Site Engineering Guide

TOOLS & MARKING OUT ACCESSORIES

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TOOLS AND MARKING OUT ACCESSORIES

INTRODUCTION

In this section the basic and essential tools used day to day are covered and some other tools that whilst not essential are useful to have access too. Marking out accessories and sundries are also covered for you to familiarise yourself with.

If possible it is the author’s opinion to have your own tools rather than relying on the use of others and from experience they should be securely stored to reduce the possibility of theft although this can result in an excessive sized toolbox.

ESSENTIAL TOOLS

These are the tools which you will most likely use regardless of the type of project you’re working on.

1. Large Spirit Level – uses include and not limited to plumbing small shutters and brick/block work etc and as a large straight edge for marking and setting out.
2. Boat Level – used for checking plumb and level of profiles and datum marks.
3. Hand Saw – used for cutting timber to make profiles and travellers.
4. 4lb Hammer – useful for driving in small pegs and steel pins for when a sledge hammer is too much and a claw hammer is not enough, easily carried around in a bucket/bag too.
5. Claw Hammer – used to driving in cartridge nails and survey nails along with building profiles and travellers.
**Safety Tip**
*Wear eye protection when using any form of hammer to protect from flying debris.*

6. String Line – used for setting out and marking lines in conjunction with survey spray, also useful for checking setting out as a visual check of line and level marks between points/pins.

7. Field Book – the most useful tool, record readings, deduce levels, write notes and draw sketches. Should be carried on your person at all times when in field and filled in correctly with title and date on each page. Also forms a legal document and should be kept after completion of project.

8. Open frame: Synthetic Tape – manufactured from multiple strands of fibreglass and then coated in PVC, producing a tape made from fibron which is impervious to water and does not require cleaning after use in wet weather. Fibron tapes can stretch over time and such be checked periodically.

9. Open Frame: Steel Tape – made from hardened tempered steel and then painted or sheathed in nylon or plastic. These tapes need to be clean and maintained periodically especially after use in wet weather; they are also more susceptible to kinking and damage in comparison to synthetic tapes.

10. 5m/8m Tape Measure – the second most useful tool you’ll ever carry with you. Uses are too numerous to mention.

**Tip**
Tape measures – when measuring with a tape, avoid using the hook, as this will wear and become loose, thus affecting accuracy, instead measure from the 100mm mark and remember to add the 100mm onto all subsequent readings, avoiding the accuracy issues of a loose hook.

11. G-clamp – used to hold a tape when establishing datum’s up a series of storeys.

**Tip**
If working on multi-storey construction, for transferring level control to the individual floors it is advisable to use steel tape measure, hung from one continuous column e.g. on a flange using the G-clamp. This tape measure should ideally be used solely for this purpose.

12. Bag/Bucket (Not Shown) – handy for carrying tools into the field along with marking out equipment.

**NON ESSENTIAL TOOLS**

These are tools that whilst not essential and not regularly used they are useful to have access to when needed.
1. Manhole Keys – used to gain access to manholes at the start of the project for tracing services and checking invert levels before starting drainage works.

2. Lifter – specialist manhole lifter for access covers and communication cable draw pits e.g. BT. used when tracing existing services etc.

3. Pry Bar – useful when salvaging timber for profiles or lifting surface boxes.

4. Rock Pick – used to loosen compacted sub base or soils to allow pegs, stakes and pins to be driven in a little easier. A no longer serviceable point from a hand held breaker as pictured is adequate for the task.

5. Torch – useful when examining drainage and trying to find stations in poor light conditions.

6. 6lb+ Sledge Hammer (Not Shown) – driving in large pegs/stakes when establishing stations or profiling.

MARKING OUT ACCESSORIES

1. Upside-down Marker Paint – variety of colours available, used to mark services, profiles, setting out point and stations etc. Yellow is the most common colour used, blue and red can be useful for concrete surfaces etc as can stay visible the longest through the dust.

2. Road Crayon – useful for marking on tarmac, brick, block and concrete surfaces.

3. Survey Station Nails – specialist nails which feature a dimple or depression for setting up an instrument or prism/pole.

4. Survey Station Nail Washers – used with a nail can make location faster.

5. Pencil/Carpenters Pencil - used for writing on timber and concrete surfaces or plasterboard.
Tip
Pencil should be used to mark datum’s on plasterboard walls when the finish is painted, use of markers or paint will result in showing through the finishes.

6. Permanent Marker – used to mark, timber, concrete and steel, useful for establishing datum marks and communicating important information.

7. Tile Scribe – used to mark concrete surfaces, easiest to do when still ‘green’ offers an alternative to permanent pen or pencil as cannot be easily erased or damaged. Ideal for marking gridlines on foundation/pile caps for structural steelwork.
8. Chalk Line – used to mark lines on both horizontal and vertical surfaces.
9. Datum Stencil – (Authors own pictured) some companies have their own stencils or stencils may be purchased so as on large sites with several contractors or for a principal contractor responsible for providing control, datum’s can be distinguished from other individuals.
10. Insulation Tape – useful for marking levels on a staff for excavation and blinding when using a laser level or levels on pins e.g. for a kerb line.
11. Glow Tape – place a piece underneath a cartridge nail and can be easily identified
12. Cartridge Gun Nails – used to create stations, setting out points and offsets in concrete and tarmac and other paved surfaces.

Safety Tip
Wear eye protection when driving in cartridge or survey nails, in some instances they can ‘ping’ off.
Tip
When driving in cartridge nails and survey nails it can be easier if the position has been piloted with an appropriate size drill bit and cordless drill, making adjustments to align after installation easier.

OPTIONAL AND ADDITIONAL MARKING OUT ACCESSORIES

1. Station Sign/Marker – a useful sign, easily printed off, laminated and written on using permanent pen to easily identify a station and its information, can be found in the appendix of the establishing control chapter
2. Retro Reflective Mounted Sticker – a sticker mounted on a piece of plastic to make sighting easier over longer distances and target reusable.
3. Sentripod™ - an alternative to traditional glass prisms and Retro stickers used for monitoring work or control stations. Effectively provides a target with 270° of visibility for sighting and can be easily transferred to another site or left in situ. See www.sentripod.co.uk for more details on their products and retailers.
4. Retro Reflective Stickers – available in a range of sizes and colours from 10mm to a 100mm, choice of size depends on observation distances. Used to create control to free station from and check for movement if monitoring for subsidence, 60mm shown is suitable for stations whilst 25-30mm monitoring work/close range stations.
5a. Target/Level Marker – a combined station marker for level and position, fixed in position either by screws or adhesive, requires a reflector less total station to use as a coordinated point.
5b. Standard Datum Marker – is cast in, fixed by screws or adhesive. Provides a datum mark, if fixed to the inside of a shutter will act as a former and when stripped a permanent datum mark, marker could also be reused in this situation.
5c. Target/Level Marker with Sticker – as with 5a, only would not require a reflectorless total station. 
All three marker plates are manufactured by Rothbucher Systeme and available from www.southsurvey.co.uk and other stockists.