31 January 2013

Ref: SM/AST/JL/2013

For the attention of Jacqy Lim
APEX SEALING TECHNOLOGIES PTE LTD

To Whom It May Concern,

RE: The analysis of "Flexseals Unimetal" for the presence of asbestos under polarised light microscopy (PLM) with dispersion staining.

Upon receipt of the above sample, Acorn Analytical Services Limited, which is an UKAS Accredited Testing Laboratory, undertook analysis for the presence of asbestos. The analysis process involves an initial inspection using Binocular Microscopy, and fibre confirmation using Polarised Light Microscopy (PLM) with Dispersion Staining. The sample was broken up and thoroughly inspected by the analyst under laboratory conditions, in accordance with our UKAS Accreditation. Further sample analysis information is attached.

The results from the bulk analysis confirmed that **Flexseals Unimetal** is an **ASBESTOS FREE** product.

Description of Terminology	
Amosite	Brown Asbestos
Chrysotile	White Asbestos
Crocidolite	Blue Asbestos
Non Detected	**Asbestos Free**

The accompanying bulk certificate **(PRN8616)** follows this letter.

Should you need further assistance, please contact your vendor accordingly.

Yours sincerely

Acorn Analytical Services
Stephen McGlone
Operations Director

Certificate Of Bulk Analysis For Asbestiform Material

Client:	Apex Sealing Technologies PTE Ltd	PRN No:	PRN8616
Contact:	Jacquerine Lim	Site:	Flexseals Unimetal
Client Address:	No.23 Pioneer Sector Singapore 6728431		
Contact No:	6266 4388		

Sample Taken by:	Not specified	OF:	Not specified		
Date taken:		Received Date:	25/01/2013	Analysis Date:	25/01/2013

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The samples were analysed using polarised light microscopy with dispersion staining in accordance with Acorn Analytical Services Ltd documented in-house procedures based upon HSE document "The Analyst Guide". Where Acorn Analytical Services Ltd did not take sample(s), the results given are based upon information supplied by those taking the sample(s). In this instance, Acorn Analytical Services Ltd guarantees the accuracy of the sample analysis only.

Opinions and interpretations raised on this certificate are outside the scope of UKAS accreditation.

Analysis Details

Samples Analysis By:	Jonathan Parker	Analyst Signature:	
Position:	Environmental Consultant		
Issued by:	Jonathan Parker	Issued by Signature:	
Issued by position:	Environmental Consultant		

Analysis Results

Sample Ref	Material Type	Sample Details	Result
BS22728	Gasket	Flexseals Unimetal	Non detected

Acorn Analytical Services Ltd
Unit 2 Station Yard Halifax Road
Liversedge WF15 6PS
T: 01924411770. F.01924407444
E: info@acorn-as.com
www.acorn-as.com

ANALYSIS OF BULK SAMPLES USING POLARISED LIGHT MICROSCOPY

Acorn Analytical Services Limited is a UKAS Accredited Inspection Body and **Testing Laboratory** – Please see UKAS Certificate attached.

This document covers the way in which samples submitted to the laboratory are examined for the presence of asbestos fibres and the identification of different asbestos types.

Please note, this procedure is based on that given in the HSE Document HSG248 The Analyst Guide:

The procedure requires the analyst to identify and remove the different types of fibres present in a sample using stereo binocular microscopy and for confirmation using polarised light microscopy. Positive confirmation of asbestos type is from the sign of elongation of the birefringent fibres and from the colours obtained using central stop dispersion staining when the fibres are mounted in liquids of known refractive index, these colours being dependent on the refractive index along the axis of the fibre.

The procedure is totally dependent on the skill and experience of the analyst and on the representation of the sample supplied. A full explanation of the scientific basis of this method and pictures of fibres viewed using these techniques are contained in the McCrone asbestos particle atlas a copy of which is available for consultation.

EQUIPMENT

The following is a list of the equipment required for carrying out analysis of the bulk materials:

- Stereo Microscope (10 or 20 magnification).
- Sample Dish.
- Tweezers.
- Microscope Slides & Cover Slips.
- Refractive Index Liquids - These liquids are guaranteed by the supplier to be accurate to within 0.0005 of the stated refractive index.
- Polarised Light Microscope - Complete with rotating stage capable of giving plain polarised light, crossed polars, sensitive tint and central stop dispersion staining.
- Ventilated and filtered enclosure for handling of samples.

METHOD OF ANALYSIS

Once the laboratory receives a sample, it will be issued with a unique Bulk Reference (BR) number and a Project Reference Number (PRN). The sample will then be opened within the fume cabinet and placed in a petri dish.

The analyst will scan the sample using the stereo binocular microscope using fine nose tweezers and look for any suspect fibres as detailed in The HSG248.

The fibres are separated and cleaned as much as possible by drawing them through the tweezers. The objective is to provide a length of clean fibre for the subsequent examination using polarized light microscopy.

The fibres selected in the preliminary assessment are placed on a slide and mounted in a suitable refractive index liquid. The liquid depends on the type of asbestos fibre suspected and is chosen as follows

The usual types of fibres found can be identified from the fibre form and optical effects using the information below and table at the end of this section. Note all reference to colours found under dispersion staining are with the central stop on the dispersion staining objective.

Fibre Type	**Description**
Amosite (Brown Asbestos)	Brownish white straight fibres under stereo microscope. Length slow under polarized light sensitive tint. Positive identification from magenta/gold dispersion staining effect in RI 1.670 liquid.
Chrysotile (White Asbestos)	White, normally curly fibres under stereo microscope. Length slow under polarized light sensitive tint. May show length first in rare conditions. Positive identification from magenta dispersion staining effect in RI 1.550 liquid.
Crocidolite (Blue Asbestos)	Distinctly grey / blue fibres under stereo microscope. Length fast under polarized light sensitive tint. May show length slow following exposure to extreme heat. Positive identification from reddish blue dispersion staining effect in RI 1.700 liquid. Displays pleochroism.
Anthophyllite (Rare Asbestos)	Brownish, often curly fibres. Length slow under polarized light sensitive tint. Positive identification from blue staining colours parallel to horizontal, and yellow perpendicular to horizontal in RI 1.605.
Tremolite (Rare Asbestos)	White fibre. Length slow under polarized light sensitive tint. Positive identification from weak blue staining colours parallel to horizontal and weak yellow blue perpendicular to horizontal in RI 1.605.
Actinolite (Rare Asbestos)	Short white fibres. Length slow under polarized light sensitive tint. Positive identification from Violet blue/red staining colours parallel to horizontal and light blue perpendicular horizontal in RI 1.640.

Where no asbestos fibres are identified, or the sample appears to be free from all fibre types, the analyst will carefully search the sample for a minimum of 10 minutes under the stereo microscope and then search a minimum of 2 preparations mounted in suitable RI liquid at high magnification by PLM for a further 5 minutes.

The derived result of the examination of a bulk sample is then transferred to a Bulk Certificate, which is signed by the analyst and distributed to the Client.

United Kingdom Accreditation Service

ACCREDITATION CERTIFICATE

TESTING LABORATORY
No. 2418

Acorn Analytical Services

is accredited in accordance with the recognised International Standard ISO/IEC 17025:2005
General Requirements for the competence of testing and calibration laboratories.

This accreditation demonstrates technical competence for a defined scope as detailed in and at the locations specified in the schedule to this certificate, and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated January 2009).

The schedule to this certificate is an essential accreditation document and from time to time may be revised and reissued by the United Kingdom Accreditation Service. The most recent issue of the schedule of accreditation, which bears the same accreditation number as this certificate, is available from the UKAS website www.ukas.com.

This accreditation is subject to continuing conformity with United Kingdom Accreditation Service requirements. The absence of a schedule on the UKAS website indicates that the accreditation is no longer in force.

Accreditation Manager, United Kingdom Accreditation Service

Initial Accreditation date
17 September 2001

This certificate issued on
03 October 2012

UKAS is appointed as the sole national accreditation body for the UK by The Accreditation Regulations 2009 (SI No 3155/2009) and operates under a Memorandum of Understanding (MoU) with the Department for Business, Innovation and Skills (BIS).