



**BUREAU
VERITAS**

TEST CERTIFICATE ACCORDING TO NF EN 1004:2004 STANDARD

N° CER-51/EK2/06/0006 rev 1

Manufacturer (Name): *ALUFASE*

Address: *Crta. Ajalvir – Torrejón, km 0,200.
Ajalvir. MADRID*

Trade Mark : *ALUFASE*

Equipment Description: *Aluminium Towers Class 3, Height 8m outdoors/12m indoors, Vertical Ladder Class C and D.*

Identification of equipment concerned: *Aluminium Towers Class 3, Height 8m outdoors/12m indoors, Vertical Ladder Class C and D, of the following dimensions:*

MODEL 300, Length 1,91m , Single Width (0,74m)
MODEL 300, Length 1,91m , Double Width (1,35m)
MODEL 300, Length 2,50m , Single Width (0,74m)
MODEL 300, Length 2,50m , Double Width (1,35m)
MODEL 300, Length 3,05m , Single Width (0,74m)
MODEL 300, Length 3,05m , Double Width (1,35m)

MODEL 400, Length 1,91m , Single Width (0,74m)
MODEL 400, Length 1,91m , Double Width (1,35m)
MODEL 400, Length 2,50m , Single Width (0,74m)
MODEL 400, Length 2,50m , Double Width (1,35m)
MODEL 400, Length 3,05m , Single Width (0,74m)
MODEL 400, Length 3,05m , Double Width (1,35m)

According to the results obtained in the tests described in the Inspection Report No. 51/EK2/06/0006-INF, the dimensions, allowable loads, strength and stiffness of the products, comply with the relevant provisions of NF EN 1004:2004, as long as they do not exceed the following values:

Maximum height from the ground to the first step in Tower MODEL 400; with the legs extended, 400mm.

Maximum height from the ground to the first step in Tower MODEL 300; with the legs extended, 400mm.

This certificate shall be deemed to be void and the manufacturer shall alone bear any consequences pursuant to its use whenever the equipment suffers any modification that could affect to the safety requirements or when the usage conditions outlaw.

Made in	On	Signed by	Signature
Madrid	May 22nd 2008	Sergio Tomás Gómez	
Registration Code: 1214651			

This certificate is subject to the terms of Bureau Veritas General Conditions of Service attached to the agreement signed by the applicant.



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INDUSTRY

TEST REPORT AS NF-EN 1004 STANDARD

Página : 1 de 8

Report No. 51/EK2/06/0006-INF Rev.1

DIVISION: **INDUSTRY**

OFFICE:

MADRID

<i>Solicitor:</i>	TERMISER SERVICIOS, S.L.		
<i>Manufacturer:</i>	ALUFASE		
<i>Inspection Place:</i>	ALUFASE, S.A. Ctra Ajalvir - Torrejón, Km 0,200 28864 – Ajalvir MADRID		
<i>Standard Reference:</i>	NF EN 1004:2004 "Mobile access and working towers made of prefabricated elements"		
<i>Issued:</i>	Sergio Tomás Gómez	<i>Date:</i>	22/02/06

SUBJECT OF INSPECTION

The object of this report is to capture and to describe the tests carried out on Towers of aluminium of ALUFASE trademark according to the Norm NF EN 1004:2004, "Mobile access and working towers made of prefabricated elements". These tests were carried out during the 6th, 9th, 10th, 14th and 16th of February 2006 at the facilities of SCI placed in the Ctra. Ajalvir- Torrejón, Km 5- Ajalvir and at the facilities of ALUFASE located in Ctra. Ajalvir- Torrejón, Km 0,200. Ajalvir –MADRID.

DESCRIPTION OF THE TOWERS

The elements to test are light alloy towers, of different length and width, as it is described later. The structure is formed by aluminium tubes joined together by means of smelting aluminium accessories. The union of the tubes and accessories is made by means of cold-formed processes.

ALUFASE presented the following equipments to Bureau Veritas for the accomplishment of the tests:

6082-T6 Aluminium Towers Class 3, Height 8m outdoors/12m indoors, Vertical Ladder Class D, of the following dimensions:

MODEL 300, Length 1,91m , Single Width (0,74m)
 MODEL 300, Length 1,91m , Double Width (1,35m)
 MODEL 300, Length 2,50m , Single Width (0,74m)
 MODEL 300, Length 2,50m , Double Width (1,35m)
 MODEL 300, Length 3,05m , Single Width (0,74m)
 MODEL 300, Length 3,05m , Double Width (1,35m)

MODEL 400, Length 1,91m , Single Width (0,74m)
 MODEL 400, Length 1,91m , Double Width (1,35m)
 MODEL 400, Length 2,50m , Single Width (0,74m)
 MODEL 400, Length 2,50m , Double Width (1,35m)
 MODEL 400, Length 3,05m , Single Width (0,74m)
 MODEL 400, Length 3,05m , Double Width (1,35m)

TEST ON PARTS OF THE STRUCTURE

Castor Wheels

The towers above described can incorporate three types of wheels:

Diameter 125x40
 Diameter 150x45
 Diameter 200x50



General aspects: The wheels are fixed to the tower by a pipe-threading with a blocking system, in such a way that the wheels can not be accidentally detached from the tower.



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Brakes: The brake can only be unlocked by a deliberated action upon it. To verify the efficiency of the brake, five wheels of each type were submitted to a load test, applying a horizontal force of 0,30kN through the vertical swivel axis of the castor as close as possible above the castor housing and in the rolling direction of the castor. The full value of the specified service load per castor wheel was applied when testing the castor brakes.

The service load for this test is the maximum of the following values:

- Nominal self-weight of the tower.
- Maximum service load for Class 3.
- 5,00kN uniformly distributed in 4 legs.

Wheel Type	Maximum tower weight	Service load class 3	Minimum Service load on structure	Load Applied
Diameter 125 x 40	342kg	3,58kN (2kN/m ² x 1,79m ²)	5,00 kN / 4 legs	1,25kN
Diameter 150 x 45	342kg	3,58kN (2kN/m ² x 1,79m ²)	5,00 kN / 4 legs	1,25kN
Diameter 200 x 50	490kg	7,44kN (2kN/m ² x 3,72m ²)	5,00 kN / 4 legs	1,86kN

Fifteen castor wheels were tested and there was no rotation of the wheel on any of them. The result of the test is considered satisfactory:



Vertical load test: The load for this test must be three times the maximum service load obtained from the most unfavourable combination of the following values:

- Nominal self-weight of the tower.
- Maximum service load for Class 3.
- 5,00kN uniformly distributed in 4 legs.





Wheel type	Maximum tower weight	Service load class 3	Service load on structure	Load applied
Diameter 125 x 40	342kg	3,58kN (2kN/m ² x 1,79m ²)	5,00 kN / 4 legs	3 x 1,25kN
Diameter 150 x 45	342kg	3,58kN (2kN/m ² x 1,79m ²)	5,00 kN / 4 legs	3 x 1,25kN
Diameter 200 x 50	490kg	7,44kN (2kN/m ² x 3,72m ²)	5,00 kN / 4 legs	3 x 1,86kN

With the brakes blocked, an initial charge of 0,50kN was applied, taking the plate of the bracket as origin for the measurements of the vertical displacements. Followed the load was increased until it reached the test load, indicated in the previous table, After 1 minute applying the maximum load the value of the total deformation (dc) was measured, after that the load was reduced to the initial load. After 30 minutes the residual deformation was taken (Dr).

This test was repeated five times for each type of wheel being the worst results:

Wheel Type	Total deflection	Residual deflection
Diameter 125 x 40	2.09mm	0.64mm
Diameter 150 x 45	1.91mm	0.65mm
Diameter 200 x 50	3.12mm	1.21mm

This test is satisfactory since the results comply with the following requirements:

- The residual deflection (dr) should not be larger than 1.5 mm after 30 minutes.
- The total deformation (dc) should not exceed 15mm.

In order to carry out these tests EM-E-04-002 machine and calibrated weights were used.



Platforms

The platforms tested had the following dimensions:

2,94m x 0,61m (1,793 m2)





1,80m x 0,61m (1,09m²)

The platforms are made of durable materials as it is Wood and Aluminium, and they are covered by an slip-resistant surface.

Dimensional Witness: The access aperture platform is 48.5m wide and 60.5m long, consequently the aperture of platforms passes the standard.

Load test: Platforms were submitted to the following loads:

Uniformly distributed load on platform Class 3; 2kN/m²

Concentrated load on 0,50 m x 0,50 m area; 1,5kN

Concentrated load on 0,20 m x 0,20 m area; 1,0kN

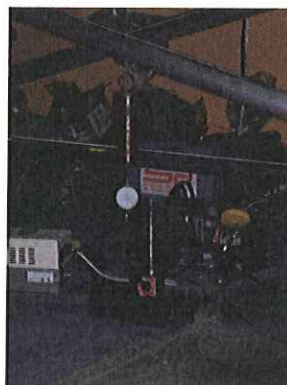
Platform dimensions	Test	Load	Deflection
2,94m x 0,61m	Uniformly distributed load	3,528kN (2kN/m ² x 1,764m ²)	N/A
2,94m x 0,61m	Concentrated load on 0,50 m x 0,50 m area	1,5kN	17,17mm
2,94m x 0,61m	Concentrated load on 0,20 m x 0,20 m area	1,0kN	13,3mm
1,80m x 0,61m	Uniformly distributed load	2,19kN (2kN/m ² x 1,09m ²)	N/A
1,80m x 0,61m	Concentrated load on 0,50 m x 0,50 m area	1,5kN	7,46mm
1,80m x 0,61m	Concentrated load on 0,20 m x 0,20 m area	1,0kN	11,66mm

Obtained values pass the following requirements:

Uniformly distributed load on platform Class 3; 2kN/m²; platforms stand the load

Concentrated load on 0,50 m x 0,50 m area; 1,5kN; Maximum deflection 25mm.

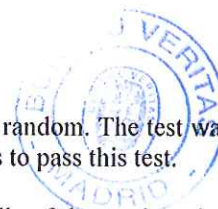
Concentrated load on 0,20 m x 0,20 m area; 1,0kN; Maximum deflection 25mm.



Toe-board:

The test was carried out on a Toe-board of 3,05m long and 150 mm height, chosen at random. The test was just carried out on the toe-board of these dimensions, as it fulfils the most unfavourable characteristics to pass this test.

Horizontal load: Distributed over an area of 45cm x 15cm and situated on the middle of the toe-board, a horizontal load of 0,15kN was applied. The most unfavourable deflection obtained was of 32 mm. The maximum deflection shall not exceed 35mm. So it is considered that the toe-board used passes the standard.





Side protection

The test was carried out on a side protection of 3,05m long chosen at random. The test was carried out on the side protection of these dimensions, as it has the most unfavourable characteristics to pass this test.

Dimensional witness: The principal guardrail is fixed so that its top surface is 1m above the adjacent level of the working area. Side protection is manufactured so that the distance between principal guardrail is less than 470mm (real value 320mm), and the distance between intermediate guardrail and top edge of toe-board is less than 470mm (real value 390mm). The distance between the external face of toe-board and the internal face of side protection is less than 80mm (real value 58mm).

Vertical load: A point load of 1,25kN was applied over the guardrails of the side protection. The application point of the load was in the middle of the guardrails (most unfavourable point) and over a base of 180 mm long, simulating a footprint. There was neither fracture nor disconnection on the side protection.

Horizontal load: A point load of 0,30kN was applied over the guardrails of the side protection. The application point of the load was in the middle of the guardrails (most unfavourable point) and over a base of 180 mm long, simulating a footprint. The most unfavourable value of the deflection obtained was 30 mm, less than the maximum value allowed by the standard (35 mm).



Ladder

Dimensional witness: The distance between the ground to the first step depends on the diameter of the wheels and on the extension of the adjustable legs. This way the height of the first step with the legs unextended is of:

- 270mm with a wheel of 125mm.
- 310mm with a wheel of 150mm
- 370mm with a wheel of 200mm.

In this part we must remark that with the legs extended the height of the first step must not exceed 400mm.

Regarding the model 400 ladder it is necessary to stand out the following values:

Distance between steps 300mm.





Steps diameter 35,01.

This value passes the values of point 7.6.3.5. of the standard.

The steps surface is slip resistant.

Connections

Once assembled the connections, it is impossible to remove the upper component until this part is elevated more than 150 mm. The connections are provided of crossbars to prevent the upper part from being removed accidentally.

Dimensional Witness: The difference of diameters between the upper element and the lower element is less than 1,5 mm, that it is less than the maximum value allowed by the norm.

TEST ON COMPLETE STRUCTURE TOWER

Test was carried out on structures with most unfavourable dimensions to pass the requirements of the standard. In particular the test were performed on the following structures:

Model 300 Length 3,05m, Width 0,74m.

Model 300 Length 1,90m, Width 0,74m.

Model 400 Length 3.05m, Width 1,35m.

Test described later, have been carried out in structures mounted with a minimum height of 6 m, adjustable legs extended to their maximum extension, with the stabilizers placed in their work position and the structure levelled.

Uniformly distributed load on the topmost platform: The structure is submitted to a vertical load that is the result of the nominal self-weight of the tower and the maximum of the following values:

Uniformly distributed load class 3,

Minimum vertical service load on the structure, equally distributed on four legs 5,0kN.

The test result is considered satisfactory if the structure is able to support the test without failures, deformations or disconnections.

As the height of the structure for the test is 6m, the difference weight between the test structure weight and the structure weight mounted to its maximum height (12m), has been added by means of ballast.

Structure Dimensions	Maximum structure weight	Uniformly distributed load class 3	Minimum vertical service load on the structure	Result
3,05m x 0,74m	380.86 kg	3,58kN (2kN/m ² x 1,79m ²)	5,0kN / 4 legs	Satisfactory
1,91m x 0,74m	295.62kg	2,19kN (2kN/m ² x 1,09m ²)	5,0kN / 4 legs	Satisfactory
3,05m x 1,35	490.85kg	7.18kN (2kN/m ² x 3.59m ²)	5,0kN / 4 legs	Satisfactory

Horizontal service load on topmost platform (6,00m): As the length of the platforms is less than 4 m, the test load was 0,3 kN. This horizontal load was applied on the topmost platform placed at a height of 6m. The application point of the load was placed in the middle longitudinal point of the side protection. The result of the test is considered satisfactory when the structure is able to support the load without overturning. The tested structures supported the load without overturning, so the result of the test is satisfactory.

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Loads resulting from an inclined position of 1%: The load to take into account is:

- Nominal self-weight of structure.
- Uniformly distributed load class 3,
- Minimum vertical service load on the structure, equally distributed on four legs 5,0kN.

Structure dimensions	Maximum structure weight	Uniformly distributed load Class 3	Minimum vertical service load on the structure	Result
3,05m x 0,74m	380.86 kg	3,58kN (2kN/m ² x 1,79m ²)	5,0kN / 4 legs	Satisfactory
1,91m x 0,74m	295.62kg	2,19kN (2kN/m ² x 1,09m ²)	5,0kN / 4 legs	Satisfactory
3,05m x 1,35	490.85kg	7.18kN (2kN/m ² x 3.59m ²)	5,0kN / 4 legs	Satisfactory

STIFFNESS TEST ON COMPLETE TOWER STRUCTURE:

The object of the test is to ensure that towers do not exceeded the maximum permitted displacement when erected to their maximum platform height and subject to horizontal loads.

The test were carried out on complete tower structures with a height of 6m. The tower was built in accordance with the manufacturer instructions. The tests was carried out with the stabilizers on their working position as manufacturer instructions.

Adjustable legs were extended to 50% of their maximum extension and the castor wheels were turned in their most unfavourable position and with the brakes locked.

Horizontal load applied of 500N.

To stabilize the towers and there is no overturning ballast is added on platforms.





Structure dimensions	Endwise displacement (D1l)	Crosswise displacement (D1c)	Allowed Height
3.05m x 1,35m	33.78mm	35.82mm	12m
3,05m x 0,74m	71.62mm	55.04mm	12m
1,91m x 1,35m	50.26mm	55.04mm	12m
1.91m x 0,74m	80.16mm	51.67mm	12m



The equipment used for the test were:
 Dynamometer EM-E-08-006
 Micrometer SEA 07016
 Micrometer SEA 07025
 Metric tape EME 08006

All of them SCI, S.A. property.

All the tests were carried out by Ignacio González de SCI, and witnessed by Virginia Vargas of Alufase and Sergio Tomás of Bureau Veritas.

Signature:

Inspector: Sergio Tomás Gómez
 Date: 22/02/06

