Global H&S Standard & Guidance - Underground Asset Avoidance (UAA)

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Contents

1 Principles

Underground assets refer to buried utility services such as water, gas, electricity, lighting, sewage, as well as telecommunications infrastructure consisting of copper wire, coax, or fibre. Nokia installs, commissions, and maintains underground telecommunications infrastructure, often in conditions where multiple underground assets are already in place. When working in underground environments the risk of striking other underground assets is ever-present. In addition to the risk of service interruption to the various service providers with consequent loss, inconvenience and cost, there can often be a high safety risk in the case that energized low or high voltage electrical cables are encountered and struck.

This global standard defines a structured set of requirements to identify, detect, and avoid underground asset strikes.

When work involves the excavation, exposure repair or maintenance on or near buried underground assets a structured process is required to be established and followed to identify the assets, validate the location and measures taken to avoid striking or otherwise compromising that asset.

A thorough evaluation of recorded data on asset presence, nature and location shall be undertaken in advance of any intrusive works. All available data or information sources shall be consulted including government or local authority databases, utility companies, and private companies managing underground assets.

A documented site survey that validates the available underground asset information and supplements it with observations and measurement is required before site works commence.

In areas of dense or complex underground high hazard assets, two dimensional, three-dimensional or GPR scanning should be used to establish the underground relative position and depth of assets if conventional methods are insufficient.

Only appropriately trained and competent workers, supervisors, or managers should be engaged in the identification, detection, excavation, exposure, installation fault location, and reinstatement work associated with underground assets.

Using This Document

This Standard details Nokia expectations in relation to the identification, detection, and avoidance of underground asset strikes.

The expectations detailed here apply to all Nokia business units and all contractors and service providers conducting work on its behalf and are in addition to local legal requirements.

Section 3 contains the minimum requirements that Nokia expects. If these cannot be achieved a documented exception needs to be agreed with PS&S stating out the reason why an exception is required and the duration of the exception.

Section 4 explains who is responsible for ensuring that the requirements are implemented.

2 Key Definitions and Scope

Construction work.

All work involving the removal, supporting, excavating, and loading earth in the construction zone for the purpose of identifying, establishing depth and routing of underground assets.

Underground assets.

Underground or concealed services, pipelines or routes that need to be avoided whilst working on a site. Typically, assets are electricity cables (low voltage and higher voltages), gas pipes, water pipes, sewerage, and other telecommunication services.

Locating equipment.

Equipment used to aid the identification and location of underground assets.

Cable detector.

A basic electromagnetic detection device that responds to reflected or reradiated electromagnetic signals.

Genny.

An RF signal generator (Genny) that when used in conjunction with an RF detector increases the accuracy of underground asset detection. Typically, a Genny is placed some distance from the location of interest where the presence of the underground asset is known. The Genny injects an RF signal into the asset which can be detected along its route for various distance.

Ground penetrating radar (GPR).

GPR is a geophysical method that uses radar pulses to image the subsurface. GPR uses high-frequency radio waves, which are transmitted into the ground. When the energy encounters a buried object or a boundary between materials having different properties, it reflected or refracted or scattered back to the surface. A receiving antenna then record the variations in the return signal which is used to interpret the subsurface conditions.

Excavation work.

The making of any man-made cavity, trench, pit, or depression formed by cutting, digging, or scooping. Main procedures are mechanized digging and manual digging.

Mechanized digging.

The removal of soil by means of cutting or digging equipment (not hand-held). Mechanical excavation work includes the use of heavy machinery, Jack Hammers, hydraulic shovel, micro slot cutting machines, micro trenching machines, surface cutting machines and directional drills.

Manual digging.

The removal of soil by means of handheld tools such as spades, picks, and shovels. Typically combined with mechanized digging.

Scope and application.

This standard applies to all Nokia employees and the employees of Suppliers and Services Providers) working for Nokia who conducts construction activities associated with locating and avoiding underground assets (electricity cables low voltage and higher voltages, gas pipes, water pipes, other telecommunication cables etc. to ensure that such work is undertaken in a safe manner and in compliance with regulatory requirements.

This global standard defines a minimum structured set of requirements to identify, detect, and avoid underground asset strikes.

3 Requirements and point by point guidance

The requirements listed in this Standard apply to all Nokia operations and apply equally to all contractors, suppliers and partners working on behalf of Nokia. They are non-negotiable.

The point-by-point guidance has been prepared to provide explanations and guidance to those individuals and organizations implementing and localizing the requirements of the Nokia Underground Asset Avoidance Safety Standard.

Outline template is also attached as an appendix which users may use if they wish to develop their own country specific standard operation procedure.

Requirements		Guidance
	3.1 Training Requirements.	
	3.1.1 Everyone working for or on behalf of Nokia, whose role is associated with locating and avoiding underground assets (electricity cables low voltage and higher voltages, gas pipes, water pipes, other telecommunication cables etc. must receive training that addresses the risks associated with their individual tasks and defines how that work is undertaken in a safe manner and in compliance with regulatory requirements.	All individuals working for Nokia (employees, subcontractors, and casual workers) meeting this description must be identified and must receive Underground Asset Avoidance Awareness training. The training must inform all workers of the risks associated with asset detection and avoidance and the controls necessary to avoid asset strikes.
	3.1.2 The risk associated with mechanized and hand digging should be covered in the training. An emphasis shall be placed on the techniques to safely expose underground assets, including the requirement to continuously verify location and depth as the digging proceeds and the application of safe digging methods to ensure strike avoidance.	It is essential that those who undertake excavation on behalf of Nokia especially those who are engaged in deliberately exposing underground assets be informed of the risks involved and the methods to do the task with care and reduce risk. The horizontal digging method should be explained.
	3.1.3 The training must cover the requirements and, expected behaviors and controls detailed in this standard.	Requirements, behaviors, and controls are clearly stated in the global standard document. The coverage of the training must include tools for detection of underground assets and training on the horizontal excavation techniques and practices.

Requirements		Guidance
	3.1.4 The training must address the heightened risk exposure when hand digging near energized electrical cables and how the heightened risk can be reduced by suitable controls.	This requirement recognizes the high-risk exposure to those who undertake the physical tasks associated with UAA. These tasks can often be undertaken by casual workers. It is therefore critical that these workers be trained and supervised.
	3.1.5 The training must cover the “right to refuse” to work on underground assets or the construction work associated with such work if they believe such works are dangerous to themselves or members of the public.	The concept of “Right to Refuse” must be addressed during the training such that all affected workers understand that they are empowered to refuse to undertake work that might put themselves or others in danger and without fear of retribution. Extract from our Life Saving Rules training. “We must respect each other’s right to refuse to do something we believe is dangerous. “This may take confidence, but you can remind others of the Life Saving Rules and why it is vital that we always follow them – no matter what!”.
	3.1.6 The training must explain the process to be followed for reporting unsafe conditions when working on the identification, detection, excavation, exposure, installation fault location, and reinstatement works associated with underground assets. The process should be documented & disseminated to all personnel involved in the planning & undertaking of these activities	Accident and Incident requirements must be included in the scope of the training and must reference any statutory reporting requirements, end customer requirements and Nokia reporting requirements.
	3.1.7 The appropriate training requirement is applicable to all duration contracts if those individuals will be exposed to potentially hazardous underground assets.	All workers need information (on the risks of the job and site, on the hazards of the task, on the methods to control risk), instruction (on how they should undertake the task safely), Training on the task if needed, including formal or on-the-job training

Requirements		Guidance
		and supervision whilst they are undertaking the task. This is especially the case where new or inexperienced persons are hired.
3.2 Competence and Supplier Qualification.		
	3.2.1 All works on the identification, detection, excavation, exposure, installation, fault location, and reinstatement work associated with underground assets must be conducted by competent personnel.	This requirement emphasises the requirement that Nokia must use only competent people (persons with appropriate knowledge, skills, and experience) whilst undertaking underground asset avoidance. Workers must receive the mandated general awareness training as stipulated in the local standard operating procedure (SOP) training as necessary to perform their role and its responsibilities.
	3.2.2 Only suppliers competent in the identification, detection, excavation, exposure, installation, fault location, and reinstatement work associated with underground assets may do so.	In situations where third-party suppliers are engaged in works involving underground asset avoidance, these suppliers must be competent in the tasks required and fully familiar with the Nokia requirements and local SOP.
	3.2.3 Records of certifications or evidence of qualifications must be held and made available on request by subcontractors.	Required qualifications and certifications of individuals must be available for inspection if requested. Qualifications may include certification on the use of locating equipment.

Requirements		Guidance
3.3 Medical Fitness to Work		
	3.3.1 Workers involved in the identification, detection, excavation, exposure, installation, fault location, and reinstatement work associated with underground assets must be medically and physically fit to work and be assessed according to local legislation where required.	Underground asset avoidance work is akin to construction work and can be strenuous with long periods working outside in hot or inclement weather. Where local requirements for medical assessment are mandated, they should be followed.
3.4 Nokia underground asset design services		
	Where Nokia undertakes design services for our customers, as the designer we must consider the health & safety implications of our design decisions, and on those that will install and maintain the network. Indeed, in many countries we operate, there is specific health and safety legislation which places strict legal duties on designers to do so. In any occurrence, the tighter H&S requirement (local or Nokia) should apply	Self-explanatory.

	When designing networks, reasonable attempts to stablish the presence of underground services must be considered.	Make all reasonable attempts to establish the presence of underground services, in localities where we are proposing to install new services where excavation will be required. The method by which this is completed must be compliant with minimum expectations in the country in which the installation activities is to be undertaken. Typically, as a minimum this will be via request of third-party asset owner's installation drawings. As part of our design services, undertake a designer's risk assessment to gather information on the environment and hazards present. Apply a hierarchy of design decisions to prioritise health and safety, to reduce the impact of the install and maintenance on the network to limit: • Limit the necessity to work in the roadway, place equipment where possible in public accessways or easements alongside the road. • When placing equipment in footways, consider minimum clearance distances for pedestrians to safely pass work sites. Limiting where possible the requirement to close the public accessway or divert pedestrians. • The potential impact to the visibility of road users, with sight lines for junctions, pedestrians, and vehicle operators from the installation of street furniture such as cabinets, poles etc. • The potential for collision from vehicles into fixed apparatus such as street furniture and the hazard this may present. Also consider the potential for live equipment to be exposed if this should occur. • The protection of operators working on the equipment, considering the frequency of required access and whether the necessity for any permanent fixed barrier.

Requirements		Guidance
		• To limit the extent of the placement of temporary traffic and pedestrian management systems, i.e., if possible, reduce need for works to work in highway zones placing and removing traffic control devices. Communicate to whomever is undertaking the construction and maintenance works, the outcome of the designers' risk assessment and highlighting any risks which we as designers were unable to fully eliminate. These are the hazards that those who build and maintain the network will need to consider and plan for prior to their works. Provide the designers risk assessment to our customers as part of handover of design package information and explain to them its purpose and need to pass to third parties where Nokia is not engaged to construct of the network.
3.5 Planning for Underground Asset Avoidance.		
	In preparation for underground work such as excavation, asset identification and exposure, installation of new underground assets etc. careful planning to identify previously recorded information on the nature and location of previously buried assets shall be undertaken.	This information is often available in the form of records or as-built drawings from the municipal authorities, the utility providers (electricity, gas, water, and telecommunications), estate management, or previous work undertaken at or near the site. This information will contribute to both the site and work risk assessment The gathered information must be reviewed to identify likely site impacts and verified where possible during the site survey stage.
	3.5.1 Sources of information	

Requirements		Guidance
	3.5.1.1.1 Records held by the municipal or local authorities in the site or location concerned.	Verify if the local authority or in the case of a 3rd party managed campus or industrial estate the management company hold records of the type, location, depth, and routes of underground assets.
	3.5.1.1.2 The utility companies and telecommunications operators who have assets in concern should be approached for information in the interest of strike avoidance and the risk of outage.	This point is mainly self-explanatory. (Note: The knowledge from suppliers who may have worked in the area in the past for either Nokia or its competitors may have information relevant to the work under consideration).
	3.5.1.1.3 Where utility companies offer a “Dial before you dig” DBYD service that service should be contacted.	Where this service is available it should be used. Determine which DBYD services, and for which utilities are available in your country. Document and record the services and the contact details.
	3.5.1.1.4 Customer records, If the customer has assets already in the site concerned, Request as-built drawings.	Nokia underground asset design services Where Nokia undertake design services for our customers, as designer we must consider the health & safety implications of our design decisions, on those that will install and maintain the network. Indeed, in many countries we operate, there is specific health and safety legislation which places strict legal duties on designers to do so. This point is self-explanatory.

Requirements		Guidance
3.6 Site and or route survey.		
	A documented site survey should be undertaken to validate the information gathered earlier and to add to or improve the information based on local observations or local contributions from those working on or managing the local site.	Self-explanatory
	3.6.1 The location and routes of utilities likely to impact or be impacted by the anticipated site work should be validated and marked if permissible.	Confirm any previously collected information on asset location provided as per section 3.4.1 of the standard. If the sources of information indicate underground utilities and especially electrical cables, their location must be verified during the site survey.
	3.6.2 A visual inspection of the site or route shall be undertaken for signs of underground assets. (Look for manholes, location cases, risers, or other indicators such as evidence of trenching).	A careful visual inspection should be undertaken to validate as much as possible previously sourced information but also to allow for deviations from the planned details and those built. When installing underground assets, it is reasonable to expect some deviation from the plan to accommodate local conditions, obstacles, or routing difficulties. Deviations should be escalated for approval by Nokia and/or the local municipal authority or utility provider.
	3.6.3 A site survey can benefit greatly from local input, invite utilities of municipal authority to the site survey so they can indicate the location of assets and routing and contribute to the protection of their assets.	Municipal authorities, utility companies or site management may be able to provide information to help plan the work with the minimum risk of asset strike or interruption. Local resources can provide critical input.

Requirements		Guidance
	3.6.4 The site survey shall establish ground conditions i.e., the type of ground involved, clay, sand etc. and compaction qualities and water table.	Self-explanatory.
	3.6.5 Identify the presence of any overhead lines or other obstructions.	“Look up before you dig below”. This is especially the case where mobile plant will be used on site. Maintain safe working distance from overhead electrical cables. See Electrical Safety Standard guidance for more information.
	3.6.6 Identify the need for any permits that are required in the area and arrange for them. (I.e., Traffic control).	Ensure that any mandated permits are applied for and secured before works commence. Where works involve street works the requirements of that standard and its localized SOP must be met.
	3.6.7 Assess safe access, egress, and movement of the public and vehicles around the site.	Where works involve street works the requirements of that standard and its localized SOP must be met.
3.7 Identification of Asset locations on Site		
	3.7.1 Before starting work to locate subsurface assets a thorough review of the information gathered at the preparation stage and the survey results should be undertaken.	Review all the available information you have on the site before you start work. Consider a final dynamic risk assessment (or last-minute risk assessment) to ensure all the risks identified and factored into the work at the earlier planning stages are addressed but also take into consideration any changes since the preparatory works. (Examples, changes to the site, access, egress, recently installed assets, buildings, adjacent works on site etc.).

Requirements		Guidance
	3.7.2 Copies of the relevant documentation gathered at the preparation stage and the site survey results should be available on site, so they can be checked periodically during the site works.	Self-explanatory.
	3.7.3 Pre-start excavation/digging checklist must be completed before activity starts.	Checklist ensuring basic requirements are met must be used before activity starts. This document must be signed by supervisor and kept as record. Document can be found as part of this document, included in Appendix 3 – Pre-Start Checklist.
	3.7.4 A cable locator (hum detector) with depth detection or other suitable equipment should be used in conjunction with the appropriate RF generator set to get the best available estimate of location and depth of the asset of interest.	Ensure that a capable hum detector is used. It is insufficient to use one with only locating capability. Use one with depth capability. The accuracy of readings is increased substantially by using a complimentary generator.
	3.7.5 The locating equipment must be in good serviceable condition, batteries charged, and the unit calibrated and maintained as per the manufacturer's recommendations.	Self-explanatory.
	3.7.6 The operators of the locating equipment shall be suitably trained and proficient in the use of the location equipment including its limitations.	A typical hum detector like a CAT 4 can be used to consistently locate position and depth of assets. The accurate use of a locator depends on training and skill. For more on Cable locating tools see: https://www.radiodetection.com/en

Requirements		Guidance
	3.7.7 As asset routes are identified they should be marked with suitable surface markers. Any residual markings should be erased after work completion where possible.	Having located position and depth of assets mark with a clear surface marker that is readily erasable is required.
3.8 Safe Digging Practice.		
	3.8.1 Personal Protection.	Burns are the main injury that results from damage to live electricity cables which can explode when struck or from fire or explosion following a gas leak. Burns are most severe when the skin is not covered. Personal protective equipment whilst digging is described below.
	3.8.1.1 Protection of the eyes with appropriate safety glasses incorporating safety shields is essential to avoid particles entering the eye during digging (especially in dry soil or where flint or rocks are present) but more specially to protect specifically against flying metal should a strike occur.	Mandate the use of eye protection and specify the acceptable types (including specification and local references if appropriate). A full list of acceptable PPEs for those undertaking UAA work is prudent.
	3.8.1.2 Protective clothing covering the skin should be worn including gloves and headwear. Clothing should be of a type that will not melt onto the skin.	Bare skin is not acceptable whilst digging to expose underground assets. Flints or sharp stones can penetrate skin and lead to acute injury and or a path for infection. Clothing that readily supports combustion and melts can in fact increase the severity of an injury.
	3.8.1.3 Boots (Rubber soles with steel toes and anti-penetration sole plates) are required.	Mandate the use of protective footwear and specify the acceptable types (including specification and local references if appropriate).

Requirements		Guidance
	3.8.2 Training and Instruction.	Digging close to underground assets is potentially dangerous. The workers undertaking the digging as well as their supervisors need to have the knowledge, skills, and experience to carry out the work and use of machinery in a safe manner.
	3.8.2.1 It is essential that workers receive sufficient training and instruction and are adequately supervised by someone who has the necessary knowledge, skills, and experience to ensure the workers follow a safe system of work.	Inexperienced workers can often be at elevated risk when they are employed on asset location work. Hand digging will often be undertaken by these workers and they can be inadvertently exposed to the consequences of an asset strike. These workers must receive adequate Instruction, information, training, and supervision. The supervisor must ensure that all the workers under their control are sufficiently trained and follow a safe system of work. The supervisor must be competent in the supervision of their teams. In addition to training on hand digging and a safe method of work casual workers must receive any other training specific to the task or site or job they will be undertaking.
	3.8.3 Safe Digging Methods	The area of highest danger relates to the use of hand tools.
	3.8.3.1 Spades and shovels should be used instead of picks or pry bars.	Tools capable of significant asset damage should be avoided, especially as the asset is approached. If sharp pointed tools are necessary to break ground, supervision and a cable locator must be in place.
	3.8.3.2 The spade or shovel should be eased into the soil with foot pressure rather than thrown into the surface.	Foot pressure gives more feedback to the user and hence better control of the dig. A high velocity edged tool may slice into or damage a cable.
	3.8.3.3 Picks should not be used in soft clay or when approaching the buried asset.	This point is self-explanatory.

Requirements		Guidance
	3.8.3.4 Shovels and spades should have insulated fiberglass or wooden handles.	In the event of an electrical strike insulated handles can reduce the severity of shock.
	3.8.3.5 Fibre glass crowbars are available, and these should be used but if not available use crowbars with insulated handles.	In the event of an electrical strike insulated handles can reduce the severity of shock.
	3.8.3.6 During the digging exercise the depth to the asset should be regularly checked using the cable locating equipment giving warning of and underground asset and the need to manage pressure to avoid a strike.	The initial measurement of both location and depth should not be exclusively relied on. Location and depth accuracy can be influenced by anomalies in the subsurface including different soils or the presence of additional assets to the one of interest. Unenergized lighting cables or well-balanced loaded three phase cables can be difficult to locate accurately. Repeat measurements should be made often while digging.
	3.8.3.7 Mechanical digging machinery must be kept under control during operations allowing the excavation team to know where the elements of the machine are and to stop and reverse operation if needed.	Mechanical digging implies the use of machinery to avoid opening the soil. This occurs when directional drilling activities (horizontal, mole boring, etc...). If the nature of the activity doesn´t allow the team to have eye contact with all elements of the machine, a process to precisely locate hidden elements must be in place. Machinery must include the possibility to stop and reverse operation if needed.
	3.8.3.8 Final location by horizontal digging is preferred. In this way, the trial hole is dug adjacent to the anticipated asset and the final breakthrough made in a horizontal direction thus reducing the risk of hitting the asset.	See Appendix 1 for a description of horizontal digging and how it can reduce the risk of asset strikes.

Requirements		Guidance
	3.8.3.9 If the asset is measured at a depth exceeding 1 meter, then care should be taken whilst digging the pilot holes to prevent collapse of the sides of the excavation and entrapment or suffocation of the of the individuals undertaking the dig. The sides of the excavation should be tapered, or suitable shoring used.	This requirement should be followed to avoid injury from collapsing trenches or pilot holes. If a more demanding requirement is in local law or construction regulation then that requirement should be identified, recorded, and implemented.
	3.8.3.10 If an asset is accidently struck and even though the damage might appear minor, inform the respective utility company concerned so it can be inspected, and repairs made if necessary.	Workers and supervisors need to be aware of the requirement to report any inadvertent damage, as what might appear as superficial damage could fail catastrophically later.
3.9	**Advanced Scanning.**	
	The combination of a cable locator, a generator and a skilled user is a well proven scanning approach used to locate underground assets especially metallic electrical cables. Other techniques are available to deal with situations such as non-conductive pipes (use of transmitters inserted in the pipe of interest). Ground penetrating radar (GPR) can be used to get a two dimensional or three-dimensional image of the subsurface layout and can be used in cable or services dense areas to determine the number and relative position of assets in these complex situations.	Self-explanatory.

	Requirements	Guidance
	3.9.1 If the combination of a cable locator (hum detector) and a generator operated by a skilled user have been used, followed by a safe trial dig but has not been successful, in resolving the conditions on site GPR should be considered and used where feasible.	GPR can be used to resolve subsurface conditions where a complex mix of services or assets are collocated.
	3.9.2 Where GPR is mandatory for types of site works (i.e., mole boring), or locations (i.e., city streets or dense conurbation) then GPR should be undertaken, records maintained and made available for the duration of the works.	It is not unusual for local authorities to mandate the use of GPR in areas of dense underground assets such as towns, cities, or industrial areas.
3.10 Site emergency arrangements.		
	When undertaking underground asset avoidance site works emergency provisions must be in place.	Self-explanatory.
	3.10.1 First aid arrangements – including mobile / or telephone number of local first aid persons.	Identify the arrangements as needed per site and implement improvements if shortfalls are identified. List first aiders in the team and their contact details. Identify where first aid kits are stored (for mobile teams, typically in vehicles).
	3.10.2 Location of nearest medical facilities.	Identify and record details of nearby medical facilities/hospitals that should contacted if an accident should occur.

Requirements		Guidance
	3.10.3 Phone numbers of ambulance and emergency services assistance.	This is self-explanatory in the main. Note: where regional or national central emergency services coordination exists, this is easy to achieve, however If no central emergency services coordination is available the appropriate emergency contact numbers should be identified and recorded and available on site if needed.
	3.10.4 Written escalation process with notification requirements and contact numbers.	In addition to accident reporting requirements a process must be defined to ensure that stakeholders within Nokia (Names, roles, contact phone numbers, email addresses) are informed of incidents.
	3.10.5 Written escalation process to the customer and/or other stakeholders including owners of underground assets with relevant contact numbers.	Site documents should contain any reporting or escalation process details as mandated by the end customer. The contact details of any asset or utility owners and the local authority responsible for the area where the site is, needs is to be included in the site documentation. This is especially important should an incident occur on site that requires an immediate response from the local authority, emergency services, utility owners, asset owners, operators, or other stakeholders.

Requirements	Guidance
3.11 Asset Strike Events.	
3.11.1 If an accident or incident with an underground service occurs, then the requirements of the emergency plan should be followed. The H&S project manager must be notified immediately as soon as it is safe to do so. All service strikes will be investigated as per the Nokia global incident investigation procedure.	The following must be undertaken: In the event of a service strike occurring the service owner must be notified to make safe, the damaged service must not be left unattended at any time. • All service strikes must be reported through accident and incident reporting procedures. A report must be provided to Nokia in all instances. Nokia may elect to undertake their own Investigation where the excavations are undertaken on our behalf. • Extensive photographs / evidence must be taken and gathered when it is safe to do so and must include: o Photo of position of service with a suitable rule showing scale and its depth recorded. o Photography of the cable avoidance tool utilised to scan the area on site, including another photo of the close up of its location. Site specific documentation should also be included the general photo to evidence the equipment was on site. o Copy of the calibration / inspection certificate for the CAT tool. o Photography of any service marking tape / aggregates around the service. o Drawing showing position of service strike and its route. o Photographs of tools used for excavation work again in the context of site environment. o A usage download report for the CAT 4+ device must also be provided.

4 Implementation Expectations.

4.1 Every business group leader must ensure, within their area of responsibility, that the requirements of this standard are implemented.

4.2 PS&S must ensure that for every location that Nokia operates works that involve Underground Assets, the minimum requirements defined in section 3 are defined for local implementation, captured in local documentation, consulted with local stakeholders, and communicated to all relevant parties and must be:

4.2.1 Specific to a country.

4.2.2 Defined across a region where there is regional alignment or Nokia requirements exceed local requirements in all listed areas.

4.2.3 Tailored based on customer requirements or expectations.

4.2.4 Consider local legal requirements and restrictions.

4.3 Nokia P&P must ensure that:
Where works within P&P area of responsibility which require efforts to avoid underground asset strikes are undertaken on owned properties or on a campus, P&P shall ensure that the requirements of this standard are met.

The site Facility manager is to be notified of any underground asset works to be undertaken by a Business Group on a Nokia site.

4.4 Where companies or individuals are sourced to undertake underground assets for Nokia, Procurement must ensure that the:

4.4.1 Requirements in section 3 are clearly communicated, understood and that the supplier can meet these expectations when they are awarded work.

4.4.2 Supplier is made aware of Nokia reporting requirements related to accidents.

4.5 Contractors/Third Parties are responsible for ensuring that minimum requirements defined in section 3 are locally adopted, clearly communicated to their employees, understood, and implemented within their area of work.

5 Recommendations

The requirements listed in section 3 apply to all Nokia operations, but the geographical spread of the business means that the extent of implementation varies. The recommendations contained in this section aim to provide guidance on how to achieve the requirements. Should these be deviated from, that decision needs to be documented.

The risk of a strike of an underground asset is factor that Nokia field employees, suppliers, contractors, and partners working for or on behalf of Nokia may be exposed to. Where they are exposed to this risk, the consequences of an incident can be severe.

The requirements of this standard apply to all of these groups, and when approaching implementation, needs to be conducted on a risk-based approach.

In order to determine the extent to which the requirements of this standard apply each business unit should conduct an assessment that the risk of a strike to an underground asset poses to their operation.

Appendix 1 – Safe Digging Practice

Once the asset routes have been determined by reliable information and location devices trial holes should be dug using hand tools to confirm the location of the underground asset.

The limitations of cable locating devices (i.e., CAT 4 +) should be appreciated; plastic cables or piping will often not be detected, nor may low voltage low current cables (street lighting), or well-balanced three phase power supply cables. In situations where one cable is situated below another the lower cable may be missed.

The limitations of records, plans, drawings, and location devices reinforce the need for careful excavation or trial digging.

Personal Protective Equipment (PPE).

Personal protective equipment whilst digging must include.

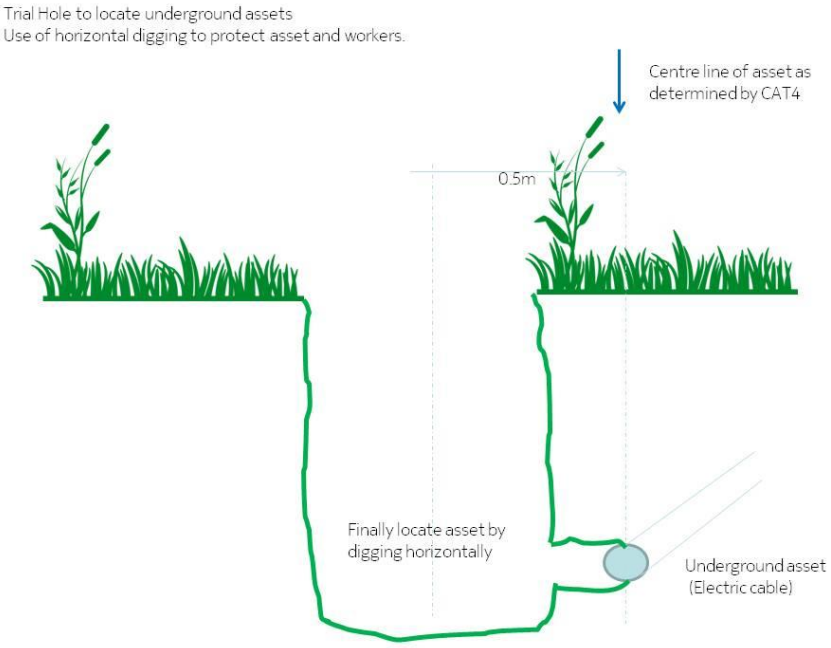
- Boots (Rubber soles with steel toes and anti-penetration sole plates),
- Glasses with side shields,
- Gloves,
- Clothes covering arms, legs, and torso (preferably of a fire-retardant type).

Safe Digging Methods.

The area of highest danger relates to the use of hand tools. Spades and shovels should be used instead of picks or thrown bars. The spade or shovel should be eased into the soil with foot pressure rather than pry into the surface. Picks should not be used in soft clay or when approaching the buried asset. Shovels and spades should have insulated fiberglass or wooden handles. Fiberglass crowbars are available, and these should be used but if not available use crowbars with insulated handles.

While digging exercise the depth to the asset should be checked using the cable locating equipment (CAT 4+) often to verify the depth to the asset and the need to relax pressure to avoid a strike.

Final location by horizontal digging is preferred. In this way the trial hole is dug adjacent to the anticipated asset and the final breakthrough made in a horizontal direction thus reducing the risk of hitting the asset.



If the asset is measured at a depth exceeding 1 meter, then care should be taken whilst digging the pilot holes to prevent collapse of the sides of the excavation and entrapment or suffocation of the of the individuals undertaking the dig. The sides of the excavation should be tapered, or suitable shoring used.

If an asset is accidently struck, and damage appears to be minor, immediately inform the perspective utility company to initiate an inspection and repair if necessary.

HORIZONTAL DIRECTIONAL DRILLING

Contractors performing Horizontal Directional Drilling on any Nokia work site must ensure that:

- Drill rig is off-loaded and loaded while the transport truck is parked on a level surface.
- The Loading / Off-loading area is barricaded to prevent unauthorized access.
- Drill pits are always be barricaded. During the drill operation barricading will also extend around the drill rig.
- Walkways will be clearly demarcated for members of the public to safely pass.
- The drill operator is trained on the type of drill rig that is used and competencies must be available on site.
- Any bentonite spillage on road surface is immediately contained and cleaned.
- Drilling contractors prevent bentonite from spilling into storm water drains.
- After drilling is completed, bentonite is removed from drill pits and kept in appropriate containers.
- Upon completion of drilling operations, drill pits are re-instated as per customer requirements.

Prerequisites for Horizontal Directional Drilling:

- All drilling activities must be planned and signed off by a competent drill operator and submitted in writing to Nokia prior to drilling. Drill plans will be available on site.
- Drill plans must indicate the presence, type, depth, and position of underground services.
- Way leaves must be available on site. And services indicated on wayleaves must be identified on drill plan.
- The drill path must be scanned for services using Ground Penetrating Radar scanning.
- Scanning equipment must be serviceable and if specified by the manufacturer it must also be calibrated as per manufacturer recommendations.
- Drill rigs must be in good serviceable condition. Machine with oil or hydraulic fluid leaks will not be brought onto any Nokia works site.
- During the drill, the drill rig will be earthed and only operated by the designated trained operator.
- The operator must be appointed in writing.
- The drill assistant tracking the position of the drill bit will wear a high visibility reflective vest, and he will be accompanied by a flagger or safety monitor whenever he works in a roadway. Traffic Management will be implemented to ensure the safety of the drill assistant when he enters the roadway.
- Workers will not enter or exit the drill pit until the drill rig is completely switched off.
- The drill rig will remain switched off while workers are swapping drill bits. Workers will not be allowed in the drill pit while drilling or reaming. Installation sites will be left in the same condition as before construction works.
- Manufacturers' safety instructions will apply when changing drill bits.

MOLE WORK

Mole work will be defined as the use of an air operated device to burrow underneath a surface for short distances by means of an un-steerable device using a thumping motion.

The following conditions must be met:

- Mole work will only be done underneath driveways.
- Mole work will not be allowed for road crossings.
- Mole work will only be allowed for distances less than 11 meters.
- Mole work will not be conducted in high dense service areas.
- Mole work will only be done by suitably trained operators (training provided by equipment supplier)
- Mole work will only be done under direct supervision of the appointed Nokia site supervisor.
- The rest will be applicable as for all other excavations.
- Scanning of route must be done prior to commencement of mole work and communicated to mole operator and team.

- Services will be marked
- Entry and exit pits must be scanned to determine if any services are present.

MICRO TRENCHING

Micro Trenching is defined as the process of machine cutting a narrow trench in a road surface with a driven / tracked machine with toothed cutting wheel.
Contractors performing Micro Trenching in road surfaces must ensure that:

- The operator of the machine is trained on the specific type of machine.
- Any workers in the immediate vicinity of the trenching machine will wear SABS approved hearing protection (earmuffs with the required Noise Reduction Rate) as well as dust masks and eye protection.
- Work is planned to avoid works during peak traffic hours.
- Adequate Traffic Management is implemented that at least includes a flagman in front of, and behind the trenching machine to warn oncoming vehicles and to be able to warn the machine operator of danger.
- Public roads include a traffic controller / STOP-GO operator accompanies the machine as it moves.
- Workmen-ahead and Reduce Speed signs are placed at a minimum of 50 meters and a maximum of 150 meters from the trenching machine.
- The signage is moved as the machine progresses.
- Open trenches are conspicuously marked by placing Heavy Base Delineators at no more than 10-meter intervals along the trench.
- Trench cutters causing excessive cavitation or breaks in the road surface more than 75% of the cutter blade width, result in work stopping, Work may only resume once permission has been given in writing by the roads department or homeowners association (In case of gated communities), as the case may be.
- No rubble is left in/on the road surface.
- During duct installation, the same standard of traffic management is applied as is required during the trenching work.
- Delineators are not removed from the trench path until the finished road surface has cured adequately for vehicular use.

SLOT-CUTTING

Slot-cutting is defined as the process of cutting a narrow slot into tar or paved surfaces using a slot cutting machine with water cooled rotating blade.
Contractors who perform Slot-Cutting will ensure that:

• Slot cutting is not permitted if the cutting route has not been scanned for electrical services using a serviceable scanner.

• Location of services are indicated using high visibility spray paint.

• Scanners / service locators are calibrated in line with manufacturer specifications.

• A valid calibration certificate for all scanners / service locators is on site.

• The machine operators are competent and trained to use the machines.

• Previously defined requirements for road traffic management apply during all road cutting operations for both road surfaces and driveways.

• All workers in vicinity of the slot cutting machine wear (Define this acronym) SABS approved impact resistant eye protection, as well as dust masks.

• The slot cutting machine operator wears SABS approved hearing protection (earmuffs with the required Noise Reduction Rating).

• All workers required to work in mud conditions wear waterproof safety boots (Mining gumboots)

• All tools used for scooping mud from the trench use insulated scooping tools / mud scoops to prevent electrocution in the event where an electrical cable was cut but the damage has not yet been discovered.

• Mud is removed immediately, and that work areas must be clearly marked by placing cones to prevent unauthorized access to hazardous areas.

Appendix 2 – Localization – Sample Standard Operating Procedure

The Nokia Global Underground Asset Avoidance Safety Standard describes the minimum non-negotiable requirements associated with locating and avoiding underground assets (electricity cables low voltage and higher voltages, gas pipes, water pipes, other telecommunication cables etc.to ensure that such work is undertaken in a safe manner and in compliance with regulatory requirements. These are the “WHATs”. The localization of the standard describes “how” these requirements are implemented in a country or market and by “whom” and “when” or “how often”

The sample Standard Operating Procedure (SOP) attached below is based on a successfully implemented SOP in South Africa and can serve as a model for implementation in other countries.

Blue Italics have been used to indicate where specific local input is advised.

SOP UAA V3.docx

Appendix 3 – Pre-Start Checklist

Appendix 3 - Guidance 02.xlsx

6 Change History

Ver	Status	Date	Author	Owner	Reviewed by	Reviewed date	Approver	Approval date	Description of changes
0.1	Draft	2018.05.25	Robert Nolan / Hugo Tovar	Gareth I Davies	Gareth I Davies	2018.05.25	Gareth I Davies		First version including available guidance documents.
1.0	Final Version	2018.12.17	Hugo Tovar	Gareth I Davies	Gareth I Davies	2018.12.17	Gareth I Davies	2018.12.17	Final version including stakeholders' input
1.1	Final Version	2020.05.04	Hugo Tovar	Gareth I Davies	Ali Mousavi, Stephan Dreyer, Marcin Lakomy	2020.05.14	Gareth I Davies	2020.06.05	Updated document with references to horizontal digging and drilling methods
2.0	Final Version	2021.05.21	Hugo Tovar	Marty Bishop	Marty Bishop	2021.05.21	Marty Bishop	2021.05.21	Updated version reflecting organizational changes.
3.0	Final Version	2022.02.01	Hugo Tovar	Marty Bishop	Marty Bishop	2022.02.04	Marty Bishop	2022.02.04	Global HS Standard and Guidance combined in one document. Section Asset Design Service added 3.4 Section Asset Strike Events added 3.11 Input from BGs and CPO P&P
4.0	Approved	2023.12.28	Sameh Eisa	Sameh Eisa			Paulo Conceicao	2023.12.28	Modifications include formatting, rebranding, and organizational changes.