

The Danish 5D network and the torsional plug – a stable, economic and efficient way of establishing geodetic markers in sedimentary landscapes

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Background and history

Traditionally, Danish geodetic markers were established as granite posts cast into a 1 m³ underground concrete block. But while certainly making it hard to move the marker, it does not necessarily ensure a very high degree of stability, since establishing the marker also meant a huge amount of soil preparation, leaving the local environment highly disturbed.

Since 2000, all new markers in Denmark have been established using torsional plugs, resembling screw-in tent pegs, but obviously much larger.

The plugs are screwed/drilled directly into the topsoil, reaching frost free depth (1,2 m) for stability. An outer casing of grease ensures that freezing/thawing movements of the upper layers do not influence the plug.

By screwing, rather than digging the plug into position, the disturbance of the local environment is minimized, and the few unavoidable disturbances are horizontal, and radially symmetric, minimizing the post-installation movements.

All in all, this results in a stable, economic and efficient way of establishing markers for geodetic networks: A field team of 2, in an ordinary family car, can install a new marker in only a few hours of on-site time.

The 5D network

The Danish 5D network (blue dots above) combines GNSS, levelling and gravity observations into an integrated geodetic network.

The network was established at the beginning of the century, and is re-surveyed on a regular (currently 3 year) basis.

All stations in the 5D network are established using torsional plugs.

The use of torsional plugs are, however, not limited to stable geodetic networks - they could equally well be used as strain net stations or benchmarks for local tide gauges.

The installation tool kit for torsional plugs is shown to the right - it includes a light weight, but powerful petrol powered auger. The plug is shown with the grease filled casing mounted. The well pipe and well cover is installed before the plug is screwed into the lower parts of the topsoil.



Some supremely torsional 5D survey scenes...

