

Appendix B - Non-Circular Design Curves - Tender No. 600-2023

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)	$\sigma_{LT} = 15.5$ to 18.5	$\sigma_{LT} = 18.6$ to 21	$\sigma_{LT} = 21.1$ to 27.5	$E_{LT} = 1000$ to 1250	$E_{LT} = 1251$ to 1750	$E_{LT} = 1751$ to 2000
S-MA20015402	Egg	1550	1200	State II	HS-25	6.42	$t = 138.43E_{LT}^{-0.242}$	$t = 308.19E_{LT}^{-0.362}$	$t = 459.08E_{LT}^{-0.419}$	$t = 30.45\sigma_{LT}^{-0.056}$	$t = 36.04\sigma_{LT}^{-0.161}$	$t = 46.92\sigma_{LT}^{-0.276}$
S-MA20015397	Egg	1550	1200	State II	HS-25	7.04	$t = 105.19E_{LT}^{-0.169}$	$t = 213.94E_{LT}^{-0.282}$	$t = 411.12E_{LT}^{-0.377}$	$t = 45.93\sigma_{LT}^{-0.126}$	$t = 64.50\sigma_{LT}^{-0.277}$	$t = 81.15\sigma_{LT}^{-0.376}$
S-MA20015403	Egg	1550	1200	State II	HS-25	6.27	$t = 121.34E_{LT}^{-0.212}$	$t = 277.44E_{LT}^{-0.338}$	$t = 486.34E_{LT}^{-0.418}$	$t = 34.82\sigma_{LT}^{-0.079}$	$t = 42.77\sigma_{LT}^{-0.193}$	$t = 60.43\sigma_{LT}^{-0.333}$
S-MA20015405	Egg	1550	1200	State II	HS-25	6.06	$t = 141.13E_{LT}^{-0.248}$	$t = 317.40E_{LT}^{-0.369}$	$t = 427.41E_{LT}^{-0.411}$	$t = 28.72\sigma_{LT}^{-0.043}$	$t = 32.45\sigma_{LT}^{-0.132}$	$t = 42.14\sigma_{LT}^{-0.247}$
S-MA20015374	Egg	1550	1200	State II	HS-25	7.30	$t = 109.55E_{LT}^{-0.191}$	$t = 262.16E_{LT}^{-0.324}$	$t = 493.46E_{LT}^{-0.415}$	$t = 37.25\sigma_{LT}^{-0.089}$	$t = 49.46\sigma_{LT}^{-0.227}$	$t = 69.29\sigma_{LT}^{-0.363}$

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