

***IGEM/SR/28 Edition 2
Communication 1753***

Trenchless techniques



*Founded 1863
Royal Charter 1929
Patron: Her Majesty the Queen*

IGEM/SR/28 Edition 2
Communication 1753

Trenchless techniques

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SECTION 1 : INTRODUCTION

- 1.1 IGE/SR/26, Communication 1662, entitled Horizontal Directional Drilling and Impact Moling, was first published by the Institution of Gas Engineers and Managers (IGEM) in 1999. IGE/SR/28, Communication 1680, entitled Trenchless Techniques was first published by the Institution of Gas Engineers and Managers (IGEM) in 2002. This Standard, IGE/SR/28 Edition 2, supersedes Communications 1662 and 1680 which are now obsolete.
- 1.2 This Standard has been drafted by a Panel appointed by IGEM's Gas Transmission and Distribution Committee and published by the authority of the Council of IGEM.
- 1.3 This Standard provides requirements to those responsible for the planning of trenchless technology works, the operation of equipment and the application of processes used to carry out work.
- 1.4 The advantages of trenchless techniques are in the ability to install new, and replace or renovate existing underground utilities and services with minimal disturbance to the surface or damage to other buried services, thereby reducing above-ground activities and eliminating the need for costly and disruptive reinstatement. These advantages open up opportunities for installation in difficult or otherwise prohibitive expensive locations, for example:
- beneath highways, access ways to plant and other surfaced areas
 - beneath railways
 - beneath water courses, estuaries and lakes
 - at sites of special scientific interest (SSI)
 - beneath structures and plant installations.
- 1.5 This Standard draws attention to those aspects of the examination, lining, repair and installation of underground duct, pipe, cable and service tunnels, using trenchless equipment and techniques which could put operators and persons working nearby and members of the public at risk, or could lead to damage and disruption of existing services, for example:
- effects of collateral damage to adjacent buried plant and services
 - damage in respect of heave or shrinkage of the ground surface.
- 1.6 This Standard makes use of the terms "must," "shall" and "should" when prescribing particular requirements. Notwithstanding Sub-Section 1.8:
- the term "must" identifies a requirement by law in Great Britain (GB) at the time of publication
 - the term "shall" prescribes a procedure which, it is intended, will be complied with in full and without deviation
 - the term "should" prescribes a procedure which, it is intended, will be complied with unless, after prior consideration, deviation is considered to be acceptable.

Such terms may have different meanings when used in legislation, or Health and Safety Executive (HSE) Approved Codes of Practice (ACoPs) or Guidance, and reference needs to be made to such statutory legislation or official guidance for information on legal obligations.

- 1.7 The primary responsibility for compliance with legal duties relating to health and safety at work rests with the employer. The fact that certain employees, for example "responsible engineers" are allowed to exercise their professional judgement does not allow employers to abrogate their primary responsibilities.

Employers must:

- have done everything to ensure, so far as is reasonably practicable, that there are no better protective measures that can be taken other than relying on the exercise of professional judgement by "responsible engineers"
- have done everything to ensure, so far as is reasonably practicable, that "responsible engineers" have the skills, training, experience and personal qualities necessary for the proper exercise of professional judgement
- have systems and procedures in place to ensure that the exercise of professional judgement by "responsible engineers" is subject to appropriate monitoring and review
- not require "responsible engineers" to undertake tasks which would necessitate the exercise of professional judgement that is not within their competence. There should be written procedures defining the extent to which "responsible engineers" can exercise their professional judgement. When "responsible engineers" are asked to undertake tasks which deviate from this they should refer the matter for higher review.

1.8 Notwithstanding Sub-Section 1.6, this Standard does not attempt to make the use of any method or specification obligatory against the judgment of the responsible engineer. Where new and better techniques are developed and proved, they should be adopted without waiting for the modification of this Standard. Amendments to this Standard will be issued when necessary and their publication will be announced in the Journal of IGEM and other publications as appropriate.

1.9 It is now widely accepted that the majority of accidents in industry generally are in some measure attributable to human as well as technical factors. People who initiated actions that caused or contributed to accidents might have acted in a more appropriate manner to prevent them.

To assist in the control of risk and proper management of these human factors, due regard should be taken of HSG48.

1.10 Requests for interpretation of this Standard in relation to matters within its scope, but not precisely covered by the current text, should be addressed to Technical Services, IGEM, IGEM House, High Street, Kegworth, Derbyshire, DE74 2DA or email to technical@igem.org.uk. Such requests will be submitted to the relevant Committee for consideration and advice, but in the context that the final responsibility is that of the engineer concerned. If any advice is given by or on behalf of IGEM, this does not imply acceptance of any liability for the consequences and does not relieve the responsible engineer of any of their obligations.

1.11 This Standard was published in May 2011.

SECTION 2 : SCOPE

2.1 This Standard addresses health, safety and environmental matters associated with the following trenchless disciplines:

- horizontal directional drilling (HDD)
- impact moling
- auger boring and rotary drilling
- micro-tunnelling (up to 1 m diameter)
- pipe ramming and pipe jacking
- pipe splitting and pipe bursting
- refurbishment of pipes using lining techniques
- internal pipe repair system(s).

Note: Guidance on high pressure cleaning, pipe inspection and blast cleaning operations are given in Appendices 8, 9 and 10 respectively.

2.2 This Standard gives requirements and is not, intended to relate to the specific performance capabilities of any particular system. Manufacturers' safety and operational manuals need to be available and those more detailed safety and operational procedures implemented.

Note: It is not feasible to provide definitive dimensional guidance on the depth, diameter and length of a bore, as these dimensions vary dependent on the equipment used and site-specific conditions. Therefore, it is essential that the equipment manufacturer's guidelines are followed in their entirety.

SECTION 3 : LEGAL AND ALLIED CONSIDERATIONS

3.1 GENERAL

3.1.1 This Standard is set out against a background of legislation in force in the GB at the time of publication. Similar considerations are likely to apply in other countries and reference to appropriate national legislation will be necessary.

Appendix 2 lists legislation, guidance notes and Standards etc. which are identified within this Standard as well as further items of legislation that may be applicable.

Where Standards are quoted, equivalent national or international Standards, etc. equally may be appropriate.

Unless otherwise stated, the latest version of the referenced document should be used.

3.1.2 Health and safety legislation must be observed, including those requirements concerned with the duties of employers towards both their employees and other persons, including members of the public whose safety may be affected.

In the absence of specific legislation, it is essential that installations are designed, constructed, installed, operated and maintained so as to be safe.

3.2 PRIMARY LEGISLATION

3.2.1 Control of Pollution Act (COPA)

3.2.1.1 A certain amount of noise is inherent in operation and maintenance activities. The best practicable methods should be employed to minimise noise emission, to protect site personnel and the public. Any relevant legal requirements must be applied.

3.2.1.2 Consideration should be given to the following:

- provision of suitable ear protection to site personnel
- siting and screening of plant
- use of acoustically-treated power tools, compressors and generators
- the timing of all operations and maintenance activities, which should take into account the impact on the environment.

3.2.1.3 Noise is a major issue both for designers (who should endeavour to “design out” noisy processes, wherever possible) and managers of construction or demolition sites where the potential of nuisance should be recognised at the earliest possible stage.

3.2.1.4 Part III of COPA relates to construction site noise, which is subject to noise abatement zones and licensing enforcement by the local authorities. Local authorities have powers to control noise (and vibration) on or from building sites. This control is by the service of a notice placing obligations on the person responsible for the construction operations to observe specified controls to minimise noise. Such a notice can specify types of plant and machinery, permitted hours of operation, boundary noise levels, etc.

3.2.1.5 When drawing up such requirements, the local authority has regard to any code of practice approved or issued under COPA. It must also have regard to the concept of “best practicable means” and any alternative plant or machinery which may be used. BS 5228 has been adopted for this purpose. Although the standard has been adopted under COPA, it is not legally binding in itself.

However, the content of each relevant part of the standard should be taken to represent current good practice.

- 3.2.1.6 Noise abatement zones are established essentially for the purposes of rationalising competing sources of noise, particularly where industrial premises and domestic premises are in proximity. Local authorities are required to keep registers of noise levels of specified premises within noise abatement zones.

3.2.2 **Environmental Protection Act (EPA)**

3.2.2.1 *Waste*

- 3.2.2.1.1 Waste is defined in Schedule 22 of the Environment Act as any substance or object which a holder discards or intends, or is required, to discard. This definition is based upon an EC Directive and is, therefore, known as "directive waste". "Controlled waste" is defined by EPA as "household, industrial and commercial waste". Controls under EPA, for example licensing requirements and the Duty of Care, apply only to "controlled waste" that is also "directive waste".

- 3.2.2.1.2 Section 34 of EPA introduced a duty of care for waste management. The duty of care applies to anyone who produces, imports, carries, keeps, treats or disposes of controlled waste. There are a number of objectives, outlined below, which duty holders should achieve, as is reasonable in the circumstances.

- 3.2.2.1.3 Every person who is subject to the duty of care must ensure not only that they do not commit an offence but that any other person does not similarly commit offence. In practice, this means that a waste holder is responsible for taking steps to prevent offences involving waste that they have controlled at some point. They must try to prevent other people from disposing of, treating or storing the waste:

- without a licence
- breaching the conditions of a licence
- in a manner likely to cause pollution or harm to health.

- 3.2.2.1.4 The producer or importer of waste must package it in such a way as to prevent escape of leakage while on site, in transit or in storage. The waste producer or holder must ensure that waste is only transferred to an authorised person. The categories of authorised persons are:

- a waste collection authority
- the holder of a waste management licence or someone who is exempt from holding a licence
- a registered carrier of controlled waste, or someone who is exempt from registration
- in Scotland, a waste disposal authority.

In addition, an accurate, written description of the waste must be provided by the producer or importer of the waste and transferred with the waste at each stage.

3.2.2.2 *Noise*

- 3.2.2.2.1 Part II of EPA relates to statutory nuisances, which include noise nuisances. Statutory nuisances are defined as including circumstances in which noise is emitting from premises so as to be prejudicial to health or a nuisance. The local authority can serve an abatement notice and enforce it in criminal proceedings before a magistrate's court in the event of non-compliance without reasonable excuse.

3.2.2.2.2 The Noise and Statutory Nuisance Act amends EPA to make noise from vehicles, machinery or equipment in the street a statutory nuisance. If the local authority is satisfied that noise from vehicles, machinery or equipment in the street is causing, or is likely to cause, a nuisance, it must serve an abatement notice on the person responsible.

3.2.2.2.3 The aim of the Control of Noise at Work Regulations (see Sub-Section 3.3.4) is to reduce the risks of occupational hearing damage to as low as reasonably practicable.

There are, among others, legal duties to:

- protect the hearing of those at work and of others
- carry out a noise assessment if employees are exposed to noise levels exceeding 85 dB(A)
- take measures to reduce noise levels to the lowest level reasonably practicable
- use warning signs to indicate where hearing protection must be worn
- inform workers about risks to hearing.

3.2.2.2.4 HSL108 is designed to give those with responsibilities for reducing noise exposure guidance and advice on legal duties on the introduction of control measures, the selection of ear protection and how to carry out a noise assessment by a competent person.

3.2.3 **Health and Safety at Work etc. Act (HSWA)**

3.2.3.1 HSWA sets out general duties which employers have towards employees and members of the public and which employees have to themselves and to each other. It is also the "umbrella" under which health and safety regulations are made.

3.2.3.2 Employers' duties of care with regard to the health and safety of their employees are set out in Section 2 of HSWA which contains a general statement of the duties of employers to their employees while at work, including:

- the provision and maintenance of plant and systems of work that are safe and without risks to health
- ensuring that the use, handling, storage and transport of articles/substances is safe and without risk
- the provision of information, instruction, training and supervision.

3.2.4 **New Roads and Street Works Act (NRSWA)**

3.2.4.1 NRSWA and the associated Regulations lay down standards of service and performance for all statutory and licensed Undertakers in the execution of their statutory rights to excavate within the public highway.

Note: Whereas NRSWA itself is specific to Undertakers, it is probable that a significant proportion of trenchless technology would be carried out on behalf of Undertakers, under NRSWA and, in that respect, a thorough knowledge of the provisions of NRSWA is required before commencing any work in public highways.

3.2.4.2 Under certain sections of NRSWA, Codes of Practice (CoPs) have been issued by the Secretaries of State for Transport, Wales and Scotland. These give practical guidance on certain matters. In instances where an Undertaker fails to comply with its duties under these Sections, the Undertaker commits an offence. This amplifies the need for a thorough working knowledge of the provisions of NRSWA.

3.2.5 **Traffic Management Act (TMA)**

3.2.5.1 TMA makes provision for traffic officers and their duties relating to the management of road works and regulating street works. It amends Part 3 of the New Roads and Street Works Act 1991 and Parts 9 and 14 of the Highways Act 1980, to allow civil enforcement of traffic contraventions and amends section 55 of the Road Traffic Regulation Act 1984.

3.2.5.2 TMA Part 3 provides for the introduction of permit schemes in England and Wales. Permit schemes provide control to specified works in the street in a particular area and require a permit to be obtained for such works.

3.2.5.3 TMA Part 4 provides for changes to the regulatory regime for utility companies' street works and also provides for increases in levels of fines of specified offences, and provides for highway authorities to issue Fixed Penalty Notices for certain offences.

3.2.5.4 TMA Part 5 includes specific measures that alter the arrangements for traffic management in London. These include provisions for the Secretary of State to designate an initial network of strategic roads (and for changes to that network to be made by the Assembly or the Mayor of London acting on its behalf). The purpose of designating this network is to enhance Transport for London's (TfL's) powers in relation to Borough roads by enabling it to object to proposals that would affect strategic roads.

TMA also amends the Highways Act 1980, most notably to provide for regulations to apply 'lane rental' charges to skips, scaffolding, building materials and temporary excavations that occupy the highway.

3.3 **SECONDARY LEGISLATION**

3.3.1 **Confined Spaces Regulations**

These Regulations apply to a large range of confined spaces. Employers and the self employed should prevent entry into confined spaces unless avoidance is not reasonably practicable and unless there is a system of work which renders the work safe. They are also required to have specific emergency arrangements in place. Approved code of practice and guidance is provided in HSL101.

3.3.2 **Construction (Design and Management) Regulations (CDM)**

3.3.2.1 CDM apply to almost all construction work. Trenchless techniques, used on projects such as the installation of an area cable television network or the installation of a utility service, would be subject to CDM, as would trenchless techniques used as part of virtually all civil engineering construction or building work. Where CDM do not apply, the principles of good construction management which they embody should be adhered to.

3.3.2.2 CDM impose duties on designers, clients, developers and contractors. The client must appoint a CDM co-ordinator and principal contractor, who must be in place throughout the construction phase. Not all the regulations apply to all construction projects. Further information is given in HSL144. For a notifiable project (as defined in CDM) the CDM Co-ordinator must notify HSE before construction work commences. Construction includes the alterations, repair, redecoration, maintenance, decommissioning and demolition of a structure. It also covers installation, commissioning, maintenance or removal of gas services.

The duties include requirements that:

- employers, so far as is reasonably practicable, provide a safe working place with sufficient working space, including suitable access to and egress from the working place
- precautions be taken to prevent people falling as a result of openings, edges and the like. This requires the provision of shuttering, shoring, barriers, scaffolds, ladders, safety nets or safety harnesses and the like
- excavations be supported whenever the nature of the work being carried out in the excavation and the ground conditions make the provision of such support necessary
- employers provide certain health and welfare provisions on site, with each employee having adequate access to them. Such provisions include accommodation for bad weather sheltering, messing, storage of working clothes and drying facilities, together with washing and sanitary facilities.

3.3.3 **Construction (Head Protection) Regulations**

Under these Regulations, employers are required to provide, maintain and replace, as necessary, suitable head protection for their employees and others working in the areas over which they have control. Employers must ensure that the head protection is worn unless there is no risk of a head injury occurring other than by falling over. Guidance is provided in HSL102.

3.3.4 **Control of Noise at Work Regulations**

3.3.4.1 These Regulations require employers to make and review noise assessments and to keep relevant records. The risk of damage to the hearing of employees from exposure to noise must be reduced. Noise must be eliminated or reduced at source so far as is reasonably practicable and before the issue of hearing protection is considered. Guidance is provided in HSL108.

3.3.4.2 Hearing protectors must be worn by employees entering a hearing protection zone.

3.3.4.3 Employees likely to be exposed to a level of noise above the specified action level must be provided with adequate information.

3.3.5 **Control of Substances Hazardous to Health Regulations (COSHH)**

3.3.5.1 COSHH, which reinforce existing statutory obligations under HSWA, impose a duty on employers to protect employees against risks to health, whether immediate or delayed, arising from exposure to substances hazardous to health, either used or encountered, as a result of a work activity. They also impose certain duties on employees.

3.3.5.2 Under COSHH, work must not be carried out which is liable to expose employees to hazardous substances unless the employer has made a suitable and sufficient assessment of the risk created by the work and the steps that need to be taken to comply with COSHH. After assessing the risk, it is necessary to inform employees of the risks and to carry out the appropriate training and instruction to ensure the risks are minimised. In certain cases, control measures such as ventilation or PPE may be necessary and, where provided, they must be used. Practical guidance can be found in HSL5 and leaflet INDG136.

3.3.6 **Electricity at Work Regulations (EWR)**

3.3.6.1 These Regulations apply to electrical installations at work and equipment using electrical energy.

They are concerned with the prevention of danger from electric shock, electric burn, electrical explosion or arcing, or from fire or explosion initiated by electrical energy.

In general, the following apply:

- systems must be designed, constructed and maintained so as to prevent danger
- electrical equipment must not be used if its strength and capability may be exceeded, so giving rise to danger
- electrical equipment which may be exposed to adverse or hazardous environments must be constructed to, or protected in such a way as to, prevent danger
- all conductors must be either insulated or protected so as to prevent danger
- in order to prevent danger when a conductor becomes charged either through use or a fault, earthing or other suitable means must be provided
- if a circuit conductor is connected to earth, nothing must be introduced into the conductor which breaks the circuit or introduces a high impedance unless suitable precautions are put in place to prevent danger
- all connections must be mechanically and electrically suitable for use
- all means to protect the circuit from excess current must be provided
- means must be provided for cutting off and isolating the supply
- electrical equipment made dead for the purpose of carrying out work must be prevented from becoming live
- work must not be carried out on live conductors unless it is unreasonable for it to be dead, it is reasonable for the work to be carried out, and suitable precautions have been taken to prevent injury
- adequate working space, lighting and means of access must be provided.

3.3.6.2 They impose duties on every employer, employee and self-employed person and require that persons engaged in electrical work be competent or be supervised by competent persons.

Note: A "Memorandum of Guidance on the Electricity at Work Regulations, 1989" is available from HMSO and gives useful information on the Regulations. Further advice is contained in HSR25.

3.3.7 **Lifting Operations and Lifting Equipment Regulations (LOLER)**

LOLER deal specifically with the lifting aspects of work equipment and the control of lifting operations.

Practical guidance on LOLER is given in HSL113.

3.3.8 **Management of Health and Safety at Work Regulations (MHSWR)**

MHSWR apply to all work activities involving services and require, among other things, that employers assess the risks to the health and safety of their employees and of persons not in their employment but who may be affected by their activities, and then to make appropriate arrangements for preventative and protective safety measures. Approved code of practice and guidance is provided in HSL21.

3.3.9 **Manual Handling Operations Regulations**

These Regulations seek to reduce the very large incidence of injury and ill-health arising from the manual handling of loads at work. More than 1 in 4 of all reportable injuries are caused by manual handling. These accidents do not

include cumulative injuries, particularly to the back which can lead to physical impediment or even permanent disablement.

The Regulations place duties upon employers in respect of their own employees. Identical duties are placed on the self-employed in respect of their own safety. Further guidance is provided in HSL23.

3.3.10 **Personal Protective Equipment at Work Regulations**

Personal protective equipment (PPE) includes waterproof clothing, gloves, safety footwear, high visibility waistcoats, eye protectors, respirators, safety harnesses and the like. An employer is required to provide suitable PPE to any employee who may be exposed to risk at work. Further guidance is provided in HSL25.

3.3.11 **Pipelines Safety Regulations (PSR)**

PSR replace earlier prescriptive legislation for both onshore and offshore pipelines and include new provisions such as arrangements for a Major Accident Prevention Document (MAPD) and for emergency plant. There are also specific regulations that no person shall cause such damage to a pipeline as may give rise to a danger to persons (Regulation 15) and for prevention of damage by providing information on the existence and whereabouts of pipelines (Regulation 16).

Note: HSL81 provides an ACoP and guidance and HSL82 provides guidance on PSR.

3.3.12 **Pressure Systems Safety Regulations (PSSR)**

3.3.12.1 PSSR impose duties on designers, importers, suppliers, installers and users or owners to ensure that pressure systems do not give rise to danger. This is done by the correct design installation and maintenance, provisions of information, operation within safe operating limits and, where applicable, examination in accordance with a written scheme of examination drawn up or approved by a competent person (as defined by PSSR).

3.3.12.2 Relevant fluids for the purpose of this document would be Natural Gas at a pressure greater than 0.5 bar above atmospheric pressure. A pressure system would include bulk storage tanks, pressure vessels, pipelines and protective devices. Once the pressure in the pipework drops below 0.5 barg, and the user/owner can show clear evidence that the system does not contain, and is not liable to contain, a relevant fluid under foreseeable operating conditions, then that part of the system is no longer covered by the Regulations. This is likely to be the case after the pressure relief valve associated with a pressure reducing valve which takes the pressure to below 0.5 barg, for example at the entry to a building.

3.3.12.3 Note the special requirements placed on protective devices in such systems (see paragraph 110b of HSL122). The regulations also apply to pipelines and their protective devices in which the pressure exceeds 2 barg (see Sch 1, part 1, item 5 of HSL122).

More information is available in HSL122 and some information is presented in INDG261 and INDG178.

3.3.13 **Provision and Use of Work Equipment Regulations (PUWER)**

3.3.13.1 PUWER place duties on employers in relation to selection, suitability, maintenance, inspection, installation, instruction and training, prevention of danger and control of equipment.

3.3.13.2 Work equipment has a wide meaning and in addition to lifting, moling, boring, pipe splitting/ramming equipment, horizontal directional drilling rigs and machinery, it also includes but is not limited to hand tools, portable power tools, ladders, shoring equipment, etc. for use at work.

3.3.13.3 More information on PUWER can be found in HSL22. Free leaflets include INDG291 and INDG229.

3.3.14 **Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR)**

3.3.14.1 RIDDOR require employers, self employed people or those in control of work premises to report certain work related accidents, diseases and dangerous occurrences.

3.3.14.2 Other people have duties to report certain gas incidents which may not appear to be work related:

- death or major injury arising out of the distribution, filling, import or supply of Natural Gas (NG) or Liquefied Petroleum Gas (LPG) should be reported by the conveyor for NG and the filler, importer or supplier for LPG
- dangerous gas fittings (as defined in RIDDOR) should be reported by a "member of a class of persons".

3.3.14.3 Major injuries, death and dangerous occurrences must be notified immediately, for example by telephone, to the enforcing authority by the "responsible person" as defined by RIDDOR. Reports can be made to the Incident Contact Centre by:

- telephone on 0845 300 9923
- email to riddor@connaught.plc.uk
- internet at www.hse.gov.uk/riddor or
- via a link from HSE website at www.hse.gov.uk.

3.3.14.4 It is also possible to report to the local HSE office by telephone and then follow up with a written report on the correct F2508 form within the required timescale (10 days, or 14 days for dangerous gas fittings). Other reports should be made as soon as practicable and within 10 days of the incident.

3.3.14.5 HSL73 contains detailed guidance on RIDDOR, including a full list of injuries etc. that need reporting.

3.3.15 **Supply of Machinery (Safety) Regulations**

These Regulations implement the requirements of the European Community (EC) Machinery Directive (as amended). The text of the Directive is contained within the Regulations. They apply to manufacturers and suppliers of machinery and set out essential requirements for all machinery.

Note: Section 6 of HSWA, relating to plant and machinery safety, remains in force.

3.4 **EUROPEAN STANDARDS**

The following European standards are directly relevant and have been published in UK as BS EN Standards:

- BS EN ISO 12100 on Safety of machinery
- BS EN 791 on Drill rig safety.

SECTION 4 : PREPARATION OF A SAFETY PLAN

4.1 INTRODUCTION

4.1.1 Any trenchless technique shall be planned with the objectives of minimizing risk to operatives, installations below and above ground and members of the public. Care shall be taken in selecting the methods and equipment most suited to the task which will overcome the identified hazards both above and below ground. This section provides requirements on the issues that shall be considered when preparing a Safety plan to use with any of the methods included in the scope.

4.1.2 A detailed Safety plan shall be established at the project planning stage and should address the following issues:

- full knowledge and agreement to the proposed works and compliance with the requirements of users of the site, utility companies or third parties if the proposed works could affect their infrastructure

Note: This is to maintain the integrity and safety of existing apparatus.

- all works to be undertaken in compliance with any safety regulations and conditions applicable to the site. All appropriate safety barriers shall be to current street works code of practice to ensure the safety of the site operators and of persons who could come into close proximity to the proposed works. This includes all operational areas on the site. Further guidance is given in the NRSWA Code of Practice "Safety at Street Works and Road Works"
- all works to be undertaken in compliance with environmental regulations.

4.2 CONSTRUCTION PHASE PLAN

4.2.1 The Principal Contractor and other contractors must identify the hazards and assess the risks relating to their work, including the risks they create for others. Using this information, Regulation 23 of CDM requires the Principal Contractor to prepare a construction phase plan which is sufficient to ensure that the construction phase is planned, managed and monitored in a way which enables, so far as is reasonably practicable, the construction work to be carried out without risk to the health or safety of their employees, other contractors or members of the public. This includes incorporating information provided by the client and CDM Co-ordinator in the plan. The Construction Phase Plan should be sufficiently completed before the client allows work to proceed on site.

The Construction Phase Plan is the foundation for good management and clarifies:

- who does what
- who is responsible for what
- the hazards and risks which have been identified
- how the works are to be controlled.

4.2.2 For all but the simplest of projects, the plan may not be sufficiently developed when construction work begins to cover all of the work that the project will involve. It may only cover early phases of work (for example site set up, enabling works, clearance and early groundworks). However, the plan at this phase should indicate how arrangements for managing the rest of the work will be added as contractors and sub-contractors are identified and can give meaningful input to their part of the plan.

4.2.3 The plan should be regarded as a live document, reviewed at regular intervals and, where necessary, amended to reflect changes in the scope of work or programme changes, where the planned interface of trades may alter.

- 4.2.4 The plan should be structured to reflect the following information:
- description of project
 - management of the work
 - arrangements for controlling significant site risks, including safety, health and environmental risks
 - the health, safety and environmental file.

- 4.2.5 Responsibility for carrying out the location of underground plant shall be clearly defined.

Note: The frequency and number of trial holes required on site will be determined following the site survey and the risk assessment.

4.3 INFORMATION

4.3.1 General

- 4.3.1.1 Information critical to the process of preparing the Site Safety Plan, common to most techniques and sites, should be sourced within the following documents:

- contract specification
- project drawings
- pre-tender health and safety plan
- utility companies' asset records
- site investigation reports
- ordnance survey maps
- HSE guidance.

Note: Appendix 3 lists organisations who can provide further information.

- 4.3.1.2 Other sources of information shall be considered, dependent upon the specific job type and the technique to be used, for example:

- for major road crossings - the Highways Authority (Highways Agency, Transport Scotland, Transport Wales etc.)
- for rail and tramway crossings – Network Rail/Northern Ireland Railways or tramway operator
- for rivers and canals - the Environment Agency, Scottish Environment Protection Agency, Northern Ireland Environment Agency, British Waterways
- for industrial plants - the plant operators/owners for agricultural or green field sites – Department for Environment, Food and Rural Affairs (DEFRA), local authority, land owner
- for fuel/oil/chemical pipelines and associated plants – British Drilling Association (BDA), Mainlines, Ministry of Defence (MOD), etc
- for areas of outstanding natural beauty or national scenic areas (Scotland) – Countryside Agency (England), Northern Ireland Environment Agency (Northern Ireland), Countryside Council for Wales or Scottish Natural Heritage
- for sites of special scientific interest or areas of special scientific interest (Northern Ireland) - Countryside Agency (England), Northern Ireland Environment Agency (Northern Ireland), Countryside Council for Wales or Scottish Natural Heritage.

4.3.2 Site survey

- 4.3.2.1 All sites should be visited and thoroughly inspected by operational and where appropriate health, safety and environmental personnel to determine the

topography, the suitability of the exit and entry points, surface features and surface evidence of buried services or structures to ensure the accuracy of the initial site information, and to gather detailed information for assembly of the Safety Plan.

- 4.3.2.2 The site survey records should include any evidence of ground movement, structural failures, such as cracks in wall, etc. to ensure no subsequent claims can be attributed to the work undertaken.

Note: Photographs are a good method of recording site conditions.

- 4.3.2.3 The site survey should ensure that all utility plans are available on site, including gas, water, electricity, telecommunications, cable, sewer, storm water drains, and indicate the presence of any third party pipelines that may be present. The presence of all buried plant should be confirmed and marked on the ground.

- 4.3.2.4 Whichever trenchless technique is chosen the proposed maximum depth of the pipeline has to be less than that designed for the chosen material.

- 4.3.2.5 Where pipelines are proposed through environmentally sensitive areas, for example within SSSI, an Environmental Statement must be submitted to the Secretary of State.

Note: SSSI sites and projects involving special engineering difficulties may significantly increase planning time and this has to be allowed for in the project development plan.

- 4.3.2.6 If hazardous underground plant is identified and potentially affected, the relevant network owner should be contacted for appropriate precaution measures.

Note: This includes all utility networks, as in the event of a high pressure water main being damaged, flooding and possibly road collapse due to soil washout.

- 4.3.2.7 Evidence of recent redevelopment or ground disturbance should be taken into account, as it could be of significant importance or could indicate the presence of buried assets.

Note: For example, if the ground levels have changed, existing services could be at a different depth to that anticipated and this would need to be taken into account when planning the works.

- 4.3.2.8 Having gathered information for the safety plan, a review should be undertaken to confirm:

- the feasibility of the chosen technique for the project
- that the plant and equipment available is fit for purpose.

Note: For example, would it be used within its operational limits?

With the foregoing confirmed, the next stage of planning should be the preparation of a detailed installation safety plan, which is specific to the technique to be used and the particular site.

4.4 **OPERATIONAL ISSUES RELEVANT TO THE PREPARATION OF A SAFETY PLAN FOR ALL TECHNIQUES**

4.4.1 **General issues**

When preparing a safety plan, consideration shall be given to the following:

- working within confined spaces and danger of asphyxiation
- assessing hazards from noise
- working within open excavations such as launch and reception pits

- determining the nature of, and dealing with, any hazardous waste
- dealing with adverse traffic and weather conditions
- dealing with high flow conditions in existing and adjacent pipelines and the environmental impact of any flow control
- establishing safe methods of work and determining the number of personnel required
- working adjacent to any water course (river, canal, coastal area, streams, lake, etc.) and the potential for drowning or causing flooding
- working adjacent to railway lines and on flight paths of runways
- determining the construction and condition of any adjacent pipeline to confirm that the chosen technique or process can be safely utilised
- assessing the potential for damage to the surface above any pipe or to adjacent properties etc. as a result of pipeline installation operations
- determining potential hazards from pipeline installation/repair processes which are specific to the technique chosen
- assessing the potential hazards of using lubricants such as bentonite, soil conditioners and ground contaminants
- assessing potential hazards in handling materials and equipment used in pipeline installation processes, for example pipe type, diameter, bending characteristics etc.
- determining potential hazards from ancillary operations such as steel pipeline welding
- determining potential hazards of working with both pneumatically and hydraulically powered equipment, for example, protection of hoses from impact damage
- the use of non-flammable hydraulic fluids
- assessing the appropriateness of all plant and equipment for the purposes it is to be used
- provision of bunds, spill trays and spill kits to prevent pollution due to fuel/lubricant spillage
- assessing potential hazards of using specialist plant such as winches, coil trailers, polyethylene pipe welding equipment etc
- determining waste disposal provisions
- other utility networks.

4.4.2 **Ground conditions**

- 4.4.2.1 Consideration shall be given to the existing ground conditions and how they will impact on the chosen technique. Particular attention should be given to the prevailing groundwater conditions.
- 4.4.2.2 Reference should be made to the manufacturers' instructions to assess the suitability of the ground against the capability of the equipment.
- 4.4.2.3 The effects of ground movement on adjacent underground equipment and resultant surface heave should be assessed. Utility companies' recommended safe working distances from their buried plant should be maintained. Requirements with respect to gas pipelines are given in IGE/SR/18. Consideration shall also be given to the depth of the installation, to avoid potential ground heave at the surface.

4.4.3 **Underground obstructions**

- 4.4.3.1 Care should be taken in identifying any underground structures and, where appropriate, detailed plans and recommendations should be obtained from the owner.

Note 1: In particular this applies to public or multi-occupied buildings/premises where cellars, basements, personnel or service corridors/tunnels protrude from the building line. For example, hospitals, schools, office blocks, cinemas, theatres, shopping malls/buildings, high rise flats, Ministry of Defence establishments, etc.

Note 2: This is particularly relevant where access excavations are to be positioned as additional space may be required to accommodate equipment and materials. Further guidance is available in HSG47.

- 4.4.3.2 The position of any known natural or artificial obstructions should be determined using existing records.

- 4.4.3.3 Consideration shall be given to the avoidance of tree roots. Further guidance is given in NJUG Volume 4.

4.4.4 **Bore route plans**

A bore route plan should be confirmed on site before commencement of the installation works.

Special consideration shall be given to:

- works below the water table or those influenced by tidal conditions
- physical or artificial obstructions along the route of the installation, for example boulders, foundations or piles
- maximum depth that the pipe material is designed to withstand.

4.4.5 **Special engineering difficulties**

- 4.4.5.1 On major projects, (for example a river crossing) geological and structural profiles shall be confirmed on site before commencement of any works. When drilling is likely to be carried out in the proximity of a tidal watercourse, the implications shall be identified and control measures put in place. Similarly, for other major crossings, such as rail, motorway, canal, subways, etc., detailed information on their below ground construction should be sought. Specific protection measures, if required, should be identified and put in place.

- 4.4.5.2 When crossing rivers, watercourses, etc. the Environmental Protection Agency/Water Company should be contacted to determine the minimum depth below the bed that drilling can be undertaken.

- 4.4.5.3 The design of a pipeline at a water crossing should not be less onerous than that required for a land pipeline and should take into account the following additional features within the selected pipeline crossing:

- type and intensity of shipping, fishing and other recreational or commercial activities
- presence of ship anchoring, dredging and dumping and of other services laid within/across
- the currents, stability and erosion of the banks and beds
- coating, corrosion protection requirements
- operational requirement, including consideration of strategic valves
- future plans identified by the local planning authority.

- 4.4.5.4 The design should identify all foreseeable events, the likelihood and consequences of occurrence and mitigation of identified risks.

Note: Further guidance and requirements are contained in IGEM/TD/1, IGE/TD/3.

4.4.6 **Water supply licence**

- 4.4.6.1 Any operations that require a supply of water for the drilling fluid need a licence from the relevant Environmental Protection Agency if the water is extracted from a water course and the relevant water company if extracted from a standpipe. This should be sought during the planning stage.

- 4.4.6.2 Detailed information on the proposed source shall be obtained from either the Environmental Protection Agency or the local water supply company.

SECTION 5 : GENERIC HEALTH, SAFETY AND ENVIRONMENTAL ISSUES

This section covers general health, safety and environmental issues to be considered for the activities, procedures, processes and equipment associated with the use of trenchless techniques.

Emphasis is given to the precautions necessary with particular attention to aspects of site personnel and public safety.

5.1 EMERGENCY PROCEDURES

5.1.1 General

5.1.1.1 Details of the nearest emergency services and contact telephone numbers shall be available on site and displayed in a prominent position.

5.1.1.2 Emergency procedures shall be developed and communicated to all those working on or visiting the site as part of the site induction training.

5.1.2 Fire precautions

5.1.2.1 Assessment of the fire risks on the site should be made and recorded.

5.1.2.2 If required by site conditions, an emergency plan shall be prepared and displayed to indicate each of the following (not necessarily in order of priority):

- means of escape
- action to be taken
- evacuation procedure
- method of calling the fire brigade
- method of raising the alarm.

5.1.2.3 If necessary, there shall be the following:

- liaison with the fire brigade, including arrangements for access
- appropriate means of fire fighting, adequate training and fire drills
- a record kept of fire-related events
- appropriate, maintained fire extinguishers available on site.

5.1.2.4 Checks shall be made to ensure safe disposal of refuse and adequate storage for flammable materials.

5.1.2.5 There shall be an adequate allocation of fire fighting equipment to cover working areas, plant and special risks.

5.1.2.6 Control of materials which are a fire risk or which contribute to the fire loading on site is required to minimise the fire risk. Where possible, flammable materials should be eliminated from the construction process.

5.1.3 Procedures in the event of utility network strike

5.1.3.1 In the event of a utility network being damaged, all machinery shall be stopped and electrical supplies isolated immediately. Providing it is safe to do so, all personnel shall be moved from the immediate vicinity and then the following steps should be taken:

- contact made with the utility network owner

Note: In the event of a Natural Gas strike, the gas utility company can be notified by contacting the gas emergency service whose number is 0800 111 999.

- remove all personnel from the vicinity
- inform the supervisor
- enforce “no smoking”
- remove naked flames
- do not attempt repairs unless competent to do so
- assist engineers or emergency services as requested.

5.1.3.2 The competent person managing the site shall ensure the area is secured from persons entering the site until the situation can be made safe.

5.1.4 **Procedures in the event of flooding**

5.1.4.1 If required by site conditions, an emergency plan shall be prepared and displayed to indicate each of the following (not necessarily in order of priority):

- action to be taken
- method of calling the fire rescue service
- method of raising the alarm.

5.1.4.2 Assessment of the drowning risks on the site should be made and recorded.

5.1.4.3 There should be the following:

- liaison with the fire rescue service, including arrangements for access
- appropriate means of rescue, for example floating aids, rescue lines, etc.,
- adequate training and immediate first aid treatment
- appropriate monitoring to verify rescue equipment is available on site at all times.

5.1.4.4 There shall be an adequate allocation of rescue equipment to cover working areas.

5.2 **WORKFORCE CONSIDERATIONS**

5.2.1 **Health**

The continuing good health of the workforce is of paramount importance. Workplace conditions shall be assessed on a continuous basis to ensure that high standards of health and welfare are maintained and to ensure that work processes are not a risk to the health of the workforce.

Health risks can result from:

- exposure to harmful materials used in the construction process
- exposure to harmful material encountered or released during the construction process
- ergonomic factors resulting from the construction process, for example noise, vibration, manual handling etc.

Note: The current HSWA legislation which relates to monitoring of occupational health in construction is included in Appendix 2.

5.2.2 **Welfare**

5.2.2.1 Due to the transient nature of trenchless work, the provision of proper welfare facilities must be provided. A suitable fixed or portable sanitary convenience or easy access to publically available toilets, facilities for hand washing or cleaning and a supply of drinking water shall be provided before work starts on site.

5.2.2.2 While it may not always be reasonably practicable to provide fixed messing facilities such as huts, a suitable place for eating and drinking away from the working area, such as a van or other vehicle, shall be provided or designated.

5.2.2.3 Facilities for cleaning, drying and storing bad weather clothing and basic PPE shall also be made available.

5.2.3 **Avoidance of accidents**

5.2.3.1 Work shall be planned to minimise lengths of cable, pipe, hose, etc in or around pedestrian worker access areas to reduce the risk of slips, trips and falls on site.

Note: General Guidance can be found in HSG150.

5.2.3.2 The control of risk from slips, trips and falls shall be included in training and induction programmes.

Note: The training and induction programme could highlight key risk areas such as:

- *slips on materials or equipment (steel rails, clay soils, etc)*
- *slips on spillages – oils, bentonites, etc.*
- *trips over rubbish, debris, equipment (cables, hoses), poor access or uneven ground*
- *falls into openings, shafts, excavations*
- *materials falling down shafts, manholes into excavations.*

5.2.4 **First aid**

5.2.4.1 A suitable number of qualified personnel must be available to provide first aid assistance on site to anyone who may become ill or injured, in accordance with the requirements of the First Aid at Work Regulations.

5.2.4.2 First aid equipment must be available.

5.2.4.3 Accidents must be recorded in an accident book.

5.2.5 **General**

5.2.5.1 Materials and processes used on site may be a risk to the health of people directly involved in the construction process, and those employed in the maintenance and disposal of any waste materials.

5.2.5.2 The risk assessment for the project should address risks to health from materials and site conditions which may include but not limited to the following:

- use of material and equipment during construction
- internal pipe contaminants (rust, Naturally Occurring Radioactive Materials (NORM), dust, monoethyleneglycol (MEG), mains treatments)
- biological agents (bacteria and other biological micro-organisms)
- working at heights, including at the top of excavations and on large plant/machinery
- working in areas or conditions that may lead to asphyxiation
- disposal of waste or surplus material
- exposure after disposal, for example at a landfill site
- activities such as maintenance and cleaning.

Note: Asbestos and lead are covered under their own sets of Regulations.

5.2.5.3 Environmental risks should be assessed as part of the project environmental impact assessment carried out in accordance with Town & County Planning (Environmental Impact Assessment) Regulations.

5.2.6 **Site access**

5.2.6.1 Access shall be provided to ensure that all personnel can safely reach their places of work.

5.2.6.2 The site shall be secured to prevent access by unauthorised persons, particularly children and animals, to:

- areas of danger such as excavations or access points, and machinery
- sites which are within public areas or highways.

Safety of the site when left unattended shall be considered as part of the risk assessment.

Note 1: The provision of barriers to satisfy NRSWA may be inadequate to prevent unauthorised access.

Note 2: Further guidance is given in HSG151.

5.2.6.3 If the site has perimeter fencing, it shall be in good condition with gates that can be securely closed.

5.2.6.4 Ladders that are not an integral part of the drilling rig shall be removed at the end of each shift or stored in a position that prevents access by the public.

5.2.7 **Control of substances that may be hazardous to health**

5.2.7.1 Materials encountered when using trenchless techniques may be a hazard to health. These materials may be used directly in the process, for example soil modifiers or conditioners may be part of the technique, silica may be present (in concrete or rock), toxic ground contaminants or grouts.

Routes of exposure are inhalation, skin contact and ingestion. Materials which are hazardous may result in an acute reaction, that is the effect occurs quickly, or it may result in a chronic condition that is one which may take many years to develop.

Hazardous materials have a Workplace Exposure Limit (WEL). These limits are given in HSEH40. They are expressed as either long-term exposure limit (LTEL) or short term exposure limit (STEL).

The LTEL is an exposure level set at a point that (based on current scientific knowledge) will not damage the health of workers exposed to it on a day to day basis.

The STEL is a limit set for substances which may cause the most serious health effects and for which "safe" levels cannot be determined, or for substances for which safe levels may exist but control to those levels is not reasonably practicable.

These set the standards for controlling the exposure of workers to the specified substances.

5.2.7.2 Only if they are dangerous should materials currently supplied to contractors be delivered with a Safety Data Sheet, as required by the Chemicals (Hazard Information and Packaging for Supply) Regulations.

5.2.7.3 The Safety Data Sheet should provide the user with details of the materials and hazards associated with them together with general advice on controls. However, it is often the case that appropriate information is lacking. Usually physical hazards are not included and the control measures given are often limited to the level of PPE that is required to control the risk.

Note 1: It is the supplier's responsibility to ensure that the information on the Safety Data Sheet is accurate. If material is supplied onwards after being used in a newly manufactured material, the supplier of the new material inherits this responsibility.

Note 2: Guidance on the law covering preparation and supply of Safety Data Sheets is contained in HSL130.

5.2.7.4 Hazardous substances must not be allowed on site unless they are in correctly-labelled packaging; a data sheet has been provided and an appropriate COSHH assessment has been carried out. Control measures must be implemented to control the risks identified in the COSHH assessment.

5.2.7.5 Trenchless technology may involve the use of chemicals or substances that could enter the body through the skin, through ingestion or inhalation, or could damage or irritate skin, eyes, ears, etc. The main risk substances that shall be considered are those that fall into the following groups:

- carcinogens
- toxic agents
- neurotoxins
- irritants
- corrosives
- sensitizers.

On any trenchless operation, some of the following substances could be found:

- acetylene
- propane
- aerosols
- antifreeze
- battery acid
- bleach
- hand cleaners
- drilling fluids
- fire extinguishers
- greases oils, cooling, lubricating and hydraulic
- paints
- biological agents.

This list is not exhaustive, but COSHH assessments must be carried out and the relevant information sheets made available to the operatives involved at all times. The major substances in use in quantity are discussed later.

5.2.8 **Fuels and oils for the operation of powered plant**

5.2.8.1 Fuels include:

- petrol
- red and white diesel
- hydraulic oil
- engine oil.

Reference should be made to the manufacturer's literature for COSHH details.

5.2.8.2 Lubricants include:

- standard grease
- pipe joint compound

- lead-free rod grease.

Reference should be made to the manufacturer's literature for COSHH details.

5.2.9 **Soil lubricants and stabilisers**

5.2.9.1 Soil lubricants and stabilisers that shall be considered include:

- sodium montmorillonite
- calcium montmorillonite
- polymers
- powders
- granular.

5.2.9.2 Although usually a low risk, care shall be taken when using powders. Due to the fine texture of the powder, eye protection and respirators should be worn when handling large quantities. Wet spillage should be treated carefully due to the high degree of slip. Light gloves should be worn if the product requires manual handling.

5.2.9.3 Reference should be made to the manufacturer's literature for COSHH details. For details of general hazards associated with soil conditioners, reference should be made to Appendix 4 or to BS 6164.

5.2.10 **Polymers as drilling fluids and as an additive to bentonite**

5.2.10.1 Polymers as drilling fluids and as an additive to bentonite include:

- liquid
- dry powder
- granular.

Most polymer drilling fluids are environmentally safe and bio-degradable. No special handling is required due to the low toxicity and low hazard potential. However, it should be recognised that polymer spills could present a slip hazard.

5.2.10.2 Dry polymer spills should be swept up immediately. Wet spills should be treated with an absorbent material and then swept up. Disposal of discarded waste material must follow applicable disposal regulations.

5.2.10.3 Light gloves should be worn if the product requires manual handling.

5.2.11 **Grouts and drilling fluid thinners**

These products are chemically similar to, and shall be treated the same as, standard bentonite.

5.2.12 **Resins used in lining techniques**

5.2.12.1 Reference should be made to the manufacturer's Safety Data Sheets to ensure that any risks associated with the use of resins have been identified to protect both operatives and the general public.

5.2.12.2 A risk assessment must be carried out for all work activities to comply with the requirements of MHSWR.

5.2.12.3 Where material health hazards are identified, a risk assessment complying with COSHH must also be carried out.

5.2.13 **Manual handling**

Wherever possible, mechanical means should be used to lift, transport and move items otherwise, manual handling methods should be arranged to take account of the size, weight and shape of the load.

Note 1: Guidance on maximum weights and lift distances is given in HSL23.

Note 2: Guidance on manual handling in the construction industry is given in HSG149.

5.2.14 **Noise**

5.2.14.1 A certain amount of noise is inherent in all construction operations. The best practicable methods shall be employed to minimise noise emissions to levels acceptable to site personnel and third parties and must be employed sufficiently so as to comply with regulations.

Note: Further advice is contained in HSL108.

5.2.14.2 Special consideration shall be given to:

- designing out noise-generating operations before construction starts
- siting and possible screening of plant and equipment
- use of acoustically-attenuated powered tools
- avoiding operations outside normal working hours.

5.2.15 **Vibration**

5.2.15.1 Regular exposure to hand-arm vibration can cause a range of permanent injuries, collectively known as Hand-arm Vibration Syndrome (HAVS) which is a notifiable occupational disease. Health surveillance must be provided where there is a risk of HAVS, in compliance with MHSWR and the Control of Vibration at Work Regulations. HSE Guidance is available for controlling risk to health due to hand-arm vibration (see Appendix 2).

5.2.15.2 Action must be taken to control exposure and prevent adverse health effects. If the HSE recommended action level of 2.8 m s^{-2} is exceeded, a programme of health surveillance must be formed to identify new cases of HAVS and to ensure that existing cases do not become more severe.

5.2.15.3 A risk assessment must be undertaken to identify any risks of HAVS and appropriate actions taken to control the risk to eliminate or reduce exposure to vibration. Consideration shall be given to the following:

- changing processes or working methods

Note: Selection of "low vibration" tools and equipment can often prevent unnecessary high exposures and equipment suppliers can provide information and advice.

- training for personnel on the risks from vibration to allow them to operate equipment so that risk is minimised.

5.2.16 **Health surveillance**

5.2.16.1 The occupational health of workers shall be monitored on a regular basis.

5.2.16.2 Early medical advice should be obtained in relation to any health problem or injury that may be affected by work.

5.2.16.3 Where the risk assessment identifies high risk to health of workers as part of the work process, a medical surveillance programme should be set up.

- 5.2.16.4 Formal health surveillance shall be carried out in certain circumstances where risk to health is judged to be high.
- 5.2.16.5 The main legislation requiring health surveillance is set out in Appendix 2.
- 5.2.16.6 A RIDDOR notification must be made where a diagnosed disease as specified in Schedule 3 of the Regulations is identified, for example, HAVS, the most common form of which is Vibration White Finger (VWF).

5.3 **PUBLIC SAFETY**

5.3.1 **General**

- 5.3.1.1 Hazards to the public shall be identified as part of the site risk assessment. Risks resulting from hazards identified should be controlled to prevent harm.
- 5.3.1.2 Where work is to be carried out within the public highway, the requirements of NRSWA must be applied, including and in particular, those defined within the associated CoPs (see clause 3.2.5.2).
- 5.3.1.3 Plant shall be immobilised at the end of every shift.
- 5.3.1.4 All statutory notices concerning safety of the public must be clearly displayed where the public can view them.
- 5.3.1.5 Parking of vehicles associated with works shall not present a hazard to the public.
- 5.3.1.6 Care shall be taken to ensure that any public right of way affected by the works is kept safe and free of any hazard. Consideration shall be given to disabled persons and those with impaired mobility, vision, hearing, etc.
- 5.3.1.7 Any walkways, including stairs, ramps, roadways and paths, must be kept free from obstruction.
- 5.3.1.8 Visitors to the site are in greater potential danger than operations personnel. They should be kept away from operational areas unless the nature of their visit demands otherwise. If necessary, operations shall be suspended until visitors are moved to a safer position.
- 5.3.1.9 All persons visiting the site shall be given safety induction training, be issued with appropriate PPE prior to entering the site and, if a risk assessment deems it necessary, the operation shall be suspended.
- 5.3.1.10 All visitors to site shall sign a visitor's book kept on site for that purpose, where appropriate.
- 5.3.1.11 Public access shall be defined clearly and signposted taking into account all disability groups. Special consideration shall be given to catering for unaccompanied children and persons with impaired mobility, vision and hearing.

5.3.2 **Equipment and materials**

- 5.3.2.1 Hazardous materials used on the site shall be stored safely. Particular attention shall be paid to the storage of flammable materials which shall be stored in accordance with HSG51.

Note: Further guidance is given in UKLPG CoP 24.

- 5.3.2.2 Attention shall be given to the siting and laying of umbilical cables and hoses.

- 5.3.2.3 Edge protection shall be provided where anyone could fall and, where practicable, toe boards shall be fitted.
- 5.3.2.4 Material stacks, including drill rods and debris, shall be kept tidy and in a safe position.
- 5.3.2.5 Rubbish and waste materials, including excess drilling fluids used during the drilling process, shall be cleared and removed at regular intervals.
- 5.3.2.6 Nails in timber used for pit shuttering shall be removed or hammered over.

5.4 **ELECTRICAL SAFETY**

5.4.1 **Electrical cable strike safety system**

Despite the most rigorous of pre-site surveys, a risk remains, in all trenchless techniques, of accidental damage being caused to buried electrical cables.

Where practical, an electrical cable strike safety system should be employed to warn of a cable strike occurring.

Note: Electricity companies bury cables of all voltage ratings between 240V and 400kV.

Depths and protection of electrical cables are variable and should be confirmed with the local electricity supplier.

5.4.2 **Explosion protection of electrical equipment**

For non-domestic premises, DSEAR require that a risk assessment be carried out and, as part of this, a hazardous area assessment must be undertaken. If such a hazardous area assessment has not been undertaken prior to the intended work involving electrical equipment, a risk assessment must be carried out to determine the likelihood of explosive gases being present and an explosion protection document must be made available to the user. This should lead to the selection of appropriate equipment for use in the expected conditions.

5.4.3 **Work on or with electrical equipment**

When carrying out work activities on or with electrical equipment, the work must comply with the Electricity at Work Regulations (see Sub-Section 3.3.6).

5.5 **LIFTING APPLIANCES AND EQUIPMENT**

- 5.5.1 All lifting appliances, equipment and lifting operations must be in accordance with LOLER and HSL113. Any lifting operation must be planned and supervised by a competent person.
- 5.5.2 A risk assessment shall be carried out to identify and assess the risks associated with the lifting operation.
- 5.5.3 Mechanical lifting is preferred. However, if manual handling is used, consideration shall be given to safe working practice to prevent injury. Guidance is given in clause 5.2.13.
- 5.5.4 A method statement should be prepared prior to any lifting operation and consideration shall be given to proximity hazards such as overhead cables, soft ground or underground services.
- 5.5.5 Lifting operations crossing live gas, water or electrical equipment present a risk to health and safety in the event of a load being dropped. If re-planning the operation cannot eliminate the risk, the method statement, including safe