Nanomaterial control banding tool worksheet

Workplace details		**De-identification number:**
Description of **nano**material (type, form, etc.)		
Details of the **parent** material/s	*(Chemical name, CAS number, risk and safety phrases, from material safety data sheet, or similar)*	
Production description	*(e.g. vapour phase, solid phase, liquid phase techniques)*	
Task description		

Date	
Control banding team members	

Risk level (RL) matrix as function of severity and probability

		Exposure probability			
HAZARD SEVERITY		Extremely unlikely (0-25)	Less likely (26-50)	Likely (51-75)	Probable (76-100)
	Very high (76-100)	RL 3	RL 3	RL 4	RL 4
	High (51-75)	RL 2	RL 2	RL 3	RL 4
	Medium (26-50)	RL 1	RL 1	RL 2	RL 3
	Low (0-25)	RL 1	RL 1	RL 1	RL 2

Control bands: Control bands are based on the overall RL

RL 1: General ventilation

RL 2: Fume hoods or local exhaust ventilation

RL 3: Containment

RL 4: Seek specialist advice

Hazard severity calculation worksheet

Hazard severity determination descriptors	Severity score (Max. total score is 100 points)	Notes/Comments/Toxicology references
Surface chemistry (NM) High surface reactivity = 10 points Medium surface reactivity = 5 points Low surface reactivity = 0 points Unknown = 7.5 points		
Particle shape (NM) Tubular or fibrous = 10 points Anisotropic = 5 points Compact or spherical = 0 points Unknown = 7.5 points		
Particle diameter (NM) 1-10 nm = 10 points 11- 40 nm = 5 points 41-100 nm = 0 points Unknown = 7.5 points		
Solubility (NM) Insoluble = 10 points Soluble = 5 points Unknown = 7.5 points		
Carcinogenicity (animal or human) (NM) Yes = 6 points No = 0 points Unknown = 4.5 points		
Reproductive toxicity (NM) Yes = 6 points No = 0 points Unknown = 4.5 points		
Mutagenicity (NM) Yes = 6 points No = 0 points Unknown = 4.5 points		
Dermal toxicity (NM) Yes = 6 points No = 0 points Unknown = 4.5 points		
Asthmagen (NM) Yes = 4 points No = 0 points		

Hazard severity determination descriptors	Severity score (Max. total score is 100 points)	Notes/Comments/Toxicology references
Unknown = 3 points		
Toxicity: OEL of parent material <10 µg/m^3 = 10 points 10 - 100 µg/m^3 = 5 points 101 µg/m^3 to 1 mg/ m^3 = 2.5 pts > 1 mg/ m^3 = 0 points Unknown = 7.5 points		
Carcinogenicity of parent material Yes = 4 points No = 0 points Unknown = 3 points		
Reproductive toxicity of parent material Yes = 4 points No = 0 points Unknown = 3 points		
Mutagenicity of parent material Yes = 4 points No = 0 points Unknown = 3 points		
Dermal hazard potential of parent material Yes = 4 points No = 0 points Unknown = 3 points		
Asthmagen potential of parent material Yes = 4 points No = 0 points Unknown = 3 points		
Total severity score		Mark score on Matrix on page 2

Further notes on hazard severity determination:

Exposure probability calculation worksheet

Exposure probability determination descriptors	Probability score (Max .total score is 100 points)	Notes/comments
Dustiness/mistiness High = 30 points Medium = 15 points Low = 7.5 points None = 0 points* Unknown = 22 points * a result of "none" automatically causes overall exposure probability score to be "extremely unlikely"		
Estimated amount of nanomaterial used during task > 100 mg = 25 points 11-100 mg = 12.5 points 0-10 mg = 6.25 points Unknown = 18.75 points		
Number of employees with similar exposure > 15 employees = 15 points 11-15 employees = 10 points 6-10 employees = 5 points 1-5 employees = 0 points Unknown = 11.25 points		
Frequency of operation Daily = 15 points Weekly = 10 points Monthly = 5 points < monthly = 0 points Unknown = 11.25 points		
Duration of operation > 4 hours = 15 points 1-4 hours = 10 points 30-60 minutes = 5 points < 30 minutes = 0 points Unknown = 11.25 points		
Total exposure probability score		Mark score on matrix on page 2

Further notes on exposure probability determination:

General conclusions on adequacy of current controls or need to improve controls, plus action plan if required:
Risk level score (from RL matrix) =
Control band recommended by RL matrix =
Current controls =

Is there a need to change controls and if so document planned action below?

Assessment of risk of explosive dust clouds from nanopowders

Explosive dust clouds can be generated from most organic materials, many metals and even some non-metallic inorganic materials. The primary factor influencing the ignition sensitivity and explosive violence of a dust cloud is the particle size or specific surface area (i.e. the total surface area per unit volume or unit mass of the dust). As the particle size decreases, the specific surface area increases. The general trend is for the violence of the dust explosion and the ease of ignition to increase as the particle size decreases, though for many dusts this trend begins to level out at particle sizes of the order of tens of micrometres (μm). However, no lower particle size limit has been established below which dust explosions cannot occur and it has to be considered that many nanoparticle types have the potential to cause explosions. At the current time, however, there is almost no data relating to the fire and explosion hazards of nanoparticles [British Standard, BSI PD 6699-2:2007].

This does not negate the need for systematic identification of such hazards and risk assessment and reasonable control implementation and evaluation.

1. Is the nanomaterial in nanopowder form? Yes/No (if yes go to question 2)

2. Is the nanopowder dispersed in the air? Yes/No

3. Is there any literature/data that provides information regarding explosion characteristics of this nanopowder? Yes/No

Reference this literature and summarise this information here:

4. Is there any literature/data that provides information regarding explosion characteristics of the micro-scale powder of the same material? Yes/No

Reference this literature and summarise this information here:

5. Are any changes required to the storage and handling of the nanopowders to control the risk of dust explosion?