

RULES FOR THE TYPE APPROVAL, INSTALLATION AND TESTING OF RIGID EXPANDED INSULATING MATERIALS

EFFECTIVE FROM 1 JANUARY 2016

Emirates Classification Society (Tasneef)
Aldar HQ 19th Floor,
Al Raha Beach, Abu Dhabi, UAE
Abu Dhabi, United Arab Emirates

Phone (+971) 2 692 2333
Fax (+971) 2 445 433
P.O. Box. 111155
info@tasneef.ae

GENERAL CONDITIONS

Definitions:

“Administration” means the Government of the State whose flag the Ship is entitled to fly or under whose authority the Ship is authorised to operate in the specific case.

“IACS” means the International Association of Classification Societies.

“Interested Party” means the party, other than the Society, having an interest in or responsibility for the Ship, product, plant or system subject to classification or certification (such as the owner of the Ship and his representatives, the ship builder, the engine builder or the supplier of parts to be tested) who requests the Services or on whose behalf the Services are requested.

“Owner” means the registered owner, the ship owner, the manager or any other party with the responsibility, legally or contractually, to keep the ship seaworthy or in service, having particular regard to the provisions relating to the maintenance of class laid down in Part A, Chapter 2 of the Rules for the Classification of Ships or in the corresponding rules indicated in the specific Rules.

“Rules” in these General Conditions means the documents below issued by the Society:

- (i) Rules for the Classification of Ships or other special units;
- (ii) Complementary Rules containing the requirements for product, plant, system and other certification or containing the requirements for the assignment of additional class notations;
- (iii) Rules for the application of statutory rules, containing the rules to perform the duties delegated by Administrations;
- (iv) Guides to carry out particular activities connected with Services;
- (v) Any other technical document, as for example rule variations or interpretations.

“Services” means the activities described in Article 1 below, rendered by the Society upon request made by or on behalf of the Interested Party.

“Ship” means ships, boats, craft and other special units, as for example offshore structures, floating units and underwater craft.

“Society” or “TASNEEF” means Tasneef and/or all the companies in the Tasneef Group which provide the Services.

“Surveyor” means technical staff acting on behalf of the Society in performing the Services.

Article 1

1.1. The purpose of the Society is, among others, the classification and certification of ships and the certification of their parts and components. In particular, the Society:

- (i) sets forth and develops Rules;
- (ii) publishes the Register of Ships;
- (iii) issues certificates, statements and reports based on its survey activities.

1.2. The Society also takes part in the implementation of national and international rules and standards as delegated by various Governments.

1.3. The Society carries out technical assistance activities on request and provides special services outside the scope of classification, which are regulated by these general conditions, unless expressly excluded in the particular contract.

Article 2

2.1. The Rules developed by the Society reflect the level of its technical knowledge at the time they are published. Therefore, the Society, although committed also through its research and development services to continuous updating of the Rules, does not guarantee the Rules meet state-of-the-art science and technology at the time of publication or that they meet the Society's or others' subsequent technical developments.

2.2. The Interested Party is required to know the Rules on the basis of which the Services are provided. With particular reference to Classification Services, special attention is to be given to the Rules concerning class suspension, withdrawal and reinstatement. In case of doubt or inaccuracy, the Interested Party is to promptly contact the Society for clarification.

The Rules for Classification of Ships are published on the Society's website: www.tasneef.ae.

2.3. The Society exercises due care and skill:

- (i) in the selection of its Surveyors
- (ii) in the performance of its Services, taking into account the level of its technical knowledge at the time the Services are performed.

2.4. Surveys conducted by the Society include, but are not limited to, visual inspection and non-destructive testing. Unless otherwise required, surveys are conducted through sampling techniques and do not consist of comprehensive verification or monitoring of the Ship or of the items subject to certification. The surveys and checks made by the Society on board ship do not necessarily require the constant and continuous presence of the Surveyor. The Society may also commission laboratory testing, underwater inspection and other checks carried out by and under the responsibility of qualified service suppliers. Survey practices and procedures are selected by the Society based on its experience and knowledge and according to generally accepted technical standards in the sector.

Article 3

3.1. The class assigned to a Ship, like the reports, statements, certificates or any other document or information issued by the Society, reflects the opinion of the Society concerning compliance, at the time the Service is provided, of the Ship or product subject to certification, with the applicable Rules (given the intended use and within the relevant time frame).

The Society is under no obligation to make statements or provide information about elements or facts which are not part of the specific scope of the Service requested by the Interested Party or on its behalf.

3.2. No report, statement, notation on a plan, review, Certificate of Classification, document or information issued or given as part of the Services provided by the Society shall have any legal effect or implication other than a representation that, on the basis of the checks made by the Society, the Ship, structure, materials, equipment, machinery or any other item covered by such document or information meet the Rules. Any such document is issued solely for the use of the Society, its committees and clients or other duly authorised bodies and for no other purpose. Therefore, the Society cannot be held liable for any act made or document issued by other parties on the basis of the statements or information given by the Society. The validity, application, meaning and interpretation of a Certificate of Classification, or any other document or information issued by the Society in connection with its Services, is governed by the Rules of the Society, which is the sole subject entitled to make such interpretation. Any disagreement on technical matters between the Interested Party and the Surveyor in the carrying out of his functions shall be raised in writing as soon as possible with the Society, which will settle any divergence of opinion or dispute.

3.3. The classification of a Ship, or the issuance of a certificate or other document connected with classification or certification and in general with the performance of Services by the Society shall have the validity conferred upon it by the Rules of the Society at the time of the assignment of class or issuance of the certificate; in no case shall it amount to a statement or warranty of seaworthiness,

structural integrity, quality or fitness for a particular purpose or service of any Ship, structure, material, equipment or machinery inspected or tested by the Society.

- 3.4. Any document issued by the Society in relation to its activities reflects the condition of the Ship or the subject of certification or other activity at the time of the check.
- 3.5. The Rules, surveys and activities performed by the Society, reports, certificates and other documents issued by the Society are in no way intended to replace the duties and responsibilities of other parties such as Governments, designers, ship builders, manufacturers, repairers, suppliers, contractors or sub-contractors, Owners, operators, charterers, underwriters, sellers or intended buyers of a Ship or other product or system surveyed.

These documents and activities do not relieve such parties from any fulfilment, warranty, responsibility, duty or obligation (also of a contractual nature) expressed or implied or in any case incumbent on them, nor do they confer on such parties any right, claim or cause of action against the Society. With particular regard to the duties of the ship Owner, the Services undertaken by the Society do not relieve the Owner of his duty to ensure proper maintenance of the Ship and ensure seaworthiness at all times. Likewise, the Rules, surveys performed, reports, certificates and other documents issued by the Society are intended neither to guarantee the buyers of the Ship, its components or any other surveyed or certified item, nor to relieve the seller of the duties arising out of the law or the contract, regarding the quality, commercial value or characteristics of the item which is the subject of transaction.

In no case, therefore, shall the Society assume the obligations incumbent upon the above-mentioned parties, even when it is consulted in connection with matters not covered by its Rules or other documents.

In consideration of the above, the Interested Party undertakes to relieve and hold harmless the Society from any third party claim, as well as from any liability in relation to the latter concerning the Services rendered.

Insofar as they are not expressly provided for in these General Conditions, the duties and responsibilities of the Owner and Interested Parties with respect to the services rendered by the Society are described in the Rules applicable to the specific Service rendered.

Article 4

4.1. Any request for the Society's Services shall be submitted in writing and signed by or on behalf of the Interested Party. Such a request will be considered irrevocable as soon as received by the Society and shall entail acceptance by the applicant of all relevant requirements of the Rules, including these General Conditions. Upon acceptance of the written request by the Society, a contract between the Society and the Interested Party is entered into, which is regulated by the present General Conditions.

4.2. In consideration of the Services rendered by the Society, the Interested Party and the person requesting the service shall be jointly liable for the payment of the relevant fees, even if the service is not concluded for any cause not pertaining to the Society. In the latter case, the Society shall not be held liable for non-fulfilment or partial fulfilment of the Services requested. In the event of late payment, interest at the legal current rate increased by 1.5% may be demanded.

4.3. The contract for the classification of a Ship or for other Services may be terminated and any certificates revoked at the request of one of the parties, subject to at least 30 days' notice to be given in writing. Failure to pay, even in part, the fees due for Services carried out by the Society will entitle the Society to immediately terminate the contract and suspend the Services.

For every termination of the contract, the fees for the activities performed until the time of the termination shall be owed to the Society as well as the expenses incurred in view of activities already programmed; this is without prejudice to the right to compensation due to the Society as a consequence of the termination.

With particular reference to Ship classification and certification, unless decided otherwise by the Society, termination of the contract implies that the assignment of class to a Ship is withheld or, if already assigned, that it is suspended or withdrawn; any statutory certificates issued by the Society will be withdrawn in those cases where provided for by agreements between the Society and the flag State.

Article 5

5.1. In providing the Services, as well as other correlated information or advice, the Society, its Surveyors, servants or agents operate with due diligence for the proper execution of the activity. However, considering the nature of the activities performed (see art. 2.4), it is not possible to guarantee absolute accuracy, correctness and completeness of any information or advice supplied. Express and implied warranties are specifically disclaimed.

Therefore, except as provided for in paragraph 5.2 below, and also in the case of activities carried out by delegation of Governments, neither the Society nor any of its Surveyors will be liable for any loss, damage or expense of whatever nature sustained by any person, in tort or in contract, derived from carrying out the Services.

5.2. Notwithstanding the provisions in paragraph 5.1 above, should any user of the Society's Services prove that he has suffered a loss or damage due to any negligent act or omission of the Society, its Surveyors, servants or agents, then the Society will pay compensation to such person for his proved loss, up to, but not exceeding, five times the amount of the fees charged for the specific services, information or opinions from which the loss or damage derives or, if no fee has been charged, a maximum of AED5,000 (Arab Emirates Dirhams Five Thousand only). Where the fees charged are related to a number of Services, the amount of the fees will be apportioned for the purpose of the calculation of the maximum compensation, by reference to the estimated time involved in the performance of the Service from which the damage or loss derives. Any liability for indirect or consequential loss, damage or expense is specifically excluded. In any case, irrespective of the amount of the fees charged, the maximum damages payable by the Society will not be more than AED5,000,000 (Arab Emirates Dirhams Five Millions only). Payment of compensation under this paragraph will not entail any admission of responsibility and/or liability by the Society and will be made without prejudice to the disclaimer clause contained in paragraph 5.1 above.

5.3. Any claim for loss or damage of whatever nature by virtue of the provisions set forth herein shall be made to the Society in writing, within the shorter of the following periods: (i) THREE (3) MONTHS from the date on which the Services were performed, or (ii) THREE (3) MONTHS from the date on which the damage was discovered. Failure to comply with the above deadline will constitute an absolute bar to the pursuit of such a claim against the Society.

Article 6

6.1. These General Conditions shall be governed by and construed in accordance with United Arab Emirates (UAE) law, and any dispute arising from or in connection with the Rules or with the Services of the Society, including any issues concerning responsibility, liability or limitations of liability of the Society, shall be determined in accordance with UAE law. The courts of the Dubai International Financial Centre (DIFC) shall have exclusive jurisdiction in relation to any claim or dispute which may arise out of or in connection with the Rules or with the Services of the Society.

6.2. However,

- (i) In cases where neither the claim nor any counterclaim exceeds the sum of AED300,000 (Arab Emirates Dirhams Three Hundred Thousand) the dispute shall be referred to the jurisdiction of the DIFC Small Claims Tribunal; and
- (ii) for disputes concerning non-payment of the fees and/or expenses due to the Society for services, the Society shall have the

right to submit any claim to the jurisdiction of the Courts of the place where the registered or operating office of the Interested Party or of the applicant who requested the Service is located.

In the case of actions taken against the Society by a third party before a public Court, the Society shall also have the right to summon the Interested Party or the subject who requested the Service before that Court, in order to be relieved and held harmless according to art. 3.5 above.

Article 7

7.1. All plans, specifications, documents and information provided by, issued by, or made known to the Society, in connection with the performance of its Services, will be treated as confidential and will not be made available to any other party other than the Owner without authorisation of the Interested Party, except as provided for or required by any applicable international, European or domestic legislation, Charter or other IACS resolutions, or order from a competent authority. Information about the status and validity of class and statutory certificates, including transfers, changes, suspensions, withdrawals of class, recommendations/conditions of class, operating conditions or restrictions issued against classed ships and other related information, as may be required, may be published on the website or released by other means, without the prior consent of the Interested Party.

Information about the status and validity of other certificates and statements may also be published on the website or released by other means, without the prior consent of the Interested Party.

7.2. Notwithstanding the general duty of confidentiality owed by the Society to its clients in clause 7.1 above, the Society's clients hereby accept that the Society may participate in the IACS Early Warning System which requires each Classification Society to provide other involved Classification Societies with relevant technical information on serious hull structural and engineering systems failures, as defined in the IACS Early Warning System (but not including any drawings relating to the ship which may be the specific property of another party), to enable such useful information to be shared and used to facilitate the proper working of the IACS Early Warning System. The Society will provide its clients with written details of such information sent to the involved Classification Societies.

7.3. In the event of transfer of class, addition of a second class or withdrawal from a double/dual class, the Interested Party undertakes to provide or to permit the Society to provide the other Classification Society with all building plans and drawings, certificates, documents and information relevant to the classed unit, including its history file, as the other Classification Society may require for the purpose of classification in compliance with the applicable legislation and relative IACS Procedure. It is the Owner's duty to ensure that, whenever required, the consent of the builder is obtained with regard to the provision of plans and drawings to the new Society, either by way of appropriate stipulation in the building contract or by other agreement.

In the event that the ownership of the ship, product or system subject to certification is transferred to a new subject, the latter shall have the right to access all pertinent drawings, specifications, documents or information issued by the Society or which has come to the knowledge of the Society while carrying out its Services, even if related to a period prior to transfer of ownership.

Article 8

8.1. Should any part of these General Conditions be declared invalid, this will not affect the validity of the remaining provisions.

INDEX

1 - FOREWORD	1
2 - DOCUMENTATION	1
3 - TYPE TESTS	1
3.1 Sampling	1
3.2 Type tests on insulating materials	1
3.2.1 Insulating materials for cargo tanks and piping (including those for process plants) of tankers carrying low temperature liquefied gases	1
3.2.2 Insulating materials for refrigerating plants, qualified by RINA, of ships carrying refrigerated cargoes ..	2
3.2.3 Insulating materials for refrigerating plants, qualified by RINA, for fishing vessels	2
3.3 Type tests on adhesive and sealing materials	2
3.3.1 Adhesive and sealing materials for cargo tanks and piping (including those for process plants) of tankers carrying low temperature liquefied gases	2
3.3.2 Adhesive and sealing materials for refrigerating plants, qualified by RINA, including those for fishing vessels	2
3.4 Type tests on sheathings constituting vapour barrier and mechanical protection	2
3.5 List of type tests	2
3.5.1 Check of density	2
3.5.2 Check of closed cell content	2
3.5.3 Check of thermal conductivity	2
3.5.4 Check of compressive strength and modulus of elasticity	2
3.5.5 Check of tensile strength and modulus of elasticity	2
3.5.6 Check of flame resistance or flame spread characteristics	2
3.5.7 Check of aging behaviour	2
3.5.8 Check of thermal expansion coefficient	3
3.5.9 Check of vibration resistance and cohesion	3
3.5.10 Check of absorption, solubility and compatibility with the products with which the insulating material may come into contact	3
3.5.11 Check of abrasion resistance	3
3.5.12 Check of adhesion resistance	3
3.5.13 Check of cargo pressure resistance	3
3.5.14 Check of fatigue strength and crack propagation resistance	3
3.5.15 Check of compatibility with cargo components or other agents which are assumed to be able to come into contact with the insulation during operation	3
3.5.16 Check of the influence of water and water pressure on insulating material properties	3
3.5.17 Check of cargo vapour de-absorption characteristics of the insulating material	3
3.5.18 Tensile test on adhesive materials	3
3.5.19 Tensile test on sealing materials	4
3.5.20 Check of water vapour transmission resistance of sheathings constituting vapour barrier	4
3.5.21 Alternative testing procedures	4
4 - TYPE APPROVAL CERTIFICATE	4
5 - PRODUCTION TESTING	4
5.1 General	4
5.2 Production testing of insulating materials manufactured in blocks	4
5.2.1 Foreword	4
5.2.2 Insulating materials for cargo tanks and piping (including those for process plants) of gas tankers with operating temperature lower than -10°C	4
5.2.3 Insulating materials for cargo tanks and piping of gas tankers with operating temperature not lower than -10°C and insulating materials for refrigerating plants, qualified by RINA, except those of fishing vessels	4
5.2.4 Insulating materials for refrigerating plants, qualified by RINA, of fishing vessels	5

INDEX

5.3 Production testing of insulating materials sprayed or foamed on spot	5
6 - CHECKS DURING THE INSTALLATION OF THE INSULATION ON BOARD	5

1 - FOREWORD

The provisions of this Rules apply to insulation systems constituted by rigid expanded plastic materials and relevant adhesives, sealing materials and sheathings, to be employed for the insulation of:

- cargo tanks and piping, including those for process plants, of tankers carrying low temperature liquefied gases in bulk;
- refrigerating plants, including those of fishing vessels, for which RINA qualification is requested.

For the type approval of the above mentioned materials the type tests under item 3 are to be carried out.

Besides, for insulating materials, testing during production as specified under item 5 is to be carried out.

For adhesives, sealing materials and sheathings, it is sufficient, as a rule, to check the compliance with the type approved type; RINA may reserve to carry out the production testing of said materials, in particular cases.

The acceptance by RINA of insulation systems is, finally, subject to the good result of the surveillance during installation, as required under item 6 and to the good result of the operational tests of the plants, when installation is ultimated.

2 - DOCUMENTATION

To the purpose of obtaining the type approval of the materials as per item 1 the manufacturer is to submit a relevant written application to the Head Office, supplying the following information:

- (a) the commercial name of the product;
- (b) the chemical, physical and mechanical properties of the product; mechanical properties are also to be referred to the temperatures for which the product is expected to be employed;
- (c) application areas for which the approval is requested, indicating in particular the maximum and minimum temperature values for which it is requested;
- (d) the names of raw material suppliers;
- (e) for insulating materials, the manufacturing procedures, with indication of possible ambient conditions (pressure, temperature and humidity) at which it is necessary to operate;
- (f) for adhesives, sealing materials and sheathings, the instructions suggested by the manufacturer for their application.

RINA reserves to require further information in the case of particular applications (as, for example, in the case of internal insulation tanks of gas tankers) or of special products.

In particular, as far as insulating materials are concerned, a RINA surveyor will carry out an inspection at the manufacturer's to the purpose of checking the following:

- the production system and its different stages and in particular the devices employed for proportioning the components;
- the daily production capacity;
- the ways and procedures for procurement, control, storage and handling of raw materials;
- the test laboratory equipment and the internal shop testing procedures.

3 - TYPE TESTS

3.1 - Sampling

Specimens for type tests of insulating materials are to be obtained from samples taken from manufactured material, according to the procedure specified by the manufacturer.

Such samples are to be taken in the presence of a RINA surveyor and marked by him, as indicated in the following items (a) to (d):

- (a) for materials produced in blocks, specimens are to be taken from normal production materials;
- (b) for materials foamed on spot, specimens are to be taken from at least three foaming operations, made according to the procedure specified by the manufacturer, and carried out in different positions at RINA judgment;
- (c) for sprayed materials, the specimens are to be taken from materials sprayed by different operators and in different positions at RINA judgment;
- (d) for materials intended for fishing vessels, specimens may be taken, at RINA judgment, during application on board.

Specimens for tests on adhesive and sealing substances are to be taken from original confections of the Manufacturer. For sheathings, specimens are to be taken from normal production materials.

3.2 - Type tests on insulating materials

3.2.1 - Insulating materials for cargo tanks and piping (including those for process plants) of tankers carrying low temperature liquefied gases

- (a) For insulations applied on the external surface of cargo tanks and piping, at least the tests under 3.5.1 to 3.5.11 are to be carried out (tests under 3.5.10 and 3.5.11 are not required in the case of type C independent cargo tanks).
- (b) For internal insulations, i.e. for those insulations whose internal surface is in direct contact with cargo, in addition to the tests as per 3.5.1 to 3.5.11, at least the tests under 3.5.12 to 3.5.17, on materials already subjected to aging and to thermal cycling, shall be carried out.

On the basis of the results of the check of the mechanical properties such as density, closed cell content, compression resistance etc., RINA may waive the request to carry out the check of resistance to vibration and cohesion as per item 3.5.9.

In particular cases, depending on the insulation system considered and on its application, as well as on the value of the operating temperature, RINA reserves to waive the requirement of some tests or to require additional tests such as low temperature vibration tests, shock tests, thermal cycling tests, hydraulic pressure tests, aging tests even on full size models.

After such additional tests RINA reserves to repeat on samples tested as above all or some tests listed under 3.5.1 to 3.5.11 for the insulations under the preceding item (a), and all or some of the tests listed under 3.5.1 to 3.5.17 for insulations under the preceding item (b).

Besides, RINA reserves to require a theoretical analysis of stresses to which the adopted insulating system is subjected, including crack propagation calculations.

3.2.2 - Insulating materials for refrigerating plants, qualified by RINA, of ships carrying refrigerated cargoes

The tests under 3.5.1, 3.5.2, 3.5.3, 3.5.4, 3.5.6, 3.5.7, 3.5.9 and 3.5.11 are to be carried out.

On the basis of the results of the check of the mechanical properties such as density, closed cell content, compression resistance etc., RINA may waive the request to carry out the check of resistance to vibration and cohesion as per item 3.5.9.

In particular cases, depending on the considered insulation system and on its application, RINA reserves to require, at its judgment, additional tests.

3.2.3 - Insulating materials for refrigerating plants, qualified by RINA, for fishing vessels

The tests under 3.5.1, 3.5.2 and 3.5.6 are to be carried out.

RINA reserves, anyhow, to require additional tests in individual cases.

The above-mentioned tests may be carried out either during the normal production in workshop or during installation on board.

3.3 - Type tests on adhesive and sealing materials

3.3.1 - Adhesive and sealing materials for cargo tanks and piping (including those for process plants) of tankers carrying low temperature liquefied gases

The tests under 3.5.6 and 3.5.10 as well as, for adhesives, the test under 3.5.18 and, for sealing materials, the test under 3.5.19 are to be carried out.

In particular cases (as, for example, in the case of internal insulation cargo tanks), RINA reserves to require additional tests.

3.3.2 - Adhesive and sealing materials for refrigerating plants, qualified by RINA, including those for fishing vessels

The test under 3.5.6 is to be carried out.

In particular cases, RINA reserves to require additional tests.

3.4 - Type tests on sheathings constituting vapour barrier and mechanical protection

For sheathings constituting vapour barrier, the test under 3.5.20 is to be carried out.

Besides, as regards the sheathing of metallic material or of glass fibre reinforced plastic or of other suitable material, that may be required for protection of the insulation against mechanical damage, RINA reserves to require, depending on its location, the carrying out of tests to check their suitability, according to procedures that will be established case by case, taking into account the characteristics of said mechanical protection.

3.5 - List of type tests

3.5.1 - Check of density

ASTM D 1622 method is applied.

3.5.2 - Check of closed cell content

ASTM D 1940 T or ASTM D 2856 method is applied.

3.5.3 - Check of thermal conductivity

ASTM C 177 or ASTM D 2326 method is applied.

Said test is to be carried out at least at three mean temperature values, in the application range for which acceptance is requested. The extreme temperature values for said tests will be established by RINA case by case.

3.5.4 - Check of compressive strength and modulus of elasticity

ASTM D 1621 method is applied and the test is to be carried out at ambient temperature.

3.5.5 - Check of tensile strength and modulus of elasticity

ASTM D 1623 method (preparation of Type A specimens) is applied. Said test is to be carried out both at ambient temperature and at a temperature lower, by at least 5°C, than the minimum temperature for which acceptance is requested.

3.5.6 - Check of flame resistance or flame spread characteristics

ASTM D 1692 method is applied.

It shall result:

$$AEB \leq 65 \text{ mm} \quad \text{and} \quad \frac{AEB}{ATB} \leq 1,25 \text{ mm/s}$$

where:

AEB = mean length, on 5 specimens, of the burnt length, in mm

ATB = mean combustion time, on 5 specimens, in seconds.

Besides, in none of the 5 specimens is the length **AEB** to be greater than 125 mm (distance of the limit gage mark considered by ASTM).

3.5.7 - Check of aging behaviour

ASTM D 2126 method is applied.

The test is to be carried out at the following conditions:

- condition A: temperature = 80°C ± 2°C
ambient humidity: (uncontrolled)
- condition B: temperature lower, by at least 5°C, than the minimum temperature for which acceptance is requested;
ambient humidity: (uncontrolled).

3.5.8 - Check of thermal expansion coefficient

ASTM D 696 method is applied.

3.5.9 - Check of vibration resistance and cohesion

The test is to be carried out according to the following procedure:

- (a) vibration frequency ≥ 500 cycles/min.;
- (b) peak-to-peak vibration amplitude $\geq 1,5$ mm;
- (c) static stress:
 - (1) not lower than $3,5 \text{ N/cm}^2$, for materials intended for insulation of cargo tanks and piping, including those of process plants, of gas tankers and bulk-heads and tops of refrigerated spaces;
 - (2) not lower than $7,5 \text{ N/cm}^2$, for materials intended for insulation of floors of refrigerated spaces;
- (d) number of cycles $\geq 2.500.000$.

For application on gas tankers, the test is to be carried out at a temperature lower, by at least 5°C , than the minimum temperature for which acceptance is requested.

For application on refrigerating plants, the test may be carried out at ambient temperature.

On the material subjected to the vibration test, the tests under the previous 3.5.1, 3.5.2, 3.5.4, 3.5.5 and 3.5.6 are to be carried out. On the basis of the results of the tests under 3.5.1 and 3.5.2, RINA reserves to require, for the vibrated material, also the carrying out of the tests under 3.5.3.

3.5.10 - Check of absorption, solubility and compatibility with the products with which the insulating material may come into contact

Immersion tests, for a period not less than 10 hours, in the products (among those listed in Chapter 19 of Section B - Part III of the Rules for the construction and classification of ships) which are expected to be carried, are to be effected.

For the products listed in the following table, which may be gathered in affinity groups, it may be sufficient to carry out the immersion tests in one product for each group only.

TABLE 2.1
GROUPS OF AFFINED PRODUCTS

GROUPS	PRODUCTS
Halogenated hydrocarbons	Ethyl chloride Methyl bromide Methyl chloride
Olefins	Butadiene Butylene Ethylene Propylene
Paraffins	Butane Butane/Propane Ethane Methane Propane
Aliphatic amines	Anhydrous dimethylamine Ethylamine

The samples are to be immersed in the product in liquid state and at atmospheric pressure.

On the material subjected to each immersion test, the tests under the previous 3.5.1, 3.5.2, 3.5.4, 3.5.5 and 3.5.6 are to be carried out. On the basis of the results of the tests under 3.5.1 and 3.5.2, RINA reserves to require, for the material which has been immersed, also the carrying out of the test under 3.5.3.

3.5.11 - Check of abrasion resistance

An abrasion resistance test shall be carried out according to procedures to be specified cases by case.

3.5.12 - Check of adhesion resistance

There shall be ascertained, by procedures to be fixed case by case, the capacity of the material to adhere to the supporting structure and to the previously applied layers.

3.5.13 - Check of cargo pressure resistance

There shall be ascertained, by procedures to be fixed case by case, the capacity of the material to withstand the liquid cargo pressure.

3.5.14 - Check of fatigue strength and crack propagation resistance

There shall be ascertained, by procedures to be fixed case by case, the fatigue strength characteristics as well as the crack propagation characteristics of the material.

3.5.15 - Check of compatibility with cargo components or other agents which are assumed to be able to come into contact with the insulation during operation

There shall be ascertained, by means of procedures to be fixed case by case, the compatibility characteristics either with single cargo components or with other agents which are assumed to be able to come into contact with the insulation during operation, taking into account the possible formation of superficial passivated areas in direct contact with cargo.

3.5.16 - Check of the influence of water and water pressure on insulating material properties

There shall be ascertained, by means of procedures to be fixed case by case, the possible influence that the presence of water and/or water pressure may have on the insulating material properties.

3.5.17 - Check of cargo vapour de-absorption characteristics of the insulating material

There shall be ascertained, by means of procedures to be fixed case by case, the de-absorption (release after absorption) characteristics of cargo vapour from the insulating material.

3.5.18 - Tensile test on adhesive materials

The tensile test is to be carried out on 5 specimens each constituted by 2 suitably treated steel sheets, 125 mm long 25 mm wide and at least 3 mm thick, which are to be overlapped and glued for a length of about 13 mm.

Said test is to be carried out both at ambient temperature and at a temperature lower, by at least 5°C , than the

minimum temperature for which the acceptance is requested and with a loading speed of 0,5 mm/min.

3.5.19 - Tensile test on sealing materials

The tensile test is to be carried out on 5 specimens each constituted by 2 parallelepipeds of insulating material having a cross section of about 50 mm x 50 mm and joined with the sealing material to be tested.

Said test is to be carried out both at the ambient temperature and at a temperature lower, by at least 5°C, than the minimum temperature for which the acceptance is requested.

3.5.20 - Check of water vapour transmission resistance of sheathings constituting vapour barrier

ASTM E 96 method, Procedure E, is applied.

The specimens to be subjected to said test are to include possible joints of the sheathing constituting vapour barrier.

3.5.21 - Alternative testing procedures

RINA reserves to accept, at its judgment, testing procedures deviating from those specified under this Article 3.5.

4 - TYPE APPROVAL CERTIFICATE

Upon satisfactory result of the tests and checks requested by this Rules, RINA issues a Type Approval Certificate.

The validity of the Certificate is 5 years from its issuing date.

5 - PRODUCTION TESTING

5.1 - General

The testing procedure for the insulation materials accepted by RINA will be fixed on the basis of the results of the type tests and on the basis of the production system as well as of the internal quality control system ascertained during the RINA surveyor's survey mentioned under item 2 and agreed upon with the manufacturer.

Unless otherwise established for particular cases, the production testing is carried out by the manufacturer, who is to enter the results of the tests into a proper register book on which the data listed in the following items (a) and (b) are to be indicated.

- (a) For insulating materials manufactured in blocks:
 - (1) manufacturing date;
 - (2) batch number, as specified under 5.2.1;
 - (3) panel number;
 - (4) identification mark of the panel, if any;
 - (5) data relating to the tests carried out.
- (b) For insulating materials sprayed or foamed on spot
 - (1) manufacturing date;
 - (2) charge number;
 - (3) data relating to the tests carried out.

The data as per (a)(1) and (a)(2) are to be indicated on the relevant panels whilst the data as per (b)(1) and (b)(2) are to be marked in way of each area foamed with the same charge.

The RINA surveyor shall carry out random checks, attending the tests performed by the manufacturer on the day of his survey and he shall check the data entered into the register book.

Anyway, the RINA surveyor shall check, at the beginning of the production, that the insulating material is manufactured with the same procedure followed for the type tests.

5.2 - Production testing of insulating materials manufactured in blocks

5.2.1 - Foreword

In addition to what possibly established on the basis of the type test results, the tests and checks indicated in the following 5.2.2 to 5.2.4 are to be carried out, as appropriate.

Said tests shall be carried out on each batch, considering a batch as a group of panels manufactured with the same charge or with only one foaming operation, but having volume not exceeding 100 m³.

The test results are to comply with the values shown in the relevant Type Approval Certificate.

In the negative, the tests which have given a negative result are to be repeated on a double number of samples on other two panels selected at random from the same batch. In the case where also these tests give negative results, same batch is to be rejected.

5.2.2 - Insulating materials for cargo tanks and piping (including those for process plants) of gas tankers with operating temperature lower than -10°C

The tests and checks listed in the following items (a) to (d) are to be carried out:

- (a) test as per 3.5.1, on a sample taken from each 10 m³;
- (b) test as per 3.5.2, on a sample taken from each batch;
- (c) on the basis of the results of the tests as per previous 3.5.1 and 3.5.2 RINA reserves to require also the tests as per 3.5.3 and 3.5.5 (at ambient temperature) to be carried out;
- (d) test as per 3.5.6 on a sample obtained from each 20 m³.

In addition to the above mentioned tests, the visual and dimensional check of all panels is to be carried out.

The panels are to result with plane and well squared surfaces and, when they are manufactured with a particular shape, same shape and relating details shall correspond to the approved drawings.

The dimensional tolerances are not to exceed those required by the specifications and, in general, they are not to exceed the following values:

- breadth and length: ± 5 mm
- thickness: +2 mm; -1 mm.

Cavities having a total surface exceeding 5 cm²/m² or, in any case, exceeding 12 mm in diameter and 10 mm in depth are not allowed on the panel face.

Cracks or other discontinuities exceeding 50 mm in length and 4 per m² in number are not allowed.

Repairs may be allowed, provided that they are carried out in such a way as to suitably restore the defective parts.

5.2.3 - Insulating materials for cargo tanks and piping of gas tankers with operating temperature not lower than -10°C and insulating materials for refrigerating plants, qualified by RINA, except those of fishing vessels

For insulating materials (including those of piping for process plants of gas tankers), what specified under 5.2.2 applies, excluding the tests as per items (c).

5.2.4 - Insulating materials for refrigerating plants, qualified by RINA, of fishing vessels

What indicated under 3.2.3 applies.

5.3 - Production testing of insulating materials sprayed or foamed on spot

In the case of materials sprayed or foamed on spot, for each charge and, anyway, at least once in a day, a sample of sprayed material or a sample of material foamed in a bag is to be prepared, on which the tests required under Article 5.2 for the different types of application are to be carried out.

In addition, checks on samples taken from the already installed insulation are to be carried out. The procedure and number of such checks shall be fixed by RINA case by case.

6 - CHECKS DURING THE INSTALLATION OF THE INSULATION ON BOARD

The installation of the insulation on board is to be carried out under the control and surveillance of a RINA surveyor.

In particular, what specified in the following items (a) and (b) is to be checked; at his judgment, when he deems it necessary, the RINA surveyor charged with the surveillance may carry out other particular checks, or require possible additional tests.

- (a) It is to be checked that the surfaces, on which the insulation is applied, are well cleaned and protected in compliance with the approved specifications.
- (b) It is to be checked that the installation of the insulation is carried out according to what indicated on the approved drawings.

In particular, high thermal conductance paths and empty spaces in the insulation are to be avoided. If the insulation is made with slabs, these are to be well joined and the joints are to be staggered. If the insulation consists of prefabricated slabs of particular shape, to the purpose of fitting them to the hull structures or to the tank surfaces, it is to be checked that said slabs are joined with the allowed tolerances and that the resulting slots are filled with the materials foreseen on the approved specifications and drawings.

It is to be checked that the employed adhesive and sealing materials are those foreseen and accepted. Particular care is to be devoted to the insulation in way of saddles, antilotation and anticollision structures, domes and wells of cargo tanks, and in way of girders, stringers, stiffening brackets, stanchion foundations, scuppers and angle areas of refrigerated spaces where it is easier to find empty spaces and high thermal conductance paths. The details of said areas are to be shown on the drawings relating to the insulation.

Besides, great care shall be devoted to the execution of possible expansion joints, whose location, construction and employed materials are to comply with what indicated on the approved drawings.

The insulation sheathing is to result perfectly tight. Suitable gaskets are to be fitted in way of possible joints of the sheathing.

When no detachable panels are foreseen in way of possible piping running into the insulation, the trace of same pipes is to be indicated on the sheathing in way of them, for future reference.

As already mentioned in this Rules, the insulating material panels are to be marked by the Manufacturer with suitable identification marks. On panels found without said marks all the required testing operations are to be carried out and the panels may be possibly rejected.

Besides, if the RINA surveyor charged with the surveillance finds defective panels or panels damaged during transport, these are to be rejected.

During the running tests, to be carried out upon completion of the installation, there is to be checked that possible icing or condensation does not occur on the external surface of the insulation of cargo tanks or on the external surface of bulkheads, decks, and shells bounding the refrigerated spaces and the absence of clogging due to ice formation within the sounding pipes crossing same refrigerated spaces.

