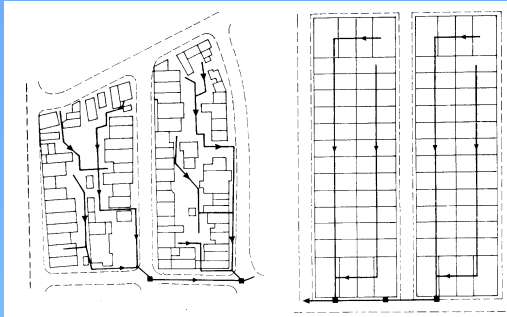




SIMPLIFIED SEWERAGE



Simplified sewerage collects all household wastewaters (WC wastes and sullage) in small-diameter pipes laid at fairly flat gradients – for example, a 100 mm diameter sewer laid at a gradient of 1 in 200 (0.5 percent) will serve around 200 households of 5 people with a wastewater flow of 80 litres per person per day. The sewers are often laid inside the housing block, or in the front garden or under the pavement (sidewalk), rather than in the centre of the road as with conventional sewerage. It is suitable for existing unplanned low-income areas and new housing estates with a more regular layout.



Simplified sewerage is most widely used in Brazil. It has also been used in other South American countries and some Asian countries.



The development and dissemination of simplified sewerage in Brazil

Simplified sewerage – generally known as condominium sewerage in Brazil – was developed by the R&D Division of CAERN, the water and sewerage company of the northeastern State of Rio Grande do Norte, and its engineering consultant José Carlos de Melo, with technical assistance being provided by Professor Cicero Onofre de Andrade Neto of the department of Civil Engineering of the Federal University of Rio Grande do Norte. It was fieldtested in the low-income areas of Rocas and Santos Reis in Natal, the State capital in the early 1980s. The CAERN team presented its experience at the biennial Congress of the Brazilian Association of Sanitary and Environmental Engineering (ABES) held in Balneario Camborit, Santa Catarina in November 1983, and also described the system in the ABES technical journal *Engenharia Sanitária**

CAERN's development of condominium sewerage in Natal was partially funded by the World Bank Medium Sized Cities project, which also saw the implementation of condominium sewerage in the city of Petrolina in the state of Pernambuco. In Natal the Brazilian Office of the World Bank/UNDP Technology Advisory Group (TAG) (project GLO/78/006, later INT/81/047) evaluated the Rocas and Santos Reis scheme. This led to the production of the Brazilian national design manual for simplified sewerage and the formation of the ABES Low-cost Sanitation Committee (1984-1986), which in turn led to the adoption of a minimum sewer diameter of 100 mm in the 1986 revision of the Brazilian national sewerage design code (previously it was 150 mm). A further key feature in the development of simplified sewerage design in Brazil was the realisation by the late Brazilian sanitary engineer Eugênio Macedo that the sewer gradient should be based on the initial design flow and the sewer diameter on the final design flow – an important consideration (incorporated into the 1975 Brazilian national sewerage design code) as in low-income areas the latter may be up to five times the former.

Simplified sewerage schemes were then implemented by several of the Brazilian state water and sewerage companies. SANEPAR and SABESP, the water and sewerage companies of the southern states of Paraná and São Paulo, introduced front-yard and pavement sewerage (laying the sewer in the front garden and sidewalk), rather than backyard (in-block) sewerage as used in the northeast of the country, and they changed the hydraulic design basis from minimum self-cleaning velocity to minimum tractive tension, a change which was also included in the 1986 Brazilian national sewerage design code.

CAESB, the water and sewerage company of Brasília and the Federal District, started implementing simplified sewerage in poor areas in 1991 and now it considers simplified sewerage as its "standard solution" for rich and poor areas alike. CAESB has over 1,200 km of condominium sewers in operation – the largest example of simplified sewerage in the world.

Simplified sewerage is now used in many states in Brazil. Many schemes have been successful, and some have been failures – mainly due to poor construction and/or poor institutional commitment, and especially due to poor maintenance. Whatever the successes and failures of individual projects, what can be said is that simplified sewerage has been successfully adopted into mainstream Brazilian sanitary engineering. The reasons for this success have been (1) the ease of dissemination of innovative technologies at the biennial ABES Congresses which are attended by all the state water and sewerage companies, (2) the relatively small number of leading Brazilian sanitary engineers who have been committed to, and have been excellent advocates of, the technology, and (3) the keen interest shown in the technology since its beginning by the World Bank and UNDP which has acted within Brazil to give the system a seal of international approval.

* Dr Gehan Sinnatambay, then a doctoral student from the University of Leeds, England was part of the CAERN R&D team and this led to dissemination of condominium sewerage outside Brazil, including the production of the UNCHS Design Manual.

Construction

Laying small diameter (commonly 100 mm diameter) pipes at fairly flat gradients (often 1 in 200) requires careful construction techniques. It is a good idea to train small contracting firms in good construction practices and then to supervise their actual work. Plastic pipes are best used as they are easily jointed correctly, and this essentially eliminates wastewater leakage from the sewer and groundwater getting into it. With simplified sewerage there is no need to have the large expensive manholes of the type used for conventional sewerage – simple brick or plastic junction chambers are used instead.



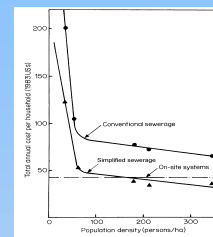
1 – A typical low-income area in northeast Brazil – before simplified sewerage.

2 – A village in the northeastern Brazilian state of Ceará served by simplified sewerage.

3 – Simplified sewerage is also suitable for middle- and upper-income areas. Here it is being installed in the very rich area of Lago Sul in Brasília.

Costs

Annual costs of conventional and simplified (in fact in-block condominium) sewerage and on-site sanitation in Natal, capital of the northeastern Brazilian state of Rio Grande do Norte, in 1983. Condominial sewerage became cheaper than on-site systems at the quite low population density of ca. 160 people per hectare.



Currently, construction costs of simplified sewerage in Brasília are around R\$40-60 (~ US\$ 22-34) per person.

Operation and Maintenance

Good operation and maintenance is essential for the long-term sustainability of simplified sewerage. However, the original concept of householders being responsible for O&M of in-block condominium sewers has not worked well in the long term.

In rural Ceará one of the villagers is employed by the Residents' Association to maintain the sewers and the wastewater treatment plant (typically, a single facultative waste stabilization pond). He is also responsible for the water supply.

In parts of Recife in northeast Brazil COMPESA (the state water and sewerage company) employs local contracting firms for O&M. Usually this is done by a small team comprising a technician engineer and two labourers who work in a low-income area served by simplified sewerage and to whom residents report any problems.

In Brasília and the Federal District CAESB (the water and sewerage company), which has over 1,200 km of condominium sewers, uses van-mounted water jet units to clear any blockages.

