DIPARTIMENTO REGIONALE TECNICO
UFFICIO DEL GENIO CIVILE DI SIRACUSA

PORTO RIFUGIO DELLA BAIA DI SANTA PANAGIA (SR)

INTERVENTI URGENTI DI RIPRISTINO DELLA STRUTTURA DELLA DIGA FORANEA NEL PORTO RIFUGIO DELLA BAIA DI SANTA PANAGIA A SIRACUSA

PROGETTO DEFINITIVO

(ai sensi dell'art.23, comma 8 D.gs. 50/2016)

Schede Tecniche

DATA PROGETTO

16/12/2021

FASE	AMBITO	TIPO	N° / SIGLA	TAVOLA	REV
PD	TEC	REL	TEC010	A.10	0

Rev.	DATA	DESCRIZIONE	STATO
A		EMISSIONE	VIGORE

RESPONSABILE UNICO DEL PROCEDIMENTO
Arch. Gino Montecchi

PROGETTAZIONE:
Ing. Ranieri Meloni
Dott.. Vincenzo Vanella

DIREZIONE LAVORI:
Ing. Ranieri Meloni

COLLABORATORI ALLA PROGETTAZIONE
Geom. Salvatore Galioto

VISTI E APPROVAZIONI

Progetto definitivo degli interventi urgenti di ripristino della struttura della diga foranea nel Porto Rifugio della baia di Santa Panagia a Siracusa.

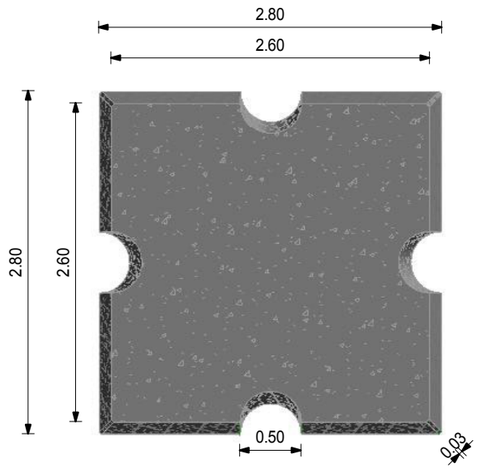
Di seguito, ad integrazione delle voci di elenco prezzi e del Capitolato Speciale d'Appalto, si allega la documentazione tecnica di alcuni degli elementi da realizzarsi.

Trattasi di documentazione illustrativa di riferimento delle caratteristiche richieste nelle specifiche voci di elenco: marca, costruttore, brevetti ecc. non sono vincolanti ai fini dell'appalto.

Schede relative a :
- Manufatti in CLS:
- Paracolpi ormeggi;
- Tappeti filtranti zavorrati antierosione
- Lampada faro rosso

MASSO IN CLS TIPO ANTIFER

- volume netto 16,68 mc
- peso specifico adottato 2,40 T/mc
- peso del masso 40,00 T



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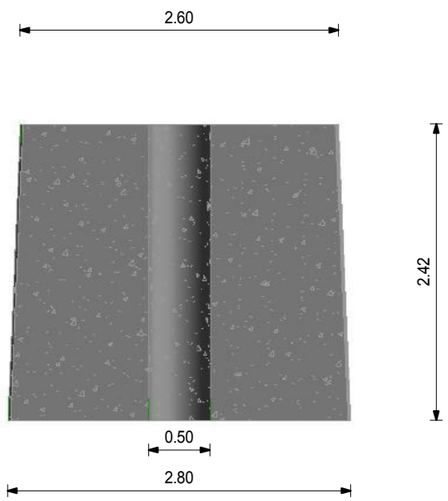

PROSPETTO
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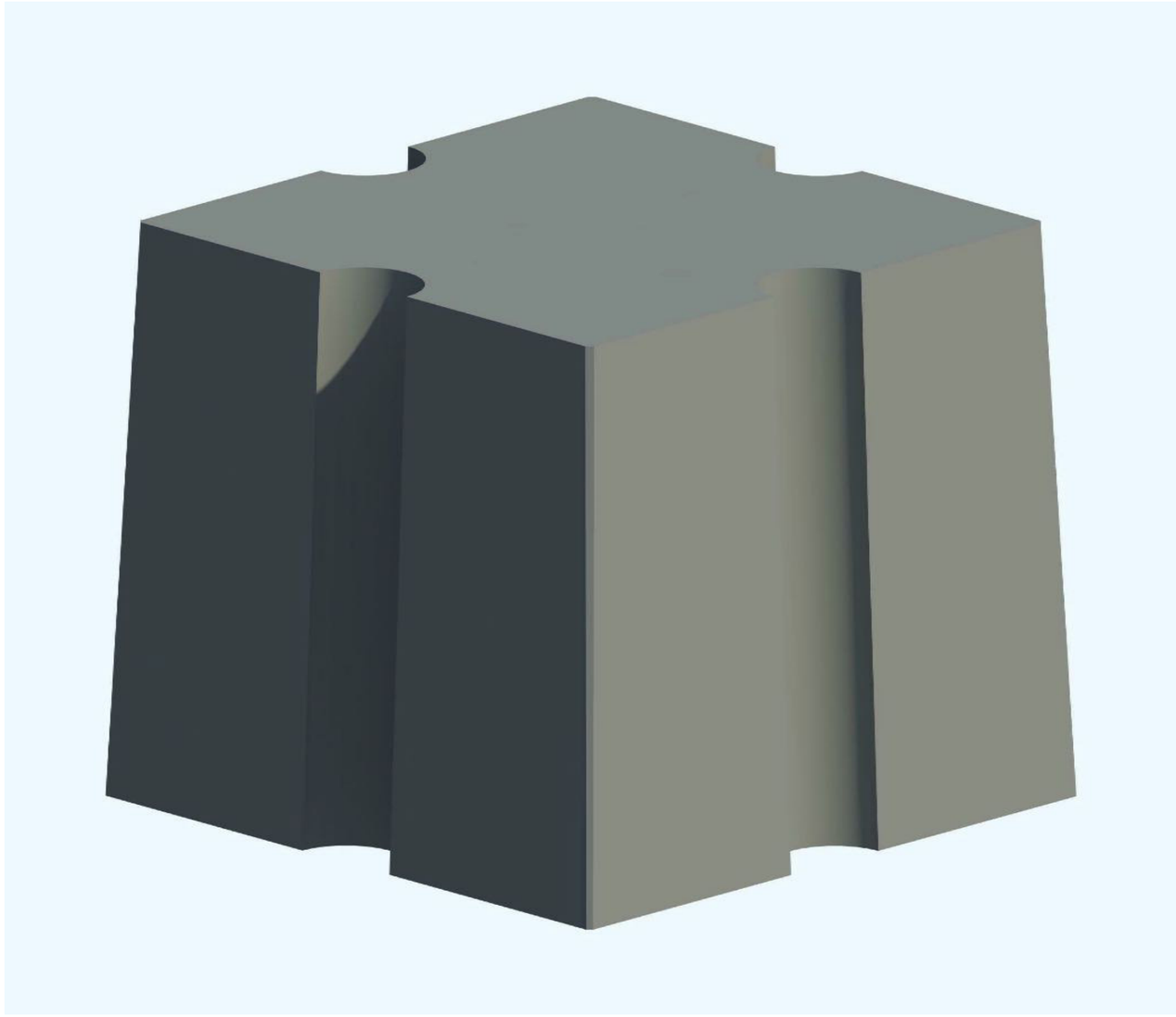
ARTICOLO DI ELENCO

17.3.2 - Massi artificiali di forma speciale (Tetrapodi, Antifer o similari), in conglomerato cementizio e di qualsiasi dimensione, con classe di resistenza C 28/35, classe di esposizione XS1 e classe di consistenza S4, dati nel cantiere massi secondo le sagome di progetto, comprese le casseforme speciali sia rette che curve, gli eventuali additivi, la vibratura, la stagionatura ed ogni altro onere per dare l'opera finita a perfetta regola d'arte.



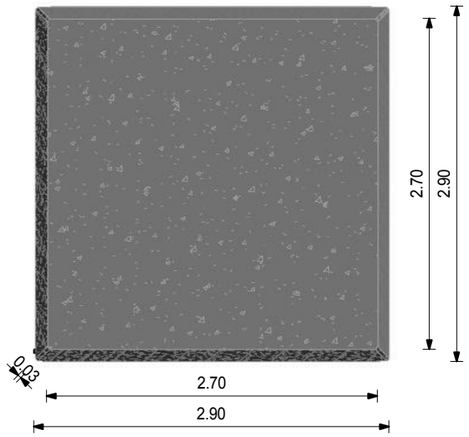
ASSONOMETRIA

MASSO IN CLS PRISMATICO

- volume netto 25,00 mc
- peso specifico adottato 2,40 T/mc
- peso del masso 60,00 T

ARTICOLO DI ELENCO

17.3.1 - Massi artificiali parallelepipedi o prismatici per mantellate o muri di sponda di qualsiasi dimensione, in conglomerato cementizio con classe di resistenza C 25/30, classe di esposizione XS1 e classe di consistenza S4, dati nel cantiere massi secondo le sagome di progetto, comprese le casseforme, gli eventuali additivi, la vibratura, la stagionatura ed ogni altro onere per dare l'opera finita a perfetta regola d'arte.



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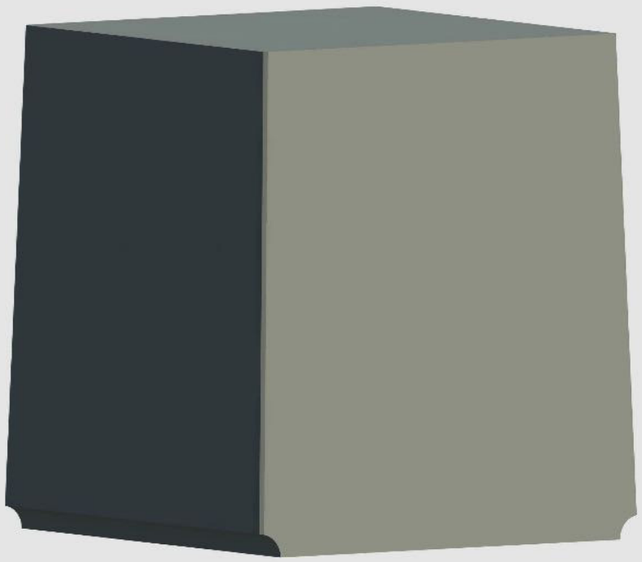
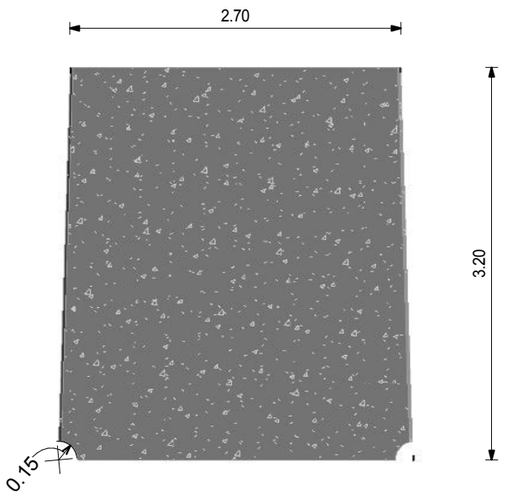


ASSONOMETRIA



PROSPETTO FRONTALE
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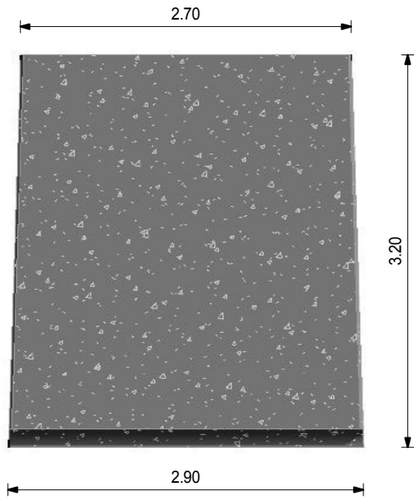

PROSPETTO LATERALE
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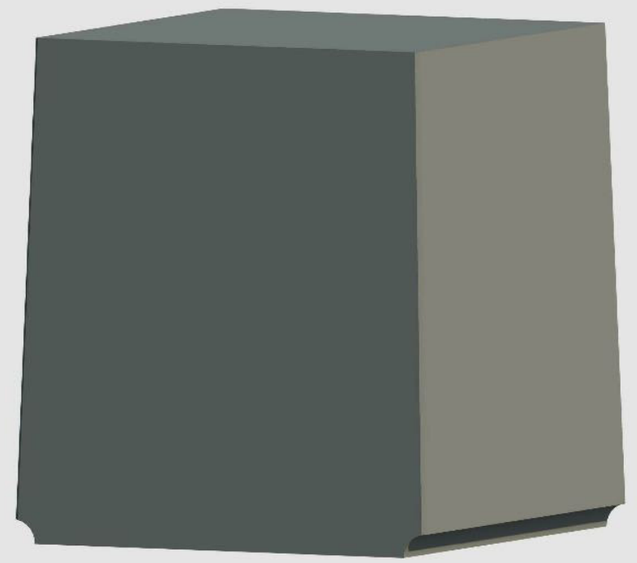

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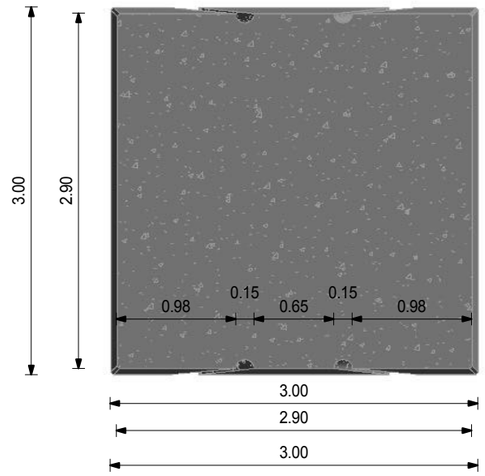

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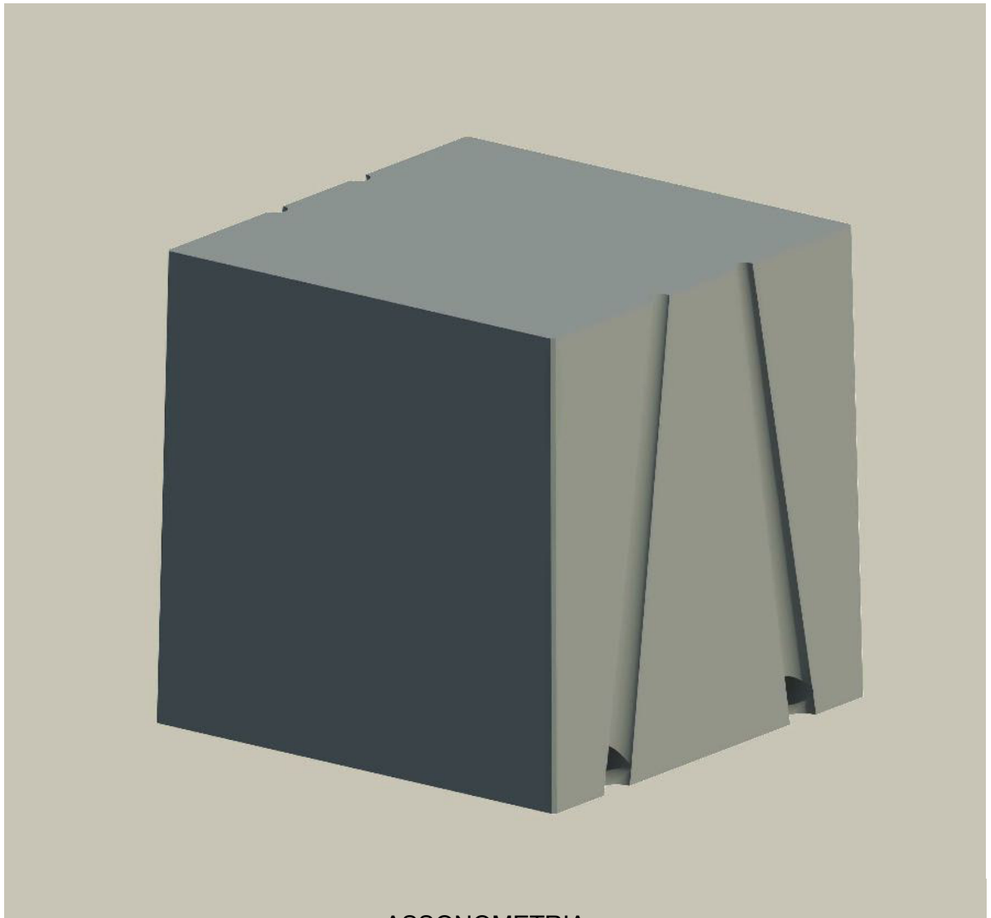

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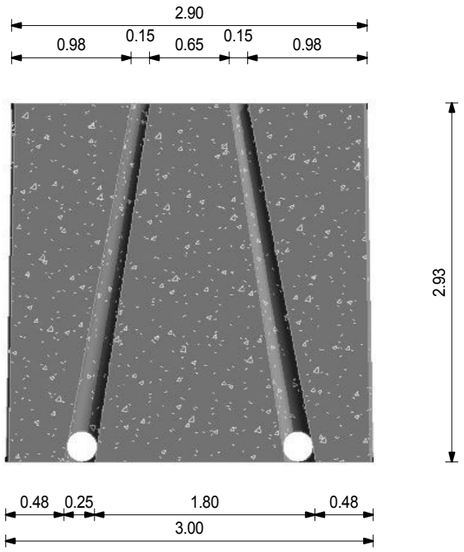

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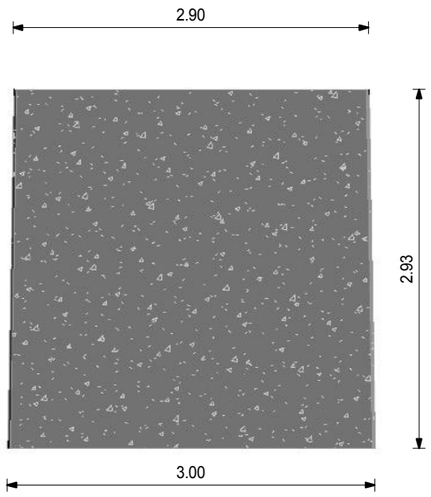

PROSPETTO LATERALE
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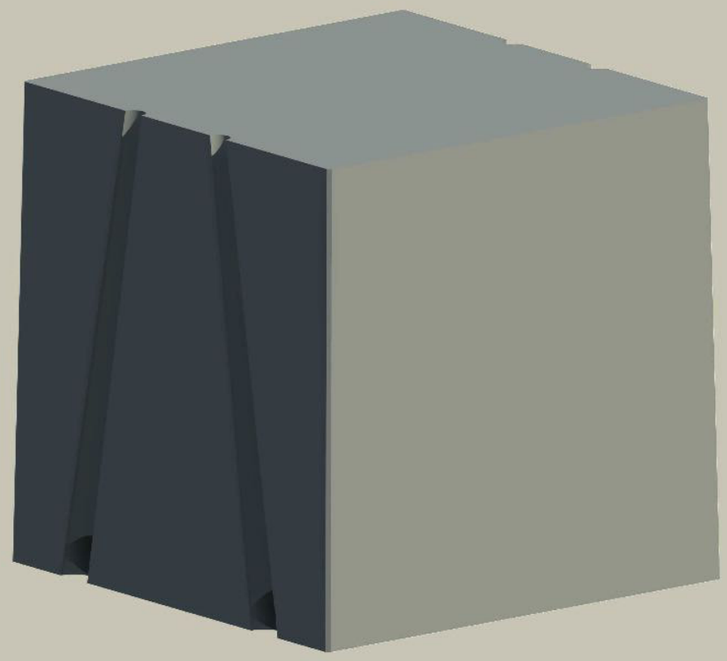
ASSONOMETRIA



Trelleborg Marine Systems

Project: SAN300x1000L & CA150 fender
Date: 04-11-2021
Quotation: ITA30481 Q-01

GENERAL TERMS AND CONDITIONS OF SALE

Version TMS 20171220

1. DEFINITIONS

The following expressions and derivatives thereof, appearing in capital letters in the CONTRACT, shall have the meaning hereby assigned to them unless otherwise specified, it being understood that such expressions appearing in small letters shall have their common meaning as the context requires.

- 'BUYER' means the person or company who accepts a quotation of the SELLER for the sale of the GOODS or whose order for the GOODS is accepted by the SELLER.
- 'GOODS' means the goods (including any instalment of the goods or any parts for them) and/or services (being labour, site services, technical support and training), which the SELLER is to supply in accordance with the CONTRACT.
- 'SELLER' means TRELLEBORG OFFSHORE & CONSTRUCTION AB with registered office at Johan Kocksgatan 10, 231 45 Trelleborg, Sweden
- 'CONDITIONS' means the standard terms and conditions of sale set out in this document and (unless the context otherwise requires) includes any special terms and conditions agreed in WRITING between the BUYER and SELLER.
- 'CONTRACT' means the contract for the purchase and sale of the GOODS.
- 'WRITING' includes telex, cable, facsimile transmission and comparable means of communication.
- 'CLIENT' means, where applicable, the person or company to whom BUYER is contracted to supply the GOODS.
- 'PARTY' means BUYER or SELLER as the context of the particular clause requires and 'PARTIES' shall mean BUYER and SELLER collectively.
- 'SUBCONTRACTOR' means any person or company to whom SELLER subcontracts part of the scope of work under the CONTRACT.
- 'CONFIDENTIAL INFORMATION' means any information exchanged between the PARTIES that can be reasonably described as sensitive, confidential or proprietary information or information marked to show it is confidential or otherwise identified as confidential at the time of disclosure.
- 'RECEIVING PARTY' means the PARTY which receives Proprietary Information from the other PARTY (the DISCLOSING PARTY).
- 'DISCLOSING PARTY' shall mean the PARTY which discloses Proprietary Information to the RECEIVING PARTY.
- 'MATERIAL BREACH' shall mean a breach of any clause of the CONTRACT contained herein which is not in the sole opinion of the SUPPLIER capable of remedy within a reasonable time and which breach is such as to deprive the BUYER from all or a material part of the benefit of the CONTRACT.

2. BASIS OF SALE

The SELLER shall sell and the BUYER shall purchase the GOODS in accordance with any written quotation of the SELLER which is accepted by the BUYER, or any written order of the BUYER which is accepted by the SELLER, subject in either case to these CONDITIONS, which shall govern the CONTRACT to the exclusion of any other terms and conditions subject to which any such quotation is accepted or purported to be accepted, or any such order is made or purported to be made, by the BUYER.

Any quotation made by the SELLER does not constitute a binding offer to sell, and any purchase order raised by the BUYER in response to SELLER's quotation shall be deemed as a binding offer to buy in accordance with SELLER's quotation, which shall be accepted by SELLER in accordance with these terms and conditions when acknowledged in WRITING by SELLER.

Any additional or different terms or conditions contained within BUYER's purchase order shall be deemed as objected to by SELLER without the requirement for notice of such objection, and shall in no way be binding on SELLER unless expressly agreed to in WRITING by SELLER's authorised representative.

No variation to these CONDITIONS shall be binding unless agreed in WRITING by the authorised representative of the SELLER.

The SELLER's employees or agents are not authorised to make any representations concerning the GOODS unless confirmed by the SELLER in WRITING. In entering into the CONTRACT the BUYER acknowledges that it does not rely on, and waives any claim for breach of, any such representations which are not so confirmed.

3. ORDER AND SPECIFICATIONS

No order submitted by the BUYER shall be deemed to be accepted by the SELLER unless and until confirmed in WRITING by the SELLER's authorised representative.

The BUYER shall be responsible to the SELLER for ensuring the accuracy of the details of any order (including any applicable specification) submitted by the BUYER, and for giving the SELLER any necessary information relating to the GOODS within a sufficient time to enable the SELLER to perform the CONTRACT in accordance with its terms.

If the GOODS are to be manufactured or any process is to be applied to the GOODS by the SELLER in accordance with a specification submitted by the BUYER, the BUYER shall indemnify the SELLER from all loss, damages, costs and expenses awarded against or incurred by the SELLER in connection with or paid or agreed to be paid by the SELLER in settlement of any claim for infringement of any patent, copyright, design, trade mark or other industrial or intellectual property rights of any other person which results from the SELLER's use of the BUYER's specification.

The SELLER reserves the right to make any changes in the specification of the GOODS which are required to conform with any applicable statutory requirements or generally accepted standards, where the GOODS are to be supplied to the SELLER's specification, provided that such change do not materially affect the quality or performance of the GOODS.

4. ASSIGNMENT AND SUBCONTRACTING

The BUYER shall not assign the CONTRACT, in full or in part, without the prior WRITTEN approval of the SELLER, which shall not be unreasonably withheld or delayed.

5. PROVISIONS FOR VARIATIONS

The BUYER has the right to request variations to the GOODS which are within the capability and resources of the SELLER. On receipt of the written variation request the SELLER shall furnish to BUYER details of any change to price or delivery schedule without undue delay. On receipt of the change in price and delivery schedule the BUYER shall issue a variation order to SELLER The variation will be implemented only on SELLER's acceptance of the BUYER's variation order. Any variation orders shall be governed by the terms and conditions contained herein.

6. PAYMENT TERMS

Unless otherwise agreed in WRITING payment for the GOODS shall be made by BUYER within 30 days of receipt of an invoice from SELLER.

If the BUYER fails to make any payment on the due date then, without prejudice to any other right or remedy available to the SELLER, the SELLER shall be entitled to:

- cancel the CONTRACT or suspend any further deliveries to the BUYER, without incurring any liability for doing so;
- appropriate any payment made by the BUYER to such of the GOODS (or any goods supplied under any other contract between the BUYER and the SELLER) as the SELLER may deem fit (notwithstanding any purported appropriation by the BUYER); and/or
- charge the BUYER interest (both before and after any judgement) on the amount unpaid, at the rate of eight percentage points per annum above EURIBOR 1M until payment in full is made.

7. CURRENCY

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All Prices are denominated in EURO (EUR) unless otherwise stated in WRITING.

8. RIGHT OF SET OFF

In the event of a dispute between the SELLER and the BUYER in relation to the CONTRACT or in relation to any other contract between the PARTIES, the BUYER shall not be entitled to withhold any payment due to SELLER under this CONTRACT or any other contract as set off against other claims under this CONTRACT or any other contract.

9. INTELLECTUAL PROPERTY AND TITLE

The BUYER or the CLIENT as applicable shall retain title to BUYER provided items and information, including but not limited to, technical information, materials and equipment.

SELLER shall retain title to the GOODS until paid for in full by the BUYER.

The SELLER shall ensure that all SELLER provided items are free from all liens and/or retention of title claims from any third party.

Title to, copyright in and ownership of all things created by or for SELLER in the course of performance of this CONTRACT, including but not limited to all data (including that stored on computers and computer aided design models), drawings, specifications, calculations, other documents, computer tapes, discs and other essential recording matter, materials and work shall vest in the SELLER as soon as the preparation, production or creation thereof commences.

No background IPR shall transfer as a result of the CONTRACT.

Notwithstanding the foregoing the SELLER, from the date of payment grants to the BUYER and/or the CLIENT the non-exclusive and irrevocable right to use any technical information, including software, provided by the SELLER, for the purposes of the installation, operation and maintenance of the GOODS and for no other purpose. Such right shall be transferable only in conjunction with a transfer of the title to the GOODS and then only to the person to whom title to the GOODS is transferred.

10. WARRANTY

10.1 STANDARD WARRANTY

SELLER will replace and/or make good defects in the GOODS caused by faulty material or workmanship provided such defect is notified to the SELLER in writing forthwith upon discovery and in any event within a period of 12 months from the date of delivery. The SELLER shall determine whether to repair, replace or credit the BUYER for the defective GOODS, which shall be at the Seller's discretion.

Repair under Warranty is based on return of defective GOODS to SELLER's factory at BUYER's expense. Re-delivery of any repaired or replaced GOODS to BUYER's/CLIENT's site will be at SELLER's expense. Alternatively and at SELLER's sole discretion SELLER may elect to repair defective GOODS at BUYER's/CLIENT's site.

Warranty repair or replacement does not extend the warranty period.

The warranty (including any Extended Warranty as referred to in Clause 10.2) shall not apply in respect of any defect of whatsoever kind in the GOODS arising out of:
operation or use of the GOODS outside of the specified operating conditions;

- misuse of the GOODS;
- repair to or alteration of any part of the GOODS by any person not authorized by the SELLER to perform such repair or alterations;
- use of spare parts or components not approved by the SELLER;
- failure to maintain, service, operate and/or inspect the GOODS on a regular basis to ensure that it is in working order; or
- use of the GOODS in a manner contrary to the design.

This warranty does not cover normal wear and tear and does not extend to replacement of consumable items such as globes, lamps, etc.

10.2 EXTENDED WARRANTY

If any Extended Warranty is offered, such Extended Warranty is offered subject to the BUYER entering into an Annual Maintenance Contract (AMC) with the SELLER or a third party appointed by the SELLER. Under the AMC, SELLER or its appointed person shall provide an annual site audit ("health check") of the GOODS and a report will be issued to the BUYER. Any defect in the GOODS caused by faulty materials or workmanship and identified during the audit will be repaired under warranty in accordance with Clause 10.1. BUYER shall maintain a stock of basic spare parts as recommended by SELLER, which spare parts will be used to maintain the GOODS in good working order at all times.

10.3 WARRANTY FOR SPARE PARTS

If and to the extent the GOODS consists of spare parts SELLER will replace and/or repair defects in such part(s) of the GOODS caused by faulty material or workmanship provided such defect is notified to the SELLER in writing forthwith upon discovery and in any event within a period of 12 months from the date of delivery. The SELLER shall determine whether to repair, replace or credit the BUYER for the defective GOODS, which shall be at the SELLER's discretion.
Warranty repair does not extend the warranty period.

All other conditions of Warranty for Spare Parts shall be as per Clause 10.1 (Standard Warranty).

10.4 WARRANTY FOR SERVICES

If and to the extent the supplies under the CONTRACT includes the provision of services the SELLER will make good any defect in workmanship provided such defect is notified to the SELLER in writing forthwith upon discovery and in any event within a period of 12 months from the date of completion of the service. The SELLER shall
determine whether to re-perform the defective services or credit the BUYER for the defective services, which shall be at the SELLER's discretion.

Warranty repair does not extend the warranty period beyond that noted in clause 10.4(n).

All other conditions of Service Warranty shall be as per Clause 10.1 (Standard Warranty).

10.5 EXCLUSIVITY OF WARRANTY

Except for the limited warranties set forth in Clauses 10.1 through 10.4 above, all other warranties, including any implied warranties of merchantability and fitness for purpose are excluded. The remedies available to the BUYER as set forth in Clauses 10.1 through 10.4 above are exclusive and shall be the sole remedies available to the BUYER in case of defects in the GOODS and/or services provided.

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11. DELIVERY & SCHEDULE

Unless otherwise stated, delivery is EXW Trelleborg or its sub-supplier's factory (as advised by SELLER). Delivery terms are based on INCOTERMS 2010.

Unless otherwise agreed in writing any time for delivery of the GOODS is estimate only, and the SELLER will not be liable for any failure to meet such estimate delivery time. Where a fixed date or period for delivery of the GOODS is agreed, the sole financial remedy available to the BUYER for failure by the SELLER to meet the agreed delivery date for the GOODS shall be payment by the SELLER of liquidated damages, which shall be in the amount of 0.5% of the part of the purchase price attributable to the GOODS delayed per full week of delay, provided that the maximum amount of such liquidated damages shall not exceed an amount equal to five (5) percent of the price paid or payable by the SELLER for the GOODS delayed. BUYER shall notify the SELLER in writing of any claim for liquidated damages within one (1) month from actual delivery of the GOODS, failing which the right to claim liquidated damages shall be forfeited.

Quoted price and delivery are based on a clear definition of scope of work at the time the CONTRACT is issued. Where scope is not clearly defined, SELLER reserves the right to requote the work and extend the delivery period.

BUYER agrees to make all reasonable efforts to review and approve Post Award documentation within two (2) weeks of submission of documentation by SELLER. BUYER accepts that any delay in approving documentation will impact delivery and may affect production scheduling.

Where a project commences on the basis of a Letter of Intent, PO number or emailed notice to proceed from BUYER in order to meet BUYER delivery requirements, any delay in receiving an agreed CONTRACT, or late receipt of funds against the payment schedule may also result in delay of project delivery or suspension of work by SELLER. Delivery may change if any options to base scope of supply are selected post award. BUYER shall notify SELLER the selected options required together with approval of Post Award documents, or earlier, failing which any such requirement may impact delivery.

SELLER will advise BUYER any changes in delivery schedule at the earliest opportunity. Any delay by the BUYER to scheduled shipping / delivery dates will incur a penalty. The penalty may include but is not limited to, interest charges and storage fees.

12. TITLE AND RISK

Risk of damage to or loss of the GOODS shall pass to the BUYER in accordance with the applicable INCOTERM. If no INCOTERM is defined, the following shall apply:
- in the case of GOODS to be delivered at the SELLER's premises, or the time when the SELLER notifies the Buyer that the GOODS are available for collection; or
- in the case of GOODS to be delivered otherwise than at the SELLER's premises, at the time of delivery or, if the BUYER wrongfully fails to take delivery of the GOODS, the time when the SELLER has tendered delivery of the GOODS.

Notwithstanding delivery and the passing of risk in the GOODS, or any other provision of these Conditions, the title in the GOODS shall not pass to the BUYER until the SELLER has received in cash or cleared funds payment in full of the price of the GOODS and all other GOODS agreed to be sold by the SELLER to the BUYER for which payment is then due.

Until such time as the title in the GOODS passes to the BUYER, the BUYER shall hold the GOODS as the SELLER's fiduciary agent and bailee, and shall keep the GOODS separate from those of the BUYER and third parties and properly stored, protected and insured and identified as the SELLER's property. Until that time the BUYER shall be entitled to resell or use the GOODS in the ordinary course of its business, but shall account to the SELLER for the proceeds of sale or otherwise of the GOODS, whether tangible or intangible, including insurance proceeds, and shall keep all such proceeds separate from any moneys or property of the BUYER and third parties and, in the case of tangible proceeds, properly stored, protected and insured.

Until such time as the title in the GOODS passes to the BUYER (and provided the GOODS are still in existence and have not been resold), the SELLER shall be entitled at any time to require the BUYER to deliver up the GOODS to the SELLER and, if the BUYER fails to do so forthwith, to enter upon any premises of the BUYER or any third PARTY where the GOODS are stored and repossess the GOODS.

The BUYER shall not be entitled to pledge or in any way charge by way of security for any indebtedness of any of the GOODS which remain the property of the SELLER, but if the BUYER does so all moneys owing by the BUYER to the SELLER shall (without prejudice to any other right or remedy of the SELLER) forthwith become due and payable.

13. ACCEPTANCE OF GOODS

GOODS delivered to BUYER by SELLER shall be deemed as accepted by BUYER with respect to compliance with the CONTRACT, and any relevant technical specifications, unless BUYER communicates in WRITING to SELLER giving reasons why the GOODS or part of the GOODS are to be rejected, within seven (7) days after delivery of the GOODS.

14. FREE ISSUE MATERIALS

In the event that the SELLER's scope of work includes the utilisation or incorporation of materials or products supplied by BUYER, the BUYER shall have the sole responsibility of ensuring such items are free from defects and discrepancies and BUYER shall indemnify SELLER against all losses or damages it may suffer as a result of defective or non-conforming material supplied by BUYER.

15. INDEMNITIES AND LIABILITIES

The SELLER shall be responsible for and shall save, indemnify, defend and hold harmless the BUYER from and against all claims, losses, damages, costs (including legal costs) expenses and liabilities in respect of:
- loss of or damage to property of the SELLER whether owned, hired, leased or otherwise provided by the SELLER arising from or relating to the performance of the CONTRACT; and
- personal injury including death or disease to any person employed by the SELLER arising from or relating to the performance of the CONTRACT.

The BUYER shall be responsible for and shall save, indemnify, defend and hold harmless the SELLER group from and against all claims, losses, damages, costs (including legal costs) expenses and liabilities in respect of:
- loss of or damage to property of the BUYER or CLIENT whether owned, hired, leased or otherwise provided by the BUYER or CLIENT arising from or relating to the performance of the CONTRACT; and
- personal injury including death or disease to any person employed by the BUYER and/or the CLIENT arising from or relating to the performance of the CONTRACT.

The BUYER shall save, indemnify, defend and hold harmless the SELLER from and against any claim of whatsoever nature arising from pollution emanating from the

property of the BUYER and/or the CLIENT, arising from or related to the performance of the CONTRACT.

The SELLER shall save, indemnify, defend and hold harmless the BUYER from and against any claim of whatsoever nature arising from pollution occurring on the premises of the SELLER and/or emanating from the property and equipment of the SELLER arising from or relating to the performance of the CONTRACT. For the purpose of this
Clause the GOODS shall be regarded as the property of the BUYER as soon as it is delivered

ISO 9001 BUREAU VERITAS Certification

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Clause the GOODS shall be regarded as the property of the BUYER as soon as it is delivered.

All exclusions and indemnities given under this Clause shall apply irrespective of cause and notwithstanding the negligence or breach of duty (whether statutory or otherwise) of the indemnified PARTY or any other entity or PARTY and shall apply irrespective of any claim in tort, under contract or otherwise at law.

16. LIMITATION OF LIABILITIES

Notwithstanding any other provision to the contrary elsewhere in the CONTRACT, the SELLER's total cumulative liability for any default whatsoever, whether under the CONTRACT or at law shall under no circumstances exceed 25% of the purchase price paid by the BUYER under the CONTRACT. In the event that the provisions of this clause are unenforceable for any particular liability, the PARTIES agree to uphold the provisions of this clause to the full extent allowed by law for any other liability.

17. CONSEQUENTIAL LOSS

Notwithstanding any other provision contained herein, neither PARTY shall be responsible or liable to the other PARTY for any consequential loss suffered by such other PARTY. For the purpose of this clause "consequential loss" shall mean any indirect or consequential loss whatsoever, and any loss of contracts, loss or deferral of profits, loss or deferral of production, loss of use, or any special, exemplary or punitive damages, irrespective of how such loss is classified under applicable law. This exclusion shall apply irrespective of whether or not such loss was foreseeable at the time of entering into the CONTRACT and irrespective of whether such liability is based or claimed to be based upon the negligence or any other act or omission on the part of the PARTY causing the loss or any of its employees, agents or servants.

18. CONFIDENTIAL INFORMATION

All CONFIDENTIAL INFORMATION disclosed by the DISCLOSING PARTY to the RECEIVING PARTY under this CONTRACT is done so on a strictly confidential basis and must not be divulged to any third PARTY, without the prior written permission of DISCLOSING PARTY, other than RECEIVING PARTIES affiliates, its other sub-contractors of any tier, the CLIENT, its co-ventures, its and their affiliates and, sub-contractors of any tier, and then only if and to the extent necessary for the performance of this CONTRACT and associated developments, provided always that RECEIVING PARTY shall remain liable towards the DISCLOSING PARTY for any acts or omissions of any person to whom it discloses CONFIDENTIAL INFORMATION received from the DISCLOSING PARTY.

The RECEIVING PARTY shall, and shall cause all persons to whom it discloses CONFIDENTIAL INFORMATION received from the DISCLOSING PARTY to:
- Use such CONFIDENTIAL INFORMATION only for the purposes of the CONTRACT and for associated developments and for no other purpose;
- Keep such CONFIDENTIAL INFORMATION secure and protected against theft, damage, loss or unauthorised access;

The provisions of this Clause 18 shall not apply to information which the RECEIVING PART can show:
- Was in the public domain prior to disclosure by the DISCLOSING PARTY;
- Was in the lawful possession of the RECEIVING PARTY prior to disclosure by the DISCLOSING PARTY;
- Subsequently comes into the public domain otherwise than as a consequence of a breach of this CONTRACT; or
- Is independently developed by the RECEIVING PARTY without access to the DISCLOSING PARTY's CONFIDENTIAL INFORMATION.

The RECEIVING PARTY shall acquire no rights whatsoever to or in CONFIDENTIAL INFORMATION disclosed to it by the DISCLOSING PARTY.

All documents containing CONFIDENTIAL INFORMATION shall be returned to the DISCLOSING PARTY immediately upon the request of the DISCLOSING PARTY.

In the event the RECEIVING PARTY is required by judicial or government administrative process to disclose any CONFIDENTIAL INFORMATION of the DISCLOSING PARTY, the RECEIVING PARTY shall promptly notify the DISCLOSING PARTY so that the DISCLOSING PARTY may seek appropriate means to protect the confidentiality of its CONFIDENTIAL INFORMATION. Notwithstanding the absence of such means, if, in the opinion of the RECEIVING PARTIES counsel the RECEIVING PARTY is compelled to disclose such CONFIDENTIAL INFORMATION, the RECEIVING PARTY may disclose only the CONFIDENTIAL INFORMATION that is required to be disclosed.

The RECEIVING PARTY accepts full liability for maintaining the confidentiality of the CONFIDENTIAL INFORMATION and hereby agrees to indemnify the DISCLOSING PARTY against any and all losses, damages, liabilities, costs and expenses suffered or incurred by the DISCLOSING PARTY (including without limitation legal fees and costs reasonably and properly incurred) as a result of the breach by the RECEIVING PARTY, or any person for whom it is responsible, of any of its undertakings under this Clause 18.

19. STANDARD PRODUCTS

Unless otherwise specified by SELLER in WRITING in the latest offer, all GOODS are manufactured to SELLER's standard designs, including as a minimum, all wiring & circuitry; cabling; glands & site entries; surface preparation and painting; labelling; materials and components. Any variation to these design standards following award of CONTRACT will incur additional costs and may delay delivery.

20. SITE SERVICES

The Man-Day charges are based on 8-hour working day (Monday thru Friday, excluding public holidays) for professional services. All additional daily hours in excess of 8 hours will be charged at the rate of 1.5 times the standard man-day rate. Unless stated otherwise in WRITING by SELLER, all job related site expenses such as but not limited to accommodation, meals and local transport shall be charged to the BUYER at actual cost plus 20% overhead, except where BUYER provides the same directly.
Estimated days for site commissioning are based on all necessary installation activities for the above scope of supply being completed prior to arrival of SELLER's personnel. Any delay or standby time will be charged at applicable standard man-day rates.

21. SOFTWARE LICENSE

The use of any software supplied as part of a system is subject to a separate software license agreement.

22. GOVERNING LAW AND JURISDICTION

This CONTRACT shall be construed and governed in accordance with the laws of Sweden.
Any dispute arising out of or in connection with this CONTRACT shall be referred to the courts of Sweden, with the District Court in Malmö as the Court of First Instance.

23. FORCE MAJEURE

GENERAL TERMS AND CONDITIONS OF SALE

Version TMS 20171220

Neither the BUYER nor the SELLER shall be responsible for any failure to fulfil any term or condition of the CONTRACT if and to the extent that fulfilment has been delayed or temporarily prevented by a force majeure occurrence, as hereunder defined, which has been notified in accordance with this Clause

For the purposes of this CONTRACT the following occurrences shall be force majeure.

Any unforeseeable event which is beyond the reasonable control and without the fault or negligence of the PARTY affected and which, by the exercise of reasonable diligence, the said PARTY is unable to provide against. Such events shall include, but not be limited to, riot, war, invasion, act of foreign enemies, hostilities (whether war be declared or not), acts of terrorism, civil war, rebellion, revolution, insurrection of military or usurped power, Ionising radiation's or contamination by radio-activity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel or radio-active, toxic, explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof, Pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds, Earthquake, flood, fire, explosion and/or other natural physical disaster, Strikes at a national or regional level or

industrial disputes at a national or regional level, or strikes or industrial disputes by labour not employed by the affected PARTY its subcontractors or its supplier's, Maritime or aviation disasters, Changes to any general or local Statute, Ordinance, Decree, or other Law, or any regulation or bye-law of any local or other duly constituted authority or the introduction of any such Statute, Ordinance, Decree, Law, regulation or bye-law.

In the event of a force majeure occurrence, the PARTY that is or may be delayed in performing the CONTRACT shall notify the other PARTY without undue delay giving the full particulars thereof and shall use all reasonable endeavours to remedy the situation without delay.
Save as otherwise expressly provided in the CONTRACT, no payments of whatever nature shall be made in respect of a force majeure occurrence. Following notification of a force majeure occurrence in accordance with this clause, the SELLER and the BUYER shall meet without delay with a view to agreeing a mutually acceptable course of action to minimise any effects of such occurrence.

24. TERMINATION FOR DEFAULT

BUYER shall have no right to terminate, in full or in part, the CONTRACT unless the SELLER commits a MATERIAL BREACH of the CONTRACT, in which case the BUYER shall have the right as its sole remedy for said default, to terminate the CONTRACT. In such event BUYER agrees to compensate fully the SELLER for all GOODS completed in accordance with the CONTRACT.
In no event shall the total amount recoverable by SELLER as a result of termination under this clause exceed the total CONTRACT PRICE.

25. ENTIRE CONTRACT

This CONTRACT constitutes the final and entire CONTRACT by and between the PARTIES on the subject being and shall supersede all previous negotiations, understandings and CONTRACTs between the PARTIES.
No amendment or supplementation hereof shall be effective or binding on either PARTY hereto unless reduced to WRITING and executed by the authorised representatives of the PARTIES.

26. NON-WAIVER

None of the terms and conditions of this CONTRACT shall be considered to be waived by either PARTY unless a waiver is given in WRITING by the authorised representative of the PARTY waiving its rights to the other PARTY. No waiver given shall constitute a waiver of any past or future default, breach or modification of the terms, provisions, conditions, or covenants of the CONTRACT unless expressly set forth in such waiver.
No failure on the part of either PARTY to enforce any of the terms and conditions of the CONTRACT shall constitute a waiver of such terms and conditions.

27. INDEPENDENT CLAUSES

If any provision of this CONTRACT shall be held to be invalid or unenforceable by any court or legal entity having jurisdiction, such determination shall not affect the validity or enforceability of any other part or provision of this CONTRACT.

28. SURVIVAL

In the event of termination or expiry of the CONTRACT for whatever reason, the rights and obligations of the PARTIES included in the following sections and clauses shall remain in full force and effect: Clauses 9, 15, 21, 22, 28, 29, 30, and 31.

29. LANGUAGE

The ruling language of the CONTRACT shall be the English language.
All reports, communications, correspondence, drawings, specifications and calculations shall be in the English language.

30. SUCCESSORS

The terms and conditions of this CONTRACT shall apply equally to any successors of the PARTIES as they apply to the PARTIES

themselves and any successors shall be fully bound by the Terms and Conditions of this CONTRACT.

31. HEADINGS

The clause headings and sub-headings included in the CONTRACT are intended for convenience only and are not in any way to be taken account of in construing the meaning of any part of the CONTRACT.

32. INSOLVENCY OF THE BUYER

The provisions of this clause shall apply if:

- BUYER makes any voluntary arrangement with its creditors or becomes subject to an administration order or (being an individual or firm) becomes bankrupt or (being a company) goes into liquidation (otherwise than for the purposes of amalgamation or reconstruction); or
- a creditor takes possession, or a receiver is appointed, or any of the property or assets of the BUYER; or
- BUYER ceases, or threatens to cease, to carry on business; or

Rubber material properties

TRELLEBORG RUBBER COMPOUND:

All Trelleborg rubber fenders are made using high quality 100% NR or 100% SBR or a blend of NR/ SBR based compound which exceeds the performance requirements of international fender recommendations, such as PIANC/ EAU. Trelleborg can also manufacture fenders from materials such as Neoprene and EPDM.

The tables below give the physical properties of rubber compounds as described above which are used for making fenders. These properties are confirmed during quality assurance testing prior to fender manufacturing.

All test results are derived from test pieces made and cured inhouse. Results from samples taken from actual fenders may differ due to the sample preparation process – please ask for details.

MOLDED FENDERS:

PROPERTY	TESTING STANDARD		CONDITION	REQUIREMENT
	ASTM	OTHERS		
Tensile Strength	ASTM D 412 Die C	DIN 53504; AS1683.11; BS ISO 37; JIS K 6251	Original	16.0 MPa (min)
			Aged for 96 hours at 70°C	12.8 MPa (min)
Elongation at Break	ASTM D 412 Die C	DIN 53504; AS 1683.11; BS ISO 37; JIS K 6251	Original	350%
			Aged for 96 hours at 70°C	280%
Hardness	ASTM D 2240	BS ISO 7619-1; DIN ISO 7619-1; AS 1683.15.2; JIS K 6253-3	Original	78° Shore A (max)
			Aged for 96 hours at 70°C	Original +8° Shore A (max)
Compression Set	ASTM D 395 Method B	AS 1683.13 Type 1; ISO 815-1; JIS K 6262	22 hours at 70°C	30% (max)
Tear Resistance	ASTM D 624 Die B	AS 1683.12; BS ISO; JIS K 6252-1	Original	70kN/m (min)
Ozone Resistance	ASTM D 1149	DIN ISO 1431-1; AS 1683-24; BS ISO 1431-1; JIS K 6259	50pphm at 20% strain, 40°C, 100 hours	No cracks
Seawater Resistance	ASTM D 471	BS ISO 1817	28 days at 95°C	Hardness: ±10° Shore A (max) Volume: +10/-5% (max)
Abrasion Loss	–	BS 903 A9 Method B	3000 revolution	1.5cc (max)
Bond Strength	ASTM D429 Method B	BS ISO 813	Rubber to steel	7N/mm (min)
Dynamic Fatigue	ASTM D430-95 Method B	–	15,000 cycles	Grade 0–2‡

‡ Grade 0 = No cracking has occurred

Grade 1 = Cracks at this stage appear as pin pricks to the naked eye. Grade as 1 if the pin pricks are less than 10 in number and less than 0.5 mm in length

Grade 2 = Assess as Grade 2 if either of the following applies: (1) The pin pricks are in excess of 10 in number, or (2) The number of cracks is less than 10 but one or more cracks have developed beyond the pin prick stage, that is, they have perceptible length without much depth, but their length is still less than 0.5 mm.

Tolerances

Trelleborg fenders are subjected to standard manufacturing and performance tolerances.

For specific applications, smaller tolerances may be agreed on a case-by-case basis.

FENDER TYPE	DIMENSION	TOLERANCE
Molded fenders	All dimensions	±3% or ±2 mm*
	Bolt hole spacing	±4 mm (non-cumulative)
Composite fenders	Cross-section	±3% or ±2 mm*
	Length	±2% or ±25 mm*
	Drilled hole centers	±4 mm (non-cumulative)
	Counterbore depth	±2 mm (under-head depth)
Keyhole fenders / M fenders / W fenders	Cross-section	±2% or ±2 mm*
	Length	±2% or ±10 mm*
	Fixing hole centers	±3 mm
	Fixing hole diameter	±3 mm
Cylindrical fenders	Outside diameter	±4%
	Inside diameter	±4%
	Length	±30 mm
Extruded fenders	Cross-section	±4% or ISO 3302-E3*
	Length	±30 mm
	Drilled hole centers	±4 mm (non-cumulative)
	Counterbore depth	±3 mm (under-head depth)
HD-PE sliding fenders† / UHMW-PE face pads†	Length and width	±5 mm (cut pads)
	Length and width	±20 mm (uncut sheets)
	Thickness (planed) : ≤ 30 mm	±0.2 mm
	31 – 100 mm	±0.3 mm
	≥ 101 mm	±0.5 mm
	Thickness (unplaned) : ≤ 30 mm	±2.5 mm
	31 – 100 mm	±4.0 mm
	≥ 101 mm	±6.0 mm
	Drilled hole centers	±2 mm (non-cumulative)
	Counterbore depth	±2 mm (under-head depth)

* Whichever is the greater dimension
† HD-PE and UHMW-PE dimensions are measured at 18°C and are subject to thermal expansion coefficients (see material properties)

Performance tolerances^

FENDER TYPE	PARAMETER	TOLERANCE
SCN, SCK, UE, AN, ANP, SAN, SANP, MV and MI fenders	Reaction, energy	±10%
Cylindricals (wrapped)	Reaction, energy	±10%
Extruded fenders	Reaction, energy	±20%
Foam fenders	Reaction, energy	±10%
Pneumatic fenders	Reaction, energy	±10%
Keyhole, composite, M, W, tug and workboat fenders	Reaction	±20%

^ Performance tolerances apply to Constant Velocity (CV) and Rated Performance. They do not apply to energy and/or reaction at intermediate deflections. The nominal rated deflection may vary when CV performance is achieved and is provided for guidance only. Please consult Trelleborg Marine Systems for performance tolerance on fender types not listed above.

Chemical composition test

CHEMICAL COMPOSITION SPECIFICATION TABLE

- Anecdotal evidence suggests that low quality fenders are more likely to be prone to faster environmental degradation and struggle to meet performance requirements.
- These rubber fenders in general utilize lower cost rubber compounds reclaimed or recycled rubber that has low polymer (rubber) percentage and high non black reinforcing filler percentage in the formulation.
- These fender compounds show high specific gravity (>1.2) indicating high usage of non-reinforcing filler such as $CaCO_3$ in the formulation. Ash analysis is a good indicator to find the quantity of non reinforcing fillers in rubber formulation.
- Historical testing requirements centered around physical properties, which are seen in most specifications are not enough to reflect the use of non-reinforcing fillers or recycled rubber.
- Chemical composition testing is useful to determine the composition of rubber in fenders utilizes a couple of key indicators to determine the quality of rubber used in the fender.

These include:

% Polymer:	To determine general level of polymer present.
% Carbon Black:	To determine amount of reinforcing filler.
Specific gravity:	To indicate high levels of recycled rubber/ non reinforcing filler:
% Ash & $CaCO_3$:	To determine level of non – reinforcing filler used.
Rubber to filler ratio:	Amount of rubber compared to amount of filler

All of the tests give a good indication of the quality of rubber used for fender production. These parameters can be determined by using analytical techniques (FTIR/TGA) described on page 72. The specification for the above indicators is given in the table above.

TEST	STANDARD	SPECIFICATION*
Density	ISO 2781	Max 1.20 g/cc
Polymer %	ASTM D6370	Min 45%
Carbon Black %	ASTM D6370	Min 20%
Ash %	ASTM D297	Max 5%
Rubber to filler ratio	–	> 1.2

* Does not apply to Trelleborg Marine Systems' standard cylindrical and extruded fenders; however, can be supplied upon special request.

TEST AVAILABLE FOR CUSTOMERS

- A lack of understanding about rubber compound composition not only has material impact on the quality and performance of fenders, but also a downstream affect and further implications for the design of other wharf infrastructure. Perhaps due to this lack of understanding, specifying and monitoring rubber compound composition are not currently practiced in the industry.
- Until recently, buyers of rubber fenders did not have any method to identify rubber compound composition and substantiate supplier documentation and reported performance characteristics.

ISO 9001 BUREAU VERITAS Certification

SUBMAC
Spessore 0.40 m

CARATTERISTICHE DEL PRODOTTO
SUBMAC è composto dai seguenti componenti : Geogriglia marcata CE e certificata BBA accoppiata ad un geotessile, i blocchi di calcestruzzo e i chiodi in materiale sintetico.

Geogriglia ad alta resistenza
La geogriglia di base certificata secondo ISO 14025 - EN 15804 (certificazione ambientale EPD) è costituita da un nucleo di filamenti di poliestere ad alta tenacità densamente raggruppati, paralleli e perfettamente allineati, racchiusi in una guaina protettiva di resina annegati in una massa di polietilene (LLDPE) a forma di nastro.

- resistenza a trazione longitudinale kN/m ≥200 (EN ISO 10319)
- allungamento a rottura < 11.5% (EN ISO 10319)
- allungamento max sulla curva dei 114 anni (1.000.000 h) al 40% del NBL <6%
- • deformazione viscosa residua post-costruzione tra la curva a 24 h e quella a 1.000.000 h non superiore all' 1% per carichi di esercizio compresi tra il 40 ed il 60% della resistenza nominale a breve termine;
- il coefficiente riduttivo del "creep" a 25°C per opere permanenti di 120 anni deve risultare non superiore a 1.40 corrispondente al 72% del carico di rottura nominale del prodotto
- la griglia dovrà risultare idonea all'impiego in ambienti basici con PH pari a 11 con coefficiente ambientale riduttivo per opere permanenti con tempo di ritorno di 120 anni a 25°C non superiore a 1.20

Tali valori dovranno essere certificati da ente terzo accreditato quale BBA.

Geotessile
Il geotessile è un tessuto in polipropilene stabilizzato ai raggi ultravioletti, resistente agli agenti chimici ed organici che possono essere presenti nell'acqua.
La resistenza a trazione del geotessile sarà almeno 200 kN/m nella direzione longitudinale e almeno 40 kN/m in quella trasversale (ISO 10319). La permeabilità è > 15 l/m^{2}s (ISO 11058).
I materassi SUBMAC sono dotati di cimose che si estendono oltre i blocchi per garantire la continuità della protezione contro l'erosione evitando la formazione di spazi fra unità adiacenti.

Blocchi di calcestruzzo
I blocchi in calcestruzzo sono prodotti con calcestruzzo colato e vibrato in molteplici stampi singoli.
La Classe di resistenza a compressione del calcestruzzo è C 35/45 MPa. La durabilità e la resistenza a compressione del calcestruzzo sono garantite dall'utilizzo della corretta miscela di cemento e aggregati a seconda delle specifiche condizioni di utilizzo.
Ogni blocco in calcestruzzo è connesso al geotessile con i chiodi in numero superiore a 3 per ogni blocco.

Chiodi sintetici
Gli elementi di ancoraggio che connettono i blocchi in calcestruzzo con il geotessile sono speciali chiodi sintetici la cui resistenza al taglio e alla trazione non dovrà essere inferiore a 2 kN.

INSTALLAZIONE
È stato sviluppato uno specifico telaio per il sollevamento e il posizionamento in opera dei materassi SUBMAC.
I materassi SUBMAC sono collegati al lato più corto del geotessile, in questo modo il carico è distribuito per l'intera lunghezza del materasso.


Figura 1 Dettagli blocco

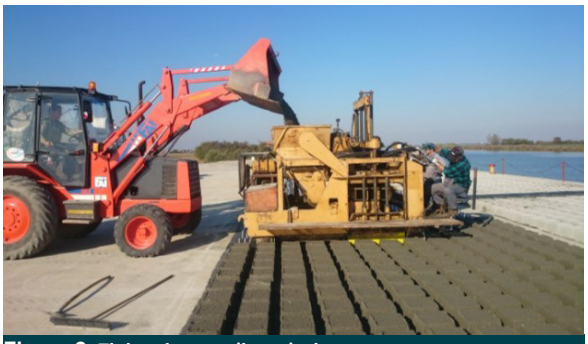


Figura 2 Tipico sistema di produzione

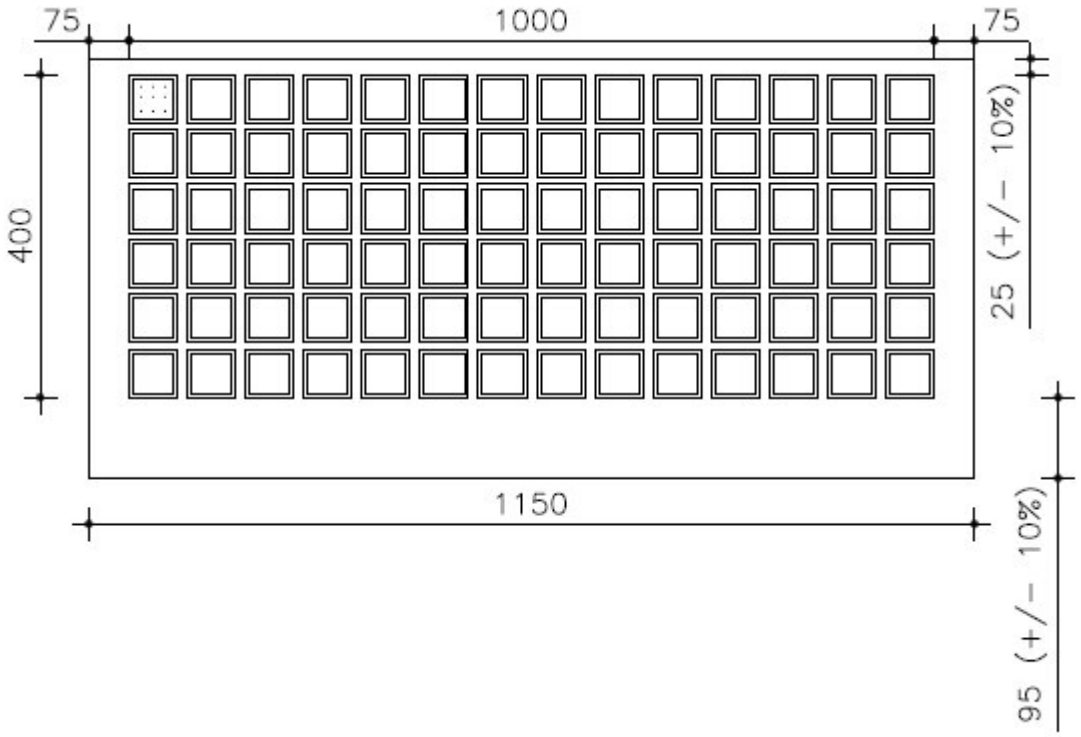

Figura 3 Movimentazione Submac


Figura 4 SubMac in stock

BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

EPD®
THE INTERNATIONAL EPD® SYSTEM

Il produttore, per il proprio processo di ottimizzazione e miglioramento delle caratteristiche tecniche dei prodotti, si riserva la facoltà di modificare gli standard e le caratteristiche dei prodotti senza alcun preavviso. Tutte le informazioni fornite sono date in buona fede sulla base della nostra esperienza; in ogni modo nessuna responsabilità per un errato utilizzo progettuale delle stesse potrà essere imputata al produttore o ai suoi distributori.



Schema tipo SubMac

DIMENSIONI TIPICHE

Lunghezza da 3 a 10 m	(±5%)
Larghezza da 2 a 4 m	(±5%)
Spessore 0.40 m	(±5%)

Peso al metro quadro		
In Aria	600 kg/mq	±10%

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E-mail: comes@maccaferri.com - Web site: www.maccaferri.com

Bureau Veritas Certified Quality System Company with Accredia's and UKAS' s accreditation.

PORTO RIFUGIO SIRACUSA

INDICE

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Nota:
La presente relazione non costituisce elaborato valido ai fini progettuale dell'opera.
L'utilizzo della stessa rimane responsabilità del tecnico Progettista e della Committenza dell'opera.
Officine Maccaferri non è responsabile dei disegni e dei calcoli trasmessi al Cliente sulla base dei dati forniti dal medesimo, né è responsabile del progetto e delle verifiche sui luoghi che dovessero successivamente realizzarsi senza specifico incarico.
Il presente elaborato è stato realizzato sulla base dei prodotti di Officine Maccaferri ai soli fini dell'elaborazione dell'offerta. Pertanto, Officine Maccaferri non è responsabile in caso di un uso dell'elaborato con prodotti diversi da quelli di Officine Maccaferri o, comunque, non controllato da parte di Officine Maccaferri stessa.

1. INTRODUZIONE

Officine MACCAFERRI nel corso degli anni ha investito in ricerca e sviluppo di prodotti innovativi per il settore delle stabilizzazioni dei fondali.
Il tema della stabilità dei fondali marini si configura sempre più come un tema sensibile nell'ingegneria moderna. Gli investimenti progressivi nel settore portuale, finalizzati al potenziamento delle strutture portuali esistenti ed all'incremento del traffico merci attraverso l'HUB Italia, hanno sollevato il problema dei dragaggi di ingenti volumi di sedimenti marini per effettuare un abbassamento dei fondali e permettere l'attracco di grandi navi porta container.
In questo tipo di interventi si configura sempre più la necessità di investire in opere ingegneristiche che garantiscano la stabilizzazione dei fondali marini appena dragati, evitando il sollevamento di plume di materiale.

2. SCOPO DEL LAVORO

Il Porto Siracusa a causa di eventi erosivi diffusi necessita di una protezione del fondale e molo nel porto rifugio della baia di Santa panagia a Siracusa-
Scopo del lavoro è la definizione di un efficace sistema di protezione dei fondali tramite sistema di facile installazione.

3. TELO FILTRANTE SUBMAC

3.1. *Descrizione generale e dimensioni standard*

SUBMAC è un telo filtrante flessibile costituito da un geotessile in polipropilene, accoppiato ad una geogriglia ad alta resistenza e zavorrato con blocchi di calcestruzzo, resi solidali al medesimo mediante dispositivi di ancoraggio.
SUBMAC è un sistema di protezione utilizzato per la stabilizzazione di fondali mobili subacquei o per le difese spondali ed è disponibile in diverse dimensioni e spessori al fine di adattarsi al meglio all'uso cui è destinato.

TOP VIEW

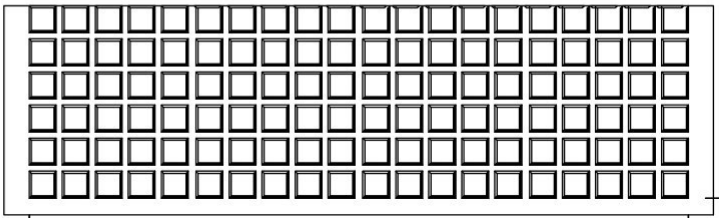

Fig. 3.1: SUBMAC tipica vista in pianta

Dimensioni Standard:

Spessore:	0,40 m
Lunghezza:	Definita in base alle necessità del progetto
Larghezza:	Definita in base alle necessità del progetto

Tolleranze:

Lunghezza and Larghezza: ± 50 mm/± 10 mm
Spessore: ± 10 mm

I valori delle tolleranze tengono conto di naturali fenomeni del calcestruzzo, che è influenzato dalle condizioni di stoccaggio, ed in particolare da: temperatura, sovrapposizione di diversi elementi, durata dello stoccaggio stesso.

3.2. *Calcolo spessore minimo*

La scelta della tipologia di protezione al fondo viene svolta valutando lo spessore idoneo della soluzione al fine di garantire la stabilità del fondo sotto le correnti generate dai propulsori delle navi in manovra.
Si allegano al presente documento di seguito i calcoli eseguiti in funzione delle condizioni geometriche del problema e delle potenze installate, nonché utilizzate, sulle navi che è previsto attraccheranno alle banchine coinvolte.

Alla luce dei calcoli e quindi dei risultati riportati nell'ultima riga della tabella sopra si è deciso di prevedere **l'utilizzo di materassi SUBMAC con spessore di almeno h=40 cm** in modo tale da garantire un coefficiente di sicurezza che permetta l'eventuale approdo futuro di navi anche più grandi.

3.3. *Dimensioni dei materassi*

La dimensione in planimetria dei materassi SUBMAC può essere decisa in seconda fase rispetto alla progettazione definitiva della soluzione che riguarda invece la determinazione dello spessore minimo. Tali materassi, infatti, possono assumere dimensioni variabili sia per quanto riguarda la larghezza per la lunghezza del telo stesso. Gli unici limiti nella scelta della dimensione adeguata, che vanno presi necessariamente in considerazione al fine di determinare la progettazione esecutiva della soluzione sono:

1. PESO = la combinazione di spessore del materasso e dimensione comporta, all'aumentare delle misure, un aumento di peso considerevole per cui alcune configurazioni non saranno realizzabili poiché troppo pesanti per essere sollevate e movimentate in sicurezza;

2. TRASPORTO = qualora si decida per la produzione dei materassi SUBMAC non in sito ma presso base Maccaferri è necessario considerare che la massima larghezza dei materassi può essere di 2,30m per questioni di trasporto;

3. OTTIMIZZAZIONE = la scelta delle dimensioni del materasso va fatta in base alla superficie da ricoprire. È preferibile quindi prevedere una dimensione del materasso tale da avere un'area di questo che sia un sottomultiplo dell'area totale.

4. DIMENSIONI DISCRETE = i materassi SUBMAC essendo realizzati in blocchetti in calcestruzzo possono avere, per la natura della soluzione, solo una dimensione multipla della dimensione del blocchetto singolo.

Si è quindi ipotizzato di impiegare teli SUBMAC h=40 cm di dimensioni 10.00x2.00 posizionati per coprire i 10m di fondale, a partire dalla banchina, in modo ottimale.

3.4. *Specifiche dei materiali*

3.4.1. Calcestruzzo

Il peso specifico teorico in aria del calcestruzzo è di 2,4 t/m³.
La tolleranza sul peso specifico in aria del calcestruzzo è di ±5%, in funzione del materiale reperibile nella zona di produzione.
Il peso totale del telo zavorrato farà riferimento allo specifico data sheet (Scheda Tecnica) in base alle esigenze progettuali del Cliente.

- La minima resistenza a compressione R_{ck} = 45 N/mm^2

Il cls è conforme alla UNI EN 206-1. Tale idoneità sarà garantita dai certificati emessi dalla centrale di produzione del calcestruzzo.

3.5. *Riferimenti tecnici e standards*

Di seguito sono riportati gli standard tecnici e i documenti di riferimento riguardo i teli filtranti SUBMAC

UNI – EN STANDARDS

- UNI EN 206-1:2006 – SPECIFICHE TECNICHE, PRODUZIONE, CONFORMITÀ
- UNI EN 12190:2000 – TEST DI COMPRESSIONE SUL CLS
- UNI EN 12390-2:2009 - PRODUZIONE DEI CAMPIONI DI CLS PER I TEST DI COMPRESSIONE
- D.M. 14/01/2008 - NUOVE NORME TECNICHE PER LE COSTRUZIONI (SEZIONE CLS)

4. PERCHE LA SOLUZIONE SUBMAC?

La scelta dei teli SUBMAC per la stabilizzazione e protezione dei fondali del porto di Siracusa può apportare a vantaggi significativi al progetto sotto diversi aspetti:

- I teli SUBMAC sono progettati specificatamente per la protezione dei fondali sottomarini e possono garantire le migliori performance;
- I teli SUBMAC prevengono l'erosione del fondale;
- I teli SUBMAC sono elementi prefabbricati pronti per l'installazione, tale soluzione tecnica permette di limitare al minimo l'utilizzo di squadre di sommozzatori;
- I teli SUBMAC non necessitano di avere un pompaggio sottomarino di malta cementizia, la quale può rilasciare plume di materiale che passa attraverso il telo in geotessile dei materassi iniettabili;
- Il materasso SUBMAC garantisce nel tempo una migliore adattabilità al fondale mantenendosi un elemento flessibile, non diventando una lastra di cls rigida;
- I teli SUBMAC possono essere installati più velocemente di altre soluzioni con rese stimate di circa 300-400 mq giorno. Una installazione più veloce significa risparmio sul progetto. Minori operazioni di varo possono portare a una riduzione significativa dei costi;
- I teli SUBMAC sono "environmental friendly". Il cls e il materiale di base del telo sono perfettamente eco-compatibili;
- I teli SUBMAC sono la migliore soluzione in termini di movimentazione. La forma dei teli permette una loro rimozione dal fondale marino in caso di necessità.

5. SISTEMA DI INSTALLAZIONE TELI SUBMAC

Considerando le passate esperienze di Officine Maccaferri nel settore, e la necessità di velocizzare le operazioni di varo sottomarino dei teli, per ridurre i costi del progetto, Officine Maccaferri può proporre una linea di telai di installazione progettati, realizzati ed eventualmente certificati da un ente 3° parte, di tipo idraulico a rilascio automatico.
L'installazione dei teli SUBMAC può avvenire, oltre che da pontone, anche dalla banchina, utilizzando una gru a traliccio.
Le tempistiche di posa del singolo elemento variano in base alla dimensione dell'elemento, al suo spessore, alla profondità di posa, all'abilità dell'operatore che manovra la gru, alle condizioni meteo e all'efficienza degli operai.
Generalmente, considerando una situazione intermedia, per la posa di un singolo telo sono necessari 25-45 minuti rispettivamente per teli più piccoli (25m^2) e per teli più grandi (50m^2).

Fig. 6.1: Telaio idraulico di tipo Automatico

6. SOLUZIONE TECNICA PROPOSTA

Considerando il progetto in essere, Officine Maccaferri consiglia l'impiego di un telo SUBMAC di spessore minimo 40 cm
Il telo verrà installato su tutto il fondale e preparato con cimose di telo atte a generare aree di sovrapposizione.
Per il progetto si prevede di realizzare cimose di sovrapposizione tra i vari teli di circa 20cm.
Lungo il perimetro delle banchine, al piede delle stesse, considerando la peculiarità della zona di connessione tra telo zavorrato SUBMAC e banchina, si propone l'inserimento di BURGHE in rete metallica doppia torsione con rivestimento Polimac, diametro D=0.65m e altezza h=2.00m (Volume V=0.66m^3) / in alternativa MACBAGS In geotessilie, atte allo smorzamento delle azioni delle correnti di rifrazione agenti sul fondale generate dalle eliche dei natanti.

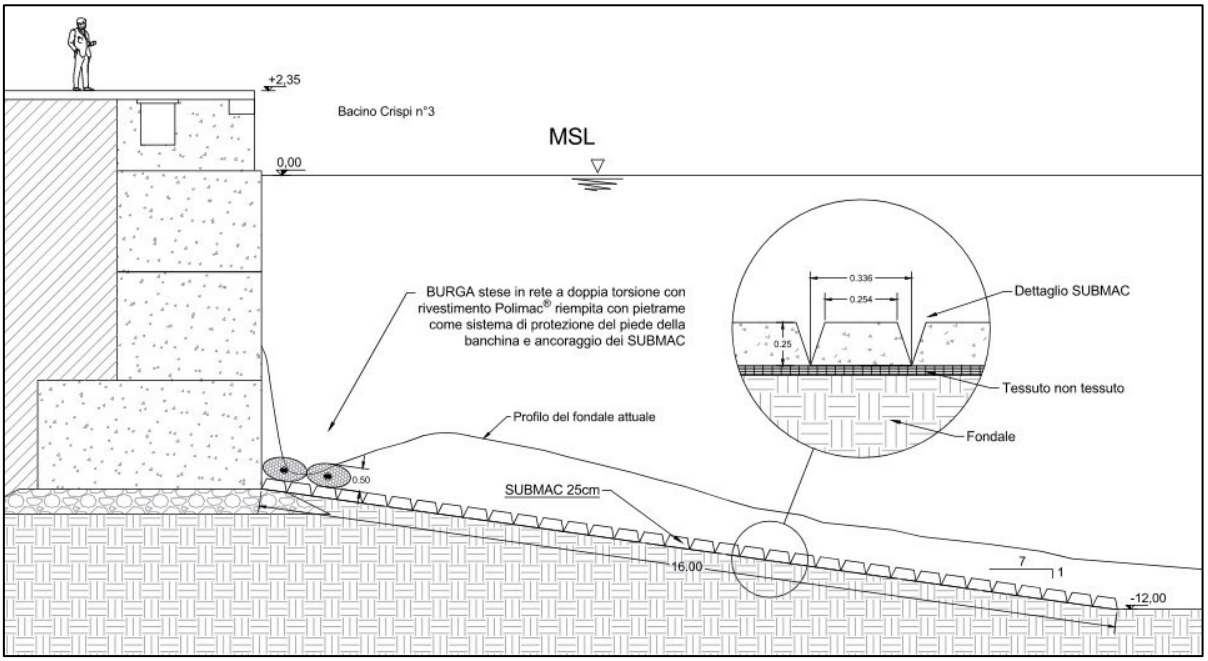

Fig. 7.1: Sezione tipo da Maccaferri

7. ESTENSIONE AREA DI INTERVENTO

La valutazione delle dimensioni delle aree di intervento è eseguita con riferimento alle raccomandazioni EAU "Recommendations of the Committee for Waterfront Structures – Harbours and Waterways".

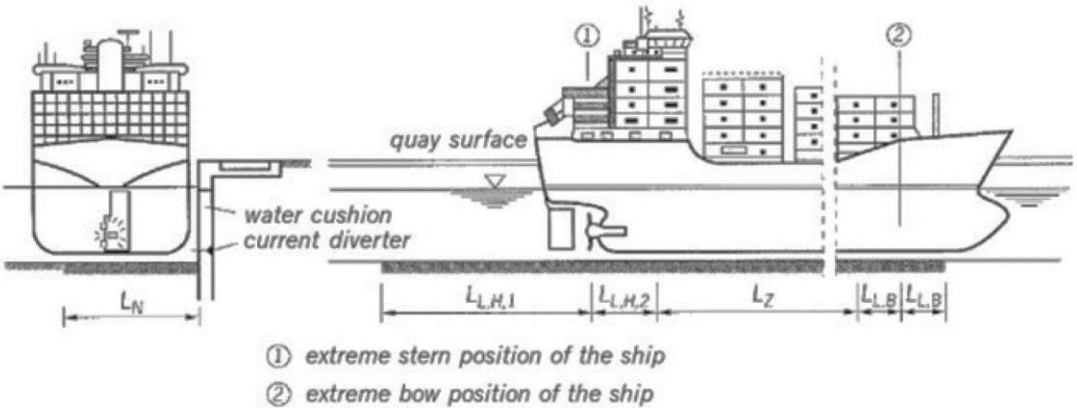

Fig. 2.2: Dimensioni delle aree di protezione lungo la banchina

Con riferimento alla terminologia delle raccomandazioni, vengono forniti i seguenti criteri di progetto al fine garantire una corretta e sicura protezione del fondo:

- Direzione Perpendicolare alla banchina:
  $L_N = (3 \div 4)D_p + \Delta RS$
- Direzione Parallela alla banchina:
  $L_{L,H,1} = (6 \div 8)D_p + \Delta RS$

$$L_{L,H,2} = 3D_p + \Delta RS$$
$$L_{L,B} = (3 \div 4)D_p + \Delta RS$$

dove D_p è il diametro dell'elica e ΔRS è il margine di sicurezza variabile fra i 3 e i 5m.
Si riportano di seguito le configurazioni tipiche dell'elica principale e dei thruster.

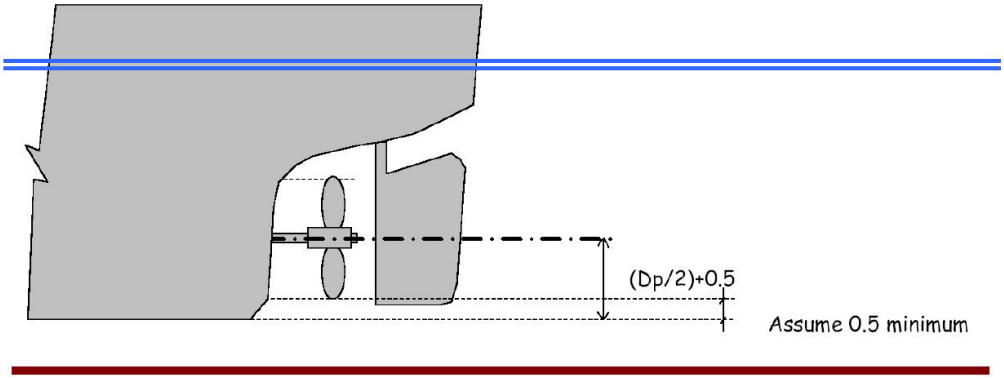

Fig. 2.2: Configurazione tipica dell'elica principale in una nave

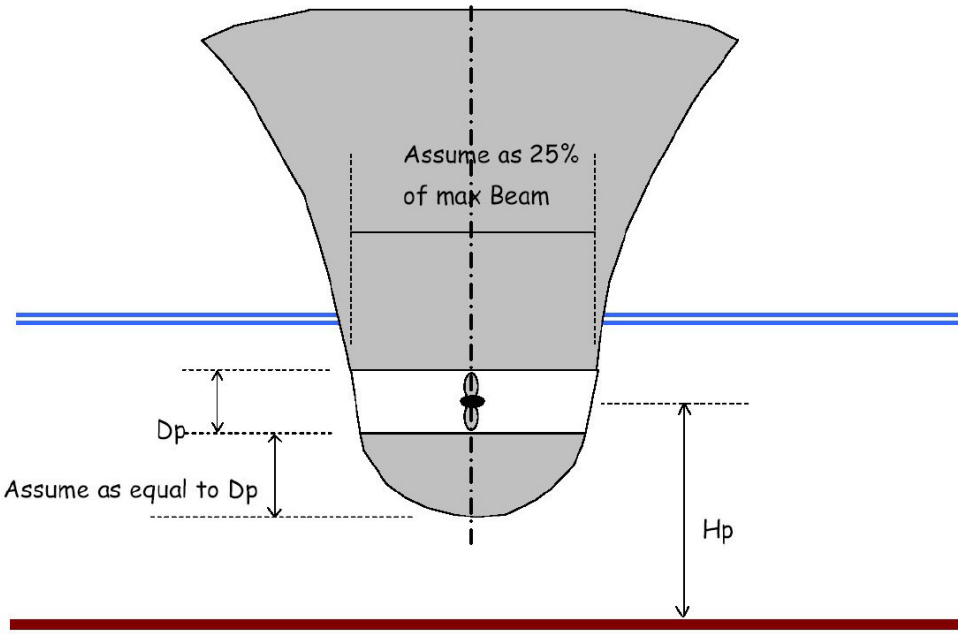

Fig. 2.3: Configurazione tipica del thruster in una nave

8. CALCOLO DELLO SPESSORE DELLA PROTEZIONE

Al fine di garantire la stabilità dei sistemi di protezione del fondale nei confronti delle azioni generate in fase di ormeggio e disormeggio delle navi, sono state dimensionate le opere di protezione del fondo facendo riferimento alle raccomandazioni del PIANC (2015).

8.1. *CALCOLO DELLA VELOCITA' DEL GETTO GENERATA DALL'ELICA PRINCIPALE*

La velocità iniziale V_0 al centro del getto è valutata mediante la seguente relazione (PIANC 2015):

$$V_{0,propeller} = C_3 \left(\frac{f_p P_D}{\rho_w D_p^2} \right)^{\frac{1}{3}}$$

dove:

- f_p = percentuale di potenza installata utilizzata (%);
- P_D = potenza massima installata sul propulsore principale (W);
- D_P = diametro dell'elica del propulsore principale (m);
- ρ_w = densità dell'acqua di mare (kg/m^3);
- C_3 = coefficiente dell'elica (1.17 per elica intubata, 1.48 per elica NON intubata)

Il PIANC Bulletin n. 180 del 2015 riporta per le manovre di ormeggio/disormeggio percentuali di uso del motore compresi tra il 5% e il 15%. Nel caso in esame si considera una percentuale del 10%.
Per il corretto dimensionamento del sistema di protezione del fondo è necessario determinare la velocità del getto prodotto dall'elica sul fondo in prossimità della banchina.
Il massimo valore della velocità sul fondo è funzione della velocità iniziale del getto e, per imbarcazioni con due propulsori, può essere ottenuto dalla seguente relazione (Fuehrer et al., 1981):

$$V_{b,max} = 0.52 * V_0 \left(\frac{D_p}{h_p} \right)^{0.275} \quad con \quad 0.9 < \frac{D_p}{h_p} < 3 \quad e \quad h_p = q_{fondo} - P_{nave} + \frac{D_P}{2} + 0.5m$$

dove h_p è la distanza tra l'asse dell'elica e il fondo.

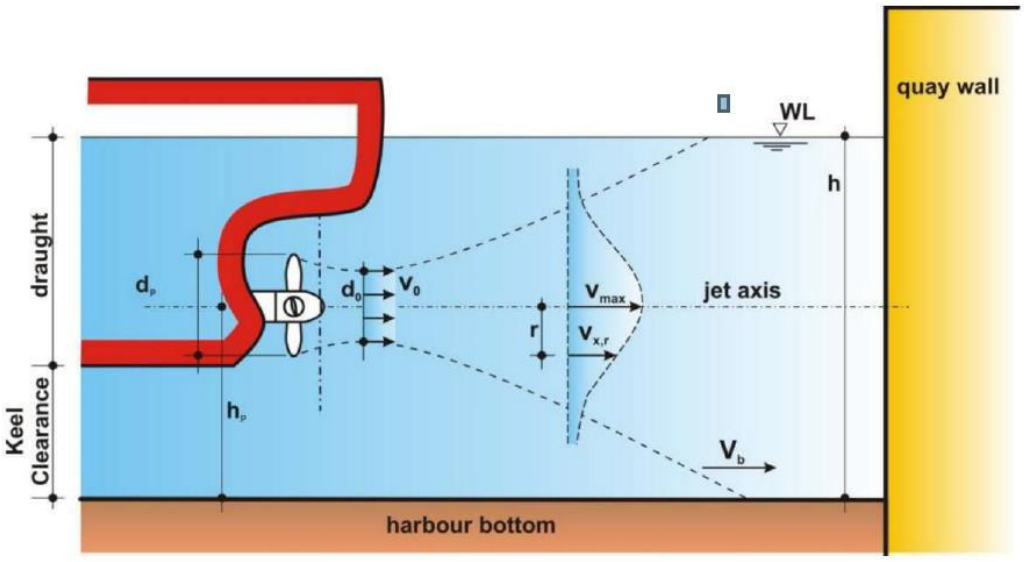

Fig. 3.1: Propagazione della velocità dell'elica del propulsore principale

Nel caso in esame la nave di progetto è TUG "Anna Cosentino", con P_D = 2400 kW e D_P = 2.8 m. La quota del fondo è pari a 6,5 m e il pescaggio pari a 5,36 m.
Di conseguenza, la velocità del getto generata dall'elica principale è pari a 2.35 m/s.

8.2. *CALCOLO DELLA VELOCITA' DEL GETTO GENERATA DALLE ELICHE DI MANOVRA (THRUSTER)*

Per il caso delle eliche di manovra disposte a prua della nave, la velocità iniziale V_0 al centro del getto è valutata mediante la seguente relazione (PIANC 2015):

$$V_{0,thruster} = C_3 \left(\frac{f_p P_{thruster}}{\rho_w D_{thruster}^2} \right)^{\frac{1}{3}}$$

dove:

- f_p = percentuale di potenza installata utilizzata (%);
- $P_{thruster}$ = potenza massima installata per un singolo thruster (W);
- $D_{thruster}$ = diametro dell'elica del singolo thruster (m);
- ρ_w = densità dell'acqua di mare (kg/m^3);
- C_3 = coefficiente dell'elica (1.17 per elica intubata, 1.48 per elica NON intubata).

Il PIANC Bulletin n. 180 del 2015 riporta per le manovre di ormeggio/disormeggio in cui si utilizzino le eliche di prua una percentuale di uso del motore del 5%.
Analogamente a quanto fatto per i propulsori principali è necessario valutare la velocità del getto sul fondo in corrispondenza della banchina.
Per il calcolo delle velocità al fondo si fa riferimento al metodo olandese in accordo al PIANC per il quale la velocità viene calcolata come segue:

$$V_{b,max} = 1.0 V_0 \left(\frac{D_{thruster}}{h_p} \right) for \frac{L}{h_p} < 1.8$$

$$V_{b,max} = 2.8 V_0 \left(\frac{D_{thruster}}{L + h_p} \right) for \frac{L}{h_p} > 1.8$$

dove:

- L = distanza fra il thruster e il muro della banchina (m);
- h_p= distanza tra l'asse dell'elica e il fondo (m).

Nel caso in esame, si considera un thruster con potenza massima 245 kW, percentuale di utilizzo del 100% e un diametro dell'elica di 1.5 m.
Considerando una distanza di 4 metri tra il thruster e il muro della banchina, la velocità max del getto risultante è di 3,32 m/s.

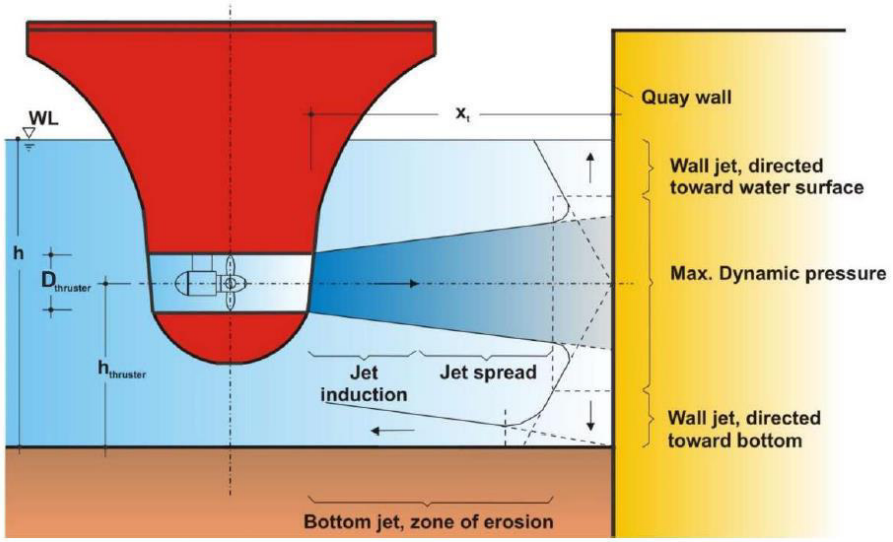

Fig. 3.2: Propagazione della velocità dell'elica delle eliche di prua contro la banchina

8.3. *VERIFICA DI STABILITA' DELLA PROTEZIONE*

Il dimensionamento dei materassi in calcestruzzo viene effettuato con riferimento alla relazione del PIANC 2015 (Equation 10-33), secondo la quale il loro spessore minimo è proporzionale al quadrato della velocità:

$$D \geq \frac{C_L}{2 * \Delta * g} * V_{bottom}^2$$

dove:

- D = spessore caratteristico del rivestimento (m);
- C_L = fattore di lift della protezione;
- Δ = densità relativa del rivestimento;
- V_{bottom} = velocità del getto sul fondo (m/s).

Il valore del coefficiente di lift C_L è assunto pari a 0.50 essendo la protezione continua (Raes el al., 1996).
Nel caso in esame, la velocità maggiore è quella dell'elica principale, pari a 3.32 m/s.
Si utilizza come protezione il materasso flessibile Submac in blocchi di calcestruzzo, con diversi spessori possibili e quindi diverse densità relative del rivestimento.
Risulta verificato uno spessore di 40 cm, in quanto si ha una densità relativa di 0.88 e di conseguenza uno spessore caratteristico del rivestimento **maggiore o uguale a 40 cm risulta accettabile.**

9. RIFERIMENTI

- PIANC – "Guidelines for protecting berthing structures from scour caused by ships", 2015
- EAU – "Recommendations of the Committee for Waterfront Structures – Harbours and Waterways", 2012

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UFFICIO DEL GENIO CIVILE SIRACUSA

PREVENTIVO FORNITURA DI N°1 PALO FISSO TIPO RESINEX FP 550 LATERALE ROSSO

Data	Redatto	Controllato	Approvato	Documento
14/12/2021	G. SPINNATO	G. CURATOLO	G. SPINNATO	Prot.llo 19621 Off_7821_RQ_949/21

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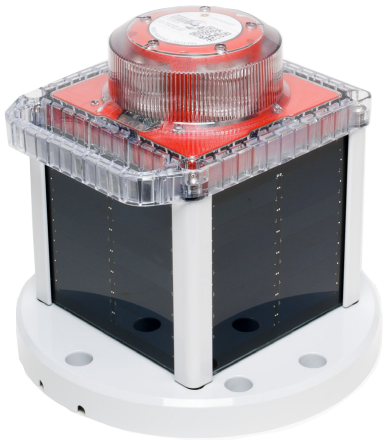
- NOAA – National Data Buoy Centre
- Panama Canal
- Suez Canal, Egypt
- Trinity House Light House Service, UK
- United States Coast Guard
- Vancouver Port Authority



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