



GUIDELINES ON TRENCHING FOR CONSTRUCTION SAFETY

Department of Occupational Safety and Health
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PREFACE

The purpose of this guideline is to provide relevant safety and health information on trenching activities. It provides basic guideline for safety and health consideration for works involving trenches in construction industry or in other sectors. This guideline is compiled to provide management and employees good and safe work practices to avoid unwanted incidences. Compliance with this guideline does not itself confer immunity from legal obligation.

This guideline will be reviewed from time to time to include any changes when necessary.

**Director General
Department Occupational Safety and Health
Malaysia**

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TRENCHING

1.0 Introduction

Excavation is an essential element of the construction process, particularly in relation to the construction of the foundations and drainage. In carrying out an excavation, the soil condition can vary widely, often in short distances. No soil, whatever its nature, can be relied upon to support its own weight for any length of time. It should never be forgotten that 1 m³ of earth weighs approximately 1.3 tonnes. Even a small fall of earth is capable of inflicting serious injury, even if it does not kill. Unless, therefore, the excavation can be battered to a safe slope, the sides will need supporting to prevent the possibility of collapse.

Trenches

Standard solution can normally be applied up to 6m, provided that the excavation is in non-water bearing ground. In all other situations, design solution must be used.

The use of Standard solutions in trench excavation will mean using either 'traditional' methods, or proprietary system.

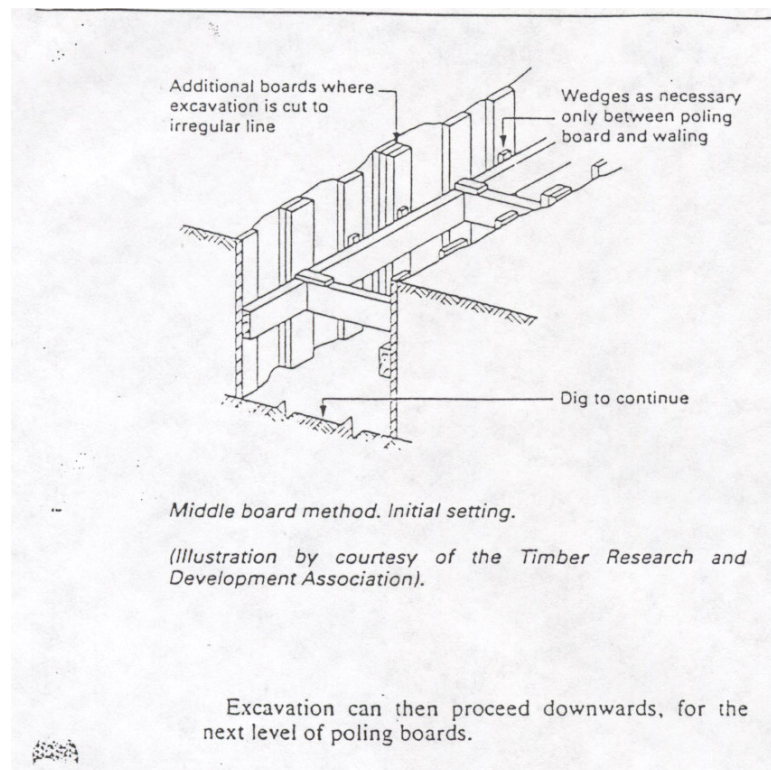
Traditional method

Traditional method use timber or steel trench sheeting as the sheeting material, timber walings and either timber or adjustable steel struts. With these components a number of options are possible, to suit varying conditions.

The use of poling boards is dependent on the material to be excavated standing up to height equal to length of poling board used during the boards installation. Two variations in installation are possible:

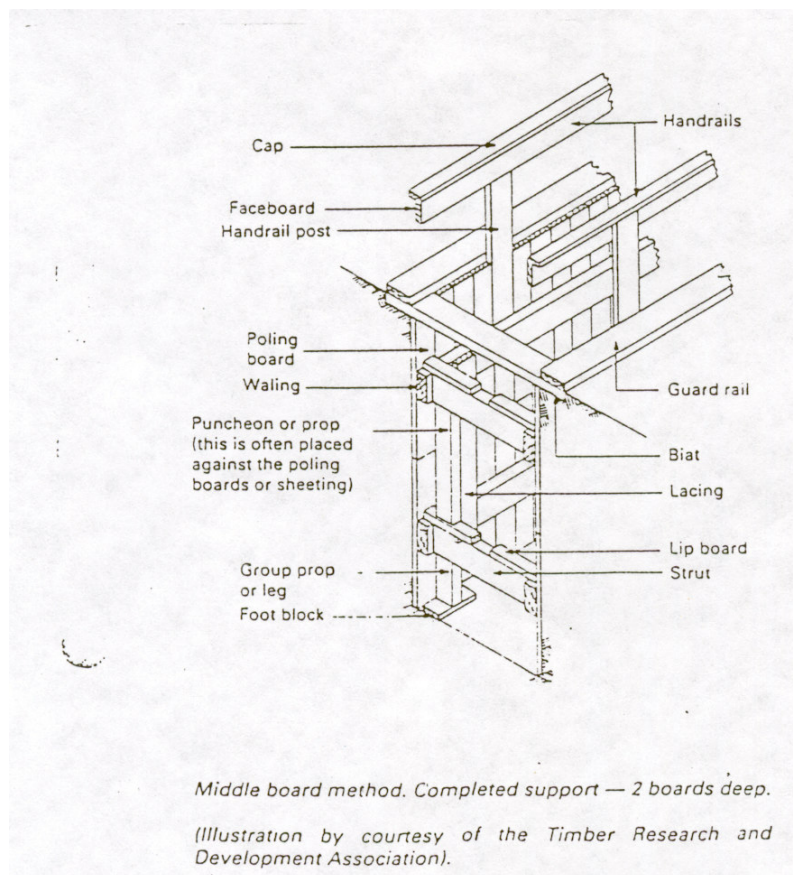
The middle board method, shown in diagram 1 is installed by excavation to the depth equal to the length of the poling board being used. Poling boards are then set up plumb, at a distance

apart equal to the length decided upon for the walings, on both side of the trench. The waling are placed in position and strutted against the first poling boards. The intermediate boards are next located, removing the minimum of face soil to provide a snug fit behind the waling member. When all board are in position, the final number of struts required are installed. All poling boards between struts must be checked and, where necessary wedges driven between the poling boards and waling to provide tight contact with the excavation.



Although the diagrams show timber struts, these can of course, be replaced by metal trench struts.

The **Tucking Frame** method shown below, only differs from the middle board approach in that the walings and struts are located at the top and bottom of the poling boards instead of the middle. The excavation prior to the installation of a level of poling boards, need to be slightly deeper than the poling boards length. This is to enable the board to be tucked up and behind the waling.



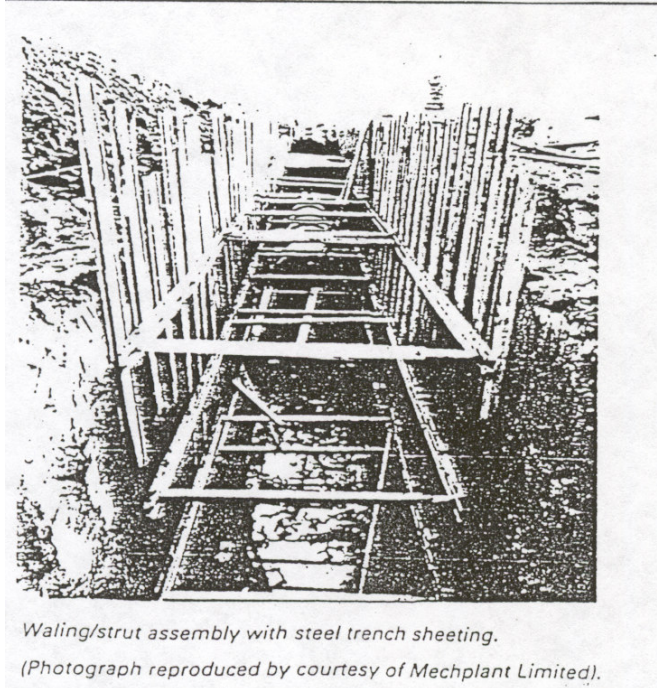
Proprietary systems

Proprietary fall into number of well defined groups:

- i. Hydraulic struts associated with waling system (usually in aluminium to save weight).
- ii. Shields or boxes which are dragged along the trench as work proceeds
- iii. Box or plate supports
- iv. Special method

Hydraulic Struts / Waling

A typical hydraulic struts/waling system is shown below. The objective is to provide a struts/waling assembly which can be lowered into the trench and hydraulically stressed against the sheeting without anyone entering the trench. Such system are normally only suitable for the support of trenches up to 6m deep.



Shields or drag boxes

As the name suggests, these are designed primarily as protection or persons working in an excavation, rather than an excavation support. The side sheeting and strutting, which keeps the sheeting - apart, provide a rigid box is pulled forward by the excavation machine to the new working area. Such box are simple to make and, as they are rigid structures, required little maintenance. Inevitably, though, they are heavy and excavator has to be powerful enough to .pull them forward in the trench.

Box or plate lining system

Box or plate lining system are designed for support, not just protection and should not be confused with shield or drag boxes. Box support systems,

have strutted support walls of a modular nature, which can be positioned by machine. And built up vertically and laterally. They are not designed to be dragged along the trench.

Plate lining method works on the principle of installing a vertical member and struts at the set intervals, between which heavy plates slide into position.

2.0 Conduct Of Trenching Operation

In major excavation of trenches, such operation is highly hazardous which requires strict precautions and supervisions. Therefore, before any excavation commences, an experienced and responsible person should be designated to ensure the following conditions are observed:-

- a. Take all necessary precautions to ensure safety of all persons engaged on such operations.
- b. Ensure that the excavation is adequately shored/propped or battered in accordance with consultant engineers' instructions to prevent the possibility of cave-in.
- c. All excavations should be inspected regularly, every day by a designated person to ensure :-
 - i. Trench-side had not been undercut by the excavator bucket .
 - ii. The supports are not overstressed.
 - iii. The stability of the ground.
 - iv. To observe for tension cracks along the top of the trench.
 - v. Static water is removed from excavation promptly.
- d. Monitor equipment or plant that causes vibration which are close to the trench for potential trench failure.
- e. Erect barricade like webbing or guardrail to prevent person from falling into the trench. If required, warning lights to be placed during the hour of darkness.
- f. Access ladders to be extended at least 1 meter above ground level and to be properly secured and placed at a 30 meters

interval.

- g. Keep all spoil pile and materials at least 600 millimeter away from the trench and side soil conditions.
- h. Trenches should be removed back filled as soon as possible and trench supports to be removed progressively during back filling.
- i. When petrol or diesel powered equipment is used, it is necessary to test the quality of air in trench. If required, breathing apparatus to be made available.