Nanomaterials Control Banding Tool Risk Assessment Form

Workplace Location		**Ref No#**	
Description of nanomaterial *(type, form, etc)*			
Details of the parent material(s) *(chemical name, CAS number, hazard and precaution statements)* from SDS			
Production Description *(e.g. vapour phase, solid phase, liquid phase techniques)*			
Task Description			
Control Banding Team members			
Date			

Risk Level (RL) matrix as a function of severity and probability					
		EXPOSURE PROBABILITY			
		Extremely Unlikely (0-25)	**Less Likely** (26-50)	**Likely** (51-75)	**Probable** (76-100)
HAZARD SEVERITY	**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: (based on the overall RL)

RL 1: General ventilation

RL 2: Fume cupboards or local exhaust ventilation

RL 3: Containment e.g. glove box.

RL 4: Seek specialist advice

Hazard severity determination descriptor of nanomaterial		Severity Score (Max score =100)	Notes/Comments/Toxicology references
Surface chemistry (NM)			
High surface reactivity	= 10 points		
Medium surface reactivity	= 5 points		
Low surface reactivity	= 0 points		
Unknown surface reactivity	= 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	= 0 points		
Unknown	= 7.5 points		
Solubility (in water) (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		
Unknown	= 3 points		

Hazard severity determination descriptor of parent material	**Severity Score** (Max score =100)	**Notes/Comments/Toxicology references**
Toxicity: OEL (occupational exposure limit) <10 µg/m^3 = 10 points 10 – 100 µg/m^3 = 5 points 101 µg/m^3– 1 mg/m^3 = 2.5 points >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 hazard severity score		**Enter score on Matrix** (page2)

*****having unequal physical properties along different axes

Exposure probability determination descriptor	**Severity Score** (Max score =100)	**Notes/Comments**
Dustiness/mistiness High = 30 points Medium = 15 points Low = 7.5 points None* = 0 points Unknown surface reactivity = 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 surface reactivity = 18.75 points		
Number of employees with similar exposure > 15 = 15 points 11 – 15 = 10 points 6 – 10 = 5 points 1 – 5 = 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		**Enter score on Matrix** (page2)

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.

Based upon **Workplace Health and Safety Queensland,** Department of Justice and Attorney-General
Nanotechnology control banding tool worksheet PN10698 Version 1 7 April 2010.