SFI FOUNDATION INC.™

QUALITY ASSURANCE SPECIFICATIONS™

SFI SPECIFICATION 31.1 EFFECTIVE: MARCH 27, 2013*

PRODUCT: Flame Resistant Motorsports Helmets

1.0 GENERAL INFORMATION

1.1 This SFI Specification establishes uniform test procedures and minimum standards for evaluating and determining performance capabilities for Flame Resistant Helmets used by individuals engaged in competitive motorsports.

1.2 The procedures, test evaluations and standards contained herein, are intended only as minimum guidelines for construction and evaluation of products. Certification that products meet such minimum standards is made by the product manufacturer and products are not certified, endorsed or approved by SFI under this program.

1.3 Use of the "This Manufacturer Certifies That This Product Meets SFI Specification 31.1" logo/designation, the authorized artwork style, or conventional lettering by a manufacturer, on a subject product, is intended only to indicate that the manufacturer of the product has represented that they have submitted the product to the recommended tests, with positive results, in compliance with the standards established herein.

1.4 This SFI Specification requires a demonstration that the product of a manufacturer meets or exceeds the requirements when the manufacturer enters the program; and on an annual basis thereafter. Any manufacturer may participate in the program by providing Flame Resistant Motorsports Helmets that meet or exceed the SFI Specification 31.1 test standards, by complying with the requirements of the SFI Specification 31.1 program, and by signing a licensing agreement with the SFI Foundation, Inc.

1.5 Compliance with this specification is entirely voluntary. However, when a manufacturer provides Flame Resistant Motorsports Helmets in compliance with all requirements of the SFI Specification 31.1 and enters into the licensing agreement with the SFI Foundation, Inc., they may certify that compliance with such standards is in accordance with the guidelines established herein.

1.6 Manufacturers wishing to participate in the program, in addition to the other requirements of this specification, must label each of their products with the manufacturer's name, trademark or symbol as well as the date of manufacture of the product.

1.7 No manufacturer may display the SFI logo/designation on their product unless the manufacturer has signed a licensing agreement with SFI and has successfully complied with all the requirements of this specification and the self-certification program.

2.0 DEFINITIONS

2.1 Full Faced Helmet: A helmet which utilizes an integral extension of the front of the shell that encompasses the chin area and encloses the facial opening.

2.2 Open Faced Helmet: A helmet which does not encompass the chin area.

2.3 Face shield: The transparent covering over the facial opening that provides facial protection from wind and debris.

2.4 Shell: The rigid exterior casing of the helmet.

2.5 EAM (Energy Absorbing Material): The material or mechanism placed on the interior of the shell that provides energy absorption. The EAM is also referred to as energy-absorbing liner.

2.6 Padding: The material used in the interior of the helmet to provide sizing and fit volume, if necessary.

2.7 Lining: The fire retardant cloth material covering the EAM and padding in the interior of the helmet. The lining shall be the only part of the helmet in direct contact with the wearer's head.

2.8 Restraint Anchor: A mounting point intended as a terminal for the tethers of an SFI 38.1 Head and Neck Restraint System.

2.9 Retention system: The complete assembly by which the helmet is retained in position on the wearer's head during use.

2.10 Testing Planes

2.10.1 Basic Plane: A plane through the centers of the right and left external ear openings and the lower edge of the eye sockets on a representation of the human head.

2.10.2 Reference Plane: A plane parallel to and above the basic plane as defined in EN 960, 1995.

2.10.3 Transverse Plane: A plane perpendicular to both the longitudinal and basic planes. It corresponds to the anatomical plane that contains the two auditory meatuses and divides the front from the rear portions of the head.

2.10.4 Midsagittal Plane: A longitudinal plane through the median of a representation of the human head that is perpendicular to the basic plane.

2.10.5 Anterior Upper Plane (A1): A plane parallel to and above the basic plane at a distance of 46.8 mm, 50 mm, 53 mm, 55.2 mm for the A through M headforms.

2.10.6 Middle Plane (A2): A plane parallel to the A1 and basic planes and lies between them at a distance of 26.1 mm, 28.2 mm, 30 mm, and 31.5 mm below the A1 plane for the A through M headforms.

2.10.7 Rear Plane (A3): A plane parallel to the A1 plane and lies below it a distance of 52.2 mm, 56.4 mm, 60 mm, and 63 mm for the A through M headforms.

2.10.8 Posterior Vertical Plane (PVP): A plane that divides the rear third of the head from the front two thirds. It is parallel to the transverse plane and lies at a given distance behind the point where the reference plane and longitudinal planes intersect with the front surface of the headform.

2.10.9 Reference Point: The distance from the front of the headform where the reference and longitudinal planes intersect, 128.6 mm, 139 mm, 148.4 mm, and 155.8 mm for the A through M headforms.

2.10.10 Anterior Vertical Plane (AVP): A plane parallel to the transverse plane that lies behind the reference point at a distance of 39 mm, 42.2 mm, 45.2 mm, and 47.4 mm for the A through M headforms.

2.11 Reference headform: A measuring device per EN 960, 1995 with surface markings indicating the locations of the basic midsagittal planes and the centers of the external ear openings.

2.12 Test headform: An impact attenuation testing headform per EN 960, 1995.

2.13 HPI (Helmet Positioning Index): The distance, as specified by the manufacturer, from the lowest point of the brow opening at the lateral midpoint of the helmet to the basic plane of the reference headform.

2.14 After-flame time: The time an object continues to flame after the thermal load is removed.

2.15 EN 960, 1995: Headforms for Use in the Testing of Protective Helmets.

2.16 TP-218-03: NHTSA "Laboratory Procedure for Motorcycle Helmet Testing," November 23, 1992.

2.17 ANSI-Z87: American National Standards Institute Standard Z87.1, "Practice for Occupational and Educational Eye and Face Protection", 1989.

3.0 CONSTRUCTION

The primary function of the helmet is to attenuate impact energy and resist penetration. The helmet shall minimally consist of a shell, EAM, lining, retention system, trim, face shield and the hardware necessary to assemble the parts. The EAM shall substantially cover the inside surface of the shell including the chin bar area. The thickness of the EAM can be reduced in the areas necessary to provide clearance for facial features. The retention system shall include a chin strap permanently anchored to the shell on both sides. The chin strap shall be fitted with a fastening device to attach each side together and to adjust and maintain tension. Alternative configurations may be satisfactory but must be evaluated by SFI individually to determine test methods and acceptance criteria.

3.1 MATERIALS

The materials used in the helmet shall be resistant to the elements that they are exposed to in normal service. Besides environmental considerations, these elements include fluids used in and around motor vehicles that may come in contact with the helmet and those used by the wearer that may be transferred to the helmet. All metal parts shall be corrosion resistant.

3.2 RESTRAINT ANCHORS

There must be permanently installed female M6 hardware accessible through a hole in the shell on each side of the helmet. The center of the female M6 hardware must be on the ISO S4 plane +/- 10mm, a minimum of 70mm rear of the helmet vertical axis centerline.

4.0 MODEL CLASSIFICATION

Any variation in materials, shell dimensions or contour, EAM dimensions or contour, construction method or retention system shall be considered a model change and requires additional testing. Any variation of the padding, including removal or addition, shall not be considered a model change.

5.0 TESTING

Calibration and procedures shall conform to TP-218-03 if not otherwise specified. It is recommended that the tests be conducted in the order listed.

5.1 SAMPLES

For initial design validation, at least eight helmets of each size shall be supplied and all tests shall be conducted. For annual revalidation, at least two helmets of each size shall be supplied and only the tests noted need be conducted. If the only difference between a set of sizes is the padding configuration, then only the size with the thinnest padding must be tested. All helmets shall represent the same model and be in as-sold condition. Additional lining material, identical to that used in the helmet, shall also be supplied in sufficient size to conduct the required flame resistance tests.

5.2 APPARATUS

A. REFERENCE HEADFORMS

The reference headforms shall conform to the A, E, J, and M as specified in EN 960, 1995.

B. TEST HEADFORMS[1]

The test headforms shall conform to the specifications contained in EN 960, 1995. The test headforms shall be of rigid, low resonance such as

[1] Headforms may be obtained from Controlled Castings Corporation, 31 Commercial Court, Plainview, NY 11803.

magnesium alloy, e.g. K-1a, or equivalent and shall conform to the A, E, J and M as specified in EN 960, 1995.

5.3 INSPECTION

All edges of the shell shall be covered by protective trim, and there shall not be any rigid projections on the inside of the shell. The face shield shall be faired into the sides of the helmet so that no projections exist which could snag on contacting surfaces. Optional devices fitted to the outside of the shell shall also be designed such that they are unlikely to snag or cause injury in the event of an impact. The outside of the helmet shall be inspected for rigid projections. The height of the projections above the outside surface of the helmet shall be measured.

5.3.1 LABELING

In addition to the information and conformance labels required by this specification, a warning label shall also be attached to the inside of the helmet. The label shall state:

"WARNING: This helmet will provide the best protection if it fits snugly on the head and the chin strap is securely fastened. Do not make any modifications to the helmet. Possible impacts may exceed the helmet's capacity to protect against severe injury or death. If the helmet experiences a severe impact, return it to the manufacturer for inspection or remove from service."

5.3.2 FIELD OF VISION

Peripheral visual clearance on each side of the helmet shall be measured in accordance with TP-218-03. The vertical distance between the upper and lower edges of the eyeport opening shall be measured. Determine the distance in three places, on the midsagittal plane and 60 degrees to each side.

5.4 TEST AREA

The test area shall be the area above a demarcation line marked on each helmet as shown in Figure 1. Firmly seat the helmet on the proper size reference headform by applying a 44.48 $\pm$1.11 newton {N} (10.00 $\pm$0.25 pound {lbf}) load perpendicular to the apex of the helmet. Center the helmet laterally and position to the HPI.

5.4.1 MARKING THE TEST AREA

Mark lines on the helmet to indicate the test area as noted below.

A. REFERENCE PLANE

A plane parallel to the basic plane and lies above it at a distance of 24 mm, 26 mm, 27.5 mm, and 29 mm for the A through M headforms.

B. ANTERIOR VERTICAL PLANE (AVP)

See paragraph 2.9.10 above.

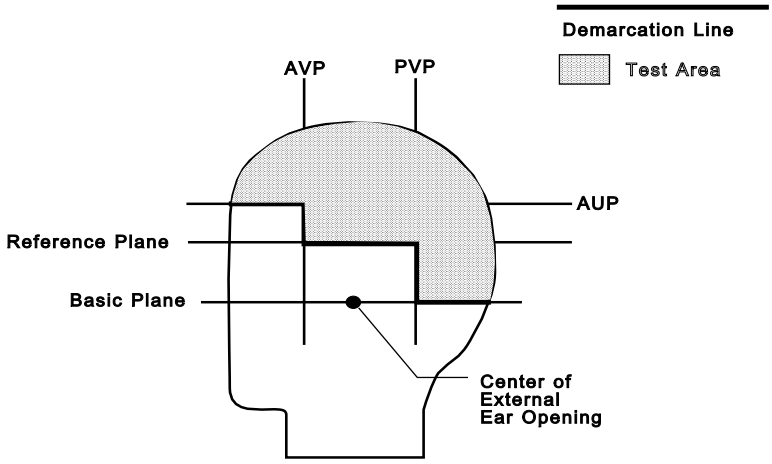
C. ANTERIOR UPPER PLANE (AUP)

See paragraph 2.9.5 above.

D. POSTERIOR VERTICAL PLANE (PVP)

See paragraph 2.9.8 above.

Figure 1



5.4.2 DEMARCATION LINE

The demarcation line shall be marked on each helmet where the particular plane intersects the outer helmet surface. It shall be the anterior upper plane in front of the anterior vertical plane. It shall be the anterior vertical plane between the anterior upper plane and the reference plane. It shall be the reference plane between the anterior and posterior vertical planes. It shall be the posterior vertical plane between the reference and basic planes and it shall be the basic plane behind the posterior vertical plane.

5.5 HELMET CONDITIONING

For initial design validation, the conditioning shall be as stated. For annual revalidation, the helmets need only be conditioned to the environment specified for the particular test. This shall be called the significant environment. Each test shall state its significant environment.

5.5.1 CHEMICAL EXPOSURE

For initial design validation, all helmets except those to be conditioned at ambient temperature shall be treated. For annual revalidation, only one helmet shall be treated. A solvent mix of 50% toluene and 50% isooctane shall be used. A cotton cloth or equivalent shall be used as an applicator for the solvent. At least 20 cubic centimeters (1.22 cubic inches) of solvent shall be applied to the entire exterior of the helmet, excluding the face shield, for not less than 10 seconds. At least 30 minutes shall elapse before further conditioning and testing.

5.5.2 ENVIRONMENTAL EXPOSURE

Each of two helmets for a given testing size, with face shields attached, shall be subjected to one of the environmental conditions as outline below for a period of not less than four hours nor more than 12 hours. Each test shall be completed within four minutes of removal from the conditioning environment and then returned if testing has not been completed. If the time out of the environment exceeds four minutes, the helmet shall be returned to the specific environment for a minimum of three minutes for each minute that the helmet remained out of the environment in excess of four minutes or for a period of four hours, whichever is less, before resumption of testing.

A. AMBIENT TEMPERATURE

Expose the helmet not treated with solvent to a temperature of 21 ±2 degrees Celsius {°C} (70 ±4 degrees fahrenheit {°F}) for the specified time.

B. LOW TEMPERATURE

The helmet shall be exposed to a temperature of -10 ±2°C (14 ±4°F) for the specified time.

C. HIGH TEMPERATURE

The helmet shall be exposed to a temperature of 50 ±2°C (122 ±4°F) for the specified time.

D. WATER IMMERSION

The helmet shall be immersed in water at a temperature of 25 ±5°C (77 ±9°F) for the specified time. The helmet shall be drained for at least 15 minutes but not more than 45 minutes.

5.6 FACE SHIELD – FULL FACE HELMETS ONLY

5.6.1 FASTENING MECHANISM

Only the two helmets conditioned at ambient temperature shall be tested. The face shield shall be fitted on the helmet with a mechanism to prevent inadvertent lifting when properly fastened. To test the mechanism, the face shield shall be installed and latched.

A. With the helmet held firmly, apply a 44.5 ±2.2 N (10 ±0.5 lbf) load for five seconds at the median bottom edge of the face shield, perpendicular to the face shield surface and perpendicular to the edge. Inspect the face shield for evidence of unlatching.

5.6.2 PENETRATION

After this test, the face shield shall be removed from the helmet.

A. SAMPLES

For initial design validation, the face shield of one helmet from each conditioning environment shall be tested. For annual revalidation, the significant environment is low temperature.

B. APPARATUS

1. HEADFORMS

EN 960, 1995 test headforms shall be used.

2. PROJECTILES

A steel projectile shall be used. It shall be 9.53 ±0.51 mm (0.375 ±0.02 inch) in diameter, weigh 44.23 ±0.57 grams (1.56 ±0.02 ounces), be 63.5 ±1.3 mm (2.50 ±0.05 inches) long with a conical point of 90 ±2 degrees included angle. The point shall have a spherical radius no greater than 0.51 mm (0.02 inch). The hardness of the steel shall be 60 ±10 on the Rockwell "C" scale.

A 6.35 mm diameter ball shall also be used.

3. FIXTURE

A fixture with a barrel or tube of sufficient length to ensure constant exit velocity of the steel ball, together with a breech or loading mechanism positioning the steel ball at a fixed position from the barrel or tube end, and capable of providing propulsion. The equipment must incorporate a means of calibrating the exit velocity of the steel ball. The velocity of the steel ball shall be recorded no less than 25 cm from the point of impact.

C. PROCEDURE

The fixture shall be positioned such that the opening shall be within 102 ±10 mm (4.0 ±0.4 inches) of the impact area. The impact area shall be on the forward optical surface and within a 25.4 mm (1 inch) diameter circle centered over the eye opening. The impact point shall be perpendicular to a plane tangent to the impact area. The steel projectile shall be dropped from a height of 3.66 ±0.01m (12.00 ±0.03 ft) above the shield surface to strike the shield point first.

Then place the face shield at ambient temperature in the normal wearing position. Fire the steel ball at a velocity of 119.0 +3.0/-0 m/s. The points of impact shall include one or more of the following: lens center, and 30 mm on each side of lens center.

5.7 RETENTION SYSTEM

5.7.1 SAMPLES

For initial design validation, one helmet from each conditioning environment shall be tested. For annual revalidation, the significant environment is hot.

5.7.2 APPARATUS

The apparatus shall be similar to the retention system test device specified by FMVSS 218.

A. JAW SIMULATOR

The jaw simulator shall be a device to simulate the human jaw. It shall consist of a structure with two freely turning metal rollers and a method to attach the load mechanism. The rollers shall be 12.7 ±0.5 mm (0.50 ±0.02 inch) in diameter. Their centers shall be separated at a fixed distance of 76.2 ±1.0 mm (3.00 ±0.04 inches). The rollers shall be rigidly mounted in the structure to enable them to support the test loads.

B. LOAD MECHANISM

The mechanism shall enable the retention system to be loaded through the jaw simulator. The load shall be applied normal to the basic plane and symmetrical with respect to the center of the retention assembly. The load shall consist of two parts. The first shall be 226 ±5 N (50.8 ±1.1 lbf) and the second, 1,223 ±15 N (275.0 ±3.4 lbf).

C. TEST HEADFORM

The test headform, for this test only, may be made of any suitable material that can provide adequate strength to fulfill the requirements of the test. It may be modified for use with the test fixture.

D. TEST FIXTURE

The test fixture shall enable the test headform to support the helmet and provide resistance to the load. The test fixture shall position the helmet's vertical axis 15 ±1 degrees to either side of a plane through the helmet's longitudinal axis parallel to the direction of the load. The headform shall remain in this position while the load is being applied to the chin strap.

5.7.3 PROCEDURE

The helmet shall be mounted on the test headform in the test fixture. The chin strap shall be fastened around the jaw simulator. The chin strap fastening device shall not be in contact with a roller. The first load shall be applied to the load mechanism for two minutes. This is when the zero line is established for measurement of elongation. The second load shall then be added to the first load and maintained for two additional minutes.

5.8 CHIN BAR – FULL FACE HELMETS ONLY

5.8.1 SAMPLES

For initial design validation, one helmet from each conditioning environment shall be tested. For annual revalidation, the significant environment is high temperature.

5.8.2 APPARATUS

A. FLAT IMPACTER

A circular flat impactor with a striking face diameter of 100 mm -0/+10 mm (3.94 -0/+0.40 inches) and a weight of 5000 g –0/+100 g (11.0 -0/+0.4 lbf) shall be used.

B. HELMET FIXTURE

The fixture shall provide a rigid mounting for the rear curvature of the shell to allow the helmet to be positioned with the plane of the base vertical. It shall also provide a method to inhibit helmet movement during impact.

C. TEST FIXTURE

The test fixture shall enable the impactor to be dropped in guided free fall the required distance onto the chin bar.

5.8.3 PROCEDURE

The helmet, without headform, shall be firmly mounted on the helmet fixture with the chin bar facing straight up and the helmet base perpendicular to the horizontal plane of the base. The assembly shall then be positioned in the test fixture to enable the impactor face to strike the median of the chin bar. The impactor shall be dropped a distance of 1 m ± 1 cm.

5.9 IMPACT ATTENUATION

Impact attenuation shall be determined by measuring acceleration of an instrumented test headform.

5.9.1 SAMPLES

For initial design validation, helmets from each conditioning environment shall be tested. For annual revalidation, the significant environment is stated for each anvil. The chin bars may be removed if they interfere with the test fixture.

5.9.2 APPARATUS

A. TEST HEADFORM ASSEMBLY

The test headform assembly shall consist of a test headform of the appropriate size, a supporting structure and a transducer. The supporting structure shall be attached to the headform in such a manner as to allow the entire assembly to be dropped vertically with a minimum of friction while enabling the helmet to be impacted on the test area. The center of gravity of the test headform assembly shall lie within the rectangular volume as defined in ISO/DIS 6220. The weight of the combined headform/supporting structure shall be not less than 5.0 kg nor more than 6.5 kg.

1. TRANSDUCER AND DATA CHANNEL

The transducer shall be mounted at the center of gravity of the test headform. The sensitive axis of the transducer shall be aligned to within five degrees of the vertical when the test

headform assembly is in the impact position. The acceleration data channel shall comply with the Society of Automotive Engineers recommended practice J211, October 1988 requirements for channel class 1,000.

B. ANVILS

Anvils shall be made of steel and have a smooth finish.

1. FLAT

The flat anvil shall be circular with a diameter of 127 -0/+10 mm (5.0 -0/+0.4 inches). The thickness shall be at least 20 mm (0.78 inch). The significant environment is low temperature.

2. HEMISPHERICAL

The hemispherical anvil shall have a radius of 48 ±0.5 mm (1.90 ±0.02 inches). The thickness of the spherical segment shall be at least 20 mm (0.78 inch). The significant environment is high temperature.

3. VERTICAL PLATE

The vertical plate anvil shall have a width of 6.3 ±1 mm (0.25 ±0.04 inch), a minimum height of 30 mm (1.18 inches) and be 180 ±1 mm (7.09 ±0.04 inches) in length. The significant environment is high temperature.

4. ROLL BAR OR CYLINDER

The roll bar anvil shall have a diameter of 41.3 ±0.5 mm (1.625 ±0.020 inches) and be 205 ±5 mm (8.07 ±0.20 inches) in length. If a cylindrical segment is used, it shall have a minimum height equal to the radius of the roll bar. The roll bar shall be rigidly attached to a flat plate to enable mounting. The significant environment is high temperature.

C. TEST FIXTURE

The test fixture shall enable the helmet and test headform assembly to be dropped in guided free fall onto the anvil. The available drop height shall be sufficient for the helmet to receive the required impact energy. The mount for the anvils shall consist of a rigid, solid weight of at least 136 kg (300 lbf), the upper surface of which shall consist of

a steel plate with a minimum thickness of 25 mm (0.98 inch) and a minimum surface area of 0.093 m^2 (144 $inch^2$).

5.9.3 IMPACT METHOD

All impacts are initially based on a zero friction height and a minimum impact velocity. The height of the helmet above the anvil, before dropping, is given. An appropriate increase in height shall be necessary since this height assumes no friction in the guiding mechanism. The actual drop height shall be verified by measuring the terminal velocity of the test headform assembly in the last 25 mm of the fall and comparing it to the minimum impact velocity specified.

5.9.4 PROCEDURE

All impact sites shall be separated from each other by a distance of at least one-sixth of the maximum circumference of the helmet. The test sites for a particular anvil shall be alternated for a helmet test set so that the same anvil does not impact the same site area on more than one helmet in that set, except as noted. Select the proper headform by matching its size to the manufacturer's specified helmet size and verify by fitting the helmet to the test headform. Install the test headform assembly in the helmet and position to the HPI. Fasten the chin strap securely per manufacturer's instructions. Raise the entire assembly to the determined height and drop onto the specified anvil. Since at least two helmets are conditioned in the same environment and there are more required impacts than those available on one helmet, both shall be used to provide ample sites to allow all impacts specified.

A. IMPACT ATTENUATION

1. FLAT ANVIL

The helmet shall receive two impacts at each of two sites against the flat anvil surface on the test area. The first and second drops shall be from a minimum height of 3.058 m (120.4 inches) and 2.039 m (80.3 inches), respectively. The minimum impact velocities shall be 7.7 m/sec (25.4 ft/sec) and 6.3 m/sec (20.7 ft/sec), respectively.

2. HEMISPHERICAL ANVIL

The helmet shall receive two impacts at one site against the hemispherical anvil surface on the test area. The first and second drops shall be from a minimum height of 3.058 m

(120.4 inches) and 2.039 m (80.3 inches), respectively. The minimum impact velocities shall be 7.7 m/sec (25.4 ft/sec) and 6.3 m/sec (20.7 ft/sec), respectively.

3. VERTICAL PLATE ANVIL

The helmet shall receive one impact against the vertical plate anvil surface on the test area. The drop shall be from a minimum height of 3.058 m (120.4 inches). The minimum impact velocity shall be 7.7 m/sec (25.4 ft/sec).

4. BAR ANVIL

The helmet shall receive impacts on the rear and side against the bar anvil surface. The rear of the helmet shall be impacted three times at the same site, with the longitudinal axis of the bar perpendicular to the vertical axis of the helmet. The side of the helmet shall also be impacted three times at the same site. The longitudinal axis of the bar shall be parallel to a plane through the vertical axis of the helmet and perpendicular to the longitudinal axis of the helmet. The center of each impact site shall be in the test area. The three impacts shall be from a minimum height of 3.058 m (120.4 inches), 2.447 m (96.3 inches) and 2.039 m (80.3 inches), respectively. The minimum impact velocities shall be 7.7 m/sec (25.4 ft/sec), 6.9 m/sec (22.7 ft/sec) and 6.3 m/sec (20.7 ft/sec), respectively.

5.10 SHELL PENETRATION TEST

5.10.1 SAMPLES

For both initial design validation and annual revalidation, one helmet from any conditioning environment shall be tested.

5.10.2 APPARATUS

A. TEST HEADFORM ASSEMBLY

The helmet shall be placed on a rigidly mounted headform. The test headform assembly shall be positioned on the test fixture so that the helmet will be impacted on the test area.

B. STRIKER

The penetration test striker shall have a mass of 3kg ± 50g (6.6 lbs ± 1.7 oz). The point of the striker shall be a cone with an included angle of 60 ± 0.5º and a height of 38 ± 0.38mm (1.50 ± 0.02 in). The striking tip shall have a hardness of 60 Rockwell (scale C3 points) and a radius of 0.5 ± 0.01mm (0.0200 ± 0.0004 in).

C. TEST FIXTURE

The test fixture shall enable the striker to be dropped in guided free fall the required distance onto the helmet shell test area.

5.10.3 PROCEDURE

If the helmet contains a sling or other adjustable sizing component, it shall be relaxed to its most extendable position. Place the helmet on the headform and fasten the chin strap. The test striker shall be dropped from a height of 3m ± 15mm (9.8 ft ± 0.6 in) onto the test area of the helmet shell, except not on a fastener or other rigid projection. After the drop, determine if contact was made between the striker and the headform.

5.11 FLAME RESISTANCE

The test shall be conducted at an ambient temperature between 10°C (50°F) and 30°C (86°F).

5.11.1 SAMPLES

For initial design validation, the helmets conditioned at ambient temperature shall be tested. For annual revalidation, the helmets shall not be tested with solvent.

5.11.2 APPARATUS

A. THERMAL LOAD

The thermal load shall be a propane flame, at the flame location generating a measured temperature of 790 ±40°C (1454 ±85°F).

B. TIMING DEVICE

A timing device with an accuracy of ±0.5 seconds shall be used to measure the after-flame times.

5.11.3 PROCEDURE

A. SHELL

The flame shall be positioned perpendicular to the shell surface and within the test area. The shell shall be subjected to the thermal load for a period of 30 ±1 seconds. Simultaneous with the removal of the flame, the timing device shall be activated. Determine the after-flame time.

B. TRIM

The trim shall be subjected to the thermal load for a period of 15 ±1 seconds. Determine the after-flame time.

C. FACE SHIELD – FULL FACE HELMETS ONLY

The face shield shall be subjected to the thermal load for a period of 45 ±1 seconds. Determine the after-flame time.

5.12 LINING PERFORMANCE

The additional lining material supplied shall be tested for its fire retardant capabilities.

5.12.1 TPP RATING

The lining shall be tested for its TPP value in accordance with SFI Technical Bulletin 3.2. Three samples shall be tested.

5.12.2 FLAMMABILITY

The lining shall be tested for flammability in accordance with SFI Technical Bulletin 3.2.

5.13 RESTRAINT ANCHOR TEST

5.13.1 SAMPLES

For both initial design validation and annual revalidation, one helmet from any conditioning environment shall be tested. All of the following tests must be performed on the largest size for that model.

5.13.2 APPARATUS

A. TEST HEADFORM ASSEMBLY

The helmet shall be placed on a rigidly mounted headform. The test headform assembly shall be positioned on the test fixture so that the helmet and headform may be tilted forward 40 degrees.

B. LOAD ASSEMBLY

The load assembly shall be capable of pulling away from the rear of the helmet with a tensile force of at least 14kN.

C. TEST FIXTURE

The test fixture shall enable the cables to be parallel and capable of pulling horizontally rear ward from each the helmet anchors.

5.13.3 PROCEDURE

A. TEST A

A load is applied to the mounting points with the helmet (S planes) angled forward-down 40deg +/- 5deg, both anchors pulled parallel to each other and perpendicular to the Y axis (or a line drawn through the left and right anchors), both tethers loaded within 0.2kN simultaneously, with a total load of 7kN for 5 seconds, with hardware creating a bending moment arm (distance from the shell surface to the centerline of the load applied to the hardware) of less than 12mm. Inspect for structural damage to the helmet and anchor hardware misalignment.

B. TEST B

A load is applied to the mounting points with the helmet (S planes) angled forward-down 40deg +/-5deg single anchor pulled perpendicular to the Y axis, with a total load of 3.5kN for 5 seconds, with hardware creating a bending moment arm (distance from the shell surface to the centerline of the load point of the hardware) of 25mm +/- 2mm. Inspect for structural damage to the helmet and anchor hardware misalignment.

C. TEST C

A load is applied to the mounting points with the helmet (S planes) angled forward-down 40deg+/-5deg, both anchors pulled parallel to each other and perpendicular to the Y axis, both tethers loaded simultaneously (within 0.2kN) with a total load of 14kN for 5 seconds, with hardware creating a bending moment arm (distance from the shell surface to the centerline of the load applied to the hardware) of less than 12mm. Inspect for structural damage to the helmet and anchor hardware misalignment.

6.0 PROOF OF COMPLIANCE

Flame Resistant Motorsports Helmet manufacturers are required to provide the following information to enroll in this program:

6.1 TEST RESULTS

Test results shall be documented in a test report. All tests that each helmet is subjected to must be passed.

6.1.1 INSPECTION

There shall not be any rigid projections greater than 7 mm (0.28 inch) above the shell unless they are blended smoothly with the outside surface. No projection shall be greater than 12 mm (0.47 inch) above the surface.

A. LABELING

The information and warning labeling shall conform as specified.

B. FIELD OF VISION

Peripheral visual clearance on each side of the midsagittal plane shall be at least 90 degrees. The eyeport opening vertical distance shall not be less than 50 mm (1.97 inches) at any of the three locations.

6.1.2 FACE SHIELD – FULL FACE HELMETS ONLY

A. FASTENING MECHANISM

The face shield shall not unlatch due to the static load or any of the three test impacts.

B. PENETRATION

The projectile shall not pass through or remain lodged in the shield. No pieces shall break loose from the shield. Cracking and piercing of the shield is permissible provided that the projectile is repulsed.

6.1.3 RETENTION SYSTEM

The chin strap shall withstand the loading with an elongation no greater than 30 mm (1.18 inches).

6.1.4 CHIN BAR – FULL FACE HELMETS ONLY

Maximum chin bar displacement shall be 60mm.

6.1.5 IMPACT ATTENUATION

No part of the protective components of the helmet other than coating or paint chips shall detach under test impacts. Each impact shall be evaluated as specified below.

A. IMPACTS

The peak acceleration for any impact shall not exceed 275 g's.

6.1.6 SHELL PENETRATION TEST

The test striker must not penetrate the helmet to achieve contact with the headform. Even momentary contact is cause for test failure.

6.1.7 FLAME RESISTANCE

A. SHELL

The after-flame time shall be ten seconds or less.

B. TRIM

The after-flame time shall be 20 seconds or less.

C. FACE SHIELD – FULL FACE HELMETS ONLY

The face shield shall not melt down so as to create an opening. The after-flame time shall be 20 seconds or less.

6.1.8 LINING PERFORMANCE

A. TPP RATING

The material shall have a TPP rating of 6.0 or greater.

B. FLAMMABILITY

The average after-flame time for all samples shall be 2.0 seconds or less for the layer to pass. The average char length for the five samples shall be 15.2 cm (6.0 inches) or less for the layer to pass. Any melting or dripping of the material shall be cause for test failure.

6.1.9 RESTRAINT ANCHOR TESTS A, B, C

A. ANCHOR HARDWARE

There shall be no permanent deformation or movement of interior helmet anchor hardware causing misalignment upon disassembly and re-assembly.

B. HELMET STRUCTURE

There shall be no structural damage to the helmet.

7.0 TEST REPORTS

A separate test report, or set of test reports if required, shall be submitted for each product model. If more than one test facility is required to complete all necessary tests, then a separate test report shall be submitted from each one. A test report shall be submitted for each component, if tested separately. The test facility shall assign a unique number to each test report. This number along with the report date and page number shall appear on each page. Each test report shall include:

7.1 RELEVANT INFORMATION

7.1.1 Manufacturer's name, contact name, address and telephone number.

7.1.2 Name, address and telephone number of the test facility.

7.1.3 Name and signature of the responsible test supervisor.

7.1.4 Actual date of the test.

7.1.5 Specification number and effective date.

7.1.6 Product name, description and model designation.

7.1.7 Component name and description.

7.2 TESTS

Each test conducted shall be listed showing the test name, apparatus used, calibration schedule, procedure used and test results obtained along with any other appropriate information.

7.3 AUTHENTICATION

Test reports shall be authenticated and stamped by a Professional Engineer who is registered in the state in which the testing is conducted. If necessary, SFI may allow an equivalent entity to provide authentication.

8.0 INITIAL DESIGN VALIDATION

To receive initial recognition from SFI as a participant in the SFI Specification 31.1 Program, the manufacturer must submit to SFI all information delineated in the Proof of Compliance section. This information shall be provided for each Flame Resistant Motorsports Helmet model offered by the applicant that is to be included in the program. Any change in design, materials and/or methods of manufacturing not specifically excluded is considered a model change and, therefore, requires initial design validation.

9.0 PERIODIC REVALIDATION

Test reports with successful test results must be submitted to SFI at least once every 24 month period following the date of the initial design validation test for each model of Flame Resistant Motorsports Helmet manufactured by the participant. If multiple test reports are required to obtain all test results, then the earliest test date shall be used to determine when the periodic revalidation reports are due.

10.0 CERTIFICATION OF COMPLIANCE

Upon demonstration of successful compliance with all the requirements of the specification and the self-certification program and upon entering the licensing agreement with SFI, the manufacturer may advertise, present and offer the Flame Resistant Motorsports Helmets for sale with the representation that their product meets the SFI Specification 31.1. Continuing certification is contingent upon the following additional considerations: (1) the product shall be resubmitted for testing following any change in design, materials and/or methods of manufacturing not specifically excluded, and (2) periodic revalidation test reports are submitted when due to SFI.

11.0 CONFORMANCE LABELS

The conformance label is a serial numbered sticker which shall be placed on the inside of the helmet. The serial number should appear on the customer invoice to aid in identification and tracking.

12.0 DECERTIFICATION

Participating manufacturers are subject to decertification when not in compliance with the requirements of this program or when their products are not in compliance with the requirements of this specification. Decertification will provide SFI the right to effect any and all remedies which are available to SFI in the licensing agreement.

13.0 APPEAL PROCEDURE

In the event of decertification, the manufacturer is entitled to an appeal of the decision of SFI. Requests for appeal must be received by SFI no later than thirty days following receipt of the notice of decertification. Appeals of such decisions will be heard at the next meeting of the Board of Directors of SFI.

14.0 STATEMENT OF LIMITATIONS

Testing procedures and/or standards contained in this specification are intended for use only as a guide in determining compliance with the minimum performance requirements as defined herein. The granting and assignment of the "This Manufacturer Certifies That This Product Meets SFI Specification 31.1" logo/designation is in no way an endorsement or certification of product performance or reliability by SFI. SFI, its officers, directors and/or members assume no responsibility, legal or otherwise, for failure or malfunctions of a product under this program.

15.0 COSTS

All costs involved in this program will be absorbed by the submitting manufacturer.

16.0 COMPLIANCE PERIOD

As this specification is revised to reflect changes in technology and/or field conditions, to remain current, participating manufacturers in the SFI Specification 31.1, Flame Resistant Motorsports Helmet, Program, must demonstrate full compliance with the requirements of this specification within ninety (90) days of the latest effective date.

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*	Original Issue:	June 18, 1991
	Review:	November 2, 1993
	Edited:	December 15, 1993
	Revised:	October 25, 1995
	Reviewed:	December 8, 1996
	Reviewed:	December 3, 1998
	Revised:	December 1, 2001
	Reviewed/Edited:	September 2, 2004
	Revised:	July 19, 2007
	Reviewed:	December 11, 2008
	Effective:	March 27, 2013
	Reviewed:	December 13, 2014