File No: NA/656

April 1999

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Golpanol ATPN

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act* 1989 (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the National Occupational Health and Safety Commission which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment and the assessment of public health is conducted by the Department of Health and Aged Care.

For the purposes of subsection 78(1) of the Act, copies of this full public report may be inspected by the public at the Library, National Occupational Health and Safety Commission, 92-94 Parramatta Road, Camperdown NSW 2050, between the following hours:

Monday - Wednesday	8.30 am - 5.00 pm
Thursday	8.30 am - 8.00 pm
Friday	8.30 am - 5.00 pm

Copies of this full public report may also be requested, free of charge, by contacting the Administration Coordinator on the fax number below.

For enquiries please contact the Administration Coordinator at:

Street Address: 92 Parramatta Rd Camperdown, NSW 2050, AUSTRALIA
Postal Address: GPO Box 58, Sydney 2001, AUSTRALIA
Telephone: (61) (02) 9577-9514 FAX (61) (02) 9577-9465

Director
Chemicals Notification and Assessment

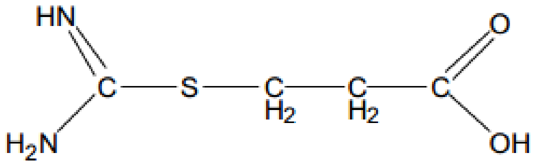
FULL PUBLIC REPORT

Golpanol ATPN

1. APPLICANT

BASF Australia Ltd of 500 Princes Highway NOBLE PARK VICTORIA 3174 has submitted a limited notification statement in support of their application for an assessment certificate for Golpanol ATPN.

2. IDENTITY OF THE CHEMICAL

Chemical Name:	propanoic acid, 3-[(aminoiminomethyl)thio]-
Chemical Abstracts Service (CAS) Registry No.:	5398-29-8
Other Names:	β-isothiureidopropionic acid; 3-(aminoiminomethyl)thiopropanoic acid; propionic acid, 3-(amidinothio)-; carboxyethyl isothiuronium betaine
Trade Name:	Golpanol ATPN
Molecular Formula:	$C_4H_8N_2O_2S$
Structural Formula:	
Molecular Weight:	148.2
Method of Detection and Determination:	purity of notified chemical determined by potentiographic titration and HPLC with UV/Vis detection; identity confirmation by infrared and nuclear magnetic resonance spectroscopy

Spectral Data:	infrared spectroscopy (KBr disc): major peaks identified at 492, 731, 782, 1084, 1116, 1160, 1278, 1384, 1560, 1689, 2914 and 3298 cm^{-1}; ^1H nuclear magnetic resonance confirmed structure

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	white powder
Particle Size Distribution:	3 - 200 μm.
Melting Point:	160.0 ± 0.3°C
Specific Gravity:	1.469 at 20°C
Vapour Pressure:	not determined; see comments below
Water Solubility:	12.01 ± 0.37 g/L at 20°C; see comments below
Partition Co-efficient (n-octanol/water):	$\log P_{ow} = <-2.16 \pm 0.16$ at 24°C; see comments below
Hydrolysis as a Function of pH:	$T_{1/2}$ at pH 7.0 and 20°C = 4 000 days $T_{1/2}$ at pH 7.0 and 50°C = 737 hours $T_{1/2}$ at pH 7.0 and 65°C = 82.5 hours $T_{1/2}$ at pH 7.0 and 80°C = 8.8 hours $T_{1/2}$ at pH 9.0 and 28.6°C = 70.8 hours $T_{1/2}$ at pH 9.0 and 50°C = 31.5 hours
Adsorption/Desorption:	$\log K_{oc} = -0.4$ at 20°C
Dissociation Constant:	$pK_a = 9.76 \pm 0.05$ at 23°C
Flash Point:	> 100°C; see comments below
Flammability Limits:	not determined
Autoignition Temperature:	> 200°C
Explosive Properties:	not determined; see comments below
Reactivity/Stability:	not reactive (stable solid)

Comments on Physico-Chemical Properties

Tests were conducted in accordance with OECD (OECD,1995-1996) and EC test guidelines (European Commission, 1992). They were performed by the analytical department (ZAX Analytik) of BASF, Ludwigshafen, Germany, which complies with the OECD principles of good laboratory practice. Full test reports were submitted for all parameters measured, except for the flash point and autoignition temperature.

The notified chemical is a stable, white solid powder. It has a high melting point (160°C) and is expected to have negligible volatility under ambient conditions. Consequently, the vapour pressure for the notified chemical was not determined. It is expected to be low.

The water solubility was determined using the piston method and HPLC for analysis of the test substance. In this method excess samples of the test substance are agitated with water at 30 ^{O}C for 1, 2 and 3 days in separate vessels. Each test was performed in triplicate and after the allotted time for dissolution the mixtures were allowed to equilibrate at 24°C and the aqueous phase filtered and then analysed for the solute using High Performance Liquid Chromatography. The solute concentration was determined to be between 11.4 and 12.5 g/L, regardless of the period allowed for dissolution, and consequently the solubility at 24 ^{O}C was determined to be 12.01 ± .37 g/L. The pH of the solutions was always between 4.77 and 5.00, which is the "natural" pH of the solutions prepared in the manner indicated.

Hydrolysis was determined at pH 4, 7 and 9 according to the indicated standard method. At 50^{O}C the half lives (t_) at pH 7 and 9 were determined in range finding tests to be respectively 737 and 31.5 hours. The compound appeared to be stable at pH 4 at this temperature. More extensive tests at pH 7 for temperatures of 80 and 65°C gave t_ values of 8.8 and 82.5 hours respectively, and extrapolations (Arrhenius relation) provided an estimate for t_ at 25°C and pH 7 of around 98,000 hours (4 000 days). A separate test at pH 9 and 28.6^{0}C gave t_ = 71 hours, and so it can be concluded that hydrolysis is very slow under ambient temperature conditions at pH 7, but considerably faster under mild alkaline conditions.

The n-octanol/water partition coefficient was determined using the shake flask method by vigorously mixing known volumes of n-octanol with 250 mL of a 3.7 g/L solution of the compound in water, followed by analysis of both phases for the test material using HPLC. The concentration in the n-octanol phase was found to be below the detection limits of the instrumentation, and consequently log Pow was determined as < -2.2.

The value of log Koc was determined by the HPLC screening method, and the low value of -0.4 determined is in good accord with expectations from the log Pow values, and indicates that the new compound would have little affinity for the organic component of soils and sediments, and would remain in the aqueous compartment.

The pK_a value of 9.76 is indicative of the deprotonation of the amino group. Under the usual environmental pH region (4-9) and in an aqueous solution, the zwitterionic form.

$[(NH_3^+)C(=NH)SCH_2CH_2COO^-]$ of the notified chemical is likely to predominate.

The flash point for the notified chemical was found to be above 100°C. In view of its high melting point, exact determination of the flash point was considered unnecessary.

The molecular structure of the notified chemical does not indicate an explosion hazard. Being an organic powder, however, the risk of dust explosions exists if electrostatic accumulation occurs

The chemical contains a variety of functional groups, including amino, imino, carboxylate and a thioether group. All these groups have the potential to complex with various transition metal ions in aqueous solution. This property is probably of importance in the compound's action as a brightening agent in electroplating baths.

4. PURITY OF THE CHEMICAL

Degree of Purity:	>98% by weight

Toxic or Hazardous Impurities:

Chemical name:	thiourea
Synonyms:	thiocarbamide
CAS No.:	62-56-6
Weight percentage:	<1% by weight
Toxic properties:	harmful if swallowed (R22), carcinogen category 3 (R40) (NOHSC 1999a)

Non-hazardous Impurities > 1%:	none
Additives/Adjuvants:	none

5. USE, VOLUME AND FORMULATION

The notified chemical Golpanol ATPN will not be manufactured in Australia. It will be imported as a solid form white powder in 50kg drums. Over the next five years, the amount imported will be less than 200kg per year to the customer. Only one or two deliveries are to be made per year.

The notified chemical is to be used as a raw material to produce a nickel brightener solution (containing 0.21% of the chemical) for the electroplating industry. It will be used as a component of a Class 1 brightener for nickel and nickel-iron alloy electroplating baths and in a brightener for copper plating. In nickel electrolytes, it improves ductility and throwing power. It has the added ability to improve the tolerance for metal impurities in electroplating baths.

The types of products that will be electroplated using the new chemical include automotive parts, shop fittings (in particular shopping trolleys), bathroom fittings and building products (predominantly fasteners).

6. OCCUPATIONAL EXPOSURE

As the notified chemical is a fine powder the potential routes of exposure are dermal and inhalation.

Transport and Storage
It is estimated by the notifier that two people would be involved in receiving the drums of notified chemical at the dock. A further two people would be involved in its transport by road, either to the BASF warehouse, or to the facilities of the customer or toll manufacturer (formulator). It is estimated by the notifier that there will only be one or two deliveries per year. Upon delivery at the BASF warehouse, the notified chemical will be handled by approximately two personnel (e.g. forklift operators) for a maximum of 30 minutes. Similarly, at the customer facilities up to two workers will be required to unload the containers with the notified chemical. These workers would handle the containers for about one hour per year. It is unlikely that transport and storage workers will be exposed to the notified chemical unless the drums are damaged. No repackaging of the notified chemical is carried out before the drums are received by the formulator.

Formulation
At the toll manufacturers site, 2 to 4 compounders will use the notified chemical to produce nickel brightener solution. It is estimated by the notifier that these workers will be handling the notified chemical for approximately one hour per day and 11 days per year.

The notified chemical will be weighed out and added to a 1 000L mixer for blending, after which the nickel brightener solution will be transported to product containers for sale and dispatch to the electroplating industry. Inhalation and dermal exposure to the notified chemical may occur during weighing out from the 50 kg drum and addition to the mixer. An extraction booth is provided to minimise exposure to the fine dust. The MSDS for Golpanol ATPNstates that overalls, goggles and gloves should be worn when handling, with a dust mask to be also worn in the event of likely dust exposure. The notifier indicated that a face shield may also be worn.

The notifier did not indicate whether the mixer was closed or open. If open, skin contamination may occur in the event of splashing. Skin contamination may also occur during transfer of nickel brightener solution to the filling machine and during filling of product containers if any spills or leaks develop or in the event of overfilling of containers. It is expected that overalls, goggles and gloves will be worn during the formulation operations. Dermal exposure to the notified chemical may also occur during the cleaning and maintenance of process equipment.

End Use (Electroplating)

At the electroplating facility, there are series electroplating baths containing solutions of the nickel brightener, metal and other ingredients or rinsing water. The nickel brightener, containing Golpanol ATPN at 0.21% w/v, is present in the bath at a concentration of 0.05% w/v, that is, the notified chemical is in the bath at a concentration of 1 ppm. Items to be plated are attached to a rack and lowered into the baths either automatically by means of a computerised pulley system, or semi-automatically with a worker pushing a button to lower items into the bath. The metal is plated onto the items (at room temperature) and the coated items are then dried. Water from the rinsing baths is recycled into the metal solution baths. All the nickel brightener is adsorbed onto the metal surface and once incorporated the notified chemical will not be bioavailable.

Although the electroplating operation is an open system, there is little potential for exposure of operators to fumes and/or spills whilst handling solutions containing the notified chemical because the process is automated. The chemical is present in very low concentrations (0.21% before addition to the bath, 1 ppm in the bath). Skin contamination to the notified chemical may occur when handling the nickel brightener solution during addition to the bath. Fumes will be removed by local exhaust ventilation and all personnel will wear standard protective equipment (for example, industrial clothing, safety glasses/goggles, face shields, gloves, respirator) that comply with the corresponding Australian Standard.

7. PUBLIC EXPOSURE

The notified chemical will be used only in the electroplating industry and will not be sold to the general public. Although members of the public will make dermal contact with electroplated products (e.g. automotive parts; shop fittings, in particular shopping trolleys, bathroom fittings and building products, predominantly fasteners) containing the notified chemical, exposure will be negligible because of the low concentration of the encapsulated form of the notified chemical in the final products from which the notified chemical is not expected to leach.

8. ENVIRONMENTAL EXPOSURE

Release

Very little release to the environment is expected during formulation of the brightener at the toll manufacturer, since preparation of a 1000 L batch requires only 2.1kg of the Golpanol ATPN and volume is made up in water. The weighing is performed in an extraction booth where fugitive particulate matter is extracted and assumed to be captured on the associated filter pads. These would then be incinerated or placed into landfill.

The formulated solution is then repackaged, presumably into drums. The notifier did not provide details of methods for cleaning the batch tanks or disposal of waste wash-water, but this is presumed to be discharged to the sewer system. No estimate of overall losses to the environment during the production of brightener were provided in the submission, but in the worst case 10% of the new material could be released as a consequence of spills and accidents. This amounts to an expected annual release of 20kg of the chemical into the Melbourne South Eastern sewer system.

Little release is expected from the intended use of the chemical in electrochemical plating baths. Concentrated solutions of metal salts (in this case nickel and/or copper salts) in water - usually containing dilute sulfuric or hydrochloric acid - are passed through electrochemical cells in which the articles to be plated with metal form the cathode. The metal is deposited onto the articles and consequently the dissolved concentration is continuously reduced. Periodically, fresh metal salts are added to the baths, along with other additives such as brightening agents, in order to replenish the dissolved metal concentration. Articles removed from the baths are rinsed to remove residual electrolyte solution and the rinse is returned to the plating cells. This is an efficient process and involves negligible release of the solutions to the environment.

However, periodically the solution has to be "bled" to remove unwanted impurities which build up in the circuit as a consequence of acid neutralisation and other causes. It is then usual to precipitate the metals with lime or other bases, filter the effluent and discharge it to sewer. As mentioned above, most of the brightening agent is assimilated into the plated metal, but it could be expected that since the ambient concentration in the baths is around 1 mg/L, some would be released with the discharged bleed stream.

Fate

The notified chemical is very water soluble and regardless of the means of disposal or release, almost all the chemical is likely to enter the water compartment. Due to the low K_{oc} the chemical is not likely to associate with sewer sediments or soils and could be expected to remain in the water compartment. However, due to the high water solubility and low log P_{ow}, it is unlikely to bioaccumulate. The compound was shown not to be readily biodegradable and less than 10% degradation occurred after 28 days in a "die away test". Nevertheless, the compound is not expected to be persistent in the environment, due to slow hydrolytic degradation.

The chemical has a very low potential for bioaccumulation and data from the US Environmental Protection Agency database ASTER Agency (US EPA, 1998) indicate a bioconcentration factor of 1 (for fathead minnow) based on Quantitative Structure Activity Relationships (QSAR).

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were provided for the notified chemical. This is acceptable for chemicals that are to be introduced at less than 1 tonne per year. Toxicological information on an analogous chemical was provided on the MSDS. The MSDS reports that the chemical is harmful if swallowed and may cause serious damage to eyes. The MSDS states that the chemical is a hazardous substance.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

While not required by the Act for chemicals with import volumes of less than 1 tonne per annum, the notifier provided the following ecotoxicological data. The ecotoxicity tests were performed in accordance with OECD test guidelines (OECD,1995-1996).

Test	***Species***	***Results (measured)***
acute immobilisation [OECD TG 202 Part 1]	*Daphnia magna*	EC_{50}(48h) = 20.8 mg/L
inhibition of algal growth [OECD TG 201]	*Scenedesmus subspicatu*s	EbC_{50} (72h) = 23.2 mg/L NOEC (72h) = 3.13 mg/L LOEC (72h) = 6.25 mg/L
inhibition of bacterial respiration [OECD TG 209]	activated sludge bacteria	NOEC > 1000 mg/L

No data for acute toxicity to fish was submitted

The acute immobilisation tests on daphnia were performed using solutions of the notified chemical made up in dechlorinated water. Five solutions of the chemical with nominal concentrations of 1.56, 3.13, 6.25, 12.5, 25, 50 and 100 mg/L were tested, together with one control. Solution analysis was conducted at the nominal concentrations of 1.56 and 100 mg/L, with the resultant measured concentrations of 2 and 96 mg/L respectively.

Five daphnia were tested at each concentration, with each test performed with four replicates. The pH of the test solutions was 8.3 ± 0.1, while dissolved oxygen levels remained between 9.0 and 11.0 mg/L and water hardness was 250 mg/L as $CaCO_3$. The results indicate that the chemical is slightly toxic to daphnia with a 48 hour EC_{50} of 20.8 mg/L determined using probit analysis.

A test on the inhibition of algal growth was conducted on *Scenedesmus subspicatus* over a 72 hour incubation period at 23 ± 2°C with nominal concentrations of the notified chemical of 0.39, 0.78, 1.56, 3.13, 6.25, 12.5, 25, 50 and 100 mg/L, together with a negative control. The results show the notified chemical is slightly toxic to this species of green algae.

The test on inhibition of bacterial respiration was conducted with activated sludge suspended in an artificial medium (OECD synthetic medium) at 20 ± 2°C. After three hours exposure of the bacteria to a range of concentrations of the notified chemical, no discernible inhibition of respiration was observed at test concentrations up to 1000 mg/L. Consequently, the NOEC is taken as greater than 1000 mg/L. The reference material used in these tests (3,5-dichlorophenol) produced greater than 70% inhibition when present at 100 mg/L.

The QSAR ASTER database calculations for this chemical (US EPA, 1998) predicted the acute toxicity LC_{50} for several fish species, including rainbow trout (9.2 mg/L), fathead minnow (16.9 mg/L), bluegill (11.6 mg/L), and channel catfish (7.2 mg/L). They also provided an acute LC_{50} of 6.6 mg/L for immobilisation of daphnia and a chronic Maximum Allowable Toxicant Concentration (MATC) of 17.5 mg/L for fathead minnow.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

It is anticipated that a maximum of 20kg per annum will be released as a result of product formulation, all into the Melbourne South Eastern sewer system. This sewer services 900,000 people and has an annual flow of around 85 x 10^9 litres, giving a mean predicted environmental concentration (PEC) in this sewer of 0.25 μg/L. If all 20kg were released on a single day (for example as result of an accident), the PEC for the chemical would be approximately 0.07 mg/L.

The submission indicates that most of the chemical is adsorbed into the plated metal mass. However, as a worst case scenario where all the material (a maximum of 200kg per annum) is released to the sewer of one large city (for example, Melbourne) over a 350 day period, then the mean PEC for the chemical in the city sewer system is estimated as 1 μg/L. The predicted worst case scenarios lead to very small sewer concentrations, which will be further reduced through dilution in the receiving waters. If it is assumed that sewage effluent is diluted by a factor of 10 on discharge to receiving waters, then the PEC is reduced to 0.1 μg/L, which is four orders of magnitude below toxic levels.

The notified chemical has a very low potential for bioaccumulation and is not likely to be adsorbed onto sediments, or to be readily biodegradable. Nevertheless the chemical is expected to degrade slowly through abiotic hydrolysis and is therefore not expected to be persistent in the environment.

In conclusion, the notified chemical is not likely to present a hazard to the environment when it is stored, transported and used in the manner indicated in the submission.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Golpanol ATPN is determined to be a hazardous substance, under the National Occupational Health and Safety Commission *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b) according to toxicology summary information provided in the submission for an analogous chemical. The oral LD_{50} in the rat is reportedly between 200 and 1000 mg/kg. It is also considered an eye irritant in rabbits, with a risk of serious damage to eyes. Inhalation of dust may result in respiratory irritation but skin contact is not expected to cause irritation. Chronic effects are not known. These health effects are described on the MSDS. The overall health hazard classification is Harmful (Xn) with risk phrases R22-Harmful if Swallowed and R41-Risk of Serious Damage to Eyes, assigned.

The notifier stated that particles of Golpanol ATPN range in size from 3-200 μm. Hence, the notified polymer is comprised of respirable particles (i.e. <10μm), as well as inspirable particles (<180μm) that may be lodged in the upper respiratory tract leading to respiratory irritation, as noted on the MSDS.

Once the chemical is diluted for blending (0.21%) and electroplating (0.001%) it will be below the concentrations likely to cause health effects in humans.

There have been no reported incidences of adverse health effects or symptoms in humans exposed to the notified chemical. There have been no work-related injuries or adverse health effects associated with products currently in use that are similar in composition and structure to this chemical.

Occupational Health and Safety

The total number of workers who will come in contact with the notified chemical during handling, reformulation, electroplating and maintenance tasks will be low, probably less than 15. Workers may be exposed to Golpanol ATPN both in the solid and aqueous form. Exposure to solid Golpanol ATPN is possible when weighing out the powder for production of the nickel brightener solution, or during transport should accidental spillage occur. Electroplating workers may be exposed to solutions of the notified chemical, via fumes, spills and splashes, when preparing and disposing of bathing liquids.

During production of the nickel brightener solution small amounts of chemical are weighed out (2.1 kg for every 1 000 L batch). Exposure may occur during this activity, however, it is carried in an extraction booth and all process operators will wear protective equipment (for example, overalls, safety glasses/goggles, gloves and faceshield or dust mask if necessary) that complies with the relevant Australian Standard. The MSDS recommends that workers use a dust mask if ventilation is inadequate or dust exposure is likely. Also the brightener solution is formulated infrequently during any 12-month period, with the total potential annual exposure estimated at 11 hours. Therefore, the risk of adverse effects resulting from exposure to the notified chemical is low.

At the electroplating facility, there is little potential for exposure of operators to fumes and/or spills as the chemical is present in very low concentrations (≤0.21%) and all solutions are aqueous. Once the notified chemical is used in the electroplating process, it will not be bioavailable as it is bound to the metal substrate. Any fumes from the baths will be removed by local exhaust ventilation and all workers will wear standard protective equipment (for example, overalls, safety glasses/goggles and gloves) that comply with the corresponding Australian Standard. Given the low concentrations of notified chemical present in solution and the high level of control available, the health risk to workers arising from exposure to the notified chemical is very low.

The risk to storage and transport workers is very low as exposure will only occur if packaging is breached. No repacking will take place.

The notified chemical does carry a risk of dust explosion potential if electrostatic accumulation occurs. However, this risk is no greater than for most other organic dusts. Dust exposure can be minimised by moistening any leaked material, then sweeping or vacuuming the residues using an industrial vacuum cleaner. The solids can be collected in a waste container. As part of good hygiene practices, dust levels in the workplace should be controlled to below the NOHSC exposure standard for ‘Dusts, not otherwise classified, 10 mg/m^3 TWA (measured as inspirable fraction)’ (NOHSC, 1995). Because the notified chemical contains respirable particles, the ACGIH respirable particulate threshold limit value (TLV) of 3 mg/m^3 can be used as guidance for the control of respirable dust in the workplace (ACGIH, 1998). Employers are responsible for ensuring the exposure standard is not exceeded.

Public Health

Based on the information provided by the notifier and the use pattern, Golpanaol ATPN is considered not to pose a significant hazard to public health. It will only be used in the electroplating industry and will not be sold to the general public. Exposure will be negligible because once it is incorporated onto the electroplated metal surface, it is bound to the substrate and becomes chemically and biologically unavailable. In any case, concentrations of the chemical would be far too low to present a hazard, if it was somehow released.

13. RECOMMENDATIONS

To minimise occupational exposure to the notified chemical, the following guidelines and precautions should be observed:

- Avoid generation of dust when handling the notified chemical in powder form;
- Provide local exhaust ventilation when weighing the notified chemical in powder form;
- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992);
- Industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987) and AS 3765.1 (Standards Australia, 1990);
- Impermeable gloves should conform to AS/NZS 2161.2 (Standards Australia/Standards New Zealand, 1998);
- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994a);
- Respirators should conform to AS 1715 and AS 1716 (Standards Australia/Standards New Zealand, 1994b,c);

- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should be put into containers for disposal;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the MSDS should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994c).

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, secondary notification of the notified chemical shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

16. REFERENCES

OECD (1995-1996) OECD Guidelines for the Testing of Chemicals on CD-Rom. Paris, Organisation for Economic Co-operation and Development (OECD).

European Commission (1992) *Methods for the Determination of Physico-Chemical Properties, Part A, Commission Directive 92/69/EC*. Official Journal of the European Communities No. L383A, December 1992.

National Occupational Health and Safety Commission (NOHSC, 1999a) *List of Designated Hazardous Substances* [NOHSC:10005(1999)]. Australian Government Publishing Service, Canberra. (In Press)

National Occupational Health and Safety Commission (NOHSC, 1994b) *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(1999)]. Australian Government Publishing Service, Canberra. (In Press)

National Occupational Health and Safety Commission (NOHSC, 1995) Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment, [NOHSC:1003(1995)]. In: Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards. Australian Government Publishing Service, Canberra,.

American Conference of Governmental Industrial Hygienists (ACGIH,1998) 1998 TLV's and BEI's: Threshold Limit Values and Physical Agents; Biological Exposure Indices. Cincinnati, American Conference of Governmental Industrial Hygienists (ACGIH).

National Occupational Health and Safety Commission (NOHSC, 1994c) *National Code of Practice for the Preparation of Material Safety Data Sheets* [NOHSC:2011(1994)]. Australian Government Publishing Service, Canberra.

Standards Australia (1987) *Australian Standard 2919-1987, Australian Standard Industrial Clothing*. Standards Australia, Sydney.

Standards Australia (1990) *Australian Standard 3765.1-1990, Australian Standard Clothing for Protection Against Hazardous Chemicals Part 1: Protection Against General or Specific Chemicals*. Standards Australia, Sydney.

Standards Australia (1994) *Australian Standard 1336-1994, Australian Standard Eye Protection in the Industrial Environment*. Standards Australia, Sydney.

Standards Australia/Standards New Zealand (1992) *Australian/New Zealand Standard 1337-1992, Australian/New Zealand Standard Eye Protectors for Industrial Applications*. Standards Australia and Standards New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1994a) *Australian/New Zealand Standard 2210-1994, Australian/New Zealand Standard Occupational Protective Footwear*. Standards Australia and Standards New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1994b) *Australian/New Zealand Standard 1715-1994, Australian/New Zealand Standards for the Selection, Use and Maintenance of Respiratory Protective Devices*. Standards Australia and Standards New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1994c) *Australian/New Zealand Standard 1716-1994, Australian/New Zealand Standard Respiratory Protective Devices*. Standards Australia and Standards New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1998) *Australian/New Zealand Standard 2161.2-1998, Australian/New Zealand Standard Occupational Protective Gloves Part 2: General Requirements*. Standards Australia and Standards New Zealand, Sydney/Wellington.

US Environment Protection Agency (US EPA, 1998) *ASTER Ecotoxicity Profile: Propanoic acid, 3-[(aminoiminomethyl)thio]- (CAS No. 5398-29-8)*. United States Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Mid-Continent Ecology Division.