GOOD PRACTICE GUIDE

Safety Publication

Safe use of Suction & Vacuum Excavators

CPA GUIDANCE
CPA GUIDANCE
CPA GUIDANCE
CPA GUIDANCE
CPA GUIDANCE
CPA GUIDANCE
CPA GUIDANCE
CPA

Safe Use of Suction/Vacuum Excavators

CPA Good Practice Guide

The Health and Safety Executive (HSE) was involved with the CPA Suction and Vacuum Excavation Interest Group, since its inception, assisted in producing this guidance and supports this industry-produced publication as it identifies sensible and proportionate approaches to managing health and safety for these specialised machine types.

Reference No. SAVESIG GPG1
First Published: December 2017
Revised: January 2019 and January 2025
Published by: Suction and Vacuum Excavators Special Interest Group
Construction Plant-hire Association
27/28 Newbury St
London
EC1A 7HU
Telephone: 020 7796 3366
Email: enquiries@cpa.uk.net

Contents

Foreword

This Good Practice Guide was originally prepared by the Suction and Vacuum Excavator Special Interest Group, managed by the Construction Plant-hire Association. This specialist group was formed following a number of incidents, including one which sadly resulted in a fatality of the operator. This unfortunate incident galvanised the suction/vacuum excavator sector at the time to come together and form a Special Interest Group to create and apply common operational standards.

One of the first actions for the Members of the Special Interest Group was the production of a Good Practice Guide which was, and remains, necessary to define safe systems of work to ensure the solid foundations required for safe and successful operations.

This guidance should be used in conjunction with the relevant legislation to ensure the safe use of suction/vacuum excavators and provides the advice necessary to ensure that the operations involving suction/vacuum excavators within construction and the allied sectors are carried out safely and efficiently.

The aim of the Good Practice Guide sets out the minimum standards necessary for the operation of all types of suction/vacuum excavators. Legislation and supporting guidance is usually written in general terms and this publication provides clarity to assist with interpreting legal requirements for this class of plant and the operations it is typically used for.

The Interest Group has now revised the publication with a refocus on the use and control of supporting personnel. However it is testament to the original publication in that limited updates were needed for the content to remain current and valid.

I thank the members of this Interest Group and staff from the Health and Safety Executive for originally providing their time and energy in producing this Good Practice Guide. I would also like to thank the first and previous Chair of this group, Pat Burke, for providing the drive and incentive to get the original publication written and produced. I commend this guidance to all of those owning, hiring or specifying the use of a suction/vacuum excavators to read and implement the recommendations and good practices contained within this document.

Declan Burke

Chair of the Suction and Vacuum Excavator Special Interest Group

1 Scope and Applications

Scope

1.1 This Good Practice Guide gives recommendations for the safe use of truck-mounted, self-propelled, trailer-mounted and static suction/vacuum excavators.

1.2 It does not deal with the construction of the machine. Reference will need to be made to the individual manufacturers and importers for specific and legal aspects.

1.3 Although this guidance does not specifically deal with gully suckers as these types have special considerations, much of the content within this document can be applied to gully sucking-type operations.

Description and Applications

1.4 Suction/vacuum excavators are items of plant utilising a powerful fan or pump to cause a pressure reduction in a suction hose in order to excavate pre-loosened earth and granular materials and draw them into a temporary store in a receiving hopper for subsequent discharge. As the spoil reaches the hopper, it is separated from the moving air by cyclonic and other filtration methods, with cleaned air exhausted via an outlet system whilst the spoil is contained within the sealed hopper.

1.5 The hose is generally of a flexible type mounted on a boom that is fully or partially hydraulically operated, or manually operated, by the operator. The supporting boom usually has an operated arc of around 180 degrees although manually operated, hand held hoses have minimal restrictions except to available hose length. Hose length may be just sufficient to reach into a shallow excavation, or may be extended tens or hundreds of metres to the point of excavation.

1.6 Suction/vacuum excavators can in general extract and store a range of materials and the following are examples of extractable materials:

- Non-aggressive types including:
  - Earth;
  - Stone;
  - Sand;
  - Rubble;
  - Scree;
  - Mud;
  - Liquids.

Applications

1.7 In general, Suction/vacuum excavators can carry out the following activities:

- Uncovering utility services;
- Cleaning of road surfaces;
- Clearance of silos (non-toxic substances);
- Cleaning of ship holds;
- Uncovering tree roots;
- Emptying water-filled shafts;
- Uncovering foundations;
- Removal of debris;
- Uncovering of structures covered by sand, earth etc.
- Protection of tree roots

NOTE: *This list is not exhaustive but highlights typical applications for suction/vacuum excavator activities.*

Higher Risk Operations

1.8 Suction/vacuum excavators should only be used for the following activities where suitable documented control measures have been put into place, or where specified specialised or dedicated machines have been stipulated:

- Removal of low-risk contaminated soils and substances;
- Cleaning of low-risk contaminated areas;
- Removal of asbestos and other high-risk materials;
- Removal of materials containing or coated with hazardous substances;
- Removal of explosive/flammable substances;
- Removal of biologically hazardous substances;
- Removal of reactive or toxic chemical substances;
- Removal of hot (heated) materials and substances;
- Removal of organic dust including mixtures and solutions that could lead to detonation and explosion (flour dust etc.).

NOTE: *This list only constitutes a general indication of high-risk activities. Serious considerations must be given to unknown substances and professional help sought to ensure that safe procedures are implemented.*

1.9 In these cases, special permits and movement orders will be required, along with appropriate risk assessments and method statements for the activity and substance type. Some materials, although low risk may cause damage or increased wear on the machine such as salt-water soaked materials or sandblast-type gravels. The manufacturer's specifications and restrictions must be referred to at the work planning stage to determine if, how and when a material can be extracted and stored by these machine types. Consideration must be taken to where contaminated material is tipped and stored and what control measures are required to reduce and minimise cross contamination whilst tipping.

1.10 The subsequent cleaning of the machine and affected components needs to be considered when dealing with hazardous substances including environmental contamination and the protection of those undertaking the cleaning activity (see Section 12).

1.11 Where the suction/vacuum excavator has been used for gully suction operations including the extraction of waste water from septic tanks, cesspools etc. biological contamination of the machine will occur for which the use and cleaning of the machine need to meet the appropriate environmental regulations. This includes the segregation and storage of affected tools and appropriate welfare facilities for operatives and maintenance staff.

1.12 Extraction of radioactive materials needs to conform to the Ionisation Radiation Regulations 2017 (https://www.legislation.gov.uk/uksi/2017/1075/contents/made)

2. Definitions

For the purposes of this good practice guide, the following definitions apply:

2.1 ***suction or vacuum excavator***

see paragraph 1.4

2.2 ***hirer***

company, firm, person, corporation or public authority taking the owner's plant on hire, including their successors or personal representatives

2.3 ***owner***

company, firm or person leasing the suction/vacuum excavator on hire, including their successors, assignees or personal representatives

2.4 ***truck-mounted suction/vacuum excavator***

a suction/vacuum excavator that is mounted on a self-propelled truck/lorry chassis

2.5 ***trailer-mounted suction/vacuum excavator***

a suction/vacuum excavator that is mounted on a trailer that can be towed

2.6 ***self-propelled suction/vacuum excavator***

a suction/vacuum excavator that is mounted on a self-propelled chassis such as a wheeled dumper or tracked chassis

2.7 ***static suction/vacuum excavator***

a suction/vacuum excavator that is mounted on a skid unit which requires placing at the required position through lifting by other plant, such as a forklift truck or crane

NOTE: *hybrid versions exist whereby a separate skid unit is mounted onto a road-going vehicle.*

2.8 ***suction hose***

a flexible hose which directs the air vacuum to the desired excavation point and conveys the material to the receiving hopper

2.9 ***competent person***

a person who has sufficient practical and theoretical knowledge, experience and training to enable them to safely organise, conduct and control allocated tasks and duties without harming himself or any other persons and without damaging plant or property

2.10 ***remote control box***

a portable control panel which is connected to the suction/vacuum excavator by a wired or wireless system, allowing the operator to operate the machine from a remote position of safety. The control levers/switches may control boom movements, suction, the vehicle's engine, tipping functions and some vehicle movement

2.11 ***stabilisers***

extendable structural members on the excavator unit to increase stability of the machine by reducing (but not removing) the load on the wheels

2.12 ***receiving hopper***

the area into which the excavated material is drawn and stored. After excavation, the hopper can be tipped allowing the discharge of the excavated material at a suitable location

2.13 ***safety induction training***

instruction given by the principal contractor or the hirer to communicate the site safety rules, safe access on the site, the location of welfare facilities, etc. The provider of the training may determine that the delivery of induction training on the first visit to the site is sufficient but may insist on further training if site conditions change significantly

2.14 ***signaller/marshaller***

a person who has had training to give directions to the suction/vacuum excavator operator by a recognised code of visual signals or by verbal communication including two-way radios. Consideration must be taken on the competency of the signaller (marshaller) as this is a significant risk when manoeuvring a vehicle. The driver/operator(s) should ascertain the competency of any third party that are nominated for these tasks

2.15 ***fully-powered arm***

all movements of the suction hose support arm/boom are controlled through a series of double acting hydraulic cylinders, operated through levers on the machine or via remote-control operation, allowing the placing of the suction nozzle remotely

2.16 ***semi-powered arm***

raising and lowering and slewing of the arm is controlled through the hydraulic system of the suction/vacuum excavator via double-acting cylinders, operated through levers on the machine’s control panel or via remote-control operation. Fine movements including slewing of the hose and nozzle is controlled manually by the operator

2.17 ***manual arm***

all movement of the arm supporting the hose is controlled manually by the operator. The arm is usually fitted with a counterbalance weight to increase operator control and reduce fatigue

2.18 ***hose nozzle***

accessory placed on the end of the suction hose that protects the end of the hose, with variant designs used according to the excavating activity or soil type

2.19 ***air lance***

hand held accessory connected to an air compressor via a hose that uses a pressurised air jet to dislodge or break up material as part of the excavating activity

2.20 ***water lance***

hand held accessory that through a pressurised water jet, dislodges or breaks up material as part of the excavating activity

2.21 ***exclusion zone***

defined area around the machine and excavating area that physically prevents unauthorised personnel from entering the area

2.22 ***buried services***

utility services located below ground level and covered by soil or granular material which vacuum/suction excavators are adept at removing to expose and work below the buried service without damaging it

2.23 ***ground agitating and engaging tool - aggressive***

hand-held implement such as a spike, clay spade etc. that loosens soil and material for excavating activities which makes direct contact with the ground and which are not suited for use in the vicinity of buried services

2.24 ***ground agitating and engaging tool – non-aggressive***

hand-held powered (air or water) lance that loosens soils and materials by the medium of air or water and which may be suitable for safe working in the vicinity of buried services

2.25 ***main operator***

personnel trained to have specific machine operating skills used to carry out the excavating activity (with the support of the second operator and/or supporting personnel) and will (in the case of road-going vehicles) be the driver of the vehicle

2.26 ***second operator***

personnel trained to have specific machine operating skills used to support the excavating activity and the main operator, although they will not hold category C on a driving license ***Note: the SAVE Interest Group consider it good practice that the addition of a trained second operator is present at all excavating activities.***

2.27 ***supporting personnel***

person designated to support the excavating activity and the main operator, commonly assigned to the duty of using tools to loosen or break up ground

2.28 ***mechanical excavation***

the removal of ground and materials using powered tools and implements that are non-hand-held

3. Selection of Personnel

3.1 The safe operation of a suction/vacuum excavator relies heavily on the selection of suitable personnel who are competent to carry out the required duties. Those responsible for the selection should ensure that the operator and supporting personnel are organised in order to promote team working and safe, efficient operation. Operators should have the correct level of competency and usually indicated through the holding of a CSCS-logoed card and having attained the relevant competence-based qualification, such as an NVQ/SVQ.

3.2 Employers should have a policy on drugs and alcohol. Nobody should be selected whose efficiency is impaired by alcohol, drugs or other influences.

Operator Requirements

3.3 The suction/vacuum excavator operator should:

- Be competent *(see Annex 3)*
- Be sufficiently mature and able if operating a suction/vacuum excavator on the site;
- Be medically and physically fit for the relevant duties, with particular regard to eyesight, hearing and reflexes and a 'Fit to Work statement' is included within the risk assessment and method statement;
- Be physically able to operate the suction/vacuum excavator safely;
- Be able to judge distances, heights and clearances;
- Be suitably trained and certified for the class of suction/vacuum excavator which they operate;
- Have sufficient knowledge of the machine and its safety devices;

  NOTE: *These may alter from machine to machine and not all the emergency controls will be the same.*
- Be fully conversant with the duties of the signaller and should understand the signals code agreed with them;
- In the case of an LGV-based suction/vacuum excavator operator, be trained and experienced in driving a large goods vehicle

  NOTE: *The holding of category C on a driving license, whether under the Construction and Use regulations or not, is recommended.*
- Take care and be responsible for their own and others health and safety.

  NOTE: *The skills required to drive a vehicle exceeding 7.5 tonnes MAM that is based on a large vehicle chassis can be demonstrated by the passing of the category C driving test, where not held.*

Fitness to work.

3.4 Evidence that the operator is medically fit to operate the machine should be obtained at intervals not exceeding 5 years or intervals as specified by an occupation health provider. Further information and procedures are to be found in the *Plant Safety Group's guidance on Medical Fitness for Plant Operators (https://www.cpa.uk.net/safety-and-technical-publications/plant-safety-group)*

Supporting Personnel

3.5 An appointed supporting person should be able to:

- Be competent (*See Annex 3*);
- Be sufficiently mature and able if operating a suction/vacuum excavator on the site;
- Be medically and physically fit for the relevant duties, with particular regard to eyesight, hearing and reflexes and a ‘Fitness to Work’ statement is included within the risk assessment and method statement;
- Be physically able to operate the suction/vacuum excavator safely;
- Be able to judge distances, heights and clearances;
- Be suitably trained and certified for the class of suction/vacuum excavator which they operate;
- Have sufficient knowledge of the machine and its safety devices;

  NOTE: *These may alter from machine to machine and not all the emergency controls are the same*.

- Be fully conversant with the duties of the signaller and should understand the signals code agreed with them.

4. Training and Certification

The Health and Safety at Work etc. Act 1974 [1] requires the employer to ensure, so far as is reasonably practicable, that employees receive "such information, instruction, training and supervision as is necessary to ensure their health and safety at work".

Training Standards

4.1 The training should be in accordance with the CITB national short duration training standards (www.citb.co.uk). The content of the standard is replicated in Annex 3.

NOTE: *The Construction Plant Competence Scheme (CPCS) provides a free-to-download training syllabus at* https://www.nocnjobcards.org/help-and-support/cpcs-support-documents/revision-support-documents/a78-vacuum-excavator/ *to provide employers with the level and skills of knowledge required at a core level for the range of equipment types.*

Training and Competency Certification

4.2 Any plant operator-based certification or carding should bear the CSCS Logo and issued by a CSCS-alliance card scheme member. This indicates that it is in complies with the Construction Leadership Council's (CLC) card scheme criteria for the construction sector. For sectors external to construction, the course content and assessment criteria should map against the relevant CITB standards as in paragraph 4.1.

Periodic Assessment

4.3 Periodic assessments of each excavator operator's abilities should be carried out by a competent person to verify the maintenance of safe standards and to assess any further training needs.

Transfer to a Different Machine

4.4 Specific training, assessment or familiarisation should be carried out whenever an operator is transferred to a different machine, even though it may be a similar model or type. Annex 3 further details factors for training and familiarisation.

Supervision During Training

4.5 Personnel undergoing training should be adequately supervised.

Proof of Training

4.6 The excavator operator should always be able to show proof of training to the owner or site management. As per the Construction (Design and Management) Regulations 2015, Scheme cards should not be accepted at face value and assessment of ability (whether desktop or through demonstration) should be undertaken on new employees.

NOTE: *The principles of training, familiarisation and competency are further detailed in Annex 3.*

5. Management of the Excavating Operation

Management Requirements

5.1 All excavating activities should be planned and risk assessed to ensure that all significant foreseeable risks have been taken into account. Planning should be carried out by personnel who have the appropriate expertise. In cases of repetitive excavating activities, this planning may only be necessary in the first instance, with periodic reviews to ensure that no factors have changed. Standing procedures should be used to form the basis of a system of work, but will usually need to be supplemented by site-specific information.

Risk Assessment and Method Statements

5.2 The suction/vacuum excavator owner should be able to supply, where requested, information to the customer that details the safe operating procedures and typical risks in suction/vacuum excavation operations. This is so that an assessment around safe operation can be devised or incorporated into the hirer's site risk assessment and method statements for the work in question. This needs to be in compliance with the Construction (Design and Management) Regulations 2015.

5.3 There should be both at the pre-work stage and during the work, dialogue between the owner and hirer so that operations are understood and carried out safely - and within the operational parameters of the machine being used. The operator should work within the hirer's risk assessment and method statement, identifying the safe operating parameters for the work to be carried out.

5.4 The drafting of a site-specific risk assessment requires detailed knowledge of the site and its surroundings, ground and support conditions, contamination, local and nearby operations and other local factors. The principal contractor for the site is best placed to prepare the site risk assessment. Plant suppliers can assist with information relating to their plant and the operations that have been discussed and contracted. Owners may need to check that going beyond the provision of basic information does not impinge on the requirements of their insurance policy and are advised to discuss with their insurance company accordingly.

5.5 Contractual arrangements relating to the operation need to be determined when risk assessments and method statements are being devised, particularly where the operation is under a contract excavation as opposed to a rental-only contract.

Information for the Hirer

5.6 To assist the hirer to select the correct model of suction/vacuum excavator, the owner should provide or source information such as:

- Maximum reach and radius of boom;
- Standard equipment carried on an excavator;
- Available accessories and implements;
- Maximum likely ground loadings of the machine;
- Footprint of the machine with all stabilisers extended;
- Boom working configuration;
- Cubic excavation rates for a range of ground types and situations;
- A policy outlining procedures where the operator is unable to work due to their concern regarding safety, health or previously unknown or unforeseen issues.

NOTE: *List 5.6 is not exhaustive and further criteria may be set by hirers.*

Where requested this list can be made site specific – but only to the extent that the owner has knowledge of the site, the site arrangements and the local area.

Suction/vacuum Excavator Hire Checklist

5.7 The hirer should discuss with the supplier the nature of task, nature of site and provide sufficient information to the hirer so that they can determine the type of machine that will be best suited for the task. The hirer may wish to make reference to a suction/vacuum excavator hire checklist to assist the owner to provide the correct machine for the job.

Safe System of Work

5.8 A safe system of work should be established by the hirer and this should be followed for every excavating operation. The hirer should include in the safe system of work, from the arrival of the suction/vacuum excavator on site to its departure:

1. Specific site hazards e.g. overhead and underground;
2. A site-specific risk assessment;
3. The preparation of a method statement;
4. Arrangements for access onto, across and off the site;
5. The planning of the operation;
6. A copy (where applicable) of the phase plan under the Construction (Design and Management) Regulations 2015;
7. The site of the excavation taking into account proximity hazards, space availability and suitability of the ground to support the weight of the suction/vacuum excavator;
8. The provision of properly trained and competent personnel who have been made aware of their relevant responsibilities under the Health and Safety at Work Act 1974 etc.;
9. Appropriate PPE and RPE for the operation;
10. Adequate supervision by competent personnel;
11. Assessment of the risks and operator abilities for lone working in the small number of situations where this is deemed acceptable (See paragraph 8.68);
12. Ensuring the safety of persons not involved in the excavating operation;
13. The selection, provision and use of ground engaging tools;
14. Size and arrangements of the exclusion zone around the excavator and working area;
15. Shielding to contain flying debris;
16. The position of the excavator and any necessary preparation of the site for its positioning;
17. The requirement for all personnel to be able to communicate clearly;
18. Ensuring that all necessary documentation is available for inspection and valid;
19. Preventing unauthorised use of the excavation plant;
20. The provision of a spoil discharging area, taking into consideration all environmental issues e.g. dust/liquid effluent mitigation measures;
21. Adequate lighting where required;
22. Welfare arrangements if the work location is too far from the main site facilities;

23. Size and depth of excavations.

***NOTE**: In principle, this has been arranged as a list in order of conduct and/or the highest priority.*

Fatigue Management

5.9. During the planning stage, the working hours and nature of work being carried out by the operator and others involved in the process needs to be considered to minimise fatigue which can lead to mistakes and incidents etc.

5.10. Fatigue is considered to be a decline in mental and/or physical performance that can result from prolonged exertion, sleep loss, monotonous or complex work, machine-paced, external or personal activities, or other workplace stresses.

5.11. There is a legal duty upon employers to manage risks from fatigue and compliance with the Working Time Regulations may not be enough to manage work-place fatigue. The HSE guidance document HSG 48 – *Reducing error and influencing behaviour* provides advice on the management of workplace fatigue. (https://www.hse.gov.uk/pubns/books/hsg48.htm). Annex 7 outlines the key factors to be taken into account when dealing with human factors.

5.12. Travel time before and after time on site should be taken into account when managing fatigue.

Documentation

5.13 Certification for both the host vehicle and suction/vacuum unit must be in accordance with the following regulations and amendments:

- Provision and Use of Work Equipment Regulations (PUWER) 1998;
- Lifting Operations and Lifting Equipment Regulations (LOLER) 1998;
- Road Vehicle (Construction and Use) Regulations 1996;
- Road Traffic Act;
- Controlled Waste (England and Wales) (Amendment) Regulations 2012;
- Waste (Scotland) Regulations 2012.

The following documentation should be available for the machine prior to the excavating operation being commenced:

- Inspection Certificate/ Certificate of Conformity if less than 12 months old/IVA;
- Operator's card or other relevant certification that prove the right level of competency required;
- Daily /weekly and other statutory check sheets;
- Certification for (where relevant):
    - harness use (including anchor points where working at height);
    - vehicle;
    - lifting;
    - ancillary equipment and accessories.

5.14 All certification must be in date and meet legislative and regulatory requirements. Evidence of the Roadworthiness Inspection Sheets should be supplied if requested.

***Note:** Where the assets are registered as an LGV, they require proof of an O license and proof of waste carriers (not exceeding vehicle weights).*

5.15 Depending on classification, some large vehicle-based units may be currently exempted from the Driver and Vehicle Standards Agency (DVSA) annual test (MOT). Even if they are, it is recommended that owners of these types present their vehicles for the annual test on a voluntary basis. Other sectors that use large vehicle-based units such as mobile cranes have recommended the introduction of voluntary MOTs. See Annex 9 for further information on classification and testing requirements

6. Selection of Suction/Vacuum Excavators

Size and Excavating Capacity

6.1 Suction/vacuum excavators are available in a number of types and capacities. The characteristics of each suction/vacuum excavator should be considered in relation to the job requirements.

Hirer's Responsibilities

6.2 The responsibilities of the hirer, in consultation with the nominated machine owner, in requesting a suitable suction/vacuum excavator should take into account:

- Access to and egress from the site suitable for the size of the machine;
- That there is sufficient area for all the machine's stabilisers to be fully deployed;
- The ability of the ground to support the loads likely to be imposed by the machine's stabilisers, tracks or wheels and consideration for load spreading pads; (See paragraphs 8.43/8.44)
- The suitability of the ground for suction/vacuum excavating activities;
- Underground restrictions, e.g. cellars under pavements, cables close to the surface, proximity of adjacent foundations/undermining;
- Overhead obstructions, e.g. cables and structures;

  NOTE: *It is the hirer's responsibility to devise a safe method of working in the vicinity of overhead cables.*
- The reach of the nozzle; boom configuration and left or right hooper tipping;
- Requirements for the vehicle to travel on the public highway with a load:
- Provision for a safe working area (allowing for exclusion zones) for the receiving hopper of the suction/vacuum excavator;
- The need for staff to undertake marshalling duties;
- The provision of a second operator*;*
- Adequate protection of the services or structures from potential damage by the nozzle and ground-engaging tools;

  NOTE: *It is the Hirer's responsibility to ensure that adequate insurance is in place in the event of damage.*
- Any special operational requirements or limitations imposed;
- The conditions of hire, particularly in respect of insurance aspects.

Machine Selection

6.3 The suction/vacuum excavator owner (in consultation with the hirer) should select the machine to be sent to a site on the basis of the following considerations:

- Information provided in paragraph 6.2 above;
- Scope of work details – including excavation details;
- The distances to be driven to and from the site by the operator to reduce the road safety risk element;
- The hours worked by the operators on the previous day and the estimated rest period between their jobs;

- Selecting the operator requirements, using a lead operator accompanied by a second competent operator;
- Need for additional labour to complete non-excavator-based tasks.

7. Travelling to and from the Site *(Truck-mounted and trailer Suction/Vacuum excavators)*

Legal Requirements

7.1 Vehicles travelling on the public highway need to meet Road Traffic Act requirements in relation to:

- Driver licensing and age restrictions;
- Maximum Authorised Mass (MAM);
- Gross Train Weight (GTW);
- Vehicle Excise Duty;
- Driving hours, tachographs etc;
- Carrying of loads;
- Plating and testing.

7.2 In the case of suction excavators that are mounted on a truck chassis and are compliant to the Construction and Use Regulations (C&U), the driver must hold the relevant category entitlement for the MAM of the vehicle on their driving license. In most cases this would be category C, however in some cases, vehicles may be classed as 'engineering plant' on the V5C. This does not take precedence over the definition of 'engineering plant' as listed in section 3(2) of the C&U regulations. As such, this means they cannot be driven on a category B.

Note: *Information on driving license categories and entitlements can be found at - https://www.gov.uk/driving-license-categories.*

Vehicles that are not compliant to the C&U regulations and are classed as 'engineering plant' are exempt from the need for vocational licenses and can be driven on a category B license.

Note: *INF52 - Large vehicles you can drive using your car, bus or lorry license. Provides further information, it is worth noting that the digging machine here is defined differently from that of taxation classes. Within the definition given in INF52:*

- *digging machines (vehicles with digging buckets or shovels) which travel on a public road only for the purpose of going to or from a site where they are used for digging or shovelling work.*

In this case, this definition would apply to vehicles such as a backhoe-loader. A suction excavator is fitted with neither a digging bucket or shovel. CPA TIN 401 provides information on driver licensing for truck mounted equipment. www.cpa.uk.net

7.3 Further restrictions apply to the towing of trailers with cars and vans, where owners/operators must check their towing vehicles permitted gross train weight (GTW). GTW will determine the permitted total weight of the towing vehicle, the trailer and its load:

- Those holding category B entitlement and having passed their test pre-1 January 1997 can drive a vehicle and trailer combination up to 8.25t MAM;
- Those holding category B entitlement and having passed their test on or post-1 January 1997 are restricted to driving vehicles up to 3.5t MAM and a trailer that weighs up to 3.5t MAM, within the towing limits of the vehicle;
- Those holding category BE entitlement and having a valid-from date on their license pre-19 January 2013, can tow any size trailer within the towing limits of the vehicle;

- Those holding category BE entitlement and having a valid-from date on their license post 19 January 2013 can tow a trailer up to 3.5t MAM, within the towing limits of the vehicle.

7.4 The carrying of excavated material within the vehicle's hopper is controlled by legislation. Information on correct registration, taxation and legalities can be found in Section 13.5.

Place of Work

7.5 Employers and employees should consider the journey to and from the site as an extension of their place of and time at work.

Planning Journey Time

7.6 Sufficient time should be allocated by the employer to allow the operator/driver to drive to the site without the need to exceed maximum speed limits or take risks on the road in general. In some cases, driving times are limited depending on the classification of the vehicle and regulatory requirements need to be met.

Pre-journey Checks

7.7 The operator/driver should use the time allocated by the employer to ensure that the vehicle/combination is safe to be driven on the road, e.g. by checking the function of the vehicle/combination's lights, tyres etc. and other essential pre-driving checks.

7.8 Many vehicles carry equipment and accessories, which are usually stored in lockable side-accessed lockers. Checks need to be made to ensure that all doors on stowage lockers are secure as equipment has been ejected from unsecured lockers during road travel.

Behaviour on the Road

7.9 The operator/driver should not take unnecessary risks on the journey, taking care for his own safety and health and that of other road users and others who may be affected by his actions.

7.10 There are in place initiatives, particularly in urban and large populated areas, to minimise collisions with vulnerable road users such as cyclists and pedestrians. Advice has been issued by transport-based authorities on additional equipment that is recommended to be fitted to working vehicles to aid driver all-round visibility and reduce blind spots where a vulnerable road user may be hidden.

7.11 Client and contractors in compliance with vulnerable user collision-reduction schemes are mandating within their supply chain that vehicles entering their sites are fitted with a minimum number of additional vision-related safety features. Further information on safe driving and vulnerable road user initiatives can be found through the Fleet Operator Recognition Scheme (FORS) who produce toolbox talk material for safe driving and vulnerable road users – www.fors-online.org.uk

Local Authority Requirements – Direct Vision Standards

7.12 The Transport Authority for London (TfL) have introduced a Direct Vision Standard (DVS) and Safety Permit Scheme for HGVs over 12 tonnes gross vehicle weight and need to obtain a safety permit before entering and operating in most of Greater London. The DVS gives HGVs a star rating, measured by how much a driver can see directly through their cab windows. Safe System measures help reduce the danger of HGVs that do not meet the minimum star rating for an HGV Safety Permit.

7.13 Vehicles can have a rating of zero stars (the lowest rating, with poor direct vision) up to five stars (the highest rating with excellent direct vision). If an HGV is rated one to five stars, the owner can apply for a permit without the need to provide any additional evidence. If an HGV is rated zero stars, the owner will need to make their vehicle safer by fitting it with Safe System improvements.

7.14 Certain HGVs and vehicles may be fully or partially exempt. Fully exempt vehicles are not required to hold a permit, but the owner can still apply for one for their records. Partially exempt vehicles include certain vehicle types which are exempt from specific Safe System requirements, as they make fitting of specific equipment impractical or impossible.

From 28th October 2024, the standard changed and the below link supplies the relevant information and requirements. In summary:

- Vehicles with zero, one or two stars will need to be fitted with a progressive safe system fitted, to operate in London post 28th October 2024.

Note: *More information, downloads and application forms can be found at: https://tfl.gov.uk/info-for/deliveries-in-london/delivering-safely/direct-vision-in-heavy-goods-vehicles*

Static and trailer-mounted Suction/Vacuum excavators

7.15 The delivery, loading/unloading and collection of trailer-mounted suction/vacuum excavators, or static units placed onto a transporter should be adequately planned by the equipment owner. The principal contractor/hirer must ensure that relevant site information, including any hazards or time restrictions, is provided to the owner to assist with arranging delivery and collection.

7.16 Those responsible for the transporting and/or delivery of units on a trailer or transporter must be sufficiently trained in the correct securing procedures and types of securing accessories that should be used, along with knowledge of the Road Traffic Act requirements in relation to loading and unloading onto or near the public highway.

7.17 Method statements relating to the delivery of a trailer or static unit need to be passed to the hirer by the owner on delivery. At the point of delivery and supported by appropriate signatures, the responsibility of any equipment passes to the hirer.

8. Arrival on Site and Setting Up the Machine

General

8.1 The suction/vacuum excavator operator is responsible for the correct operation of the excavator in accordance with the manufacturer's instructions and within the safe systems of work.

8.2 On arrival, the suction/vacuum excavator operator must immediately report to the site office or appropriate reception area for registration purposes.

Site Induction

8.3 The suction/vacuum excavator operator must attend site safety induction training as required by the site.

Authorised Access Routes

8.4 The suction/vacuum excavator operator must use only authorised routes across the site.

***NOTE**: It is the hirer's responsibility to assess the ground conditions and confirm its suitability to support the suction/vacuum excavator. The excavator operator should use only authorised routes across the site. Where possible, site routes should be taken to eliminate reversing. Where this is not possible, the hirer/contractor should supply a vehicle marshaller to assist with manoeuvring when necessary. Suitable correctly fitted and working mirrors, CCTV cameras/sensors and other visual aids should be considered to reduce the risk of collisions.*

Identifying Underground Services

8.5 The hirer is responsible for obtaining information on underground services within the work area. Utility records should be checked to identify any known services and their approximate route. This should be followed by suitable and sufficient ground surveys to identify the actual location, types, depths and nature of all services. Where any of these services will be exposed or could be e.g. affected by ground movement, the transmission and utility owners should be contacted to ensure compliance with their procedures and to check what actions need to be taken in emergency situations. Relevant services include:

- Electricity;
- Gas (low, medium, high pressure);
- Water, telecoms;
- Hydrocarbon fuels grids;
- Foul drainage/sewage, storm water and land drains;
- Data services.

In addition, on or in the vicinity of chemical works or factories, there may be buried chemical feedstock pipelines.

8.6 Requirements can alter e.g. depending on the size, supply pressure or voltages involved and care must be taken that the correct service has been identified. Services that are particularly old – such as those involving brittle cast iron (gas or water) or asbestos cement (water) may need a high level of protection during access to the work area and during excavation.

8.7 In many cases, working practices associated with the excavation of material around, or the exposure of buried services needs agreement by the utility services owner prior to work taking place.

8.8 Detection of existing services e.g. desktop study and site reconnaissance, topographical survey, geophysical utilities survey will need to be taken.

The level and extent of survey needed will be dependent on the historical use of the proposed worksite and types of services.

8.9 Surveys and reporting surveys/interpretation of results need to be carried out by suitably qualified and/or experienced personnel. Surveys should be considered in the planning of, and prior to, the work.

8.10 Guidance on procedures for undertaking survey work is contained within HSE Guidance Note HS(G) 47 – *Avoiding danger from underground services.*

***NOTE**: This guidance is predicated on avoidance of mechanical excavation unless the exact location of the service has been proven by hand digging. Suction/vacuum excavators using non-ground engaging tools to loosen soil can provide a safe means to expose a buried service provided account is taken of the likely aged condition of the service, its likely depth and any need to provide immediate support to prevent damage due to movement*

Site plans and markings

8.11 The location of all service routes identified by site survey should be clearly marked on the ground prior to excavation, usually by flagged markers and line markers (using marker spray-paint). The required area for excavation also needs to be clearly marked.

8.12 Mechanical excavation should not be used within 500mm of a live service that has been positively located using survey equipment on the ground. This includes use of intrusive ground agitating tools and attachments.

8.13 Mechanical excavation should not be used at all where a service believed to be in the area is not located by site survey. Instead suction/vacuum or other forms of non-invasive/non-intrusive-type excavation methods should only be used to confirm the presence and route of the service which can then be marked.

8.14 Where the ground surface consists of concrete or tarmac, a core drill or breaker plant can be used by competent people, following approval for the activity, to remove the hard capping and ensuring minimal over-break as some services may be shallower than expected. Services encased in concrete are sometimes encountered, even though this is extremely poor practice. Utility support will be needed if this occurs as services may need to switched off and isolated, with gas services needing to be isolated and depressurised.

Permits to dig (where applicable)

8.15 A permit-to-dig forms part of the risk assessment and method statement that is issued by the principal contractor (possible as part of an overall package plan) and will only be issued once the full nature of the operations, types of services, scope of work, ground type, site constraints and conditions and all emergency procedures have been established.

8.16 The operator and others undertaking the work should be supplied with a written plan about the location of, and types and nature of the underground services and forms part of the site induction and approval to work procedures. There should be an effective supervision and monitoring system in place to ensure that the conditions of a permit have been complied with.

8.17. All works must be in accordance with the HSE Guidance Note HS(G) 47 – *Avoiding danger from underground services.*

Siting the Machine

8.18 The position of the machine must be determined by the hirer after discussion with the owner, bearing in mind the ground conditions, the distance to the excavation, the working position of the suction/vacuum excavator operator and positioning to avoid trench collapse.

Underground voids - e.g. basements, cellars, culverts, manhole chambers etc. and weak ground e.g. loosely backfilled drainage trenches and weak or waterlogged soils - should be avoided when determining the positions of stabilisers.

8.19 Where the vehicle is to be manoeuvred remotely using the hydrostatic drive function for positioning or re-positioning, this activity should be carried out only if the following requirements are met:

- The vehicle is on level and firm ground;
- There is a trained LGV driver in the driving seat;
- That there are a minimum of two trained operators for the activity;
- Hold a drivers license as a minimum and have undergone a briefing on hydrostatic drive capabilities.

Overhead Cables

8.20 Overhead cables must be considered when setting up the machine; the boom must never be positioned where it might touch overhead cables or where electricity might arc to the boom or other parts of the machine. A safe method of working in the vicinity of overhead cables must be included in the overall safe system of work.

8.21 Planning and risk management of work close to overhead cables must include liaison with the owner to see whether there are any strong reasons why the service cannot be made dead for the duration of the work. Where this is not possible, the machine should be located elsewhere and connected to the excavation location by hose laid on the ground.

NOTE: *Further guidance is given in HSE Guidance Note GS6 - Avoidance of danger from overhead electric power lines.*

Exclusion zones

8.22 An effective exclusion zone needs to be facilitated consisting of barriers that physically restrict the entry of unauthorised personnel, with sufficient signs to inform others of the restricted area.

Safety with Excavations

8.23 A risk assessment must be undertaken by a competent person (e.g. groundworks designer for shallow excavations and a Geotechnical Engineer for deep excavations) and take into consideration the potential for an excavation wall collapse, possibly causing injury, and the need for appropriate support structures. The risk assessment should seek to eliminate or reduce the risk at source e.g. battering the sides etc.

8.24 A permit-to-enter system may be required under the permit to work process. The permit to enter may be used where all preparatory work has been carried out - i.e. temporary works designed by a competent temporary works designer - to meet the requirements of the permit to work, with a permit to enter issued when all final pre-entry checks have been carried out. This is to ensure that entry into the excavation does not occur before it has been made safe.

8.25 The following hazards need to be taken into account:

- Collapse of trench sides, including where this could result from adding additional weight on the ground adjacent to the excavation sides;
- Number, type and location of underground services;
- Contaminated ground/groundwater;
- Fall of persons, equipment of machinery;

- Poisonous or explosive atmosphere, or a lack of oxygen within the excavation;
- Flooding;
- Overhead services;
- Undermining of adjacent structures or objects;
- Position of the machine, considering the angle of repose and overloading the sides of an excavation-consider the exhaust position when siting the machine as the fumes could enter the excavation.

***Note**: Use of gas detection equipment to check e.g. oxygen, carbon monoxide/dioxide, hydrogen sulphide and where necessary attendance by a contaminated land expert.*

8.26 The following control measures should be considered:

- Stabilisation of excavation sides by battering, stepping or use of shoring;
- Stability of adjacent structures;
- Storage of excavated and other materials well away from the edge (i.e. further than 1x depth of excavation);
- Plant located away from the excavation edge;
- Traffic routed well away from the area being excavated;
- Safe access and egress into the excavation;
- Safe exposure and support of underground services;
- Fall prevention for those involved in the activity;
- Adequate ventilation;
- Dewatering arrangements;
- Regular inspections by a competent person;
- Lighting requirements;
- Size of the exclusion zone around the excavation for pedestrians and plant;
- PPE and RPE.

8.27 Trench support must be considered and will depend upon:

- Type of excavation;
- Nature of the ground i.e. geotechnical properties of the soil/ground conditions;
- Groundwater conditions;
- Additional pressures on the ground adjacent to the trench – such as the vacuum excavator itself;
- Period of the excavation being open;
- Depth of the excavation;
- Requirement for worker access.

8.28 Trench support materials and techniques will depend upon the factors listed and must be determined by a competent person, usually a specialist engineer and preceded by a survey to determine soil and other ground conditions. The installation, alteration and removal of any support must be supervised by a competent person.

8.29 The excavation must be closely monitored when first opened and when unsupported. Environmental factors such as heavy rain or prolonged periods of dryness, or high temperatures can affect ground and impact upon the stability of the excavation.

8.30 There must be a safe means of accessing and egressing the excavation, with the use of equipment such as ladders meeting regulatory requirements in terms of material, design and length in relation to the trench depth.

8.31 Appropriate steps must be taken to prevent persons, materials, plant and equipment, earth or other materials from falling into the excavation. Physical barriers should be used of suitable strength and resistance to movement. This means being rigid enough to retain a person falling hard against them. Lightweight barriers are only suitable to keep persons at least 2 metres from any open edge. If working on the highway or in public spaces, Highway Authority approval may be required. Appropriate lighting of the excavation and barriers may be needed, particularly near to or on the highway or public spaces.

8.32 Excavations must be sufficiently ventilated to prevent both the build-up of toxic gases and oxygen depletion. Exhaust gases of nearby plant or vehicles can seep into the excavation and deplete breathable air. Where persons may need to enter the excavation, monitoring for the presence of toxic and asphyxiant gases will be needed unless it can be shown that air quality will not deteriorate. All excavations require a safe system of work and permit to work procedures may need to be implemented.

Working on the Public Highway

8.33 For the operation and maintenance of highways, temporary traffic management measures need to be implemented. This is to facilitate safe roadworks whilst keeping traffic flow disruption to a minimum. With high traffic flows on many roads, it is important to plan all work activities to optimise safety and work efficiency whilst minimising congestion.

8.34 All reasonable steps need to be taken to ensure that the effects of works are reduced to a minimum and need to confirm with the requirements set out in the Traffic Signs Manual Chapter 8 (2009) to offer advice on the mandatory requirements under legislation and regulations for the signing and marking of obstructions and temporary traffic control measures, for which the standard is considered as a minimum. Chapter 8 comprises of three parts:

- Part 1 (Design) provides guidance for those responsible for the design of temporary traffic management arrangements;
- Part 2 (Operations) provides guidance for those responsible for planning, managing and participating in operations to implement, maintain and remove temporary traffic management arrangements;
- Part 3 (Update) provides information on the changes to the methods used to prescribe traffic signs according to the 2016 Traffic Signs Regulations and General Directions.

8.35 Safe and efficient traffic management arrangements are founded on the following basic principles:

- Provision of clear and early warning of obstructions in the highway;
- Optimisation of road space and the provision of adequate safety zones and working space at working locations;
- Clear directions relating to decisions/actions required from road users;
- Minimisation of potential conflict between road users - and between road users and those working within the affected area;

- Credibility of traffic signs and temporary arrangements, speed limits and restrictions appropriate for the temporary highway geometry and safety features.

8.36 Planners of road work schemes, and those involved with working on the highway, need to take into account a number of factors including that:

- Safety is the prime consideration;
- The needs of pedestrians and other vulnerable road users are properly managed to ensure they are provided with suitable alternatives and not forced into dangerous situations;
- Space is often at a premium and that there is adequacy for the proposed work operations and storage of materials and equipment;
- Arrangements are made for access to and exit from the site;
- On some roads including live motorways, a restriction including some traffic management and in particular reduction of the speed limit through the works requires approval by the Highway Authority and prior publication of a notice advising the public of the work.

8.37 The temporary traffic management design should be set out in a clear documented format which including drawings and specifications, if appropriate, which are scheme specific and able to be relayed to those responsible for and working within the relevant areas.

8.38 Obstructions and excavations must be adequately guarded at all times by the use of appropriate barriers, which are visible both day and night. They should protect persons from roadside hazards and also protect workers from errant vehicles. Four types of safety barriers are common:

- Pedestrian barriers;
- Traffic barriers for guiding vehicles and indicating that a traffic lane or part of a lane is closed;
- Lightweight barriers for delineating the inner edge of safety zones;
- Vehicle restraint safety barriers.

8.39 For off-the-carriageway works, guarding or signing may not be required on single carriageways where the works are carried out on minor roads or on all-purpose carriageway in daylight on or above footway, verge, central reservation etc. providing they are within specified situations as outlined in Chapter 8. However, if a works vehicle cannot fully pull off the carriageway, a risk assessment must be carried out which may necessitate advanced signing. Sufficient space will need to be provided for the works vehicle and signing and traffic cones provided as per the requirements of Chapter 8.

8.40 Access for works vehicles to site within the highway requires careful planning and needs to take into account:

- Provision of adequate signing;
- Imposition of temporary speed limits;
- Access to the works from the adjoining network;
- Conflict with local land-use patterns and timing of works;
- Prevention/removal of mud and debris left on a road surface by vehicles leaving the site;

- Segregation of light and heavy vehicles who may need to follow different access routes;
- Impact upon the local area.

8.41 There may be additional requirements placed upon the excavating activity if undertaken near to highway structures such as bridges, flyovers, subways, tunnels, culverts, sign-gantries, lighting columns etc. Restrictions will also apply to ancient structures, scheduled ancient monuments and listed buildings. These can include single items – such as a milestone or posts setting out an extensive medieval causeway and may require special specific consent before work can commence. Excavation among tree roots can also be problematic and require advice and consent from the Local Authority Tree Preservation Officer.

8.42 All those involved with work activities on the highway have obligations to comply with the (NRSWA) act and the various sections of the act and in compliance with the code of practice. Those working on the highway need to be familiar with and comply with temporary traffic management arrangements and work specifications devised by the principle undertaker of the works.

Reference: *Code of Practice for the Co-ordination of Street Works and Works for Road Purposes and Related Matters (Department of Transport), Traffic Signs Manual Chapter 8 (2009).*

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1149654/co-ordination-code-of-practice-2023.pdf and

https://www.gov.uk/government/publications/traffic-signs-manual

Use of Stabilisers

Manufacturer's Instructions

8.43 All stabilisers (where fitted) must be fully deployed in accordance with the manufacturer's instructions - where appropriate. Sole plates must be used where ground conditions are not suitable to withstand the loads generated by the vehicle.

Sole or Spreader Plates

8.44 All sole-plates must be of adequate strength and size to support and distribute the loads likely to be applied. They should be laid on level ground that makes full contact with the plate. If the ground is locally uneven, it will need to be prepared ready for the plate. Plates must not be levelled using bits of timber, bricks etc.

Responsibility for Ground Conditions

8.45 It is the responsibility of the site management to provide suitable hard standing for the machine to be set up for work and discharging purposes. The ground must be capable of adequately supporting the loads likely to be imposed on it. The Construction Industry Plant Safety Group's - Ground conditions for Construction Plant provides further information on ground conditions. Information on ground conditions can be sourced from the Temporary Works Forum (TWf) who publish information sheets and technical guidance material and where some material can be downloaded free of charge at: https://www.twforum.org.uk/home

NOTE: *Plant Safety Group publications can be freely downloaded at:*
https://www.cpa.uk.net/safety-and-technical-publications/plant-safety-group

Stabiliser Loading Information

8.46 Information should be available on the maximum load (worst case scenario) likely to be applied to each stabiliser. This can vary for each machine type, for which reference will need to be made with manufacturers and suppliers. For example, as spoil collects in the hopper, the loadings on the stabilisers will increase accordingly and therefore maximum loadings may apply.

If the machine is not level, the point loading through the corresponding stabiliser can increase, particularly as the load in the hopper increases – the manufacturer's information should indicate the maximum gradient for each operating condition. Where a substitute machine has been supplied compared to the original specification at the point of hire, amended point loadings will need to be supplied by the owner to the hirer. More information on ground loadings and support requirements can be found in Annex 4.

Pre-use Checks (Vacuum Unit)

8.47 The function of all controls and safety devices should be checked by the suction/vacuum excavator operator for correct working before excavating commences. The correct function of the emergency stop buttons needs to be proven by testing following manufacturer's instructions. The emergency stop buttons should not be used to stop the machine in normal conditions, but only in emergencies.

8.48 All protective guarding and shielding should be in place and non-essential persons kept away from the danger zones of the excavator, such as air intake or exhaust areas.

8.49 The machine should be thoroughly checked as per manufacturer's instructions before the machine is put into use. Checks must include visual inspections of stressed areas, particularly the area between the arm and body. This means that equipment such as hand brushes etc. may be needed to expose areas hidden by dirt and debris.

Remote Control Units

8.50 The unit should be checked to ensure sufficient battery power is available for the intended operations. It should be clean and free from damage including the wearing harness and umbilical cable (where relevant). The operation of the emergency stop button and any other isolating devices must be checked for operational function.

8.51 Before commencing excavation each control function on the remote control should be checked for correct operation. Any fault - such as lack of progressive control, failure to activate, failure to stop and on multi-directional controls, failure to reverse operation - should result in the remote control unit being taken out of service immediately until fully repaired.

8.52 A fully qualified second operative should be in close vicinity to the operation and who has full capability of using the remote control unit, particularly in cases of emergency.

8.53 The length of the umbilical wire needs to be of sufficient length to allow the operator to both be sufficiently clear of the machine's boom arc and radius - and the resultant excavations. The appropriate channel and strength of signal on radio remote units must be ensured before work starts.

Working Near to Slopes

8.54 If the excavator is to be positioned near to a trench or slope, a minimum distance needs to be kept. This should be based on an assessment of the soil by a competent person. Where sufficient expertise is not available and it is not reasonably practicable to obtain an assessment that is specific to the soil type/s and condition on site, there are other options that are suitable for simple situations. Various formulae can be used to calculate the minimum distance required (See Figures 8.1 and 8.2 for examples).

These can be used to determine the horizontal distance from the foot of the slope to the nearest point loading of the machine onto the ground. Figure 8.1 generates a maximum allowable angle of 27 degrees to the horizontal – i.e. toe of slope to nearest stabiliser or wheel.

NOTE: *This angle is NOT the slope of the excavated face.*

8.55 The example formula is based on a low safe-slope angle: The soil itself may stand up with a steeper angle – guidance suggests that an angle of below 40 degrees to the horizontal in dry soils will usually stand-up for sufficient time to complete a short-term task. However, placing a high point load close to the edge places additional load onto the ground and the dug face, which can encourage a collapse – hence a much lower angle to the horizontal is needed.

8.56 Formula based rule-of-thumb methods are not suitable for use on very small section shafts, keyhole access or on hard rock strata as they are deemed too conservative. Neither are they suitable on unstable hillsides etc. – such as berms crossing scree slopes as they do not consider potential instability outside the assessed envelope.

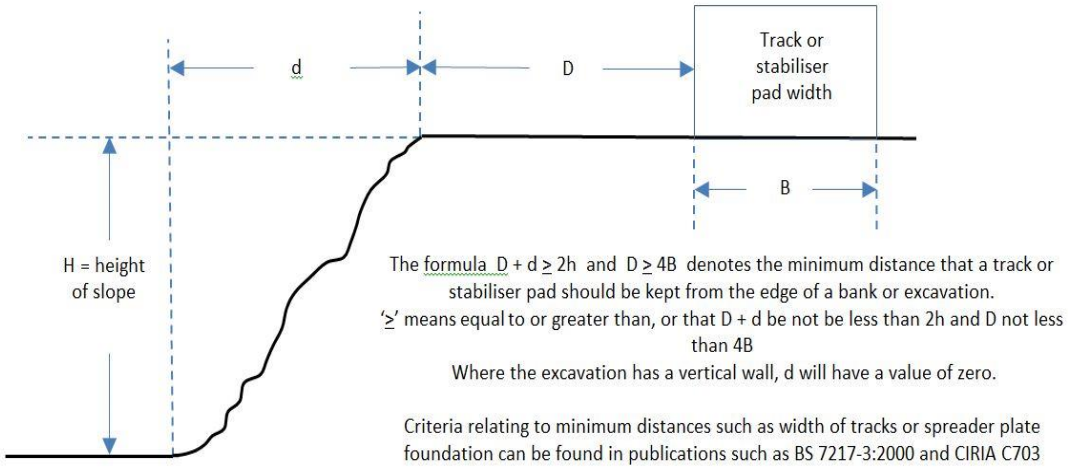


Figure 8.1: Distance to be maintained from slopes

H Height	2 x H	d horiz slope	D Dist from edge	d + D	Is D+d >2h ?	B Width of track or pad e.g.	4 x B	Is D > 4B ?
1.0m	2	0 (vertical)	2m	2m	2 + 0m = 2m = okay	0.5m	2	2 = 2 = Okay
1.5m	3	0.5m	2m	2.5m	2.5 < 3 = Not okay	0.75	3	2 < 3 = Not okay
2m	4	0 (vertical)	2m	2m	2 + 0m < 4m = Not okay	0.75m	3	2 < 3 = Not okay

Figure 8.2: Worked examples

Working at Height

8.57 Excavating a trench means that the operator and support personnel are regarded as working at height as the danger of slips, trips and falls into the excavation could occur.

8.58 The edges of the excavation can be prone to collapse with many soil types as well as the interaction of groundwater. Conventional excavation practice is to provide shoring (support) to prevent the sides and edges collapsing - and to provide edge protection to prevent falls into the excavation. Alternatively, the excavation may be battered (sloping sides – e.g. 40^{o} from the horizontal) or stepped to a similar angle so as to be self-supporting. The work should be planned without shoring only where:

- there is no main entry into the excavation;
- there is no close approach;
- the excavation will only be open for a short period;
- the excavation is very shallow.

8.59 For shallower excavations – e.g. less than 1m deep, advice will be needed from someone experienced in excavation work and knows the hazards involved before a decision can be made that any support would not needed. The nature of much suction/vacuum excavation work involves relatively shallow trenches and may have a support worker close to or in the excavation.

8.60 Working at height includes accessing the machine to carry our preparation, maintenance, cleaning or adjustment activities. Suitable accessing arrangements and fall prevention control measures need to be considered where such work is necessary.

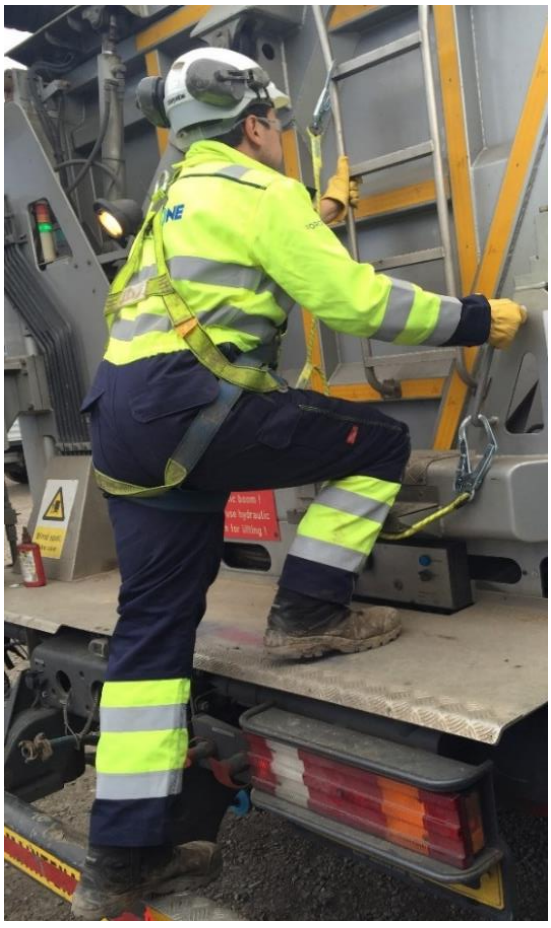
8.61 When considering the risk of working at height during working and cleaning processes, the hierarchy of control be followed (See Paragraph 8.63) should. However, for this type of work, the arrangements also need to consider whether the edge is likely to fail and whether means should be provided to both reduce the likelihood of the edge failing - and support the person if the edge were to fail. This includes the additional use of staging, or other boards or sheet material laid on the ground at the edge, to spread the support worker's weight and to support them if the edge begins to fail.

8.62 Where ladders are used, the potential to maintain three points of contact is a safety requirement. This generally involves hands and feet which must be used when climbing or descending a ladder. On stable inclined ladders, additional support provided by, for example, knees or hips/waist can be taken into account in considering whether a person will be sufficiently stable to allow the work to go ahead while using one or both hands for the task.

8.63 Hierarchy of Measures:

- Avoid work at height wherever possible and actively seek solutions to facilitate this;
- …If this is not possible, use "collective" means of prevention such as guardrails;
- …If this is not possible, use "personal" means of prevention such as work positioning / work restraint systems – such as an inertia reel block attached to a suitable anchor above the work position and attached to a full body harness;
- …if this is not possible, and where a fall may occur, use either "collective" means of protection;

  NOTE: *Examples include soft landing systems such as fall arrest nets or bean bags or air bags but these have limited use in most types of vacuum excavation work.*
- …or, if this is not possible, use personal fall protection such as a fall arrest system (this incorporates a shock absorber in the lanyard which is designed to slow the person before the lanyard goes fully taut) or a fixed lanyard.



© Force One

Figure 8.3: Examples of accessing the machine utilising collective and personal fall protection system

Training

8.64 All persons working at height must be trained to ensure that they are competent to work at height and are able to use any equipment, especially personal fall protection systems, safely.

Selection of Personal Fall Protection Equipment

8.65 Where a risk assessment indicates that a personal fall protection system is required, a work restraint system is preferred where the arrangement can be used to prevent a person from reaching an open edge. Where the work involves access onto a vertical face, a work positioning system may be used but for intermittent users, a fall arrest system is usually needed – albeit often as back up to e.g. working from a ladder.

8.66 Where the use of fall arrest personal fall protection systems is unavoidable, there will be a risk of the wearer being left suspended following a fall. Duty holders need to plan for emergencies and rescue, with a safe system of work and emergency plan in place which will involve the following stages:

- Identify the task to be undertaken and hazards associated with the task;
- Assess the risks involved with a rescue operation and identify the appropriate control measures;
- Develop the method to be used and ensure sufficient workers are trained in the procedures, together with any rescue equipment that may be needed.

8.67 A rescue plan should address the following issues:

- The need for rescue in good time taking into account lone working;
- Communication issues;
- Safety of persons carrying out or assisting with the activity;
- Means of access to the individual needing retrieving;
- Medical needs that may arise through the incident;
- Anchor points and other forms of equipment needed for a rescue;
- Method of retrieving the individual.

Lone Working

8.68 Lone working can be hazardous due to the high risk of the activity and the environment, particularly where:

- Working in or near to a confined area;
- Working with or near to live electricity or pressured medium such as gas or water.

Lone working is not recommended by the SAVE Interest Group and for which two competent operatives should be present at all times during any excavation operations as good practice.

Supervision

8.69 A risk assessment and method statement, constructed by the hirer in consultation with the owner - who has knowledge of the site and machine type - needs to determine the level and extent of work allowed and the level of supervision required. Factors to be taken into account include:

- Fatigue;
- High stress levels;
- Physical nature of the work;
- Length of the task;
- Nature of the environment including seasonal issues;

- Type and nature of the location;
- Complexity of the operation.

8.70 The risk assessment and method statement needs to be overseen by the client/hirer and determine when and how much supervision is required to effectively supervise or support the operation. The supervisor should have a good understanding of what the emergency procedures are in relation to the type of suction/vacuum excavator being used and the nature of the work being carried out.

Contaminated Land – Radioactive Material

8.72 Excavation or extraction work on or near to current or historic nuclear sites, hospitals, universities, pharmaceutical sites, local authority landfill sites etc. may contain a nuclear inventory.

8.73 Advice about working in potentially radioactively contaminated brown field land shall be sought from a Radiation Protection Advisor prior to commencement of work to ensure compliance with IRR 17 and any local site requirements. The advice should typically consider:

- Management arrangements for radioactively contaminated land e.g. designated access/egress controls, radiological monitoring requirements while on site and during execution of work; personnel monitoring when leaving the working area i.e. for comfort breaks, end of shift etc. Monitoring includes fixed, portable and wearable samplers with alarm and e.g. film badges that record dose over time;
- Types of PPE/RPE;
- Arrangements for hygiene;
- How the machine and hoses will be radiologically tested/verified as being clean at the end of the work;

  ***NOTE**: Items which may not be able to be either radiologically cleaned or verified may have to be assessed tested and sentenced to an authorised radioactive waste site or retained (safe, secure storage) on the site of origin for future use.*

- The safe discharge/storage arrangements of the waste container and any liquid effluent;
- Radiological monitoring arrangements for HEPA filters.

Radioactive Waste

8.74 Radioactive Waste Advisors (for solid waste/spoil and liquid effluent) will be required to determine characterisation requirements (i.e. radiological testing of solid waste - spoil and liquid effluent) and assist in authorised sentencing disposal arrangements.

8.75 Any spoil or liquid waste will require testing at laboratories licensed to receive radioactive samples.

8.76 Transportation of samples must comply with the appropriate Transport Regulations – Carriage of Dangerous Goods 2009 - as advised by the Radiation Protection Advisor and Dangerous Goods Safety Advisor.

8.77 HEPA filters will need to be sampled for radioactivity/chemotoxic contamination to establish an authorised disposal route.

***NOTE:** Regulations that deal with radioactive contaminated land include:*

- *Environmental Protection Act 1990 - Section 78Y as amended by section 57 of the Environment Act 1995;*

- *Radioactive Contaminated Land (Enabling Powers) (England) Regulations 2005;*
- *Radioactive Contaminated Land (Modification of Enactments) (England) Regulations 1996;*
- *'Ionising Radiation Regulations (latest version applies).*

Further information on radioactive contaminated land can be sought from:

https://www.gov.uk/government/collections/radioactive-contaminated-land

9. During the Excavation

General

9.1 If, in the opinion of the suction/vacuum excavator operator, there is a risk of injury to themselves, other persons, damage to property or their machine; caused by the operation of the excavator or boom, the operation must cease immediately.

Avoiding Overhead Power Lines

9.2 The boom must never be operated in a position where it might come into contact with live electricity cables or approach them to a point where the electricity arcs to the boom. The suction/vacuum excavator operator must be provided with a safe access route that takes account of the height of the equipment; with a safe working area that does not create a risk of contact with overhead power lines.

9.3 Work should be planned to maintain the safety clearance distances provided by the hirer before work commences and these should be based on industry guidance and advice from the utility/owner of the overhead lines.

9.4 Where the plant needs to travel under overhead lines, then marked routes and height warnings in the form of goal posts or similar should be in place. Where vacuum excavation needs to take place close to overhead lines, fencing or barriers should be in place to demarcate the safe working zone.

9.5 Where clearance distances in accord with industry expectations cannot be provided, smaller plant should be considered. If this however cannot resolve the concern, the utility/owner of the overhead lines should be given advance warning and the request made to arrange for the lines to be powered down for the duration. Where this is not possible, an alternative method of excavation may be needed.

NOTE: *Further guidance is given in HSE Guidance Note GS6 - Avoidance of danger from overhead electric power lines****.***

Operating the Suction/vacuum Excavator

9.6 The excavator should be positioned to allow work to be undertaken with sufficient hose reach, with minimal or no re-movement of the machine. The minimum allowable distance to the edge of the intended excavation should have been calculated by a competent person (see Section 8.54).

9.7 The correct fan speed and/or pump speed for the task needs to be set along with the nozzle type and diameter. Where needed and fitted, the earthing system should be used by driving the earthing stake into the ground near to the excavation and checked for proper function. The driving of earthing stakes should only be undertaken after ensuring that no underground hazards exist.

9.8 The nozzle should be placed vertically above the area of excavation and at a distance close to but not engaging with the ground. The ground engaging tool is used to break the ground using the correct method and spoil removal is via the hose. The nozzle itself should not contact the ground. It is recommended to use non-conductive nozzles when working in the vicinity of potential services.

9.9 At all times, no personnel including the operator should be under the arm and/or hose assembly, either at ground level or within an excavation. No parts of the body should be in near proximity to the end of the hose whilst suction is underway. There is a high risk of limbs etc. being drawn into the hose if anyone gets too close.

9.10 The large movement of air caused by the suction of the hose can cause some depletion of clean air in an enclosed area such as a trench, tunnel or chamber and may in certain circumstances, cause breathing difficulties. Sufficient ventilation to maintain a flow of clean replacement air must be maintained during works.

9.11 Incidents have occurred whereby the nozzle has inadvertently detached from the hose due to a failure of the connection clamps. This can pose a significant risk to anyone or anything within the immediate vicinity. Thorough and regular examination of the clamp should be undertaken during operations. Some owners have engineered solutions through the fitment of secondary restraint systems which although cannot prevent the actual detachment, prevents the nozzle (and in some cases, the clamp itself) from free-falling.

9.12 The SAVE Interest Group do not recommend the use of rotating nozzles as this is a form of aggressive digging. Where the nozzle is required to contact the ground, there is the potential to damage services and tree roots.

IMPORTANT: The nozzle is not designed to be used aggressively to excavate ground and materials. This action can cause excessive wear to the machine and nozzle and could damage buried services or objects.

Figure 9.1 – Examples of poor excavating practices

Control of Noise

9.13 The combination of the noise levels from different items of plant may exceed the action levels in the Control of Noise at Work Regulations 2005. If this cannot be eliminated or reduced to a safe level, the suction/vacuum excavator operator should be supplied with appropriate hearing protection and be instructed on the use of them in accordance with legal requirements for training.

Remote Controls

9.14 The availability of a remote control unit, whether operated by cable or by radio signals, allows the suction/vacuum excavator operator to select the optimum position from which to operate the excavator and boom. This position will vary according to the work in hand. The operator should select the location that offers the safest overall position for the job.

9.15 When using the suction/vacuum excavator, the following safety points should be observed:

- The operator may be at risk of tripping and falling when trying to move around the site over uneven ground whilst concentrating on controlling the machine. Suction/vacuum excavators should only be controlled whilst the operator is stationary;
- To optimise control of the machine, the operator may need to hear the changing note of the engine/power unit which indicates performance and machine movements. Noise-cancelling ear protection and in-ear music-playing devices may interfere with this. (see Section 15.8);
- The operator has no direct feedback from the machine – particularly from fully powered machines and could subject the machine to higher than normal stress, or wear and tear;
- The operator may not have a good view of the excavation, hose and any obstructions. Consequently, the operator must always ensure they position themself to get the best and safest view possible;
- Infra-red remote control units can be unreliable if the receiving sensor loses alignment with the transmitter.

9.16 To prevent unauthorised use, the operator should retain the control station (transmitter) in their physical possession or remove the key from its key-lock switch and, for short periods, retain the key in their possession. For longer periods, or when the machine is not in use, the transmitter should be kept in secure storage.

IMPORTANT:

1. ***The remote control unit must be isolated when not being used. This includes when fitting, repositioning or removing the unit when worn on the body so as to prevent inadvertent operation;***
2. ***When being placed onto a surface, care must be taken to ensure the unit remains in an upright position and where a control cannot be unintentionally activated – e.g. by contact with another object or the ground. This includes getting tangled with clothing, the carrying straps or the harness;***
3. ***Any damage or malfunction - including intermittent faults - means the remote control must not be used. Other than battery maintenance, there are no operator serviceable parts in or on the remote and 'bodge'-type repairs must not be attempted.***

On Completion of Operations

9.17 On completion of operations, the following actions should have been taken:

a) By the operator:

- Air suction system shut down;
- The boom parked and secured;
- The hose stored in the transport position;
- The machine moved away from the excavation;
- All accessories, tools and equipment cleaned and stowed in the correct locations;
- The machine readied for transportation to the spoil discharge area;

- That lights, tyres, mirrors and cab windows (where relevant) are checked and cleaned before moving and again before entering the public highway;
- Advised/liaised with site management and reported work completed, condition of work area, incomplete aspects of the operation etc. before the site was left.

b) By the hirer:

- Trench support (where necessary), designed by a competent person, has been installed by a competent person;
- The excavation sufficiently guarded to prevent falls;
- Exposed services and the surrounding area made safe to prevent movement or other deterioration.

NOTE: *Contract conditions will determine the responsibility for each action required. This will be determined between the hirer and owner.*

Use of Signallers and Communication

9.18 If the suction/vacuum excavator operator is required to position themselves where they cannot see the excavation - and the contract has not included for sufficient personnel to be provided by the supplier, the site must supply a signaller to give appropriate signals to the operator.

9.19 A code of signals must be agreed between the suction/vacuum excavator operator and the signaller. The operator should at any one time respond only to the signals from the appointed signaller, who should be clearly identified. The operator must respond immediately to signals given by a signaller. Typical signals are shown in Annex 2.

9.20 Radio communication may be a better method of communication between signallers, supporting staff and supervisors with the operator, especially if distances are large or the view obstructed. Annex 8 provides further advice on the use of radios.

Personnel in the Vicinity of the Excavating Operation

9.21 Only trained and competent personnel should be within the safe working zone for the excavation, but should remain clear of the nozzle, hose and boom.

Exhaust Fumes

9.22 Arrangements must be made to extract exhaust fumes when the machine is operating inside a building or a confined area. Extraction may need to be supplemented by fresh air fan, ducted into the working area. Sufficient fresh air needs to be introduced to maintain a safe working environment. This includes taking account of any additional contamination – including any volatile contamination from disturbed ground that could evaporate once exposed to air.

9.23 Suction/vacuum excavators should not be taken into or operated in a confined space unless a rigorous assessment and use of suitable control measures shows that the risk of incident is low.

Leaving the Suction/Vacuum Excavator Unattended

9.24 If the suction/vacuum excavator has to be left unattended, the operation of the boom and excavator must be isolated and keys retained by the operator.

Hose Considerations

9.25 The maximum length of hose to be directly suspended from the end of a boom is specified by the manufacturer and must not be exceeded. The weight of the hose will need to be considered when being supported by the machine boom. Any additional external supports may need to be specified.

Falling Debris

9.26 Material must be prevented from falling out of the hose when the boom is being manoeuvred and if available for the attachment in use, a blanking device - fitted in accordance with the manufacturer's instructions - should be used. This is particularly important if the hose is working in an occupied excavation; or one containing delicate services; or where the vacuum excavator is set up on a benched site at higher level than the area being excavated.

Use of the Boom as a Crane

9.27 The boom must not be used as a means of lifting equipment unless approved by design and is compliant with the requirements of the Lifting Operations and Lifting Equipment Regulations (LOLER) 1998.

Securing Devices

9.28 Securing devices must be fitted to all suction hose couplings and ground-engaging tools pipework to prevent them from fully detaching accidentally.

Hose Extensions

9.29 Where there are restricted areas that can be hard to access with the machine, the pipework can be extended from the machine up to distances in the region of 150 metres. Considerations when using pipework extensions include the vertical suspension of hoses and the additional weight – especially if a blockage occurs. The specification of hose extensions and anchoring and fixing points needs to be through the devising of a specific risk assessment and method statement, with a safe system of work produced.

9.30 The safe system of work must further indicate the disconnection and breakdown procedures of the hose and ancillaries following completion of operations. Where hoses are to be used in a vertical plane, they must be designed for this application and need to have integrated attachment points allowing them to be anchorable to a structure or suitable object.

9.31 The structure that any hose is lashed or clipped to needs to be checked prior to installation and operation to ensure that it has sufficient load bearing capacity to accommodate a blocked (heavy) hose including if disconnection is needed. The hose line should be regularly checked to ensure it is able to maintain the capacity of the hose during use. Many excavation support systems (e.g. walings) are not able to support vertical load and could fail unless designed to provide additional support.

Movement of Truck-mounted Suction/Vacuum Excavators on Site

Travelling Configuration

9.32 If a truck-mounted suction/vacuum excavator has to be moved on site, the boom must always be folded to the travelling position. The only exception to this recommendation would be a procedure laid down by the machine manufacturer that allows otherwise.

9.33 Any procedure endorsed by the equipment manufacturer should be strictly adhered to as laid down in their operating instructions, as the risk of the machine turning over, or striking objects or structures, is greatly increased. However, the safest and accepted procedure is to return the boom to its folded travelling position whenever the machine is to be moved.

9.34 A mobile suction/vacuum excavator fitted with long hoses to allow deep working should be derigged before travelling. Hoses should be lifted out of the excavation – they should not be dragged out by the vehicle.

Site Traffic Management Arrangements

9.35 On first arrival at a site, the suction/vacuum excavator operator should be inducted/briefed about the site traffic management arrangements and must comply with these. It is the responsibility of the hirer to ensure that alterations in the site traffic management arrangements are suitable to allow the suction/vacuum excavator access and egress. The driver/operator should be briefed about any changes introduced since their last visit.

10. Use of Ground Engaging Tools

Application

10.1 Ground engaging tools break soils and allow swift removal using the suction system. Some tool types allow material to be dislodged around buried services and is considered the equivalent of hand-digging.

10.2 Air or water pressure through a lance is considered a safer system than manually breaking soils and allows quick and easy displacement of material around sensitive areas of services. The use of a lance minimises the need for the operator to be at the edge of or within an excavation.

10.3 The hirer of the equipment should be asked to explain the specific ground conditions and operations that need to be performed, including what services are likely to be encountered. Where available, this should include information taken from a geotechnical soils report for the site. This will allow the supplier to provide the most suitable type of ground-engaging tool for the task. Consideration needs to be given on the circumstances where a ground engaging tool may be needed, which type is likely to be suitable and how it should be used.

10.4 The use of air/water lances should be risk assessed for use in contaminated land. If acceptable for use, then suitable PPE will be required to protect against the contaminants of concern. In the case of working on ionised contaminated land, a Radiation Protection Advisor should be consulted on the appropriateness of using a water or air-powered lance.

Selection of Tools

10.5 The selection of a ground engaging tool and accompanying accessories will be dependent on the nature of the services, soil type, digging depths and effects on the surrounding area. There are a number of variations of ground engaging tools with features such as angled jets, extensions etc. making the tool more adaptable.

10.6 Ground engaging tools are either classed as either aggressive or non-aggressive. An aggressive tool, such as a clay spade, directly engages through manual insertion into the ground whilst the opposite occurs with the non-aggressive tool. Air and water tools are classed as non-aggressive.

10.7 Water-based tools have a number of advantages in both productivity and safety, such as they help suppress dust which would otherwise become airborne, which is often harmful to health if regularly breathed in, and can also obscure vision and cause a nuisance. However, water run-off can create environmental issues which may require containment, control and removal. They are normally suited for non-porous type soils such as clay.

10.8 The use of air-based tools can lower the risk of damage to the services being exposed and are efficient and are both efficient and suitable for all porous-type soils. However, there is a risk of flying debris over larger distances, which requires suitable shielding to prevent debris striking anyone in the vicinity. In addition, air tools can raise considerable volumes of dust, especially in hot, dry conditions. Air tools should not be used to clear soil from cementitious water or drain pipes that contain asbestos fibre reinforcement.

10.9 Nozzles come in a range of materials including steel, brass and nylon. The selection of the tip type is dependent on the type of service being exposed and the type of ground being excavated. The wear rate of each type of material varies as does the ability of each to conduct electricity or accumulate static electricity.

The type of environment will determine the nozzle material that may be suitable or non-suitable for the conditions. Users should refer to manufacturer to check nozzle types for the conditions and environment.

10.10 Where there is a risk of flammable or explosive gases, or volatile liquids being present - e.g. methane from buried organic matter, leaking gas supply pipe, soil containing leaking industrial solvents/petrol etc, then tools that could cause sparks should be avoided. A steel nozzle striking e.g. a flint will lead to sparks as a result of high friction heating of tiny steel fragments. Whereas air being drawn rapidly past a dry nylon nozzle could result in static electricity being built up until it discharges causing a spark. Brass nozzles are classed as non-sparking as they do not generate high friction sparks on impact with stone. All types of metal nozzle and metal tool bodies will conduct electricity if either the machine or the tool is in contact or close to unprotected (or damaged) live conductors. Isolating tools have insulators or insulated handles to provide a high resistance break between the ground and the operator, or the ground and the machine. (see Paragraph 10.18)

Guarding and Protection

10.11 Tools fitted with a self-releasing trigger are recommended, which stops the function of the lance when the trigger is released. Units with trigger locks should not be used as they may continue to operate if dropped or, in the event of an incident, the operator is unable to reach and release the lock.

10.12 The trigger should be covered with a handguard which prevents unintentional operation of the trigger through, for example, being dropped or laid on the ground.

10.13 Purpose built ground-engaging tools are available on the market, with many both designed and tested to relevant protection and operational standards. Converted lances from other applications, such as from a domestic pressure-wash, or ‘home-made’ units, should not be used.

Protection of the Working Area

10.14 Where air operated ground engaging tools are to be employed, a number of processes should be used to minimise dusts and ejected pieces of debris. These can include:

- Cone or debris skirt on the base of the lance – mainly for protecting the operator;
- Fine netting – contains ejected material within a small area;
- Solid fencing, shielding and boarding – where larger work areas need protection.

Inspection

10.15 All ground-engaging tools need to be checked for correct function prior to work commencing, along with being subjected to detailed inspections and maintenance on a regular basis by a competent person. Air powered tool systems that include an air receiver may also require thorough examination under the Pressure Systems Safety Regulations 2000 unless the receiver volume and pressure do not exceed 250 bar/litres.

10.16 Nozzles and extensions should be checked for tightness before use and during use as loosening may occur. Where tightening is required, it must be undertaken using the correct tools.

Couplings

10.17 Couplings on both water and air-fed systems must be free from damage and whip-check devices must be fitted at each coupler to prevent hose flail in the upstream hose, should it become unrestrained.

Isolation

10.18 Ground-engaging tools should be properly and fully insulated in order to protect the user from electrocution should a live electrical service be struck and penetrated. Non-conductive nozzles should be used on or near to electrical services.

10.19 Personal protective equipment needs to be dialectic when using water-based ground engaging tools – this is where no conduction when wet can take place.

Connecting to the Compressor (air)

10.20 To be effective, the compressed air supply must be matched – i.e. of sufficient pressure and volume and the correct components fitted to the lance, so that it is within the specifications for the air supply.

10.21 Air hoses must be connected using whip check devices for security and that any outlet valves are positioned in the 'Off' or closed position. The compressor can then be started and with the air outlet valve open, the lance is ready for use.

Using the Lance (Air)

10.22 The lance should be held perpendicular to the surface and the debris cone (where used) positioned as close to the surface as possible.

10.23 With the nozzle in contact with the surface, the trigger can be depressed and air flow controlled by varying the travel of the operating trigger. Once the ground starts to break, the nozzle may be inserted into the loosened material.

10.24 Once agitated, material removal occurs by it being drawn up the suction hose which should be positioned with the inlet directly above the area being worked.

10.25 Once operation with the lance is completed, the compressor must be shut down, and residual air pressure in the system exhausted before disconnecting the supply hoses. The lance should be cleaned following the manufacturers guidance and should not be cleaned using compressed air.

10.26 The lance must not be aimed at any part of the body or at other persons. High pressure air can be injected under the skin from which serious injury could occur, including loss of circulation due to air bubbles coalescing in the blood stream. The injection of bacteria and debris can lead to infection and consequent amputation if treated late. A pressure injection injury is a medical emergency and the cause of the injury, and the pressure and agent involved, must be drawn to the medical team who may not be familiar with this type of injury.

10.27 Where an air supply may also eject oil (as an air mist within the air flow), this type of supply should not be used with air lances as contamination of the breathing air and of the environment may occur.

Using the Lance (Water)

10.28 The operation of a water lance involves the ejection of pressurised water at high velocities through the nozzle, which aids the breakdown of soil for suction purposes.

10.29 Couplings, whether threaded or quick-release need to be secure with appropriate whip checks used. Unrestrained hoses can cause a whipping effect, with a potential for injury to those nearby.

10.30 Once spent, the ejected water pools or collects around the working area. The water is mixed with the material being removed causing a slurry-like material to be formed. This slurry needs to be contained to prevent contamination and/or blockages to any nearby water courses, waste or foul water infrastructure etc.

10.31 Wet ground can increase the likelihood of slips and falls, meaning water run-off should be channelled away from the working area. Other methods can include boarding or other materials to create a dry platform for working on and for access/egress to the working area.

10.32 When being used to expose services, care must be taken as the concentration of the water jet in a fixed position can penetrate the outer surfaces of the service and cause damage. To minimise localised pressure or ‘pin-pointing’, an oscillating head should be used which rapidly and continually moves the water jet within a given pattern. High pressure water also has the potential, if aimed directly at exposed skin, to penetrate beyond the skin layer, carrying entrained air and bacteria into the body.

10.33 When aimed at solid objects or compacted materials, water being ejected at high velocities can cause a rebound effect, spreading water and material over a wide area. The operator and those nearby can be ‘coated’ with water and dislodged material which can cause harm. The working area should be shielded and the operator and supporting personnel attired with suitable PPE which is both impervious to water and protects exposed skin to flying material. Exposure to cold water over a period of time can have an effect on the operator, especially in the colder seasons.

Figure 10.1: Examples of an air lances

Operative Positioning

10.34 The competent operator who is using either the air or water ground engaging tool will need to be positioned in a safe location when next to the excavation. They should be well clear of the suction boom. The suction fans can be engaged at the same time as the ground engaging tool.

Figure 10.2 Examples of operatives positioning including good (left upper picture) and poor (right lower picture) *Note: pictures staged for illustrative purposes only*

11. Dealing with Blockages

General

11.1 Blockages of the hose and airway through to the hopper can occur for which procedures need to be in place and adhered to.

Causes of Blockages

11.2 Blockages may be caused through a number of factors including:

- Ground conditions e.g. wet sand, types of clay, etc;
- Large or unsuitable material such as house bricks, clotted clay, lump sand stone or other rock types, cohesive type materials etc;
- Exceeding the maximum capability of the hose diameter and machine type. For example: a 9” (230mm) long house brick drawn into a 10” (255mm) hose can get stuck because the opposing diagonal tip-to-tip dimension exceeds 10”;
- Operator error e.g. not letting the hose clear itself on regular basis;
- Wind-chill effect of the vacuum air current that can cause a freezing situation.

Unblocking Procedures

11.3 The specific procedures that needs to be followed should be stipulated within the manufacturer’s operating manual or other information sources. In principle, the basic procedure to be undertaken in order to safely remove blockages are in this order:

- Agitate the hose in a controlled manner whilst the machine is switched off;
- Use a drain rod-type system such as the use of rodding kits or other manufacturer-recommended tools to loosen the blockage. This should be done at ground level;
- Use a water lance or jet wash to loosen the blockage. Positive air pressure must not be used to dislodge a blockage – it can result in debris being fired out of the hose.

11.4 Where long runs of hose are involved, it is often necessary to remove sections, starting at the intake nozzle end until location of the blockage can be confirmed. Hoses must only be disconnected once it has been ascertained that they are adequately supported and will not move or drop once disconnected. For vertically suspended hoses, the full load may need to be carried on a chain block to allow safe disconnection and ease of reconnection.

11.5 Where it is either known or suspected that any spoil or groundwater contaminated by radioactivity has been vacuum excavated, the operator shall seek the advice of the Radiation Protection Advisor prior to opening any parts of the machine for unblocking. Appropriate Health Physics Monitoring/PPE will be advised accordingly. (see Paragraph 8.72)

11.6 In all cases of unblocking the machine, the hose must be clear of the excavation and the machine switched off before any further actions take place. Clear access is needed to the relevant parts of the machine and the full hose run. There may be a need to work at height to clear blockages i.e. both on the machine and any structure that the hose is in contact with. Appropriate control measures and training in their use need to be in place. Measures for working at height are further described in Paragraph 8.57.

11.7 The blockage of a hose can cause a substantial increase in the weight of a suspended hose.

12. Cleaning the Machine

General

12.1 Cleaning out a suction/vacuum excavator is a specialist operation. If the excavator operator requires assistance when cleaning out, this has to be carried out under close supervision or after specific training. Where the machine is known to have been used in an area of radioactivity, the Radiation Protection Adviser should be consulted. If access at height is required, the deployment of an assistant should be considered essential to the activity.

12.2 Where possible, any cleaning should be carried out from ground level and in a manner that avoids workers becoming contaminated or breathing water mist which may contain chemicals or bacteria. Clean water should be used, but this may pick up contamination from the residue within the hopper. The higher the water pressure, the more likely that fine droplets or mist is breathed in. Personal protective equipment (PPE) will be needed and respiratory protective equipment (RPE) may be needed depending on the circumstances.

12.3 If using air pressure to clean the hopper and associated filtration components, as dust is produced and can contaminate the surrounding area, the cleaning area needs to be of sufficient size to prevent a dust nuisance to others and nearby property. The operator must be wearing PPE and RPE suitable for protection against nuisance dusts (see Section 16). Many machines utilise an air or water injection system so that internal filters can be cleared of accumulated residue without releasing this into an airborne environment.

12.4 The hopper may be classed as a confined space, especially if contaminated ground is being excavated. Procedures and control measures need to be in place if any entry into the hopper is required. Procedures need to cater for:

- Working at height;
- Isolation of the controls;
- Hydraulics and other moving parts locked off in place to prevent entanglement or trapping in parts that could otherwise move;
- Potential for exposure to hazardous substances; assistance or rescue in the event of a problem occurring;
- Getting cleaned up or decontamination on leaving the hopper;
- Ensuring that the falling of stuck, accumulated and suspended material cannot fall from height onto anyone.

12.5 The residues of cleaning may contain contaminated materials which, depending on their type and nature, may require specialist or controlled disposal that complies with environmental regulations and procedures. Paragraph 8.72 provides information relating to the handling of radioactive materials.

12.6 Operatives should not be under a tipped hopper during the cleaning activity due to the potential of falling debris which may fall and make physical contact. Where a tipped hopper needs cleaning, a risk assessment should be constructed that introduces a hierarch of control measure so that cleaning can be carried out without the operative needing to be in the falling debris e.g. the use of long handled tools or water jetting. Where this is not feasible or that material is stuck, then personal protective measure that eliminate harm should be utilised.

Designated Tipping Areas

12.7 Areas for spoil discharge should be determined before excavation work commences. Factors that should be taken onto account include:

- Travel route between excavation area and tipping area;
- Suitability of the tipping area in relation to the environment;
- Travelling on the public highway;
- Changed vehicle characteristics due to high centre of gravity and increased weight;
- Use of spoil heaps and their position within the site area;
- Wheeled vacuum/suction excavators are generally not suitable for driving onto spoil heaps, and are not to be positioned so as to tip over an open edge;
- Tipping areas should be on firm, level ground with any movement of tipped materials onto a spoil heap, or over an open edge being carried out by tracked plant;
- Mitigation measures for contamination migration/mobilisation of spoil and liquid effluents;
- Collection of liquid effluents for sampling and authorised disposal.

12.8 Before the discharge of the hopper commences, the following should be observed:

- The area must be capable of handling discharged material without causing an obstruction to other machines, personnel and other work;
- The ground must be capable of supporting the machine while travelling and when tipping occurs. Tipping can cause the ground loading on one side of the machine to increase significantly;
- The area for discharging must be clear of overhead hazards such as power lines and other overhead obstructions such as low structures etc;
- An exclusion zone should be set up around the discharge area, with sufficient space to allow the operator to be clear of the load being discharged;
- Where fitted, stabilisers must be fully deployed;
- The suction function should be disabled during discharging, unless designated as part of the procedure by the manufacturer;
- Stuck material should not be able to fall onto anyone during tipping or while it is being dislodged.

Isolating the Machine

12.9 Before working in or around the hopper area, the operator should always switch off the engine, isolate and remove the keys.

13. Leaving the Site (LGV-types)

Stowing

13.1 Before leaving the site, the suction/vacuum excavator operator must ensure that the boom is properly stowed and that all equipment is securely loaded.

Emptying the Receiving Hopper

13.2 Spoil should not be carried in the receiving hopper on the highway unless the conditions in Annex 6 apply and the vehicle must also be correctly registered and taxed. The vast majority of suction excavators are registered as special vehicles - this is possible as they can be classed as a digging machine within this classification. This however means that the following applies:

The term ‘Digging Machine’ means a vehicle designed, constructed and used for the purpose of trench digging or any kind of excavating or shovelling work which:

- is used on a road only for excavating or digging work or for going to or from the place where the work is to be carried out;
- when it is so proceeding does not carry any load other than that which is necessary for its propulsion or equipment.

The carrying of any load within the hopper would constitute carrying of goods, load or burden. This could contravene the above conditions. To legally carry goods or a load on the highway, the vehicle would need to be registered as a goods-carrying HGV. In addition to the above, the owner/operator of any vehicle carrying a load would need to ensure that they have in place the relevant Operator’s License.

Further information on taxation classes and definitions can be found at https://assets.publishing.service.gov.uk/media/637218fde90e07185aae771d/v355x1-notes-about-tax-classes.pdf

Checking of Tyres

13.3 General condition of the tyres should have been checked as part of the daily or regular checks. However, before leaving a site, the tyres should be re-checked for damage, cuts, nails or screws in the tread and material trapped between twin-wheeled tyres, which may have occurred during site travel.

13.4 The Hirer should have procedures in place to minimise the presence of mud or other debris that could contaminate or damage the vehicle. If contamination with mud or soil is likely, they should provide a means to clean the vehicle before it goes onto the public highway. Road Traffic legislation makes the driver primarily responsible if contamination of the highway occurs and particularly so in the event of an accident that involves other road users.

Carrying of Waste

13.5 The definition of waste under directives and acts is:

- 'A substance or object which the holder discards, intends to discard or is required to discard' and 'any substance which constitutes a scrap material, an effluent or other unwanted surplus arising from the application of any process or any substance or article, which requires to be disposed of, which has been broken, worn out, contaminated or otherwise spoiled'.

13.6 Movement of waste of the public highway is controlled by legislation and places duties on the storing transporting and disposing of waste. In essence:

- Producers of waste must identify the material as waste and classify as non-hazardous or hazardous the waste classification code;

  NOTE: *Also referred to as LoW (List of Waste) or EWC (European Waste Catalogue) code - classification codes for common types of waste are in the relevant parts of the guidance etc.; - see https://www.gov.uk/how-to-classify-different-types-of-waste*

- Producers of waste have a legal duty of care to ensure it is passed onto an authorised person holding the relevant technical competence and permits or licenses;
- The carrying of construction (or demolition) waste requires a waste carrier license;
- Waste transfers require correct documentation in respect of non-hazardous and hazardous waste, which includes a declaration that the producer of the waste has considered the waste hierarchy when deciding disposal;
- That producers of hazardous waste over a certain amount register their premises with official bodies;
- Materials that have been treated or processed and intended to be re-used at the point of extraction may need an environment permit of registered exemption.
- If working on a nuclear site, the Radiation Protection Advisor should be consulted to ensure all monitoring and documentation requirements have been met before leaving the site.

Further information on the required actions and procedural compliance should be sought.

Travelling on the Public Highway

13.7 If a load is to be carried on the public highway, the addition of the load raises the machine's centre of gravity which increases the risk of instability during cornering and on cambered roads.

13.8 The carrying and transporting of slurry, liquid, fluidised solids, powder-type materials etc. can increase instability due to dynamic forces acting during accelerating, braking and cornering actions. Vehicles not fitted with internal baffling can have a higher potential for a load to move and create instability.

13.9 Where the transporting vehicle is registered and taxed correctly as a goods vehicle, it will be subject to use of a tachograph and the driver will be subject to EU drivers hours rules, Working on site and travelling to and from a disposal site may mean a driver exceeds statutory driving hours. Owners and drivers need to check statutory requirements as part of the initial planning of the work.

13.10 The overall weight needs to be considered when e.g. loaded and carrying additional equipment as the vehicle's chassis strength, suspension and braking actions could be compromised along with /driver's ability to ascertain overall vehicle weight.

14. Emergency Procedures

General

14.1 Emergency procedures must be planned prior to the works taking place to take into account foreseeable issues and be in accordance with regulatory requirements, manufacturer's instructions and safe systems of work, as described in other sections of this guidance. The manufacturer's operator's manual and other information sources will indicate how the machine may be stopped and re-set where required, which must be conveyed to those selected to act in cases of emergency.

14.2 The nature of work or other factors will require a second operator, who is someone who has had specific and adequate training to operate a number of, or all of the functions of the machine in the event of principal operator incapacitation or through temporary absence.

14.3 During the emergency procedures planning stage, consideration must be given to the outcomes and procedures if the emergency stop button has been activated on the machine. The activation of the emergency stop button immediately halts any movement of part of or all of the hydraulically-operated components and in most cases, stops the engine. To restore functional aspects of the machine means undergoing a re-starting process, which will be unique to the make and model of machine. Emergency procedures planning needs to take into account the consequences of activating the emergency stop which in rare cases, could worsen a situation where immediate hydraulic activity is required.

Hazardous Materials

14.4 The following action should be taken if unexpected material or features are uncovered in the ground which the operator cannot identify but suspects may be hazardous. The immediate action is to stop excavation and seek advice.

14.5 Unexpected potentially hazardous material includes but is not limited to:

- Asbestos - which may be in the form of boards, sheets, pipes, thick cloth or pipe lagging; and may be in large pieces, fragments, or clumps and may be hard, crumbly, fibrous; or, in the case of lagging, may be mixed with wool or other materials;
- Buried canisters or drums - that may contain chemicals and leak if disturbed;
- Buried pressurised gas bottles - that could be corroded and close to sudden failure;
- Strong smell of petrol or other organic solvent or gas stenching agent;
- Objects (generally metal cased) that could contain explosives – such as bombs, shells, grenades, etc. These range from 20mm diameter cannon shells to objects several metres long. Small arms ammunition and small projectiles will pass up the vacuum pipe. Larger items could move and be activated if the surrounding ground is excavated. If the site was formally a front-line Ministry of Defence (MOD) site (e.g. airfield), any unexpected 75mm to 150mm diameter steel pipes may be live demolition charges dating back to the Second World War. If doubt exists, the item must not be moved and the client/hirer informed who should contact the police who will request support from the MOD to identify the item and deal with it where necessary;
- Stained ground or change of colour not associated with change of strata/mixed fill materials - this could be from leaking chemicals, including touch-sensitive explosives leaching from a nearby ruptured casing;

- Visible or sound of gas or fumes escaping from the ground identified by a steady stream of bubbles in wet ground. This could indicate a leak from a service pipe but may also be geological, or ground gas, or a reactive chemical freshly exposed to oxygen. It is important to note that ground gas may be flammable and/or oxygen depleted and could cause fire/explosion and/or asphyxiation;
- Animal carcasses, medical waste or sewage leak – multiple carcass pit burial was a common way of disposing of anthrax infected cattle – the infectious bacterial spores can survive inactive for long periods and must not be breathed in. Other infectious material should not be handled without suitable protective equipment, face masks/face shields and access to washing facilities;
- For completeness (although not necessarily a health and safety risk), excavation work should also cease immediately if it is suspected that a crime scene or any archaeological remains have been uncovered.

Note*: if a service or a buried container has ruptured and it is suspected that a flammable, or explosive, or a low oxygen atmosphere is now present, all plant should be shut down using emergency controls and the area evacuated. If the blow-out is too severe to allow this, then plant should be abandoned still running and the area evacuated, preferably in an upwind direction.*

14.6 If any material uncovered turns out not to be hazardous to humans, it could still be toxic to the environment and strict disposal legislation may apply. This means that notification to the Hirer is important and the least that may be required is for the contaminated arisings to be removed and disposed of separately from other waste. This may further allow additional costs to be minimised.

14.7 Where any material proves to be hazardous to human health, special procedures may be needed to recover and dispose of or treat the contaminated ground. In these circumstances, it may not be appropriate to use vacuum excavation methods and further planning will be needed.

14.8 The original planned vacuum excavation work should not recommence until any suspect ground has been checked and analysed by a specialist with experience with that type of material. This will often involve samples being collected and checked in a laboratory, which means the work in that area should be placed on hold until the results and assessment are available.

Contamination

14.9 General cleaning of the suction or vacuum excavator is covered in Section 12. However, where a machine has become unexpectedly contaminated, additional procedures are needed. If the operator/s or others have come into contact with ground that is suspected to be contaminated, they may need to be decontaminated urgently.

14.10 Chemical contaminants could be toxic or corrosive on contact with the skin. Any vapour, fume or dust breathed in could cause breathing difficulties and will need immediate medical treatment. A small amount of unknown chemical or infectious material inadvertently ingested - e.g. by wiping the mouth with a contaminated hand, by splashing, by eating open food with contaminated hands – could lead to symptoms of acute poisoning or infection.

14.11 Disturbance of asbestos must be prevented by recognising the indicators that asbestos containing material may be present. Prior to current legal requirements for the safe disposal of asbestos at licensed tipping sites, it was common for asbestos – of all types – to be buried in pits that were often unmarked and unrecorded. For example, on a large industrial site undergoing demolition in the mid-20th century, this may have involved hundreds of cubic metres of pipe and vessel lagging.

14.12 Working with a water lance is less likely to cause asbestos fibres to become airborne and be breathed in, although any splashing may leave clothing contaminated. Air lance work in dry ground will raise large quantities of fibres if asbestos is disturbed. A grade-P3 face mask, correctly fitted and worn, will help protect against brief inadvertent dry disturbance of asbestos fibres and also protect against inhalation of free silica that is present in most dry dust on a construction site. Both these substances are capable of causing lung cancer and other respiratory diseases.

14.13 Most contamination can be removed from impervious outer clothing by a water spray (gentle hosing down) and using disposable cloths to wipe down. Possible contamination by asbestos fibres should be washed out of the hair and outer clothing changed. Potentially asbestos-contaminated clothing should be stored in a sealed plastic bag. It can be removed for washing using a water spray to prevent asbestos fibres becoming airborne. Heavily contaminated clothing should be sealed in a plastic bag followed by being sealed into second bag (double bagging) for specialist cleaning or disposal. Contamination by chemical substances that will not wipe off or wash off – i.e. not water soluble – will need specialist advice for both hygiene and clothing/equipment recovery.

Cross-contamination

14.14 Early recognition of a problem and action to prevent cross-contamination is important. For example, suspecting that dry asbestos has been encountered and that fibres are on any clothing must be dealt with immediately. Clothing needs to be removed, hair needs washing, preferably followed by a shower and fresh clothing needs to be used. If contaminated clothing is worn in a vehicle, the cab can become contaminated. If clothing is worn home or taken home for washing in an uncontrolled way, then the home and other occupants may also become contaminated. It is the employment of simple preparations, simple precautions and simple actions which if correctly carried out, can make large difference to preventing cross-contamination.

NOTE: *There have been cases of a working individual surviving into old age while their spouse, partner or offspring at home have died early from asbestos contamination brought home from work on clothing.*

Contamination Containment Procedures

14.15 If excavation work has been stopped as soon as suspected contamination has been spotted then, in most cases - including where asbestos has been found, the machine is unlikely to be contaminated. As a precaution, the following procedures should be used in this situation:

- Cease excavation work and inform the Hirer;
- Wear a grade P3 disposable face mask or FFP3 half mask;
- Where possible, use gentle water spray to damp down the exposed suspect material if it is dry, followed by the use of a weighted down plastic sheet to cover the exposed material (this helps prevents drying and release of fibres by wind disturbance);
- Mark the site plan and place warning signs to both identify the exact location and warn others of the concern;
- If there are concerns about personnel contamination, then the actions within Paragraph's 15.13 – 15.14 should be followed - which includes keeping the face mask on, removing clothing without raising or releasing dust, showering including thorough hair wash (hose pipe if nothing else immediately available) and the wearing of fresh clothes;

- Wearing of impervious coveralls, a P3 mask and use of a gentle water spray to clean the outside of vehicle;
- Agree with the Hirer whether and where waste can be discharged (this may need to be removed as contaminated waste and may need to be covered by clean soil, etc). However, this may not be a problem if excavation ceased immediately if suspected asbestos had been exposed;
- At discharging points, use water spray to suppress any dust, all other personnel to be kept away from area, the operator (wearing coveralls and a P3 face mask) to stay upwind, tip and hose out the hopper and the surrounding area.

14.16 The following actions may vary dependent on the machine manufacturer's instructions:

- Close the hopper and operate the filter shake down/water wash system;
- Tip the hopper whilst using water spray to supress any dust;
- Hose out the hopper and hose down all filters.

***NOTE**: In some circumstances the client/hirer may insist that run-off water is recovered, but this is only necessary if it is believed that excavation did not cease immediately if suspected asbestos was exposed.*

***NOTE:** This cleaning cycle may need to be repeated several times under controlled conditions (conducted in open area away from public areas and other workers plus damping down with worker/s wearing correct PPE and RPE).*

Monitoring

14.17 Although unlikely to be necessary where immediate action was taken to prevent disturbance, a licensed asbestos removal contractor or, preferably, a UKAS-accredited asbestos laboratory can attend site and carry out one or more of the following:

- Air monitoring of the machine's exhaust air;
- Air monitoring at the downwind public boundary (this is unlikely to detect anything but is useful for public reassurance – note that in some cases monitoring at the upwind boundary is needed in case asbestos contaminated air is drifting across the site from somewhere else);
- Personal monitoring of air being breathed in by workers dealing with the situation (whilst this cannot reverse what occurred, it can help reassure workers that the correct controls are in place to prevent any further exposure);
- Swab testing to see whether asbestos fibres are present on the machine body, in the cab, etc;
- Swab testing of one or both sides of the machine filter (where accessible without dismantling).

14.18 Asbestos issues are complex and the machine's owner and Hirer should ensure that they have a clear understanding of the basis of the Control of Asbestos Regulations 2012. Asbestos issues should be taken seriously with no complacency - which will remain the largest UK occupational killer for many years to come. This is in part due to the long latency between exposure and onset of disease symptoms (10 – 50 years) but also to new exposure due in part to a possible lack of awareness by duty holders and workers at risk of exposure.

Decontamination Procedures

14.19 The guidance in Sections 14.15 to 14.17 is based on the assumption that asbestos contamination is light and that excavation work has stopped as soon as the suspected source was uncovered. I cases where a quantity of asbestos has been excavated and is either sitting in the machine hopper or has been tipped, or both, then the same principles as outlined in those sections will need to be followed as a minimum. However, additional measures may be needed to safely clean-up workers, plant and discharging areas plus additional work may be need to recover loose asbestos materials. These include more rigorous:

- Decontamination of exposed workers – including rapid assessment and possibly bringing an asbestos decontamination unit to site, along with consumables and a licensed asbestos supervisor to instruct those affected on how to use the unit;
- Use of a licensed asbestos contractor to sift/clean or bulk remove tipped wasted for disposal at a licensed asbestos tip;
- Use of a licensed asbestos contractor to empty and clean the suction or vacuum unit involved;
- Use of a UKAS accredited laboratory to conduct agreed swab and air monitoring tests and to undertake clearance testing of the machine (so far as is possible) and clearance testing of the decontamination unit when clean-up work has been completed.

14.20 The following should be noted in relation to the level of control needed during clean up and decontamination:

- Unless the suction or vacuum excavation machine is covered in visible fibre and the hopper contains a large quantity of dry, loose asbestos fibre, there should not be a need to build an asbestos enclosure around the machine;
- Most spoil will be damp and in most circumstances, the asbestos content will be dispersed amongst soil etc. If needed, additional water spray can be added through an inspection hatch and if needed, a polythene sheet and lashings or tape can be used to minimise exposure of the hopper during opening for cleaning access;
- Most asbestos licensed contractors and most accredited asbestos laboratories may have little experience in dealing with the kind of incident outlined in paragraph 14.19. It is possible that they may take a conservative approach and may suggest control measures which may not be justifiable. If the machine can be left undisturbed, then the outside (and the inside of the cab if needed) can be cleaned as a precaution while discussion takes place about dealing with the hopper content and the filters;
- In most instances, the filters are likely not to need replacing. The standard membrane on this type of plant is usually 10 microns, but many use a shake-down and/or water flush system for cleaning;
- Replacement of the main filters should only be considered where the following has been carried out in the sequence listed:
    - Cleaning of the external body;
    - Decontamination of tools, accessories, etc;
    - Decontamination of the inside of the cab (if needed);
    - Emptying and cleaning of the inside of the hopper;
    - Shake down / automated washing of the main filters;

- Decontamination of the external body;
- Running of the unit in an open area away from all downwind persons to allow the filters to stabilise;
- Repeat cleaning of any area needed;
- Running of the unit with air exhaust from the main filters monitored by standard air sampling for asbestos fibres.

NOTE: *If needed, the monitoring can be repeated after an additional running period to check whether fibre count is diminishing or stabilised. This sequence can be repeated several times over several hours continuous running. For public reassurance, downwind air monitoring can also be carried out to establish a realistic fibre level during this process. (Upwind monitoring at the public boundary may be needed if it is suspected that asbestos contaminated air is blowing across the site from elsewhere).*

14.21 The details of sequences and any arrangements should be agreed between the machine owner, hirer and the appointed licensed contractor/accredited laboratory prior to proving stages being carried out. In some situations, it may not be possible to fully comply with normal sampling methodology due to the unusual nature of this equipment - hence an agreed separate protocol should be used.

14.22 It is beyond the scope of this SAVE guidance to advise on how asbestos or other exposed contaminants should be removed from the ground and disposed of. In these circumstances, advice should be sought from a licensed asbestos removal contractor who has experience in ground decontamination work.

15. Health and Safety Control Equipment/Personal Protective Equipment

General

15.1 The excavator operator is likely to be exposed to a variety of working conditions; the majority of these cannot be avoided. In line with the hierarchy for the assessment of risks, suitable Personal Protective Equipment (PPE) and Respiratory Protective Equipment (RPE) conforming to appropriate British Standards has to be issued to the operator if the hazard cannot be removed completely or minimised by engineering controls or systems of work that significantly reduce risk.

Appropriate PPE

15.2 The personal protective equipment needed to be worn by the operator may include:

- flame-retardant clothing;
- a safety helmet;
- safety footwear;
- eye protection;
- ear defenders;
- fall protection equipment;
- high visibility clothing conforming to BS EN 471;
- impervious gloves or gauntlets;
- barrier cream;
- waterproof clothing (for wet operations or inclement weather);
- respiratory equipment (where required).

15.3 In all cases, the above types and use of PPE and RPE will be determined by a risk assessment undertaken by a competent person.

Charging for PPE

15.4 Operators must not be charged for PPE and RPE. Where the employee opts to request a more expensive item, they may they be asked to pay the difference. Self-employed persons are usually expected to provide their own PPE and RPE of a suitable grade and fit.

PPE/RPE Replacement

15.5 PPE and RPE should be replaced by the employer as necessary.

Additional PPE and RPE

15.6 Other PPE and RPE should be supplied when required by risk assessments.

Noise Reduction Equipment

15.7 The operation of an excavator is high in noise volume which requires effective ear protection equipment to reduce exposure, particularly long term. It however must allow verbal communication to be maintained, particularly in the case of emergencies.

15.8 In some cases, noise-cancelling headphones are being used in conjunction with traditional ear defenders, which effectively reduces the noise by emitting an opposite signal which cancels out external noise. Verbal communication can still be maintained and in some cases, radio links are provided to increase effective communication. These may not be helpful where the operator needs to hear and respond to for example, the engine note.

16. Suction/Vacuum Excavator Examination and Testing

Regulatory Requirements

16.1 A suction/vacuum excavator is not generally designed as an item of lifting equipment as defined in the Lifting Operations and Lifting Equipment Regulations 1998 [LOLER]. The examination of excavators is specified in BS EN 12001. The Provision and Use of Work Equipment Regulations 1998 (PUWER) apply and require that inspections and maintenance are carried out.

16.2 However, some suction/vacuum excavators may be able to undertake a lifting duty for which needs to comply with LOLER and require thorough examination under LOLER at intervals usually not exceeding 12 months. Any lifting accessories – such as strops, chains, shackles etc. will need to undergo thorough examination at 6 monthly intervals.

EC Declaration of Conformity

16.3 An EC Declaration of Conformity must be issued by the manufacturer for each new machine supplied; a copy of this declaration or, where appropriate, a copy of the machine's test certificate, must be made available for viewing on the machine. Alternatively, UKCA marking may be issued in lieu of or in addition to CE marking.

Inspection

16.4 In accordance with the Provision and Use of Work Equipment Regulations 1998 (PUWER), the machine (including attachments and accessories normally carried) must be inspected *"at suitable intervals to ensure that health and safety conditions are maintained and that any deterioration can be detected and remedied in good time".*

NOTE: *Each item is also a piece of work equipment in its own right.*

Inspection Frequency

16.5 An excavator should be inspected according to the requirements indicated by the equipment manufacturer. In addition, inspections should be made:

- Prior to any new hire agreement by the owner;
- Daily – pre-use checks by the operator.

16.6 The manufacturer of the excavator or the competent person appointed to inspect it may specify a more frequent examination period because of the machine's age, its condition or its operating conditions, etc.

Inspection Reports

16.7 A certificate of inspection should be issued by the competent person following each inspection; a copy should be made available for viewing on the machine. These may be stored in any way appropriate to the owner of the machine, i.e. in paper format, electronically etc.

Safe Working Conditions

16.8 The safe working conditions of the machine should be marked and noted on inspection and examination reports.

Retention of Inspection Records

16.9 Following an inspection in line with Annex B of BS EN 12001:2003, the record should be retained for a period of at least three years to prove a regular inspection regime.

Weekly and Maintenance Inspections

16.10 Inspections of the machine including attachments and accessories normally carried) should be completed by the suction/vacuum excavator operator on a weekly basis at least, and by mechanical staff carrying out routine services. A written record of the inspections should be retained and be available at all times for examination. PUWER inspections are frequently carried out by the owner's plant fitter who will often also carry out any maintenance work needed.

Sale of Used Equipment

16.11 If a used suction/vacuum excavator be sold, the current certificate of inspection and its EC declaration of conformity (where applicable) - or UKCA certificate should be supplied to the buyer.

17. Maintenance

General

17.1 Good maintenance of a suction/vacuum excavator is paramount to safety. Road safety and on-site safety have both to be considered when planning a maintenance system. An effective defect reporting and repair system is also vital.

Maintenance Inspections

17.2 The suction/vacuum excavator owner should carry out regular inspections of the excavator components and vehicle to ensure that they are fit for use. Maintenance and inspection schedules may need to correspond to those required by the Driver and Vehicle Standards Agency (DVSA).

Defects Reporting and Recording

17.3 Any defect that, in the opinion of the excavator operator or driver, would affect the safe operation of the machine - and its supporting structure and vehicle, should be recorded on the daily and weekly maintenance checklist and handed to a relevant manager immediately. Any part of the machine or any accessory, or carried equipment that is found to be unsafe to use should be removed from the vehicle and a replacement in good working order obtained. Owner/operator procedures should be set up to ensure that defective quarantined parts or items are not able to re-enter service until they have been repaired to manufacturer's standards and checked to ensure full functionality.

NOTE: *Any defects affecting vehicle safety in respect of Road Traffic Act requirements have to be reported immediately to the owner's maintenance department and, depending on their nature, may need to be corrected before the vehicle continues or before it returns to base.*

Minor Defects

17.4 Defects of a minor, non-safety related nature should be recorded on the daily and weekly maintenance checklist. They should be recorded weekly until the defects have been repaired.

Preventive Maintenance

17.5 A programme of servicing the vehicle, the excavator and its supporting structure, and all accessories should be devised as a part of a preventative maintenance system. The period between services may be determined by the manufacturer or the owner of the machine and may be based on mileage, the number of hours worked or a period of time. This reveals any pattern in wear or need for replacement parts and allows gradual deterioration to be monitored. This is the most economical way of preventing replacement of parts too early, whilst also ensuring that parts are replaced prior to reaching their end of life. Safety and reliability is thus ensured.

Testing of Vehicle and Trailer Brakes (road-going types) check validity

17.6 In addition to the operator's daily check on brake function, the braking system should be serviced and tested at least every six months or where operating conditions may require more frequent checks.

Retention of Maintenance Records

17.7 Maintenance and service records should be retained for at least three years to prove a regime of regular maintenance.

Accessing the machine

17.8 Safe access to the machine needs to be considered for maintenance activities such as greasing, cleaning, fitting hoses etc. Suitable supporting systems need to be considered for hydraulic-operated components that may fall due to gravity or where stored energy exists. Working at height needs further to be considered (see paragraph 8.57).

Annexes

Annex 1	Example of Daily and Weekly Checks and Inspections Records
Annex 2	Recommended Hand Signals
Annex 3	Training, Competency and Certification Schemes
Annex 4	Ground Loadings and Support
Annex 5	Procedure for Working at Height on Suction/Vacuum Excavators
Annex 6	Transporting Waste on the Public Highway/Dangerous Goods Control Measures
Annex 7	Human Factors – Key Messages
Annex 8	Radio Communication
Annex 9	Annual Testing (MOT) Requirements
Annex 10	Bibliography
Annex 11	Working Group Members

Annex 1. Example of Daily and Weekly Checks and Inspections Record

Kindly supplied by Force One Ltd

Suction/Vacuum Excavator Daily/Weekly Check Sheet

Name	**Date W/C**	**Date W/E**	**Signature**							
Daily checks must be carried out: Defects or concerns must be reported immediately to the line manager. Details of checks that should be made are listed below **Note:** ***a)*** if the vehicle is to be driven on a public highway, form VC40 or equivalent must be filled out ***b)*** this complete list is not exhaustive.			Please Mark: or against each day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Cab										
Beacons	All beacons are full functional, clean & reflector spins if applicable.									
All lights and lenses	Ensure lenses are clean, intact and undamaged.									
All cab signage (no smoking / drugs)	Visible, in place & secure.									
First aid kit in cab	In cab, in date, fully stocked & in a safe position.									
Fire extinguishers	In the cab, in date and full.									
2 remotes with belt and batteries	2 x remotes plus 2 x batteries in the cab, with body strap.									
Battery and charger	Secured in cab and functional.									
Operator's manual	In cab, relevant to machine & easy to access.									
Remote Control checks										
Condition of strap	Good general condition, free from rips, secured to the remote, retaining clip functional.									
General condition of remote	Casing clean, free from cracks/splits, rubber seals intact & screws tight.									
Movement of joysticks and switches	Joysticks & switches move freely & smoothly.									
Emergency STOP button is out	Button must move freely & be released.									
Batteries charged	Check battery in remote displays, solid green light & charger.									
External										
All emergency STOP buttons are out	All buttons must move freely & be released.									
Visual check of nuts and bolts	During walk round, visual inspection of chassis nuts, bolts and fixings carried out.									
All rams are free from leaks	Observing obvious oil trails down rams or on nearby surfaces.									
Extension pipe / long nozzle	Extension pipe is free from; holes, kinks splits etc. with the clamps in full working order.									
Condition of all pipes (suction pipe)	Free from; holes, splits, kinks, visible re-enforcement.									
Retaining clamps	Must be tight, in good condition and free from severe corrosion.									
Suction hose seated properly	Hose ends fully on each flange - roof & end of boom, seated properly on structure.									
Basket condition	Handles securely attached & welds free from defects.									
Signs of greasing	Visual check of moving joints to ensure adequate greasing. Grease if necessary.									
All signage in place	Ensure PPE signage and warning labels secure & clean.									
Reversing/turning camera functional & clean	Check camera lenses, screens are clean & provides a clear view of area.									
Audible alarms working reversing/left turn (if fitted)	Test left turn audible warning system.									

Cont'd

Storage Cabinets									
Compressor hose & whip checks	Hoses free of splits, couplings tightly fastened, whip checks in good condition								
Air lance/soil pick	Ensure shaft is screwed tightly on, trigger moves freely and does not stick.								
Cleaning tools (scrappers)	Check general condition & for signs or wear and tear.								
Spill kits	Located in an easy to access place & has ample sheets/containment rings.								
Tool Kit	Present has a variety of tools and equipment.								
Operational & Fan housing									
Oiler	Ensure air oil is to an adequate level.								
Hydraulic oil level	Check the hydraulic tank & ensure level is between Min-Max, Top up if required & check for visible leaks on tank.								
Auto-lube level	Ensure level is between Min-Max & top up if required.								
Omsi oil level (If applicable)	Visual inspection of oil level at sight glass if present. Top up if required.								
Hydrostatic oil Level (If applicable)	Visual inspection of oil level at sight glass if present. Top up if required.								
Fan hours	Check and log hours in comments below								
Compressor hours	Check and log hours in comments below								
Compressor air filter	Ensure air filter is secure and free from large amounts of dirt/dust.								
Condition of hydraulic lines	Check hydraulic lines and Valve blocks look for any obvious oil trails.								
Fuses in computer	Make sure no fuses are tripped & in a good visible condition.								
Running Checks									
Function of all emergency STOPS & Remote Control	Start machine hit each emergency stop starting with remote to check functionality								
Full function check boom & tipping	Move each Ram both ways individually, to check function. Lower legs, raise lid & half tip body.								
Fans & variable speeds functional	Test speeds 1, 2 and 3 with fans on to ensure the variable speeds are functional.								
Compressor & variable speeds functional	Test speeds 1, 2 and 3 with the compressor on to ensure the variable speeds are functional								

Comments & Observations:

Actions taken/Close out Form

Measures taken/Remedies made:		
Confirmed By(Print):	**Sign:**	**Date:**

Annex 2. Recommended Hand Signals

The following hand signals are recommended within the Health and Safety (Safety, Signs and Signals) Regulations 1996.

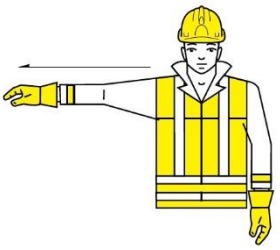
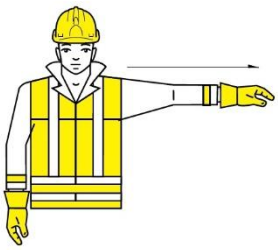
A General signals

START Attention Start of command	Both arms are extended horizontally with the palms facing forwards.	
STOP Interruption End of movement	The right arm points upwards with the palm facing forwards.	
END of the operation	Both hands are clasped at chest height.	

B Vertical movements

RAISE	The right arm points upwards with the palm facing forward and slowly makes a circle.	
LOWER	The right arm points downwards with the palm facing inwards and slowly makes a circle.	
VERTICAL DISTANCE	The hands indicate the relevant distance.	

C Horizontal movements

MOVE FORWARDS	Both arms are bent with the palms facing upwards and the forearms make slow movements towards the body.	
MOVE BACKWARDS	Both arms are bent with the palms facing downwards and the forearms make slow movements away from the body.	
RIGHT to the signalman	The right arm is extended more or less horizontally with the palm facing downwards and slowly makes small movements to the right.	
LEFT to the signalman	The left arm is extended more or less horizontally with the palm facing downwards and slowly makes small movements to the left.	
HORIZONTAL DISTANCE	The hands indicate the relevant distance.	

D Danger

DANGER Emergency stop	Both arms point upwards with the palms facing forwards.	
QUICK	All movements faster.	
SLOW	All movements slower.	

Annex 3. Training, Competency and Certification Schemes

1. Assessment of Training Needs

1.1 As part of personnel selection, an assessment should be made of the extent of training which is needed for an individual, bearing in mind that this could be influenced by any previous training and experience. When supervisors or operators are recruited, it is essential that employers check that their skills and experience relate to the job they are to do. Where the type of suction/vacuum excavator to be used is outside the employee's skill set or previous experience, additional training must be provided. In any event, some further job specific training is likely to be necessary.

2. Training

2.1 Any gaps in the knowledge, skills and understanding required for the tasks must be remedied by suitable and sufficient training. This may be carried out in-house or by an external training provider. At the end of the training period, the trainee must be assessed to ensure that the learning objectives have been met.

2.2 Training courses offered by training providers and certification bodies should be checked to ensure that excavating using suction/vacuum excavators forms part of the training and assessment process. When specifying training for their employees, the employer must ensure that the training programme confirms that operator is assessed as competent at the end of the training period.

2.3 Selected training providers and trainers must be able to demonstrate that they have appropriate expertise of using suction/vacuum excavators. Expertise with, for example gully suckers does not automatically infer ability to train on suction/vacuum excavators and vice versa. Learning programmes, whether employer or training body delivered, should be based on skill standards set by the requisite industry standard-setting body, and any training should include appropriate knowledge of signalling techniques and methods. The SAVE Interest Groups has worked with CITB to develop a training standard for suction and vacuum excavators. The training content is replicated in section 9 of this annex.

3. Assessment

3.1 Employers should ensure that personnel are assessed against industry-devised occupational standards to establish that they are competent to carry out the tasks they are required to undertake. This applies equally to personnel recently completing training and experienced workers who have been recently recruited.

3.2 Assessment should contain both practical activities to demonstrate the skills and standards achieved and the answering of questions to demonstrate relevant underpinning knowledge. The assessment should be carried out by occupationally competent and authorised assessors.

4. Applying Learnt Skills in the Workplace

4.1 On the majority of operator training programmes, for safety reasons, candidates may not operate the machine at its full potential in terms of excavating around genuine services or deep depths. Consequently, employers should ensure that newly trained operators are limited to activities and/or working areas encountered within the training programme until they become confident in operating to the parameters experienced within training. When being required to excavate in the workplace, appropriate supervision must be applied to ensure the operator can safely carry out the task.

4.2 Employers and supervisors should be aware of skills attained during the training course and provide further specific training as required. Manufacturers and importers of vacuum excavators, as well as external specialist training providers, who offer vacuum excavator training, can be approached for advice on relevant training requirements.

4.3 Employers and supervisors should for newly qualified operators:

- Specify any particular work requirements to nominated training providers prior to the commencement of training;
- Establish the type and the content of training and/or assessment programmes undertaken by the operator;

- Identify differences in learnt skills and work site activities utilising training body learning outcomes and/or training material;
- Initially limit the operator to activities and/or working areas measured by the end assessment;
- Provide time for the operator to study the machine's operating notes/handbook and other related data;
- Provide time and facilities for the operator to practice with a new machine type;
- Monitor work undertaken to gauge operator confidence and ability;
- Introduce new activities and/or working areas under supervision, especially if working within hazardous or busy areas;
- Carry out periodic assessments and ascertain when new or high-risk activities can be undertaken safely;
- Provide specific additional training for specific types of attachment.

5. Familiarisation

5.1 Suction/vacuum excavators, accessories and attachments come in a variety of types, sizes and differences in operating controls, methods and characteristics. It is therefore essential that operators and supervisors are given adequate familiarisation on an unfamiliar type or model of excavator and/or attachments and accessories before they begin operations. **The employer of the excavator operator is responsible for ensuring that familiarisation is provided.**

5.2 Familiarisation may be carried out by:

- an experienced person employed by the excavator owner or;
- a representative of the excavator or attachment manufacturer or supplier or;
- any other competent, experienced and authorised person*.

NOTE: **This could be the operator of the machine*

5.3 The person giving familiarisation should have been authorised by a suitable person in a supervisory position, after checking that they are competent to do so. All familiarisation should be recorded by both the operator and their employer.

6. Competency

6.1 Competency is defined holistically in having attained the relevant skills, knowledge, experience and behaviours that are relevant to the machine type and the sector or sectors that the operative will work in.

6.2 The duty to ensure that plant operators are competent rests with their employer and the process of ensuring competence requires cooperation between employers, training providers and operators, all of whom have a significant part to play in the process. Many organisations see training as a proxy for competence; this is not the case.

6.3 It may indicate a general level of ability to operate plant but does not take into account the difficulty of the task or complexity of environment or experience of the operator. These all have a bearing on the successful management of the task.

6.4 The route to ensuring that an operator is competent to perform a task begins with assessment of the individual. An appropriate level of maturity and responsibility must be present within the candidate before they can even be considered as suitable for the task. This assessment is followed by a period of initial training where familiarisation with the operation of the machine and the working environment are built up- under supervision; the greater the experience, the less reliance on supervision. At the end of this basic training, a test of the practical and theoretical knowledge should be taken and passed.

6.5 After this initial training period, the normal route (although not the only route), is to sign on for an NVQ or vocational qualification. This should be a period of development where the operator gains skills and experience 'on the job' and is presented as evidence of growing competence in a portfolio for the gaining of an NVQ. Non NVQ routes should use the National occupational standards (NOS) as a framework to demonstrate an equivalent level of experience.

6.6 It is reasonable to assume that the operator can be responsible for the safe use of their work equipment with minimal supervision. However, as the degree of difficulty of tasks increases with time, so a commitment to on-going development is necessary. This should be recorded within a log book or equivalent as evidence of being able to undertake more complex tasks.

7. Certification Schemes

7.1 Any plant operator-based certification or carding should bear the CSCS Logo and issued by a CSCS-alliance card scheme member. This indicates that it is in complies with the Construction Leadership Council's card scheme criteria for the construction sector and mandates the attainment of the relevant NVQ or approved competence based process. For sectors external to construction, the course content and assessment criteria should map against the relevant CITB standards as in paragraph 9.

8. Further guidance

8.1 Further information on training and competence is detailed within the *Construction Industry Plant Safety Group's Best Practice Guide on Competence for Plant Operators*, available free of charge from https://www.cpa.uk.net/safety-and-technical-publications/plant-safety-group as well as

8.2 The Plant Sector Representative Organisations Plant Operations (PSRO) has published a Competency Framework detailing the processes for ensuring competency for both certification bodies and employers and which can be downloaded free of charge at www.psro.org.uk

9. Training Syllabus

9.1 To both be able to safely operate a vacuum excavator and able to attain operator-based certification, the trainee should be training in accordance with the following training content that has been delivered following a programme of learning with ongoing assessments to check the level of learning retained. This syllabus has been developed by Members of the SAVE Interest Group through a CITB short duration training standard.

On completion of training, the trainee should be able to:

- use of the operator's manual to identify key preparation, operational and safety aspects of the machine
- complete all pre-start and running checks before any activity takes place, including visual checks for damage, functionality, and effectiveness
- checking all componentry systems are fully functional, including mechanical, hydraulic, pneumatic, electrical, and electronic etc.
- replenish fuels, fluids, and lubricants, and undertake grease-based lubrication activities
- follow manufacturers periodic checks and operator level maintenance requirements
- carry out routine adjustments
- check safety systems functions including emergency stop procedures
- follow health and safety requirements when undertaking basic maintenance activities including personal protection equipment (PPE)
- check the condition and function of seatbelt and any other restraining equipment
- check the condition and function of any lighting and warning systems
- safely use all hand holds and steps
- face the machine when getting in to and out the vehicle cab and other areas for operational and maintenance purposes

- use seatbelts and other restraining equipment
- adjust seating position and mirrors
- carryout vehicle and relevant vacuum unit checks
- check isolation/emergency stop controls
- carry out starting and stopping procedures including cold starting
- carry out starting and stopping the vacuum unit safely and efficiently
- ensure warning and safety systems are operable
- configure the machine for site travel
- checking the vehicle size including height, width, length and weight relevant to working area
- use vehicle marshallers and relevant communication methods for manoeuvring activities
- have an awareness of other machines and workers
- set up and maintaining restricted, segregation and exclusion zoning requirements
- position and configure the machine for intended activity
- apply visual reference points for vacuum excavator work
- establish work requirements using method statements, job specifications, risk assessments,
- establish safe working zones to avoid personal contact with arm and nozzle
- carry out a range of excavating activities to remove materials to expose underground services following given instructions
- carry out a range of excavating duties to form excavations according to given dimensions
- ensuring maintaining stability and safety of the machine and operative
- use ground engaging and agitating tools including water and air to dislodge materials
- clean and store the vacuum unit, hoses and ground engaging equipment
- keeping clear of any arm and nozzle movements to avoid personal contact
- minimising tripping and falling hazards around the machine whilst using the remote control function
- identifying the best and safest view of the excavation works
- set up and use remote control units
- ensure remote control units are isolated when not being used
- use remote control to reposition the vehicle (hydrostatic mode)
- ensuring the suitability of ground and surrounding area to discharge loads
- follow PPE and RPE requirements for the discharging of loads
- carry out discharging procedures inc. vehicle isolation requirements when working within hopper
- carry out parking, shut down and isolation requirements according to manufacturer's instructions
- use any anti-vandalism, vehicle, vacuum unit and accessories protection equipment

The trainee should have good knowledge of the following:

- why the industry has many hazards and why safe working practices must be adopted and maintained
- why personal health and safety is not just physical injury and can include the effects of noise and vibration.
- relevant legislation and regulations applicable to vacuum excavator operations
- operators' moral obligations, legal obligations, and environmental obligations
- reporting structures, the importance of good communication on site (colleagues, management, and other workers on site)
- previous incidences involving relevant plant and pedestrians
- working with other related roles e.g., marshallers, supervisors, other plant operatives, other occupations, and support workers

- awareness of the limits to their personal knowledge, skills, and experience and when situations exceed these limits the need to stop and seek further advice from supervisors
- types of information sources including machine control systems
- the purpose and function of principal components, the basic construction, controls, electronic aids and terminology (host vehicle and suction/vacuum unit)
- purpose and location of all operational and warning signs and decals
- defect reporting requirements
- how correct and sympathetic use of the controls can ensure efficiency and safety of the machine and help prolong machine life by reducing wear and tear
- requirements for dealing with fluid spills including prevention and clean-up methods
- what safety control equipment/PPE should be worn/used for vacuum excavator operations
- why weather conditions, including heat and cold, can determine what PPE is worn when using specific machine and the personal effects of incorrect equipment
- working at height requirements
- effects of continually getting in/up to and out and/or down of/from the vacuum excavator e.g., fatigue, increased risk of falling etc.
- safe areas to get in to/out of the vacuum excavator e.g., ground location, other vehicle movements etc.
- procedures for accessing the vacuum excavator when carrying out adjustment and maintenance activities
- types of visibility aids and what factors can affect effective vision
- where and why effective vision is important
- where issues can arise where vision is limited during operation
- legislative requirements and restrictions for travelling on the public highway, including carrying of materials
- how travel speeds can affect vacuum excavator stability, safety, and emissions
- issues which can occur if departing from designated travel routes and work areas/restricted zones
- types of underground services and the effects of travelling near to/over services
- effects of travelling close to edges, embankments, structures, and trenches
- factors and limitations when travelling over various types of terrain
- how certain types of surfaces can affect traction and stability, particularly if on inclines
- how uncompacted surfaces affect machine stability
- how the weight and centre of gravity of the vehicle can cause instability issues
- how the vehicle’s turning circle can affect stability and traction
- how a loaded vehicle affects the driving characteristics when travelling
- effects due to changes of centre of gravity when on inclines
- precautions and obstructions on travel routes including overhead utilities
- regulative requirements for travelling near to or under overhead power lines
- precautions to be taken when manoeuvring in areas of restricted space
- requirements when working alongside highways, railways, and public areas
- lighting requirements and issues that may occur due to poor light
- safety checks that must be carried out to ensure the area is clear of hazards
- typical hazards that may be present in the work area
- working near to edges and deep excavations
- communication and relationship requirements and methods with other machine operators and supporting workers
- requirements for sufficient manoeuvring area for manoeuvring between work areas
- ground conditions for activities and how to maintain stability
- types of overhead obstructions and nearby proximity hazards

- people/plant interface – requirements and procedures and dangers of allowing others near to a working machine
- reasons for excavation dimensions and effects of not conforming to given tolerances
- methods of efficient excavation techniques for different types of ground and support requirements
- danger zones of a working vacuum excavator
- working in hours of darkness and lighting requirements
- how driving, working and shift patterns can cause risks to the operator and others
- identification of contaminated ground and hazardous materials e.g. asbestos, radioactive etc.
- methods of relaying and interpreting vacuum excavator work specification
- temporary works requirements
- actions required for hazards, underground and overhead services
- regulatory requirements for working near to or under overhead services
- types of services, including buried and surface laid,
- different types of ground engaging and agitating tools, attributes, safety aspects, operating procedures and when they should and should not be used
- how the type of terrain/materials determines the type of tools and procedures to be used
- methods of establishing excavation dimensions and tolerances
- procedures for carrying out excavation works near to populated areas e.g. public roads, pathways etc.
- causes of safety issues and correct procedures for dealing with blockages
- effects of poor and aggressive digging techniques when using the arm of the vacuum excavator
- considerations, factors and risks that affect nozzle selection and type
- risks and dangers in the use of ground engaging nozzles and why they should not be used
- procedures that need to be taken in the event of emergency issues occurring
- importance of the effects terrain can have on the selection of tools and attachments
- types of attachments and nozzles
- methods of safely fitting, securing and removing attachments secondary restraint
- maintenance and storage requirements for tools and attachments
- procedures if unknown contaminated materials are discovered during the excavation activity
- requirements and methods for trench access and egress
- typical types of remote control units e.g. cable or radio signals
- methods of wearing and using remote control units
- importance of placing remote safely when not in use
- out-of-service and storage and charging procedures for remote control units
- discharging area and locations including acceptable and non-acceptable discharging points
- travelling/discharging procedures on stock piles, inclines, next to open excavations etc.
- authorisation requirements for discharging loads
- environmental issues and procedures to be followed
- likely hazards in the discharging area to be taken into account
- discharging procedures for fluids, effluents etc.
- stability factors to be taken into account when discharging loads
- procedural and safety requirements for cleaning the hopper including positioning to prevent contact with falling material
- methods of cleaning the hopper including water and air
- containment requirements for contaminated cleaning-out water
- safety requirement of using compressed air for cleaning purposes
- regulatory requirements when transporting materials on the public highway including waste movement orders/licenses, axle loadings etc.
- procedures, requirements and methods for cleaning the filters

- procedures and precautions to be followed where filters have been/are suspected of being contaminated
- health and social reasons to reduce machine emissions
- government industry zero emission initiatives
- what ‘tailpipe’ emissions are caused by IC (diesel) engines
- air quality and the component gases of air
- how engine emissions, including particulate matter, affect air quality and the effects on human and environmental wellbeing
- measures to reduce emissions during operations including alternative/low emission fuels, fuel treatments and particulate filtration systems etc.
- efficient use of the machine and when and how minimising engine use can aid air quality and fuel savings
- eco-friendly oils, fluids, and lubricants
- fuel-saving techniques for specific item of plant
- spillage procedures
- types of safe locations, areas, and ground/terrain types where a vacuum excavator may be parked and should not be parked
- reasons for ensuring safe parking and unintentional movement and ground support requirements
- reasons for machine isolation including security and non-authorised use by others

Annex 4. Ground Loadings and Support

Requirements for the ground support

The ground below on which the suction excavator is driven and set up must meet the following requirements:

- The envisaged movement area of the suction excavator must have ground below that can support the load (axle load up to 12t);
- The place where the machine is set up for suction and emptying should be horizontal (max. incline setting 4 degrees).

The operator is (together with the driver of the vehicle if applicable) responsible for the choice of a safe setup location with:

- Selection of the stationary location and determination/assessment of the load- bearing capacity of the ground below;
- Note of the maximum support load and determination of the required support area;
- Selection and use of suitable/sufficient base material.

When assessing the grounds below, the following are to be noted:

- Secured supporting ground are streets, paths, parking spaces, paved surfaces, rear courtyards;
- Footpaths usually have a low load-bearing capacity (little load-bearing capacity, frequently there are also pipes laid in the footpaths);
- The following must be avoided for example (*this list is not exhaustive):*
  - Grates;
  - Manhole/access covers (*note the gradient*);
  - Sewage pipes;
  - Hollow areas from cellars, tunnels or similar;
  - Badly-filled pits;
  - Borders of paved areas (usually have low load-bearing capacity.
- Unsecured supporting ground must always be fully assessed:
  - Especially after a period of heavy rain;
  - when the water level is too high;
  - near to waterways or in depressions;
  - with loamy or muddy ground.

Ground pressure that a suction excavator creates per support during tipping

- Vehicles with an 8 m³ material container:
  - Small pressure plates (standard): Approx. 95 N/ cm²
  - Large pressure plates (option): approx. 55 N/cm²
- Vehicles with an 10 m³ material container:
  - Small pressure plates (standard): approx. 120 N/cm²
  - Large pressure plates (option): approx. 70 N/cm²

Supporting ground	Permitted ground pressure of the supporting ground N/cm²
Filled, not artificially-crushed ground	0 - 10
Mud, marsh, peat, silt	0
Natural ground (such as a meadow)	10
Asphalt (such as footpaths)	20
Dirt roads	25 - 35
Crushed stone	25
Clay ground, solid	30
Grain mixture, solid	35
Solid surface	40 - 60
Gravel, solid	40
Rock, weathered	100
Road surface	75-100

A suitable **base** is to be created below the supports according to the above table before the emptying process.

The following overview shows the dependency of:

- The container size;
- The size of the pressure plates on the supports and;
- the maximum pressure permitted by the supporting ground.

The **minimum size** of an assumed **square-shaped** stable base:

	8 m³ material container		**10 m³ material container**	
	No pressure plates	Large pressure plates	No pressure plates	Large pressure plates
Ground pressure	Approx. 95 N/ cm²	Approx. 55 N/ cm²	Approx. 120 N/ cm²	Approx. 70 N/ cm²
Permitted ground pressure [N/cm²]	**Dimensions of a square plate for an additional base [cm]**			
5	120 x 120		135 x 135	
10	85 x 85		95 x 95	
15 … 20	70 x 70		80 x 80	
25 ... 45	55 x 55		60 x 60	
50 … 70	40 x 40		45 x 45	
>75	30 x 30	No base needed	35 x 35	No base needed

- Pieces of timber / plates should be placed **centrally** and **horizontally** below the supports;
- When extending the supports, the supporting ground must be constantly observed to

ensure that it can take the pressure;

- During the work, the vehicle should be checked to see that it is parked securely by means of a visual check;
- Sufficient distance must be kept on slopes.

Annex 5. Procedure for Working at Height on Suction/Vacuum Excavators

FORCE ONE
PROVIDING SAFE EFFECTIVE SOLUTIONS
Limited

Safety Management System

Procedure:	Working at Height		
Revision No:	**Date:**	**Description:**	**Initials**
001	17/08/2015	Introduction of formally documented Working at Height Procedure	DB

1.0 Scope

This procedure identifies the expectations and correct way in which Force One employees are expected to carry out any work at height. This includes training requirements, equipment to be used and correct manner of working. This document will be reviewed annually.

2.0 Responsibilities

The responsibilities of this procedure are firstly that of the Force One Management team. It is their duty to ensure, proper instruction, information and training is given on working at height. That all required equipment is readily available and fit for use. Lastly it is their duty to ensure all employees that are, or likely to be required to do **ANY** working at height have been trained and briefed on this procedure.

It is also the responsibility of Force One employees to ensure this procedure is adhered to, defect reporting is carried out, that all fall arrest equipment is looked after and properly stored i.e. In the provided bags.

3.0 Training

Any staff wishing to, or that may be required to Work at Height, must firstly be trained to do so by a competent person, this training will be arranged by *(named person)*

4.0 Equipment

4.1 Purchasing Equipment:

Equipment for working at Height shall be purchased from a qualified retail supplier and shall be supplied with relevant certification. Equipment shall include, but not be limited to:

- Fall Arrest Harness (full body)
- Fixed length lanyard, with 2 connecting points when climbing the rear ladder
- Full suction excavator PPE minus face shield

© Force One

4.2 Hiring Equipment:

If hired equipment is to be used then this should be CE marked and come with relevant records of inspection and certification. This shall only be done as a last resort, all equipment shall be purchased by Force One Ltd.

4.3 Examination and Record Keeping:

LOLER requires the examination of equipment at certain times throughout its life. Due to Force One using this equipment on rare occasions (few times yearly) thorough examinations shall be carried out on a 6-monthly basis by a competent and certified 3rd party.

Operatives to carry out a visual inspection before every use. Any defects to be reported to Force One management.

4.4 Defective Equipment:

Any defective equipment shall be stored in a Quarantine area, in which Force One's HSEQ advisor shall have control over.

5.0 Procedure

The roof may be accessed for a variety of reasons the main being; maintenance greasing, inspections and clearing blockages.

5.1 Before accessing the roof:

The roof may only then be accessed when the following criteria can be met-

Only the operative(s) that have been briefed on this working at height procedure **AND** trained in working at height may access the roof of a Suction Excavator.

- Full PPE must be worn; Hard hat, Glasses, Gloves, Hi-Vis clothing and boots.
- Work on the roof/lid must not take place if there is any risk from ice, high winds or very low visibility.
- Operative(s) must be aware of conditions underfoot, such as wet surfaces, leaves or mud on boots.
- Pre-use checks have been carried out on fall arrest equipment prior to use by the operative(s). Should any equipment be found to be unfit for use, it must be reported immediately to Force One management. Checks by a competent person will have been carried out as detailed in 4.3

5.2 Accessing/Egressing roof:

The instructions below must be followed, should anyone wish to gain access to the roof/lid of our suction excavators.

1. The arm must first be moved out of the way, in a similar position to tipping. If the arm is in an excavation or has a nozzle on it must be placed in a position of safety and grounded where possible.

2. The Suction Excavator and remote must then be completely isolated.

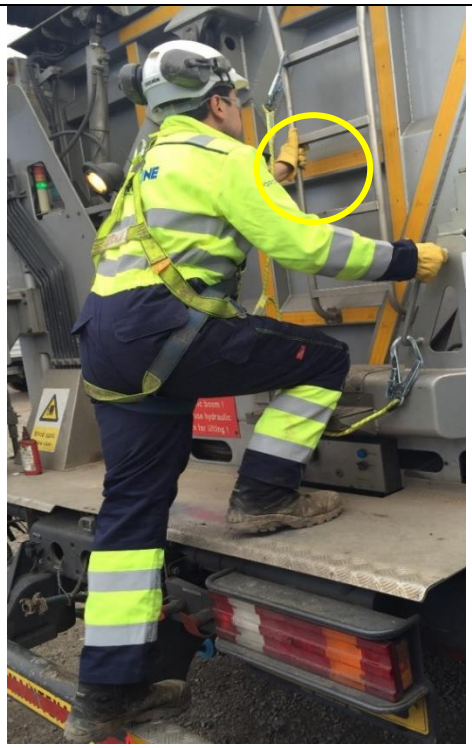
3. The operative wearing their harness and **FULL** PPE will then approach the rear of the Suction Excavator as in picture 1.

4. Before climbing onto the rear of the lorry the lanyard must first be connected to point 1.

5. The operative can then climb onto the back plate of the lorry, **THREE POINTS** of contact **MUST** be maintained at **ALL TIMES**.

Picture 1.

6. Lanyard to should then be attached to the steps/ladder as shown in picture 2 before removal of the first.

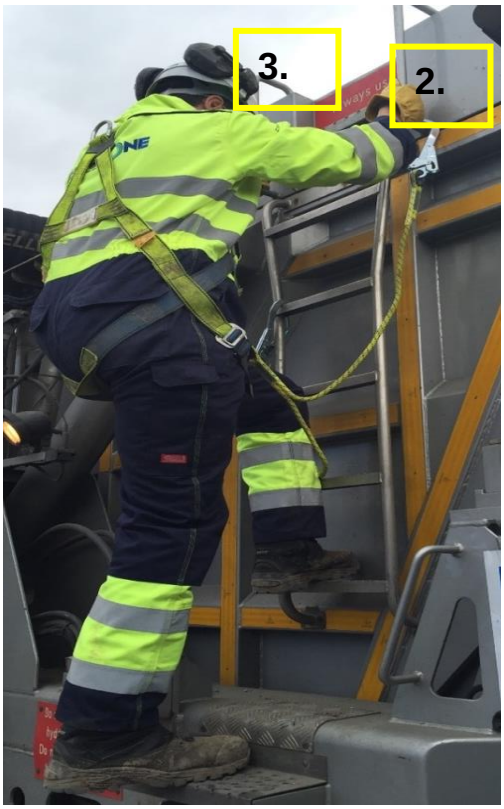


© Force One

Picture 2

7. The lanyard will be first attached to rail at point 2 before removing the other.

8. The other lanyard can then be attached to the rail at point 3, the ladder can then be fully climbed and the roof accessed. Take care not to get legs caught in the lanyard.



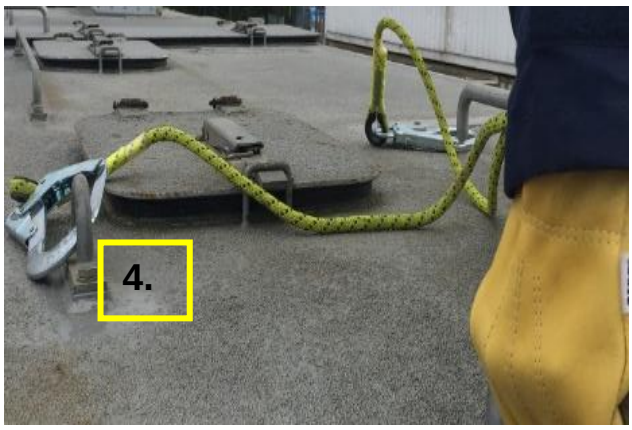
© Force One

© Force One

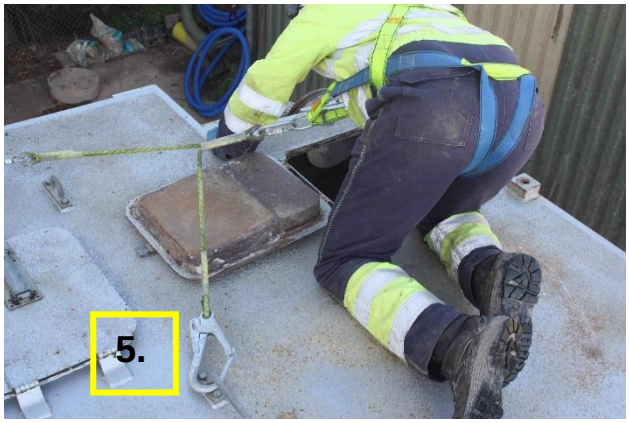
Various anchor points are mounted to the roof to be used, these will be highlighted below.

9. The left hand lanyard must then be attached to the anchor point to the right as marked by 4.

10. The right hand lanyard must then be attached to the anchor rail number 5. The inspection hatch can then be opened and the blockage cleared.

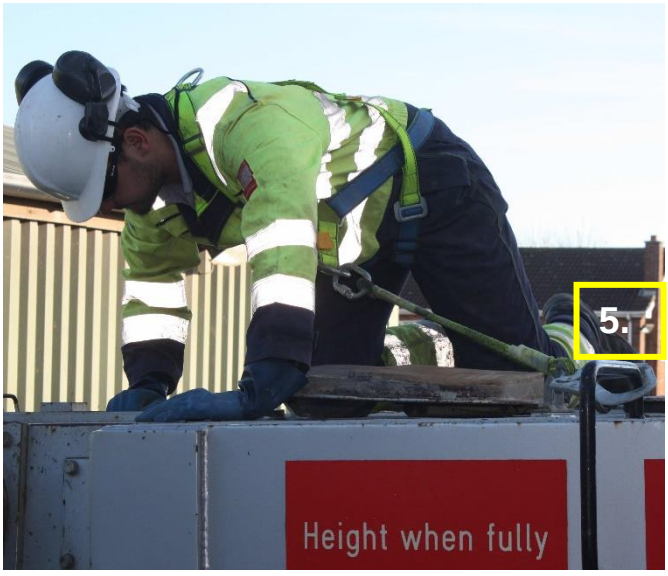


© Force One



© Force One

The secondary inspection hatch can also be accessed while attched onto rail 5.



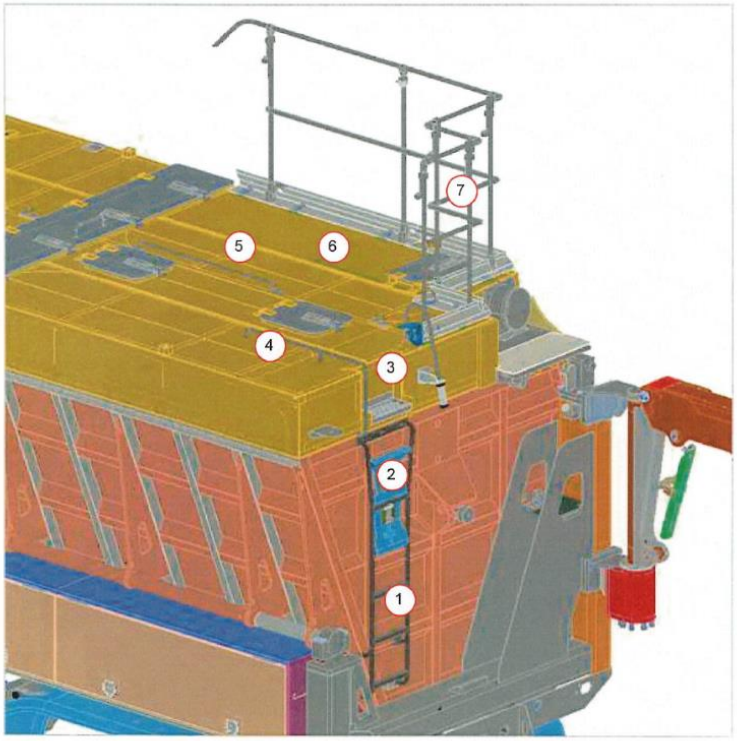
© Force One

Once work has been completed on the roof, it can be egressed by following the above steps in reverse. Operatives **MUST NOT** leave any tools, equipment or debris on the roof. This will pose a serious risk to other operatives, pedestrians and road users.

If unsure operatives must remain on the ground and seek advice from Force One management. Any damage to anchor points or steps/ladders are to be immediately reported to Force One management, and are not to be used until signed off by a competent person.

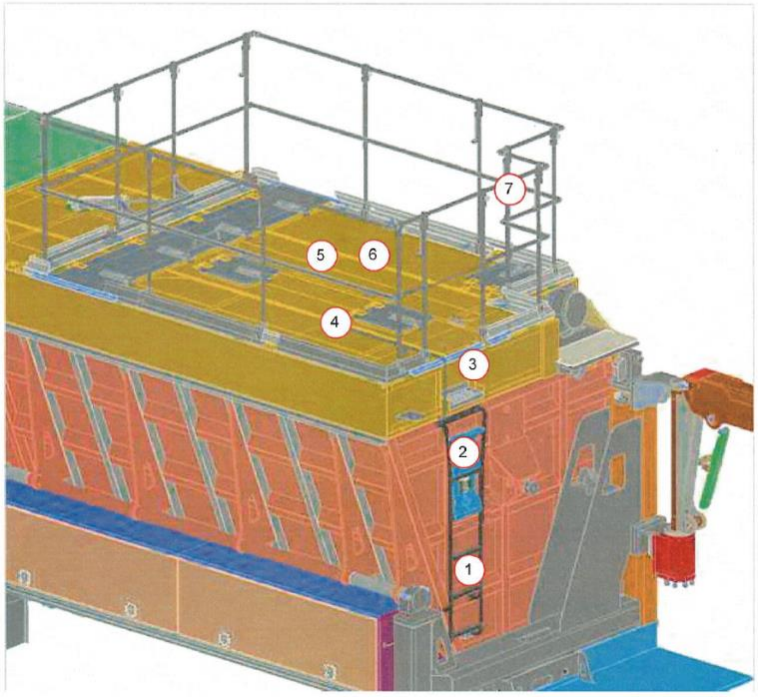
Alternative Option 1 – corner-safety-railing:

1. Lid with ladder.
2. Access to the lid is prevented through a lockable ladder guard.
3. Lid with integrated step.
4. Handrail on the lid.
5. Eyelets for fixation of PPE.
6. Stepping area equipped with a slip-resistant surface.
7. Corner-safety-railing, manually operated.



Alternative Option 2 – peripheral safety railing

1. Lid with ladder.
2. Access to the lid is prevented through a lockable ladder guard.
3. Lid with integrated step.
4. Handrail on the lid.
5. Eyelets for fixation of PPE.
6. Stepping area equipped with a slip-resistant surface.
7. Peripheral safety-railing, electrically operated.



Annex 6. Transporting Waste on the Public Highway (inc. sold-on materials) and Dangerous Goods Control Measures

Waste carrying

1. Those who transport waste on the public highway as part of a trade, commercial undertaking or as part of their work must register as a waste carrier with the Environment Agency. Where waste has been produced by the organisation, they must also be registered as a waste carrier.

2. The requirement to be licensed as a waste carrier applies regardless of where the waste is being taken such as being taken to the carrying organisation's own premises, other premises or directly to a licensed disposal facility.

3. Registering as a waste carrier is undertaken via an application form which can be download from or completed via the Environment Agency's website. On registration, a waste carriers license and license number in produced and the organisation entered onto a central database. Registration lasts for three years from which renewal can be undertaken for an additional cost.

Failure to Register

4. Not registering as a waste carrier can result in criminal prosecution, including a fine and seizure of the vehicle used to transport the waste at the point of the apprehension. Breach of contract could further occur with those where removal and disposal of waste forms part of a contract.

Waste Transfer Notes

5. This is a document that records a transfer of waste from one party to another and includes details of:

- Place, date and time of transfer;
- Parties involved;
- License or permit number of the person receiving the waste
- Description of the waste being transferred.

6. The description of the waste should include the List of Waste (LWC) or the relevant European Waste Catalogue (EWC) codes, as well as an indication of quantity and/or weight. Downloadable duty of care waste transfer forms and hazardous waste consignment notes can be downloaded from www.gov.uk/topic/environmental-management/waste

7. A transfer of waste to another party requires this activity to be recorded by a waste transfer note. The definition of transfer means the passing of the responsibility to others and not necessarily transporting from A to B. The waste transfer note details the parties and address where the transfer of responsibility took place not where the waste ended up.

Annex 7. Human Factors – Key Messages

The HSE Publication HSG48: *Reducing Error And Influencing Behaviour'* examines human factors and how they can affect workplace health and safety. It looks at:

- The general impact of human error and behaviour;
- How workers' physical and mental health can be affected by these and other factors;
- Practical ideas on how to identify, assess and control risks arising from such issues; and
- Case studies detailing how various organisations have approached these challenges.

HSG487 is aimed at managers with health and safety responsibilities, health and safety professionals and employee safety representatives. The message is that proper consideration of 'human factors' is a key ingredient of effective health and safety management. Human factors is a broad field and organisations may have viewed it in the past as being too complex or difficult to do anything about.

The guidance aims to overcome such fears by providing practical help on how to tackle some of the important issues and:

- explains how human error and behaviour can impact on health and safety;
- shows how human behaviour and other factors in the workplace can affect the n physical and mental health of workers;
- provides practical ideas on what you can do to identify, assess and control n risks arising from the human factor; and
- includes illustrative case studies to show how other organisations have tackled n different human problems at work.

The following are messages taken from each chapter of the guidance:

What are Human Factors

Consideration of 'human factors' is a key ingredient of effective health and safety management. It involves:

- thinking about relevant job, individual and organisational aspects;
- addressing human factors in risk assessment, during accident investigation,
- in design and procurement and in day-to-day operations;
- involving the workforce and their representatives; and
- selecting from a range of effective control measures.

Understanding Human Failure

Everyone can make errors no matter how well trained and motivated they are. Sometimes we are 'set up' by the system to fail. The challenge is to develop error-tolerant systems and to prevent errors from occurring.

Failures arising from people other than those directly involved in operational or maintenance activities are important. Managers' and designers' failures may lie hidden until they are triggered at some time in the future.

There are two main types of human failure: errors and violations. Controls will be more effective if the types are identified and addressed separately.

Reducing human error involves far more than taking disciplinary action against an individual. There are a range of measures which are more effective controls including design of the job and equipment, procedures, and training.

Paying attention to individual attitudes and motivations, design features of the job and the organisation will help to reduce violations.

Designing for People

Occupational ergonomics is about making a good ‘fit’ between people, the equipment they use, the task they carry out and the environment in which they work. Effective use of ergonomics will make work safer, healthier and more productive.

Jobs are often designed to minimise skill requirements and decision making. This can reduce levels of job satisfaction at work and can affect employee mental well-being. Job redesign usually has a positive impact on job satisfaction and mental well-being providing that it is not just the variety of tasks that is altered.

Consider the user when writing procedures. Use of procedures can be improved if human factors issues are addressed. Think carefully about the format, style and content of procedures to make them easy to use and understand. Try to promote ownership of procedures through involvement of users in their development, review or updating.

Do not assume that everyone will notice, read and comply with warnings. To reduce risks consider additional controls. Think about the design, content and feasibility of a warning. Consider individual factors which are known to influence warning behaviour.

Human Reliability Assessment (HRA) is useful within the wider approach to occupational health and safety. It is a logical part of the process of risk assessment and is carried out in a stepwise manner. Training, auditing, feedback and independent analysis can all improve the HRA process and results.

Managing the Influences on Human Performance

Find out if there is a problem with shift work and fatigue in your organisation. Pay particular attention to night workers and safety-critical staff. Talk to people doing shift work about how they are coping. Look at the timing of accidents and near misses. Consider the shift schedules of people who make critical mistakes at work. Tackle the problem with a variety of approaches such as shift rostering, improved work environment, better job design and shift work education.

For safer communication pay attention to high-risk situations such as during maintenance, if the work continues over a shift change, or communications between experienced and novice staff. A number of simple steps can improve shift communications.

Accidents and injuries are the result of a combination of employee, employer and job factors. The view that accidents are caused by ‘carelessness’ is outdated. Nevertheless health and safety behaviour at work is an important topic Safe behaviour can be influenced by various things including: education and training, improved ergonomic design, and by careful introduction of behavioural management programmes.

The health and safety culture of an organisation is an important factor in achieving and maintaining good health and safety performance. Key factors for a positive culture include: open communications, management commitment and leadership, availability of resources, and the balancing of production and health and safety goals.

Annex 8. Radio Communications

1. The use of hand held VHF/UHF radios are often used can lead to a number of issues which may interfere with the clear communication vital for safe operation of plant on site which include:

- Loss of signal and thus communication, leading to loss of control of the operation;
- Interference from radios on adjacent sites, which can lead to loss of communication or directions being given to the wrong operator;
- Misunderstanding between the operator and the signaller, leading to problems such as part of the machine colliding with people or the building structure.

Radio Specification

2. The first two issues should be addressed by specifying the correct radio equipment for the application taking into account:

- Signal strength – if it is too low, there is a risk of signal loss and if too high, will cause interference with adjacent sites. When working blind, the structure may well cause signal loss and a booster aerial could be required. Signal strength should be checked at the beginning of each shift before lifting operations are started;
- Frequency – choosing a different frequency from other radios on the site or in the area will avoid interference from or to other radios;
- Durability – radio hand-sets should be sufficiently durable to withstand use on site;
- Charging – adequate charging arrangements to ensure that batteries are charged;
- At the end of a shift and that spare charged batteries are available at all times;
- Battery capacity – sufficient capacity to last for a full shift;
- Radios in machine cabs should be equipped with foot switches allowing the operator to transmit whilst leaving both hands free to operate the controls.

Calls Signs and Standard Commands

3. The third issue, misunderstandings between the operator and communicator, should be addressed as follows:

- Both parties must have a sufficient command of a common language (normally English) to ensure that clear, unambiguous communication can take place;
- A clear, unique call sign should be allocated to each communicator and operator;
- Each message should be preceded by the call sign;
- The operator should not respond to any command (other than Stop) that is not preceded by the call sign;
- Voice commands must only be given by one person, normally the signaller, at any one time;
- Voice commands should be given using an agreed set of signals.

Radio System Familiarisation

4. It is essential that all radio users are familiar with the controls and operation of the model of radio that they are required to use.

Radio Licensing Requirements

5. Radios used for two-way communication on construction sites, and for industrial use, are referred to as Private Mobile Radio (PMR). Some low powered PMR radios use a European system called PMR446 and does not require a license. This system is however limited to 8 UHF frequencies - each with 38 channels, which may lead to interference from other users. PMR446 radios are also limited to a maximum of 500 mW Effective Radiated Power, giving a range of 0.5 to 1 mile in built up areas and 2 miles in open country. More powerful radios work on VHF and UHF radio frequencies which are assigned to a user by OFCOM, who also regulate the frequency bands.

6. To obtain a license on one of these frequencies, an application needs to be made to OFCOM. The benefits of a licensed frequency are generally greater range, less interference from other users and more features available on the radio sets. These frequencies are allocated to businesses only, on a case-by-case basis. Once the license has been issued, radios can subsequently be purchased. The supplier will need to see a copy of the license to program the radios to the correct frequency before shipping.

7. Additional guidance is given in the Tower Crane Interest Group's Technical Information Note: Radio Communication for Lifting Operations (TIN 017) which can be downloaded free of charge from https://www.cpa.uk.net/safety-and-technical-publications/tower-crane-guidance/tcig-technical-information-notes

Annex 9. Annual Testing (MOT) requirements

1. Heavy vehicles constructed on or adapted from an HGV-based chassis are subject under the Goods Vehicles (Plating and Testing) Regulations 1988 to require plating and testing and can encompass mobile concrete pumps, vacuum/suction excavators, truck mounted access platforms and mobile cranes mounted on a truck-based chassis.

2. Equipment on a bespoke chassis which come under the Special Types Goods Order (STGO) Regulations remain exempt from the annual MOT test.

3. Generally, there are no specific exemption for suction/vacuum excavators and other such vehicles. However, it is possible that they meet the definition of plant/engineering plant under the Road Vehicles (Construction and Use) Regulations 1986 as follows:

Engineering plant is defined in regulation 3 (2) of the C&U regulations as:

> *"(a) movable plant or equipment being a motor vehicle or trailer specially designed and constructed for the special purposes of engineering operations, and which cannot, owing to the requirements of those purposes, comply with all the requirements of these regulations and which is not constructed primarily to carry a load other than a load being either excavated materials raised from the ground by apparatus on the motor vehicle or trailer or materials which the vehicle or trailer is specially designed to treat while carried thereon; or*
>
> *(b) a mobile crane which does not comply in all respects with the requirements of these regulations."*
>
> *There are derogations from the regulations for vehicles considered to be engineering plant. However, it should be noted that there are no derogations from Regulations 7 (length), 8 (width) or 75 to 80 (axle and gross weights).*

4. The DfT since 2018 have removed the testing exemption for plant and engineering plant unless the vehicle is:

- based on a bespoke (non-HGV) chassis; or
- operating under the STGO.

These two caveats will apply consistently across all exemptions that have been removed.

5. Equipment that operates above normal weights authorised via the STGO criteria would continue to be exempt. Any that operate within standard limits and on a lorry-based chassis is likely to be subject to testing.

6. For exempted vehicles, there is still a need to ensure that the host vehicle or unit remains roadworthy. The CPA Crane Interest Group have produced a Guide to Maintaining Roadworthiness of Mobile Cranes and is based on the DVSA's Guide to Maintaining Roadworthiness publication and the DSA's Heavy Goods Vehicle Manual. Each can be downloaded free of charge from:

https://www.cpa.uk.net/safety-and-technical-publications/mobile-and-crawler-crane-guidance

https://www.gov.uk/government/publications/guide-to-maintaining-roadworthiness

https://www.gov.uk/government/publications/hgv-inspection-manual

Annex 10. Bibliography

NOTE: *All statutes (legislation) and publications by government departments and agencies are available for free download from the internet.)*

Legislation

Health & Safety at Work etc. Act 1974.

Management of Health & Safety at Work Regulations 1999/SI3242.

Workplace (Health, Safety & Welfare) Regulations 1992/SI3004.

Provision & Use of Work Equipment Regulations 1998/SI2306.

L22 Safe use of work equipment, HSE Books.

Lifting Operations & Lifting Equipment Regulations 1998/SI2307.

L113 Safe use of lifting equipment, HSE Books.

Personal Protective Equipment at Work Regulations 1992/SI2966.

Work at Height Regulations 2005/SI735.

Supply of Machinery (Safety) Regulations 2008/SI1597.

The Confined Spaces Regulations 1997

The Construction (Design and Management) Regulations 2015/SI51.

The Control of Substances Hazardous to Health Regulations 2002/SI2677.

The Control of Noise at Work Regulations 2005/SI1643.

The Ionising Radiation Regulations 2017

The Working Time Regulations 1998/SI1833

The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013/SI 1471

The Road Traffic Act 1991.

The Control of Asbestos Regulations 2012.

Standards

BS 7121 (all parts), Code of practice for safe use of cranes.

BS EN 471, High-visibility warning clothing for professional use – Test methods and requirements.

BS EN ISO 12100-1:2009 A +1, Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology.

PD 5304:2005, Guidance on safe use of machinery.

Other Publications

HSE Leaflet INDG218 – Guide to Risk Assessment.

HSE Leaflet INDG163 – Five Steps to Risk Assessment.

HSE Leaflet INDG 73 – Working alone in safety.

HSE Guidance Note GS6 - Avoidance of danger from overhead electric power lines.

HSE Guidance Note HSG 47 – Avoiding danger from underground services.

HSE Guidance Notes HSG 144 - The safe use of vehicles on construction sites.

DVLA INF95 – A general guide to driving licenses.

DVLA INF52 – Special Licensing Arrangements for Drivers of Large Vehicles.

Useful Websites

Construction Plant-hire Association	www.cpa.uk.net
Health and Safety Executive	www.hse.gov.uk
DVSA	https://www.gov.uk/government/organisations/driver-and-vehicle-standards-agency
Plant Safety Group	https://www.cpa.uk.net/safety-and-technical-publications/plant-safety-group
PSRO	www.psro.org.uk
Construction Leadership Council	www.constructionleadershipcouncil.co.uk/workstream/people-and-skills/competence/
CSCS	www.cscs.uk.com
CPCS	https://www.nocnjobcards.org/CPCS/
Energy and Utility Skills Register	www.eusr.co.uk

Annex 11. Working Group Members

The following individuals representing the named organisations from the Suction and Vacuum Excavator Special Interest Group (SAVE) or others who contributed to the development of the good practice guide:

First Edition Group 2017

Pat Burke	Force One *(Chair of the SAVE Interest Group)*
Andy Martin	Cadent
Brian Jones	Cadent/CPA
David Hignett	Sellafield Ltd
Graham Pirson	Quattro Plant
John Patrick Mee	Vac-Ex
John Underwood	Health and Safety Executive
Kevan Lee	Sellafield Ltd
Lee Davidson	Morgan Sindall
Lewis Sinclair	PSS Hire
Lloyd Gardener	RSP Suction Excavators
Mark Aspinall	J A Rattigan
Mark Dixon	Morrison Utility Services
Mark Hamilton	PSS Hire
Mel Edwards	CITB
Mick Dysart	LMD Vacuum Excavation
Richard Dyke	Hitachi Capital
Russell Fairhurst	MTS Suction Systems
Sean Quinn	Pier UK
Stephen Coen	GPL Group
Steve Goodwin	Balfour Beatty
Tom Vanson	Vac-ex

2024 Revision

Declan Burke	Force One *(Chair of the SAVE Interest Group)*
This revision was undertaken by the 2024 membership of the SAVE Interest Group.	
CPA Support	
Rob Squires	CPA (SAVE IG Co-ordinator)
Peter Brown	CPA (Editor)
Katie Kelleher	CPA (Publications Manager)