

APPENDIX 6. GUIDANCE ON THE HEALTH AND SAFETY HAZARDS ARISING FROM UNDERTAKING EXCAVATIONS ON STFC SITES AND THEIR CONTROL

A number of health and safety hazards arise when excavation work is carried out. These can impact those undertaking the excavation and those working or moving near an excavation, adjacent buildings and the services to them.

The STFC's major laboratories are over 50 years old and have been re-developed many times complicating the history of their use and resulting in an organic development of sub soil services for which the location of sub soil hazards is not well defined.

The purpose of this document is to highlight the key hazards that must be considered when undertaking a risk assessment of any work that involves site excavation. The contents of this document have been structured to facilitate their inclusion in a specific risk assessment for the work being undertaken, and focus on those specific to hazards posed by excavation. Consideration will also need to be given to the activities being undertaken in the excavated site, the equipment used if the site is outdoors the impact of prevailing weather conditions etc.

The hazards that must be considered and possible control measures are detailed in the table below:

Hazard	Impact	Potential control measures and other information
Buried services such as electric cables, gas pipes & water pipes. At RAL, a former RAF base, consider buried munitions. Underground tunnels.	Severance of services can result in the uncontrolled release of flammable gases, electrocution of those working and disruption to service supplies.	<ul style="list-style-type: none"> Identify underground services prior to commencing work. Check available site drawings for buried services. Contact local service providers for information. Survey the site to identify indicators of electric cables such as junction boxes or street lights. <p>Safe digging methods</p> <ul style="list-style-type: none"> Use locators to determine the position and route of pipes or cables(frequently using them during the course of the work) Consider digging at side of known services and expose with horizontal hand digging. Regard all buried cables as alive until proved otherwise. Make dead where possible. Exposed cables and pipes should be supported and protected against damage by backfilling. Prepare an emergency plan to deal with any damage from cables or pipes.
Contaminated ground arising from former site activities.	Creation of toxic, asphyxiating or explosive atmospheres in the confined space of the excavation affecting those working	<ul style="list-style-type: none"> Contact local service providers for information on past site use. Note that contaminants can change over time due to chemical or bacterial action. Carry out soil tests to show the presence of any

Hazard	Impact	Potential control measures and other information
	in or near the excavation site.	<p>contaminants and, if present, identify suitable control measures e.g. PPE, hygiene facilities, safe systems of work etc.</p> <ul style="list-style-type: none"> • Certain contaminants are subject to specific legislation such as asbestos, lead, radioactive material, contact local SHE team.
Collapse of sides in deep excavations.	Asphyxiation of those working in the excavation, crush injuries from weight of spoil and potential for others to fall into excavation.	<ul style="list-style-type: none"> • The type of support structure used will depend on the type of ground being excavated, the length of time the excavation will be open, type of work being carried out, groundwater conditions and potential for flood, depth of the excavation and number of persons in the excavation. • Types of excavation supports include battering, where the properties of the soil of the excavation forms a stable sloping pile when allowed to form naturally. The sloping surface is called the angle of repose which will differ depending on the moisture content of the soil or type of spoil. • A more common method involves shoring the walls of the excavation with steel sheets, secured together by expandable steel struts or wooden beams. The steel sheets should be toed in at the bottom and rise above the top of the trench sides. • The use of trench boxes or drag boxes are a viable option for most ground conditions which allows operative to enter the excavation and can be moved along as the work progresses. It is important to note that suitable protected access should be provided as well as edge protection. <p>NB: When working within a trench, at least two persons must be present at all times. A trench may also be designated as a 'confined space'; therefore appropriate controls should be applied. See SHE code 11 Work in confined spaces.</p>
Collapse of adjacent structures as a result of undermining their foundations.	Potential for adjacent structures or materials to fall into an excavation injuring those working in the excavation.	<ul style="list-style-type: none"> • Where there are structures (walls, bridges, roads etc.) or buildings next to where excavations will be dug, it may be necessary to prop and/or underpin these structures to prevent the excavation causing their collapse.
Falls of persons / equipment / materials into excavation and excavation vehicles.	Potential for injury arising from falls from height or falling objects.	<ul style="list-style-type: none"> • Suitable barriers, signage and lighting should be used to warn people of the excavation hazards. • Arrange suitable access and egress facilities. • Provide stops to prevent vehicles from driving too close. • Don't stack the spoil too close to the sides of the excavation. • Keep excavation open for minimum time. • SHE code 9: Working at height.
Water ingress.	Damaging service or equipment in the	<ul style="list-style-type: none"> • Water can enter an excavation directly from rain

Hazard	Impact	Potential control measures and other information
	excavation, hindering egress in an emergency, drowning or weakening the excavation's integrity resulting in side wall collapse.	<p>or sleet if the excavation is uncovered, from the run off following a downpour, through the sides of the excavation if the surrounding water table is high and through accidental damage to water pipes or nearby tanks.</p> <ul style="list-style-type: none"> • One method of control is to use run off channels to a sump point where the water can be pumped away. • Strengthening the sides of the excavation by higher shoring and sandbagging the outside would reduce ingress of water. However continued flow of water may cause settlement problems.
Storage of spoil from excavation.	Spoil precipitates collapse of excavation walls, or hinders the safe movement of others near the excavation.	<ul style="list-style-type: none"> • Storage of spoil should be kept away from traffic routes or from being stored too close to the excavation • A better alternative would be to remove the spoil from the site of the excavation especially if the excavation is going to be open for a period of time. • Specific consideration should be given to the location/storage of contaminated spoil to minimise the potential for further environmental damage and hazards to others. Contact SHE team to consider the environmental implications.

Further notes:

All excavation work should be under permit to work control.

All excavations should be inspected prior to each shift while open.