Calculation Cover Sheet

Project	V.C. Summer Units 2 & 3
Job No.	25242
Subject	ALOHA® Analysis for On–Site Chemicals Stored at Unit 1
Calc. No.	25242-ENV-006
Discipline	Nuclear/Environmental
Sheet	1 of 29

Calculation Status Designation	Preliminary	Confirmed with Preliminary Information	Confirmed	Superseded	Voided
			X		

Computer Program/Type	SCP	Program No.	Version/Release	Operating System
ALOHA	X	EV150	5.4.1	Windows XP

Nuclear Quality Classification	Safety-Related	Augmented Quality	Nonsafety-Related
	X		

[Proprietary Information Deleted]

This calculation has been reviewed by Bechtel Power Corporation and any proprietary information has been removed. Wherever proprietary information has been removed, brackets have been inserted containing the statement "Proprietary Information Deleted"

Rev. No.	Reason for Revision	Total No. of Sheets	Last Sheet No.	By	Checked	Approved/ Accepted	Date
002	Update calculation for new control room HVAC air exchange rate and add a meteorological sensitivity study	39 plus 1 CD	Attachment C, page C1	EKM	MCR	NJC	10/28/09
001	Provide Additional Analysis of Ammonium Hydroxide with dammed puddle for response to NRC RAI 6.04-3	72	Att. F, pg. 4	ZRH	SWS	RJK/NJC	5/28/09
000	Issuance of original calculation.	80	Att. H, pg. 1	SWS	JMS	RJK/DP	10/11/07

Record of Revisions

Table of Contents

1. PURPOSE

This calculation will determine the toxic, flammable and explosive minimum safe distances, control room (CR) concentrations, and overpressure values due to explosions, using the Areal Locations of Hazardous Atmospheres (ALOHA®) software, for the proposed V.C. Summer Unit 2 from chemicals associated with Unit 1 at the V.C. Summer nuclear facility.

For toxic vapor clouds it is necessary to determine the maximum distance at which the Immediately Dangerous to Life or Health (IDLH) value, or other toxicity limit, exists for a given amount of a chemical (NRC 2001). This distance represents the minimum safe distance that a nuclear power plant can operate, without protection, when near a toxic chemical. The distance depends on the prevailing meteorological conditions, wind speed, toxicity of the chemical and the quantity of chemical released. It is also necessary to determine the concentration inside the CR to ascertain the effects of a spill on the operators.

For flammable vapor clouds it is necessary to determine the distances at which lower flammability limits (LFL) exist. Once the concentration is below the LFL the vapor is no longer flammable. The distance to the outer edge of the LFL section of the cloud is the minimum distance that a nuclear power plant can operate from the chemical source when near a flammable chemical.

For explosive vapor clouds it is necessary to determine the maximum distance at which the peak overpressure is less than or equal to 1 psi (NRC 1978). This is the minimum safe distance for explosions. A peak overpressure of 1 psi will shatter glass but not do any significant structural damage to buildings (NRC 1978). The peak overpressure at the nearest safety related structure (NSRS) is also established. The Unit 2 CR is the NSRS for all chemicals in this calculation.

ALOHA® is capable of modeling all of these scenarios.

2. REASONS FOR REVISIONS

[Proprietary Information Deleted]

3. REFERENCES

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

4. INPUTS AND ASSUMPTIONS

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

5. METHODOLOGY

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

6. RESULTS

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

7. CONCLUSIONS

None of the analyzed chemicals presented any design based hazards to the proposed V.C. Summer Unit 2 or Unit 3 CRs. The highlighted values in section 6 are the worst case values for each chemical and are summarized in Table 7.1. For most of the chemicals, F stability class, 1 m/s wind speed and an ambient temperature of 94.2 °F were the predominant conditions that produced the worst case scenarios. There were two cases where the indoor concentration was worse at F stability class and 2 m/s, for gasoline and hydrazine. Comparing the runs that occurred during daylight to the runs that occurred during darkness, it can be seen that the dominant effect is the stability class and wind speed versus the solar radiation. Temperature also plays a large role, as can be seen by comparing the F stability class and 1 m/s second runs at 25°C (77°F) and 94.2°F. Increasing the ambient temperature had a significant effect on the evaporation rate and thus the total quantity released and the concentration at the control room as well as having a minor effect on dispersion within the plume. Given the selection of either F or E stability, which occur at night time with a cloud cover fraction of ≤3/8, 25°C would be a conservative selection (Seinfeld 1986), however as shown, even with an ambient air temperature of 94.2°F, no hazards exist at the CR. As stated in section 5.1, wind speeds less than 1.5 m/s occur 2.18% annually (ABS 2009a, 2009b), thus the selection of F stability class with 1 m/s wind speed is overly conservative.

Table 7.1: Summary of ALOHA® Results (Worst case conditions are F stability class and 1 m/s wind speed unless otherwise noted)

[Proprietary Information Deleted]

[Proprietary Information Deleted]

Attachment A: Tier II Chemical Screening Analysis

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

[Proprietary Information Deleted]

Calculation Sheet

Subject	ALOHA® Analysis for On-Site Chemicals Stored at Unit 1	Project	V. C. Summer Units 2 & 3
		Job No.	25242
		Calc. No.	25242-ENV-006
		Sheet No.	A5 of A5
By	Zachary Hollcraft/Ellen K. Mussman Date 8/30/09	Sheet Rev.	002

[Proprietary Information Deleted]

Attachment B: Regulatory Guide 1.78 Screening

[Proprietary Information Deleted]

[Proprietary Information Deleted]

Attachment B: Regulatory Guide 1.78 Screening

[Proprietary Information Deleted]

[Proprietary Information Deleted]

Calculation Sheet		Project	VC Summer Units 2 & 3
		Job No.	25242
Subject	ALOHA® Analysis for On-Site Chemicals Stored at Unit 1	Calc. No.	25242-ENV-006
		Sheet No.	C1 of C1
By	Zachary Hollcraft/Ellen K. Mussman Date 8/30/09	Sheet Rev.	002

Attachment C: Data CD: ALOHA Data Sheets

[Proprietary Information Deleted]