Saddle Load QL (Wind/Seismic contribution)	QL	6028.9	N
Maximum Transverse Force	Ft	10617.3	N
Maximum Longitudinal Force	Fl	11053.0	N
Saddle Bolted to Steel Foundation		No	

Bolt Area Calculation per Dennis R. Moss

Bolt Area Requirement Due to Longitudinal Load [Bltarearl]:
= 0.0 (QO > QL --> No Uplift in Longitudinal direction)

Bolt Area due to Shear Load [Bltarears]:
= Fl / (Stba * Nbolts)
= 11052.96 / (172.38 * 8.00)
= 8.0159 mm²

Bolt Area due to Transverse Load

Moment on Baseplate Due to Transverse Load [Rmom]:
= B * Ft + Sum of X Moments
= 1828.80 * 10617.27 + 0.00
= 19424742.00 N-mm

Eccentricity (e):
= Rmom / QO
= 19424742 / 25166.08
= 771.55 mm > Bplen/6 --> Uplift in Transverse direction

f = Bplen / 2 - Edgedis
= 2316.48 / 2 - 50.80
= 1107.44 mm

Modular Ratio Of Steel/Concrete (n1):
= ES / EC
= 203402.50 / 21526.32
= 9.45

K1 = 3 (e - 0.5 * Bplen)
= 3 (771.55 - 0.5*2316.48)
= -1160.07 mm

K2 = 6 * n1 * At / Bpwid * (f + e)
= 6 * 9.45 * 779.35 / 254.00 * (1107.44 + 771.55)
= 326860.70 mm ²

K3 = -K2 * (0.5 * Bplen + f)
= -326860.69 * (0.5 * 2316.48 + 1107.44)

= -740561677.81 mm ³

Iteratively Solving for the Effective Bearing Length:

$Y^3 + K1 * Y^2 + K2 * Y + K3 = 0$

$Y^3 + -1160.07 * Y^2 + 326860.69 * Y + -0.7E+09 = 0$

$Y = 1332.06$ mm

Num = (Bplen / 2 - Y / 3 - e)
= (2316.48 / 2 - 1332.06 / 3 - 771.55)
= -57.33

Denom = (Bplen / 2 - Y / 3 + f)
= (2316.48 / 2 - 1332.06 / 3 + 1107.44)
= 1821.66

Total Bolt Tension Force [Tforce]:
= - Q0 * Num / Denom
= - 25166.08 * -57.33 / 1821.66
= 791.98 N

Bolt Area Required due to Transverse Load [Bltareart]
= Tforce / (Stba * Nbt)
= 791.98 / (172.38 * 4.00)
= 1.1487 mm²

Required of a Single Bolt [Bltarear]
= max[Bltarearl, Bltarears, Bltareart]
= max[0.0000 , 8.0159 , 1.1487]
= 8.0159 mm²

Baseplate Thickness Calculation per D. Moss:

Bearing Pressure (fc)
= 2 * (Q0 + Tforce) / (Y * Bplen)
= 2 * (25166.08 + 791.98) / (1332.06 * 2316.48)
= 0.02 MPa

Distance from Baseplate Edge to the Web [ADIST]:
= (Bplen - Weblngth) / 2
= (2316.48 - 2265.68) / 2
= 25.4000 mm

Overturning Moment due To Bolt Tension [Mt]:
= Tforce * Adist
= 791.98 * 25.40

= 20124.53 N-mm

Equivalent Bearing Pressure (f1):
= fc * (Y - Adist) / Y
= 0.02 * (1332.06 - 25.40) / 1332.06
= 0.02 MPa

Overturning Moment due to Bearing Pressure [Mc]:
= (Adist² * Bpwid / 6) * (f1 + 2 * fc)
= (25.40² * 254.00 / 6) * (0.02 + 2 * 0.02)
= 1370.34 N-mm

Baseplate Required Thickness [Treq]:
= (6 * max(Mt,Mc) / (Bpwid * Sba))½
= (6 *max(20124.53 ,1370.34 / (254.00 * 142.73))½
= 1.8247 mm

ASME Horizontal Vessel Analysis: Stresses for the Right Saddle
(per ASME Sec. VIII Div. 2 based on the Zick method.)

*Warning: Wear Pad Width is less than 1.56*sqrt(rm*t) and less than 2a.*
The wear plate will be ignored.

Minimum Saddle Width [b1]:
= min(b + 1.56*sqrt(Rm * t), 2a)
= min(203.200 + 1.56*sqrt(1228.4075 * 12.0650), 2 * 1320.800)
= 393.1151 mm

Input and Calculated Values:

Vessel Mean Radius	Rm	1228.41	mm
Tangent to Tangent Length	L	4673.60	mm
Distance from Saddle to Vessel tangent	a	660.40	mm
Saddle Width	b	203.20	mm
Saddle Bearing Angle	theta	120.00	degrees
Inside Depth of Head	h2	612.78	mm
Shell Allowable Stress used in Calculation		137.90	MPa
Head Allowable Stress used in Calculation		137.90	MPa
Saddle Force Q, Operating Case		49277.21	N

Horizontal Vessel Analysis Results:	**Actual**	**Allowable**