Safe Operating Procedure

Procedure for Identifying Desensitised Explosives

This procedure provides information for the identification of desensitised explosives and what to do if you find any in your laboratories.

1. What are desensitised explosives?

Desensitised explosives are liquids or solids that were originally classified as explosives but have had their explosive properties suppressed by adding a desensitising agent, making them safer to handle and transport. Common examples include 2,4-Dinitrophenylhydrazine, 2,4-dinitrophenol, 1-Hydroxybenzotriazole hydrate and Picric acid (Trinitrophenol, wetted).

While desensitisation reduces the likelihood of a fire, blast, or projection hazard, it does not eliminate the risk; these chemicals may still be sensitive to heat, friction, impact, and fire.

If the desensitising agent dries out, the chemical can become a Class 1 explosive.

There may be a risk of fire or explosion if the substances have not been stored, maintained, or used correctly, e.g.

- There is no record of monthly inspection and wetting.
- The container is damaged or degraded.
- The container has been stored beyond its expiry date.
- All or part of the desensitising agent has evaporated (i.e. if there is evidence of a crystalline substance around the cap of the bottle or within it).
- The chemical has begun to degrade/decompose or otherwise change from its normal form, possibly releasing other chemicals.

2. How to identify desensitised explosives

Desensitised explosives do not carry an explosive hazard warning label, due to the presence of the stabilising solvent. The safety data sheet (SDS) should be used to identify desensitised explosives, the sections of the SDS are shown below:

Section 2: Hazard identification

The chemical will have:

- A flammable GHS symbol
- A signal word (either Danger or Warning)
- One of the following hazard statements:
  - **H206** - Fire, blast, or projection hazard; increased risk increased risk of explosion if desensitising agent is reduced.
  - **H207** - Fire or projection hazard; increased risk of explosion if desensitising agent is reduced.

- **H208** - Fire hazard; increased risk of explosion if desensitising agent is reduced

Section 14: Transport information.
Desensitised explosives can also be identified in Section 14, see sections:

- **Section 14.1 UN number** - This is a four-digit code used to identify hazardous materials during transport. A list of UN Numbers classified as desensitised explosives is given below, in Appendix A.
- **Section 14.3 Transport hazard class** - Desensitised explosives will be in one of the following transport hazard classes:
  - **Class 3** - Flammable liquids. **D** – Liquid desensitised explosive, (this letter is not always shown on the SDS but is available on the list below).
  - **Class 4.1** - Flammable solids, self-reacting substances, polymerising substances, and solid desensitised explosives. **D** – solid desensitised explosive, (this letter is not always shown on the SDS but is available on the list below).

3. What to do if you find a desensitised explosive

a) If you identify a desensitised explosive in your inventory:
- Check if there are records of visual inspections/ wetting of the substance (e.g. monthly).
- If no records are in place, then treat it as if it is dried out. **Do not attempt to find, move, or open the bottle.**
- Contact the Faculty Operation Teams and HS&R Team immediately. The HS&R team will advise on the next steps.

If the desensitised explosive listed on the inventory, has been regularly inspected and wetted. The owner should inform the HS&R Team, so that a central register of the chemical and its location can be recorded. The owner should continue to regularly inspect and wet the chemical. Refer to “Information sheet: Safe use of desensitised explosives.”

b) If a container of a desensitised explosive is found in your lab/cabinet:
- Check if there are records of visual inspections/ wetting of the substance (e.g. monthly).
- If no records are in place, then treat it as if it is dried out. **Do not attempt to move or open the bottle.**
- Contact the Faculty Operation Teams and HS&R Team immediately. The HS&R team will advise on the next steps.

If there are records of visual inspection/ wetting of the substance (e.g. monthly), contact the owner.
- The owner of the chemical should conduct a visual inspection (following their risk assessment).

Without opening the bottle, they should:
- Look at the container, check that it is intact and not showing signs of degradation or swelling.

- Look at the label on the bottle, check that it has not exceeded the expiry date recorded.
- Without opening the bottle, conduct a visual check:
  - Check that there are no dried crystals on the outside of the bottle near the cap.
  - Check that the material inside has not dried out (look for dryness, crystals, or cracking), and check that it looks wetted (usually moist, pasty, or glossy).
  - Check if it appears to have altered from its original form (it may be solid or liquid in its desensitised state).

Warning: Do not open the bottle if there are signs of crystals outside of the bottle near the cap or if the chemical is not adequately wetted as this would be a sign that there may be dried crystals on the thread of the bottle that may detonate when opening.

If you suspect that the desensitised explosive has dried out:

- Isolate the chemical.
- Contact the Faculty Operation Teams and HS&R Team immediately. The HS&R team will advise on the next steps.

If the chemical remains in a desensitised state, the owner should inform the HS&R Team, so that a central register of the chemical and its location can be recorded.

Appendix A: Desensitised Explosives

To identify desensitised explosives, go to section 14 of the safety data sheet. Find the UN number. UN Numbers classified as desensitised explosives are listed below.

- **Class 3** Flammable liquids, D – Liquid desensitised explosives
- **Class 4.1** Flammable solids, self-reacting substances, polymerising substances, and solid desensitised explosives. D – solid desensitised explosive, T – Toxic.

Note

- A single CAS Number can have several UN Numbers associated with it. When an explosive is wetted or desensitised, it may be considered a distinct substance with different physical and handling properties — leading to different UN Numbers.
- Several CAS numbers can have the same UN Number (e.g. isomers of Dinitrophenol, that are desensitised explosives, are classified as UN1320).

UN No.	Class, classification code	Name and description	CAS number	Description
1310	4.1, D (1.1 dry)	**Ammonium Picrate wetted** with not less than 10% water, by mass	131-74-8	This comes in a form of a wet slurry and can dry out if not maintained correctly. Can explode under prolonged exposure to fire or heat.
1320	4.1, DT (1.1 dry)	**Dinitrophenol, wetted** with not less than 15% water, by mass. Covers all isomers of DNP - 2,3-DNP, 2,4-DNP, 2,5-DNP, 2,6-DNP, 3,4-DNP, and 3,5 DNP.	Generic 25550-58-7 2,3-dinitrophenol 66-56-8 2,4-dinitrophenol 51-28-5 2,5-dinitrophenol 329-71-5 2,6-dinitrophenol 573-56-8	Keep away from open flames, hot surfaces, and sources of ignition. Take precautionary measures against static discharge.

UN No.	Class, classification code	Name and description	CAS number	Description
			3,4-dinitrophenol 577-71-9 3,5-Dinitrophenol 586-11-8	
1321	4.1, DT (1.3 dry)	**Dinitrophenolates, wetted** with not less than 15% water, by mass	74893-76-8 Sodium 2,4-dinitrophenolate 1011-73-0	
1322	4.1, D (1.1 dry)	**Dinitroresorcinol, wetted** with not less than 15% water, by mass	35860-51-6 4,6-Dinitroresorcinol 616-74-0 2,4-Dinitroresorcinol 519-44-8	
1336	4.1, D (1.1 dry)	**Nitroguanidine (picrite), wetted** with not less than 20% water, by mass	556-88-7	This comes in a form of a wet slurry and can dry out if not maintained correctly. May explode under exposure to intense heat or fire.
1337	4.1, D (1.1 dry)	**Nitrostarch, wetted** with not less than 20% water, by mass	9056-38-6	Clearly wet on inspection and can dry out if not maintained correctly. Need to protect from static discharge due to ignition risk. When dry is a fluffy, nearly white, cotton-like material.
1344	4.1, D	**Trinitrophenol (picric acid), wetted** with not less than 30% water, by mass	88-89-1	Comes in form of wet slurry. The dry compound is a sensitive explosive,

UN No.	Class, classification code	Name and description	CAS number	Description
				dangerous if shocked or exposed to heat.
1347	4.1, D	**Silver picrate, wetted** with not less than 30% water, by mass	146-84-9	When wetted with at least 30% water, silver picrate appears as a white to light-coloured solid paste.
1348	4.1, DT	**Sodium dinitro-o-cresolate, wetted** with not less than 15% water, by mass	25641-53-6	Yellow crystalline solid when wetted or dry. Dried out - material may explode if exposed to heat, flame, friction, or shock.
1349	4.1, D (1.3. dry)	**Sodium picramate, wetted** with not less than 20% water, by mass	831-52-7	Dark red crystals in a slurry form when wetted. Highly explosive, especially in large quantities or if dry.
1354	4.1, D (1.1 dry)	**Trinitrobenzene, wetted** with not less than 30% water, by mass	99-35-4	Moist mass of crystals or a slurry. Highly explosive, especially when dry.
1355	4.1, D (1.1 dry)	**Trinitrobenzoic acid, wetted** with not less than 30% water, by mass	129-66-8	Sludge of yellow crystals. When dry is easily ignited, burns vigorously, and is highly explosive.
1356	4.1, D (1.1 dry)	**Trinitrotoluene (TNT), wetted** with not less than 30% water, by mass	118-96-7	Sludge of yellow crystals. When dry is easily ignited, burns vigorously, and is highly explosive.

UN No.	Class, classification code	Name and description	CAS number	Description
1357	4.1, D (1.1 dry)	**Urea nitrate, wetted** with not less than 20% water, by mass	124-47-0	Slurry of colourless crystals. The dry form is a high explosive and easily ignites.
1517	4.1, D (1.3 dry)	**Zirconium picramate, wetted** with not less than 20% water, by mass	63868-82-6	Looks like a slurry or sludge of yellow crystals. Dried out material may explode if exposed to heat, flame, friction, or shock.
1571	4.1, D (1.1 dry)	**Barium azide, wetted** with not less than 50% water, by mass	18810-58-7	Suspension or slurry of an unstable solid (barium azide) in water. When dry, it is a high explosive that can ignite easily and decompose explosively under shock or heat. Wetting reduces its sensitivity but does not eliminate the risk
2555	4.1, D (1.1 dry)	**Nitrocellulose with water** (not less than 25% water, by mass)	9004-70-0	Clearly wet on inspection and can dry out if not maintained correctly. Need to protect from static discharge due to ignition risk. When dry is a fluffy, nearly white, cotton-like material.
2556	4.1, D (1.1 dry)	**Nitrocellulose with alcohol** (not less than 25% alcohol, by mass, and not more than 12.6% nitrogen, by dry mass)	9004-70-0	Clearly wet on inspection and can dry out if not maintained correctly. Need to protect from static discharge due to ignition risk. When dry

UN No.	Class, classification code	Name and description	CAS number	Description
				is a fluffy, nearly white, cotton-like material.
2557	4.1, D (1.1 dry)	**Nitrocellulose**, with not more than 12.6% nitrogen, by dry mass, mixture with or without plasticiser, with or without pigment	9004-70-0	Clearly wet on inspection and can dry out if not maintained correctly. Need to protect from static discharge due to ignition risk. When dry is a fluffy, nearly white, cotton-like material.
2852	4.1, D (1.1 dry)	**Dipicryl sulphide, wetted** with not less than 10% water, by mass	2217-06-3	White/ light coloured solid when wetted. Insoluble in water, so water should be visible. Flammable/ combustible material. May be ignited by heat, sparks, or flames. Dried out - material may explode if exposed to heat, flame, friction, or shock.
2907	4.1, D.	**Isosorbide dinitrate mixture** with not less than 60% lactose, mannose, starch, or calcium hydrogen phosphate.	87-33-2	White crystalline solid. Will likely appear as a powder or granular material. The specific colour and texture will depend on the chosen diluent and any other excipients included in the formulation. If mixed with reducing agents, including hydrides, sulphides, and nitrides, they may begin a vigorous reaction that

UN No.	Class, classification code	Name and description	CAS number	Description
				culminates in a detonation
3317	4.1, D	**2-amino-4,6-dinitrophenol, wetted** with not less than 20% water, by mass	96-91-3	Picramic acid. Dark red crystals/solid. Insoluble in water so level of water should be visible. Explodes if dried and exposed to heat, flame, friction, or shock.
3319	4.1, D. (1.1 Desensitised)	**Nitroglycerin mixture, desensitised, solid**, not otherwise specified (n.o.s.) with more than 2% but not more than 10% nitroglycerin, by mass	55-63-0	The mixture is in a solid state. It is a Colourless to pale-yellow, viscous liquid when not desensitised.
3344	4.1, D *(*1.1 dry)	**Pentaerythrite tetranitrate (pentaerythritol tetranitrate; PETN) mixture, desensitised, solid**, n.o.s. with more than 10% but not more than 20% PETN, by mass	78-11-5	A thick to waxy slurry of white crystals. Dry Colourless to white solid. Sensitive to heat, shock, and friction.
3364	4.1, D (1.1 dry)	**Trinitrophenol (picric acid), wetted** with not less than 10% water, by mass	88-89-1	A yellow mass of moist crystals or a slurry. Dangerously explosive if allowed to dry out (less than 10%). Highly sensitive to heat, shock, and friction.
3365	4.1, D (1.1 dry)	**Trinitrochlorobenzene (picryl chloride), wetted** with not less than 10% water, by mass	88-88-0	Light yellow, fine crystals/needles in slurry. Explosive when dry.

UN No.	Class, classification code	Name and description	CAS number	Description
				Risk of explosion in contact with impact, friction, ignition sources.
3366	4.1, D (1.1 dry)	**Trinitrotoluene (TNT), wetted** with not less than 10% water, by mass	118-96-7	Yellowish mass of crystals or a slurry. Highly explosive when dry.
3367	4.1, D (1.1 dry)	**Trinitrobenzene, wetted** with not less than 10% water, by mass	*99-35-4*	Light yellow, crystalline sludge, or slurry. Dangerously explosive if allowed to dry out (heat, flame, friction, or shock).
3368	4.1, D *(1.1dry).*	**Trinitrobenzoic acid, wetted** with not less than 10% water, by mass	129-66-8	White to yellow moist mass of crystals or a slurry. Dangerously explosive if allowed to dry out.
3369	4.1, DT (1.3 dry)	**Sodium dinitro-o-cresolate, wetted** with not less than 10% water, by mas	534-52-1	Yellow crystalline solid when wetted or dry. Dried out - material may explode if exposed to heat, flame, friction, or shock.
3370	4.1, D (1.1 dry)	**Urea nitrate, wetted** with not less than 10% water, by mass	124-47-0	Milky cloudy appearance when wet. Dry white / pale yellow crystal. Sensitive to prolonged heat, friction, and shock,
3376	4.1, D	**4-Nitrophenyl-hydrazine,** with not less than 30% water, by mass	100-16-3	Orange/red leaflet or needles wetted with water.

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				It may be explosive and sensitive to friction in the dry state.
3880	4.1, D	**Desensitised explosive, solid,** n.o.s.	N/A	
3474	4.1, D (1.3C Anhydrous)	**1-Hydroxybenzotriazole monohydrate**	123333-53-9	Solid. White / almost white crystal powder. Fire or projection hazard; increased risk of explosion if desensitising agent is reduced.
3343	3, D (1.3 dry)	**Nitroglycerin mixture, desensitised, liquid, flammable,** n.o.s. with not more than 30% nitroglycerin, by mass	55-63-0	Colourless liquid. Avoid operations that could increase the concentration of the nitroglycerin or separate it from the diluent. Concentrated nitroglycerin is explosive. Contacting the product with water will dissolve the diluent and concentrate the nitroglycerin. When desensitising agent has reduced the nitroglycerin will become more dense, oily liquid that is typically colourless or pale yellow
3357	3, D (1.3 dry)	**Nitroglycerin mixture, desensitised, liquid,** n.o.s. with not more than 30% nitroglycerin, by mass	55-63-0	Avoid operations that could increase the concentration of the nitroglycerin or separate it from the diluent. Concentrated nitroglycerin is explosive. Contacting

UN No.	Class, classification code	Name and description	CAS number	Description
				the product with water will dissolve the diluent and concentrate the nitroglycerin. When desensitising agent has reduced the nitroglycerin will become more dense, oily liquid that is typically colourless or pale yellow
3379	3, D	**Desensitised explosive, liquid,** n.o.s.		
2059	3, D	**Nitrocellulose solution, flammable** with not more than 12.6% nitrogen, by dry mass, and not more than 55% nitrocellulose	9004-70-0	Desensitised is a light yellowish, clear, or slightly opalescent, syrupy liquid. Dried out - is a fluffy, nearly white, cotton-like material. Nitrocellulose solutions can be ignited by heat, sparks, or friction