Formulas for Single-Layer Tensegrity Structures

Six-strut Tensegrity (Tetrahedral)

for strut length 2:

$$d = \frac{4\sin^2\phi - 1 + \sqrt{1 + 8(1 - 2\sin^2\phi)^2}}{4\cos\phi}$$

$$short = \sqrt{2}\sqrt{d^2 - d(\cos\phi + \sin\phi) - \cos\phi\sin\phi + 1}$$

$$long = \sqrt{2}\sqrt{d^2 - d(\cos\phi - \sin\phi) + \cos\phi\sin\phi + 1}$$

Twelve-strut Tensegrity (Octahedral)

for strut length 2:

$$d = \frac{\frac{\sqrt{2}}{2} - \sin\phi\cos\phi \pm \sqrt{4\sin^2\phi\cos^2\phi + \frac{1}{2}}}{\cos\phi + \sqrt{2}\sin\phi}$$

$$short = \sqrt{d^2 - 2\sqrt{2}d\cos\phi - \cos^2\phi + 3}$$

$$long = \sqrt{d^2 - 2d\sin\phi + \cos^2\phi + 1}$$

— John Kirk