

Title		Version 6, 2015
GES 6 Stainless, special steels and special alloys manufacturing (S4A)		
Life cycle	Formulation – DU of Ni metal	
Free short title	Stainless, special steels and special alloys manufacturing (S4A)	
Systematic title based on use descriptor	SU: SU 14: Manufacture of basic metals and alloys PC: PC 7 Base metals and alloys AC: AC 7 Metal articles ERC: ERC 3: Formulation in materials ERC 10a: Wide dispersive outdoor use of long-life articles and materials with low release ERC 11a: Wide dispersive indoor use of long-life articles and materials with low release ERC 12a: Industrial processing of articles with abrasive techniques (low release) ERC 12b: Industrial processing of articles with abrasive techniques (high release) PROC: PROC 4: Use in a batch and other process where opportunity for exposure arises PROC 8b: Transfer of substance or preparation from/to vessels/large containers at dedicated facilities PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature PROC 21: Low energy manipulation of substances bound in materials and/or articles PROC 23: Open processing and transfer operations with metals at elevated temperature PROC 24: High (mechanical) energy work-up of substance bound in materials PROC 25: Other hot work operations with metals PROC 0: Cleaning and maintenance	
Processes, tasks, activities covered (environment)	Stainless, special steels and special alloys manufacturing (S4A)	
Processes, tasks, activities covered (workers)	Contributing exposure scenario ES 6.1: PROC 8b: Raw material handling Contributing exposure scenario ES 6.2: PROC4, PROC 22, PROC 23: First processing Contributing exposure scenario ES 6.3: PROC 24: Further processing Contributing exposure scenario ES 6.4: PROC 24, PROC 25: Finishing Contributing exposure scenario ES 6.5: PROC 0: Cleaning and maintenance Contributing exposure scenario ES 6.6: PROC 21: Packaging, shipping and storage	
2. Operational conditions and risk management measures		
2.1 Control of environmental exposure		
Environmental related free short title	Stainless, special steels and special alloys manufacturing (S4A)	
Systematic title based on use descriptor (environment)	ERC 3: Formulation in materials ERC 10a: Wide dispersive outdoor use of long-life articles and materials with low release ERC 11a: Wide dispersive indoor use of long-life articles and materials with low release ERC 12a: Industrial processing of articles with abrasive techniques (low release)	

	ERC 12b: Industrial processing of articles with abrasive techniques (high release)
Processes, tasks, activities covered (environment)	Stainless, special steels and special alloys manufacturing (S4A)
Environmental Assessment Method	Estimates based on monitoring local and regional concentrations are used for calculation of PEC
Product characteristics	
Ni metal is used in the form of Ni briquettes, Ni plates, shots or ingots, part of steel or alloys scrap, FeNi (ingots and granules) and nickel sinter oxide.	
Amounts used	
Maximum daily use at a site	ES 1: 4.2 tonnes/day (median 50th % emission days, 25th % tonnage) ES 2: 38 tonnes/day (median 50th % emission days, 50th % tonnage) ES 3: 152 tonnes/day (median 50th % emission days, 90th % tonnage) ES 4: 152 tonnes/day (median 50th % emission days, 90th % tonnage)
Maximum annual use at a site	ES 1: 1,520 tonnes (25th %, 2007) ES 2: 14,000 tonnes (50th %, 2007) ES 3: 55,300 tonnes (90th %, 2007) ES 4: 55,300 tonnes (90th %, 2007)
Frequency and duration of use	
Pattern of release to the environment	365 days per year per site (median 50 th %)
Environment factors not influenced by risk management	
Receiving surface water flow rate	ES 1: 18,000 m3/d (Effluent Site: 2000 m3/d) ES 2: 198,000 m3/d (Effluent Site: 2000 m3/d) ES 3: 1998,000 m3/d (Effluent Site: 2000 m3/d)
Dilution capacity, freshwater	ES 1: 10 (default) ES 2: 100 ES 3: 1000
Dilution capacity, marine	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 waste water treatment in a physico-chemical treatment plant by chemical precipitation, sedimentation, filtration, oiling removal or a combination of these methods.	
Release factor after on-site treatment to freshwater:	
ES 1: Release factor after on-site treatment: 13.80 g/T (90 th %, RAR dataset)	
ES 2: Release factor after on-site treatment: 13.80 g/T (90 th %, RAR dataset)	
ES 3: Release factor after on-site treatment: 13.80 g/T (90 th %, RAR dataset)	
ES 4: Release factor after on-site treatment to marine water: 7.25 g/T (75 th %, RAR dataset)	
Air:	
Treatment of stack air emission by fabric or bag filters, or wet scrubbers. (Efficiency min. 99%)	
Release factor after on-site treatment: 136.8 g/T (90 th %, RAR dataset)	
Organizational measures to prevent/limit release from site	
None	
Conditions and measures related to municipal sewage treatment plant	
Municipal Sewage Treatment Plant (STP)	No
Discharge rate of the Municipal STP	Not relevant
Incineration of the sludge of the Municipal STP	Not relevant
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 6.1

Raw material handling

Workers related free short title	Stainless, special steels and special alloys manufacturing (S4A)
Use descriptor covered	PROC 8b: Transfer of substance or preparation from / to vessels/large containers at dedicated facilities
Processes, tasks, activities covered	Raw material handling including unloading, transferring, storage and furnace charge
Assessment Method	Estimation of exposure based on measured data.

Product characteristic

Ni metal is used in the form of Ni briquettes, Ni plates, shots or ingots, part of steel or alloys scrap and FeNi (ingots and granules) and nickel sinter oxide

Amounts used

Not relevant

Frequency and duration of use/exposure

8 hour shifts. Exposure occurs in the process area for one third of the working day (160 minutes). The remaining time is spent in control room or pressure ventilated cabins.

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

Work is taken place outdoor.

Oral: Good workplace hygiene practice	
Technical conditions and measures at process level (source) to prevent release	
None	
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	
Gloves are required for hand protection, coveralls and eye protection is required when handling dusty materials.	
2.3 Control of workers exposure for contributing exposure scenario ES 6.2	
First processing	
Workers related free short title	Stainless, special steels and special alloys manufacturing (S4A)
Use descriptor covered	PROC 4: Use in a batch and other process where opportunity for exposure arises PROC 22: Potentially closed processing operations with metals at elevated temperature PROC 23: Open processing and transfer operations with metals at elevated temperature
Processes, tasks, activities covered	First processing including melting (EAF, VIM, BOF, induction furnace), decarburisation (AOD, VOD), secondary metallurgical processes ESR and VAR, and casting
Assessment Method	Estimation of exposure based on measured data and a Tier 1 model
Product characteristic	
Ni metal is used in the form of Ni briquettes, Ni plates, shots or ingots, part of steel or alloys scrap and FeNi (ingots and granules) and nickel sinter oxide. Ni metal is used in the form of molten metal charge when fed to the AOD, VOD, VIM, VAR or ESR and in the form of liquid or molten steel for casting.	
Amounts used	
Not relevant	
Frequency and duration of use/exposure	
8 hour shifts. Exposure occurs in the process area for one third of the working day (160 minutes). The remaining time is spent in control room or pressure ventilated cabins. Duration of task maximum 4 hours	
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	
Oral: Good workplace hygiene practice	
Technical conditions and measures at process level (source) to prevent release	
During charge and tapping the system is open, while in use the converters are considered as a closed system.	
Technical conditions and measures to control dispersion from source towards the worker	
General ventilation and LEV systems are required for steelmaking and casting and in dusty areas or when handling dusty materials. When adding alloying elements LEV system is required.	
Organisational measures to prevent /limit releases, dispersion and exposure	
None	
Conditions and measures related to personal protection, hygiene and health evaluation	
Gloves are required for hand protection, coveralls and eye protection is required when handling dusty materials. Steelmaking and casting: Gloves and coveralls suitable for handling hot metal are required. Eye/face protection against heat and splashing of hot metal is required.	
2.4 Control of workers exposure for contributing exposure scenario ES 6.3	
Further processing	

Workers related free short title	Stainless, special steels and special alloys manufacturing (S4A)	
Use descriptor covered	PROC 24: High (mechanical) energy work-up of substance bound in materials	
Processes, tasks, activities covered	Further processing including hot and cold rolling, forging, die-forging, grinding, and welding	
Assessment Method	Estimation of exposure based on measured data and a Tier 1 model	
Product characteristic		
After casting Ni metal is incorporated in a chemical matrix such as massive stainless steel		
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
8 hour shifts. Exposure occurs in the process area for one third of the working day (160 minutes). The remaining time is spent in control room or pressure ventilated cabins. Duration of task maximum 4 hours		
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		
Oral: Good workplace hygiene practice		
Technical conditions and measures at process level (source) to prevent release		
None		
Technical conditions and measures to control dispersion from source towards the worker		
General ventilation is required for hot and cold rolling.		
Organisational measures to prevent /limit releases, dispersion and exposure		
None		
Conditions and measures related to personal protection, hygiene and health evaluation		
Hot rolling: Gloves and coveralls suitable for handling hot surfaces are required. Eye/face protection is required against heat. Cold rolling: Gloves and overalls suitable for handling metal are required.		
2.5 Control of workers exposure for contributing exposure scenario ES 6.4		
Finishing		
Workers related free short title	Stainless, special steels and special alloys manufacturing (S4A)	
Use descriptor covered	PROC24: High (mechanical) energy work-up of substance bound in materials PROC 25: Other hot operations with metals	
Processes, tasks, activities covered	Finishing including annealing, pickling, grinding and welding	
Assessment Method	Estimation of exposure based on measured data and a Tier 1 model	
Product characteristic		
After casting and further processing Ni metal is incorporated in a chemical matrix such as massive stainless steel		
Amounts used		
Not relevant		
Frequency and duration of use/exposure		
8 hour shifts. Exposure occurs in the process area for one third of the working day (160 minutes). The remaining time is spent in control room or pressure ventilated cabins. Duration of task maximum 4 hours		
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		
Oral: Good workplace hygiene practice		
Technical conditions and measures at process level (source) to prevent release		
None		
Technical conditions and measures to control dispersion from source towards the worker		

General ventilation is required.	
Organisational measures to prevent /limit releases, dispersion and exposure	
None	
Conditions and measures related to personal protection, hygiene and health evaluation	
Annealing and pickling: Gloves and overalls suitable for handling hot surfaces and pickling media are required. Eye/face protection against heat and pickling media is required.	
Welding and grinding: Eye/face protection when welding and grinding is required. For manual welding and grinding respiration protection – Air purifying full mask (for example APF 10) is required.	
2.6 Control of workers exposure for contributing exposure scenario ES 6.5	
Cleaning and maintenance	
Workers related free short title	Stainless, special steels and special alloys manufacturing (S4A)
Use descriptor covered	PROC 0 – cleaning and maintenance
Processes, tasks, activities covered	Cleaning and maintenance
Assessment Method	Estimation of exposure based on measured data
Product characteristic	
Ni metal is in the form of dust, pickling residues, incorporated in a chemical matrix such as massive stainless steel or in an article	
Amounts used	
Not relevant	
Frequency and duration of use/exposure	
8 hour shifts. Exposure occurs in the process area for one third of the working day (160 minutes). The remaining time is spent in control room or pressure ventilated cabins.	
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	
Oral: Good workplace hygiene practice	
Technical conditions and measures at process level (source) to prevent release	
None	
Technical conditions and measures to control dispersion from source towards the worker	
General ventilation and LEV system when applicable.	
Organisational measures to prevent /limit releases, dispersion and exposure	
None	
Conditions and measures related to personal protection, hygiene and health evaluation	
Gloves and overalls suitable for handling metal should be worn when appropriate. Eye/face protection against dust and heat is required. Respiration protection, dust filter, half mask – P2 (APF=20) is required.	
2.7 Control of workers exposure for contributing exposure scenario ES 6.6	
Packing, shipping and storage	
Workers related free short title	Stainless, special steels and special alloys manufacturing (S4A)
Use descriptor covered	PROC 21 Low energy manipulation of substances bound in materials and/or articles
Processes, tasks, activities covered	Packing, shipping and storage
Assessment Method	Estimation of exposure based on a Tier 1 model
Product characteristic	
Ni metal is incorporated in a chemical matrix such as massive stainless steel or in an article. Composition maximum 38 % in stainless steel, >35% in nickel alloys, <20% in other nickel containing alloys	
Amounts used	
Not relevant	
Frequency and duration of use/exposure	
8 hour shifts. Exposure occurs in the process area for one third of the working day (160 minutes). The remaining time is spent in control room or pressure ventilated cabins.	
Duration of task maximum 4 hours	
Human factors not influenced by risk management	

Respiration volume under conditions of use	Light to medium level work, 10 m ³ /d						
Room size and ventilation rate	Not relevant						
Area of skin contact with the substance under conditions of use	1980 cm ²						
Body weight	70 kg						
Other given operational conditions affecting workers exposure							
No direct handling involved.							
Oral: Good workplace hygiene practice							
Technical conditions and measures at process level (source) to prevent release							
None							
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							
Gloves and overalls suitable for handling metal are required.							
3. Exposure and risk estimation							
Environment							
ERC 3, ERC 10a, ERC 11a, ERC12a, ERC12b Stainless, special steels and special alloys manufacturing (S4A)							
Compartment	Unit	PNEC	PEC _{Regional}	C _{local}	PEC	RCR	Methods for calculation of environmental concentrations
ES 1: Freshwater direct discharge D10							Measured values, Tier 3-RWC
Freshwater	µg Ni/L	7.1	2.9	2.06	4.96	0.70	
Sediment	mg Ni/kg	136	33.5	54.2	87.7	0.65	
Terrestrial	mg Ni/kg	29.9	16.2	0.07	16.27	0.54	
ES 2: Freshwater direct discharge D100							
Freshwater	µg Ni/L	7.1	2.9	1.90	4.80	0.68	
Sediment	mg Ni/kg	136	33.5	49.9	83.4	0.61	
Terrestrial	mg Ni/kg	29.9	16.2	0.64	16.84	0.56	
ES 3: Freshwater direct discharge D1000							
Freshwater	µg Ni/L	7.1	2.9	0.75	3.65	0.51	
Sediment	mg Ni/kg	136	33.5	19.7	53.2	0.39	
Terrestrial	mg Ni/kg	29.9	16.2	2.52	18.72	0.63	
ES 4: Marine direct discharge							
Marine water	µg Ni/L	8.6	0.3	3.94	4.24	0.49	
Sediment	mg Ni/kg	136	16.1	103.6	119.7	0.88	
Terrestrial	mg Ni/kg	29.9	16.2	2.52	18.72	0.63	
Workers							
ES 6.1							
PROC 8b: Raw material handling							
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure		
Dermal							
Acute systemic	mgNi/kg/day	-	NR				
Acute local	mgNi/cm ² /day	-	NR				
Long-term systemic	mgNi/kg/day	-	NR				
Long-term local	mgNi/cm ² /day	0.035	0.0001	0.003	75 th percentile for alloy handler and raw material inspector		

Inhalation					
Acute local	mgNi/m ³	4.0	0.018	0.004	3 x 90 th percentile long-term inhalation exposure
Long-term systemic and local	mgNi/m ³	0.05	0.006	0.12	90 th percentile long-term inhalation exposure for raw material handling, personal samples (n=5), inhalable measurement
ES 6.2					
PROC 4, PROC 22, PROC 23: First Processing					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
Dermal					
Acute systemic	mgNi/kg/day	-	NR		
Acute local	mgNi/cm ² /day	-	NR		
Long-term systemic	mgNi/kg/day	-	NR		
Long-term local	mgNi/cm ² /day	0.035	0.00003	< 0.001	Exposure estimated using a Tier 1 model for PROC 22 (concentration > 25%, non-dispersive use, non-direct handling, intermittent exposure for the maximum of 4 hours, and the use of properly designed gloves).
Inhalation					
Acute local	mgNi/m ³	4	0.036	0.09	3 x 75 th percentile long-term exposure for steelmaking and casting
Long-term systemic and local	mgNi/m ³	0.05	0.012	0.24	75 th percentile for steelmaking and casting, personal samples (n=194), inhalable measurement
ES 6.3					
PROC 24: Further processing					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
Dermal					
Acute systemic	mgNi/kg/day	-	NR		
Acute local	mgNi/cm ² /day	-	NR		

Long-term systemic	mgNi/kg/day	-	NR		
Long-term local	mgNi/cm ² /day	0.035	0.00003	< 0.001	Exposure estimated using a Tier 1 model for PROC 22 (concentration > 25%, non-dispersive use, non-direct handling, intermittent exposure for the maximum of 4 hours, and the use of properly designed gloves).
Inhalation					
Acute local	mgNi/m ³	4.0	0.09	0.0225	3 x 75 th percentile long-term exposure for hot rolling
Long-term systemic and local	mgNi/m ³	0.05	0.03	0.6	75 th percentile for hot rolling, personal samples (n=61), inhalable measurement
			0.009	0.18	75 th percentile for cold rolling, personal samples (n=14), inhalable measurement
ES 6.4 PROC 13, PROC 24, PROC 25: Finishing					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
Dermal					
Acute systemic	mgNi/kg/day	-	NR		
Acute local	mgNi/cm ² /day	-	NR		
systemic					
Long-term	mgNi/kg/day	-	NR		
Long-term local	mgNi/cm ² /day	0.035	0.00003	< 0.001	Exposure estimated using a Tier 1 model for PROC 25 (concentration > 25%, non-dispersive use, non-direct handling, intermittent exposure for the maximum of 4 hours, and the use of properly designed gloves).
Inhalation					
Acute local	mgNi/m ³	4.0	0.114	0.029	3 x 75 th percentile long-term exposure for

					annealing, pickling, and welding
Long-term systemic and local	mgNi/m ³	0.05	0.038	0.76	75 th percentile for annealing, pickling, and welding, personal samples (n=41), inhalable measurements
ES 6.5					
PROC 0: Cleaning and maintenance					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
Dermal					
Acute systemic	mgNi/kg/day	-	NR		
Acute local	mgNi/cm ² /day	-	NR		
Long-term systemic	mgNi/kg/day	-	NR		
Long-term local	mgNi/cm ² /day	0.035	0.00035	0.01	75 th percentile for maintenance (short-term exposure)
Inhalation					
Acute local	mgNi/m ³	4	0.34	0.086	3 x 75 th percentile for cleaning and maintenance (full shift)
Long-term systemic and local	mgNi/m ³	0.05	0.115	2.3 excl. RPE By use of RPE (P2, APF 20): 0.115	75 th percentile for cleaning and maintenance, personal samples (n=13), inhalable measurements
ES 6.6					
PROC 21: Packing, shipping and storage					
	Unit	DNEL	Exposure concentration	RCR	Methods for calculation of exposure
Dermal					
Acute systemic	mgNi/kg/day	-	NR		
Acute local	mgNi/cm ² /day	-	NR		
Long-term systemic	mgNi/kg/day	-	NR		
Long-term local	mgNi/cm ² /day	0.035	0.0003	0.008	Exposure estimated using MEASE, a tier 1 model for PROC 21 for a massive object, >25% composition, and industrial use <240 min assumed. It is also assumed that properly designed gloves for direct handling and

					incidental exposure occurs.
Inhalation					
Acute local	mgNi/m ³	4	0.09	0.0225	Acute exposure assumed to be 3X long term calculated with MEASE
Long-term systemic and local	mgNi/m ³	0.05	0.03	0.6	Exposure estimated using MEASE, a tier 1 model for PROC 21 for a massive object, >25% composition, and industrial use <240 min assumed. Exposure estimated using MEASE, a tier 1 model for PROC 21 for a massive object, >25% composition, and industrial use <240 min assumed.
NR: Not Relevant					
<u>Acute local inhalation</u> 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 stainless, special steels and special alloys manufacturing (S4A)

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/m³ as annual average in PM₁₀ 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/m³. The value of 15.5 is derived from the difference between the DNEL of 20 ng Ni/m³ and the EU regional background concentration ($C_{regional}$) of 4.5 ng Ni/m³ (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/m ³)	$C_{regional}$ (ng/m ³)	PEC_{local} (ng/m ³)	$RCR = PEC/DNEL$ (DNEL= 20 ng/m ³)
All	T	EF	$T \times EF < 18000$	<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