PUBLIC

ABU DHABI PUBLIC HEALTH CENTRE | مركز أبوظبي للصحة العامة

Abu Dhabi Occupational Safety and Health System Framework

(ADOSH-SF)

Code of Practice

CoP 46.0 – Underground Construction

Version 4.1

February 2026

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1. Introduction

(a) This Code of Practice (CoP) applies to all employers within the Emirate of Abu Dhabi. This CoP is designed to incorporate requirements set by Abu Dhabi Public Health Centre (ADPHC) and Sector Regulatory Authorities in the Emirate of Abu Dhabi.

(b) This CoP establishes the requirements and standards so that the risks associated with underground construction are assessed, that control measures are implemented in accordance with the hierarchy of controls and ensures measures are implemented to prevent injury, illness and disease to persons who might be exposed to risks arising from those activities.

(c) Principal Contractor when used in this CoP refers to the main contractor overseeing and responsible for activities undertaken on the site within the Building and Construction Sector. Refer to *ADOSH-SF – CoP 53.0 – OSH Management during "Construction Work"*.

(d) Underground construction work in this CoP includes, but is not limited to:

(i) piling

(ii) tunnelling; and

(iii) shaft sinking.

2. Training and Competency

(a) Employers shall ensure that OSH training complies with the requirements of:

(i) *ADOSH-SF – Element 5 – Training, Awareness and Competency.*

(ii) *ADOSH-SF – Mechanism 7.0 – Occupational Safety and Health Practitioner and Service Provider Registration.*

(b) Employers shall ensure personnel required to implement the requirements of this CoP are trained in underground construction and understand the risks associated with underground construction and the control measures implemented by the employer.

(c) Employers shall ensure all employees involved in underground construction shall be trained to recognise and respond to hazards associated with this type of work.

(d) Training shall be tailored to the specific requirements of the jobsite and include any unique issues or requirements and the following subjects shall be part of the employee underground construction training program:

(i) identified hazards and risks;

(ii) site rules and prohibited activities;

(iii) confined space operations;

(iv) devised safe methods of working;

(v) air monitoring and ventilation;

(vi) access and egress;

(vii) illumination;

(viii) communications;

(ix) flood control;

(x) personal protective equipment;

(xi) emergency procedures, including evacuation;

(xii) check-in/check-out procedures;

(xiii) fire prevention and protection; and

(xiv) mechanical equipment.

(e) Employers shall maintain a record of the required training that contains the following information:

(i) name and ID number;

(ii) Emirates ID number;

(iii) subject(s) of training;

(iv) training provider;

(v) date(s) of training; and

(vi) person(s) providing the training.

3. Requirements

3.1 Roles and Responsibilities

3.1.1 Employers

(a) Employers shall undertake their roles and responsibilities in accordance with the general requirements of *ADOSH-SF – Element 1 – Roles, Responsibilities and Self-Regulation* Section 3.2.5.

(b) Employers shall undertake their specific roles and responsibilities in accordance with the following:

(i) that prior to the commencement of any underground construction work an assessment is carried out by a competent person and appropriate control measures in line with this CoP are undertaken;

(ii) documented safe systems of work are prepared which are designed to ensure that the underground construction works are systematically planned and appropriate work methods and procedures are in place;

(iii) that the site has been surveyed correctly with markers/confirmation of alignments and boundaries and that all available site diagrams, maps, drawings, specifications and relationships with surrounding properties are obtained;

(iv) all services searches are initiated and validated;

(v) any historical, archaeological or geological items are safeguarded or documented;

(vi) the notification of adjoining property owners of the proposed underground construction;

(vii) the principal contractor has all the available relevant information on the work areas to be excavated. This includes site surveys, plans of services and information on the nature and location of hazardous materials;

(viii) securing of the site and provision of health and safety control measures until the principal contractor takes possession;

(ix) inform the principal contractor and any other relevant parties of the method or methods of underground construction selected and the equipment to be used;

(x) obtain all necessary work permits, authorizations and provide all necessary notifications concerning the work;

(xi) nominate a person to supervise the work at all times and implement the underground construction safety operations. This person shall be competent in the type of underground construction work needed for the particular project and experienced in the implementation of safe work procedures;

(xii) ensure an inspection of adjacent properties is undertaken when necessary, and ensure that any change in the condition of adjacent properties during the underground construction work is reported to the relevant parties;

(xiii) erect all appropriate fencing and overhead protection barriers for the protection of employees at the workplace and any others who may be affected by the work;

(xiv) ensure appropriate control measures to prevent cave-in or collapse;

(xv) ensure employees are consulted and provided with all the information about the underground construction work, instructions, training and supervision that they need to perform their work safely;

(xvi) arrange for the recycling of building waste wherever reasonably practicable and the disposal of all other refuse and debris;

(xvii) provide appropriate amenities for employees;

(xviii) provide appropriate first aid and emergency procedures / services; and

(xix) ensure all persons employed have a high standard of physical fitness and that all persons working underground and all plant operators and banksmen be at least 18 years old.

3.1.2 Principal Contractors

(a) In the case of the Building and Construction Sector, Principal Contractors shall undertake their roles and responsibilities in accordance with the general requirements of *ADOSH-SF - CoP 53.0 - OSH Management during "Construction Work".*

(b) Principal Contractors shall undertake their specific roles and responsibilities in accordance with the following:

(i) the underground construction employer has been provided with all available descriptions of the site, including drawings, site surveys, plans of services and information on the nature and location of hazardous materials, the nature of building materials and the building or structure's relationship to surrounding properties;

(ii) all relevant authorities and utility service providers are notified, and all necessary approvals are obtained before work commences;

(iii) the notification of the owners of adjoining properties of the proposed underground construction work;

(iv) the location of all utility services is known;

(v) ensure appropriate control measures to prevent cave-in or collapse;

(vi) verification of the location and condition of all underground tanks, vaults, wells, voids and structures, and that any chemicals, volatile fuels and gases contained in them are completely removed; and

(vii) the workplace is secured.

3.1.3 Employees

(a) Employees shall undertake their roles and responsibilities in accordance with the general requirements of *ADOSH-SF – Element 1 – Roles, Responsibilities and Self-*Regulation Section 3.2.7.

(b) Employees shall undertake their specific roles and responsibilities in accordance with the following:

(i) carry out their work in accordance with the underground construction procedures;

(ii) report identified hazards and risks; and

(iii) use equipment in accordance with the instruction and training provided.

3.2 Planning and Assessment

3.2.1 Planning

(a) Employers shall ensure the following:

(i) an assessment of the various risks is undertaken and systems of work are established which are safe to all parties involved or affected including the public;

(ii) that appropriate control measures are implemented in order to manage activities safely and without risk to health;

(iii) that for the Building and Construction Sector the management of underground construction requirements are included in the Pre-Tender Environment, Health and Safety Plan in accordance with *ADOSH-SF - CoP 53.0 - OSH Management during "Construction Work"*; and

(iv) that associated safe systems of work, and site rules are included in the Occupational Safety and Health Construction Management Plan (OSH-CMP) in the case of the Building and Construction Sector in accordance with *ADOSH-SF - CoP 53.0 - OSH Management during "Construction Work".*

3.2.2 Assess the Site

(a) Before any underground construction work is carried out employers shall ensure a competent person assesses the work requirements for the site.

(b) Following the assessment, the competent person shall prepare documented safe systems of work.

3.2.3 Documented Safe Systems of Work

(a) Employers shall ensure that an underground construction risk assessment and appropriate control measures are undertaken through the completion of the documented safe systems of work.

(b) Employers shall ensure the documented safe systems of work are designed to ensure that:

(i) underground construction work is systematically planned; and

(ii) appropriate safe work practices and control measures are in place.

3.2.4 Site Survey and Plans

(a) In developing site surveys and plans employers shall ensure that:

(i) the site has been surveyed correctly with markers/confirmation of alignments and boundaries;

(ii) all available site diagrams, maps, drawings and specifications that determine the relationships with surrounding properties are obtained;

(iii) any historical, archaeological or geological items are safeguarded or documented; and

(iv) the owners of adjoining property of the proposed excavation are notified.

3.2.5 Services Search

(a) Employers shall ensure that all services searches are conducted and these are validated.

3.2.6 Validation Area Risk Assessment

(a) The validation area is the area nominated by the service owner which is the distance from the supposed location of an underground service. The method for determining the exact location of the service within the validation area will be determined by the service owner.

(b) Employers shall ensure a validation area risk assessment is conducted in consultation with the Client / Asset Owner when services are identified, located and marked on the surface.

(c) Where the nominated area differs or overlaps for different authorities or services, the combined areas of the different nominated areas for the different authorities are taken into account.

(d) Validation Area risk assessment and applicable control measures are undertaken through the completion of the documented safe systems of work which also includes the controls to be implemented.

3.3 Communication

3.3.1 Above Ground Person

(a) Employers shall ensure that:

(i) any time an employee is working underground, the employer shall maintain at least one designated person on duty above ground;

(ii) the designated person shall maintain a check-in/check-out procedure for keeping an accurate count of persons underground and prevent unauthorized persons from gaining access to the site; and

(iii) the designated person is responsible for calling for immediate assistance and summoning emergency aid if needed.

3.3.2 Audible Signals

(a) Employers shall ensure:

(i) that audible signals by bell, whistle, or other device shall be used for routine operations such as hoisting and lowering in a shaft;

(ii) these signals are distinctive and sufficiently loud to avoid confusion with any incidental or accidental noises; and

(iii) all operatives involved in the operation shall understand what the signals mean.

(b) The recommended code is:

(i) stop: one extended signal;

(ii) lower: two signals;

(iii) hoist: three signals;

(iv) hoist personnel: four signals; and

(v) emergency: continuous.

(c) Employers shall ensure that if natural unassisted voice communication is ineffective at any time, a power-assisted means shall be used to ensure communication between the work face, the bottom of the shaft, and above ground.

(d) Ensure all signals are in accordance with *ADOSH-SF - CoP 17.0 - Safety Signage and Signals.*

3.3.3 Visual Signals

(a) Employers shall ensure:

(i) signals to machine operators shall be given only by competent banksmen; and

(ii) ensure all signals are in accordance with *ADOSH-SF - CoP 17.0 - Safety Signage and Signals*.

3.4 Lone Working

(a) Employers shall ensure that no lone working is permitted when working underground. A team with two persons as a minimum with an intrinsically safe form of communication between them shall be used for the work.

(b) Employers shall ensure that all communication systems are in line with the requirements of section 3.3 and also those set out within *ADOSH-SF - CoP 30.0 - Lone Work and/or in Remote Locations.*

3.5 Reporting Hazards and Risks

(a) Employers shall ensure that any hazardous conditions or occurrences that might affect the safety of employee's shall be recorded and the employer shall notify all oncoming shifts of occurrences or conditions.

(b) These shall include equipment failures, movement/collapse, flooding, fires, or release of gas, any abnormal ground levels, tidal levels and rainfall.

3.6 Control of Access and Egress

(a) Employers shall maintain safe access to and egress from all underground construction areas at the construction site to protect employees from potential hazards, such as being struck by excavators or other moving equipment.

(b) To help control access, all unused openings shall be tightly covered, bulk headed, barricaded, or fenced off, and posted with warning signs that read, "Keep Out" or similar.

3.7 Heat Stress and Exhaustion

(a) Mechanisation, ventilation and job rotation shall be arranged to reduce the risk of heat stress and exhaustion.

(b) Appropriate supplies of cold potable water shall be made available. Refer to *ADOSH-SF - CoP 11.0 - Safety in the Heat*.

3.8 First Aid

(a) Employers shall ensure:

(i) that competent persons, trained in first aid and capable of responding rapidly to any incident, are available on each shift during working hours. Refer to *ADOSH-SF - 4.0 - First Aid and Medical Treatment;*

(ii) all personnel shall be told that, in the event of serious injury, a casualty shall be moved only by a trained first-aider, unless there is the immediate risk of further injury;

(iii) appropriate first aid boxes are provided, designed to protect the contents as far as reasonably practicable from damp and dirt. They shall be clearly identified, readily accessible to working areas and in the charge of designated first-aiders on each shift;

(iv) stretchers (and blankets) appropriate for the confined space of a tunnel shall be provided and maintained. They shall be readily accessible for use in working areas in an emergency and shall be protected against dirt and damp. In particular, where access to a tunnel is by a shaft, stretchers shall, where reasonably practicable, be stored at tunnel level; and

(v) an appropriate means of transporting an injured person to the surface shall be provided. Lifting arrangements in shafts shall take this into account.

3.9 Evacuation

(a) Employers shall ensure a clear plan of action is formulated for the rapid transfer of any injured persons from working areas and to ensure that ambulances can reach shaft tops or other access points quickly.

(b) Employers shall ensure:

(i) all employees are given clear instructions on the procedures to be adopted for evacuating tunnels in an emergency;

(ii) all employees working in the tunnel shall have a portable hand lamp or cap lamp unless natural light or an emergency lighting system provides appropriate illumination;

(iii) employees are provided with an escape type breathing apparatus and approved gas monitor if the area they are working may present a gas or smoke hazard;

(iv) if 25 or more employees work underground at any one time, the employer shall provide a fully equipped and trained rescue team together with an appropriate vehicle to transport an injured person to the nearest hospital;

(v) if less than 25 employees work underground, there shall be a direct means of communication with the local emergency services; and

(vi) if a shaft is used as the means of egress, the employer shall arrange for a readily available lifting capability unless the regular lifting means will function in the event of a power failure.

3.10 Fire Prevention and Control

(a) Employers shall ensure:

(i) open flames and fires are prohibited in underground construction areas except as permitted for welding, cutting, or other hot work operations;

(ii) smoking is prohibited at all times and notices shall be prominently displayed;

(iii) fire extinguishers or extinguishing means shall be available at the head and work areas;

(iv) all underground structures and those within 30 meters of an opening to the underground shall be constructed of materials with a fire resistance rating of at least one hour. Also, flammable or combustible material may not be stored above ground within 30 meters of any access point to an underground operation;

(v) petrol is not kept underground at any time for any purpose;

(vi) oil, grease, and diesel fuel stored underground shall be kept in tightly sealed containers in fire-resistant areas away from passage ways;

(vii) acetylene and liquefied petroleum gas may be used underground for welding, cutting, and other hot work if all requirements/standards pertaining to such activities are met;

(viii) only enough fuel gas and oxygen cylinders for welding, cutting, or hot work during a 12-hour period are allowed underground; and

(ix) non-combustible barriers shall be installed below such activities if they are performed in or over a shaft or rise.

(b) Specific requirements apply to the use of diesel fuel in underground construction operations, and employers shall ensure:

(i) a surface level tank holding diesel fuel to be pumped to an underground storage site shall have a maximum capacity no greater than the amount of fuel required to supply underground equipment for 24 hours;

(ii) a surface level tank shall be connected to the underground fuelling station by an acceptable pipe or hose system controlled at the surface by a valve and at the bottom by a hose nozzle;

(iii) the transfer pipe shall remain empty at all times except when transferring diesel fuel; and

(iv) all hoisting operations in the shaft shall be suspended during refueling operations if the supply piping in the shaft is not protected from potential damage.

(c) Ensure compliance to *ADOSH-SF – CoP 28.0 – Hot Work Operations (e.g., Welding and Cutting).*

3.11 Noise

(a) Since there is inappropriate space to reduce the level of noise emission by confinement and/or containment retrospectively, employers shall ensure all machines and tools are selected on the basis of risk assessment to be designed to eliminate or reduce the noise at source with minimum operator exposure.

(b) Thereafter employers shall establish a management system that will:

(i) confirm the appropriateness of the noise and vibration controls;

(ii) continually identify significant residual noise sources; and

(iii) ensure regular maintenance checks and replacement or repair.

(c) Ensure compliance to *ADOSH-SF – CoP 3.0 – Occupational Noise* and *ADOSH-SF - CoP 3.1 – Vibration.*

3.12 Ventilation

3.12.1 General

(a) Employers shall ensure:

(i) polluted air is continually removed from tunnels;

(ii) if natural ventilation does not provide the necessary air quality through appropriate air volume and air flow, the employer shall provide positive mechanical air ventilation to ensure that each employee working underground has at least 5.7 cubic meters (200 cubic feet) of fresh air per minute;

(iii) the inlet to the ventilation system is positioned away from petrol and diesel engines, hazardous materials and dust fumes;

(iv) When performing work that is likely to produce dust, fumes, mists, vapors, or gases (such as manual and mechanized tunneling, blasting or rock drilling), the linear velocity of air flow in tunnels, shafts, and all other underground work areas must be at least 9.15 m (30 feet) per minute; and

(v) the outlet from the ventilation system is positioned such that it is free to disperse any harmful substances away from the entire work area.

3.12.2 Ventilation Systems

(a) Employers shall ensure the ventilation system is simple, intrinsically safe and designed to be moved forward or extended with the progress of tunnelling.

(b) Ventilation systems can include one or more of the following:

(i) a forced supply of fresh air, exhaust being through the tunnel and access ways;

(ii) extraction of polluted air from the tunnels, fresh air being drawn into the tunnel due to the reduction in pressure caused by the exhaust ventilation;

(iii) alternation of forced supply and extraction; and

(iv) air movers to assist locally and to eliminate stagnant pockets. If air movers are used locally, care shall be taken to ensure that these will not cause recirculation.

(c) Employers shall ensure that all ventilation systems are maintained and tested in line with the manufactures instructions.

3.12.3 Cooling

(a) Employers shall ensure the volume of fresh air required for cooling purposes is examined carefully to ensure an appropriate flow of air to keep the working temperature within acceptable limits.

3.12.4 Selection

(a) Employers shall ensure the methods of ventilation adopted are in accordance with the hazards presented by each tunnelling situation. Factors to be considered include:

(i) the numbers of face employees;

(ii) the work locations;

(iii) the length, size and gradient of drive;

(iv) the presence of water, dust or fumes;

(v) the presence of methane;

(vi) whether drilling and firing will be taking place; and

(vii) the amount of waste heat generated by mechanized tunneling operations.

(b) Where dust is a major problem, employers shall ensure the system is designed to control dust and shall incorporate filters to clean the dusty air before readmission to the general body of airflow.

3.12.5 Positioning of Fans

(a) Employers shall ensure air intake and exhaust fans on the surface are sited well away from sources of contamination.

3.12.6 Earthing

(a) The movement of dust and gases through a ventilation system can cause a dangerous build-up of static electricity. Employers shall ensure all ducts, fan bodies, casings and support structures are appropriately bonded to each other and to an appropriate earth.

(b) Employers shall ensure air movers and venturi devices are earthed.

3.12.7 Methane

(a) Employers shall ensure:

(i) where an extraction ventilation system is in use and there is a risk of methane being encountered, the design and construction of the system takes into account the hazard of methane passing through fans and fan motors;

(ii) the methane concentration in the ducts is continuously monitored; and

(iii) if methane is reasonably foreseeable, the fans are explosion-protected.

3.12.8 Dust

(a) Employers shall ensure:

(i) dust generated from tunneling works is suppressed at the source as far as is reasonably practicable;

(ii) its spread is controlled by methods such as water spraying, water infusion and extraction ventilation;

(iii) all efforts shall be made to minimize the problem, and this can be done by dampening down all routes on site, dampening stockpiles and erecting mesh and hoarding to contain materials;

(iv) in dusty conditions, extraction ventilation is provided. Dusty air is usually very erosive, and fans and ducts shall be designed accordingly and be appropriately maintained;

(v) where extraction ventilation is provided to prevent dust particles migrating back against the main body of airflow, the air velocity in any section of tunnel is not less than 0.5 m/s. Ventilation calculations shall use this as a minimum value; and

(vi) when drilling rock or concrete, dust control measures such as wet drilling, vacuum collectors, and water mix spray systems shall be used to maintain dust levels within limits set for gases, vapors, fumes, dusts, and mists.

3.13 General Illumination

(a) Employers shall ensure:

(i) general lighting levels are such that any hazards can readily be seen. Higher lighting levels shall be provided locally, particularly near machinery and in working areas;

(ii) a risk assessment is carried out to help determine whether or not fixed electric lighting is required and, in the exceptional case where it is not, hand lamps or cap lamps shall be provided;

(iii) where potentially explosive atmospheres could exist, all lighting shall be explosion-protected;

(iv) where machinery with moving parts or edges is used, the illumination source shall not create a stroboscopic effect;

(v) the lighting scheme shall be designed to minimize glare; and

(vi) where color recognition is an important factor, the type of light source shall be carefully considered and not affect normal color perception.

3.13.1 Level of Lighting

(a) Lighting levels shall be measured with a light meter and shall be as high as is reasonably practicable, taking into account the work to be undertaken in the area. Table 1 below sets out the recommended mean lighting levels.

Area	Lighting Level
Walkways	Minimum 10 lux at walkway level
General working areas	Minimum 100 lux at working surfaces
Tunnel face Excavation areas Crane lifting points	Minimum 100 lux illuminated from at least two widely separated sources to avoid shadows

Table 1: Lux levels

(b) The presence of dust or mist in the atmosphere can have a very significant effect on lighting levels and shall be a consideration in meeting the values in table 1.

(c) Employers shall ensure regular maintenance including cleaning is conducted and lighting equipment shall be as easily accessible as reasonably practicable.

3.13.2 Type of Lighting

(a) Floodlights - shall be located at an appropriate height to light areas from above and shall not be directed horizontally. They shall be arranged so that their fields overlap and sited to minimize shadows cast on walkways or workplaces by obstructions or plant etc.

(b) Temporary fixed lighting - considered for longer-term works.

(c) Portable lighting – used where no other form of lighting exists for pedestrian access to worksites.

(d) Hand lamps or cap lamps – if used it is essential that management procedures be put in place and facilities provided for their appropriate storage, charging, distribution, use, and maintenance.

3.13.3 Emergency Lighting

(a) Because tunnelling is wholly dependent on artificial light, lighting systems shall be made as secure as reasonably practicable, provided with appropriate emergency resources and power supplies.

(b) Battery-powered emergency lighting can be used to provide standby lighting. The capacity of the batteries shall be appropriate to maintain the lights for enough time to allow persons in the area to take appropriate action without danger.

(c) Emergency lighting shall be installed along the tunnel length at intervals of not more than 10 meters to allow safe egress from the tunnel, and shall be installed at the following locations:

(i) fire and first aid points;

(ii) escape routes;

(iii) emergency exits;

(iv) tunnel access points;

(v) control and communication points; and

(vi) locations where particular hazards exist.

(d) Alternative mains supplies or standby generation can also be used to provide emergency lighting.

(e) Where the emergency lighting is dependent on an alternative supply or standby generator supply, the wiring shall be appropriately protected e.g. resistance to fire, resistance to fire with water, and for resistance to fire with mechanical shock.

(f) It shall also be protected against mechanical damage.

3.14 Atmospheric Conditions

(a) Employers shall monitor and control atmospheric conditions within shafts and tunnels at all times with the use of qualified staff and approved atmospheric monitoring devices to be used whilst employees are working in or around shaft or tunnel area.

(b) Employers shall ensure relevant employees are trained in the use of atmospheric monitoring devices, device maintenance, and understanding of gases and other atmospheric conditions that can alter air conditions.

(c) The quality of air shall be to the following standards:

(i) not less than 19.5% Oxygen;

(ii) 79% Nitrogen (includes 0.94% argon);

(iii) 0.03% carbon dioxide;

(iv) the total of all other gases shall be less than 0.1%; and

(v) pollutant levels shall not exceed their occupational exposure limits and shall be reduced as low as reasonably practicable.

3.15 Lifting Equipment

3.15.1 General

(a) Employers shall ensure:

(i) in the vicinity of any shaft, precautions are taken to prepare an appropriate base for positioning a crane to minimize settlement and to spread crane loads as widely as reasonably practicable, and also to avoid excessive lateral thrust from the ground against the shaft lining;

(ii) a reinforced concrete raft, or beams, spanning any sensitive area shall be designed and provided if the ground resistance is locally inappropriate;

(iii) with mobile cranes that are not restricted to predetermined locations, particular care shall be taken to check that loadings imposed upon the ground are kept within safe limits so that they are no greater than the bearing capacity of the ground;

(iv) where appropriate personnel clearance around a crane (500 mm minimum) cannot be provided, access to areas of restricted clearance shall be prohibited while the crane is operating;

(v) when long loads need to be slung vertically because of restricted space, the slinging arrangements shall be devised to prevent the load from slipping. This shall be done by providing appropriately designed lifting points;

(vi) if any difficult loads are to be lifted, the shaft is to be cleared of persons other than any essential to the hoisting operation while the lift is in progress and these persons shall be safely positioned;

(vii) hoists used in underground construction shall be equipped with a limit switch to prevent over travel at the top and bottom of the hoist way; and

(viii) the limit switch shall only be used when operational controls malfunction. Hoist controls shall be arranged so the operator can reach all controls and the emergency power cutoff without reaching beyond his normal operating position.

(b) Ensure compliance to *ADOSH-SF - CoP 34.0 - Safe Use of Lifting Equipment and Lifting Accessories*.

3.16 Shaft Sinking Methods and Controls

3.16.1 Shafts under Construction

(a) Employers shall ensure:

(i) where mechanical means of excavation are used, it is essential that control measures are implemented to ensure the safety of personnel;

(ii) if grabs are to be used, personnel shall be either protected within the shaft, or removed from the shaft before grabbing commences;

(iii) the number of persons in the shaft bottom area shall be kept to a minimum whilst operations are in progress;

(iv) control measures shall be established to avoid persons being underneath suspended loads;

(v) in small diameter shafts, particular care shall be taken due to the limited scope for refuge, and persons are to be alerted to any loads being sent down;

(vi) all skips used in shafts shall have positive fixings so that they cannot tip while being hoisted. Other potential hazards, such as material falling off the top due to overfilling, or loose material becoming stuck to the bottom, shall be assessed and minimized;

(vii) larger shafts are often excavated by a 360° hydraulic excavator working within the shaft. Control measures shall be implemented to minimize the risk of persons being struck or trapped by moving plant; and

(viii) when handling loads with a crane or hoist, precautions shall be taken to ensure that:

1. the load or skip does not swing or twist causing it to strike the lining of the shaft or other structure;
2. the load or skip does not catch a ledge, either in lowering or in hoisting, causing it to tip over and spill out its contents (whether persons or materials);
3. the rope does not become slack when the load is resting on the bottom or on a stage and catch in some part of the shaft structure, with resultant damage when tightened;
4. all plant regularly transferred down the shaft shall be designed for hoisting and be tested and certificated for such work; and
5. as a standard procedure in lifting, the load shall be lifted a short distance then stopped, steadied and inspected before hoisting continues.

3.16.2 Permanently Disused Shafts

(a) Employers shall ensure:

(i) when a shaft is to be decked over on completion of its use, the decking used shall be specifically designed for that purpose and shall be installed for its intended use;

(ii) if a void is left, it shall be ventilated; and

(iii) traceable records shall be kept of all disused shafts or access tunnels giving details of the shaft or tunnel, and the method of capping or filling.

3.16.3 Temporarily Disused Shafts

(a) Employers shall ensure:

(i) when a shaft is temporarily disused following sinking, it shall be securely covered to prevent unauthorized access;

(ii) to enable escape or to allow access for inspection purposes it is advisable to maintain a lockable opening in the cover; and

(iii) the cover shall be vented.

3.16.4 Tunnel Eye

(a) Employers shall ensure:

(i) a shaft through which any opening is to be formed shall be designed to facilitate the safe construction and use of that opening;

(ii) when a tunnel eye is to be provided near the shaft bottom through which the tunnel or heading is to be formed, the shaft structure shall be supported as for a tunnel opening;

(iii) the actual operation of breaking out shall be carried out with the utmost care because the ground is inevitably disturbed by the sinking of the shaft, and it is probable that water has followed down the side of the shaft however carefully grouting has been done. Employers shall provide immediate close support of all ground around the opening; and

(iv) in bad ground, employers shall fix the first setting of a heading, or build the first ring of iron or concrete, within the shaft. Alternatively, a small heading can be driven out of the shaft, from which a break-up for the full-size access tunnel is constructed at a safe distance in undisturbed ground, the heading or tunnel being subsequently enlarged back to the shaft.

3.16.5 Shaft Top Layout

(a) Employers shall ensure:

(i) the layout and detail at the top of the shaft shall be designed to prevent the accidental fall of persons, plant, spoil or material into the shaft;

(ii) the area immediately around each shaft shall be level, clear of obstructions and appropriately drained; it shall generally provide a safe working area, and shall be appropriately lit;

(iii) stacking and storage of materials shall be arranged at a distance from the shaft top so that excessive ground pressures are not imposed on the shaft;

(iv) the shaft shall be guarded using, for example, additional segmental rings or substantial steelwork and/or solid barriers and mesh, which shall reach a height of at least 1.2 meters above adjacent ground level;

(v) surface water shall be excluded from the shaft by the provision of run-off barriers and by drainage and pumping if necessary. Special precautions shall be taken against inundation; and

(vi) as mobile plant poses a particular hazard, either it shall be physically prevented from working near a shaft, or barriers shall be erected that are robust enough to prevent the equipment from falling into the shaft.

3.16.6 Personnel Access

(a) Employers shall ensure:

(i) personnel access in shafts shall be by fixed access equipment such as a mast climbing hoist or man-riding crane where it is reasonably practicable to provide such equipment;

(ii) in all cases where the normal means of access is by mechanical means (hoist or crane), there shall be a secondary means of egress to cover plant breakdown;

(iii) fixed access shall be provided in every shaft as early as reasonably practicable, and in any case on completion, except where an alternative route provides safe pedestrian access to the base of the shaft. Fixed access includes stairways, ladder-ways or vertical ladders with protective hoops;

(iv) ladders shall be securely fixed at its base and at the upper landing. It shall extend at least 1.1 meters above the upper landing unless other appropriate handhold is provided;

(v) vertical ladders fixed to shaft walls shall be made of steel (rather than light alloy or timber). Vertical ladders shall have protective hoops and straps fixed above a height of 2.5 meters from a landing;

(vi) the foothold at every rung on all ladders shall be unobstructed. Landings shall be at intervals not exceeding 9 meters. They shall be solidly constructed with handrails, guard rails and toe boards. Openings for ladders shall be as small as is practicable and sited clear of the foot of the upper ladder. Every landing shall be appropriately lit;

(vii) stair bays and ladder bays in shafts shall be protected by substantial barriers against swinging loads being handled in the shaft; and

(viii) all means of access including hoists shall be inspected weekly, and maintenance carried out where necessary.

(b) Refer to *ADOSH-SF - CoP 37.0 - Ladders* and *ADOSH-SF - CoP 23.0 - Working at Height.*

3.17 Pipe Jacking

(a) Employers shall ensure:

(i) the high thrusts necessary to propel the pipe forward shall be resisted by an appropriately designed and constructed abutment or thrust wall at the shaft base;

(ii) hydraulic rams and any load-spreading rings, spacing blocks or packers shall be carefully secured, with all loaded surfaces precisely aligned perpendicular to the thrust;

(iii) as far as reasonably practicable, persons shall be protected from and withdrawn from the vicinity of highly stressed equipment during thrusting;

(iv) hydraulic pipes and, in particular, flexible hoses, shall be appropriately protected from crushing and impact damage;

(v) when jacking pipes through loose or water-bearing soils, a slurry machine or an earth-pressure balance machine shall preferably be used to contain the face safely;

(vi) when using an open shield, precautions shall be taken against a run of loose material into the face of the shield, which could lead to the collapse of the overlying ground;

(vii) when jacking pipes into firm or stiff clays, the techniques adopted shall take into account any displacement of the soil caused by entry of the pipes, and reasonably practicable heave of the ground surface; and

(viii) jacking pipes are installed via a working shaft and joined using hydraulic jacks. It is essential that all persons seek shelter or protection within the part-completed pipeline or elsewhere whilst pipes are lowered.

3.18 Ground Support

3.18.1 Ground Support of Portal and Subsidence Areas

(a) Portal openings and access areas shall be guarded by shoring, fencing, head walls or equivalent protection to ensure that employees and equipment have a safe means of access to these areas.

(b) Subsidence areas shall be similarly guarded by shoring, filling in, or placing barricades and warning signs to prevent entry.

(c) Adjacent areas shall be scaled or secured to prevent loose soil, rock, or fractured materials from endangering portal, subsidence, and access areas.

3.18.2 Ground Support of Underground Areas

(a) A competent person shall inspect the roof, face, and walls of the work areas at the beginning of each shift and as often as necessary, also any loose ground considered to be hazardous to employees shall be scaled, supported, or taken down.

(b) A competent person shall determine how often rock bolts need to be tested to ensure that they meet the necessary torque, taking into consideration ground conditions, distance from vibration sources and the specific bolt system in use. Only torque wrenches shall be used when torsion-dependent bolts are used for ground support.

(c) Employees involved in installing ground support systems shall be appropriately protected from the hazards of loose ground.

(d) The bottoms of any support sets installed shall have appropriate anchorage to prevent ground pressures from dislodging the support base.

(e) Lateral bracing (including collar bracing, tie rods, or spreaders) shall be provided between immediately adjacent sets to increase stability.

(f) Any dislodged or damaged ground supports that create a hazardous condition shall be promptly repaired or replaced. The new supports shall be installed before removing the damaged supports. Some type of support, such as a shield, shall be used to

maintain a safe travel way for employees working in dead-end areas ahead of any support replacement operations.

3.18.3 Ground Support of Shafts

(a) Shafts and wells more than 1.5 meters deep and entered by employees shall be supported by steel casing, concrete pipe, timber, solid rock, or other appropriate material.

(b) The full depth of the shaft shall be supported except where it penetrates into solid rock that will not change as a result of being exposed.

(c) Where the potential for shear exists, where the shaft passes through earth into solid rock in either direction, or where the shaft ends in solid rock, the casing or bracing shall extend at least 1.5 meters into the solid rock.

(d) The casing or bracing shall also extend a minimum of 1.2 meters above ground level unless a standard railing is installed, the adjacent ground slopes away from the shaft collar and barriers exist to prevent mobile equipment operating near the shaft from jumping over the bracing.

(e) If these conditions are met, the casing or bracing may be reduced to 300mm (12 inches) above ground.

3.19 Piling Operations

3.19.1 Underground services

(a) Employers shall ensure that prior to any piling operation all underground services in the area shall be located, clearly marked and where reasonably practicable rendered safe.

(b) Employers shall consult the relevant utility service providers where underground services are expected or known to exist.

(c) Employers shall conduct a ground survey to identify any underground storage tanks, culverts or other underground spaces that could present a hazard during piling operations.

3.19.2 Piling Rigs

(a) Employers shall ensure that piling rigs are subject to the requirements of *ADOSH-SF - CoP 34.0 - Safe Use of Lifting Equipment and Lifting Accessories*.

(b) Employers shall ensure that all piling rigs with a SWL in excess of 1 ton are provided with a fully operational 'Automatic Safe Load Indicator' (ASLI).

(c) Employers shall ensure the following:

(i) piling mats shall be used where necessary to provide a firm and level surface with an appropriate bearing value for the piling rig(s);

(ii) all piling rig movements shall be under the supervision of a trained and competent banksman;

(iii) barriers shall be erected around piling rig operations to prevent access to hazardous areas by unauthorized persons. Barriers shall be provided in accordance with *ADOSH-SF - CoP 22.0 - Barricading of Hazards*; and

(iv) all piling rigs shall be maintained in accordance with the manufacturer's manual and recommendations.

3.19.3 Piling Activities

(a) Employers shall ensure the following:

(i) where reasonably practicable pile cases shall extend between 1.2 meters and 1.5 meters above the ground level to provide edge protection to the shaft;

(ii) spoil from auger piling activities shall be cleared from around the pile casing regularly, the accumulation of spoil shall be avoided;

(iii) work shall be organized to allow piles to be concreted on the same day. Where piles are not filled, they shall be securely covered at the end of each shift;

(iv) an effective means of cleaning the auger as it is being withdrawn shall be implemented to prevent spoil falling from the top of the extracted auger onto persons working below;

(v) care shall be taken when raising and lowering sheet piles to ensure that the load on the crane hook is kept vertical;

(vi) the lifting of steel reinforcement cages shall be under the direction of a competent engineer. Lifting points shall be designed into the steel reinforcement cage construction with an appropriate safety factor;

(vii) sheet piles and pile cases shall not be left in the vertical position and unsupported unless at least one third of the length has been driven into the ground;

(viii) access by any person into a pile shaft is strictly prohibited; and

(ix) the extraction of sheet piles shall be subject to the recommendations of a competent engineer taking into account the ground conditions and frictional forces imposed by the soil.

3.19.4 Requirements Relating to the Use of Tripods

(a) Employers shall ensure the following:

(i) no tripod shall be used unless the rig is tested and the legs marked with a unique identification number. The numbers on the items shall coincide with the numbers on the test and examination records;

(ii) wire ropes shall be secured with appropriate fastenings, e.g. bulldog clips;

(iii) where appropriate, appropriately constructed saddles or hard eyes shall be used;

(iv) base plates shall be appropriate and secured to prevent any accidental movement of the rig;

(v) tripod legs shall not be overspread or overloaded;

(vi) only the correct pins shall be used in the sheerlegs;

(vii) the safe working load shall be clearly marked on the winch, and records kept of test and thorough examination;

(viii) all parts of the winch shall be guarded;

(ix) constant attention shall be paid to the condition of ropes, which shall be replaced when worn outside the manufacturer's limits;

(x) when a rope/chain block is being used to extract the casings, the capacity of the block shall not exceed the capacity of the rig; and

(xi) under no circumstances shall there be less than 2 full turns of the rope on the winch drum at any time.

4. Document Amendment Record

Version	*Revision Date*	*Description of Amendment*	*Page/s Affected*
4.0	*15th July 2024*	*System acronym updated from OSHAD-SF to ADOSH-SF to accurately reflect document title*	*Throughout*
		Change from OSHAD to ADPHC	
		Change of Logo	
		Minor editorial changes throughout the document without changing requirements.	
		Title of Mechanism 7.0 updated to ADOSH-SF - Mechanism 7- Occupational Safety and Health Practitioner and Service Provider Registration	
		OSHAD-SF - Mechanism 8.0 - OSH Practitioner Registration deleted	
4.1	*16th February 2026*	*Minor editorial changes throughout the document without changing requirements*	*Throughout*

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