New FIM CCR (Homologated) Additional Protective Devices

Dear Sir or Madam,

Further to the tests carried out recently at the Impact Laboratory (University of Zaragoza), a new system has been successfully tested and homologated by the FIM-CCR Bureau. This Air Protek - Racing Safety Wall is homologated Type C.

The 2018 FIM Standards for Circuits are therefore amended as follows:

**4.10 ADDITIONAL PROTECTIVE DEVICES**

When deciding what measures will be used for the protection of riders, race officials, service personnel and spectators during competitions, the characteristics of the course should be taken into consideration. These include track layout and profile, topography, racing trajectories, adjacent areas, buildings and constructions, as well as the speed reached at any point of the track.

There will be a first line of protection at the edge of the verges and run-off areas around the complete Circuit Layout.

Most frequently it is necessary or preferable to contain an accident in relative proximity to the trackside by absorbing the bike’s energy and/or providing conditions for the rider to regain control. In order to achieve this, various deceleration systems and energy-dissipating and stopping barriers may be installed to constitute an additional protection. In other circumstances it may be appropriate to provide sufficient obstacle - and spectator - free spaces for the energy of a bike leaving the track out of control to be completely dissipated.
The type of additional protection devices to be installed will have to take into account the available space from the racetrack edge to the first line of protection, the possible impact angle and the type of facility behind of the first line of protection.

The additional protective devices used must be homologated by the CCR/FIM (see appendices)

4.10.1 CCR/FIM ADDITIONAL PROTECTIVE DEVICES

The following additional protective devices are used by the CCR/FIM (see manufacturers’ and/or distributors’ details in Appendix).

Type A (homologated devices)
- **Air Active Protective Devices**
  - Alpina Air-Module AA

- **Air Protective Devices**, Alpina Air-Module
  - Airfence Type IS and Airfence IIS
  - Liski Air Safety Mattress
  - SPM AirPADS
  - Trackcare Inflatable Barrier

- **Foam Protective Devices**
  - Alpina Super Defender and Alpina Super Defender 2
  - Airfence Bike and Airfence Bike Evo
  - Bridgestone Module 1000 and Bridgestone Module 1300
  - Liski Safety 1
  - Recticel Safeguard barrier 1 and Recticel Safeguard RR
  - SPM Energy Absorber Type A
  - Trackcare Hi-Lite
  - PKS Modele 1

Type B (homologated devices)
- Airfence Type I and Airfence Bike B
- Alpina Defender Barrier
- Liski Safety 3
- Recticel Safeguard barrier 2
- SPM Energy Absorber Type B1
TypeC (homologated devices)
- Air Protek - Racing Safety Wall
- Alpina Synthetic bales and “Big bales”
- Filling Italiano Protection System (ONDA 27/33 - 20/26)
- Liski Safety 4
- PKS Modele 5
- Recticel Safeguard barrier 3 and Safeguard barrier 4
- SPM Energy Absorber Type C2
- Trackcare barrier
- Horizontal tyre barrier built and installed according to FIM Specifications and assembly instructions for tyre barriers (available on request to the FIM Secretariat)
- Vertical tyre barrier built and installed according to FIM Specifications and assembly instructions for tyre barriers (available on request to the FIM Secretariat)

Until the end of 2018, additional protective devices may be approved at the sole discretion of the track Inspector.

All additional protective devices must be placed against the rigid obstacle (no free space).

All additional protective devices must be used and installed according to the manufacturer’s indications and requirements.

The homologation report may require non-homologated contingency protective devices to be available at each FIM event.

You will find enclosed the results of the tests carried out for these new (homologated Type C) tyre barrier installations as well as the specifications for the installation of such barriers.

We remain at your disposal for any additional information you may require.

With best regards,

Paul DUPARC
CCR COORDINATOR

CO-ORDINATES OF MANUFACTURERS & SUPPLIERS OF ADDITIONAL PROTECTIVE DEVICES:

Airfence 1, 1S, IIS, Bike, Bike B & Bike Evo
AIRFENCE SAFETY SYSTEMS
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Fax : +61 (0) 3 8660 2577
airfence@airfence.com
www.airfence.com

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46200 SOUILLAC, FRANCE
Tel : +33 (5) 65 27 01 85
Philippe.poux@airprotek.com

Alpina Air-Module, Air-Module AA, Defender, Super Defender, Super Defender 2, Synthetic Bales & Big bales
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Fax: +43 4243 2480 5
robert@alpina.at
office@alpina.at
www.alpina.at

Bridgestone Module 1000 & Module 1300
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YOKOHAMA - JAPAN
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Filling Italiano Protection System (ONDA 27/33-20/26)
Filling Technologies s.r.l., M. Paolo Barbazza
Via Pavoni, 1 -
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Tel.: +39 (0) 39 20 50 999
Fax: +39 (0) 39 20 51 266
fillingtechnologies@pec.it
www.fillingtech.it

Liski Air Safety Mattress, Safety 1, 3 and 4
LISKI S.r.l. Via Veneto, 8
Brembate (BG) - ITALY
Tel. +39 0 35 4826195
Fax +39 035 2283818
info@liski.it
www.liski.it

PKS Modele 1 & Modele 5
PKS PROMOTER SERVICE
Via Michele Angileri 162
91020 PETROSINO (TP) - ITALIE
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pksc@ctomline.it

Recticel Safeguard Barrier 1, 2, 3, 4 & RR
The Awning Company
Unit 1 Jubilee Works, Vale Street, Bolton
Lancashire BL2 6QF - GRANDE BRETAGNE
Tél. : +44 1204 544900
information@theawningcompany.co.uk or
tsafeguard@theawningcompany.co.uk
www.theawningcompany.co.uk or
www.safeguardbarriers.co.uk

SPM AirPADS & Energy Absorber Type A, B1 and C2
SPM SpA
Via Provinciale, 26
21030 BRISSAGO (Varese) - ITALY
Tel. +39 0332 54 20 11
Fax +39 0332 57 61 68
sport@spmspa.it
www.spm-sport.com
Trackcare Barrier, Inflatable Barrier & Hi-Lite
TRACKCARE MARKETING AND MAINTENANCE
2 Casaeldona Rise
BELFAST BT6 9RA - N. IRELAND
Tél. : +44 1232 791 665
Fax : +44 1232 791 665
info@trackcare.com
Dynamic Test of Protective Devices: Barrier

References: S-157 - S-158
Date: 01/JUN/2018

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1. Goal

Dynamic test of stopping barrier according to FIM rules: “Duties and criteria for barriers homologation”:

Duties and Criteria

The tests must be carried out with a hanging body block, which comes off just before the impact.

- Depth of the module: 120 cm (for type A)
- Weight of the body block: 35 kg
- Body block surface that comes into contact with the tested sample: 0.24 m²
- Velocity at the instant of impact: 24 km/h (+/- 1 km/h)

Classification criteria:

- Peak deceleration (g number): the maximum deceleration.
  - Type A: G ≤ 10
  - Type B: 10 < G ≤ 20
  - Type C: G > 20
- Deformation distance:
  - Maximum 50% of the width of the module, for all the types.
2. Description of the Test

Tests were performed using the Universal Impactor Machine shown in Figure 1. The universal impactor is capable of throwing different body forms up to a nominal speed of 15 m/s, either in free or guided flight. The upper boundary of the impactor is a throwing energy of 3 000 J.

The tests of the stopping barriers were done using a certified body block with a nominal mass of 34-36 kg and a moment of inertia of 2.26 ± 0.23 kgm². The body block was launched in free flight at a nominal speed of 6.66 m/s (24 km/h). The body block was instrumented with two accelerometers (Measurement, Model 64C) and one angular rate sensor (DTS, Model ARS-8K).

<table>
<thead>
<tr>
<th>Location</th>
<th>Sensor</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center of gravity of the body block (X Local Axis)</td>
<td>Accelerometer</td>
<td>ACE-027</td>
</tr>
<tr>
<td>Center of gravity of the body block (Y Local Axis)</td>
<td>Angular rate</td>
<td>ARS-119</td>
</tr>
<tr>
<td>Center of gravity of the body block (Z Local Axis)</td>
<td>Accelerometer</td>
<td>ACE-026</td>
</tr>
</tbody>
</table>

The local coordinate system and the polarities for the sensors were defined according to the standardized sign convention in SAE J211. Data were recorded at 10 000Hz and were filtered using a 180 Channel Frequency Class (180 CFC).

Therefore, the global reference system is defined as:

- X global axis perpendicular to the impact face of the barrier (horizontal).
- Z global axis pointing downward (vertical).
- Y global axis defines a right-handed coordinate system.

Two high-speed video cameras (1 000 Hz) were used to track the motion of the body block during the flight (lateral and zenithal planes). To calculate the test results, a two-dimensional (2D) analysis was carried out.
3. Description of the Samples

Model: AIR PROTEK – RACING SAFETY WALL
Depth of the module: 500 mm
Reference: S-157; S-158
Pneumatic declared pressure: 40-60 mbar

Figure 2. S-157; S-158.

Model: AIR PROTEK – RACING SAFETY WALL
Depth of the module: 500 mm
Reference: S-160¹
Pneumatic declared pressure: 40-60 mbar

Figure 3. S-160.

The sampling has been done outside the Impact Laboratory.

4. Tests Configuration

<table>
<thead>
<tr>
<th>Test</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-157</td>
<td>Guardrail + AIR PROTEK – RACING SAFETY WALL. Centered impact. First Impact</td>
</tr>
<tr>
<td>S-158</td>
<td>Guardrail + AIR PROTEK – RACING SAFETY WALL. Centered impact. Second Impact (15 min later)</td>
</tr>
<tr>
<td>S-160</td>
<td>Guardrail + AIR PROTEK – RACING SAFETY WALL. Impact at the union of two modules</td>
</tr>
</tbody>
</table>

¹ This test is included just as additional information about the connection between modules.
5. Tests Results

The 2D analysis of the data allowed calculating the following specifications:

- Impact velocity [km/h]: velocity in the X global axis at the instant of the body block impact with the barrier.
- Rebound distance/velocity [km/h]: the return velocity in the X global axis (calculated from the deceleration curve).
- Absorbed energy [%]: the percentage of total impact kinetic energy absorbed by the tested sample (calculated from velocity in X global axis).
- Peak acceleration [g]: the maximum deceleration in the X global axis.
- Average acceleration [g]: mean deceleration in the X global axis. Calculated from the beginning of the event up to the instant when the maximum deformation distance is reached.
- Event duration [ms]: time-frame of the impact event, taken from the beginning of the event up to the instant when the maximum deformation distance is reached.
- Deformation distance [mm]: the maximum distance reached by the impacting body block penetrating into the tested sample.

Table 1 summarizes the results of the tests.

<table>
<thead>
<tr>
<th>Sample identification no.</th>
<th>S-157</th>
<th>S-158</th>
<th>S-160</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact velocity (Angle)</td>
<td>23.78 km/h (-0.5°)</td>
<td>23.95 km/h (-0.9°)</td>
<td>23.94 km/h (-0.2°)</td>
</tr>
<tr>
<td>Rebound distance/velocity</td>
<td>20.95 km/h</td>
<td>20.79 km/h</td>
<td>20.62 km/h</td>
</tr>
<tr>
<td>Absorbed energy</td>
<td>21.0%</td>
<td>23.5%</td>
<td>24.3%</td>
</tr>
<tr>
<td>Peak acceleration</td>
<td>20.7 g</td>
<td>20.8 g</td>
<td>20.0 g</td>
</tr>
<tr>
<td>Average acceleration</td>
<td>12.7 g</td>
<td>12.6 g</td>
<td>13.0 g</td>
</tr>
<tr>
<td>Event duration</td>
<td>53 ms</td>
<td>54 ms</td>
<td>52 ms</td>
</tr>
<tr>
<td>Deformation distance (Angle*)</td>
<td>226 mm (-7.9°)</td>
<td>229 mm (-8.1°)</td>
<td>218 mm (-6.4°)</td>
</tr>
<tr>
<td>Deformation [%]</td>
<td>45.2%</td>
<td>45.8%</td>
<td>43.6%</td>
</tr>
</tbody>
</table>

*Note: The value of the deformation distance corresponds to the center of gravity of the body block, as the orientation of the body block, at the instant of maximum deformation, is not perpendicular to the ground. This inclination value is indicated in brackets ( ).

Table 1. Results of the tests.
Deceleration Graphs:

**Figure 4. Deceleration pulse of S-157 test.**

**Figure 5. Deceleration pulse of S-158 test.**

**Figure 6. Deceleration pulse of S-160 test.**
6. Conclusions

According to the classification criteria described in section 1, test results lead to the following conclusions:

- Peak acceleration obtained is: 20.7 g (1st shot); 20.8 g (2nd shot). These values classify the barrier as a type C stopping barrier.

- Deformation obtained is: 45.2% (1st shot); 45.8% (2nd shot). The deformation values do not exceed the 50% of the width of the module.

Final conclusion: These values classify the barrier as a type C stopping barrier.
7. Notes and Comments

1) For the test, the module was installed leaning against a triple guard rail as it is defined by FIA for circuits.
2) The fixation method between the protective device and the back support (triple guardrail) was by means of straps.
3) The manufacturer declares the inner pressure of the module.
4) There was not anti-sliding "skirt" in the tested samples, but it was present in the samples used for checking the connection between modules. The barriers are designed to be equipped with the skirt, which is fixed by means of “Velcro” straps.
5) It was appreciated that the protective device did not contain any metal rings (ex. for attaching advertising panels).
6) It was appreciated that the protective device presented a connection between modules robust enough to prevent the rider to slide in between modules. One impact test was done on the connection between modules. The connection between modules withstood the impact and the results were similar to the impacts at the center of the module.