

Appendix B - Non-Circular Design Curves - Tender No. 599-2023

Thickness Requirements for CIPP Egg Shaped Liners

Design Information							Design Thickness shall be the greater of Eq. 1 & Eq. 2					
							Eq. 1 - Select Based on σ_{LT} Range			Eq. 2 - Select Based on E_{LT} Range		
							Long Term Flexural Strength Range (MPa)			Long Term Flexural Modulus Range (MPa)		
Asset ID	Shape	Height (mm)	Width (mm)	ASCE MOP 145 State	Live Load Model	Depth (m)	$\sigma_{LT} = 15.5$	$\sigma_{LT} = 21$	$\sigma_{LT} = 27.5$	$E_{LT} = 1000$	$E_{LT} = 1500$	$E_{LT} = 2000$
S-MA50014578	Egg	1125	750	State II	HS-25	5.03	$t = 162.50E_{LT}^{-0.281}$	$t = 293.57E_{LT}^{-0.366}$	$t = 319.70E_{LT}^{-0.378}$	$t = 24.60\sigma_{LT}^{-0.015}$	$t = 23.97\sigma_{LT}^{-0.053}$	$t = 27.850\sigma_{LT}^{-0.134}$
S-MA70019662	Egg	1200	900	State II	HS-25	6.17	$t = 121.53E_{LT}^{-0.214}$	$t = 250.40E_{LT}^{-0.323}$	$t = 329.34E_{LT}^{-0.362}$	$t = 32.03\sigma_{LT}^{-0.053}$	$t = 36.05\sigma_{LT}^{-0.133}$	$t = 45.66\sigma_{LT}^{-0.238}$
S-MA50007563	Egg	1200	750	State II	HS-25	7.27	$t = 80.48E_{LT}^{-0.132}$	$t = 171.04E_{LT}^{-0.251}$	$t = 330.74E_{LT}^{-0.348}$	$t = 47.01\sigma_{LT}^{-0.139}$	$t = 66.88\sigma_{LT}^{-0.290}$	$t = 87.86\sigma_{LT}^{-0.399}$

t = design thickness (mm)

σ_{LT} = Long Term Flexural Strength (MPa)

E_{LT} = Long Term Flexural Modulus (MPa)

Design Method: ASCE MOP 145 Rigid Pipe Design

Applicable Long Term Flexural Strength: 15.5 MPa to 27.5 MPa

Applicable Long Term Flexural Modulus: 1000 MPa to 2000 MPa

Soil Density: 18.85 kN/m³

Modulus of Soil Reaction: 6.890 MPa

Assumed Ground Water Table: 2.0 m below ground surface