TECHNICAL DATA INFORMATION

NATIONAL POLYSTYRENE SYSTEMS

RIGID CELLULAR EXPANDED POLYSTYRENE

NATIONAL POLYSTYRENE SYSTEMS
Introduction

EPS or Expanded Polystyrene ~

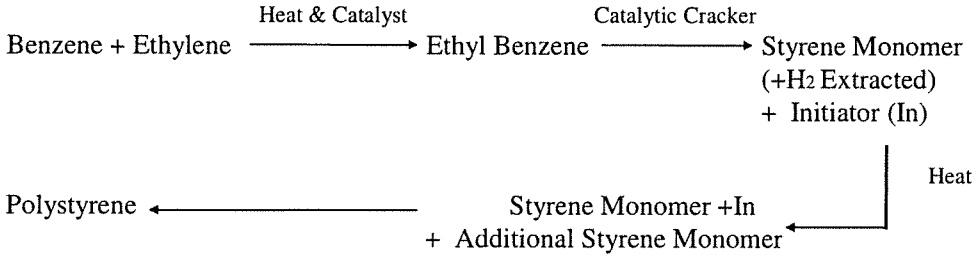
Expanded polystyrene is an inexpensive, versatile, light weight cellular plastic material made up of fine spherical shaped cells which are comprised of 98% air. This air is trapped within the closed hollow cells of the particles forming a strong stable material.

EPS has a very high strength to weight ratio which, dependent of the density of the material, offers exceptional compressive and flexural strength, and dimensional stability characteristics.

Where it comes from ~

EPS is manufactured from Expandable Polystyrene bead, which are particles of polystyrene polymer containing a CFC - Free expanding agent. This raw expandable polystyrene is manufactured from Styrene Monomer. Styrene monomer is manufactured around the world from by-products of the production of gas, petroleum, and steel.

The chemical composition of polystyrene as it is manufactured is as follows:



How it is manufactured ~

The expandable polystyrene is softened by heating with steam causing hollow cells to be formed within the particle due to the blowing or expanding agent (normally pentane). This expansion causes the raw bead particles to expand up to 50 times their original volume.

Blocks of EPS are manufactured by resoftening the expanded bead with steam and fusing them together under pressure in a mould. These blocks are then cut with hot wires to form sheets and profiled shapes. Shaped EPS is manufactured by fusing softened beads in specially designed moulds.

TECHNICAL INFORMATION

PHYSICAL PROPERTIES ~

National Polystyrene Systems (NPS) E.P.S range comprises block moulded and shape moulded expanded polystyrene products. NPS block foam is manufactured to AS1366 Part 3 ~ 1992 and contains a flame retardent.

The minimum physical properties specified in this standard are the minimum requirements to which NPS foam complies, however if physical properties outside this standard are required, a tailor made class of NPS foam can be designed to meet these requirements. The nominal densities used to manufacture expanded polystyrene are as listed in the standard, however the physical properties may be achieved using other densities, depending on raw material and other variables. The table below lists the minimum physical properties of NPS foam as it compares to AS1366 Part3 ~ 1992.

Physical Property	*Unit*	*Class*						*Test method used to measure compliance*
		L	*SL*	*S*	*M*	*H*	*VH*	
Average Density	kg/cum	11	13.5	16	19	24	28	---
Identification Colour per AS1366.3	Colour	Blue	Yellow	Brown	Black	Green	Red	
Compressive strength at 10% deformation (min).	kPa	50	70	85	105	135	165	AS2498.3
Cross breaking strength (min).	kPa	95	135	165	200	260	320	AS2498.4
Rate of water vapour transmission (max) measured parallel to rise	ug/m2s	710	630	580	520	460	400	AS2498.5
Dimensional stability (max)	%	1	1	1	1	1	1	AS2498.6
Thermal resistance (min) at 25 degree C.(50mm Sample)	m2K/W	1	1.13	1.17	1.20	1.25	1.28	AS2464.5 or AS2464.6
Thermal Conductivity (min) at 0 degree C. (50mm Sample)	W/mK	0.039	0.037	0.036	0.035	0.034	0.032	
Flame propagation:								AS2122.1
median flame	s	2	2	2	2	2	2	
duration	s	3	3	3	3	3	3	
eight value (max)	%	15	18	22	30	40	50	
median volume retained	%	12	15	19	27	37	47	
eight value (max)								

FLOATATION PROPERTIES ~

The density of NPS Foam is low compared to water, with a nominal density range from 13 to 28 kg/m3 compared with water at 1000 kg/m3. The water buoyancy per cubic meter of NPS Foam is determined by subtracting its kg/m3 density from 1000. The result is the weight in kilograms, which a cubic meter of NPS Foam can support when fully submerged in water.

CHEMICAL PROPERTIES ~

NPS Foam is resistant to virtually all aqueous media, including diluted acids and alkalis. It is also resistant to water-miscible alcohol such as methanol, ethanol and
I-Propanol, and also to silicone oils.
NPS Foam has limited resistance to paraffin oil, vegetable oils, diesel fuel, and Vaseline. These substances may attack the surface of NPS Foam after long term contact. NPS Foam is not resistant to hydrocarbons, chlorinated hydrocarbons, ketones and esters.
Paint containing thinners and solutions of synthetic adhesives fall into this category, and this should be taken into account in any painting or bonding operations. Anhydrous acids such as glacial acetic acid and fuming sulfuric acid destroy NPS Foam.

RESISTANCE TO FUNGI AND BACTERIA ~

Fungus attack has not been observed on EPS Foam. nd does not support bacterial growth. Surface spoilage (in the form of spilt soft drink, sugar, etc) can however supply the nutrient for fungal or bacterial growth.

RESISTANCE TO ANTS, TERMITES, AND RODENTS ~

Since it has no food value, NPS Foam does not attract ants, termites, or rodents. However, it is not a barrier to them. Ants, termites and rodents may chew through NPS Foam to reach food or establish a comfortable home.

TOXICITY ~

The heat of combustion of solid polystyrene polymer is 40,472 kJ/kg – Combustion products are carbon dioxide, water, soot (carbon), and to a lesser extent carbon monoxide.
A CSIRO report comments that the toxicity of gases associated with the burning of EPS is no greater than that associated with timber. Toxicity of thermal decomposition products of EPS appears to be no greater than for wood and decidedly less than other conventional building products i.e.

Polystyrene	CO=0.09	plus	CO2=0.01	Total=0.10
White Pine	CO=0.09	plus	CO2=0.003	Total=0.09

FLAMMABILITY PROPERTIES ~

Expanded polystyrene products are combustible and should not be exposed to open flame or other ignition sources.

Insulation material, as with other organic material, must be considered combustible and to constitute a fire hazard if improperly used or installed. Expanded polystyrene (Fire Grades) contains a fire retardant additive to inhibit accidental ignition from small fire sources.

Please refer to the table below for a comparison of expanded polystyrene with other common building materials.

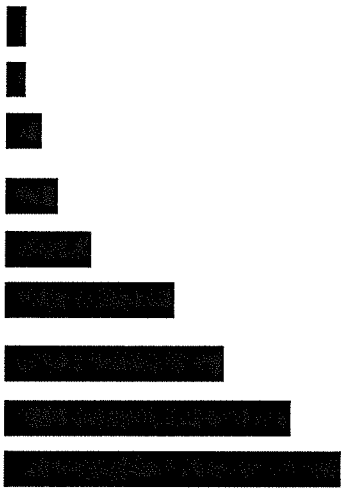
Material	Ignitability Index (0-20)	Spread of Flame Index (0-10)	Heat Evolved Index (0-10)	Smoke Produced Index (0-10)
Expanded Polystyrene - with sizalation 450 facing	0	0	0	0 - 1
Expanded Polystyrene - sandwich panel with 0.65mm steel	0	0	0	0
Expanded Polystyrene	12	0	3	5
Rigid Polyurethane	18	10	4	7
Australian Hardboard - Bare - Impregnated with fire retardant (4.75mm)	 14 0	 6 0	 7 0	 3 7
Australian Softboard - Bare - Impregnated with fire retardant (12.7mm)	 16 4	 9 0	 7 0	 3 7
T&G Boarding (25x100) - Bluegum - Oregon	 11 13	 0 6	 3 5	 2 3
Plywood, Coachwood veneer (4.75mm) - Bare - Impregnated with fire retardant	 15 12	 7 0	 7 3	 4 5

THERMAL PROPERTIES ~

Due to the low k value (thermal conductivity value) and high R value (thermal resistance value) of expanded polystyrene, it is an excellent insulating material. This is brought about by stabilized air trapped within the cellular structure of the EPS polymer.

The exceptionally high R value of expanded polystyrene as compared to other commonly used insulating materials can be seen below (all figures based on 50mm thick samples).

Concrete	0.040
Brick	0.043
Glass	0.048
EPS Concrete	0.120
Wood	0.350
Compressed Wood	0.830
Fibreglass	1.000
EPS - Class SL	1.113
EPS - Class VH	1.280



Expanded polystyrene has long term performance at a wide range of temperatures. Changes in mechanical properties and structural integrity are minimal between a temperature range of -75degrees C and 80 degrees C.

k Values

k Value is the thermal conductivity of a material. This can also be expressed as a C Value, which is the amount of heat energy transmitted through a unit area of a structure per unit of temperature difference between the hot and cold surfaces.

The lower the k value the better the insulating material. Expanded polystyrene has an extremely low k value compared to other materials used in similar applications.

To determine the k value for different classes of EPS, the following should be applied:

1. Determine average or mean temperature of the insulation:

Mean T degrees C = Temp. on outside of insulation + Temp. on inside of insulation

2. Apply mean temperature to table below for class of EPS being used:

Temp degrees C	L	SL	S	M	H	VH
0	0.0389	0.0370	0.0360	0.0349	0.0337	0.0321
5	0.0397	0.0378	0.0367	0.0356	0.0343	0.0327
10	0.0406	0.0386	0.0375	0.0362	0.0349	0.0333
15	0.0414	0.0394	0.0382	0.0369	0.0356	0.0340
20	0.0422	0.0402	0.0390	0.0376	0.0362	0.0346
25	0.0430	0.0410	0.0397	0.0383	0.0368	0.0352
30	0.0438	0.0418	0.0405	0.0390	0.0374	0.0358
35	0.0446	0.0426	0.0412	0.0397	0.0381	0.0365
40	0.0454	0.0434	0.0420	0.0404	0.0387	0.0371
45	0.0463	0.0442	0.0427	0.0410	0.0393	0.0377
50	0.0471	0.0450	0.0435	0.0417	0.0399	0.0383
55	0.0479	0.0457	0.0442	0.0424	0.0406	0.0390
60	0.0487	0.0465	0.0450	0.0431	0.0412	0.0396

R Value

R Value is the thermal resistance of a material, which expresses the ability of a particular thickness of a material to resist heat flow. The higher the R Value, the better the insulating material. Expanded polystyrene has an extremely high R Value compared to other materials used for similar applications, as seen on the comparison table on the previous page.

To determine the R Value for different thickness and different classes of EPS, the following should be applied:

$$\text{R Value} = \frac{\text{Thickness of material m}}{\text{k value (thermal conductivity) of material W/mK}}$$

for example, to determine the R value of 150mm SL Class EPS at a mean temperature of 25 degrees C:

$$= \frac{0.150 \text{ m}}{0.0410 \text{ W/mK}}$$

$$R = 3.66 \text{ m}_2\text{K/W}$$

to determine the thickness of Class SL required to achieve a R Value of 2.5 under the same conditions:

Thickness = R Value x k Value
= 2.50 x 0.0410
= 0.103 m = 103 mm

ACOUSTIC PROPERTIES ~

By itself, expanded polystyrene only offers a limited absorption of airborne sound, due to the air trapped in the closed cell structure.

Coated with a suitable material, that offers a high acoustic absorption rate, expanded polystyrene can offer a light weight cost effective alternative to other sound insulation materials and systems.

RATE OF WATER VAPOUR TRANSMISSION ~

In conditions where the adverse effects of moisture are present, expanded polystyrene has one of the highest resistance levels of all materials used for insulation. Expanded polystyrene has a low water vapour transmission rate, however it is not considered as an adequate vapour barrier. In applications where high humidity and high temperature differentials are present, and adequate vapour barrier should be installed.

SAFETY DATA SHEET

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

1.1 Product identifier

Product name **EXPANDED POLYSTYRENE**

Synonyms RIGID CELLULAR EXPANDED POLYSTYRENE

1.2 Uses and uses advised against

Uses FOAM • INSULATING COMPOUND • PACKAGING

1.3 Details of the supplier of the product

Supplier name **NATIONAL POLYSTYRENE SYSTEMS**

Address 121 Ingram Road, Acacia Ridge, QLD, 4110, AUSTRALIA

Telephone (07) 3323 8588

Fax (07) 3323 8576

1.4 Emergency telephone numbers

Emergency (07) 3323 8588

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

NOT CLASSIFIED AS HAZARDOUS ACCORDING TO SAFE WORK AUSTRALIA CRITERIA

2.2 GHS Label elements

No signal word, pictograms, hazard or precautionary statements have been allocated.

2.3 Other hazards

No information provided.

3. COMPOSITION/ INFORMATION ON INGREDIENTS

3.1 Substances / Mixtures

Ingredient	CAS Number	EC Number	Content
PENTANE	109-66-0	203-692-4	<0.1%
STYRENE	100-42-5	202-851-5	<0.1%
POLYSTYRENE BEADS	-	-	>60%

4. FIRST AID MEASURES

4.1 Description of first aid measures

Eye If in eyes, hold eyelids apart and flush continuously with running water for at least 15 minutes.

Inhalation If inhaled, remove from contaminated area. Apply artificial respiration if not breathing.

Skin Exposure is considered unlikely. Skin irritation is not anticipated.

Ingestion Due to product form and application, ingestion is considered unlikely.

First aid facilities None allocated.

4.2 Most important symptoms and effects, both acute and delayed

See Section 11 for more detailed information on health effects and symptoms.

4.3 Immediate medical attention and special treatment needed
Treat symptomatically.

5. FIRE FIGHTING MEASURES

5.1 Extinguishing media
Dry agent, carbon dioxide or water fog. Prevent contamination of drains and waterways.

5.2 Special hazards arising from the substance or mixture
Combustible. May evolve toxic gases (carbon oxides, styrene, hydrocarbons) when heated to decomposition. Expanded polystyrene (Fire Grades) contains a fire retardant additive to inhibit accidental ignition from small fire sources. May shrink, melt, or drip.

5.3 Advice for firefighters
Dust generated from handling, cutting, or storage may form explosive mixtures with air. Evacuate area and contact emergency services. Toxic gases may be evolved in a fire situation. Remain upwind and notify those downwind of hazard. Wear full protective equipment including Self Contained Breathing Apparatus (SCBA) when combating fire. Use waterfog to cool intact containers and nearby storage areas.

5.4 Hazchem code
None allocated.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear Personal Protective Equipment (PPE) as detailed in section 8 of the SDS.

6.2 Environmental precautions
Prevent product from entering drains and waterways.

6.3 Methods of cleaning up
If spilt, collect and reuse where possible.

6.4 Reference to other sections
See Sections 8 and 13 for exposure controls and disposal.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Before use carefully read the product label. Use of safe work practices are recommended to avoid eye or skin contact and inhalation. Observe good personal hygiene, including washing hands before eating. Prohibit eating, drinking and smoking in contaminated areas.

7.2 Conditions for safe storage, including any incompatibilities
Store in a cool, dry, well ventilated area, removed from moisture, incompatible substances, heat or ignition sources and foodstuffs. Ensure packages are adequately labelled, protected from physical damage and sealed when not in use.

7.3 Specific end uses
No information provided.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters
Exposure standards

Ingredient	Reference	TWA		STEL	
		ppm	mg/m³	ppm	mg/m³
Pentane	SWA [AUS]	600	1770	750	2210
Pentane (all isomers)	SWA [Proposed]	1000	3000	--	--
Styrene, monomer	SWA [AUS]	50	213	100	426

Biological limits

Ingredient	Determinant	Sampling Time	BEI
STYRENE	Mandelic acid plus phenylglyoxylic acid in urine	End of shift	400 mg/g creatinine
	Styrene in urine	End of shift	40 µg/L

Reference: ACGIH Biological Exposure Indices

8.2 Exposure controls

Engineering controls Avoid inhalation. Use in well ventilated areas. Where an inhalation risk exists, mechanical extraction ventilation is recommended.

PPE

Eye / Face When using large quantities or where heavy contamination is likely, wear dust-proof goggles.

Hands When using large quantities or where heavy contamination is likely, wear PVC or rubber gloves.

Body Not required under normal conditions of use.

Respiratory Where an inhalation risk exists, wear a Class P1 (Particulate) respirator. If cutting or sanding with potential for dust generation, wear a Class P1 (Particulate) respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	FORMED OR SHEETED SOLID
Odour	ODOURLESS
Flammability	COMBUSTIBLE
Flash point	NOT RELEVANT
Boiling point	NOT AVAILABLE
Melting point	NOT AVAILABLE
Evaporation rate	NOT AVAILABLE
pH	NOT AVAILABLE
Vapour density	NOT AVAILABLE
Relative density	0.01 to 0.04
Solubility (water)	INSOLUBLE
Vapour pressure	NOT AVAILABLE
Upper explosion limit	NOT AVAILABLE
Lower explosion limit	NOT AVAILABLE
Partition coefficient	NOT AVAILABLE
Autoignition temperature	NOT AVAILABLE
Decomposition temperature	> 240°C
Viscosity	NOT AVAILABLE
Explosive properties	NOT AVAILABLE
Oxidising properties	NOT AVAILABLE
Odour threshold	NOT AVAILABLE

10. STABILITY AND REACTIVITY

10.1 Reactivity

Carefully review all information provided in sections 10.2 to 10.6.

10.2 Chemical stability

Stable under recommended conditions of storage.

10.3 Possibility of hazardous reactions

Polymerization will not occur.

10.4 Conditions to avoid

Avoid heat, sparks, open flames and other ignition sources.

10.5 Incompatible materials

Incompatible with hydrocarbon solvents, acids (e.g. nitric acid), esters, amines, aldehydes, heat and ignition sources.

10.6 Hazardous decomposition products

May evolve toxic gases (carbon oxides, styrene, hydrocarbons) when heated to decomposition.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity This product is expected to be of low toxicity. This product may only present a hazard if boards/panels are sanded, drilled or cut with dust generation.

Information available for the ingredients:

Ingredient	Oral LD50	Dermal LD50	Inhalation LC50
PENTANE	--	--	364 g/m³/4 hours (rat)
STYRENE	> 2000 mg/kg (rat)	> 2000 mg/kg (rat) (OECD 402)	11.8 mg/L/4 hours (rat) (vapour)

Skin Mechanical irritant. Prolonged or repeated contact may result in mild irritation due to mechanical action.

Eye Due to product form and nature of use, the potential for exposure is reduced. Product may only present a hazard if dust is generated. Contact may result in mechanical irritation.

Sensitisation Not classified as causing skin or respiratory sensitisation.

Mutagenicity Not classified as a mutagen.

Carcinogenicity Not classified as a carcinogen.

Reproductive Not classified as a reproductive toxin.

STOT - single exposure Not classified as causing organ damage from single exposure. An inhalation hazard is not anticipated unless cut, drilled or sanded with dust generation, which may result in irritation of the nose and throat.

STOT - repeated exposure Not classified as causing organ damage from repeated exposure.

Aspiration Not classified as causing aspiration.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No information provided.

12.2 Persistence and degradability

No information provided.

12.3 Bioaccumulative potential

No information provided.

12.4 Mobility in soil

No information provided.

12.5 Other adverse effects

No information provided.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Waste disposal Reuse where possible or return to manufacturer (the manufacturer may have a method/solution for neutralisation available). Contact the manufacturer for additional information.

Legislation Dispose of in accordance with relevant local legislation.

14. TRANSPORT INFORMATION

NOT CLASSIFIED AS A DANGEROUS GOOD BY THE CRITERIA OF THE ADG CODE, IMDG OR IATA

	LAND TRANSPORT (ADG)	SEA TRANSPORT (IMDG / IMO)	AIR TRANSPORT (IATA / ICAO)
14.1 UN Number	None allocated.	None allocated.	None allocated.
14.2 Proper Shipping Name	None allocated.	None allocated.	None allocated.
14.3 Transport hazard class	None allocated.	None allocated.	None allocated.
14.4 Packing Group	None allocated.	None allocated.	None allocated.

14.5 Environmental hazards

No information provided.

14.6 Special precautions for user

Hazchem code None allocated.

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Poison schedule A poison schedule number has not been allocated to this product using the criteria in the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

Classifications Safework Australia criteria is based on the Globally Harmonised System (GHS) of Classification and Labelling of Chemicals.

Inventory listings **AUSTRALIA: AIIC (Australian Inventory of Industrial Chemicals)**
All components are listed on AIIC, or are exempt.

16. OTHER INFORMATION

Additional information

PERSONAL PROTECTIVE EQUIPMENT GUIDELINES:
The recommendation for protective equipment contained within this report is provided as a guide only. Factors such as form of product, method of application, working environment, quantity used, product concentration and the availability of engineering controls should be considered before final selection of personal protective equipment is made.

HEALTH EFFECTS FROM EXPOSURE:
It should be noted that the effects from exposure to this product will depend on several factors including: form of product; frequency and duration of use; quantity used; effectiveness of control measures; protective equipment used and method of application. Given that it is impractical to prepare a report which would encompass all possible scenarios, it is anticipated that users will assess the risks and apply control methods where appropriate.

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
CAS #	Chemical Abstract Service number - used to uniquely identify chemical compounds
CNS	Central Nervous System
EC No.	EC No - European Community Number
EMS	Emergency Schedules (Emergency Procedures for Ships Carrying Dangerous Goods)
GHS	Globally Harmonized System
GTEPG	Group Text Emergency Procedure Guide
IARC	International Agency for Research on Cancer
LC50	Lethal Concentration, 50% / Median Lethal Concentration
LD50	Lethal Dose, 50% / Median Lethal Dose
mg/m^3	Milligrams per Cubic Metre
OEL	Occupational Exposure Limit
pH	relates to hydrogen ion concentration using a scale of 0 (high acidic) to 14 (highly alkaline).
ppm	Parts Per Million
STEL	Short-Term Exposure Limit
STOT-RE	Specific target organ toxicity (repeated exposure)
STOT-SE	Specific target organ toxicity (single exposure)
SUSMP	Standard for the Uniform Scheduling of Medicines and Poisons
SWA	Safe Work Australia
TLV	Threshold Limit Value
TWA	Time Weighted Average

Report status

This document has been compiled by RMT on behalf of the manufacturer, importer or supplier of the product and serves as their Safety Data Sheet ('SDS').

It is based on information concerning the product which has been provided to RMT by the manufacturer, importer or supplier or obtained from third party sources and is believed to represent the current state of knowledge as to the appropriate safety and handling precautions for the product at the time of issue. Further clarification regarding any aspect of the product should be obtained directly from the manufacturer, importer or supplier.

While RMT has taken all due care to include accurate and up-to-date information in this SDS, it does not provide any warranty as to accuracy or completeness. As far as lawfully possible, RMT accepts no liability for any loss, injury or damage (including consequential loss) which may be suffered or incurred by any person as a consequence of their reliance on the information contained in this SDS.

Prepared by

Risk Management Technologies
5 Ventnor Ave, West Perth
Western Australia 6005
Phone: +61 8 9322 1711
Fax: +61 8 9322 1794
Email: info@rmt.com.au
Web: www.rmtglobal.com

[End of SDS]