

Exposure Scenarios: Zinc Borate EC# 235-804-2

1.1 Exposure scenario for manufacture of zinc borate									
Systematic title based on use descriptor	ERC	PROC	SU	PC	AC				
	1	1, 2, 3, 8a, 8b, 15	8	0, 12, 19, 21	NA				
Product characteristics	Zinc borate is a fine, white, odourless powder. Particle diameter < 16 µm.								
Amounts used	1,000 T zinc borate per year. Maximum 1 T per shift.								
Frequency and duration of use	300 days/year, 7 days/week, 24 hours/day, 3 shifts/day								
Technical conditions and measures at process level (source) to prevent release	Zinc borate is manufactured in a continuous, automated, remote controlled and completely enclosed system to avoid exposure. No emissions to water.								
Organisational measures to prevent/limit releases, dispersion and exposure	Emissions of substance to the air are controlled by using fabric or bag filters, wet, semi-dry or dry scrubber units and other measures to avoid release of zinc borate particles to the air of workplaces. The potential occupational exposure is periodically monitored by taking personal and/or ambient samples.								
1.2.1 Controlling environmental exposure									
Environment factors not influenced by risk management	Dilution factor 10								
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Release factor to water after on-site treatment	0 g/T							
	Release factor to air after on-site treatment	300 g/T							
Conditions and measures related to municipal sewage treatment plant	Not relevant, no wastewater discharge in this scenario								
Conditions and measures related to external treatment of waste for disposal	Where appropriate material should be recovered and recycled through the process. Waste containing zinc borate should be handled as hazardous waste.								
1.2.2 Environmental exposure estimation									
Environmental Exposure Estimations			PEC boron	PEC zinc	Total RCR				
	Aquatic environment		-	-	0				
	Sediment environment		-	-	0				
	Terrestrial environment		0.01 mg/kg dw	41.33 mg/kg dw	0.388				
1.3.1 Controlling worker exposure									
Human factors not influenced by risk management	Worker body weight of 70 kg. Inhalation volume is 10 m ³ /8h								
Technical onsite conditions and measures to control dispersion from source towards worker	Efficient LEV present during transfer of substance.								
Conditions and measures related to personal protection, hygiene and health evaluation	Clothing	Overalls							
	Gloves	Required							
	Eye protection	Safety glasses							
	RPE	P3 required for most tasks except lab work and remote control of the process							
1.3.2 Occupational exposure estimation									
PROC	Duration (h)	Setting	LEV	RPE	Inhalation exposure (mg/m ³)	Dermal dose (mg/kg bw/d)	RCR inhalation	RCR dermal	RCR combined
Controlling closed, continuous manufacturing process									
No likelihood of exposure, processes contained and controlled from remote									
Packing zinc borate into big bags (1 tonne bags)									
Packing zinc borate into 25 kg bags									
Loading trucks									
Loading of zinc borate into mixing vessels to produce liquid products									
8a	4 to 8	Industrial, indoors	90%	90%	0.50	13.71	0.022	0.009	0.031
8b	4 to 8	Industrial, indoors	90%	90%	0.25	6.86	0.011	0.004	0.016
9	4 to 8	Industrial indoors	90%	90%	0.2	6.86	0.009	0.004	0.013
Loading of zinc borate into mixing vessels to produce liquid products									
1	4 to 8	Industrial indoors	No	No	0.01	0.34	0.0004	0.0002	0.0007
Quality control sampling									
2	0.25 to 1	Industrial indoors	No	90%	0.02	1.37	0.001	0.001	0.002
3	0.25 to 1	Industrial indoors	No	90%	0.02	0.34	0.001	0.0002	0.001
15	0.25 to 1	Industrial indoors	No	90%	0.01	0.34	0.005	0.0002	0.005
Cleaning									
4	0.25 to 1	Industrial indoors	No	90%	0.5	6.86	0.022	0.004	0.027
10	0.25 to 1	Industrial indoors	No	90%	0.2	27.43	0.009	0.017	0.026

2.1 Exposure scenario for formulation of zinc borate into mixtures or materials

Systematic title based on use descriptor	ERC	PROC	SU	PC	AC
	2, 3	1, 2, 3, 4, 5, 6, 8a, 8b, 9, 12, 14, 21, 24	3, 6, 8, 10, 11, 12, 13, 14, 16, 19, 22	1, 9a, 32	1, 2, 4, 7, 8, 10, 11, 13
Product characteristics	Zinc borate is a fine, white, odourless powder.				
Amounts used (T/day)	ES 2a 0.33	ES 2b 3	ES 2c 0.07	ES 2d 75	
Frequency and duration of use	Environmental emissions occur over 365 days/year. Occupational exposure: 12 and 360 operating days/year, 3 to 7 days/week, 1 to 3 shifts of 8 hours each.				
Organisational measures to prevent/limit releases, dispersion and exposure	Emissions of substance to the air are controlled by using fabric or bag filters, wet, semi-dry or dry scrubber units and other measures to avoid release of zinc borate particles to the air of workplaces.				

2.2.1 Controlling environmental exposure

Environment factors not influenced by risk management	Dilution factor	ES 2a	ES 2b	ES 2c	ES 2d
		50	1,000	50	No releases to water
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Release factor to water after on-site treatment	ES 2a, 2b, 2c B: 20,000 g/T Zn: 3,500 g/T		ES 2d B: 0 g/T Zn: 0 g/T	
	Release factor to air after on-site treatment	100 g/T			
Conditions and measures related to municipal sewage treatment plant	No municipal STP has been considered in this scenario, only onsite WWTP were considered.				
Conditions and measures related to external treatment of waste for disposal	Where appropriate material should be recovered and recycled through the process. No external recovery of waste.				

2.2.2 Environmental exposure estimation

		PEC boron	PEC zinc	Total RCR
Environmental Exposure Estimations 2a	Aquatic environment	68 µg/L	4.9 µg/L	0.26
	Sediment environment	-	213.7 mg/kg dw	0.91
	Terrestrial environment	0.01 mg/kg dw	41.3 mg/kg dw	0.39
Environmental Exposure Estimations 2b	Aquatic environment	61.7 µg/L	4.1 µg/L	0.22
	Sediment environment	-	121.7 mg/kg dw	0.52
	Terrestrial environment	0.01 mg/kg dw	41.3 mg/kg dw	0.39
Environmental Exposure Estimations 2c	Aquatic environment	19.4 µg/L	0.7 µg/L	0.13
	Sediment environment	-	87.9 mg/kg dw	0.78
	Terrestrial environment	0.01 mg/kg dw	41.3 mg/kg dw	0.39
Environmental Exposure Estimations 2d	Aquatic environment	-	-	-
	Sediment environment	-	-	-
	Terrestrial environment	0.01 mg/kg dw	41.3 mg/kg dw	0.39

2.3.1 Controlling worker exposure

Human factors not influenced by risk management	Worker body weight of 70 kg. Inhalation volume is 10 m ³ /8h	
Technical onsite conditions and measures to control dispersion from source towards worker	LEV and/or electrostatic precipitators and dust collecting systems are present in areas where products are transferred and mixed.	
Conditions and measures related to personal protection, hygiene and health evaluation	Clothing	Overalls
	Gloves	Required
	Eye protection	Safety glasses
	RPE	P1-P2 required for some tasks (opening of bags and filling material into the mixer)

2.3.2 Occupational exposure estimation

PROC	Duration (h)	Setting	LEV	RPE	Inhalation exposure (mg/m ³)	Dermal dose (mg/kg bw/d)	RCR inhalation	RCR dermal	RCR combined
Transfer of substance and materials during manufacture of plastic and rubber products and formulation									
8a	1 to 4	Industrial, indoors	90%	90%	0.3	13.71	0.013	0.009	0.022
8b	1 to 4	Industrial, indoors	90%	90%	0.15	6.86	0.007	0.004	0.011
9	1 to 4	Industrial, indoors	90%	90%	0.1	6.86	0.005	0.004	0.009
Mixing and blending during manufacture of plastic and rubber products and formulation									
5	0.25 to 1	Industrial, indoors	90%	No	0.5	13.71	0.022	0.009	0.031
Industrial processing of plastic and rubber materials containing 50% w/w zinc borate									

1	4 to 8	Industrial, indoors	90%	No	0.001	0.171 ^(a)	0.00004	0.0001	0.0002
2	4 to 8	Industrial, indoors	90%	No	0.001	0.686 ^(a)	0.00004	0.0004	0.0005
3	4 to 8	Industrial, indoors	90%	No	0.01	0.171 ^(a)	0.0004	0.0001	0.0006
4	4 to 8	Industrial, indoors	90%	No	0.05	3.429 ^(a)	0.002	0.002	0.004
5	4 to 8	Industrial, indoors	90%	No	0.05	6.857 ^(a)	0.002	0.004	0.007
6	4 to 8	Industrial, indoors	90%	No	0.01	13.714 ^(a)	0.0004	0.009	0.009
8a	4 to 8	Industrial, indoors	90%	No	0.05	6.857 ^(a)	0.002	0.004	0.007
8b	4 to 8	Industrial, indoors	90%	No	0.01	3.429 ^(a)	0.0004	0.002	0.003
9	4 to 8	Industrial, indoors	90%	No	0.01	3.429 ^(a)	0.0004	0.002	0.003
14	4 to 8	Industrial, indoors	90%	No	0.01	1.714 ^(a)	0.0004	0.001	0.002
21	4 to 8	Industrial, indoors	90%	No	0.1	1.414 ^(a)	0.005	0.0009	0.005
24a	4 to 8	Industrial, indoors	90%	No	0.1	1.414 ^(a)	0.005	0.0009	0.005
Professional processing of plastic and rubber materials containing 50% w/w zinc borate									
1	4 to 8	Professional, indoors	90%	No	0.001	0.171 ^(a)	0.00004	0.0001	0.0002
2	4 to 8	Professional, indoors	90%	No	0.001	0.686 ^(a)	0.00004	0.0004	0.0005
3	4 to 8	Professional, indoors	90%	No	0.01	0.171 ^(a)	0.0004	0.0001	0.0006
4	4 to 8	Professional, indoors	90%	No	0.1	3.429 ^(a)	0.005	0.002	0.007
5	4 to 8	Professional, indoors	90%	No	0.1	6.857 ^(a)	0.005	0.004	0.009
6	4 to 8	Professional, indoors	90%	No	0.1	13.714 ^(a)	0.005	0.009	0.013
8a	4 to 8	Professional, indoors	90%	No	0.05	6.857 ^(a)	0.002	0.004	0.007
8b	4 to 8	Professional, indoors	90%	No	0.05	3.429 ^(a)	0.002	0.002	0.004
9	4 to 8	Professional, indoors	90%	No	0.05	3.429 ^(a)	0.002	0.002	0.004
14	4 to 8	Professional, indoors	90%	No	0.1	1.714 ^(a)	0.005	0.001	0.006
21	4 to 8	Professional, indoors	90%	No	0.3	1.414 ^(a)	0.013	0.0009	0.014
24a	4 to 8	Professional, indoors	90%	No	0.3	1.414 ^(a)	0.013	0.0009	0.0143

^(a) No release of zinc borate from solid matrices is anticipated. In addition, workers wear gloves, safety glasses and appropriate working suits that minimize dermal exposure. Therefore, the dermal dose given here is likely to be a vast overestimation of the dermal doses.

3.1 Exposure scenario for formulation of zinc borate or formulations containing zinc borate									
Systematic title based on use descriptor	ERC		PROC		SU		PC		AC
		4-7		5, 7, 8a, 10, 11, 13, 19		3, 10, 19, 21, 22		1, 9a, 32	
Product characteristics	Zinc borate is a fine, white, odourless powder.								
Amounts used (T/day)	ES 3a	ES 3b	ES 3c	ES 3d					
	0.33	3	0.07	75					
Frequency and duration of use	Environmental emissions: 365 days/year. Occupational exposure: 225 days/year, 4 to 8 hours/day, 5 consecutive days/week								
Organisational measures to prevent/limit releases, dispersion and exposure	Mixing and spraying processes may be contained and automatic to reduce occupational exposure to airborne particles or aerosols.								
3.2.1 Controlling environmental exposure									
Environment factors not influenced by risk management		ES 3a	ES 3b	ES 3c	ES 3d				
	Dilution factor	50	1,000	50	No releases to water				
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Release factor to water after on-site treatment			ES 3a, 3b, 3c		ES 3d			
	Release factor to air after on-site treatment			1,000 g/T		B: 5,000 g/T Zn: 875 g/T B: 0 g/T Zn: 0 g/T			
Conditions and measures related to municipal sewage treatment plant	No municipal STP has been considered, only onsite WWTP.								
Conditions and measures related to external treatment of waste for disposal	Where appropriate material should be recovered and recycled through the process. No external recovery of waste.								
3.2.2 Environmental exposure estimation									
			PEC boron		PEC zinc		Total RCR		
Environmental Exposure Estimations 3a	Aquatic environment		59.4 µg/L		3.8 µg/L		0.20		
	Sediment environment		-		87.2 mg/kg dw		0.37		
	Terrestrial environment		0.01 mg/kg dw		41.3 mg/kg dw		0.39		
Environmental Exposure Estimations 3b	Aquatic environment		57.8 µg/L		3.6 µg/L		0.19		
	Sediment environment		-		64.2 mg/kg dw		0.27		
	Terrestrial environment		0.01 mg/kg dw		41.3 mg/kg dw		0.39		
Environmental Exposure Estimations 3c	Aquatic environment		18.5 µg/L		0.6 µg/L		0.11		
	Sediment environment		-		74.5 mg/kg dw		0.66		
	Terrestrial environment		0.01 mg/kg dw		41.3 mg/kg dw		0.39		
Environmental Exposure Estimations 3d	Aquatic environment		-		-		-		
	Sediment environment		-		-		-		
	Terrestrial environment		0.01 mg/kg dw		41.3 mg/kg dw		0.39		
3.3.1 Controlling worker exposure									
Human factors not influenced by risk management	Worker body weight of 70 kg. Inhalation volume is 10 m ³ /8h								
Technical onsite conditions and measures to control dispersion from source towards worker	LEV may be present in areas where products are transferred, mixed or applied by spraying.								
Conditions and measures related to personal protection, hygiene and health evaluation	Clothing		Overalls						
	Gloves		Required						
	Eye protection		Safety glasses						
	RPE		Personal respiratory protection possible (spray applications)						
3.3.2 Occupational exposure estimation									
PROC	Duration (h)	Setting	LEV	RPE	Inhalation exposure (mg/m ³)	Dermal dose (mg/kg bw/d)	RCR inhalation	RCR dermal	RCR combined
Industrial use of solid, formulated mixtures containing 50% w/w zinc borate									
5	4 to 8	Industrial, indoors	90%	No	0.5	6.857	0.022	0.004	0.027
7	4 to 8	Industrial, indoors	90%	No	2	21.429	0.0899	0.014	0.103
8a	4 to 8	Industrial, indoors	90%	No	0.5	6.857	0.022	0.004	0.0027
10	4 to 8	Industrial, indoors	90%	No	0.5	13.714	0.022	0.009	0.031
13	4 to 8	Industrial, indoors	No	No	1	6.857	0.045	0.004	0.049
19	4 to 8	Industrial, indoors	90%	No	0.5	70.714	0.022	0.045	0.067
Industrial use of liquid, formulated mixtures containing 25% w/w zinc borate									
5	4 to 8	Industrial, indoors	No	No	0.3	3.429	0.013	0.002	0.016
7	4 to 8	Industrial, indoors	90%	95%	4.65	10.714	0.208	0.007	0.214
8a	4 to 8	Industrial, indoors	No	No	0.3	3.429	0.013	0.002	0.016
10	4 to 8	Industrial, indoors	No	No	0.3	6.857	0.013	0.004	0.018
13	4 to 8	Industrial, indoors	No	No	0.06	3.429	0.003	0.002	0.005

19	4 to 8	Industrial, indoors	No	No	0.3	35.357	0.013	0.022	0.036
Professional use of solid, formulated mixtures containing 50% w/w zinc borate									
5	4 to 8	Professional, indoors	90%	No	0.5	6.857	0.022	0.004	0.027
8a	4 to 8	Professional, indoors	90%	No	0.5	6.857	0.022	0.004	0.027
10	4 to 8	Professional, indoors	90%	No	0.5	13.714	0.022	0.0095	0.031
11	4 to 8	Professional, indoors	90%	No	2	53.571	0.089	0.034	0.123
13	4 to 8	Professional, indoors	90%	No	0.5	6.857	0.022	0.004	0.027
19	4 to 8	Professional, indoors	90%	No	0.5	70.714	0.022	0.045	0.067
Professional use of liquid, formulated mixtures containing 25% w/w zinc borate									
5	4 to 8	Professional, indoors	No	No	0.6	3.429	0.027	0.002	0.029
8a	4 to 8	Professional, indoors	No	No	0.3	3.429	0.013	0.002	0.016
10	4 to 8	Professional, indoors	No	No	0.3	6.857	0.013	0.0041	0.018
11	4 to 8	Professional, indoors	90%	95%	4.65	26.786	0.208	0.017	0.225
13	4 to 8	Professional, indoors	No	No	0.3	3.429	0.013	0.002	0.016
19	4 to 8	Professional, indoors	No	No	0.3	35.357	0.013	0.022	0.036

4.1 Exposure scenario for use of fertilizers containing zinc borate									
Systematic title based on use descriptor		ERC 8e, 8f	PROC 5, 8b	SU 1, 22	PC 12	AC NA			
Product characteristics		The zinc borate is a component of a liquid fertilizer.							
Amounts used		The quantity applied depends from the crop in question.							
Frequency and duration of use		Zinc borate-fertilizers are only used when there are insufficient boron and zinc levels in the soil, and are use in small quantities and short periods of time.							
Organisational measures to prevent/limit releases, dispersion and exposure		Drift should be minimised. Application rate should be adjusted to the soil and crop requirements.							
4.2.1 Controlling environmental exposure									
Environment factors not influenced by risk management		Used on soils that have low concentrations of boron and zinc.							
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil		There are no direct releases to adjacent surface waters.							
Conditions and measures related to municipal sewage treatment plant		Not relevant							
Conditions and measures related to external treatment of waste for disposal		Not relevant							
4.2.2 Environmental exposure estimation									
No calculated exposure scenario is required. Zinc borate should only be applied to soil in cases of deficiency and drift should be minimized.									
4.3.1 Controlling worker exposure									
Human factors not influenced by risk management		Worker body weight of 70 kg. Inhalation volume is 10 m ³ /8h							
Technical onsite conditions and measures to control dispersion from source towards worker		The liquid diluted fertilizer is applied to the soil by avoiding the formation of aerosols. The worker sits in an air-conditioned cabin, with air filtered through active carbon or paper filters.							
Conditions and measures related to personal protection, hygiene and health evaluation		Clothing	-						
		Gloves	Required						
		Eye protection	Safety glasses						
		RPE	-						
4.3.2 Occupational exposure estimation									
PROC	Duration (h)	Setting	LEV	RPE	Inhalation exposure (mg/m ³)	Dermal dose (mg/kg bw/d)	RCR inhalation	RCR dermal	RCR combined
Professional direct handling of fertilizer suspension concentrate containing 50% w/w zinc borate									
5	0.25 to 1	Professional, indoors	No	No	0.2	6.857	0.009	0.004	0.013
8b	0.25 to 1	Professional, indoors	No	No	0.1	3.429	0.005	0.002	0.007
5	0.25 to 1	Professional, outdoors	No	No	0.14	6.857	0.006	0.0043	0.011
8b	0.25 to 1	Professional, outdoors	No	No	0.07	3.429	0.0031	0.002	0.005

4.1 Exposure scenario for use of fertilizers containing zinc borate									
Systematic title based on use descriptor	ERC	PROC	SU	PC	AC				
	8e, 8f	5, 8b	1, 22	12	NA				
Product characteristics	The zinc borate is a component of a liquid fertilizer.								
Amounts used	The quantity applied depends from the crop in question.								
Frequency and duration of use	Zinc borate-fertilizers are only used when there are insufficient boron and zinc levels in the soil, and are use in small quantities and short periods of time.								
Organisational measures to prevent/limit releases, dispersion and exposure	Drift should be minimised. Application rate should be adjusted to the soil and crop requirements.								
4.2.1 Controlling environmental exposure									
Environment factors not influenced by risk management	Used on soils that have low concentrations of boron and zinc.								
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	There are no direct releases to adjacent surface waters.								
Conditions and measures related to municipal sewage treatment plant	Not relevant								
Conditions and measures related to external treatment of waste for disposal	Not relevant								
4.2.2 Environmental exposure estimation									
No calculated exposure scenario is required. Zinc borate should only be applied to soil in cases of deficiency and drift should be minimized.									
4.3.1 Controlling worker exposure									
Human factors not influenced by risk management	Worker body weight of 70 kg. Inhalation volume is 10 m ³ /8h								
Technical onsite conditions and measures to control dispersion from source towards worker	The liquid diluted fertilizer is applied to the soil by avoiding the formation of aerosols. The worker sits in an air-conditioned cabin, with air filtered through active carbon or paper filters.								
Conditions and measures related to personal protection, hygiene and health evaluation	Clothing	-							
	Gloves	Required							
	Eye protection	Safety glasses							
	RPE	-							
4.3.2 Occupational exposure estimation									
PROC	Duration (h)	Setting	LEV	RPE	Inhalation exposure (mg/m ³)	Dermal dose (mg/kg bw/d)	RCR inhalation	RCR dermal	RCR combined
Professional direct handling of fertilizer suspension concentrate containing 50% w/w zinc borate									
5	0.25 to 1	Professional, indoors	No	No	0.2	6.857	0.009	0.004	0.013
8b	0.25 to 1	Professional, indoors	No	No	0.1	3.429	0.005	0.002	0.007
5	0.25 to 1	Professional, outdoors	No	No	0.14	6.857	0.006	0.0043	0.011
8b	0.25 to 1	Professional, outdoors	No	No	0.07	3.429	0.0031	0.002	0.005

5.1 Exposure scenario for zinc borate in plastics during service life					
Systematic title based on use descriptor	ERC	PROC	SU	PC	AC
	10a, 11a	NA	NA	NA	NA
Product characteristics	The zinc borate is encapsulated in the polymer matrix, solid or liquid.				
Amounts used	3,000 T zinc borate per year.				
Frequency and duration of use	365 days per year, continuous				
Technical conditions and measures at process level (source) to prevent release	The zinc borate is included into a mixture and then included into an article.				
Organisational measures to prevent/limit releases, dispersion and exposure	None				
5.2.1 Controlling environmental exposure					
Environment factors not influenced by risk management	Dilution factor 10				
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Release factor to water after on-site treatment	100 g/T			
	Release factor to air after on-site treatment	0 g/T			
Conditions and measures related to municipal sewage treatment plant	Default municipal STP				
Conditions and measures related to external treatment of waste for disposal	At the end of the lifecycle the article should be correctly disposed. Waste containing zinc borate should be disposed of correctly in accordance to local regulations.				
5.2.2 Environmental exposure estimation					
Environmental Exposure Estimations		PEC boron	PEC zinc	Total RCR	
	Aquatic environment	56.5	3.4	0.19	
	Sediment environment	-	45	0.19	
	Terrestrial environment	0.01	41.3	0.39	
5.3.1 Controlling worker exposure					
Human factors not influenced by risk management	-				
Technical onsite conditions and measures to control dispersion from source towards worker	-				
Conditions and measures related to personal protection, hygiene and health evaluation	Clothing	-			
	Gloves	-			
	Eye protection	-			
	RPE	-			
5.3.2 Occupational exposure estimation					
Not applicable. Final products may be solid or liquid and in the majority of cases will be used in such a way that the zinc borate will be bound to a solid matrix from which it will not be released.					

6.1 Exposure scenario for use of zinc borate in lubricants in cars					
Systematic title based on use descriptor	ERC	PROC	SU	PC	AC
		9b	NA	NA	NA
Product characteristics	The zinc borate is a component of a lubricant used in a closed system in a car.				
Amounts used	< 10 T zinc borate per year.				
Frequency and duration of use	365 days per year, continuous				
Technical conditions and measures at process level (source) to prevent release	Zinc borate is used in completely closed systems with no releases to the environment.				
Organisational measures to prevent/limit releases, dispersion and exposure	None				
6.2.1 Controlling environmental exposure					
Environment factors not influenced by risk management	-				
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Release factor to water after on-site treatment	B: 0 g/T Zn: 0 g/T			
	Release factor to air after on-site treatment	B: 0 g/T Zn: 0 g/T			
Conditions and measures related to municipal sewage treatment plant	Default municipal STP				
Conditions and measures related to external treatment of waste for disposal	The article should be removed by licensed professionals according to the environmental laws, at the end of the service life. The lubricant is not recycled.				
6.2.2 Environmental exposure estimation					
No release to the environment.					
6.3.1 Controlling worker exposure					
Human factors not influenced by risk management	-				
Technical onsite conditions and measures to control dispersion from source towards worker	-				
Conditions and measures related to personal protection, hygiene and health evaluation	Clothing	-			
	Gloves	-			
	Eye protection	-			
	RPE	-			
6.3.2 Occupational exposure estimation					
Not relevant, the use of zinc borate as a lubricant in cars is in completely closed systems with no exposure to consumers.					

7.1 Exposure scenario for consumer use of formulated products and materials containing zinc borate

	ERC	PROC	SU	PC	AC
Systematic title based on use descriptor	6	-	NA	1, 9a, 32	1, 2, 4, 7, 8, 11, 13
Product characteristics	Glues and adhesives, intumescent coatings and powdery products				
Amounts used	4.25 – 15,000 g/event				
Frequency and duration of use	0.25 - 52 events/year				
Technical conditions and measures at process level (source) to prevent release	No emissions to the environment.				

7.2.1 Controlling environmental exposure

Environment factors not influenced by risk management	-				
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Release factor to water after on-site treatment	B: 0 g/T Zn: 0 g/T			
	Release factor to air after on-site treatment	B: 0 g/T Zn: 0 g/T			
Conditions and measures related to municipal sewage treatment plant	-				
Conditions and measures related to external treatment of waste for disposal	-				

7.2.2 Environmental exposure estimation

No intended emissions to the environment. No exposure.

7.3.1 Controlling worker exposure

Human factors not influenced by risk management	Consumer body weight of 60 kg. Inhalation volume of 20 m ³ /day.				
Technical onsite conditions and measures to control dispersion from source towards consumer	Consumers may come into contact with glues or sealants containing zinc borate, but intumescent coatings are not available to consumers. Consumer exposure to zinc borate due to the use of sealants is negligible because the substance is not released from the matrix. Low air exchange rate of 0.6/hour and a room volume of 20 m ³ assumed. Adhesives and sealants should be used in well-ventilated rooms.				
Conditions and measures related to personal protection, hygiene and health evaluation	Clothing	-			
	Gloves	-			
	Eye protection	-			
	RPE	-			

7.3.2 Occupational exposure estimation

Type of glue	Frequency (event/year)	Use amount (g/event)	Inhalation exposure (mg/m ³)	Dermal dose (mg/kg bw/d)	RCR inhalation	RCR dermal	RCR combined
Glue in tube	52	9	1.79 x 10 ⁻⁴	0.308	0.00002	0.0003	0.0003
Glue in bottle (universal)	52	10	1.8 x 10 ⁻⁴	0.308	0.00002	0.0003	0.0003
Glue in bottle (construction)	2	250	1.82 x 10 ⁻⁴	0.962	0.00002	0.0008	0.0008
Carpet glue	0.25	9,000	5.7 x 10 ⁻⁵	8.65	0.000007	0.007	0.007
Tile glue, mixing	0.5	15,000	7.5 x 10 ⁻⁴	3.38 x 10 ⁻³	0.00009	0.0000	0.00009
Tile glue, use	0.5	15,000	3.75 x 10 ⁻⁴	41.5	0.00005	0.034	0.034
Wallpaper glue, mixing a)	0.5	Not given	7.5 x 10 ⁻⁴	3.38 x 10 ⁻³	0.00009	0.0000	0.00009
Wallpaper glue, use a), b)	0.5	Not given	5.7 x 10 ⁻⁵	27.7	0.000007	0.023	0.023
Hot melt adhesive	12	65	2.61 x 10 ⁻⁵	0.769	0.000003	0.0006	0.0006
Spray glue	12	4.25	0.0716	1.09	0.009	0.0009	0.010