commerce Weather Bureau, April 1956
5. Soil Survey, Lea County, New Mexico, United States Department of Agriculture, Soil Conservation Service, Issued January 1974
6. Waste Isolation Pilot Plant (WIPP) Contact Handled (CH) Waste Safety Analysis Report, Department of Energy (DOE), DOE/WIPP 95-2065, Rev. 7, June 2003

Executive Summary

The structures comprising the National Enrichment Facility (NEF) have been evaluated for winter precipitation loads including snow and ice. As part of the Integrated Safety Analysis (ISA) for external events, snow loads for the facility were evaluated. Through the ISA process, the appropriate design basis loads can be specified as outlined in this document.

During the ISA Team meetings, each area in each of the main plant buildings was discussed as to whether or not roof failure was acceptable from a safety standpoint. The following areas were selected by the team as requiring a "Highly Unlikely" design basis snow load:

- Separations Building Module (UF_6 Handling Area, associated Cascade Halls and Process Services Area)
- Cylinder Receipt and Dispatch Building (CRDB)
- Blending and Liquid Sampling Area
- Centrifuge Test Facility (CTF) in the Centrifuge Assembly Building (CAB)
- Technical Services Building (TSB)

Note that only specific areas of the TSB containing uranium hexafluoride (UF_6) and/or uranium were explicitly identified as requiring protection from this external event load. However, for design purposes, the entire TSB may be designed for this load.

This assessment demonstrates that a ground snow load of 32 pounds per square foot (psf) should be applied in the roof design of the plant structures listed above.

The ISA Accident Sequence and Risk Index for external event snow are provided in Table 2. The ISA Accident Description for external event snow is provided in Table 3. Table 4 summarizes the items relied on for safety (IROFS) that are associated with external event snow.

1. Introduction

The structures comprising the National Enrichment Facility (NEF) have been evaluated for winter precipitation loads including snow and ice.

As part of the ISA for external events, snow loads for the facility were evaluated. Through the ISA process, the appropriate design basis loads can be specified as outlined in this document.

The external event portion of the baseline ISA was performed on October 29, 2002. In addition to the full ISA Team, G. Harper (document preparer) presented the external events during the ISA Team meeting. The external event portion of the ISA was re-assessed on September 24, 2003 to identify any changes due to the NEF design and location. No changes were identified other than the new design basis values associated with the NEF site

(Attachment 1). D. Pepe was the ISA Team scribe at both ISA meetings and is the verifier of record for ISA-related information in this document. S. Thomson is the verifier for information related to development of the design basis snow load.

2. Discussion

The NRC Branch Position for Winter Precipitation Loads (Reference 1) establishes an acceptable method to develop a winter precipitation load for the design of nuclear facilities. A copy is provided in Attachment 2. The prescribed loads to be included in the combination of normal live loads, are based on the weight of the 100-year snow pack or snowfall, whichever is greater, recorded at ground level. Winter precipitation loads to be included in the combination of extreme live loads is based on the addition of the weight of the 100-year snow pack at ground level plus the weight of the 48-hour Probable Maximum Winter Precipitation (PMWP) at ground level for the month corresponding to the selected snow pack. Snow pack and snowfall are adjusted for density differences and ground level values are adjusted to represent appropriate weights on roofs.

This approach for defining snow loads has been found to be acceptable to the NRC for nuclear power plants. Therefore, for purposes of the ISA, this snow load is by engineering judgment taken to satisfy the definition of "highly unlikely" for assignment of likelihoods.

3. Quality Assurance

In addition to Urenco supplied design inputs, Framatome ANP (FANP) is also utilizing design inputs supplied by Lockwood Greene. Urenco has authorized FANP in writing (Reference 2) to use design inputs from Lockwood Greene for work in the preparation of the NEF License Application under the context of the FANP QA program.

4. Assessment

As indicated in the 1975 NRC Branch Position for Winter Precipitation Loads (Reference 1), it is acceptable to determine the 100-year snow pack and snowfall utilizing information in American National Standards Institute (ANSI) A58.1 (1972) with an adjustment of 30 years or more of regional data and maximization of water content for snow depth. Based on more recent ANSI information issued 26 years since ANSI A58.1, the 50-year mean recurrence ground snow load in the site region is 10 psf for elevations up to 3,600 feet (Reference 3). Considering that the approximate elevation of the NEF site is between 3,390 feet to 3,430 feet (Reference 4), the 50-year mean recurrence ground snow load of 10 psf is appropriate for the site. The ANSI importance factor described in Reference 3 can be used to adjust the 50-year to a 100-year recurrence (Sections 7.3.3 and C7.3.3 of Reference 3). Using an importance factor of 1.2, the 100-year mean recurrence ground snow load is 12 psf.

The 48-hour PMWP can be determined from Hydrometeorological Report (HMR) No. 33 (Reference 5) by taking the probable maximum 48-hour precipitation during the winter

months of December through February. The 10-square mile (mi^2), 48-hour PMWP is conservatively selected for the site. The 200-mi^2, 24-hour PMWP is obtained directly from HMR No. 33. The factors to adjust the 200-mi^2, 24-hour PMWP to a 10-mi^2, 48-hour PMWP are also provided in HMR No. 33. The PMWP is summarized in Table 1.

Table 1
PMWP Values

Winter Months	200-mi^2 24-hour PMWP (inches)	10-mi^2 48-hour Adjustment for Zone 4	10-mi^2 48-hour PMWP (inches)
December	13.0	1.46	19.0
January	10.7	1.42	15.2
February	11.4	1.46	16.6

The month of December provides the most conservative PMWP of 19.0 inches. Note that the Lea County average total precipitation for December is 0.56 inches (Table 10 of Reference 6, Attachment 5). Considering the Lea County average daily maximum temperature of 58 °F for December (Table 10 of Reference 6, Attachment 5) and the southern location of the NEF site, most of this PMWP would occur as liquid rain. Considering that for Lea County, snow melts soon after falling (p. 86 of Reference 6, Attachment 5), in order to define the overall ground snow load, assume that 20 percent of the PMWP combines with the 100-year mean recurrence ground snow load of 12 psf. Therefore, the PMWP component is:

$$\text{PMWP Load} = (19 \text{ inches})\frac{(62.4 \text{ psf})}{12 \text{ inches}}(.20) = 19.8 \text{ psf}$$

Combining with the 100-year mean recurrence ground snow load yields an overall design ground snow load of 32 psf for use in the design of roofs. Note that the ground snow load for the Waste Isolation Pilot Plant (WIPP) in Eddy County, New Mexico (the adjacent county west of Lea County), was determined to be 27 psf (Section 2.4.1.2.8 of Reference 7, Attachment 6). Roofs should be designed so as not to pond water to a depth during the PMWP that could exceed the design load for the roof. This can be accomplished by designing the parapets to a height that will preclude significant ponding on the roof. As an alternative, the parapets can be provided with scuppers that are designed to preclude significant roof ponding during the PMWP.

During the ISA, it was taken by engineering judgment that excessive snow loads beyond the design basis on the roofs of critical plant areas could structurally fail the roof, collapse onto plant processing systems and lead to gross failure of the UF_6 systems or containers storing UF_6 or uranium. The consequences to the public were conservatively taken as "Category 3 – High." Therefore, per the ISA Risk Matrix with Risk Index Values (Table 9 in Reference 8), the acceptable likelihood category for this case is "Likelihood Category 1 – Highly Unlikely." The 32 psf snow load defined above is considered by engineering judgment to

meet the definition of "Highly Unlikely". By engineering judgment, this snow load bounds all snow and ice loads.

During the ISA Team meetings, each area in each of the main plant buildings was discussed as to whether or not roof failure was acceptable from a safety standpoint. The following Lockwood Greene drawings were reviewed during the ISA Team Meeting on September 24, 2003:

- Separations Bldg. Module, Ground Floor, Lockwood Greene Drawing 1000A2000, Rev. A (Reference 9)
- Separations Bldg. Module, First Floor, Lockwood Greene Drawing 1000A2100, Rev. A (Reference 10)
- Separations Bldg. Module, Second Floor, Lockwood Greene Drawing 1000A2200, Rev. A (Reference 11)
- Separations Bldg. Module, Sections, Lockwood Greene Drawing 1000A4000, Rev. A (Reference 12)
- Cylinder Receipt & Dispatch/Part A, Blending and Liquid Sampling, Ground Floor, Lockwood Greene Drawing 1100A2000a, Rev. A (Reference 13)
- Cylinder Receipt & Dispatch/Part B, Ground Floor, Lockwood Greene Drawing 1100A2000b, Rev. A (Reference 14)
- Blending & Liquid Sampling Area, Ground Floor, Lockwood Greene Drawing 1200A2000, Rev. A (Reference 15)
- Centrifuge Assembly Building, Ground Floor, Lockwood Greene Drawing 1300A2000, Rev. A (Reference 16)
- Centrifuge Assembly Building, First Floor, Lockwood Greene Drawing 1300A2100, Rev. A (Reference 17)
- Centrifuge Assembly Building, Penthouse, Lockwood Greene Drawing 1300A2200, Rev. A (Reference 18)
- Technical Services Building, Ground Floor, Lockwood Greene Drawing 1500A2000, Rev. A (Reference 19)
- Technical Services Building, First Floor, Lockwood Greene Drawing 1500A2100, Rev. A (Reference 20)

- Central Utilities Building, Ground Floor, Lockwood Greene Drawing 1600A2000, Rev. A (Reference 21)

The following areas were selected by the ISA Team as requiring a "Highly Unlikely" design basis snow load:

- Separations Building Module (UF_6 Handling Area, associated Cascade Halls and Process Services Area)
- Cylinder Receipt and Dispatch Building (CRDB)
- Blending and Liquid Sampling Area
- Centrifuge Test Facility (CTF) in the Centrifuge Assembly Building (CAB)
- Technical Services Building (TSB)

Note that subsequent to the ISA Team meetings, Revision 0 of the above referenced Lockwood Greene Drawings were issued (Reference 22 through Reference 34). Based on a review of Revision A drawings against Revision 0 drawings, no drawing revisions impact this assessment.

Also note that only specific areas of the TSB containing UF_6 and/or uranium were explicitly identified as requiring protection from this external event load. However, for design purposes, the entire TSB may be designed for this load.

Based on the above, a ground snow load of 32 psf should be applied in the roof design of the plant structures listed above. This design for snow will be a portion of IROFS27.

The ISA Accident Sequence and Risk Index for external event snow are provided in Table 2. The ISA Accident Description for external event snow is provided in Table 3. The items relied on for safety (IROFS) for external event snow is a portion of IROFS27. IROFS27 describes the building design basis for various external events including snow. Information on IROFS27 is provided in Table 4. These tables were developed in accordance with Reference 8.

The objective of this Engineering Information Record has been met.