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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Z-21

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Z-21

1. APPLICANT

Lubrizol Australia of 28 River Street SILVERWATER NSW 2141 has submitted a standard notification for assessment of Z-21.

2. IDENTITY OF THE CHEMICAL

Z-21 is not considered to be hazardous based on the nature of the chemical and the data provided. Therefore the chemical name, CAS number , molecular and structural formulae, exact use, exact molecular weight and exact import volume have been exempted from publication in the Full Public Report and the Summary Report.

Other name: Z-21

Molecular weight: < 1000

Methods of detection and determination:

UV/Vis, Infrared (IR) and Nuclear Magnetic Resonance (NMR) spectroscopy. May also be detected using an ion selective electrode.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	amber solid
Melting point:	81.5°C
Vapour pressure:	8.15 X 10^{-5} Pa at 25°C
Density:	1.0587 (relative to water) at 20°C
Water Solubility:	0.275 g/L at 20°C
Partition coefficient (n-octanol/water) log Pow:	3.17 (estimated)
Soil adsorption/desorption:	not determined
Hydrolysis as a function of pH:	not expected to hydrolyse on the basis of chemical structure
Dissociation Constant pKa:	not determined (Z-21 is expected to ionise)

Surface Tension: 36.4 mN/m at 21°C

Flammability Limits: not flammable

Autoignition Temperature: degrades at 425°C

Explosive Properties: none

Reactivity/Stability: not an oxidising agent

Comments on the physico-chemical properties

The partition coefficient was estimated by the ratio of solubilities in pure water and n-octanol, due to the problems of measurement associated with the low concentrations of cations in the presence of organic solvents. The substance was quite soluble in octanol, but less soluble in water (< 0.27466 g/L). Thus the determined value actually represents an approximation only. In addition, the results of the surface tension testing indicate that the substance has significant surface activity, which adds further uncertainty to the estimated results.

Adsorption/desorption tests were not conducted on the grounds that there will be no loss to soils. Although it is foreseeable that there would be some losses to soils as a result of accidental spills, the estimated high log P_{ow} indicates that the substance should sorb strongly to soils. However, the qualifications concerning the estimated log P_{ow} outlined above should be noted.

4. PURITY OF THE CHEMICAL

Degree of purity: 67.5 - 82.5%

Toxic impurities: Alkylphenol (22.5 - 27.5 Wt %)

Toxic Properties: Moderate to strong eye irritant; Skin irritant; Oral (rats) LD_{50} > 2000 mg/kg and < 5000 mg/kg

Non-toxic impurities (> 1% by weight): none known

Additives/Adjuvants: none

5. INDUSTRIAL USE

The notified chemical is to be used as an oil additive in the fuel of 2-cycle engines, including utility, motorcycle and snowmobile engines.

6. OCCUPATIONAL EXPOSURE

The notified chemical will be imported as a component (20%) of an oil additive package in 205 L steel drums at a rate of 1 - 20 tonnes per year for the first five years. Typically, a performance additive package which contains the notified chemical, contains anti-

oxidants, corrosion inhibitors, antiwear agents, detergents and dispersants. Viscosity modifiers may be part of the package or may be added separately by the lubricant manufacturer.

Following transport by road or rail to the blend facilities of the oil industry, the drums are stored prior to lubricant manufacture. Typically, lubricant manufacture involves first charging the blending vessel with an oil blend. Then two blend plant operators transfer the oil additive package to the blend vessel either by decanting it into a drum dump trough or inserting a spear into the drum. In either case the additive package is pumped directly into the blend vessel through enclosed lines. Additional diluent oil is pumped into the blend vessel. This process is overseen by one operator and is typically computerised.

The blend is stirred for 1 - 2 hours and then about 0.5 L is sampled for analysis. When the blend is approved it is 'bottled' in containers for sale to workshops and retail outlets. Once the 'bottling' process is completed the various feed lines are flushed with diluent oil. The flushings are labelled and used in subsequent batches. The concentration of the notified chemical in the final product will vary between < 10%.

It is stated that the above processes are carried out in closed systems.

Typically the blending process may continue for several days depending on the amount to be blended. In the first year this would mean a total processing time of 1 day.

The final product will be added to gasoline in the ratio of 20:1 - 100:1 (v/v), gasoline: product either by the general public from 1 - 5 L containers, by 2-cycle fuel manufacturers or in 20 L containers by commercial operators of, possibly, lawnmowers, chainsaws or motor boats. In the case of the fuel manufacturers, oil containing the notified chemical is metered into road tankers through enclosed lines into which the gasoline is being pumped .

7. PUBLIC EXPOSURE

The public is unlikely to be exposed to Z-21 during importation and commercial blending operations. The oil product containing Z-21 will be sold to the public in cylindrical cans or in cans equipped with angled pour spouts. However, dermal contact is expected to be infrequent and the notified chemical is present at low levels in the oil.

8. ENVIRONMENTAL EXPOSURE

. Use

Z-2 1 is to be used as part of an oil additive which is to be used in two stroke engines of motorbikes, snowmobiles and "utility engines" (presumed to include lawn mowers, chainsaws, and so on). It is claimed that two-stroke engines generally are accepted to have a combustion efficiency of 95-98%, which means that approximately 2-5% passes through the combustion chamber uncombusted and into the atmosphere. The additive package may be either sold pre-mixed in two-stroke engine fuel, or sold in 1-5 L containers for the general public to mix into fuel as required. There is also the possibility of larger containers (20 L) being sold for commercial operators, but this circumstance is considered rare by the company.

Some spills may be expected as the additive package in mixed into fuel tanks with petrol, but the company has provided no estimates of the likely extent of such spills. It is unlikely that such spills would be collected and properly disposed of, and they will most likely remain on the substrate onto which they were spilt. The recommended route of disposal for spilt product is incineration.

As two-stroke fuel is consumed during the combustion process, the only other anticipated release of the additive package in oils is from the disposal of emptied containers. The company estimates that approximately 1-3% of the oil additive will be left behind in the containers after they are used. Assuming 5 L containers are to be sold routinely, approximately 150 mL of Z-21 could be released each time a container is disposed of. Containers are to be disposed of in normal garbage and eventually incinerated or placed in landfills. Land filling is the more common option in Australia.

. Fate

The notified substance is relatively soluble in water at normal environmental temperatures (275 ppm at 20°C), and therefore has the potential to leach. As adsorption/desorption tests were not conducted it is difficult to accurately predict the behaviour of any spills and from landfill disposal on empty containers. The substance will not readily hydrolyse, and has a relatively high estimated log P_{ow} value and surface activity. These factors combine to suggest that although the substance may be potentially mobile in pore water, it will most likely bind to soils and sediments. Should a spill occur to water, some of the substance may be expected to mix with the water column, with the remainder settling onto sediments.

· Biodegradation

The substance was examined for ready biodegradability (using OECD Guideline 301B) at two concentrations - 10 and 20 mg/L. In both cases, ready biodegradability was very low over 28 days (3.5% and 3.8% of theoretical $C0_2$ evolution, respectively). The reference substance, sodium benzoate, returned a value of 89.7% theoretical $C0_2$ evolution over the same period. The company claims that the test substance was not inhibitory to microbial metabolism, as the inoculum was able to metabolise the reference material in the presence of the test material. The degree of inherent biodegradability remains unclear.

· Bioaccumulation

As the notified substance has a relatively high water solubility, but has an estimated partition co-efficient of 3.17 and does not readily biodegrade, it may be seen as a potential bioaccumulator. The company claims that because of the manner of use of this substance, it will not be released to the environment in any great quantity, and therefore will not be available for organisms to bioaccumulate. Spills of the notified substance during transport will be of greatest concern.

9. EVALUATION OF TOXICOLOGICAL DATA

9.1 Acute Toxicity

Table 1 Summary of the acute toxicity of Z-21

Test	Species	Outcome	Reference
Acute oral toxicity	Rat	LD_{50} > 5000 mg/kg	(1)
Acute dermal (2) toxicity	Rabbit	LD_{50} > 2000 mg/kg	
Skin Irritation	Rabbit	slight irritant	(3)
Eye irritation	Rabbit	slight irritant	(4)
Skin sensitisation	Guinea-pig	non-sensitiser	(5)

9.1.1 Oral Toxicity (1)

Sprague-Dawley rats (5/sex) received a single dose of Z-21 by gavage at a dose level of 5000 mg/kg.

There were no deaths over the 14 day observation period, no significant clinical changes were observed and no gross macroscopic changes were noted on necropsy at day 15.

It can be concluded that the acute oral LD_{50} for the notified chemical in rats is > 5000 mg/kg.

9.1.2 Dermal Toxicity (2)

New Zealand White rabbits (5/sex) received a single dose of 2000 mg/kg of Z-21 applied under a gauze patch held in place for 24 hours.

There were no deaths during the 14 day observation period, no significant effects on body weight gain, no significant clinical findings and no significant gross necropsy findings.

The notified chemical induced slight to moderate erythema and very slight to moderate oedema in all rabbits. Residual test material was present on the application site of all animals for the duration of the study. Subcutaneous haemorrhaging for five sites and fissuring for one site were observed on days 1 and 2. Very slight to slight dermal irritation persisted through to day 14 for all animals.

It can be concluded that the acute dermal LD_{50} for the notified chemical in rabbits is > 2000 mg/kg.

9.1.3 Skin Irritation (3)

New Zealand White rabbits (2 males, 4 females) received a dose of 0.5 g of the notified chemical under a gauze patch (moistened with 0.5 mL physiological saline) for 4 hours.

Very slight erythema was observed in all animals at 1 hour, slight erythema was observed in 5 animals and moderate to severe erythema in 1 animal at 24 hours and

slight erythema was observed in all animals at 48 and 72 hours post-treatment. At 4 days erythema responses were 5 slight and 1 moderate to severe, at 5 days: 4 slight and 2 very slight, at 6 days: 3 slight and 3 very slight and at 7 days post-treatment 1 slight, 4 very slight and 1 no response.

For oedema, responses at 1 hour were 5 very slight and 1 no response, at 24 hours: 4 very slight and 2 slight, at 48 and 72 hours: 1 slight, 4 very slight and 1 no response, at 4 days: 1 slight and 5 no response, at 5 days: 1 slight, 1 very slight and 4 no response, at 6 days: 2 very slight and 4 no response and at 7 days: 1 very slight and 1 no response.

It can be concluded that the notified chemical is a slight skin irritant in rabbits.

9.1.4 Eye Irritation (4)

New Zealand White rabbits (3/sex) received a dose of 0.1 mL of a 45% (w/v) solution of the notified chemical in light white mineral oil directly into the cupped lower conjunctival sac of the right eye of each animal.

No effects on the cornea or iris were observed for any animal. Slight conjunctival redness was observed in all animals at 24 hours, in 4 animals at 48 hours and in 2 animals at 72 hours post-treatment. Slight chemosis was observed in 4 animals at 24 hours and in 2 animals at 48 hours post-treatment.

It can be concluded that the notified chemical is a slight eye irritant in rabbits.

9.1.5 Skin Sensitisation (5)

This study was conducted using a modified Buehler method (6) with 10 guinea pigs (5/sex) of the Hartley strain in the test group. All applications of the test material were to the shaved skin under an occluded patch.

Induction was carried out as three 6-hour topical applications of a 25% w/v mixture of the test substance in light, white mineral oil over a three week period. Challenge was performed 2 weeks after induction with a 5% w/v mixture and rechallenge 7 days later with a 2.5% w/v mixture of Z-21 in light, white mineral oil.

Equivalent slight or very slight irritation responses were observed in both the controls and the animals which had undergone induction.

It can be concluded that the notified chemical is a not a sensitising agent in guinea pigs.

9.2 Repeated Dose Toxicity (7)

This study was conducted in accordance with OECD guideline No. 407 (8). Sprague-Dawley rats (5/sex/dose) received doses of 0, 50, 200 or 800 mg/kg/day by gavage with an additional 5/sex in the zero and high dose groups given a 14 recovery period prior to necropsy.

One male was killed *in extremis* as a result of intubation trauma but all other animals survived to scheduled necropsy.

The predominant clinical signs occurred in the 800 mg/kg/day dose group and included clear, orange or red material and yellow or orange staining on several body surfaces

(especially around the nose or mouth and on the forelimbs), rales and salivation. These symptoms appeared in the first week and continued throughout the treatment period.

Dose-related decreases in body weights and body weight gain were observed predominantly in the 200 and 800 mg/kg/day dose groups and paralleled decreases in food consumption.

No treatment-related changes in urinalysis parameters were observed.

The only treatment-related change in haematology parameters was an increase in lymphocytes in the 800 mg/kg/day males.

Several clinical chemistry parameters suggested impaired liver metabolism. These were increases in alanine aminotransferase values (800 mg/kg/day males and females), alkaline phosphatase values (200 and 800 mg/kg/day males and females) and gamma glutamyltransferase levels (800 mg/kg/day males and females). In addition, group mean cholesterol values were reduced in 800 mg/kg/day males and females. These changes were observed at the end of week 4.

Group mean adrenal gland and liver weights were elevated in 800 mg/kg/day males and females. The increased liver weights were still apparent in females following the recovery period.

No treatment-related macroscopic findings were noted.

One microscopic hepatic tissue change, cytoplasmic vacuolation (minimal to moderate), exhibited an increased incidence in 800 mg/kg/day males and females but this change was not observed in the recovery groups.

It can be concluded that the notified chemical exhibits liver toxicity on repeated oral administration but that the effects are reversible.

9.3 Genotoxicity

9.3.1 Salmonella typhimurium Reverse Mutation Assay (9)

This study was conducted in accordance with *OECD Guideline* No. 471 (10). *Salmonella typhimurium* strains TA 1535, TA 1537, TA 1538, TA 98 and TA 100 and *Escherichia coli* strain *WP2uvrA* were treated with doses up to 5000 μg/plate in the presence or absence of metabolic activation provided by rat liver S9.

Growth inhibition and precipitation of the test substance occurred at concentrations above 500 μg/plate. No treatment-related increase in the number of prototrophic back mutants was observed in any strain. Responses to the positive control substances 9-aminoacridine, sodium azide, N-ethyl-N' -nitro-N-nitrosoguanidine, 2-nitrofluorene and 2-anthramine were as expected.

It can be concluded that the notified chemical is unlikely to be mutagenic in *Salmonella typhimurium* and *Escherichia coli.*

9.3.2 Micronucleus Assay in the Bone Marrow Cells of the Mouse (11)

Groups of CD-1 mice (5/sex) were dosed once intraperitoneally at 0, 20, 40 or 80 mg/kg and then killed 24, 48 or 72 hours later. One thousand polychromatic erythrocytes per animal were scored for the presence of micronuclei.

The positive control substance, triethylenemelamine, at 0.5 mg/kg, induced micronuclei as expected but the notified chemical did not increase the frequency of micronucleated polychromatic erythrocytes above control levels.

It can be concluded that the notified chemical is unlikely to be clastogenic in mice.

9.3.3 Dominant Lethal Test (12)

This study appears to have been conducted using the methods of Anderson *et al.* (13) and Green *et al.* (14) but this is not specifically stated.

Sprague-Dawley male rats (15/dose) received doses of 0, 50, 200 or 800 mg/kg/day of Z-21 for 70 days. Another group received the positive control substance triethylenemelamine at 0.05 mg/kg/day for 70 days.

Ten male rats in the high dose group were dead by day 64 and 1 male rat in the low dose group died as a result of accident.

On day 70 each surviving male rat was co-housed with 2 virgin young adult Sprague-Dawley female rats per week for 2 consecutive weeks following which the male rats were killed and their testes and final body weights recorded.

No statistically significant reduction in fertility or increase in post-implantation loss was detected in females mated with Z-21-treated males at any of the doses evaluated. However, a statistically significant increase in pre-implantation loss in the 200 and 800 mg/kg/day females was observed.

For the positive control substance statistically significant ($p \leq 0.01$) decreases in the number of live implants, increases in the number of dead implants and increases in the frequency of post-implantation loss were observed.

In can be concluded that the notified chemical did not induce dominant lethal mutations in the germ cells of the male rats under the conditions of the study.

9.4 Overall Assessment of Toxicological Data

The notified chemical exhibited low acute oral toxicity in rats, low acute dermal toxicity in rabbits, was a slight skin and eye irritant in rabbits and was not a skin sensitiser in guinea pigs. A 28-day oral repeated dose toxicity study suggested there may be some liver toxicity in rats primarily at the highest dose used.

The notified chemical was non-genotoxic as judged by the non-induction of prototrophic back mutants in bacteria, of dominant lethal mutations in the germ cells of rats and of micronuclei in bone marrow cells of mice.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

Toxicity testing was conducted for a number of organisms, with all test conducted using relevant OECD Guidelines. Complete test reports were submitted, with all tests conducted at Wildlife International Ltd. Easton, Maryland. Results of these tests are shown in the table below.

TEST SPECIES	TEST	GUIDELINE	RESULT
Fathead minnow *(Pimephales promelas*)	Acute toxicity, Static Renewal Conditions[1]	OECD 203	LC_{50} 96hr = 1.0 mg/L NOEC 96hr = 0.76 mg/L
Daphnia magna (neonates)	Acute toxicity[2]	OECD 202	EC_{50} 48hr = 0.37 mg/L NOEC 48hr =0.17 mg/L
Daphnia magna (neonates)	Life-cycle toxicity[3]	OECD 202 and ASTM Standard E 1193-87	EC_{50} = 0.08 mg/L (21 days) NOEC = 0.014 mg/L LOEC = 0.031 mg/L MATC = 0.020 mg/L
Selanastrum capricornutum	Growth Inhibition	OECD 201	EC_{50} = 588 mg/L (96hr) WAF[3] NOEC = 250 mg/L[1] WAF NOEC = 250 mg/L

[1] Average measured concentrations of test material ranged from 96-108% (Day 0) to 71-91% (96 hr). Stock solution made up in methanol.

[2] Concentrations of test material in solutions varied from 77-97% (Day 0) to 54-84% at 48 hours, of nominal values. Stock solution made up in methanol.

[3] Results presented as Water Accommodated Fractions, with actual concentrations not measured (a method recommended for use in testing oil products - see Reference 15). The company assumes that WAF's at or below 274 mg/L are close to actual concentrations.

Overall, the results of the toxicity testing reveal that the notified substance is moderately to highly toxic to fish, highly to very highly toxic to daphnia, and practically non-toxic to algae. Chronic effects to daphnia occur at particularly low concentrations.

11. ENVIRONMENTAL HAZARD

Due to the proposed use pattern of the notified substance (as an additive in two-stroke engine fuels), the anticipated environmental hazard is low. Most of the substance will be consumed in the combustion of the fuel, with only small amounts expected to be spilt as a result of adding the additive package to fuel tanks of mowers, chainsaws, motorbikes

and so on. A small percentage will not be combusted and will be released to the atmosphere in a diffuse manner.

Although the substance is relatively soluble, the estimated partition co-efficient value and the high surface activity (as indicated by the surface tension) indicates that it will probably sorb to soil and sediments in the event of a spill. Thus emptied containers and residues therein, disposed of to landfill, should not represent a threat to the environment. Spills to soils/workshop surfaces at petrol stations and so on should be adsorbed onto adsorbent material and disposed of by incineration. Without accurate knowledge of the extent of the use of this additive package, it is impossible to predict the amount of material that will be disposed of in this way.

Transport spills to waterways, although unlikely, would be of particular concern, due to the toxic nature of the substance to aquatic invertebrates. Such spills should be dealt with as normal fuel spills, with spilt material being adsorbed onto appropriate substance, and then incinerated. Should the substance reach waterways, both acute and chronic effects of aquatic invertebrates would be expected.

Spills to soils, as a result of accidental spillage during the fuelling of two-stroke engines, are unlikely to remain on the soil until washed away by rainfall. They are not likely to rapidly breakdown, as indicated by the very low levels of biodegradability found in the modified Sturm tests. Such spills are likely to be small, isolated, and will be considerably diluted as they pass through soils, and therefore are not of major concern.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Exposure to the undiluted notified chemical may cause slight skin and eye irritation. Manufacture of the oil blend containing the notified chemical involves the use of closed systems for blending in additives and 'bottling' the resulting product. Exposure during these processes is expected to be negligible. However, there is a small possibility of exposure to the notified chemical during decanting of drums prior to blending.

Occupational exposure to the notified chemical during its addition to gasoline is expected to be minimal given its low concentration (< 10% v/v maximum) in the oil product to be added and the fact that it is expected to be pumped through enclosed lines from 20 L containers into the gasoline. Similarly, exposure to the notified chemical while the oil containing it is being metered into gasoline road tankers is expected to be minimal through the use of enclosed lines.

It can be concluded that there is a low risk of adverse health effects arising from occupational exposure during lubricant manufacture and during its addition to gasoline. There is also a low risk of adverse health effects arising from public exposure during addition of the lubricant to gasoline.

13. RECOMMENDATIONS

To minimise occupational exposure to Z-21 the following guidelines and precautions should be observed:

. if engineering controls and work practices are insufficient to reduce exposure to a safe level, then personal protective devices which conform to and are used in accordance with Australian or Australian/ New Zealand Standards (AS or AS/NZS) for eye protection (AS 1336, AS/NZS 1337) (16,17) and impermeable gloves (AS 2161) (18) should be worn. Overalls conforming to AS 2919 (19) and protective footwear conforming to AS/NZS 2210 (20) also should be worn;

. good personal hygiene should be practised;

. work practices should be implemented to avoid spills which should be cleaned up promptly and disposed of in accordance with the recommendations contained in the MSDS and with Local or State government regulations. During clean-up of spills, the personal protection described above should be worn;

. a copy of the Material Safety Data Sheet (MSDS) should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for Z-21 was provided in an acceptable format.

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

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, secondary notification of Z-21 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

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2. *Acute Dermal Toxicity Study in Albino Rabbits with OS #89887*, Project No.: WIL-168056, data on file, WIL Research Laboratories Inc, Ashland, OH, USA, 1992.

3. *Primary Dermal Irritation Study in Albino Rabbits with OS #89887*, Project No.: WIL-168057, data on file, WIL Research Laboratories Inc, Ashland, OH, USA, 1992.

4. *Primary Eye Irritation Study in Albino Rabbits with OS #89887*, Project No.: WIL-168058, data on file, WIL Research Laboratories Inc, Ashland, OH, USA, 1992.

5. *Skin Sensitisation Study of OS #89887 in Albino Guinea Pigs*, Project No.: WIL-168088, data on file, WIL Research Laboratories Inc, Ashland, OH, USA, 1993.

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8. OECD Guidelines for Testing of chemicals - *Repeated Dose Oral Toxicity No: 407*, 1981.

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10. OECD Guidelines for Testing of chemicals - *Salmonella typhimurium, Reverse Mutation Assay No: 471*, 1983.

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12. *Dominant Lethal Test in Male Rats Treated with OS #89887,* Project No.: PH 327-LU-001-93, data on file, Pharmakon USA, Waverley, PA, USA, 1994.

13. Anderson, D. A. *et al.*, 1983, Dominant Lethal Mutation Assays in: Dean, B. J. (Ed.), *Reports of the UKEM Sub-committee on Guidelines on Mutagenicity Testing*.

14. Green, *et al.*, 1987, A Guide for Mutagenicity Testing Using the Dominant Lethal Assay, Mutation Res., **189**, 164-174.

15. Girling, A. E., Markarian, R. K. and Bennett, D., 1992, *Aquatic toxicity Testing of Oil Products - Some recommendations*. Chemosphere, **24**: 1469-1472.

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18. Standards Australia, 1978, *Australian Standard 2161-1978, Industrial Safety Gloves and Mittens (excluding Electrical and Medical Gloves*), Standards Association of Australia Publ., Sydney, Australia.

19. Standards Australia, 1987, *Australian Standard 2919 - 1987 Industrial Clothing,* Standards Association of Australia Publ., Sydney, Australia.

20. Standards Australia, Standards New Zealand 1994, *Australian/ New Zealand Standard 2210 - 1994 Occupational Protective Footwear, Part 1: Guide to Selection, Care and Use. Part 2: Specifications,* Standards Association of Australia Publ., Sydney, Australia, Standards Association of New Zealand Publ. Wellington, New Zealand.