

Reference Standards for FRP Products

Object of Amendment

Rules for the Survey and Construction of Steel Ships Part C
Guidance for the Approval of Materials and Equipment for Marine Use

Reason for Amendment

ASTM F3059 specifies the standard specifications for fibre-reinforced polymer (FRP) gratings used in marine construction and shipbuilding. In addition, as for the use of FRP products, the Society's rules stipulate a handling based on ASTM F3059-14 (2014 edition) in "Annex 3.2, Chapter 3, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships" and "Chapter 9, Part 3 of the Guidance for the Approval of Materials and Equipment for Marine Use".

ASTM F3059-14 (2014 edition), however, was revised to clarify test conditions and acceptance criteria and re-issued as ASTM F3059-24 (2024 edition). Additionally, there are industry requests for type approval based on the latest revision.

Therefore, requirements related to ASTM F3059 are amended to take into account the latest revision of the ASTM F3059 and to unify the terms related to testing in our Rules.

Outline of the Amendment

The main contents of this amendment are as follows:

- (1) Amends the reference "ASTM F3059-14" to ASTM F3059" in Annex 3.2 "GUIDANCE FOR THE USE OF FIBRE REINFORCED PLASTIC (FRP)", Chapter 3, Part 1, Part C of Rules for the Survey and Construction of Steel Ships and in "TYPE APPROVAL OF FIBER REINFORCED PLASTIC (FRP)", Chapter 9, Part 3 of Guidance for the Approval of Materials and Equipment for Marine Use so as to consider the latest revision by aligning the reference to other standards.
- (2) Amends the description of the fire retardance test for FRP products to flame spread test.

Effective Date and Application

This amendment applies to FRP products for which the application for approval is submitted on or after 1 July 2026.

Amended-Original Requirements Comparison Table (Reference Standards for FRP Products)

Amended	Original	Remarks
<p align="center">RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS</p> <p align="center">Part C HULL CONSTRUCTION AND EQUIPMENT</p> <p align="center">Part 1 GENERAL HULL REQUIREMENTS</p> <p align="center">Annex 3.2 GUIDANCE FOR THE USE OF FIBRE-REINFORCED PLASTIC (<i>FRP</i>)</p> <p>An1 General</p> <p>An1.1 Overview</p> <p>An1.1.1 Application (Same)</p>	<p align="center">RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS</p> <p align="center">Part C HULL CONSTRUCTION AND EQUIPMENT</p> <p align="center">Part 1 GENERAL HULL REQUIREMENTS</p> <p align="center">Annex 3.2 GUIDANCE FOR THE USE OF FIBRE-REINFORCED PLASTIC (<i>FRP</i>)</p> <p>An1 General</p> <p>An1.1 Overview</p> <p>An1.1.1 Application This Annex provides standards for choosing the appropriate fibre-reinforced plastic (hereinafter, referred to as "<i>FRP</i>") products, in cases where their use has been approved by the Society, for each ship design in accordance with their purpose of use and location of use on a case-by-case basis.</p>	

Amended-Original Requirements Comparison Table (Reference Standards for FRP Products)

Amended	Original	Remarks
<p>An2 Requirements for <i>FRP</i> Products</p> <p>An2.1 General Requirements for <i>FRP</i> Products</p> <p>An2.1.1 General Requirements (Same)</p> <p>An2.1.2 Strength of Connections (Same)</p> <p>An2.2 Requirements for <i>FRP</i> Products Depending on Service and/or Locations</p> <p>An2.2.1 Requirements Depending on Service and/or Locations</p> <p>1 The requirements for fire integrity, flame spread and surface flammability as well as smoke generation for <i>FRP</i> products are, in principle, to be in accordance with those given in Table An1. If an <i>FRP</i> product falls under multiple classifications of service in Table An1, it is to satisfy the most stringent requirements.</p> <p>2 (Same)</p>	<p>An2 Requirements for <i>FRP</i> Products</p> <p>An2.1 General Requirements for <i>FRP</i> Products</p> <p>An2.1.1 General Requirements</p> <p>1 All <i>FRP</i> products are to be approved by the Society in accordance with Chapter 9, Part 3 of the Guidance for the Approval of Materials and Equipment for Marine Use and are to be adequate for the service conditions.</p> <p>2 All <i>FRP</i> products are to be resistant to any substances they are expected to be exposed to during service.</p> <p>An2.1.2 Strength of Connections</p> <p>1 The connections of <i>FRP</i> products are to be of sufficient strength.</p> <p>2 All tightening of joints is to be performed in accordance with the manufacturer’s instructions.</p> <p>3 All bonding procedure specifications are to be submitted to the Society.</p> <p>An2.2 Requirements for <i>FRP</i> Products Depending on Service and/or Locations</p> <p>An2.2.1 Requirements Depending on Service and/or Locations</p> <p>1 The requirements for fire integrity, <u>fire retardance</u>, flame spread and surface flammability as well as smoke generation for <i>FRP</i> products are, in principle, to be in accordance with those given in Table An1. If an <i>FRP</i> product falls under multiple classifications of service in Table An1, it is to satisfy the most stringent requirements.</p> <p>2 Subdivisions other than those specified in Table An1 are to be as deemed appropriate by the Society.</p>	

Amended-Original Requirements Comparison Table (Reference Standards for FRP Products)

Amended	Original	Remarks
<p>3 Where the fire integrity test and the flame spread test have been approved as the approval tests specified in Chapter 9, Part 3 of the Guidance for the Approval of Materials and Equipment for Marine Use in accordance with <i>ASTM F_3059</i>, notwithstanding Table An1, applicable requirements for <i>FRP</i> products can be in accordance with <u><i>ASTM F 3059</i></u>.</p> <p>4 (Same)</p>	<p>3 Where the fire integrity test and the flame spread test have been approved as the approval tests specified in Chapter 9, Part 3 of the Guidance for the Approval of Materials and Equipment for Marine Use in accordance with <i>ASTM F_3059-14</i>, notwithstanding Table An1, applicable requirements for <i>FRP</i> products can be in accordance with <u><i>ASTM F 3059-14</i></u>.</p> <p>4 Notwithstanding the requirements in -1 and -3 above, <i>FRP</i> products used for safe access to bows specified in 14.13.2 are to be tested and approved by the Society in accordance with the fire integrity test specified in 9.4.2-1(4), Chapter 9, Part 3 of the Guidance for the Approval of Materials and Equipment for Marine Use, the surface flammability test specified in 9.4.2-3(2), the smoke generation test specified in 9.4.2-4(2), and the toxicity test specified in 9.4.2-5(1).</p> <p>5 In case of use in inspection equipment specified in 14.16, <i>FRP</i> products are to be used for ladders, handrails, steps and small platforms because they are not considered to be part of the hull construction.</p> <p>6 In cases where <i>FRP</i> products are installed in the hazardous areas specified in 4.3 and 4.7, Part H, the risk of electrical charge of the <i>FRP</i> is to be taken into account. In cases where <i>FRP</i> products are installed in cargo tanks, fuel oil tanks, or the areas deemed necessary by the Society, such <i>FRP</i> products are to have no electrostatic properties. Generally, in cases where comb-like gratings of personnel walkways are installed in areas except for those mentioned above, <i>FRP</i> products that have electrostatic properties may be used. Here, “no electrostatic properties” means that the earth resistance of these products at any point is not greater than $1 M\Omega$.</p>	
<p>5 (Same)</p>		
<p>6 (Same)</p>		

Amended-Original Requirements Comparison Table (Reference Standards for FRP Products)

Amended	Original						Remarks
Table An1 Applicable Requirements for FRP Products							Since fire retardance and flame spread are the same test contents based on ASTM E84, fire retardance is deleted and integrated into flame spread.
Location	Service	Fire Integrity	Fire Retardance	Flame Spread and Surface Flammability	Smoke Generation	Toxicity	
Cargo Pump Rooms	All personnel walkways, catwalks, ladders, platforms, or access areas	L_1	⊖	○	—	—	
Cargo Holds	Walkways or areas that may be used for escape, or access for firefighting, emergency operation, or rescue	V_1	⊖	=○	—	—	
	Walkways, catwalks, ladders, platforms, or access areas other than those described above	—	⊖	=○	—	—	
Cargo Tanks	All personnel walkways, catwalks, ladders, platforms, or access areas	<i>See Note (3)</i>	⊖	=○	—	—	
Fuel Oil Tanks	All personnel walkways, catwalks, ladders, platforms, or access areas	<i>See Note (3)</i>	⊖	=○	—	—	
Ballast Water Tanks	All personnel walkways, catwalks, ladders, platforms, or access areas	<i>See Note (4)</i>	⊖	=○	—	—	
Cofferdams, void spaces, double bottoms, pipe tunnels, etc.	All personnel walkways, catwalks, ladders, platforms, or access areas	<i>See Note (4)</i>	⊖	=○	—	—	
Accommodation, service spaces and control rooms	All personnel walkways, catwalks, ladders, platforms, or access areas	L_1	⊖	○	○	—	
Lifeboat embarkation or safe refuge stations in open deck areas	All personnel walkways, catwalks, ladders, platforms, or access areas	L_2	⊖	=○	—	—	
Open decks or semi-enclosed areas	Walkways or areas which may be used for escape or access for firefighting, emergency operation, or rescue ⁽⁶⁾	$L_3^{(5)}$	⊖	=○	—	—	
	Walkways, catwalks, ladders, platforms, or access areas other than those described above	—	⊖	=○	—	—	
(Notes) (1) Symbols ○: The fire retardance test, flame spread and surface flammability test, smoke generation test and toxicity test specified in 9.4.2, Chapter 9, Part 3 of the Guidance for the Approval of Materials and Equipment for Marine Use are to be satisfied. —: Not applicable (2) Abbreviations L_1 : L_1 is the abbreviation for Fire Integrity Level 1. FRP products complying with Fire Integrity Level 1 are those specified in 9.1.2(4), Chapter 9, Part 3 of the Guidance for the Approval of Materials and Equipment for Marine Use . L_2 : L_2 is the abbreviation for Fire Integrity Level 2. FRP products complying with Fire Integrity Level 2 are those specified in 9.1.2(3), Chapter 9, Part 3 of the Guidance for the Approval of Materials and Equipment for Marine Use .							

Amended-Original Requirements Comparison Table (Reference Standards for FRP Products)

Amended	Original	Remarks
<p><i>L₃</i>: <i>L₃</i> is the abbreviation for Fire Integrity Level 3. <i>FRP</i> products complying with Fire Integrity Level 3 are those specified in 9.1.2(2), Chapter 9, Part 3 of the Guidance for the Approval of Materials and Equipment for Marine Use.</p> <p>(3) Fire integrity is not required in principle. However, if these spaces are normally entered and exited when underway, <i>FRP</i> of <i>L₁</i> is to be applied.</p> <p>(4) Fire integrity is not required in principle. However, if these spaces are normally entered and exited when underway, <i>FRP</i> of <i>L₃</i> is to be applied.</p> <p>(5) Vessels fitted with fixed foam fire-extinguishing systems and fixed dry chemical powder type extinguishing systems on deck require <i>FRP</i> of <i>L₁</i> integrity for foam system operational areas and access routes.</p> <p>(6) Excluding the safe access to the bow specified in 14.13.2.</p>		

Amended-Original Requirements Comparison Table (Reference Standards for FRP Products)

Amended	Original	Remarks
<p align="center">GUIDANCE FOR THE APPROVAL OF MATERIALS AND EQUIPMENT FOR MARINE USE</p> <p align="center">Part 1 GENERAL</p> <p align="center">Part 3 EQUIPMENT</p> <p align="center">Chapter 9 TYPE APPROVAL OF FIBER REINFORCED PLASTIC (FRP)</p> <p>9.4 Approval Tests</p> <p>9.4.1 Approval Tests 1 Approval tests are to be carried out in the presence of the Society’s surveyor by the method according to the testing standard specified in 9.4.2 or a method considered to be equivalent by the Society. Other than the smoke generation test and toxic test specified in 9.4.2, <i>ASTM F-3059</i> is regarded as an equivalent testing standard by the Society. (Same)</p> <p>(Same)</p>	<p align="center">GUIDANCE FOR THE APPROVAL OF MATERIALS AND EQUIPMENT FOR MARINE USE</p> <p align="center">Part 1 GENERAL</p> <p align="center">Part 3 EQUIPMENT</p> <p align="center">Chapter 9 TYPE APPROVAL OF FIBER REINFORCED PLASTIC (FRP)</p> <p>9.4 Approval Tests</p> <p>9.4.1 Approval Tests 1 Approval tests are to be carried out in the presence of the Society’s surveyor by the method according to the testing standard specified in 9.4.2 or a method considered to be equivalent by the Society. Other than the smoke generation test and toxic test specified in 9.4.2, <i>ASTM F 3059-14</i> is regarded as an equivalent testing standard by the Society. 2 Where approval tests are carried out by an authorized organization or any organization considered appropriate by the Society, the presence of a Society surveyor may not be required. 3 In case where it is deemed necessary, the Society may require a retest be carried out.</p>	<p>Delete the year number as in other references</p>

Amended-Original Requirements Comparison Table (Reference Standards for FRP Products)

Amended	Original	Remarks
<p>9.4.2 Testing Procedures and Criteria</p> <p>1 Fire Integrity</p> <p>Test procedures are to be in accordance with the following:</p> <p>(1) (Same)</p>	<p>9.4.2 Testing Procedures and Criteria</p> <p>1 Fire Integrity</p> <p>Test procedures are to be in accordance with the following:</p> <p>(1) To be qualified as level 3 (L3), the FRP is to be subjected to the following fire test procedures for both the pre-loaded tests specified in (b) and post-loaded tests specified in (c) for the test specimen and test condition specified in (a):</p> <p>(a) Test specimen and conditions</p> <p>i) The test specimen is to be 300-350 <i>mm</i> wide to allow for the differences in the spacing of longitudinal supporting members.</p> <p>ii) The length of test specimen is to be the length of the maximum span actually in service plus 200 <i>mm</i>.</p> <p>iii) One specimen each of FRP and steel for the pre-loaded test specified in (b), and one specimen each of FRP and steel for the post-loaded test specified in (c) are to be prepared as described i) and ii).</p> <p>iv) A fire test is to be conducted in the furnace in accordance with <i>ASTM E-119, Standard Test Method for Tests of Building Construction and Materials</i>.</p> <p>v) The time-temperature curve is to be the standard for <i>ASTM E-119</i> or the ISO equivalent.</p> <p>(b) The pre-loaded test is to consist of the following:</p> <p>i) The specimens, simply supported on two</p>	

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Amended	Original	Remarks
	<p>I-beams, are to be placed with a minimum flange width of 100 <i>mm</i> at an elevation of at least one half of the furnace height or a minimum of 300 <i>mm</i> above the burners.</p> <p>ii) The specimens are to be placed on the I-beams such that 100 <i>mm</i> of each side of the specimen rests on each of the two I-beams.</p> <p>iii) One steel specimen and one FRP specimen are to be placed adjacent to one another in the furnace.</p> <p>iv) A static load represented by 392 <i>N</i> is to be placed in the center span of the test specimens.</p> <p>v) The 392 <i>N</i> load is to consist of a steel container filled with sand, the base of which is to be square with an area of 0.09 <i>m</i>².</p> <p>vi) Arrangements are to be made to measure the deflection at the center of the span of each of the loaded specimens during the test with a degree of accuracy of ±5 <i>mm</i>.</p> <p>vii) Deflection of the two loaded test specimens is to be measured throughout the duration of the fire test and the average furnace temperature is to be recorded when each of the two specimens has deflected a distance of L/10 (failure point) from the horizontal where L is equal to the maximum unsupported span of the specimens.</p> <p>viii) The test will be considered successful if the difference between the average furnace temperature at the time of failure of the steel and the average furnace temperature at</p>	

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Amended	Original	Remarks
<p>(2) (Same)</p>	<p>the time of failure of the FRP is less than 100 °C.</p> <p>(c) The post-loaded test is to be consisted of the following:</p> <ul style="list-style-type: none"> i) The specimens, simply supported on two I-beams, are to be placed with a minimum flange width of 100 mm at an elevation of at least one half of the furnace height. ii) The specimens are to be placed on the I-beams such that 100 mm of each side of the specimen rests on each of the two I-beams. iii) One steel specimen and one FRP specimen are to be placed adjacent to one another in the furnace. iv) At the end of the 60 minutes the specimens will be allowed to cool and are to then be subjected to a static load represented by the 392 N specified in the pre-loaded test in proceeding (b)iv) and v), placed in the center span of the test specimens. v) The test will be considered successful if the FRP specimen is intact at the end of the test and does not collapse under the 392 N. <p>(2) To be qualified as level 2 (L2), the FRP is to meet the requirements for qualification as level 3 (L3) in proceeding (1). In addition, it is to be subjected to the following test procedures:</p> <ul style="list-style-type: none"> (a) On the FRP specimen and the steel specimen subjected to the level 3 (L3) post-loaded testing, the specimen is to be gradually loaded in increments not to exceed 196 N, placed in such a manner as to represent a uniformly distributed 	

Amended-Original Requirements Comparison Table (Reference Standards for FRP Products)

Amended	Original	Remarks
<p>(3) (Same)</p> <p>(4) The test procedures for FRP products used for safe access to tanker bows specified in 14.13.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships are to be in accordance with the level 2 (L2) fire integrity test specified in</p>	<p>load across the span.</p> <p>(b) The test will be considered successful if the FRP remains intact at a load greater than or equal to a uniform 4.5 kN/m^2 or greater than or equal to the steel failure loading, whichever is less. Failure will be indicated by collapse of the grate.</p> <p>(3) To be qualified as level 1 (L1), the FRP is to meet the requirements for qualification as level 2 (L2) in proceeding (2). In addition, it is to be subjected to the following test procedures:</p> <p>(a) Three FRP specimens which passed the level 2 (L2) testing are to be prepared.</p> <p>(b) The specimens are to be prepared for impact testing in the manner specified for horizontal specimens in <i>ASTM E-695</i>. However, 100 mm at each end of the specimen is to be placed on the supports.</p> <p>(c) A lead shot bag of 40 kg mass is to be dropped once from a height of 2 m such that the point of impact is in the center of the span.</p> <p>(d) Where all specimens pass the impact test without collapse, the uniform load test specified in (2) are to be carried out for same specimens.</p> <p>(e) The test will be considered successful if all three (3) specimens remain intact after being subjected to the test specified in (d). Failure will be indicated by collapse of one or more of the specimens.</p> <p>(4) The test procedures for FRP products used for safe access to tanker bows specified in 14.13.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships are to be in accordance with the level 2 (L2) fire integrity test specified in</p>	

Amended-Original Requirements Comparison Table (Reference Standards for FRP Products)

Amended	Original	Remarks
<p><i>ASTM F-3059, Standard Specification for Fiber-Reinforced Polymer (FRP) Gratings Used in Marine Construction and Shipbuilding.</i> (Deleted)</p> <p>2 Flame Spread and Surface Flammability The requirements of flame spread and surface flammability for FRP are given in Table An1, Annex 3.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships. The conditions, procedures and criteria of the test are to be in accordance with the following (1) or (2);</p> <p>(1) When testing flame spread characteristics according to <i>ASTM E-84</i>, the flame spread rating is not to exceed <u>following values</u>;</p> <p><u>(a) 20 for cargo pump rooms, accommodation, service spaces and control rooms;</u> <u>(b) 25 for location other than (a) above.</u></p> <p>(2) When testing surface flammability by “Test for Surface Flammability” carried out in accordance with the <i>FTP Code</i> defined in 3.2.23, Part R of the Rules for the Survey and Construction of Steel Ships, the criteria established for materials used for bulkheads, linings, or ceilings are to be complied with.</p>	<p><i>ASTM F3059-14, Standard Specification for Fiber-Reinforced Polymer (FRP) Gratings Used in Marine Construction and Shipbuilding.</i></p> <p>2 Fire Retardance The requirements of fire retardance for FRP are given in Table An1, Annex 3.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships. The test procedures are to be in accordance with <i>ASTM E-84, Standard Test Method for the Surface Burning Characteristics of Building Materials</i>. The testing criterion is not to exceed a fire spread rating of 25. Alternatively, where the FRP passes the test specified in 9.4.2-3, it can be regarded as a fire retardance FRP.</p> <p>3 Flame Spread and Surface Flammability The requirements of flame spread and surface flammability for FRP are given in Table An1, Annex 3.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships. The conditions, procedures and criteria of the test are to be in accordance with the following (1) or (2);</p> <p>(1) When testing flame spread characteristics according to <i>ASTM E-84</i>, the flame spread rating is not to exceed <u>20</u>; or</p> <p>(2) When testing surface flammability by “Test for Surface Flammability” carried out in accordance with the <i>FTP Code</i> defined in 3.2.23, Part R of the Rules for the Survey and Construction of Steel Ships, the criteria established for materials used for bulkheads, linings, or ceilings are to be complied with.</p>	<p>Since the contents of the fire retardance test is same as flame spread test, it is integrated into -3. (original).</p> <p>Relocate and specify the flame spread rating specified in -2 (original).</p>

