

Guidance notes

Selecting pressure ratings

Background

We have three common approaches to pipe pressure ratings:

- 16bar for transmission
- 12bar for local networks
- Common denominators for plants and process works

Pipe fittings and components for both transmission and local networks are typically 16bar rated.



Discussion

Transmission systems transport water in bulk from the treatment facilities to reservoirs and pump stations:

- Traditionally constructed from steel, the material is typically rated more than 16bar for the longevity and long-term safety of the installation. Where appropriate, plastic and glass reinforced pipe is also used.
- In setting the standard pressure rating the following are considered:
 - Elevation differences
 - The need to maintain resiliency by opting to reverse flow and pump from one side of the transmission network to the other
 - Possibility of straining the asset safely with a high rate of recharge.
- Equipment pressure rating remains similar for all pressure wastewater to provide commonality for maintenance and spares.

Local network systems connect to the transmission system and may utilise small pump stations:

- To manage pressure in the area, the distribution systems are typically connected through a pressure reduction point or reservoir, and are designed for up to 12bar of pressure.
- Our customer agreement is to supply pressure between 2bar to 8bar.
- Supply zones can be cross fed from different areas allowing for changes in area pressures. Pipework is mostly plastic which is more susceptible to cyclic fatigue. Cyclic fatigue occurs over time and is caused by pressure and flow velocity fluctuations from daily demand cycles or system pumping.
- Boost pumping for firefighting is also a factor in some areas.

Plants and process:

- Various systems will be specified at different pressure ratings and may depend on the specific process.

References

Watercare

- MS – Material supply standard
- DP-07 – Design for transmission water and wastewater pipeline systems
- DP-19 – General plant layout and equipment selection principles
- COP-01 – Code of practice for land development, Chapter 6 Water.

Other

- AS/NZS2566 buried flexible pipelines – structural design
- ASME B31 Pressure piping (series)
- POP101 PVC pressure pipes design for dynamic stresses
- POP10A Polyethylene pressure pipes design for dynamic stresses.

Guidance notes *continued*

Selecting pressure ratings

Select a pressure rating by considering:

- The process area common pressure rating
- Service life of the asset and performance level
- Static pressure
- Dynamic pressure and water hammer
- Negative pressure
- Cyclic fatigue de-rating
- Depending on the material type and joint methodology the pipe system may be derated by up to 85%
- Temperature or installation location may require pressure de-rating
- External loading/pressure
- For plants and process select common pressure 'bands' to reduce variability
- Maintenance and replacement considerations i.e. common equipment and availability



What if the pressure is considerable lower?

- In a plant or process setting, consider the pressure in bandwidths
- In local networks or transmission, select the common pressure rating

What if the pressure is higher?

- Consider reducing the pressure or introducing intermediate staging if pumping is involved
- A cost and risk analysis on operational, environmental and public safety should be used to confirm raising pressure rating above 16bar or 12bar.

Component considerations

! Most transmission and network valves are made from ductile iron. The castings are usually made the same for these valves, only the flange patterns may differ. They are typically rated more than 16bar and marketed for lower pressure. This means there is often little to gain in purchasing a lower rated ductile iron component.

! For spiral welded steel pipe, the minimum standard is more than 20bar. For seamless pipe the lowest rating is typically 10bar. There is more flexibility in producing lower pressure rated plastic pipe materials such as PVC and polyethylene, however, these thin-walled pipes are more susceptible to mechanical damage and deflection under load which could cause premature failure of the pipe asset.

Useful links:

www.watercare.co.nz/Water-and-wastewater/Building-and-developing/Engineering-standards-framework
www.aucklanddesignmanual.co.nz/regulations/codes-of-practice
<http://www.legislation.govt.nz/act/public/2009/0032/latest/DLM2044909.html>

References

Other

- POP10B fusion fittings for use with polyethylene pressure pipes design for dynamic stresses
- POP013 temperature rating of PE pipes
- Transmission pipeline calculations and simulations manual, Menon, E Shashi 2015

Disclaimer

This guideline is provided as information only and should not be relied on for technical or contractual instruction.