

Blackburn with Darwen Borough Council

Contaminated Land Remediation Guidance: Cover Systems



Engineered cover systems are a widely used form of remediation on sites which comprise grassed, garden or soft-landscaped areas. Although not suitable to mitigate all forms of contamination, the basic principle is to fit a physical barrier to the surface of the new development. The aim of the barrier is to **prevent**¹ the exposure of contaminants to people using the site, and/or break pathways between a contaminant source and an environmental receptor.

The advantages of the technique are that it may be cost effective on larger sites where disposal/treatment is not feasible, there is minimal disturbance to the contaminated material, it is an established practice, and it can be used as a temporary measure quite effectively. However, the disadvantages include the fact that the contamination is left on site and groundwater is not treated, there is limited groundwater protection, the technique may not be durable over the lifetime of the development (a requirement for any remedial technique), and long term monitoring may be necessary. As such, the design of the engineered cover system must be robust, and always reflect the level and nature of the ground contamination observed on site.

1.0 General Notes

- There are two broad categories of cover system available for use in the remediation of contaminated land:
 1. **Engineered cover systems:** Designed to provide the complete separation of the receptor from the source. They perform a number of functions including limiting upward migration of contaminants and controlling the downward infiltration of water.
 2. **Simple cover systems:** Designed to provide a reduction of risk to human health, and to provide a suitable medium for plant growth.
- It is important to note that the second option above is not generally an accepted approach, as there is very limited research into the concept of 'reduction in risk'. As such, this Authority would always seek a **complete prevention of exposure** in any cover system design.
- This Authority would always encourage the characterisation and delineation of contamination through sampling and chemical testing, before deciding that a cover system was an appropriate form of remediation. This is because an engineered cover cannot protect all receptors from all contaminants, and cannot break all exposure pathways.

¹ BRE 465 'Cover Systems for Land Regeneration, Thickness of Cover Systems for Contaminated Land' 2004 is a useful discussion document, but as noted in the publication, the principle aim of the research is focussed on a *reduction in risk* rather than the *prevention* of exposure.

- The movement of 'waste' materials is tightly regulated by the *Environment Agency*. This Authority recommends consultation with the *Environment Agency* (See *Appendix 2*) where fill materials are to be imported, exported or moved across site to confirm regulatory requirements for the movement of the fill material.

References:

Environment Agency/DEFRA Guidance Document (CLR11), *Model Procedures for the Management of Contaminated Land*

Environment Agency R & D Publication 66, 2008, *Guidance for the safe development of housing on land affected by contamination*,

ODPM Report PPS23, *Planning Policy Statement 23: Planning and pollution control*

Blackburn with Darwen Borough Council, *Validation Guidance Notes*

2.0 Cover System Requirements

- As a rule, the *minimum* standard adopted by this Authority for cover system depth on sites including gardens is 600mm. However, site specific circumstances will dictate the actual requirements of the cover system.
- As a rule, where the development does **not** include private garden areas, or areas where vegetable growth will **not** be possible, then a *minimum* cover system layer of 450mm may be applied. In line with the precautionary principle advocated, the possibility of vegetable growth, rather than the probability, must be considered in the first instance.
- All cover system proposals should be agreed with the Regulator in advance of site works commencing.
- Careful consideration should be given to the how the site is to be used. Cover systems may need to be deeper/thicker in areas where, for example, trees are proposed. In addition, where garden activities involve digging at depth, for example, to install a pond, consideration should be given to the appropriateness of the cover and its durability.
- In some extreme cases, informatives can be added on to the deeds or the lease of the new build to advise owners/occupiers of the potential risk of penetrating a cover system. However, this Authority would strongly discourage such an approach, as the principle of 'suitable for use' can be questioned in such circumstances.
- All site works associated with remediation, including cover systems, will be subject to *Validation* at the end of the new build. This is in the form of a *Validation Report* to be submitted to this Authority upon completion of site works and must include documentary evidence showing that all remedial measures have been installed in line with criteria previously agreed with the Local Authority.

REQUIREMENTS SUMMARY

- Minimum depth for garden areas is 600mm
- Cover system material must be independently analysed for an agreed suite of contaminants
- Cover systems shall be largely uniform across site
- Agree all cover system specifications with the Regulator in advance
- Cover systems are subject to Validation upon completion of site works

References:

Building Research Establishment Report 465 (BRE465), *Cover systems for land regeneration: Thickness of cover systems for contaminated land*
Environment Agency/DEFRA Guidance Document (CLR11), *Model Procedures for the Management of Contaminated Land*,
Environment Agency R & D Publication 66, (2008) *Guidance for the safe development of housing on land affected by contamination*
ODPM Report PPS23, *Planning Policy Statement 23: Planning and pollution control*
Blackburn with Darwen Borough Council, *Validation Guidance Notes*
CIRIA Special Publication 124, *Barrier, Liners and Cover Systems for Containment and Control of Land Contamination 1996 & 2004*

3.0 Fill Suitability

- The material comprising the cover system used for any part of the design must have been independently validated as 'suitable for use'. This is achieved in one of two ways:
 1. Obtain fill material from an **on-site source**, complete with supporting documentation showing that the soil has been chemically-tested and is free of contamination at levels exceeding agreed Generic or Site Specific Assessment Criteria.
 2. Obtain fill material from an **off-site source** and sample the material independently, testing for an agreed suite of contaminants (See *Appendix 1*) to ensure compliance with agreed Generic or Site Specific Assessment Criteria. NB. Certificates provided by the supplier will not be accepted as Validation.
- Although not necessarily chemically contaminated, this Authority would not generally consider material containing foreign objects as being 'suitable for use', particularly in a residential setting. BS3882:2007 British Standard Specification for Topsoil contains useful guidance regarding topsoil and subsoil.
- Regardless of the option selected above, the chemical data must observe **sampling frequencies** for *Imported Material*. All imported material must be subject to validation testing to determine its suitability for on-site use. If the material is obtained from a known 'primary' source, testing should be at a frequency of one sample for every 100m³ of material imported. If the imported material is from an unknown or potentially contaminated source, then testing should be at a frequency of one sample per 50m³ of imported fill. This testing will form part of the validation report.
- Cover system design, depth and composition will be subject to *Validation* upon completion of site works. This Authority recommends:
 - The use of photographic evidence to verify cover system depth, collected during cover system installation.

- The use of photographic evidence to verify the various components of the cover system.
- Chemical analysis of the material used in the cover system before this is placed in the cover, at a sampling rate agreed with the Local Authority. If it is tested in-situ, the risk is run that the material is not suitable, and will therefore have to be removed.
- Waste transfer notes demonstrating where material has been brought from, and removed to, and the quantity of material brought on to site.

Other verification techniques, such as topographic surveys, can be used post-installation, but may prove to be both time-consuming and more expensive.

FILL SUITABILITY SUMMARY

- *Cover system material sourced on or off-site must be independently tested to demonstrate 'suitability for use'*
- *Chemical testing sampling frequencies must adhere to those outlined for 'Imported Material'*
- *Fill suitability is subject to Validation once site works have been completed*

References:

CIRIA Special Publication 105, *Remedial treatment for contaminated land: Excavation and disposal*
CIRIA Special Publication 124, *Barrier, Liners and Cover Systems for Containment and Control of Land Contamination 1996 & 2004*
ODPM Report PPS23, *Planning Policy Statement 23: Planning and pollution control*
Blackburn with Darwen Borough Council, *Validation Guidance Notes*

4.0 Additional Capping Measures

The following media can be employed as part of an engineered cover system design, to improve and reinforce the capping layer itself. These measures offer additional protection receptors and assist in breaking specific pollutant linkages where particular types of contaminants are present, such as hydrocarbons, or where site conditions, such as a high water table, warrant additional measures

1. Geotextile, Geomembrane or Geosynthetic Layers:

Geotextiles are permeable synthetic fabrics, which have the ability to separate, reinforce, protect, or drain the capping layer in question. They represent one possible method of reducing the mixing between capping and sediment layers, while providing both a physical barrier and visual warning should the cover system be compromised. Geotextiles can also be used to improve sediment stability in the capping layers during their placement/installation and to limit the intrusion of bioturbators into the cap once the cover system is installed. Geotextiles placed within a capping layer would also assist in minimising root penetration by plants and vegetation, should vegetable uptake of contamination be an issue.

2. Capillary Break Layers:

This can be a layer of high-permeability granular material used to stop upward capillary movement of soluble contaminants by means of *capillary rise*.

3. Visual Warning Membrane:

The provision of a visual marker, either within the cover system, or at its base, would discourage excavation below that point and again assist in reducing the degree of intermixing between soils. This Authority encourages the use of such markers as part of even the most basic cover system to prevent accidental excavation into potentially contaminated soils.

4. Physical Barrier:

In addition to membranes, physical barriers such as rock layers etc. can be incorporated in to the cover system design, to prevent the penetration of the cap by regular garden activities eg. digging.

ADDITIONAL CAPPING MEASURES SUMMARY

- *Geotextiles reduce bioturbation and intermixing within cover system layers*
- *With mobile contaminants, Capillary Break Layers reduce contaminant mobility by inhibiting capillary rise*
- *Visual warning membranes can be incorporated into even basic cover systems*
- *Consultation with the Regulator regarding 'Additional Capping Measures' is recommended*

References:

Environment Agency/DEFRA Guidance Document (CLR11), *Model Procedures for the Management of Contaminated Land*,

CIRIA Special Publication 124 (SP124), *Barriers, liners and cover systems for containment and control of land contamination*

CIRIA Special Publication 105 (SP105), *Remedial treatment for contaminated land: Excavation and disposal*

CIRIA Special Publication 106 (SP106), *Remedial treatment for contaminated land: Containment and hydraulic measures*

CIRIA Special Publication 107 (SP107), *Remedial treatment for contaminated land: Ex-situ remedial measures for soils, sludges and sediments*

CIRIA Special Publication 108 (SP108), *Remedial treatment for contaminated land: Ex-situ remedial measures for contaminated groundwater and other liquids*

CIRIA Special Publication 109 (SP109), *Remedial treatment for contaminated land: In-situ methods of remediation*

Appendix 1: SGV Standard Suite of Contaminants

Where the source of any imported material is unknown, a standard suite of common contaminants represents a good starting point for screening materials. The suite includes all of the determinants for which a Soil Guideline Value has been issued in accordance with the CLEA model.

The determinants are:

Metals & semi-metals

Total Arsenic	Total Selenium
Total Cadmium	Water Soluble Boron
Total Chromium	Total Copper
Total Lead	Total Nickel
Total Mercury	Total Zinc

Non-metals & inorganic parameters

Total Cyanide	Water Soluble Sulphate
Free Cyanide	Sulphide
Thiocyanate	Sulphur
Total Sulphate	Asbestos

General parameters

pH Value	Organic Matter
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Organic parameters

Speciated Polycyclic Aromatic Hydrocarbons (PAH)
(Including Naphthalene and Benzo(a)pyrene)
Speciated Petroleum Hydrocarbons
Total Phenols

Appendix 2: Contact Information for Regulators

5. Environment Agency

Regulates contaminated land risks to controlled waters; waste transfer; hazardous waste materials:

General Enquiries - 0870 8 506 506
Hazardous Wastes - 0870 8 502 858

Email: enquiries@environment-agency.gov.uk

Address: Contaminated Land Section
Environment Agency
Lutra House
Dodd Way
Bamber Bridge
PRESTON
Lancashire
PR5 8BX

6. Blackburn with Darwen Borough Council

Regulates contaminated land risks to human health through the *Pollution Control Section* within Environmental Health & Trading Standards:

General Enquiries - 01254 585 585
Public Protection - 01254 222 507

Email: environmentalhealth@blackburn.gov.uk

Address: Public Protection Service
3-5 Salford
BLACKBURN
Lancashire
BB1 6HG