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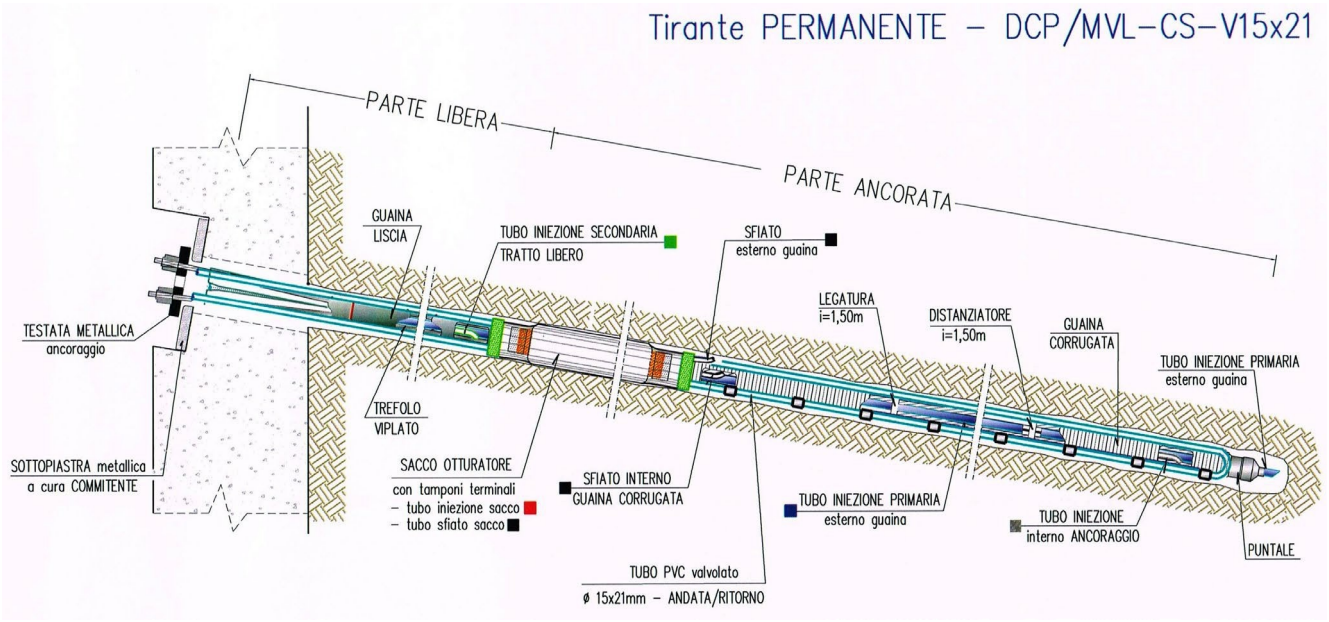
PERMANENT ANCHOR DCP/MVL-CS-V15x21



Encoding, classification, and static function :

Tie rod for geotechnics, **active** type**, permanent**, complying with UNI EN 1537:2013, suitable for installation by **high-pressure cementing** operations (pmax=55bar), **with obturator bag**, particularly suitable for **loose soils.**

Assembly type :

- *Metal reinforcement* → 0.6-inch strands of stabilized harmonic steel type c.a.p., according to UNI EN10138.
- *strand number* → No. 2-8.
- *maximum operating pull* → 300-1200 kN
- *Cementation mode* → high-pressure injection (**pmax=55bar**), repeated (I.R) carried out by hole mouth
- *permanent protection section anchorage* → corrugated sheathing
- *permanent protection free stretch* → smooth sheath
- *protection* single *stranded* → single *stranded*
- *free stretch/anchor stretch* separation → separator pad and with TNT obturator bag

- *permanent underplate protection* → metal inlet pipe
- *permanent protection* single *locking* → single-refrain cover (polyolefin-based synthetic polymer)
- *permanent protection tested anchor* → CAP protection (polyolefin-based synthetic polymer)

Assembly mode :

Protection of the free part is achieved by impregnation of the strands by suitable anti-corrosive product (grease), after opening the individual strands and subsequent monoplating of the strands themselves using polyethylene pipe ⌒ 16.5x19.5mm.

The bundle of strands (No. 2-8) is then wrapped externally with a polyethylene sheath, smooth

In order to increase the adherence of the reinforcement in the cemented anchorage section (foundation portion), the strand bundle is configured with the prescribed 'sinusoidal' pattern, alternating 'binding' sections with the placement of specific spacers, arranged at spacing of no more than 1.50 ml.

Protection of the entire foundation length of the tie rod (anchor section) is achieved by wrapping the strand bundle with a corrugated polyethylene sheath of suitable diameter and equal length.

The end of the tie rod is equipped with a ferrule (polyolefin-based synthetic polymer) to facilitate the insertion of the tie rod into the borehole and protect the end of the anchor from infiltration of harmful agents.

The ferrule is installed, covering the strands, with metal strapping and tape.

The separation between the free part and the foundation part of the tie rod, is achieved by the interposition of an 'obturator bag', having the function of containment and confinement and consisting of an element (diam. 190mm) made of non-woven fabric (from 300 gr/sqm) with a length of about 1.0 ml, installed in the free part of the tie rod.

The two ends of the obturator bag, strapped and taped with plasticized adhesive tape, consist of pads made with the use of specific sealing product (called 'z-strip').

To prevent filtration through the obturator bag, even of only the liquid phase of the cement mixture, sealant is inserted between the strands of the strand, immediately after the pad, upstream of the bag.

To improve the watertightness of the conduit joints (corrugated and smooth), a specific 'heat-shrinking' sleeve is applied at the height of the separation pad and the toe piece.

Inside the borehole, in the anchorage section, the correct positioning of the tie rod is ensured through the use of specific 'centering devices', with variable cross-section, made of non-oxidizable material (PVC), of the 'flask' type, the installation of which ensures the correct minimum overburden expected.

For operational purposes, in order to put the obturator bag into operation, we first proceed with the injection, at low pressure, of 'fat' cement mixture, inside the obturator bag itself, operating through a polyethylene pipe ⌀ 16x20mm (with outlet at the end, lower, inner part of the bag) and with the help of a similar polyethylene vent pipe ⌀ 12x16mm (with outlet at the initial, upper, inner part of the bag).

Approximately 12 hours after bag injection, we proceed with the 'primary injection' of the foundation section, inside the corrugated sheath, using a suitable cement mixture, operating at low pressure ($p_{max=2-3bar}$), through a polyethylene tube ⌀ 12x16mm, with the end placed about 10cm from the toe bottom, while a similar polyethylene tube ⌀ 12x16mm, with an outlet downstream of the bottom buffer of the obturator bag, ensures the escape of any air pockets and acts as an indicator to find that the foundation itself has been filled.

A third polyethylene tube, ⌀ 16x20mm, with the end passing through the bottom ferrule, enables the execution of the 'primary injection' of the foundation section, outside the corrugated liner, i.e., the cavity between the hole wall and the tie rod, operating at low pressure (pmax=2-4bar).

A fourth polyethylene tube ⌀ 12x16mm, the end of which is located downstream of the lower bag buffer, outside the corrugated liner, functions as a telltale that the interspace between the outer part of the tie rod and the borehole wall has been filled.

A last polyethylene tube, ⌀ 16x20mm, inserted inside the smooth sheathing, is used to perform the 'secondary injection' of the free part, after the tensioning of the tie rod has taken place.

The identification of the different injection and vent tubes, according to their operational function, is done by reference to the color of the tubes :

- red color → tube ⌀ 16x20mminiezione - shutter bag

- black color → tube ◠ 12x16mm — *injection vent - shutter bag*
- gray color → pipe conduit — ◠ 12x16mminiezione primary - inside corrugated
- black color → tube ◠ 12x16mm — *primary injection vent - inside corrugated conduit*
- blue color → pipe sheath — ◠ 16x20mminiezione primary - outer corrugated
- black color → tube ◠ 12x16mm — *primary injection vent - external corrugated conduit*
- green color → tube sheath — ◠ 16x20mminiezione secondary - inside smooth

To allow repeated injection (R.I.), under pressure ($p_{max=55bar}$), of the interspace between corrugated sheathing and hole wall, a pvc pipe, ◠ 15x21mm (blue color), equipped with 'manchettes' valves at the full length of the anchor line, is placed (by taping), outside the protective sheaths and passing through the obturator bag.

The pipe is equipped with injection valves (i=33-150cm), arranged according to the design and execution requirements provided by the Construction Designer, and a 'blind return', with plug, at the borehole mouth.

The above tube is used to carry out high-pressure repeat injection, after primary injection, at low pressures (p=2-4bar), via the tube ◠ 16x20mm passing through the bottom tip.

'Post-injection,' is performed after several hours of curing of the primary (or liner) injection mixture, operating from the mouthpiece, at high pressure ($p_{max=55bar}$) and injecting cementitious mixture, with the purpose of creating sbulbling on the previously made cementitious liner and improving the bulb-soil adherence effect.

After the first 'post-injection' operation is finished, the tube can be 'flushed' (by removing the cap of the blind mouth-return element), in order to be able to repeat, several times, if necessary and/or planned, the high-pressure injection operation.

Tie rods are complete with metal header plates, of appropriate size and varying according to the number of strands planned, as well as clamping systems (monotrefolo) for stringing them.

In order to preserve the metal anchor header from the effects of corrosion over time (which can be generated by weathering, chemical/physical attack, and the presence of percolating water in the wall and/or rising at the end of the tie rod) and to ensure the

functionality of the tie rod, permanently, the following guards are to be placed :

- a specific under-plate protection device (metal inlet tube), which makes it possible to preserve, over time, the end of the strands from the effects of corrosion.
- individual strand covers, for each strand.
- a specific over-plate protective device (protective CAP) that is watertight, impervious to water, and resistant to aging brittleness and radiation damage ultraviolet during storage, transport and installation. - In addition, the adoption of a 'High' rather than 'Low' series protection CAP also ensures that the header can be inspected over time and re-tensioning of the strands over time if necessary and/or planned.