## Appendix 3
Proposed Dust Monitoring Scheme and Dust Action Plan

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### Appendices:

- **Appendix 1** Proposed location of dust monitors in respect of Grandcourt Quarry extension (K01/P15/062)
- **Appendix 2** Procedures for horizontal frisbee sample collection and analysis
- **Appendix 3** Procedures for sample collection and analysis of vertical directional sticky pad gauges
1. INTRODUCTION

1.1 As part of the planning application seeking an extension to Grandcourt Quarry, Sibelco is proposing a dust monitoring scheme and dust action plan (Dust Scheme).

1.2 Sibelco proposes that this dust scheme will also be applied across the currently permitted Grandcourt Quarry as required.

1.3 The scheme is intended to encompass operational areas of Grandcourt Quarry as amended by any forthcoming consent to extend and time extend the site.

1.4 That part of this proposed dust scheme relating to the Dust Action Plan draws together control and mitigation measures and management procedures. The Dust Action Plan provides clear guidance for the control and mitigation of dust and management of the action plan during the lifetime of the proposed operations.

2. DUST MONITORING SCHEME

2.1 A weather station is installed at the Sibelco processing plant area site office to monitor and log rainfall, wind speed and wind direction and this will be retained in use throughout the operational periods of Grandcourt Quarry and Grandcourt Quarry if approved.

2.2 Some dust monitoring equipment is already installed and operational and further gauges are proposed as shown in Table 1 below. Figure K01/P15/062 in Appendix 1 shows the location and type of all dust monitors proposed and includes monitoring locations already in operation. The monitoring equipment is proposed to be located so as to be representative of the potential impacts at nearby receptors.
### TABLE 1: Dust Monitoring Equipment, Locations and Limits

<table>
<thead>
<tr>
<th>Parameter to be Monitored</th>
<th>Monitoring Equipment</th>
<th>Location</th>
<th>Sample Collection Interval</th>
<th>Action Level¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust Deposition (mg/m²/day)</td>
<td>Combined Dry Foam Frisbee gauge and vertical sticky gauge (Installed)</td>
<td>Grandcourt extension area</td>
<td>One Month (until area required for operations)</td>
<td>Monthly average &gt;200mg/m²/day¹ and Monthly average &gt; 0.5 EAC.day⁻¹</td>
</tr>
<tr>
<td>Dust Deposition (mg/m²/day)</td>
<td>Dry Foam Frisbee gauge (Installed)</td>
<td>Town Close, East Winch</td>
<td>One Month</td>
<td>Monthly average &gt;200mg/m²/day¹</td>
</tr>
<tr>
<td>Dust Deposition (mg/m²/day)</td>
<td>Dry Foam Frisbee gauge and vertical sticky gauge (Proposed)</td>
<td>Close to Holland House</td>
<td>One Month</td>
<td>Monthly average &gt;200mg/m²/day¹ and Monthly average &gt; 0.5 EAC.day⁻¹</td>
</tr>
<tr>
<td>Dust Deposition (mg/m²/day)</td>
<td>Dry Foam Frisbee gauge (Proposed)</td>
<td>Grandcourt Cottage (Carr Pit Cottage)</td>
<td>One Month</td>
<td>Monthly average &gt;200mg/m²/day¹</td>
</tr>
<tr>
<td>Dust Flux Calculated Soiling Rate (%EAC.day⁻¹)</td>
<td>Vertical sticky gauge (Proposed)</td>
<td>Town Close, East Winch</td>
<td>One Month</td>
<td>Monthly average &gt; 0.5 EAC.day⁻¹</td>
</tr>
<tr>
<td>PM₁₀ (µg/m³)²</td>
<td>Turnkey Osiris</td>
<td>Town Close, East Winch</td>
<td>Daily average (reported quarterly)</td>
<td>Annual average PM₁₀ concentration of 40 µm⁻³ and a maximum of 35 days exceedances per calendar year of the Air Quality Strategy daily mean limit of 50µg m⁻³</td>
</tr>
</tbody>
</table>

¹ The Action Level for the dry foam Frisbee gauges will be >200mg/m²/day subject to annual review against an agreed background location. Sibelco undertakes to monitor results and trends and review/take actions if deposited dust is approaching the 200mg/m²/day level. Nuisance may become likely if the rate exceeds about 200 mg/m²/day.

It is often considered that complaints about dust may occur when the monthly dust deposition rate is about 2.5 times the median rate, and are likely if the monthly rate is about 3.5 times the median rate. The median background deposition rate of, on average, 60 mg/m²/day recorded within the extension land and at East Winch indicates that the onset of potential nuisance may occur if the deposition rate exceeds 150 mg/m²/day.

² The Turnkey Osiris instruments also record PM2.5, PM1, Total Suspended Particles (TSP), wind speed and wind heading at 15 minute intervals – but Action Levels will be based on the PM₁₀ criteria noted above.

2.3 The Dry Foam Frisbee gauge samples will be collected on a monthly basis by trained personnel and taken to Sibelco laboratory for analysis and reporting.
APPENDIX 3 – DUST MONITORING SCHEME AND DUST ACTION PLAN

2.4 Sibelco proposes to deploy combined horizontal Frisbee gauge and vertical sticky pad gauge in the vicinity of Town Close and Holland House and a horizontal Frisbee gauge in the vicinity of Carr Pit Cottage, if consent for the quarry extension is granted (See proposed locations shown on drawing K01/P15/062). The samples will be collected monthly by trained personnel. The results from these gauges will be used determine source apportionment and will inform the findings and results from the depositional dust monitors noted in Table 1. These gauges will be analysed and reported by an independent third party laboratory.

2.5 The continuous sampling results from the Osiris monitor will be collated to show the calendar year annual average and daily mean concentrations. Comparisons will be made with the UK Air Quality Strategy objective values for PM$_{10}$, i.e. an annual average concentration of 40 $\mu$m$^{-3}$ and a maximum of 35 days exceedances per calendar year of the Air Quality Strategy daily mean limit of 50 $\mu$g m$^{-3}$. The results of this monitoring against the criteria in Table 1 will be forwarded to the County Planning Authority on a six monthly basis with an annual report summarizing the Osiris data over each calendar year. The Osiris instruments will be serviced and calibrated annually and undergo interim maintenance (under contract) if results are seen to drift from expected norms. If the Osiris instrument needs to be removed for maintenance, or during absence due to calibration, a temporary calibrated replacement instrument will be put in place.

2.6 Sibelco will review data collected for particulates, dust flux and dustfall on a monthly basis to examine results/trends and any significant variations in results. Reporting to the County Planning Authority will be on a six monthly basis. If, during monthly review, the results are seen to be approaching the Action Levels (shown in Table 1), site management will review the data and appropriate elements of the Dust Action Plan (see below) will be acted upon. The objective will be to control levels below the stated Action Levels. If unexpected results are observed (either higher or lower than expected), checks will be made on the monitoring and sampling procedures, condition of the gauges and functionality/calibration of the Turnkey Osiris instrument.

3. DUST ACTION PLAN

3.1 The following Dust Action Plan specifies appropriate procedures to manage and to control and mitigate emissions, taking actual and forecast meteorological conditions such as rainfall, wind direction and wind speed; routine visual observations of dust emissions; and dust monitoring results into consideration.

3.2 The Dust Action Plan identifies procedures to investigate and take appropriate action in response to the monitoring results identified in the dust monitoring scheme above or when climatic conditions require action to be implemented.

3.3 This Dust Action Plan will be adopted to limit the potential for airborne dust to be generated and to mitigate any dust emissions that may occur. The Dust Action Plan will include the following control and mitigation measures.
TABLE 2: Control and Mitigation Measures

<table>
<thead>
<tr>
<th>Activity or Operation</th>
<th>Routine Process (permanent controls)</th>
<th>Response Management (additional controls)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile bowsers used for damping down dust generating areas during dry periods (defined as 5 or more consecutive dry days with less than 0.2mm rainfall per day).</td>
<td></td>
<td>√</td>
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<tr>
<td>Regular maintenance of access routes. Speed restrictions of 30mph along the hard surfaced site access road and 10mph around the loading areas to minimize wheel generated dust.</td>
<td>√</td>
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<tr>
<td>Water sprays close to active quarry faces likely to give rise to dust generation due to raised wind speeds)</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Drop heights at loading points to be minimized and transfer points to be shrouded.</td>
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<td></td>
</tr>
<tr>
<td>Evenly load mobile plant</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Use of designated access routes within the site. for mobile plant</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Surface stabilisation to be used where uncovered sand is identified as a potential problem.</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Grassing/planting of bunds and open areas as soon as practicable to minimise open sand areas.</td>
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<tr>
<td>Trees, bushes and hedges planted (as soon as practicable in accordance with consents) to form wind breaks/dust screens.</td>
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<tr>
<td>Minimum removal of hedges trees as required for the approved development etc. during top soil/overburden removal.</td>
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</tbody>
</table>
3.4 The following management procedures will be implemented:

**TABLE 3: Management Procedures**

<table>
<thead>
<tr>
<th>Activity or Operation</th>
<th>Management Process (permanent controls)</th>
<th>Response Management (additional controls)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust control measures form part of Sibelco employees and contractors induction.</td>
<td></td>
<td>√</td>
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<tr>
<td>Recording and when appropriate, investigation and reporting (internally and externally as required) of environmental complaints.</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Training of site personnel in dust management and establishment of an action team to monitor dust management and control.</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Good housekeeping and routine daily visual observations will be undertaken and recorded to assess whether there is any significant dust emission occurring.</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Observation and recording of weather forecasts and weather station readings to identify adverse conditions and decide on preventative/mitigation measures.</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Assessments will be undertaken by site management and findings recorded if monitoring results consistently approach levels defined in the Dust Monitoring Scheme.</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Investigations will be undertaken by site management and findings recorded if monitoring results exceed levels defined in the Dust Monitoring Scheme.</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>When ongoing operations are contributing to dust emissions likely to give rise to nuisance which cannot be adequately suppressed by any of the above measures, the activity will be temporarily suspended.</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Log kept to record use of mitigation equipment</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Preventative maintenance programmes in place to ensure efficient operation of relevant plant and equipment</td>
<td></td>
<td>√</td>
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</tbody>
</table>

3.5 The above Dust Action Plan and Dust Monitoring Scheme will be subject to periodic reviews which are proposed to be undertaken at no greater than annually for the duration of quarrying operations (extraction and restoration activities) in Grandcourt Quarry and the extension area.

3.6 The following flow diagrams, chart the routine management protocol for the control and mitigation of emissions associated with Grandcourt Quarry and extension, together with the response management process in the event of any recorded incident or received complaint.
GRANDCOURT QUARRY EXTENSION
DUST ACTION PLAN

Response Management

Company monitoring shows dust fall exceeding 30 times the established median monthly background level or substantially greater background level (note - the median is a maximum of 200 mg/m³)

- Initial investigation initiated

Company notified (by phone call / email / in writing)

Internal Environmental Complaint Form commenced

- Does the internal investigation indicate there has been a dust nuisance?

  - Yes
    - Identify source(s) of dust and undertake appropriate dust control measures as described in the scheme
    - If appropriate, temporarily cease activities responsible for dust nuisance until conditions improve
    - Visual inspection of site
    - Review dust mitigation measures
    - Complete Environmental Complaint Form and report findings to Regulator / complaint
  
  - No
    - Complete Environmental Complaint Form and report findings to Regulator / complaint

*Data from horizontal filter gauges to be reviewed after 12 months to assess longer-term median values. Thereafter, the full available dataset will be used for calculation of the median values.*
APPENDIX 3 – DUST MONITORING SCHEME AND DUST ACTION PLAN

Appendices:

Appendix 1 Proposed location of dust monitors in respect of Grandcourt Quarry extension (K01/P15/062)

Appendix 2 Procedures for horizontal frisbee sample collection and analysis

Appendix 3 Procedures for sample collection and analysis of vertical directional sticky pad gauge
1. SCOPE

Static dust traps collect dust from the atmosphere at many of the Sibelco UK sites. The liquid from these traps is filtered to determine the levels of solids which are reported to the IMS and Geology departments.

The procedure used is adapted from the current British Standard for the measurement of air pollution and the recommended protocol from the Stockholm Environment Institute (SEI) on the use of dry Frisbee dust deposit gauges (See Bibliography).

The British Standard consulted applies only to the standard directional dust gauges received and the SEI protocol applies only to the Frisbee depositional dust gauges.

2. WARNINGS AND SAFETY PRECAUTIONS

<table>
<thead>
<tr>
<th>Health &amp; Safety Issues</th>
<th>1. The liquid from the dust traps frequently contains flies and algae.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Samples should be handled with care.</td>
</tr>
<tr>
<td></td>
<td>3. Gloves should be worn.</td>
</tr>
<tr>
<td></td>
<td>4. MSDS and COSHH assessment available for copper sulphate solution (Workbench Docs. 6894 &amp; 5894 respectively).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental Issues</th>
<th>1. Waste material must be discarded safely by following the correct waste disposal procedure</th>
</tr>
</thead>
</table>

3. REFERENCES


4. DEFINITIONS

N/A

5. PRINCIPLES
Static dust traps collect dust from the atmosphere. The liquid from these traps is filtered to determine the levels of solids. Some also contain high levels of organic matter e.g. Flies, Algae, Grass etc, this method is designed to remove most of this matter.

6. REAGENTS AND MATERIALS

6.1. Copper sulphate solution

6.1.1. Dissolve 3g Copper (II) Sulphate Pentahydrate in 500ml distilled water.
6.1.2. Make up to 2 litre mark using distilled water.

7. APPARATUS AND EQUIPMENT

7.1. Vacuum pump
7.2. Buchner flask system
    7.2.1. Connect the vacuum flask to the vac pump, and place the glass filtering unit on top.
7.3. Whatmann filters GFC 70cm
7.4. 710µ screen
7.5. Drying oven
7.6. Desiccator
7.7. Watch glasses
7.8. Wire baskets for drying filter papers in watch glasses.
7.9. Balance sensitive to 0.0001g

8. SAMPLES AND SAMPLING

Samples are received in either the white screw-top pots or the large Frisbee collecting bottles.

9. CALIBRATION

The balance is serviced and calibrated every six months by an external company and checked weekly in-house. The external company used can provide certificates regarding the traceability of the weights used in their calibration services to National Standards.
10. QUALITY CONTROL

The Group Central Laboratory holds a Corporate Certificate of Registration which meets the requirements of ISO 14001:2004. This has been issued by Complete Integrated Certification Services Ltd (CICS) and covers the provision of design and development, evaluation of customer supplied products and analytical services to both group and external customers.

11. PROCEDURE

11.1 Standard Procedure

**NOTE:** Always use tweezers when handling the filter papers.

11.1.1 Place new filter papers into a drying oven for a minimum of 2 hours at 105°C.
11.1.2 Remove and place into a desiccator to cool.
11.1.3 Print off the 'Dust Gauge Worksheet' from LIMS and label the set of samples with a number from 1 onwards.
11.1.4 Label up a watch glass with the number assigned for each sample.
11.1.5 Weigh a dried filter paper for each sample and place on its labelled watch glass ($m_1$).
11.1.6 Remove the clips from the glass filtering unit and take off the top tube.
11.1.7 Place the filter paper on top of the filtering unit, replace the top tube and secure with the clips.
11.1.8 Remove the lid from the sample pot to be tested and carefully pour the liquor through a 710µ screen into a large foil tray.

**NOTE:** The water from the large Frisbees can be decanted with extreme care to reduce the amount of water to be put through the filtering unit.

11.1.9 Jet wash the pot until all the debris has been cleaned out.
11.1.10 Throw away the debris collected on the screen.
11.1.11 Carefully pour the liquor into the filtering unit ensuring that the tray is washed out, and then switch on the vacuum.
11.1.12 Allow the liquor to filter through, topping up where necessary.
11.1.13 Once the liquor has filtered through, switch off the vacuum and remove the top section as in step 11.1.6.

11.1.14 Carefully remove the filter paper and place back on the watch glass.

**NOTE:** Occasionally the samples will become blinded due to the amount of dust etc in the sample; in this case remove the blinded filter and replace with a new dried and weighed filter paper before continuing with the filtering of the sample.

11.1.15 Dry the loaded filter paper(s) for a minimum of 30 minutes.

11.1.16 Weigh the loaded filter paper(s) \( m_2 \).

11.1.17 Calculate the Total and Daily Deposit Dried using equations 12.1 and 12.2 for directional dust gauges (White pots) or equations 12.1 and 12.3 for the depositional Frisbee dust gauges (large bottles).

11.2 Laminating of samples

11.2.1 Switch on the laminator.

11.2.2 Type up labels with the LIMS number, the gauge location and direction.

11.2.3 Arrange the filters in the batches of locations, as shown on the example below.

Add the labels under each of the filters and laminate the samples.

```
EXAMPLE          NORTH          EAST
SOUTH            SOUTH          WEST
```

11.3 Preparation of pot for next sample

11.3.1 Wash the pots out and place copper sulphate solution in the bottom to about 0.5 to 1cm depth

11.3.2 Pots are ready to return to the IMS Department.
12. CALCULATIONS

12.1 Total Deposit Dried (mg) = (m₂ – m₁)*1000

**NOTE:** If more than one filter paper has been used, add the weights of the samples together before doing the calculation.

**Directional Dust Gauges**

12.2 Daily Deposit Dried (mg/m²/day) = Total Deposit Dried
(Area collected x Total No days sample collected)

12.2.1 Area collected (m²) = 0.34 x 0.045 = 0.0153m²

**NOTE:** Area collected calculated using dimensions provided in Figure 3 (Page 15) of BS1747: Part 5: 1972.

12.2.2 Total No. days sample collected = The number of days between when the pot was first put onto the equipment and the date when it was removed.

**Depositional (Frisbee) Dust Gauges**

12.3 Daily Deposit Dried (mg/m²/day) = Total Deposit Dried
(Area collected x Total No days sample collected)

12.3.1 Area collected (m²) = π x (0.227/2)² = 0.0405m²

**NOTE:** Area collected calculated using dimensions provided in Figure 1 of SEI Protocol.

12.3.2 Total No. days sample collected = The number of days between when the pot was first put onto the equipment and the date when it was removed.

13. RECOGNISED SPECIAL CASES – DEVIATIONS FROM STD PROCEDURE

The British Standard consulted applies only to the standard directional dust gauges received and the SEI protocol applies only to the Frisbee depositional dust gauges.

There may be occasion when the IMS department asks for the filter papers to have the extra Loss on Ignition stage applied to them. In that case please use HOUK EN07 Directional Dust Gauge Analysis with Loss on Ignition Stage (Workbench Doc. 8042).

14. REPORTING PROCEDURE

Method in LIMS = DUST GAUGE STD (Method Number 1112)
Method in LIMS = DUST GAUGE FRISBEE STD (Method Number 1442)
Total and Daily deposits are to be reported to 1 decimal place together with the start and finish dates that the pots were sampling for.

15. METHOD VALIDATION

The weights of the calibration company used are certified for conformity to within class E2 and F1 standards and are traceable to National Standards through certificates issued by UKAS laboratory 0797 and DKD-K-11801 laboratory.

16. METHOD UNCERTAINTY

During a calibration by the external company approximately ten readings will be taken and an approximation of the standard deviation will be recorded as reproducibility within the balance’s accuracy. Reproducibility for the balance used for this procedure has been determined as <+/- 0.0001g.

17. BIBLIOGRAPHY


Procedure for changing dust collection pots on Frisbee (with foam insert) dust deposition gauge

1. At the end of each collection period (usually one month), rinse the Frisbee (with foam disc still in place) with water. The washings from the Frisbee, foam disc and connecting pipe being added to the collecting bottle before its removal.

2. Inspect the condition of the Frisbee and foam disc and remove (and make a note of) any leaves, bird droppings or other extraneous material on its surface.

3. Label and remove the collecting bottle and replace it with a clean one containing a suitable biocide.

4. Make a note of any activity (agricultural, grass cutting, construction) in the vicinity of the gauge which may contribute to the dust deposition.

5. Dispatch collection bottles to Group Central Laboratory as soon as possible for determination of dust deposition rates.

1. The collecting bottle should be darkened to suppress algal growth.
2. Foam discs should as a minimum be renewed annually.

Procedure based upon Stockholm Environment Institute (SEI) protocol for using dry Frisbee (with foam insert) dust deposit gauge.

Issue 1 (December 2010)
Combined Frisbee & Adhesive Strip Dust Gauge – Assembly & Preparation

A typical sampling kit will consist of the following items:

i. Tripod base unit
ii. Extension pole
iii. Bottle holder (also acts as adhesive strip support)
iv. 5 litre plastic bottle and cap
v. Aluminium Frisbee with fitted screw threaded red cap
vi. Fablon adhesive strip
vii. Frisbee Sampling Kit
   a. Spray wash bottle containing de-ionised water
   b. Rubber bung for centre of frisbee
   c. Small paint brush
viii. Suitable sample submission forms

Setting-up the Frisbee Gauge

i. Open out the tripod legs and secure into place using the bolts and wing-nuts supplied
ii. Attach the extension pole to the tripod base and secure by tightening the attached bolts using a spanner
iii. Attach the bottle holder to the top of the pole and secure by tightening the attached bolts using a spanner
iv. Secure the Frisbee to the 5 litre bottle using the screw threaded red cap on the stem of the Frisbee
v. Place the bottle and Frisbee into the bottle holder
vi. Secure the tripod using pegs or sand bags etc.
(The Frisbee gauge is now ready for use as a dust deposition gauge)

Adhesive Strip Directional Dust Gauge

i. Carefully peel back a section of backing paper from the fablon strip.
ii. Fold back a 1” strip from the end of the fablon and use this to stick the end of strip to the bottle holder after first making sure that the notched “V” mark (or other similar mark) on the strip is lined up with the N (North) mark on the bottle holder.
iii. Wrap the rest of the strip around the bottle with the backing paper on the outside, as shown opposite, and ensure that the two ends of the strip overlap and are secured to the bottle holder. Completely remove the backing paper and keep it safe for use when the sample is collected.
iv. The sticky side of the strip is now exposed on the outside of the bottle holder and will collect dust particles that impact on its surface.
v. Ensure that the N point on the gauge faces to the North.

ESG Ltd contacts: Neil Fenwick, Tel: 01283 554487   John Perry, Tel: 01283 554488
Combined Frisbee & Adhesive Strip Dust Gauge – Sample Collection

i. Sampling periods will usually range from 1 – 4 weeks. Before collecting the sample check that everything is satisfactory with the sampling equipment and make a note of any problems or defects.

ii. Place a rubber bung in the hole in the centre of the frisbee top

iii. Remove the frisbee from the sample bottle and pour a small amount of collected rainwater from the bottle into the frisbee top

iv. If no rainwater has been collected spray the frisbee top with a small amount of de-ionised water

i. Use a small brush to wash round the inner surface of the frisbee top. Re-connect the frisbee top to the sample bottle and remove the bung from the frisbee

ii. Use the brush to thoroughly clean out the frisbee and direct water and dust down the hole and into the sample bottle. Remove the frisbee and seal the sample bottle with the screw cap provided.

iii. Ensure that the sample bottle is clearly marked with all relevant sample details. (See above)

i. To collect the adhesive strip gauge sample replace the original backing paper over the surface of the strip and remove from the bottle holder. Ensure that the backing paper completely covers the sticky surface of the strip

ii. Ensure that the none sticky side of the strip is clearly marked with all relevant sample details. Fold the strip twice ensuring that no sticky surfaces come into contact.

PLEASE ENSURE THAT COMPLETED SAMPLE WORKSHEETS ACCOMPANY ALL SAMPLES forwarded FOR ANALYSIS

ESG Ltd contacts: Neil Fenwick, Tel: 01283 554487    John Perry, Tel: 01283 554488
<table>
<thead>
<tr>
<th>Version Number</th>
<th>Issue Date</th>
<th>Reviewed by</th>
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<th>Approved by</th>
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<td>Section 3 - amended to reflect the use of a separate white / grey optical standard for QC purposes. Section 7 - Prior to analysis a label providing a unique sample identification number is attached to each adhesive strip. Section 8 - due to the variability in the quality of ‘fablon’ currently available the QC procedure has been amended and is now based on a separate white / grey optical standard. Section 8 has been re-written to reflect this change. Appendix 3 – Example Test Report removed.</td>
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<td>Method prefixed ENV/ Section 7, addition of reference to deviating sample information. Section 8.3.6, addition of retention time. Section 10, repeatability etc. moved to intranet. Appendix 3, uncertainty budget, moved to intranet. Appendix 1&amp;2 removed.</td>
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1. INTRODUCTION AND SCOPE

This document describes a method for the measurement of environmental airborne dust collected on the adhesive side of a vertically or horizontally mounted piece of white self-adhesive surface covering, for example 'Fablon'.

2. PRINCIPLE OF THE METHOD

The reduction in the reflectance of the self-adhesive surface caused by collected dust is measured using a 'Smoke Stain' photoelectric reflectometer of the type described in BS 1747: Part 2: 1969.

3. REFERENCE MATERIALS

White and grey standards are supplied by the reflectometer manufacturer to check the linearity of the instrument. A Master Standard has been calibrated by Ceram Research, Stoke on Trent (UKAS Accredited Laboratory - Calibration No 0420) and is used to calibrate the other white and grey standards in use. The Master Standard will be re-calibrated at 5 year intervals and working white and grey standards will be calibrated against the Master Standard at 2 year intervals.

The initial calibration of a reflectometer is carried out using a white standard prior to a QC check being undertaken at regular intervals using a grey standard.

4. EQUIPMENT

4.1 Smoke Stain Reflectometer: Model: EEL 43M (ERN/SSR/03): of the type described in BS 1747: Part 2

4.2 White Background: on which to place the adhesive strip whilst reflectance measurements are being carried out.

4.3 White sample analysis board marked with lines indicating the eight main compass points. The markings on the board are laid out in such a way to allow strips of non-standard sizes to be assessed.

4.4 Alcohol impregnated wipes for cleaning the white-grey calibration standard and optical head connected to the smoke stain reflectometer.

4.5 Calibrated Master White/Grey reflectance standard (ERN/RMN/SSTAIN03).

4.6 White/Grey reflectance standard tiles for calibration and quality control measurements (ERN/RMN/SSTAIN02).

5. ENVIRONMENTAL CONTROL

Not required.
6. **INTERFERENCES**

If the optical head and mask do not have intimate contact with the surface of the adhesive strip being measured, then lower than expected readings may result due to loss of light from the measuring head.

Avoid placing the optical head on areas of the strip where large pieces of collected material (such as plant stems, grasses etc) or creases are present, since any measurements taken in these areas would be unrepresentative.

7. **SAMPLING AND SAMPLE PREPARATION**

Sampling is carried out by either the customer or ESG field staff using a modified version of the Beaman and Kingsbury Method whereby the adhesive strip is placed adhesive side outermost, around a circular object (usually plastic bottle) and mounted in a vertical position on a pole. The sample bottle holder on an ESG Frisbee Gauge stand may also be used for this purpose.

In some situations small, square adhesive strips are mounted in a horizontal position (adhesive side uppermost).

The onus is on the sampler to sample correctly, mark the strips accurately (North Point, site identification and sample dates) and return the strips to the Laboratory in a suitable condition for measurement.

All samples are analysed on an ‘as received basis’. It is assumed that the samples have been collected in accordance with the recommendations given in the relevant standards, either by clients themselves or ESG Field Staff.

Prior to analysis a label providing a unique sample identification number is attached to each adhesive strip.

Deviating sample information is recorded in SOP25. Data is available in the validation library on the intranet.

8. **ANALYTICAL PROCEDURE**

8.1 **Setting Up, Calibration and QC check**

8.1.1 Switch on the model EEL43M reflectometer and leave for a minimum of 5 minutes to warm up.

8.1.2 With the reflectometer head connected to the INPUT socket place the head on the white optical standard of the combined white/grey standard (ERN/RMN/SSTAIN02). Press the CAL button so that the meter indicates a reading of 100.0. This establishes the white standard calibration point.

8.1.3 A QC measurement is then carried out using the same white/grey optical standard (ERN/RMN/SSTAIN02). Place the reflectometer head on the white optical standard and press the CAL button so that the meter indicates a reading of 100.0. The reflectometer head is then transferred to the grey part of the optical standard and the meter reading noted. All results shall be recorded in the ENV/FD05 QC Record folder and also plotted on the relevant QC spreadsheet. Analysis of samples can be undertaken if the QC results are within the appropriate limits as described in 8.3 below.
8.2 Analysis

8.2.1 Place a clean, unexposed piece of the adhesive strip on the white background used for measurement (the melamine covered board) and place the reflectometer head onto the strip. Press the CAL button so that the meter indicates a reading of 100.0. If a clean area of the adhesive strip sample is not available, take a measurement on a piece of stock material of the same type of ‘Fablon’. This is facilitated by comparing the non adhesive sides of the strips, and also by taking measurements of the adhesive sides of the strips.

8.2.2 Prior to analysing a sample reference readings of the white standard (ERN/RMN/SSTAIN02) are taken at the beginning and end of each set of samples and recorded on the worksheets. If the final reference reading is greater than ±1 displayed units of the initial reading the sample run must be repeated.

8.2.3 Lay out the adhesive strip sample for analysis, ensuring that it is adequately secured at each end (either weighted down or clamped) to prevent creasing occurring during analysis, and that the north point marked on the strip (the notch) is aligned with the north point marked on the white sample analysis board. Also ensure that the exposed area of the strip is correctly lined up with the appropriate marks on the board. Place the reflectometer head on an exposed sample, at each of the compass points (in the case of horizontally exposed strips, in the centre of the strip) and note the meter readings to the nearest whole number on the sample worksheet. If a sample is found to be unsuitable for analysis e.g. strip badly damaged, contaminated with insects or seeds etc or incorrectly presented (backing strip replaced incorrectly) no readings will be taken and the reasons will be recorded in the comments box on the worksheet.

8.2.4 For horizontal adhesive samples eight measurements are taken randomly over the surface of the sample. Each individual measurement is recorded on the worksheet provided.

8.2.5 When a sample has been completed replace the backing strip. Put all completed strips from a batch into a re-sealable bag which should be marked up with relevant details i.e. Job No., Client and Site.

8.3 Quality Control

8.3.1 The calibration and QC procedures described in section 8.1 should be carried out at the start of each working day. Re-calibration and additional QC measurements should be carried out if any anomalous readings are observed, or if any white standard reading falls out of the tolerance criteria specified in section 8.2.2.

8.3.2 Target values of the QC standard are stated in QC Chart document and shown on the QC Chart.

   a) If result does not exceed warning levels proceed with analysis.

   b) If result is between warning and action levels, re-check the 100% standard setting then repeat QC reading of grey standard.

   c) If the result is outside the action levels, clean the glass above the white and grey standards, clean the reflectometer head and then repeat section 8.1.3.

   d) If the reading is still outside the action levels consult the Technical Manager or Senior Analyst before proceeding with analysis.
e) All results should be plotted on the reflectometer QC chart.

8.3.4 After every twenty batches, or at the end of each analysis session, whichever is the sooner, the QC procedure given in 8.1.3 shall be repeated. All results shall be recorded in the FD05 QC Record folder and in the relevant QC spreadsheet which will provide information on warning and action levels.

8.3.5 If measurement of the Quality Control Standard is within the calculated warning levels, the batch analysis results are accepted.

8.3.6 If the results fall outside the displayed action limits, the batch results are rejected and the tests will be repeated after following the calibration and QC check procedures documented in section 8.1 above.

Adhesive strips are retained for 6 months following analysis.

9. CALCULATION OF RESULTS

The results are expressed either as a shade value or as percentage effective area covered per day (% eac.day⁻¹).

Shade value is calculated as follows:

\[
\text{Shade value} = \frac{100 - \text{reflectance value obtained}}{10}
\]

the result is rounded up to the nearest whole number.

\%eac.day⁻¹ is calculated as follows:

\[
\%eac.day^{-1} = \frac{100 - \text{reflectance value obtained}}{\text{number of days sample exposed}}
\]

The result being reported to one decimal place if the result is < 0.9; or rounded to the nearest whole number if the result is 1 or above.

All these calculations are performed after data entry into the Laboratory Management Information System (LIMS).

10. REPORTS

The results are reported either as a shade value or as percentage effective area covered per day, depending upon the client requirement.

Reports are generated via the Laboratory Information Management System (LIMS) and checked and approved by the Technical Manager or a Senior Analyst.

11. SAFETY

No hazardous substances are used in the procedure.
Laboratory Safety Rules, outlined in TES Bretby Document ‘Health and Safety in the Laboratory’ apply at all times.

All electrical equipment is tested in compliance with requirements of the Electricity at Work Regulations (1989).

COSHH and Risk Assessment are in place and are reviewed and revised as necessary on an annual basis.

All staff undertake a safety induction course in commencement of employment.

13. LITERATURE REFERENCES


14. IDENTIFICATION OF TEST SAMPLES

Upon receipt, the test samples are booked-in using the LIMS system and worksheets and adhesive labels generated. Each adhesive label is attached to the appropriate sample in a convenient position on the back of the adhesive strip.

15. OPERATOR CLASSIFICATION AND SCOPE

15.1 Operator classification and scope are defined in the Quality Manual and individual training records.