TABLES IIIA and IIIB
Laundry Worker Exposure and Margin of Exposure Assumptions and Calculations

APERC conducted exposure screening assessments to calculate potential exposure of industrial laundry workers to NPE. They are based on multiple, conservative assumptions regarding exposure and therefore represent an upper bound estimate of laundry worker occupational exposure - not actual exposure.

Table III A **Calculated Upper-Bound Laundry Worker Inhalation Exposure to NPE9 from Respirable Dust in Granular Laundry Detergent**			
	Value	Units	
			Basis
Exposure scenario	Double pouring granular detergent. No personal protection equipment		Hendricks (1970)
Dust exposure factor	0.27	µg	Hendricks (1970) measured 0.27 µg exposure per 0.2 kg handled
NPE percentage in detergent	28%	%	EPA (2007) assumes powdered detergents used in smaller laundries formulated similar to consumer detergents
Respirable dust fraction in granular laundry detergent	0.2%	%	Hendricks (1970)
Detergent handled daily	154	kg	EPA (2007) Assumes one worker handles all detergent for site in 8 hour shift

Table III A **Calculated Upper-Bound Laundry Worker Inhalation Exposure to NPE9 from Respirable Dust in Granular Laundry Detergent**			
	Value	Units	
			Basis
Exposure scenario	Double pouring granular detergent. No personal protection equipment		Hendricks (1970)
Inhalation dose	0.116	µg/day	Calculated
Convert units	1.2E-04	mg/day	Calculated. Inhalation Dose/1000
Body weight	71.8	kg	EPA (1999) Table 7-2. Mean body weight (males and females age 18<75)
Estimated daily dose	1.6E-06	mg/kg-bw/day	Calculated
No Observed Effect Level (NOEL) for NPE9	50	mg/kg/day	EPA (2006, July 31)
Margin of Exposure (MOE)	30,835,567	none	Calculated MOE = NOEL ÷ Est. Daily Dose (inhalation)

Table IIIB. Calculated Upper-Bound Laundry Worker Dermal Exposure to NPE9 from Laundry Detergents (Liquid and Granular)						
	A*	**B***	**C**	**D**	**Units**	**Basis**
Exposure scenario	Single layer clothing, no gloves	Single layer clothing, no gloves	Single layer clothing, using gloves	Single layer clothing, using gloves		EPA PHED (1998)
	Granular, open loading and washing	Liquid, open loading and washing	Liquids, open loading and washing	Liquids, closed loading and washing		EPA PHED (1998).
Dermal unit exposure value	0.0084	2.9	0.023	0.0086	mg NPE / lb detergent handled	Derived from EPA PHED (1998) active ingredient exposure based on lbs handled
NPE fraction of detergent	28%	100%	100%	100%	fraction	EPA (2007) 28% for powder and 100% for liquid.
Detergent handled daily by one worker in 8 hour shift	154	154	154	154	kg	
NPE handled daily	95.1	339.6	339.6	339.6	lb	Calculated
External dermal dose	0.80	984.75	7.81	2.92	mg/day	Calculated
Relative dermal absorption	1%	1%	1%	1%	%	Monteiro-Riviere et al., 2000

Table IIIB. Calculated Upper-Bound Laundry Worker Dermal Exposure to NPE9 from Laundry Detergents (Liquid and Granular)						
	A*	**B***	**C**	**D**	**Units**	**Basis**
Exposure scenario	Single layer clothing, no gloves	Single layer clothing, no gloves	Single layer clothing, using gloves	Single layer clothing, using gloves		EPA PHED (1998)
	Granular, open loading and washing	Liquid, open loading and washing	Liquids, open loading and washing	Liquids, closed loading and washing		EPA PHED (1998).
Dermal dose	0.008	9.848	0.078	0.029	mg/day	Calculated
Mean body weight	71.8	71.8	71.8	71.8	kg	EPA (1999) Table 7-2. Mean body weight (males and females age 18<75)
Absorbed dose	1.11E-04	1.37E-01	1.09E-03	4.07E-04	mg/kg/day	Calculated
NOEL for NPE9	50	50	50	50	mg/kg/day	EPA (2006, July 31)
MOE	449,498	365	45,966	122,932	none	Calculated

***** Note EPA PHED (1998) did not have an exposure estimate value for a scenario for loading powders or liquids with single layer clothing and no gloves with closed loading and mixing or washing. Scenarios A and B are provided as a worst case alternatives.

References for Table IIIA and IIIB:

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