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ABU DHABI PUBLIC HEALTH CENTRE | مركز أبوظبي للصحة العامة

Abu Dhabi Occupational Safety and Health System Framework

(ADOSH-SF)

Code of Practice

CoP 29.0 – Excavation Work

Version 4.0

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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 excavation work are assessed, that control measures are implemented in accordance with the hierarchy of controls and ensures control measures are implemented to prevent injury, illness and disease to persons who might be exposed to risks arising from those activities.

(c) Excavation includes:

(i) all processes and activities that move earth or rock, or disturb or break ground;

(ii) any work that involves driving an object into the ground;

(iii) any other work, which may cause or may create the likelihood of:

1. underground services being struck, damaged, undermined or unsupported; and

2. protective covers, warning tapes or earthing conductors becoming exposed or damaged.

(d) Excavation activities include:

(i) all digging, including ditches, shafts, wells, and trenching or trench filling;

(ii) grading;

(iii) tunneling; boring and/or drilling;

(iv) post driving, including driving of earth electrodes, driving of star pickets, and driving of fence posts; and

(v) any works using caissons or cofferdams - cofferdams and caissons function to provide a space down to foundation level from which water is excluded sufficiently to permit the descent of workmen, plant, and the removal of spoil and the execution of the permanent work.

(e) 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 *Abu Dhabi Occupational Safety and Health System Framework (ADOSH-SF) – CoP 53.0 – OSH Management During Construction Work*.

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 and understand the risks associated with excavation work and the control measures put in place by the employer.

(c) Employers shall provide a training program appropriate to ensure that all persons involved in excavation work acquire the understanding, knowledge, and skills necessary for the safe performance of all excavation activities.

(d) Employers shall ensure that training is planned specifically for persons who:

(i) perform excavation work;

(ii) compile the documented safe systems of work to be used for the excavation work;

(iii) manage sites where excavation work takes place;

(iv) supervise excavation work;

(v) are operators of particular types of machinery or plant and equipment used in excavation work; and

(vi) are users of personal protective equipment to be used in excavation work.

(e) The precise form of the training and instruction shall depend on the individual operations, but in addition to any specialised training for particular tasks, general training for work in excavation shall include:

(i) observance of the documented safe systems of work;

(ii) the hazards of excavation work, risk assessment procedures, and risk control measures;

(iii) details of procedures and systems relating to safe systems of work, emergency rescue, first aid systems, night time excavation procedures, removal of debris, site security and restriction of personnel; and

(iv) any other factors which may affect the health and safety of the employees requiring training.

(f) Training shall be provided to each affected employee:

(i) before the employee is first assigned duties involving excavation work;

(ii) before there is a change in assigned duties;

(iii) whenever there is a change in the excavation operations that presents a hazard about which an employee has not previously been trained; and

(iv) whenever the employer has reason to believe either that there are deviations from the excavation procedures or that there are inadequacies in the employee's knowledge of the procedures.

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 an appropriate risk assessment is conducted in consultation with the relevant stakeholders and that services are identified, located and marked on the surface;

(ii) 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;

(iii) all services searches are initiated and validated;

(iv) in consultation with the Principal Contractor, develop documented safe systems of work for the proposed excavation work, including the method or methods of excavation;

(v) inform the Principal Contractor and any other relevant parties of the method or methods of excavation selected and the equipment to be used;

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

(vii) nominate a person to supervise the work at all times and implement the documented safe systems of work. This person shall be competent in the type of excavation work needed for the particular project and be experienced in the implementation of safe work procedures;

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

(ix) erect all appropriate fencing and overhead protection barriers for the protection of the public and employees at the workplace;

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

(xi) maintain the security of the site to prevent;

(xii) comply to appropriate requirements *of ADOSH-SF – CoP 27.0 – Confined Spaces*; and

(xiii) arrange for the recycling of waste wherever reasonable practicable and the disposal of all other refuse and debris.

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.*

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

(ii) the employer undertaking excavation work has all available descriptions of the site to be excavated, including drawings, site surveys, plans of services and information on the nature and location of hazardous materials;

(iii) all relevant authorities and utility service providers are notified and all necessary approvals and NOC's are obtained before work commences;

(iv) the notification of the owners of adjoining properties of the proposed excavation work;

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

(vi) the workplace is secured;

(vii) appropriate atmospheric monitoring; and

(viii) that the documented safe systems of work are in place.

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 documented safe systems of work;

(ii) report identified hazards and risks in accordance with the process outlined during the induction and excavation specific training; 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 effective procedures and control measures are in place, refer to *ADOSH-SF - CoP 21.0 - Permit to Work Systems*, which are implemented in order to manage activities safely and without risk to health;

(iii) Shall ensure that all foreseeable emergency situations are identified and appropriate emergency procedures developed to manage these situations;

(iv) that for the Building and Construction Sector the management of excavation requirements are included in the Pre-Tender Safety and Health Plan in accordance with *ADOSH-SF - CoP 53.0 - OSH Management During Construction Work*; and

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

3.2.2 Assess the Site

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

(b) Following the assessment the competent person may need to prepare documented safe systems of work (eg. permit to work system).

3.2.3 Documented Safe Systems of Work

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

(b) Employers shall ensure that, where required by the risks involved with the excavation, a permit to work system is implemented for an excavation that complies with the requirements of *ADOSH-SF - CoP 21.0 - Permit to Work Systems*.

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

(i) excavation and earthworks are systematically planned; and

(ii) appropriate work methods and procedures 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 are obtained and determine the relationships with surrounding properties;

(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) Employers shall ensure:

(i) that 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;

(ii) a validation area risk assessment is conducted in consultation with the asset owner when services are identified, located and marked on the surface;

(iii) 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; and

(iv) the validation area risk assessment and applicable control measures are undertaken through the completion of the documented safe systems of work which also includes the control measures to be implemented.

3.3 Ground Conditions

(a) Employers shall ensure:

(i) that before commencing any excavation work they identify the type of ground in which the excavation is to be carried out;

(ii) as part of the site investigation, detailed information is made available with the contract documentation, in the form of bore hole or trial pit logs carried out;

(iii) when examining bore holes or trial pit information, particular importance shall be given to the location of any water table. If the water table is going to be exposed by the excavation, careful consideration will need to be given as to how it may affect the stability of the excavation sides; and

(iv) as part of the examination of bore holes and trial pits the employer shall also ensure the ground that is to be excavated has not been previously contaminated.

3.4 Ground Water

(a) Employers shall ensure:

(i) if the ground is appropriate, one of several ground dewatering techniques may be used. Such methods involve either shallow well pumping or well-pointing. In either case, the pumping out of water has the effect of lowering the ground water table to a level below that to which the excavation is to be taken;

(ii) where a water bearing strata overlays an impervious one and the depth of these impervious strata are not too great, the use of sheet piling may be more effective. The piling, being substantially watertight, cuts off the water from the excavated area, thus enabling the excavation to proceed in the dry;

(iii) when dewatering an excavation care shall be taken not to contaminate any nearby water courses or drains with silty/dirty water. Therefore the pumped water shall be directed to run out over porous waste ground eg. not concreted or tarmac where the silt/ sand can settle and the water can then soak away;

(iv) barriers are created around water courses and drains to prevent the flow of dirty water into them. The barriers could take the form of straw bales or some other type of absorbent material that would catch the silt/sand and let clear water flow into the water course. Dirty/silty water shall not be pumped directly into drains; and

(v) disposal of water through appropriate registered service provides as per the requirement of *ADOSH-SF – CoP 54.0 – Waste Management.*

3.5 Temporary Safe Slopes

(a) Battered sides or benches will generally provide temporary stability if the slopes are as given in Table 1 below:

Ground Conditions	Safe Temporary Slopes (degrees from the horizontal)	
	Dry Site	Wet Site
Boulders	35/45	30/40
Cobbles	35/40	30/35
Gravel	30/40	10/30
Sand	30/35	10/30
Silt	20/40	5/20
Soft clay	20/30	10/20
Firm Clay	30/40	20/25
Stiff clay	40/45	25/35

Table 1: Safe Temporary Slopes

3.6 Choice of Support Method

(a) Employers shall consider factors such as availability of plant, site conditions and skill (or lack thereof) of operatives who may determine the support method selected. The choice lies mainly between:

(i) sheeting, waling and strutting (traditional);

(ii) sheeting, waling and strutting (hydraulic struts);

(iii) proprietary support systems; and

(iv) soldier pile support.

(b) In some soils the vertical excavation sides may stand unsupported for a short period. Employers shall ensure the use of experienced and competent operatives to be used to erect the support system.

(c) Employers shall ensure the excavation is dug to level over a short length and the support system installed without delay, preferably from outside the trench.

(d) If the operatives need to enter the excavation during the erection of the full support system, a protective cage or other interim support shall be used. The interim support shall be quick and easy to erect to minimise risk. Choice of interim support could include:

(i) skeletal system of struts and waling's giving immediate protection and forming part of the final system of support; and

(ii) pinchers or protective cages.

(e) The interim support is only intended to allow safe access for installation of the full support system which shall follow without delay. All other activities shall be done after the full support system is installed.

(f) The exposed face of the excavation does not necessarily reflect the total ground condition. An adjacent service trench or old well may contain weak saturated fill which could initiate a failure. Where there are buried services adjacent to, or crossing the excavation, employers shall ensure these are not left unsupported, even for a short period.

(g) In unstable ground the sheeting can be pre driven and the waling frames installed as excavation progresses, or the sheeting can be driven progressively as excavation continues. Both trench sheeting and proprietary boxes and slide rail systems can be adapted to this method.

(h) Where it is necessary to form a 'stop- end' to an excavation (eg. where a trench is constructed in two halves across a road) the employees shall be given guidance on the bracing required for appropriate support to the stop-end sheeting.

3.7 Support Systems

(a) Employers shall provide timbering or shoring for trenches or excavations greater than 1.2 meters deep where there is a danger of any material falling or collapsing.

(b) Employers shall ensure, for larger excavations, a survey of the soil prior to excavation by a trained and experienced person shall be conducted which will provide appropriate information for appropriate methods of excavation and support to be determined, and decided by a competent engineer.

(c) Employers shall ensure appropriate supplies of support materials are available before the excavation commences which shall be sound, free from defects, of appropriate strength, good construction, appropriately maintained and:

(i) fixed securely to prevent displacement;

(ii) only be erected/altered/dismantled by competent employees under supervision;

(iii) conventional timber shuttering or steel trench sheets and adjustable props shall be used;

(iv) props may be mechanical (jacks or acrow props) or hydraulic;

(v) precautions to protect employees and others taken before and during any excavation work;

(vi) temporary framework on supports, or a protective box or cage may be needed to protect employees while they put in permanent timbering;

(vii) a box or cage can be moved forward as timbering progresses such as in the case of a 'drag box'; and

(viii) care shall be taken to see that excavation work does not jeopardize the stability of any adjacent structure.

3.8 Access

(a) Employers shall ensure:

(i) that a safe means of getting into and climbing out of an excavation shall be provided;

(ii) ladders shall be securely fixed and appropriately maintained, and shall permit quick and easy escape in case of flooding or fall of materials; and

(iii) that using the waling's and struts for access and egress purposes shall be prohibited.

3.9 Site Lighting

(a) Employers shall ensure the workplace is appropriately lit, in particular at access points and openings, and whenever lifting operations take place.

3.10 Ventilation

(a) Employers shall give consideration to ventilation requirements which may include:

(i) excavations shall be kept clear of suffocating, toxic or explosive gases;

(ii) there may be natural gases like hydrogen sulphide, methane and sulphur dioxide, or exhaust gases from nearby plant, or leaks from nearby pipes or installations;

(iii) leakage of propane and butane from LPG cylinders;

(iv) blowing of clean air into the excavation in appropriate volume to dissipate any gas accumulation; and

(v) comply with the requirements of *ADOSH-SF - CoP 27.0 - Confined Spaces.*

3.11 Barriers around Excavations

(a) Employers shall ensure that barriers around excavation include:

(i) a safe means to enter and exit an excavation;

(ii) ladders shall be positioned within the excavation at a height-base ratio not flatter than 4:1 where reasonably practicable, secured by tying at the upper end to prevent slipping and the overhang at the top of the excavation shall lead to an appropriate stable and secure landing point;

(iii) the upper end of the ladder shall project at least 1 meter (4 rungs) above ground level to ensure appropriate hand hold and the overhang from the ladder will need to allow for safe exit from the excavation. Ladders shall be positioned where they will not be damaged by plant or from material handling operations;

(iv) where a person may fall more than 2 meters, appropriate rigid barriers shall be erected, below 2 meters a physical demarcation of the excavation edge is required;

(v) barriers shall be 950mm high and can also serve to keep materials, plant and equipment away from the edges of an excavation;

(vi) barriers may be removed to permit access of employees, plant and equipment, etc., but shall be replaced as soon as reasonable practicable;

(vii) during darkness, the edges of an excavation shall be marked with hazard warning lights, especially where they are close to public thoroughfares;

(viii) where excavation work is carried out on the roads, Traffic Police approval is necessary and appropriate barricades and warning notices shall be erected, as per the requirement of *ADOSH-SF – CoP 33.0 – Work On or Adjacent to a Road*;

(ix) provide protection against vehicles falling into or driving into excavations, through the use of wheel stops or barriers;

(x) where barricades have been erected facing traffic they shall be red and white or reflective strips shall be affixed to the barriers; and

(xi) comply with the requirements of *ADOSH-SF – CoP 22.0 – Barricading of Hazards.*

3.12 Maintenance Inspections

(a) Employers shall consider that all excavation work requires careful watching, especially when they are first opened and sides are unsupported, even when support work has been installed, constant vigilance is essential.

(b) Employers shall ensure the following items are considered for maintenance inspections:

(i) all timber shall be regularly checked, for if it remains in position for any length of time, it may dry out, shrink or rot;

(ii) the only positive method of checking the state of timber is to drill small holes with an auger;

(iii) ground, too, may dry out and shrink - which loosens the timbering;

(iv) the soil face; wedges or telescopic struts holding them shall always be kept tight;

(v) raking or angle struts shall all be regularly examined for signs of having been dislodged;

(vi) during bad weather soil heaps tend to slump, and loose boulders or masonry may fall into the excavation;

(vii) heavy vehicles shall not be allowed near the edge of excavations unless the support work has been specially designed to permit it; and

(viii) where plant is required to come close to the edge of an excavation such as in the case of a dumper truck to remove spoil, baulk timbers shall be provided to prevent overrun of the plant into the excavation.

3.13 Inspection and Examination

(a) Employers shall ensure that excavations are inspected by an experienced and competent person, before work starts, at least once a day, and before each shift.

(b) Excavations shall be thoroughly examined by a competent person weekly (every seven days) and after substantial collapse or damage, the results of the inspection shall be recorded.

3.14 Cofferdams and Caissons

3.14.1 General Public

(a) Employers shall ensure that members of the public are protected from activities involving cofferdams and caissons.

(b) Employers shall ensure that cofferdams and caissons are securely fenced and that clear warning signs are displayed.

(c) Public footpaths and rights of way shall be protected wherever reasonably practicable or alternative public access shall be provided.

(d) The risk assessment carried out by the employer shall take into account the safety of the general public and ensure that control measures are put in place so that the public are not exposed to risks associated with the work.

3.14.2 Site Supervision

(a) A competent person shall be delegated / appointed to supervise the work operations.

(b) Employers shall ensure this person is capable of recognising and assessing any potential dangers as they arise which includes unexpected ground conditions that may require a change in construction technique, or unusual smells which may indicate the presence of noxious or dangerous gases.

3.14.3 Chemical Grouts

(a) Employers shall ensure that a respirator and goggles are provided and used when changing the grout or cleaning up chemical spills and the manufacturer's SDS instructions shall be observed for the full OSH requirements.

3.14.4 Air Testing

(a) In deep and confined excavations a continuous routine shall be established for testing for noxious gases and deficiency of oxygen as per the requirements of *ADOSH-SF-CoP 27.0 - Confined Spaces.*

3.14.5 Excluding Water from Excavations (pump sumps)

(a) Although a sheet pile wall can prevent the ingress of water into an excavation, it is not reasonable practicable to give any guarantee that a cofferdam will be watertight. In order to deal with any water which enters the excavation employers shall consider installing a drainage system which can channel water to a sump from which the water can be pumped away.

(b) Employers shall place any sumps at excavation level as far as reasonably practicable from any corner and wall as the hydraulic gradient adjacent to the corner of a cofferdam is at its largest.

(c) Employers shall consider forming a sump using a perforated drum into which the hose can be fixed to limit damage. It shall not be forgotten that pumps are able to remove soil as well as water and a suction hose laid in the bottom of a cofferdam can disturb the base of the excavation with subsequent movement of the wall if the hose is badly located.

3.14.6 Land Cofferdams

(a) If the sheeting to the cofferdams extends less than 1 meter above ground level, guard-rails shall be provided to form a barrier at the edge; toe-boards shall also be provided. When a land cofferdam is located near to a watercourse, historical flood levels shall be checked to ensure that the cofferdam is appropriate to withstand exceptional flooding.

3.14.7 Steel, Concrete and Steel Sheet Piling

(a) The safety precautions necessary in handling steel piles and interlocking steel sheet piling are also applicable to precast concrete piles.

(b) The pile topman who guides the pile into the interlock of a pile shall be provided with a fenced platform which can often be built onto the temporary timber trestle used for pitching the piles in panels or provided with a safety harness attached to a permanent static line. If a man-riding skip used for access is suspended from a crane, then the hoisting mechanism of the crane has to be provided with automatic braking facilities.

(c) Only competent employees with appropriate and safe equipment shall be employed to carry out the potentially hazardous operation of interlocking steel sheet piles.

(d) The extraction of steel sheet piles shall be carried out with an extractor of appropriate size, so that the performance is not mainly dependent on the pull of the crane and there is no danger of overloading or overturning the crane.

4. Document Amendment Record

Version	*Revision Date*	*Description of Amendment*	*Page/s Affected*
4.0	*DATE*	*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	

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