

Horizontal Atmospheric Tank

Project **CEREBRO - EXEMPLOS**

Vessel Identification **DEMO-Tanque-CER-03**

1 - Main Characteristics

1.1	Type	Horizontal	
1.2	Operation	Atmospheric	
1.3	Useful Volume (V_{PU})	5000	L
1.4	Actual Volume (V_R)	5250	L
1.5	Total Volume (V_{TTV})	5250	L
1.6	Additional of Volume.....	5.00	%
1.7	Heads.....	Hemispherical	
1.8	Product maximum density	1300.00	kg/m ³
1.9	Overthickness (Little Corrosive Medium).....	1.50	mm
1.10	Shell Weld Efficiency(Not Radiographed)(ϵ_c)	0.70	
1.11	Head Weld Efficiency(Not Radiographed)(ϵ_t)	0.70	

2 - Geometry

2.1	Inside Diameter (D).....	1396	mm
2.2	Cylindric Length (H)	2500	mm
2.3	Liquid Height (H_{LL})	1252	mm
2.4	D/L ratio	0.56	
2.5	Shell Length (H_c)	2500	mm
2.6	Head's height (H_{TS})	701	mm
2.7	Tank Total Length (H_{TT})	3896	mm
2.8	Height from bottom to ground (H_{FP})	150	mm
2.9	Vessel total height (H_{TT})	1555	mm

3 - Material

3.1	Heads.....	User defined - Aço Carbono SAE 1010
3.2	Shell	User defined - Aço Carbono SAE 1010
3.3	Saddle Top Flange	User defined - Aço Carbono SAE 1010
3.4	Saddles (Stiffeners, Plates and Base0	User defined - Aço Carbono SAE 1010

4 - Plates Thickness

4.1	Heads(e_{ts})	3.18	mm
4.2	Shell(e_c)	4.76	mm
4.3	Saddle Top Flange(e_r)	5.00	mm
4.4	Stiffeners(e_n)	3.00	mm
4.5	Base Plate(e_b)	3.97	mm
4.6	Support Pad Plates(e_{cr})	0.00	mm

5 - Finish

5.1	Tank Inside Surface.....	Primer with finish in Epoxy
5.2	Tank External Surface	Primer with finish in Epoxy
5.3	Saddles	Primer with finish in Epoxy

6 - Saddle Net Weight

6.1	Saddle Top Flange(G_{fs})	6	kgf
6.2	Webs(G_a)	7	kgf
6.3	Stiffeners(G_n)	5	kgf
6.4	Base Plate(G_b)	4	kgf
6.5	Complete Saddle(G_s).....	22	kgf

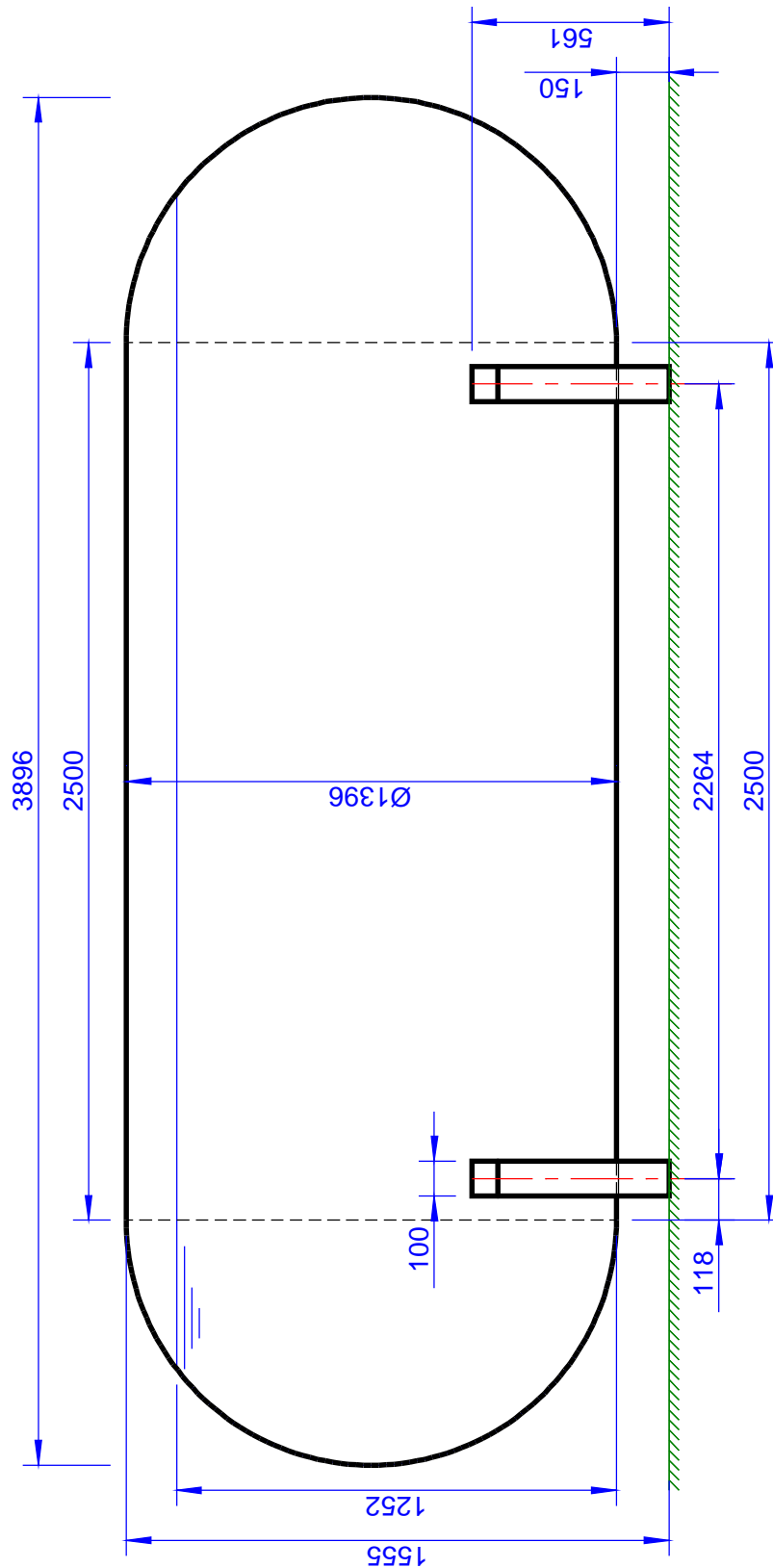
7 - Net Weight (without features)

7.1	Heads(G_i).....	187	kgf
7.2	Shell(G_c).....	410	kgf
7.3	Complete Saddles(G_s)	44	kgf
7.4	Empty Tank(G_v)	641	kgf
7.5	Tank with the Product(G_{tot})	7466	kgf

8 - Supporting System - Main Characteristics

8.1	Supporting	Saddles	
8.2	Number of Saddles	2	
8.3	Contact Angle(δ)	120	°
8.4	Saddle Length(L_b)	1217	mm
8.5	Saddle width(B_b)	100	mm
8.6	Saddle total height(B_n)	561	mm
8.7	Distance among stiffeners(L_n)	607	mm
8.8	Number of Stiffeners(N)	3	
8.9	Saddles Position(L_s)	118	mm

9 - Vessel (Dimensions)



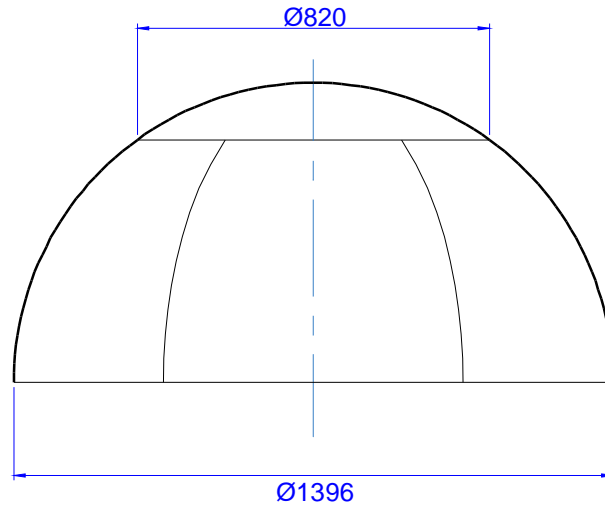
Head Report

10 - Main Data

10.1	Head Type	Hemispherical	
10.2	Inside Diameter.....	1,396	mm
10.3	Thickness.....	3.18	mm
10.4	Thin Out	0.00	mm
10.5	Material	User defined - Aço Carbono SAE 1010	
10.6	Density	7,850	kg/m ³
10.7	Crown diameter (d)	820	mm
10.8	Number of formed sections (N)	6	

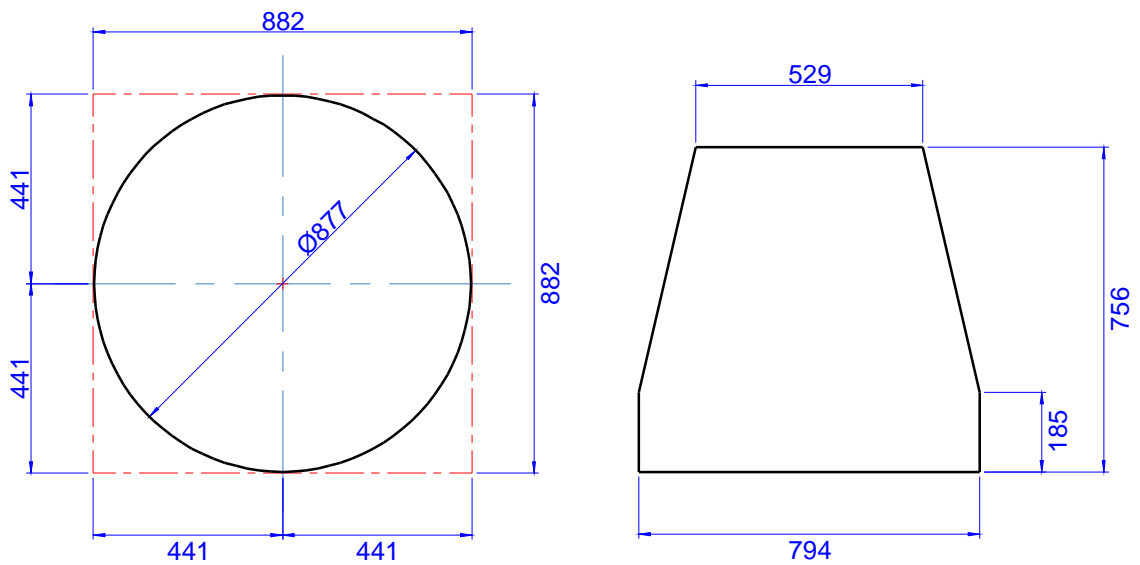
11 - Results

11.1	Bending radius (R).....	698	mm
11.2	Crown : Developed disc diameter (D _s)	877	mm
11.3	Crown net weight (P _{Lc}).....	15.07	kg
11.4	Crown gross weight (P _{Bc})	19.19	kg
11.5	Formed Section : Formed section bottom width (B)	794	mm
11.6	Formed section top width (b)	529	mm
11.7	Height of rectangular area of formed section	185	mm
11.8	Formed section height (A)	756	mm
11.9	Formed section net weight (P _{Lg})	13.09	kg
11.10	Formed section gross weight (P _{Bg})	14.98	kg
11.11	Head total volume(V _{total})	0.712	m ³
11.12	Head Net weight (P _L)	93.63	kgf
11.13	Head gross weight (P _B)	109.07	kgf



Head: Hemispherical (No scale)

Th.3.18mm



Crown and Formed Section Developed Plate (No scale)

Supporting Report

12 - Requirements in Supporting System

12.1	Wind Velocity (V_v)	0	km/h
12.2	Wind Deriving Strength (F_v)	0	kgf
12.3	Seismic Zone	0	
12.4	Seismic Empiric Coefficient (k_{ms})	0.00	
12.5	Horizontal Inertia Strength (F_{JH})	0	kgf
12.6	Horizontal Force (F_H)	0	kgf
12.7	Friction Force (F_a)	556	kgf
12.8	Friction Deriving Momentum (M_a)	-141	kgf.m
12.9	Saddle's weight (G_s)	3706	kgf
12.10	Longitudinal Bending Stress on the Saddles Position (σ_{1at})	25	kgf/cm ²
12.11	Longitudinal Bending Stress on the Tank Center (σ_{1b})	25	kgf/cm ²
12.12	Compressure Stress on the Saddles Position (σ_{1ac})	14	kgf/cm ²
12.13	Tangential Shearing Stress on the Shell (σ_{2a})	142	kgf/cm ²
12.14	Tangential Shearing Stress on the Head (σ_{2b})	309	kgf/cm ²
12.15	Additional stress on the head (σ_3)	141	kgf/cm ²
12.16	Circumferential Stress at the Saddle Edge (σ_4)	1692	kgf/cm ²
12.17	Circumferential Stress on the Shell (σ_5)	495	kgf/cm ²

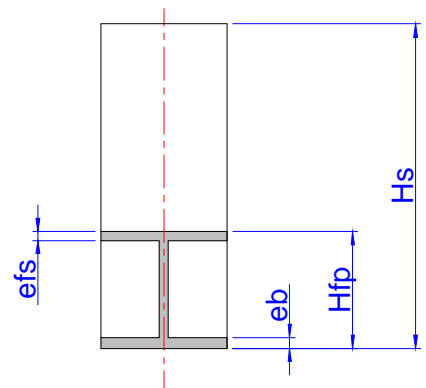
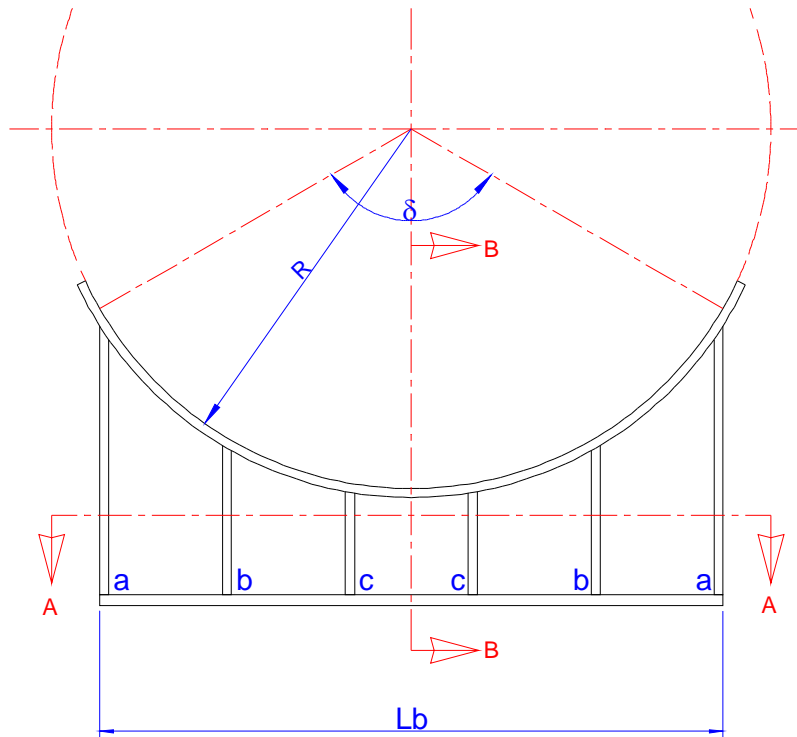
13 - Stresses Checking

13.1	Allowable Stress on the Tank (σ_a)	1800	kgf/cm ²
13.2	Material Drainage Stress on the Saddles (σ_{ys})	2109	kgf/cm ²
13.3	Combined Stress on the Stiffeners/Allowable Stress ($-0.526 < 1$)	OK	
13.4	$\sigma_{1at} + p_0R/2e_c \leq \epsilon \cdot \sigma_a$ ($25 \leq 1260$)	OK	
13.5	$\sigma_{1b} + p_0R/2e_c \leq \epsilon \cdot \sigma_a$ ($25 \leq 1260$)	OK	
13.6	$\sigma_{1ac} \leq \frac{1}{2} \cdot \sigma_y$ ($14 \leq 1055$)	OK	
13.7	$\sigma_{1b} \leq \frac{1}{2} \cdot \sigma_y$ ($25 \leq 1055$)	OK	
13.8	$\sigma_{s2a} \leq 0,8 \cdot \epsilon \cdot \sigma_a$ ($142 \leq 1008$)	OK	
13.9	$\sigma_{s2b} \leq 0,8 \cdot \epsilon \cdot \sigma_a$ ($309 \leq 1008$)	OK	
13.10	$\sigma_3 \leq 1,25 \cdot \epsilon \cdot \sigma_a$ ($141 \leq 1575$)	OK	
13.11	$\sigma_4 \leq 1,5 \cdot \epsilon \cdot \sigma_a$ ($1692 \leq 1890$)	OK	
13.12	$\sigma_5 \leq \frac{1}{2} \cdot \sigma_y$ ($495 \leq 1055$)	OK	

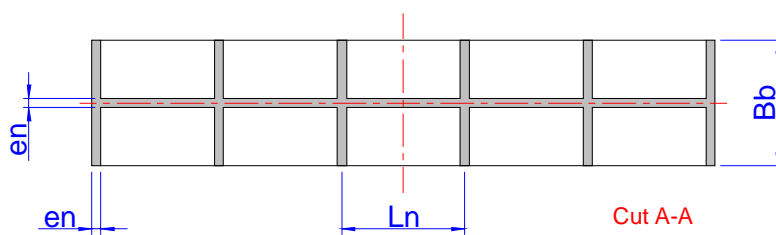
14 - Saddle Main Dimensions

14.1	Saddle's Top Flange Dimensions (L x B x e)	1,618 x 100 x 5.00	mm
14.2	Base Plate Dimensions (L x B x e)	1,217 x 100 x 3.97	mm
14.3	Web Dimensions (L x H x e)	1,211 x 482 x 3.00	mm
14.4	Stiffeners Dimensions (H x B x e)(a)	487 x 100 x 3.00	mm
14.5	Stiffeners Dimensions (H x B x e)(b)	141 x 100 x 3.00	mm
14.6	Stiffeners Dimensions (H x B x e)(c)	482 x 100 x 3.00	mm

15 - Saddle Detail (no scale)



Cut B-B



Cut A-A

Dimension	Value (mm)
B_b	100.00
eb	3.97
efs	5.00
en	3.00
H_{fp}	150.00
H_s	561.00
L_b	1217.00
L_n	607.00
R	702.70