

File No: PLC/87

September 1998

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

WQ-258P

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Director
Chemicals Notification and Assessment

WQ-258P**1. APPLICANT**

The Valspar (Australia) Corporation Pty Limited of 203 Power Street GLENDENNING NSW 2761 has submitted a notification statement accompanying their application for assessment of a Synthetic Polymer of Low Concern, WQ-258P.

2. IDENTITY OF THE CHEMICAL

Chemical Name: 2-propenoic acid, polymer with ethenylbenzene, ethyl 2-propenoate and (1-methylethenyl) benzene

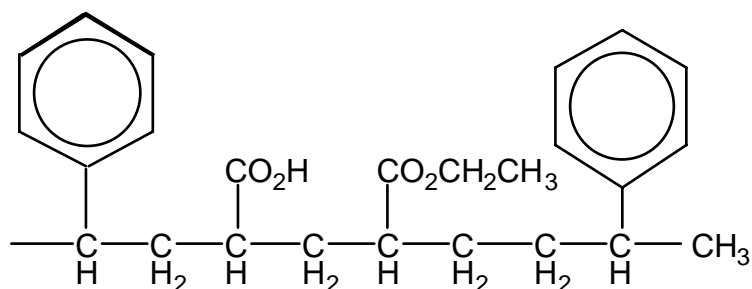
Chemical Abstracts Service (CAS) Registry No.: 68650-88-4

Other Names: 2-propenoic acid, 2-ethyl polymer with benzene, ethenyl and benzene propenyl and 2-propenoic acid.
Ethyl acrylate, ethyl ester, polymer with styrene, alpha-methylstyrene and acrylic acid

benzene, ethenyl with propenoic acid, ethyl ester and with benzene, propenyl with 2-propenioc acid polymer and 2-butoxyethanol

Trade Name: WQ-258P

Molecular Formula: $(C_5H_8O_2 \cdot C_8H_8 \cdot C_9H_{10} \cdot C_3H_4O_2)_n$

Structural Formula:**IDEALISED STRUCTURE OF WQ-258P****Number-Average****Molecular Weight (NAMW):** 5 174**Weight-Average****Molecular Weight (WAMW):** 86 430**Maximum Percentage of Low
Molecular Weight Species****Molecular Weight < 500:** 0.1 (maximum)**Molecular Weight < 1 000:** 2.2**Weight Percentage of
Ingredients:**

<i>Chemical Name</i>	<i>CAS No.</i>	<i>Weight %</i>
benzene ethenyl (Styrene)	100-42-5	3.69
2-propenoic acid, ethyl ester (Ethyl acrylate)	140-88-5	17.5
benzene, 2-propenyl (α -methyl styrene)	98-83-9	4.37
2-propenoic acid (Acrylic acid)	79-10-7	4.95

**Maximum Content
of Residual Monomers:** estimated at <0.01%

<i>Chemical Name</i>	<i>CAS No.</i>	<i>Weight %</i>
benzene ethenyl (Styrene)	100-42-5	0.006
benzene, 2-propenyl (α -methyl styrene)	98-83-9	0.003

**Method of Detection
and Determination:**

infrared (IR), gel permeation chromatography (GPC)

Spectral Data:

IR spectrometric data was submitted for the identification of the notified polymer

GPC trace and associated printout were supplied to

determine the molecular weight and percentage of low molecular species. This indicates a NAMW of 5 174 and WAMW of 32 838 with a polydispersity of 6.3457

Comments on Chemical Identity

WQ-258P is manufactured as a 30% (28-32%) w/w solution in 2-butoxyethanol (17%) and water (53%).

A report with IR (Infrared) spectrometric data was submitted for the identification of the notified substance.

A GPC (Gel Permeation Chromatography) trace and associated printout were supplied to determine the molecular weight and percentage of low molecular species. This indicates a number-average molecular weight (M_n) of 5 174 and weight-average molecular weight (M_w) of 32 838, with a polydispersity of 6.3457.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	clear, moderately yellow solution (as manufactured); pale yellow, brittle, coherent solid
Boiling Point:	100°C (that of the water solvent)
Density:	1.048 g/cm ³ (of the resin solution)
Hydrolysis:	not expected
Water Solubility:	2.4 mg/L +/- 0.17 mg/L at 25°C
Particle Size Distribution	the notified polymer in a dry state appears as a film and does not form particulate dust
Stability:	stable under normal conditions
Charge density:	not polycationic
Cationic/Anionic potential in pH range 4 to 9:	not expected under normal conditions

Reactive functional groups: functional groups present in the notified polymer are not expected to undergo further reaction under normal conditions

Flammability Limits: not flammable

Explosive Properties: not explosive

Comments on Physico-Chemical Properties

The data provided are acceptable for a synthetic polymer of low concern.

If allowed to dry at room temperature and pressure, WQ-258P will appear as a slightly yellow, clear film.

Testing for solubility was carried out according to OECD method No 105 (Organisation for Economic Co-operation and Development, 1995-1996). A solubility for WQ-258P of approximately 2.4 mg/L was achieved probably due to the carboxylic acid functionalities being neutralised by the N,N-dimethylaminoethanol. This result is in excess of the solubility allowed for PLC submissions. However, the solubility should not be of environmental concern since there is low exposure to the aquatic compartment for the applied and cured coating of which the notified substance is a component.

The notifier claims that due to the nature of its end use, the notified polymer should not hydrolyse, and should not undergo photo or thermal degradation or depolymerisation during use or storage. Whilst the notified polymer does contain a number of acid and ester linkages, hydrolysis in the environmental pH range of 4-9 would not be expected.

4. USE, VOLUME, MANUFACTURE AND FORMULATION

The notified polymer will be manufactured and formulated into protective and decorative coatings at one particular site in Glendenning NSW. The polymer will not be distributed in any uncompounded form.

It is estimated that the volume of notified polymer manufactured in Australia will be approximately 16 tonnes (as solid resin) or 53 tonnes as resin solution per annum.

The notified polymer will be used in-house (at the site of manufacture) to prepare clear and pigmented aluminium can coatings.

Manufacture

The polymer (resin) will be manufactured in an enclosed heated reaction vessel fitted with stirring and over-head condenser system. The vessel is also fitted with a vacuum pump and facilities for input of an inert gas blanket. All charging and vent lines associated with the reactor are connected to a vapour extraction system which is discharged to atmosphere

through an exhaust vent incinerator. The incinerator controls monomer and co-solvent emissions from the polymerisation process.

All monomers will be pumped directly into the reactor from bulk holding tanks or 200L drums via dedicated closed lines held under negative pressure. The reactor is sealed, heat is applied, then the reactor is allowed to cool.

After polymerisation is complete, co-solvent, 2-butoxyethanol is added to the reaction vessel via automated pump lines to dilute and thin the resin. The resin (batch) is dropped into a closed thinning tank containing water and neutralising amine and then drummed off through a filter into 200 L steel drums. The concentration of notified polymer in this final resin product is between 28 to 32 % w/w.

Formulation

Details of the formulation process were not provided. The final coating product, containing up to 30% of the notified polymer, will be packaged in 200 L returnable steel drums. Single 20 L pails may also be dispatched by courier for customer trials.

End-use

Once dry, the notified polymer will be present between 2.5 % to 5 % in the dry coating.

5 OCCUPATIONAL EXPOSURE

The notified polymer will be manufactured, then formulated into protective and decorative coatings at the notifier's site. The surface coatings will be sold, and transported by road to customers for industrial applications.

Manufacture

During manufacture the number and categories of workers with potential exposure to the notified polymer and coatings are as follows: batch processing and reaction vessel operators (12 personnel); store attendant/fork lift truck (4 personnel); drivers (2 personnel); quality control technicians (4 personnel) and supervisors (4 personnel).

The notifier indicates that workers involved in batch processing are required to wear chemical goggles, PVC gloves, and overalls. During reactor operation, personal protective equipment includes chrome leather gloves, face shield, dust mask or air supplied hood, in addition.

Throughout the manufacturing process, monomers, co-solvents, water and neutralising amine are pumped directly into the reaction vessel or thinning tank through closed lines, held under negative pressure. Fugitive emissions of co-solvent and monomers from the reactor are combusted in the overhead incinerator. Therefore, under normal conditions of operation, worker exposure to monomers and co solvent is not expected.

During and after the polymerisation reaction, a technician will sample approximately 100 grams of the reactor contents via a sampling valve at the base of the reactor. In the laboratory, analysis occurs under fume extraction. The notifier indicates that the technician would wear recommended protective clothing, gloves, goggles, and respiratory protection during sampling and preparation for analysis.

After quality control analysis, the product is drummed off through a filter into 200L drums. Skin, ocular and inhalation exposure can occur whilst handling the drums for filling and sealing, and during cleaning and changeover of the Cuno filter. Vapour emission of co-solvent into the workplace is controlled by mechanical exhaustion of fumes.

Formulation

Other than indicating that the coating mixture containing the notified polymer is drummed off into 200 L drums, the notifier did not provide details of the formulation process. It is expected that during handling of the drums for filling and sealing there will be ocular, dermal and inhalation exposure to the notified polymer and co-solvent. Storage and transport (truck and forklift drivers) workers will handle sealed drums containing the notified polymer and later coating product containing the notified polymer. During these activities worker exposure is unlikely except in the event of a spillage.

End use

The notifier states that the coatings containing the notified polymer will be applied using highly efficient systems such as roller coaters and spray guns that produce very little waste. Skin, eye and inhalation exposure to the notified polymer and co-solvent may occur during preparation of the coating mixture for spraying, spray application and clean up. Exhaust ventilation is in position in the spray application and baking-oven (for curing) area.

No other information or exposure controls operating during manufacture, formulation or end use were provided.

5. PUBLIC EXPOSURE

The notified polymer will be manufactured as a high molecular weight solution in water and co-solvent, 2-butoxyethanol and dimethylaminoethanol. The notified polymer would be used within the plant where it is manufactured and will not be transported outside the plant. However, coatings containing the notified chemical would be transported to customers.

The potential for public exposure to the notified polymer during synthesis and coating operations is assessed as negligible. Although the public will make contact with the notified polymer on the surface of aluminium cans, at this stage it will exist as a cured, inert film which would not be bioavailable.

6. ENVIRONMENTAL EXPOSURE

Release

During polymer manufacture, all distillate (6 kg per 5 tonne batch) from the reaction vessel condenser and other aqueous wastes are neutralised, sedimented and treated in an aerobic digester prior to discharge of the treated water phase to the sewer system (under licence). Organic sludge from the water treatment system will be disposed of at the Lidcombe Waste Plant, also under licence. Gases from the reflux condenser and vapours from the vacuum

pump are drawn into an in-line incinerator. The 200 L drums are rinsed and transported to a local drum recycler.

Waste resin produced during the coating mixing and packing process will become a dry inert solid waste at the time of disposal. The notifier claims that the quantity of solid waste from the process will mainly consist of rags which have been used to clean equipment and wipe up resin or coating spills. Solid waste will be disposed of in the solid waste system and goes to an approved landfill.

The coating products will be applied at aluminium can industry production lines where overspray vapours and suspended matter are drawn from the spray applicator through filters to an incinerator.

Fate

Polymer that is sent to the in-line incinerator is expected to be completely combusted, forming water vapour and oxides of carbon. Aqueous wastes are neutralised and treated in an aerobic digester on site. Due to its low water solubility, the polymer is likely to be removed during this process, with disposal to an approved industrial waste plant. Any remaining polymer in the liquid waste will be sent to sewer. Should dry polymer be sent to landfill, its low water solubility indicates leaching from landfill sites is not expected.

The coating is expected to dry to form a solid inert mass that will after use share the fate of the aluminium can and be recycled by re-smelting or disposed of to landfill where the coating on the cans will remain inert.

The notifier claims that as the notified polymer is an acrylic resin, normally in combination with other materials to “form a coating resistant to weather and environmental conditions, biodegradation will be an extremely slow process, persisting in the environment for a long time”. Bioaccumulation of the polymer is unlikely due to the high molecular weight of the polymer, even before curing (Connell DW, 1989).

7. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were provided. None are specifically requested for a Synthetic Polymer of Low Concern.

8. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided. None are specifically requested for a Synthetic Polymer of Low Concern.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The notifier estimates that during polymer manufacture the amount of waste distillate (containing 5% organics and 95% water) produced, based on maximum manufacturing rates, will be 6 kg per 5 tonne batch (or 0.5 kg per day). These and other aqueous wastes are treated on site in an aerobic digester prior to discharge to the sewer. Approximately 0.005 kg of solid polymer per day will be directly disposed of to landfill, which should remain immobile.

Waste (attributable to the notified polymer) generated during mixing and packing of the final use product should not average more than 0.008 kg per day (3 kg per annum at expected manufacturing rates).

Overspray and other wastes generated during application are contained and treated by emission capture processes. The quantity of polymer lost in overspray is estimated to be 0.48 tonnes per year, or 1.3 kg per day.

The majority of the notified polymer is not expected to be released to the environment until it has been cured into a solid polymer matrix. Disposal of the notified polymer to landfill either as an inert solid or cured coating is unlikely to present a hazard to the environment, as it will be in a solid matrix that is not expected to biodegrade or leach.

The main environmental hazard would arise through spillage in transport accidents that may release small quantities of the polymer to drains and waterways. However, the polymer should quickly become immobile on association with the soil/sediment layer.

The low environmental exposure of the polymer as a result of the proposed use indicates the overall environmental hazard should be low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer is not water-soluble and since it has a number average molecular weight greater than 1 000, it is unlikely to readily cross biological membranes. The percentage of low molecular weight species below 1 000 is low. The notified polymer does not contain any reactive functional groups so toxicity from this source is unlikely. The residual monomer content for each of the constituents is estimated at less than 0.01%. The polymer is not classified as hazardous according to NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1994a).

Occupational Health and Safety

The monomer constituents of the notified polymer are hazardous substances (National Occupational Health and Safety Commission, 1994b). The following table lists the hazard classification and risk phrases of each monomer according to the *List of Designated Hazardous Substances* (National Occupational Health and Safety Commission, 1994b).

<i>Chemical Name</i>	<i>CAS No.</i>	<i>Hazard Classification</i>	<i>Risk Phrases</i>
benzene ethenyl; styrene	100-42-5	Irritant	R20, R36/38
2-propenoic acid, ethyl ester; ethyl acrylate	140-88-5	Irritant	R20/22, R36/37/38, R43
benzene, 2-propenyl; α -methyl styrene	98-83-9	Irritant	R36/37
2-propenoic acid; acrylic acid	79-10-7	Corrosive	R34, R41

R20: harmful by inhalation	R34: causes burns
R22: harmful if swallowed	R38: Irritating to skin
R36: Irritating to eyes	R41: Risk of serious eye damage
R37: Irritating to respiratory system	R43: may cause sensitisation by skin contact

All monomer constituents of the notified polymer have national exposure standards, identified in *NOHSC Exposure Standards for Atmospheric Contaminants in the Occupational Environment* (National Occupational Health and Safety Commission, 1995), and are listed as follows:

<i>Chemical Name</i>	<i>NOHSC Exposure Standard (National Occupational Health and Safety Commission, 1995)</i>
styrene	50 ppm or 213 mg/m ³ (TWA); 100 ppm or 426 mg/m ³ (STEL)
ethyl acrylate	5 ppm or 20 mg/m ³ Peak Limitation; sensitiser notation
α -methylstyrene	50 ppm or 242 mg/m ³ (TWA); 100 ppm or 483 mg/m ³ (STEL)
acrylic acid	2 ppm or 5.9 mg/m ³ (TWA); skin notation

TWA: Time Weighted Average
STEL: Short Term Exposure Limit

Employers are responsible for ensuring that the exposure standards are not exceeded in the workplace.

The notified polymer is made up in the co-solvent, 2-butoxyethanol, which is a hazardous substance, R36: irritating to skin (*List of Designated Hazardous Substances*), and is readily absorbed through the skin (National Industrial Chemicals Notification and Assessment Scheme, 1996). However, 2-butoxyethanol is present in the polymer resin at a concentration of 12%, which is below the concentration cut-off level for classification of the mixture as hazardous. The notifier stated that co-solvent vapour emission occurs during coating formulation, packaging and industrial application (spraying process). In the workplace atmosphere, the notifier claims that the solvent vapour concentration is well below the national exposure standard for 2-butoxyethanol. However, employers should ensure that the exposure standard for 2-butoxyethanol of 25 ppm (TWA) (National Occupational Health and Safety Commission, 1995) is not exceeded during coating, formulation, packaging and

industrial application of the notified polymer. The wearing of impervious gloves (see Section 12) should control dermal exposure to 2-butoxyethanol and therefore any potential for skin absorption.

The notified polymer will be manufactured and formulated in Australia. All ingredients are pumped via closed lines to the reaction vessel and mixing tank. The production of the notified polymer occurs in closed vessels and lines held under negative pressure. These engineering controls will control the potential for worker exposure and consequently any adverse health effects from exposure to hazardous monomers, co-solvent and notified polymer.

The occupational health risk posed to laboratory staff is minimal, given that typical sampling procedures from closed systems should not result in substantial exposure, and analysis occurs under fume extraction. In addition, technicians would wear recommended protective clothing, gloves and goggles, and respiratory protection during sampling and preparation for analysis.

During drum filling and coating formulation, skin, eye and inhalation exposure to the notified polymer and co-solvent may occur. These activities are carried out under local exhaust ventilation. In addition to engineering controls, the wearing of recommended protective clothing, gloves, goggles and appropriate respiratory protection (see Section 12) by workers involved in coating formulation should control the potential for eye, skin and inhalation exposure and consequently any adverse health effects, to co-solvent and notified polymer.

The occupational health risk posed to storage and transport workers is negligible, given that exposure is not expected to occur except in the event of a spill.

The notifier indicates that a health surveillance program is operative at the site. The program consists of a pre-employment medical examination and biological monitoring for specific substances during employment. Information gained from the health surveillance program will serve to reduce risk or prevent further exposure and progression of any adverse health effect from hazardous substance exposure.

The notifier states that workers receive education and training on safety procedures for each task they are assigned.

The notifier states that no adverse health effects have been reported in the production of similar polymers at the site.

Exposure of workers to the notified polymer during application of coatings onto aluminium cans is expected to be minimal given that highly efficient systems such as roller coaters and spray guns are used. In addition, the notifier states that the application area and the baking oven are exhausted to control inhalation exposure to the notified polymer. No other control measures are mentioned by the notifier during the application process. The wearing of recommended protective clothing, gloves, goggles and appropriate respiratory protection (see Section 12) by workers involved in coating application should control the potential for eye, skin and inhalation exposure and consequently any adverse health effects, to co-solvent and notified polymer.

On the information provided, the notified polymer is not considered hazardous and is unlikely to pose a health risk to workers.

Public Health

The notified polymer will enter the public domain as a cured film on cans coated with products containing the notified polymer ranging between 2.5 to 5% in the dry film. Although members of the public will have dermal contact with the notified polymer, exposure will be negligible because of the cured state, low concentration, and the high molecular weight of the notified polymer. Based on the use pattern of the notified polymer and its physico-chemical properties the notified polymer is considered not to pose a significant hazard to public health

13. RECOMMENDATIONS

To minimise occupational exposure to monomers, notified polymer, and co-solvent the following guidelines and precautions should be observed:

- Respirators should be selected and fitted in accordance with Australia/New Zealand Standard 1715-1994: *Use and Maintenance and Respiratory Protective Devices* (Standards Australia/Standards New Zealand, 1994a) and Australian/New Zealand Standard 1716-1991 *Respiratory Protective Devices* (Standards Australia/Standards New Zealand, 1994b);
- 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 or mittens should conform to AS 2161.2 (Standards Australia, 1998);
- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994c);
- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should then 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.

During manufacture of the notified polymer, the NOHSC exposure standards (see Table below) (National Occupational Health and Safety Commission, 1995) and NOHSC workplace guidance for the relevant monomer ingredients (National Occupational Health and Safety Commission, 1994b) should be adopted.

<i>Chemical Name</i>	<i>NOHSC Exposure Standard (National Occupational Health and Safety Commission, 1995)</i>
styrene	50 ppm or 213 mg/m ³ (TWA); 100 ppm or 426 mg/m ³ (STEL)
ethyl acrylate	5 ppm or 20 mg/m ³ peak limitation; sensitiser notation
α-methylstyrene	50 ppm or 242 mg/m ³ (TWA); 100 ppm or 483 mg/m ³ (STEL)
acrylic acid	2 ppm or 5.9 mg/m ³ (TWA); skin notation

TWA = Time Weighted Average

STEL = Short Term Exposure Limit

Employers should ensure that the exposure standard for 2-butoxyethanol of 25 ppm (TWA) (National Occupational Health and Safety Commission, 1995) is not exceeded during coating, formulation, packaging and industrial application of the notified polymer.

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* (National Occupational Health and Safety Commission, 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

Connell DW (1989) General Characteristics of Organic Compounds Which Exhibit Bioaccumulation. In: D. W. Connell ed. *Bioaccumulation of Xenobiotic Compounds*. CRC Press, Boca Raton, .

National Industrial Chemicals Notification and Assessment Scheme (1996) 2-Butoxyethanol in Cleaning Products. Canberra, Australian Government Publishing Service.

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National Occupational Health and Safety Commission (1994b) List of Designated Hazardous Substances [NOHSC:10005(1994)]. Canberra, Australian Government Publishing Service.

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

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

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

Standards Australia (1990) Australian Standard 3765.1-1990, Clothing for Protection against Hazardous Chemicals Part 1 Protection against General or Specific Chemicals. Sydney, Standards Association of Australia.

Standards Australia (1994) Australian Standard 1336-1994, Eye protection in the Industrial Environment. Sydney, Standards Association of Australia.

Standards Australia (1998) Australian Standard 2161.2:1998, Occupational Protective Gloves, Part 2: General Requirements. Sydney, Standards Association of Australia.

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

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

Standards Australia/Standards New Zealand (1994b) Australian/New Zealand Standard 1716-1994, Respiratory Protective Devices. Sydney/Wellington, Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994c) Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear. Sydney/Wellington, Standards Association of Australia/Standards Association of New Zealand.