PECHINEY RHENALU	CAHIER DES CHARGES		Issoire
Origine : 03/07/02 **Indice : 2** **Date : 06/05/04**	**Rédacteur Origine AZ/SL**	SPECIFICATION FOR THE DELIVERY OF ALUMINIUM ALLOY SHEETS AND PLATES Alloy : ***Sealium*** ® Temper : Marine Grade	**N°** IS-5423A **Page : 1/9**

Indice	***Date***	***Nature Modifications***	***Rédacteur Indice en cours***
0	03/07/02	Création	*SL*
1	21/05/03	§ 7.1.1 : modif. of equality modif. table of maximum thichness for the 4 mm	*SL*
2	06/05/04	§ 6 : Addition resistance to intergranular corrosion and references to standard ASTM B928	*SL*

REDACTION	**VERIFICATION/APPROBATION**	**APPROBATION**
SMQ ATO	SMQ/Service	CIAL/TMI
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		Pour transmission aux clients

ADRRESSEES

SECTEUR	**POLE QUALITE**
SMQ Central	Service
ATF Bureaux	SM
ATO Bureaux	SM Conformité produits
Connexe Ventes	TMI

A copy of this document is transmitted to our customers by the Sales Department concerned.

1 – SCOPE

This specification defines the properties and characteristics of ***Sealium*®** - Marine Grade.
Delivered by Pechiney-Rhenalu Issoire in sheets or plates in alloy 5383 temper H116.

2 - CONCERNED PRODUCTS

Sheets and plates, in the mill-finish condition, thickness range as indicated in the table below :

Thickness range (mm)	Thickness range (in.)
$2 \leq th \leq 50$	$0.079 \leq th \leq 1.97$

3 - CHEMICAL COMPOSITION

Elements (%)	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Zr	Other elements	
										Each	Total
Mini (%)	-	-	-	0.7	4.0	-	-	-	-	-	-
Maxi (%)	0.25	0.25	0.20	1.0	5.2	0.25	0.40	0.15	0.20	0.05	0.15

4 - MECHANICAL PROPERTIES

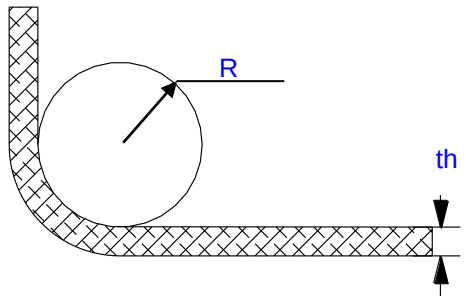
The test specimen (1 sample per rolled slab) is taken in the transverse rolling direction at one third of the width at mid-thickness for plate (th > 12,7) and at full thickness for e ≤ 12,7
The table below indicates minimum values. Values in ksi are given only for information.

Rp0,2 (MPa)	Rm (MPa)	A %
220	305	10

Rp0,2 (ksi)	Rm (ksi)	A %
32	44	10

5 . Bending properties

As per prEN-485-2 : 2001 recommendations, sheet (th < 12,5 mm (0.492 ″)) are capable of being bent cold through an angle of 90 deg. around a pin having a radius equal to *N* times the thickness (*th*) of the sheet without cracking.
The bending axe's will be parallel to the rolling direction



R is the bending radius
th is the thickness of the sheet

The certified minimum bending radius is given in the following table :

Thickness mm/inches	Certified minimum bending radius
Over 1.5 / 0.059 to 3 / 0.118	R ≥ 2.00 x th.
Over 3 / 0.118 to 6 / 0.236	R ≥ 2.50 x th.
Over 6 / 0.236 to 12,5 / 0.492	R ≥ 4.00 x th.

6 - Exfolation and intergranular Corrosion resistance (Asset and NAMLT tests)

***Sealium*®** - Marine Grade is resistant to exfoliation and intergranular corrosion as described in ASTM B928 standard.

7 - TOLERANCES

7-1. Thickness - General statement

Ship Classification Societies may require specific tolerances on products intended to be used in constructions inspected by them.

If the ***Sealium*®** products are intended to be used in constructions inspected by a Classification Society, the purchaser shall indicate this on the order. Otherwise, the following tolerances shall apply as minimum requirements.

7.1.1. Thickness tolerances

Minus thickness tolerances

Nominal thickness (mm)	Width of plate (mm)		
	Up to 1500	Above 1500 To 2000	above 2000
2 < th < 4	- 0,10	- 0,15	- 0,15
4 ≤ th < 8	- 0,20	- 0,20	- 0,25
8 ≤ th < 12	- 0,25	- 0,25	- 0,25
12 ≤ th < 20	- 0,35	- 0,40	- 0,50
20 ≤ th ≤ 50	- 0,45	- 0,50	- 0,65

Nominal thickness (in.)	Width of plate (in.)		
	Up to 59.1	Above 59.1 To 78.7	Above 78.7
0.079 < th < 0.157	- 0.0039	- 0.0059	- 0.0059
0.157 ≤ th < 0.315	- 0.0079	- 0.0079	- 0.0098
0.315 ≤ th < 0.472	- 0.0098	- 0.0098	- 0.0098
0.472 ≤ th < 0.787	- 0.0138	- 0.0157	- 0.0197
0.787 ≤ th ≤ 1.969	- 0.0177	- 0.0197	- 0.0256

Plus thickness tolerances

The maximum thickness is obtained by adding to the minimum thickness specified in §. 5.1.1 the values indicated in the following tables :

Thickness (mm)	Width (mm) ≤ 1600	Width (mm) 1600 < w ≤ 2000	Width (mm) 2000 < w ≤ 2400
2 < th < 4	0,30	0,35	0,35
th = 4	0,40	0,40	0,50
4 < th ≤ 8	0,30	0,35	0,35
8 < th ≤ 12,7	0,50		

Thickness (inches)	Width (inches) ≤ 63	Width (inches) 63 < w ≤ 78.7	Width (inches) 78.7 < w ≤ 94.5
0.078 < th < 0.157	0.0118	0.0137	0.0137
th = 0.157	0.0157	0.0157	0.0197
0.157 < th ≤ 0.315	0.0118	0.0137	0.0137
0.315 < th ≤ 0.5	0.0197		

For definition of maximum length and width > 2400 mm / 94.5 inches, consult the plant if thickness ≤ 12.7 mm / 0.5 inch.

Thickness (mm)	Width (mm)			
	< 1600	1600 ≤ w < 2000	2000 ≤ w < 2500	2500 ≤ w ≤ 3050
12.7 < th ≤ 15	+ 0.82	+ 0.90	+ 1.02	+ 1.12
15 < th ≤ 20	+ 0.88	+ 0.96	+ 1.08	+ 1.18
20 < th ≤ 25	+ 0.94	+ 1.02	+ 1.14	+ 1.24
25 < th ≤ 30	+ 1.00	+ 1.08	+ 1.20	+ 1.30
30 < th ≤ 40	+ 1.12	+ 1.20	+ 1.32	+ 1.42
40 < th ≤ 50	+ 1.20	+ 1.30	+ 1.40	+ 1.50

Thickness (inches)	Width (inches)			
	< 63	63 ≤ w < 78.7	78.7 ≤ w < 98.4	98.4 ≤ w ≤ 120
0.50 < th ≤ 0.59	+ 0.0323	+ 0.0354	+ 0.0402	+ 0.0441
0.59 < th ≤ 0.79	+ 0.0346	+ 0.0378	+ 0.0425	+ 0.0465
0.79 < th ≤ 1.00	+ 0.0370	+ 0.0402	+ 0.0448	+ 0.0488
1.00 < th ≤ 1.18	+ 0.0394	+ 0.0425	+ 0.0472	+ 0.0512
1.18 < th ≤ 1.57	+ 0.0441	+ 0.0472	+ 0.0520	+ 0.0560
1.57 < th ≤ 1.97	0.0472	0.0512	0.0551	0.0591

For example : - For a width of 2000 mm and a thickness of 6 mm
- Minimum thickness : 6 - 0.20 = 5.80 mm
- Maximum thickness : 5.80 + 0.35 = 6.15 mm

7-2. Width tolerances (mm/inches)

Specified thickness mm	Specified width mm	
	Over 900 / Under 2000	2000 and greater
≤ 8	+/- 3	+/- 3.5
> 8	+/- 2.5	+/- 3

Specified thickness inches	Specified width inches	
	Over 35.4 / Under 78.7	78.7 and greater
≤ 0.315	± 0.118	± 0.138
> 0.315	± 0.1	±0.118

Whatever the length
Better tolerances can be achieved upon request for sawn edges : ± 1.5 mm, ± 0.06 inch.

7-3. Length tolerances (mm/inches)

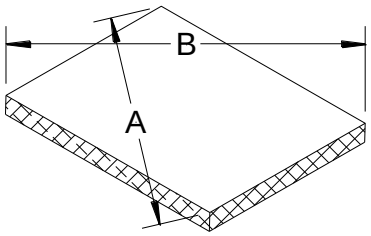
Specified thickness mm	Specific length mm		
	Under 2000	2000 to 5000	Over 5000
th ≤ 6	± 2.5	± 3	± 4
6< th ≤ 8.0	± 4	± 4.5	± 5
th > 8.0	± 2.5	± 3	± 3.5

Specified thickness inches	Specific length inches		
	Under 78.7	78.7 to 197	Over 197
th ≤ 0.236	± 0.1	± 0.118	± 0.157
0.236 < th ≤ 0.315	± 0.157	± 0.177	± 0.2
th > 0.315	± 0.1	± 0.118	± 0.138

Better tolerances can be achieved upon request for sawn edges : ± 1.5 mm, ± 0.06 inch.

7-4. Squareness tolerances

The maximum difference between diagonals shall be as shown in the following table :



Specified thickness mm	Specific length mm		
	Under 2000	2000 to 5000	Over 5000
th < 6	5	6	8
6 ≤ th ≤ 8.00	8	9	10
th > 8.00	5	6	7

Specified thickness inches	Specific length inches		
	Under 78.7	78.7 to 197	Over 197
th < 0.236	0.197	0.236	0.315
0.236 < th ≤ 0.315	0.315	0.354	0.394
th > 0.315	0.197	0.236	0.276

Better squareness can be achieved upon request for sawn edges : maximum difference between AA and BB ± 1.5 mm / ± 0.06 inch.

7-5. Lateral bow tolerances

Specified thickness mm	Specific length mm	
	Under 3000	3000 and greater
th ≤ 8.00	3 mm/m	4 mm/m
th > 8.00	1 mm/m	1,5 mm/m

Specified thickness inches	Specific length inches	
	Under 118	118 and greater
th ≤ 0.315	0.354 inch/mm	0.472 inch/foot
th > 0.315	0.118 inch/mm	0.177 inch/foot

Smaller lateral bow can be achieved upon request for sawn edges :

- 3 mm (0.118 inch) on the total length (if less than 5 m (197 inches).
- 5 mm (0.197 inch) on the total length if L > 5 m (197 inches).

7-6. Flatness tolerances

Sheet

Specified thickness (mm)	Longitudinal or transverse distance (mm) center to center of buckles or edge waves				
	≤ 500	500 < w ≤ 1000	1000 < w ≤ 1500	1500 < w ≤ 2000	w > 2000
th < 6,35	5	7	10	12	15

Specified thickness (inches)	Longitudinal or transverse distance (inches) center to center of buckles or edge waves				
	≤ 20	20 < w ≤ 40	40 < w ≤ 60	60 < w ≤ 80	w > 80
th < 0.25	0.2	0.275	0.394	0.472	0.590

Plate thickness 6.35 to 50 mm (0.25 to 1.97 inches)

- Longitudinal flatness : allowable deviation from flat = 7 mm in any 2000 mm or less (0.275 inch in any 78.7 inches or less).
- Transverse flatness :

Specified Thickness mm		Width (mm)					
Over	Thru	≤ 300	300 < w ≤ 1000	1000 < w ≤ 1500	1500 < w ≤ 2000	2000 < w ≤ 2500	2500 < w ≤ 3050
6.35	50	Short * span flat-ness	7	10	13	16	19

Specified Thickness inches		Width (inches)					
Over	Thru	≤ 12	12 < w ≤ 40	40 < w ≤ 60	60 < w ≤ 80	80 < w ≤ 98,5	98,5 < w ≤ 120
0.25	3.15	Short * span flat-ness	0.276	0.394	0.512	0.63	0.75

** short span flatness : deviation from flat for spans 300 mm (12 inches and less).*

Allowable deviation from flat = 2 mm (0,08 inch) for specified thickness over 6.35 thru 80 mm (0.25 to 3.15 inches).

8 - SURFACE ASPECT

Large mechanical defects such as deep scratches, deep roll marks and deep dents detrimental to the final use of the material are not accepted.

9 - IDENTIFICATION MARKING

On each sheet or plate, on one side, continuous ink marking:

PECHINEY - ***Sealium*** ® - Marine grade - Order number - Traçability number - Certification stamp *.

** If reception by a Classification Society is required.*

10 – TECHNICAL CONDITIONS FOR INSPECTION AND DELIVRERY

The technical conditions fot inspection and delivery of ***Sealium*** ® products shall be as specified herein, unless otherwise expressly requested by the purchaser on the order.

In addition to the technical conditions for inspection and delivery specified in these standards, the purchaser shall indicate on the order whether or not the constructions in which the ordered ***Sealium*** ® products are incorporated are intended to be inspected by a Classification Society. The purchaser shall expressly indicates the required Classification Society on the order (DNV, ABS, BVN, LR, GL, RINA …). An inspection report (form EN.10204.3.2) for the requested Classification Society, shall be mailed separately from the order upon approval.

11 - SHEET AND PLATE PROTECTION

Paper or "Renitex" (wood complex separator) interleaves between each sheet or plate if requiered on the order.

12 - PACKAGING

A fork-lift truck (side and longitudinal handling) or slings can be used for handling purposes.
Pack weight is decided jointly by the customer and Pechiney Rhenalu (Issoire plant), at the time of order. Standard is 7.5 metric tons or 16500 lbs gross weight per unit.
The purchaser is liable for storage when the usual safety measures shall be taken (dry and aerated place).

13 - INSPECTION CERTIFICATE

An inspection report EN.10204.3.1B (or EN.10204.3.2*) is supplied to the customer in the same time of the products. This inspection report includes :

- the product designation
- the chemical composition
- the mechanical properties
- certification stamp*

* *If reception by a Classification Society is required*