1. Title GES 8 Production of nickel-containing glass	Version 6, 2015
Life cycle	Industrial use – DU of NiO
Free short title	Production of nickel-containing glass from NiO
Systematic title based on use descriptor	**SU:** SU 13 Manufacture of other non-metallic mineral products, *e.g.* plasters, cement **PC:** PC 19 Intermediate **ERC:** ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates) **PROC:** PROC 2 Use in closed, continuous process with occasional controlled exposure (*e.g.* sampling) PROC 3 Use in closed batch process (synthesis or formulation) PROC 4 Use in batch and other process (synthesis) where opportunity for exposure arises PROC 8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 22 Potentially closed processing operations (with minerals) at elevated temperature PROC 26 Handling of solid inorganic substances at ambient temperature PROC 0 Cleaning and maintenance
Processes, tasks, activities covered (environment)	Production of glass: - Raw material transport - Manually filling of raw material - Raw material dosing and weighing - Mixing - Batch transportation to furnace or batch filling to tank - Fumes treatment - Cleaning and maintenance
Processes, tasks, activities covered (workers)	Contributing exposure scenario ES 8.1 PROC 8b, PROC 9: Raw material handling Contributing exposure scenario ES 8.2 PROC3, PROC 26, PROC 5: Formulation and Mixing Contributing exposure scenario ES 8.3 PROC 22: Melting Contributing exposure scenario ES 8.4 PROC 2, PROC 3, PROC 4: Forming Contributing exposure scenario ES 8.5 PROC 8b: Packing Contributing exposure scenario ES 8.6 PROC 0: Cleaning and maintenance
2. Operational conditions and risk management measures	
2.1 Control of environmental exposure	
Environmental related free short title	Production of nickel-containing glass from NiO
Systematic title based on use descriptor (environment)	ERC6A: Industrial use resulting in manufacture of another substance (use of intermediates)
Processes, tasks, activities covered (environment)	Production of glass: - Raw material transport - Manually filling of raw material - Raw material dosing and weighing - Mixing - Batch transportation to furnace or batch filling to tank - Fumes treatment - Cleaning and maintenance
Environmental Assessment Method	Estimates based on monitoring local and regional concentrations are used for calculation of PEC.

Product characteristics	
The tonnage is based on Ni originating from the use of NiO as well as other Ni compounds used at same sites.	
Amounts used	
Maximum daily use at a site	41.1 kg (100th)
Maximum annual use at a site	15 tonnes (100th)
Frequency and duration of use	
Pattern of release to the environment	365 days per year per site
Environment factors not influenced by risk management	
Receiving surface water flow rate	ES 1 Discharge to STP: 18,000 m^3/d (Effluent STP: 2000 m^3/d) ES 2 Direct discharge: 18,000 m^3/d (Effluent Site: 2000 m^3/d)
Dilution capacity, freshwater	ES 1 Discharge to STP: 10 ES 2 Direct discharge: 10
Dilution capacity, marine	ES 3 Marine discharge: 100 (default)
Other given operational conditions affecting environmental exposure	
None	
Technical conditions and measures at process level (source) to prevent release	
None	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Waste water: On-site wastewater treatment by cooling and wet cleaning, a) with and b) without pollution abatement system. Off-site wastewater treatment plant, municipal STP for ES1. ES 1 Freshwater discharge to STP: Release factor after on-site treatment: 1000 g/T ES 2 Freshwater direct discharge: Release factor after on-site treatment: 1000 g/T ES 3 Marine direct discharge: Release factor after on-site treatment: 1000 g/T **Air:** Treatment of Dust/gaseous emissions: a) no pollution abatement system b) dust collector, pollution abatement system. ES 1, 2 & 3: Release factor to air: 1,400 g/T	
Organizational measures to prevent/limit release from site	
None	
Conditions and measures related to municipal sewage treatment plant	
Municipal Sewage Treatment Plant (STP)	Yes for ES 1 Discharge to STP
Discharge rate of the Municipal STP	2000 m^3/d (default)
Incineration of the sludge of the Municipal STP	The sludge is applied to agricultural soil
Conditions and measures related to external treatment of waste for disposal	
Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the nickel content of the waste is elevated enough, internal or external recovery/recycling might be considered. **Fraction of daily/annual use** expected in waste: - Nickel producers = 0.05 % - DU: stainless steel and alloy steels = 0.6 % - DU: nickel alloys, copper alloys, foundry, batteries, catalysts, chemicals, dyes and others = 0.5 % - DU: Plating = 3% **Appropriate waste codes:** 01 03 07*, 02 01 10*, 06 03 13*, 06 03 15*, 06 04 05*, 06 05 02*, 10 08 04, 10 08 08*, 10 08 09, 10 08 15*, 10 08 16, 10 10 03, 10 10 05*, 10 10 07*, 10 10 09*, 10 10 10, 10 10 11*, 11 02 07*, 12 01 03*, 12 01 04, 15 01 04*, 15 01 10*, 16 01 04*, 16 01 06*, 16 01 08*, 16 06 02*, 16 06 05, 16 08 02*, 16 08 03*, 17 04 07*, 17 04 09*, 19 09 04*, 19 10 02*, 19 12 03* **Suitable disposal:** Keep separate and dispose of to either - Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive	

2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006. - Hazardous landfill operated under Directive 1999/31/EC.	
Conditions and measures related to external recovery of waste	
Shredders pre-treating metal wastes should have a maximum release factors to air of 0.0015 after RMM and no releases to water and soil. Qmax, local(shredding)=26kg Ni/day (Note: This Qmax, local for shredders is based on the existing information at the moment of the update. It will be reviewed when new information is available from the BREF for shredding)	
2.2 Control of workers exposure for contributing exposure scenario ES 8.1	
Raw material handling	
Workers related free short title	Production of nickel-containing glass from NiO
Use descriptor covered	PROC 8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Processes, tasks, activities covered	Two general options for handling raw material handling are available and are presented here: 1) NiO powder is received in palletised bags/sacks/drums which are stored in warehouse and then opened and contents emptied into intermediate (flow) bins for transfer to the mixing area (repacking), or 2) NiO powder is pumped from a tanker into bulk storage (silos) and then conveyed directly or transferred via 'repacking' (into flow bins) to the mixing area
Assessment Method	Estimation of dermal and inhalation exposure based on Tier 1 model.
Product characteristic:	
Black NiO powder – diameter : 98% > 0.15mm	
Amounts used	
0.5 to 1 tonne nickel as NiO annually	
Frequency and duration of use/exposure	
8 hour shifts	
Human factors not influenced by risk management	
Respiration volume under conditions of use	Not relevant
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	480 cm^2
Body weight	Not relevant
Other given operational conditions affecting workers exposure	
1) Sealed palletised bags/sacks/drums of NiO powder are stored in closed warehouses and manually tipped into intermediate (flow) bins. Then the bins are sealed off and transported (fork lift truck, FLT) to the mixing area 2) NiO powder is (screw) conveyed from the silo to the mixing area or is 'repacked' into an intermediate flow bin and driven to the mixing area NiO fines recovered in the LEV are returned to the silos or flow bins, automatically or manually Oral: Good workplace hygiene practice.	
Technical conditions and measures at process level (source) to prevent release	
Inhalation: 1) Powder transfer operations where there is complete enclosure during driving of flow bins containing NiO powder are unlikely to give rise to significant exposures to inhalable Ni 1) Manual powder recovery operations are likely to give rise to significant exposures to inhalable NiO Dermal: Automation of processes should be used where possible to eliminate dermal contact.	
Technical conditions and measures to control dispersion from source towards the worker	
LEV is required for process steps that are not fully enclosed and involve NiO powder.	
Organisational measures to prevent /limit releases, dispersion and exposure	
A 'De-dusting system' may be applied throughout the whole handling process if indicated by the risk analysis.	
Conditions and measures related to personal protection, hygiene and health evaluation	
Inhalation: RPE (FFP3) {approved to EN 149} is required at process steps that are not fully enclosed and are likely to give	

rise to NiO dust Dermal: Gloves suitable for handling powders and other suitable protective clothing are required where direct contact with NiO could occur.	
2.3 Control of workers exposure for contributing exposure scenario ES 8.2	
Formulation and Mixing	
Workers related free short title	Production of nickel-containing glass from NiO
Use descriptor covered	PROC 3 Use in closed batch process (synthesis or formulation) PROC 26 Handling of solid inorganic substances at ambient temperature
Processes, tasks, activities covered	Batches of NiO and other raw material ingredients are transferred to and weighed out on balances, transferred to the mixer and mixed together for furnacing.
Assessment Method	Estimation of inhalation exposure based on measured data. Estimation of dermal exposure based on Tier 1 model.
Product characteristic	
Black NiO powder – diameter : 98% > 0.15mm	
Amounts used	
Frequency and duration of use/exposure	
8 hour shifts	
Human factors not influenced by risk management	
Respiration volume under conditions of use	Not relevant
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	1980 cm^2
Body weight	Not relevant
Other given operational conditions affecting workers exposure	
NiO powder, released from flow bins or silos, is (screw or vibratory) conveyed to the balance where the charge is weighed out. Alternatively, because NiO is a minor ingredient it may be manually tipped into the balance from a sack or added last - just before discharge to the furnace. The sack of NiO is added and mixing with the others raw materials just before transferring by truck to the furnace. The NiO-containing charge is transferred, along with other ingredients, to the mixer using an enclosed system (closed belt conveyor or pneumatic conveying). The mixed batch is conveyed from the mixer to furnace using an automated (closed belt conveyor or pneumatic conveying) or mechanised {'repacking' (into flow bins) and driving (of flow bins)} enclosed system. Oral: Good workplace hygiene practice.	
Technical conditions and measures at process level (source) to prevent release	
Inhalation: Powder transfer operations are unlikely to give rise to significant exposures to inhalable NiO where there is complete enclosure during driving of flow bins of NiO-containing powder from the mixer to the furnace area. Enclosure of NiO powder weighing and mixing operations is unlikely to give rise to significant exposures to inhalable Ni. Powder transfer operations where there is not complete enclosure, *e.g.* during manual tipping of NiO powder into the balance, are likely to give rise to significant exposures to inhalable Ni. Dermal: Automation of processes should be used where possible to eliminate dermal contact.	
Technical conditions and measures to control dispersion from source towards the worker	
LEV is required at process steps that are not fully enclosed and are likely to give rise to NiO dust , *e.g.* discharging and charging	
Organisational measures to prevent /limit releases, dispersion and exposure	
None	
Conditions and measures related to personal protection, hygiene and health evaluation	
Inhalation: RPE (FFP3) {approved to EN 149} is required at process steps that are not fully enclosed and are likely to give rise to NiO dust. Dermal: Gloves suitable for handling powders and other suitable protective clothing are required where direct contact with NiO could occur.	
2.4 Control of workers exposure for contributing exposure scenario ES 8.3	
Melting	
Workers related free short title	Production of nickel-containing glass from NiO
Use descriptor covered	PROC22 Potentially closed processing operations (with minerals) at elevated temperature

Processes, tasks, activities covered	Melting of the mixed batch in the furnace.
Assessment Method	Estimation of inhalation exposure based on measured data. Estimation of dermal exposure based on Tier 1 model.
Product characteristic	
Powder containing NiO, silica, sodium oxide, calcium oxide/alumina/boric oxide, cobalt oxide	
Amounts used	
Frequency and duration of use/exposure	
8 hour shifts	
Human factors not influenced by risk management	
Respiration volume under conditions of use	Not relevant
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	1980 cm^2
Body weight	Not relevant
Other given operational conditions affecting workers exposure	
The furnace charge is melted at between 1425 to 1600 °C using refractory pots (for specialised products such as optical glass and works of art), day tanks (coloured glass) and continuous tanks (flat and container glass). Oral: Good workplace hygiene practice.	
Technical conditions and measures at process level (source) to prevent release	
Inhalation: Automatised system during all the melting process should be applied where possible. Automation and complete enclosure of melting operations during furnacing are unlikely to give rise to significant exposures to inhalable Ni as dust or fume Dermal: Automation of processes should be used where possible to eliminate for dermal contact.	
Technical conditions and measures to control dispersion from source towards the worker	
None	
Organisational measures to prevent /limit releases, dispersion and exposure	
None	
Conditions and measures related to personal protection, hygiene and health evaluation	
Inhalation: RPE (FFP3) {approved to EN 149} is required at process steps that are not fully enclosed and are likely to give rise to NiO fumes or dust. Dermal: Gloves suitable for handling powders and other suitable protective clothing are required where direct contact with NiO could occur.	
2.5 Control of workers exposure for contributing exposure scenario ES 8.4	
Forming	
Workers related free short title	Production of nickel-containing glass from NiO
Use descriptor covered	PROC2 Use in closed, continuous process with occasional controlled exposure (*e.g.* sampling)
Processes, tasks, activities covered	Shaping of the molten glass containing NiO.
Assessment Method	No data
Product characteristic	
Molten metal oxides	
Amounts used	
Frequency and duration of use/exposure	
8 hour shifts	
Human factors not influenced by risk management	
Respiration volume under conditions of use	Not relevant
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	Not relevant
Body weight	Not relevant
Other given operational conditions affecting workers exposure	
Glass is shaped or formed by blowing (used for light bulbs, bottles, Christmas tree ornaments and jars), pressing (used for domestic ware, optical and filters), drawing (used for tubes and rods), and casting (for telescope mirrors). In machine pressing and blowing, the discharged melt from the furnace is basically cut into gobs which are pressed or blown into a mould and the finished product taken removed. After the shaping process, finishing techniques such as annealing may be used to further the glass.	

Oral: Good workplace hygiene practice.	
Technical conditions and measures at process level (source) to prevent release	
No data	
Technical conditions and measures to control dispersion from source towards the worker	
No data	
Organisational measures to prevent /limit releases, dispersion and exposure	
No data	
Conditions and measures related to personal protection, hygiene and health evaluation	
No data	
2.6 Control of workers exposure for contributing exposure scenario ES 8.5	
Packaging	
Workers related free short title	Production of nickel-containing glass from NiO
Use descriptor covered	
Processes, tasks, activities covered	Finished glass products are inspected and boxed for dispatch
Assessment Method	No data
Product characteristic	
Solid	
Amounts used	
Frequency and duration of use/exposure	
8 hour shifts	
Human factors not influenced by risk management	
Respiration volume under conditions of use	Not relevant
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	Not relevant
Body weight	Not relevant
Other given operational conditions affecting workers exposure	
No data	
Technical conditions and measures at process level (source) to prevent release	
No data	
Technical conditions and measures to control dispersion from source towards the worker	
No data	
Organisational measures to prevent /limit releases, dispersion and exposure	
No data	
Conditions and measures related to personal protection, hygiene and health evaluation	
No data	
2.7 Control of workers exposure for contributing exposure scenario ES 8.6	
Cleaning and maintenance	
Workers related free short title	Production of nickel-containing glass from NiO
Use descriptor covered	PROC 0 Cleaning and maintenance
Processes, tasks, activities covered	Cleaning and maintenance
Assessment Method	Estimation of dermal and inhalation exposure based on Tier 1 model.
Product characteristic	
No data, directly recycling.	
Amounts used	
Frequency and duration of use/exposure	
8 hour shifts	
Human factors not influenced by risk management	
Respiration volume under conditions of use	Not relevant
Room size and ventilation rate	Not relevant
Area of skin contact with the substance under conditions of use	1500 cm^2
Body weight	Not relevant
Other given operational conditions affecting workers exposure	
Cleaning of the factory premises and plant in the formulation area (weighing out raw materials on the balance) is carried out by vacuum cleaning or brushing under wet conditions	

Regular maintenance on filter bags and changing of filters are carried out.

Technical conditions and measures at process level (source) to prevent release

No data

Technical conditions and measures to control dispersion from source towards the worker

No data

Organisational measures to prevent /limit releases, dispersion and exposure

None

Conditions and measures related to personal protection, hygiene and health evaluation

Inhalation: RPE (FFP3; APF 40) {approved to EN 149}is required where exposure to Ni containing dust is likely.
Dermal: Gloves suitable for handling powders and other suitable protective clothing are required where direct contact with NiO could occur.

3. Exposure and risk estimation

Environment

ERC 6A
Production of nickel-containing glass from NiO

Compartment	Unit	PNEC	$PEC_{Regional}$	C_{local}	PEC	RCR	Methods for calculation of environmental concentrations
ES 1: Freshwater STP discharge							Measured values, Tier 3-RWC
Freshwater	µg Ni/L	7.1	2.9	0.88	3.78	0.53	
STP	mg Ni/L	0.33	-	-	0.012	0.04	
Sediment	mg Ni/kg	136	33.5	23.3	56.8	0.42	
Terrestrial	mg Ni/kg	29.9	16.2	0.39	16.59	0.55	
ES 2: Freshwater direct discharge							
Freshwater	µg Ni/L	7.1	2.9	1.47	4.37	0.62	
Sediment	mg Ni/kg	136	33.5	38.8	72.3	0.53	
Terrestrial	mg Ni/kg	29.9	16.2	0.01	16.21	0.54	
ES 3: Marine direct discharge							
Marine water	µg Ni/L	8.6	0.3	0.15	0.45	0.05	
Sediment	mg Ni/kg	136	16.1	3.9	20.0	0.15	
Terrestrial	mg Ni/kg	29.9	16.2	0.01	16.21	0.54	

Workers

ES 8.1
PROC 8b, PROC 9: Raw material handling

	Unit	DNEL NiO	Exposure concentration	RCR	Methods for calculation of exposure
Dermal					
Acute systemic	mg Ni/kg/day	-	NR	-	
Acute local	mg Ni/cm^2/day	-	NR	-	
Long-term systemic	mg Ni/kg/day	-	NR	-	
Long-term local	mg Ni/cm^2/day	0.012	0.0005	0.041	Modeled with MEASE for PROC 8b. NiO is assumed to be greater than 25% in the material handled. Exposure assumed to occur for more than 4 hours. Direct handling and use of gloves is also assumed.
Inhalation					
Acute local	mg Ni/m^3	3.9	0.084	0.02	3 times the long-term exposure.
Long-term systemic	mg Ni/m^3	0.05	0.028	0.56	Modeled with MEASE for

and local					PROC 8b. NiO is assumed to be greater than 25% in the material handled. Exposure assumed to occur for more than 4 hours. Direct handling, use of RPE (APF=40) and LEV are assumed.
ES 8.2 PROC 3, PROC 5 PROC 26: Formulating and mixing					
	Unit	DNEL NiO	Exposure concentration	RCR	Methods for calculation of exposure
Dermal					
Acute systemic	mg Ni/kg/day	-	NR	-	
Acute local	mg Ni/cm²/day	-	NR	-	
Long-term systemic	mg Ni/kg/day	-	NR	-	
Long-term local	mg Ni/cm²/day	0.012	0.00005	0.004	90th percentile from MEASE modelling (PROC 3, 26, partly enclosed, gloves)
Inhalation					
Acute local	mg Ni/m³	3.9	0.01	0.03	Estimated as 10x the long-term value. A factor of 10 was considered sufficient to account for the uncertainties in the dataset.
Long-term systemic and local	mg Ni/m³	0.05	0.001	0.02	Estimate of maximum measured exposure value
ES 8.3 PROC 22: Melting					
	Unit	DNEL NiO	Exposure concentration	RCR	Method for calculation of exposure
Dermal					
Acute systemic	mg Ni/kg/day	-	NR	-	
Acute local	mg Ni/cm²/day	-	NR	-	
Long-term systemic	mg Ni/kg/day	-	NR	-	
Long-term local	mg Ni/cm²/day	0.012	0.00005	0.004	90th percentile from MEASE modelling (PROC 22, automated, enclosed)
Inhalation					
Acute local	mg Ni/m³	3.9	0.001	<0.001	Estimated as 10x the long-term value. A factor of 10 was considered sufficient to account for the uncertainties in the dataset.
Long-term systemic and local	mg Ni/m³	0.05	0.0001	0.002	Estimate of maximum measured exposure value
ES 8.4 PROC 2, PROC 3, PROC 4: Forming					

Exposure to NiO is not likely during this operation					
	Unit	DNEL NiO	Exposure concentration	R□R	Methods for calcul□tion of exposure
Dermal					
Acute systemic	mg Ni/kg/day	-	NR	-	
Acute local	mg Ni/cm²/day	-	NR	-	
Long-term systemic	mg Ni/kg/day	-	NR	-	
Long-term local	mg Ni/cm²/day	0.012	NR	-	
Inhalation					
Acute local	mg Ni/m³	3.9	NR		
Long-term systemic	mg Ni/m³	0.05	NR		
Long-term local	mg Ni /m³	0.05	NR		
ES 8.5 PROC 8b: Packaging Exposure to NiO is not likely during this activity					
	Unit	DNEL NiO	Exposure concentration	RCR	Methods □or calculation of exposure
Dermal					
Acute systemic	mg Ni/kg/day	-	NR	-	
Acute local	mg Ni/cm²/day	-	NR	-	
Long-term systemic	mg Ni/kg/day	-	NR	-	
Long-term local	mg Ni/cm²/day	0.012	NR	-	
Inhalation					
Acute local	mg Ni/m³	3.9	NR		
Long-term systemic and local	mg Ni/m³	0.05	NR		
ES 8.6 PROC 0: Cleaning & Maintenance					
	Unit	DNEL NiO	Exposure concentration	□CR	Methods for calculation of exposure
Dermal					
Acute systemic	mg Ni/kg/day	-	NR	-	
Acute local	mg Ni/cm²/day	-	NR	-	
Long-term systemic	mg Ni/kg/day	-	NR	-	
Long-term local	mg	0.012	0.00003	0.0025	Exposure estimated using

	Ni/cm²/day				MEASE for PROC10. Greater than 25% in the preparation, no direct handling, non dispersive techniques, no more than 4 hours, gloves
Inhalation					
Acute local	mg Ni/m³	3.9	0.225	0.06	3 times the long-term exposure estimate.
Long-term systemic and local	mg Ni/m³	0.05	0.075 (0.017 with LEV)	1.5 (0.34 with LEV)	Exposure estimated using MEASE for PROC10. (greater than 25% in the preparation, no direct handling, non dispersive techniques, no more than 4 hours, RPE (APF=40))

NR: Not relevant

Acute local inhalation
DNEL based on respirable size aerosols. Equivalent inhalable fraction levels expected to be at least 3-fold higher

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

Environment
Scaling tool: Metals EUSES IT tool (free download: http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool)

Scaling of the release to air and water environment includes:
Refining of the release factor to air and waste water and/or and the efficiency of the air filter and wastewater treatment facility.

Scaling of the PNEC for aquatic environment by using a tiered approach for correction for bioavailability and background concentration (C_{local} approach).

Scaling of the PNEC for soil compartment by using a tiered approach for correction for bioavailability and background concentration (C_{local} approach).

Workers
Scaling considering duration and frequency of use
Collect process monitoring data with an inhalable sampler. The simultaneous use of a respirable sampler is encouraged. Use aerosol particle size information, when available, to confirm the appropriate use of the inhalable DNEL of 0.05 mg Ni/m³. Respirable fraction exposure levels should be kept below 0.01 mg Ni/m³.

For further information and guidance on exposure scenarios, available tools, and scaling options, please visit the Nickel Consortia exposure scenario library at the following link: http://www.nickelconsortia.eu/exposure-scenario-library.html

Man via Environment exposure and risk characterisation assessments for the produciton of nickel-containing glass

Inhalation is the critical exposure pathway for humans via the environment. The PEC for air at site neighbouring residential areas should be lower than the chronic inhalation DNEL for the general public of 20 ng Ni/m^3 as annual average in PM_{10} in order to demonstrate adequate control of risk (RCR < 1) for Man via the Environment (MvE).

Hereto a Generic safe use Exposure Scenario for MvE was developed based on the EUSES model. The MvE GES is defined as the product of tonnage (T) and emission factor to air (EF) being lower than 18000 g Ni/year. The value of 18000 g Ni/year is derived by using EUSES model to back-calculate the product of T and EF that results in a local air concentration (C_{local}) of 15.5 ng Ni/m^3. The value of 15.5 is derived from the difference between the DNEL of 20 ng Ni/m^3 and the EU regional background concentration ($C_{regional}$) of 4.5 ng Ni/m^3 (P90 annual concentration for 2012).

Generic safe use ES for all sectors according to Tier 1 (EUSES model)

Sector	Tonnage (Ni T /year)	Emission factor (g Ni/T)	Tonnage × emission factor (g /year)	C_{local} (ng/m³)	$C_{regional}$ (ng/m³)	PEC_{local} (ng/m³)	RCR = PEC/DNEL (DNEL= 20 ng/m³)
All	T	EF	T × EF < 18000	<15.5	4.5*	<20	<1

**: EU average of country P90 annual Ni concentrations (2012)*

If a site is not compliant with these conditions, meaning that the product of tonnage and emission factor is above 18000 g Ni/year, a tiered approach including site-specific modelling can be applied to demonstrate safe use