EXPOSURE SCENARIO FOR COMMUNICATION

Substance Name: zinc oxide
EC Number: 215-222-5
CAS Number: 1314-13-2
Registration Number:
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Author: IZA Europe

Table of Contents

1. ES 1: Manufacture

1.1. Title section

ES name: *Zinc oxide production - pyrometallurgical process*

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 1
2: *Discharge via additional off-site sewage treatment plant*	ERC 1
Worker	
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2
4: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
5: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
6: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
7: *Manufacturing and processing of minerals and/or metals at substantially elevated temperature*	PROC 22
8: *Handling of solid inorganic substances at ambient temperature*	PROC 26
9: *Manual maintenance (cleaning and repair) of machinery*	PROC 28

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 1)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 50 tonnes/day
Annual amount per site <= 1.5E4 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
Assumed effluent discharge flow from site >= 2E3 m3/day

1.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 1)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 50 tonnes/day
Annual amount per site <= 1.5E4 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.

Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

1.3. Exposure estimation and reference to its source

1.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

2. ES 2: Manufacture

2.1. Title section

ES name: *Zinc oxide production - hydrometallurgical process*

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 1
2: *Discharge via additional off-site sewage treatment plant*	ERC 1
Worker	
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2
4: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
5: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
6: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
7: *Manufacturing and processing of minerals and/or metals at substantially elevated temperature*	PROC 22
8: *Handling of solid inorganic substances at ambient temperature*	PROC 26
9: *Manual maintenance (cleaning and repair) of machinery*	PROC 28

2.2. Conditions of use affecting exposure

2.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 1)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 25 tonnes/day
Annual amount per site <= 7.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day
Local freshwater dilution factor 500
Local marine water dilution factor 100

2.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 1)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 25 tonnes/day
Annual amount per site <= 7.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant

Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Local freshwater dilution factor 500
Local marine water dilution factor 100

2.3. Exposure estimation and reference to its source

2.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

3. ES 3: Manufacture

3.1. Title section

ES name: *Zinc oxide production in the catalyst sector*

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 1
2: *Discharge via additional off-site sewage treatment plant*	ERC 1
Worker	
3: *Chemical production or refinery in closed continuous process without likelihood of exposure or processes with equivalent containment conditions*	PROC 1
4: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2
5: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
6: *Chemical production where opportunity for exposure arises*	PROC 4
7: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
8: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
9: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
10: *Manual maintenance (cleaning and repair) of machinery*	PROC 28

3.2. Conditions of use affecting exposure

3.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 1)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 5.7 tonnes/day
Annual amount per site <= 1.62E3 tonnes/year
Technical and organisational conditions and measures
Direct emissions to air should be mitigated by application of one or more of the following RMMs: • HEPA filtration (ESCOM 9267234005), Fabric filters (ESCOM 9267234003) and Bag or Ceramic Filters (ESCOM 12355002122) • Wet Scrubbers (ESCOM 9267234016) • Dry or semi-dry Scrubbers (No available ESCOM phrase) • Metallic Grids (ESCOM 12355002122)
Direct emissions to water should be mitigated by application of one or more of the following RMMs: • Precipitation (ESCOM 12355002126) • Sedimentation (ESCOM 12355002126) • Filtration (ESCOM 12355002126) • Distillation (ESCOM 9267234037) • Ion Exchange (ESCOM 12355002126)
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day
Local freshwater dilution factor 10
Local marine water dilution factor 100

3.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 1)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 5.7 tonnes/day
Annual amount per site <= 1.62E3 tonnes/year
Technical and organisational conditions and measures

Direct emissions to air should be mitigated by application of one or more of the following RMMs: • HEPA filtration (ESCOM 9267234005), Fabric filters (ESCOM 9267234003) and Bag or Ceramic Filters (ESCOM 12355002122) • Wet Scrubbers (ESCOM 9267234016) • Dry or semi-dry Scrubbers (No available ESCOM phrase) • Metallic Grids (ESCOM 12355002122)
Direct emissions to water should be mitigated by application of one or more of the following RMMs: • Precipitation (ESCOM 12355002126) • Sedimentation (ESCOM 12355002126) • Filtration (ESCOM 12355002126) • Distillation (ESCOM 9267234037) • Ion Exchange (ESCOM 12355002126)
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Local freshwater dilution factor 10
Local marine water dilution factor 100

3.3. Exposure estimation and reference to its source

3.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

4. ES 4: Manufacture

4.1. Title section

ES name: *Nano zinc oxide production*

Environment	
1: *No emissions to water and air*	ERC 1
Worker	
2: *Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions*	PROC 1
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2
4: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
5: Transfer of substance or mixture (charging/discharging) at dedicated facilities	PROC 8b
6: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)	PROC 9
7: Manufacturing and processing of minerals and/or metals at substantially elevated temperature	PROC 22
8: Handling of solid inorganic substances at ambient temperature	PROC 26

4.2. Conditions of use affecting exposure

4.2.1. Control of environmental exposure: *No emissions to water and air* (ERC 1)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 10 tonnes/day
Annual amount per site <= 3E3 tonnes/year
Technical and organisational conditions and measures
The substance should not be released to water
The substance should not be released to air
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day

4.3. Exposure estimation and reference to its source

4.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

5. ES 5: Formulation or re-packing; Fertilizers (PC 12)

5.1. Title section

ES name: *Industrial distribution, repacking from big to smaller containers*
Product category: Fertilizers (PC 12)

Environment	
1: *No emissions to water*	ERC 2
Worker	
2: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
3: *Mixing or blending in batch processes*	PROC 5
4: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
5: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
6: *Use as laboratory reagent*	PROC 15

5.2. Conditions of use affecting exposure

5.2.1. Control of environmental exposure: *No emissions to water* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 1 tonnes/day
Annual amount per site <= 100 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
The substance should not be released to water
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day

5.3. Exposure estimation and reference to its source

5.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

6. ES 6: Formulation or re-packing; Various products (PC 0, PC 14, PC 16, PC 18, PC 24, PC 26, PC 33)

6.1. Title section

ES name: *Generic formulation of zinc oxide*
Product category: Other (PC 0), Metal surface treatment products (PC 14), Heat Transfer Fluids (PC 16), Ink and Toners (PC 18), Lubricants, Greases, Release Products (PC 24), Paper and board treatment products (PC 26), Semiconductors (PC 33)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 2
2: *Discharge via additional off-site sewage treatment plant*	ERC 2
Worker	
3: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
4: *Mixing or blending in batch processes*	PROC 5
5: *Transfer of substance or mixture (charging and discharging) at non-dedicated facilities*	PROC 8a
6: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
7: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
8: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
9: *Handling of solid inorganic substances at ambient temperature*	PROC 26

6.2. Conditions of use affecting exposure

6.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.1 tonnes/day
Annual amount per site <= 25 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day
Local freshwater dilution factor 10
Local marine water dilution factor 100

6.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.1 tonnes/day
Annual amount per site <= 25 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter

Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Local freshwater dilution factor 10
Local marine water dilution factor 100

6.3. Exposure estimation and reference to its source

6.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

7. ES 7: Formulation or re-packing; Various products (PC 0, PC 14, PC 16, PC 18, PC 24, PC 33)

7.1. Title section

ES name: *Generic formulation of nano zinc oxide*
Product category: Other (PC 0), Metal surface treatment products (PC 14), Heat Transfer Fluids (PC 16), Ink and Toners (PC 18), Lubricants, Greases, Release Products (PC 24), Semiconductors (PC 33)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 2
2: *Discharge via additional off-site sewage treatment plant*	ERC 2
Worker	
3: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions	PROC 2
4: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
5: *Mixing or blending in batch processes*	PROC 5
6: *Transfer of substance or mixture (charging and discharging) at non-dedicated facilities*	PROC 8a
7: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
8: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
9: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
10: *Handling of solid inorganic substances at ambient temperature*	PROC 26

7.2. Conditions of use affecting exposure

7.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.1 tonnes/day
Annual amount per site <= 25 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day
Local freshwater dilution factor 10
Local marine water dilution factor 100

7.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.1 tonnes/day
Annual amount per site <= 25 tonnes/year
Technical and organisational conditions and measures

Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Local freshwater dilution factor 10
Local marine water dilution factor 100

7.3. Exposure estimation and reference to its source

7.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

8. ES 8: Formulation or re-packing; Polymer Preparations and Compounds (PC 32)

8.1. Title section

ES name: *Formulation of bulk ZnO in uncured rubber mixtures*
Product category: Polymer Preparations and Compounds (PC 32)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 3
2: *Discharge via additional off-site sewage treatment plant*	ERC 3
Worker	
3: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions	PROC 1
4: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions	PROC 2
5: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
6: Chemical production where opportunity for exposure arises	PROC 4
7: *Mixing or blending in batch processes*	PROC 5
8: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
9: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
10: *Roller application or brushing*	PROC 10
11: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
12: *Low energy manipulation and handling of substances bound in/on materials or articles*	PROC 21
13: Handling of solid inorganic substances at ambient temperature	PROC 26

8.2. Conditions of use affecting exposure

8.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 3)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 5 tonnes/day
Annual amount per site <= 1.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day
Local freshwater dilution factor 10
Local marine water dilution factor 100

8.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 3)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 5 tonnes/day

Annual amount per site <= 1.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Local freshwater dilution factor 10
Local marine water dilution factor 100

8.3. Exposure estimation and reference to its source

8.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

9. ES 9: Use at industrial sites; Polymer Preparations and Compounds (PC 32); Manufacture of rubber products (SU 11)

9.1. Title section

ES name: *Industrial use of bulk ZnO as additive for production of rubber, resins and related preparations*
Product category: Polymer Preparations and Compounds (PC 32)
Sector of use: Manufacture of rubber products (SU 11)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 6d
2: *Discharge via additional off-site sewage treatment plant*	ERC 6d
Worker	
3: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
4: Chemical production where opportunity for exposure arises	PROC 4
5: *Mixing or blending in batch processes*	PROC 5
6: Calendering operations	PROC 6
7: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
8: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
9: *Roller application or brushing*	PROC 10
10: Treatment of articles by dipping and pouring	PROC 13
11: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
12: *Low energy manipulation and handling of substances bound in/on materials or articles*	PROC 21
13: High (mechanical) energy work-up of substances bound in/on materials and/or articles	PROC 24
Subsequent service life exposure scenario(s)	
ES 10: Service life (consumers); Various articles (AC 2, AC 10)	
ES 11: Service life (consumers); Various articles (AC 1, AC 10)	

9.2. Conditions of use affecting exposure

9.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 6d)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 5 tonnes/day
Annual amount per site <= 1.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day
Local freshwater dilution factor 10
Local marine water dilution factor 100

9.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 6d)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 5 tonnes/day
Annual amount per site <= 1.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Local freshwater dilution factor 10
Local marine water dilution factor 100

9.3. Exposure estimation and reference to its source

9.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

10. ES 10: Service life (consumers); Various articles (AC 2, AC 10)

10.1. Title section

ES name: *Service life of rubber articles containing bulk ZnO*
Article category: Machinery, mechanical appliances, electrical/electronic articles (AC 2), Rubber articles (AC 10)

Environment	
1: *Service life of rubber articles containing bulk ZnO*	ERC 10a, ERC 11a
Consumer	
2: *Machinery, mechanical appliances, electrical/electronic articles*	AC 2
3: *Rubber articles*	AC 10
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 9: Use at industrial sites; Polymer Preparations and Compounds (PC 32); Manufacture of rubber products (SU 11)	

10.2. Conditions of use affecting exposure

10.2.1. Control of environmental exposure: *Service life of rubber articles containing bulk ZnO* (ERC 10a, ERC 11a)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

10.3. Exposure estimation and reference to its source

10.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

11. ES 11: Service life (consumers); Various articles (AC 1, AC 10)

11.1. Title section

ES name: *Service life of tyres containing bulk ZnO*
Article category: Vehicles (AC 1), Rubber articles (AC 10)

Environment	
1: *Service life of tyres containing bulk ZnO*	ERC 10b, ERC 11b
Consumer	
2: *Vehicles*	AC 1
3: *Rubber articles*	AC 10
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 9: Use at industrial sites; Polymer Preparations and Compounds (PC 32); Manufacture of rubber products (SU 11)	

11.2. Conditions of use affecting exposure

11.2.1. Control of environmental exposure: *Service life of tyres containing bulk ZnO* (ERC 10b, ERC 11b)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

11.3. Exposure estimation and reference to its source

11.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

12. ES 12: Formulation or re-packing; Polymer Preparations and Compounds (PC 32)

12.1. Title section

ES name: *Formulation of nano ZnO in uncured rubber mixtures*
Product category: Polymer Preparations and Compounds (PC 32)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 3
2: *Discharge via additional off-site sewage treatment plant*	ERC 3
Worker	
3: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions	PROC 1
4: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions	PROC 2
5: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
6: Chemical production where opportunity for exposure arises	PROC 4
7: *Mixing or blending in batch processes*	PROC 5
8: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
9: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
10: *Roller application or brushing*	PROC 10
11: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
12: *Low energy manipulation and handling of substances bound in/on materials or articles*	PROC 21
13: Handling of solid inorganic substances at ambient temperature	PROC 26

12.2. Conditions of use affecting exposure

12.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 3)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 5 tonnes/day
Annual amount per site <= 1.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day
Local freshwater dilution factor 10
Local marine water dilution factor 100

12.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 3)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 5 tonnes/day

Annual amount per site <= 1.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Local freshwater dilution factor 10
Local marine water dilution factor 100

12.3. Exposure estimation and reference to its source

12.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

13. ES 13: Use at industrial sites; Polymer Preparations and Compounds (PC 32); Manufacture of rubber products (SU 11)

13.1. Title section

ES name: *Industrial use of coated or uncoated nano ZnO as additive for production of rubber, resins and related preparations*
Product category: Polymer Preparations and Compounds (PC 32)
Sector of use: Manufacture of rubber products (SU 11)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 6d
2: *Discharge via additional off-site sewage treatment plant*	ERC 6d
Worker	
3: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
4: Chemical production where opportunity for exposure arises	PROC 4
5: *Mixing or blending in batch processes*	PROC 5
6: Calendering operations	PROC 6
7: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
8: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
9: *Roller application or brushing*	PROC 10
10: Treatment of articles by dipping and pouring	PROC 13
11: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
12: *Low energy manipulation and handling of substances bound in/on materials or articles*	PROC 21
13: High (mechanical) energy work-up of substances bound in/on materials and/or articles	PROC 24
Subsequent service life exposure scenario(s)	
ES 14: Service life (consumers); Various articles (AC 2, AC 10)	
ES 15: Service life (consumers); Various articles (AC 1, AC 10)	

13.2. Conditions of use affecting exposure

13.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 6d)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 5 tonnes/day
Annual amount per site <= 1.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day
Local freshwater dilution factor 10

Local marine water dilution factor 100

13.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 6d)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 5 tonnes/day
Annual amount per site <= 1.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Local freshwater dilution factor 10
Local marine water dilution factor 100

13.3. Exposure estimation and reference to its source

13.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

14. ES 14: Service life (consumers); Various articles (AC 2, AC 10)

14.1. Title section

ES name: *Service life of rubber articles containing nano ZnO*
Article category: Machinery, mechanical appliances, electrical/electronic articles (AC 2), Rubber articles (AC 10)

Environment	
1: *Service life of rubber articles containing nano ZnO*	ERC 10a, ERC 11a
Consumer	
2: *Machinery, mechanical appliances, electrical/electronic articles*	AC 2
3: *Rubber articles*	AC 10
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 13: Use at industrial sites; Polymer Preparations and Compounds (PC 32); Manufacture of rubber products (SU 11)	

14.2. Conditions of use affecting exposure

14.2.1. Control of environmental exposure: *Service life of rubber articles containing nano ZnO* (ERC 10a, ERC 11a)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

14.3. Exposure estimation and reference to its source

14.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

15. ES 15: Service life (consumers); Various articles (AC 1, AC 10)

15.1. Title section

ES name: *Service life of tyres containing nano ZnO*
Article category: Vehicles (AC 1), Rubber articles (AC 10)

Environment	
1: *Service life of tyres containing nano ZnO*	ERC 10b, ERC 11b
Consumer	
2: *Vehicles*	AC 1
3: *Rubber articles*	AC 10
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 13: Use at industrial sites; Polymer Preparations and Compounds (PC 32); Manufacture of rubber products (SU 11)	

15.2. Conditions of use affecting exposure

15.2.1. Control of environmental exposure: *Service life of tyres containing nano ZnO* (ERC 10b, ERC 11b)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

15.3. Exposure estimation and reference to its source

15.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

16. ES 16: Formulation or re-packing; Various products (PC 1, PC 9b)

16.1. Title section

ES name: *Formulation of bulk ZnO in adhesives / sealants / mastics*
Product category: Adhesives, Sealants (PC 1), Fillers, putties, plasters, modelling clay (PC 9b)

Environment		SPERC
1: *Formulation of solvent-borne and solvent-less adhesives / sealants and construction chemical products - non-volatile substances*	ERC 2	*FEICA / EFCC SPERC 2.1a.v3*
2: *Formulation of water-borne adhesives / sealants and construction chemical products – non-volatile substances*	ERC 2	*FEICA / EFCC SPERC 2.2b.v3*
Worker		SWED
3: *Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.*	PROC 1	
4: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2	
5: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition*	PROC 3	
6: *Chemical production where opportunity for exposure arises*	PROC 4	
7: *Mixing or blending in batch processes*	PROC 5	
8: *Transfer of substance or mixture (charging and discharging) at non-dedicated facilities*	PROC 8a	
9: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b	
10: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9	
11: *Use as laboratory reagent*	PROC 15	
12: *Handling of solid inorganic substances at ambient temperature*	PROC 26	

16.2. Conditions of use affecting exposure

16.2.1. Control of environmental exposure: *Formulation of solvent-borne and solvent-less adhesives / sealants and construction chemical products - non-volatile substances* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.167 tonnes/day
Annual amount per site <= 50 tonnes/year
Technical and organisational conditions and measures
High degree of automation in adhesive / sealant formulation
The manufacture of adhesive chemicals is a multi-stage batch process. The process is arranged to maximise the efficiency of use of input raw materials, through the highest conversion into formulated products.
use of closed or covered manufacturing equipment to minimise evaporative losses of solids below respective OELs. Use of general and manufacturing plant extraction.
Air extraction systems with dust filters during transfer and formulation of powder raw materials with efficiencies of 99%
Conditions and measures related to biological sewage treatment plant

Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Equipment cleaned with organic solvent, washings are collected and disposed of as solvent waste
Other conditions affecting environmental exposure
No water contact during use.
Indoor use

16.2.2. Control of environmental exposure: *Formulation of water-borne adhesives / sealants and construction chemical products – non-volatile substances* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.05 tonnes/day
Annual amount per site <= 15 tonnes/year
Technical and organisational conditions and measures
High degree of automation in adhesive / sealant formulation
The manufacture of adhesive chemicals is a multi-stage batch process. The process is arranged to maximise the efficiency of use of input raw materials, through the highest conversion into formulated products.
use of closed or covered manufacturing equipment to minimise evaporative losses of solids below respective OELs. Use of general and manufacturing plant extraction.
Air extraction systems with dust filters during transfer and formulation of powder raw materials with efficiencies of 99%
Conditions and measures related to biological sewage treatment plant
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Equipment cleaned with water, washing disposed of with wastewater
Other conditions affecting environmental exposure
Indoor use

16.3. Exposure estimation and reference to its source

16.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

17. ES 17: Use at industrial sites; Various products (PC 1, PC 9b, PC 32); Various sectors; automated use of adhesives by roller or brushing application

17.1. Title section

ES name: *Industrial use of bulk ZnO as additive contained in adhesives / sealants / mastics*
Product category: Adhesives, Sealants (PC 1), Fillers, putties, plasters, modelling clay (PC 9b), Polymer Preparations and Compounds (PC 32)
Sector of use: Manufacture of wood and wood products (SU 6a), Manufacture of pulp, paper and paper products (SU 6b), Manufacture of fabricated metal products, except machinery and equipment (SU 15), Manufacture of computer, electronic and optical products, electrical equipment (SU 16), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Manufacture of furniture (SU 18)

Environment		SPERC
1: *Industrial use of non-volatile substances in solvent-borne and solvent-less adhesives / sealants*	ERC 5	*FEICA SPERC 5.1a.v3*
2: *Industrial use of non-volatile substances in water borne adhesives / sealants*	ERC 5	*FEICA SPERC 5.1c.v3*
Worker		SWED
3: *Changing of containers, drums or buckets for industrial application equipment*	PROC 8b	FEICA SWED IS_8b_i-a
4: *Industrial automatic use of adhesives*	PROC 10	FEICA SWED IS_10_i-c
5: *Industrial automatic spray application of adhesives*	PROC 7	FEICA SWED IS_7_i-a
6: *Industrial manual spray application of adhesives with spray guns in a ventilated booth*	PROC 7	FEICA SWED IS_7_i-b
7: *Industrial small scale use of adhesives, sealants and primers*	PROC 10	FEICA SWED IS_10_i-d
8: *Industrial use of adhesives, sealants and primers, manual application without LEV*	PROC 10	FEICA SWED IS_10_i-f
Subsequent service life exposure scenario(s)		
ES 20: Service life (consumers); Various articles (AC 1, AC 2, AC 4, AC 6, AC 7, AC 8, AC 10, AC 11, AC 13)		

17.2. Conditions of use affecting exposure

17.2.1. Control of environmental exposure: *Industrial use of non-volatile substances in solvent-borne and solvent-less adhesives / sealants* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.167 tonnes/day
Annual amount per site <= 50 tonnes/year
Technical and organisational conditions and measures
High degree of automation in adhesive / sealant formulation
Conditions and measures related to biological sewage treatment plant
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Equipment cleaned with organic solvent, washings are collected and disposed of as external solvent waste.

Mats used for scavenging overspray are disposed as external waste (no wet-scrubbing).
Other conditions affecting environmental exposure
Indoor use
No water contact during use.

17.2.2. Control of environmental exposure: *Industrial use of non-volatile substances in water borne adhesives / sealants* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.05 tonnes/day
Annual amount per site <= 15 tonnes/year
Technical and organisational conditions and measures
High degree of automation in adhesive / sealant formulation
Equipment cleaned with water, additional wastewater emission controls are not applicable as releases to wastewater are small.
Targeted application of adhesive / sealant to substrate, Upon curing, substances are included into matrix without intended release to the environment. Solvents evaporate to a significant extent upon curing of the adhesives.
Conditions and measures related to biological sewage treatment plant
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Equipment cleaned with water, washing disposed of with wastewater. Low amount of solid waste (mats used for scavenging overspray) is disposed as external waste (no wet-scrubbing).
Other conditions affecting environmental exposure
Indoor use
No water contact during use.

17.3. Exposure estimation and reference to its source

17.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

18. ES 18: Widespread use by professional workers; Various products (PC 1, PC 9b, PC 24); Various sectors; small scale application of adhesives, sealants or primers

18.1. Title section

ES name: *Professional use of bulk ZnO as additive contained in adhesives / sealants / mastics*
Product category: Adhesives, Sealants (PC 1), Fillers, putties, plasters, modelling clay (PC 9b), Lubricants, Greases, Release Products (PC 24)
Sector of use: Manufacture of wood and wood products (SU 6a), Manufacture of pulp, paper and paper products (SU 6b), Manufacture of fabricated metal products, except machinery and equipment (SU 15), Manufacture of computer, electronic and optical products, electrical equipment (SU 16), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17)

Environment		SPERC
1: *Widespread use of non-volatile substances in adhesives / sealants - indoor*	ERC 8c	*FEICA SPERC 8c.3.v3*
2: *Widespread use of non-volatile substances in adhesives / sealants and construction chemical products - outdoor*	ERC 8f	*FEICA / EFCC SPERC 8f.1a.v2*
Worker		SWED
3: *Professional small scale indoor use of adhesives, sealants or primers by low energy spreading*	PROC 10	FEICA SWED PW_10_i-a
4: *Professional small scale outdoor use of adhesives, sealants or primers by low energy spreading*	PROC 10	FEICA SWED PW_10_o-a
Subsequent service life exposure scenario(s)		
ES 20: Service life (consumers); Various articles (AC 1, AC 2, AC 4, AC 6, AC 7, AC 8, AC 10, AC 11, AC 13)		

18.2. Conditions of use affecting exposure

18.2.1. Control of environmental exposure: *Widespread use of non-volatile substances in adhesives / sealants - indoor* (ERC 8c)

Technical and organisational conditions and measures
Manual raw materials handling
Information on proper dosing is provided on packaging.
Equipment cleaned with solvent (organic or water), washing disposed of with wastewater
Professional and consumer product use with limited or no technical control of emission. Upon curing, substances are included into matrix without intended release to the environment. Very little water contact possible.
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Residues of products must be cured in the container before discarded via household waste. Larger solvent washing volumes are collected and disposed of as solvent waste.
Other conditions affecting environmental exposure
Indoor use

18.2.2. Control of environmental exposure: *Widespread use of non-volatile substances in adhesives / sealants and construction chemical products - outdoor* (ERC 8f)

Technical and organisational conditions and measures
Manual raw materials handling
Information on proper dosing is provided on packaging.
Equipment cleaned with solvent (organic or water), washing disposed of with wastewater
Professional and consumer product use with limited or no technical control of emission. Upon curing, substances are included into matrix without intended release to the environment. Very little water contact possible.
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Residues of products must be cured in the container before discarded via household waste. Larger solvent washing volumes are collected and disposed of as solvent waste.
Other conditions affecting environmental exposure
Outdoor use

18.3. Exposure estimation and reference to its source

18.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

19. ES 19: Consumer use; Various products (PC 1, PC 9b); joint sealants

19.1. Title section

ES name: *Consumer use of bulk ZnO as additive contained in adhesives / sealants / mastics*
Product category: Adhesives, Sealants (PC 1), Fillers, putties, plasters, modelling clay (PC 9b)

Environment		SPERC
1: *Widespread use of non-volatile substances in adhesives / sealants - indoor*	ERC 8c	*FEICA SPERC 8c.3.v3*
2: *Widespread use of non-volatile substances in adhesives / sealants and construction chemical products - outdoor*	ERC 8f	*FEICA / EFCC SPERC 8f.1a.v2*
Consumer		SCED
3: *Extruding and spreading sealants and smoothing with a spatula. Widespread consumer use.*	PC 1	*FEICA_SCED_1_04_a_v1*
4: *Fillers, putties, plasters, modelling clay*	PC 9b	
Subsequent service life exposure scenario(s)		
ES 20: Service life (consumers); Various articles (AC 1, AC 2, AC 4, AC 6, AC 7, AC 8, AC 10, AC 11, AC 13)		

19.2. Conditions of use affecting exposure

19.2.1. Control of environmental exposure: *Widespread use of non-volatile substances in adhesives / sealants - indoor* (ERC 8c)

Conditions and measures related to external treatment of waste (including article waste)
Residues of products must be cured in the container before discarded via household waste. Larger solvent washing volumes are collected and disposed of as solvent waste.
Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.
Indoor use
Manual raw materials handling
Information on proper dosing is provided on packaging.
Equipment cleaned with solvent (organic or water), washing disposed of with wastewater
Professional and consumer product use with limited or no technical control of emission. Upon curing, substances are included into matrix without intended release to the environment. Very little water contact possible.

19.2.2. Control of environmental exposure: *Widespread use of non-volatile substances in adhesives / sealants and construction chemical products - outdoor* (ERC 8f)

Conditions and measures related to external treatment of waste (including article waste)
Residues of products must be cured in the container before discarded via household waste. Larger solvent washing volumes are collected and disposed of as solvent waste.
Other conditions affecting environmental exposure
Outdoor use
Municipal sewage treatment plant is assumed.
Manual raw materials handling
Information on proper dosing is provided on packaging.

Equipment cleaned with solvent (organic or water), washing disposed of with wastewater
Professional and consumer product use with limited or no technical control of emission. Upon curing, substances are included into matrix without intended release to the environment. Very little water contact possible.

19.3. Exposure estimation and reference to its source

19.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

20. ES 20: Service life (consumers); Various articles (AC 1, AC 2, AC 4, AC 6, AC 7, AC 8, AC 10, AC 11, AC 13)

20.1. Title section

ES name: *Service life of adhesives / sealants / mastics containing bulk ZnO*
Article category: Vehicles (AC 1), Machinery, mechanical appliances, electrical/electronic articles (AC 2), Stone, plaster, cement, glass and ceramic articles (AC 4), Leather articles (AC 6), Metal articles (AC 7), Paper articles (AC 8), Rubber articles (AC 10), Wood articles (AC 11), Plastic articles (AC 13)

Environment	
1: *Service life of adhesives / sealants / mastics containing bulk ZnO*	ERC 10a, ERC 11a
Consumer	
2: *Vehicles*	AC 1
3: *Machinery, mechanical appliances, electrical/electronic articles*	AC 2
4: *Stone, plaster, cement, glass and ceramic articles*	AC 4
5: *Leather articles*	AC 6
6: *Metal articles*	AC 7
7: *Paper articles*	AC 8
8: *Rubber articles*	AC 10
9: *Wood articles*	AC 11
10: *Plastic articles*	AC 13
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 17: Use at industrial sites; Various products (PC 1, PC 9b, PC 32); Various sectors; automated use of adhesives by roller or brushing application	
ES 18: Widespread use by professional workers; Various products (PC 1, PC 9b, PC 24); Various sectors; small scale application of adhesives, sealants or primers	
ES 19: Consumer use; Various products (PC 1, PC 9b); joint sealants	

20.2. Conditions of use affecting exposure

20.2.1. Control of environmental exposure: *Service life of adhesives / sealants / mastics containing bulk ZnO* (ERC 10a, ERC 11a)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

20.3. Exposure estimation and reference to its source

20.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

21. ES 21: Formulation or re-packing; Various products (PC 1, PC 9b)

21.1. Title section

ES name: *Formulation of nano ZnO in adhesives / sealants / mastics*
Product category: Adhesives, Sealants (PC 1), Fillers, putties, plasters, modelling clay (PC 9b)

Environment		SPERC
1: *Formulation of solvent-borne and solvent-less adhesives / sealants and construction chemical products - non-volatile substances*	ERC 2	*FEICA / EFCC SPERC 2.1a.v3*
2: *Formulation of water-borne adhesives / sealants and construction chemical products – non-volatile substances*	ERC 2	*FEICA / EFCC SPERC 2.2b.v3*
Worker		SWED
3: *Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.*	PROC 1	
4: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2	
5: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition*	PROC 3	
6: *Chemical production where opportunity for exposure arises*	PROC 4	
7: *Mixing or blending in batch processes*	PROC 5	
8: *Transfer of substance or mixture (charging and discharging) at non-dedicated facilities*	PROC 8a	
9: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b	
10: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9	
11: *Use as laboratory reagent*	PROC 15	
12: *Handling of solid inorganic substances at ambient temperature*	PROC 26	

21.2. Conditions of use affecting exposure

21.2.1. Control of environmental exposure: *Formulation of solvent-borne and solvent-less adhesives / sealants and construction chemical products - non-volatile substances* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Annual amount per site <= 10 tonnes/year
Daily amount per site <= 0.033 tonnes/day
Technical and organisational conditions and measures
High degree of automation in adhesive / sealant formulation
The manufacture of adhesive chemicals is a multi-stage batch process. The process is arranged to maximise the efficiency of use of input raw materials, through the highest conversion into formulated products.
use of closed or covered manufacturing equipment to minimise evaporative losses of solids below respective OELs. Use of general and manufacturing plant extraction.
Air extraction systems with dust filters during transfer and formulation of powder raw materials with efficiencies of 99%
Conditions and measures related to biological sewage treatment plant

Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Equipment cleaned with organic solvent, washings are collected and disposed of as solvent waste
Other conditions affecting environmental exposure
No water contact during use.
Indoor use

21.2.2. Control of environmental exposure: *Formulation of water-borne adhesives / sealants and construction chemical products – non-volatile substances* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Annual amount per site <= 10 tonnes/year
Daily amount per site <= 0.033 tonnes/day
Technical and organisational conditions and measures
High degree of automation in adhesive / sealant formulation
The manufacture of adhesive chemicals is a multi-stage batch process. The process is arranged to maximise the efficiency of use of input raw materials, through the highest conversion into formulated products.
use of closed or covered manufacturing equipment to minimise evaporative losses of solids below respective OELs. Use of general and manufacturing plant extraction.
Air extraction systems with dust filters during transfer and formulation of powder raw materials with efficiencies of 99%
Conditions and measures related to biological sewage treatment plant
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Equipment cleaned with water, washing disposed of with wastewater
Other conditions affecting environmental exposure
Indoor use

21.3. Exposure estimation and reference to its source

21.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

22. ES 22: Use at industrial sites; Various products (PC 1, PC 9b, PC 32); Various sectors; automated use of adhesives by roller or brushing application

22.1. Title section

ES name: *Industrial use of nano ZnO as additive contained in adhesives / sealants / mastics*
Product category: Adhesives, Sealants (PC 1), Fillers, putties, plasters, modelling clay (PC 9b), Polymer Preparations and Compounds (PC 32)
Sector of use: Manufacture of wood and wood products (SU 6a), Manufacture of pulp, paper and paper products (SU 6b), Manufacture of fabricated metal products, except machinery and equipment (SU 15), Manufacture of computer, electronic and optical products, electrical equipment (SU 16), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Manufacture of furniture (SU 18)

Environment		SPERC
1: *Industrial use of non-volatile substances in solvent-borne and solvent-less adhesives / sealants*	ERC 5	*FEICA SPERC 5.1a.v3*
2: *Industrial use of non-volatile substances in water borne adhesives / sealants*	ERC 5	*FEICA SPERC 5.1c.v3*
Worker		SWED
3: *Changing of containers, drums or buckets for industrial application equipment*	PROC 8b	FEICA SWED IS_8b_i-a
4: *Industrial automatic use of adhesives*	PROC 10	FEICA SWED IS_10_i-c
5: *Industrial automatic spray application of adhesives*	PROC 7	FEICA SWED IS_7_i-a
6: *Industrial manual spray application of adhesives with spray guns in a ventilated booth*	PROC 7	FEICA SWED IS_7_i-b
7: *Industrial small scale use of adhesives, sealants and primers*	PROC 10	FEICA SWED IS_10_i-d
8: *Industrial use of adhesives, sealants and primers, manual application without LEV*	PROC 10	FEICA SWED IS_10_i-f
Subsequent service life exposure scenario(s)		
ES 25: Service life (consumers); Various articles (AC 1, AC 2, AC 4, AC 6, AC 7, AC 8, AC 10, AC 11, AC 13)		

22.2. Conditions of use affecting exposure

22.2.1. Control of environmental exposure: *Industrial use of non-volatile substances in solvent-borne and solvent-less adhesives / sealants* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Annual amount per site <= 10 tonnes/year
Daily amount per site <= 0.033 tonnes/day
Technical and organisational conditions and measures
High degree of automation in adhesive / sealant formulation
Conditions and measures related to biological sewage treatment plant
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Equipment cleaned with organic solvent, washings are collected and disposed of as external solvent waste.

Mats used for scavenging overspray are disposed as external waste (no wet-scrubbing).
Other conditions affecting environmental exposure
Indoor use
No water contact during use.

22.2.2. Control of environmental exposure: *Industrial use of non-volatile substances in water borne adhesives / sealants* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Annual amount per site <= 10 tonnes/year
Daily amount per site <= 0.033 tonnes/day
Technical and organisational conditions and measures
High degree of automation in adhesive / sealant formulation
Equipment cleaned with water, additional wastewater emission controls are not applicable as releases to wastewater are small.
Targeted application of adhesive / sealant to substrate, Upon curing, substances are included into matrix without intended release to the environment. Solvents evaporate to a significant extent upon curing of the adhesives.
Conditions and measures related to biological sewage treatment plant
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Equipment cleaned with water, washing disposed of with wastewater. Low amount of solid waste (mats used for scavenging overspray) is disposed as external waste (no wet-scrubbing).
Other conditions affecting environmental exposure
Indoor use
No water contact during use.

22.3. Exposure estimation and reference to its source

22.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

23. ES 23: Widespread use by professional workers; Various products (PC 1, PC 9b, PC 24); Various sectors; small scale application of adhesives, sealants or primers

23.1. Title section

ES name: *Professional use of nano ZnO as additive contained in adhesives / sealants / mastics*
Product category: Adhesives, Sealants (PC 1), Fillers, putties, plasters, modelling clay (PC 9b), Lubricants, Greases, Release Products (PC 24)
Sector of use: Manufacture of wood and wood products (SU 6a), Manufacture of pulp, paper and paper products (SU 6b), Manufacture of fabricated metal products, except machinery and equipment (SU 15), Manufacture of computer, electronic and optical products, electrical equipment (SU 16), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17)

Environment		SPERC
1: *Widespread use of non-volatile substances in adhesives / sealants - indoor*	ERC 8c	*FEICA SPERC 8c.3.v3*
2: *Widespread use of non-volatile substances in adhesives / sealants and construction chemical products - outdoor*	ERC 8f	*FEICA / EFCC SPERC 8f.1a.v2*
Worker		SWED
3: *Professional small scale indoor use of adhesives, sealants or primers by low energy spreading*	PROC 10	FEICA SWED PW_10_i-a
4: *Professional small scale outdoor use of adhesives, sealants or primers by low energy spreading*	PROC 10	FEICA SWED PW_10_o-a
Subsequent service life exposure scenario(s)		
ES 25: Service life (consumers); Various articles (AC 1, AC 2, AC 4, AC 6, AC 7, AC 8, AC 10, AC 11, AC 13)		

23.2. Conditions of use affecting exposure

23.2.1. Control of environmental exposure: *Widespread use of non-volatile substances in adhesives / sealants - indoor* (ERC 8c)

Technical and organisational conditions and measures
Manual raw materials handling
Information on proper dosing is provided on packaging.
Equipment cleaned with solvent (organic or water), washing disposed of with wastewater
Professional and consumer product use with limited or no technical control of emission. Upon curing, substances are included into matrix without intended release to the environment. Very little water contact possible.
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Residues of products must be cured in the container before discarded via household waste. Larger solvent washing volumes are collected and disposed of as solvent waste.
Other conditions affecting environmental exposure
Indoor use

23.2.2. Control of environmental exposure: *Widespread use of non-volatile substances in adhesives / sealants and construction chemical products - outdoor* (ERC 8f)

Technical and organisational conditions and measures
Manual raw materials handling
Information on proper dosing is provided on packaging.
Equipment cleaned with solvent (organic or water), washing disposed of with wastewater
Professional and consumer product use with limited or no technical control of emission. Upon curing, substances are included into matrix without intended release to the environment. Very little water contact possible.
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Residues of products must be cured in the container before discarded via household waste. Larger solvent washing volumes are collected and disposed of as solvent waste.
Other conditions affecting environmental exposure
Outdoor use

23.3. Exposure estimation and reference to its source

23.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

24. ES 24: Consumer use; Various products (PC 1, PC 9b); joint sealants

24.1. Title section

ES name: *Consumer use of nano ZnO as additive contained in adhesives / sealants / mastics*
Product category: Adhesives, Sealants (PC 1), Fillers, putties, plasters, modelling clay (PC 9b)

Environment		SPERC
1: *Widespread use of non-volatile substances in adhesives / sealants - indoor*	ERC 8c	*FEICA SPERC 8c.3.v3*
2: *Widespread use of non-volatile substances in adhesives / sealants and construction chemical products - outdoor*	ERC 8f	*FEICA / EFCC SPERC 8f.1a.v2*
Consumer		SCED
3: *Extruding and spreading sealants and smoothing with a spatula. Widespread consumer use.*	PC 1	*FEICA_SCED_1_04_a_v1*
4: *Fillers, putties, plasters, modelling clay*	PC 9b	
Subsequent service life exposure scenario(s)		
ES 25: Service life (consumers); Various articles (AC 1, AC 2, AC 4, AC 6, AC 7, AC 8, AC 10, AC 11, AC 13)		

24.2. Conditions of use affecting exposure

24.2.1. Control of environmental exposure: *Widespread use of non-volatile substances in adhesives / sealants - indoor* (ERC 8c)

Conditions and measures related to external treatment of waste (including article waste)
Residues of products must be cured in the container before discarded via household waste. Larger solvent washing volumes are collected and disposed of as solvent waste.
Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.
Indoor use
Manual raw materials handling
Information on proper dosing is provided on packaging.
Equipment cleaned with solvent (organic or water), washing disposed of with wastewater
Professional and consumer product use with limited or no technical control of emission. Upon curing, substances are included into matrix without intended release to the environment. Very little water contact possible.

24.2.2. Control of environmental exposure: *Widespread use of non-volatile substances in adhesives / sealants and construction chemical products - outdoor* (ERC 8f)

Conditions and measures related to external treatment of waste (including article waste)
Residues of products must be cured in the container before discarded via household waste. Larger solvent washing volumes are collected and disposed of as solvent waste.
Other conditions affecting environmental exposure
Outdoor use
Municipal sewage treatment plant is assumed.
Manual raw materials handling
Information on proper dosing is provided on packaging.

Equipment cleaned with solvent (organic or water), washing disposed of with wastewater
Professional and consumer product use with limited or no technical control of emission. Upon curing, substances are included into matrix without intended release to the environment. Very little water contact possible.

24.3. Exposure estimation and reference to its source

24.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

25. ES 25: Service life (consumers); Various articles (AC 1, AC 2, AC 4, AC 6, AC 7, AC 8, AC 10, AC 11, AC 13)

25.1. Title section

ES name: *Service life of adhesives / sealants / mastics containing nano ZnO*
Article category: Vehicles (AC 1), Machinery, mechanical appliances, electrical/electronic articles (AC 2), Stone, plaster, cement, glass and ceramic articles (AC 4), Leather articles (AC 6), Metal articles (AC 7), Paper articles (AC 8), Rubber articles (AC 10), Wood articles (AC 11), Plastic articles (AC 13)

Environment	
1: *Service life of adhesives / sealants / mastics containing nano ZnO*	ERC 10a, ERC 11a
Consumer	
2: *Vehicles*	AC 1
3: *Machinery, mechanical appliances, electrical/electronic articles*	AC 2
4: *Stone, plaster, cement, glass and ceramic articles*	AC 4
5: *Leather articles*	AC 6
6: *Metal articles*	AC 7
7: *Paper articles*	AC 8
8: *Rubber articles*	AC 10
9: *Wood articles*	AC 11
10: *Plastic articles*	AC 13
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 22: Use at industrial sites; Various products (PC 1, PC 9b, PC 32); Various sectors; automated use of adhesives by roller or brushing application	
ES 23: Widespread use by professional workers; Various products (PC 1, PC 9b, PC 24); Various sectors; small scale application of adhesives, sealants or primers	
ES 24: Consumer use; Various products (PC 1, PC 9b); joint sealants	

25.2. Conditions of use affecting exposure

25.2.1. Control of environmental exposure: *Service life of adhesives / sealants / mastics containing nano ZnO* (ERC 10a, ERC 11a)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

25.3. Exposure estimation and reference to its source

25.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

26. ES 26: Use at industrial sites; Various products (PC 24, PC 25); Manufacture of fabricated metal products, except machinery and equipment (SU 15)

26.1. Title section

ES name: *Industrial use of ZnO containing lubricants / grease / metal working fluids and other fluids*
Product category: Lubricants, Greases, Release Products (PC 24), Metal Working Fluids (PC 25)
Sector of use: Manufacture of fabricated metal products, except machinery and equipment (SU 15)

Environment		SPERC
1: *Lubricants (industrial): solvent-borne*	ERC 4	*ESVOC SPERC 4.6a.v2*
2: *Use in metal working fluids/rolling oils (industrial): solvent-borne*	ERC 4	*ESVOC SPERC 4.7a.v3*
Worker		SWED
3: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b	
4: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9	

26.2. Conditions of use affecting exposure

26.2.1. Control of environmental exposure: *Lubricants (industrial): solvent-borne* (ERC 4)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 3.33 tonnes/day
Annual amount per site <= 999 tonnes/year
Technical and organisational conditions and measures
Assumes no free product in wastewater stream; oil-water separation (e.g. via oil water separators, oil skimmers, dissolved air floatation) may be required under some circumstances.
Conditions and measures related to biological sewage treatment plant
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Aerobic biological treatment
No application of sewage sludge to soil
Other conditions affecting environmental exposure
Indoor use

26.2.2. Control of environmental exposure: *Use in metal working fluids/rolling oils (industrial): solvent-borne* (ERC 4)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 25 tonnes/day
Annual amount per site <= 500 tonnes/year
Technical and organisational conditions and measures
Assumes no free product in wastewater stream; oil-water separation (e.g. via oil water separators, oil skimmers, dissolved air floatation) may be required under some circumstances.
Conditions and measures related to biological sewage treatment plant
Assumed domestic sewage treatment plant flow >= 2E3 m3/day

Aerobic biological treatment
No application of sewage sludge to soil
Other conditions affecting environmental exposure
Indoor use

26.3. Exposure estimation and reference to its source

26.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

27. ES 27: Widespread use by professional workers; Various products (PC 14, PC 24, PC 25); Various sectors (SU 17, SU 18)

27.1. Title section

ES name: *Professional use of ZnO-containing Lubricants / Grease / Metal working fluids*
Product category: Metal surface treatment products (PC 14), Lubricants, Greases, Release Products (PC 24), Metal Working Fluids (PC 25)
Sector of use: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Manufacture of furniture (SU 18)

Environment		SPERC
1: *Lubricants – high environmental release (professional): solvent-borne*	ERC 8d, ERC 8a	*ESVOC SPERC 8.6c.v2*
2: *Metal working fluids/rolling oils (professional): solvent-borne*	ERC 8d, ERC 8a	*ESVOC SPERC 8.7c.v2*
3: *Lubricants – low environmental release (professional): solvent-borne*	ERC 9b, ERC 9a	*ESVOC SPERC 9.6b.v2*
4: *Functional fluid use (professional): solvent-borne*	ERC 9b, ERC 9a	*ESVOC SPERC 9.13b.v2*
Worker		SWED
5: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b	
6: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9	
7: *Roller application or brushing*	PROC 10	
8: *Non industrial spraying*	PROC 11	
9: *Treatment of articles by dipping and pouring*	PROC 13	
10: *Lubrication at high energy conditions in metal working operations*	PROC 17	
11: *Hand-mixing with intimate contact and only PPE available*	PROC 19	
12: *Low energy manipulation of substances bound in materials and/or articles*	PROC 21	

27.2. Conditions of use affecting exposure

27.2.1. Control of environmental exposure: *Lubricants – high environmental release (professional): solvent-borne* (ERC 8d, ERC 8a)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Other conditions affecting environmental exposure
Indoor or outdoor use

27.2.2. Control of environmental exposure: *Metal working fluids/rolling oils (professional): solvent-borne* (ERC 8d, ERC 8a)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Other conditions affecting environmental exposure
Indoor or outdoor use

27.2.3. Control of environmental exposure: *Lubricants – low environmental release (professional): solvent-borne* (ERC 9b, ERC 9a)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Other conditions affecting environmental exposure
Indoor or outdoor use

27.2.4. Control of environmental exposure: *Functional fluid use (professional): solvent-borne* (ERC 9b, ERC 9a)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Other conditions affecting environmental exposure
Indoor or outdoor use

27.3. Exposure estimation and reference to its source

27.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

28. ES 28: Consumer use; Various products (PC 14, PC 24, PC 25)

28.1. Title section

ES name: *Consumer use of ZnO-containing Lubricants / Grease / Metal working fluids*
Product category: Metal surface treatment products (PC 14), Lubricants, Greases, Release Products (PC 24), Metal Working Fluids (PC 25)

Environment		SPERC
1: *Consumer use of ZnO-containing Lubricants / Grease / Metal working fluids*	ERC 8d, ERC 8a	*ESVOC SPERC 8.6e.v2*
Consumer		SCED
2: *Use of metal surface treatment products*	PC 14	
3: *Use of lubricants, greases, release products*	PC 24	
4: *Use of metal working fluids*	PC 25	

28.2. Conditions of use affecting exposure

28.2.1. Control of environmental exposure: *Consumer use of ZnO-containing Lubricants / Grease / Metal working fluids* (ERC 8d, ERC 8a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site = tonnes/day
Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.
Indoor or outdoor use

28.3. Exposure estimation and reference to its source

28.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

29. ES 29: Formulation or re-packing; Various products (PC 9a, PC 9b, PC 9c, PC 18); liquid non-specified

29.1. Title section

ES name: *Formulation of bulk ZnO in solvent borne or water borne liquid coatings and inks*
Product category: Coatings and Paints, Thinners, paint removers (PC 9a), Fillers, putties, plasters, modelling clay (PC 9b), Finger paints (PC 9c), Ink and Toners (PC 18)

Environment		SPERC
1: *Formulation of ZnO in organic solvent and water borne coatings and inks (where specific formulation not known) - non volatiles*	ERC 2	*CEPE SPERC 2.4c.v2*
Worker		SWED
2: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2	
3: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3	
4: *Mixing or blending in batch processes*	PROC 5	
5: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b	
6: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9	

29.2. Conditions of use affecting exposure

29.2.1. Control of environmental exposure: *Formulation of ZnO in organic solvent and water borne coatings and inks (where specific formulation not known) - non volatiles* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 4.444 tonnes/day
Annual amount per site <= 1E3 tonnes/year
Technical and organisational conditions and measures
Installation controlled under IED– abatement or use of solvent management plan (95-97% efficiency)
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Process waste may be recycled or incinerated by waste disposal company
Other conditions affecting environmental exposure
Indoor use

29.3. Exposure estimation and reference to its source

29.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following

parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

30. ES 30: Use at industrial sites; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; spraying, exhaust ventilation

30.1. Title section

ES name: *Industrial spray painting and coating of bulk ZnO-containing formulations, exhaust ventilation*
Product category: Coatings and Paints, Thinners, paint removers (PC 9a)
Sector of use: Offshore industries (SU 2b), Manufacture of wood and wood products (SU 6a), Manufacture of pulp, paper and paper products (SU 6b), Printing and reproduction of recorded media (SU 7), Manufacture of plastics products, including compounding and conversion (SU 12), Manufacture of fabricated metal products, except machinery and equipment (SU 15), Manufacture of computer, electronic and optical products, electrical equipment (SU 16), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Manufacture of furniture (SU 18), Building and construction work (SU 19)

Environment		SPERC
1: Application; Industrial; Spraying; Indoor use; Solids	ERC 5	*CEPE SPERC 5.1a.v2*
Worker		SWED
2: *Industrial spray painting, exhaust ventilation (liquid) - drying/curing*	PROC 4	CEPE_SWED_IS_03_v2_L_1
3: *Industrial spray painting, exhaust ventilation (liquid) - loading, handling and waste management*	PROC 8b	CEPE_SWED_IS_03_v2_L_2
4: *Industrial spray painting, exhaust ventilation (liquid) - preparation and cleaning*	PROC 5	CEPE_SWED_IS_03_v2_L_3
5: *Industrial spray painting, exhaust ventilation (liquid) - spray application*	PROC 7	CEPE_SWED_IS_03_v2_L_4
6: *Industrial spray painting, exhaust ventilation (powder) - drying/curing*	PROC 4	CEPE_SWED_IS_03_v2_P_1
7: *Industrial spray painting, exhaust ventilation (powder) - loading, handling and waste management*	PROC 8b	CEPE_SWED_IS_03_v2_P_2
8: *Industrial spray painting, exhaust ventilation (powder) - preparation and cleaning*	PROC 5	CEPE_SWED_IS_03_v2_P_3
9: *Industrial spray painting, exhaust ventilation (powder) - spray application*	PROC 7	CEPE_SWED_IS_03_v2_P_4
Subsequent service life exposure scenario(s)		
ES 35: Service life (consumers); Various articles (AC 1, AC 2, AC 5, AC 6, AC 7, AC 8, AC 11)		

30.2. Conditions of use affecting exposure

30.2.1. Control of environmental exposure: Application; Industrial; Spraying; Indoor use; Solids (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 4.444 tonnes/day
Annual amount per site <= 1E3 tonnes/year
Technical and organisational conditions and measures
Smaller users (see IED) – none Larger users (see IED)– abatement or use of solvent management plan
Conditions and measures related to external treatment of waste (including article waste)
Process waste may be recycled or incinerated by waste disposal company

Other conditions affecting environmental exposure
Indoor use
Assumed effluent discharge flow from site >= 2E3 m3/day

30.3. Exposure estimation and reference to its source

30.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

31. ES 31: Use at industrial sites; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; non-spray (exhaust ventilation)

31.1. Title section

ES name: *Industrial non-spray painting and coating of bulk ZnO-containing formulations, exhaust ventilation*
Product category: Coatings and Paints, Thinners, paint removers (PC 9a)
Sector of use: Offshore industries (SU 2b), Manufacture of wood and wood products (SU 6a), Manufacture of pulp, paper and paper products (SU 6b), Printing and reproduction of recorded media (SU 7), Manufacture of plastics products, including compounding and conversion (SU 12), Manufacture of fabricated metal products, except machinery and equipment (SU 15), Manufacture of computer, electronic and optical products, electrical equipment (SU 16), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Manufacture of furniture (SU 18), Building and construction work (SU 19)

Environment		SPERC
1: *Application - industrial - non-spray - indoor use - solids*	ERC 5	*CEPE SPERC 5.3.v2*
Worker		SWED
2: *Industrial non-spray painting, exhaust ventilation (liquid) - drying/curing*	PROC 4	CEPE_SWED_IS_05_v2_L_1
3: *Industrial non-spray painting, exhaust ventilation (liquid) - loading, handling and waste management*	PROC 8b	CEPE_SWED_IS_05_v2_L_2
4: *Industrial non-spray painting, exhaust ventilation (liquid) - preparation and cleaning*	PROC 5	CEPE_SWED_IS_05_v2_L_3
5: *Industrial non-spray painting, exhaust ventilation (liquid) - application*	PROC 10	CEPE_SWED_IS_05_v2_L_4a
6: *Industrial non-spray painting, exhaust ventilation (liquid) - application*	PROC 13	CEPE_SWED_IS_05_v2_L_4
7: *Industrial non-spray painting, exhaust ventilation (powder) - drying/curing*	PROC 4	CEPE_SWED_IS_05_v2_P_1
8: *Industrial non-spray painting, exhaust ventilation (powder) - loading, handling and waste management*	PROC 8b	CEPE_SWED_IS_05_v2_P_2
9: *Industrial non-spray painting, exhaust ventilation (powder) - preparation and cleaning*	PROC 5	CEPE_SWED_IS_05_v2_P_3
10: *Industrial non-spray painting, exhaust ventilation (powder) - application*	PROC 13	CEPE_SWED_IS_05_v2_P_4
Subsequent service life exposure scenario(s)		
ES 35: Service life (consumers); Various articles (AC 1, AC 2, AC 5, AC 6, AC 7, AC 8, AC 11)		

31.2. Conditions of use affecting exposure

31.2.1. Control of environmental exposure: *Application - industrial - non-spray - indoor use - solids* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.018 tonnes/day
Annual amount per site <= 4 tonnes/year
Technical and organisational conditions and measures
Smaller users (see IED) – none Larger users (see IED)– abatement or use of solvent management plan
Conditions and measures related to external treatment of waste (including article waste)

Process waste may be recycled or incinerated by waste disposal company
Other conditions affecting environmental exposure
Indoor use
Assumed effluent discharge flow from site >= 2E3 m3/day

31.3. Exposure estimation and reference to its source

31.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

32. ES 32: Widespread use by professional workers; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; spraying (indoor, without respiratory protective equipment)

32.1. Title section

ES name: *Professional spray painting and coating of bulk ZnO-containing formulations, indoor/outdoor*
Product category: Coatings and Paints, Thinners, paint removers (PC 9a)
Sector of use: Offshore industries (SU 2b), Manufacture of wood and wood products (SU 6a), Manufacture of pulp, paper and paper products (SU 6b), Printing and reproduction of recorded media (SU 7), Manufacture of plastics products, including compounding and conversion (SU 12), Manufacture of fabricated metal products, except machinery and equipment (SU 15), Manufacture of computer, electronic and optical products, electrical equipment (SU 16), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Manufacture of furniture (SU 18), Building and construction work (SU 19)

Environment		SPERC
1: *Professional spray painting of bulk ZnO-containing formulations, Indoor use*	ERC 8c	*CEPE SPERC 8c.3a.v2*
2: *Professional spray painting of bulk ZnO-containing formulations, Outdoor use*	ERC 8f	*CEPE SPERC 8f.3a.v2*
Worker		SWED
3: *Professional spray painting - drying/curing*	PROC 4	CEPE_SWED_PW_03a_v2_1
4: *Professional spray painting - loading, handling and waste management*	PROC 8a	CEPE_SWED_PW_03a_v2_2
5: *Professional spray painting - preparation and cleaning*	PROC 5	CEPE_SWED_PW_03a_v2_3
6: *Professional spray painting - spray application*	PROC 11	CEPE_SWED_PW_03a_v2_4
Subsequent service life exposure scenario(s)		
ES 35: Service life (consumers); Various articles (AC 1, AC 2, AC 5, AC 6, AC 7, AC 8, AC 11)		

32.2. Conditions of use affecting exposure

32.2.1. Control of environmental exposure: *Professional spray painting of bulk ZnO-containing formulations, Indoor use* (ERC 8c)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Waste water from equipment cleaning discharged to standard municipal sewage treatment plant Process waste may be recycled or incinerated by local authority or waste disposal company
Other conditions affecting environmental exposure
Indoor use

32.2.2. Control of environmental exposure: *Professional spray painting of bulk ZnO-containing formulations, Outdoor use* (ERC 8f)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.

Conditions and measures related to external treatment of waste (including article waste)
Waste water from equipment cleaning discharged to standard municipal sewage treatment plant Process waste may be recycled or incinerated by local authority or waste disposal company
Other conditions affecting environmental exposure
Outdoor use

32.3. Exposure estimation and reference to its source

32.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

33. ES 33: Widespread use by professional workers; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; non-spray (indoor)

33.1. Title section

ES name: *Professional painting and coating of bulk ZnO-containing formulations, indoor/outdoor brush/roller*
Product category: Coatings and Paints, Thinners, paint removers (PC 9a)
Sector of use: Offshore industries (SU 2b), Manufacture of wood and wood products (SU 6a), Manufacture of pulp, paper and paper products (SU 6b), Printing and reproduction of recorded media (SU 7), Manufacture of plastics products, including compounding and conversion (SU 12), Manufacture of fabricated metal products, except machinery and equipment (SU 15), Manufacture of computer, electronic and optical products, electrical equipment (SU 16), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Manufacture of furniture (SU 18), Building and construction work (SU 19)

Environment		SPERC
1: *Professional painting of bulk ZnO-containing formulations, indoor brush/roller*	ERC 8c	*CEPE SPERC 8c.2a.v2*
2: *Professional painting of bulk ZnO-containing formulations, outdoor brush/roller*	ERC 8f	*CEPE SPERC 8f.2a.v2*
Worker		SWED
3: *Professional painting - drying/curing*	PROC 4	CEPE_SWED_PW_04_v2_1
4: *Professional painting - loading, handling and waste management*	PROC 8a	CEPE_SWED_PW_04_v2_2
5: *Professional painting - preparation and cleaning*	PROC 5	CEPE_SWED_PW_04_v2_3
6: *Professional painting - application brush/roller*	PROC 10	CEPE_SWED_PW_04_v2_4
Subsequent service life exposure scenario(s)		
ES 35: Service life (consumers); Various articles (AC 1, AC 2, AC 5, AC 6, AC 7, AC 8, AC 11)		

33.2. Conditions of use affecting exposure

33.2.1. Control of environmental exposure: *Professional painting of bulk ZnO-containing formulations, indoor brush/roller* (ERC 8c)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Waste water from equipment cleaning discharged to standard municipal sewage treatment plant Process waste may be recycled or incinerated by local authority or waste disposal company
Other conditions affecting environmental exposure
Indoor use

33.2.2. Control of environmental exposure: *Professional painting of bulk ZnO-containing formulations, outdoor brush/roller* (ERC 8f)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)

Waste water from equipment cleaning discharged to standard municipal sewage treatment plant Process waste may be recycled or incinerated by local authority or waste disposal company
Other conditions affecting environmental exposure
Outdoor use

33.3. Exposure estimation and reference to its source

33.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

34. ES 34: Consumer use; Various products (PC 9a, PC 9c, PC 18); interior wall paints

34.1. Title section

ES name: *Consumer use of bulk ZnO-containing paints & coatings*
Product category: Coatings and Paints, Thinners, paint removers (PC 9a), Finger paints (PC 9c), Ink and Toners (PC 18)

Environment		SPERC
1: *Consumer use of ZnO-containing paints & coatings indoor*	ERC 8c	*CEPE SpERC 8c.1a.v2*
2: *Consumer use of ZnO-containing paints & coatings outdoor*	ERC 8f	*CEPE SpERC 8f.1a.v2*
Consumer		SCED
3: *Wall paints – roller/brush*	PC 9a	*CEPE_SCED_9a_01_v1*
4: *Finger paints*	PC 9c	
5: *Ink and toners*	PC 18	
Subsequent service life exposure scenario(s)		
ES 35: Service life (consumers); Various articles (AC 1, AC 2, AC 5, AC 6, AC 7, AC 8, AC 11)		

34.2. Conditions of use affecting exposure

34.2.1. Control of environmental exposure: *Consumer use of ZnO-containing paints & coatings indoor* (ERC 8c)

Conditions and measures related to external treatment of waste (including article waste)
Waste water from equipment cleaning discharged to standard municipal sewage treatment plant Process waste may be recycled or incinerated by local authority
Other conditions affecting environmental exposure
Indoor use
Municipal sewage treatment plant is assumed.

34.2.2. Control of environmental exposure: *Consumer use of ZnO-containing paints & coatings outdoor* (ERC 8f)

Conditions and measures related to external treatment of waste (including article waste)
Waste water from equipment cleaning discharged to standard municipal sewage treatment plant Process waste may be recycled or incinerated by local authority
Other conditions affecting environmental exposure
Outdoor use
Municipal sewage treatment plant is assumed.

34.3. Exposure estimation and reference to its source

34.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution

factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

35. ES 35: Service life (consumers); Various articles (AC 1, AC 2, AC 5, AC 6, AC 7, AC 8, AC 11)

35.1. Title section

ES name: *Service life of painted and coated articles containing bulk ZnO*
Article category: Vehicles (AC 1), Machinery, mechanical appliances, electrical/electronic articles (AC 2), Fabrics, textiles and apparel (AC 5), Leather articles (AC 6), Metal articles (AC 7), Paper articles (AC 8), Wood articles (AC 11)

Environment	
1: *Service life of painted and coated articles containing bulk ZnO*	ERC 10a, ERC 11a
Consumer	
2: *Vehicles*	AC 1
3: *Machinery, mechanical appliances, electrical/electronic articles*	AC 2
4: *Fabrics, textiles and apparel*	AC 5
5: *Leather articles*	AC 6
6: *Metal articles*	AC 7
7: *Paper articles*	AC 8
8: *Wood articles*	AC 11
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 30: Use at industrial sites; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; spraying, exhaust ventilation	
ES 31: Use at industrial sites; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; non-spray (exhaust ventilation)	
ES 32: Widespread use by professional workers; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; spraying (indoor, without respiratory protective equipment)	
ES 33: Widespread use by professional workers; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; non-spray (indoor)	
ES 34: Consumer use; Various products (PC 9a, PC 9c, PC 18); interior wall paints	

35.2. Conditions of use affecting exposure

35.2.1. Control of environmental exposure: *Service life of painted and coated articles containing bulk ZnO* (ERC 10a, ERC 11a)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

35.3. Exposure estimation and reference to its source

35.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

36. ES 36: Formulation or re-packing; Various products (PC 9a, PC 9b, PC 9c, PC 18); liquid non-specified

36.1. Title section

ES name: *Formulation of nano ZnO in solvent borne or water borne liquid coatings and inks*
Product category: Coatings and Paints, Thinners, paint removers (PC 9a), Fillers, putties, plasters, modelling clay (PC 9b), Finger paints (PC 9c), Ink and Toners (PC 18)

Environment		SPERC
1: *Formulation of nano ZnO in organic solvent and water borne coatings and inks (where specific formulation not known) - non volatiles*	ERC 2	*CEPE SPERC 2.4c.v2*
Worker		SWED
2: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2	
3: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3	
4: *Mixing or blending in batch processes*	PROC 5	
5: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b	
6: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9	

36.2. Conditions of use affecting exposure

36.2.1. Control of environmental exposure: *Formulation of nano ZnO in organic solvent and water borne coatings and inks (where specific formulation not known) - non volatiles* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.222 tonnes/day
Annual amount per site <= 50 tonnes/year
Technical and organisational conditions and measures
Installation controlled under IED– abatement or use of solvent management plan (95-97% efficiency)
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Process waste may be recycled or incinerated by waste disposal company
Other conditions affecting environmental exposure
Indoor use

36.3. Exposure estimation and reference to its source

36.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following

parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

37. ES 37: Use at industrial sites; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; spraying, exhaust ventilation

37.1. Title section

ES name: *Industrial spray painting and coating with nano ZnO-containing formulations, exhaust ventilation*
Product category: Coatings and Paints, Thinners, paint removers (PC 9a)
Sector of use: Offshore industries (SU 2b), Manufacture of wood and wood products (SU 6a), Manufacture of pulp, paper and paper products (SU 6b), Printing and reproduction of recorded media (SU 7), Manufacture of plastics products, including compounding and conversion (SU 12), Manufacture of fabricated metal products, except machinery and equipment (SU 15), Manufacture of computer, electronic and optical products, electrical equipment (SU 16), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Manufacture of furniture (SU 18), Building and construction work (SU 19)

Environment		SPERC
1: Application; Industrial; Spraying; Indoor use; Solids	ERC 5	*CEPE SPERC 5.1a.v2*
Worker		SWED
2: *Industrial spray painting, exhaust ventilation (liquid) - drying/curing*	PROC 4	CEPE_SWED_IS_03_v2_L_1
3: *Industrial spray painting, exhaust ventilation (liquid) - loading, handling and waste management*	PROC 8b	CEPE_SWED_IS_03_v2_L_2
4: *Industrial spray painting, exhaust ventilation (liquid) - preparation and cleaning*	PROC 5	CEPE_SWED_IS_03_v2_L_3
5: *Industrial spray painting, exhaust ventilation (liquid) - spray application*	PROC 7	CEPE_SWED_IS_03_v2_L_4
6: *Industrial spray painting, exhaust ventilation (powder) - drying/curing*	PROC 4	CEPE_SWED_IS_03_v2_P_1
7: *Industrial spray painting, exhaust ventilation (powder) - loading, handling and waste management*	PROC 8b	CEPE_SWED_IS_03_v2_P_2
8: *Industrial spray painting, exhaust ventilation (powder) - preparation and cleaning*	PROC 5	CEPE_SWED_IS_03_v2_P_3
9: *Industrial spray painting, exhaust ventilation (powder) - spray application*	PROC 7	CEPE_SWED_IS_03_v2_P_4
Subsequent service life exposure scenario(s)		
ES 42: Service life (consumers); Various articles (AC 1, AC 2, AC 5, AC 6, AC 7, AC 8, AC 11)		

37.2. Conditions of use affecting exposure

37.2.1. Control of environmental exposure: Application; Industrial; Spraying; Indoor use; Solids (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.222 tonnes/day
Annual amount per site <= 50 tonnes/year
Technical and organisational conditions and measures
Smaller users (see IED) – none Larger users (see IED)– abatement or use of solvent management plan
Conditions and measures related to external treatment of waste (including article waste)
Process waste may be recycled or incinerated by waste disposal company

Other conditions affecting environmental exposure
Indoor use
Assumed effluent discharge flow from site >= 2E3 m3/day

37.3. Exposure estimation and reference to its source

37.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

38. ES 38: Use at industrial sites; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; non-spray (exhaust ventilation)

38.1. Title section

ES name: *Industrial non-spray painting and coating with nano ZnO-containing formulations, exhaust ventilation*
Product category: Coatings and Paints, Thinners, paint removers (PC 9a)
Sector of use: Offshore industries (SU 2b), Manufacture of wood and wood products (SU 6a), Manufacture of pulp, paper and paper products (SU 6b), Printing and reproduction of recorded media (SU 7), Manufacture of plastics products, including compounding and conversion (SU 12), Manufacture of fabricated metal products, except machinery and equipment (SU 15), Manufacture of computer, electronic and optical products, electrical equipment (SU 16), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Manufacture of furniture (SU 18), Building and construction work (SU 19)

Environment		SPERC
1: *Application - industrial - non-spray - indoor use - solids*	ERC 5	*CEPE SPERC 5.3.v2*
Worker		SWED
2: *Industrial non-spray painting, exhaust ventilation (liquid) - drying/curing*	PROC 4	CEPE_SWED_IS_05_v2_L_1
3: *Industrial non-spray painting, exhaust ventilation (liquid) - loading, handling and waste management*	PROC 8b	CEPE_SWED_IS_05_v2_L_2
4: *Industrial non-spray painting, exhaust ventilation (liquid) - preparation and cleaning*	PROC 5	CEPE_SWED_IS_05_v2_L_3
5: *Industrial non-spray painting, exhaust ventilation (liquid) - application*	PROC 10	CEPE_SWED_IS_05_v2_L_4a
6: *Industrial non-spray painting, exhaust ventilation (liquid) - application*	PROC 13	CEPE_SWED_IS_05_v2_L_4
7: *Industrial non-spray painting, exhaust ventilation (powder) - drying/curing*	PROC 4	CEPE_SWED_IS_05_v2_P_1
8: *Industrial non-spray painting, exhaust ventilation (powder) - loading, handling and waste management*	PROC 8b	CEPE_SWED_IS_05_v2_P_2
9: *Industrial non-spray painting, exhaust ventilation (powder) - preparation and cleaning*	PROC 5	CEPE_SWED_IS_05_v2_P_3
10: *Industrial non-spray painting, exhaust ventilation (powder) - application*	PROC 13	CEPE_SWED_IS_05_v2_P_4
Subsequent service life exposure scenario(s)		
ES 42: Service life (consumers); Various articles (AC 1, AC 2, AC 5, AC 6, AC 7, AC 8, AC 11)		

38.2. Conditions of use affecting exposure

38.2.1. Control of environmental exposure: *Application - industrial - non-spray - indoor use - solids* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.018 tonnes/day
Annual amount per site <= 4 tonnes/year
Technical and organisational conditions and measures
Smaller users (see IED) – none Larger users (see IED)– abatement or use of solvent management plan
Conditions and measures related to external treatment of waste (including article waste)

Process waste may be recycled or incinerated by waste disposal company
Other conditions affecting environmental exposure
Indoor use
Assumed effluent discharge flow from site >= 2E3 m3/day

38.3. Exposure estimation and reference to its source

38.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

39. ES 39: Widespread use by professional workers; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; spraying (indoor, without respiratory protective equipment)

39.1. Title section

ES name: *Professional spray painting and coating with nano ZnO-containing formulations, indoor/outdoor*
Product category: Coatings and Paints, Thinners, paint removers (PC 9a)
Sector of use: Offshore industries (SU 2b), Manufacture of wood and wood products (SU 6a), Manufacture of pulp, paper and paper products (SU 6b), Printing and reproduction of recorded media (SU 7), Manufacture of plastics products, including compounding and conversion (SU 12), Manufacture of fabricated metal products, except machinery and equipment (SU 15), Manufacture of computer, electronic and optical products, electrical equipment (SU 16), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Manufacture of furniture (SU 18), Building and construction work (SU 19)

Environment		SPERC
1: *Professional spray painting with nano ZnO-containing formulations, Indoor use*	ERC 8c	*CEPE SPERC 8c.3a.v2*
2: *Professional spray painting with nano ZnO-containing formulations, Outdoor use*	ERC 8f	*CEPE SPERC 8f.3a.v2*
Worker		SWED
3: *Professional spray painting - drying/curing*	PROC 4	CEPE_SWED_PW_03a_v2_1
4: *Professional spray painting - loading, handling and waste management*	PROC 8a	CEPE_SWED_PW_03a_v2_2
5: *Professional spray painting - preparation and cleaning*	PROC 5	CEPE_SWED_PW_03a_v2_3
6: *Professional spray painting - spray application*	PROC 11	CEPE_SWED_PW_03a_v2_4
Subsequent service life exposure scenario(s)		
ES 42: Service life (consumers); Various articles (AC 1, AC 2, AC 5, AC 6, AC 7, AC 8, AC 11)		

39.2. Conditions of use affecting exposure

39.2.1. Control of environmental exposure: *Professional spray painting with nano ZnO-containing formulations, Indoor use* (ERC 8c)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Waste water from equipment cleaning discharged to standard municipal sewage treatment plant Process waste may be recycled or incinerated by local authority or waste disposal company
Other conditions affecting environmental exposure
Indoor use

39.2.2. Control of environmental exposure: *Professional spray painting with nano ZnO-containing formulations, Outdoor use* (ERC 8f)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.

Conditions and measures related to external treatment of waste (including article waste)
Waste water from equipment cleaning discharged to standard municipal sewage treatment plant Process waste may be recycled or incinerated by local authority or waste disposal company
Other conditions affecting environmental exposure
Outdoor use

39.3. Exposure estimation and reference to its source

39.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

40. ES 40: Widespread use by professional workers; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; non-spray (indoor)

40.1. Title section

ES name: *Professional painting and coating with nano ZnO-containing formulations, indoor/outdoor brush/roller*
Product category: Coatings and Paints, Thinners, paint removers (PC 9a)
Sector of use: Offshore industries (SU 2b), Manufacture of wood and wood products (SU 6a), Manufacture of pulp, paper and paper products (SU 6b), Printing and reproduction of recorded media (SU 7), Manufacture of plastics products, including compounding and conversion (SU 12), Manufacture of fabricated metal products, except machinery and equipment (SU 15), Manufacture of computer, electronic and optical products, electrical equipment (SU 16), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Manufacture of furniture (SU 18), Building and construction work (SU 19)

Environment		SPERC
1: *Professional painting with nano ZnO-containing formulations, indoor brush/roller*	ERC 8c	*CEPE SPERC 8c.2a.v2*
2: *Professional painting with nano ZnO-containing formulations, outdoor brush/roller*	ERC 8f	*CEPE SPERC 8f.2a.v2*
Worker		SWED
3: *Professional painting - drying/curing*	PROC 4	CEPE_SWED_PW_04_v2_1
4: *Professional painting - loading, handling and waste management*	PROC 8a	CEPE_SWED_PW_04_v2_2
5: *Professional painting - preparation and cleaning*	PROC 5	CEPE_SWED_PW_04_v2_3
6: *Professional painting - application brush/roller*	PROC 10	CEPE_SWED_PW_04_v2_4
Subsequent service life exposure scenario(s)		
ES 42: Service life (consumers); Various articles (AC 1, AC 2, AC 5, AC 6, AC 7, AC 8, AC 11)		

40.2. Conditions of use affecting exposure

40.2.1. Control of environmental exposure: *Professional painting with nano ZnO-containing formulations, indoor brush/roller* (ERC 8c)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Waste water from equipment cleaning discharged to standard municipal sewage treatment plant Process waste may be recycled or incinerated by local authority or waste disposal company
Other conditions affecting environmental exposure
Indoor use

40.2.2. Control of environmental exposure: *Professional painting with nano ZnO-containing formulations, outdoor brush/roller* (ERC 8f)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)

Waste water from equipment cleaning discharged to standard municipal sewage treatment plant Process waste may be recycled or incinerated by local authority or waste disposal company
Other conditions affecting environmental exposure
Outdoor use

40.3. Exposure estimation and reference to its source

40.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

41. ES 41: Consumer use; Various products (PC 9a, PC 9c, PC 18); interior wall paints

41.1. Title section

ES name: *Consumer use of nano ZnO-containing paints & coatings*
Product category: Coatings and Paints, Thinners, paint removers (PC 9a), Finger paints (PC 9c), Ink and Toners (PC 18)

Environment		SPERC
1: *Consumer use of nano ZnO-containing paints & coatings indoor*	ERC 8c	*CEPE SpERC 8c.1a.v2*
2: *Consumer use of nano ZnO-containing paints & coatings outdoor*	ERC 8f	*CEPE SpERC 8f.1a.v2*
Consumer		SCED
3: *Wall paints – roller/brush*	PC 9a	*CEPE_SCED_9a_01_v1*
4: *Finger paints*	PC 9c	
5: *Ink and toners*	PC 18	
Subsequent service life exposure scenario(s)		
ES 42: Service life (consumers); Various articles (AC 1, AC 2, AC 5, AC 6, AC 7, AC 8, AC 11)		

41.2. Conditions of use affecting exposure

41.2.1. Control of environmental exposure: *Consumer use of nano ZnO-containing paints & coatings indoor* (ERC 8c)

Conditions and measures related to external treatment of waste (including article waste)
Waste water from equipment cleaning discharged to standard municipal sewage treatment plant Process waste may be recycled or incinerated by local authority
Other conditions affecting environmental exposure
Indoor use
Municipal sewage treatment plant is assumed.

41.2.2. Control of environmental exposure: *Consumer use of nano ZnO-containing paints & coatings outdoor* (ERC 8f)

Conditions and measures related to external treatment of waste (including article waste)
Waste water from equipment cleaning discharged to standard municipal sewage treatment plant Process waste may be recycled or incinerated by local authority
Other conditions affecting environmental exposure
Outdoor use
Municipal sewage treatment plant is assumed.

41.3. Exposure estimation and reference to its source

41.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution

factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

42. ES 42: Service life (consumers); Various articles (AC 1, AC 2, AC 5, AC 6, AC 7, AC 8, AC 11)

42.1. Title section

ES name: *Service life of painted and coated articles containing nano ZnO*
Article category: Vehicles (AC 1), Machinery, mechanical appliances, electrical/electronic articles (AC 2), Fabrics, textiles and apparel (AC 5), Leather articles (AC 6), Metal articles (AC 7), Paper articles (AC 8), Wood articles (AC 11)

Environment	
1: *Service life of painted and coated articles containing nano ZnO*	ERC 10a, ERC 11a
Consumer	
2: *Vehicles*	AC 1
3: *Machinery, mechanical appliances, electrical/electronic articles*	AC 2
4: *Fabrics, textiles and apparel*	AC 5
5: *Leather articles*	AC 6
6: *Metal articles*	AC 7
7: *Paper articles*	AC 8
8: *Wood articles*	AC 11
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 37: Use at industrial sites; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; spraying, exhaust ventilation	
ES 38: Use at industrial sites; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; non-spray (exhaust ventilation)	
ES 39: Widespread use by professional workers; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; spraying (indoor, without respiratory protective equipment)	
ES 40: Widespread use by professional workers; Coatings and Paints, Thinners, paint removers (PC 9a); Various sectors; non-spray (indoor)	
ES 41: Consumer use; Various products (PC 9a, PC 9c, PC 18); interior wall paints	

42.2. Conditions of use affecting exposure

42.2.1. Control of environmental exposure: *Service life of painted and coated articles containing nano ZnO* (ERC 10a, ERC 11a)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

42.3. Exposure estimation and reference to its source

42.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

43. ES 43: Formulation or re-packing; Cosmetics, personal care products (PC 39)

43.1. Title section

ES name: *Formulation of bulk ZnO in cosmetics*
Product category: Cosmetics, personal care products (PC 39)

Environment	
1: *Generic small scale formulation of ZnO containing cosmetics with emissions to water*	ERC 2
2: *Formulation of ZnO in cosmetic products involving cleaning with organic solvents (varnish, removers, decorative cosmetics, spray, lacquer, fine fragrance, solar oil, solid products) (medium scale)*	ERC 2
Worker	
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2
4: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
5: Chemical production where opportunity for exposure arises	PROC 4
6: *Mixing or blending in batch processes*	PROC 5
7: *Transfer of substance or mixture (charging and discharging) at non-dedicated facilities*	PROC 8a
8: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
9: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
10: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
11: *Use as laboratory reagent*	PROC 15

43.2. Conditions of use affecting exposure

43.2.1. Control of environmental exposure: *Generic small scale formulation of ZnO containing cosmetics with emissions to water* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.06 tonnes/day
Annual amount per site <= 15 tonnes/year
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

43.2.2. Control of environmental exposure: *Formulation of ZnO in cosmetic products involving cleaning with organic solvents (varnish, removers, decorative cosmetics, spray, lacquer, fine fragrance, solar oil, solid products) (medium scale)* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 3.6 tonnes/day
Annual amount per site <= 900 tonnes/year

Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
Assumed effluent discharge flow from site >= 2E3 m3/day

43.3. Exposure estimation and reference to its source

43.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

44. ES 44: Widespread use by professional workers; Cosmetics, personal care products (PC 39); Various sectors (SU 0, SU 20)

44.1. Title section

ES name: *Professional use of bulk ZnO-containing cosmetics*
Product category: Cosmetics, personal care products (PC 39)
Sector of use: Other (SU 0), Health services (SU 20)

Environment	
1: *Professional use of bulk ZnO-containing cosmetics*	ERC 8a
Worker	
2: *No assessment needed => 'specific regulatory status': use in cosmetics products covered under Regulation (EC) N° 1223/2009*	PROC 0

44.2. Conditions of use affecting exposure

44.2.1. Control of environmental exposure: *Professional use of bulk ZnO-containing cosmetics* (ERC 8a)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.

44.3. Exposure estimation and reference to its source

44.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

45. ES 45: Consumer use; Cosmetics, personal care products (PC 39)

45.1. Title section

ES name: *Consumer use of bulk ZnO-containing cosmetics*
Product category: Cosmetics, personal care products (PC 39)

Environment	
1: *Consumer use of bulk ZnO-containing cosmetics*	ERC 8a
Consumer	
2: *Use of cosmetics*	PC 39

45.2. Conditions of use affecting exposure

45.2.1. Control of environmental exposure: *Consumer use of bulk ZnO-containing cosmetics* (ERC 8a)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

45.3. Exposure estimation and reference to its source

45.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

46. ES 46: Formulation or re-packing; Cosmetics, personal care products (PC 39)

46.1. Title section

ES name: *Formulation of nano ZnO (coated or uncoated) containing UV filter in cosmetic emollients used for sunscreen, skin care and pharmaceuticals preparations*
Product category: Cosmetics, personal care products (PC 39)

Environment	
1: *Generic small scale formulation of of nano ZnO (coated or uncoated) containing UV filter in cosmetic emollients used for sunscreen, skin care and pharmaceuticals preparations*	ERC 2
2: *Formulation of nano ZnO in cosmetic products involving cleaning with organic solvents (varnish, removers, decorative cosmetics, spray, lacquer, fine fragrance, solar oil, solid products) (medium scale)*	ERC 2
Worker	
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2
4: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
5: Chemical production where opportunity for exposure arises	PROC 4
6: *Mixing or blending in batch processes*	PROC 5
7: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
8: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
9: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
10: *Use as laboratory reagent*	PROC 15
11: *Handling of solid inorganic substances at ambient temperature*	PROC 26

46.2. Conditions of use affecting exposure

46.2.1. Control of environmental exposure: *Generic small scale formulation of of nano ZnO (coated or uncoated) containing UV filter in cosmetic emollients used for sunscreen, skin care and pharmaceuticals preparations* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.06 tonnes/day
Annual amount per site <= 15 tonnes/year
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

46.2.2. Control of environmental exposure: *Formulation of nano ZnO in cosmetic products involving cleaning with organic solvents (varnish, removers, decorative cosmetics, spray, lacquer, fine fragrance, solar oil, solid products) (medium scale)* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 1 tonnes/day
Annual amount per site <= 250 tonnes/year
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
Assumed effluent discharge flow from site >= 2E3 m3/day

46.3. Exposure estimation and reference to its source

46.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

47. ES 47: Widespread use by professional workers; Cosmetics, personal care products (PC 39); Various sectors (SU 0, SU 20)

47.1. Title section

ES name: *Professional use of nano ZnO-containing cosmetics*
Product category: Cosmetics, personal care products (PC 39)
Sector of use: Other (SU 0), Health services (SU 20)

Environment	
1: *Professional use of nano ZnO-containing cosmetics*	ERC 8a
Worker	
2: *No assessment needed => 'specific regulatory status': use in cosmetics products covered under Regulation (EC) N° 1223/2009*	PROC 0

47.2. Conditions of use affecting exposure

47.2.1. Control of environmental exposure: *Professional use of nano ZnO-containing cosmetics* (ERC 8a)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.

47.3. Exposure estimation and reference to its source

47.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

48. ES 48: Consumer use; Cosmetics, personal care products (PC 39)

48.1. Title section

ES name: *Consumer use of nano ZnO-containing cosmetics*
Product category: Cosmetics, personal care products (PC 39)

Environment	
1: *Consumer use of nano ZnO-containing cosmetics*	ERC 8a
Consumer	
2: *Use of cosmetics*	PC 39

48.2. Conditions of use affecting exposure

48.2.1. Control of environmental exposure: *Consumer use of nano ZnO-containing cosmetics* (ERC 8a)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

48.3. Exposure estimation and reference to its source

48.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

49. ES 49: Formulation or re-packing; Fertilizers (PC 12)

49.1. Title section

ES name: *Formulation of fertilizer products*
Product category: Fertilizers (PC 12)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 2
2: *Discharge via additional off-site sewage treatment plant*	ERC 2
Worker	
3: *Closed operations, no likelihood of exposure.*	PROC 1
4: *Closed continuous process with occasional controlled exposure.*	PROC 2
5: *Closed batch process with occasional controlled exposure.*	PROC 3
6: *Production process where opportunity for exposure arises.*	PROC 4
7: *Process in stages with significant contact, including payloader work in bulk storages.*	PROC 5
8: *Transfers, loading, unloading, sampling and cleaning without dedicated engineering controls in place.*	PROC 8a
9: *Transfers, loading, unloading, sampling and cleaning with dedicated engineering controls in place.*	PROC 8b
10: *Packing liquids and solids in a dedicated filling line, including weighing.*	PROC 9
11: *Production of fertilizers by granulation or low-energy compression.*	PROC 14
12: *Use in laboratory for quality control and other analyses.*	PROC 15
13: *Manual maintenance of equipment during intentional pauses and blockages.*	PROC 28

49.2. Conditions of use affecting exposure

49.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 8.333 tonnes/day
Annual amount per site <= 2.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day
Local freshwater dilution factor 10
Local marine water dilution factor 100

49.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 8.333 tonnes/day
Annual amount per site <= 2.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal

mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Local freshwater dilution factor 10
Local marine water dilution factor 100

49.3. Exposure estimation and reference to its source

49.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

50. ES 50: Formulation or re-packing; Fertilizers (PC 12); Processing into/onto a matrice.

50.1. Title section

ES name: *Formulation by incorporating fertilizers onto or into a matrix*
Product category: Fertilizers (PC 12)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 3
2: *Discharge via additional off-site sewage treatment plant*	ERC 3
Worker	
3: *Closed continuous process with occasional controlled exposure.*	PROC 2
4: *Closed batch process with occasional controlled exposure.*	PROC 3
5: *Production process where opportunity for exposure arises.*	PROC 4
6: *Process in stages with significant contact.*	PROC 5
7: *Transfers, loading, unloading, sampling and cleaning without dedicated engineering controls in place.*	PROC 8a
8: *Transfers, loading, unloading, sampling and cleaning with dedicated engineering controls in place.*	PROC 8b
9: *Packing the treated materials with dedicated engineering controls in place, including weighing.*	PROC 9
10: *Treatment of growth substrates or seeds by dipping and pouring.*	PROC 13
11: *Use in laboratory for quality control and other analyses.*	PROC 15

50.2. Conditions of use affecting exposure

50.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 3)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 8.333 tonnes/day
Annual amount per site <= 2.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day
Local freshwater dilution factor 10
Local marine water dilution factor 100

50.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 3)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 8.333 tonnes/day
Annual amount per site <= 2.5E3 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal

mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Local freshwater dilution factor 10
Local marine water dilution factor 100

50.3. Exposure estimation and reference to its source

50.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

51. ES 51: Widespread use by professional workers; Fertilizers (PC 12); Agriculture, forestry, fishery (SU 1)

51.1. Title section

ES name: *Professional use of fertilizers*
Product category: Fertilizers (PC 12)
Sector of use: Agriculture, forestry, fishery (SU 1)

Environment		SPERC
1: *Outdoor use - direct application of solid fertilizers to soil; surface spreading*	ERC 8e	*Fertilizers Europe SPERC 8e.1.v2*
2: *Outdoor use - direct application of solid or liquid fertilizers to soil; incorporation, placement, mixing, seed treatment, drip irrigation*	ERC 8e	*Fertilizers Europe SPERC 8e.2.v2*
3: *Outdoor use - application of fertilizers by helicopter*	ERC 8e	*Fertilizers Europe SPERC 8e.3.v2*
4: *Outdoor use - spray application of fertilizers in liquid form; soil surface spreading, sprinkler, pivot, foliar spray, slurry*	ERC 8e	*Fertilizers Europe SPERC 8e.4.v3*
5: *Indoor use of fertilizer (nutrient).*	ERC 8b	
Worker		SWED
6: *Handling of fertilizer in stages with significant contact (without additional RMMs).*	PROC 5	FE_SWED10_PW_s_1_i_noRPE
7: *Unloading and loading of fertilizer in non-dedicated facilities, including sampling and cleaning fertilizer residues from the equipment (without additional RMMs).*	PROC 8a	FE_SWED10_PW_s_1_i_noRPE
8: *Unloading and loading of fertilizer in dedicated facilities (e.g. in greenhouses where dedicated engineering controls are in place), including sampling (without additional RMMs).*	PROC 8b	FE_SWED10_PW_s_1_i_noRPE
9: *Packing fertilizers in a dedicated filling line, including weighing (without additional RMMs).*	PROC 9	FE_SWED10_PW_s_1_i_noRPE
10: *Air-dispersive application of fertilizers (without additional RMMs).*	PROC 11	FE_SWED14_PW_s_8_i_noRPE
11: *Chemical analyses of fertilizers (without additional RMMs).*	PROC 15	FE_SWED10_PW_s_1_i_noRPE

51.2. Conditions of use affecting exposure

51.2.1. Control of environmental exposure: *Outdoor use - direct application of solid fertilizers to soil; surface spreading* (ERC 8e)

Amount used, frequency and duration of use (or from service life)
Number of days per year the substance is released to the environment
Technical and organisational conditions and measures
Controlled application to agricultural soil.
Operators to comply with European and national requirements specified under Cross-Compliance of the Common Agricultural Policy of the EU (https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/cross-compliance_en)
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Outdoor use

No water contact during use.

51.2.2. Control of environmental exposure: *Outdoor use - direct application of solid or liquid fertilizers to soil; incorporation, placement, mixing, seed treatment, drip irrigation* (ERC 8e)

Amount used, frequency and duration of use (or from service life)
Number of days per year the substance is released to the environment
Technical and organisational conditions and measures
Controlled application to agricultural soil.
Operators to comply with European and national requirements specified under Cross-Compliance of the Common Agricultural Policy of the EU (https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/cross-compliance_en)
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Outdoor use
No water contact during use.

51.2.3. Control of environmental exposure: *Outdoor use - application of fertilizers by helicopter* (ERC 8e)

Amount used, frequency and duration of use (or from service life)
Number of days per year the substance is released to the environment
Technical and organisational conditions and measures
Controlled application to agricultural soil.
Operators to comply with European and national requirements specified under Cross-Compliance of the Common Agricultural Policy of the EU (https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/cross-compliance_en)
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Outdoor use

51.2.4. Control of environmental exposure: *Outdoor use - spray application of fertilizers in liquid form; soil surface spreading, sprinkler, pivot, foliar spray, slurry* (ERC 8e)

Amount used, frequency and duration of use (or from service life)
Number of days per year the substance is released to the environment
Technical and organisational conditions and measures
Controlled application to agricultural soil.
Operators to comply with European and national requirements specified under Cross-Compliance of the Common Agricultural Policy of the EU (https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/cross-compliance_en)
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Outdoor use

51.2.5. Control of environmental exposure: *Indoor use of fertilizer (nutrient)*. (ERC 8b)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.

51.3. Exposure estimation and reference to its source

51.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance: If a downstream user (DU) has OCs or RMMs outside the OC/MM specifications in the generic ES, then the DU can evaluate whether he works inside the boundaries set by the ES through scaling:
Scaling tool: Scaling method, exposure estimation tool used: Fertilizer Environmental Exposure (FEE) Tool v1.2 http://www.reachfertilizers.com/
Scaling instructions: Scalable parameters: Total annual fertilizer use rate, Number of applications, Time between applications, Crop type, Crop growth stage, European crop yield scenario, Crop substance concentration, Crop yield, Risk management measures (drift and runoff' reduction, soil incorporation). All other parameters have to be taken directly from the exposure scenario provided. Boundaries of scaling: refer to boundaries as set in Fertilizer Environmental Exposure (FEE) Tool v1.2 http://www.reachfertilizers.com/ For Scaling instructions please go to the following website: www.reachfertilizers.com
Scaling tool web link: http://www.reachfertilizers.com/

52. ES 52: Consumer use; Fertilizers (PC 12)

52.1. Title section

ES name: *Consumer use of fertilizer products*
Product category: Fertilizers (PC 12)

Environment		SPERC
1: *Outdoor use - direct application of solid fertilizers to soil; surface spreading*	ERC 8e	*Fertilizers Europe SPERC 8e.1.v2C*
2: *Outdoor use - direct application of solid or liquid fertilizers to soil; incorporation, placement, mixing, seed treatment, drip irrigation*	ERC 8e	*Fertilizers Europe SPERC 8e.2.v2C*
3: *Outdoor use - spray application of liquid fertilizers; soil surface spreading, sprinkler, pivot, foliar spray, slurry*	ERC 8e	*Fertilizers Europe SPERC 8e.4.v3C*
4: *Indoor use of fertilizer (nutrient).*	ERC 8b	
Consumer		SCED
5: *Consumer use of solid fertilizers (indoor).*	PC 12	
6: *Consumer use of solid fertilizers (outdoor).*	PC 12	
7: *Consumer use of liquid fertilizers (indoor).*	PC 12	
8: *Consumer use of liquid fertilizers (outdoor).*	PC 12	

52.2. Conditions of use affecting exposure

52.2.1. Control of environmental exposure: *Outdoor use - direct application of solid fertilizers to soil; surface spreading* (ERC 8e)

Amount used, frequency and duration of use (or from service life)
Operators comply with best agricultural practice
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Controlled application to agricultural soil.
Other conditions affecting environmental exposure
Outdoor use
No water contact during use.

52.2.2. Control of environmental exposure: *Outdoor use - direct application of solid or liquid fertilizers to soil; incorporation, placement, mixing, seed treatment, drip irrigation* (ERC 8e)

Amount used, frequency and duration of use (or from service life)
Operators comply with best agricultural practice
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Controlled application to agricultural soil.
Other conditions affecting environmental exposure
Outdoor use
No water contact during use.

52.2.3. Control of environmental exposure: *Outdoor use - spray application of liquid fertilizers; soil surface spreading, sprinkler, pivot, foliar spray, slurry* (ERC 8e)

Amount used, frequency and duration of use (or from service life)
Operators comply with best agricultural practice
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Controlled application to agricultural soil.
Other conditions affecting environmental exposure
Outdoor use

52.2.4. Control of environmental exposure: *Indoor use of fertilizer (nutrient)*. (ERC 8b)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

52.3. Exposure estimation and reference to its source

52.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance: If a downstream user (DU) has OCs or RMMs outside the OC/MM specifications in the generic ES, then the DU can evaluate whether he works inside the boundaries set by the ES through scaling:
Scaling tool: Scaling method, exposure estimation tool used: Fertilizer Environmental Exposure (FEE) Tool v1.2 http://www.reachfertilizers.com/
Scaling instructions: Scalable parameters: Total annual fertilizer use rate, Number of applications, Time between applications, Crop type, Crop growth stage, European crop yield scenario, Crop substance concentration, Crop yield, Risk management measures (drift and runoff' reduction, soil incorporation). All other parameters have to be taken directly from the exposure scenario provided. Boundaries of scaling: refer to boundaries as set in Fertilizer Environmental Exposure (FEE) Tool v1.2 http://www.reachfertilizers.com/ For Scaling instructions please go to the following website: www.reachfertilizers.com
Scaling tool web link: http://www.reachfertilizers.com/

53. ES 53: Use at industrial sites; Electrolytes for batteries (PC 42); Various sectors (SU 0, SU 16)

53.1. Title section

ES name: *Industrial use of ZnO in the production of fuel cells - batteries*
Product category: Electrolytes for batteries (PC 42)
Sector of use: Other (SU 0), Manufacture of computer, electronic and optical products, electrical equipment (SU 16)

Environment		SPERC
1: *Direct discharge to water after on-site treatment*	ERC 5	*Eurometaux SPERC 5.2.v3*
2: *Discharge via additional off-site sewage treatment plant*	ERC 5	*Eurometaux SPERC 5.2.v3*
Worker		SWED
3: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3	
4: *Mixing or blending in batch processes*	PROC 5	
5: *Low energy manipulation and handling of substances bound in/on materials or articles*	PROC 21	
Subsequent service life exposure scenario(s)		
ES 76: Service life (consumers); Electrical batteries and accumulators (AC 3)		

53.2. Conditions of use affecting exposure

53.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.045 tonnes/day
Annual amount per site <= 10 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day

53.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.045 tonnes/day
Annual amount per site <= 10 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal

mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

53.3. Exposure estimation and reference to its source

53.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

54. ES 54: Use at industrial sites; Other (PC 0); Various sectors (SU 0, SU 13)

54.1. Title section

ES name: *Industrial use of ZnO or ZnO-formulations in manufacturing of ceramics and frits*
Product category: Other (PC 0)
Sector of use: Other (SU 0), Manufacture of other non-metallic mineral products, e.g. plasters, cement (SU 13)

Environment		SPERC
1: *Direct discharge to water after on-site treatment*	ERC 6a	*Eurometaux SPERC 6a.1.v3*
2: *Discharge via additional off-site sewage treatment plant*	ERC 6a	*Eurometaux SPERC 6a.1.v3*
Worker		SWED
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2	
4: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3	
5: *Chemical production where opportunity for exposure arises*	PROC 4	
6: *Mixing or blending in batch processes*	PROC 5	
7: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14	
8: *Manufacturing and processing of minerals and/or metals at substantially elevated temperature*	PROC 22	
9: *Handling of solid inorganic substances at ambient temperature*	PROC 26	

54.2. Conditions of use affecting exposure

54.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.14 tonnes/day
Annual amount per site <= 25 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day

54.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.659 tonnes/day
Annual amount per site <= 120 tonnes/year

Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

54.3. Exposure estimation and reference to its source

54.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

55. ES 55: Use at industrial sites; Other (PC 0); Various sectors (SU 0, SU 13)

55.1. Title section

ES name: *Industrial use of ZnO as additive / component for production of glass*
Product category: Other (PC 0)
Sector of use: Other (SU 0), Manufacture of other non-metallic mineral products, e.g. plasters, cement (SU 13)

Environment		SPERC
1: *Direct discharge to water after on-site treatment*	ERC 6a	*Eurometaux SPERC 6a.1.v3*
2: *Discharge via additional off-site sewage treatment plant*	ERC 6a	*Eurometaux SPERC 6a.1.v3*
Worker		SWED
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2	
4: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3	
5: *Chemical production where opportunity for exposure arises*	PROC 4	
6: *Mixing or blending in batch processes*	PROC 5	
7: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b	
8: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9	
9: *Manufacturing and processing of minerals and/or metals at substantially elevated temperature*	PROC 22	
10: *Handling of solid inorganic substances at ambient temperature*	PROC 26	

55.2. Conditions of use affecting exposure

55.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.14 tonnes/day
Annual amount per site <= 25 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day

55.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 6a)

Amount used, frequency and duration of use (or from service life)

Daily amount per site <= 0.14 tonnes/day
Annual amount per site <= 25 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

55.3. Exposure estimation and reference to its source

55.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

56. ES 56: Use at industrial sites; Other (PC 0); Other (SU 0)

56.1. Title section

ES name: *Industrial use of ZnO in surface treatment of flat glass*
Product category: Other (PC 0)
Sector of use: Other (SU 0)

Environment		SPERC
1: *Direct discharge to water after on-site treatment*	ERC 5	*Eurometaux SPERC 5.1.v3*
2: *Discharge via additional off-site sewage treatment plant*	ERC 5	*Eurometaux SPERC 5.1.v3*
Worker		SWED
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2	
4: *Calendering operations*	PROC 6	
5: *Handling of solid inorganic substances at ambient temperature*	PROC 26	
Subsequent service life exposure scenario(s)		
ES 80: Service life (consumers); Stone, plaster, cement, glass and ceramic articles (AC 4)		

56.2. Conditions of use affecting exposure

56.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.011 tonnes/day
Annual amount per site <= 2.5 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day

56.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.011 tonnes/day
Annual amount per site <= 2.5 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

56.3. Exposure estimation and reference to its source

56.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

57. ES 57: Use at industrial sites; Various sectors (SU 8, SU 9, SU 13)

57.1. Title section

ES name: *Industrial use of ZnO as component for production of organic and inorganic zinc compounds (intermediate use)*
Sector of use: Manufacture of bulk, large scale chemicals (including petroleum products) (SU 8), Manufacture of fine chemicals (SU 9), Manufacture of other non-metallic mineral products, e.g. plasters, cement (SU 13)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 6a
2: *Discharge via additional off-site sewage treatment plant*	ERC 6a
Worker	
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2
4: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
5: Transfer of substance or mixture (charging/discharging) at dedicated facilities	PROC 8b
6: Transfer of substance or mixture into small containers (dedicated filling line, including weighing)	PROC 9
7: *Use as laboratory reagent*	PROC 15
8: *Manufacturing and processing of minerals and/or metals at substantially elevated temperature*	PROC 22
9: *Handling of solid inorganic substances at ambient temperature*	PROC 26

57.2. Conditions of use affecting exposure

57.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 1 tonnes/day
Annual amount per site <= 250 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
Assumed effluent discharge flow from site >= 2E3 m3/day

57.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 2 tonnes/day
Annual amount per site <= 500 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter

Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

57.3. Exposure estimation and reference to its source

57.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

58. ES 58: Use at industrial sites; Base metals and alloys (PC 7); Manufacture of basic metals, including alloys (SU 14)

58.1. Title section

ES name: *Industrial use of ZnO in zinc production by electrowinning (intermediate use)*
Product category: Base metals and alloys (PC 7)
Sector of use: Manufacture of basic metals, including alloys (SU 14)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 6a
2: *Discharge via additional off-site sewage treatment plant*	ERC 6a
Worker	
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2
4: *Low energy manipulation and handling of substances bound in/on materials or articles*	PROC 21
5: *Manufacturing and processing of minerals and/or metals at substantially elevated temperature*	PROC 22

58.2. Conditions of use affecting exposure

58.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 2.75 tonnes/day
Annual amount per site <= 1E3 tonnes/year
Technical and organisational conditions and measures
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
Assumed effluent discharge flow from site >= 2E3 m3/day

58.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 2.75 tonnes/day
Annual amount per site <= 1E3 tonnes/year
Technical and organisational conditions and measures
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day

Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

58.3. Exposure estimation and reference to its source

58.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

59. ES 59: Use at industrial sites; Base metals and alloys (PC 7); Manufacture of basic metals, including alloys (SU 14)

59.1. Title section

ES name: *Industrial use of ZnO in zinc production by pyrometallurgy (distillation) (intermediate use)*
Product category: Base metals and alloys (PC 7)
Sector of use: Manufacture of basic metals, including alloys (SU 14)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 6a
2: *Discharge via additional off-site sewage treatment plant*	ERC 6a
Worker	
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2
4: *Low energy manipulation and handling of substances bound in/on materials or articles*	PROC 21
5: *Manufacturing and processing of minerals and/or metals at substantially elevated temperature*	PROC 22

59.2. Conditions of use affecting exposure

59.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 2.75 tonnes/day
Annual amount per site <= 1E3 tonnes/year
Technical and organisational conditions and measures
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
Assumed effluent discharge flow from site >= 2E3 m3/day

59.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 2.75 tonnes/day
Annual amount per site <= 1E3 tonnes/year
Technical and organisational conditions and measures
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day

Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

59.3. Exposure estimation and reference to its source

59.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

60. ES 60: Use at industrial sites; Laboratory Chemicals (PC 21)

60.1. Title section

ES name: *Zinc oxide as laboratory reagent*
Product category: Laboratory Chemicals (PC 21)

Environment	
1: *Discharge via either on-site or off-site sewage treatment plant*	ERC 6a
Worker	
2: *Use as laboratory reagent*	PROC 15

60.2. Conditions of use affecting exposure

60.2.1. Control of environmental exposure: *Discharge via either on-site or off-site sewage treatment plant* (ERC 6a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 2.5E-3 tonnes/day
Annual amount per site <= 0.05 tonnes/year
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

60.3. Exposure estimation and reference to its source

60.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

61. ES 61: Use at industrial sites; Other (PC 0); Various sectors (SU 0, SU 13, SU 17)

61.1. Title section

ES name: *Industrial use of ZnO as friction agents in brake pads*
Product category: Other (PC 0)
Sector of use: Other (SU 0), Manufacture of other non-metallic mineral products, e.g. plasters, cement (SU 13), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 5
2: *Discharge via additional off-site sewage treatment plant*	ERC 5
Worker	
3: *Chemical production where opportunity for exposure arises*	PROC 4
4: *Mixing or blending in batch processes*	PROC 5
5: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
6: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
7: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
Subsequent service life exposure scenario(s)	
ES 77: Service life (consumers); Various articles (AC 0, AC 1)	

61.2. Conditions of use affecting exposure

61.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.46 tonnes/day
Annual amount per site <= 100 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
Assumed effluent discharge flow from site >= 2E3 m3/day

61.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.46 tonnes/day
Annual amount per site <= 100 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant

Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

61.3. Exposure estimation and reference to its source

61.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

62. ES 62: Use at industrial sites; Various products (PC 0, PC 30, PC 33); Various sectors (SU 0, SU 16)

62.1. Title section

ES name: *Industrial use of bulk ZnO as additive in the manufacturing of electronic components*
Product category: Other (PC 0), Photo-chemicals (PC 30), Semiconductors (PC 33)
Sector of use: Other (SU 0), Manufacture of computer, electronic and optical products, electrical equipment (SU 16)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 5
2: *Discharge via additional off-site sewage treatment plant*	ERC 5
Worker	
3: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
4: *Chemical production where opportunity for exposure arises*	PROC 4
5: *Mixing or blending in batch processes*	PROC 5
6: *Industrial spraying*	PROC 7
7: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
8: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
9: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
10: *Manufacturing and processing of minerals and/or metals at substantially elevated temperature*	PROC 22
11: *High (mechanical) energy work-up of substances bound in materials and/or articles*	PROC 24
12: *Handling of solid inorganic substances at ambient temperature*	PROC 26
Subsequent service life exposure scenario(s)	
ES 78: Service life (consumers); Various articles (AC 2, AC 4, AC 7)	

62.2. Conditions of use affecting exposure

62.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 1 tonnes/day
Annual amount per site <= 216 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
Assumed effluent discharge flow from site >= 2E3 m3/day

62.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 1 tonnes/day

Annual amount per site <= 216 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

62.3. Exposure estimation and reference to its source

62.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

63. ES 63: Use at industrial sites; Various products (PC 0, PC 30, PC 33); Various sectors (SU 0, SU 16)

63.1. Title section

ES name: *Industrial use of nano ZnO as additive in the manufacturing of electronic components*
Product category: Other (PC 0), Photo-chemicals (PC 30), Semiconductors (PC 33)
Sector of use: Other (SU 0), Manufacture of computer, electronic and optical products, electrical equipment (SU 16)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 5
2: *Discharge via additional off-site sewage treatment plant*	ERC 5
Worker	
3: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
4: *Chemical production where opportunity for exposure arises*	PROC 4
5: *Mixing or blending in batch processes*	PROC 5
6: *Industrial spraying*	PROC 7
7: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b
8: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
9: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
10: *Manufacturing and processing of minerals and/or metals at substantially elevated temperature*	PROC 22
11: *High (mechanical) energy work-up of substances bound in materials and/or articles*	PROC 24
12: *Handling of solid inorganic substances at ambient temperature*	PROC 26
Subsequent service life exposure scenario(s)	
ES 79: Service life (consumers); Various articles (AC 2, AC 4, AC 7)	

63.2. Conditions of use affecting exposure

63.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Annual amount per site <= 5 tonnes/year
Daily amount per site <= 0.023 tonnes/day
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
Assumed effluent discharge flow from site >= 2E3 m3/day

63.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Annual amount per site <= 5 tonnes/year

Daily amount per site <= 0.023 tonnes/day
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

63.3. Exposure estimation and reference to its source

63.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

64. ES 64: Use at industrial sites; Other (PC 0); Various sectors (SU 0, SU 6a)

64.1. Title section

ES name: *Industrial use of ZnO containing glazes and glassy thin film coatings*
Product category: Other (PC 0)
Sector of use: Other (SU 0), Manufacture of wood and wood products (SU 6a)

Environment		SPERC
1: *Direct discharge to water after on-site treatment*	ERC 5	*Eurometaux SPERC 5.1.v3*
2: *Discharge via additional off-site sewage treatment plant*	ERC 5	*Eurometaux SPERC 5.1.v3*
Worker		SWED
3: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions	PROC 2	
4: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition	PROC 3	
5: *Industrial spraying*	PROC 7	
6: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b	
7: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9	
8: *Roller application or brushing*	PROC 10	
9: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14	
10: *Low energy manipulation and handling of substances bound in/on materials or articles*	PROC 21	
Subsequent service life exposure scenario(s)		
ES 73: Service life (professional worker); Stone, plaster, cement, glass and ceramic articles (AC 4)		

64.2. Conditions of use affecting exposure

64.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.011 tonnes/day
Annual amount per site <= 2.5 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day

64.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.011 tonnes/day
Annual amount per site <= 2.5 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

64.3. Exposure estimation and reference to its source

64.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

65. ES 65: Use at industrial sites; Pharmaceuticals (PC 29); Various sectors (SU 0, SU 20)

65.1. Title section

ES name: *Industrial use of ZnO as ingredient for dental cement*
Product category: Pharmaceuticals (PC 29)
Sector of use: Other (SU 0), Health services (SU 20)

Environment	
1: *No emissions to water and air*	ERC 5
Worker	
2: *Chemical production where opportunity for exposure arises*	PROC 4
3: *Mixing or blending in batch processes*	PROC 5
4: *Treatment of articles by dipping and pouring*	PROC 13
5: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
6: *Handling of solid inorganic substances at ambient temperature*	PROC 26

65.2. Conditions of use affecting exposure

65.2.1. Control of environmental exposure: *No emissions to water and air* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.02 tonnes/day
Annual amount per site <= 5 tonnes/year
Technical and organisational conditions and measures
The substance should not be released to air
The substance should not be released to water
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day
Assumed effluent discharge flow from site >= 2E3 m3/day

65.3. Exposure estimation and reference to its source

65.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

66. ES 66: Use at industrial sites; Polymer Preparations and Compounds (PC 32); Manufacture of plastics products, including compounding and conversion (SU 12)

66.1. Title section

ES name: *Industrial use of bulk ZnO as additive for production of polymer-matrices, plastics, thermoplastics and related preparations*
Product category: Polymer Preparations and Compounds (PC 32)
Sector of use: Manufacture of plastics products, including compounding and conversion (SU 12)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 5
2: *Discharge via additional off-site sewage treatment plant*	ERC 5
Worker	
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2
4: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
5: *Mixing or blending in batch processes*	PROC 5
6: *Calendering operations*	PROC 6
7: *Industrial spraying*	PROC 7
8: *Transfer of substance or mixture at dedicated facilities*	PROC 8b
9: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
10: *Roller application or brushing*	PROC 10
11: *Treatment of articles by dipping and pouring*	PROC 13
12: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
13: *Low energy manipulation and handling of substances bound in/on materials or articles*	PROC 21
14: *High (mechanical) energy work-up of substances bound in materials and/or articles*	PROC 24
15: Handling of solid inorganic substances at ambient temperature	PROC 26
Subsequent service life exposure scenario(s)	
ES 81: Service life (consumers); Various articles (AC 1, AC 2, AC 13)	

66.2. Conditions of use affecting exposure

66.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.46 tonnes/day
Annual amount per site <= 100 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

Assumed effluent discharge flow from site >= 2E3 m3/day

66.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.46 tonnes/day
Annual amount per site <= 100 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

66.3. Exposure estimation and reference to its source

66.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

67. ES 67: Use at industrial sites; Polymer Preparations and Compounds (PC 32); Manufacture of plastics products, including compounding and conversion (SU 12)

67.1. Title section

ES name: *Industrial use of coated or uncoated nano ZnO as additive for production of polymer-matrices, plastics, thermoplastics and related preparations*
Product category: Polymer Preparations and Compounds (PC 32)
Sector of use: Manufacture of plastics products, including compounding and conversion (SU 12)

Environment	
1: *Direct discharge to water after on-site treatment*	ERC 5
2: *Discharge via additional off-site sewage treatment plant*	ERC 5
Worker	
3: *Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions*	PROC 2
4: *Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment conditions*	PROC 3
5: *Mixing or blending in batch processes*	PROC 5
6: *Calendering operations*	PROC 6
7: *Industrial spraying*	PROC 7
8: *Transfer of substance or mixture at dedicated facilities*	PROC 8b
9: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9
10: *Roller application or brushing*	PROC 10
11: *Treatment of articles by dipping and pouring*	PROC 13
12: *Tabletting, compression, extrusion, pelletisation, granulation*	PROC 14
13: *Low energy manipulation and handling of substances bound in/on materials or articles*	PROC 21
14: *High (mechanical) energy work-up of substances bound in materials and/or articles*	PROC 24
15: Handling of solid inorganic substances at ambient temperature	PROC 26
Subsequent service life exposure scenario(s)	
ES 82: Service life (consumers); Various articles (AC 1, AC 2, AC 13)	

67.2. Conditions of use affecting exposure

67.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.46 tonnes/day
Annual amount per site <= 100 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

Assumed effluent discharge flow from site >= 2E3 m3/day

67.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.46 tonnes/day
Annual amount per site <= 100 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Other conditions affecting environmental exposure
Receiving surface water flow >= 1.8E4 m3/day

67.3. Exposure estimation and reference to its source

67.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

68. ES 68: Use at industrial sites; Various products (PC 0, PC 2, PC 20, PC 21, PC 40); Various sectors (SU 8, SU 9)

68.1. Title section

ES name: *Industrial use of bulk ZnO-containing catalysts*
Product category: Other (PC 0), Adsorbents (PC 2), Products such as ph-regulators, flocculants, precipitants, neutralization agents (PC 20), Laboratory Chemicals (PC 21), Extraction agents (PC 40)
Sector of use: Manufacture of bulk, large scale chemicals (including petroleum products) (SU 8), Manufacture of fine chemicals (SU 9)

Environment	
1: *Industrial use of bulk ZnO-containing catalysts*	ERC 4
2: *Industrial use of bulk ZnO-containing catalysts*	ERC 6b
3: *Industrial use of bulk ZnO-containing catalysts with emissions to water*	ERC 4
Worker	
4: *Industrial use of powdered catalysts*	PROC 8b, PROC 1, PROC 8a, PROC 4, PROC 2, PROC 9, PROC 28, PROC 3
5: *Industrial use of shaped catalysts*	PROC 8b, PROC 1, PROC 8a, PROC 4, PROC 2, PROC 9, PROC 28, PROC 3

68.2. Conditions of use affecting exposure

68.2.1. Control of environmental exposure: *Industrial use of bulk ZnO-containing catalysts* (ERC 4)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 50 tonnes/day
Annual amount per site <= 100 tonnes/year
Technical and organisational conditions and measures
The substance should not be released to air
The substance should not be released to water

68.2.2. Control of environmental exposure: *Industrial use of bulk ZnO-containing catalysts* (ERC 6b)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 50 tonnes/day
Annual amount per site <= 100 tonnes/year
Technical and organisational conditions and measures
The substance should not be released to air
The substance should not be released to water

68.2.3. Control of environmental exposure: *Industrial use of bulk ZnO-containing catalysts with emissions to water* (ERC 4)

Amount used, frequency and duration of use (or from service life)
Annual amount per site <= 25 tonnes/year
Daily amount per site <= 0.09 tonnes/day

Technical and organisational conditions and measures
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
The substance should not be released to air
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day
No discharge to freshwater assumed

68.3. Exposure estimation and reference to its source

68.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

69. ES 69: Use at industrial sites; Various products (PC 0, PC 2, PC 20, PC 21, PC 40); Various sectors (SU 8, SU 9)

69.1. Title section

ES name: *Industrial use of nano ZnO-containing catalysts*
Product category: Other (PC 0), Adsorbents (PC 2), Products such as ph-regulators, flocculants, precipitants, neutralization agents (PC 20), Laboratory Chemicals (PC 21), Extraction agents (PC 40)
Sector of use: Manufacture of bulk, large scale chemicals (including petroleum products) (SU 8), Manufacture of fine chemicals (SU 9)

Environment	
1: *Industrial use of nano ZnO-containing catalysts*	ERC 4
2: *Industrial use of nano ZnO-containing catalysts*	ERC 6b
Worker	
3: *Industrial use of powdered catalysts*	PROC 8b, PROC 1, PROC 8a, PROC 4, PROC 2, PROC 9, PROC 28, PROC 3
4: *Industrial use of shaped catalysts*	PROC 8b, PROC 1, PROC 8a, PROC 4, PROC 2, PROC 9, PROC 28, PROC 3

69.2. Conditions of use affecting exposure

69.2.1. Control of environmental exposure: *Industrial use of nano ZnO-containing catalysts* (ERC 4)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 50 tonnes/day
Annual amount per site <= 100 tonnes/year
Technical and organisational conditions and measures
The substance should not be released to air
The substance should not be released to water

69.2.2. Control of environmental exposure: *Industrial use of nano ZnO-containing catalysts* (ERC 6b)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 50 tonnes/day
Annual amount per site <= 100 tonnes/year
Technical and organisational conditions and measures
The substance should not be released to air
The substance should not be released to water

69.3. Exposure estimation and reference to its source

69.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following

parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

70. ES 70: Use at industrial sites; Various products (PC 0, PC 9a, PC 33); Other (SU 0)

70.1. Title section

ES name: *Industrial use of bulk ZnO-containing thin film coatings*
Product category: Other (PC 0), Coatings and Paints, Thinners, paint removers (PC 9a), Semiconductors (PC 33)
Sector of use: Other (SU 0)

Environment		SPERC
1: *Direct discharge to water after on-site treatment*	ERC 5	*Eurometaux SPERC 5.1.v3*
2: *Discharge via additional off-site sewage treatment plant*	ERC 5	*Eurometaux SPERC 5.1.v3*
Worker		SWED
3: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions	PROC 2	
4: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition	PROC 3	
5: *Industrial spraying*	PROC 7	
6: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b	
7: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9	
8: *Roller application or brushing*	PROC 10	
Subsequent service life exposure scenario(s)		
ES 74: Service life (professional worker); Stone, plaster, cement, glass and ceramic articles (AC 4)		

70.2. Conditions of use affecting exposure

70.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.011 tonnes/day
Annual amount per site <= 2.5 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day

70.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.011 tonnes/day
Annual amount per site <= 2.5 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

70.3. Exposure estimation and reference to its source

70.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

71. ES 71: Use at industrial sites; Various products (PC 0, PC 9a, PC 33); Other (SU 0)

71.1. Title section

ES name: *Industrial use of nano ZnO-containing thin film coatings*
Product category: Other (PC 0), Coatings and Paints, Thinners, paint removers (PC 9a), Semiconductors (PC 33)
Sector of use: Other (SU 0)

Environment		SPERC
1: *Direct discharge to water after on-site treatment*	ERC 5	*Eurometaux SPERC 5.1.v3*
2: *Discharge via additional off-site sewage treatment plant*	ERC 5	*Eurometaux SPERC 5.1.v3*
Worker		SWED
3: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions	PROC 2	
4: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition	PROC 3	
5: *Industrial spraying*	PROC 7	
6: *Transfer of substance or mixture (charging and discharging) at dedicated facilities*	PROC 8b	
7: *Transfer of substance or mixture into small containers (dedicated filling line, including weighing)*	PROC 9	
8: *Roller application or brushing*	PROC 10	
Subsequent service life exposure scenario(s)		
ES 75: Service life (professional worker); Stone, plaster, cement, glass and ceramic articles (AC 4)		

71.2. Conditions of use affecting exposure

71.2.1. Control of environmental exposure: *Direct discharge to water after on-site treatment* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.011 tonnes/day
Annual amount per site <= 2.5 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 2E3 m3/day

71.2.2. Control of environmental exposure: *Discharge via additional off-site sewage treatment plant* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 0.011 tonnes/day
Annual amount per site <= 2.5 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2E3 m3/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

71.3. Exposure estimation and reference to its source

71.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

72. ES 72: Consumer use; Explosives (PC 11)

72.1. Title section

ES name: *Consumer use of ZnO-containing pyrotechnic products*
Product category: Explosives (PC 11)

Environment	
1: *Consumer use of ZnO-containing pyrotechnic products*	ERC 8d
Consumer	
2: *Use of explosives*	PC 11

72.2. Conditions of use affecting exposure

72.2.1. Control of environmental exposure: *Consumer use of ZnO-containing pyrotechnic products* (ERC 8d)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

72.3. Exposure estimation and reference to its source

72.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

73. ES 73: Service life (professional worker); Stone, plaster, cement, glass and ceramic articles (AC 4)

73.1. Title section

ES name: *Glazes and glassy thin film coatings coated materials*
Article category: Stone, plaster, cement, glass and ceramic articles (AC 4)

Environment	
1: *Glazes and glassy thin film coatings coated materials*	ERC 11a
Worker	
2: *Low energy manipulation of substances bound in materials and/or articles*	PROC 21
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 64: Use at industrial sites; Other (PC 0); Various sectors (SU 0, SU 6a)	

73.2. Conditions of use affecting exposure

73.2.1. Control of environmental exposure: *Glazes and glassy thin film coatings coated materials* (ERC 11a)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.

73.3. Exposure estimation and reference to its source

73.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

74. ES 74: Service life (professional worker); Stone, plaster, cement, glass and ceramic articles (AC 4)

74.1. Title section

ES name: *Thin film coated materials with bulk ZnO*
Article category: Stone, plaster, cement, glass and ceramic articles (AC 4)

Environment	
1: *Thin film coated materials with bulk ZnO*	ERC 11a
Worker	
2: *Low energy manipulation of substances bound in materials and/or articles*	PROC 21
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 70: Use at industrial sites; Various products (PC 0, PC 9a, PC 33); Other (SU 0)	

74.2. Conditions of use affecting exposure

74.2.1. Control of environmental exposure: *Thin film coated materials with bulk ZnO* (ERC 11a)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.

74.3. Exposure estimation and reference to its source

74.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

75. ES 75: Service life (professional worker); Stone, plaster, cement, glass and ceramic articles (AC 4)

75.1. Title section

ES name: *Thin film coated materials with nano ZnO*
Article category: Stone, plaster, cement, glass and ceramic articles (AC 4)

Environment	
1: *Thin film coated materials with nano ZnO*	ERC 11a
Worker	
2: *Low energy manipulation of substances bound in materials and/or articles*	PROC 21
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 71: Use at industrial sites; Various products (PC 0, PC 9a, PC 33); Other (SU 0)	

75.2. Conditions of use affecting exposure

75.2.1. Control of environmental exposure: *Thin film coated materials with nano ZnO* (ERC 11a)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.

75.3. Exposure estimation and reference to its source

75.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

76. ES 76: Service life (consumers); Electrical batteries and accumulators (AC 3)

76.1. Title section

ES name: *Service life of fuel cells - batteries*
Article category: Electrical batteries and accumulators (AC 3)

Environment		SPERC
1: *Service life of fuel cells - batteries*	ERC 11a	*Eurometaux SPERC 11A.2.v2*
Consumer		SCED
2: *Electrical batteries and accumulators*	AC 3	
Exposure scenario of the uses leading to the inclusion of the substance into the article		
ES 53: Use at industrial sites; Electrolytes for batteries (PC 42); Various sectors (SU 0, SU 16)		

76.2. Conditions of use affecting exposure

76.2.1. Control of environmental exposure: *Service life of fuel cells - batteries* (ERC 11a)

Conditions and measures related to external treatment of waste (including article waste)
Dedicated recollection infrastructure required for waste
Other conditions affecting environmental exposure
Indoor or outdoor use
No water contact during use.

76.3. Exposure estimation and reference to its source

76.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

77. ES 77: Service life (consumers); Various articles (AC 0, AC 1)

77.1. Title section

ES name: *Service life of brake pads*
Article category: Other (AC 0), Vehicles (AC 1)

Environment	
1: *Service life of brake pads*	ERC 10a, ERC 11a
Consumer	
2: *Vehicles*	AC 1
3: *Brake pads*	AC 0
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 61: Use at industrial sites; Other (PC 0); Various sectors (SU 0, SU 13, SU 17)	

77.2. Conditions of use affecting exposure

77.2.1. Control of environmental exposure: *Service life of brake pads* (ERC 10a, ERC 11a)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

77.3. Exposure estimation and reference to its source

77.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

78. ES 78: Service life (consumers); Various articles (AC 2, AC 4, AC 7)

78.1. Title section

ES name: *Service life of electronic and electric devices containing bulk ZnO*
Article category: Machinery, mechanical appliances, electrical/electronic articles (AC 2), Stone, plaster, cement, glass and ceramic articles (AC 4), Metal articles (AC 7)

Environment		SPERC
1: *Service life of electronic and electric devices containing bulk ZnO*	ERC 11a	*Eurometaux SPERC 11A.3.v1*
Consumer		SCED
2: *Machinery, mechanical appliances, electrical/electronic articles*	AC 2	
3: *Stone, plaster, cement, glass and ceramic articles*	AC 4	
4: *Metal articles*	AC 7	
Exposure scenario of the uses leading to the inclusion of the substance into the article		
ES 62: Use at industrial sites; Various products (PC 0, PC 30, PC 33); Various sectors (SU 0, SU 16)		

78.2. Conditions of use affecting exposure

78.2.1. Control of environmental exposure: *Service life of electronic and electric devices containing bulk ZnO* (ERC 11a)

Conditions and measures related to external treatment of waste (including article waste)
Dedicated recollection infrastructure required for waste
Other conditions affecting environmental exposure
Indoor use
No water-contact during use. Avoid cleaning with water.

78.3. Exposure estimation and reference to its source

78.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

79. ES 79: Service life (consumers); Various articles (AC 2, AC 4, AC 7)

79.1. Title section

ES name: *Service life of electronic and electric devices containing nano ZnO*
Article category: Machinery, mechanical appliances, electrical/electronic articles (AC 2), Stone, plaster, cement, glass and ceramic articles (AC 4), Metal articles (AC 7)

Environment		SPERC
1: *Service life of electronic and electric devices containing nano ZnO*	ERC 11a	*Eurometaux SPERC 11A.3.v1*
Consumer		SCED
2: *Machinery, mechanical appliances, electrical/electronic articles*	AC 2	
3: *Stone, plaster, cement, glass and ceramic articles*	AC 4	
4: *Metal articles*	AC 7	
Exposure scenario of the uses leading to the inclusion of the substance into the article		
ES 63: Use at industrial sites; Various products (PC 0, PC 30, PC 33); Various sectors (SU 0, SU 16)		

79.2. Conditions of use affecting exposure

79.2.1. Control of environmental exposure: *Service life of electronic and electric devices containing nano ZnO* (ERC 11a)

Conditions and measures related to external treatment of waste (including article waste)
Dedicated recollection infrastructure required for waste
Other conditions affecting environmental exposure
Indoor use
No water-contact during use. Avoid cleaning with water.

79.3. Exposure estimation and reference to its source

79.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

80. ES 80: Service life (consumers); Stone, plaster, cement, glass and ceramic articles (AC 4)

80.1. Title section

ES name: *Service life of constructions of massive metal, alloys or metallic coating, outdoor*
Article category: Stone, plaster, cement, glass and ceramic articles (AC 4)

Environment		SPERC
1: *Service life of constructions of massive metal, alloys or metallic coating, outdoor*	ERC 10a, ERC 11a	*Eurometaux SPERC 10A.1.v2*
Consumer		SCED
2: *Flat glass*	AC 4	
Exposure scenario of the uses leading to the inclusion of the substance into the article		
ES 56: Use at industrial sites; Other (PC 0); Other (SU 0)		

80.2. Conditions of use affecting exposure

80.2.1. Control of environmental exposure: *Service life of constructions of massive metal, alloys or metallic coating, outdoor* (ERC 10a, ERC 11a)

Conditions and measures related to external treatment of waste (including article waste)
Dedicated recollection infrastructure required for waste
Other conditions affecting environmental exposure
Outdoor use
Municipal sewage treatment plant is assumed.

80.3. Exposure estimation and reference to its source

80.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

81. ES 81: Service life (consumers); Various articles (AC 1, AC 2, AC 13)

81.1. Title section

ES name: *Service life of plastic articles containing bulk ZnO*
Article category: Vehicles (AC 1), Machinery, mechanical appliances, electrical/electronic articles (AC 2), Plastic articles (AC 13)

Environment	
1: *Service life of plastic articles containing bulk ZnO*	ERC 10a, ERC 11a
Consumer	
2: *Vehicles*	AC 1
3: *Machinery, mechanical appliances, electrical/electronic articles*	AC 2
4: *Plastic articles*	AC 13
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 66: Use at industrial sites; Polymer Preparations and Compounds (PC 32); Manufacture of plastics products, including compounding and conversion (SU 12)	

81.2. Conditions of use affecting exposure

81.2.1. Control of environmental exposure: *Service life of plastic articles containing bulk ZnO* (ERC 10a, ERC 11a)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

81.3. Exposure estimation and reference to its source

81.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.

82. ES 82: Service life (consumers); Various articles (AC 1, AC 2, AC 13)

82.1. Title section

ES name: *Service life of plastic articles containing nano ZnO*
Article category: Vehicles (AC 1), Machinery, mechanical appliances, electrical/electronic articles (AC 2), Plastic articles (AC 13)

Environment	
1: *Service life of plastic articles containing nano ZnO*	ERC 10a, ERC 11a
Consumer	
2: *Vehicles*	AC 1
3: *Machinery, mechanical appliances, electrical/electronic articles*	AC 2
4: *Plastic articles*	AC 13
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 67: Use at industrial sites; Polymer Preparations and Compounds (PC 32); Manufacture of plastics products, including compounding and conversion (SU 12)	

82.2. Conditions of use affecting exposure

82.2.1. Control of environmental exposure: *Service life of plastic articles containing nano ZnO* (ERC 10a, ERC 11a)

Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

82.3. Exposure estimation and reference to its source

82.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Scaling tool: Scaling tool: This can be done by using the MetalEUSES scaling tool (free download: http://www.arche-consulting.be/tools/du-scaling-tool/) to estimate the associated exposure. Following parameters can be scaled: amount used at local site, number of emission days, discharge effluent rate, dilution factor (or flow rate of the river), presence/absence of municipal sewage treatment plant (STP), removal rate municipal STP, use of municipal sludge on agricultural soil, and release factors to air and water.