SMART FEATURE: DIGGING

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> *'...others [died] because they did not dig as energetically as they should have. Officers returning from the peninsula later in 1915 vowed that they would instil in recruits discipline and a determination to dig.'*
>
> *Dr Stanley,* Quinn's Post*, 2005*

Experience and trials have shown that a hole in the ground is normally the best and easiest way of obtaining protection on the battlefield and therefore is the basis for most field defences.

This article is about digging holes such as pits or utility trenches with hand tools, including the entrenching tool (ET). Yes, any moderately able-bodied person can dig a hole, but this article is about doing it efficiently and safely.

The following information was sourced from Australian doctrine and interviews with RAE personnel.

Soil

In-situ soil is compacted – how much depends on the soil type and other conditions. Clay is heavily compacted and dense; dry sand is not. Wet sand and loam are in the middle. The soil in your proposed hole is compacted but will become loose when you dig it up. Loose soil is:

- easier to shovel, so consider breaking it up before shovelling it,
- not as good as compacted soil at stopping bullets, and
- the pile of spoil is always bigger than the hole it came from.

Soil has different characteristics at different depths from the surface. This includes changing visual and thermal signatures – remember this if concealment is important and save the topsoil separately for covering the spoil.

Safety

Safety risks can be reduced through the effective care and maintenance of equipment, the application of sound work practices, and the use of correct techniques. Some general safety rules include:

- keep the work area uncluttered and well-lit (within tactical constraints);
- keep tools; keep them sharp and oiled;
- wear eye protection when digging;
- inspect tools and repair or replace problem equipment immediately;
- do not wear jewellery or loose clothing;
- use the right tool for the job;
- when swinging a tool, ensure that:
  - the tool's head is not loose,
  - all other personnel are at a distance greater than 1.5 times the combined length of the tool and the user's arm,
  - there is no obstruction to the

swing, and

- you will not harm yourself if you miss the mark;
- carry tools at the trail with the sharp edge pointed downward, and never carry over the shoulder;
- protect a sharp blade with a cover;
- use tools of a non-sparking material to negate fire or explosion hazards;
- use the large muscles in your legs to do the work;
- protect your back by keeping it straight and maintaining proper technique;
- avoid repetitive motion injury and hold tools in neutral (balanced) positions; and
- carry a good pair of work/rigger's gloves in your ET cover and look after them.

Planning

Firstly, think about the digging task and decide where the hole, spoil and topsoil are going before you start work. The topsoil will be used to assist in concealment and refurbishment.

Outline the hole with spray paint, chalk line or other means, 'spitlock' it – dig a small trench around the outline – then remove any markers that are trip hazards.

Select the first (and hopefully final) location for the spoil. This should be far enough away from the hole to not fall back in or collapse the hole's edge. It may also need to address tactical issues such as being located behind the pit to conceal silhouettes.

Select where the topsoil (and low plants) will be carefully placed for reuse. This should be close but not in the way.

Timings

One person with a pick and shovel should be able to dig 1.0 to 1.5 m^3 of compacted soil in about four hours. In the same time, a person with an ET may be able to dig 0.5 to 1.0 m^3. However, the presence of rocks will blow these timings right out. A person with a shovel should be able to dig about 3.5 m^3 of loose soil in four hours.

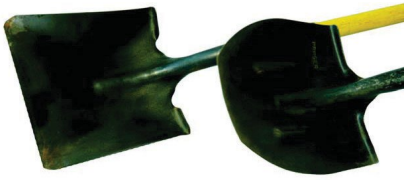
Digging Tools

Entrenching Tool. The ET can be used when kneeling or lying down. The earth is loosened with the chisel point and scraped aside or lifted with the shovel. The shovel edge must be kept in good condition, and the tightening screw and sliding latch must be well lubricated.

Entrenching Tool

Shovel. There are three types of service shovel. The two digging shovels are the general service and the round-edge. They are used to dig, carry and throw soil. The round-edge shovel, as well as having a short 'T' handle, may also be fitted with a long handle specifically designed for the throwing of earth from deep excavations. The

square-mouth shovel is designed for picking up sand, gravel and similar loose material from a flat surface. It is an ideal tool for concrete work but not for digging holes.



Shovels

The Spade. The spade is a useful tool for digging post-holes or for cutting blocks of turf to use as revetment or camouflage. Because of its flat face, it is not as good as a shovel for carrying soil.

Spade

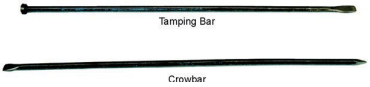
The Pick. The pick is designed for breaking up hard rock so that it can be moved with a shovel. It is also useful for 'spitlocking'; marking out the outline of an excavation on the ground.

Pick

The Mattock. The mattock is a combined digging and cutting tool. It is a useful tool for loosening clay and chopping through roots. It is swung in a similar manner to a pick.

Mattock

Fulcrum Bars. The tamping bar is used for breaking or loosening hard ground, breaking up masonry or as a lever for moving heavy rocks or logs. Its cutting edge has a chisel shape, while the flat round end is used for tamping. The crowbar is used in the same way as the tamping bar except that it has a cutting edge at both ends.



Tamping Bar and Crowbar

Techniques

Tips for Handling Shovels. The knack with shovelling is not about getting a full load on the shovel but rather depositing that load in the required place. With practice, a soldier should be able to throw a shovel full of soil a distance of about 3m with reasonable accuracy. The correct way to hold and load a shovel and the method of throwing soil correctly are shown below.

Holding and Loading a Shovel

Throwing Soil

Tips for Using the Pick and Mattock. The pick and the mattock require the head to be firmly attached. Tap the head on the ground to lock the handle and tool head together before use.

Like the shovel, the pick can be used either left-handed or right-handed. In fact, it is advantageous to be able to work either way when working in confined spaces such as weapon pits. The correct method of holding and using a pick is shown below. The arms, back and legs should be used in the swing while allowing gravity to assist in swinging the tool's head into the target.

Holding and Using the Pick

Digging. Create and maintain a 'working face' so that soil can be removed as easily as possible. The working face should be as vertical as possible and is where the soil will be dug from. With compacted soil, the pick, mattock or shovel is driven vertically into the soil a convenient distance back from the working edge to allow the tool to break the soil away and towards the hole. If the shovel was used, the load should be broken free, lifted and thrown in a continuous motion. With loose soils, the shovel is used horizontally from the hole and driven into the working face a convenient distance below the top of the soil. Some spilt soil will fall into the hole, and this should be cleared periodically – before your boots compact it too much.

Maintaining a smooth and flat bottom in the hole will make shovelling out the spilt soil easier.

Sequence. Start in a corner and dig a hole a blade deep and a blade wide. Then, using a working face, extend the hole across the width of the intended

hole. Now, again using a working face, extend the hole towards the far end. Complete one full width of the hole before moving to the next working face. Once you have a hole big enough to stand in and work from, deepen it. Continue lengthening and deepening the hole from working faces until the hole is the right size. Finally, tidy the sides and top edges as required.

Side Slope. The sides of the holes should lean outwards – the looser the soil the bigger the lean. This is done to reduce the chance of the sides collapsing.

Rocks. Picks and fulcrum bars may be suitable for breaking rocks when Sappers with plant or power tools are unavailable. Attempts should be made to find the edge of the rock. If an edge is found, it may be possible to lever it out by clearing soil from above it and digging beside and under it to make a space for a lever to be applied. If it can't be levered out then look for cracks, indents or other areas of weakness that may be used to split the rock. As pieces are broken away keep checking for the chance to lever the rock out.

Drainage

If necessary, water should be directed away from the hole using small channels that funnel water running down-slope towards the hole and direct it around the hole and on down the slope. Water that does get into the hole may be collected in a sump. A sump is a deeper section of the hole's floor.

More information on this topic can be accessed in:

- *LWP-G 3-6-3, Basic Military Engineering*, 2007 - for information on hand tools, power tools and working safely with plant.
- *LWP-G 3-6-4, Physical Force Protection*, 2007 - for basic field fortifications and a whole lot more, including rough timings and urban fortification.
- *LWP-CA (ENGR) 1-3-5, Conduct of Plant Tasks*, 2007 - for how to get the most out of plant support.
- *LWP-CA (ENGR) 4-1-7, Personnel Rescue*, 2007 - for shoring and tunnelling in rubble.