Manual recommendations for minimum residual pressures	
Single storey:	7m
Two storeys:	12m
Three storey Building:	17m

The fact is that in most cases, we have excessive pressure in the network in some areas and very low pressure in other areas.

The following pressures are considered satisfactory. Manual recommendations for minimum residual pressures, Distribution systems should not ordinarily be designed for residual pressures exceeding 22meters. Multi-storeyed buildings needing higher pressure should be provided with boosters. *(Water supply engineering by B.C Pumia Ashok Jain and Arun Jain)*

Practical Solutions (reducing excessive pressure)

- ❑ determine average desired pressure for different areas
- ❑ determine the current pressure
- ❑ then address the high pressure problem
  - There are two solutions to an existing network. Use of pressure break tanks and
  - the use of pipe fittings (Length/Diameter ratios)

In water engineering it is easier to work in terms of the equivalent height of water column, referred to by engineer's as head, sooner than repeating pressure calculations, especially if dealing with an already

existing problematic network. As water flows through pipes, tanks and fittings some energy is lost through friction and turbulence.

Solution

Pipeline fittings all provide a "point source" of head loss. The head losses are estimated by considering the equivalent length of pipe necessary to provide the same amount of head loss.

This is commonly described as the Length/Diameter (L/D) ratio.

Note: Isolated fittings need not be considered for a long pipeline, as the head loss that they generate is negligible compared with the normal head loss through the pipe.

Losses can be ignored for pipe lengths longer than 90m in the case of 3 inches and above (in this case **pressure reducing reservoirs** may be installed). Importantly, when several fittings are grouped close together the actual head loss is greater than the sum of the individual losses for each fitting. If practical, the close grouping of fittings should be avoided.

Equivalent Pipe lengths of Various Fittings ~L/D Ratios(Engineering in Emergencies ~ Appendix 16)

Pipe bend ~ 3 – 5 metre radius	5	Tee ~ flow from main to the branch	68
Pipe bend ~ 2 – 3 metre radius	10	Gate valve ~ fully open	7
Elbow	33	Non-return valve ~ flap type	50
Tee ~ flow in main line	27	Foot valve and strainer	70

Appendix 2

Chart used for Water Balance and computation of Non-Revenue Water

Non-Revenue Water System Input Volume	**Authorized Consumption**	Billed Authorized Consumption	Billed Metered Consumption	**Revenue Water**
			Billed Unmetered Consumption	
		Unbilled Authorized Consumption	Unbilled Metered Consumption	**Non-Revenue Water (NRW)**
			Unbilled Unmetered Consumption	
	Water Losses	Commercial Losses	Unauthorized Consumption	
			Customer Metering Inaccuracies & Data Handling Errors	
		Physical Losses	Leakage on Transmission and/or Distribution Mains	
			Leakage and Overflows at Utility's Storage Tanks	
			Leakage on Service Connections up to Point of Customer Use	

This manual is part of a Utility Management Series for Small Towns. It can be used either as a training module to support the delivery of capacity building programmes in utility management and operations or as a reference manual to guide operations and maintenance staff in designing and implementing programmes to reduce the rate of Unaccounted-For-Water. When used by urban water utilities, the manual should be widely circulated to ensure that all staff and Supervisors involved/working in concerned Departments/Sections receive a copy. This will ensure a systematic and consistent approach to the implementation of an Illegal Water Use Reduction Strategy.

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