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DES Expansion with PEX-R Piping

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Outline

- Introduction to South East False Creek Neighbourhood Energy Utility - Pilot Project
- What is PEX-R Pipe?
- Key Considerations
  - Cost & schedule impacts
  - Design & installation pros/cons
  - Understanding failure modes
- Where would we use it again?

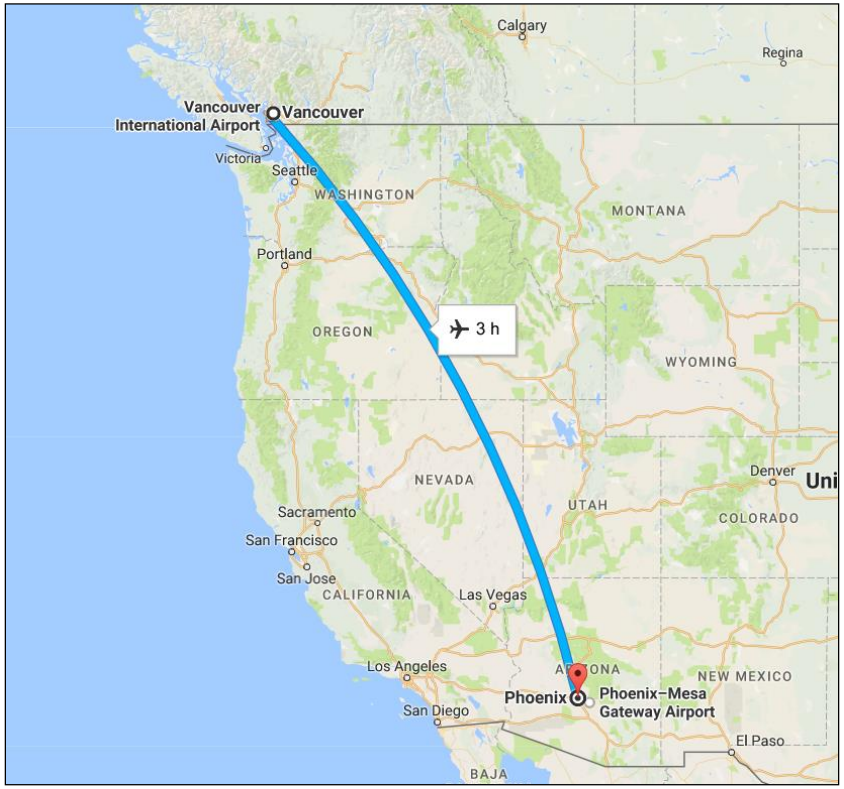
Southeast False Creek Neighbourhood Energy Utility

- Est. 2010, in time for Winter Olympics
- Waste thermal energy captured from sewage
- >60% reduction in heating GHGs
- Serves >395,000 m^2 (4,300,000 ft^2)

Source: City of Vancouver

Project Context

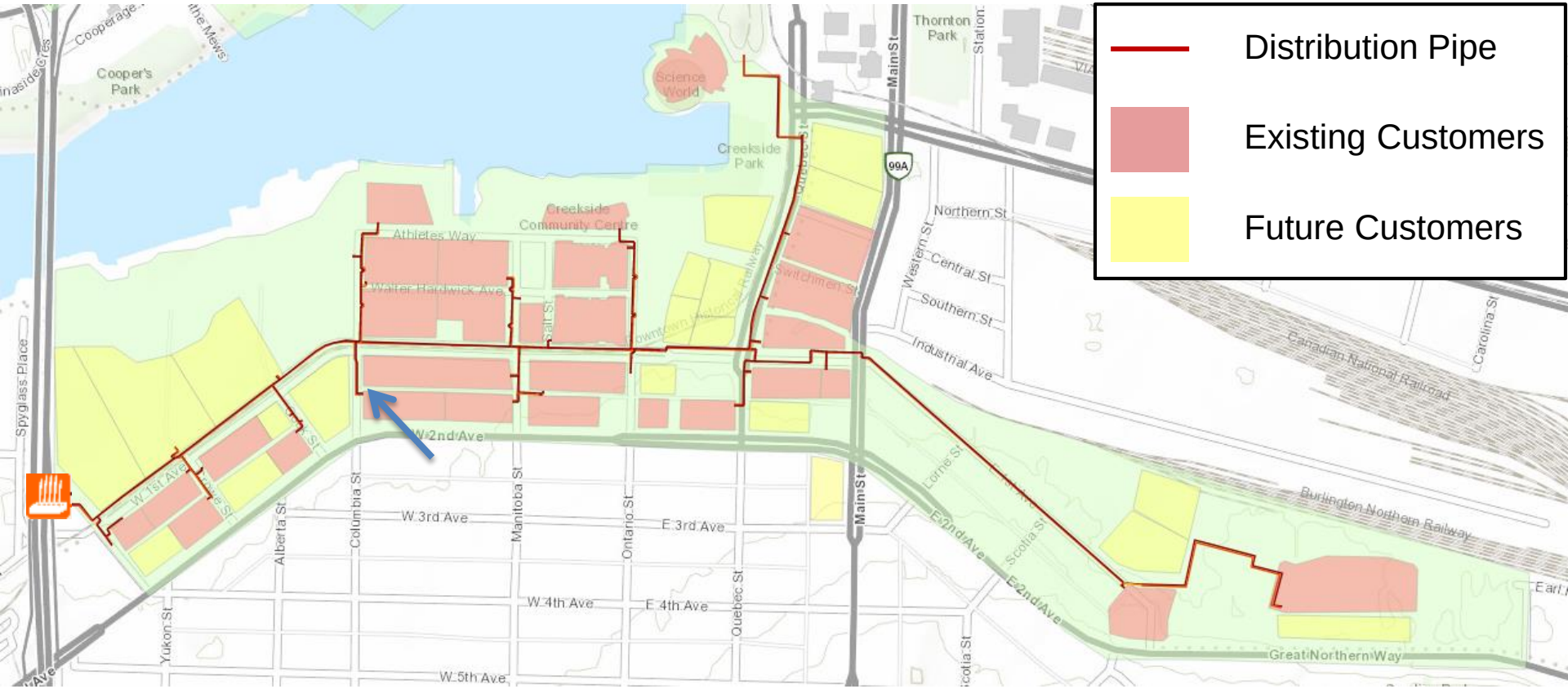
Southeast False Creek



Source: Google Maps

Vancouver to Phoenix

Project Context



PEX-R Piping

- **Reinforced, cross-linked polyethylene pipe**
  - 100 ºC (212 ºF) continuous
  - 16 Bar (240 psi)
  - NPS 50 – 160 mm (NPS 2” – 6”): consider wall thickness

PEX-R Piping Components

Piping

Fittings

Joint Tool

Joint

Joints

Steel to PEX-R

PEX-R to PEX-R

Cost Comparison

Pipe Type	PEX-R Piping	Thin wall steel
Engineering	Simpler	-
Material Costs	+ 15-20 %	-
Civil Installation	Similar	Similar
Mechanical Installation	-	+ 25% longer
Labour required	Semi-skilled labour	Skilled labour (welder)
Quality control	Visual check	X-ray test
Pipe Handling	More challenging (new)	-

- PEX-R piping is more expensive to procure but cheaper to install.

Schedule Comparison

Pipe Type:	PEX-R Piping	Thin wall steel
Procurement Time	Similar	Similar
Civil Installation Time	Similar	Similar
Mechanical Installation	-	+ 25% longer
Pipe joining (70 lin.m)	4 joints (~4 hrs)	24 joints (~75 hrs)
Expansion compensation	n/a	Pre-stress / additional joints
Pipe Handling	Longer (uncoiling)	-
Unexpected utilities	-	Longer

- PEX-R piping is quicker to install.

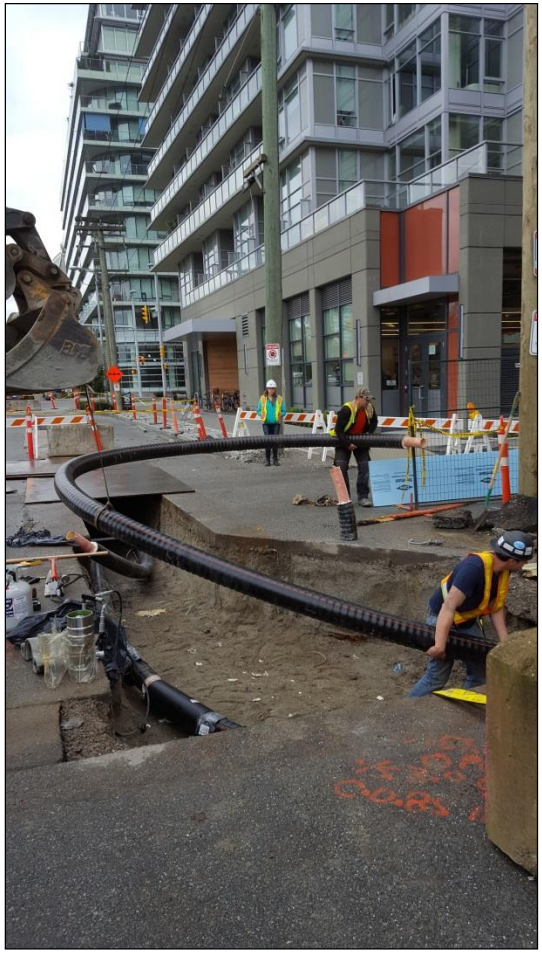
PEX-R Installation – High Point

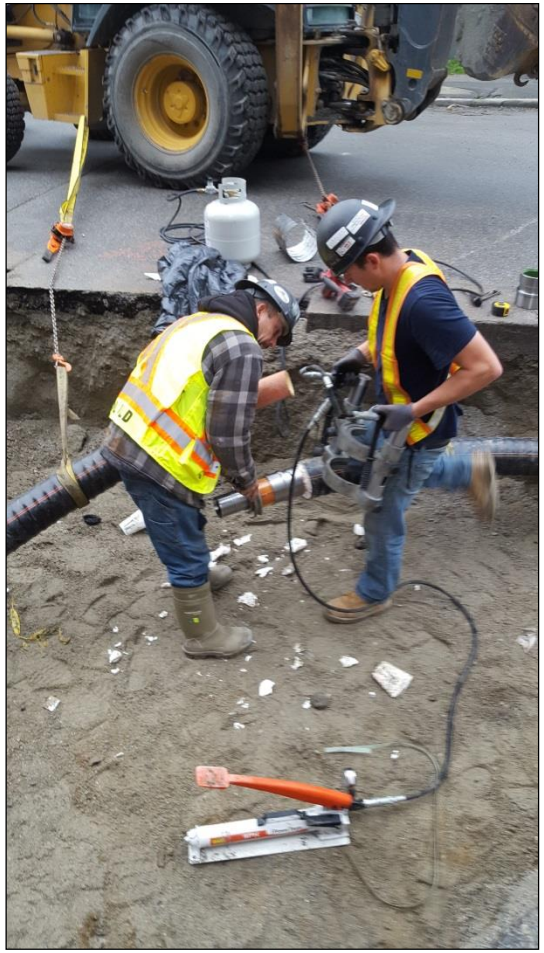
- Gas main crossing
  - 150 mm (6”) clearance required
- Creates high point
  - No corrosion concern
  - Limit air pockets
- Option: use tee fitting

PEX-R Installation – Flexibility

- Utility conflicts
  - Add joint to pipe to maneuver through
  - Saves redesign effort
- Uncoiling is hard in cold weather
  - Propane heater (carefully)
  - Store somewhere warm

PEX-R Installation





Pros & Cons

Pros

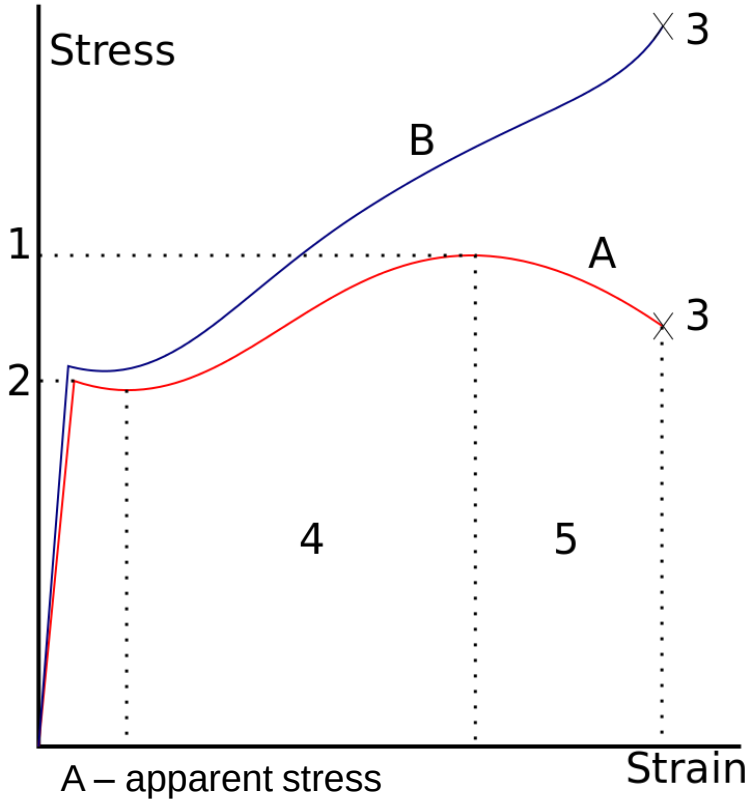
- Fewer joints
- Semi-skilled labour (no welding)
- Easy to design around utility conflicts
- Quick to install long, uninterrupted stretches
- Self-compensating (for thermal expansion)
- Does not rust

Cons

- Challenging to manipulate large segments
- Difficult to handle when cold outside (need to heat pipe)
- No leak detection
- Quality control (cannot X-ray)
- Failure mode

Failure Modes

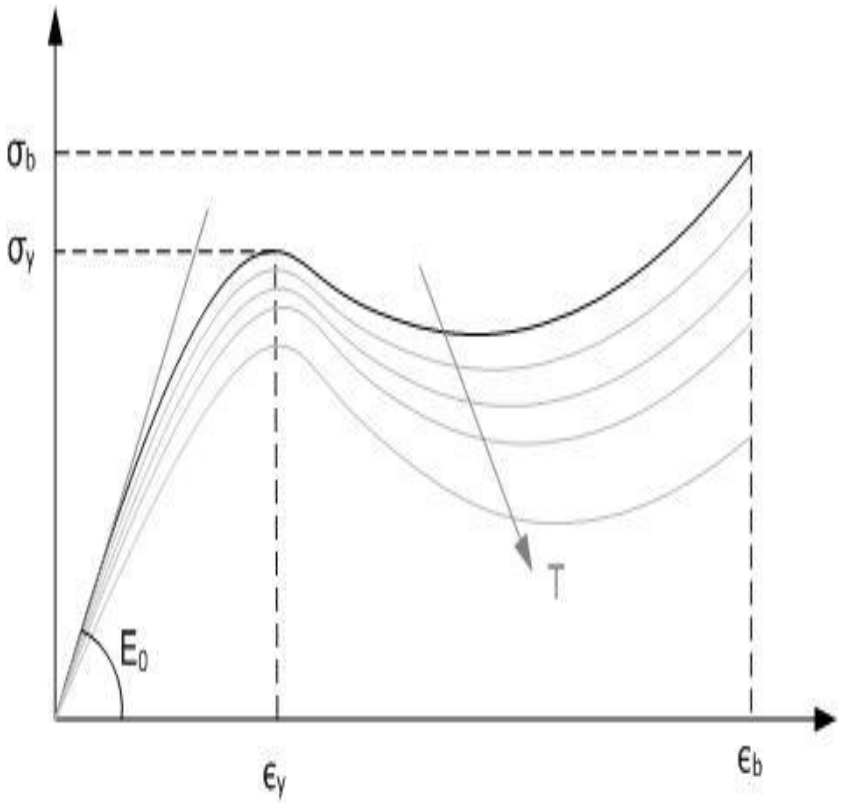
Carbon Steel



A – apparent stress

B – actual stress

PEX



Source: Wikipedia

Project Takeaways

- Consider PEX-R when:
  - ≤ 5” NPS; ≤ 212 ºF; ≤ 240 psi
  - It’s warm outside (more flexible)
  - Long uninterrupted sections
  - Corrosion is a concern
  - Schedule is tight

- Don’t forget to:
  - Order extra tee fittings (for vents) and PEX-PEX joints
  - Plan for failure (add valves, pressure sensors, etc.)

Questions

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