SFI SPECIFICATION 7.1 EFFECTIVE: FEBRUARY 13, 1998*

PRODUCT: Lower Engine Containment Device

1.0 GENERAL INFORMATION

1.1 This SFI Specification establishes uniform test procedures and minimum standards for evaluating and determining performance capabilities for Lower Engine Containment Devices 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 7.1" 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 a periodic basis thereafter. Any manufacturer may participate in the program by providing Lower Engine Containment Devices that meet or exceed the SFI Specification 7.1 test standards, by complying with the requirements of the SFI Specification 7.1 program, and by signing a licensing agreement with the SFI Foundation, Inc.

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1.5 Compliance with this specification is entirely voluntary. However, when a manufacturer provides Lower Engine Containment Devices in compliance with all requirements of the SFI Specification 7.1 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 A Lower Engine Containment Device is used to constrain both parts and oil in the event of a failure of reciprocating mass and the resultant failure of the engine block.

2.2 Any containment device pertaining to this specification shall remain as constructed by the original manufacturer and not modified.

2.3 Adsorbent is a material with a length and width much greater than thickness which has both linear form and strength sufficient to be handled either saturated or unsaturated. The adsorbent material must be located such that the top of the sack has no air gap between the adsorbent material and the engine block.

2.4 The service life of the product shall be one year after which it shall be returned to the original manufacturer for inspection and recertification.

3.0 CONSTRUCTION

3.1 A Lower Engine Containment Device shall consist of a ballistic material formed into a sack which covers the lower engine and oil pan. A minimum of four straps shall be attached to the device.

3.2 Two thicknesses of ballistic material can be used. The heavier ballistic material ($\geq$1385 fps V_{50} rating) must cover the sides of the block and pan extending from no more than two (2) inches (51mm) above the bottom surface of the pan to within one (1) inch (25mm) of the head mating surface and extend to within 1 1/2 inches (38mm) of the front and rear of the cylinder case area and be permanently secured on each corner. The remainder of

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the oil pan (front and rear shall extend upward to the pan rail) must be covered with ballistic material that measures at least 50% (≥700 fps V_{50} rating) of the heavier ballistic material.

3.3 A positive device must be used to cover and contain the oil pump, (Note: any oil pump with a remote location away from the containment (oil pan) area does not need to be covered.) This containment can be a separate piece from the rest of the Lower Engine Containment Device and have holes to accommodate the oil lines. This containment does not need to be constructed of ballistic material, but must contain potential oil leakage.

3.4 The **Flexible Type** Lower Engine Containment Device must be attached to the engine block or header flange, attachment to the frame rails is prohibited. The **Rigid Type** Lower Engine Containment Device **only** may be attached to the engine block, header flange or to the frame rails. The Lower Engine Containment Device must have a solid member (hard part) along the top edge to form a zero air gap between the sides of the bag and the engine itself.

3.5 The absorbent material shall be separate from the ballistic material and capable of being easily replaced. It may be necessary to encapsulate the absorbent material in order to maintain desired shape and location characteristics and not materially affect performance capability.

4.0 MODEL CLASSIFICATION

Any variation of the original design, i.e. ballistic material, absorption material, straps or mounting method is considered a model change and will require initial design testing.

5.0 TESTING

5.1 PENETRATION RESISTANCE

This test is based on Military Standard 662D, "Ballistic Test for Armor" (MIL-STD-662D).

5.1.1 SAMPLES

Two samples, 11 by 14 ±1 inch (27.9 by 35.6 ±2.5 centimeters) shall be supplied. The samples shall have the identical layer fabric, layer order and construction, thread and stitch composition, and overall assembly as that of the ballistic material that is being evaluated. One sample represents the sides of the containment device while the other represents the bottom.

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5.1.2 APPARATUS

As per MIL-STD-662D.

A. PROJECTILE

Caliber .22 - Type 2, fragment simulators conforming to MIL-P-46593A shall be used.

5.1.3 PROCEDURES

The sample shall be tested in accordance with MIL-STD-662D for the Ballistic Limit, V_{50} BL(P). The maximum velocity span shall be 150 feet per second {fps} (46 meters per second {mps}).

5.1.4 INTERPRET RESULTS

The V_{50} BL(P) shall be calculated by taking the arithmetic mean of the two highest partial, and the two lowest complete, penetration impact velocities within the allowable velocity span.

5.2 ABSORPTION CAPABILITY

This test is based on ASTM F726 - Standard Method of Testing Sorbent Performance of Adsorbents.

5.2.1 SAMPLES

Test samples must be the same size as supplied in the finished product. Cut the adsorbent material into three sheets 20 X 22 inches (51cm X 56cm).

5.2.2 APPARATUS

This test employs the use of a mesh basket approximately 50 inch² X 5 inches deep (323cm² X 13cm).

5.2.3 PROCEDURE

Determine the tare weight of the basket by fully immersing it into the liquid being used in the test with no adsorbent sample contained. Record the total weight of the liquid and basket by placing the tared pan on a top loading balance after a 30 second drain period. Place adsorbent sample in the center of the basket and lower into the solution until fully saturated and record the elapsed time to that point. Remove the basket and sample and drain for 30 seconds. Determine the total weight by placing the basket and sample on a tared pan balance.

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5.2.4 INTERPRET RESULTS

Calculate net oil retained by subtracting total tare and dry adsorbent weights from total weight. Run the test three times and average data for final results. Determine the total amount of adsorbent material required to hold 6 quarts of racing oil.

5.3 TENSILE STRENGTH

5.3.1 SAMPLES

Test samples shall be fully processed new containment devices which are representative of containment devices currently produced or to be produced. All necessary mounting hardware along with mounting instructions shall be supplied with the containment device. Although the strap material may require sheathing, it is optional for testing.

5.3.2 APPARATUS

A. EQUIPMENT

The test machine must be capable of applying a minimum tensile load of 8,000 lbs with an excursion travel of four to ten inches per minute {ipm}, and must have adequate instrumentation to verify the test load. The test machine must also be in calibration and traceable to the National Bureau of Standards.

B. TEST FIXTURE

The test fixture must duplicate the mounting method of the lower engine containment device and be capable of withstanding the applied load.

5.3.3 PROCEDURES

A. The lower engine containment device shall be mounted to the test fixture per manufacturer's instructions with the supplied attachment hardware.

B. The test fixture shall be installed into the test machine. The strap attachments shall be mounted and oriented in the same position and connected as in an actual vehicle.

C. Using an excursion rate between four and ten ipm, apply an increasing load to the containment device. Continue until a

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load of 8,000 lbs is applied. Hold at that level for ten seconds, then release the load.

6.0 PROOF OF COMPLIANCE

Lower Engine Containment Device 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.

6.1.1 PENETRATION RESISTANCE

The V_{50} BL(P) ballistic resistance of the sample shall be ≥1385 fps for the sides and ≥700 fps for the bottom.

6.1.2 ABSORPTION CAPABILITY

The adsorbent material must be of sufficient size to absorb the equivalent of 6 quarts of racing oil.

6.1.3 TENSILE STRENGTH

The restraint device shall pass the tensile strength test if it is able to maintain the test load (8,000 lbs) for ten seconds.

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.

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7.1.6 Product name, description and model designation.

7.1.7 Component name and description.

7.1.8 Photographs of the submitted part.

7.2 TESTS

Each test conducted shall be listed showing the test name, apparatus used, 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 7.1 Program, the manufacturer must submit to SFI all information delineated in the Proof of Compliance section. This information shall be provided for each Lower Engine Containment Device 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 Lower Engine Containment Device 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. Also, SFI shall retain the option to conduct random audit reviews. SFI shall purchase the product on a commercial basis and test for compliance to the specification. The submitting manufacturer shall reimburse SFI for all audit costs.

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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 Lower Engine Containment Devices for sale with the representation that their product meets the SFI Specification 7.1. 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 patch. A patch shall be attached to each strap facing outward. The month and year of manufacturer shall appear on each patch.

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 7.1" 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.

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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 7.1, Lower Engine Containment Device, Program, must demonstrate full compliance with the requirements of this specification within ninety (90) days of the latest effective date.

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