Technical Note (CPDA Technical Note reference – No 1)

Laying pipes in soft ground

Where the trench formation has little bearing strength and therefore will not support pipe bedding material effectively, it is necessary to provide a stable formation before pipe laying. Such conditions most commonly occur in peat, silty ground, soft to very soft alluvial clays, running sand, or in artificially filled ground.

Although trench formations are sometimes stabilised with concrete, this is unlikely to assure long-term stability in all cases, and a form of flexible bedding construction is the preferred method of dealing with this situation.

The trench formation and manhole base should be over-excavated by 600-800mm, depending on the bearing strength of the ground. Gravel reject material or small hardcore, less than 75mm, is then compacted in layers to form a firm trench bottom. A 50mm thickness of lean-mix concrete is then placed as blinding. The pipe is then laid on granular bedding material. These details are illustrated in Fig. S5.

The pipe bedding construction requirements are calculated in the normal way, for example by using the CPDA's Bedding Tables or Simplified tables of external loads on buried pipelines. It is important that 'wide trench' design criteria are used because 'narrow trench' conditions cannot be guaranteed in this situation. The extra depths of granular bedding material shown in Fig. S5, 150mm for sleeve-jointed pipes and 200mm for socketed pipes, rather than the usual 50mm and 100mm respectively, are required because of the hard nature of the constructed trench bottom. For a class 'F' bedding, selected backfill material is then placed to 150mm above the pipe and compacted before the main backfill is placed. Where class 'B' or class 'S' beddings are required, additional bedding material will either partially or wholly replace the selected backfill material.

Where groundwater exists at a level above the interface between the rejects and the new trench bottom, procedure detailed in Technical Note No. 2 should also be applied. The geotextile should surround both the material in the base of the trench as well as the pipe bedding material. Alternatively a stable base for the pipeline can be constructed by the construction of a geogrid reinforced granular mattress below the pipe bedding.

Shown in Fig. S6 traditional pipe support, in the form of a high quality graded granular aggregate, is considerably improved by the use of geogrids. The unique interlock mechanism between grid and aggregate creates a flexibly stiff supporting mattress which provides an efficient load spread into the weaker ground, and also helps to control any longitudinal differential settlement which may start to take place.

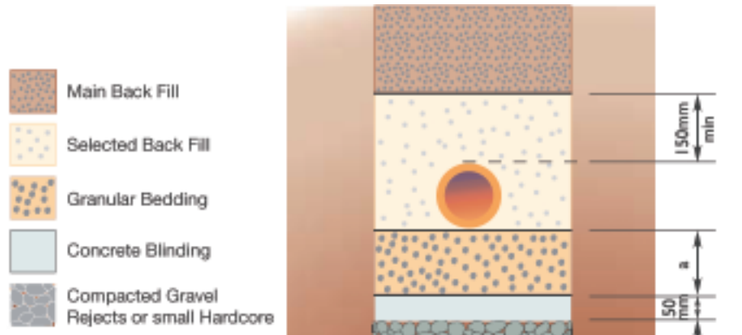
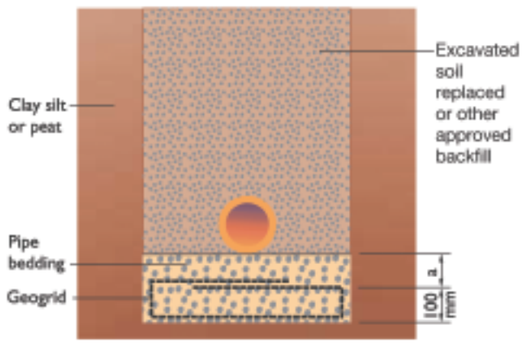


Fig. S6
Pipeline Construction in Weak Ground using a Geogrid



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A periodic update for the clay drainage industry from the cpda

Issue 2

Worldwide Demand for Clayware Sewers is on the Increase

The 90's saw construction concentrating on short term "cost out" initiatives with little concern for the environment or sustainability for future generations. However, as the very real threats to the environment grow due to increasing worldwide consumption sustainable construction will necessarily become the code to be followed by specifiers and developers. As this happens the specification of Clayware Sewers will increase and there is strong evidence that new demand will arise even in markets where there is no existing Clayware market today.

The major Clayware markets of the UK and Germany have declined in the 90's through this short term approach, stagnant or declining markets and with relatively saturated sewer networks. However, we are now seeing a reversal of this trend as longer term thinking plays an increasing role in decision making. Yet, the largest growth is arising in developing markets which have either learned "the hard" way or are only now creating their sewer infrastructure and are doing so at a time when sustainability is on the agenda.

In Saudi Arabia the demand for Clayware Sewers has nearly trebled, outstripping local capacity, resulting in over 50,000 tonnes of imports from European manufacturers. The lessons learned from their earlier sewer investments utilising cheaper construction materials, which have failed prematurely, has led to their choice of Clayware pipe systems.

In Japan, interest in clayware systems has increased since detailed CCTV examination of both pipe structure and flexible joints following the Kobe earthquake proved the robustness of the Supersleve clayware pipe and coupling joint. It may surprise readers to know that over 8,000 tonnes of clay pipes were exported to Japan from the UK in 2005.

The Western coast of America, again through its susceptibility to earth tremors, has always been a strong market for Clay sewers and where performance of cheaper plastic systems has been found to be less than "promised". >

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For example in the city of Modesto, PVC pipelines failed to pass their 11 month deformation performance test in 45% of lines tested.

Currently, Iran is seeking European partners to develop Clayware pipe manufacturing plants. Their underdeveloped mains sewers, relatively recently installed (15-20 years) are already failing through the corrosive affect of sewer gases.

This time around, Iran wishes to learn from the experience of the UK and Germany, where sewer replacement rates are running at less than one percent per annum. Once developed this will provide a huge new market for Clayware pipe systems.

It will be for these sound sustainable reasons that Clay demand world wide will grow in the 21st Century, a century when responsibility for the environment and the impact of today's consumption on the future, will be made to matter.

W T Knowles Hits a Century

Not only do clay pipes last over a hundred years but so does the manufacturer W T Knowles.

Clay Fact: All water companies accept clay BEWARE over 50% of water companies have some restrictions on use of plastics

Vitrified Clayware Sewers Sustainable Performance

The natural performance of Clayware Sewers provides the most relevant system to meet the needs of a modern world:

- Longevity, well in excess of 100 years meets the requirement for long replacement cycles. Unlike plastic systems, its rigid strength does not reduce over time.
- Durability, against damage from rodents and high pressure water jetting (7500 psi) allows necessary blockage clearance procedures to be undertaken without risk of damage to the sewer structure.
- Rigid strength, certified ex-factory, provides most of the structural strength of the sewer installation. Meaning less reliance on contractor installation than plastics, no need for deformation tests prior to adoption, and provides the opportunity to reduce the amount of bedding and surround, in turn reducing spoil to landfill.
- Certified for use with re-cycled bedding and surround material, providing cost and environmental saving opportunities.
- High chemical resistance. Clay as a natural material provides the highest resistance to chemical attack when compared with competing materials.
- Low Co2 footprint when compared with competing materials

All of these features combine to provide a sewer system with a long life expectancy, low whole life cost and low impact on the environment, a truly sustainable solution.

W T Knowles has been manufacturing vitrified clay pipes, fittings, and chimney pots, on the same site, in Elland, West Yorkshire, since it was founded by Walter Thomas Knowles in 1906. It is still very much a family business, now being managed by its fourth generation of the Knowles family.

Besides the Knowles family there continues to be many long service employees some retiring after an incredible 50 years of service, with half the present workforce having been employed by the company in excess of 20 years.

Yet, age is no inhibition to innovation as Knowles continue to provide newly designed and highly crafted product such as clay channel blocks which were developed in 2005 and are currently being used in parks and other public places. A family business proud to see their high quality products used within the local community.

Clay drainage for a longer life

Sample of clay pipe from a functioning 2000 year old sewer finally due for replacement

Clay Fact: Clay retains its ring stiffness throughout its life unlike plastics with progressively reduces

The current round of government investment in schools and hospitals has refocused attention on the greater life expectancy of a clay drainage specification. This greater longevity is recognised by the WRC sewer rehabilitation manual, which includes an assumed design life for the appraisal of new sewers and ancillary works of between 80-125 years for rigid materials (clay, concrete) as compared to just 40 years for pvc and other new materials.

Clay's greater longevity is no less relevant to water company work. A crude calculation in Water UK's publication "Perspectives on Global sustainability" implies as average life expectancy based on current investment levels of 133 years. With plastics systematically losing strength over their life, the onus should be on Water Companies to specify longer-lived rigid alternatives, with clay a natural choice.

As further evidence of clay's longevity, a short length of clayware brought back from the Middle East was on assessment found to be almost 2000 years old. More impressively, the pipe was part of a functioning pipeline immediately prior to excavation!

Jacking Pipe Developments

Naylor has continued to develop its Denlok clay jacking pipe range, resulting in increasing worldwide recognition. Whilst jacking pipes are made out of other materials such as concrete and GRP, clay as a material readily lends itself to trenchless installation, due to the benefits associated with clay drainage such as inherent strength, ability to withstand abrasion and above all durability. The use of clay, as a naturally occurring raw material, is well received by those parties to whom environmental considerations are paramount.

Denlok's principal use has been in sewerage applications, in a variety of challenging environments. The product has been installed under major motorways and highways, enabling traffic flow to be maintained, under canals, overcoming the problems of putting a pipeline under a waterway, under docks, avoiding potential disruption and under major railway lines, minimising disruption to scheduled train services. There have also been specialist uses for the product. As an example, Denlok was used as specialist ducting on a challenging project for the National Grid at Nunthorpe, Teeside, where clay was the ideal material to deal with the heat generated by the high voltage cables and special 316TI stainless steel was used to provide a non-magnetic jointing material.

2004 saw the addition of a DN700 pipe to the existing range of DN150-600 and a major scheme in Bandar Seri Begawan, Brunei's capital was an early user of the new size. Ground conditions in Brunei are very difficult, with sloppy clays and also wet sandy conditions requiring 24 hour dewatering work. Clay's strength and corrosion resistance (to deal with sulphide attack) made it the ideal material for these challenging conditions.

Developers and Contractors Return to Clayware as Increasing Plastic Failures are Reported

Clay is chosen for the new Arsenal ground

Since the last issue of "Clay Today" manufacturers are reporting increasing numbers of contractors and developers choosing clayware pipes in order to avoid the risk of "non-adoption" or the high cost of replacing structured wall pipes which have not met the maximum 6% deformation criteria.

This is not surprising when during the same period reports of deformation failures and, two major failures of twinwall plastics following jetting on sites at Virginia Park and Castlegate, Caerphilly have been received.

This trend towards clayware sewers will not only benefit the contractor and developer by reducing their risk, but also the Water Company and the rate payers by providing a more robust sewer system with longer replacement cycles and greater resilience to aggressive maintenance techniques, necessary for blockage removal.