	TRENCHLESS TECHNOLOGIES INFORMATION CENTRE	
INTERNATIONAL SOCIETY FOR TRENCHLESS TECHNOLOGY	TRENCHLESS TECHNOLOGY GUIDELINES	SECOND EDITION
	SECTIONAL LINERS	NEW VERSION AUGUST 2005

1. OVERVIEW

Sectional Lining is generally taken to be the sliplining of man-entry sized pipes by the introduction of pre-formed liners, whole or in sections for assembly in-situ.

2. APPLICATION ENVELOPE

Usually applied in gravity sewer situations, liner sections are available from minimum man-entry sizes, the size of which depends largely on the country in which the liner is to be applied and its regulations. However generally sizes between 825 and 6,400 mm have been available with liner section thicknesses from 10 to 30 mm. Section lengths are nominally between 0.5 and 1.5 m for installation in all shapes of pipe and may be WRc Type I or II Liners.

These dimensions are in many cases simply examples of what is available as some manufacturers manufacture to client order to whatever diameter, shape, length and joint arrangement required, including length and shape variations to accommodate pipeline bends and anomalies. Sectional liners can also be designed for lining pumping mains.

3. INSTALLED LINER MATERIAL

Sectional liners are generally constructed of GRC (glass-reinforced concrete), GRP (glass-reinforced plastic) or RPM (reinforced polymer matrix). Sectional liners are generally installed and connected along the length of a pipeline. They are then grouted in-situ, filling the annulus between liner and host pipe to complete the lining process. The option also exists to utilize a combination of in-situ applied Gunite or Shotcrete and prefabricated invert units under the right circumstances.

The sections themselves may also be sub-divided, depending on the liners ultimate sizes and pipeline access circumstances with a liner being divided horizontally or vertically in further sections for ease of transport. Sections may be invert and soffet or left/right side sections or combinations thereof.

4. EQUIPMENT

A significant amount of equipment is required to complete a sectional lining operation including segment lifting and delivery equipment (both surface and in-pipe requirements), grout mixing and injection equipment or gunite/shotcrete spraying equipment, pipeline plugs and confined spaces/safety apparatus. This also means that operators in the pipe will need to be fully trained not only in the construction of the liner but also to confined space working certification according to local regulations.

5. ACCESS REQUIREMENTS

A sectional lining operation will also need good logistical management for site storage for materials, working space for delivery apparatus and mixing stations, well managed site access in many instances all requiring a generally small footprint.

6. LINER PERFORMANCE

Liners can be designed to withstand external and internal water pressures, chemical attack, soil and traffic loads. However, overall performance and durability have a significant dependency on the level of workmanship of the installation of the liner both of the liner itself and its grouting. The fact that the liner is a form of sliplining will lead to some loss of hydraulic capacity.

7. CONNECTIONS & FITTINGS

As with all lining technologies, lateral connections will have to be remade once the main lining is completed. This may be achieved using prefabricated or in-situ fabricated joint connections and seals. They can also usually be installed without the need for open cut working from inside the now lined pipe.

8. BENDS

As previously mentioned bends can be accommodated during the section fabrication process by most manufacturers using prefabricated bend designs. This does however rely on a very accurate pipeline survey work in the planning stage to ensure the bend characteristics are well established. Large radius bends may also utilize some form of flexibility in the section jointing mechanism to accommodate the directional change.

9. TIMESCALES

Construction can be slow depending on the size of the liner sections, the ease of placement and the grouting system requirements. Normally work rates are viewed in m/day rather then 10s or hundreds of m/day.

10. STANDARDS & SPECIFICATIONS

WRc has issued a range of WIS and Information and Guidance Notes for Sectional Liners

11. SOCIAL & ENVIRONMENTAL IMPACT

There is nominally some impact on the local environment associated with the duration of these projects, but properly managed this can be minimized.

12. HEALTH & SAFETY ISSUES

Confined spaces considerations and security of pipe plugs sealing off working sections from on-line sections are critical issues with manpower being in the sewer under rehabilitation for long periods of time. Pipe segment storage and lifting, use of chemicals and traffic management are also important.

13. LIMITATIONS

Sectional lining is only practical for man entry pipe sizes. As mentioned there is always some loss of hydraulic capability, which needs to be accounted for by planners against projected future capacity requirements. The level of workmanship required for a successful installation of sectional liners would also require relatively high levels of supervision.

14. COST CATEGORY

>CIPP in man entry sizes

15. SELECTION INDICATORS

The Sectional lining option would generally be chosen for large diameter sewers rehabilitation. Flow through construction is possible using the technique so minimising over pumping requirements in the right circumstances in terms of Health and Safety.

16. SUMMARY

1. Generally applied to gravity operations in man-entry sizes only
2. Generally constructed of GRC (glass-reinforced concrete), GRP (glass-reinforced plastic) or RPM (reinforced polymer matrix) materials.
3. Can be equipment and time intensive due to the multi-stage installation process.
4. Liners can be designed to withstand external and internal water pressures, chemical attack, soil and traffic loads.
5. Loss of hydraulic capacity due to the nature of the construction process.
6. Cost greater than for CIPP lining in man-entry sizes.