Unbound sub-bases for paved surfaces

1. Description of works

Preparation of an unbound sub-base for hard surfaces. This is a non-site-specific technical detail only. Setting out completed by TGL. Larger areas to be set out by a Setting Out Engineer. SOP to be read in conjunction with relevant job specifications, drawings and site-specific RAMS for additional health and safety information prior to commencement of works . SOP to be read in conjunction with Preparation of Suitable Sub-Grades (ref SOP 01).

2. Sequence of Events

2.1 Site Arrival & Induction

Appropriate site induction is to be carried out before commencing work for any staff members or contractors who have not previously visited the site.

- Toolbox talks are to be carried out before commencing work to familiarise staff and contractors with the expected schedule and work procedures.
- Staff and contractors are to be made aware of all welfare facilities.
- Staff and contractors are to be made aware of who the designated first aider is on site and of the location of the first aid kit.
- Staff and contractors are to be made aware of other people using the site and work to be carried out is to be communicated to others using the site as necessary.
- Associated RAMS to be read and signed by operatives prior to commencement of works
- Review the relevant plan, drawing if present or specification.

2.2 Setting out for surfacing

Fig. 4: Setting up profiles, profile construction.

2.2.1) Driving two pointed 2"x1" stakes into the ground outside of the working area, positioned to allow a string line to run through the previously marked X (see Preparation of Suitable Sub-Grade no. 2.2).

2.2.2) Fix a 2"x1" cross bar between the two driven stakes at the desired finish heights, taking falls into account. Ensure the cross bar is long enough that lines can be set up to 100mm outside of the finished surface (to allow for a working area and overspill of sub-base material) AND to the finished boundary of the surface. This will ensure the profiles can remain in situ for the duration of works. See fig. 4.

2.2.3) Marking the 2"x1" cross bar with a pencil line to give the outer boundary of the finished surface and an additional pencil line to allow up to 100mm of sub-base material overspill. See fig. 6

2.2.4) Fix screws down into the cross bar to hold the string line. Screws should be fixed with the pencil line touching their left-hand edge (looking down as you stand behind the pencil line).

2.2.5) Points on a curve or on an arc can be plotted using individual stakes driven into the ground with the levels shown using insulating tape

Fig. 5: Plan view of profiles.

2.3: Installing the unbound, granular sub-base

Table 4: Passes required for compaction		
Vibrating Roller	Minimum number of passes	
Sub-base depth	100mm	150mm
1.3-1.8 tonnes	6	16
1.8-2.3 tonnes	4	6
2.3-2.9 tonnes	3	5
2.9-3.6 tonnes	3	5
Over 3.6 tonnes	2	4
Whacker Plate (compaction force)		
1.4-1.8 t/m2	8	Not suitable
1.8-2.1 t/m2	5	8
Over 2.1 t/m2	3	6

2.3.1) Lay non-woven geo-textile membrane across the hard surface area. Ensure sides are upturned to cover any exposed soil 'shelves' exposed during excavation. Ensure seams are overlapped by 300-500mm. Cut using a sharp blade.

2.3.2) Raise a taught string line between your profiles at the 100mm outside of finish surface mark to show levels and alignment.

2.3.3) Determine the required depth of the sub-base material and calculate the distance below the string line for the finished sub-base level (assuming string line level is set to finish surface height).

2.3.4) Import and rake out Type 1 (most paved surfaces) or Type 3 (self-binding gravel surfaces) to the specified finish compacted depth. This is typically 100mm for light foot and vehicle traffic or 150mm to include vehicles not exceeding 7.5 tonnes. Material to be compacted in 50-75mm layers using company owned whacker plate. Compaction depths will vary; installing layers in smaller increments helps with accuracy.

2.3.5) Dip below the string line to the measurement calculated in 2.3.3 to ensure the material is installed to correct level.

2.3.6) Finish surface of Type 1 (not the case when using more open Type 3) should be tight with few open voids. Where these present, fill and compact with fines or coarse sand to prevent surface settlement.

2.3.7) During excessively dry periods, mist the material until it sufficiently binds. Do not soak.

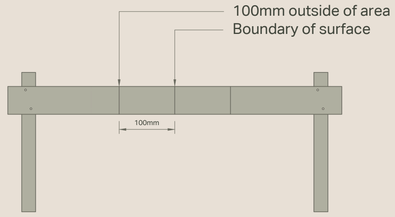

Fig. 4: Setting up profiles, profile construction

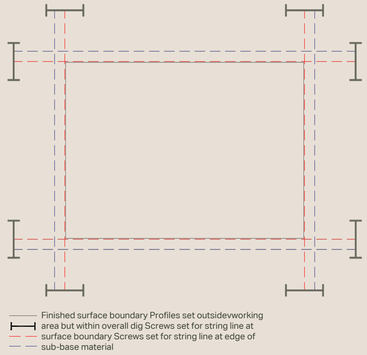

Fig. 5: Plan view of profiles

Useful Information

· Endfall (Longitudinal Fall): The fall or gradient along the length of a pavement or surface
· Crossfall (Transverse Fall): The fall or gradient across the breadth of a pavement or surface
· Gradient = level difference (fall) / distance (run) expressed as percentage or ratio
· Using a 1:60 ratio fall as an example, this means 16.7mm of fall per metre (1000mm / 60 = 16.7mm)
· For ordering purposes, allow 10% overage for sub-base material

Table 1: Overview of falls		
Percentage	Ratio	Typical Applications
1%	1:100	Minimum fall for surface water drainage
1.25%	1:80	Minimum Endfall for commercial paving Minimum fall for residential paving
1.67%	1:60	Typical fall for residential paving
2%	1:50	
2.50%	1:40	Minimum fall for foul water with no WCs Minimum Crossfall for commercial paving
5%	1:20	Max extended gradient for disabled access
6.66%	1:15	
8.33%	1:12	Max short span gradient for disabled access
10%	1:10	
15%	1:6.7	
20%	1:5	
33.30%	1:3	Max stable slope for unsupported soil

Table 2: Weights of typical materials handled by excavators	
Material	Mass (kg/m3)
Clay compacted	1746
Clay, dry	1073
Clay, wet	1602
Earth, dense	2002
Earth, dry, loam	1249
Earth, moist	1442
Earth, wet	1602
Turf	400

Table 3: Bulkage of soils (after excavation)	
Type of soil	Approximate bulking of 1m3 after excavation
Vegetative soil and loam	25-30%
Soft Clay	30-40%
Stiff Clay	10-20%

Table 5: Type 1 and Type 3 Conversions			
Material	M3	Tonnes	Bulk Bag (800kg) to m3
Type 1	1	1.8-2.1	0.45m3
Type 3	1	1.8-2.1	0.45m3

Tools List

Note: Appropriate PPE to be available for all tasks as per site specific RAMS.
It is assumed that all personnel will carry suitable pencils/markers.

Digging shovels	Hosepipe, reel and connections	Laser level, staff, tripod (and batteries)	Petrol and funnels	Tarpaulin	Wheelbarrows
Knife (sharp)	Landscape rakes	Manual plate rammer	Tape measure	Whacker plate	

Suppliers

Aggregates (Bulk Bags and Cement)

Parker Building Supplies, St. Leonards on sea (on account), Highfield Dr, St. Leonards-on-sea TN38 9TG, 01424 856800

Misc. disposable materials

Parker Building Supplies, St. Leonards on sea (on account), Highfield Dr, St. Leonards-on-sea TN38 9TG, 01424 856800

Aggregates Loose

Parker Building Supplies, St. Leonards on sea (on account. Reseller of quarried products), Highfield Dr, St. Leonards-on-sea TN38 9TG, 01424 856800

Robins Herstmonceux (includes recycled aggregate for general fill such as 75mm down or 100mm cobbles and grading sub-base such as Type 1 50mm down), 2 Chilsham Ln, Herstmonceux, Hailsham BN27 4Q, Tel: 01323 833181

Gardenscape Direct, The Wharf, Rye Road, Newenden TN18 5QG, 0800 654663

Tool and Plant Hire

Top Plant,The Stage, Stable Works, Climpsetts Farm, Robertsbridge TN32 5SP, Tel: 07527 164641

Waste Grab Hire (Muckaway)

GW Grab Hire (Gary), Tel: 07890 597147

Hollingdale Grab Hire, Tel: 07854 761328

Robins Herstmonceux (includes recycled aggregate for general fill such as 75mm down or 100mm cobbles and grading sub-base such as Type 1 50mm down), 2 Chilsham Ln, Herstmonceux, Hailsham BN27 4Q, Tel: 01323 833181

Waste Skip Hire

French's Skip Hire (local to Hastings and Bexhill), Tel: 01424 437 697

Omni Recycling (Tunbridge Wells and surrounding areas), Tel: 01892 617472

THE GARDEN LANDSCAPERS

Standard Operating Procedures

Hard Landscaping
Paved Surfaces

Unbound sub-bases (02)