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PLASTIC IDENTIFICATION CODES

The SPI resin identification coding system is a set of symbols placed on plastics to identify the polymer type. It was developed by the Society of the Plastics Industry (SPI) in 1988 and is used internationally, voluntarily. Omission of the symbol is often due to ignorance and Plastics|SA is encouraging the South African plastics industry to use the symbol on all plastic products. The primary purpose of the codes is to allow efficient separation of different polymer types for recycling.

The universal **recycling symbol** is an internationally recognised symbol for recyclable materials. It consists of three chasing arrows, or Möbius strip. Because the **material identification codes** look very similar to the recycling symbol, they are often regarded as recycling signs.



Figure 1: Universal Recycling Symbol

The following table explains the material identification codes and list some examples of where they can be found. Some of the myths surrounding the specific material are also briefly discussed.

Material	Packaging		Non-packaging	
	Material identification code	Product examples	Material identification code	Product examples
PET Poly(ethylene terephthalate)		Carbonated drink bottles, mineral water bottles, clear bottles used for dishwashing liquids, edible oils; etc. Jars, Salad domes, Biscuit trays, Punnets.	>PET<	Carpeting, fibres for apparel and industrial applications. Engineering components, e.g. sewing machine parts.
<p>PET bottles can be re-used. They do not contain “phthalates”. Beverage PET bottles are widely recycled in South Africa and the recyclate is used in fibre applications for apparel, bedding and industrial uses. A small percentage is also recycled back into food contact applications, e.g. thermoformed trays and punnets and bottles for mineral water and juices. PET raw material is manufactured in South Africa by Hosaf (Pty) Ltd.</p>				
PE-HD High density polyethylene		Milk bottles, fruit juice bottles, drums, packaging films, carrier type shopping bags, tubs, closures, cosmetic bottles, crates, pallets, bins	>PE-HD<	Irrigation pipes, water reticulation, shade-cloth, netting, shopping trolleys, refuse bins, toys, medical implants, e.g. hip replacement components
<p>PE-HD is suitable for industrial chemical packaging as it is an inert material and does not react easily with the contents. Vest-type carrier bags are made from PE-HD for its high tensile strength, even in relatively low micron applications. The material is manufactured in South Africa by Safripol.</p>				

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<p>PVC-P Flexible Poly(vinyl chloride)</p>	<p>PVC</p>	<p>Industrial cling film, pouches</p>	<p>>PVC-P<</p>	<p>Cable insulation, gum boots, shoe soles, flooring, matting, medical cloth and tubing, tarpaulins, hoses, safety gloves, soft toys, rain wear, erasers, see-through “vinyl” curtains, banners, supported cloth used for rubber ducks, jumping castles, tents and upholstery, unsupported cloth used for shower curtains and water proofing applications, etc. Automotive, soft interior “leather finish” applications.</p>
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PVC is never used on its own. The material consists of a combination of additives. The flexibility in PVC-P is obtained from plasticisers. There are more than twenty potential plasticisers that can be used to soften PVC and the selection is based on the cost of the final product, the application and the presence of other ingredients in the compound. Some of the plasticisers are called phthalates, which again is a generic term for a range of chemicals. There is international pressure to phase out some of the phthalates as there are indications that they are some that may be carcinogenic. This is not applicable to all plasticisers. In South Africa, there are commitments to phase out DEHP plasticisers. For years already, it has not been locally used for food contact applications or toys.

Not all phthalates are used as plasticisers for PVC. Different phthalates keep nail polish from chipping, make perfume linger longer, or make tool handles strong and more resistant to breaking. Others help adhesives, sealants, paint pigments and many other materials perform their jobs better.

Flexible PVC is very popular for recycling and find applications in shoe soles and industrial hoses. PVC raw material is manufactured from 50% salt and is locally made by Sasol Polymers.

<p>PVC-U Rigid Poly(vinyl chloride)</p>	<p>PVC</p>	<p>Limited use in clear bottles and jars. Blister packaging, food packaging, inserts, e.g. chocolate trays.</p>	<p>>PVC-U<</p>	<p>Pipes for water reticulation and sewage, conduit, profiles, cladding, stationery foils, plumbing, skirting, cornices, trunking, cooling tower packing, building panels, etc</p>
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PVC is never used on its own. The material consists of a combination of additives. Rigid PVC does not contain plasticisers and therefore the un-plasticised part in the name, PVC-U. Rigid PVC can successfully be stabilised for UV resistance for outdoor applications and is the

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only material that will maintain its strength for more than 20 years in the sun. It is therefore widely used in the construction and building industry.

Rigid PVC is hardly used in packaging. The bulk of solid domestic waste is incinerated in Europe and the chlorine in PVC packaging needs to be specially dealt with in incineration systems which are expensive. Pressure from the European governments resulted in very little PVC used for packaging.

Uncontaminated rigid PVC is recycled in South Africa and the recyclate is used for conduit and sewage pipes. The PVC raw material is manufactured in South Africa by Sasol Polymers. A number of compounding companies manufacture PVC compounds, either rigid or flexible. Some manufacturers compound their own raw materials prior to the manufacturing of products.

<p>PE-LD and PE-LLD</p> <p>Low and Linear low density polyethylene</p>		<p>Packaging films, domestic cling film, stretch wrap, shrink wrap, bags, shrouds, dust covers, peelable lids, cosmetic tubes, boutique shopping bags</p>	<p>>PE-LD<</p>	<p>Irrigation pipes, cable insulation, agricultural films, rotational moulded products, e.g. tanks and corner protectors. Bubble wrap, airothene® foam sheeting, etc.</p>
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PE-LD is a very good material for flexible packaging as it is the plastic material with the highest impact strength. It is an inert material and will not react with the contents. It is used for food application films as well as for flexible industrial packaging.

PE-LD is the most popular material for recycling and over 100 000 tons are recycled per annum. Recycled PE-LD is used for film again in packaging and industrial applications. It is also used in irrigation piping. PE-LD is locally made by Sasol Polymers.

<p>PP</p> <p>Polypropylene</p>		<p>Yoghurt tubs, margarine tubs, ice cream containers, wrappers, packaging films, bottles, caps and closures, canisters, strapping tape, woven bags, crates</p>	<p>>PP<</p>	<p>Coat hangers, battery cases, reels, automotive components incl. bumpers, furniture, bowls, buckets, carpeting, non-wovens, bristles, hair extensions, appliances, e.g. toasters and kettles. Toilet seats, ropes, fishing nets</p>
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PP is one of the plastics that have the highest variety of applications. The material is slightly more heat resistant than PE-HD and is used in hot filling and microwavable applications. PP is an inert material and will not chemically interact with the contents. PP is not resistant to acids and therefore not used in acidic industrial applications.

PP maintains its stiffness even at very low thicknesses and is therefore a very cost effective packaging material in thin-wall applications like drinking straws and take-away food tubs.

It is very popular for recycling and the demand for recycled PP is far greater than the

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available supply. High levels of soiling in the domestic solid waste stream limit the recycling from this source.

PP is used as a homopolymer and a copolymer and is locally manufactured by Safripol and Sasol Polymers. South Africa exports high volumes of PP raw material to the rest of the world.

<p>PS and PS-HI</p> <p>Polystyrene (general purpose and high impact)</p>		<p>Yoghurt and other dairy product tubs, display boxes, cake domes, punnets</p>	<p>>PS<</p>	<p>Coat hangers, take-away cutlery, take-away crockery, toys, cups, plates, audio and video cassette housings, CD and DVD covers, housings, cell phone covers, stationery items, e.g. pens and rulers, toys, watch glasses, shower doors, office drawers, stationery trays, etc</p>
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Polystyrene comes in many different formats. General purpose (PS-G) and impact modified (PS-HI) are hard, solid materials used for their gloss, transparency and rigidity. It can be moulded in fine detail and is easy to decorate. Applications illustrating these properties include model aircraft, dinky toys, and cutting edges for knives and even tooth picks.

PS-G and PS-HI are popular for recycling and find applications in toys, coat hangers, take away cutlery and wood effect furniture feet.

<p>PS-E</p> <p>Expanded Polystyrene</p>		<p>Protective packaging, take-away food containers, clamshell packaging, meat- and vegetable trays, punnets</p>	<p>>PS-E<</p>	<p>Vending cups, insulation panels, suspended ceiling panels,</p>
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Expanded polystyrene is used for its insulative properties, stiffness and cost effectiveness. PS-E take away food containers is incredibly light weight (only 5% of the product is actually polystyrene, the rest is air) and will keep the food at a comfortable eating temperature for a while.

There are indications that styrene can leach from polystyrene at higher temperatures. There is still no proof that sufficient styrene will leach from the containers if food is eaten out of PS-E take-away containers to cause health and safety problems. However, is not advisable to use PS-E containers for food storage or as cooking utensils. *Do not reheat your food in the PS-E container in the microwave!*

Uncontaminated PS-E is recycled into decorative picture frames in South Africa. The low mass to volume ratio makes it challenging to transport PS-E waste over any distance for recycling. Developments are in the process to densify PS-E scrap for transport to recyclers.

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<p>ABS Acrylonitrile Butadiene Styrene</p>		<p>Tubs, portion packs for margarine and jam,</p>	<p>>ABS<</p>	<p>Cones, reels, bobbins, TV and other housings, toys, automotive components, telephone casings, signage</p>
<p>The “7” is used for all packaging materials that are not included from “1” to “6”. The actual material names need to appear underneath the three arrows which is not always the case. As a result, there is lots of miss-information spread about the “7” packaging symbol. In this case, the material is ABS which is not commonly used for packaging. ABS is a derivative from PS and has similar properties, although it is seldom found in a clear application.</p>				
<p>PC Polycarbonate</p>			<p>>PC<</p>	<p>Baby bottle, drinking fountain water bottles, durable sportsman’s drink bottles, housings for cameras, video equipment, light covers, traffic light covers, safety glasses, visors, crash helmets</p>
<p>Polycarbonate is not used for packaging, mainly because of the price of the raw material. It found applications as lenses and visors for its high heat and shatter resistance. It has also been used extensively in baby bottles as it allows the bottle to be clear, not to break when dropped and also to be sterilised by boiling in hot water. There is some evidence that the monomer, Bisphenol A (BPA) may leach from the product when exposed to excessively high temperatures. Politicians have used the opportunity to ban PC baby bottles in most of the world. BPA is metabolised from the human body within 24 hours and sufficient levels to cause health and safety concerns have not yet been proven in human applications. Plastics SA supports the phasing out of PC baby bottles based on the “as low as reasonably achievable” principle.</p>				

A substantial number of polymers are not listed in the above table as they are more likely to be used for a longer working lifetime in engineering type applications, e.g. sky lights, gutters, washing machines and optical fibre cables, etc. The numbering system is only used for packaging applications.