meridian

Intake Screen Refurbishment across Meridian's Assets

Managing uncertainty and risk
APEX 2016

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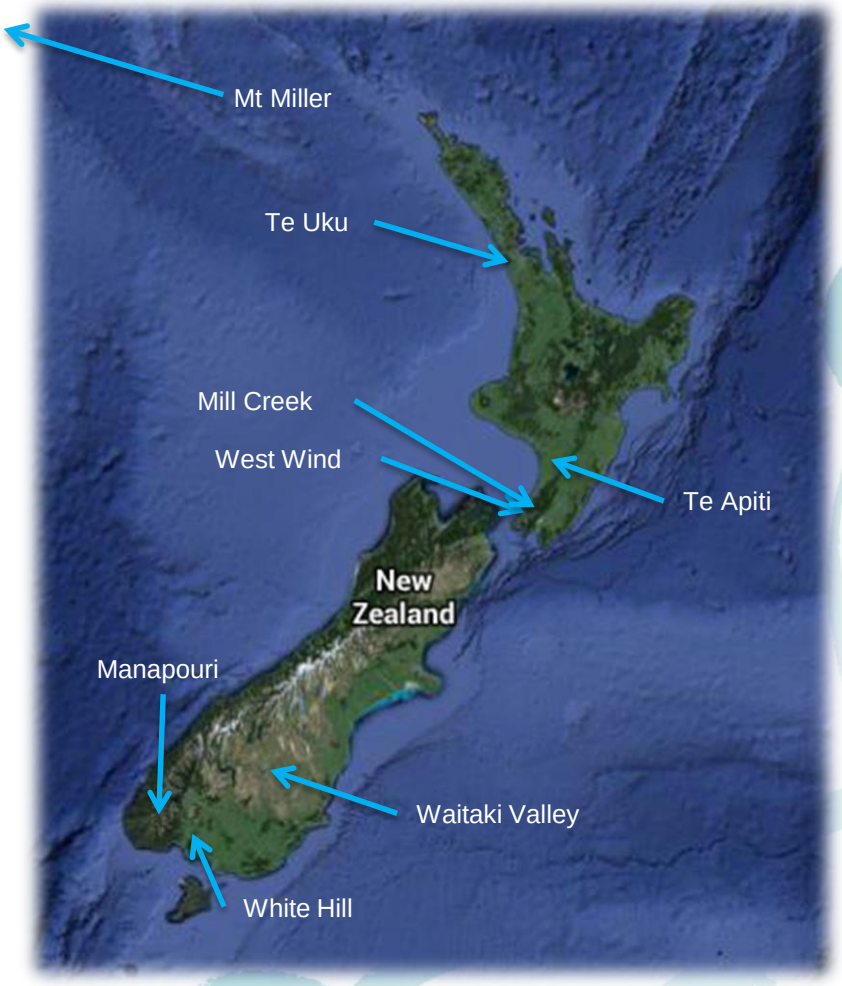
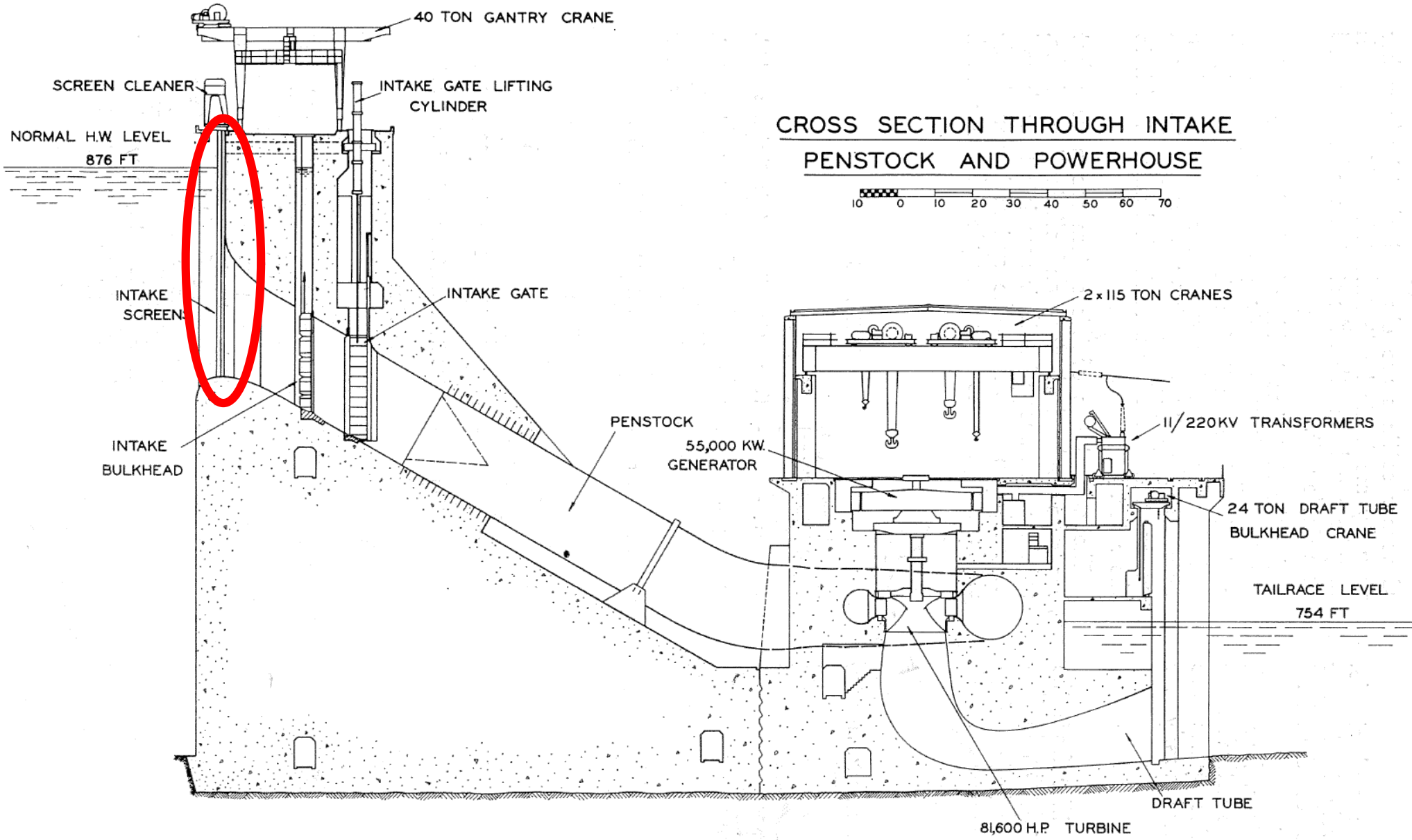
Meridian at a Glance

- Electricity generator and retailer
- Generates from only renewable sources (Wind, Hydro)
- Owns and operates 7 hydro stations and 7 windfarms
- Three year graduate engineering program



Intake Screens



Intake Screens

The Problem

- Protection provided by galvanised coating (hot dip galvanised)
- Screens have not been touched since construction

The Problem

Uncertainty

- No standard methods
- Small factor of safety
- Large number of screens

Risk

- Damage
- Loss of production
- Cost

Inspection

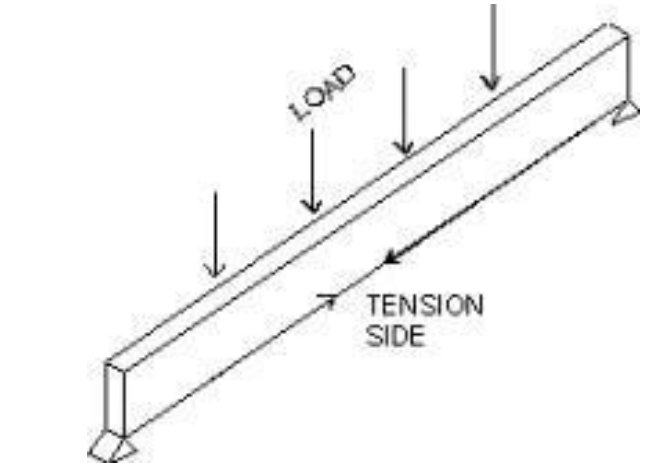
Above water line

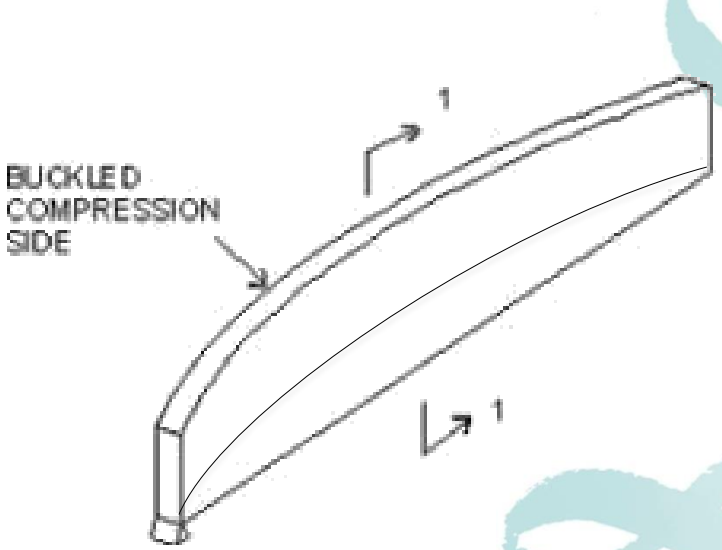
At water line

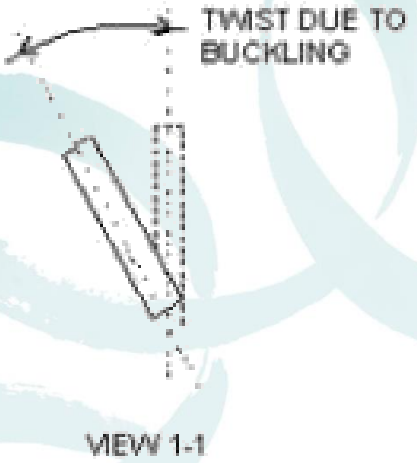
Below water line

Driving Failure Mode

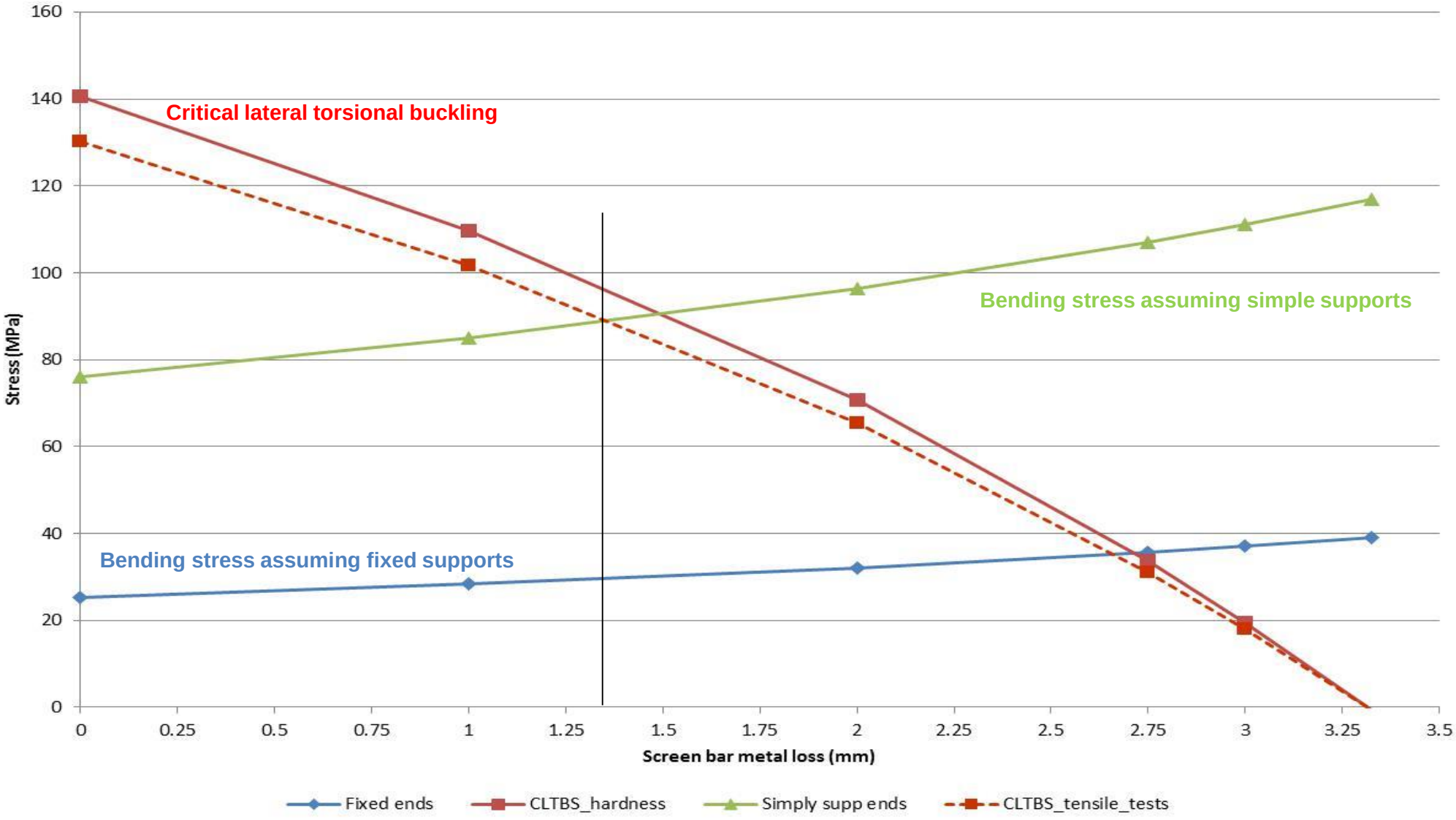
Lateral torsional buckling







Material loss calculation



Testing corroded screen bars

	A Extensive corrosion	B	C	D	E	F	G Light corrosion
Figure number showing wall loss	Figure 1		Figure 2		Figure 3		Figure 4
Ultimate tensile force (kN)	227	229	235	235	244	251	254
Effective cross sectional area (mm^2)	493	498	511	510	529	545	551
Metal loss (mm)	1.77	1.68	1.48	1.49	1.19	0.95	0.85

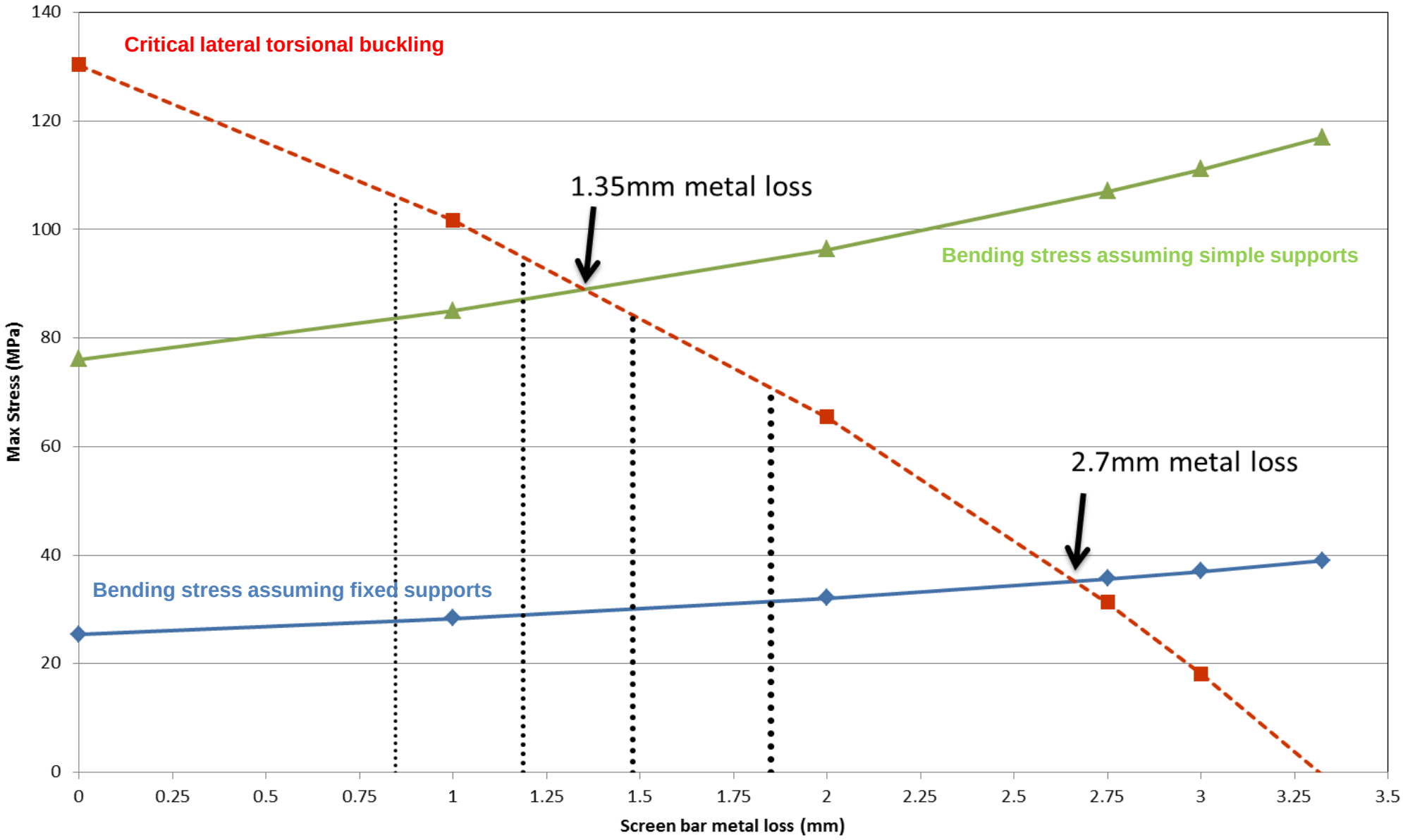
Figure 1 - Bar A metal loss 1.77mm

Figure 2 - Bar C Metal loss 1.48mm

Figure 3 - Bar E Metal loss 1.19mm

Figure 4 - Bar G Metal loss 0.85mm

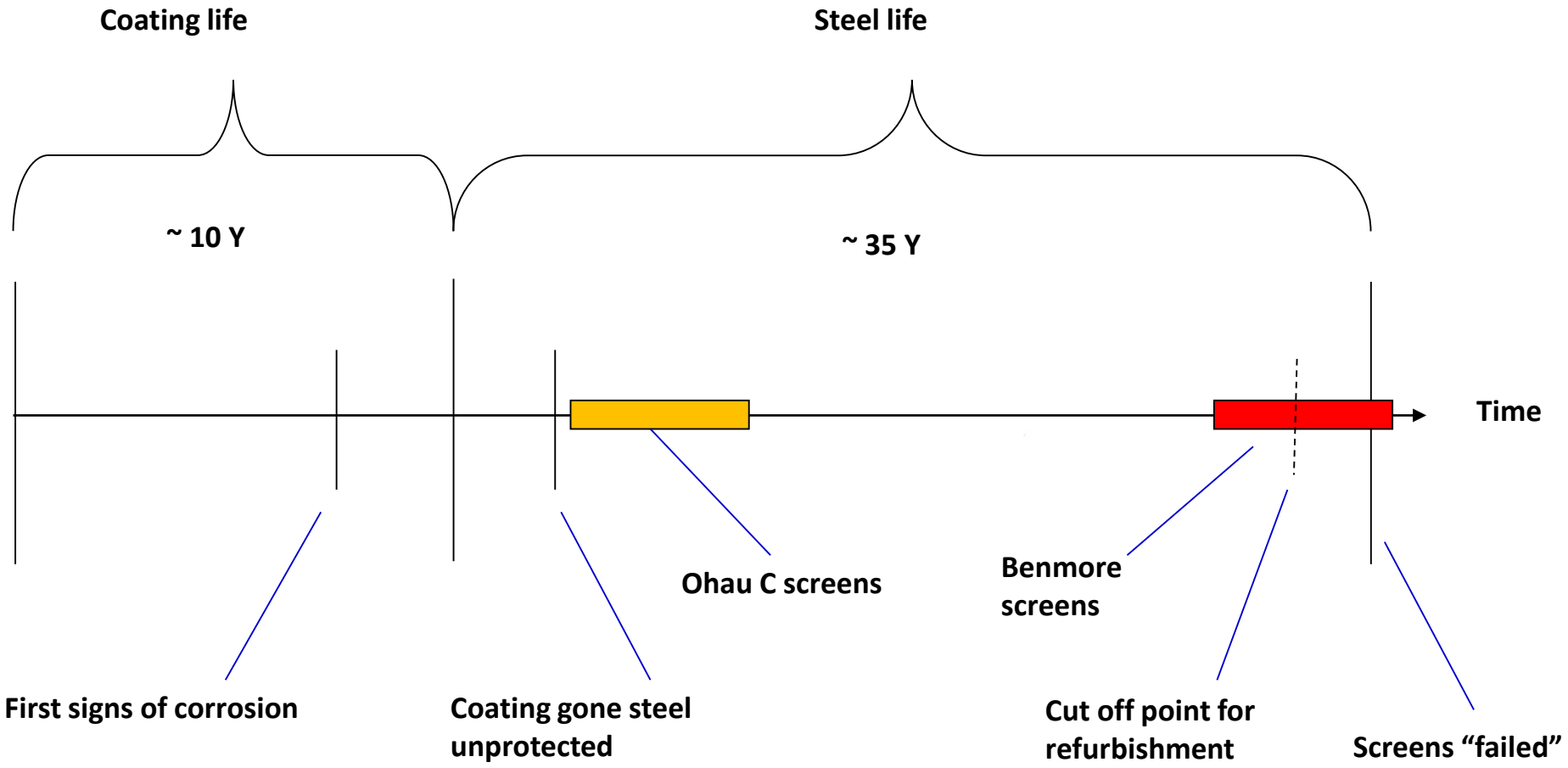
Material Loss



On Site Application

- Water blast screens
- Lay them out in bright light
- Gain a feel for the samples and bars
- Compare the test bars with the screen bars
  - Compare with the best of the worst and the worst of the best
  - Look for pit depths
  - Look for profile loss (leading edge)

Coating and Structure Life Cycle



Intake Screens - Coating Options

Hot dip galvanising 5-10 years

Epoxy Paint 20+ years

Duplex 40+ years

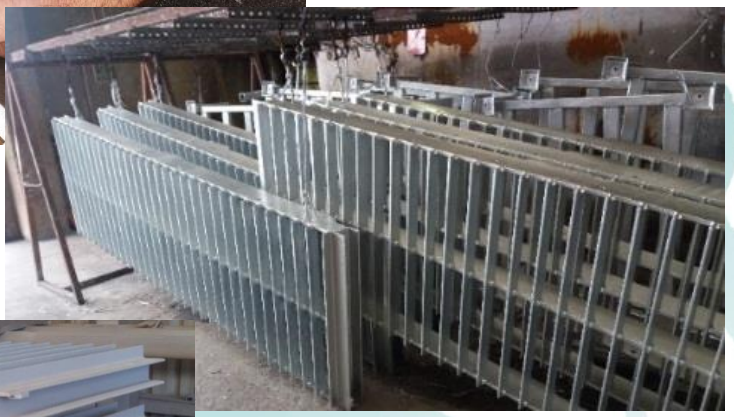
	Average Refurbishment costs (per unit)	*On-going coating costs*	*Life (years)*
Painting	$ 116,000	$ 61,000	20
Galvanising	$ 137,000	$ 84,000	5
Duplex	$ 168,000	$ 115,000	40 +

Duplex option

- Best of both coating systems
- Creates a synergistic relationship between the HDG and Paint systems
- Increases the life of the coating by 1.5 – 2.3 time the sum of the life of the individual coatings – 35 to 55+ year coating life
- Allow for short term protection due to impact damage

Coating Preparation

1. Grit blast to remove all existing galvanising and any rust nodules
2. Hot dip galvanise to minimum of 85µm thickness for steel over 6mm thick
3. Surface preparation for paint is light shot blast
4. Two coats of Interzone 954 (two pot epoxy) to a minimum thickness of 750µm.



Install Methodology

- Rotable spare sets of screens manufactured
- Multiple unit outages – due to common manifold
- Change out time frame approximately 12 – 14 hours per unit
- Use of headgate crane and HIAB crane to handle the screens
- Care taken during install to not damage the paint coating
- Pick a fine weekend

Questions?