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# **IMPACT TEST ON F.R.P. FENCING FOR AIRPORT APPLICATION (INSIDE EXPERIMENTAL TESTS)**

**Udine, 10<sup>th</sup> April 2008**



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## INTRODUCTION

This relation has the purpose of describing and establishing the behavior of *FIBRE FENCE AIRPORT* when submitted to the impact of a rigid or soft element.

The airport fencing system shown in the present relation has been developed according to ICAO international standard.

The content of this relation does not exempt of the necessity to evaluate the real conditions and specific requirements of the specific airport, if any.

### 1. STANDARD AND REGULATION REFERENCES

This is a summary of ICAO's ruling on frangibility, combined from the latest edition of Annex 14 and Aerodrome Design Manual Part 6.

Any structure which is located within 60m to either side of the centre line of the runway and approach line(s) must be of low mass and frangible. The same frangibility criteria is applied to fencing located in the above defined area which shall be lightweight and frangible.

For installations with overall height above 1.2 m the frangibility must be verified through a full-scale dynamic impact test or computer analysis supported by a respective field test, aimed to verify the following:

- the support structure should not impose on the colliding aircraft a force in excess of 45 kN,
- the maximum energy needed to break the structure at the collision should not exceed 55 KJ, to allow the aircraft to pass,
- the failure mode of the support structure should be fracture, windowing or bending, upon impact,
- the support structure may fragment into several components and the mass of these components should be as low as possible,
- the manner of structure release should not cause a secondary hazard to the aircraft.

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## 2. DESCRIPTION OF SYSTEM COMPONENTS

*FIBRE FENCE AIRPORT* fencing system is fully made of glassfiber based composite material G.F.R.P. (Glass Fiber Reinforced Polymer).

It consists of:

- G.F.R.P. posts and windbracings made of square section tubular profile dim. 50x50x5 mm, weight 1,5 kg/mt, made of pretensioned glassfiber impregnated with thermosetting isophthalic polyester resin, green color
- G.F.R.P. mesh, square dim. 33x33 mm, weight 800 gr/sq.mt. made of pretensioned glassfiber impregnated with thermosetting isophthalic polyester resin, green color

Stiffening wires and clamping accessories are made of high mechanical and chemical resistance polyamide plastic material.

## 3. TEST METHOD

The impact resistance test of a soft and rigid body through the pendulum method on the *FIBRE FENCE AIRPORT* fencing system is executed at FIBRE NET premises in Udine – Italy on 10<sup>th</sup> April 2008, on a full-scale fence height 2 mt, length 10 mt, consisting of:

- G.F.R.P. mesh dim. 33x33 mm, height 200 cm
- G.F.R.P. posts dim. 50x50x5 mm, height 200 cm, installed every 2 mt, and fixed to the paving through steel supporting systems
- n.4 stiffening parallel polyamide wires
- n.2 “St. Andrew’s cross” polyamide wires

The G.F.R.P. mesh is applied to the posts and wires through plastic strips.

The impact body consists of a dry sand bag, duly supported and shaped in order to obtain a plain and homogeneous surface, having the following characteristics:

- Weight: kg 30 and kg 55
- Dimensions: 350(vertical) mm x 200 (horizontal) mm
- Impact surface: 700 cm<sup>2</sup>

The impact body is supported through two steel cables applied in such a way to avoid unforeseen torsions of the element itself and to allow hitting of the fence in the center at an height of 1 mt from the ground.

The pendulum length at impact body center is 380 cm; in the rest state it brushes the mesh without any weighing.

The impact body is dropped from different progressive heights (50, 100, 150, 200 cm). At each throwing the deformations, breaks and structural failures are evaluated.

## 5. EXPERIMENTAL RESULTS

<b>Impact body Kg</b>	<b>Height H (m)</b>	<b>Energy J</b>	<b>N° of throwings</b>	<b>Results observed</b>
<b>30</b>	<b>0.5</b>	<b>147</b>	<b>10</b>	<b>Nothing to observe</b>
<b>30</b>	<b>1.0</b>	<b>294</b>	<b>10</b>	<b>Nothing to observe</b>
<b>30</b>	<b>1.5</b>	<b>441</b>	<b>10</b>	<b>Nothing to observe</b>
<b>30</b>	<b>2.0</b>	<b>588</b>	<b>10</b>	<b>Nothing to observe</b>
<b>55</b>	<b>0.5</b>	<b>270</b>	<b>10</b>	<b>Nothing to observe</b>
<b>55</b>	<b>1.0</b>	<b>539</b>	<b>10</b>	<b>Nothing to observe</b>
<b>55</b>	<b>1.5</b>	<b>808</b>	<b>10</b>	<b>Loosening of some plastic strips</b>
<b>55</b>	<b>2.0</b>	<b>1078</b>	<b>2</b>	<b>Posts breaking at the base (corresponding to the posts supporting area)</b>



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## 5. CONCLUSIONS

By evaluating the type of posts breaking and by developing the experimental test results, we can state that the *FIBRE FENCE AIRPORT* fencing system as described above, breaks without releasing elements of significant size, with an impact energy more than 1100 J, and through the impact of a soft body mass 80 kg at a speed of 13 km/hour.