



# **Guidance to Manufacturers, Suppliers and Test Laboratories on the Application Requirements for WRAS Product Approval**

## **Appendix A**

### **Guidance on the Requirements for Approval of Non-Metallic Materials in Fittings**

**Version 2.8  
February 2007**

**CONTENTS**

<b>A1.</b>	<b>INTRODUCTION .....</b>	<b>3</b>
<b>A2.</b>	<b>EVIDENCE OF SUITABILITY.....</b>	<b>4</b>
A2.1.	Use of WRAS Approved fitting.....	4
A2.2.	Testing of the individual component .....	4
A2.3.	Prior WRAS Approval of the Component.....	4
A2.4.	Material Only Approvals .....	4
A2.5.	Date of testing/approval .....	4
<b>A3.</b>	<b>ADDITIONAL TESTING .....</b>	<b>5</b>
A3.1.	Changes in Formulation.....	5
A3.2.	Changes in Method of Manufacture.....	6
A3.3.	Changes in Application/Use.....	7
A3.4.	Classification of Materials .....	7
<b>A4.</b>	<b>ARRANGEMENTS FOR TESTING .....</b>	<b>8</b>
A4.1.	Hot Water Testing .....	8
A4.2.	Site Applied Products.....	8
A4.3.	Components made from Acetal (POM) or polyphenylene oxide (PPO) materials.....	8
A4.4.	Hoses and Tubing .....	8
A4.5.	Ranges of Sizes .....	8
A4.6.	Ranges of Hardnesses .....	9
A4.7.	Water Treatment Chemicals and Filtration Media .....	9
A4.8.	Products Containing Specific Substances .....	9
A4.9.	Magnetic, Ceramic and Vitreous Enamel Materials.....	9
A4.10.	Waterproof Membranes for Treated Water Reservoir Roofs.....	10
A4.11.	Fluids for Indirect Heating Systems .....	10
A4.12.	Recycled Materials.....	10
<b>A5.</b>	<b>DECISION TREE FOR TESTING REQUIREMENTS (INFORMATIVE) .....</b>	<b>11</b>

**ANNEX TO APPENDIX A**

## A1. INTRODUCTION

Non-metallic materials are used in a wide variety of different water fittings and assemblies. However, some materials can produce effects on the odour, flavour, colour or turbidity of the water. Non-metallic materials may also release toxic metals or soluble organic chemicals into the water. If they support microbial growth, materials may give rise to unsatisfactory microbiological quality of the water or may release metabolic products which cause odour, flavour, colour or turbidity or may result in slimes or flakes of microbial growth in the water.

Applications for WRAS Approval for fittings or appliances must include evidence of the suitability of non-metallic materials which are likely to be in contact with water which is required to be wholesome.

The test methods and criteria used by WRAS to assess non-metallic materials are described in BS 6920: 2000 "Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of water." The tests in BS 6920 have been developed to reproduce the most exacting conditions that a material might be likely to meet during its service life in contact with potable water.

WRAS uses five tests contained within BS 6920 to show that a non-metallic material does not:

- Impart odour or flavour on the water (Section 2.2);
- Cause change in the appearance of the water (colour, turbidity) (Section 2.3);
- Promote microbial growth (MDOD test) (Section 2.4);
- Leach substances harmful to human health into the water (cytotoxicity) (Section 2.5);  
or
- Leach toxic metals into the water (Section 2.6).

Satisfactory results for these tests do not guarantee that the material cannot cause adverse water quality effects, if circumstances favour it. It is only an indication that the material is less likely to cause unwanted water quality effects than materials which have not passed the tests, and it does not signify fitness for purpose.

## A2. EVIDENCE OF SUITABILITY

When seeking WRAS Approval for a fitting, assembly or appliance, there are four routes by which the non-metallic components can be shown to comply with the Scheme's requirements for acceptability of their effect on water quality:

- (i) Use of a component already tested and fully approved by being listed in the **Fittings Section** of the Water Fittings and Materials Directory (e.g. a check valve)
- (ii) Presentation of a satisfactory BS6920 report of the direct testing of the individual component.
- (iii) Use of a component which has prior WRAS Approval of its water quality effects by listing as a specific *component* in the **Materials Section** of the Directory (e.g. polyethylene water storage cistern material).
- (iv) Use of a component manufactured from a non-metallic material which is listed as having 'Material Only' approval in the **Materials Section** of the Directory, **provided** WRAS acceptance is gained that the production process used for making the component will not have altered its performance in BS6920 tests.

### A2.1. Use of WRAS Approved fitting

Provided the sub-fitting is suitable for the intended use and any installation conditions (IRNs) or provisos attached to its WRAS Approval are complied with, the suitability of the materials used will be accepted.

### A2.2. Testing of the individual component

Manufacturers can submit reports of tests carried out to BS6920 by one of the Scheme's accredited materials testing laboratories on the individual components which are used in the fitting for which they seek WRAS Approval.

### A2.3. Prior WRAS Approval of the Component

Where materials have been formed into components and satisfactorily tested only for their effects on water quality using BS6920, they are listed as Components in the Materials Section of the Directory. These components can be used in fittings for which approval is sought without further testing. Other components made by the same process from the same material but of different sizes, thicknesses or shapes from that which is listed may require some additional testing to show that these differences have not caused any change in the material acceptability (see Additional Testing).

### A2.4. Material Only Approvals

Materials approved by the Scheme which have been tested not as a finished component but usually as specially moulded blocks or plaques are listed in the Materials Section of the Directory, under the specific material type with a subheading of "Material Only". Such materials are deemed by the Scheme to fulfil the requirements of BS 6920 with the proviso that they may require additional testing when processed into components (see Additional Testing). Their listing is to assist fitting manufacturers to source materials which when processed are likely to fulfil the Scheme's requirements.

### A2.5. Date of testing/approval

Evidence in the form of test reports or existing WRAS Approvals of non-metallic components or materials submitted must be less than five years old on the date of the fitting or appliance receiving its approval by the WRAS Test and Assessment Group.

### A3. ADDITIONAL TESTING

Where changes have been made to the formulation or the method of manufacture compared with the item which is already approved, the following additional testing is required. The list is not exhaustive. If there is any doubt as to the requirements, advice should be sought from a designated test laboratory or the Scheme.

#### A3.1. Changes in Formulation

Changes in the formulation of material which is already WRAS-approved must be notified to the Scheme before being made. Changes in formulation include the addition of pigments, changes in the percentages of fillers used and introduction of processing aids which can all alter the results of BS 6920 testing. Changes in suppliers of ingredients can also affect the results of BS 6920 testing due to the introduction of unexpected contaminants. Table 1 describes the tests required when changes are made to formulation or suppliers.

**TABLE 1      ADDITIONAL TESTING REQUIREMENTS FOR CHANGES IN FORMULATION**

Change	Testing required				
	Organoleptic	Appearance	MDOD	Cytotoxicity	Metals
Rubbers/elastomers: change in hardness using the same curing conditions and the same ingredients in different concentrations:					
• harder hardness	✓	-	✓	-	-
• softer hardness	✓	✓	✓	✓	✓
Change in pigmentation:					
• change from "natural" colour to either white or black	✓	-	-	-	-
• change from "natural" colour to any other colours	✓	-	-	-	✓
• change from one colour to another	✓	-	-	-	✓
• change from white to black	✓	-	-	-	-
• change from colour/black/white to natural	✓	-	✓	-	-
Alternative supplier of the main polymer in a thermosetting plastic or elastomeric material	✓	-	✓	✓	-
Alternative supplier of the main polymer in a thermoplastic material	✓	-	-	-	-
Alternative supplier of any other ingredient	✓	-	✓	-	✓ <sup>1</sup>
Addition or increase in concentration of a filler/reinforcing agent, e.g. glass, talc or carbon black	✓	-	✓	-	✓
Decrease in concentration of a filler/reinforcing agent, e.g. glass, talc or carbon black	✓	-	-	-	-
Note 1: only required for pipes and hoses					

### A3.2. Changes in Method of Manufacture

BS 6920 stipulates that materials should be tested in their final form (i.e. as a component). With the exception of thermosetting plastics and elastomeric components, the size and shape of a component made from a material does not normally adversely affect BS 6920 results. However, where a material is used in a different manufacturing process the changes in processing pressure and temperature can cause changes to the chemical composition of the product which may result in different BS 6920 test results.

**TABLE 2      ADDITIONAL TESTING REQUIREMENTS FOR CHANGES IN METHOD OF MANUFACTURE**

Change	Testing required				
	Organoleptic	Appearance	MDOD	Cytotoxicity	Metals
Change in the method of manufacture of an approved thermoplastics or thermosetting plastic material e.g. injection moulding to extrusion	✓	-	✓	-	-
Change in the method of manufacture of an approved thermosetting elastomeric material e.g. compression moulding to extrusion or calendaring	✓	-	✓	✓	-
Rubbers/elastomers: change in hardness using the same ingredients with different curing conditions	✓	-	✓	-	-
Manufacture of a component from an approved thermosetting elastomeric material	✓	-	✓	✓	-
Change from “factory application” to “site application” of a coating	✓	✓	✓	-	-
Components made from Acetal (POM) materials	-	-	-	✓ <sup>1</sup>	-
Components made from polyphenylene oxide (PPO) materials	✓ <sup>1</sup>	-	-	-	-
Rubbers/elastomers – approval of a different size of components (same material formulation and same manufacturing conditions):					
•      thinnest sample (that with the smallest inradius)	✓	-	-	-	-
•      thickest sample (that with the largest inradius)	✓	-	✓	✓	-
Note 1: See notes on the use of components made from POM and PPO materials in Section A4.3.					

The Scheme requires that where an approved material is formed by a different method to that used for preparation of the test sample (for example a change from injection moulding to extrusion), limited testing is required to confirm that the material has not been adversely affected.

In the case of components made from thermosetting elastomers testing is also required when the shape moulded, the method of manufacture (e.g. compression moulding, calendaring, extruding) or curing/post-curing is changed. This is due to the potential effects of such changes on the performance of these materials in the BS 6920 tests.

Already-approved site or factory applied coatings and paints when used in accordance with the manufacturers instructions for use (including instructions on the appropriate substrates, undercoats and primers), require no additional testing.

The test requirements when changes are made to the method of manufacture are shown in Table 2.

### **A3.3. Changes in Application/Use**

Materials and components with Cold Water Only approval can be upgraded to Hot Water Use but all testing except the MDOD test must be repeated at the higher temperature.

### **A3.4. Classification of Materials**

A list is given in the annex to this appendix of approved non-metallic materials quoted in the Water Fittings and Materials Directory, with an indication of the type of non-metallic material – elastomers, thermosetting, thermoplastic etc. to assist in interpreting the requirements for additional testing.

## A4. ARRANGEMENTS FOR TESTING

Test samples should comprise single materials and should not be assemblies of components made from different materials that are mechanically joined (for example tap headworks assemblies). Test samples should have an homogeneous surface, but include any undercoats, primers, reinforcing materials, oxygen barriers or other encapsulated materials.

Testing should be carried out at one of the Scheme's designated test laboratories, details of which can be obtained from WRAS. Test laboratories and the Scheme are able to give additional advice on sample requirements.

### A4.1. Hot Water Testing

Any material which is likely to be used in contact with water with a temperature of greater than 25°C should be tested at the maximum temperature at which the material will be used or at 85°C, whichever is the lower.

### A4.2. Site Applied Products

Products designed to be applied by the user on site must be prepared for testing by one of the designated test laboratories to ensure that the samples are representative of the material as it would be used under real conditions.

### A4.3. Components made from Acetal (POM) or polyphenylene oxide (PPO) materials

Acetal and polyphenylene materials, when formed into components, can cause water quality problems when in contact with hot water. Additional testing is required on any component made from WRAS Approved or BS6920 compliant POM or PPO used in the following circumstances:

- The component will be used with hot water (>30°C);
- The component will be used in a terminal fitting (a water outlet device); and
- The component has a water contact surface area of greater than 3,000 mm<sup>2</sup> (based on a minimum draw off of 200 ml resulting in a surface area of greater than 15,000 mm<sup>2</sup> l<sup>-1</sup>).

Where ranges of sizes of components are produced by the same manufacturing process and in the same manufacturing site only the component with the largest surface area need be tested.

### A4.4. Hoses and Tubing

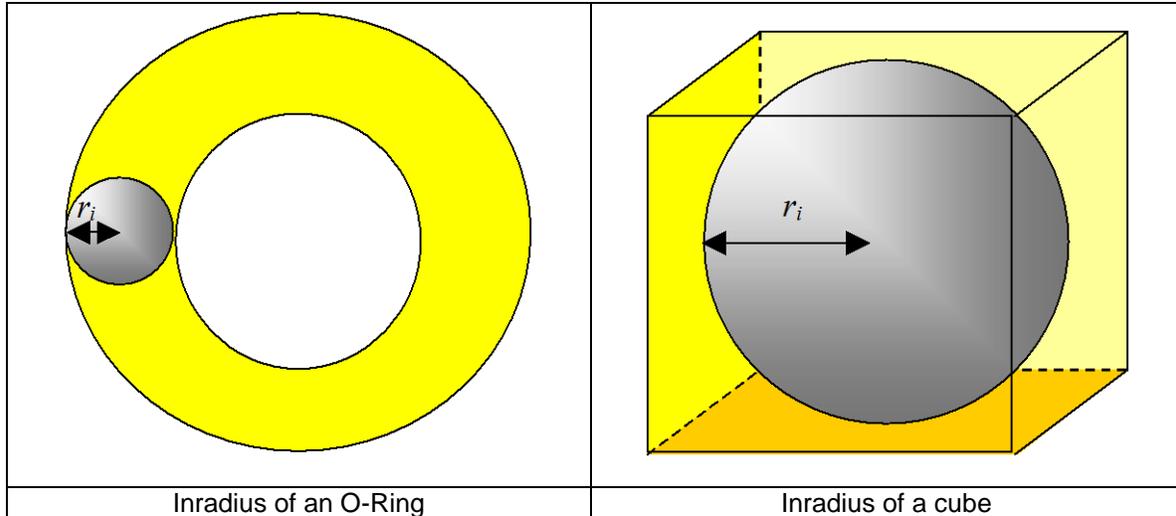
BS 6920 specifies additional requirements which hoses and tubing must meet; these are given in Sections 2.2.2 and 2.2.3 as appropriate.

### A4.5. Ranges of Sizes

Where a range of sizes of rubbers/elastomer components are made from the same formulation and using the same manufacturing conditions is may be assumed from appropriate testing on samples with the largest and smallest inradius that all components falling between these inradii are also deemed to comply with the requirements of BS 6920 Parts 1-3.

Solid Shape	Inradius ( $r_i$ )
Tetrahedron	$\frac{\sqrt{6}}{12} s$
Cube	$\frac{1}{2} s$
Octahedron	$\frac{\sqrt{6}}{6} s$
Where $s$ is the side length	

The inradius is the radius of the sphere inscribed in a given solid (as shown below).



#### A4.6. Ranges of Hardnesses

Where a rubbers/elastomer is produced in a range of hardnesses by variation of one ingredient (where all other ingredients are kept in the same ratio and the method of manufacture is not changed), it may be assumed by full testing on the softest grade and organoleptic and MDOD testing on hardest grade that all hardnesses between those tested are also deemed to comply with the requirements of BS 6920 Parts 1-3.

#### A4.7. Water Treatment Chemicals and Filtration Media

Water treatment chemicals and filtration media covered by BS EN standards should be tested against the relevant standard. In the case of a chemical not covered by one of these standards advice should be sought from the Scheme.

Activated Carbon Blocks should be tested in accordance with BS 6920 Section 2.2 and be tested, using a method specified by WRAS, for the leaching of metals and polyaromatic hydrocarbons (PAH).

#### A4.8. Products Containing Specific Substances

Products containing asbestos, coal-tar bitumen or PVC containing lead-based stabilisers are not accepted by the Scheme. Products containing petroleum or asphaltic bitumen are not approved for use on water-retaining structures with large surface:volume ratio such as lining of pipes, cisterns or water storage tanks in contact with wholesome water, but may be acceptable for use where there is only a small surface area in contact with the water – e.g. taps, valves and pipe connectors.

The test laboratory must be notified of any product containing a biocide prior to testing. The applicant must provide information regarding the biocide trade name, chemical name, product material safety data sheets (together with available toxicological data), solubility of the biocide in water and its mode of action. Additional laboratory controls as described in Part 2 Section 2.4 Clause 10.1.2 of BS 6920: 2000 should be carried out.

The test laboratory must be notified of any antioxidants contained in the product and must report to the Scheme any odours or flavours detected in these samples.

#### A4.9. Magnetic, Ceramic and Vitreous Enamel Materials

Any of these products which do not contain organic ingredients, either because they are not present in the formulation or would have been lost due to firing or sintering should be tested in accordance with BS 6920 Section 2.6 only.

#### **A4.10. Waterproof Membranes for Treated Water Reservoir Roofs**

Waterproofing membranes designed for use in service reservoirs roofs can be tested at a reduced surface area of 1000 mm<sup>2</sup> per litre and will be designated by the Scheme as “tested at a reduced surface area”.

#### **A4.11. Fluids for Indirect Heating Systems**

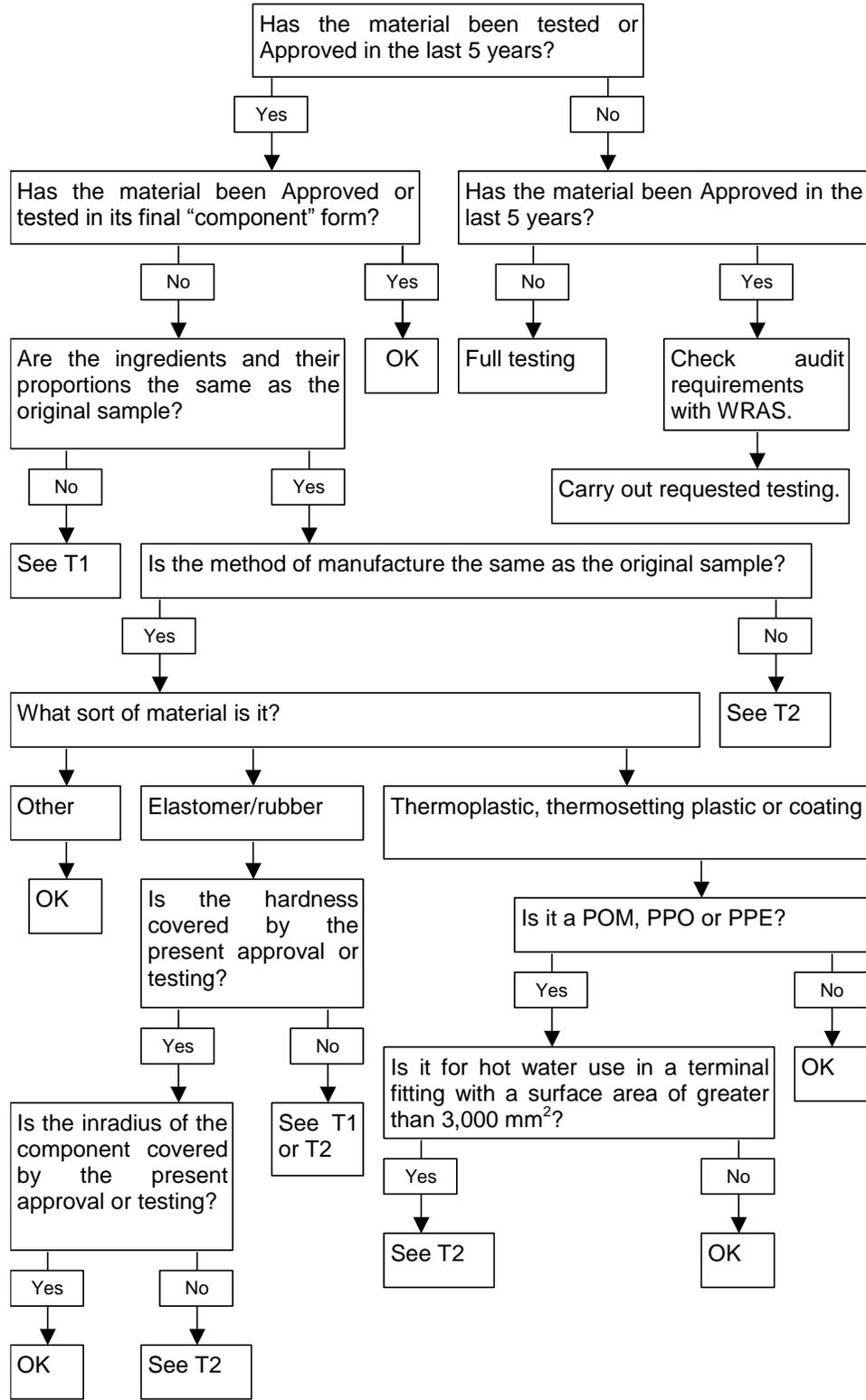
The Scheme will accept testing of these at a 10% dilution against Section 2.5 and 2.6 of BS 6920. These products are listed separately in the Directory.

#### **A4.12. Recycled Materials**

Products made from recycled materials must, in addition to the normal testing requirements, be tested in triplicate for odour and flavour (BS 6920-2.2.1) on separate, randomly selected batches. The Scheme also requires information on sources of the recycled ingredients, evidence to demonstrate full traceability of the recycled material (including the product formulation of the recycled material), details of any treatments given to them before re-use, an outline of any analytical quality checks undertaken and details of any Quality Systems covering these materials. The Scheme reserves the right to withhold approval if the information given does not provide an adequate safeguard to the reproducibility of the material.

Products containing clean “regrind” material from the production process are not deemed to be made from recycled material, however, the sample submitted for testing must contain the maximum “regrind” content that is used.

**A5. DECISION TREE FOR TESTING REQUIREMENTS (INFORMATIVE)**



Notes: T# = Table number in text.

**ANNEX TO APPENDIX A**

The following table is taken from the Water Fittings and Materials Directory and gives the Scheme's interpretation of what Materials are elastomers and therefore require additional BS 6920 testing when used to manufacture components.

<b>Section</b>	<b>Title</b>	<b>Sub title</b>	<b>Nature</b>
5010	Acetal	Components	Thermoplastics
5015	Acetal	Material only	Thermoplastics
5020	Acrylonitrile Butadiene Styrene Copolymer (ABS)		Thermoplastics
5021	Bituminous Based Products	Small surface area contact only	Other
5022	Carbon		Other
5023	Ceramic		Other
5026	Coatings, Paints & Linings	Factory applied concrete coatings	Other
5028	Coatings, Paints & Linings	Factory applied metal coatings	Other
5030	Coatings, Paints & Linings	Factory applied pipe & fittings coatings	Other
5034	Coatings, Paints & Linings	Factory applied tank coatings	Other
5038	Coatings, Paints & Linings	Site applied concrete coatings	Other
5040	Coatings, Paints & Linings	Site applied metal coatings	Other
5042	Coatings, Paints & Linings	Site applied pipe & fittings coatings	Other
5044	Coatings, Paints & Linings	Site applied sheet lining materials	Other
5046	Coatings, Paints & Linings	Site applied tank coatings	Other
5050	Concrete, Cement and Mortar	Accelerators & retarders	Other
5053	Concrete, Cement and Mortar	Water reducers & air entrainers	Other
5055	Concrete, Cement and Mortar	Waterproofers	Other
5057	Concrete, Cement and Mortar	Curing compounds	Other
5059	Concrete, Cement and Mortar	Corrosion inhibitor	Other
5062	Concrete, Cement & Mortar	Permeability reducers	Other
5063	Concrete, Cement and Mortar	Repair materials	Other
5065	Concrete Cement and Mortar	Synthetic latex modifiers	Other
5070	Epoxy Compound		Other
5075	Fibre		Other
5090	Fluxes		Other
5100	Gland Packings		Other
5110	Glass Reinforced Concrete (GRC)		Other
5120	Glass Reinforced Plastics (GRP)	Components	Thermoset
5125	Glass Reinforced Plastics (GRP)	Material only	Thermoset
5130	Graphite	Components	Other
5135	Graphite	Material only	Other
5140	Hoses & Tubing		Not defined
5150	Ion Exchange Resin		Other
5160	Lubricants		Other

Section	Title	Sub title	Nature
5165	Magnetic Material - Injection Moulded		Other
5170	Metal Fillers		Other
5172	Miscellaneous		Not defined
5175	Nylon	Components	Thermoplastics
5180	Nylon	Material only	Thermoplastics
5200	Polybutylene		Thermoplastics
5205	Polybutylene Terephthalate		Thermoplastics
5210	Polycarbonate	Material only	Thermoplastics
5215	Polyester	Components	Not defined
5217	Polyester	Material only	Not defined
5220	Polyether Ether Ketone		Thermoplastics
5223	Polymethyl Methacrylate	Material only	Thermoplastics
5224	Polyethersulphone	Components	Thermoplastics
5225	Polyethersulphone	Material only	Thermoplastics
5235	Polyether Polyurethane	Material only	Thermoplastics
5240	Polyethylene	Components	Thermoplastics
5245	Polyethylene	Material only	Thermoplastics
5246	Polyethylene Terephthalate (PET)		Thermoplastics
5248	Polyphenyleneoxide (PPO)	Components	Thermoplastics
5250	Polyphenyleneoxide (PPO)	Material only	Thermoplastics
5253	Polyphenylene Ether	Material only	Thermoplastics
5255	Polyphenylene Sulphide (PPS)	Material only	Thermoplastics
5256	Polyphenylsulfone		Thermoplastics
5257	Polyphtalamide	Material only	Thermoplastics
5260	Polypropylene	Components	Thermoplastics
5265	Polypropylene	Material only	Thermoplastics
5270	Polystyrene	Material only	Thermoplastics
5272	Syndiotactic Polystyrene (sPS)		Thermoplastics
5280	Polysulphone	Material only	Thermoplastics
5295	Polytetrafluoroethylene (PTFE)	Material only	Thermoplastics
5296	Polytetrafluoroethylene (PTFE) and (ETFE) Thermoplastic	Copolymer	Thermoplastics
5297	Polyurethane	Material only	Not defined
5298	Polyurethane	Components	Not defined
5300	Polyvinylchloride (PVC, PVC-U and CPVC)	Components - only lead free PVC-U listed in this section	Thermoplastics
5305	Polyvinylchloride (PVC, PVC-U and CPVC)	Material only - only lead free PVC-U listed in this section	Thermoplastics
5307	POLYVINYLIDINE FLUORIDE		Thermoplastics
5308	Repair Material		Other
5310	Release Agents		Other
5311	Resin Anchors		Other
5315	Rubbers	General - components	Other
5320	Rubbers	General - material only	Other
5330	Rubbers	Butyl - material only	Elastomer
5350	Rubbers	Ethylene propylene (EP) components	Elastomer
5355	Rubbers	Ethylene propylene (EP) - material only	Elastomer
5360	Rubbers	Ethylene propylene diene	Elastomer

Section	Title	Sub title	Nature
		monomer (EPDM) - components	
5365	Rubbers	Ethylene propylene diene monomer (EPDM) - material only	Elastomer
5370	Rubbers	Fluorocarbon - components	Elastomer
5375	Rubbers	Fluorocarbon - material only	Elastomer
5380	Rubbers	Natural or isoprene - material only	Elastomer
5390	Rubbers	Nitrile (acrylonitrile butadiene) - components	Elastomer
5395	Rubbers	Nitrile (acrylonitrile butadiene) material only	Elastomer
5399	Rubbers	Polyester/polyether elastomer components	Elastomer
5400	Rubbers	Polyester/polyether elastomer material only	Elastomer
5410	Rubbers	Silicone - components	Elastomer
5415	Rubbers	Silicone - material only	Elastomer
5420	RUBBERS	Styrene butadiene (SBR)	Elastomer
5440	Sealants - Flat Faced Joints	General	Not defined
5450	Sealants - Flat Faced Joints	Butyl rubber	Elastomer
5460	Sealants - Flat Faced Joints	Epoxide	Other
5470	Sealants - Flat Faced Joints	Polyethylene foam	Thermoplastics
5480	Sealants - Flat Faced Joints	PTFE	Thermoplastics
5490	Sealants - Flat Faced Joints	Polyurethane	Not defined
5495	Sealants - Flat Faced Joints	Polysulphide	Other
5500	Sealants - Flat Faced Joints	Silicone	Other
5505	Sealants - Flat Faced Joints	Waterstops	Seek advice
5510	Sealants - Screwed Joints	General	Other
5520	Sealants - Screwed Joints	Anaerobic adhesives	Other
5530	Sealants - Screwed Joints	PTFE	Thermoplastic
5550	Sealants - Screwed Joints	Silicone	Other
5560	Solvent Cements		Other
5582	Thermoset Moulding Compounds		Thermoset
5585	Thermoplastic Moulding Compound		Thermoplastic