

Dump hopper wall at Weipa ... showing exposed ties into embankment.



The narrow void in which the work was carried out.

Facing the challenges of grouting ... clearly

How purpose-built drills mounted on scaffolding solved a dump hopper problem at Weipa.

WITH over 25 years of working with grout, Norm Howell is one of the most experienced people in the country. He learnt quite a lot over the years, from the people he worked with and from his own on-the-job experience.

However, when he decided that it was time to start his own business, he spent almost a year drawing on his experience and writing procedures to fully document the business. Along the way he challenged many previously accepted practices and in some instances altered these to match his own experience and judgment.

His view was that many of the problems that occur in grouting jobs result from poor practices, or poor adherence to correct procedures.

The growth of his business, Groutech, is a tribute to the quality of the practices used in the business, as well as the use of quality materials.

The presence of clear, well thought out practices is important to a grouting business, as much of the work they are asked to take on involves fixing problems. Much of this involves filling voids under slabs, behind walls, or around pipes and culverts.

These voids occur because of poor compaction of subgrade material during construction, or water causing further natural compaction of this material, or water running through subgrade material and washing out fines, or swelling and contraction of clay beneath a slab, which can disturb the slab to create voids, and destroy seals to let water in. Proper application of back-

fill grout will re-support the slab, stop the slab from breaking up and prolong the life of joints.

Where subsidence occurs mudjacking can be used in conjunction with backfill grouting. Controlled injection of mudjacking grout can lift a slab or structure and support it, with backfill grout used to fill the remaining voids.

For pavements a regular maintenance program is recommended. There is no known way of permanently eliminating voids but in conjunction with ground-penetrating radar, the voids can be quickly identified and backfilled before cracking and displacement of the slab occurs, which ultimately leads to expensive repair or replacement options.

Grouts can be used to provide a water-

and basements. This technique was used to create an underground dam at Lake Kounpee on Stradbroke Island (Qld). The dam was 50m underground, 275m long and 12m high!

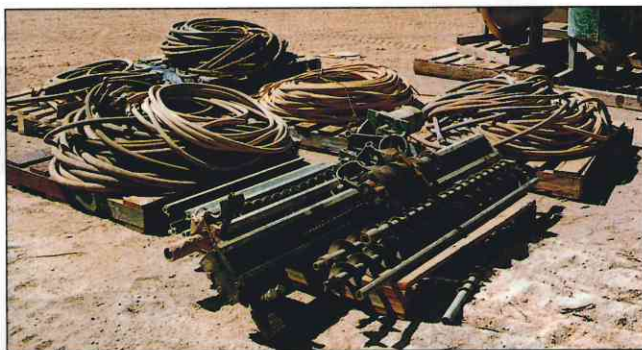
Recently a major grouting project was undertaken at Weipa, involving grouting behind the retaining wall at a dump hopper. The retaining wall was formed of half-pipe sections, tied back into the earth with metal strips, with compaction of the earth over the tie-backs providing stability for the structure.

The retaining wall surrounded a dump hopper and conveyor belt which feeds the ore dumped by large bottom dump trucks to a stockpile. The hopper was tied into, and suspended from, the retaining wall.

Poor compaction during construction, in part due to the presence of a bridge abutment that did not allow compaction up to the wall, eventually left large voids behind the retaining walls of the hopper. Gaps in the wall allowed fines to be washed out, which accelerated the problem.

Up to 400mm subsidence occurred, causing the hopper to drop. As a temporary measure the hopper was jacked up and the supports from the retaining wall were cut and re-welded.

Various options were canvassed to arrive at a more permanent solution, with some form of grouting regarded as the only means of avoiding major rebuilding. With a gap of only 500mm-750mm between the dump hopper and



Drilling equipment specially for the job.

proof membrane behind a wall below the water table. Termed technical waterproofing, this process involves drilling through the wall and pumping a membrane into the void behind the wall. This technique has been used for years in dam construction to stop water from leaking below the dam and is equally applicable to lift pits, tunnels, car parks

the retaining wall, most believed it necessary to drill large diameter access shafts into the retained earth area to allow access for drilling into the affected area to inject grout.

This would have meant a serious disruption to production since these access shafts would have blocked off access to the dump hopper. However, Groutech proposed a system using scaffolding erected in the gap between the dump hopper and retaining wall, with purpose-built drills mounted on the scaffolding to drill behind the retaining wall. (Groutech uses its own high capacity grout pumps on all its jobs.)

Work was done at night over a period of four months and there was no interruption to production. Core samples of the completed work showed that the microfine cement grout combined well with the compressed earth and greatly increased its strength. In addition, grout was used to seal gaps in the wall.

Apart from the four months on site, nine weeks were spent in preparation for the job, building equipment for the job and training the site staff in the techniques to be used. The end result was a job that ran smoothly, was completed on time, minimised disruption and cost around a fifth of some of the alternative proposals.

The ability to purpose-design equipment for a job is one of the strengths of Groutech, which has built up a reputation over the years of being the company to approach for difficult jobs. The use of purpose-designed equipment does not necessarily mean a huge equipment component in the tender price of a job. Groutech's approach is to adopt a modular design to any equipment it builds so that it can be re-used on other jobs.

Because of the long lead times from preparing proposals to actually being granted the contract to do a job, Groutech often knows which future jobs equipment can be re-used on, and is thus able to charge only a part of the cost of the specialised equipment to each job. ■