Rules for Checking the Arrangements intended for Sea Transportation of Special Cargoes

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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 authorized 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 certificate on 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 authorization 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

Chapter 1 – GENERAL

1 GENERAL

1.1 PURPOSE

1.1.1 Application

These Rules apply to the carriage of special or exceptional cargoes, such as offshore platform jackets and topside modules, harbour cranes, ship parts by means of cargo barges, semisubmersible heavy lift vessels, offshore-support vessels or general cargo ships.

These Rules address also the sea towing of unmanned tows such as cargo barges, non propelled units (pipe-laying barges, crane barges, semisubmersible platforms) and offshore structures temporarily floated for transportation.

Transport by towage of large floating objects, such as non self-propelled platforms, concrete or steel structures in temporary floating condition, damaged vessels, is also addressed, limitedly to the adequacy of the towing equipment.

These Rules apply also to loading, unloading and launching operations, only as far as vessel structural strength is concerned.

1.1.2 Definition of Special Transport

In general, sea transport is considered special or exceptional when:

- The loads induced by cargo and relevant seafastening on vessel structures exceed or are differently distributed in comparison with the allowable loads reported in the barge or vessel documents.
- Cargo weight and position are such that the stability condition is different from those reported in the vessel stability booklet.
- Cargo can be subject to wave impact loads.
- Other reasons for which the transport conditions can be deemed different from those expected in the regular vessel service, approved by its Classification Body.

For special or exceptional sea transport, the involved bodies (Authorities, Insurance, etc.) commonly require a Declaration of Suitability as detailed in the following paragraphs.

1.1.3 Declaration of Suitability

The purpose of these Rules is to define the requirements to be complied with in order to obtain a suitability declaration for the carriage on ships of special or exceptional cargoes, which cannot be assimilated to a distributed load on the weather deck, as described in the previous [1.1.2].

The declaration may address the suitability of the towing arrangement, in the case of transport to be performed by towing.

The declaration may also address other operations related to the transport, such as load out, load in, and launch.

Compliance with these Rules, in order to obtain the aforesaid declaration, is apart from and does not exempt from the obligation of fulfilling the rules and requirements, possibly different and/or more stringent than those issued by Tasneef, of the Administration of the country whose flag the vessel is flying, and possible different provisions.

1.1.4 Marine Warranty Survey

The suitability declaration for transportation and/or towing (hereinafter referred to as “Declaration”) is intended to provide the independent technical verification that is commonly requested by Permitting Authorities (Coast Guard, etc.) to authorize transit in their competence area, or by Insurance Bodies to provide coverage against damage and loss that could occur during transport operations.

In the latter case, Tasneef acts as Marine Warranty Surveyor and the generic scope of work described in these rules may be modified based on a project specific agreement, to be defined at the time the contract is awarded.

1.1.5 Manned Tow

Towing operations with people aboard the towed unit will be subject to special consideration in each instance, based on the stability and free board conditions, the safety, emergency rescue and fire-fighting equipment, together with the due presence on board of power generation equipment and accommodation. The number of passengers allowed on board shall be limited, as far as possible, to the necessary crew only and will be reported on the final statement.

1.2 COMPLIANCE WITH OTHER RULES

1.2.1 General

“Rules for the classification of ships” (hereinafter indicated simply as “Rules”) or other Tasneef Rules are applicable, except as outlined below.

In particular, general requirements which are indicated in Part A, Ch 1, Sec 1 of the Rules are to be complied with.

Chapter 1 – GENERAL

1.3 DOCUMENTATION

1.3.1 General

Whenever the Declaration is required, the documentation indicated in Tab 1 must be submitted to Tasneef.

Tasneef will accept reduced documentation whenever it is considered acceptable in respect of the particular features of the transport.

Whenever the voyage is subject to weather and favourable sea conditions, maximum allowable wind speed and significant wave height shall be specified. The proposed values will be reviewed by Tasneef in order to evaluate their compatibility with the chosen routes and seasonal period.

This restriction shall be noted in the issued Declaration.

Chapter 1 – GENERAL

Table 1 : Documentation to be submitted

No.	I/A (1)	Document	Document details
1	I	Structural Analysis and Seafastening Design	a) load definition (see Chapter 2 and Ch 4, [1.3.2]); b) longitudinal strength calculations (see Ch 4, [1.2]); c) structural analysis d) structural checks of grillage and seafastening; e) structural checks of vessel structures (see Ch 4, [1.3]).
2	I	Naval Analysis and Stability Checks	a) determination of the position of the global centre of gravity of vessel and cargo with the correction due to possible tree surface of liquid in tanks and/or suspended load; b) righting moment and wind heeling moment curves (see Chapter 3); c) seakeeping analysis and definition of design acceleration; d) stability checks; e) evaluation of maximum towing pull.
3	I	Transportation Procedure	Including at least: a) vessel description and certificates; b) route, refuge harbours (if any) and relevant distance; c) seasonal period and weather limitations (if any); d) estimated voyage duration; e) seafastening fabrication (welding/NDT procedures, personnel qualification, etc.).
4	A	Transportation layout and general arrangement	Drawings showing position of masses on board, including: a) cargo weight, distribution, C.o.G. position; b) ballast plan; c) position of crane jibs or other mobile devices; d) weight and position of possible secondary items; e) wind exposed area.
5	A	Grillage and Seafastening General Arrangement	Drawings showing grillage and seafastening position in relation to deck/hull structures.
6	A	Seafastening Details	Construction drawings showing: a) structural members and joints; b) materials; c) standard items (i.e. beams, bolts. etc.); d) lashing items (i.e. ropes, shackles, padeyes, chains, tensioners. etc.).
7	A	Barge structure modification (if any)	Construction drawings relevant to: a) structural modification; b) selected materials; c) welding procedures and electrodes used.
8	A	Towing Plan	Towing line draft showing the position of each component (i.e. ropes, shackles, chains, triple plate. etc.) and relevant identification code and certified capacity (MBL, SWL, etc.).
(1) A = to be submitted for approval, in quadruplicate I = to be submitted for information, in duplicate.			

Chapter 2 – LOADS

1 LOADS

1.1 GENERAL

1.1.1 Load classification

Because of the purpose and applicability limits of the present Rules, in this Chapter only loads induced by cargoes acting on vessel structures during carriage are taken into account.

These loads may be divided into gravitational and environmental loads. The environmental loads considered here are those due to the wind action on the exposed areas of the cargoes or the seafastening, to the inertia forces due to vessel motion induced by waves and to possible wave impact against cargo parts.

1.2 GRAVITY LOADS

1.2.1 Permanent gravity loads

These loads consist of the weight of the cargoes and lashing arrangements.

1.2.2 Variable gravity loads

Gravitational overload due to ice and/or snow accumulation shall be taken into account, according to the routes followed, the seasonal periods and the morphological characteristics of the cargoes.

1.3 WIND ACTION

1.3.1 Wind action

Loads induced by the wind on the cargo and on seafastening features shall be evaluated according to the relevant Articles of Pt E, Ch 4, Sect 2 and Sec 3 of the Rules for the Classification of Floating Offshore Units at Fixed Locations and Mobile Offshore Drilling Units.

Wind forces shall be considered from any direction in order to obtain, combined with other kinds of loads, the maximum load effects.

In general, a wind velocity of 51.5 m/s (100 knots) shall be used. Where transport is dependent on favourable sea and weather conditions, the value specified in the design documentation shall be taken into account; this value, however, shall be deemed acceptable by Tasneef.

1.4 INERTIA FORCES DUE TO VESSEL MOTION

1.4.1 Calculation principles

Inertia forces acting on cargo and on seafastenings shall be calculated by multiplying the mass of these elements by the dynamic acceleration which their centre of gravity is subjected to, due to the pontoon movements induced by waves.

The dynamic acceleration components in the longitudinal, transverse and vertical directions relevant to the vessel shall be taken into account.

The contribution due to gravity acceleration because of pitch and roll heel angles of the vessel shall be taken into account, evaluating longitudinal and transverse acceleration.

1.4.2 Evaluation of accelerations

Dynamic accelerations can be evaluated by seakeeping calculations taking into account hydrostatic, geometrical and inertia characteristics of vessel and cargo.

Theories and parameters defining sea states, hypotheses and computer programs used shall be agreed with Tasneef.

Alternatively, the results of realistic model tests, performed by recognized laboratories, can be accepted.

An accepted simplified method for general cargo ships is provided by the IMO Code of Safe Practice for Cargo Stowage and Securing.

1.4.3 Formulas for Cargo Barges

For carriage in the Mediterranean Sea, without any seasonal or route limitations, should difficulties arise in finding reliable data relevant to the sea state concerned and/or theoretical or experimental evaluation of dynamic acceleration, the formulas given below in subparagraphs a), b) and c) with reference to Fig 1 can be used.

These formulas are applicable to cargo barges with the following characteristics:

$$50 \le L \le 150$$

$$0{,}2 \le B/L \le 0{,}4$$

$$5 \le B/T \le 10$$

$$1 \le z_G/T \le 4$$

$$0{,}3 \le R_P/B \le 0.6$$

where the symbols stand for the meaning explained in the following subparagraphs a), b) and c) and:

z_G = distance, in m, of the global centre of gravity of the cargo-pontoon system from the waterplane.

a) longitudinal acceleration

$A_x = [40+122\ B/L+(1-L/25)^2](14{,}8 \cdot K_x \cdot L)^{-1}$

$K_x = 0{,}1\ B^{0.5}+2{,}4\ B/L$

g = gravity acceleration, in m/s^2;

L = cargo barge length, in m;

B = cargo barge width, in m;

z = distance, in m, between the point where acceleration has been calculated and the waterplane;

$a_x/g = A_x [1+K_x (z/T)^{1,5} (T/B)]+0,2$

where:

a_x = dynamic longitudinal acceleration, in m/s^2

b) transverse acceleration

$a_y/g = A_y (1+K_y z/B)[1+0,2(x/L)^2]+0,15$

where:

a_y = dynamic transverse acceleration, in m/s^2

$A_y = 1/280(0,3+ C_y^2)[21+(48 - B) C_y]$ where B≤48 m

$A_y = 0.075 (0,3+ C_y^2)$. where B>48 m

$C_y = (1-0,054 K_y)$; C_y should never be less than 0,7

$K_y = B GM / R_p^2$

GM = actual transverse metacentric height, in m;

R_p = polar inertia roll radius, in x direction, of the whole pontoon-cargo with dry hull, in m;

T = average pontoon draft, in m;

x = longitudinal distance between the point where acceleration has been calculated and midship, in m.

c) vertical acceleration

$a_z/g = A_z [1+K_z(x/L)^2]^{0,5} + A_{zy}$

where:

a_z = dynamic vertical acceleration, in m/s^2

$A_z = 16 L^{-1}+0,24-0,5 B/L$

$K_z = 7,1$

$A_{zy} = y (a_y/g-0,15) / (z+R_p^2/GM)$

y = transversal distance between the point where acceleration has been calculated and midship, in m.

The value of acceleration obtained by the formulas reported in subparagraphs a), b) and c) are inclusive of the contribution of gravity acceleration due to pitch and roll healing.

1.4.4 Weather Limitations

Where carriage takes place in the Mediterranean Sea and is dependent on favourable sea and weather conditions, the values of accelerations reported in a), b) and c) of [1.4.3] can be reduced by a certain percentage.

The extent of this reduction shall be to Tasneef satisfaction. In particular, the following cases apply:

a) When the transport conditions do not exceed moderate sea (significant wave height Hs is lower than 3,0 m), a reduction of 30%, 20% and 40% respectively for longitudinal, transverse and vertical acceleration can be assumed.

b) When the transport conditions do not exceed smooth sea (H_s is lower than 1,0 m) and the route is coastal, a further reduction of 50% can be applied to the reduced values quoted above in point a).

c) When transport takes place in sheltered water, such as transport from one quay to another inside the same harbour, the value of 0,1 g can be assumed for the three accelerations: a_x, a_y, a_z.

1.4.5 Slamming

Possible wave slamming against cargo elements protruding beyond sides, bow or stern of the pontoon and consequent impulsive loads, shall be taken into account. Relative wave surface speed must be evaluated and suitable slamming coefficients must be considered.

Similarly, the possibility of green sea must be investigated and, in such a case, the seafastening elements must be able to resist green sea forces generated by the water impact pressure acting on the cargo and seafastenings.

In the absence of specific studies, the pressure due to slamming and green sea is to be taken not less than 200 kN/m^2.

1.5 FATIGUE

1.5.1 Calculation principles

When the transport is very long or seafastening structures are used for several trips, a fatigue assessment may be required, in order to evaluate the amount of damage due to cyclic loading on seafastening elements and relevant connections on cargo and on vessel deck. The same assessment can be extended to cargo structures, if deemed necessary, but this aspect is in general not related to transport safety but only to the cargo design, in particular if the cargo is a structural item subject to fatigue loading also after the transport phase (i.e. offshore structures, skids for vibrating equipment, etc.) .

1.5.2 Analysis Procedure

Several analysis criteria are acceptable, depending on the expected level of criticality.

In general, the main analysis steps should be:

a) Collect the scatter diagrams applicable for the various areas encountered along the route.

b) Calculate the ship response (RAOs).

c) Calculate local delta-stress in fatigue details due to single amplitude cyclic loading, including appropriate stress concentration factors.

d) Store stress results as hot spot stress transfer functions.

e) Calculate the sea spectra according to recognized formulas (Pierson-Moscovitz, Jonswap, etc.).

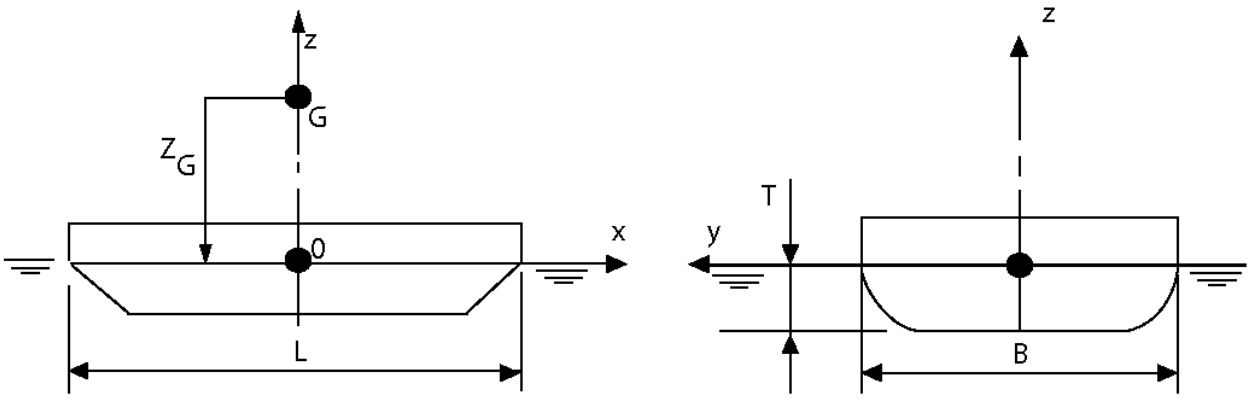
f) Calculate the stress response to each sea state encountered.

g) Choose S-N curves to associate with each hot spot stress location.

h) Cumulate the fatigue damage using Miner's rule.

i) Apply a safety factor to the calculated fatigue damage.

Figure 1



Chapter 3 – STABILITY

1 STABILITY

1.1 GENERAL

1.1.1 Stability criteria

Before the beginning of each voyage, calculations, showing that stability characteristics of the vessel-cargo system comply with the recognized requirements applicable to the kind of unit and navigation in question and the additional requirements hereinafter reported in [1.2], are to be submitted to Tasneef for review.

As an alternative to the additional stability calculations requested in [1.2], the results of experimental tests, performed by recognized Institutes or Organizations on representative models of the system may be accepted.

1.2 ADDITIONAL STABILITY CRITERIA

1.2.1 Stability check

The ratio between the area under the righting moment curve, in the stability diagram, and the area under the transverse wind heeling curve shall be 1,4 or higher. These areas are limited to the range of heeling angles between origin and second intercept (between the two curves) or downflooding angle, whichever is less (Fig 1).

1.2.2 Righting effect

The righting moment curve shall be calculated for a sufficient number of heel angles to define the curve, taking into account the liquid surface effects and suspended loads. The contribution given to the righting moment by the buoyancy of cargo parts which result immersed due to pontoon heeling shall be ignored.

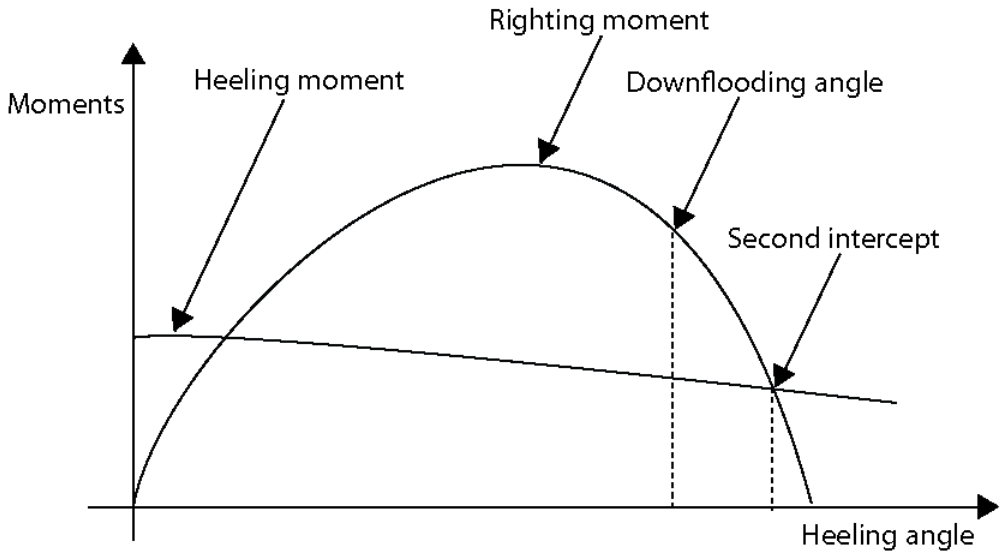
1.2.3 Wind action

The wind heeling moment curve shall be calculated for a sufficient number of heel angles to define the curve.

Wind force on emerged parts of the vessel and on cargo shall be calculated according to Ch 2, [1.3]. Particular attention will be paid to the influence of horizontal surfaces which are exposed to the wind in heeled positions.

The lever of the wind heeling force shall be measured vertically from the centre of pressure of all surfaces exposed to the wind up to the centre of lateral resistance or to the geometrical centre of the projection of the underwater body of the pontoon, on a vertical plane.

Figure 1



1 GENERAL PRINCIPLES OF ANALYSIS AND STABILITY

1.1 GENERAL

1.1.1 Load distribution

The arrangements for the carriage of cargo shall be designed so as to distribute static and dynamic loads induced on the vessel structures and to reduce still water and wave loads on pontoon hull beam.

Concentrated loads cannot be applied on areas of the weather deck which are not in correspondence with structural reinforced elements; gravitational and environmental loads should be transferred by seafastening features to vessel structural elements able to bear them efficaciously, like bulkheads, deck beams, girders, columns, sides.

Transmission of normal tensile stresses through thickness of doubling plates or plates welded along external contours are to be avoided.

1.1.2 Vessel structure modification

Changes to vessel structural elements shall be carried out, if possible, without complex solutions and sudden section variations, which may induce dangerous stress concentrations.

The constructive solutions used shall be consistent, with regard to shape, functionality, materials and welding procedures, with existing pontoon structures .

1.2 LONGITUDINAL STRENGTH

1.2.1 Loads

It is to be checked that loads acting on the hull beam while cargo is carried are lower than design loads of structural pontoon dimensioning.

1.2.2 Structural Checks

The check should be carried out by calculating hull beam loads in still water for the vessel in transport condition and, on the basis of these, by calculating the required strength moduli and side shell thickness according to Pt B, Ch 6 of the Rules.

These moduli and thicknesses shall be lower than those of different transverse sections of the vessel.

1.2.3 Load calculation

Where the condition established in [1.2.1] has not been complied with, the Declaration can be issued only when the results of direct calculations can demonstrate, to Tasneef satisfaction, that wave loads, which are evaluated for the environmental conditions forecasted for transport, plus those calculated for still water condition do not induce stresses higher than the allowable ones reported in [1.4].

1.3 LOCAL STRUCTURAL ANALYSIS

1.3.1 General

The check of local strength of vessel structural elements is to be carried out by comparing working stresses, calculated according to the present item [1.3], with allowable stresses reported in item [1.5].

Alternative methods will be subject to special consideration in each instance by Tasneef.

1.3.2 Load effect determination

Determination of force, moments, stresses and strains shall be based on recognized criteria of static analysis, dynamic analysis and material strength.

Load effects evaluation shall be performed on the basis of the elasticity theory. Methods which are based on the plasticity theory will be considered by Tasneef in each instance.

1.3.3 Loads on vessel structures

The evaluation of load effects on the vessel structure shall be generally performed by taking into account the whole cargo-seafastening features subjected to the loads reported in Chapter 2.

In particular instances, whenever particular hypotheses on relative stiffness between cargo and vessel and on actual boundary conditions are verified, a simplified analysis may be accepted. An example is shown in Appendix 1 relevant to two typical cases.

1.3.4 Load cases

For every vessel structural element, the stress values due to each of the following load cases acting on the transported cargo shall be calculated:

a) gravitational loads;
b) wind action;
c) longitudinal acceleration;
d) transversal acceleration;
e) vertical acceleration.

These values shall be calculated according to the heaviest combination which may really exist for the single element, taking into account the statistical correlation of load cases. The stress combination methods will be subject to review by Tasneef.

1.3.5 Load combination

Provided that a different request has not been made by Tasneef, and when the loads relevant to load cases a) and b) can be considered static and if the loads relevant to load cases c), d) and e) may be considered statistically independent, the combination of the single stress components shall be performed according to the following formula:

$S = S_a + S_b + (S_c^2 + S_d^2 + S_e^2)^{0,5}$

where:

S = work stress, normal or tangential, in the analysed structural component.

S_a = induced stress in this component by the load case relevant to the aforesaid subparagraph [1.3.4] a).

S_b, S_c, S_d, S_e = maximum stress value induced in this component respectively by load cases relevant to the aforesaid subparagraphs [1.3.4] b), c), d) and e).

1.3.6 Other loads

For the vessel structural elements which, in addition to the loads induced by the seafastening features, have to bear direct loads (hydrodynamic head, distributed load on deck, etc.), the relevant stresses must be added to the ones mentioned in the previous paragraph, considering the worst combination realistically possible for the considered element, of static and dynamic loads.

1.3.7 Load reduction

A reduction of loads may be accepted by Tasneef depending on the pontoon's navigational characteristics and/or on subordination of transport to established sea and weather conditions. See also Ch 2, [1.4.4].

1.3.8 Non-linear effects

Possible aspects of geometrical non linearity or lack of homogeneity in material which can have a significant influence on structure behaviour shall be carefully considered.

1.3.9 Deck girders

In the calculation of stresses due to the bending on ordinary girders of deck panels, the "effective width" evaluated according to Pt B, Ch 4 of the Rules is to be considered.

1.4 ANALYSIS METHODS

1.4.1 Elastic linear analysis

For vessel and seafastening structural components checked within linear elastic limits, the equivalent stress, evaluated according to the Von Mises criterion, stall not exceed the allowable values defined in [1.5].

Where criteria different from Von Mises' are chosen, they have to be agreed with Tasneef.

1.4.2 Buckling analysis

This analysis method shall be used for those structural components for which buckling failure may occur.

Buckling analysis shall be performed using generally accepted methods and theories.

Alternative criteria shall be approved by Tasneef.

The effect of pre-strains due to geometrical and construction faults shall be taken into account when critical buckling stresses are evaluated.

1.4.3 Local crippling analysis

When high compressive loads are induced through areas which are limited by girder webs, local web crippling shall be analysed, checking that the following formula is verified:

$P / [s (c+2d)] \leq 1,15 \sigma_{amm}$

Where:

σ_{amm} = allowable compressive stress of web material (see [1.5]), in N/mm^2;

P = acting load, in N;

s = web thickness, in mm;

c = element width through which the load P is transmitted, in mm;

d = thickness of plate close to the web, in mm.

1.4.4 Seafastening

The seafastenings are not to be considered as an integral part of the pontoon structure and are generally removed at the end of each carriage.

The check of the seafastenings is to be carried out on the basis of the loads described in Chapter 2, according to general principles of analysis described in Chapter 4 and considering the allowable stresses stated in [1.5].

Seafastenings made of chains, ropes, shackles and tensioners should be avoided for heavy cargoes and replaced by rigid elements, such as welded braces and brackets.

Mixed seafastenings made of rigid elements together with chains and ropes should be avoided too, because the lower stiffness of flexible elements considerably reduces their contribution to the seafastening system (if the mixed solution is used, rigid seafastenings should be able to withstand all the design loads as if no flexible element were present).

When the seafastenings include chains, ropes, shackles and rods, the load to which they are submitted must not be higher than 1/3 of the rated breaking load and the connection elements (padeyes, D-rings, etc.) must be welded to the deck plating exactly in way of the webs or reinforcements such as beams, stringers, girders, etc. Moreover, the welding is to be carried out in way of the intersection of the reinforcement web symmetry plane with the deck plane.

1.5 ALLOWABLE STRESSES

1.5.1 Vessel Structures

For all vessel structural elements, the allowable stress σ_{amm}, in N/mm^2, with which equivalent working stresses have to be compared, is given by:

$\sigma_{amm} = 177/ K$

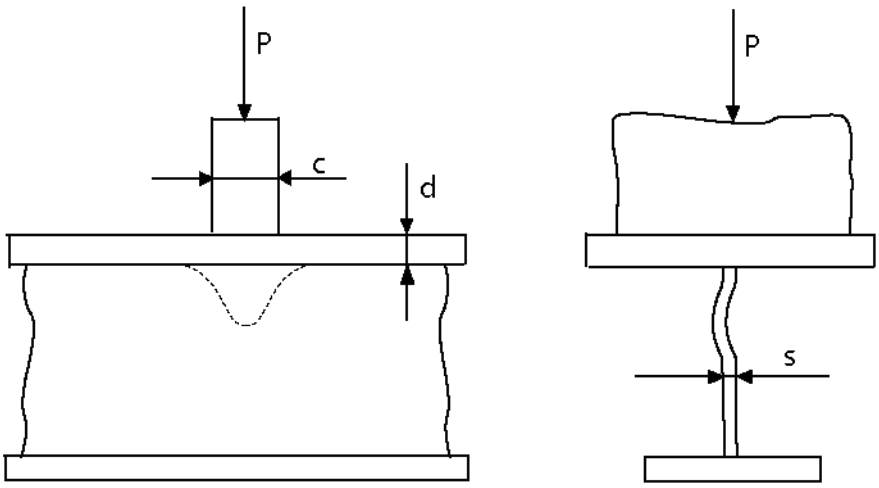
where K is the coefficient for the structural element dimensioning which is related to the steel type (see Pt B, Ch 4, Sec 1 of the Rules). The equivalent working stresses are evaluated by the Von Mises criterion, taking into account, where necessary, hull beam stresses.

1.5.2 Grillage and seafastening structures

Allowable stresses from recognized "Working Stress Design" codes for steel construction (AISC, etc.) are accepted. In consideration of the acting environmental load, an increase of 1.33 in allowable stress value may apply.

"Load and Resistance Factor" codes and relevant limit state checks are also accepted, provided that the structural analysis is performed in full compliance with all the factors prescribed by the selected code.

Figure 1



Chapter 5 – LOADING, UNLOADING AND LAUNCHING OF TRANSPORTED CARGO

1 LOADING, UNLOADING AND LAUNCHING OF TRANSPORTED CARGO

1.1 GENERAL

1.1.1

This Chapter applies to the launching of cargo from the vessel and/or loading and unloading it from and onto the vessel by means of skids (bogies) or rubber tyre trailers (SPMT).

Tasneef may not require documents or check calculations which are in its opinion superfluous in relation to the particular characteristics of the cargo and/or to the type of operation to be carried out.

1.1.2

The regulations given in the following articles do not take into account the functionality of the concerned operations but have the only aim of ensuring the same safety level required for the carriage depending on stability, longitudinal strength and local resistance of the pontoon.

1.2 DOCUMENTATION

1.2.1 Manual

For each loading, unloading and launching operation envisaged, a specific manual will be provided for Tasneef review, including at least:

a) a procedure describing every single stage of the operation;

b) description and checks of the equipment and devices used;

c) a ballast plan relevant to the main stages of the operation with any possible limitations due to environment or procedural conditions;

d) any maximum allowable values of wind velocity and wave height which allow the operation to begin;

e) description of the changes made in the vessel structures;

f) calculations relevant to stability, longitudinal strength and local resistance of the vessel;

g) bathimetric charts of the operational area (quay or offshore) and checks of the seabed clearance;

h) mooring analysis and mooring equipment description and checks.

1.3 STABILITY

1.3.1 General

The vessel shall have sufficient stability and buoyancy reserve for all operations of loading, unloading and launching.

1.3.2 Metacentric height

During all the operations in a port, the actual metacentric height of the vessel is to be at least 1 m.

1.3.3 Launch

During the launching operation in open sea, the problem of stability is to be carefully considered in relation to the dynamic type of operation and to the environmental influence.

1.4 LONGITUDINAL STRENGTH

1.4.1 Loading and unloading operations in a port

The distribution of bending moment and shear force in still water along the hull beam are to be evaluated for each stage of the operation, and it is to be verified that the consequent stresses do not exceed the admissible ones.

1.4.2 Launching operations in open sea

The longitudinal strength of the barge is to be verified for a sufficient number of positions included between the beginning of trim variation obtained by means of ballasting and the completion of cargo launching, taking into account the dynamic characteristics of the operation.

The position of the cargo centre of gravity on the vertical of the launching rocker arm pin is to be given special consideration.

1.5 LOCAL STRUCTURAL ANALYSIS

1.5.1 Analysis principles

The local structural analysis of the vessel during the operations of loading, unloading and launching is to be carried out according to the general principles explained in Ch 4, [4.3] and referring to the allowable stresses set forth in Ch 4, [1.4].

1.5.2 Deck levelling

The possibility that, due to an imperfect complanarity between the quay plane and the vessel deck, during loading and unloading operations, the cargo weight may be distributed on a number of supports which is lower than the envisaged one is to be taken into consideration.

1.5.3 Launching devices

With regard to the launching operations, special consideration shall be given to the stresses of the structures to which the rocker arm or similar devices are connected.

1.5.4 Loads due to barge immersion

It is to be checked that the bottom and side structures of the barge are able to withstand the hydrostatic pressures corresponding to the drafts which are reached depending on the particular launching trimmings.

1.5.5 Environmental actions

When deemed suitable by Tasneef, also possible stresses induced by environmental conditions are to be included in the structural check.

1 TOWING ARRANGEMENT

1.1 GENERAL

1.1.1 Definitions

The abbreviations used in this chapter have the following meaning:

BP: documented continuous bollard pull

MP: maximum towing pull foreseen for the voyage

MBL: minimum breaking load

SWL: safe working load

1.1.2 Towing Plan

The tug Master shall provide a towing plan drawing showing position, identification and capacity (MBL or SWL) of each component of the towing line (wires, chains, shackles, triple plate, etc.), including bridle legs and relevant connections to the tow. The towing plan must report also the value of maximum pull MP foreseen during the voyage.

The continuous bollard pull BP of the towing vessel(s) involved should be sufficient to maintain station keeping of the tow in the design environmental conditions, therefore BP must not be lower than MP.

All the elements in the towing plan must have adequate capacity with respect to MP.

1.1.3 Calculation of Maximum Towing Pull

The maximum pull MP should be computed by means of recognized formulas, based on the design combination of wind, wave and current, considering zero forward speed.

For unrestricted operations, MP must be related to the following environmental conditions acting in the same direction:

- Wind speed: 20 m/s
- Significant wave height: 5 m
- Current speed: 0,5 m/s

1.1.4 Emergency Towing Line

The tow must be equipped with an emergency towing line sized according to the same criteria and safety factors applicable to the main line.

1.2 TOWING EQUIPMENT CAPACITY

1.2.1 Towline Safety Factor

Each component in the towing line, including bridle legs and relevant connections to the tow, must have a documented MBL in excess of BP according to the safety factors reported in Tab 1.

Table 1: Towing Equipment Safety Factors

BP (tonnes)	Safety factor MBL / BP
BP ≤ 40	3,0
40 < BP ≤ 90	3,8 - BP/50
BP > 90	2,0

Components identified by SWL instead of MBL are acceptable if MP does not exceed SWL, provided that SWL has been defined, by the manufacturer or certification body, considering a safety factor against breaking not lower that those reported in Tab 1.

1.2.2 Shackles and Connections

All connecting items such as shackles, rings, etc., must have a documented MBL in excess of BP according to the safety factors reported in Tab 1, increased by 10%.

All connecting items such as shackles, rings, etc., should have a documented MBL in excess of a minimum 50% in excess of the towline documented ultimate capacity (i.e. MBL of the weakest element in the towline).

1.2.3 Fibre Rope Pennants

If fibre rope pennants are used, they must have a documented MBL in excess of BP according to the safety factors reported in Tab 1, increased by 50%.

Fibre rope pennants should have a documented MBL in excess of the towline documented ultimate capacity (i.e. MBL of the weakest element in the towline) according to the safety factors reported in Tab 2.

Table 2: Fibre Rope Safety Factors

BP (tonnes)	Safety Factor $MBL_{fibrerope}$ / $MBL_{towline}$
BP ≤ 50	2,0
50 < BP ≤ 100	2,5 - BP/100
BP > 100	1,5

1.2.4 Oversized Tug

If the available towing vessel is oversized with regard to the specific needs of the towage to perform, in particular for weather restricted operations, then the towline capacity may be related to the calculated MP instead of the

available BP. Therefore, the towline safety margin can be assessed by replacing BP with MP in Tab 1.

In this case, the tug must be equipped with a suitable monitoring system (load cell on winch cable, weather forecast service, etc.) so that the Master can properly adjust route and speed in order to avoid any risk of exceeding MP during the voyage.

1.2.5 Connecting Items on the Tow

Towing accessories on the towed object (fairleads, chain brackets, etc.) are to be approved by a QSCS Classification Society (as defined in Pt A, Ch 1, Sec 1 of the Rules) for a SWL or working load limit greater than BP.

If such approval is not documented, the capacity must be assessed by means of suitable structural calculations.

Chapter 7 – SURVEYS

1 SURVEYS

1.1 VESSEL SURVEY

1.1.1 General

All units involved in the transportation must be in good condition and provided with Class Certificates in due course of validity, along with all other applicable certificates required for the service.

The Tasneef surveyor shall take note of the fore and aft draught, to be reported in the Declaration. These values must be in compliance with the visaed drawings, where applicable.

1.2 SEAFASTENING SURVEY

1.2.1 Visual and Dimensional Survey

The loaded, sea fastened and ballasted unit in transport condition must be surveyed by Tasneef. if the transport features are not particularly challenging or exceptional, in the opinion of Tasneef, the suitability of the transport arrangement including the stability condition, can be assessed directly by the Tasneef Surveyor, during the survey.

1.2.2 Material

Sea fastening material must be provided with manufacturer certificates confirming the

mechanical properties assumed for the design and reported on the approved drawings.

If seafastening material is high strength steel (tensile stress greater than 410 N/mm^2), or whenever specifically requested, seafastening samples shall be subject to laboratory tests in order to verify the mechanical properties, according to recognized testing procedures (Tasneef, EN, etc.).

1.2.3 Welding and NDT

Welders to be used for welded joints with manual process are to be approved by Tasneef.

Specific welding processes are allowed if approved for types that are appropriate to the joint categories, in compliance with Tasneef requirements.

Seafastening welds must be visually inspected on 100% of their length and shall be NDT tested according to the following scheme:

- Butt weld: 30% UT + 10% MT
- Fillet weld with groove: 20% UT + 20% MT
- Fillet weld without groove: 20% MT

If unacceptable defects are highlighted, welds must be repaired and NDT test percentage increased to Tasneef surveyor satisfaction.

1.2.4 Used Seafastenings

If seafastening structures are made from second-hand steel, the original material certificates must be available. Otherwise, coupon testing will be performed in order to verify that the mechanical properties are in compliance with the design assumptions.

NDT must be performed in critical areas, such as old welds and nearby cuttings, in order to demonstrate the absence of possible defects and cracking.

1.3 TOWING PLAN VERIFICATION

1.3.1 Visual and Dimensional Survey

All towing line components must be in good condition. No piece of towline equipment should be used if:

- the reduction in cross sectional area due to wear, abrasion, corrosion and broken wires exceeds 10%;
- there is severe kinking, crushing or other damage resulting in distortion of the rope structure;
- end sockets, thimbles or other rope terminations are damaged, deformed or significantly corroded.

1.3.2 Equipment Certificates

The towing equipment on-board tug and cargo barge (or other towed unit) must have a certified capacity not lower than the one assumed on the approved towing plan.

Such capacity should be certified by a recognized Third Party body or a QSCS Classification Society (see Ch 6, [1.2.5]).

1.3.3 Emergency line

The tow must be equipped with an emergency towing line secured on board.

1.3.4 Towing Line Length

The towline must have an appropriate length determined using established criteria for the specific towage. As a general rule, in unrestricted operations, the main towline length should be at least:

L (m) = (BP/BL) x 1800

where BL is the documented breaking load of the towline, i.e. the minimum breaking load (MBL) of its weakest element.

The main towline should never be shorter than 500 m plus the minimum length that needs to remain always on the winch drum.

It is the Master's responsibility to deploy an adequate towing wire length, depending on the tow characteristics and weather conditions.

1.4 DELIVERABLES

After the survey has been performed, Tasneef issues the Declaration relevant to the performed verification activities.

Appendix 1 – SIMPLIFIED STRENGTH ANALYSIS METHOD FOR SOME TYPICAL CASES

1 SIMPLIFIED STRENGTH ANALYSIS METHOD FOR SOME TYPICAL CASES

1.1 FOREWORD

1.1.1

The check of the local resistance of the structural components of the pontoons, carried out considering the global cargo - seafastening – pontoon system, requires a rather complicated analysis.

However, in many practical cases, when it is possible to consider the pontoon as a substantially rigid support for the cargo and the boundary conditions may be outlined according to a limited number of supports symmetrically arranged, the check may be divided into two separate parts, whose treatment is thus made easier:

a) calculation of the stresses acting upon a single boundary formed by one seafastening;
b) check of the local structures of the pontoons, to which the above stresses are transmitted.

To give an example, it is explained below how the analysis can be simplified for two cases, which are frequent in the field of offshore carriage.

1.2 PLATFORM JACKET FASTENED TO THE PONTOON DECK BY MEANS OF RIGID SEAFASTENINGS

1.2.1

With reference to Fig 1 only the assembly, which is symmetric to the symmetric longitudinal plan, is taken into consideration while the vertical component of the wind force due to the roll inclination, may be ignored due to the particular tubular structure of the cargo.

Attention is focused on support n°1 and the following parameters are considered:

P = own weight of the jacket;

G = centre of gravity of the jacket;

P_1 = P fraction weighing on support n°1;

G' = centre of gravity of the jacket part weighing on supports 1 and 2:

F_V = resultant of the transversal wind loads on the jacket;

F_x, F_y and F_z = longitudinal, transversal and vertical forces transmitted by the jacket on support n° 1.

The forces transmitted by the cargo to support n°1 are indicated below in Tab 1 (see Ch 4, [1.3.4]).

Table 1

Condition	Cause	F_x	F_y	F_z
(a)	Own weight	-	-	P_1
(b)	Transversal wind	-	$\frac{F_v}{4}$	$\frac{F_v}{2} \cdot \frac{z_v}{d}$
(c)	Longitudinal acceleration	$\frac{P}{4} \cdot \frac{a_x}{g}$	-	$\frac{P}{2} \cdot \frac{a_x}{g} \cdot \frac{z_G}{b}$
(d)	Transversal acceleration	-	$P_1 \cdot \frac{a_y}{g}$	$2P_1 \cdot \frac{a_y}{g} \cdot \frac{z'_G}{d}$
(e)	Vertical acceleration	-	-	$P_1 \cdot \frac{a_z}{g}$

where:

g = gravity acceleration, in m/s';

a_x = longitudinal dynamic acceleration calculated in way of the global centre of gravity of the jackets, in m/s^2.

a_y. a_z = vertical and transversal dynamic acceleration, calculated in way of centre of gravity G ' of the jacket part weighing on supports 1 and 2, in m/s^2.

The stresses S_a, S_b, S_c, S_d and S_e acting on each lashing component can be determined by subjecting a structural model of the lashing corresponding to support n° 1 to the above-mentioned loading conditions.

These stresses are composed into the two resultant stresses S' and S" on the basis of which the pontoon structures involved are checked by means of the following formula:

$$S' = S_a + S_b + (S_c^2 + S_d^2 + S_e^2)^{0,5}$$

$$S'' = S_a - S_b - (S_c^2 + S_d^2 + S_e^2)^{0,5}$$

Appendix 1 – SIMPLIFIED STRENGTH ANALYSIS METHOD FOR SOME TYPICAL CASES

Figure 1

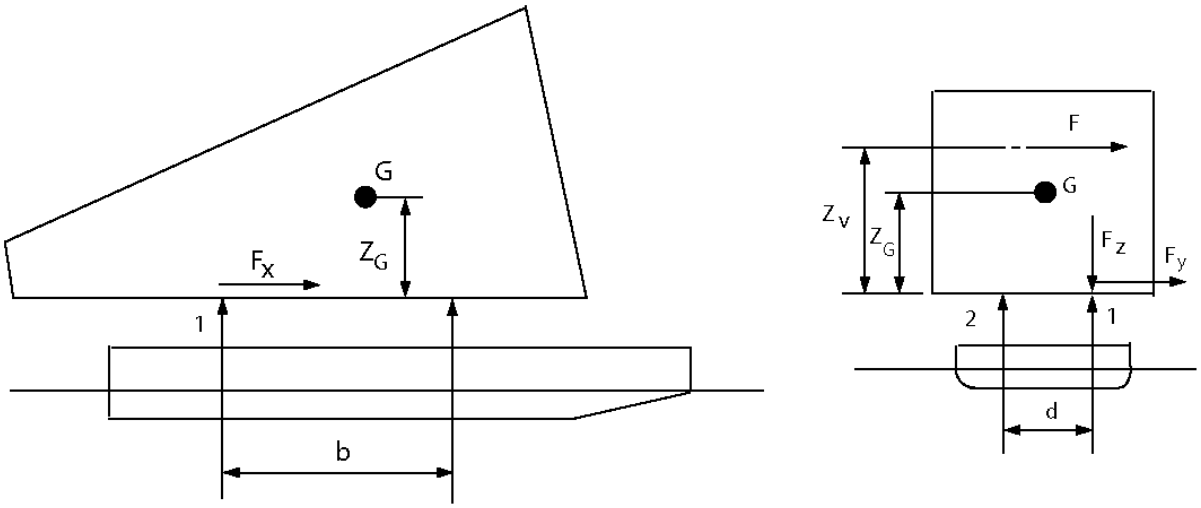
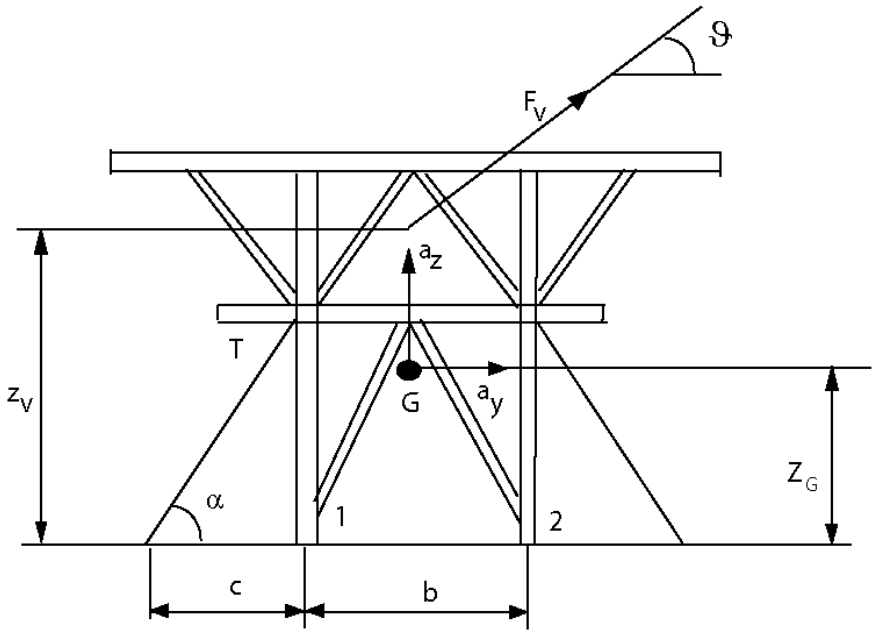


Figure 2



Appendix 1 – SIMPLIFIED STRENGTH ANALYSIS METHOD FOR SOME TYPICAL CASES

1.3 PLATFORM DECK LAID ON THE PONTOON DECK AND LASHED BY MEANS OF ROPES

1.3.1 Foreword

With reference to Fig 2, considering in the first instance the problem only on the transversal plane and assuming that the deck has a double symmetry and that the rope pretension may be ignored, it is necessary to consider the two conditions explained in the following paragraphs [1.3.2] and [1.3.3].

1.3.2 Condition 1

$$\frac{F_V \cos\theta\,(z_V/z_G) + (P/g)a_Y}{P - (P/g)a_z - F_V \sin\theta} \le \frac{b}{2z_G}$$

where θ is the calculated roll angle, P ts the deck weight and the other parameters are those defined in [1.2].

In this condition, the rope is not stressed to avoid capsizing of the deck. The reactions on the most stressed support are calculated in the same way as in [1.2] unless the friction between the support and the deck is insufficient to ensure the required horizontal reaction; in this case it will be necessary to have recourse to different solutions. The effect of the wind in the horizontal areas as a consequence of the inclination of the whole, cannot in this case be ignored.

1.3.3 Condition 2

$$\frac{F_V \cos\theta\,(z_V/z_G) + (P/g)a_Y}{P - (P/g)a_z - F_V \sin\theta} \ge \frac{b}{2z_G}$$

In this condition, one support is unloaded and the adjacent rope is stressed to avoid capsizing; they are therefore calculated in a different way. As they originate from two different situations:

- the maximum tensile load on the rope T;
- the maximum vertical and horizontal reactions on the most stressed support.

a) Calculation of the maximum load T on the rope

For this calculation the effect of the wind force and of the vertical and transversal accelerations, directed as indicated in Fig 2, are combined by means of the following formula:

$$T = T_P + T_V + (T_Z^2 + T_y^2)^{0,5}$$

Where:

T_P = load due to the structure's own weight (which tends to release the rope stress), given by;

$$T_P = -P/2 \frac{b}{(b+c)\sin\alpha}$$

T_V = load due to the transversal wind, given by:

$$T_V = F_V \frac{z_V \cos\theta + (b/2)\sin\theta}{(b+c)\sin\alpha}$$

T_Z = load due to the vertical acceleration, given by:

$$T_Z = P \frac{a_z}{g} \frac{b}{b+c} \frac{1}{2\sin\alpha}$$

T_y = load due to the transversal acceleration, given by;

$$T_y = P \frac{a_y}{g} \frac{z_G}{(b+c)\sin\alpha}$$

b) Calculation of the maximum vertical and horizontal reactions on the most stressed support (support 2 in the example of Fig 2).

These reactions occur when the vertical acceleration is directed in the opposite direction to the one indicated in Fig 2.

The maximum vertical reaction C_{max} is obtained by the following formula:

$$C_{max} = C_P + C_V + (C_Z^2 + C_Y^2)^{0,5}$$

where:

C_P = force due to the structure's own weight, given by:

$$C_P = (c + b/2) \frac{P}{b+c}$$

C_V = force due to the transversal wind, given by:

$$C_V = F_V \frac{z_V \cos\theta - (c + b/2)\sin\theta}{(b+c)}$$

C_Z = force due to the vertical acceleration, given by:

$$C_Z = P \frac{a_z}{g} \frac{2c + b}{2(b + c)}$$

C_y = force due to the transversal acceleration, given by:

$$C_y = P \frac{a_y}{g} \frac{z_G}{b+c}$$

It will also be necessary to verify that the maximum transversal reaction on the compressed support, calculated in a similar way to the one explained above, may be transmitted by the friction. Otherwise, and in the case of a lack of proper constraints, a new suitable model shall be adopted.

To take into account the effects of the longitudinal acceleration, in connection with longitudinal seafastening features, considerations similar to those in [1.2] and [1.3] may be made.