Skirt Data :

Skirt Outside Diameter at Base	SOD	4130.0000	mm
Skirt Thickness	STHK	14.0000	mm
Skirt Internal Corrosion Allowance	SCA	1.0000	mm
Skirt External Corrosion Allowance		1.0000	mm
Skirt Material		SA-285 C	

Basering Input: Type of Geometry: Continuous Top Ring W/Gussets

Thickness of Basering	TBA	42.0000	mm
Design Temperature of the Basering		60.00	°C
Basering Matl		SA-285 C	
Basering Operating All. Stress	BASOPE	1103.80	kgf/cm²
Basering Yield Stress		2008.00	kgf/cm²
Inside Diameter of Basering	DI	3950.0000	mm
Outside Diameter of Basering	DOU	4350.0000	mm
Nominal Diameter of Bolts	BND	30.0000	mm
Bolt Corrosion Allowance	BCA	1.5000	mm
Bolt Material		SA-36	
Bolt Operating Allowable Stress	SA	1167.10	kgf/cm²
Number of Bolts	RN	28	
Diameter of Bolt Circle	DC	4240.0000	mm
Bolt Allowable Shear Stress		1530.000	kgf/cm²
Ultimate Comp. Strength of Concrete	FPC	255.0	kgf/cm²
Allowable Comp. Strength of Concrete	FC	117.0	kgf/cm²
Modular ratio Steel/Concrete		8.000	
Thickness of Gusset Plates	TGA	12.0000	mm
Width of Gussets at Top Plate	TWDT	100.0000	mm
Width of Gussets at Base Plate	BWDT	100.0000	mm
Gusset Plate Elastic Modulus	E	2044309.9	kgf/cm²
Gusset Plate Yield Stress	SY	2008.0	kgf/cm²
Height of Gussets	HG	73.0000	mm
Distance between Gussets	RG	70.0000	mm
Dist. from Bolt Center to Gusset (Rg/2)	CG	35.0000	mm
Number of Gussets per bolt	NG	2	
Thickness of Top Plate or Ring	TTA	40.0000	mm
Radial Width of the Top Plate	TOPWTH	100.0000	mm
Anchor Bolt Hole Dia. in Top Plate	BHOLE	33.0000	mm
External Corrosion Allowance	CA	2.0000	mm
Dead Weight of Vessel	DW	74236.6	kgf
Operating Weight of Vessel	ROW	266153.1	kgf
Earthquake Moment on Basering	EQMOM	493311.0	kgf-m.
Wind Moment on Basering	WIMOM	89739.1	kgf-m.
Percent Bolt Preload	ppl	100.0	
Use AISC A5.2 Increase in Fc and Bolt Stress		No	
Use Allowable Weld Stress per AISC J2.5		No	
Factor for Increase of Allowables	Fact	1.0000	

Results for Brownell and Young Basering Analysis : Analyze Option

Note: This analysis is based on Neutral Axis shift method for Steel on Concrete (or a material with significantly different Young's modulus).

Governing Bolt Load Condition, Earthquake + Operating Condition:

Area Available in 1 Bolt (corroded)	Abss :	3.9078	cm²
Area Available in all the Bolts	Abss * RN :	109.4189	cm²

Trial#	k	knew	Cc	Ct	z	j	Ft	Fc
2	0.707	0.560	2.457	1.491	0.342	0.781	32519.7	46294.5
4	0.487	0.450	1.970	2.030	0.396	0.785	14033.3	43429.0

checking for trial#2
Ft=Mwind-Wdwzd / jd (eq.10.24)
Ft= Mearthquake (governing) -Wdwzd / jd
Ft= (493311.0kgf-m-74236.6 kgf *0.342*4242mm) / 0.781*4240mm
Ft= 493311.0 kgf-m-107699.78 kgf-m / 3.31144m
Ft= 116448.19 kgf
Ft+Wdw-Fc = 0 (eq.10.27)
hence Fc = 116448.19 kgf + 74236.6kgf
Fc = 85880.79 kgf

FileName : 1211_12-V-003 _kg
Basering Calculations : Step: 17

6	0.469	0.460	1.928	2.071	0.400	0.785
8	0.455	0.457	1.896	2.102	0.403	0.785
10	0.456	0.457	1.898	2.099	0.403	0.785
11	0.457	0.457	1.900	2.098	0.403	0.785

The Actual Stress in a Single Bolt [Sbolt]:
= 2 * Ft / (T1 * Dc * Ct)
= 2 * 11661.3/(0.821 * 4240.000 * 2.098)
= 319.171 kgf/cm² , Should be less than 1167.1

Thickness of the Band of Bolting Steel [T1]
= RN * Bolt Area / (3.14159 * Dc)
= 28 * 3.908/(3.14159 * 4240.000)
= 0.821 mm

Check the Bearing Stress in the Concrete [fc(max)]
= fc`[(2kd + t3) / (2kd)]
= 216.287[(2*0.457*4240.000+200.000)/(2*0.457*4240.000)]
= 35.256 kgf/cm² , Should be less than 117.0

Values for table 10.3, l = 110.000 , b = 237.863 , l/b = 0.462450

Maximum Moment per unit width [Mmax]:
= Max(Mx, My) = Max(487.840 , 1465.607) = 1465.607 kgf

Reqd Thickness of Basering, Brownell & Young Method [T]:
= (6 * Mmax / fallow)½ + Ca
= (6 * 1465.607/1325.3)½ + 2.000
= 27.759 mm

Nomenclature:

a = (Dc-Ds)/2	Skirt Distance to Bolt Circle
P = Sa * Abss	Maximum Load on one Bolt
l = Avgwdt	Average Gusset Width
g1 = Gamma 1	Constant Term f(b/l)
g2 = Gamma 2	Constant Term f(b/l)
g = Flat distance / 2	Nut 1/2 Dimension (from Tema)
Fb	Allowable Bending Stress

Values for table 10.6, l = 100.000 , b = 70.000 , b/l = 0.700000
As b/l (0.700) is less than 1, inverting b/l = 1.429 .

Moment Term, based on geometry [Mo]:
= P/(4pi) [1.3(ln((2lsin(pi*a/l)/(pi*g))) + 1] - [(0.7-g2)P/(4pi)]
= 4560.81/(4*3.14) [1.3(ln((2*100.000 *SIN(3.14* 55.000/100.000))/
(3.14 * 25.000))) + 1] - [(0.7 - 0.079)* 4560.81/(4 * 3.14)]
= 572.7263 kgf

Required Thickness of Continuous Top Ring [Tc]:
= (6 * Abs(Mo) / Fb)½ + Ca
= (6 * Abs(572.73)/1655.70)½ + 2.0000
= 16.4065 mm

Required Gusset Plate Thickness [tg]:
= P / (Stress Term * l) + Ca
= 4560.81/(1265.5260 * 110.000) + 2.000
= 11.525 (not less than 9.525 + 2.000) mm

Bolt spacing [m]:
= pi * Bolt Circle Diameter / number of Bolts
= 3.142 * 4240.00/28 = 475.727 mm

Req. Skirt Thk. to withstand Local Bending, (Brownell and Young) [t]:
= 1.76 * (P*a/(m * (h + tba) * 1.5 * Sktope))$^{2/3}$ * r$^{1/3}$ + Ca
= 1.76*(4560*55.000/(475.73*115.00*1655))$^{2/3}$*2065.00$^{1/3}$+Ca
= 9.522 + 2.000 = 11.522 mm

Shear Stress in a Single Bolt [taub]:
= Shear Force / (2 * Bolt Area * Number of Bolts)

= 28939/(2 * 3.91 * 28)
= 132.2 kgf/cm². Must be less than 1530.0 kgf/cm² .

Summary of Basering Thickness Calculations

Required Basering Thickness (tension)	27.7591	mm
Actual Basering Thickness as entered by user	42.0000	mm
Required Thickness of Chair Cap	16.4065	mm
Actual Top Ring Thickness as entered by user	40.0000	mm
Required Gusset thickness, + CA	11.5250	mm
Actual Gusset Thickness as entered by user	12.0000	mm
Required Thickness of Skirt for Local Stress	11.5220	mm
Given Thickness of Skirt	14.0000	mm
Required Gusset Height to meet local stress	39.2860	mm

Weld Size Calculations per Steel Plate Engineering Data - Vol. 2

Compute the Weld load at the Skirt/Base Junction [W]
= SkirtStress * (SkirtThickness - CA)
= 487.012 * (14.000 - 2.000)
= 58.44 kgf/mm

Results for Computed Minimum Basering Weld Size [BWeld]
= W / [(0.4 * Yield) * 2 * 0.707]
= 58/[(0.4 * 1965) * 2 * 0.707]
= 5.256 mm

Results for Computed Minimum Gusset and Top Plate to Skirt Weld Size

Vertical Plate Load [Wv]
= Bolt Load / (Cmwth + 2 * (Hg + Tta))
= 4560.8/(176.500 + 2 * (73.000 + 40.000))
= 11.331 kgf/mm

Horizontal Plate Load [Wh]
= Bolt Load * e / (Cmwth * (Hg+Tta) + 0.6667 * (Hg+Tta)²)
= 4560.8 * 55.000/(176.500 * (113.000) + 0.6667 * (113.000)²)
= 8.815 kgf/mm

Resultant Weld Load [Wr]
= (Wv² + Wh²)½
= (11.33² + 8.81²)½
= 14.356 kgf/mm

Results for Computed Min Gusset and Top Plate to Skirt Weld Size [GsWeld]
= Wr / [(0.4 * Yield) * 2 * 0.707]
= 14.36/[(0.4 * 1965) * 2 * 0.707]
= 1.291 mm

Results for Computed Minimum Gusset to Top Plate Weld Size

Weld Load [Wv]
= Bolt Load / (2 * TopWth)
= 4560.8/(2 * 100.000)
= 22.804 kgf/mm

Weld Load [Wh]
= Bolt Load * e / (2 * Hgt * TopWth)
= 4560.8 * 55.00/(2 * 113.000 * 100.000)
= 11.099 kgf/mm

Resultant Weld Load [Wr]
= (Wv² + Wh²)½
= (22.80² + 11.10²)½
= 25.362 kgf/mm

Results for Computed Min Gusset to Top Plate Weld Size [GtpWeld]
= Wr / [(0.4 * Yield) * 2 * 0.707]
= 25.36/[(0.4 * 1965) * 2 * 0.707]
= 2.281 mm

Note: The calculated weld sizes need not exceed the component thickness framing into the weld. At the same time, the weld must meet a minimum size specification which is 3/16 in. (4.76 mm) or 1/4 in. (6.35 mm), depending on the component thickness.

Summary of Required Weld Sizes:

Required Basering to Skirt Double Fillet Weld Size	6.3500	mm
Required Gusset to Skirt Double Fillet Weld Size	4.7625	mm
Required Top Plate to Skirt Weld Size	6.3500	mm
Required Gusset to Top Plate Double Fillet Weld Size	2.2809	mm