

**Arnie Van Amerongen describes the construction of a new lined green in Switzerland which meets the country's stringent environmental constraints**

# Design considerations



These days, particularly here in Switzerland, golf course constructors and greenkeepers are operating under severe restrictions on the construction of golf courses imposed upon them by councils, ecologists and many other organisations.

These are aimed at preventing fertilisers, fungicides, herbicides and other chemicals ending up in the ground and ultimately in the main water supply as tapwater.

Here in the French part of Switzerland, in Sion, I am currently extending a 9-hole golf course to 18 holes.

The new nine holes are built on terrain which belongs to the municipality, and is close to the water reservoir for the city of Sion.

The greens are built out of two draining layers of gravel 100% sand on top of the gravel.

No.1	8-16 mm (round)	depth 20 cm
No.2	4-8 mm (round)	depth 5 cm
Sand	0-2 mm	depth 30 cm

As you will see this type of construction will give a very high infiltration and leaching effect, so you might ask where does all this water go from these greens? Well, we have to gather this water to respect special ecological requirements.

The answer is a liner. I will describe the construction of these types of green.

On photograph A, we can see the special constructed v-formed shaped shuffel for this type of drainage to a depth of the 30 cm.

When the drainage lines are finished and the stones are removed from the surface, we put on the surface of the subgrade, the protection sheet colour grey see photograph b, strong 500 gr/m.

After this we put the liner in the drainage lines on top of the protection sheet, the green coloured liner thick 1.2 mm - see on photograph B.

The drainage uses the herringbone system.

It is important for the welding of the liner that the outside temperatures needs to be higher than 5°C and the humidity needs to be lower than 75%.

If the drainlines are welded and the perforated drainage is in the drainlines they can be filled up with the gravel 8 - 16 mm (round).

All the perforated drains have the same size in diameter 110 mm.

If the drains are all connected to the main drain, we can start to fill up the drain lines with the gravel 8-16 mm.

It involves a lot of hand work at the beginning to fill up these drain lines - photograph C.

If the drainage lines are filled up with the gravel 8-16 mm, the rest of the big areas from the green can be welded.

On photograph D, we see the outlet of the green, from there the water will go into a concrete collector.

The drainage water from the green will go via transport drainage to a safe area where there will be no risk of pollution to the main ground water.

As we can see on photograph E., the green is completely welded and the rounded gravel 8 - 16 mm, can be transported in to the green. The wooden sticks are taped on the following heights 20 cm, 5 cm and 30 cm.

In my opinion the tractor with balloon tyres, driving in straight lines on 20 cm rounded gravel and wooden planks will not cause damage to the liner at all.

The rest of the procedure is identical to that of a normally constructed green.

Levelling the gravel 8-16 mm, after this levelling out the gravel 4-8 mm, topsoil around the green and starting bringing the sand on the green.

Here we can see on photograph F from the drive point the ending result of the construction, the sand is spread and levelled out and this year 2001, in spring, we are starting with the preparation for the seeding.

I hope that environmental organisations are not going too far and that they only remain with lining the greens and not to line a complete golf course, the work and the costs, if that were to be the case would be enormous!

The work which was carried out was supervised by the writer Arne Van Amerongen.

