

Geoenvironmental - Ground Gas



Ground Gas Risk Assessment

Hazardous ground gases are often found on sites from an anthropogenic source, however they also occur naturally within the environment. The Ground-Gas risk assessment has been a practice within the construction industry for the past few decades with guidance largely remaining unchanged over the past 20 years. However the CL:AIRE pragmatic approach (RB17) released in 2012 was a notable change. Without an adequate risk assessment, the use of ground-gas membranes within new buildings, run the risk of producing and using unnecessary plastics, as well as adding unnecessary cost.

As with all risk assessments, the UK guidance (the EA's Land Contamination: Risk Management) requires the generation of a conceptual site model, resulting from a review of historical mapping, geological mapping and other datasets to identify any source-pathway-receptor linkages that may be present.

Following the preliminary review of data, site-specific information is required in order to adequately assess the risk from ground gases.

For sites where limited sources have been identified this can be through soil derived information (Total Organic Carbon) and in other cases will be through the direct sampling of ground gases in monitoring wells. The monitoring period is dictated by UK guidance (CIRIA C665 and BS8576:2013). Upon

completion of monitoring/sampling, the multiple lines of evidence approach will be used, where appropriate, to classify the ground gas regime at the site and make any recommendations that may be required such as: gas protection measures or further monitoring/sampling or testing. On sites where a full understanding of the site model is known, zoning of the site may be appropriate.



Gas Membrane Verification

Since Ground-Gas Risk Assessments have been undertaken, there has been a requirement for the installation of gas protection measures on sites that pose an unacceptable risk to receptors from ground gases. In order to ensure that ground-gas protection measures are installed correctly and adequately, to act as mitigation; independent verification is required in line with CIRIA C735. Gas precautions typically comprise gas resistant membranes underlying a floor slab, which is underlain by a high permeability layer from which gas can be vented in order to prevent a build-up within the building or structure.

The verification on any particular site is dependent on four factors:

- Complexity of design - where the more complex the design requires stricter verification
- The Gas regime - a higher risk will require more stricter verification
- Number of plots - a large development will require more visits, with the option to reduce frequency towards the end
- Skill of the installer - where a suitably qualified installer will require less verification than a non-specialist.

The verification process comprises the note taking and photography of the plot and its features as well as the inspection of the plot for possible damage and/or poor installation that will lead to loss of integrity. The areas inspected and verified comprise: Gas membrane – type of membrane used, condition, lapping design, joint seals, areas of concern (corners) and service entries; passive venting – inspection of the subfloor void (if appropriate), inspection and ratio of external wall air bricks, any internal walls that may affect ventilation.

Gas Integrity Testing

Anyone working within the construction industry knows a building site can be a hectic fast paced environment, where installation of delicate equipment such as gas membranes can be difficult. It is no surprise that a large number of gas membranes are damaged during the installation process, which adversely compromises the integrity of the design and impacts the reliability of the product and safety to future residents.

Gas integrity testing is a means of certifying the installation of the gas membrane, ensuring the integrity of the product is upheld and the membrane has obtained the required gas resistant barrier and is suitable for use.



The test begins once the membrane has been installed, but prior to it being covered by the subsequent construction of the development. The test works by temporarily inflating the area underneath the membrane with a mixture of clean air and specialised tracer gasses which aim to identify any punctures to the membrane. The specialist tracer gas is a non-toxic cocktail of inert gasses which are highly detectable to the specialist tracer equipment. Particular attention is paid to high priority areas such as joints, corners and junctions formed between membranes. A certificate is issued upon completion of the testing.

Volatile Vapour Risk Assessments

Volatile vapours, also known as Volatile Organic Compounds (VOCs), include hydrocarbons and organosulfur compounds. VOCs can occur as a component of ground gas originating from historically contaminated ground, spills and leaks from industry, commercial or residential properties, land-filled wastes and from naturally occurring sources. Therefore, Volatile Vapour Risk Assessments may be undertaken in conjunction with Ground-gas Risk Assessments.

The monitoring period and frequency of monitoring for VOCs in ground gases, is developed on a site-specific basis from the conceptual site model (formulated during the Phase 1 Desk Study) and investigation data quality objectives.



As part of our investigation we can use a number of approaches to identify the Volatile Vapour Risk:

- A Phase 1 Desk Study – This identifies if there is a risk of VOCs
- A Phase 2 Site Investigation – If Phase 1 has identified that there is a potential risk of ground-gases or VOCs on site we can:
 - Use a Photoionization Detector (PID) Mini-Rae 3000, with a 10.6 eV UV lamp to screen for volatile vapours within soil samples and during well monitoring
 - We can undertake chemical analysis of the soils groundwater and/or gases within the monitoring well to identify any presence of VOCs in-situ.
- A Phase 3 Remediation Strategy - If Phase 2 confirms the presence of contamination, it may be appropriate to utilize a DQRA.

If you require any of the services described above, please email:

enquiries@groundandwater.co.uk

or call us on **0333 600 1221**