

DESCRIPTION OF THE INSTALLATION PROCESS

Construction Methodology

- 1 The stages of construction of the panels are described below. These are:
 - (i) mark-out and lay-out legs;
 - (ii) piling-in of legs;
 - (iii) bolting together of frames;
 - (iv) bolting-on of panels;
 - (v) cabling and trenching.

- 2 The machinery used includes:
 - (i) agricultural loadall;
 - (ii) tractor and trailer;
 - (iii) pile driver with rubber tracks;
 - (iv) standard 360° excavator on tracks with generally small buckets.

- 3 Panels are installed rapidly. The process involves marking out the grid on the grass and laying out the steel stanchions. This stage is non-intrusive. It does involve machinery carrying the legs, however, and should take place when soils are suitably dry. Typically a tractor and farm trailer are used to transport the legs to the fields, then each leg is lifted off by hand.

- 4 Alternatively the machinery used will also involve an agricultural loadall or, as per the example below, a smaller loadall in this case with tracks to spread the weight.

Loadall Delivering Legs



- 5 A team then arrives to knock the stanchions / legs in. From operations we have observed it takes a little over a minute per pole to knock the pole into the ground and move the machine to the next pole³. This operation is shown in the photograph below. This was inserting legs into a clay soil, but the deep stoneless soil at Norlington Farm will be similar.

Inserting a Stanchion



- 6 Typically there will be two or more teams working simultaneously, as shown below.

Team Installing Panels



- 7 The details vary slightly between panel manufacturers, but the panels will have a taller and shorter stanchion, as shown below. The lack of damage or disturbance to the grassland and ground conditions from this operation is evident in this photograph.

³ This observation was made on clay soils at the Purton Solar Farm, Wiltshire, in 2015. Ground conditions will inevitably affect installation speed.

Stanchions Inserted (example in Wiltshire)



- 8 Leg designs vary. A pile of legs is shown below, and the cross section can be seen below and in the ground.

Framework Example



- 9 The next task is to construct the subframe, which is bolted onto the legs. This does not affect the soil. A loadall machine carries in the subframe and so as long as ground conditions are suitable there is no damage. The assembly team then lift the frame off the loadall and assemble the frame by hand. There are many different designs. The first below is a design not intended for grazing. The second is an installation at Manor Farm, Lanvapley⁴.

⁴ The Manor Farm project was installed in 2016. The author undertook a site visit in April 2022 to investigate the current conditions of the site and how the land is being farmed during the operational phase of the solar farm development.

Constructing the Frame (Bentham Farm, Wiltshire)



The Frames at Manor Farm, Llanvapley



- 10 The panels are then attached to the frame. This stage is also non-intrusive to the ground and the only impact is from vehicular access, carrying in the panels. It can be seen that if ground conditions are suitable, there is no damage. The photo simply shows bruised grass from the passage of vehicles.

Panels Added



- 11 The cabling along the length of the panels is hung underneath the panels (out of the reach of sheep) and then, at the end of a row, it goes underground, as shown below.

Cabling along Panels



- 12 It is necessary to connect electric cables between the panels and to run the cables back to the substation. This involves trenches, dug with a machine. Immediately after digging these look disruptive to the soil, but they are installed in a similar way to field drainage pipes. Typically topsoil and subsoil are separated, as below.

Cabling Channels



13 The installation of cables is one of the few operations that involves digging whereby the soil structure could potentially be affected. The trenches are always narrow, but soil does have to be dug up to install the cable. In this country we have been burying services (water, oil, gas, telecomms) for many years. In areas where there is a clear subsoil and topsoil distinction, the topsoil should be placed on one side of the trench, and the subsoil on the other. Then once the cable has been laid the subsoil can be added back first, then the topsoil second, to reinstate the soil structure to its original order and state.

14 That means that soils are restored and settle within days, and return to grass growth rapidly.
The Area Two Weeks Later



This photo was taken 14 days after the trench was first dug

15 This particular set of panels is set with the lower edge low to the ground, and so the site is not grazed. The photo shows that there is no evidence of differentiated forage growth over the trench.

Panels After Five Years



- 16 The route between the legs and the substation is indistinguishable at the Llanvapley site, as shown below. The site is grazed by sheep.

Buried Cables, Monmouthshire



- 17 With a poorly informed machinery operator, this stage can go wrong. Topsoils and subsoils can get mixed. Topsoils can get placed at the bottom of the trench and subsoils at the top. Properly informed and supervised, this will not happen, and there must be very few machinery operators not aware of how to trench and restore.
- 18 Critically, however, it would not cause ALC downgrading. The trench is circa 30 - 50cm wide, and even if the excavator operator made a bad mistake (which would be easily seen and so should be capable of being stopped quickly), the mixing of subsoils and topsoils from the trench to the surrounding land, thus rectifying (largely) the error, would be possible after just a few passes with a plough or set of disc cultivators. The ALC system takes one sample very 100 metres. A narrow slit of soil of different texture would not result in ALC downgrading.

Soil Damage from Inserting Legs and Constructing Panels

- 19 Soil damage should be limited if good practice is followed. The soils are clayey, and therefore sticky when wet but hard and easily trafficked when dry. The installation of legs involves small machinery. The example above involved a pile driver without a cab, at about two tonnes. A three tonne cabbed version is shown below, with people. I compare that to a modern tractor (next to an older one).

Three Tonne Cabbed Pile Driver and Modern Tractor



- 20 Soil should not be damaged during the installation of legs, because the machinery used is lightweight compared to modern farm machinery.
- 21 If soil was damaged it can easily be rectified. Soil is frequently affected by agricultural practice. I show below a maize harvest and a photo of soil affected by wheelings during manure spreading. Both show agricultural practice. Neither results in long term damage.
- Maize Harvest (Library Photo) and Field Affected by Wheelings During Manure Spreading*



- 22 Even if done poorly it should be possible, and easy, to run a tractor down between the rows of panels with a subsoiler or tines to loosen and restore any compaction. There will be no long-term impact on soils as a result of construction of the panel arrays.
- 23 There are different models of transformer on the market, so the final details may vary depending upon availability. These stand on concrete bases or pads, and are connected to a drainage system for the water run-off

Transformers at Llanvapley



24 There may also be small connector boxes, such as those shown below.

Connection Boxes



25 The tracks are created by removing the topsoil and then adding stone to the surface. The tracks run along hederows except for the sections shown to access the transformers. These areas can be restored by removing the stone, decompacting the subsoil with agricultural machinery, and replacing the topsoil. The photo below also shows a yard area created for handling the sheep.

Track



- 26 The soil will be stored in bunds for reuse at the decommissioning stage, as shown below, or will be banded adjacent to the track.

Storage Bund



- 27 The construction compound will typically use mats to dissipate weight during use, and will be returned to agriculture after the works are completed.