

2600SEG134 EXCAVATION STANDARD

1.0 PURPOSE

To establish the Panama Canal Authority (ACP) occupational safety requirements for excavations.

2.0 BACKGROUND

Excavation activities are highly dangerous and thus require adequate planning prior to starting. In Panama, several deaths have occurred as a result of failure to comply with safety procedures prior and during excavations. Because of the mandatory nature of due excavation coordination, requesting of necessary permits, and training of workers that will participate in such type of work for the ACP, the establishment of a standard to regulate such activities is a need that cannot be postponed.

3.0 SCOPE

This standard is applicable to all Panama Canal Authority (ACP) employees, contractors, and third parties that carry out work or participate in activities within ACP installations or areas under its responsibility.

4.0 LEGAL FOUNDATION

This Standard is established pursuant to Agreement No. 12 of the Board of Directors of the Panama Canal Authority (ACP), Safety and Health Regulations, Chapter 1, Article 7.

5.0 DEFINITIONS

For the purpose of this Standard, the following definitions apply:

5.1 Angle of Repose: is an angle where the soil remains on the edge of the trench without sliding down.

5.2 Shoring System: is a structure that reinforces the borders of an excavation or trench with materials that prevent land or sand from sliding down or caving in.

5.3 Shields: are prefabricated structures made up of steel, aluminum, or lumber used for protection. They are placed along the trench and can be moved as the work progresses.

5.4 Excavation: any activity that involves erosion control, relief excavations as a result of cave-ins or landslides, removal of part of the soil or sub-soil surface to conduct soil analysis, land leveling, drilling operations, well digging, tree planting, hole digging to install posts, street lights or signs; the repair, construction or demolition of trenches, buildings, structures, streets; and the construction or repair of installations and infrastructures such as optic fiber, electrical and communications cables or culverts, waterlines, as well as diesel and gasoline pipelines.

5.5 Competent Person: is a person who by degree, certificate, professional standing, or extensive knowledge, training and experience, is capable of identifying existing and predictable hazards or conditions in areas surrounding excavations, is knowledgeable of safety excavation procedures, and is authorized to take corrective measures to eliminate or control these hazards and conditions. The competent person should have and be able to demonstrate training, experience, and knowledge of soil analysis and use of protective systems. Must have the ability to detect conditions that could result in cave-ins, failures in protective systems, hazardous atmospheres and other hazards including those associated with confined spaces.

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5.6 Skirting Board: is a board placed on the edge of the trench to prevent materials along the edge from falling.

5.7 Layered Soil: soil in layers of different resistance. It must be classified based on the weakest layer or each layer individually should the most resistant layers be those at the bottom.

5.7 Protective System: Refers to a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, and from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

5.8 Slope: is the inclination or gradient of the soil.

5.9 Trench: is a long and relatively narrow excavation in the ground.

5.10 Underground Installations: underground utilities (electric or communications wires and cables, as well as conduits and pipes for liquid and gas substances) that may be affected during an excavation.

5.11 Permit: is a document issued by the unit responsible for the utility that must be received prior to starting an excavation.

6.0 GENERAL

6.1 Excavation works or works near an excavation which may pose dangers to workers or the general public must be reviewed and planned, and must be carried out under the supervision of a competent person.

6.1.1 Works in areas near an excavation can only be started if access / exits in case of an emergency have been coordinated.

6.1.2 A permit must be requested and reference stakes must be placed on the site prior to an excavation.

6.1.3 Measures must be taken to guarantee worker safety, taking into account: placing trench shields, using ladders or other means of access / exit, protection against uneven terrain, and earth movements with slope adjustments.

6.1.4 Prior to excavating, a study must be conducted to assess terrain stability and determine the possible existence of underground installations, especially the electrical site infrastructure.

6.1.5 The accumulation of spoils and equipment at the edge of the excavation shall be avoided. If this is unavoidable, precautions shall be taken to prevent the collapse of walls and the fall of materials onto the bottom of the excavation. As a general rule, no spoils, equipment, trucks or other loads shall be placed at a distance that is less than half the depth of the excavation.

6.1.6 When the depth of an excavation is equal to or larger than 1.5 m in depth it is advisable to shield it. If this is not done, then angles of repose must be respected.

6.1.7 When rain floods an excavation, it is essential to conduct a careful and detailed inspection prior to resuming work. Any water that surfaces or falls inside trenches shall be immediately removed to prevent slope stability alterations. Preventive measures to divert water flows

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must be taken during the rainy season or as a result of runoffs from drainage systems, leaks or springs.

6.1.8 Machines activated by internal combustion engines that emit gases such as carbon monoxide shall not be installed in trenches unless the necessary equipment for the extraction of such gases is used.

6.2 Shielding of Trenches

6.2.1 Shields must be checked at the beginning of the work day. Extreme caution should be taken when starting work after an interruption of more than one day or following atmospheric alterations such as rain. The shielding must work as a protective system to prevent water from falling into the trench and provisional rain drainage must be provided to avoid this problem.

6.2.2 It is recommended to surpass the shielding by 20 cm over the edge of the trench to serve as skirting board and prevent the fall of objects and materials into the trench.

6.2.3 When excavation operations approach the estimated location of underground installations, all necessary measures such as protection of underground installations, manual excavation, and use of a shovel, gloves and other recommended safety equipment must be taken.

6.2.4 If the trench is 1.2 meters deep or more, a ladder, steps, ramps or any other means for a safe egress must be put in place no more than 7.5 m from the work site.

6.2.5 Employees working in a trench must stand away from vehicles loading or unloading material to avoid being struck by materials of equipment.

6.2.6 If an excavation activity interrupts natural drainage of surface water ditches, dikes, or other adequate means must be used to prevent water from entering the excavation.

6.2.7 When the stability of buildings, walls, fences, or other adjacent structures are in danger as a result of excavation operations, support systems such as shoring, bracing or underpinning, or other retention and support structures must be used.

6.2.8 A competent person shall inspect an excavation and the areas around it daily for possible cave-ins, failures of protective systems, and hazardous atmospheres.

6.2.9 In areas where workers are required or allowed to walk or cross over excavations, walkways or bridges equipped with guardrails must be provided.

6.2.10 At the end of each work day the excavation site shall be covered as much as possible, placing warning signs that indicate that there is an excavation in progress, and cordoning off the area in the event the cover that was placed cannot resist the weight of pedestrians or vehicles. Only the necessary trenches will be dug.

6.2.11 When necessary to leave excavation equipment unattended, the blades, bucket or shovel shall be lowered to the floor, shutting off and locking up the ignition system.

6.3 Prior to Beginning Work, Check:

6.3.1 That the personnel working inside trenches know the risks they may be subjected to.

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- 6.3.2 The Impact of adjacent activities.
- 6.3.3 Proximity of nearby buildings.
- 6.3.4 Public utilities installations, busy highways, and any other source of vibrations.
- 6.3.5 Underground utilities and installations, especially electrical cables to prevent possible contact.
- 6.3.6 Soil condition.
- 6.3.7 That the necessary permits are obtained.

6.4 Slopes

Excavation workers must protect themselves from cave-ins through adequate protective systems, whether by sloping or benching, or through shoring or shielding systems, unless the excavations are completely made on stable rock or are located less than 1.5 m in depth and the soil tests conducted by a competent person showed no indication of potential cave-ins.

6.5 Protective Support System

When a protective system is chosen, the competent person must take the following into consideration: type of soil, vibration sources, soils disturbed by man on soil surface, presence of water, layered soils, heavy equipment work adjacent to the excavation, limited work area, and other hazardous conditions that may emerge or occur.

- 6.5.1 Slopes to reach the soil (excavated material) to its angle of repose.
- 6.5.2 Face protection, shoring system.
- 6.5.3 Shielding if no sloping is done.
- 6.5.4 The removal of shoring systems must begin and continue from the bottom of the excavation up.

6.6 Personal Protective Equipment

- 6.6.1 Construction workers must be issued safety helmets and boots, as well as other protective gear needed for each specific risk.
- 6.6.2 Employees who are exposed to public vehicular traffic must wear reflective orange vests or other safety garments.

6.7 Training

- 6.7.1 Excavation workers must be duly informed about and trained in rescue procedures.

7.0 RESPONSIBILITIES

- 7.1 The responsibilities to guarantee compliance with this standard are described in the ACP Safety and Occupational Health Management Standard 2600SEG101.

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7.1.1 The manager of the installation is responsible for planning and coordinating work procedures of all the personnel involved in excavation activities.

7.1.2 All ACP personnel, contractors, and third parties must observe the warning signs placed at the excavation site.

8.0 INQUIRIES

Any information or clarification on the contents or application of this standard must be requested in writing to the Safety and Industrial Hygiene Unit.

9.0 EXCEPTIONS

Any requests for changes or temporary exceptions to this Standard must be made in writing to the Safety and Industrial Hygiene Unit (RHSH). This standard does not include excavations using explosives.

10.0 DURATION

This Standard shall remain in force until amended or revised.

11.0 REFERENCES

- 11.1** ACP Safety and Occupational Health Manual.
- 11.2** ACP Form 2765, ACP. Application for excavation permit.
- 11.3** ACP Form 2779. Procedure to obtain approval of excavation permits.
- 11.4** Instructions to Obtain ACP Excavation Permit, INS 0015.