



**RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:**

**Bid Receiving - PWGSC / Réception des
soumissions - TPSGC**

11 Laurier St. / 11, rue Laurier

Place du Portage , Phase III

Core 0B2 / Noyau 0B2

Gatineau

Québec

K1A 0S5

Bid Fax: (819) 997-9776

**REQUEST FOR PROPOSAL
DEMANDE DE PROPOSITION**

**Proposal To: Public Works and Government
Services Canada**

We hereby offer to sell to Her Majesty the Queen in right of Canada, in accordance with the terms and conditions set out herein, referred to herein or attached hereto, the goods, services, and construction listed herein and on any attached sheets at the price(s) set out therefor.

**Proposition aux: Travaux Publics et Services
Gouvernementaux Canada**

Nous offrons par la présente de vendre à Sa Majesté la Reine du chef du Canada, aux conditions énoncées ou incluses par référence dans la présente et aux annexes ci-jointes, les biens, services et construction énumérés ici sur toute feuille ci-annexée, au(x) prix indiqué(s).

Comments - Commentaires

Vendor/Firm Name and Address

Raison sociale et adresse du

fournisseur/de l'entrepreneur

Issuing Office - Bureau de distribution

Marine Machinery and Services / Machineries et services maritimes

11 Laurier St. / 11, rue Laurier

Place du Portage III, 8B3

Gatineau

Québec

K1A 0S5

Title - Sujet 5 gangways for the MSPV Class	
Solicitation No. - N° de l'invitation F7044-200198/B	Date 2022-09-15
Client Reference No. - N° de référence du client F7044-200198	
GETS Reference No. - N° de référence de SEAG PW-\$\$ML-066-28809	
File No. - N° de dossier 066ml.F7044-200198	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM Eastern Daylight Saving Time EDT on - le 2022-10-28 Heure Avancée de l'Est HAE	
F.O.B. - F.A.B. Plant-Usine: <input type="checkbox"/> Destination: <input type="checkbox"/> Other-Autre: <input type="checkbox"/>	
Address Enquiries to: - Adresser toutes questions à: Durocher, Daniel	Buyer Id - Id de l'acheteur 066ml
Telephone No. - N° de téléphone (873) 455-3877 ()	FAX No. - N° de FAX () -
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction: Specified Herein Précisé dans les présentes	

Instructions: See Herein

Instructions: Voir aux présentes

Delivery Required - Livraison exigée See Herein – Voir ci-inclus	Delivery Offered - Livraison proposée
Vendor/Firm Name and Address Raison sociale et adresse du fournisseur/de l'entrepreneur	
Telephone No. - N° de téléphone Facsimile No. - N° de télécopieur	
Name and title of person authorized to sign on behalf of Vendor/Firm (type or print) Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)	
Signature	Date

Solicitation No. - N° de l'invitation F7044-200198/B	Amd. No. - N° de la modif.	Buyer ID - Id de l'acheteur 066ml
Client Ref. No. - N° de réf. du client F7044-200198	File No. - N° du dossier 066ml.F7044-200198	CCC No./N° CCC - FMS No./N° VME

This bid solicitation cancels and supersedes previous bid solicitation number F7044-200198/A dated 2021-09-27 with a closing of 2021-11-08 at 14:00. A debriefing or feedback session will be provided upon request to bidders/offerors/suppliers who bid on the previous solicitation.

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		2	6 Sep 2022

Solicitation No. - N° de l'invitation	Amd. No. - N° de la modif.	Buyer ID - Id de l'acheteur
F7044-200198/B		066ml
Client Ref. No. - N° de réf. du client	File No. - N° du dossier	CCC No./N° CCC - FMS No./N° VME
F7044-200198	066ml.F7044-200198	
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1. PART 1 - GENERAL INFORMATION

1.1. Summary

The Canadian Coast Guard (CCG) has a requirement to replace the existing gangways onboard the Canadian Coast Guard (CCG) Hero Class / Mid Shore Patrol Vessels (MSPVs) with new Class approved Lightweight Gangways (LG).

The Initial Procurement will be for the replacement of five (5) Lightweight Gangways (LG).

The contract includes three (3) options for additional Lightweight Gangways (LG) replacement and options for additional periods.

The requirement includes all associated Work and Services described herein including the Statement of Work (SOW) attached as Annex "A".

1.2. Debriefings

Bidders may request a debriefing on the results of the bid solicitation process. Bidders should make the request to the Contracting Authority within 15 working days from receipt of the results of the bid solicitation process. The debriefing may be in writing or by telephone.

1.3. epost Connect service

This bid solicitation allows bidders to use the epost Connect service provided by Canada Post Corporation to transmit their bid electronically. Bidders must refer to Part 2 entitled Bidder Instructions, and Part 3 entitled Bid Preparation Instructions, of the bid solicitation, for further information.

2. PART 2 - BIDDER INSTRUCTIONS

2.1. Standard Instructions, Clauses and Conditions

All instructions, clauses and conditions identified in the bid solicitation by number, date and title are set out in the Standard Acquisition Clauses and Conditions Manual (<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual>) issued by Public Works and Government Services Canada.

Bidders who submit a bid agree to be bound by the instructions, clauses and conditions of the bid solicitation and accept the clauses and conditions of the resulting contract.

The 2003 (2020-05-28) Standard Instructions - Goods or Services - Competitive Requirements, are incorporated by reference into and form part of the bid solicitation.

2.1.1 Condition of Material - Bid

Material supplied must be new and conform to the latest issue of the applicable drawing, specification and/or part number that is in effect on the bid solicitation closing date.

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2.2. Submission of Bids

Bids must be submitted only to Public Works and Government Services Canada (PWGSC) Bid Receiving Unit by the date, time and place indicated in the bid solicitation.

Note: For bidders choosing to submit using epost Connect for bids closing at the Bid Receiving Unit in the National Capital Region (NCR) the email address is:

tpsgc.dgareceptiondessoumissions-abbidreceiving.pwgsc@tpsgc-pwgsc.gc.ca

Note: Bids will not be accepted if emailed directly to this email address. This email address is to be used to open an epost Connect conversation, as detailed in Standard Instructions [2003](#), or to send bids through an epost Connect message if the bidder is using its own licensing agreement for epost Connect.

Due to the nature of the bid solicitation, bids transmitted by facsimile to PWGSC will not be accepted.

2.2.1. Transmission by using the epost Connect Service

Bids must be submitted with the epost Connect service in accordance with Standard Instructions 2003 Goods or Services Competitive Requirements.

Unless specified otherwise in the bid solicitation, bids may be submitted by using the epost Connect service (https://www.canadapost.ca/web/en/products/details.page?article=epost_connect_send_a) provided by Canada Post Corporation. The process to follow is available on the Steps to Submit a Bid Using epost Connect Service (<https://buyandsell.gc.ca/steps-to-follow-for-the-bid-submission-to-bid-receiving-unit-bru-using-epost-connect>) webpage.

The only acceptable email address to use with epost Connect for responses to bid solicitations issued by Public Works and Government Services Canada (PWGSC) in the National Capital Region is: TPSGC.DGAreceptiondessoumissions-ABBidReceiving.PWGSC@tpsgc-pwgsc.gc.ca

To submit a bid using epost Connect service, the Bidder must either:

- a) send directly its bid only to the specified PWGSC Bid Receiving Unit, using its own licensing agreement for epost Connect provided by Canada Post Corporation; or
- b) send as early as possible, and in any case, at least six federal government business days prior to the bid solicitation closing date and time, (in order to ensure a response), an email that includes the bid solicitation Number to the specified PWGSC Bid Receiving Unit requesting to open an epost Connect conversation. Requests to open an epost Connect conversation received after that time may not be answered.

If the Bidder sends an email requesting epost Connect service to the specified Bid Receiving Unit in the bid solicitation, an officer of the Bid Receiving Unit will then initiate an epost Connect conversation. The epost Connect conversation will create an email notification from Canada Post Corporation prompting the Bidder to access and action the message within the conversation. The Bidder will then be able to submit its bid afterward at any time prior to the bid solicitation closing date and time.

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If the Bidder is using its own licensing agreement to send its bid, the Bidder must keep the epost Connect conversation open until at least 30 federal government business days after the bid solicitation closing date and time.

The bid solicitation Number should be identified in the epost Connect message field of all electronic transmissions.

The use of epost Connect service requires a Canadian mailing address. Should a Bidder not have a Canadian mailing address, they may use the Bid Receiving Unit address specified in the bid solicitation in order to register for the epost Connect service.

For bids submitted by epost Connect service, Canada will not be responsible for any failure attributable to the transmission or receipt of the bid including, but not limited to, the following:

- a) Receipt of a garbled, corrupted or incomplete bid;
- b) Availability or condition of the epost Connect service;
- c) Incompatibility between the sending and receiving equipment;
- d) Delay in transmission or receipt of the bid;
- e) Failure of the Bidder to properly identify the bid;
- f) Illegibility of the bid;
- g) Security of bid data; or
- h) Inability to create an electronic conversation through the epost Connect service.

The Bid Receiving Unit will send an acknowledgement of the receipt of bid document(s) via the epost Connect conversation, regardless of whether the conversation was initiated by the supplier using its own license or the Bid Receiving Unit. This acknowledgement will confirm only the receipt of bid document(s) and will not confirm if the attachments may be opened nor if the content is readable.

Bidders must ensure that they are using the correct email address for the Bid Receiving Unit when initiating a conversation in epost Connect or communicating with the Bid Receiving Unit and should not rely on the accuracy of copying and pasting the email address into the epost Connect system.

A bid submitted by epost Connect service constitutes the formal bid of the Bidder and must be submitted in accordance with Section 5 Submission of Bids, of Standard Instructions [2003 \(2022-03-29\)](#), Goods or Services Competitive Requirements.

Due to the nature of the bid solicitation, bids transmitted by facsimile to PWGSC will not be accepted.

2.3. Enquiries - Bid Solicitation

All enquiries must be submitted in writing to the Contracting Authority no later than seven (7) calendar days before the bid closing date. Enquiries received after that time may not be answered.

Bidders should reference as accurately as possible the numbered item of the bid solicitation to which the enquiry relates. Care should be taken by Bidders to explain each question in sufficient detail in order to enable Canada to provide an accurate answer. Technical enquiries that are of a proprietary nature must be clearly marked "proprietary" at each relevant item. Items identified as "proprietary" will be treated as such except where Canada determines that the enquiry is not of a proprietary nature. Canada may edit the question(s) or may request that the Bidder do so, so that

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the proprietary nature of the question(s) is eliminated, and the enquiry can be answered to all Bidders. Enquiries not submitted in a form that can be distributed to all Bidders may not be answered by Canada.

2.4. Applicable Laws

Any resulting contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in Ontario.

Bidders may, at their discretion, substitute the applicable laws of a Canadian province or territory of their choice without affecting the validity of their bid, by deleting the name of the Canadian province or territory specified and inserting the name of the Canadian province or territory of their choice. If no change is made, it acknowledges that the applicable laws specified are acceptable to the Bidders.

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2.5. Bid Challenge and Recourse Mechanisms

- (a) Several mechanisms are available to potential suppliers to challenge aspects of the procurement process up to and including contract award.
- (b) Canada encourages suppliers to first bring their concerns to the attention of the Contracting Authority. Canada's Buy and Sell website, under the heading "Bid Challenge and Recourse Mechanisms" contains information on potential complaint bodies such as:
 - a. Office of the Procurement Ombudsman (OPO); and
 - b. Canadian International Trade Tribunal (CITT).

Note: Suppliers should note that there are **strict deadlines** for filing complaints, and the time periods vary depending on the complaint body in question. Suppliers should therefore act quickly when they want to challenge any aspect of the procurement process.

3. PART 3 - BID PREPARATION INSTRUCTIONS

3.1. Bid Preparation Instructions

Canada requests that the Bidder submits its bid in accordance with section 08 of the [2003](#) standard instructions. The epost Connect system has a limit of 1GB per single message posted and a limit of 20GB per conversation.

The bid must be gathered per section and separated as follows:

Section I : Technical Bid;
Section II : Financial Bid; and
Section III : Certifications.

Prices must appear in the financial bid only. No prices must be indicated in any other section of the bid.

Section I: Technical Bid

The Technical Bid must include:

- (a) A duly completed Annex "E" Mandatory Technical Criteria; and
- (b) A duly completed Statement of Compliance to the SOW in a requirement matrix format as per example provided in Annex "F".

Section II: Financial Bid

Bidders must submit their financial bid in accordance with the Basis of Payment / Financial Evaluation Plan in Annex "B".

3.1.1. Electronic Payment of Invoices – Bid

If you are willing to accept payment of invoices by Electronic Payment Instruments, complete Annex "D" Electronic Payment Instruments, to identify which ones are accepted.

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If Annex "D" Electronic Payment Instruments is not completed, it will be considered as if Electronic Payment Instruments are not being accepted for payment of invoices.

Acceptance of Electronic Payment Instruments will not be considered as an evaluation criterion.

3.1.2. Exchange Rate Fluctuation

The requirement does not offer exchange rate fluctuation risk mitigation. Requests for exchange rate fluctuation risk mitigation will not be considered. All bids including such provision will render the bid non-responsive.

Section III: Certifications

Bidders must submit the certifications and additional information required under Part 5.

4. PART 4 - EVALUATION PROCEDURES AND BASIS OF SELECTION

4.1. Evaluation Procedures

- (a) Bids will be assessed in accordance with the entire requirement of the bid solicitation including the technical and financial evaluation criteria.
- (b) An evaluation team composed of representatives of Canada will evaluate the bids.

4.1.1. Technical Evaluation

IAW Part 3, section 3.1, the following Bidder's technical deliverables will be evaluated:

- (a) A duly completed Annex "E" Mandatory Technical Criteria; and
- (b) A duly completed Statement of Compliance to the SOW in a requirement matrix format as per example provided in Annex "F".

4.1.2. Financial Evaluation

IAW Part 3, section 3.1, the following Bidder's financial deliverables will be evaluated:

- (a) The full legal name of the Bidder;
- (b) Complete contact information of the company's representative responsible for the proposal; and
- (c) Duly completed Annex "B" Basis of Payment / Financial Evaluation Plan. The price of the bid will be evaluated in Canadian dollars, Applicable Taxes excluded, Incoterms® 2010 (Delivered Duty Paid - DDP), Canadian customs duties and excise taxes included.

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4.2. Basis of Selection

A bid must comply with all requirements of the bid solicitation and meet all mandatory technical and financial criteria to be declared responsive. The responsive bid with the lowest Total Evaluation Price of the Proposal will be recommended for award of a contract.

5. PART 5 – CERTIFICATIONS AND ADDITIONAL INFORMATION

Bidders must provide the required certifications and additional information to be awarded a contract.

The certifications provided by Bidders to Canada are subject to verification by Canada at all times. Unless specified otherwise, Canada will declare a bid non-responsive, or will declare a contractor in default if any certification made by the Bidder is found to be untrue whether made knowingly or unknowingly, during the bid evaluation period or during the contract period.

The Contracting Authority will have the right to ask for additional information to verify the Bidder's certifications. Failure to comply and to cooperate with any request or requirement imposed by the Contracting Authority will render the bid non-responsive or constitute a default under the Contract.

5.1. Certifications Required with the Bid

Bidders must submit the following duly completed certifications as part of their bid.

5.1.1. Integrity Provisions - Declaration of Convicted Offences

In accordance with the Integrity Provisions of the Standard Instructions, all bidders must provide with their bid, **if applicable**, the declaration form available on the Forms for the Integrity Regime website (<http://www.tpsgc-pwgsc.gc.ca/ci-if/declaration-eng.html>), to be given further consideration in the procurement process.

5.1.2. Welding Certification – Bid

Welding must be performed by a welder certified by the Canadian Welding Bureau (CWB) for the following Canadian Standards Association (CSA) standards or international equivalent, as accepted by CCG TA and Class Surveyor from a Classification Society recognized by Transport Canada.

All bidders must provide with their bid the CSA W47.2 (current version), Certification of Companies for Fusion Welding of Aluminum Division level 1 or 2, or international equivalent, as accepted by CCG TA and Class Surveyor from a Classification Society recognized by Transport Canada.

5.2. Certifications Precedent to Contract Award and Additional Information

The certifications and additional information listed below should be submitted with the bid, but may be submitted afterwards. If any of these required certifications or additional information is not completed and submitted as requested, the Contracting Authority will inform the Bidder of a time frame within which to provide the information. Failure to provide the certifications or the additional information listed below within the time frame provided will render the bid non-responsive.

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5.2.1. Integrity Provisions – Required Documentation

In accordance with the section titled Information to be provided when bidding, contracting or entering into a real property agreement of the Ineligibility and Suspension Policy (<http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html>), the Bidder must provide the required documentation, as applicable, to be given further consideration in the procurement process.

5.2.2. Federal Contractors Program for Employment Equity - Bid Certification

By submitting a bid, the Bidder certifies that the Bidder, and any of the Bidder's members if the Bidder is a Joint Venture, is not named on the Federal Contractors Program (FCP) for employment equity "FCP Limited Eligibility to Bid" list available at the bottom of the page of the Employment and Social Development Canada (ESDC) - Labour's website (<https://www.canada.ca/en/employment-social-development/programs/employment-equity/federal-contractor-program.html#>).

Canada will have the right to declare a bid non-responsive if the Bidder, or any member of the Bidder if the Bidder is a Joint Venture, appears on the "FCP Limited Eligibility to Bid" list at the time of contract award.

Canada will also have the right to terminate the Contract for default if a Contractor, or any member of the Contractor if the Contractor is a Joint Venture, appears on the "FCP Limited Eligibility to Bid" list during the period of the Contract.

The Bidder must provide the Contracting Authority with a completed annex titled Federal Contractors Program for Employment Equity - Certification, before contract award. If the Bidder is a Joint Venture, the Bidder must provide the Contracting Authority with a completed annex Federal Contractors Program for Employment Equity - Certification, for each member of the Joint Venture.

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1. PART 6 - RESULTING CONTRACT CLAUSES

The following clauses and conditions apply to and form part of any contract resulting from the bid solicitation.

1.1. Security Requirements

There is no security requirement applicable to the Contract.

1.2. Procurement Summary

The Contractor will replace the existing gangways onboard the Canadian Coast Guard (CCG) Hero Class / Mid Shore Patrol Vessels (MSPVs) by new Class approved Lightweight Gangways (LG).

The Initial Procurement will be for the replacement of five (5) Lightweight Gangways (LG).

The contract includes three (3) options for additional Lightweight Gangways (LG) replacement and options for additional periods.

The requirement includes all associated Work and Services described herein including the Statement of Work (SOW) attached as Annex "A".

1.3. Standard Clauses and Conditions

All clauses and conditions identified in the Contract by number, date and title are set out in the Standard Acquisition Clauses and Conditions Manual (<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual>) issued by Public Works and Government Services Canada.

1.3.1. General Conditions

2030 (2022-05-12), General Conditions - Higher Complexity-Goods, apply to and form part of the Contract.

1031-2 (2012-07-16) Contracting Cost Principles, apply to and form part of the Contract.

1.4. Term of Contract

1.4.1. Initial Period of the Contract

All deliverables listed in SOW, Section 4.1.1, Initial Procurement, must be manufactured, tested, delivered and accepted by Canada as of March 31st 2023 or prior.

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066ml

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1.4.1.1 Initial Procurement

INITIAL PROCUREMENT		
ITEM #	CCGS	QTY OF LG
1	A. Leblanc	1
2	Caporal Kaebler V.C.	1
3	Constable Carrière	1
4	Corporal Teather C.V.	1
5	G. Peddle S.C.	1

1.4.2. Canada will have the right to exercise any of the following options

The Contractor grants to Canada the irrevocable option to acquire the goods, services or both under the same conditions and at the prices and/or rates stated in the Contract. The option may only be exercised by the Contracting Authority and will be evidenced, for administrative purposes only, through a contract amendment. The Contracting Authority may exercise the option at any time before the expiry of the Contract by sending a written notice to the Contractor.

Canada will have the right to exercise one or both of the following options:

a. The first (1st) one is an option for additional quantities

As per Table below, Canada reserve the right to exercise the following options:

OPTIONS		
OPTION #	CCGS	QTY OF LG
1	M. Charles M.B.	1
2	Private Robertson V.C.	1
3	Captain Goddard M.S.M.	1

b. The second (2nd) one is an option for additional periods

The initial contract period will have a duration of up to March 31st 2023. Each year, Canada reserves the right to extend the contract duration by one (1) additional year, this until all options for additional quantities are exercised or until Canada intends to keep options valid. All prices will be subject to an Economic Price Adjustment (EPA).

During the initial period of contract or during any additional periods, Canada reserves the right to procure one (1) or all of the remaining options under the actual contract. Both options will be exercised through contract amendments.

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1.4.3. Delivery Points

Deliverables must be delivered as per Annex A, SOW, Section 4, Lightweight Gangway (LG) Delivery.

1.5. Authorities

1.5.1. Contracting Authority

The Contracting Authority for the Contract is:

Name: Daniel Durocher
 Title: Supply Specialist
 Public Works and Government Services Canada
 Defence and Marine Procurement Branch
 Refit Logistics and Small Vessel Construction Directorate

Address:
 11 rue Laurier
 Place du Portage III, 6A2
 Gatineau, QC
 K1A 0S5

Telephone: 873-455-3877
 E-mail address: daniel.durocher@tpsgc-pwgsc.gc.ca

The Contracting Authority is responsible for the management of the Contract and any changes to the Contract must be authorized in writing by the Contracting Authority. The Contractor must not perform work in excess of or outside the scope of the Contract based on verbal or written requests or instructions from anybody other than the Contracting Authority.

1.5.2. Technical Authority

The Technical Authority for the Contract is:

Name: _____
 Title: _____
 Organization: _____
 Address: _____

Telephone: ____ ____ ____

Facsimile: ____ ____ ____

E-mail address: _____

(the contracting authority will insert the Technical authority information's at the contract award)

The Technical Authority is the representative of the department or agency for whom the Work is being carried out under the Contract and is responsible for all matters concerning the technical content of the Work under the Contract. Technical matters may be discussed with the Technical Authority, however the Technical Authority has no authority to authorize changes to the scope of the Work. Changes to the scope of the Work can only be made through a contract amendment issued by the Contracting Authority.

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1.5.3. Contractor's Representative

Name: _____

Title: _____

Organization: _____

Address: _____

Telephone: ____ _

Facsimile: ____ _

E-mail address: _____

(the contracting authority will insert the Contractor's Representative as specified by the Bidder in its bid).

1.6. Payment

1.6.1. Basis of Payment - Firm Unit Prices

In consideration of the Contractor satisfactorily completing all of its obligations under the Contract, the Contractor will be paid the firm unit prices, as indicated in Annex "B" Basis of Payment, Incoterms® 2010 "Delivered Duty Paid" (DDP) to destinations, Canadian customs duties and excise taxes included and Applicable Taxes are extra.

Canada will not pay the Contractor for any design changes, modifications or interpretations of the Work, unless they have been approved, in writing, by the Contracting Authority before their incorporation into the Work.

If the option is exercised, the Contractor will be paid the firm unit prices in Annex "B" – Basis of Payment.

1.6.2. Economic Price Adjustment (EPA)

The initial contract period will have a duration of up to March 31st 2023. Each year, Canada reserves the right to extend the contract duration by one (1) additional year, this until all options for additional quantities are exercised or until Canada intends to keep options valid. All prices of Annex "B" Basis of Payment will be subject to an EPA.

All options for additional quantities that will be order following the initial contract period, will be subject as stated above, to an EPA.

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1.6.2.1. Calculation of the Economic Price Adjustment

At the beginning of each Contract year, all Firm unit price(s) indicated in the Annex "B" Basis of Payment will be adjusted upward or downward to account for inflation or deflation. The adjusted Firm unit price(s) for the coming twelve (12) months period shall be calculated IAW with the formula below and they will be firm for the coming twelve (12) months.

$$P(x) = P(o) \times \text{Index}(x) / \text{Index}(o)$$

P(x) = Firm Price for the coming twelve (12) months period

P(o) = Firm Price for the Initial Period of Contract

Index (x) = The index used to calculate the EPA will be obtained from the Consumer Price Index, monthly, not seasonally adjusted, Table 18-10-004-001, Geography Canada, Products and product groups All-items, Published by Statistic Canada. Consumer Price Index, monthly, not seasonally adjusted (statcan.gc.ca) The index to be used shall be the one that is three (3) months prior to the anniversary of the contract.

Index (o) = The index used to calculate the EPA will be obtained from the Consumer Price Index, monthly, not seasonally adjusted, Table 18-10-004-001, Geography Canada, Products and product groups All-items, Published by Statistic Canada. Consumer Price Index, monthly, not seasonally adjusted (statcan.gc.ca) The index to be used shall be the one that is three (3) months prior to the contract award date.

1.6.3. Taxes - Foreign-based Contractor, if applicable

Unless specified otherwise in the Contract, the price includes no amount for any federal excise tax, state or local sales or use tax, or any other tax of a similar nature, or any Canadian tax whatsoever. The price, however, includes all other taxes. If the Work is normally subject to federal excise tax, Canada will, upon request, provide the Contractor a certificate of exemption from such federal excise tax in the form prescribed by the federal regulations.

Canada will provide the Contractor evidence of export that may be requested by the tax authorities. If, as a result of Canada's failure to do so, the Contractor has to pay federal excise tax, Canada will reimburse the Contractor if the Contractor takes such steps as Canada may require to recover any payment made by the Contractor. The Contractor must refund to Canada any amount so recovered.

1.6.4. Basis of Payment – Additional and Unscheduled Work (A/U)

1.6.4.1. The A/U Work Hourly Labour Rates for authorized A/U Work including Design Change, Engineering Change or change in the scope of work will be paid in accordance with:

- a. Annex "B" Basis of Payment;
- b. Annex "C" Procedure for Processing A/U Work;
- c. Contract Cost Principles 1031-2 (2012-07-16) and inclusive of a profit in accordance with Chapter 10 - Cost and Profit of the Supply Manual, Public Works and Government Services Canada (PWGSC); and,

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- d. The firm A/U Work Hourly labour rate must be a blended rate of all classes of labour required to achieve the Known Work of the Contract and not being part of the Contractor's and/or Contractor's subcontractors overhead costs. The firm A/U Work Hourly labour rate must be all inclusive and include, without being limited to, the labourer salary, the fringe benefits, the applicable overhead and the profits

1.6.4.2. The Additional / Unscheduled Work (A/U Work) related to Material, Subcontracts and Travel & Living for authorized A/U Work including Design Change, Engineering Change or change in the scope of work will be paid in accordance with:

- a. Annex "C" Procedure for Processing A/U Work; and,
- b. The Contractor will be reimbursed for the authorized Unscheduled and Additional Material and Subcontracts costs (other than Subcontract costs where the applicable A/U Work Hourly Labour Rate of the Annex "B" applies) reasonably and properly incurred in the performance of the A/U Work, at cost, in accordance with Contract Cost Principles 1031-2.

The following allowance will be paid as follows:

- i. Administrative overhead: ten (10) percent of authorized Material and Subcontracts costs; and
- ii. Profit: zero (0) percent of authorized Material and Subcontracts costs.

All payments are subject to government audit.

1.6.5. Discretionary Audit for Additional / Unscheduled Work Only

SACC Manual clause C0100C (2010-01-11), Discretionary Audit - Commercial Goods and/or Services

1.6.6. Time Verification for Additional / Unscheduled Work Only

SACC Manual clause C0711C (2008-05-12), Time Verification

1.6.7. Limitation of Price

SACC Manual clause C6000C (2017-08-17) Limitation of Price

1.6.8. Multiple Payments

Canada will pay the Contractor upon completion and delivery of units in accordance with the payment provisions of the Contract if:

- a. an accurate and complete invoice and any other documents required by the Contract have been submitted in accordance with the invoicing instructions provided in the Contract;
- b. all such documents have been verified by Canada; and
- c. the Work delivered has been accepted by Canada.

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1.6.9. Electronic Payment of Invoices – Contract

(The Contracting Authority will reproduce below, the information from Annex “D” Electronic Payment Instruments, in which were identified electronic payment instruments accepted by the Bidder)

The Contractor accepts to be paid using any of the following Electronic Payment Instrument(s):

- a. Visa Acquisition Card;
- b. MasterCard Acquisition Card;
- c. Direct Deposit (Domestic and International);
- d. Electronic Data Interchange (EDI); and,
- e. Wire Transfer (International Only).

1.7. Invoicing Instructions

1. The Contractor must submit invoices in accordance with the section entitled "Invoice Submission" of the general conditions. Invoices cannot be submitted until all work identified in the invoice is completed.

Each invoice must be supported by a copy of the release document and any other documents as specified in the Contract.

2. Invoices must be distributed as follows:

- a. The original and one (1) copy must be forwarded to the following address for certification and payment.

Department of Fisheries & Oceans, Canadian Coast Guard

_____ (the contracting authority will insert the address and the e-mail at contract award)

- b. One (1) copy must be forwarded to the Contracting Authority identified under the section entitled "Authorities" of the Contract.

1.8. Certifications and Additional Information

1.8.1. Compliance

Unless specified otherwise, the continuous compliance with the certifications provided by the Contractor in its bid or precedent to contract award, and the ongoing cooperation in providing additional information are conditions of the Contract and failure to comply will constitute the Contractor in default. Certifications are subject to verification by Canada during the entire period of the Contract.

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1.9. Applicable Laws

The Contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in _____ (the contracting authority will insert the law of the province as specified by the Bidder in its bid, if applicable).

1.10. Priority of Documents

If there is a discrepancy between the wording of any documents that appear on the list, the wording of the document that first appears on the list has priority over the wording of any document that subsequently appears on the list:

- (a) The Articles of Agreement;
- (b) The general conditions 2030 (2020-05-28), General Conditions - Higher Complexity-Goods;
- (c) 1031-2 (2012-07-16), Contract Cost Principles;
- (d) Annex "A", Statement of Work;
- (e) Annex "B", Basis of Payment;
- (f) Annex "C", Procedure for Processing Additional / Unscheduled Work; and
- (g) The Contractor's bid dated _____.
(the contracting authority will insert the date of bid as specified by the Bidder in its bid).

1.11. Insurance - No Specific Requirement

SACC Manual clause G1005C (2016-01-28) Insurance - No Specific Requirement

1.12. SACC Manual Clauses

B7500C (2006-06-16) Excess Goods
D2025C (2017-08-17) Wood Packaging Materials
D9002C (2007-11-30) Incomplete Assemblies

1.13. Dispute Resolution

1. The parties agree to maintain open and honest communication about the Work throughout and after the performance of the contract.
2. The parties agree to consult and co-operate with each other in the furtherance of the contract and promptly notify the other party or parties and attempt to resolve problems or differences that may arise.
3. If the parties cannot resolve a dispute through consultation and cooperation, the parties agree to consult a neutral third party offering alternative dispute resolution services to attempt to address the dispute.
4. Options of alternative dispute resolution services can be found on Canada's Buy and Sell website under the heading "Dispute Resolution".

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1.14. Condition of Material - Contract

The Contractor must provide material that is new production of current manufacture supplied by the principal manufacturer or its accredited agent. The material must conform to the latest issue of the applicable drawing, specification and part number, as applicable, that was in effect on the bid closing date.

1.15. Packaging

The dispatch packaging must adequately secure and protect from damage the parts and components during transport and handling.

Each despatch packaging (pallet unit or despatch carton) must be marked using a shipping label that can resist and remain attached during transport and handling.

Each despatch packaging must contain a packing slip that must contain, but not limited to, the following: name and address of the Shipper, name and address of the recipient, a packing slip number, an itemized list of the contents, and the Contract number.

1.16. Welding Certification - Contract

1. The Contractor must ensure that welding is performed by a welder certified by the Canadian Welding Bureau (CWB) for the following Canadian Standards Association(CSA) standard(s) or international equivalent, as accepted by CCG TA and Class Surveyor from a Classification Society recognized by Transport Canada:
 - a. CSA W47.2 (current version), Certification of Companies for Fusion Welding of Aluminum Division level 1 or 2, or international equivalent, as accepted by CCG TA and Class Surveyor from a Classification Society recognized by Transport Canada.
2. In addition, welding must be done in accordance with the requirements of the applicable drawings and specifications.

Before the commencement of any fabrication work, and upon request from the Technical Authority, the Contractor must provide approved welding procedures and/or a list of welding personnel they intend to use in the performance of the Work. The list must identify the CWB welding procedure qualifications attained by each of the personnel listed and must be accompanied by a copy of each person's current CWB certification to CSA welding standards or international equivalent, as accepted by CCG TA and Class Surveyor from a Classification Society recognized by Transport Canada.

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ANNEX "A"

STATEMENT OF WORK

FOR THE

PROCUREMENT

OF

LIGHTWEIGHT GANGWAYS

FOR THE

**CANADIAN COAST GUARD (CCG)
HERO CLASS VESSELS / MID SHORE PATROL VESSELS (MSPV)**

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1. SCOPE

1.1. Purpose

This Statement of Work (SOW) defines the technical requirements for the new ABS design-approved Lightweight Gangway (LG) to replace the existing Gangways onboard the Canadian Coast Guard (CCG) Hero Class / Mid Shore Patrol Vessels (MSPVs).

The initial contract will be for a quantity of five (5) new LG with an option of up to three (3) additional LG, see Section 4 – Deliverables.

Three (3) LG model designs (see Table 1) have been developed over two drawings and approved by a Classification Society (CS), American Society of Shipping (ABS). The Contractor must manufacture each LG in accordance with (IAW) the model selected and IAW the contract drawings.

Table 1 - LG Model Designs

Model Number	Description	Design references
Model #1	Modified one-piece	ABS Review Letter T2129624, see Appendix 1; and Drawing J20046-S02-R7 , Note 8 , see Appendix 2.
Model #2	Two-piece (sectional)	ABS Review Letter T2129624, see Appendix 1; and Drawing J20046-S02-R7 , see Appendix 2.
Model #3	One-piece	ABS Review Letter T2129624, see Appendix 1; and Drawing J20046-S03-R6 , see Appendix 2.

1.2. Background

The MSPVs were built by Irving Shipyards between 2012 and 2014 under “Lloyd's Rules and Regulations for the Classification of Special Craft, 2009”. The existing gangways are made of aluminium and have dimensions of are 21 feet long and 30 inches wide with a total weight of 389 pounds. The designer was ABCO Industrial Ltd. See Figures 1 and 2 for examples.

The existing gangways are difficult for vessel crew to lift from stowage and put it into place due to the gangway's weight. With no lifting appliances forward of the superstructure, the gangways must be manoeuvred by hand when placed on the forward decks.

1.3. Objective

The fundamental objective of the LG procurement is to manufacture and deliver the required number of LG certified by a Classification Society recognized by Transport Canada.



Figure 1 - Example of Current MSPV Gangway



Figure 2 - Gangway in stowed position

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1.4. Acronyms

Table 2 – Acronyms

Acronym	Name
ABS	American Bureau of Shipping
CA	Contracting Authority
CCG	Canadian Coast Guard
CCGS	Canadian Coast Guard Ship
Class or CS	Classification Society
CWB	Canadian Welding Bureau
FAT	Factory Acceptance Test
AWS	American Welding Society, Inc
IAW	In accordance with
IMO	International Maritime Organization
ISO	International Organization for Standardization
ITP	Inspections and Tests Plan
SOW	Statement Of Work
TA	Technical Authority

2. References

2.1. The prescribed latest versions of the following documents are to form a part of this specification to the extent specified herein.

2.2. Government Furnished Documents

Table 3: Government furnished documents

CCG Common Documents		
1	CT-043-EQ-EG-001-E	CCG Welding Specification
2	18-080-000-SG-003	CCG Standard – Paint and Coatings Standard
3	J20046-S02-R7	Hero Class, 21FT x 30 IN, Sectional Aluminum Gangway Assembly Details (16 and 5 feet)
4	J20046-S03-R6	Hero Class, 21FT x 30 IN Aluminum Gangway Structural Details

See attached documents

2.3. Applicable Standards and Regulations

- 2.3.1.** The Contractor must ensure all specified work is completed in accordance with the latest edition at the time of signing, in order of precedence: all applicable laws, acts, policies, regulations, standards, manuals, drawings, and guidance documents. In the event of a conflict between the contents of the reference documents, the Contractor must inform the CCG TA of the differences and submit a written request for a resolution.
- 2.3.2.** Where standards are referenced in this document, the whole standard must apply.
- 2.3.3.** Failure by Canada to list a document, regulation, or standard does not relieve the Contractor of responsibility for compliance with any applicable rules and/or regulations.

Table 4: List of Non-Government Documents (not provided)

Reference	Title
American Welding Society (AWS) D1.2	Structural Welding Code – Aluminum
ISO 7061:2015	Ships and Marine Technology: “Aluminium Shore Gangways for Seagoing Vessels”.
ISO 10005:2005	Quality management systems – “Guidelines for quality plans”
ISO 7599:2018	Anodizing of aluminium and its alloys — Method for specifying decorative and protective anodic oxidation coatings on aluminium
IMO SOLAS	International Convention for the Safety of Life at Sea (SOLAS)
IMO Circular MSC. 1/Circ. 1331	Guidelines for construction, installation, maintenance and inspection/survey of means of embarkation and disembarkation
Classification Society Rules	Rules and Regulations for the Classification of Special Service Craft, July 2017
CSA W47.2	Certification of Companies for Fusion Welding of Aluminum Division level 1 or 2
CSA W59.2	Welded Aluminum Construction
Canada Labour Code (R.S.C., 1985, c. L-2)	Canada Labour Code and Regulations Pursuant to the code such as: <ul style="list-style-type: none"> 1. Work Place Harassment and Violence Prevention Regulations (SOR/2020-130) 2. Canada Occupational Health and Safety Regulations (SOR/86-304)
Canada Shipping Act, 2001	<ul style="list-style-type: none"> 1. Cargo, Fumigation and Tackle Regulations (SOR/2007-128) 2. C.R.C., c.1494, Part III, Section 8, Item 2, iv Tackle Regulations

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3. Miscellaneous Provisions

3.1. Occupational Health and Safety

- 3.1.1. The Contractor and all sub-Contractors must follow Occupational Health and Safety (OHS) procedures in accordance with applicable federal and provincial/state OHS regulations ensuring that Contractor activities are carried out in a safe manner and do not endanger the safety of any personnel.

3.2. Inspections – Contractor's Role

- 3.2.1. The Contractor must contact, coordinate, schedule, and be completely prepared for all required regulatory inspections by the applicable authority as indicated in individual sections of this SOW. The Contractor is responsible for all other costs and fees associated with required regulatory inspections by the applicable authority as indicated in individual sections of this SOW.
- 3.2.2. The Contractor must not substitute inspection or correspondence by the TA for the required regulatory inspections.

3.3. Recording of Work in Progress

- 3.3.1. The TA may record any work in progress, including acceptance testing, using various means including, but not limited to, photography and video, digital or film.

3.4. Documentation

- 3.4.1. The Contractor must provide all text documentation in text searchable Adobe PDF format. Lossless software conversion of the original and lossless scanning conversion of the original are both acceptable.

- 3.4.2. The Contractor must scan or convert all documentation, reports, test results, certificates, or data obtained by the Contractor in paper form for the TA. These scans must be unprotected, searchable, Adobe PDF formatted files and named according to the following file naming format:

Lightweight gangway individual serial # – Date (yyyy-mm-dd) – File Name Describing Information.
For Example: "LG1.0 – 2021-04-01 – Details of file naming.pdf".

- 3.4.3. The Contractor must deliver to the TA for acceptance a "Data Book" with all documentation generated as a result of specified deliverables. The Data Book must be delivered to the TA in an electronic format. For each Lightweight Gangway the Data Book must contain the following documentation:

- Make, model, serial number, and supplier contact information for each contractor furnished equipment item;
- Material Certification from a Classification Society recognized by Transport Canada;
- All reports as per SOW Section 7, Inspections;

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- d. All Measurements, Calibrations and Reading as per SOW Section 3.5;
- e. Quality control documents;
- f. Lightweight Gangway Certification by a Classification Society recognized by Transport Canada; and,
- g. All warranty information and documentation obtained or generated as part of the contract.

3.5. Measurements, Calibrations, and Readings

- 3.5.1. The Contractor must ensure that all Contracted measurements, calibrations and readings are recorded, and are signed by the person taking the measurements, dated and scanned into electronic format as part of the **Data Book**.
- 3.5.2. The Contractor must ensure, unless otherwise specified, contracted measurement dimensions are recorded to a precision of three significant digits in the OEM unit of measure with the metric equivalent conversion in closed brackets recorded.
- 3.5.3. The Contractor must provide to the TA current and valid calibration certificates, and control values for all instrumentation used in the Contract, showing that the instruments have been calibrated in accordance with the manufacturer's instructions. The Contractor must include these records where measurements are recorded in the **Data Book**.

4. Lightweight Gangway (LG) Delivery

4.1. Deliverables

4.1.1. Initial Procurement

Delivery and Acceptance of a Quality Assurance Plan approved by a Classification Society recognized by Transport Canada for the Lightweight Gangways, see Section 4.2 of this SOW.

a. CCGS A. Leblanc

The Contractor must produce and deliver the LG (Item 2) as described in this SOW and in the following Table 5 to Pêches et Océans ou Garde côtière canadienne, 6 Rue du Chantier Maritime, Gaspé, QC, G4X 2E8. The deliverables under Items 1 and 2 must be emailed to TA for acceptance and the CA must be cc'd.

Table 5: Initial Contract, CCGS A. Leblanc

Item	Deliverable	Quantity
1	Delivery and Acceptance of the Lightweight Gangway Data Book with the corresponding serial number.	1
2	Delivery and Acceptance of the Lightweight Gangway, Model #1, manufactured as per ABS Review Letter T2129624, see Appendix 1 and drawing J20046-S02-R7, Note 8, see Appendix 2	1

b. CCGS Caporal Kaeble V.C.

The Contractor must produce and deliver the LG (Item 2) as described in this SOW and in the following Table 6 to Pêches et Océans ou Garde côtière canadienne, Dépôt 18, 101 boulevard Champlain, Québec, QC, G1K 7Y7. The deliverables under Items 1 and 2 must be emailed to TA for acceptance and the CA must be cc'd.

Table 6: Initial Contract, CCGS Caporal Kaeble V.C.

Item	Deliverable	Quantity
1	Delivery and Acceptance of the Lightweight Gangway Data Book with the corresponding serial number.	1
2	Delivery and Acceptance of the Lightweight Gangway, Model #2, manufactured as per ABS Review Letter T2129624, see Appendix 1 and drawing J20046-S02-R7, see Appendix 2	1

c. CCGS Constable Carrière

The Contractor must produce and deliver the LG (Item 2) as described in this SOW and in the following Table 7 to Pêches et Océans ou Garde côtière canadienne, Dépôt 18, 101 boulevard Champlain, Québec, QC, G1K 7Y7. The deliverables under Items 1 and 2 must be emailed to TA for acceptance and the CA must be cc'd.

Table 7: Initial Contract, CCGS Constable Carrière

Item	Deliverable	Quantity
1	Delivery and Acceptance of the Lightweight Gangway Data Book with the corresponding serial number.	1
2	Delivery and Acceptance of the Lightweight Gangway, Model #3, manufactured as per ABS Review Letter T2129624, see Appendix 1 and drawing J20046-S03-R6, see Appendix 2	1

d. CCGS Corporal Teather C.V. and CCGS G. Peddle S.C.

The Contractor must produce and deliver the LG (Item 2) as described in this SOW and in the following Table 8 to Bedford Institute of Oceanography, C/O Jeffrey Mercier, 1 Challenger Drive, Dartmouth, NS, B2Y 4A2. The deliverables under Items 1 and 2 must be emailed to TA for acceptance and the CA must be cc'd.

Table 8: Initial Contract, CCGS Corporal Teather C.V. and CCGS G. Peddle S.C.

Item	Deliverable	Quantity
1	Delivery and Acceptance of the Lightweight Gangway Data Book with the corresponding serial number.	2
2	Delivery and Acceptance of the Lightweight Gangway, Model #3, manufactured as per ABS Review Letter T2129624, see Appendix 1 and drawing J20046-S03-R6, see Appendix 2	2

4.1.2. Contract options

a. Option 1: CCGS M. Charles M.B.

The Contractor must produce and deliver the LG (Item 2) as described in this SOW and in the following Table 9 to Institute of Ocean Science, C/O Cody McMillan, 9860 W. Saanich Rd, Sidney, BC, V8L 1V6. The deliverables under Items 1 and 2 must be emailed to TA for acceptance and the CA must be cc'd.

Table 9: Option 1, CCGS M. Charles M.B.

Item	Deliverable	Quantity
1	Delivery and Acceptance of the Lightweight Gangway Data Book with the corresponding serial number.	1
2	Delivery and Acceptance of the Lightweight Gangway, Model #3, manufactured as per ABS Review Letter T2129624, see Appendix 1 and drawing J20046-S03-R6, see Appendix 2	1

b. Option 2: CCGS Private Robertson V.C.

The Contractor must produce and deliver the LG (Item 2) as described in this SOW and in the following Table 10 to Institute of Ocean Science, C/O Cody McMillan, 9860 W. Saanich Rd, Sidney, BC, V8L 1V6. The deliverables under Items 1 and 2 must be emailed to TA for acceptance and the CA must be cc'd.

Table 10: Option 2, CCGS Private Robertson V.C.

Item	Deliverable	Quantity
1	Delivery and Acceptance of the Lightweight Gangway Data Book with the corresponding serial number.	1
2	Delivery and Acceptance of the Lightweight Gangway, Model #3, manufactured as per ABS Review Letter T2129624, see Appendix 1 and drawing J20046-S03-R6, see Appendix 2	1

c. Option 3: CCGS Captain Goddard M.S.M.

The Contractor must produce and deliver the LG (Item 2) as described in this SOW and in the following Table 11 to Institute of Ocean Science, C/O Cody McMillan, 9860 W. Saanich Rd, Sidney, BC, V8L 1V6. The deliverables under Items 1 and 2 must be emailed to TA for acceptance and the CA must be cc'd.

Table 11: Option 3, CCGS Captain Goddard M.S.M.

Item	Deliverable	Quantity
1	Delivery and Acceptance of the Lightweight Gangway Data Book with the corresponding serial number.	1
2	Delivery and Acceptance of the Lightweight Gangway, Model #3, manufactured as per ABS Review Letter T2129624, see Appendix 1 and drawing J20046-S03-R6, see Appendix 2	1

4.2. Quality Assurance Plan

4.2.1. For all Contractor's work and for all parts and services acquired from all of its suppliers and subcontractors, the Contractor must ensure that the quality and performance prescribed by the contract are met. Therefore, within 21 days after contract award and prior to any manufacturing of the Lightweight Gangways or their components, the Contractor must develop and submit the Lightweight Gangway Quality Assurance (QA) Plan to the CCG TA for their review and acceptance. The QA Plan must be prepared in accordance with the latest issue, at contract date, of ISO 10005:2005 "Quality management systems – Guidelines for quality plans".

4.2.2. As a minimum, the QA Plan must include:

- a. The Contractor's proposed Quality Assurance activities at all stages of LG material procurement and storage, manufacturing, testing, certification, packaging, and delivery of final product, as required to meet the quality and performance standards imposed by this contract;
- b. The Contractor's Inspection and Test Plan (ITP); and,
- c. All related Inspection Report Forms and Test Sheets.

4.2.3. Upon acceptance of the QA Plan by the TA, the Contractor must implement the QA Plan. The Contractor must update the QA Plan throughout the term of the contract to reflect any changes to planned quality activities. The Contractor must resubmit any new versions of the QA Plan to the TA for approval.

4.3. Lightweight Gangway Inspection and Test Plan (ITP)

4.3.1. As part of the Quality Assurance Plan, the Contractor must develop and implement an Inspection and Test Plan (ITP); the Contractor's ITP must identify all inspection points, hold points, tests,

required attendances, and Inspection Report Forms and Test Sheets to be delivered to CCG TA following each of the following inspection/test activity:

1. Inspection, certification, and storage of the raw material received IAW Section 6.1 of this SOW;
2. Dimensional inspection of the assembly after welding but prior to CWB welding inspection IAW Section 7.1;
3. CWB welding inspection IAW Section 7.2;
4. Inspection of the anodic coating after application IAW Section 7.3; and,
5. Acceptance testing, including Set-to-Work procedure and Factory Acceptance Testing IAW Section 7.4.

4.3.2. Lightweight Gangway Test/Inspection Records and Certificates

- a. The Contractor must deliver a complete and accurate record of each test and inspection conducted IAW the Contractor's ITP as part of the contract. Prior to the commencement of a test or inspection, all relevant documentation and associated test sheets, including shop test data, must be complete and attached to the test/inspection agenda;
- b. Test and Inspection Records and Certificates are identified as a deliverables in the individual sections of this SOW;
- c. Test/Inspection Report Forms must be filled out, signed by the Contractor's representatives, and submitted to TA for review and acceptance after each inspection and testing phase. Test/Inspection Report Forms must be submitted to CCG TA as they are generated throughout the course of the Contract, and copies must be included in the final Data Book to be delivered at the conclusion of the project;
- d. The Contractor must include Test/Inspection Records, and Certificates as a separate section in the Databook;
- e. All reports must be completed in English or French (as agreed upon between CCG TA and the Contractor's Project Manager) in a timely manner (within a 24 hour period for small reports to a maximum of a week for detailed reports; timeline as identified by the CCG TA) and provided to the CCG TA immediately following their completion;
- f. The Contractor must ensure that all recorded test and inspection data is legible. Handwritten records must be transcribed into electronic format. The originals must be signed by the regulatory body, the TA, the Contractor and each subcontractor who witnessed the tests; and
- g. The Contractor must provide originals of each certificate document to the TA in an envelope marked with the individual LG serial number, the contract number, and the words "Original Certificates".

5. Project Management

5.1. Organization

The Contractor must have a named Project Manager (PM) who is responsible to carry out the work required for the LG. The Contractor's Project Manager must be the main point of contact with Canada, and must be fluent in written and spoken English and French.

5.2. Initial Kick-off Meeting and Progress Meetings

A project kick-off teleconference meeting will be organized by the Project Authority within two (2) weeks of contract award, and the date/time of said meeting must be provided to the CCG TA so that they can make arrangements to attend. Additional progress meetings will be organized by the PA on a weekly basis, and at times as agreed upon between both Canada and the Contractor.

6. New Lightweight Gangways (LG) Requirement

6.1. Manufacturing

6.1.1. The new LG shall be manufactured IAW ABS T2129624 Review Letter, ABS-approved drawing J20046-S02-R7 (Sheet 1, 2, and 3 of 3), and ABS-approved drawing J20046-S03-R6 (Sheet 1 and 2 of 2), identified as "Hero Class, 21FT x 30 IN Sectional Aluminum Gangway Assembly Details" and "Hero Class, 21FT x 30 IN Aluminum Gangway Structural Details", respectively (see Appendix 1 and 2) and:

- a. For the Initial Contract, the LG models will be; J20046-S02-R7, or J20046-S02-R7 Note 8 or J20046-S03-R6, see Section 4, Lightweight Gangway (LG) Delivery, Tables 5 to 8; and
- b. If an option was to be exercised, the LG model will be J20046-S03-R6, see Section 4, Tables 9 to 11.

6.1.2. All material used in the manufacturing of the Lightweight Gangways must be in "as new" condition, tested and certified by a Classification Society recognized by Transport Canada and IAW ABS Review Letter see Appendix 1.

Proof of compliance with the aforementioned documents must be provided to the TA prior to using raw material for LG manufacturing.

6.1.3. The storage, preparation, manufacturing, and finishing of the aluminum Lightweight Gangway must be performed with dedicated tools and in a dedicated area isolated from airborne foreign particulates that may contaminate the aluminum and its welding.

6.1.4. The Contractor must not use any asbestos-containing material.

6.1.5. Quality of manufacture requirements of ISO 7061:2015 or latest version at time of manufacture must be met.

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6.2. Welding

- 6.2.1** All welding and related activities must meet the requirements of CSA Standards W47.2 and W59.2, or equivalent international standard as accepted by CCG TA, such as AWS D1.2 “Structural Welding Code – Aluminum”, except as modified by the CCG Welding Specification CT-043-EQ-EG-001-E.
- 6.2.1.1** Where manufacturing and welding activities will take place outside of Canada, explicit permission from CCG TA and Class Surveyor from a Classification Society recognized by Transport Canada must be given if the Contractor intends to use international standards and certifications in place of CSA Standards W47.2 and W59.2; in this case, a complete audit of the proposed international standard is to be performed by CCG TA to ensure they meet CWB requirements.
- 6.2.2** For any item requiring the application of fusion welding to aluminum structures, the Contractor and all sub-contracted welders must be certified by the Canadian Welding Bureau to CSA W47.2, latest edition, and the Contractor’s company must be certified as Division 1 or 2 i.e. has full- or part-time welding engineer or international equivalent, as accepted by CCG TA.
- 6.2.3** For structural aluminum > 3 mm in thickness, welding must meet the requirements of CSA Standards W47.2 and W59.2 or international equivalent, as accepted by CCG TA, except as modified by the CCG Welding Specification CT-043-EQ-EG-001.
- 6.2.4** The Contractor must provide to the CCG TA proof of compliance with the welding certification requirements specified in CCG Welding Specification CT-043-EQ-EG-001. Typical documents include but are not necessarily limited to: Letter of Validation, Welding Procedures, Welder Performance Qualification Cards, Inspection Personnel Qualification Cards, Inspection Reports, etc.
- 6.2.5** IAW CCG Welding Specification CT-043-EQ-EG-001-E, all welding procedure specifications and/or welding procedure data sheets must be reviewed by CCG TA, Class Surveyor from a Classification Society recognized by Transport Canada, and CWB, and approved by CCG TA, Class Surveyor from a Classification Society recognized by Transport Canada, and CWB prior to use.
- 6.2.6** IAW CCG Welding Specification CT-043-EQ-EG-001-E, all welding personnel must be approved by the CWB and CCG TA prior to their commencing any welding work.
- 6.2.7** The Contractor must assemble and weld the gangway components using appropriate weld sequencing specifically developed to prevent distortion and maintain the alignment of the Lightweight Gangway and all of its components.
- 6.2.8** All welding completed on each Lightweight Gangway must be inspected and approved by certified welding inspector(s) as determined in section 7.2 of this SOW or international equivalent, as accepted by CCG TA and CWB, prior to application of anodic oxide coating (section 6.4 of this SOW).

6.3. Information Plate

- 6.3.1.** IAW ISO 7061:2015, the Contractor must permanently attach an engraved Information Plate in a prominent location on each LG and on both of its sections, when applicable. The data engraved on the information plate must be clear and legible. The size of the print used on the name plate must not be smaller than ¼ inch. An example is provided in Figure 3.

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6.3.2. The LG information plate must contain the following data as per ISO 7061:2015:

1. The manufacturer's name or trademark;
2. The name of the product ("Aluminum Shore Gangway");
3. The number of the International Standard ("ISO 7061");
4. The product specification – overall length and net width included in SAE and Metric;
5. The type of gangway ("Type A");
6. The design loading ("4000 N/m²/83.54 lb/ft²");
7. The working capacity ("6 persons or 1000lb, 1300 lb maximum, persons + gear")
8. The maximum permitted angle of inclination, in degrees;
9. The weight of the gangway section, in kilograms, with and without handrails;
10. The date of manufacture;
11. Lightweight gangway individual serial number; and
12. The stamp of the ship inspection department.

For example, the designation of an aluminum shore gangway of overall length 9 m, limited to 30° angle of inclination, is: Gangway ISO 7061-A9–30.

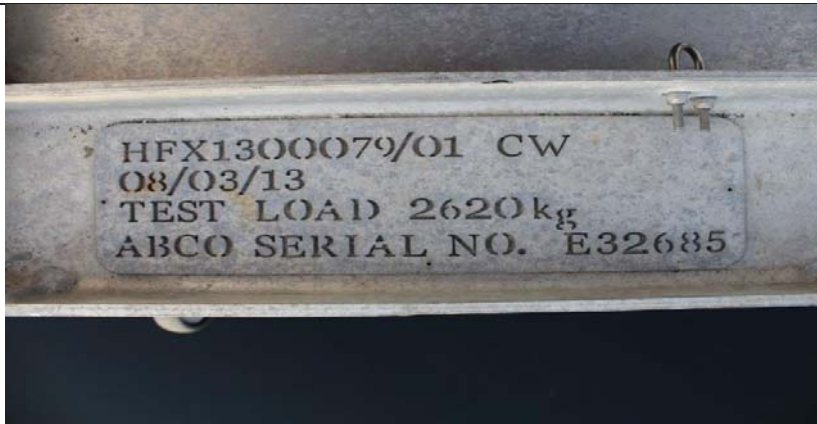


Figure 3 - Example of Information Plate

6.4. Anodic Oxide Treatment of the Aluminum LG Assembly, Handrails, and Treads (Anodization)

- 6.4.1.** Anodic oxide treatment suitable for the gangway material alloy (6061-T6 grade aluminum) must be carried out on all aluminum surfaces of the gangway assembly, gangway aluminum handrails with a thickness of 1.8 µm to 25 µm (0.00007" to 0.001"), and with the anti-slip treads IAW ABS-approved drawings J20046-S02-R7 and J20046-S03-R6 and ISO 7599:2018 "Anodizing of aluminum and its alloys – Specification for anodic oxidation coatings on aluminum and its alloys".

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This section is applicable only to the LG aluminum assembly, handrails, and aluminum anti-slip treads (prior to application of suitable anti-slip tape to treads).

- 6.4.2.** All cutting, drilling, welding, sanding, grinding and any other work on the LG aluminum assembly, handrails, and treads must be completed as per drawings J20046-S02-R7 and J20046-S03-R6 prior to anodic oxide treatment.
- 6.4.3.** In order to obtain optimum results, the handrails and aluminum anti-slip treads must be anodized separately from the rest of the LG aluminum assembly, and all removable components such as the Fibergrate decking (see Section 6.5), and casters (see Section 6.6) must be removed from the gangway assembly before anodization.
- 6.4.4.** All aluminum surfaces of the gangway assembly, handrails, and treads must be thoroughly cleaned and rinsed prior to treatment, IAW ISO 7599:2018.
- 6.4.5.** The anodic oxide coating must be grey in colour. The Contractor must consult CCG TA for alternate colour choice if grey is not available, or if multiple shades of grey are available.
- 6.4.6.** Contact (jigging) marks must be arranged to be in a hidden location wherever possible.
- 6.4.7.** Packaging and delivery of anodized articles must be IAW Annex G of ISO 7599:2018.

6.5. Decking

- 6.5.1.** This section is applicable only after the anodic oxide treatment has been completed and inspected according to contract requirements.
- 6.5.2.** For each LG, the Contractor must:
 - 1. Purchase and install new "Fibergrate Molded Grating" as decking for each LG, as per ABS-approved drawings J20046-S02-R7, and J20046-S03-R6, and,
 - a. The Fibergrate decking used must be 2"x2" square mesh, 1.0" thickness, with a minimum strength requirement of 383 pounds per square foot (psf);
 - b. The Fibergrate Molded Grating decking must be Fibergrate Vi-Corr® standard resin, unless otherwise recommended by the manufacturer;
 - c. The surface of the Fibergrate decking used must be the "grit" style, unless otherwise recommended by the manufacturer;
 - d. The Fibergrate decking must be secured to the Lightweight Gangway using suitable OEM Fibergrate clips that meet the following requirements:
 - 1. Clips must meet strength requirements IAW approved drawings;

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2. Clips must be composed of a material suitable for use outdoors to prevent corrosion due to exposure to salt water and air in 316 Stainless steel or equivalent; and
3. Clips must be composed of a material compatible for use on aluminum structures (i.e. accounting for dissimilar metals so as to prevent galvanic corrosion).
- e. The Contractor must cut and install the Fibergrate decking such that the mesh pattern is closed at the ends of each section of gangway;
- f. The colour of the Fibergrate decking used must be "dark grey", and the Contractor must consult CCG TA for alternate colour choice if unavailable;
- g. The Contractor must follow all manufacturers' recommendations with regards to Fibergrate molded grating product selection, layout, and installation, including clip and hardware selection and installation. If any conflicts arise, the Contractor must contact CCG TA for a resolution;

Fibergrate website: <https://www.fibergrate.com/products/molded-gratings/fibergrate%C2%AE-molded-gratings/>

2. Incorporate horizontal aluminum anti-slip treads (otherwise known as "steps", as per ISO 7061:2015) to the decking arrangement, as per ABS-approved drawings J20046-S02-R7, and J20046-S03-R6:
 - a. Treads must be welded to bolting plates (two bolting plates per tread) and securely fastened at both ends to the gangway aluminum structure via the bolting plates using 1/4"-20 UNC 6061-T6 bolts, and either one of the following options at the Contractor's discretion:
 - i. 1/4"-20 UNC 6061-T6 hex nuts, with 1/4" 6061-T6 lock washers installed between the hex nuts and the gangway structure, and 1/4" 6061-T6 flat washers installed between the bolt heads and gangway structure (1 flat washer per bolt); Or
 - ii. 1/4"-20 UNC 6061-T6 nylon lock nuts, with 1/4" 6061-T6 flat washers installed between the hex nut and the gangway structure, and 1/4" 6061-T6 flat washers installed between the bolt heads and gangway structure (2 flat washers per bolt).
 - b. Tread and bolting plate material must be 6061-T6 aluminum; and
 - c. All treads must be covered with anti-slip tape, only after the treads have been treated with anodic oxide coating.

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6.6. Casters

6.6.1. Caster make and model

- a. The Contractor must purchase and install the required number of casters on each LG in accordance with ABS-approved drawings J20046-S02-R7, and J20046-S03-R6. Casters must be in "as new" condition and must be the caster model Colson, part number 120XP04201SL stipulated in drawings J20046-S02-R7 and J20046-S03-R6, which were selected specifically for their diameter and load rating;
- b. The caster mount plate designs shown in drawings J20046-S02-R7, and J20046-S03-R6 are compatible with the specific caster model stipulated therein (Colson, part number 120XP04201SL).

7. Inspections

7.1. Dimensional Inspection of the fully assembled LG following all welding

- 7.1.1. For each LG, following all welding and grinding of the fully assembled LG as per drawings J20046-S02-R7, J20046-S02-R7 Note 8 and J20046-S03-R6, and IAW the approved ITP, the Contractor must conduct a complete Dimensional Inspection of the LG and submit to the TA the Dimensional Inspection report for review and acceptance before proceeding further.

7.2. Welding Inspection

- 7.2.1. For each LG, following the accepted Dimensional Inspection of the fully assembled and welded LG, the Contractor must schedule attendance by a certified Canadian Welding Bureau (CWB) inspector or international equivalent, as accepted by CCG TA and CWB to conduct a welding inspection IAW the approved ITP and CCG Welding Specification CT-043-EQ-EG-001.
- 7.2.2. For each LG, the Class Surveyor from a Classification Society recognized by Transport Canada and CCG TA must also be given opportunity to be in attendance for the CWB welding inspection. The recognized Classification Society may waive this requirement.
- 7.2.3. For each LG, the welding inspection must consist of the following:
 - a. Visual inspection on one hundred percent (100%) of the welds, to be performed by CWB inspector certified to CSA W178.2, Level 2 or higher or international equivalent, as accepted by CCG TA; and
 - b. Non-destructive liquid dye penetrant inspection (LPI) on hundred percent (100%) of the welds, to be performed by a CAN/CGSB 48.9712 Level 2 inspector or higher or international equivalent, as accepted by CCG TA, with the assistance of the Contractor if required.

- 7.2.4.** For each LG, the attending certified welding inspector(s) as determined in 7.2.3, Class Surveyor from a Classification Society recognized by Transport Canada, and CCG TA must all be satisfied with the results of the welding inspection for the inspection to be deemed "successful".
- 7.2.5.** Following each successful welding inspection, the Contractor must provide to the CCG TA the following deliverables for review and acceptance before proceeding further:
- All original reports submitted by the attending certified welding inspector(s) as determined in 7.3.3, signed by all attending parties including CCG TA and Class Surveyor from a Classification Society recognized by Transport Canada; and
 - Copies of all certification required to prove compliance with CCG Welding Specification CT-043-EQ-EG-001 and CSA W59.2 or international equivalent, as accepted by CCG TA.
- 7.2.6.** All costs of re-work deemed necessary by the attending certified welding inspector(s) as determined in 7.2.3 or Class Surveyor from a Classification Society recognized by Transport Canada as a result of an unsuccessful welding inspection must be done at the Contractor's expense.

7.3. Anodization Inspection

- 7.3.1.** For each aluminum LG assembly, following completion and certification of anodic oxide treatment, the Contractor must conduct a visual Anodization Inspection of one hundred percent (100%) of the LG and the handrails, IAW the Contractor's ITP and ISO 7599:2018, Anodizing of aluminum and its alloys – Specification for anodic oxidation coatings on aluminum and its alloys.
- 7.3.2.** The Contractor must provide the CCG TA or their delegated representative the opportunity to attend each Anodization Inspection, therefore the Contractor must advise the TA of the Anodization Inspection date for each LG a minimum of two (2) weeks in advance or as agreed upon by CCG TA and the Contractor.
- 7.3.3.** The Anodization Inspection Report must be submitted to the TA for their review and acceptance.

7.4. Acceptance Testing

- 7.4.1.** The Contractor must implement the Acceptance Testing procedures IAW the approved ITP. The Contractor is responsible for all costs associated with the normal activities of the certifying Classification Society recognized by Transport Canada throughout the Acceptance Testing activities.

7.4.2. Set-to-Work Procedures

- In preparation for the FAT, the Lightweight Gangway must be Set-to-Work, meaning that the Contractor must fully assemble all gangway components and ensure that all components fit smoothly and function as intended, to the satisfaction and acceptance of CCG TA;

- b. Gangway components that must be Set-to-Work include, but are not limited to: Pinned connections, handrails, latching rod, casters, and Fibergrate decking;
- c. As part of Set-to-Work procedures, the Contractor must measure and record the weight of each fully assembled gangway with and without handrails using a calibrated scale; and
- d. The Contractor must schedule the CCG TA or their delegated representative to view each LG when Set-to-Work.

7.4.3. Factory Acceptance Tests (FAT)

- a. Following Set-to-Work procedures, the Contractor must complete a FAT on each individual fully assembled Lightweight Gangway. The entire FAT must be conducted IAW the approved ITP, and must be witnessed and accepted by the attending Class Surveyor from a Classification Society recognized by Transport Canada;
- b. CCG TA or their delegated representative, and the CA or their delegated representative must also be provided opportunity to attend the FAT, therefore the TA and the CA must be advised of the FAT date a minimum of two (2) weeks in advance;
- c. The Contractor will provide all necessary documents to the CCG TA and Class Surveyor from a Classification Society recognized by Transport Canada IAW Sections 7.1, 7.2, and 7.3 of this SOW prior to scheduling the FAT;
- d. For the FAT of each gangway, the Contractor must perform a full capacity load test IAW ISO 7061:2015, Ships and Marine Technology: "Aluminium Shore Gangways for Seagoing Vessels" or latest version at time of manufacture, to the satisfaction of the Class Surveyor from a Classification Society recognized by Transport Canada, consisting of the following:
 1. The handrails and casters previously installed for Set-to-Work procedures must be temporarily removed from the LG prior to load testing to prevent damage to those components;
 2. Each gangway must be lifted by means of the integral lifting lugs, and inspected to ensure no evidence of strain to the lugs or the adjacent structure;
 3. Each gangway must then be supported at both ends, oriented at a zero degree angle from the horizontal, and at a sufficient height that will prevent the gangway or test weights from touching the ground when loaded. "Initial sag" of each gangway must be determined and recorded IAW ISO 7061:2015; and
 4. Immediately after results of "initial sag" are determined, a uniform testing load equivalent to 4000 N/m² (or 83.54 lb/ft²) must be applied uniformly and without shock to the longitudinal centerline of the gangway decking:
 - i. The load must be arranged from a selection of conveniently sized sandbags or other material that will not damage the gangway, and located at equally spaced intervals of not more than 1m or 3.28 feet;

- ii. Where the design incorporates individual decking plates, apply a load equivalent to 4000 N/m² (83.54 lb/ft²) to each plate;
 - iii. The test load must be maintained for fifteen (15) minutes before the total deflection of the gangway at each side stringer is measured to determine “deflection under load”, IAW ISO 7061:2015; and,
 - iv. The Contractor must provide a calibrated weight scale and ensure said calibrated weight scale is readily available during load testing to verify the weight of the sandbags/weights, if requested by the attending Class Surveyor from a Classification Society recognized by Transport Canada .
- e. Immediately following the aforementioned load test, the Contractor, in the presence of CCG TA and Class Surveyor from a Classification Society recognized by Transport Canada , must carefully inspect the gangway to ensure the following minimum criteria have been met to the satisfaction of CCG TA and the Class Surveyor from a Classification Society recognized by Transport Canada :
1. There is no distortion of the sideframes;
 2. The decking and anti-slip treads are adequately secured;
 3. The handrails can be easily erected into position;
 4. Removable fittings can be properly stowed when the gangway is dismantled; and,
 5. The information plate of the section 6.3 of this SOW is affixed and correct.
- f. Canada accepts responsibility for the outcome of the full capacity load test, including all material, fabrication, and disposal costs, unless failure of the FAT resulting in rejection by the attending Class Surveyor from a Classification Society recognized by Transport Canada occurs as a result of Contractor error, negligence, or non-compliance with contract documents;
- g. If failure is found to be a result of Contractor error, negligence, and/or non-compliance with contract documents or manufacturers’ recommendations, and the LG in question can reasonably be repaired by the Contractor to the satisfaction of the attending Class Surveyor from a Classification Society recognized by Transport Canada, then:
1. The Contractor must carry out the required repairs at their own expense; or
 2. The disposal of the rejected LG and manufacturing the replacement LG will be the responsibility of the Contractor.
- h. All costs of all subsequent inspections by a Class Surveyor from a Classification Society recognized by Transport Canada required on the same LG due to the Contractor’s error, negligence, and/or non-compliance with the contract documents or manufacturers’ recommendations will be the responsibility of the Contractor; and

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- i. In the event the gangway fails the load test and is rejected by the attending Class Surveyor from a Classification Society recognized by Transport Canada for any reason, the Contractor must immediately stop the manufacturing of subsequent LG's in production, and consult CCG TA for a resolution. The Contractor must also consult CCG TA for authorization and instructions for disposal of the LG(s) in question.

7.4.4. Factory Acceptance Test (FAT) Reports

IAW the approved ITP of the Section 4.3 of this SOW, the Contractor must deliver a complete and accurate record of each Factory Acceptance Test for each LG conducted as part of the Contract; the LG FAT Reports must be delivered to the CCG TA and attending Class Surveyor from a Classification Society recognized by Transport Canada after the completion of the FAT for review and acceptance by both parties.

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Appendix 1

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Reference T2051099, dated 18-NOV-2020.



Page 1 of 2

Task – T2051099

"PRIVATE ROBERTSON V.C.", Class No.: 12276268,
"CAPORAL KAEBLE V.C.", Class No.: 12276269,
"CORPORAL TEATHER C.V.", Class No.: 13276270,
"CONSTABLE CARRIERE", Class No.: 13276271,
"G. PEDDLE S.C.", Class No.: 13276267,
"CORPORAL MCLAREN M.M.V.", Class No.: 13276272,
"A. LEBLANC", Class No.: 14276273,
"M. CHARLES M.B.", Class No.: 14276274,
"CAPTAIN GODDARD M.S.M.", Class No.: 14276275,
HALIFAX SHIPYARD., Hulls 6094, 6095, 6096, 6097, 6098, 6099, 6101,
6102, and 6103
Flag: Canada

Attention: Nathalie Elliott, CANADIAN COAST GUARD (477243)

The documents shown in the attached list are reviewed in accordance with the applicable requirements of the following as part of a Statement of Compliance (SOC) review:

- ABS Rules for Building and Classing High Speed Craft, 2020
- Transport Canada Regulations (SOR/2007-128)
- ISO 5488:2015 Ships and Marine Technology – Accommodation Ladders

Please note our review is based on the following conditions:

1. The work is to be completed to the satisfaction of the attending ABS Surveyor.
2. Materials used in the submittals are to be free from asbestos.

For any clarifications, contact Richard McCullough at (281) 877-6816 or RMcCullough@eagle.org and Md Abdullah abdullah@eagle.org.

Very truly yours,

Roy H. Bleiberg
Vice President, Engineering

Electronically Signed by: Richard McCullough

ABS Global Engineering
275 Slater Street, Suite 1003 | Ottawa (ON), K1P 5H9 | Canada

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Documents List

Drawing No.	Rev. No.	Title	Status
J20046-S03	1	21 FT x 30 IN Aluminum Gangway Structural Details	Reviewed
J20046-S02	1	21 FT x 30 IN Aluminum Gangway Assembly Details	Reviewed
AF6097-89940-01	AF	GENERAL ARRANGEMENT PLAN	Filled for Reference
ATS-5071398-H-01	-	LR Design Appraisal Document, 21 ft Sectional Gangway	Filled for Reference

Electronic copies of the documents appropriately stamped, are available in the ABS Client Portal.

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Appendix 2

Drawing J20046-S02-R7

See attached documents

Drawing J20046-S03-R6

See attached documents

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ANNEX "B"
Basis of Payment / Financial Evaluation Plan

1. Initial Contract

Item	Hero Class / Mid Shore Patrol Vessels (MSPVs)	Firm Unit Price
1	Delivery and Acceptance of CCGS A. Leblanc, all deliverables IAW Annex A, SOW, Table 5	\$
2	Delivery and Acceptance of CCGS Caporal Kaebler V.C., all deliverables IAW Annex A, SOW, Table 6	\$
3	Delivery and Acceptance of CCGS Constable Carrière, all deliverables IAW Annex A, SOW, Table 7	\$
4	Delivery and Acceptance of CCGS Corporal Teather C.V., all deliverables IAW Annex A, SOW, Table 8	\$
5	Delivery and Acceptance of CCGS G. Peddle S.C., all deliverables IAW Annex A, SOW, Table 8	\$
Total Price of the Initial Contract		\$

2. Contract Options

Any Contract Option, must to be approved, in writing, by the Contracting Authority before their incorporation into the Contract.

Option	Hero Class / Mid Shore Patrol Vessels (MSPVs)	Firm Unit Price
1	Delivery and Acceptance of CCGS M. Charles M.B., all deliverables IAW Annex A, SOW, Table 9	\$
2	Delivery and Acceptance of CCGS Private Robertson V.C., all deliverables IAW Annex A, SOW, Table 10	\$
3	Delivery and Acceptance of CCGS Captain Goddard M.S.M., all deliverables IAW Annex A, SOW, Table 11	\$
Total Price of the Contract Options		\$

3. Blended Hourly Labor Rate for Additional and Unscheduled Work

Item	Hero Class / Mid Shore Patrol Vessels (MSPVs)	Firm Hourly Labor Rate
1	Blended Hourly Labor Rate for Additional and Unscheduled Work	\$

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4. For evaluation purpose only. Blended Hourly Labor Rate applicable to the LG Additional and Unscheduled Design, Engineering, Manufacturing and Testing Work

TOTAL EVALUATION PRICE OF THE BLENDED HOURLY LABOUR RATE APPLICABLE TO THE LG ADDITIONAL AND UNSCHEDULED DESIGN, ENGINEERING, MANUFACTURING AND TESTING WORK			
DESCRIPTION	FIRM HOURLY LABOR RATE	LEVEL OF EFFORT FOR EVALUATION PURPOSE ONLY	TOTAL PRICE OF THE ADDITIONNAL AND UNSCHEDULED WORK
Blended Hourly Labor Rate applicable to the LG Additional and Unscheduled Design Engineering, Manufacturing and Testing Work. Rate use in this section 4 must be same as the one used in Section 3 above.	\$	500 Hours	\$

5. For evaluation purpose only. Total Evaluation Price of the Proposal

Item	Hero Class / Mid Shore Patrol Vessels (MSPVs)	Prices
1	Annex B, Section 1, Total Price of the Initial Contract	\$
2	Annex B, Section 2, Total Price of the Contract Options	\$
3	Annex B, Section 4, Total Price of the Additional and Unscheduled Work	\$
Total Evaluation Price of the Proposal		\$

Signed: _____ Date: _____

ANNEX "C"

PROCEDURE FOR PROCESSING ADDITIONAL / UNSCHEDULED WORK

1. Purpose

The Additional / Unscheduled Work (A/U Work) Procedure has been instituted for the following purposes:

- A) To establish a uniform method of dealing with requests for A/U Work;
- B) To obtain the necessary Technical Authority approval and Contracting Authority authorization before A/U Work commences; and
- C) To provide a means of maintaining a record of A/U Work requirements including Serial Numbers, dates, and accumulated costs. The Contractor shall have a cost accounting system that is capable of assigning job numbers for each A/U Work requirement so that each requirement can be audited individually.

2. Definitions and Particulars:

- A) An A/U Work Procedure is a contractual procedure whereby changes to the scope of Work under the Contract may be defined, priced and contractually agreed to. Such changes may arise from:
 - i. "Work Arising" from the contracted Work (Unscheduled Work), or;
 - ii. "New Work" not initially contracted but requiring to be done in order to achieve the contract (Additional Work).
- B) The procedure does not allow for the correction of deficiencies in the Contractor's Proposal;
- C) No A/U Work may be undertaken by the Contractor without written authorization of the Contracting Authority except under emergency circumstances described in Sub. Paragraph 3(b);
- D) Work undertaken without written Contracting Authority authorization will be considered the Contractor's responsibility and cost, and;
- E) The form PWGSC-TPSGC [1379](#) (10/2011) will contain the final description of the A/U Work requirement, and the prices negotiated and agreed to.

3. Procedures:

- A) The procedure involves the electronic form PWGSC-TPSGC [1379](#) (10/2011) for refit and repair and will be the only form for authorizing all A/U Work;
- B) Emergency measures required to prevent loss or damage to the Procured Equipment and /or the Vessel which would occur if this A/U Work procedure were followed, shall be taken by the Contractor on its own authority. The responsibility for the cost of such measures shall be determined in accordance with the terms and conditions of the Contract;

- C) The Technical Authority will initiate a work estimate request by defining the A/U Work requirement. It will attach drawings, sketches, additional specifications, other clarifying details as appropriate, and allocate their Serial Number for the request;
- D) Notwithstanding the foregoing, the Contractor may propose to the Technical Authority in writing, either by letter or some type of Defect Advice Form (this is the Contractor's own form) that certain A/U Work should be carried out;
- E) The Technical Authority will either reject or accept such Proposal, and advise the Contractor and Contracting Authority. Acceptance of the Proposal is not to be construed as authorization for the work to proceed. If required, the Technical Authority will then define the A/U Work requirement in accordance with Sub. Paragraph 3.C);
- F) The Contractor will electronically submit its Proposal to the Contracting Authority together with all price support, any qualifications, remarks or other information requested;

The price support must demonstrate the relationship between the scope of work, the Contractor's estimated costs and its selling blended hourly Labor rate of the Annex B, Basis of Payment. It is a breakdown of the Contractor's Blended Hourly Labor Rate, estimate of material cost per item, for both the contractor and all of its subcontractors, estimates of any related impact, and an evaluation of the contractor's time required to perform the A/U Work;

- G) The Contractor must provide copies of purchase orders and paid invoices for Subcontracts and/or materials, including stocked items, in either case. The Contractor shall provide a minimum of two quotations for Subcontracts or materials. If other than the lowest, or sole source is being recommended for quality and/or delivery considerations, this shall be noted. On request to the Contractor, the Contracting Authority shall be permitted, to meet with any proposed Subcontractor or material supplier for discussion of the price and always with the Contractor's representative present;
- H) After discussion between the Contracting Authority and the Contractor and if no negotiation is required, the Contracting Authority will seek Technical Authority confirmation to proceed by signing the form. The Contracting Authority will then sign and authorize the A/U Work to proceed;
- I) In the event the Technical Authority does not wish to proceed with the work, it will cancel the proposed A/U Work through the Contracting Authority in writing;
- J) In the event the negotiation involves a Credit, the appropriate PWGSC form will be noted as "credit" accordingly, and;
- K) In the event that the Technical Authority requires A/U Work of an urgent nature or an impasse has occurred in negotiations, the commencement of the A/U Work should not be unduly delayed and should be processed as follows, in either case. The Contractor will complete the appropriate PWGSC 1379 form indicating the offered cost and pass it to the Contracting Authority. If the Technical Authority wishes to proceed, the Technical Authority and the Contracting Authority will sign the completed PWGSC 1379 form with the notation, "CEILING PRICE SUBJECT TO DOWNWARD ADJUSTMENT", and allocate a Serial Number having the suffix "A". The work will proceed with the understanding that following an audit of the Contractor's actual costs for completing the described work, the cost will be finalized at the ceiling price or lower, if justified by the audit. A new PWGSC 1379 form will then be completed with the finalized costs, signed and issued with the same Serial Number

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without the suffix "A", and bearing a notation that this form is replacing and cancelling the form having the same Serial Number with the suffix "A".

NOTE: PWGSC 1379 forms bearing Serial Numbers with a suffix "A" shall not to be included in any contract amendments, and therefore no payment shall be made until final resolution of the price and incorporation into the contract.

4. Amendment to Contract or Formal Agreement

The Contract will be amended from time to time in accordance with the Contract terms to incorporate the costs authorized on the appropriate PWGSC 1379 forms.

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ANNEX "D" to PART 3 OF THE BID SOLICITATION

Electronic Payment Instrument(s)

As indicated in Part 3, clause 3.1.1, the Bidder must identify which electronic payment instruments they are willing to accept for payment of invoices.

The Bidder accepts any of the following Electronic Payment Instrument(s):

- ☐ VISA Acquisition Card;
- ☐ MasterCard Acquisition Card;
- ☐ Direct Deposit (Domestic and International);
- ☐ Electronic Data Interchange (EDI); and
- ☐ Wire Transfer (International Only).

Signed: _____ **Date:** _____

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ANNEX "E"

Mandatory Technical Evaluation Criteria

Item #	Criteria	Compliant		Reference to applicable page and paragraph of Bidder's Proposal
		Yes	No	
1	Bidder must provide proof of company's valid Canadian Welding Bureau (CWB) certification to CSA Standard W47.2, Division 1 or 2, and CSA Standard W59.2 or international equivalents as approved by CCG TA. The Bidder must agree to maintain all required certifications until the completion of the LG contract, including contract options.			
2	Bidder must provide proof of valid certification to CSA Standard W47.2 and W59.2 or international equivalent as approved by CCG TA certification for its welding supervisors.			
3	Bidder must provide proof of valid certification to CSA Standard W47.2 and W59.2 or international equivalent as approved by CCG TA certification for its employee welders and/or sub-contracted welders.			
4	Bidder must provide proof of valid certification to CSA Standard certification or international equivalent as approved by CCG TA for its employee inspectors and/or sub-contracted inspectors as follows: a. Inspectors performing Visual Inspections require Level 2 or higher certification according to CSA W178.2; b. Inspectors performing Non-Destructive Testing (NDT) require certification to CAN/CGSB 48.9712, Level 2 or higher.			
5	Bidder must provide: - CWB-approved welding procedure specifications, signed and stamped by a certified welding engineer; - Procedure Qualification Record (PQR) or international equivalent as explicitly approved by CCG TA; and - Supporting welding data sheets.			
6	Bidder must provide the name of their subcontractor they intend to use for the anodizing, if the anodization is not done in house. Bidder must demonstrate that their			

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	company or their sub-contractor will meet the contract anodization requirements and that their anodization tanks are large enough to fully immerse the longest LG.			
7	Bidder must demonstrate that they have successfully welded at least three (3) aluminium structures of similar complexity to the LG in the last five (5) years.			

Signed: _____

Date: _____

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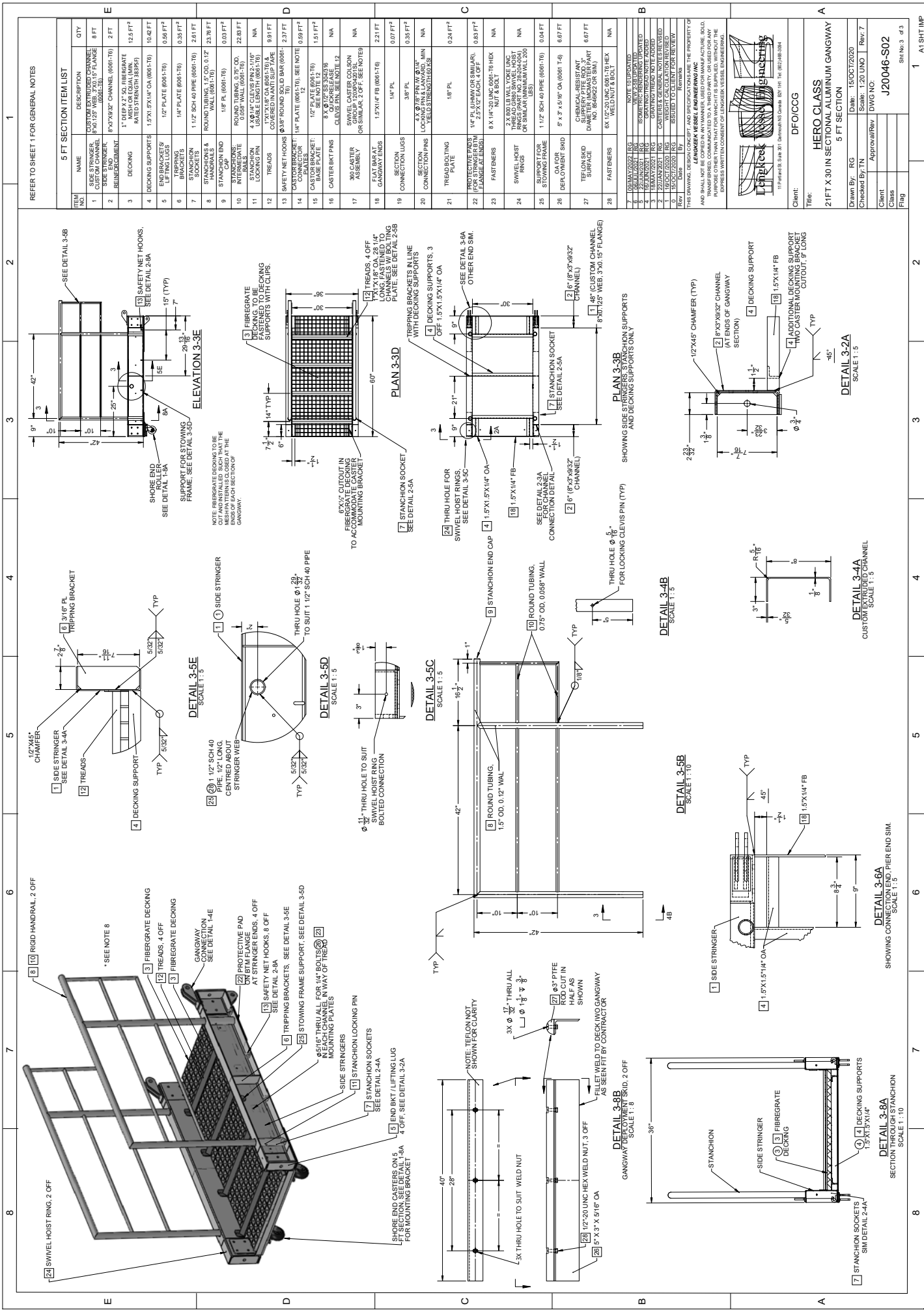
Buyer ID - Id de l'acheteur
066ml
CCC No./N° CCC - FMS No./N° VME

ANNEX "F"
EXAMPLE OF A STATEMENT OF COMPLIANCE TO THE SOW
IN A REQUIREMENT MATRIX FORMAT

SOW REF #	SOW PARAGRAPH TITLE	COMPLIANCE	CROSS REFERENCE IN BIDDER'S PROPOSAL	COMMENTS
1.1	Purpose	Comply	Read and understood	
1.2	Background	Comply	Read and understood	
1.3	Objectives	Comply	Read and understood	
2.	References			
2.2	Government Furnished Documents			
2.3	Applicable Standards and Regulations			
3.	Miscellaneous Provisions			
3.5	Measurements, Calibrations, and Readings			
4.1	Deliverables	Comply	Read and understood	
5.	Project Management	Comply	Read and understood	
6.	New Lightweight Gangways (LG) Requirement	Comply	Read and understood	
7.	Inspections			

Signed: _____ **Date:** _____

Instruction to Bidder: It is mandatory that all sections of the SOW must be addressed in the Compliance Matrix.



3

8	SHIP END CONNECTION: LUG	1/2" PLATE (6061-T6)	0.3 FT ²
	SHIP END		

14	ROPE FASTENING POINT	Ø 1/4" SOLID ROUND BAR (6061-T6)	3.70 FT
----	----------------------	----------------------------------	---------

20	CASTER BRACKET:	1/2" PLATE (6061-T6)	1.54 CT2
----	-----------------	----------------------	----------

25	PROTECTIVE PADS (FOR STRINGER RTM)	1/4" PL (UHMW OR SIMILAR).	0.94 CT2
		NUT & BOLT	

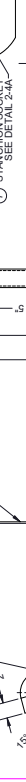
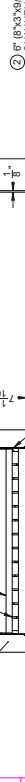
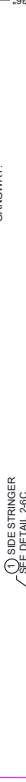
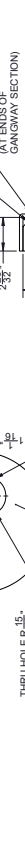
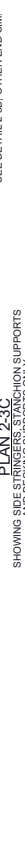
28	SUPPORT FOR STOWING FRAME	1 1/2" SCH 40 PIPE (6051-T6)	0.08 FT
----	---------------------------	------------------------------	---------

6	09/MAY/2022	RG	NOTE 9 UPDATED
---	-------------	----	----------------

TRANSFERRED, COMMUNICATED TO A THIRD PARTY, OR USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUPPLIED, WITHOUT THE

HERO CLASS

	A1 SHT IMP
1	





Fisheries and Oceans
Canada

Pêches et Océans
Canada

Coast Guard

Garde côtière

18-080-000-SG-003
(FORMERLY DFO/5884)

Paints and Coatings Standard



Canadian Coast Guard
Standards

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[illegible]

FOREWORD

This Standard is issued by the Director General Integrated Technical Support, CCG's National Authority under delegation from Deputy Minister Fisheries and Oceans and the Commissioner of the Canadian Coast Guard.

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1.0 GENERAL

1.1 Paints and Coatings Standard

This Standard has been prepared by Canadian Coast Guard, Fisheries and Oceans Canada, Ottawa.

The intended purpose is to provide basic paints and coatings specifications for use on ships and boats.

Refer to ***Canadian General Standards Board CAN/CGSB - 1.211-95 Coating Systems for Marine Floating Navigational Aids (buoys)*** for Paints and Coatings Standard for use on floating aids (buoys).

Paints and coatings from various manufacturers may slightly alter specifications. The manufacturers specifications and product data sheets should always be consulted and adhered to. Once a specification has been written using a specific coating, manufacturers' products, always obtain technical approval from the manufacturer for the specification

All inquiries regarding this Standard, including suggestions for revision and requests for interpretation shall be addressed to Director, Technical Services, Canadian Coast Guard, Fisheries and Oceans Canada, 200 Kent Street, 7th Floor, Ottawa, Ontario, CANADA, K1A 0E6.

All requests should:

- define the problem;
- reference the specific section, sub-section, paragraph, data sheet, and;
- provide a detailed explanation surrounding the actual work conditions.

2.0 TERMS AND COMMENTS

The following terms apply to this Standard:

- 2.1 *New building specifications*** are based on the assumption that latest generation (low) zinc shop primer is utilized.
- 2.2 *Surface preparation*** for underwater systems generally calls for gritblasting to SA 2½ for optimum results. Some coating manufacturers may allow their products to be applied to a lesser standard (say SA2). Also there may be special circumstances that dictates a lesser standard be used than that specified.
- 2.3 *Abrasive blasting*** standards Sa2 and Sa 2½ refers to Swedish standard SIS 055900.
- 2.4 *Power tool cleaning*** standard PT2 and PT3 refers to Shipbuilding Research Association of Japan (JSRA). See also section on Surface Preparation.
- 2.5 *Wash off of oil and grease*** is effectively done using an emulsifying cleaner. This type of cleaner can readily be rinsed off the surface with freshwater.
- 2.6 *Application:*** The number of coats and dry film thickness (DFT) listed in the specifications are generally based on the coating being applied by airless spray. When coatings are applied by brush and/or roller, as often is the case during on board maintenance (OBM), two or more coats may be necessary to obtain the specified DFT. Always consult Manufacturer's Product Data Sheets for wet film thickness needed to achieve required DFT, and use wet film thickness gauge for every coat.
- 2.7 *Products:*** Primers containing lead and chromates have been used extensively in the past. Due to their toxicity alternate products have been developed. Many good lead and chromate free primers are available and should be used instead of the old lead/chromate types. As far as is practical and available, lead free top coats should also be promoted.
- 2.8 *Epoxy Coatings:*** are used extensively in the specifications in this Standard. They are tough, long-wearing coatings that by far out perform single component conventional paints. In general, pure epoxy coatings are specified on exterior areas of the vessel and modified epoxy coatings (hydro carbon resin modified) on most internal areas. It should be noted that modified epoxies can be used externally and pure epoxies internally. The choice is based on the fact that modified epoxies tend to be less abrasion resistant and less resistant to solvents and chemicals than the pure epoxies. However, they can also be lower in cost than pure epoxies. One drawback with epoxy coatings is their tendency to chalking and loss of gloss (and colour) after some time of exterior exposure. On areas of a vessel, such as the superstructure, where a good cosmetic finish is desirable, polyurethane cosmetic coats have been widely specified. However in the last few years acrylic modified epoxy coatings have become available. They may not have quite the "gloss retention" of a polyurethane finish but will retain reasonable gloss for several years. In this standard acrylic modified epoxy coatings, (AME) can be specified or substituted for polyurethane finish (PUF) at the same DFT. (See also Section 2.9)
- 2.9 *Polyurethane Coatings*** A large number of specifications in this standard specify polyurethane finish (PUF) as a cosmetic coat over high build epoxy coatings. These coating systems are considered excellent systems with long service life. However, polyurethane coatings contain isocyanate which may present a health hazard. The applicator must consult product data sheets and material safety data sheets for these products concerning health and safety information. If a paint contractor or shipyard would prefer not to apply polyurethane coatings, acrylic modified epoxy (AME) can be specified or substituted. (See also section 2.8)

Terms and Comments

- 2.10 Antifouling:** Specified in this Standard is of the type called Controlled Depletion Polymer Antifouling (CDP). Most of these antifoulings are TBT (tributyltin) free. Other types of antifouling such as self-polishing copolymer (SPC) types are very efficient products and are fully acceptable from a technical point of view. However, these antifoulings often contain TBT. Although the leaching rate of TBT in antifoulings in Canada is strictly controlled by Agriculture Canada, Pesticides Division, the use of these products is controversial. If, from an operational point of view, such antifoulings are desirable, they can, in most cases, be substituted or interchanged with CDP types. The 24 months service period in these specifications may be substantially prolonged by the application of more coats and higher DFT.

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4.0 PAINTS AND COATINGS SPECIFICATION SHEETS**4.1 Steel Vessels****4.1.1 EXTERNAL AREAS: UNDERWATER SYSTEMS**

EXTERNAL AREAS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ VESSELS THAT, DURING NORMAL OPERATION, SEE SERVICE IN ICE.			▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS		
UNDERWATER HULL AND RUDDER			SYSTEM: HIGH ABRASION RESISTANT LOW FRICTION EPOXY COATING		
SURFACE PREPARATION:		HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. (NOT APPLICABLE TO NEW BUILDINGS.) GRITBLAST ² ALL STEEL TO Sa2½. ON NEW BUILDINGS, ALL SHOP PRIMER MUST BE REMOVED. SURFACE PROFILE TO BE A <u>MINIMUM</u> OF 80µ (MICRONS). PAY PARTICULAR ATTENTION TO SURFACE PROFILE ON NEW STEEL.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	HARPE ³ - LFC ⁴		1 FULL	750	
NOTE(S):					
Definition(s):		<div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div> <div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div> <div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div> <div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div> <div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div> <div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div> <div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div> <div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div> <div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div> <div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div>			
ABBREVIATION(S):		HARPE-LFC = HIGH ABRASION RESISTANCE PURE EPOXY - LOW FRICTION COATING			

EXTERNAL AREAS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
<ul style="list-style-type: none"> ▪ VESSELS THAT, DURING NORMAL OPERATION, SEE SERVICE IN ICE. 			<ul style="list-style-type: none"> ▪ ON BOARD MAINTENANCE ▪ M & R DOCKING 		
UNDERWATER HULL AND RUDDER			SYSTEM: HIGH ABRASION RESISTANT LOW FRICTION EPOXY COATING		
SURFACE PREPARATION:		HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. DAMAGED AND BARE AREAS TO BE GRITBLASTED ² TO Sa2½. SURFACE PROFILE TO BE A <u>MINIMUM</u> OF 80µ (MICRONS). PAY PARTICULAR ATTENTION TO SURFACE PROFILE ON NEW STEEL. EXISTING COATING EDGES TO BE FEATHERED BY CAREFUL BLASTING 6-8" (15-20 CM) INTO SOUND COATING SURFACE.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	HARPE ³ - LFC ⁴		1 T/U	750	
NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		HARPE-LFC = HIGH ABRASION RESISTANCE PURE EPOXY - LOW FRICTION COATING			

EXTERNAL AREAS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ VESSELS THAT, DURING NORMAL OPERATION, DO NOT SEE SERVICE IN ICE, BUT REQUIRE A HIGH ABRASION RESISTANT COATING.			▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS		
Underwater Hull and Rudder			SYSTEM: HIGH ABRASION RESISTANT PURE EPOXY COATING (ANTIFOULING OPTIONAL)		
SURFACE PREPARATION:		HIGH PRESSURE FRESHWATER WASH ¹ WASH OFF OIL AND GREASE. (NOT APPLICABLE TO NEW BUILDINGS.) GRITBLAST ² ALL STEEL TO Sa2½. ON NEW BUILDINGS, ALL SHOP PRIMER MUST BE REMOVED. STEEL SHOULD HAVE A SURFACE PROFILE OF 80µ MINIMUM.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
A	HARPE ³		1 FULL ⁷	125	
	HARPE ³		1 FULL ⁷	125	
IF ANTIFOULING IS REQUIRED:					
B	VME ⁶ (TIECOAT) CDPAF		1 FULL 2 FULL	75-100 75 EA. *	* BEST OPTION FOR GOOD COATING DISTRIBUTION
OR:					
	CDPAF		1 FULL	150	
NOTE(S):		▪ TIECOAT MAY BE OMITTED IF ANTIFOULING CAN BE APPLIED TO EPOXY COAT WHILE STILL "THUMB PRINT SOFT". ▪ ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS SERVICE.			
Definition(s):		<ol style="list-style-type: none">HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(S):		HARPE = HIGH ABRASION RESISTANCE PURE EPOXY VME = VINYL MODIFIED EPOXY CDPAF = CONTROLLED DEPLETION POLYMER ANTIFOULING (TBT FREE)			

EXTERNAL AREAS: UNDERWATER SYSTEMS					
Vessel Type / Characteristics:			Type of Specification:		
▪ VESSELS THAT, DURING NORMAL OPERATION, DO <u>NOT</u> SEE SERVICE IN ICE, BUT REQUIRE A HIGH ABRASION RESISTANT COATING.			▪ ON BOARD MAINTENANCE ▪ M & R DOCKING		
UNDERWATER HULL AND RUDDER			SYSTEM: HIGH ABRASION RESISTANT PURE EPOXY COATING (ANTIFOULING OPTIONAL)		
SURFACE PREPARATION:		HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. DAMAGED AND BARE AREAS TO BE GRITBLASTED ² TO SA2½. STEEL SHOULD HAVE A SURFACE PROFILE OF 80µ MINIMUM. EXISTING COATING EDGES TO BE FEATHERED BY CAREFUL BLASTING 6-8" (15-20 CM) INTO SOUND COATING SURFACE.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
A	HARPE ³		1 T/U ⁷	125	
	HARPE ³		1 T/U ⁷	125	
IF ANTIFOULING IS REQUIRED:					
B	VME ⁶ (TIECOAT) CDPAF		1 T/U 2 FULL	75-100 75 EA. *	* BEST OPTION FOR GOOD COATING DISTRIBUTION
OR:					
	CDPAF		1 FULL	150	
NOTE(S):		▪ TIECOAT MAY BE OMITTED IF ANTIFOULING CAN BE APPLIED TO EPOXY COAT WHILE STILL "THUMB PRINT SOFT". ▪ ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS SERVICE. ▪ NEW ANTIFOULING MUST BE COMPATIBLE WITH OLD ANTIFOULING			
Definition(s):		<ol style="list-style-type: none">HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(S):		HARPE = HIGH ABRASION RESISTANCE PURE EPOXY VME = VINYL MODIFIED EPOXY CDPAF = CONTROLLED DEPLETION POLYMER ANTIFOULING (TBT FREE)			

EXTERNAL AREAS: UNDERWATER SYSTEMS					
Vessel Type / Characteristics:			Type of Specification:		
<ul style="list-style-type: none"> VESSELS THAT, DURING NORMAL OPERATION, DO <u>NOT</u> SEE SERVICE IN ICE, BUT REQUIRE AN ABRASION RESISTANT EPOXY COATING. 			<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 		
UNDERWATER HULL AND RUDDER			SYSTEM: ABRASION RESISTANT PURE EPOXY COATING (ANTIFOULING OPTIONAL)		
SURFACE Preparation:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½. NEW BUILDINGS: SECONDARY SURFACE PREPARATION OF SHOP PRIMER SHOULD BE BLASTING TO SA2½ OR POWER TOOL ⁹ CLEANING TO PT3. ALL ZINC SALTS (WHITE RUST), IF ANY, MUST BE REMOVED BY LIGHT BLASTING OR SCRUBBING AND WASHING.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
A	ARPE ⁸		1 FULL	125	
	ARPE ⁸		1 FULL	125	
IF ANTIFOULING IS REQUIRED:					
B	ARPE ⁸		1 FULL	125	* BEST OPTION FOR GOOD COATING DISTRIBUTION
	VME ⁶		1 FULL	125	
	CDPAF		2 FULL	75 EA *	
OR:					
	CDPAF		1 FULL	150	
NOTE(S):		<ul style="list-style-type: none"> IF FIRST COAT OF ANTIFOULING CAN BE APPLIED TO THE EPOXY COAT WHILE IT IS STILL "THUMB PRINT SOFT", SYSTEM "A" CAN BE USED. ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS SERVICE. 			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		ARPE = ABRASION RESISTANT PURE EPOXY VME = VINYL MODIFIED EPOXY CDPAF = CONTROLLED DEPLETION POLYMER ANTIFOULING (TBT FREE)			

EXTERNAL AREAS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
<ul style="list-style-type: none"> ▪ VESSELS THAT, DURING NORMAL OPERATION, DO <u>NOT</u> SEE SERVICE IN ICE, BUT REQUIRE AN ABRASION RESISTANT EPOXY COATING. 			<ul style="list-style-type: none"> ▪ ON BOARD MAINTENANCE ▪ DOCKING 		
UNDERWATER HULL AND RUDDER			SYSTEM:		
			ABRASION RESISTANT PURE EPOXY COATING (ANTIFOULING OPTIONAL)		
SURFACE PREPARATION:		HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. DAMAGED AND BARE AREAS TO BE GRITBLASTED ² TO SA2½. EXISTING COATING EDGES TO BE FEATHERED BY CAREFUL BLASTING 6-8" (15-20 CM) INTO SOUND COATING SURFACE.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
A	ARPE ⁸ ARPE ⁸		1 T/U 1 T/U	125 125	
IF ANTIFOULING IS REQUIRED:					
B	ARPE ⁸ VME ⁶ CDPAF		1 T/U 1 T/U 2 FULL	125 125 75 EA.	BEST OPTION FOR GOOD COATING DISTRIBUTION
OR:					
	CDPAF		1 FULL	150	
NOTE(s):		<ul style="list-style-type: none"> ▪ IF FIRST COAT OF ANTIFOULING CAN BE APPLIED TO THE EPOXY COAT WHILE IT IS STILL "THUMB PRINT SOFT", SYSTEM A CAN BE USED. ▪ ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS' SERVICE. ▪ NEW ANTIFOULING MUST BE COMPATIBLE WITH OLD ANTIFOULING. 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		ARPE = ABRASION RESISTANT PURE EPOXY VME = VINYL MODIFIED EPOXY CDPAF = CONTROLLED DEPLETION POLYMER ANTIFOULING (TBT FREE)			

EXTERNAL AREAS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> VESSELS THAT, DURING NORMAL OPERATION, DO <u>NOT</u> SEE SERVICE IN ICE AND WHERE A VINYL ANTICORROSIVE COATING IS DESIRED. 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
UNDERWATER HULL AND RUDDER				SYSTEM:	
				TAR FREE VINYL ANTICORROSIVE SYSTEM WITH ANTIFOULING	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT, BY LIGHT GRIT BLASTING OR SCRUBBING AND WASHING. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE BLASTED TO SA2½ OR POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	VATF ⁷		1 FULL	100	3 COATS OF 75µ EACH GIVES BETTER COATING DISTRIBUTION BEST OPTION FOR GOOD COATING DISTRIBUTION
	VATF ⁷		1 FULL	125	
	CDPAF		2 FULL	75 EA.	
OR:					
	CDPAF		1 FULL	150	
NOTE(S):		<ul style="list-style-type: none"> VINYL ANTICORROSIVE COATINGS WHEN APPLIED TO PROPER FILM THICKNESS, ARE CONSIDERED VERY EFFECTIVE. LOW TEMPERATURE APPLICATION PROPERTIES HAVE MADE THEM POPULAR IN COLD CLIMATES. HOWEVER, DUE TO LEGISLATION REGARDING VOC REGULATIONS, THESE PRODUCTS, WILL IN THE FUTURE, BE REPLACED BY VOC COMPLIANT PRODUCTS. ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS SERVICE. 			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		VATF = VINYL ALUMINUM ANTICORROSIVE TAR FREE CDPAF = CONTROLLED DEPLETION POLYMER ANTIFOULING (TBT FREE)			

EXTERNAL AREAS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
<ul style="list-style-type: none"> VESSELS THAT, DURING NORMAL OPERATION, DO NOT SEE SERVICE IN ICE AND WHERE A VINYL ANTICORROSIVE COATING IS DESIRED. 			<ul style="list-style-type: none"> ON BOARD MAINTENANCE DOCKING 		
UNDERWATER HULL AND RUDDER			SYSTEM: TAR FREE VINYL ANTICORROSIVE SYSTEM WITH ANTIFOULING		
SURFACE PREPARATION:	HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² ALL DAMAGED AREAS TO SA2½.				
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	VATF ⁷ VATF ⁷ CDPAF		1 T/U 1 T/U 2 FULL	100 125 75 EA.	BEST OPTION FOR GOOD COATING DISTRIBUTION
OR:					
	CDPAF		1 FULL	150	
NOTE(s):	<ul style="list-style-type: none"> VINYL ANTICORROSIVE COATINGS WHEN APPLIED TO PROPER FILM THICKNESS, ARE CONSIDERED VERY EFFECTIVE. LOW TEMPERATURE APPLICATION PROPERTIES HAVE MADE THEM POPULAR IN COLD CLIMATES. HOWEVER, DUE TO LEGISLATION REGARDING VOC REGULATIONS, THESE PRODUCTS, WILL IN THE FUTURE, BE REPLACED BY VOC COMPLIANT PRODUCTS. ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS' SERVICE. NEW ANTIFOULING MUST BE COMPATIBLE WITH OLD ANTIFOULING 				
Definition(s):	<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 				
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EXTERNAL AREAS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS. 			<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 		
SEA CHESTS			SYSTEM: PURE EPOXY COATING WITH ANTIFOULING. FOR USE ON EPOXY OR VINYL COATED VESSELS.		
SURFACE PREPARATION:		HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. (NOT APPLICABLE TO NEW BUILDINGS.) GRITBLAST ² TO SA2½. ON NEW BUILDINGS, PREPARE DAMAGED SHOP PRIMER AREAS WITH POWER TOOLS ⁹ TO PT3 OR BLAST TO SA2½.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	PE VME ⁶ CDPAF		1 FULL 1 FULL 2 FULL	125 125 75 EA.	BEST OPTION FOR GOOD COATING DISTRIBUTION
OR:					
	CDPAF		1 FULL	150	
NOTE(s):		<ul style="list-style-type: none"> A SYSTEM UTILIZING 2 COATS OF PURE EPOXY COATINGS FOLLOWED BY 2 COATS OF ANTIFOULING, CAN BE USED IF ANTIFOULING CAN BE APPLIED WHILE EPOXY COATING IS STILL "THUMB PRINT SOFT". MODIFIED EPOXY COATING MAY BE USED INSTEAD OF PURE EPOXY COATINGS. ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS SERVICE. FOR VESSELS COATED WITH HIGH ABRASION OR ABRASION RESISTANT EPOXY COATINGS, IT MAY BE DESIRABLE AND PRACTICAL TO USE THESE COATINGS IN THE SEA CHESTS. IF SO, USE SAME SYSTEM AS FOR UNDERWATER HULL. 			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		PE = PURE EPOXY COATING VME = VINYL MODIFIED EPOXY CDPAF = CONTROLLED DEPLETION POLYMER ANTIFOULING (TBT FREE)			

EXTERNAL AREAS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
<ul style="list-style-type: none"> ▪ ALL APPLICABLE VESSELS. 			<ul style="list-style-type: none"> ▪ ON BOARD MAINTENANCE ▪ DOCKING 		
SEA CHESTS			SYSTEM: PURE EPOXY COATING WITH ANTIFOULING. FOR USE ON EPOXY OR VINYL COATED VESSELS.		
SURFACE PREPARATION:		HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. IF PRESENT COATING IS IN POOR CONDITION, GRITBLAST ² TO SA2½ AND APPLY SYSTEM AS LISTED UNDER MAJOR REFIT/REBLAST. IF PRESENT SYSTEM IS IN PERFECT CONDITION JUST APPLY NEW ANTIFOULING AS PER SYSTEM LISTED UNDER MAJOR REFIT/REBLAST. IF REPAIRS TO EXISTING SYSTEM IS NEEDED BLAST DAMAGED AREAS TO SA2½ OR POWER TOOL ⁹ CLEAN TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	PE VME ⁶ CDPAF		1 T/U 1 T/U 2 FULL	125 125 75 EA.	BEST OPTION FOR GOOD COATING DISTRIBUTION
OR:					
	CDPAF		1 FULL	150	
NOTE(S):		<ul style="list-style-type: none"> ▪ A SYSTEM UTILIZING 2 COATS OF PURE EPOXY (PE) COATINGS FOLLOWED BY 2 COATS OF ANTIFOULING, CAN BE USED IF ANTIFOULING CAN BE APPLIED WHILE EPOXY COATING IS STILL "THUMB PRINT SOFT". ▪ MODIFIED EPOXY (ME) COATING MAY BE USED INSTEAD OF PE COATINGS. ▪ ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS' SERVICE. ▪ FOR VESSELS COATED WITH HIGH ABRASION OR ABRASION RESISTANT EPOXY COATINGS, IT MAY BE DESIRABLE AND PRACTICAL TO USE THESE COATINGS IN THE SEA CHESTS. IF SO, USE SAME SYSTEM AS FOR UNDERWATER HULL. ▪ NEW ANTIFOULING MUST BE COMPATIBLE WITH OLD ANTIFOULING 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		PE = PURE EPOXY COATING VME = VINYL MODIFIED EPOXY CDPAF = CONTROLLED DEPLETION POLYMER ANTIFOULING (TBT FREE)			

EXTERNAL AREAS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS. 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
SEA CHESTS				SYSTEM:	
				TAR FREE VINYL ANTICORROSIVE SYSTEM WITH ANTIFOULING.	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½. NEW BUILDINGS: REMOVE ALL ZINC SALTS (WHITE RUST) IF PRESENT, BY LIGHT GRITBLASTING OR SCRUBBING AND WASHING. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE BLASTED TO SA2½ OR POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	VATF ⁷		1 FULL	100	BEST OPTION FOR GOOD COATING DISTRIBUTION
	VATF ⁷		1 FULL	125	
	CDPAF		2 FULL	75 EA.	
OR:					
	CDPAF		1 FULL	150	
NOTE(s):		<ul style="list-style-type: none"> VINYL ANTICORROSIVE COATINGS WHEN APPLIED TO PROPER FILM THICKNESS, ARE CONSIDERED VERY EFFECTIVE. LOW TEMPERATURE APPLICATION PROPERTIES HAVE MADE THEM POPULAR IN COLD CLIMATES. HOWEVER, DUE TO LEGISLATION REGARDING VOC REGULATIONS, THESE PRODUCTS, WILL IN THE FUTURE, BE REPLACED BY VOC COMPLIANT PRODUCTS. ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS SERVICE. 			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		VATF = VINYL ALUMINUM ANTICORROSIVE TAR FREE CDPAF = CONTROLLED DEPLETION POLYMER ANTIFOULING (TBT FREE)			

EXTERNAL AREAS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS. 			<ul style="list-style-type: none"> ON BOARD MAINTENANCE DOCKING 		
SEA CHESTS			SYSTEM:		
			TAR FREE VINYL ANTICORROSIVE SYSTEM WITH ANTIFOULING.		
SURFACE PREPARATION:		<p>HIGH PRESSURE FRESHWATER WASH¹. WASH OFF OIL AND GREASE. PREPARE DAMAGED AND CORRODED AREAS BY GRITBLASTING² TO Sa2½ OR POWER TOOL⁹ CLEAN TO PT3.</p> <p>IF NO DAMAGE OR CORROSION IS PRESENT, HIGH PRESSURE FRESHWATER WASH¹ AND APPLY 2 COATS OF ANTIFOULING.</p>			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	VATF ⁷		1 T/U	100	
	VATF ⁷		1 T/U	125	
	CDPAF		2 FULL	75 EA.	BEST OPTION FOR GOOD COATING DISTRIBUTION
OR:					
	CDPAF		1 FULL	150	
NOTE(S):		<ul style="list-style-type: none"> VINYL ANTICORROSIVE COATINGS WHEN APPLIED TO PROPER FILM THICKNESS, ARE CONSIDERED VERY EFFECTIVE. LOW TEMPERATURE APPLICATION PROPERTIES HAVE MADE THEM POPULAR IN COLD CLIMATES. HOWEVER, DUE TO LEGISLATION REGARDING VOC REGULATIONS, THESE PRODUCTS, WILL IN THE FUTURE, BE REPLACED BY VOC COMPLIANT PRODUCTS. ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS SERVICE. NEW ANTIFOULING MUST BE COMPATIBLE WITH OLD ANTIFOULING 			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		<p>VATF = VINYL ALUMINUM ANTICORROSIVE TAR FREE</p> <p>CDPAF = CONTROLLED DEPLETION POLYMER ANTIFOULING (TBT FREE)</p>			

EXTERNAL AREAS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS				REFERENCE	
IN WAY OF CATHODIC PROTECTION				<u>SYSTEM:</u>	
SURFACE PREPARATION:					
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
NOTE(s):		<ul style="list-style-type: none"> ▪ PLEASE REFER TO SPECIFICATIONS PROVIDED BY THE SUPPLIER / MANUFACTURER OF THE CATHODIC PROTECTION SYSTEM. ▪ FOR MORE INFORMATION ON CATHODIC PROTECTION, SEE SECTION 6.0, CATHODIC PROTECTION (PAGE 144). 			
Definition(s):					
ABBREVIATION(s):					

4.1.2 EXTERNAL AREAS: ABOVE WATER SYSTEMS

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
ALL VESSELS (STEEL)			MAJOR REFIT / REBLAST NEW BUILDINGS		
TOPSIDE AND EXTERIOR BULWARK			SYSTEM: ABRASION RESISTANT PURE EPOXY AND POLYURETHANE		
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² ALL STEEL TO SA2½ (PREFERRED) OR SA2 NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY LIGHT GRITBLASTING OR SCRUBBING AND WASHING. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE BLASTED TO SA2½ OR SA2 OR POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ARPE ⁸ ARPE ⁸ PUF ¹⁰ OR AME		1 FULL 1 FULL 1 FULL	100 100 50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(S):					
Definition(s):		<div><div>1.</div><div>HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div></div> <div><div>2.</div><div>GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div></div> <div><div>3.</div><div>HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>4.</div><div>LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div></div> <div><div>5.</div><div>ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div></div> <div><div>6.</div><div>VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div></div> <div><div>7.</div><div>SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div></div> <div><div>8.</div><div>ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>9.</div><div>POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div></div> <div><div>10.</div><div>PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(S):		ARPE = ABRASION RESISTANT PURE EPOXY PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
TOPSIDE AND EXTERIOR BULWARK				SYSTEM: ABRASION RESISTANT PURE EPOXY AND POLYURETHANE	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW 2 COATS OF EPOXY ALUMINUM AND 1 TOP COAT TO BE APPLIED IN ONE DAY, (DEPENDENT ON TEMPERATURE.) ABRASION RESISTANT PURE EPOXY COATING (AS IN PRESENT SYSTEM) MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE		1 T/U	100	SEE ITEMS 2.8 AND 2.9, PAGE 2
	APSTE		1 T/U	100	
	PUF ¹⁰ OR AME		1 T/U	50	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
TOPSIDE AND EXTERIOR BULWARK				<u>SYSTEM:</u> PURE EPOXY AND MODIFIED ACRYLIC TOP COAT	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW 2 COATS OF EPOXY ALUMINUM AND 1 TOP COAT TO BE APPLIED IN ONE DAY, (DEPENDENT ON TEMPERATURE.) EPOXY COATINGS (AS IN PRESENT SYSTEM) MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE APSTE MAF		1 T/U 1 T/U 1 OR 2T/U	100 100 40 EA.	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY MAF = MODIFIED ACRYLIC FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
TOPSIDE AND EXTERIOR BULWARK				SYSTEM: MODIFIED ALKYD PRIMER AND MODIFIED ACRYLIC FINISH	
SURFACE PREPARATION:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTIPURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP		1 T/U	75	
	MPMAP		1 T/U	75	
	MAF		1 OR 2T/U	40 EA.	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER MAF = MODIFIED ACRYLIC FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
TOPSIDE AND EXTERIOR BULWARK				SYSTEM:	
				ALKYD	
SURFACE PREPARATION & COMMENTS:		<p>WASH OFF OIL AND GREASE. FRESHWATER WASH¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD.</p> <p>MANY TYPES OF ALKYD OR MODIFIED ALKYD PRIMERS ARE AVAILABLE AND SUITABLE FOR MAINTENANCE OF ALKYD SYSTEMS. CHOOSE A SURFACE TOLERANT, MULTI-PURPOSE FAST DRYING PRIMER WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.</p>			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP MPMAP AF		1 T/U 1 T/U 1 OR 2T/U	75 75 40 EA.	
NOTE(S):		<p>▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.</p>			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		<p>MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER</p> <p>AF = ALKYD FINISH</p>			

EXTERNAL AREAS: ABOVE WATER SYSTEMS						
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:			
ALL VESSELS (STEEL)			MAJOR REFIT / REBLAST NEW BUILDINGS			
BULWARK INTERIOR			SYSTEM: ABRASION RESISTANT PURE EPOXY AND POLYURETHANE			
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² ALL STEEL TO SA2½ (PREFERRED) OR SA2 NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY LIGHT GRITBLASTING OR SCRUBBING AND WASHING. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE BLASTED TO SA2½ OR SA2 OR POWER TOOL ⁹ CLEANED TO PT3.				
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS	
	ARPE ARPE PUF ¹⁰ OR AME		1 FULL 1 FULL 1 FULL	100 100 50	SEE ITEM 2.8 AND 2.9, PAGE 2	
NOTE(s):		ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.				
Definition(s):		<div><div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div><div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div><div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div><div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div><div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div><div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div><div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div><div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>				
ABBREVIATION(S):		ARPE = ABRASION RESISTANT PURE EPOXY PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY				

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
BULWARK INTERIOR				SYSTEM: ABRASION RESISTANT PURE EPOXY AND POLYURETHANE	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW 2 COATS OF EPOXY ALUMINUM AND 1 TOP COAT TO BE APPLIED IN ONE DAY, (DEPENDENT ON TEMPERATURE.) EPOXY COATINGS (AS IN PRESENT SYSTEM) MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE		1 T/U	100	SEE ITEMS 2.8 AND 2.9, PAGE 2
	APSTE		1 T/U	100	
	PUF ¹⁰ OR AME		1 T/U	50	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div><div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div><div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div><div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div><div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div><div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div><div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div><div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(S):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
BULWARK INTERIOR				SYSTEM: PURE EPOXY AND MODIFIED ACRYLIC TOP COAT	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW 2 COATS OF EPOXY ALUMINUM AND 1 TOP COAT TO BE APPLIED IN ONE DAY, (DEPENDENT ON TEMPERATURE.) EPOXY COATINGS (AS IN PRESENT SYSTEM) MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE		1 T/U	100	
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	MAF		1 OR 2T/U	40 EA.	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY MAF = MODIFIED ACRYLIC FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL VESSELS (STEEL)			▪ ON BOARD MAINTENANCE		
BULWARK INTERIOR			SYSTEM: MODIFIED ALKYD PRIMER AND MODIFIED ACRYLIC FINISH		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTIPURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP		1 T/U	75	
	MPMAP		1 T/U	75	
	MAF		1 OR 2T/U	40 EA.	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1.</div><div>HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div></div> <div><div>2.</div><div>GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div></div> <div><div>3.</div><div>HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>4.</div><div>LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div></div> <div><div>5.</div><div>ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div></div> <div><div>6.</div><div>VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div></div> <div><div>7.</div><div>SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div></div> <div><div>8.</div><div>ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>9.</div><div>POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div></div> <div><div>10.</div><div>PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER MAF = MODIFIED ACRYLIC FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
BULWARK INTERIOR				SYSTEM: ALKYD	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTIPURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75 μ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	MPMAP		1 T/U	75	
	MPMAP		1 T/U	75	
	AF		1 OR 2T/U	40 EA.	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER AF = ALKYD FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS 			<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 		
STEEL DECKS - UNDER DECK MACHINERY			SYSTEM:		
			PURE EPOXY		
SURFACE PREPARATION:		REBLAST: IF OLD EQUIPMENT IS REMOVED AND NEW EQUIPMENT INSTALLED - HIGH PRESSURE FRESHWATER WASH. WASH ¹ OFF OIL AND GREASE. GRITBLAST ² TO Sa2½. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) BY LIGHT GRITBLASTING OR SCRUBBING AND WASHING. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE BLASTED TO Sa2½ OR POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	PE		1 FULL	250	
NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		PE = PURE EPOXY COATING			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
STEEL DECKS - UNDER WOOD PLANKING				SYSTEM:	
				PURE EPOXY	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½ (PREFERRED) OR SA2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) BY LIGHT GRITBLASTING OR SCRUBBING AND WASHING. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE BLASTED TO SA2½ OR SA2 OR POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	PE		1 FULL	125	
	PE		1 FULL	125	
NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		PE = PURE EPOXY COATING			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
<ul style="list-style-type: none"> ▪ ALL VESSELS WITH STEEL DECKS 			<ul style="list-style-type: none"> ▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS 		
EXTERIOR DECKS			SYSTEM: ABRASION RESISTANT PURE EPOXY (OPTIONAL POLYURETHANE TOP COAT)		
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½ (PREFERRED) OR SA2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) BY LIGHT GRITBLASTING OR SCRUBBING AND WASHING. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE BLASTED TO SA2½ OR SA2 OR POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	ARPE ⁸		2 FULL	100 EA.	BEST OPTION FOR GOOD COATING DISTRIBUTION
OR:					
	ARPE ⁸		1 FULL	200	
IF A COSMETIC COAT IS DESIRABLE, APPLY:					
	PUF ¹⁰ OR AME		1 FULL	50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(S):		<ul style="list-style-type: none"> ▪ WHERE A NON-SKID SURFACE IS DESIRABLE, ADD 3 KG (7 LBS.) OF GLASS GRANULES TO 5 GAL. (20 L) OF EPOXY COATING AND APPLY THIS AS SECOND COAT. GRANULE COARSENESS OF 18-25 U.S. SCREEN SIZE GIVES A GOOD NON-SKID FINISH. ALUMINUM OXIDE GRIT CAN ALSO BE USED. 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		ARPE = ABRASION RESISTANT PURE EPOXY COATING PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS WITH STEEL DECKS				▪ ON BOARD MAINTENANCE	
EXTERIOR DECKS				SYSTEM: ABRASION RESISTANT PURE EPOXY (OPTIONAL POLYURETHANE TOP COAT)	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ⁹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW FOR 2 OR MORE COATS TO BE APPLIED IN ONE DAY (DEPENDENT ON TEMPERATURE). TWO COATS OF ABRASION RESISTANT PURE EPOXY COATING AS IN PRESENT SYSTEM, MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE ARPE ⁸		1 T/U 1 T/U	100 100	
If A COSMETIC COAT IS DESIRABLE, APPLY:					
	PUF ¹⁰ OR AME		1 T/U	50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(s):		<ul style="list-style-type: none"> ONE COAT OF ARPE (ABRASION RESISTANT PURE EPOXY COATING) TO 200μ IS ALSO ACCEPTABLE. WHERE A NON-SKID SURFACE IS DESIRABLE, ADD 3 KG (7 LBS.) OF GLASS GRANULES TO 5 GAL. (20 L) OF EPOXY COATING AND APPLY THIS AS SECOND COAT. GRANULE COARSENESS OF 18-25 U.S. SCREEN SIZE GIVES A GOOD NON-SKID FINISH. ALUMINUM OXIDE GRIT CAN ALSO BE USED. ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE. 			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY ARPE = ABRASION RESISTANT PURE EPOXY COATING PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL VESSELS WITH STEEL DECKS			▪ ON BOARD MAINTENANCE		
EXTERIOR DECKS			SYSTEM: PURE EPOXY AND MODIFIED ACRYLIC FINISH		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW FOR 2 OR MORE COATS TO BE APPLIED IN ONE DAY (DEPENDENT ON TEMPERATURE). TWO COATS OF EPOXY COATING AS IN PRESENT SYSTEM, MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE		1 T/U	100	
	APSTE		1 T/U	100	
	MAF		1 OR 2 T/U	40 EA.	
NOTE(s):		<ul style="list-style-type: none">▪ ONE COAT OF APSTE (ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY) TO 200μ IS ALSO ACCEPTABLE.▪ WHERE A NON-SKID SURFACE IS DESIRABLE, ADD 3 KG (7 LBS.) OF GLASS GRANULES TO 5 GAL. (20 L) O F EPOXY COATING AND APPLY THIS AS SECOND COAT. GRANULE COARSENESS OF 18-25 U.S. SCREEN SIZE GIVES A GOOD NON-SKID FINISH. ALUMINUM OXIDE GRIT CAN ALSO BE USED.▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none">1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(s):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY MAF = MODIFIED ACRYLIC FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
EXTERIOR DECKS				<u>SYSTEM:</u> MODIFIED ALKYD PRIMER AND MODIFIED ACRYLIC FINISH	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTIPURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP		1 T/U	75	
	MPMAP		1 T/U	75	
	MAF		1 OR 2 T/U	40 EA.	
NOTE(s):		<ul style="list-style-type: none">▪ FOR THIN FILM TOP COATS SUCH AS ACRYLICS, USE GROUND NUTSHELLS, 0.5 KG (1 LB.) PER GAL., OR POLYPROPYLENE BEADS, 0.25 KG (8 OZ.) PER GAL., FOR NON-SKID AGENT.▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none">1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(S):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER MAF = MODIFIED ACRYLIC FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS WITH STEEL DECKS				▪ ON BOARD MAINTENANCE	
EXTERIOR DECKS				SYSTEM: ALKYD	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. MANY TYPES OF ALKYD OR MODIFIED ALKYD PRIMERS ARE AVAILABLE. CHOOSE A SURFACE TOLERANT, MULTIPURPOSE, FAST DRYING PRIMER WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP MPMAP MAF		1 T/U 1 T/U 1 OR 2 T/U	75 75 40 EA.	
NOTE(S):		<ul style="list-style-type: none">▪ FOR THIN FILM TOP COATS SUCH AS ALKYD, USE GROUND NUTSHELLS, 0.5 KG (1 LB.) PER GAL., OR POLYPROPYLENE BEADS, 0.25 KG (8 OZ.) PER GAL., FOR NON-SKID AGENT.▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none">1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(S):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER MAF = MODIFIED ACRYLIC FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL VESSELS WITH STEEL DECKS 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
FLIGHT DECKS				SYSTEM: ABRASION RESISTANT PURE EPOXY (OPTIONAL POLYURETHANE TOP COAT)	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½ (PREFERRED) OR SA2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) BY LIGHT GRITBLASTING OR SCRUBBING AND WASHING. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE BLASTED TO SA2½ OR SA2 OR POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	ARPE		2 FULL	100 EA.	BEST OPTION FOR GOOD COATING DISTRIBUTION
OR:					
	ARPE		1 FULL	200	
FOR MARKINGS AND AS A COSMETIC COAT IF DESIRABLE					
	PUF ¹⁰ OR AME		1 FULL	50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(S):		<ul style="list-style-type: none"> WHERE A NON-SKID SURFACE IS DESIRABLE, ADD 3 KG (7 LBS.) OF GLASS GRANULES TO 5 GAL. (20 L) OF EPOXY COATING AND APPLY THIS AS SECOND COAT. GRANULE COARSENESS OF 18-25 U.S. SCREEN SIZE GIVES A GOOD NON-SKID FINISH. ALUMINUM OXIDE GRIT CAN ALSO BE USED. 			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		ARPE = ABRASION RESISTANT PURE EPOXY COATING PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL VESSELS WITH STEEL DECKS			▪ ON BOARD MAINTENANCE		
FLIGHT DECKS			SYSTEM: ABRASION RESISTANT PURE EPOXY (OPTIONAL POLYURETHANE TOP COAT)		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ⁹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW FOR 2 OR MORE COATS TO BE APPLIED IN ONE DAY (DEPENDENT ON TEMPERATURE). TWO COATS OF ABRASION RESISTANT PURE EPOXY COATING AS IN PRESENT SYSTEM, MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE ARPE		1 T/U 1 T/U	100 100	
FOR MARKINGS AND AS A COSMETIC COAT IF DESIRABLE:					
	PUF 10 OR AME		1 OR 2 T/U	50 EA.	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(s):		<ul style="list-style-type: none"> ▪ ONE COAT OF ARPE (ABRASION RESISTANT PURE EPOXY COATING) TO 200μ IS ALSO ACCEPTABLE. ▪ WHERE A NON-SKID SURFACE IS DESIRABLE, ADD 3 KG (7 LBS.) OF GLASS GRANULES TO 5 GAL. (20 L) OF EPOXY COATING AND APPLY THIS AS SECOND COAT. GRANULE COARSENESS OF 18-25 U.S. SCREEN SIZE GIVES A GOOD NON-SKID FINISH. ALUMINUM OXIDE GRIT CAN ALSO BE USED. ▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE. 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY ARPE = ABRASION RESISTANT PURE EPOXY COATING PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS WITH STEEL DECKS				▪ ON BOARD MAINTENANCE	
FLIGHT DECKS				SYSTEM: MODIFIED ALKYD PRIMER, MODIFIED ACRYLIC FINISH ALKYD SYSTEM	
SURFACE PREPARATION:					
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
NOTE(s):		<ul style="list-style-type: none"> • VESSELS WITH THESE SYSTEMS ON THE FLIGHT DECK CAN MAINTAIN THE SYSTEMS AS OUTLINED IN SPECIFICATIONS FOR "EXTERIOR DECKS". • THESE SYSTEMS ARE NOT NORMALLY RECOMMENDED FOR FLIGHT DECKS DUE TO THEIR RELATIVELY LOW RESISTANCE TO HYDRAULIC FLUID, CHEMICALS, ETC. • SEVERAL "HIGH TECH" OR "NEW TECHNOLOGY" SYSTEMS ARE AVAILABLE FOR FLIGHT DECKS. • SYSTEMS RANGE FROM SIMPLE ZINC/EPOXY SYSTEMS TO SOPHISTICATED SYSTEMS INCORPORATING ELASTOMERIC TECHNOLOGY. POLYURETHANE COATINGS ARE WIDELY USED IN THESE SYSTEMS AND THE NON SKID PROFILE CAN BE FROM FINE GRAIN TO EXTREMELY AGGRESSIVE. • THESE SYSTEMS OFFER UNMATCHED PERFORMANCE BOTH ON STEEL AND ALUMINUM DECKS. THEY ARE HARD WEARING AND OFFER LOW MAINTENANCE EVEN IN HIGH TRAFFIC AREAS. THEY OFFER EXCELLENT ABRASION RESISTANCE, EXCELLENT FUEL AND CHEMICAL RESISTANCE AND MINIMIZE CORROSION DUE TO MECHANICAL DAMAGE. THEY ARE USED ON AIRCRAFT CARRIERS AND OTHER NAVY VESSELS AS WELL AS COMMERCIAL VESSELS SUCH AS MAJOR CRUISE SHIPS. INQUIRE WITH THE MAJOR COATING MANUFACTURES REGARDING THIS TYPE OF SYSTEM FOR FLIGHT DECKS. 			
Definition(s):					
ABBREVIATION(s):					

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
<ul style="list-style-type: none"> ALL VESSELS (STEEL). 			<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 		
SUPERSTRUCTURE			SYSTEM:		
			PURE EPOXY AND POLYURETHANE		
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½ (PREFERRED) OR SA2. NEW BUILDINGS: REMOVE ALL ZINC SALTS (WHITE RUST) IF PRESENT, BY LIGHT GRITBLASTING OR SCRUBBING AND WASHING AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE BLASTED TO SA2½ OR SA2 OR POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	PE		1 FULL	100	SEE ITEMS 2.8 AND 2.9, PAGE 2
	PE		1 FULL	100	
	PUF ¹⁰ OR AME		1 FULL	50	
NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		PE = PURE EPOXY COATING PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
SUPERSTRUCTURE				<u>SYSTEM:</u> PURE EPOXY AND POLYURETHANE	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW FOR 2 OR MORE COATS TO BE APPLIED IN ONE DAY (DEPENDENT ON TEMPERATURE). TWO COATS OF PURE EPOXY COATING, AS IN PRESENT SYSTEM, MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE APSTE PUF ¹⁰ OR AME		1 T/U 1 T/U 1 OR 2 T/U	100 100 50 EA.	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none">1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(s):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL VESSELS (STEEL)			▪ ON BOARD MAINTENANCE		
SUPERSTRUCTURE			SYSTEM: MODIFIED ALKYD PRIMER AND MODIFIED ACRYLIC FINISH		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTI-PURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP		1 T/U	75	
	MPMAP		1 T/U	75	
	MAF		1 OR 2 T/U	40 EA.	
NOTE(s):		ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div><div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div><div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div><div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div><div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div><div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div><div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div><div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER MAF = MODIFIED ACRYLIC FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
SUPERSTRUCTURE				<u>SYSTEM:</u> ALKYD	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTI-PURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP		1 T/U	75	
	MPMAP		1 T/U	75	
	AF		1 OR 2 T/U	40 EA.	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER AF = ALKYD FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL VESSELS (STEEL)			▪ ON BOARD MAINTENANCE		
SUPERSTRUCTURE			SYSTEM: MODIFIED ALKYD PRIMER AND NO STAIN FINISH (MODIFIED VINYL ESTER)		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTI-PURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP		1 T/U	75	
	MPMAP		1 T/U	75	
	NSF		1 T/U	40	
	NSF		1 T/U	40	
NOTE(s):		<ul style="list-style-type: none">▪ NSF (NO STAIN FINISH) CAN BE APPLIED TO 80µ IN ONE COAT IF SPRAYED. AS THE NON -STAINING QUALITIES OF THIS TYPE PRODUCT ACTUALLY DIMINISHES WITH TIME, IT MAY BE DESIRABLE TO APPLY A FULL COAT ONCE EVERY 3-4 YEARS.▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none">1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER NSF = NO STAIN FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS						
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:		
▪ ALL APPLICABLE VESSELS (STEEL).				▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS		
MASTS, BOOMS, CRANES, VENTILATORS				SYSTEM: PURE EPOXY AND POLYURETHANE		
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½ (PREFERRED) OR SA2. NEW BUILDINGS: ENSURE ALL SURFACES ARE FREE OF OIL, GREASE AND FOREIGN MATTER. GRITBLAST TO SA2½ OR SA2. IF EQUIPMENT IS COATED BY OEM SPECIFY PRIMER COMPATIBLE WITH EPOXY COATINGS OR SPECIFY FULL EPOXY AND POLYURETHANE SYSTEM.				
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS	
	PE PE PUF ¹⁰ OR AME		1 FULL 1 FULL 1 FULL	100 100 50	SEE ITEMS 2.8 AND 2.9, PAGE 2	
NOTE(S):						
Definition(s):		<div><div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div><div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div><div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div><div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div><div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div><div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div><div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div><div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>				
ABBREVIATION(S):		PE = PURE EPOXY COATING PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY				

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL APPLICABLE VESSELS (STEEL)			▪ ON BOARD MAINTENANCE		
MASTS, BOOMS, CRANES, VENTILATORS			SYSTEM: PURE EPOXY AND POLYURETHANE		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW FOR 2 OR MORE COATS TO BE APPLIED IN ONE DAY (DEPENDENT ON TEMPERATURE). TWO COATS OF PURE EPOXY COATING, AS IN PRESENT SYSTEM, MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE APSTE PUF ¹⁰ OR AME		1 T/U 1 T/U 1 OR 2 T/U	100 100 50 EA.	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div><div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div><div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div><div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div><div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div><div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div><div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div><div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(s):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL).				▪ ON BOARD MAINTENANCE	
MASTS, BOOMS, CRANES, VENTILATORS				SYSTEM: MODIFIED ALKYD PRIMER AND MODIFIED ACRYLIC FINISH	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTI-PURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75μ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	MPMAP		1 T/U	75	
	MPMAP		1 T/U	75	
	MAF		1 OR 2 T/U	40 EA.	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER MAF = MODIFIED ACRYLIC FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL APPLICABLE VESSELS (STEEL).			▪ ON BOARD MAINTENANCE		
MASTS, BOOMS, CRANES, VENTILATORS			SYSTEM: ALKYD		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTI-PURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP		1 T/U	75	
	MPMAP		1 T/U	75	
	AF		1 OR 2 T/U	40 EA.	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1.</div><div>HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div></div> <div><div>2.</div><div>GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div></div> <div><div>3.</div><div>HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>4.</div><div>LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div></div> <div><div>5.</div><div>ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div></div> <div><div>6.</div><div>VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div></div> <div><div>7.</div><div>SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div></div> <div><div>8.</div><div>ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>9.</div><div>POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div></div> <div><div>10.</div><div>PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER AF = ALKYD FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL). 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
DECK MACHINERY				SYSTEM:	
				PURE EPOXY AND POLYURETHANE	
SURFACE PREPARATION & COMMENTS:		<p>REBLAST: HIGH PRESSURE FRESHWATER WASH¹. WASH OFF OIL AND GREASE. IF BLASTING IS POSSIBLE, GRITBLAST ² TO SA2½ (PREFERRED) OR SA2 AND APPLY SYSTEM SPECIFIED BELOW. IF BLASTING IS NOT POSSIBLE, POWER TOOL ⁹ TO BEST POSSIBLE STANDARD. PRESUMING PRESENT SYSTEM IS AGED ALKYD PAINT TOUCH UP WITH EPOXY COATING THEN APPLY ONE FULL COAT OF EPOXY AND ONE COAT OF POLYURETHANE AS SPECIFIED BELOW. SOME MANUFACTURERS MAY REQUIRE A BARRIER COATING BETWEEN ALKYD AND EPOXY SYSTEMS. REFER TO PRODUCT DATA SHEETS.</p> <p>NEW BUILDINGS: IF EQUIPMENT IS COATED BY OEM SPECIFY PRIMER COMPATIBLE WITH EPOXY COATINGS OR SPECIFY FULL EPOXY AND POLYURETHANE SYSTEM.</p>			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	PE		1 FULL	100	SEE ITEMS 2.8 AND 2.9, PAGE 2
	PE		1 FULL	100	
	PUF ¹⁰ OR AME		1 FULL	50	
NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		PE = PURE EPOXY COATING PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL APPLICABLE VESSELS (STEEL).			▪ ON BOARD MAINTENANCE		
DECK MACHINERY			SYSTEM: (FOR EQUIPMENT COATED WITH) PURE EPOXY AND POLYURETHANE SYSTEM		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW FOR 2 OR MORE COATS TO BE APPLIED IN ONE DAY (DEPENDENT ON TEMPERATURE). TWO COATS OF PURE EPOXY COATING, AS IN PRESENT SYSTEM, MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE APSTE PUF ¹⁰ OR AME		1 T/U 1 T/U 1 OR 2 T/U	100 100 50 EA.	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div><div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div><div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div><div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div><div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div><div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div><div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div><div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(s):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL).				▪ ON BOARD MAINTENANCE	
DECK MACHINERY				SYSTEM: (FOR EQUIPMENT COATED WITH) MODIFIED ALKYD PRIMER AND MODIFIED ACRYLIC FINISH	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE CHOOSE A MULTI-PURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP		1 T/U	75	
	MPMAP		1 T/U	75	
	MAF		1 OR 2 T/U	40 EA.	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER MAF = MODIFIED ACRYLIC FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL).				▪ ON BOARD MAINTENANCE	
DECK MACHINERY				<u>SYSTEM: (FOR EQUIPMENT COATED WITH)</u> ALKYD	
SURFACE PREPARATION & COMMENTS:		<p>WASH OFF OIL AND GREASE. FRESHWATER WASH¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD.</p> <p>FOR MAINTENANCE CHOOSE A MULTI-PURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.</p>			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP MPMAP AF		1 T/U 1 T/U 1 OR 2 T/U	75 75 40 EA.	
NOTE(s):		<ul style="list-style-type: none"> ▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE. 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER AF = ALKYD FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
Bollards, Fairleads, Mooring pipes, etc. (Steel)				SYSTEM: ABRASION RESISTANT PURE EPOXY (OPTIONAL POLYURETHANE TOP COAT)	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½ (PREFERRED) OR SA2 OR POWER TOOL ⁹ CLEAN TO PT3. NEW BUILDINGS: DEPENDING ON EQUIPMENT CONDITION FROM SUPPLIER; PREPARE AS ABOVE.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	ARPE ⁸		1 FULL	100	
	ARPE ⁸		1 FULL	100	
IF COSMETIC COAT IS DESIRABLE:					
	PUF ¹⁰ OR AME		1 FULL	50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		ARPE = ABRASION RESISTANT PURE EPOXY COATING PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL APPLICABLE VESSELS			▪ ON BOARD MAINTENANCE		
BOLLARDS, FAIRLEADS, MOORING PIPES, ETC. (STEEL)			SYSTEM: ABRASION RESISTANT PURE EPOXY (OPTIONAL POLYURETHANE TOP COAT)		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW FOR 2 OR MORE COATS TO BE APPLIED IN ONE DAY (DEPENDENT ON TEMPERATURE). TWO COATS OF ABRASION RESISTANT PURE EPOXY COATING AS IN PRESENT SYSTEM, MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	APSTE ARPE		1 T/U 1 T/U	100 100	
IF COSMETIC COAT IF DESIRABLE:					
	PUF ¹⁰ OR AME		1 OR 2 T/U	50 EA.	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY ARPE = ABRASION RESISTANT PURE EPOXY COATING PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS 				<ul style="list-style-type: none"> ON BOARD MAINTENANCE 	
Bollards, Fairleads, Mooring pipes, etc. (Steel)				SYSTEM: MODIFIED ALKYD PRIMER, MODIFIED ACRYLIC FINISH	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTI-PURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75 μ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	MPMAP		1 T/U	75	
	MPMAP		1 T/U	75	
	MAF		1 OR 2 T/U	40 EA.	
NOTE(S):		<ul style="list-style-type: none"> ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE. 			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
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EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL APPLICABLE VESSELS			▪ ON BOARD MAINTENANCE		
Bollards, Fairleads, Mooring pipes, etc. (Steel)			<u>SYSTEM:</u> ALKYD		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTI-PURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP		1 T/U	75	
	MPMAP		1 T/U	75	
	AF		1 OR 2 T/U	40 EA.	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div><div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div><div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div><div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div><div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div><div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div><div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div><div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER AF = ALKYD FINISH			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ▪ ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> ▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS ▪ ON BOARD MAINTENANCE 	
EXTERIOR HATCH COVERS & HATCH COAMINGS				<u>SYSTEM:</u>	
SURFACE PREPARATION:					
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
NOTE(s):		<ul style="list-style-type: none"> ▪ TO BE COATED AS EXTERIOR DECKS 			
Definition(s):					
ABBREVIATION(s):					

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 			<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 		
INTERIOR OF HATCH COVERS			SYSTEM:		
			PURE EPOXY		
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. IF BLASTING IS POSSIBLE, GRITBLAST ² TO SA2½. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	PE		1 FULL	125	
	PE		1 FULL	125	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		PE = PURE EPOXY COATING			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
Interior of hatch covers:				SYSTEM: PURE EPOXY	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW FOR 2 OR MORE COATS TO BE APPLIED IN ONE DAY (DEPENDENT ON TEMPERATURE). TWO COATS OF PURE EPOXY COATING AS IN PRESENT SYSTEM, MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE PE		1 T/U 1 T/U	125 125	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY PE = PURE EPOXY COATING			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
INTERIOR OF HATCH COVERS				SYSTEM:	
				MODIFIED EPOXY	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. IF BLASTING IS POSSIBLE, GRITBLAST ² TO SA2½. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ME		1 FULL	125	
	ME		1 FULL	125	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		ME = MODIFIED EPOXY COATING (HYDROCARBON RES. MOD.)			

EXTERNAL AREAS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
INTERIOR OF HATCH COVERS				<u>SYSTEM:</u> ON BOARD MAINTENANCE	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW FOR 2 OR MORE COATS TO BE APPLIED IN ONE DAY (DEPENDENT ON TEMPERATURE). TWO COATS OF PURE EPOXY COATING AS IN PRESENT SYSTEM, MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE ME		1 T/U 1 T/U	125 125	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY ME = MODIFIED EPOXY COATING (HYDROCARBON RES. MOD.)			

4.1.3 INTERNAL AREAS: ACCOMMODATIONS, STORE ROOMS, LOCKERS, ETC.

INTERNAL AREAS: ACCOMMODATIONS, STORE ROOMS, LOCKERS, ETC.					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL APPLICABLE VESSELS (STEEL)			▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS		
Accommodations: (all interior structure covered by insulation)			SYSTEM: ZINC RICH EPOXY PRIMER		
SURFACE PREPARATION:		REFIT: A SPECIFIC SPECIFICATION IS NOT AVAILABLE. IT CAN ONLY BE MADE WHEN IT IS KNOWN WHAT THE EXACT COATING TYPE IS THAT PRESENTLY IS ON THE STEEL. REBLAST: IF A TOTAL REBLAST IS TO TAKE PLACE, BLAST TO SA2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. AREA WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	ZREP		1 FULL	50	
NOTE(s):					
Definition(s):		<div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div> <div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div> <div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div> <div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div> <div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div> <div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div> <div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div> <div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div> <div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div> <div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div>			
ABBREVIATION(s):		ZREP = ZINC RICH EPOXY PRIMER			

INTERNAL AREAS: ACCOMMODATIONS, STORE ROOMS, LOCKERS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
ACCOMMODATIONS (ALL INTERIOR STRUCTURE COVERED BY INSULATION)				SYSTEM: ALKYD	
SURFACE PREPARATION:		REFIT: SEE ON BOARD MAINTENANCE SPECIFICATION FOR APPROPRIATE SYSTEM. REBLAST: IF A REBLAST IS TO TAKE PLACE, BLAST TO SA2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APHB		1 FULL	85	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		APHB = ALKYD PRIMER H.B.			

INTERNAL AREAS: ACCOMMODATIONS, STORE ROOMS, LOCKERS, ETC.					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
ALL APPLICABLE VESSELS (STEEL)			MAJOR REFIT / REBLAST NEW BUILDINGS		
ACCOMMODATIONS (ALL INTERIOR STRUCTURE <u>NOT</u> COVERED BY INSULATION, EXCEPT DECKS)			SYSTEM: ZINC RICH EPOXY PRIMER WITH WATER BASED ACRYLIC FINISH		
SURFACE PREPARATION:		REFIT: SEE ON BOARD MAINTENANCE SPECIFICATION FOR APPROPRIATE SYSTEM. REBLAST: IF A REBLAST IS TO TAKE PLACE, BLAST TO SA2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	ZREP WBAF		1 FULL 1 OR 2 FULL	50 - 75 40 EA.	
NOTE(s):		ONE OR TWO TOP COATS DEPEND ON COLOUR APPLICATION METHOD, ETC. IN WET OR HUMID AREAS, USE THE HIGHER DRY FILM THICKNESS.			
Definition(s):		1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM ²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME.			
ABBREVIATION(s):		ZREP = ZINC RICH EPOXY PRIMER WBAF = WATER BASED ACRYLIC FINISH			

INTERNAL AREAS: ACCOMMODATIONS, STORE ROOMS, LOCKERS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
ACCOMMODATIONS (ALL INTERIOR STRUCTURE <u>NOT</u> COVERED BY INSULATION, EXCEPT DECKS)				SYSTEM: ZINC RICH EPOXY PRIMER WITH WATER BASED ACRYLIC FINISH	
SURFACE PREPARATION:		WASH OFF OIL, GREASE AND DIRT. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT2. IF OVER COATING OLD, HARD, GLOSSY SURFACES, REMOVE GLOSS BY SANDING OR WASHING WITH APPROPRIATE CHEMICAL. RINSE WELL TO REMOVE ANY RESIDUUM.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	WBAP WBAF		1 FULL 1 OR 2 T/U AND / OR FULL	60 40 EA.	
NOTE(s):		<ul style="list-style-type: none"> ▪ ONE OR TWO TOP COATS DEPEND ON COLOUR, APPLICATION METHOD, ETC.. ▪ IN WET OR HUMID AREAS, USE TWO TOP COATS. ▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE. 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(s):		WBAP = WATER BASED ACRYLIC PRIMER WBAF = WATER BASED ACRYLIC FINISH			

INTERNAL AREAS: ACCOMMODATIONS, STORE ROOMS, LOCKERS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ▪ ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> ▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS 	
ACCOMMODATIONS (ALL INTERIOR STRUCTURE NOT COVERED BY INSULATION, EXCEPT DECKS)				SYSTEM:	
				ZINC RICH EPOXY PRIMER WITH WATER BASED EPOXY TOP COAT	
SURFACE PREPARATION:		REBLAST: IF A REBLAST IS TO TAKE PLACE, BLAST TO SA2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	ZREP WBPE		1 FULL 1 FULL	50 - 75 50 - 75	
NOTE(S):		<ul style="list-style-type: none"> ▪ ON BULKHEADS, THE LOWER DRY FILM THICKNESS FIGURES SHOULD SUFFICE. USE THE HIGHER DRY FILM THICKNESS FIGURE FOR WET AND HUMID AREAS. 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
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VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
ACCOMMODATIONS (ALL INTERIOR STRUCTURE <u>NOT</u> COVERED BY INSULATION, EXCEPT DECKS)				SYSTEM: ZINC RICH EPOXY PRIMER WITH WATER BASED EPOXY TOP COAT	
SURFACE PREPARATION:		WASH OFF OIL, GREASE AND DIRT. RINSE WITH FRESHWATER. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	WBEP WBPE		1 T/U 1 T/U AND/OR 1 FULL	50 - 75 50 - 75	
NOTE(s):		<ul style="list-style-type: none"> ▪ ON BULKHEADS, THE LOWER DRY FILM THICKNESS FIGURE SHOULD SUFFICE. USE THE HIGHER DRY FILM THICKNESS FIGURE FOR WET OR HUMID AREAS. ▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE. 			
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INTERNAL AREAS: ACCOMMODATIONS, STORE ROOMS, LOCKERS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ▪ ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> ▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS 	
ACCOMMODATIONS (ALL INTERIOR STRUCTURE <u>NOT</u> COVERED BY INSULATION, EXCEPT DECKS)				SYSTEM: ALKYD	
SURFACE PREPARATION:		REFIT: SEE ON BOARD MAINTENANCE SPECIFICATION FOR APPROPRIATE SYSTEM. REBLAST: IF REBLAST IS TO TAKE PLACE, BLAST TO Sa2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT, BY BEST PRACTICAL METHOD. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APHB AF		1 FULL 1 OR 2 FULL	85 40 EA	
NOTE(s):		<ul style="list-style-type: none"> ▪ TWO FULL COATS OF ALKYD FINISH WOULD BE BENEFICIAL IN WET AND HUMID AREAS 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(s):		APHB = ALKYD PRIMER H.B. AF = ALKYD FINISH			

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VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
ACCOMMODATIONS (ALL INTERIOR STRUCTURE <u>NOT</u> COVERED BY INSULATION, EXCEPT DECKS)				SYSTEM: ALKYD	
SURFACE PREPARATION:		<p>WASH OFF OIL, GREASE AND DIRT. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT2. IF OVER COATING OLD, HARD, GLOSSY SURFACES, REMOVE GLOSS BY SANDING OR WASHING WITH APPROPRIATE CHEMICAL. RINSE WELL TO REMOVE ANY RESIDUUM.</p> <p>MANY TYPES OF ALKYD OR MODIFIED ALKYD PRIMERS ARE AVAILABLE AND SUITABLE FOR MAINTENANCE OF ALKYD SYSTEMS. CHOOSE A SURFACE TOLERANT, MULTI-PURPOSE FAST DRYING PRIMER WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.</p>			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP AF		1 T/U 1 OR 2 T/U AND / OR FULL	75 40 EA.	
NOTE(S):		<ul style="list-style-type: none"> ▪ IN WET OR HUMID AREAS, USE TWO TOP COATS. ▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE. 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER AF = ALKYD FINISH			

INTERNAL AREAS: ACCOMMODATIONS, STORE ROOMS, LOCKERS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ▪ ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> ▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS 	
INTERIOR DECKS WITH DECK COVERING				<u>SYSTEM:</u>	
SURFACE PREPARATION:					
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
NOTE(S):		<ul style="list-style-type: none"> ▪ DECKS TO BE COVERED WITH TILE, ETC., NEED NOT BE COATED. ▪ ON NEW BUILDINGS, INTACT SHOP PRIMER CAN BE LEFT IN PLACE. IF A COATING IS DEEMED TO BE DESIRABLE, ONE COAT OF ZINC EPOXY PRIMER OR PURE EPOXY COATING TO 50μ WILL SUFFICE. ▪ PRIOR TO APPLICATION, FLOORING CONTRACTOR SHOULD BE CONSULTED IN ORDER TO ASCERTAIN COMPATIBILITY BETWEEN PROPOSED COATING AND FLOOR COVERING ADHESIVE / FLOOR COVERING. 			
Definition(s):					
ABBREVIATION(S):					

INTERNAL AREAS: ACCOMMODATIONS, STORE ROOMS, LOCKERS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
INTERIOR UNCOVERED DECKS				SYSTEM:	
				ZINC RICH EPOXY PRIMER WITH WATER BASED EPOXY TOP COAT	
SURFACE PREPARATION:		REFIT: SEE ON BOARD MAINTENANCE SPECIFICATION FOR APPROPRIATE SYSTEM REBLAST: IF A REBLAST IS TO TAKE PLACE, BLAST TO Sa2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT, BY BEST PRACTICAL METHOD. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	ZREP		1 FULL	75	
	WBPE		1 FULL	75	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		ZREP = ZINC RICH EPOXY PRIMER WBPE = WATER BASED PURE EPOXY			

INTERNAL AREAS: ACCOMMODATIONS, STORE ROOMS, LOCKERS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
INTERIOR UNCOVER DECKS				SYSTEM: ZINC RICH EPOXY PRIMER WITH WATER BASED EPOXY TOP COAT	
SURFACE PREPARATION:		WASH OFF OIL, GREASE AND DIRT. RINSE WITH FRESHWATER. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	WBEP WBPE		1 T/U 1 T/U AND / OR FULL	75 75	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		WBEP = WATER BASED EPOXY PRIMER WBPE = WATER BASED PURE EPOXY			

INTERNAL AREAS: ACCOMMODATIONS, STORE ROOMS, LOCKERS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
INTERIOR UNCOVERED DECKS				SYSTEM: ALKYD	
SURFACE PREPARATION:		REFIT: SEE ON BOARD MAINTENANCE SPECIFICATION FOR APPROPRIATE SYSTEM. REBLAST: IF A REBLAST IS TO TAKE PLACE, BLAST TO Sa2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APHB		1 FULL	85	
	AF		1 FULL	40	
	AF		1 FULL	40	
NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		APHB = ALKYD PRIMER H.B. AF = ALKYD FINISH			

INTERNAL AREAS: ACCOMMODATIONS, STORE ROOMS, LOCKERS, ETC.					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL APPLICABLE VESSELS (STEEL)			▪ ON BOARD MAINTENANCE		
INTERIOR UNCOVERED DECKS			SYSTEM: ALKYD		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL, GREASE AND DIRT. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT2. IF OVER COATING OLD, HARD, GLOSSY SURFACES, REMOVE GLOSS BY SANDING OR WASHING WITH APPROPRIATE CHEMICAL. RINSE WELL TO REMOVE ANY RESIDUUM. MANY TYPES OF ALKYD OR MODIFIED ALKYD PRIMERS ARE AVAILABLE AND SUITABLE FOR MAINTENANCE OF ALKYD SYSTEMS. CHOOSE A SURFACE TOLERANT, MULTI-PURPOSE FAST DRYING PRIMER WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP AF		1 OR 2 T/U 1 OR 2 T/U AND/OR FULL	75 EA. 40 EA.	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none">HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME.			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER AF = ALKYD FINISH			

4.1.4 INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES

INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
BULKHEADS, DECK HEADS				SYSTEM:	
				ZINC RICH EPOXY PRIMER WITH WATER BASED EPOXY TOP COAT	
SURFACE PREPARATION:		REBLAST: N/A NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	ZREP		1 FULL	60	
	WBPE		1 FULL	60	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		ZREP = ZINC RICH EPOXY PRIMER WBPE = WATER BASED PURE EPOXY			

INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
BULKHEADS, DECK HEADS				SYSTEM:	
				ZINC RICH EPOXY PRIMER WITH WATER BASED EPOXY TOP COAT	
SURFACE PREPARATION:		WASH OFF OIL, GREASE AND DIRT. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	WBEP		1 T/U	60	
	WBPE		1 T/U	60	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(s):		WBEP = WATER BASED EPOXY PRIMER WBPE = WATER BASED PURE EPOXY			

INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
BULKHEADS, DECK HEADS				SYSTEM: ALKYD	
SURFACE PREPARATION:		REFIT: SEE ON BOARD MAINTENANCE SPECIFICATION FOR APPROPRIATE SYSTEM. REBLAST: N/A NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. ENSURE SURFACE IS FREE OF ALL FOREIGN MATTER. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APHB		1 FULL	85	
	AF		1 FULL	40	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		APHB = ALKYD PRIMER H.B. AF = ALKYD FINISH			

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VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL APPLICABLE VESSELS (STEEL)			▪ ON BOARD MAINTENANCE		
BULKHEADS, DECK HEADS			SYSTEM: ALKYD		
SURFACE PREPARATION:		WASH OFF OIL, GREASE AND DIRT. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT2. IF OVER COATING OLD, HARD, GLOSSY SURFACES, REMOVE GLOSS BY SANDING OR WASHING WITH APPROPRIATE CHEMICAL. RINSE WELL TO REMOVE ANY RESIDUUM. MANY TYPES OF ALKYD OR MODIFIED ALKYD PRIMERS ARE AVAILABLE AND SUITABLE FOR MAINTENANCE OF ALKYD SYSTEMS. CHOOSE A SURFACE TOLERANT, MULTI-PURPOSE FAST DRYING PRIMER WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75μ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	MPMAP AF		1 T/U 1 OR 2 T/U AND / OR FULL	75 40 EA.	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div><div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div><div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div><div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div><div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div><div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div><div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div><div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME.</div></div>			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER AF = ALKYD FINISH			

INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
DECKS				SYSTEM:	
				ZINC RICH EPOXY PRIMER WITH WATER BASED EPOXY TOP COAT	
SURFACE PREPARATION:		REBLAST: N/A NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	ZREP		1 FULL	60	
	WBPE		1 FULL	60	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
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DECKS				SYSTEM:	
				ZINC RICH EPOXY PRIMER WITH WATER BASED EPOXY TOP COAT	
SURFACE PREPARATION:		WASH OFF OIL, GREASE AND DIRT. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT2			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	WBEP		1 T/U	60	
	WBPE		1 T/U	60	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
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SURFACE PREPARATION:		REFIT: SEE ON BOARD MAINTENANCE SPECIFICATION FOR APPROPRIATE SYSTEM. REBLAST: N/A NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. ENSURE SURFACE IS FREE OF ALL FOREIGN MATTER. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APHB AF		1 FULL 1 OR 2 FULL	85 40 EACH	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
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DECKS			SYSTEM: ALKYD		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL, GREASE AND DIRT. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT2. IF OVER COATING OLD, HARD, GLOSSY SURFACES, REMOVE GLOSS BY SANDING OR WASHING WITH APPROPRIATE CHEMICAL. RINSE WELL TO REMOVE ANY RESIDUUM. MANY TYPES OF ALKYD OR MODIFIED ALKYD PRIMERS ARE AVAILABLE AND SUITABLE FOR MAINTENANCE OF ALKYD SYSTEMS. CHOOSE A SURFACE TOLERANT, MULTI-PURPOSE FAST DRYING PRIMER WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
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INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES		
VESSEL TYPE / CHARACTERISTICS:		Type of Specification:
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 		<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS ON BOARD MAINTENANCE
ENGINE ROOM, HOT SURFACES		<u>SYSTEM:</u> HEAT RESISTANT SYSTEM
SURFACE PREPARATION:	FOR NEW APPLICATIONS, BEST RESULTS WILL BE OBTAINED BY BLASTING TO SA2½. FOR ON BOARD MAINTENANCE POWER TOOL ⁹ CLEANED TO PT3.	
FOR SURFACES UP TO:		TYPE OF PRODUCT TO USE:
250° (482°F)		A GOOD QUALITY HYDROCARBON RESIN ALUMINUM PAINT. APPLY 2 COATS OF 25-40μ EACH.
420°C (800°F)		SILICONE/ALKYD ALUMINUM PAINT. APPLY 1 OR 2 COATS OF 25-40μ EACH. WHEN APPLYING 2 COATS, THE FIRST COAT SHOULD BE HEATED TO WORKING TEMPERATURE BEFORE COOLING AND APPLYING SECOND COAT.
BETWEEN 260°C (500°F) - 540°C (1000°F)		SILICONE ALUMINUM PAINT. APPLY 1 OR 2 COATS OF 15-20μ EACH. FIRST COAT SHOULD BE HEATED TO WORKING TEMPERATURE BEFORE COOLING AND APPLYING SECOND COAT. IF HEATING/COOLING OF FIRST COAT CAN NOT BE ACHIEVED, APPLY ONLY ONE COAT.
NOTE(S):		
Definition(s):	<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 	
ABBREVIATION(S):		

INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ▪ ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> ▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS ▪ ON BOARD MAINTENANCE 	
PIPES AND VALVES				<u>SYSTEM:</u>	
SURFACE PREPARATION:					
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
NOTE(s):		<ul style="list-style-type: none"> ▪ PIPES WITH LAGGING SHOULD BE PAINTED WITH 1 OR 2 COATS OF WATER BASED ACRYLIC LATEX 40-50μ EACH. OTHERWISE, PIPES AND VALVES ARE PAINTED AS THE REST OF THE AREA IN WHICH THEY ARE INSTALLED. 			
Definition(s):					
ABBREVIATION(s):					

INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
BATTERY ROOM (EXCLUDING DECK)				SYSTEM: PURE EPOXY	
SURFACE PREPARATION:		REBLAST: WASH OF OIL, GREASE AND DIRT. BLAST TO SA2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT, BY BEST PRACTICAL METHOD. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	PE		1 FULL	100	
	PE		1 FULL	100	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		PE = PURE EPOXY COATING			

INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
BATTERY ROOM (EXCLUDING DECK)				SYSTEM: PURE EPOXY	
SURFACE PREPARATION & COMMENTS:		<p>WASH OFF OIL AND GREASE. FRESHWATER WASH¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD.</p> <p>IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW 2 OR MORE COATS TO BE APPLIED IN ONE DAY. (DEPENDING ON TEMPERATURE.) TWO COATS OF PURE EPOXY COATING AS IN PRESENT SYSTEM MAY ALSO BE USED, ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.</p>			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE PE		1 T/U 1 T/U	100 100	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(s):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY PE = PURE EPOXY			

INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL APPLICABLE VESSELS (STEEL)			▪ ON BOARD MAINTENANCE		
BATTERY ROOM (EXCLUDING DECK)			SYSTEM: CHLORINATED RUBBER		
SURFACE PREPARATION:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT2 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTI-PURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75μ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	MPMAP		1 T/U	75	
	CRHB		1 T/U	75	
	CRHB		1 FULL OR 1 T/U	75	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1.</div><div>HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div></div> <div><div>2.</div><div>GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div></div> <div><div>3.</div><div>HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>4.</div><div>LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div></div> <div><div>5.</div><div>ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div></div> <div><div>6.</div><div>VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div></div> <div><div>7.</div><div>SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div></div> <div><div>8.</div><div>ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>9.</div><div>POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div></div> <div><div>10.</div><div>PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME.</div></div>			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER CRHB = CHLORINATED RUBBER H.B.			

INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
BATTERY ROOM (EXCLUDING DECKS)				SYSTEM: ALKYD	
SURFACE PREPARATION & COMMENTS:		<p>WASH OFF OIL AND GREASE. FRESHWATER WASH¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT2 OR BEST POSSIBLE STANDARD.</p> <p>FOR MAINTENANCE, CHOOSE A MULTI-PURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.</p>			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP MPMAP AF		1 T/U 1 T/U 1 OR 2 T/U	75 75 40 EA.	
NOTE(s):		<ul style="list-style-type: none"> ▪ ALKYD SYSTEM IS NOT RECOMMENDED FOR DECK AND OTHER AREAS WHERE ACID MAY BE SPILLED. ▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE. 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(s):		<p>AF = ALKYD FINISH</p> <p>MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER</p>			

INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
battery room (deck)				SYSTEM: PURE EPOXY	
SURFACE PREPARATION:		REBLAST: WASH OFF OIL, GREASE AND DIRT. BLAST TO SA2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	PE		1 FULL	100	
	PE		1 FULL	100	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		PE = PURE EPOXY COATING			

INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL APPLICABLE VESSELS (STEEL)			▪ ON BOARD MAINTENANCE		
Battery room (decks)			SYSTEM: PURE EPOXY		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW 2 COATS OF EPOXY ALUMINUM AND 1 TOP COAT TO BE APPLIED IN ONE DAY, (DEPENDENT ON TEMPERATURE.) TWO COATS OF PURE EPOXY COATING (AS IN PRESENT SYSTEM) MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE PE		1 T/U 1 T/U	100 100	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(s):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY PE = PURE EPOXY COATING			

INTERNAL AREAS: ENGINE ROOM, MACHINERY SPACES					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
BATTERY ROOM (DECKS)				<u>SYSTEM:</u> CHLORINATED RUBBER	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT2 OR BEST POSSIBLE STANDARD. FOR MAINTENANCE, CHOOSE A MULTI-PURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75μ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.. USE 2 COLOURS OF SAME PRIMER TO DIFFERENTIATE BETWEEN COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	MPMAP		1 T/U	75	
	CRHB		1 T/U	75	
	CRHB		1 FULL OR 1 T/U	75	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER CRHB = CHLORINATED RUBBER H.B.			

4.1.5 INTERNAL AREAS: CARGO HOLDS

INTERNAL AREAS: CARGO HOLDS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
ALL APPLICABLE VESSELS (STEEL)			MAJOR REFIT / REBLAST NEW BUILDINGS		
Cargo holds (no lining) Interior of hatch coamings			SYSTEM: ABRASION RESISTANT PURE EPOXY		
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ OFF OIL AND GREASE. IF BLASTING IS POSSIBLE, GRITBLAST ² TO SA2½. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. ENSURE SURFACES ARE CLEAN AND FREE OF ALL FOREIGN MATTER. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT3 OR BLASTED TO SA2½.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ARPE ⁸		1 FULL	125	
	ARPE ⁸		1 FULL	125	
NOTE(s):		ALL APPLICABLE VESSELS (STEEL)			
Definition(s):		IF ABRASION RESISTANCE IS NOT OF IMPORTANCE, USE SYSTEM WITH MODIFIED EPOXY AS SPECIFIED FOR CARGO HOLDS BEHIND LININGS.			
		HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)			
		GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)			
		HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.			
		LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.			
		ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.			
		VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.			
		SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.			
		ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.			
		POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.			
		PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME.			
ABBREVIATION(s):		ARPE = ABRASION RESISTANT PURE EPOXY			

INTERNAL AREAS: CARGO HOLDS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
Cargo holds (no lining) Interior of hatch coamings				SYSTEM: ABRASION RESISTANT PURE EPOXY	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW 2 COATS OF EPOXY ALUMINUM AND 1 TOP COAT TO BE APPLIED IN ONE DAY, (DEPENDENT ON TEMPERATURE). TWO COATS OF PURE EPOXY COATING (AS IN PRESENT SYSTEM) MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE ARPE ⁸		1 T/U 1 T/U	125 125	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY ARPE = ABRASION RESISTANT PURE EPOXY			

INTERNAL AREAS: CARGO HOLDS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ▪ ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> ▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS 	
Cargo holds, behind linings and holds where abrasion resistance is not important (including interior of hatch coamings)				SYSTEM: MODIFIED EPOXY	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ OFF OIL AND GREASE. GRITBLAST ² TO SA2½ (PREFERRED) OR SA2. NEW BUILDINGS: REMOVE ZINC SALTS (WHITE RUST) IF PRESENT BY BEST PRACTICAL METHOD. ENSURE SURFACES ARE CLEAN AND FREE OF ALL FOREIGN MATTER. AREAS WHERE SHOP PRIMER IS DAMAGED SHOULD BE POWER TOOL ⁹ CLEANED TO PT3 (PREFERRED) OR PT 2, OR BLASTED TO SA2½ (PREFERRED) OR SA2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ME		1 FULL	125	
	ME		1 FULL	125	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		ME = MODIFIED EPOXY COATING (HYDROCARBON RES. MOD.)			

INTERNAL AREAS: CARGO HOLDS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
CARGO HOLDS, BEHIND LININGS AND HOLDS WHERE ABRASION RESISTANCE IS NOT IMPORTANT (INCLUDING INTERIOR OF HATCH COAMINGS)				SYSTEM: MODIFIED EPOXY	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. PREPARE DAMAGED AREAS BY POWER TOOL ⁹ CLEANING TO PT3 OR BEST POSSIBLE STANDARD. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS, A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW 2 COATS OF EPOXY ALUMINUM AND 1 TOP COAT TO BE APPLIED IN ONE DAY, (DEPENDENT ON TEMPERATURE.) TWO COATS OF EPOXY COATING (AS IN PRESENT SYSTEM) MAY ALSO BE USED ALTHOUGH SURFACE TOLERANCE MAY NOT BE AS GOOD.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE ME		1 T/U 1 T/U	125 125	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(s):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY ME = MODIFIED EPOXY COATING (HYDROCARBON RES. MOD.)			

4.1.6 INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ REPAIR OF TANK COATINGS	
Tanks, Double Bottoms, etc.				<u>SYSTEM:</u>	
SURFACE PREPARATION:					
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
NOTE(S):		<ul style="list-style-type: none"> ▪ IF REPAIRS ARE DEEMED NECESSARY IN TANKS, BILGES, DOUBLE BOTTOMS, ETC., SURFACES TO BE REPAIRED SHOULD BE FRESHWATER WASHED AND RINSED TO REMOVE ANY SURFACE CONTAMINANTS. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT3. ▪ APPLY THE SAME COATING THAT IS PRESENTLY BEING REPAIRED TO THE SAME FILM THICKNESS SPECIFIED IN REBLAST / NEW BUILDINGS SPECIFICATIONS. 			
Definition(s):					
ABBREVIATION(S):					

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
CHAIN LOCKERS				SYSTEM:	
				ABRASION RESISTANT PURE EPOXY	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. IF BLASTING IS POSSIBLE, GRITBLAST ² TO SA2½. NEW BUILDINGS: INTACT SHOP PRIMER MUST BE CLEANED OF ANY CONTAMINANTS, INCLUDING ZINC SALTS (WHITE RUST) IF PRESENT. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ARPE	COLOURED	1 FULL	100	
	ARPE	OFF WHITE	1 FULL	150	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		ARPE = ABRASION RESISTANT PURE EPOXY			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
CHAIN LOCKERS				SYSTEM: MODIFIED EPOXY	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO Sa2½. NEW BUILDINGS: INTACT SHOP PRIMER MUST BE CLEANED OF ANY CONTAMINANTS, INCLUDING ZINC SALTS (WHITE RUST) IF PRESENT. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ME	COLOURED	1 FULL	125	
	ME	OFF WHITE	1 FULL	125	
NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(s):		ME = MODIFIED EPOXY COATING (HYDROCARBON RES. MOD.)			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
SEA BAYS				SYSTEM:	
				MODIFIED EPOXY, NO ANTIFOULING	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. IF BLASTING IS POSSIBLE, GRITBLAST ² TO SA2½. NEW BUILDINGS: INTACT SHOP PRIMER MUST BE CLEANED OF ANY CONTAMINANTS, INCLUDING ZINC SALTS (WHITE RUST) IF PRESENT. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ME	ALTERNATE	1 FULL	125	
	ME	COLOURS	1 PREFERABLY 2 STRIPE COATS		
	ME	OFF WHITE	1 FULL	125	
NOTE(S):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		ME = MODIFIED EPOXY COATING (HYDROCARBON RES. MOD.)			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ▪ ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> ▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS 	
SEA BAYS				SYSTEM:	
				MODIFIED EPOXY WITH ANTIFOULING	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½. NEW BUILDINGS: MAKE SURE SHOP PRIMER IS FREE OF ANY CONTAMINANTS. DAMAGED AREAS SHOULD BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ME	ALTERNATE COLOURS	1 FULL	125	
	ME		1 PREFERABLY 2 STRIPE COATS		
	VME	OFF WHITE	1 FULL	125	
	CDPAF		2 FULL	75 EA.	BEST OPTION FOR GOOD
OR:	CDPAF		1 FULL	150	COATING DISTRIBUTION
NOTE(S):		<ul style="list-style-type: none"> ▪ A SYSTEM UTILIZING 2 COATS OF ME (MODIFIED EPOXY) FOLLOWED BY 2 COATS OF ANTIFOULING CAN BE USED, IF ANTIFOULING CAN BE APPLIED WHILE EPOXY COATING IS STILL "THUMB PRINT SOFT". ▪ ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTH SERVICE. 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		ME = MODIFIED EPOXY COATING (HYDROCARBON RES. MOD.) VME = VINYL MODIFIED EPOXY CDPAF = CONTROLLED DEPLETION POLYMER ANTIFOULING (TBT FREE)			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
POTABLE FRESHWATER TANKS				SYSTEM:	
				SOLVENT FREE HIGH BUILD EPOXY	
SURFACE PREPARATION:		REBLAST: DRY AND DEHUMIDIFY TANK. GRITBLAST ² TO SA2½. NEW BUILDINGS: BLAST TO SA2½. (SEE NOTE BELOW.) - OR REMOVE ZINC SALTS (WHITE RUST) IF PRESENT, BY BEST PRACTICAL METHOD. ENSURE SURFACE IS CLEAN AND FREE OF ANY FOREIGN MATTERS. AREAS WHERE SHOP PRIMER IS DAMAGED MUST BE POWER TOOL ⁹ CLEANED TO PT3 OR BLASTED TO SA2½. SHOP PRIMER MAY HAVE TO BE REMOVED.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	SFHBE SFHBE	COLOURED WHITE	STRIPE COAT 1 FULL	460	
NOTE(s):		<ul style="list-style-type: none"> PROPER VENTILATION / AIR EXCHANGE IN THE TANK IS VERY IMPORTANT DURING CURE. FOLLOW COATING MANUFACTURER'S RECOMMENDATION FOR VENTILATION AND CHLORINE RINSING OF TANK BEFORE USE. COATINGS CERTIFIED FOR POTABLE WATER ARE NORMALLY CERTIFIED BASED ON APPLICATION DIRECT TO STEEL. CHECK THIS FACT WITH COATING SUPPLIER. STRICTLY FROM A TECHNICAL POINT OF VIEW, THE COATING CAN BE APPLIED OVER A CLEANED SHOP PRIMER. 			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(s):		SFHBE = SOLVENT FREE HIGH BUILD EPOXY			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALL APPLICABLE VESSELS (STEEL)				▪ ON BOARD MAINTENANCE	
POTABLE FRESHWATER TANKS				SYSTEM: SOLVENT FREE HIGH BUILD EPOXY	
SURFACE PREPARATION:		DRY AND DEHUMIDIFY TANK. POWER TOOL ⁹ CLEAN DAMAGED AREAS TO PT3. OR SPOT BLAST TO SA 2½			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	SFHBE SPHBE	COLOURED WHITE	STRIPE COAT 1 T/U	125 460	
NOTE(s):		<ul style="list-style-type: none">▪ A MINIMUM DRY FILM THICKNESS OF 460µ MUST BE APPLIED IN TOTAL. SEVERAL COATS MAY BE NECESSARY TO ACHIEVE THIS, DEPENDING ON APPLICATION METHOD.▪ PROPER VENTILATION / AIR EXCHANGE IN THE TANK IS VERY IMPORTANT DURING CURE. FOLLOW COATING MANUFACTURER'S RECOMMENDATION FOR VENTILATION AND CHLORINE RINSING OF TANK BEFORE USE.			
Definition(s):		<ol style="list-style-type: none">1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME.			
ABBREVIATION(s):		SFHBE = SOLVENT FREE HIGH BUILD EPOXY			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
DOMESTIC FRESHWATER TANKS				SYSTEM:	
				SOLVENT FREE HIGH BUILD EPOXY	
SURFACE PREPARATION:		REBLAST: DRY AND DEHUMIDIFY TANK. GRITBLAST ² TO SA2½. NEW BUILDINGS: BLAST TO SA2½. (SEE NOTE BELOW.) - OR REMOVE ZINC SALTS (WHITE RUST) IF PRESENT, BY BEST PRACTICAL METHOD. ENSURE SURFACE IS CLEAN AND FREE OF ANY FOREIGN MATTERS. AREAS WHERE SHOP PRIMER IS DAMAGED MUST BE POWER TOOL ⁹ CLEANED TO PT3 OR BLASTED TO SA2½. SHOP PRIMER MAY HAVE TO BE REMOVED.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	SFHBE SFHBE	COLOURED WHITE	STRIPE COAT 1 FULL	460	
NOTE(s):		<ul style="list-style-type: none"> PROPER VENTILATION / AIR EXCHANGE IN THE TANK IS VERY IMPORTANT DURING CURE. FOLLOW COATING MANUFACTURER'S RECOMMENDATION FOR VENTILATION AND CHLORINE RINSING OF TANK BEFORE USE. COATINGS CERTIFIED FOR POTABLE WATER ARE NORMALLY CERTIFIED BASED ON APPLICATION DIRECT TO STEEL. CHECK THIS FACT WITH COATING SUPPLIER. STRICTLY FROM A TECHNICAL POINT OF VIEW, THE COATING CAN BE APPLIED OVER A CLEANED SHOP PRIMER. 			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(s):		SFHBE = SOLVENT FREE HIGH BUILD EPOXY			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
COFFER DAMS (DRY)				SYSTEM:	
				MODIFIED EPOXY	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2. NEW BUILDINGS: INTACT SHOP PRIMER MUST BE CLEANED OF ANY CONTAMINANTS, INCLUDING ZINC SALTS (WHITE RUST) IF PRESENT. DAMAGED AREAS TO BE POWER TOOL ⁹ CLEANED TO PT2.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	ME	OFF WHITE	1 FULL	125	
NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(s):		ME = MODIFIED EPOXY (HYDROCARBON RES. MOD.)			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
BALLAST TANKS				SYSTEM:	
				MODIFIED EPOXY	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½. NEW BUILDINGS: INTACT SHOP PRIMER MUST BE CLEANED OF ANY CONTAMINANTS, INCLUDING ZINC SALTS (WHITE RUST) IF PRESENT. DAMAGED AREAS TO BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ME	ALTERNATE	1 FULL	125	
	ME	COLOURS	1 PREFERABLY 2 STRIPE COATS		
	ME	OFF WHITE	1 FULL	125	
NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		ME = MODIFIED EPOXY (HYDROCARBON RES. MOD.)			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ▪ ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> ▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS 	
FLUME AND DUMP TANKS				SYSTEM:	
				MODIFIED EPOXY	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½. NEW BUILDINGS: INTACT SHOP PRIMER MUST BE CLEANED OF ANY CONTAMINANTS, INCLUDING ZINC SALTS (WHITE RUST) IF PRESENT. DAMAGED AREAS TO BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ME	ALTERNATE	1 FULL	125	
	ME	COLOURS	1 PREFERABLY 2 STRIPE COATS		
	ME	OFF WHITE	1 FULL	125	
NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		ME = MODIFIED EPOXY (HYDROCARBON RES. MOD.)			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
BILGES				SYSTEM:	
				MODIFIED EPOXY	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½. NEW BUILDINGS: INTACT SHOP PRIMER MUST BE CLEANED OF ANY CONTAMINANTS, INCLUDING ZINC SALTS (WHITE RUST) IF PRESENT. DAMAGED AREAS TO BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ME	ALTERNATE	1 FULL	125	
	ME	COLOURS	1 PREFERABLY 2 STRIPE COATS		
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NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		ME = MODIFIED EPOXY (HYDROCARBON RES. MOD.)			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ▪ ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> ▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS 	
DOUBLE BOTTOMS				SYSTEM:	
				MODIFIED EPOXY	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½. NEW BUILDINGS: INTACT SHOP PRIMER MUST BE CLEANED OF ANY CONTAMINANTS, INCLUDING ZINC SALTS (WHITE RUST) IF PRESENT. DAMAGED AREAS TO BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ME	ALTERNATE	1 FULL	125	
	ME	COLOURS	1 PREFERABLY 2 STRIPE COATS		
	ME	OFF WHITE	1 FULL	125	
NOTE(s):					
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		ME = MODIFIED EPOXY (HYDROCARBON RES. MOD.)			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
HOLDING TANKS (SEWAGE)				SYSTEM:	
				PURE EPOXY	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½. NEW BUILDINGS: INTACT SHOP PRIMER MUST BE CLEANED OF ANY CONTAMINANTS, INCLUDING ZINC SALTS (WHITE RUST) IF PRESENT. DAMAGED AREAS TO BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	PE	ALTERNATE	1 FULL	125	
	PE	COLOURS	1 PREFERABLY 2 STRIPE COATS		
	PE	OFF WHITE	1 FULL	125	
NOTE(s):		<ul style="list-style-type: none"> MODIFIED EPOXY COATINGS SHOULD NOT BE USED IN SEWAGE TANKS 			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(s):		PE = PURE EPOXY COATING			

INTERNAL AREAS: TANKS, DOUBLE BOTTOMS, ETC.					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
<ul style="list-style-type: none"> ALL APPLICABLE VESSELS (STEEL) 				<ul style="list-style-type: none"> MAJOR REFIT / REBLAST NEW BUILDINGS 	
GRAY WATER TANKS				SYSTEM:	
				PURE EPOXY	
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. GRITBLAST ² TO SA2½. NEW BUILDINGS: INTACT SHOP PRIMER MUST BE CLEANED OF ANY CONTAMINANTS, INCLUDING ZINC SALTS (WHITE RUST) IF PRESENT. DAMAGED AREAS TO BE POWER TOOL ⁹ CLEANED TO PT3.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	PE	ALTERNATE	1 FULL	125	
	PE	COLOURS	1 PREFERABLY 2 STRIPE COATS		
	PE	OFF WHITE	1 FULL	125	
NOTE(s):		<ul style="list-style-type: none"> MODIFIED EPOXY COATINGS SHOULD NOT BE USED IN GRAY WATER TANKS. 			
Definition(s):		<ol style="list-style-type: none"> HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. 			
ABBREVIATION(S):		PE = PURE EPOXY COATING			

4.2 Aluminum Vessels

4.2.1 PAINTING OF ALUMINUM

In order to successfully paint aluminum, a two-step surface preparation has to take place. Namely, *degreasing* and *etching*.

Degreasing can be done by solvent cleaning, but in many instances, this method merely "moves the grease around". It is far better to use an emulsifying cleaner of which many types are available. After degreasing, use the "water test" to see if the aluminum surface is clean. Simply spray or flow water on the surface. If the surface is uniformly wet, it is clean. If the water "curtains" or "withdraws" from areas, the surface is still greasy and must be washed again.

Etching takes place after the surface has been properly degreased. It can be done by surface treatment such as application of etch primers or by abrading the surface by light abrasive blasting. A light abrasive blast is the best way to ensure good adhesion of paint to aluminum surfaces. An abrasive such as 80 mesh garnet or 50 grit aluminum oxide should give a 25-40 μ (1-1.5 mil) surface profile, an ideal aluminum surface to receive various coatings. Surface profile should be 25 μ minimum, (check with abrasive supplier). For small areas *Scotchbrite* (by 3M Canada) abrasive pads or careful disc grinding can be used. Coating should take place immediately after blasting and removal of dust is done.

Note: When long over coating times are needed between epoxy coats and cosmetic top coats, a vinyl modified epoxy tiecoat may be necessary.

Important Note: Aluminum and its alloys readily form galvanic couples with paint containing lead and copper compounds. Do not use primers containing red lead. Also, it is generally not recommended to use antifoulings containing cuprous oxide or metallic copper.

4.2.2 ALUMINUM VESSELS: UNDERWATER SYSTEMS

ALUMINUM VESSELS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS		
UNDERWATER HULL AND RUDDER			<u>SYSTEM:</u> ABRASION RESISTANT PURE EPOXY (WITH/WITHOUT ANTIFOULING)		
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ · WASH OFF OIL AND GREASE. BLAST OFF OLD COATINGS AND LIGHTLY ABRASE SURFACE TO ACHIEVE 40µ (MICRONS) SURFACE PROFILE. NEW BUILDINGS: DEGREASE AND BLAST AS OUTLINED UNDER "PAINTING OF ALUMINUM" IMPORTANT NOTE: IF, FOR ANY REASON, THE SURFACE TO BE PAINTED CAN NOT BE ABRADED BY BLASTING APPLY, 1 COAT ETCH PRIMER TO 12µ DFT. FOLLOW PRODUCT DATA SHEET CLOSELY WITH REGARDS TO APPLICATION AND OVER COATING TIMES.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
A	ARPE ⁸		1 FULL	100	DEPENDING ON SERVICE REQUIREMENTS, TOTAL FILM THICKNESS COULD BE REDUCED TO 100µ DFT
	ARPE ⁸		1 FULL	100	
IF ANTIFOULING IS REQUIRED:					
B	ARPE ⁸		1 FULL	100	SEE ABOVE
	VME ⁶		1 FULL	100	
	CFAF		1 FULL	75	
	CFAF		1 FULL	75	
NOTE(S):		▪ ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS SERVICE. ▪ APPLY TWO DIFFERENT COLOURS OF ANTIFOULING. THIS WILL ENSURE MORE UNIFORM COVERAGE AND ALLOW A VISIBLE CHECK FOR SYSTEM DEPLETION AND NEED FOR RECOATING.			
Definition(s):		<div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div> <div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div> <div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div> <div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div> <div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div> <div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div> <div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div> <div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div> <div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div> <div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div>			
ABBREVIATION(S):		ARPE = ABRASION RESISTANCE PURE EPOXY VME = VINYL MODIFIED EPOXY CFAF = COPPER FREE ANTIFOULING FOR ALUMINUM			

ALUMINUM VESSELS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ ON BOARD MAINTENANCE / DOCKING		
UNDERWATER HULL AND RUDDER			SYSTEM: ABRASION RESISTANT PURE EPOXY (WITH/WITHOUT ANTIFOULING)		
SURFACE PREPARATION:		HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
A	ARPE ⁸		1 T/U	100	DEPENDING ON SERVICE REQUIREMENTS, TOTAL FILM THICKNESS COULD BE REDUCED TO 100 μ DFT.
	ARPE ⁸		1 T/U	100	
IF ANTIFOULING IS REQUIRED:					
B	ARPE ⁸		1 T/U	100	SEE ABOVE
	VME ⁶		1 T/U	100	
	CFAF		1 FULL OR 1 T/U	75	
	CFAF		1 FULL OR 1 T/U	75	
NOTE(s):		<ul style="list-style-type: none">ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS SERVICE.APPLY TWO DIFFERENT COLOURS OF ANTIFOULING. THIS WILL ENSURE MORE UNIFORM COVERAGE AND ALLOW A VISIBLE CHECK FOR SYSTEM DEPLETION AND NEED FOR RECOATING.NEW ANTIFOULING MUST BE COMPATIBLE WITH OLD ANTIFOULING.			
Definition(s):		<ol style="list-style-type: none">HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(s):		ARPE = ABRASION RESISTANCE PURE EPOXY VME = VINYL MODIFIED EPOXY CFAF = COPPER FREE ANTIFOULING FOR ALUMINUM			

ALUMINUM VESSELS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALUMINUM VESSELS				▪ ON BOARD MAINTENANCE / DOCKING	
UNDERWATER HULL AND RUDDER				SYSTEM: TAR FREE VINYL ANTICORROSIVE (WITH/WITHOUT ANTIFOULING)	
SURFACE PREPARATION:		HIGH PRESSURE FRESHWATER WASH ¹ · WASH OFF OIL AND GREASE. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
A	VATF ⁷		1 T/U	100	
	VATF ⁷		1 T/U	100	
IF ANTIFOULING IS REQUIRED:					
B	VATF ⁷		1 T/U	100	
	VATF ⁷		1 T/U	100	
	CFAF		1 FULL OR 1 T/U	75	
	CFAF		1 FULL OR 1 T/U	75	
NOTE(S):		<ul style="list-style-type: none"> ▪ ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS SERVICE. ▪ APPLY TWO DIFFERENT COLOURS OF ANTIFOULING. THIS WILL ENSURE MORE UNIFORM COVERAGE AND ALLOW A VISIBLE CHECK FOR SYSTEM DEPLETION AND NEED FOR RECOATING. ▪ NEW ANTIFOULING MUST BE COMPATIBLE WITH OLD ANTIFOULING. 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		VATF = VINYL ALUMINUM ANTICORROSIVE TAR FREE FAF = COPPER FREE ANTIFOULING FOR ALUMINUM			

ALUMINUM VESSELS: UNDERWATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALUMINUM VESSELS				▪ ON BOARD MAINTENANCE / DOCKING	
UNDERWATER HULL AND RUDDER				SYSTEM: CHLORINATED RUBBER PRIMER (WITH/WITHOUT ANTIFOULING)	
SURFACE PREPARATION:		HIGH PRESSURE FRESHWATER WASH ¹ · WASH OFF OIL AND GREASE. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
A	CRHB		1 T/U	75	
	CRHB		1 T/U	75	
IF ANTIFOULING IS REQUIRED:					
B	CRHB		1 T/U	75	
	CRHB		1 T/U	75	
	CFAF		1 FULL OR 1 T/U	75	
	CFAF		1 FULL OR 1 T/U	75	
NOTE(S):		<ul style="list-style-type: none"> ▪ ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS SERVICE. ▪ APPLY TWO DIFFERENT COLOURS OF ANTIFOULING. THIS WILL ENSURE MORE UNIFORM COVERAGE AND ALLOW A VISIBLE CHECK FOR SYSTEM DEPLETION AND NEED FOR RECOATING. ▪ NEW ANTIFOULING MUST BE COMPATIBLE WITH OLD ANTIFOULING. 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		CRHB = CHLORINATED RUBBER H.B. CFAF = COPPER FREE ANTIFOULING FOR ALUMINUM			

ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS		
TOPSIDES			SYSTEM: ABRASION RESISTANT PURE EPOXY WITH POLYURETHANE FINISH		
SURFACE PREPARATION:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. BLAST OFF OLD COATINGS AND LIGHTLY ABRASE SURFACE TO ACHIEVE 40µ (MICRONS) SURFACE PROFILE. NEW BUILDINGS: DEGREASE AND BLAST AS OUTLINED UNDER "PAINTING OF ALUMINUM" IMPORTANT NOTE:: IF, FOR ANY REASON, THE SURFACE TO BE PAINTED CAN NOT BE ABRADED BY BLASTING APPLY, 1 COAT ETCH PRIMER TO 12µ DFT. FOLLOW PRODUCT DATA SHEET CLOSELY WITH REGARDS TO APPLICATION AND OVER COATING TIMES.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	ARPE ⁸ PUF ¹⁰ OR AME		1 FULL 1 FULL	100 50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(S):					
Definition(s):		<div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div> <div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div> <div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div> <div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div> <div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div> <div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div> <div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div> <div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div> <div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div> <div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div>			
ABBREVIATION(S):		ARPE = ABRASION RESISTANCE PURE EPOXY PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ ON BOARD MAINTENANCE		
TOPSIDES			SYSTEM: ABRASION RESISTANT PURE EPOXY WITH POLYURETHANE FINISH		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW TWO OR MORE COATS TO BE APPLIED IN ONE DAY. (DEPENDENT ON TEMPERATURE.) ONE COAT OF EPOXY COATING, AS IN PRESENT SYSTEM, MAY ALSO BE USED.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE PUF ¹⁰ OR AME		1 T/U 1 FULL OR 1 T/U	100 50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none">1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(S):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ ON BOARD MAINTENANCE		
TOPSIDES			SYSTEM: ABRASION RESISTANT PURE EPOXY WITH MODIFIED ACRYLIC TOPCOAT		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW TWO OR MORE COATS TO BE APPLIED IN ONE DAY. (DEPENDENT ON TEMPERATURE.) ONE COAT OF EPOXY COATING, AS IN PRESENT SYSTEM, MAY ALSO BE USED.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE MAF		1 T/U 1 FULL OR 1 T/U	100 50	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
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ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ ON BOARD MAINTENANCE		
TOPSIDES			<u>SYSTEM:</u> CHLORINATED RUBBER WITH MODIFIED ACRYLIC TOPCOAT		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. FOR MAINTENANCE, CHOOSE A MULTIPURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP MAF		1 T/U 1 FULL OR 1 T/U	75 40	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
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ABBREVIATION(S):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER MAF = MODIFIED ACRYLIC FINISH			

ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ ON BOARD MAINTENANCE		
TOPSIDES			SYSTEM: ALKYD		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. FOR MAINTENANCE, CHOOSE A MULTIPURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP AF		1 T/U 1 FULL OR 1 T/U	75 40	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
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ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS		
EXTERIOR DECKS			SYSTEM: ABRASION RESISTANT PURE EPOXY (OPTIONAL POLYURETHANE TOPCOAT)		
SURFACE PREPARATION & COMMENTS:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. BLAST OFF OLD COATINGS AND LIGHTLY ABRABE SURFACE TO ACHIEVE 40μ (MICRONS) SURFACE PROFILE. NEW BUILDINGS: DEGREASE AND BLAST AS OUTLINED UNDER "PAINTING OF ALUMINUM" IMPORTANT NOTE:: IF, FOR ANY REASON, THE SURFACE TO BE PAINTED CAN NOT BE ABRADED BY BLASTING APPLY, 1 COAT ETCH PRIMER TO 12μ DFT. FOLLOW PRODUCT DATA SHEET CLOSELY WITH REGARDS TO APPLICATION AND OVER COATING TIMES.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	ARPE ⁸		1 FULL	100	
	ARPE ⁸		1 FULL	75	NON-SKID COAT OPTIONAL
If A COSMETIC COAT IS DESIRABLE, APPLY:					
	PUF ¹⁰ OR AME		1 FULL	50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(s):		▪ WHERE NON-SKID SURFACE IS DESIRABLE, ADD 3 KG (7LBS.) OF GLASS GRANULES TO 5 GAL (20 L) OF EPOXY COATING AND APPLY THIS AS A SECOND COAT. GRANULE COARSENESS OF 18-25 U.S. SCREEN SIZE GIVES A GOOD NON-SKID FINISH. ALUMINUM OXIDE GRIT CAN ALSO BE USED.			
Definition(s):		<ol style="list-style-type: none">HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. If/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
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▪ ALUMINUM VESSELS			▪ ON BOARD MAINTENANCE		
EXTERIOR DECKS			SYSTEM: ABRASION RESISTANT PURE EPOXY (OPTIONAL POLYURETHANE TOP COAT)		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW TWO OR MORE COATS TO BE APPLIED IN ONE DAY. (DEPENDENT ON TEMPERATURE.) TWO COATS OF EPOXY COATING, AS IN PRESENT SYSTEM, MAY ALSO BE USED.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE ARPE ⁸		1 T/U 1 T/U	100 75	NON-SKID COAT OPTIONAL
IF A COSMETIC COAT IS DESIRABLE, APPLY					
	PUF ¹⁰ OR AME		1 FULL OR 1 T/U	50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(S):		<ul style="list-style-type: none">WHERE NON-SKID SURFACE IS DESIRABLE, ADD 3 KG (7LBS.) OF GLASS GRANULES TO 5 GAL (20 L) OF EPOXY COATING AND APPLY THIS AS A SECOND COAT. GRANULE COARSENESS OF 18-25 U.S. SCREEN SIZE GIVES A GOOD NON-SKID FINISH. ALUMINUM OXIDE GRIT CAN ALSO BE USED.ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none">HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(S):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY ARPE = ABRASION RESISTANCE PURE EPOXY PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ ON BOARD MAINTENANCE		
EXTERIOR DECKS			SYSTEM: ABRASION RESISTANT PURE EPOXY (OPTIONAL MODIFIED ACRYLIC TOPCOAT)		
SURFACE PREPARATION:		WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW TWO OR MORE COATS TO BE APPLIED IN ONE DAY. (DEPENDENT ON TEMPERATURE.) TWO COATS OF EPOXY COATING, AS IN PRESENT SYSTEM, MAY ALSO BE USED.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE ARPE ⁸		1 T/U 1 T/U	100 75	NON-SKID COAT OPTIONAL
If A COSMETIC COAT IS DESIRABLE, APPLY:					
	MAF		1 FULL OR 1 T/U	50	
NOTE(S):		<ul style="list-style-type: none">WHERE NON-SKID SURFACE IS DESIRABLE, ADD 3 KG (7LBS.) OF GLASS GRANULES TO 5 GAL (20 L) OF EPOXY COATING AND APPLY THIS AS A SECOND COAT. GRANULE COARSENESS OF 18-25 U.S. SCREEN SIZE GIVES A GOOD NON-SKID FINISH. ALUMINUM OXIDE GRIT CAN ALSO BE USED.ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none">HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. If/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(S):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY ARPE = ABRASION RESISTANCE PURE EPOXY MAF = MODIFIED ACRYLIC FINISH			

ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALUMINUM VESSELS				▪ ON BOARD MAINTENANCE	
EXTERIOR DECKS				SYSTEM: CHLORINATED RUBBER WITH MODIFIED ACRYLIC TOPCOAT	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. FOR MAINTENANCE, CHOOSE A MULTIPURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP MAF		1 T/U 1 FULL OR 1 T/U	75 40	
NOTE(s):		<ul style="list-style-type: none">▪ FOR THIN FILM TOP COATS SUCH AS ACRYLICS, USE GROUND NUT SHELLS 0.5 KG (1LB.) PER GAL. OR POLYPROPYLENE BEADS - 0.25 KG (8 OZ.) PER GAL. AS NON-SKID AGENTS.▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none">1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER AF = ALKYD FINISH			

ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALUMINUM VESSELS				▪ ON BOARD MAINTENANCE	
EXTERIOR DECKS				<u>SYSTEM:</u> ALKYD	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. FOR MAINTENANCE, CHOOSE A MULTIPURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP AF		1 T/U 1 FULL OR 1 T/U	75 40	
NOTE(s):		<ul style="list-style-type: none"> ▪ FOR THIN FILM TOP COATS SUCH AS ALKYDS, USE GROUND NUT SHELLS 0.5 KG (1LB.) PER GAL. OR POLYPROPYLENE BEADS - 0.25 KG (8 OZ.) PER GAL. AS NON-SKID AGENTS. ▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE. 			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(S):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER AF = ALKYD FINISH			

4.2.3 ALUMINUM VESSELS: ABOVE WATER SYSTEMS

ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS		
SUPERSTRUCTURE			SYSTEM: PURE EPOXY WITH POLYURETHANE FINISH		
SURFACE PREPARATION & COMMENTS:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. BLAST OFF OLD COATINGS AND LIGHTLY ABRABE SURFACE TO ACHIEVE 40µ (MICRONS) SURFACE PROFILE. NEW BUILDINGS: DEGREASE AND BLAST AS OUTLINED UNDER "PAINTING OF ALUMINUM" IMPORTANT NOTE:: IF, FOR ANY REASON, THE SURFACE TO BE PAINTED CAN NOT BE ABRADED BY BLASTING APPLY, 1 COAT ETCH PRIMER TO 12µ DFT. FOLLOW PRODUCT DATA SHEET CLOSELY WITH REGARDS TO APPLICATION AND OVER COATING TIMES.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	PE PUF ¹⁰ OR AME		1 FULL 1 FULL	100 50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(S):					
Definition(s):		<div><div>1.</div><div>HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div></div> <div><div>2.</div><div>GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div></div> <div><div>3.</div><div>HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>4.</div><div>LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div></div> <div><div>5.</div><div>ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div></div> <div><div>6.</div><div>VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div></div> <div><div>7.</div><div>SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div></div> <div><div>8.</div><div>ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>9.</div><div>POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div></div> <div><div>10.</div><div>PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(S):		PE = PURE EPOXY COATING PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ ON BOARD MAINTENANCE / DOCKING		
SUPERSTRUCTURE			SYSTEM: PURE EPOXY WITH POLYURETHANE FINISH		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW TWO OR MORE COATS TO BE APPLIED IN ONE DAY. (DEPENDENT ON TEMPERATURE.) ONE COAT OF EPOXY COATING, AS IN PRESENT SYSTEM, MAY ALSO BE USED.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE PUF ¹⁰ OR AME		1 T/U 1 FULL OR 1 T/U	100 50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div><div>2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div><div>3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div><div>5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div><div>6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div><div>7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div><div>8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div><div>9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div><div>10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(S):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ ON BOARD MAINTENANCE		
SUPERSTRUCTURE			SYSTEM: PURE EPOXY WITH MODIFIED ACRYLIC TOPCOAT		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW TWO OR MORE COATS TO BE APPLIED IN ONE DAY. (DEPENDENT ON TEMPERATURE.) ONE COAT OF EPOXY COATING, AS IN PRESENT SYSTEM, MAY ALSO BE USED.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE MAF		1 T/U 1 FULL OR 1 T/U	100 50	
NOTE(S):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1.</div><div>HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div></div> <div><div>2.</div><div>GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div></div> <div><div>3.</div><div>HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>4.</div><div>LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div></div> <div><div>5.</div><div>ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div></div> <div><div>6.</div><div>VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div></div> <div><div>7.</div><div>SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div></div> <div><div>8.</div><div>ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>9.</div><div>POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div></div> <div><div>10.</div><div>PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(S):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY MAF = MODIFIED ACRYLIC FINISH			

ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ ON BOARD MAINTENANCE		
SUPERSTRUCTURES			SYSTEM: CHLORINATED RUBBER WITH MODIFIED ACRYLIC TOPCOAT		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. FOR MAINTENANCE, CHOOSE A MULTIPURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP MAF		1 T/U 1 FULL OR 1 T/U	75 40	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1.</div><div>HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div></div> <div><div>2.</div><div>GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div></div> <div><div>3.</div><div>HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>4.</div><div>LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div></div> <div><div>5.</div><div>ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div></div> <div><div>6.</div><div>VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div></div> <div><div>7.</div><div>SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div></div> <div><div>8.</div><div>ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>9.</div><div>POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div></div> <div><div>10.</div><div>PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER MAF = MODIFIED ACRYLIC FINISH			

ALUMINUM VESSELS: ABOVE WATER SYSTEMS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALUMINUM VESSELS				▪ ON BOARD MAINTENANCE	
SUPERSTRUCTURE				SYSTEM: ALKYD	
SURFACE PREPARATION & COMMENTNS:		WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. FOR MAINTENANCE, CHOOSE A MULTIPURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP AF		1 T/U 1 FULL OR 1 T/U	75 40	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<div><div>1.</div><div>HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div></div> <div><div>2.</div><div>GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div></div> <div><div>3.</div><div>HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>4.</div><div>LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div></div> <div><div>5.</div><div>ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div></div> <div><div>6.</div><div>VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div></div> <div><div>7.</div><div>SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div></div> <div><div>8.</div><div>ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>9.</div><div>POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div></div> <div><div>10.</div><div>PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER AF = ALKYD FINISH			

4.2.4 ALUMINUM VESSELS: INTERNAL AREAS

ALUMINUM VESSELS: INTERNAL AREAS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS		
ALUMINUM SURFACES UNDER INSULATION AND LININGS			SYSTEM: PURE EPOXY		
SURFACE PREPARATION & COMMENTS:		REBLAST: WASH OFF OIL, GREASE AND DIRT, RINSE WITH FRESHWATER. BLAST OFF OLD COATINGS AND LIGHTLY ABRASE SURFACE TO ACHIEVE 40μ (MICRONS) SURFACE .□ NEW BUILDINGS: DEGREASE AND BLAST AS OUTLINED UNDER "PAINTING OF ALUMINUM" IMPORTANT NOTE:: IF, FOR ANY REASON, THE SURFACE TO BE PAINTED CAN NOT BE ABRADED BY BLASTING APPLY, 1 COAT ETCH PRIMER TO 12μ DFT. FOLLOW PRODUCT DATA SHEET CLOSELY WITH REGARDS TO APPLICATION AND OVER COATING TIMES.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	PE	LIGHT	1 FULL	100	
NOTE(S):					
Definition(s):		<div><div>1.</div><div>HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div></div> <div><div>2.</div><div>GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div></div> <div><div>3.</div><div>HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>4.</div><div>LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div></div> <div><div>5.</div><div>ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div></div> <div><div>6.</div><div>VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div></div> <div><div>7.</div><div>SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div></div> <div><div>8.</div><div>ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>9.</div><div>POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div></div> <div><div>10.</div><div>PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(S):		PE = PURE EPOXY COATING			

ALUMINUM VESSELS: INTERNAL AREAS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS		
INTERIOR ACCOMMODATION, PAINTED SURFACES			SYSTEM: PURE EPOXY WITH POLYURETHANE FINISH		
SURFACE PREPARATION & COMMENTS:		REBLAST: HIGH PRESSURE FRESHWATER WASH ¹ . WASH OFF OIL AND GREASE. BLAST OFF OLD COATINGS AND LIGHTLY ABRABE SURFACE TO ACHIEVE 40µ (MICRONS) SURFACE PROFILE. NEW BUILDINGS: DEGREASE AND BLAST AS OUTLINED UNDER "PAINTING OF ALUMINUM" IMPORTANT NOTE:: IF, FOR ANY REASON, THE SURFACE TO BE PAINTED CAN NOT BE ABRADED BY BLASTING APPLY, 1 COAT ETCH PRIMER TO 12µ DFT. FOLLOW PRODUCT DATA SHEET CLOSELY WITH REGARDS TO APPLICATION AND OVER COATING TIMES.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	PE PUF ¹⁰ OR AME		1 FULL 1 FULL	100 50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(S):					
Definition(s):		<div><div>1.</div><div>HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div></div> <div><div>2.</div><div>GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div></div> <div><div>3.</div><div>HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>4.</div><div>LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div></div> <div><div>5.</div><div>ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div></div> <div><div>6.</div><div>VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div></div> <div><div>7.</div><div>SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div></div> <div><div>8.</div><div>ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>9.</div><div>POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div></div> <div><div>10.</div><div>PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(S):		PE = PURE EPOXY COATING PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

ALUMINUM VESSELS: INTERNAL AREAS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ ON BOARD MAINTENANCE		
INTERIOR ACCOMMODATION, PAINTED SURFACES			SYSTEM: PURE EPOXY WITH POLYURETHANE FINISH		
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH ¹ AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. IT IS RECOMMENDED THAT FOR ON BOARD MAINTENANCE OF EPOXY SYSTEMS A HIGH BUILD SURFACE TOLERANT ALUMINUM PIGMENTED EPOXY IS USED. THE PRODUCT SHOULD FEATURE FAST CURE, LOW TEMPERATURE CURE AND FAST OVER COATING TIMES. THIS WILL ALLOW TWO OR MORE COATS TO BE APPLIED IN ONE DAY. (DEPENDENT ON TEMPERATURE.) ONE COAT OF EPOXY COATING, AS IN PRESENT SYSTEM, MAY ALSO BE USED.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
	APSTE PUF ¹⁰ OR AME		1 T/U 1 FULL OR 1 T/U	100 50	SEE ITEMS 2.8 AND 2.9, PAGE 2
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none">HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(s):		APSTE = ALUMINUM PIGMENTED SURFACE TOLERANT EPOXY PUF = POLYURETHANE FINISH AME = ACRYLIC MODIFIED EPOXY			

ALUMINUM VESSELS: INTERNAL AREAS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALUMINUM VESSELS			▪ MAJOR REFIT / REBLAST ▪ NEW BUILDINGS		
INTERIOR ACCOMMODATION, PAINTED SURFACES			SYSTEM: ALKYD		
SURFACE PREPARATION & COMMENTS:		REBLAST: WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. BLAST OFF OLD COATINGS AND LIGHTLY ABRASE SURFACE TO ACHIEVE 40µ (MICRONS) SURFACE PROFILE. NEW BUILDINGS: DEGREASE AND BLAST AS OUTLINED UNDER "PAINTING OF ALUMINUM" IMPORTANT NOTE:: IF, FOR ANY REASON, THE SURFACE TO BE PAINTED CAN NOT BE ABRADED BY BLASTING APPLY, 1 COAT ETCH PRIMER TO 12µ DFT. FOLLOW PRODUCT DATA SHEET CLOSELY WITH REGARDS TO APPLICATION AND OVER COATING TIMES.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	APHB AF		1 FULL 1 OR 2 FULL	85 40 EACH	
NOTE(s):		▪ ON DECKS IN PARTICULAR IT WOULD BE BENEFICIAL WITH TWO COATS ALKYD FINISH			
Definition(s):		<div><div>1.</div><div>HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)</div></div> <div><div>2.</div><div>GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)</div></div> <div><div>3.</div><div>HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>4.</div><div>LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.</div></div> <div><div>5.</div><div>ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.</div></div> <div><div>6.</div><div>VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.</div></div> <div><div>7.</div><div>SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.</div></div> <div><div>8.</div><div>ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.</div></div> <div><div>9.</div><div>POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.</div></div> <div><div>10.</div><div>PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.</div></div>			
ABBREVIATION(s):		APHB = ALKYD PRIMER H.B. AF = ALKYD FINISH			

ALUMINUM VESSELS: INTERNAL AREAS					
VESSEL TYPE / CHARACTERISTICS:				Type of Specification:	
▪ ALUMINUM VESSELS				▪ ON BOARD MAINTENANCE	
INTERIOR ACCOMMODATIONS, PAINTED SURFACES				<u>SYSTEM:</u> ALKYD	
SURFACE PREPARATION & COMMENTS:		WASH OFF OIL AND GREASE. FRESHWATER WASH AND RINSE TO REMOVE SALT AND DIRT. LIGHTLY BLAST DAMAGED AREAS, OR POWER DISC TO BRIGHT METAL. FOR MAINTENANCE, CHOOSE A MULTIPURPOSE MODIFIED ALKYD PRIMER. IT SHOULD BE SURFACE TOLERANT, FAST DRYING WITH RELATIVELY HIGH VOLUME SOLID CONTENT (40-50%) AND REASONABLE HIGH BUILD QUALITIES (50-75µ) AND FAST OVER COATING TIMES. THE PRIMER SHOULD ACCEPT TOP COATS OF ALKYD, ACRYLIC, CHLORINATED RUBBER, URETHANE, VINYL ESTER AND SOME EPOXY COATINGS. THE PRIMER SHOULD BE LEAD AND CHROMATE FREE.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS µ	COMMENTS
	MPMAP AF		1 T/U 1 OR 2 T/U OR FULL	75 40	
NOTE(s):		▪ ON BOARD MAINTENANCE IS OFTEN CARRIED OUT WITH BRUSH AND ROLLER. ENSURE THAT PROPER FILM THICKNESS IS APPLIED BY USING WET FILM THICKNESS GAUGE.			
Definition(s):		<ol style="list-style-type: none"> 1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD. 			
ABBREVIATION(s):		MPMAP = MULTI-PURPOSE MODIFIED ALKYD PRIMER AF = ALKYD FINISH			

4.3 Fiberglass Vessels

4.3.1 PAINTING OF FIBERGLASS

When we talk about painting fiberglass vessels, we mean "bare" fiberglass or, the exterior layer of the vessel namely the gelcoat. The gelcoat is often coloured and sometimes mistaken for paint. The way fiberglass vessels are manufactured necessitates/dictates that a mold release agent is used in order to get the vessel, or parts of it, released out of the mold.

Theoretically, a new fiberglass vessel should not need to be painted, with exception perhaps of antifouling on the underwater area of the hull. Waxing and polishing can maintain a fiberglass vessel in reasonable condition for sometime. However, exposure to the elements promotes chalking and fading of the gelcoat, and wear and tear often makes painting a necessary maintenance.

Hull blistering may be another reason for painting fiberglass vessels. The blistering is caused by water permeating the gelcoat and being absorbed by dry laminate in the hull. The subject of repair and painting due to hull blistering will not be dealt with here. Let it suffice to say that application of high build epoxy coatings can drastically minimize the risk of blistering before it takes place. And if it has happened, repairs and dry out of the hull along with application of epoxy coatings can restore a hull to sound condition. Major marine coating manufacturers have available products and procedures for such repairs.

SURFACE PREPARATION:

The first step is to remove all traces of mold release agent and waxes. Wash and scrub the surface with a stiff brush, soap and water (preferably warm). Flush and rinse to remove soap or cleaner residue. Dry surface. Next, wipe surface with clean rags dampened with "solvent wash". This is a specific blend of solvents for this particular purpose. Change rags often to make sure wax or mold release agent is not merely "moved around" on the surface. To be sure all contaminants have been cleaned off, use the "water test" to check the surface. Flush or spray fresh water on the surface. The surface should be uniformly wet. If the water "curtains", "withdraws", or "beads up", wash the area affected with solvent wash again and until surface is clean.

The second step is to either abrade the surface or use an "etch type primer". These primers are called "fiberglass primers" or "no sanding primers". This type primer "etches" into the surface of the gelcoat to provide adhesion for subsequent coats of paint. The primer is applied by roller or brush, is fast drying and has a very short over coating time. Product data sheets and label directions must be followed in detail.

The alternative to the use of a fiberglass primer is to abrade the gelcoat thoroughly, using 80 grit production paper and sanding until a uniform flat surface is obtained. After sanding, wipe down surface with solvent wash to remove all sanding residue and dust. A sanded surface offers the most "fool proof" alternative and probably the best surface to ensure good adhesion of paint to fiberglass. It also eliminates the "no sanding primer" and the short over coating time, which often is a problem with the "etch type primer" method. However, the sanding option does have its own draw back. Apart from the labour involved, the sanding operation slightly reduces the thickness of the gelcoat. Below water, this may not be desirable from a hull blistering point of view. One should also make sure the builder's hull warranty is not being affected. If the slight loss of gelcoat thickness on the underwater hull is of concern, it can easily be rectified by the application of 1 or 2 coats of epoxy coating prior to application of antifouling paint.

If painting is to take place over surfaces that are scratched or chipped, fill imperfections with epoxy putty and/or fairing compound and sand smooth. Depending on the condition of the gelcoat, 1 or 2 coats of epoxy coating should be considered before the final paint system is applied.

The preceding recommendations and the following specifications are meant as a guide to obtain a good practical "work boat finish" using commercial heavy duty paint coatings.

4.3.2 FIBERGLASS VESSELS: UNDERWATER AREAS

FIBERGLASS VESSELS: UNDERWATER AREAS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ FIBERGLASS			▪ BARE GELCOAT OR RECOATING OF ANTIFOULING		
UNDERWATER HULL			SYSTEM: ABRASION RESISTANT PURE EPOXY (OPTIONAL) ANTIFOULING		
SURFACE PREPARATION:		FOR BARE GELCOAT PROCEED AS OUTLINED IN "PAINTING OF FIBERGLASS VESSELS". (SEE SECTION 4.3) FOR REPAIRS/RE-COATING: HIGH PRESSURE FRESH WATER WASH ¹ . WASH OFF OIL AND GREASE. IF THERE IS NO DAMAGE TO THE COATING OR HULL, RE-APPLY 1 OR 2 COATS OF ANTIFOULING AS PER SYSTEM B. IF THERE IS DAMAGE, REPAIR WITH EPOXY PUTTY OR EPOXY COATINGS AS SPECIFIED IN SYSTEM A BEFORE RE-COATING WITH ANTIFOULING.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
A	ARPE ⁸		1 FULL	125	2 COATS ARE BEST OPTIONAL 1 COAT AT 150μ
	VME ⁸		1 FULL	125	
	CDPAF		1 FULL	75	
	CDPAF		1 FULL	75	
IF NOT DAMAGED:					
B	CDPAF		1 FULL	75	SEE NOTE ABOVE.
	CDPAF		1 FULL	75	
NOTE(s):		<ul style="list-style-type: none">• ANTIFOULING SYSTEM SPECIFIED IS FOR 24 MONTHS SERVICE.• NEW ANTIFOULING MUST BE COMPATIBLE WITH OLD ANTIFOULING.			
Definition(s):		<ol style="list-style-type: none">1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.)2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.)3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013.5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION.6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME.7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT.8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS.9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING.10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NO INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(S):		ARPE = ABRASION RESISTANCE PURE EPOXY VME = VINYL MODIFIED EPOXY CDPAF = CONTROLLED DEPLETION POLYMER ANTIFOULING (TBT FREE)			

4.3.3 FIBERGLASS VESSELS: ABOVE WATER AREAS

FIBERGLASS VESSELS: ABOVE WATER AREAS					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ FIBERGLASS			▪ BARE GELCOAT OR RECOATING		
ABOVE WATER AREAS			SYSTEM: POLYURETHANE (BEST PERFORMANCE) OR ALKYD OR MODIFIED ACRYLIC		
SURFACE PREPARATION:		PREFERRED METHOD IS SANDING METHOD AS DESCRIBED UNDER : "PAINTING OF FIBERGLASS VESSELS". (SEE SECTION 4.3) IF GELCOAT IS IN GOOD CONDITION, PROCEED TO THE PAINTING OPERATION. IF GELCOAT IS IN POOR CONDITION, SCRATCHES, CHIPS, AND CRACKS SHOULD BE REPAIRED USING EPOXY PUTTY AND FAIRING COMPOUND. REPAIRED AREAS SHOULD BE SANDED SMOOTH LIKE THE SURROUNDING AREA. SERIOUS CONSIDERATION SHOULD BE GIVEN TO APPLICATION OF 1 OR 2 COATS OF HIGH BUILD EPOXY PRIOR TO APPLICATION OF THE FINISH COAT. FOR REPAIRS/RE-COATING, WASH OFF OIL AND GREASE. WASH AND RINSE WITH FRESH WATER TO REMOVE DIRT AND SALT. REPAIR DAMAGED AREAS WITH EPOXY PUTTY AND FAIRING COMPOUND. SAND SMOOTH. TOUCH-UP REPAIRED AREAS WITH 1 OR 2 COATS OF THE FINISH COATING TO BE APPLIED. THEN APPLY 1 OR 2 COATS OF FINISH COATING. FOR NON-SKID FINISH ON DECK AREAS, USE GROUND NUT SHELLS 0.5 KG (1LB.) PER GAL OR POLYPROPYLENE BEADS, 0.25 KG (1/2 LB.) PER GAL., IN THE FINAL AND/OR BOTH COATS.			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
A	(AR)PE ⁸ VME ⁶ PUF OR AME		1 OR 2 FULL	40 EA.	OPTIONAL OPTIONAL SEE ITEMS 2.8 AND 2.9, PAGE 2
B	OR AF		1 OR 2 FULL	40 EA.	
C	OR MAF		1 OR 2 FULL	40 EA.	
Definition(s):		1. HIGH PRESSURE FRESHWATER WASH SHOULD BE CARRIED OUT WITH A FAN JET LANCE PROVIDING NOZZLE PRESSURE OF APPROXIMATELY 3000 PSI (68 BAR / 210 KG/CM ²) SUFFICIENT VOLUME OF WATER MUST BE PROVIDED. (SEE NOTES ON HYDROBLASTING UNDER SURFACE PREPARATION.) 2. GRITBLASTING AS USED IN THIS MANUAL MEANS BLAST CLEANING WITH VARIOUS TYPES OF GRIT, INCLUDING THOSE DERIVED FROM COPPER, NICKEL OR COAL BASED SLAG. OBSERVE STANDARDS FOR BLASTING MEDIA. (SEE NOTES UNDER SURFACE PREPARATION/ABRASIVE BLASTING.) 3. HARPE (HIGH ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 65-70 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1,000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 4. LFC (LOW FRICTION COATINGS) WITH VERY LOW DYNAMIC COEFFICIENT OF FRICTION WITH ICE, TYPICALLY -0.030 - 0.013. 5. ALL UNDERWATER ANTICORROSIVE COATINGS MUST BE COMPATIBLE WITH CATHODIC PROTECTION. 6. VME (VINYL MODIFIED EPOXY) TIECOAT INCREASE OVER COATING TIME BETWEEN PURE EPOXY COATINGS AND ANTIFOULING. IN SOME SYSTEMS, IT MAY FORM PART OF THE ANTICORROSIVE PAINT SCHEME. 7. SOME COATINGS MANUFACTURERS REQUIRE A SPECIFIC COATING SEQUENCE. ENSURE PROPER PRODUCT IS USED FOR FIRST AND SECOND COAT. 8. ARPE (ABRASION RESISTANT PURE EPOXY COATINGS) SHOULD HAVE A MAXIMUM 80-90 MG LOSS MEASURED ON TABER ABRASER USING A CS10 WHEEL, 1000 CL., 1000 GR. WEIGHT. HIGH TENSILE STRENGTH, GOOD EXTENSIBILITY AND GOOD IMPACT RESISTANCE ARE ALSO IMPORTANT FACTORS. SEE TABLE ON COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS. 9. POWER TOOL CLEANING WITH WIRE BRUSHES IS NOT NORMALLY RECOMMENDED. THIS METHOD TENDS TO POLISH THE SURFACE AND IS THUS DETRIMENTAL TO GOOD ADHESION OF COATINGS. IF/WHEN NEEDLE GUNS ARE USED THEY OFTEN PRODUCE A VERY ROUGH / HIGH SURFACE PROFILE. IT IS THEREFORE ADVISABLE TO LIGHTLY POWER DISC NEEDLE GUNNED AREAS PRIOR TO COATING. 10. PUF (POLYURETHANE FINISH) CAN BE ONE COMPONENT MOISTURE CURED TYPE OR TWO COMPONENT TYPE. HOWEVER, DO NOT INTERMIX THE TWO TYPES IN ONE SYSTEM. MAKE SURE THE PRODUCT CHOSEN IS RE-COATABLE AND HAS INDEFINITE OVER COATING TIME. DO NOT CONFUSE THESE PRODUCTS WITH ONE COMPONENT POLYURETHANE MODIFIED ALKYD.			
ABBREVIATION(S):		ARPE = (ABRASION RESISTANCE) PURE EPOXY VME = VINYL MODIFIED EPOXY PUF = POLYURETHANE FINISH		AF = ALKYD FINISH MAF = MODIFIED ACRYLIC FINISH AME = ACRYLIC MODIFIED EPOXY	

4.3.4 FIBERGLASS VESSELS: DECKS – WITH NO SKID EFFECT

FIBERGLASS VESSELS: DECKS – WITH NO SKID EFFECT					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ FIBERGLASS			▪ BARE GELCOAT		
DECKS, WITH NO SKID EFFECT EMBOSSED IN GELCOAT			SYSTEM: POLYURETHANE (BEST PERFORMANCE) OR ACRYLIC MODIFIED EPOXY OR ALKYD OR MODIFIED ACRYLIC		
SURFACE PREPARATION:					
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
NOTE(s):		<ul style="list-style-type: none"> MANY DECKS HAVE A NON-SKID EFFECT MOLDED INTO THE GELCOAT. THIS AREA PRESENTS A PROBLEM TO PAINT BECAUSE IT NOT POSSIBLE TO CLEAN AND SAND AS DONE ON A SMOOTH SURFACE. IF PAINTING IS DEEMED DESIRABLE, WASH AND SCRUB SURFACE WITH A STIFF BRUSH, SOAP AND WATER (PREFERABLY WARM). FLUSH AND RINSE TO REMOVE ANY CLEANER RESIDUE. LET DRY. SCRUB SURFACE WITH BRONZE WOOL AND SOLVENT WASH, USING PLENTY OF CLEAN RAGS TO SOAK UP THE SOLVENT AFTER SCRUBBING. TREAT A SMALL AREA AT A TIME. WHEN SURFACE IS CLEAN AND DRY, APPLY 1 THIN COAT OF FIBERGLASS PRIMER, FOLLOWING INSTRUCTIONS ON THE CAN. WITHIN ALLOWABLE OVER COATING TIME, APPLY FIRST OF 1 OR 2 COATS OF SELECTED FINISH COAT. IF NECESSARY, GROUND NUT SHELLS, 0.5 KG (1 LB.) PER GAL OR POLYPROPYLENE BEADS, 0.25 KG (1/2 LB.) PER GAL., CAN BE ADDED TO THE PAINT FOR EXTRA NON-SKID EFFECT. 			
Definition(s):					
ABBREVIATION(s):					

4.4 Wood

4.4.1 PAINTING OF WOOD

WOOD: (AS INSTALLED ON SHIPS)					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
<ul style="list-style-type: none"> ALL VESSELS, AS INSTALLED 			<ul style="list-style-type: none"> BARE WOOD 		
WOOD, PAINTED			SYSTEM:		
			CONVENTIONAL ALKYD OR MODIFIED ALKYD (SILICONE OR URETHANE MODIFIED)		
SURFACE PREPARATION:		<ul style="list-style-type: none"> SAND BARE WOOD WITH 80-100 GRIT PAPER. WIPE DOWN, USING LINT FREE RAG DAMPENED WITH MINERAL SPIRIT PAINT SOLVENT. IF OPEN GRAIN WOOD IS BEING PAINTED AND A SMOOTH FINISH IS DESIRED, USE A PASTE WOOD FILLER TO FILL THE GRAIN. SAND AGAIN AND WIPE DOWN. IF SOFT WOODS OR PLYWOOD IS BEING PAINTED, USE A KNOT AND WOOD SEALER TO SEAL THE SURFACE. FIR PLYWOOD IN PARTICULAR MUST BE SEALED. SEVERAL COATS OF SEALER MAY BE NECESSARY. APPLY SEALER COATS UNTIL THE POROUS GRAIN TAKES ON A GLOSSY APPEARANCE. ONCE GLOSS IS OBTAINED, SAND WITH 120 GRIT PAPER AND WIPE DOWN. DEPENDING ON FINISH DESIRED, APPLY 1 OR 2 COATS OF UNDER COATER (OR PRIMER), SANDING BETWEEN COATS WITH 120 GRIT PAPER. NEXT, APPLY 2 COATS OF FINISH, SANDING BETWEEN COATS, USING 220 GRIT PAPER. FOR INTERIOR USE, A 3-COAT SYSTEM WOULD BE CONSIDERED MINIMUM. FOR EXTERIOR USE, A 4-COAT SYSTEM WOULD BE CONSIDERED MINIMUM. 			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
NOTE(S):		<ul style="list-style-type: none"> TEAK IS NOT NORMALLY PAINTED. USE AN OIL FINISH TO MAINTAIN TEAK. 			
Definition(s):					
ABBREVIATION(S):					

4.4.2 VARNISHING OF WOOD

WOOD: (AS INSTALLED ON SHIPS)					
VESSEL TYPE / CHARACTERISTICS:			Type of Specification:		
▪ ALL VESSELS, AS INSTALLED			▪ BARE WOOD		
WOOD, VARNISHED			SYSTEM: WOOD, VARNISHED		
SURFACE PREPARATION:		<ul style="list-style-type: none"> ▪ A MULTITUDE OF DIFFERENT CLEAR FINISHES ARE AVAILABLE FOR BRIGHT WORK. A ONE COMPONENT POLYURETHANE VARNISH IS A GOOD CHOICE FOR INTERIOR WORK. THIS TYPE STAYS CLEAR WITH MINIMUM YELLOWING. FOR EXTERIOR WORK, CHOOSE A CONVENTIONAL BAKELITE VARNISH OR A POLYURETHANE TYPE WITH UV FILTER. ▪ SAND THE WOOD WITH 80-100 GRIT PAPER. WIPE DOWN, USING LINT FREE RAG DAMPENED WITH MINERAL SPIRIT PAINT SOLVENT. OPEN GRAIN WOOD, SUCH AS MAHOGANY, MAY BE TREATED WITH A WOOD FILLER STAIN TO FILL THE GRAIN. AFTER FILLING, SAND AND WIPE DOWN. THE <u>FIRST COAT</u> OF VARNISH SHOULD BE THINNED 10-20% WITH APPROPRIATE SOLVENT. USE A SEPARATE CLEAN CAN FOR THE VARNISH THAT IS BEING THINNED FOR THE FIRST COAT. LET THE VARNISH STAND AFTER STIRRING UNTIL ALL BUBBLES HAVE DISAPPEARED. FOR SUBSEQUENT COATS, USE THIS CAN ON WHICH TO WIPE VARNISH BRUSH TO AVOID BUBBLES IN THE VARNISH CAN. USE THE BEST BRUSH AVAILABLE. WHEN FIRST COAT IS DRY, SAND LIGHTLY WITH 220-320 GRIT PAPER, THEN WIPE DOWN AND APPLY SECOND COAT. SAND AND WIPE DOWN BETWEEN EACH COAT. ▪ <i>THE MORE COATS APPLIED THE DEEPER THE LUSTER OF THE BRIGHT WORK.</i> ▪ FOR INTERIOR USE, 4 COATS ARE CONSIDERED MINIMUM. ▪ FOR EXTERIOR USE, 5 COATS ARE CONSIDERED MINIMUM. 			
	PRODUCT	COLOUR	NO. OF COATS FULL / TOUCH-UP	DRY FILM THICKNESS μ	COMMENTS
NOTE(S):		<ul style="list-style-type: none"> ▪ TEAK IS NOT NORMALLY VARNISHED. USE AN OIL FINISH TO MAINTAIN TEAK. • NO CLEAR COATING APPLIED ON WOOD WILL LAST FOR LONG PERIODS OF TIME. UV RAYS TEND TO PENETRATE CLEAR COATINGS AND DECOMPOSE THE WOOD FIBER TO WHICH THE VARNISH IS APPLIED. SHIELDING BRIGHT WORK FROM THE SUN "AS IN A BOAT HOUSE" GREATLY EXTENDS THE LIFE OF THE COATING. 			
Definition(s):					
ABBREVIATION(S):					

Comparative Technical Data For Abrasion Resistant Coatings**5.0 COMPARATIVE TECHNICAL DATA FOR ABRASION RESISTANT COATINGS**

The figures below are given as a guidance in helping to choose the right coating for a particular application.

PRODUCT TYPE	TENSILE ¹ STRENGTH N/MM ²	EXTENSIBILITY ² % INCREASE BEFORE FRACTURE		TABER VALUE ³ RESISTANCE TO EROSIVE WEAR MG/LOSS RANKING 1 - 5		RELATIVE ⁴ IMPACT RESISTANCE RANKING 1 - 5	DYNAMIC CO-EFFICIENT OF FRICTION	OVERALL ABRASION CAPABILITY (MAX = 20)
		1 - 5	1 - 5	1 - 5	1 - 5			
HIGH ABRASION RESISTANT / LOW FRICTION EPOXY COATING	24	3	3	60	4	4	0.030-0.013	14
HIGH ABRASION RESISTANT PURE EPOXY	25	3	2	65	4	4	N/A	13
ABRASION RESISTANT PURE EPOXY	30	4	2	85	2	4	N/A	12
NOTE(s): TO ACHIEVE THE BEST PERFORMANCE FROM AN ABRASION RESISTANT COATING, SOUNDNESS OF SUBSTRATE AND ADHESION TO THAT SUBSTRATE ARE CRITICAL. AT MAINTENANCE / REPAIR DRY DOCKINGS THERE IS NO SUBSTITUTE FOR GRITBLASTING TO SA2½ STANDARD AND PRODUCING AN ANGULAR SURFACE PROFILE OF 75-100 MIC. THIS PREPARATION STANDARD IS THE OPTIMUM OVER WHICH ABRASION RESISTANT COATINGS WILL SOUNDLY ADHERE AND PERFORM TO THEIR MAXIMUM.								
1 & 2	ASTM D2370-68 ON INSTRON TENSOMETER. HIGHER VALUES INDICATE GREATER STRENGTH OR EXTENSIBILITY.							
3	MEASURED ON TABER ABRASER USING CS10 WHEELS, 1000 CL. A LOWER VALUE DENOTES BETTER RESISTANCE TO EROSIVE WEAR.							
4	ASTM D2794-69 ON GARDNER IMPACT TESTER. HIGHER VALUES DENOTES BETTER IMPACT RESISTANCE.							
5	OVERALL ABRASION CAPABILITY; GOOD RESISTANCE OF A COATING TO MECHANICAL DAMAGE IS TYPIFIED BY HIGH TENSILE STRENGTH, EXTENSIBILITY AND IMPACT RESISTANCE, COUPLED WITH A LOW TABER VALUE. THE OVERALL ABRASION CAPABILITY OF A COATING SCHEME IS THE SUM OF THE RANKINGS AND INDICATES THE OVERALL RESISTANCE OF A SYSTEM TO MECHANICAL DAMAGE IN SERVICE. FOR ICE BREAKER COATINGS WITH LOW FRICTION QUALITIES OTHER KEY FEATURES INCLUDE LOW TEMPERATURE OPERATION CAPABILITIES, LOW FRICTIONAL RESISTANCE IN ICE AND GOOD RESISTANCE TO ICE ADHESION.							

6.0 CATHODIC PROTECTION

The surface of steel plate is not electrically neutral overall, but is characterised by points of relatively high electrical potential.

When the steel plate is immersed in water, an electric current commences and corrosion occurs at those points where the current leaves the metal and enters the water (i.e. anodic areas). The remainder of the surface (i.e. cathodic areas) acts as a receiver of current and remains protected. This, in very broad terms, forms the basis of the corrosion cell.

In recent years, it has become common practice to preserve the steel by means of the superimposition of an artificially contrived current which tends to render the entire surface cathodic. In the case of the steel hull of a ship, the electrical potential is made some 150 to 200 millivolts, more negative than it was originally, by means of either sacrificial anodes or by a current generated from within the vessel and introduced via electrodes fitted in the hull.

To take the simpler case of the sacrificial anode system, the net result can be simply regarded as the zinc or aluminum anode material taking the place of the previously anodic steel surface, so that all of the steel is effectively more cathodic and therefore unlikely to corrode. Thus, this method of corrosion prevention is named cathodic protection.

An increasingly common fault is to refer to the degree of cathodic protection as "milliamps per square foot" or similar units. This unit is in fact a measure of the current required to raise the hull to the more negative potential and is largely dependent on the condition of the paint, the speed through the water, and the temperature of the water.

When referring to the degree of cathodic protection, the correct units are those of electrical potential, and are usually around 800 to 850 millivolts relative to the silver chloride reference electrode which is normally used to make such measurements.

CORRECT CHOICE OF PAINT SYSTEM:

One of the side reactions of the above general process is that of alkali formation at the cathodic surface. This occurs under normal cathodic protection conditions, and is increased where over-protection (i.e. potentials more negative than 900 mv) occurs. Where an unsuitable paint system, or too high a potential, is used, the alkali causes saponification and degradation of the coatings, and electro-osmotic blistering frequently occurs.

It is therefore essential to be selective in the choice of coating. The various available systems are listed below, together with their relative suitability. It should be borne in mind that areas such as the boottop and lower topsides are affected by cathodic protection, as well as the bottom.

▪ Paints based on Alkyds, Epoxy Ester, Oleoresinous and Similar Resins:	These coatings contain oils or fatty acids, which are saponifiable, (i.e., attached by alkali). For this reason, they are not recommended for use on boottop, lower topsides or bottoms, in conjunction with any form of cathodic protection.
▪ Bituminous Aluminum, Chlorinated Rubber, Vinyl Tar and Vinyl Coatings:	These coatings are fully compatible with zinc and aluminum anode systems, and with impressed current cathodic protection (except in the vicinity of the impressed current anode) provided that a sufficient dry film thickness has been applied. With magnesium anodes, Coal Tar Epoxy system is recommended.
▪ Epoxy, Epoxy Hydrocarbon and Coal Tar Epoxy Systems:	These systems have perhaps the highest resistance to cathodic protection, and are fully compatible with both impressed current and sacrificial anode systems.

STRAY CURRENT CORROSION:

The opposite effect to cathodic protection is sometimes seen on vessels where, after electrical work on board, mounds of rust cover the immersed steel and deep pits are found beneath the rust.

The most likely cause of the problem is stray current corrosion. A leak of an alternating system is much less likely to cause corrosion of steel as the polarity changes rapidly and the steel surface alternates from being anodic to being cathodic. A direct current leak, such as that from welding, could make the hull of the vessel an anode and steel would tend to go into solution.

The rate of steel loss would be controlled by three factors:

- 1) The continuity of the coating (pinholes or areas of low thickness and low electrical resistance) and the amount of bare metal.
- 2) The voltage applied and the current available.
- 3) The relative resistance of the route to earth through the ship's ground and the leakage route through steel and seawater to earth.

In the absence of suitable cathodic protection, which is capable of ensuring the entire hull is maintained at all times at a negative potential, anodic steel will always corrode as the path to earth through bare metal or pinholes will always take some current as no matter how massive a ground or how short the path to earth, its resistance can never be reduced to zero. The low resistance of copper grounding wires might seem to eliminate the problem as:

- Copper has a resistance of 1.7 microhm-cm.
- Steel varies with composition, but 12 microhm-cm would be typical.
- Seawater varies with salinity, but 35,000 microhm-cm will serve as an example.

This indicates that seawater conducts electricity 20,000 times more poorly than copper. However, in practice, the current flow to ground is almost exclusively through seawater when the ship has limited grounding, because the area of bare metal is often much greater than the cross sectional area of grounding cables.

If there is a leak from the welding process, there is little resistance to steel going into solution. Iron has an atomic weight of 55.847 and an equivalent weight of 27.9235 (converting to the ferrous state).

A Faraday which is 96,489 coulombs will liberate 1 gram equivalent. Thus, one coulomb (amps x seconds) will dissolve $27.9235 / 96,495$ grams of iron. A leak of 1 amp for 1 hour will liberate $27.9235 \times 60 \times 60 / 96,495$ g or about 1.04 grams. Thus, each amp of current flowing through the hull to ground dissolves about 1 gram of steel per hour.

In six weeks (eight hour day: 5 days per week) a 10 amp leak would dissolve about 2.4 kilos of steel. As iron has an S.G. of 7.874, this corresponds to a volume of about 0.3 litres. This could translate into thousands of small pinholes or a 6" hole in one location.

If there are few pinholes in the coating and bare areas, the hull may well perforate as the metal loss would be concentrated. A perfect paint coating without a single pinhole or detached area could prevent such a problem, but this is virtually impossible to achieve.

The only way to prevent such mishaps is not to weld afloat or to have massive grounding, a deep water berth, extending the distance of the ship from the dock and putting multiple anodes over the side using heavy cables to limit the electrical resistance. These anodes may damage the paint coating. However, a damaged paint system is more easily repaired than a perforated hull and many high build epoxy and coal tar systems have excellent resistance to the effects of cathodic protection.

7.0 SURFACE PREPARATION

No paint system will give optimum performance over a poorly prepared surface. Painting over rust, grease or contaminated surfaces can be wasteful in terms of time and material. All paint systems fail prematurely unless applied over a suitably prepared surface.

POOR PREPARATION MEANS COATING FAILURE:

In marine conditions, a paint system relies on a number of fundamental properties to give and maintain protection. These are:

- Compatibility with the surface to which it is applied.
- Resistance to water penetration.
- Resistance to attack by the elements and other agents in contact with it.
- Resistance to "wear and tear" in service.

WHAT EFFECTS DO CONTAMINANTS AND RUST HAVE ON THOSE PROPERTIES?

Contamination and the products of corrosion, etc., can destroy or seriously impair adhesion. A paint system on an unsuitable surface will not have a secure foundation to resist abrasion or other mechanical stress to which it may be subjected.

Paint systems are not completely impermeable to water; salts in rust or on the steel surface may encourage blistering by osmosis. Contamination trapped between coats can cause adhesion failure and accelerate water penetration or penetration by other aggressive agents.

Corrosion products formed under the film have a larger volume than the steel from which they originated and can cause the film to rupture.

In all methods of preparation, the aim is to remove contamination and corrosion as far as practically possible to provide a sound and clean substrate for paint.

7.1 Surface Preparation Standards

7.1.1 Steel

The performance of the coating is dependent upon the proper and thorough preparation and pretreatment of the basic metal. Some of the various methods of surface preparation are listed below, but it should be noted that these are described in a condensed form. For more explicit details, please refer to full specifications such as:

- *Steel Structures Paint Council (SSPC), Pittsburgh, PA, USA*
- *Swedish Standard SIS 05 5900 - Pictorial Surface Preparation Standards for Painting Steel Surfaces*
- *Shipbuilding Research Association of Japan - Standard for the Preparation of Steel Surfaces prior to Painting*

BLAST CLEANING

There are three well known commercial grades of blast cleaning. The recommended grade for a particular painting specification is determined by several inter-related factors, the most important being the coating system selected to protect the steel in the environment in which it is to be used. The approximate equivalence of the American, Japanese and Swedish Standards are:

Surface Preparation**Surface Preparation Standards Comparison**

SYSTEM	AMERICAN	SWEDISH	JAPANESE
Solvent Clean	SSPC-SP1		
Hand Tool Clean	SSPC-SP2	St. 2 (approx.)	
Power Tool Clean	SSPC-SP3	St. 3	PT2:
Flame Clean (New Steel)	SSPC-SP4		
White Metal Blast	SSPC-SP5	Sa. 3	Sd3: and Sh3:
Commercial Blast	SSPC-SP6	Sa. 2	Sd1: and Sh1:
Brush Off Blast	SSPC-SP7	Sa. 1	Ss:
Pickling	SSPC-SP8		
Near White Metal Blast	SSPC-SP10	Sa. 2½	Sd2: and Sh3:
Power Tool to Bright Metal	SSPC-SP11		PT3:

WELDS

Welds too often receive but scant attention before painting. Surface preparation is most important here. Welding fluxes are strongly alkaline and residues are found after welding on or near the weld area which act as very efficient paint removers. The surface of the weld is usually rough with a range of high and low spots, and if painted in this condition, an inadequate coating of paint will result. Both welding flux and a rough finish can cause premature rusting and film failure. Correct treatment should include removal of all flux by water washing and grinding of welds and weld spatter. The use of some shop primers will greatly reduce the problem with weld spatter. It is also good practice to apply an extra coat of paint on weld areas.

The standard of blasting should be to the approved visual standard and degree of roughness. The profile of roughness will depend upon the abrasives used, the air pressure and the techniques employed, such as open blasting, vacuum blasting or automatic methods.

SURFACE PROFILE

The term surface profile or surface anchor is used to describe the height of the metal that extends from the pit or valley to the peak of the metal after blast cleaning and is influenced by the type of abrasive used, as shown in the following table:

ABRASIVE TYPE	MESH SIZE	MAXIMUM HEIGHT OF PROFILE
Very fine non metallic	80	37.5µ (1.5 mils)
Large non metallic	12	70 µ (2.8 mils)
Iron grit No G.16	12	200 µ (8.0 mils)
Iron shot No. S390	14	90 µ (3.6 mils)

7.1.2 SHOP PRIMED STEEL

Because the use of a shop primer is so common in shipyards today, it is important to have a standard for secondary surface preparation of shop primed surfaces, welds and damages prior to protective painting.

The following standards are from the Japanese publication "JSRA - Standard for Preparation of Steel Surfaces Prior to Painting" (SPS 1984):

JSRA PT1	}	Power tool cleaning standards.
JSRA PT2		
JSRA PT3		

When using power tooling: at new construction, the JSRA Pt standards are more relevant whereas at maintenance and repair, the Swedish St standards are more relevant.

Shop primers must be treated correctly before over coating to ensure optimum performance.

7.1.3 Non Ferrous Metals

ALUMINUM

Solvent cleaning, steam cleaning and recognized chemical pretreatments are acceptable methods of surface preparation. For large vessels a light abrasive blast is the preferred surface preparation. Application of an etch primer is sometimes recommended before painting. See also section on Painting of Aluminum.

GALVANIZED STEEL

Solvent cleaning to remove surface contaminants is necessary before painting new galvanized surfaces. A pretreatment with an etch primer or a zinc dust based primer is also recommended.

Galvanized steel which has been treated with a proprietary chromate or silicate product immediately after galvanizing must be allowed to weather for several months before pretreatment with an etch or zinc dust primer. An alternative method is to abrade the surface to remove the surface treatment.

COPPER AND LEAD

Solvent cleaning and abrasion or very careful abrasive blasting using low pressure and non-metallic abrasives are satisfactory methods of preparing the surface.

OTHER NON FERROUS METALS

Solvent cleaning and an application of an etch primer is recommended before painting.

7.2 Technique for Surface Cleaning

BLASTING

A corroded or "dirty" steel surface can be very rapidly and effectively cleaned by abrasive blasting. Using a medium (air is most common), abrasive particles (grit, sand, etc.) are propelled at high speed through a nozzle to impact on the surface, removing corrosion and contamination.

A grit size in the range 0.3 - 1.5 mm (12-60 mils) has proven to be the most cost effective in terms of production rates and in achieving specified standards especially when preparing pitted surfaces.

The rate of cleaning using mineral slags (grit) is usually greater than when using sand and reduces the health risk associated with silica.

SPOT BLASTING

This localized abrasive cleaning is often carried out on the outside of the hull of a vessel where patchy corrosion has occurred. It will effectively remove corrosion and yield surfaces cleaned to standards described in the Swedish pictorial booklet. In practice there are some precautions which need to be taken in order to prevent subsequent breakdown:

- The surrounding paint film can be undercut by the abrasive particles and the edges around the blasted patch loosened from the steel surface. If this occurs, the loose edges must be removed by thorough scraping or feathering, using a rotary disc.

Surface Preparation

- The surrounding paint will be peppered by stray abrasive particles and the protective value of the scheme in the vicinity may be destroyed. In making good the protective coating system, it is necessary to treat the area of damage around the blasted patch.
- Damage can also occur in the areas between patches if the jet of abrasive particles is played across the surface. Blasting should be discontinued whilst moving from one patch to the next. Any damage which is sustained in this way should be made good as described above.
- It is recommended that, whenever possible, the patches to be blasted should be defined by "chalking in" the boundaries.

GRIT BLASTING

When large areas of a vessel's hull or tanks are cleaned by grit blasting, a variety of steel surface conditions will be found. Previously coated or superficially corroded steel, can be readily cleaned to Sa2½. However cleaning heavily corroded or pitted surfaces is more difficult and Sa2½ may not be practically achievable.

The effectiveness of various types and particle sizes of abrasives has been examined in carefully controlled practical trials and the most efficient grit particle size for corroded steel is found to be mineral slag with a range of 0.3 - 1.5 mm (12-60 mils).

After blasting, surface dust must be removed. In open conditions, blowing with dry compressed air from the blasting kettle is satisfactory. Tanks however require careful cleaning, normally using vacuum cleaners to remove all grit and dust particles.

SWEEP BLASTING

Sweep blasting is the treatment of a surface by the sweeping of a jet of abrasive across the surface. Its effectiveness depends on the nature and condition of the surface, the type and particle size of the abrasive and above all, the skill of the operator.

a) Light sweeping

Rapid sweep blasting will clean the surface of contamination or loose coatings. It may be used to etch the surface of an existing hard and tough coating to improve the adhesion of the following coat. Superficial corrosion such as that found on weathered shop primed steel also responds well to this type of treatment, but more deep seated corrosion is not removed. Where such removal is required, Sa 2½ by "full blasting" is most suitable when the paint surface under treatment is not to be destroyed (grit or sand particle size -0.2 - 0.5 mm (8-20 mils).

b) Hard/heavy sweeping

The old coating is removed to shop primer or bare steel. The surface standard of steel exposed will vary but all standards, nevertheless, are satisfactory provided rust scale has been removed. Particle size considerations are the same as those described in the sections dealing with blasting/grit blasting.

HIGH PRESSURE FRESHWATER CLEANING

The operation consists of directing a high pressure freshwater jet at the surface. As with sweep blasting, the effect will depend on the nature and condition of the surface and also on the pressure of water. Distance of the nozzle from, and angle of the jet to the surface, will also have an effect. Usually for removing surface contamination or weed fouling, pressures in the range 2000 - 3000 psi (140-210 kg./sq.cm.) are employed. Shell fouling may resist the water jet. See the section on Shell Fouling.

Pressures as high as 5000 psi (350 kg./sq.cm.) are used when weak or poorly adhering coatings are to be removed. Even at these high pressures, firmly adhering paint will not be damaged.

WATERBLASTING WITH ABRASIVE (SLURRY BLASTING)

For slurry blasting, abrasive is introduced into the freshwater stream. It can be used for the removal of tenacious and tough coatings and corrosion scale to give satisfactory results. There are various types of equipment on the market which vary in the method of mixing the abrasive and the water.

Normally this method is restricted to pressures up to 3000 psi (210 kg./sq.cm.). By careful selection of abrasive and adjustment of pressure, precise results can be obtained such as removal of spent antifouling from anticorrosive without undue damage to the anticorrosive surface. If damage to the underlying coatings does occur, the broken areas should be made good.

Flash rusting on exposed steel surfaces is normal after slurry blasting. The cleaned surface will oxidize rapidly whilst wet. Some proprietary inhibitors have been used by operators to prevent flash rusting, but at present these are not recommended. Particularly not on under water areas and must be removed by freshwater hosing prior to coating application. It is recommended that loose deposits produced on the surface should be removed by rotary wire brushing. The remaining firmly bonded ginger coloration provides an acceptable surface for most exterior coatings.

POWER ROTARY WIRE BRUSHING

The brushes used on this type of equipment consist of steel bristles which bend in contact with the surface. As a result, rust scale is often polished rather than broken away from the surface.

Rust scale is not easily removed and a method such as this fails to give a clean surface. However, it does have some value in the treatment of superficially rusted surfaces, such as the flash rusting present after water blasting and the superficial corrosion on the peaks of shop primed steel where breakdown is still at an early stage.

ROTARY POWER DISCING

This method is effective in producing a surface suitable for the application of most types of coating. The silicone carbide pads will effectively abrade the rust scale from the surface of the steel substrate. To penetrate deep pits, conical carborundum heads must be used. When this method is employed for complete removal of corrosion in localized areas, it can be efficient, but the physical effort required is great, particularly when overhead surfaces are treated. Although theoretically this method can be used for large areas, the operator's endurance limits its use and constant control is required because effectiveness is so closely allied to operator effort.

MANUAL TREATMENTS

The term "slicing" refers to manual scraping using a sharp bladed implement. This together with wire brushing and chipping are the traditional, but ineffective methods of removing corrosion. Scraping has been used for many years to remove the more obvious loose rust scale and loose paint coatings. However, it fails to remove the compacted scale and the salts which are contained within that scale. Chipping can remove scale in small areas but a considerable portion remains fixed to the surface and this layer is probably the most chemically reactive part of the scale. Hand wire brushing will remove loose, powdery, superficial corrosion but is inadequate for the removal of corrosion scale.

MECHANICAL CHISELS

These instruments, usually air-driven, consist of either vibrating needles or chisel edges which pound the surface to break away corrosion scale. This method is more effective than hand cleaning, but a proportion of scale will still be left on the surface and cleaning is only effective at the point of contact.

Points of impact can show as bright points of steel particularly with the chisel edge device, but the areas between these points could still bear a layer of corrosion.

7.3 Common Surface Contaminants

OIL AND GREASE

The presence of even a very thin layer of oil or grease can destroy or seriously impair adhesion of paint. Solvents (e.g., paraffin or mineral spirit) can be used to dissolve the grease, but the problem then becomes one of completely removing the solution of oil in the solvent. Drying with cloths is only effective if two or three treatments are carried out, each time drying with clean cloths. A single treatment is rarely satisfactory and can aggravate the situation by spreading the oil or grease over an area greater than originally affected.

Commercial chemical cleaners are available but before they are used it must be determined that they will not adversely attack the painted surface. It is usual to apply sufficient cleaner to incorporate the contaminant, leave for a few minutes and then hose down thoroughly with fresh water. It is imperative that all traces of the cleaner should be removed before painting.

SALTS

Sea salts are fairly easily dissolved by fresh water. Surfaces should therefore be thoroughly hosed with fresh water.

The major difficulty however, is not the solubility of the salt but surface irregularities and porosity. Fine hair cracks in a paint surface can hold salt quite tenaciously. Spent and spongy antifouling films also prevent easy salt removal.

For this reason, high pressure freshwater washing should always be used to flush out all the salt from the surface cracks and crevices. If high-pressure freshwater washing is not available then normal fresh hosing with thorough scrubbing should be employed. This is time consuming, but necessary, as to paint over salt residues will certainly lead to detachment or blistering of the fresh paint.

WEED FOULING

The term "weed fouling" is meant to encompass not only those organisms which are readily recognized as marine weeds, but also the algal slimes which are often only visible when wet.

They are most effectively removed by high pressure freshwater washing, the pressure being in the range of 2000-5000 psi (140-350 kg./sq.cm.).

If high pressure freshwater washing equipment is not available, scraping, hosing and scrubbing should be employed. Results are not as good as high pressure freshwater washing, but with care and attention, a satisfactory result can be achieved. It must be remembered that with manual methods, the final phase of the operation should be to thoroughly hose the surface with fresh water.

SHELL FOULING

Acorn barnacles, tubeworms, etc., are much more difficult to dislodge from a surface than weed. Quite often high pressure water washing will not remove acorn barnacles, although other species such as goose necked barnacles, tubeworms and hydrozoa may be removed. In all cases, the first step should be to determine the effect of high pressure freshwater cleaning.

Those organisms which resist removal by high pressure freshwater washing should be removed by scraping, although in many cases it will be found that either shell bases remain or else the underlying paint coatings are broken. After scraping, the surface should be re-washed to clear away all the shell splinters, tissue remnants and soluble material.

7.4 Abrasive Blasting

The subject of abrasive blasting and selection of the abrasives used in this operation is large and complex. Detailed information can be found in special publications such as those issued by SSPC and NACE.

It is an accepted fact that the performance and service life one can expect from high performance coatings is directly linked to the "surface standard" over which they are applied. On ships, the most critical areas are the immersed areas such as the underwater area of the hull and areas in tanks, double bottoms, etc. High abrasion resistant low friction coatings used on ice breakers demand exact surface standards. To achieve this standard, the right type and size of abrasive must be used along with proper air pressure and blasting nozzle. It is up to the contractor carrying out the job to supply the necessary materials and equipment to achieve the specified standard. It is up to the shipowner to ensure the end result is as specified.

Before blast cleaning takes place, deposits of oil, grease and salt must be removed. It is wrong to think that salt on a ship's bottom will be removed by the abrasive blasting operation. Clean dry compressed air, free of oil, must be used for blasting. Moisture separators, oil separators, traps or other equipment may be necessary to achieve this requirement. Abrasives used should have the following characteristics:

- | | | |
|----|--|------------------------|
| 1. | Low soluble salt content | 0.05% maximum |
| 2. | Low oil content (if applicable) | 10 mg/kg maximum |
| 3. | Hardness factor | 6 - 7 MOHS range |
| 4. | Shatter index (low dust) | 18-25 Range |
| 5. | Low silica content | 1% free silica maximum |
| 6. | Qualities that offer minimum grit impingement | |
| 7. | Correct grit size to obtain desired surface profile. | |

The surface profile produced by a certain grit is not only dependent on the size of the grit but also on factors such as air pressure at nozzle, distance of nozzle from surface, etc. The supplier of the abrasive should furnish all necessary details prior to the start of blasting.

The following table, compiled from various sources, may be of some guidance:

ABRASIVE TYPE	MESH SIZE PRODUCT DESIGNATION	EXPECTED SURFACE PROFILE IN MICRONS (AT APPROXIMATELY 100 PSI)
Mineral, very fine	80	40
Mineral, fine	40	50
Mineral, medium	18	65
Mineral, heavy	12	70
Steel Grains, G80	40	30 – 75
Steel Grains, G50	25	85
Steel Grains, G40	18	90
Steel Grains, G25	16	100
Steel Grains, G16	12	200
Copper, Nickel, Copper Based Slag:		
▪ Black Beauty	4016R	60 – 75
▪ Black Beauty	4016M	60 – 75
▪ Black Beauty	400M	40 – 50
▪ Black Beauty	400R	60 – 75
▪ Black Lightening	20/40	50 – 60
▪ Black Lightening	12/40	85 – 100
▪ Pure Grit	20/40	40 – 60
▪ Pure Grit	16/30	60 – 85
▪ Ebony Grit	EG20	60 – 75
▪ Ebony Grit	EG12	85 – 100
▪ Ebony Grit	EG8	100 – 112
▪ Bar Shot	#50	40 – 50
▪ Bar Shot	#30	60 – 85
▪ Bar Shot	#20	100 – 125

7.5 Hydroblasting

Hydroblasting is increasing in popularity due to several advantages it has over dry abrasive blasting. The term hydroblasting, hydrojetting and water jetting essentially describe the same process. However, there can be confusion over the difference of water washing and hydroblasting. To clarify the difference, below are listed terms from SSPC/NACE standard.

- **Low pressure water washing:**
Operates at pressures less than 1,000 psi (68 bar)
- **High pressure water washing:**
Operates at pressures between 1,000 - 10,000 psi (68-680 bar)
(3,000 psi is recommended for high pressure freshwater wash of ships.)
- **High pressure hydroblasting:**
Operates at pressures between 10,000 - 25,000 psi (680-1,700 bar)
- **Ultra high pressure hydroblasting:**
Operates at pressures above 25,000 psi (1,700 bar) with most machines operating in the 30,000 - 36,000 psi range (2,000 - 2,500 bar)

Hydroblasting is a technique for cleaning surfaces, which relies entirely on the energy of water striking a surface to achieve its cleaning effect. Abrasives are not used in hydroblasting operations. Consequently, the problem caused by dust pollution and by the cleaning up and disposal of spent abrasives are eliminated. Two different hydroblasting operating pressures are commonly encountered.

- **High pressure and ultra high pressure (see above):**
Excellent results can be achieved by hydroblasting and surface preparation standards have been established, similar to those for dry abrasive blasting. Visual standards (pictorial standards) are available from major marine coatings manufacturers many of whom today produce high performance coatings designed to be applied to hydroblasted surfaces.

8.0 PAINT APPLICATION

The object in applying a paint coating is to provide a film which will give protection and decoration to the surface being painted. The success of any paint application will be governed by a number of parameters, including, surface preparation, film thickness, conditions during application, and methods of application.

SURFACE PREPARATION

The importance of surface preparation to the success of a paint system cannot be over-emphasized. A separate section on surface preparation has been included in this manual.

FILM THICKNESS

An adequate film thickness is essential for the success of any coating system. Under application will generally result in premature failure for obvious reasons. However, the old adage of "the more paint, the better" can be equally dangerous. The gross over application of modern high technology paint coatings can lead either to solvent entrapment and subsequent loss of adhesion, or to splitting of primer coats. With the majority of coatings, the limits of acceptable dry film thickness allow for reasonable practical variation, but the correct film thickness should always be the target during application.

The actual dry film thickness recommended for a particular surface will depend on the type of paint system being used and the nature of the surface. Recommended dry film thicknesses for individual products are given on the Product Data Sheets and System Specification Sheets.

CONDITIONS DURING APPLICATION

APPLICATION CONDITIONS

When applying marine paints, the most important factor to consider are the state of the surface, the surface temperature and the atmospheric conditions at the time of painting. When a vessel enters drydock, the hull temperature up to the floating line will usually be that of the sea water. Above the floating line, the steel temperature will be closer to atmospheric.

During the night, steel temperatures fall. They rise again during the day, but there is always a lag in movement of steel temperature compared to the atmospheric condition, so condensation on the steel surfaces is possible.

Condensation will occur if the steel temperature is below the dew point of the atmosphere. If this is likely to be a problem, the ship should be totally emptied of ballast water to reduce its thermal mass as soon as possible after entering drydock.

Bad weather is a familiar problem to those using marine paints. Relative humidity itself rarely creates a problem. Most paints will tolerate high humidities, but humidity should not be permitted to lead to condensation on the surface being painted. In order to determine whether or not a surface is wet, the steel temperature should be measured using a surface temperature thermometer and the dew point calculated after measurement of humidity with a hygrometer. Paint application should not take place when steel temperature is less than 3°C (5°F) above the dew point.

Paint should not be applied when surfaces are affected by rain or ice. Some two pack paints (certain epoxies for example) should not be applied at low temperatures as curing may be retarded.

EXTREME CONDITIONS

Generally, extreme conditions refers to temperatures below 5°C (41°F) or above 35°C (95°F).

Paint Application

Below 5°C (41°F), the curing of paints such as epoxies slows down dramatically and for some paints, curing stops altogether. However "Cold Curing Catalysts" are available for many epoxy coatings. These products can be successfully applied and will cure at temperatures as low as -7°C (19°F) to -10°C (14°F). Product data sheets should be consulted for curing times and limitations. Other marine paints are not so severely affected. Chlorinated rubbers and vinyls are quite suitable for use at temperatures below 0°C (32°F) provided that the surface is clean and free from ice or frost.

At the other extreme, 35°C (95°F) and above, the drying and curing of paints is rather rapid and care should be taken to avoid dry spray. This is caused by the too rapid loss of solvent from paint droplets between the spray nozzle and the surface. It can be overcome/avoided by:

1. Keeping the spray gun at the minimum suitable distance from the work piece, spraying consistently at 90° to the surface being painted.
2. Adding thinners, if necessary, up to a maximum of 5% by volume.

METHODS OF APPLICATION**AIRLESS SPRAY**

An airless spray gun atomizes a paint stream by ejecting it at a high pressure from a specially designed tip.

All the normal range of marine paints for ship stores and maintenance can be applied by airless spray.

This is the quickest method of applying paint and higher film thicknesses can be obtained. Problems may arise if too little or too much paint is applied.

Some paints are designed to be applied at a high film thickness. Others, such as conventional finishing paints are not. The data sheet will show a typical film thickness. To avoid over-application, the recommendations for each product shown on the appropriate data sheet should be followed.

The area sprayed should be within a comfortable distance of the operator to avoid a long traverse of the jet or arcing of the gun.

It is essential that due regard be paid to safety because an airless spray gun ejects a paint stream under very high pressure, and injury can be caused if the jet is directed at someone close by. The skin can be easily penetrated.

CONVENTIONAL SPRAY

A conventional spray gun forms paint droplets by mixing air with the paint stream but turbulence will be rather higher than with airless spray. To ensure the paint is fully dispersed in fine droplets, its viscosity must be low. Conventional, decorative materials and water based zinc silicates are the most common conventionally sprayed marine coatings.

BRUSH/ROLLER APPLICATION

Brush Application	This method is relatively slow but is generally used for decorative paints or for coating small areas. It is particularly suitable for coating complex and complicated areas where the use of spray application can not be justified. With most high build coatings it is not possible to achieve the desired film thickness in the same number of coats as for example if the application was done by airless spray. Multi-coat applications may therefore be necessary to give the specific film build.
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Roller Application This method is faster than brush on large even surfaces and can be used for the application of most decorative paints. Control of film thickness is not easy to achieve however, and the same constraints as brush application generally apply. Particular care must be taken, by selection of the correct roller pile length, when coating rough or irregular surfaces.

8.1 Volume Solids

8.1.1 Volume Solids Measurement

The volume solids of a paint is the ratio of the volume of its non volatile components to its total wet volume and this determines the theoretical coverage or spreading rate on a flat substrate.

Traditionally, this figure was calculated from the paint formulation but, since this took no account of factors such as pigment packing, solvent retention, or film contraction, the actual number bore little relation to practical coverage. Also, since these factors vary in importance between paint types, the calculated volume solids can result in an under estimation of coverage on some generic types of paint and an over estimation on others.

To overcome this problem, many paint manufacturers use a more practical method to establish a paint's "volume solids".

The method used measures the dry film thickness obtained from a measured wet film thickness, and volume solids is given by:

$$\text{Volume solids} = \frac{\text{measured d.f.t.} \times 100}{\text{measured w.f.t.}}$$

8.1.2 Measurement of Volume Solids in the Laboratory

Utilizing the above method, the volume solids figures quoted in data sheets have been measured in the laboratory by applying paints at their recommended film thickness, allowing the film to dry at 23°C (± 1°C) for seven days, then determining the dry film thickness.

8.1.3 Special Situations - Zinc Paints

The volume solids of such paints are determined by different means because they are so highly pigmented. The high pigment loading means that the dry film contains voids and the extent of the voids is dependent, to some extent, on techniques of application. An alternative method of measuring volume solids has therefore been used to circumvent the variable void content of the dry film and thus provide a consistent figure.

8.1.4 Paint Losses - The Conversion of Theoretical (or Ideal) to a Practical Spreading Rate

It is very difficult to give accurate estimates of the quantity of paint required for a particular job in spite of the accurate data the paint manufacturer gives about the products. The data refers to paint in the can, but converting paint in the can to a film of paint involves variable "losses". Losses are defined as the difference between the quantity of wet paint actually used and the quantity of wet paint calculated as necessary from the theoretical spreading rate for the measured area involved. By far, the biggest discrepancy in practice results from an inability to distribute paint evenly. Measured dry film thickness at any one point is either well below or above the target thickness. It may be stipulated that the measured thickness should not fall below a minimum.

Paint Application

Typically, such guidelines takes the form: "95% of readings will be at the specified thickness or better and no reading will be less than 80% of specified". Attempts to ensure that the minimum thickness requirements are met everywhere means applying more paint than the calculated "theoretical". Experience shows that paint losses can be large. In the past, there has been a tendency to use loss factors which are too low, especially where minimum thicknesses are specified.

8.1.5 Excessive Use of Paint - Apparent LossesEFFECT OF THE BLAST PROFILE

When steel is roughened by abrasive blasting and painted, if the thickness of applied paint is measured by a magnetic gauge, e.g., Elcometer (or similar instrument), the thickness actually measured is closer to the average thickness over peaks and valleys than it is to the thickness over the peaks. It is the thickness over the peaks in general however, which is important in relation to performance. Therefore, it can be considered that the paint which does not contribute to this thickness is "lost in the steel profile".

The surface roughness produced by the blasting and hence the extent of the paint loss is proportional to the dimensions of the abrasive used. Laboratory experiments have in fact shown that a loss in d.f.t. equivalent to half the blast profile amplitude usually applies. Where steel has been blasted by small round steel shot and shop primed, the influence of the fine surface roughness on paint loss is low, but when in-situ blasting is carried out, particularly with coarse grit, then the allowance necessary for paint "lost in profile" is considerable. The tabulated "losses" in dry film thickness are suggested for relevant roughness likely to be encountered.

Surface	Blast Profile	D.F.T. "Loss"
Steel prepared by wheelabrator using fine round steel shot and shop primed.	0 - 50 μ	10 μ
Fine open blasting (e.g. J. Blast Super).	50 - 100 μ	35 μ
Coarse open blasting (e.g. J. Blast A).	100 - 150 μ	60 μ
Old "honeycomb pitted" steel - reblasted.	150 - 300 μ (or more)	125 μ

WET FILM THICKNESS MEASUREMENT

In addition to the magnetic gauge measuring closer to the average thickness over peaks and valleys, wet paint shrinks into valleys during drying. Wet film quoted on data sheets will only provide the correct dry film thickness on a smooth surface. The first coat on blasted steel should have additional wet paint applied depending upon the blast profile. As a rule of thumb, multiply half the average profile height by 100 and divide by the volume solids. A 3 mil profile and a 50% volume solids paint would require an additional 3 mils wet ($3/2 \times 100/50$) to compensate for paint "losses" into the profile.

PAINT DISTRIBUTION LOSSES

This is the loss of paint resulting from over-application, when a competent painter is attempting to achieve the minimum paint thickness specified with reasonable certainty. The extra paint used over and above that calculated from the ideal spreading rate in this case is very dependent on the type of structure being painted, e.g., a simple (un-complicated) shape with a high proportion of flat surfaces should not incur heavy losses, but if the job is complicated by the presence of many stiffeners or if there is open lattice work involved, then, obviously losses will be high.

The following very approximate over-applications are suggested as being appropriate for the situations mentioned:

STRUCTURES	BRUSH & ROLLER "Loss"	SPRAY "Loss"
Simple	5%	20%
Complex (including stripe coat)	10 -15%	60% (single coat) 40% (two coats) 30% (three coats)

Where open lattice work is sprayed, no close estimate can be made of paint distribution loss.

8.1.6 PHYSICAL LOSS OF PAINT - ACTUAL "LOSSES"

APPLICATION LOSSES

This factor applies to a *real* loss of paint during the painting operation, i.e., paint which drips from a brush or roller during the transfer from the paint container to the surface to be painted. If the painter is careful, this can be discounted as a significant contribution to the overall "loss". The use of "extension handles" to extend the painter's reach, however, can increase this type of loss, and in an extreme case, could result in a 5% loss.

When application is by spray, losses are inevitable and their magnitude obviously dependent on the shape of the structure being painted together with conditions of air movement. The following losses are common:

Well ventilated, but confined space	5%
Outdoors, in almost static air	5 - 10%
Outdoors, in windy conditions	over 20%

Obviously, this last figure can become ridiculously high if painting is attempted in extremely windy conditions.

PAINT WASTAGE

Some paint wastage is inevitable even by a highly disciplined contractor; paint is spilt, a certain amount remains in the discarded containers and in the case of two pack materials, mixed paint may be left beyond its pot life. (This is most common with protective primers.) The following losses are common:

Single pack paints	No more than 5%.
Two pack paints	5 - 10%

8.2 Conversion of Theoretical to Practical Spreading Rate

These four distinctly separate factors must be considered when estimating the practical spreading rate for paint.

	FACTORS	
APPARENT LOSS	1.1	Surface roughness
	1.2	Distribution
ACTUAL LOSS	2.1	Application loss
	2.2	Wastage

Factor 1.1 applies effectively to the first coat alone.

Factors 1.1 and 1.2 should be added.

Factors 2.1 and 2.2 should be compounded.

Paint Application

The most convenient way to assess the total "loss" from all factors is to calculate it in terms of dry film thickness. The following example will illustrate the calculation and choice of appropriate factors.

Example: Two coats of two-pack paint are applied by spray in a confined space to a shotblasted and shop primed surface to yield a d.f.t. per coat of 125 μ (i.e. 250 μ total d.f.t.). Theoretical spreading rate for the paint at the recommended film thickness is 5.0 m²/litre. What is the practical spreading rate?

Consider 1st coat	125μ Required
Loss due to surface roughness	10 μ
Loss due to distribution - 40% (i.e. 125 x 0.4)	<u>50μ</u>
	185 μ
Loss due to application - 5% (i.e. 185 x 0.05)	<u>9.25μ</u>
	194.25 μ
Loss due to wastage - 10% (i.e. 194.25 x 0.1)	<u>19.42μ</u>
	213.67 μ
Extra paint used (213.67 - 125) = $\frac{88.67}{125} \times 100 =$	70.9%
Consider 2nd coat	125μ Required
Loss due to surface roughness	10 μ
Loss due to distribution - 40% (i.e. 125 x 0.4)	<u>50μ</u>
	175 μ
Loss due to application - 5% (i.e. 175 x 0.05)	<u>8.75μ</u>
	183.75 μ
Loss due to wastage - 10% (i.e. 183.75 x 0.1)	<u>18.37μ</u>
	202.12 μ
Extra paint used: (202.12 - 125) = $\frac{77.12}{125} \times 100 =$	61.7%
Total loss for two coats: $\frac{70.9 + 61.7}{2} =$	66.3%
or $\frac{(213.67 + 202.12) - 250}{250} =$	66.3%

In other words, for the two coat system, 66.3% more paint has been needed than would have been calculated from the ideal spread rate.

LOSS FACTORS

In the example, the theoretical spreading rate is one litre of paint per 5 sq. meters. In practice, 1.66 litres of paint can be expected to cover 5 sq. meters.

$$\text{Practical spreading rate} = \frac{5}{1.66} = 3 \text{ m}^2/\text{litre}$$

It has been customary in our industry to refer to "loss factors" i.e., the difference between theoretical spreading rate and practical spreading rate expressed as a percentage of the theoretical spreading rate. In the above example,

$$\text{Loss factor} = \frac{5 - 3}{5} \times 100 = 40\%$$

8.3 Coating Calculations

The calculation of the theoretical coverage or spreading rate of a paint is determined from the volume solids. The volume solids is determined by the coatings manufacturer and listed on the product data sheets. In metric measure, one litre of paint with a 100% volume solids content will cover 1000 square meters at a dry film thickness of one micron. Therefore, the theoretical coverage of any paint can be calculated as follows:

$$\frac{1000 \times \% \text{ vol. sol.}}{100 \times \text{DFT } \mu} = \text{Theoretical coverage in square meters per litre.}$$

In Imperial measure, one Imperial gallon of paint 100% volume solids will cover 1926 sq. ft. at a dry film thickness of one mil. (0.001"). Therefore we have:

$$\frac{1926 \times \% \text{ vol. Sol}}{100 \times \text{DFT mils}} = \text{Theoretical coverage in sq. ft. / Imperial gallon.}$$

In US measure, one US gallon of paint at 100% volume solids will cover 1604 sq. ft. at a dry film thickness of one mil. (0.001").

$$\frac{1604 \times \% \text{ vol. sol.}}{100 \times \text{DFT mils.}} = \text{Theoretical coverage in sq.ft. / US gallon.}$$

For example for an epoxy coating with a volume solids content of 80% and a specification that calls for a DFT of 5 mils (125μ).

$$\frac{1604 \times 80}{100 \times 5} = 257 \text{ sq.ft. / US gallon}$$

Other useful calculations are:

$$\frac{\text{DFT} \times 100}{\% \text{ sol. vol.}} = \begin{array}{l} \text{wet film thickness (mils)} \\ \text{(needed to be applied to reach desired DFT)} \end{array}$$

$$\frac{1604 \times \% \text{ sol. vol.}}{100 \times \text{coverage (sq.ft. / US gal.)}} = \text{dry film thickness (mils)}$$

$$\frac{1604 \text{ sq.ft.}}{\text{wet film thickness}} = \text{spreading rate}$$

$$\% \text{ vol. sol.} \times 1604 \text{ sq.ft.} = \text{coverage at 1 mil}$$

$$\frac{\text{cost per gal.}}{\text{coverage at 1 mil}} = \text{cost per mil/sq.ft.}$$

$$\frac{\text{cost per gal.}}{\text{coverage at } x \text{ mil}} = \text{cost per sq.ft. at } x \text{ mil}$$

Note: 1 mil = 25 microns (μ)

9.0 PAINT INSPECTION

The potential life of a coating system can be realized if it is correctly applied to a suitably prepared surface, under the correct environmental condition. Preparation and the subsequent coating application is labour intensive and therefore subject to operator abuse. The process itself is susceptible to adverse environmental influences throughout all stages of the work. Inspection is an important requirement to ensure the success of the coating operation. This section is intended as a guide to operations that can be carried out in paint inspection, and is not a comprehensive guide to inspection procedures.

SURFACE PREPARATION

Before any preparation operations commence, the surface must be free of oil and grease, substrate defects and where possible, sharp edges removed.

After the cleaning operation the procedures for inspection are mainly visual, with the degree of cleanliness and surface character evaluated with standards or comparators.

SURFACE CONTAMINATION

Visual testing is to ensure that dust or dirt has been removed from the surface. Use can also be made of adhesive tapes, especially on blast cleaned surfaces, which will pick up any contamination from the profile.

RESIDUAL MILL SCALE

Visual examination will normally indicate the presence of residual mill scale. If necessary, however, a copper sulphate test can be carried out on new steel that has been blast cleaned. The copper sulphate will *plate out* with a bronze deposit on steel, but not on mill scale. Good test on new steel, but not effective on old, well rusted steel.

SOLUBLE IRON SALTS

A qualitative test can be carried out in accordance with BS 5493, Appendix G. The test consists of potassium ferricyanide papers, which are yellow in colour, being pressed onto a dampened surface. If blue spots occur then the soluble iron salts are present. The test is simply a go/no go procedure, and no concentration is given as to the level of iron salts.

STANDARDS OF CLEANLINESS

Steel	Most common method is visual comparison of the steel surface with the photographic standards included in Swedish Standard SIS 05 5900 (1967), and the Steel Structures Painting Council Guide to Visual Standard No.1.
Shop Primed Steel	The Japanese SPSS standards give guidance on secondary surface preparation, describe and illustrate standards which can be obtained during the grit sweeping of shop primed surfaces.
Surface Profile	Surface profile will be best achieved by using grit of the correct dimension. It can, however, be measured optically or by a needle probe (provided only the maximum values are considered). The use of an optical method is preferred using a profile comparator such as the Keane Tator Surface Profile Comparator which consists of a five vaned disc, each vane blasted to a different profile. Different discs are available for shot, grit and sand.

To carry out the comparison, the reference disc should be placed on the surface and examined with an illuminated magnifier. The reference section most closely matching the profile of the surface being tested is selected.

Another useful technique is to use the Press-o-film tape technique (Keane-Tator Inc.) which can measure profiles up to 114 μ (4.5 mils).

Paint Inspection

WET FILM THICKNESS

Estimates of the ultimate dry film thickness can be obtained by measuring the wet film thickness applied, and is therefore a good method of controlling the application. Measurement is most commonly carried out using a comb gauge.

The gauge consists of a number of calibrated teeth which are pressed firmly into the wet coating material at 90° to the surface. The wet film thickness is the last tooth to be wetted by the coating material. Gauges are available with different combinations of calibration, and should be selected in the range of the correct wet film thickness. It is important that the calibrated teeth are kept clean and are free from dry paint.

The most satisfactory approach is to establish the application technique required to achieve the specified wet film thickness at the start of the operation. This is commonly done to establish how many passes of the spray gun are necessary. Spot checks can then be carried out during the course of the operation to ensure the thickness is being maintained.

Wet film quoted on data sheets will only provide the correct dry film thickness on a smooth surface. The first coat on blasted steel should have additional wet paint applied depending upon the blast profile. As a rule of thumb, multiply half the average profile height by 100 and divide by the volume solids. A 3 mil profile and a 50% volume solids paint would require an additional 3 mils wet ($3/2 \times 100/50$) to compensate for paint "losses" into the profile.

DRY FILM THICKNESS

After the film is sufficiently dry or cured for inspection the dry film should be examined. The initial inspection is visual, and an accurate appraisal of the quality of work can be quickly established. Visual inspection will also reveal application defects such as over spray, misses, dirt inclusion, blisters, sags, runs or other defects.

The dry film thickness can be obtained by either destructive or non-destructive methods. The most popular instruments for non-destructive testing employ the magnetic principle. A permanent magnet is mounted at the end of a balanced, pivoted arm assembly with a coil spring attached to the pivot and to a calibrated rotatable dial. When used the instrument must be firmly placed on the substrate and the rotatable dial moved forward until the probe sticks to the surface. Variations in film thickness above the steel substrate will alter the attractive force of the magnet. When the dial is rotated slowly backward a tension will be applied to the spring. When the spring tension exceeds the magnetic force, the magnet breaks contact with the coated surface, and the film thickness is shown on the calibrated dial. These types of instruments are known as "Banana" gauges due to their shape, with the most common instrument, the Inspector Gauge manufactured by Elcometer, and the Mikrotest manufactured by ElectroPhysik.

These types of gauges have an accuracy of $\pm 10\%$. Care must be taken to inspect the hemispherical tipped magnet for dirt, paint or wear before use. With older instruments, the film thickness must be recorded as the magnet breaks contact.

Another version of the magnetic principle involves instruments which utilize a magnetic reluctance technique. The probe contains a permanent magnet as a flux source, which when placed on the substrate forms a magnetic current the size of which is relative to the thickness of the coating. This is displayed on the meter scale. This type of gauge is portable and battery operated, the most common of which is the Minitecor manufactured by Elcometer, and the Mikrotest manufactured by Elektro Physik.

The other method of portable gauge currently available utilizes the eddy current principle. The probe contains a coil of wire in the tip which is energized with a high frequency alternating current. When the tip is brought into close proximity to a coated steel surface, eddy currents are induced altering the electrical characteristics of the probe. The change in electrical characteristics is measured and displayed on the meter scale. This instrument can also be used on non-ferrous substrates.

Recently more sophisticated instruments have become available which utilize micro processors. These have additional characteristics such as digital read-outs, memories and print-out capabilities.

When comparing the different gauges, the type "banana" is the cheapest and the most robust, but accuracy is limited. The Minitecor or Minitest are more accurate and are easier to read, but are prone to damage which can distort the results.

OPERATING TECHNIQUE

1. Before readings are taken the paint film must be firm enough to accept the gauge without forming an impression. Also the surface must be dry and free from contamination.
2. Prior to use, the instruments should always be calibrated using thickness "shims" of known thickness. Calibration should be in the range that is anticipated and carried out on a smooth surface. For readings over blast cleaned steel using a Mikrotest or Minitecor, the zero can be used as a measure of blast profile and allowances made in subsequent readings. This would then be a measure of thickness over the peaks of the metal profile.
3. When using battery operated instruments ensure that the battery is not run down.
4. The greatest difficulty is the accurate assessment of the dry film thickness. Some specifications may stipulate the number of measurements to be taken, but usually the assessment of the number of readings required is personal judgment. On large areas the initial readings taken should give an indication of the evenness of the thickness. If the readings constantly agree with the requirements, without wide variations, assessment should continue to be random. If, however, the readings are low or spasmodic, more readings will be required to determine the extent of any low areas. Experienced personnel will also be able to identify where low thickness can be expected, i.e., backs of bars, flanges, etc., and inspect accordingly. The other method of checking dry film thickness is a destructive technique. This technique involves the cutting of a V-shaped notch in the coating with a precision ground cutter. The thickness of the coating, or each coat of paint, is measured geometrically by viewing through an illuminated microscope. This technique is used where the thickness of each coat is required or thickness on concrete surface. It must always be recalled that the coating should be repaired.

A number of other tests can also be carried out on dry films; the most important of which are as follows:

HOLIDAY DETECTION

When protective coatings are applied there is a possibility that flaws have occurred due to the presence of trapped air, or voids and pinholes. Of these defects only the largest can be detected visually. A series of battery operated field instruments are available.

1. Low Voltage Detectors
The wet sponge method is most commonly used. This is suitable for coatings up to approximately 375µ (15 mils). The method of operation is to draw the moistened sponge over the surface. Where a defect has occurred a small current will flow and activate an audible alarm. Excessive wetting of the sponge should be avoided.
2. High Voltage (Spark) Detectors
For thicker film a higher voltage is required for flaw detection. Two types are used, either with AC or DC voltages. The AC type is not totally satisfactory, as the coating is subject to cyclic stresses which can cause fatigue and subsequent breakdown of some coatings. The DC types produce a continuous current. Care must be taken with high voltage (spark) detectors to ensure that the test voltage selected is not excessive for the coating thickness. It is possible to destroy the coating and in some cases the retained solvent is conductive enough to provide a current flow through the paint film.

Paint Inspection

DEGREE OF CURE

An indication regarding the cure of two component materials, such as zinc silicates or epoxies, can be obtained by solvent swabbing. If no coating is removed after scrubbing the surface with relatively strong solvents, the cure will be well advanced. Your paint supplier should be consulted regarding the solvent composition and test method.

ENVIRONMENTAL CONDITIONS

The process of surface preparation and paint application are all influenced by environmental conditions. In order to ensure the success of the operation the following should be monitored.

STEEL TEMPERATURE

Various types of coating have differing minimum curing/drying or film forming temperatures. In each case, the surface temperature should be above the minimum at the time of application. If the steel temperature is below the specified minimum problems can occur with solvent entrapment, retardation of the cure with two component products, etc. Also, with low temperature the minimum and maximum re-coat intervals will be extended. High temperatures present different problems such as dry spray, solvent boiling, etc., however, these can often be solved at site. It must be noted that minimum and maximum re-coat intervals will be reduced when steel temperature is high.

Two methods are commonly used to measure steel temperature, namely a battery operated thermocouple, or a contact thermometer that is simply clamped to the surface with a magnet. With both instruments it is important that time must be allowed for the device to reach a stable temperature. This could be up to 15 minutes for the contact type. Also a representative area should be selected.

RELATIVE HUMIDITY AND DEW POINT

There is a variable amount of water vapour in the atmosphere. The maximum amount air can hold before precipitation occurs is dependent on temperature and atmospheric pressure. The warmer the air, the more water it can hold. Relative humidity takes into account these factors, although from a practical viewpoint atmospheric pressure is taken as a constant. If the substrate is of a lower temperature than the air, the air in contact with the substrate will be cooled. A point can be reached where the air in contact with the substrate is at such a low temperature that it cannot hold its water vapour. This temperature is known as the dew point.

As the dew point is a temperature where water is spontaneously deposited, the substrate temperature must always be a minimum of 3°C (5°F) above the dew point if paint is to be applied to a dry surface. This even refers to coating with moisture tolerant properties, because these materials displace moisture at the time of application, and then lose it to the atmosphere.

Many types of instruments exist which will give readings of relative humidity, one of which is the Whirling Hygrometer.

This instrument consists of two thermometers mounted in a frame, with one thermometer attached by a wick to a water container. Prior to use, the water container should be filled with distilled water, ensuring the wet bulb is properly wetted. The instrument should then be whirled again until successive readings are equal. The wet/dry bulb temperatures can then be used to calculate relative humidity and the dew point from either psychometric charts or a dew point calculator.

Another product now available is the Surface Humidity Monitor. (From Wymark Technical Products Ltd.).

This instrument is attached to a steel surface by a magnet. The user can read off the instruments various scales;

- Surface Humidity,
- Surface Temperature,
- Air Temperature,
- Dewpoint.

There is no need for psychometric charts or dew point calculations.

As stated previously, the dew point is the temperature at which spontaneous condensation occurs, often referred to as "sweating". Inaccuracies due to Hygroscopic surfaces require a safety margin of dew point plus 3°C (5°F).

10.0 HEALTH AND SAFETY

These notes concern health and safety requirements, industrial hygiene and potential hazards involved in handling paint and thinners. They are not intended to be exhaustive and do not cover all eventualities during the application and storage of paint.

Advice on local and/or national regulations covering the use and storage of paints and solvents should be obtained and full recognition made of the regulations. The disposal of waste and empty containers are also subject to regulations and it is in our common interest to ensure these regulations are followed to protect our fragile environment.

PERSONAL PROTECTION:

Material Safety Data Sheets on all products are available on request. These sheets and all precautionary statements on the product container(s) should be read before handling and applying the product. When two component products are activated, the activated mixture will have the hazards of both components.

FIRE AND EXPLOSION:

The majority of paints contain flammable organic solvents. As soon as a paint container is opened, solvent vapours are released.

The flash point is the lowest temperature at which a liquid gives off sufficient vapour to form a flammable mixture in contact with air.

If the flash point of the paint is lower or close to the temperature of the air there is a very considerable risk of fire or explosion. It only needs a spark of flame to set it off. If the flash point exceeds the air temperature there is still a risk of fire. Therefore no naked flames, cigarettes or matches should be allowed near the area where paint is being applied or stored. Precautions should also be taken to avoid sparks caused by metal to metal contact or from electrical appliances. If a fire involving paint does occur:

1. Use a dry chemical, foam, or CO₂ extinguisher.
2. Protect yourself from the fumes with breathing apparatus.
3. Do not extinguish with water, as paint solvents float on water and this helps to spread the fire.

Paint soaked rags left in heaps can build up heat within the pile and self-ignite. Maintain good housekeeping conditions at all times.

Explosion of solvent vapours can be prevented by adequate ventilation. Ventilation maintains the solvent vapours below the Lower Explosion Limit (LEL), reduces the concentration of the vapours to below the minimum level at which they can be ignited in the air. The LEL of a paint, especially with regard to spray application, is independent of the flash point. However, this level of ventilation is much less than that required to reduce the concentration of the fumes to below the Threshold Limit Values (TLV's) of the vapours and spray mists.

The TLV represents conditions under which it is believed that workers may repeatedly be exposed during their working hours without adverse effect to health. The TLV's for paints and paint solvents are much lower than the safe explosion limits, and ventilation to the TLV is often impractical. Ventilation to the LEL together with the use of air fed hoods or masks is therefore advisable.

SPILLAGE

If paint is spilled, the following precautions should be taken:

1. Ventilate the area to remove the fumes.
2. Mop up all spilled paint with absorbent material, ensuring that all materials used to mop up the paint are disposed of in closed metal containers.
3. Ensure that spilled paint is prevented from entering drains or contaminating soil in the area of the spill.

SKIN AND EYE CONTACT

It is recommended that the following precautions should be taken to prevent paint coming into contact with the skin and eyes:

1. Select sensible working clothes that cover as much of the body as possible. Replace soiled clothing as quickly as possible, especially when using materials which are toxic and can be absorbed through the skin.
2. Always wear gloves and eye protection. Replace/clean eye shields, etc., frequently when spraying to prevent accidents due to obscured vision.
3. Do not touch your mouth or eyes with your gloves.
4. Remove rings and watches before starting work as they can trap paint or solvent next to the skin.
5. Read and observe precautionary notices on paint containers and the MSDS.
6. Eyes are particularly sensitive, so if you are splashed in the eyes by paint or thinners, flood them immediately with fresh water for the least 15 minutes and seek medical advice immediately.
7. If paint should splash on your skin, remove it with soap and water or an industrial cleaner. Never use solvent.
8. Remember to wash hands and rinse mouth after working with paint.
9. Despite these precautions, paint can still come into contact with the skin or eyes (e.g., spray mist, excessive splashing), so a non-greasy barrier cream is recommended for all exposed skin. Remember the objective is to avoid skin contact. If your clothes become soaked in paint, change them immediately and thoroughly wash the affected garments with soap and water. Such precautions help prevent skin conditions, which tend to persist once they occur.

INHALATION

The inhalation of fumes, dust and paint vapours must be avoided. Please follow the precautions listed and read the MSDS for specific details.

1. When removing rust or old coatings by manual dry abrading techniques, wear eye protection and a dust mask. If blast cleaning, flame cutting or welding, an air fed hood is recommended.
2. Ensure that ventilation is available to remove solvent fumes.
3. If spaces are difficult to ventilate efficiently, wear an air fed hood/mask.
4. Think about where the fumes are being vented. They could affect other people in adjacent spaces.

Remember solvent fumes are heavier than air, they displace breathable air upwards. They can flow down drains or ventilation ducts.

5. If dizziness, drunkenness or headaches are experienced, this could indicate you are being affected by solvent fumes. Move into the fresh air and do not return until the ventilation has improved.
6. If breathing fumes results in the collapse of a painter, he should be carefully moved into fresh air and allowed to recover gradually. Forced exercise is inadvisable.
7. Never enter a space where fumes have or could have accumulated without wearing breathing apparatus.
8. Remember, if you are not wearing an air fed hood or mask, you are relying on ventilation to provide fresh air.

To prevent the inhalation of spray mists:

9. The mist of paint particles created when spraying should not be inhaled.
10. In well ventilated spaces, an organic vapour plus dust cartridge respirator can filter out these particles of paint effectively. (Replace the cartridge regularly.)
11. If ventilation is poor, an air fed hood or mask is essential. If any doubt whatsoever exists, wear an air fed hood/mask.
12. Never filter spray mists through rags wrapped over the mouth. The rags can get soaked and allow paint to come into direct contact with the mouth. The rags are most inefficient filters.

INGESTION

Food and drink should not be consumed, stored or prepared in areas where paint is stored or being applied.

In the case of accidental paint ingestion, medical attention should be obtained at once.

AIRLESS SPRAY

This method of application uses very high pressures. The paint jet can easily penetrate the skin if used without proper care. Always wear gloves, coveralls and eye protection. Equipment should be grounded to prevent build up of static electricity.

10.1 WHMIS Information *

Canada's Hazardous Materials regulations are intended to make the workplace safer by what is essentially a workers' education program. Hazardous materials must be labeled in a certain way; a Material Safety Data Sheet (MSDS) must be available for industrial users and workers must be trained to understand what the warnings and precautions on labels and MSDS mean, so that they can adopt safe working practices.

LABELS ON CONTAINERS

- Labels will now fall into three classifications:
 1. Domestic paints which are covered by the Hazardous Products Act.
 2. Antifoulings which are covered by the Pest Control Products Act.
 3. Commercial paints for industrial users which must comply with WHMIS.
- Industrial labels will now show:
 1. First aid message.
 2. Precaution message.
 3. Warning message.
 4. Pictograms for:
 - a. flammable
 - b. toxic or
 - c. very toxic
 - d. corrosive
 - e. oxidizer
 - f. dangerously reactive
 5. Transport of Dangerous Goods (TDG) classifications

* (Curtesy of International Paints Canada Limited.)

6. Directions for use:
- a) generic statement about surface preparation
 - b) catalyst, if appropriate
 - c) mixing ratio, if appropriate
 - d) low temperature catalyst, if appropriate
 - e) thinner
 - f) cleaner, if different
 - g) generic statement to see spec sheet and data sheet
 - h) warning on freezing, if appropriate
- Antifouling paint labels will show additional information as required by the Pest Control Products Act.

MATERIAL SAFETY DATA SHEETS

The MSDS is divided into nine sections, each one covering a different aspect of safety. MSDS are not required for domestic products or antifouling but a conscientious manufacturer will make them available to all industrial users.

Section 1. Material Identification and Use

This section contains the company's name, address and telephone number together with the description of the product, its code number and a very simple material use. More detailed information on product use is contained in the Product Data Sheets.

Section 2. Preparation Information

This section requires the name of the person who prepared the form, when it was issued and the sources used.

Section 3. Hazardous Ingredients

In this section, the hazardous ingredients are listed, plus ingredients which are contained in the Government's Hazardous Ingredient List. Non-hazardous materials will not appear and cut-off points of 0.1% or 1.0% ensure very small amounts of hazardous materials will not have to be included. The cut-off point for many chemicals is set by the Government's Hazardous Ingredient List.

One problem with this list is that powders, which are a problem as dusts, but not in paints, will erroneously show up as hazardous ingredients.

Headings:

- %** • Shows the approximate content or range of concentration in the formulation.
- CAS No** • Identifies the chemical in a world wide listing (chemical abstracts).
- LD₅₀** • Indicates the dose that kills 50% of the animals used in a test and indicates whether the ingredient was given orally or absorbed through the skin. Most toxicity information is available for oral toxicity which is not really relevant for paint coatings except perhaps for ingestion of lead, etc.
 - Dermal absorption is often more important but often unavailable. Very few people are going to ingest significant quantities of liquid paint, but droplets and dust can be taken into the body if proper personal protection equipment is not employed.
- LC₅₀** • Is the concentration of vapour or dust that will kill 50% of test animals. The time of the test is also shown. This is important for solvents and paint fumes.

- TLV** • Is the threshold limiting value and is an accepted safe working level for an eight hour day. It is based not only on animal studies, but on clinical effects noted on workers who have been exposed to these chemical. The tlv of some paint ingredients can be measured during application by sampling.

Section 4. Physical Data

This section simply identifies the physical state of material (solid, liquid, gas), odour and appearance, S.G. and the amount of volatile material. In most cases, no information is available on Odour Threshold, pH, vapour pressure, etc.

Section 5. Fire or Explosion Hazard

If the product has a flash point, the MSDS is marked to indicate the product is flammable, a standard message is printed, and the means of extinction boxes are marked. A flash point is the temperature at which solvent vapour will ignite if an open flame or spark is present.

The special procedures indicate problems for fire fighters. Warnings are based on the flash point or presence of chlorinated solvent. Unopened paint cans can explode in a fire and burning paint should be extinguished with foam or other non-aqueous extinguisher but not with water which tends to spread the fire.

The TDG flammability Class is based upon the flash point. The upper and lower explosive limits are not usually available for mixed solvents or paints, but all paints, especially those with a flash point below 30°C, should be used with great care in enclosed spaces as typically 1% of solvent vapour in air forms an explosive mixture. One litre of xylene will produce 185 litres of vapour.

A standard phrase for Hazardous Combustion products is shown if the material is flammable or uses chlorinated solvent. Smoke is toxic, regardless of its composition, so the message is simple. Self contained breathing apparatus is needed to enter a smoke filled area.

Section 6. Reactivity Data

Most paints are not very chemically reactive. The few which are reactive include:

- zinc and aluminum which may react with water to produce hydrogen gas which swells the can and may blow the lid off the container.
- polyester, vinyl esters, acrylic monomers which may react with free radical initiators, get very hot and burn.
- isocyanates which react with amines or other bases, may also get very hot and burn.
- peroxides used as catalysts for polyesters can explode in certain conditions.
- unthinned liquid epoxies can exotherm when mixed with amines.

Section 7. Toxicological Properties

This is the section that is going to worry most paint applicators and lead to lots of questions. Warnings suggesting "Can or may cause cancer.", "May cause lung cancer.", "May cause liver cancer.", "May be toxic to fetus.", "May cause birth defects.", "May cause heritable genetic damage.", etc. , may appear on the MSDS due to the presence of a hazardous ingredient.

The evidence for some of these statements is often much weaker than that associated with cigarette smoking and lung cancer or heart disease. Much evidence (but not all) relates to large doses given to lab animals, but nevertheless provide a warning to workers that should not be ignored.

Why risk your health by ignoring the risks associated with the use of chemicals such as paint? Personal protection will fully protect the worker against any of these potential health problems.

Health and Safety

Route of Entry

This shows how toxic material could enter the body. In most cases, all boxes will be ticked except skin absorption. Paint or its vapours can obviously be taken into the eyes, lungs or mouth and most prolonged skin contact can be harmful.

Irritancy

Each ingredient has been assessed for irritancy. Worst case logic will pick the most irritating ingredient to select the warning. Avoid contact to protect yourself.

Carcinogenicity

Chromate pigments and carbon tetrachloride in chlorinated rubber will trigger a "Can cause cancer." message as will coal tar. Human, suspect human or animal carcinogens present in an amount over 0.1% will produce a warning message.

Mutagenicity

This is the ability to cause chromosome damage. Certain products could trigger the message "May cause heritable genetic damage." or "Positive Ames Test.", if one of the ingredients shows this tendency.

Teratogenicity

Many chemicals such as phthalidimide can cause birth defects and a teratogenic ingredient will trigger "May cause birth defects.", even if present in small quantities.

Reproductive Toxicity

In this section, worst case logic has been used with fetal death rating the highest followed by fetal toxic. Sterility is included but may not show up because of priority given to an ingredient which shows fetal toxicity. In this case, sterility will be shown under the effect of chronic exposure.

Sensitization

Sensitization means that lung or skin tissue is affected by the chemical and that afterwards much smaller doses can cause the condition to reappear often more seriously than during the first reaction. Isocyanates are a good example of the problem of sensitization but other chemicals can cause a similar problem.

Acute Effects

Acute effects are the short term immediate effects such as nausea, headache, burns, etc.,. Any effect from each ingredient is added to a list of possible problems.

Chronic Effects

Effects are the permanent, long term problems caused by exposure to chemicals. Obviously there are so many medical conditions, we cannot list them all on an MSDS. For each raw material, we indicate an effect on a major body part and in addition, we indicate that the product "may cause" a limited number of health problems such as cancer, sterility, blindness, etc.

These potential long term effects are documented for your guidance. Most solvents will cause acute and chronic effects if breathed in high concentrations over a period of time. This is equivalent to "glue sniffing" in immature adolescents. These effects are easily avoided by the use of proper personal protection equipment.

Exposure Limits

No limits have been determined on any of our products except single solvent thinners. Therefore the TLV is not shown here but included with the information of LD₅₀, etc.

Section 8. Preventative Measures

These are most important and paint applicators should follow them carefully. One cannot overemphasize the need for proper personal protection and ventilation. One would also like to stress the need to dispose of old paint and containers in a legal and responsible manner and to avoid all contamination of soil and water.

Section 9. First Aid

These are simple guidelines common to all MSDS, but if anyone has a health problem during or after application of paint, medical advice should be sought as soon as possible.

10.2 Summary

The major health problems associated with paint are:

- a) Fire or explosion, especially in confined spaces such as tanks
- b) Skin problems due to poor industrial hygiene
- c) Breathing in solvents due to poor ventilation or lack of an organic vapour mask
- d) Absorption through the skin of toxic materials such as amines
- e) Severe allergic reactions caused by isocyanates
- f) Ingestion or inhalation of heavy metal pigmented products (such as lead or chromium) during spraying, sanding or by blasting old paint.

One would like to stress most strongly to all users:

- 1) Avoid all sources of flames and sparks, especially in enclosed spaces.
- 2) Wear eye protection at all times.
- 3) Avoid paint contacting or remaining on you skin.
- 4) Wear organic vapour masks when the TLV is exceeded, and air fed masks in enclosed spaces or when suggested on the MSDS.
- 5) Remove paint from surfaces to be welded or flame cut, with the exception of thin films of certain preconstruction primers.

Welding Specification



Canadian Coast Guard

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2	January 2016	Corrections made to some of the references herein, to section 5	CG
3	August 2017	CWB and NDT audit requirements, Clauses 5.6.1 and 5.6.2 Quantity of NDT required for New Construction, Clause 5.6.5.2 Undercut Acceptance Criterion, Clauses 5.6.9.2 and 5.6.10.2 Third Party Weld Inspection Requirement, Clause 5.6	L.P

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Foreword

This Specification has been prepared by Marine Engineering, Integrated Technical Services (ITS), Canadian Coast Guard, Fisheries and Oceans Canada, Ottawa.

The purpose of this Specification is stated in Chapter 1.0, Scope.

When, this Specification is used other than as stated in the Scope, it shall remain the responsibility of the user to judge its suitability for their particular purpose.

Section 1 SCOPE

This Specification establishes the requirements of Marine Engineering, Integrated Technical Services, Canadian Coast Guard, Fisheries and Oceans Canada, Ottawa.

This Specification shall be followed whenever required by contract.

This Specification details the requirements for welding and non-destructive inspection of welds for structural steel, aluminum and stainless steel and the wide variety of other materials used for installation of pressure piping, pressure vessels and pressure containment systems and, shipboard equipment.

This Specification is intended as an Owner's requirement. In addition to this Specification, the Contractor shall meet all regulations and rules required by Transport Canada Marine Safety and Security and, the governing Classification Society as applicable.

When the above mentioned rules exceed the requirements specified herein, the more stringent requirement shall take precedence.

Section 2 DEFINITIONS & ABBREVIATIONS

The following definitions and abbreviations apply in this Specification:

Approved (approval)	means reviewed and accepted by the Delegated Representative of the Director, Marine Engineering, unless otherwise specified.
Contractor	means the company to which a contract has been awarded by the Owner.
CWB	means the Canadian Welding Bureau.
Delegated Representative	means the individual that has been assigned the authority to represent the Director, Marine Engineering regarding matters related to the requirements of this Specification, as applied to a specific contract.
Engineer (in the referenced standards)	means the Delegated Representative.
Examination, Inspection, Testing	the act of looking at something closely, by either destructive or non-destructive methods, in order to learn more about it, to determine acceptance or rejection to a defined criterion, to locate problems.
Owner	means, in the context of this Specification as applied to a given contract, Marine Engineering, Integrated Technical Services (ITS), Canadian Coast Guard, Fisheries and Oceans Canada, Ottawa.
Pressure Piping	means any piping used to convey a fluid at a pressure above atmospheric pressure, unless otherwise stated.
Provincial Pressure Vessel Authority	means the organizations legislated by the Provinces of Canada to provide oversight for welding pressure piping, pressure vessels and pressure containment systems.
Structure (s) or Structural	means primary hull structure and secondary structure.
Structure, Primary Hull	means that part of the vessel hull structure which makes up the primary hull girder, including structure to resist ice loadings. It consists of strength decks, platforms and shell plating and their supporting framing, tank top, vertical keel, longitudinal and main transverse bulkheads. In addition to the primary hull girder, water, oil and gas tight bulkheads shall be considered part of the primary hull structure.
Structure, Secondary	means all of the vessel structure which is not included in the definition for primary hull structure.
Sub-Contractor	means the company to which a contract has been awarded by the Contractor.

Section 3 APPLICABLE DOCUMENTS

The Contractor or Sub-Contractor performing welding or inspection of welds shall be familiar with the applicable Codes, Standards, Rules and Publications referred to within this Specification (See Annex "A").

Use of the above-mentioned references shall be the latest edition approved by the organization issuing the publication specified at the time of contract award.

Except as noted in Chapter 1, when the requirements of other publications are in conflict with the requirements specified herein, the Delegated Representative shall be requested to establish precedence.

Section 4 ADMINISTRATION

This Specification shall be administered by the Director, Marine Engineering, Integrated Technical Services, Canadian Coast Guard, Fisheries and Oceans Canada, Ottawa.

For the purpose of administration, the Director, Marine Engineering shall delegate representatives that shall be responsible for measuring the Contractor's performance and ability to meet the requirements specified herein.

The Contractor shall allow the Delegated Representatives access to the facilities, files and records relative to the requirements of this Specification for the duration of the contract and warranty period.

The documentation that is to be made available to the Delegated Representatives shall include, but not necessarily be limited to, personnel qualification records, welding specifications and weld procedure data sheets, certification records, visual and non-destructive inspection results, quality control and quality assurance manuals and reports, and other associated documents.

Section 5 WELDING STRUCTURES

5.1 CONTRACTOR REQUIREMENTS

5.1.1 Steel Structures

All welding contractors shall be certified by the CWB to CSA Standard W47.1 Division 1 or 2 for new construction and work packages other than new construction.

5.1.2 Aluminum Structures

All welding contractors shall be certified by the CWB to CSA Standard W47.2 Division 1 or 2 for new construction and work packages other than new construction.

5.1.3 Welding Procedures

All welding procedure specifications and/or welding procedure data sheets shall be reviewed and approved by the CWB prior to use.

5.1.4 Welding Personnel

All welding personnel shall be approved by the CWB prior to their commencing any welding work

5.1.5 Performance and Qualification Testing

All performance and procedure qualification testing shall be fully witnessed and documented by the CWB.

5.1.6 Limitations Prior to Commencing Welding Work

All Contractors shall submit their welding personnel qualification records and approved welding procedures to the Delegated Representative prior to commencing any welding work.

All welding procedures, including welding procedure specifications and welding procedure data sheets, shall include an indication of acceptance by the Contractor (by signature, seal or other appropriate means) and a stamp of acceptance by the CWB.

5.1.7 Governing Standards for Welding

For structural steels ≥ 3 mm in thickness, welding shall meet the requirements of CSA Standards W47.1 and W59, except as modified by this Specification.

For structural aluminum ≥ 3 mm in thickness, welding shall meet the requirements of CSA Standards W47.2 and W59.2, except as modified by this Specification.

5.2 WELD DESIGN

Weld design shall be to the Rules of a Classification Society that is an approved Recognized Organization by Transport Canada Marine Safety and Security. Unless otherwise approved by the Delegated Representative, the following conditions shall be met:

- all groove welds in butt joints shall be full penetration; and,
- all corner joints shall be full penetration groove welds combined with single continuous fillet weld

A weld design schedule shall be submitted to the Delegated Representative in drawing form for review prior to commencing any welding work.

5.3 SYMBOLS FOR WELDING

Design drawings shall include weld requirement symbols and construction drawings shall include welding symbols following the requirements of CSA Standards W59 and W59.2. For fillet welds, the drawings shall indicate if the weld dimension shown in the symbol is throat size or leg length.

5.4 WELDING CONSUMABLES

This Section provides contractors means to quickly finding the information required to match welding consumables to the various grades of steel and aluminum materials used for shipbuilding and repair. For steel, cross reference is made between CSA welding consumable and shipbuilding material designations.

This Section also guides the contractor in the selection of corrosion resistant welding consumables for ships built of atmospheric corrosion resistant steels and for welds located in the external shell envelope of ice transiting ships. For welding processes other than those listed herein, consult the governing standards referenced in Chapter 5.1, Section 5.1.7 of this specification.

5.4.1 Steel

5.4.1.1 Electrode and Consumable Selection

Electrodes and consumables for welding processes shall be selected on the basis of retained hydrogen, mechanical properties (UTS, YS, elongation and toughness) and resistance to corrosion in sea water.

Generally, the requirements of Tables 5.1- 5.5 inclusive shall apply involving use of steels having a yield stress below 360 MPa (N/mm²) and charpy-v-notch toughness requirements at test temperatures above -45°C.

For other materials or conditions, welding electrodes and consumables shall be selected in accordance with the requirements of the following Sections of this Specification:

- Section 5.4.1.8 for higher strength notch tough steels;
- Section 5.4.1.9 for atmospheric corrosion resistant steels;
- Section 5.4.1.10 for Shell Butts & Seams – Ice Transiting Steel Ships

Welding electrodes and consumables for welding steel shall be certified by the CWB to the requirements of CSA Standard W48 or the applicable AWS A5 series of standards.

When two different grades of material of the same tensile strength properties are being joined by welding and corrosion resistance is not a consideration, electrodes and consumables for the lower grade is generally acceptable. Similarly, when joining materials with differing tensile strength properties, electrodes and consumables are to be suitable for the tensile strength of the component on which the weld size (e.g. fillet weld) has been determined.

Care shall be taken not to overmatch weld metal mechanical properties.

5.4.1.2 Storage and Handling

Storage and handling of welding consumables, electrodes and fluxes shall be in accordance with the requirements of CSA Standard W59.

5.4.1.3 Low or Controlled Hydrogen Electrode Requirements

In addition to other factors that must be considered for matching weld metal deposits to various grades of base materials, welding processes and their respective welding electrodes and consumables produce varying amounts of hydrogen gas which may be retained in the deposited weld metal.

Although the amount of retained hydrogen may be reduced by increasing preheat temperatures, low and controlled hydrogen electrodes and consumables shall be required in accordance with Table 5.1.

Table 5.1 Selection of Low or Controlled Hydrogen Electrodes

Mandatory Use of Low & Controlled Hydrogen Electrodes		Other than Low Hydrogen Electrodes (1)	
Material Grade	Material Thickness	Material Grade	Material Thickness
Gr. A Gr. E Gr. AH 32, 34 36 Gr. DH 32, 34, 36 Gr. EH 32, 34, 36 Gr. FH 32, 36, 40 Gr. FH 42 - 69	(t) ≥ 19 mm All Thicknesses	Gr. A	(t) ≤ 19 mm
Where (t) is the thickest member		Where (t) is the thickest member	

Note: (1) Independent of the material grade specified, when the carbon equivalent (CE) of the material exceeds 0.40 where the carbon equivalent is calculated from the ladle analysis as follows:

$$CE = \frac{Mn}{6} + \frac{Cr}{5} + \frac{Mo}{5} + \frac{V}{15} + \frac{Ni}{15} + \frac{Cu}{15}$$

Basic or controlled hydrogen electrodes are required.

When the grades of base metals requiring low or controlled hydrogen electrodes and consumables are produced using thermo-mechanical controlled rolling practice, the Contractor may apply to the Delegated Representative for exemption from mandatory requirements listed in Table 5.1. Exemption will only be granted after due consideration of susceptibility to hydrogen assisted or induced cold cracking.

5.4.1.4 Shielded Metal Arc Welding (SMAW)

Welding electrodes for shielded metal arc welding normal and higher strength shipbuilding grade steels shall be selected following the requirements of Table 5.2.

Table 5.2 Selection of Welding Electrodes for Shielded Metal Arc Welding

Material Grade	CSA W48 Electrode
Grade A	E4300, 10, 11, 13, 27 (2) E4914, 24 (2) E4918, 28, 48 (1)
Grade E	E4918-1 (1)
Grades AH32, 34, 36 DH32, 34, 36	E4918, 28, 48 (1)
Grades EH32, 34, 36	E4918-1 (1)
Grades EH40 FH-XX XX-40-69	See Section 5.4.1.8 herein

NOTE: (1) As required in Table 5.1; (2) Restricted use as detailed in Table 5.1

5.4.1.5 Submerged Arc Welding (SAW)

Wire electrode-flux combinations for submerged arc welding normal and higher strength shipbuilding grade steels shall be selected following the requirements of Table 5.3.

Table 5.3 Selection of Wire Electrodes and Flux for Submerged Arc Welding

Base Material	CSA W48	
Grade	Flux (1)	Electrodes
Grade A	F43A1-XXXX F49A1-XXXX	XXXX-EL12 XXXX-EM12K
Grades E	F49A4-XXXX F49A5-XXXX	XXXX-EM12K XXXX-EM13K
Grades AH32, 34, 36 DH32, 34, 36	F49A1-XXXX F49A2-XXXX	XXXX-EM12K XXXX-EM13K
Grades EH32, 34, 36	F49A4-XXXX F49A5-XXXX	XXXX-EM12K XXXX-EM13K
Grades EH40 FH-XX XX-40-69	See Section 5.4.1.8 herein.	See Section 5.4.1.8 herein.

Note: (1) Neutral flux only for shell plate groove welds.

5.4.1.6 Flux Cored and Metal Cored Arc Welding (FCAW & MCAW)

Wire electrodes for flux cored arc welding and metal cored arc welding normal and higher strength shipbuilding grade steels shall be selected following the requirements of Table 5.4. Shielding gas type shall be in accordance with approved weld procedure data sheets for the wire electrode selected.

Table 5.4 Selection of Wire Electrodes for Flux Cored and Metal Cored Arc Welding

Base Materials	Wire Electrode					
Grade	CSA W48					
Grade A	E49X See Note #2	T	-1 (M) -5 (M) -6 (M) -8 -9 (M) -12 (M)	E490X See Note #2	T	-G (1) GS (1) -4 (1) -7 (1) -10 (1) -11(1)
	E49X See Note #2	C	-3 (M) -6 (M)	E49X See Note #2	C	-G (1)
Grades AH 32, 36 DH 32, 36	E49X See Note #3	T	-1 (M) -5 (M) -6	E49X See Note #3	T	-8 -9 (M) -12 (M)
	E49X See Note #3	C	-3 (M) -6 (M)	E49X See Note #3	C	-G1
Grades E EH 32, 36	E49X-T-X(X)-J, E49X-C-X(X)-J See Notes #3 & 4 E49X-T-X(X)-J, E49X-C-X(X)-J See Notes #3 & 4 E55X-T-X(X)-J, E55X-C-X(X)-J See Notes #3 & 4					
EH40 FH-XX XX-40-69	No pre-approved consumables. See Section 5.3.2.8 herein. Qualification Tests are required using the shielding gas type planned for production.					

1. Submit for approval;
2. H16 designation for the thicknesses required by Table 5.1
3. H16 designation for all thicknesses.
4. Must carry "J" designation, average impact energy of 27 j @ -40

5.4.1.7 Gas Metal Arc Welding (GMAW)

Wire electrodes for gas metal arc welding normal and higher strength shipbuilding grade steels shall be selected following the requirements of Table 5.5. Shielding gas type shall be in accordance with the approved weld procedure data sheets for the wire electrode selected.

Table 5.5 Selection of Wire Electrodes for Gas Metal Arc Welding

Base Materials	Wire Electrodes
Marine Grade	CSA W48:06 CAN/ISO 14341:06
Grade A t ≤ 19 mm.....	ISO 14341-B-G-49A-X-X-XX
t > 19 mm.....	ISO 14341-B-G-49A-2-X-XX ISO 14341-B-G-49A-3-X-XX
Grade E	ISO 14341-B-G-49A-4-X-XX ISO 14341-B-G-49A-5-X-XX ISO 14341-B-G-49A-6-X-XX
Grades AH 32, 36 & DH 32, 36	ISO 14341-B-G-49A-2-X-XX ISO 14341-B-G-49A-3-X-XX
EH 32, 36	ISO 14341-B-G-49A-4-X-XX ISO 14341-B-G-49A-5-X-XX ISO 14341-B-G-49A-6-X-XX ISO 14341-B-G-55A-4-X-XX ISO 14341-B-G-55A-5-X-XX ISO 14341-B-G-55A-6-X-XX
Grades : EH40 FH-XX XX-40-69	No pre-approved consumables. Section 5.4.1.8 herein. Qualification Tests are required using the shielding gas type planned for production

Wire electrodes approved by the yield strength and average impact values of 47 J, the “A” suffix method, shall be submitted to the Delegated Representative for review and acceptance. Weld procedure qualification testing is required.

5.4.1.8 Electrodes for Higher Strength Notch Tough Steels

Welding electrodes and consumables for joining normal and high strength shipbuilding grade steels that have been manufactured using the thermo-mechanical controlled rolling practice method shall be approved by a series of weld procedure qualification tests.

Welding electrodes and consumables for joining shipbuilding steel grades FH-XX and XX-40 through XX-69 inclusive shall also be approved by a series of weld procedure qualification tests.

As a minimum, welding electrodes and consumables shall match the base metal strength (UTS, YS and elongation) and notch toughness properties at the base metal test temperature.

To qualify welding electrodes and consumables, a series of weld procedure qualification tests shall be performed in each position of welding using joint configurations typical of that intended for production. For each of the test conditions, two welds shall be made; one test each at the minimum and maximum anticipated heat inputs (kJ/mm) planned for production welding.

Assemblages, type of tests and specimens shall be in accordance with CSA Standard W47.1. Each procedure qualification test shall be supplemented with 15 charpy-v-notch specimens; 5 specimens with the "v" notch located at the centre of the joint, 5 specimens with the "v" notch intersecting the line of fusion and 5 specimens with the "v" notch located 5 mm from the fusion line (HAZ). Charpy-v-

notch specimens shall be tested in accordance with the requirements of CSA Standard W47.1 at test temperatures equivalent to that of the base metal classification (ie. E & EH @ -40°C, FH @ -60°C, etc). The minimum acceptance requirements for each test method shall be those requirements of the test specification under which the base metal was qualified.

5.4.1.9 Electrodes for Atmospheric Corrosion Resistant Steels

Welding electrodes and consumables for joining atmospheric corrosion resistant steels such as CSA Standard G40.21 grades 350A, 350AT, 400A and 400AT including ASTM grades A242 and A588 steels shall be carefully selected to match the copper and nickel content of the base plate and the ultimate and yield strength, elongation and toughness properties. Close attention shall be paid to matching all of the chemical elements that prevent corrosion in sea water.

Butts and seams in the shell, weather decks and all welds in uncoated ballast tanks shall be performed with welding electrodes and consumables that are proven to be resistant to weld zone (weld deposit and HAZ) corrosion in accordance with the requirements of Section 5.4.1.10 herein. These requirements also apply to weld repair of scars in shell plating caused by removal of temporary attachments and permanent markings made by welding. There are no pre-approved corrosion resistant weld metal deposits for welding atmospheric corrosion resistant steels. For welds in other locations of primary and secondary structure, electrodes and consumables may be selected and matched in accordance with the requirements of CSA Standard W59.

5.4.1.10 Shell Butts & Seams – Ice Transiting Steel Ships

The finishing layers of shell butts and seams located on the sea water side of ice-transiting ships shall be performed with welding electrodes and consumables that are proven to be resistant to weld zone (weld deposit and HAZ) corrosion in accordance with the requirements of this Section.

For shielded metal arc welding, E5518-C3 is approved for use without testing. There are no other pre-approved corrosion resistant consumables for any welding process.

Once the Contractor has matched a welding electrode and consumable to the minimum base plate mechanical property requirements of this Specification; coupons shall be prepared, welded and tested for corrosion resistance in sea water by conducting anodic dissolution tests as outlined in Annex “B” of this Specification. Two weld coupons shall be made for each weld metal/base metal combination; one test each at the anticipated minimum and maximum heat inputs (kj/mm) planned for production welding. Welding bead sequence for these tests must employ a stringer temper bead technique as illustrated in Annex B of this Specification. No weaving is permitted.

The target acceptance criterion sought is near equivalent loss of the base plate, heat affected zone and weld metal deposit. Since this may not always be accomplished for all grades of base metal, slight loss of weld metal is desired over any loss in the heat affected zone. Anodic dissolution test results shall be tabulated and submitted to the Delegated Representative for approval.

For finishing layers of welds located on the external shell plating of ice transiting ships, a temper bead approach shall be employed similar to what is illustrated in Figure 5.1.

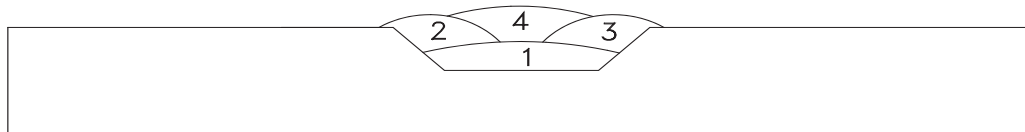


Figure 5.1 Temper Bead Approach for Finishing Layers in Shell Plating

The first layer of corrosion resistance weld metal shall be deposited 5 mm below the plate surface.

5.4.2 Aluminum

5.4.2.1 Electrode and Consumable Selection

Welding electrodes, rods and consumables shall be matched to the base metal in accordance with the requirements of CSA Standard W59.2. All welding electrodes, rods and consumables shall be certified by the CWB to the requirements of AWS A5.10.

5.4.2.2 Storage and Handling

Storage and handling of welding electrodes, rods and consumables shall be in accordance with the requirements of CSA Standard W59.2.

5.5 WORKMANSHIP

5.5.1 Environment

The work being welded shall be adequately protected against the direct effects of wind, rain and snow throughout the welding operation.

Welding steel at ambient temperatures below -18°C requires approval in accordance with CSA Standard W59. Aluminum welding shall not be carried out when the work surfaces are damp or wet or at ambient temperatures below 0°C.

Welding with processes that utilize externally supplied shielding gas shall not be performed in a draught or wind unless the weld zone is protected from loss of shielding gas as required by CSA Standards W59 and W59.2 for steel and aluminum, respectively.

5.5.2 Preheat and Interpass Temperatures

Preheating and interpass temperatures for welding steel and aluminum shall follow the requirements of CSA Standards W59 and W59.2, respectively.

5.5.3 Plate Forming

Heat line bending by the application of oxy-fuel gas torches for creating curvatures in steel plates is permitted for certain shipbuilding grade steels, providing the requirements of this Section are met.

Heat line bending of aluminum requires special consideration and approval. Annex "C" of this Specification offers guidance notes on hot and cold forming practices for aluminum.

5.5.3.1 Personnel

Personnel performing heat line bending shall be trained and qualified prior to forming plates for production or repair of distortion. A list of qualified personnel shall be submitted to the Delegated Representative prior to any heat line bending operations.

5.5.3.2 Materials

Heat line bending is permitted on shipbuilding grade materials "A"-"EH36" providing the material has not been produced by the thermo-mechanical controlled rolling practice method. All other grades of steel including "FH-XX" and "XX-40 through XX-69" inclusive, shall require special consideration and approval by the Delegated Representative. Heat line bending is not permitted on quench and tempered steels.

5.5.3.3 Procedures

For those pre-approved shipbuilding grades of steel listed in Section 5.5.3.2 herein, forming is not to be performed between 205° C and 425° C. If the forming temperature exceeds 650° C for as-rolled, controlled rolled or normalized steels, mechanical tests are to be made to assure that these temperatures have not adversely affected the mechanical properties of the steel. Water quenching should not occur at temperatures above 550° C.

For applications where toughness is of particular concern, when the steel is formed below 650° C beyond 3% strain on the outer fibre, charpy-v-notch impact tests shall be performed to the satisfaction of the Delegated Representative to demonstrate impact properties meet material specification minimum requirements. The percent strain on the outer fibre shall be calculated by; 65 times the plate thickness divided by the outer radius.

For those materials not pre-approved, heat line bending procedures shall be submitted to the Delegated Representative for consideration. The submission shall contain results of metallurgical, physical and corrosion tests.

5.5.3.4 Controls

During plate forming, controls shall be in place to check maximum plate and water or air quenching temperatures. On material grades having notch toughness properties, direct supervision and monitoring is required.

5.5.4 Weld Size and Dimensions

The size and length of welds shall not be less than, nor shall they be substantially in excess of, those specified by the design requirement.

For tee joints in the skewed condition, the deposited leg length of fillet welds shall be adjusted based on the fitted angle and gap as required by CSA Standards W59 and W59.2 for steel and aluminum, respectively. Gaps shall not exceed 5 mm and the dihedral angle shall not exceed 135°.

5.5.5 Adjacent Weld Spacing

The minimum dimension between adjacent groove welds that do not appear on approved drawings or form part of an insert located in shell plating shall be 300 mm minimum.

The minimum dimension between a groove weld in a table member and a fillet weld to the same table member that do not appear on approved drawings shall be 30 mm minimum.

The minimum dimension between fillet welds attaching an abutting member to a table member and a groove weld in the same abutting member that do not appear on approved drawings shall be 300 mm minimum.

5.5.6 Inserts and Doublers

Where local increase in plate thickness is required, insert plates shall be used instead of doubler plates.

When an insert is to be located within the shell envelope the minimum dimension shall be 1000 mm x 1000 mm. When an insert is to be located in other locations the minimum dimension shall be 300 mm x 300 mm. Welds should be connected to existing butts and seams whenever possible. The minimum corner radius used for all insert plates independent of location shall be 5 (t), 75 mm minimum.

For shell and weather deck plating, the rolling direction of an insert plate shall be fitted to match the rolling direction of the surrounding base plates.

Welding sequences shall be carefully developed in order that shrinkage stress is balanced and restraint cracking does not occur.

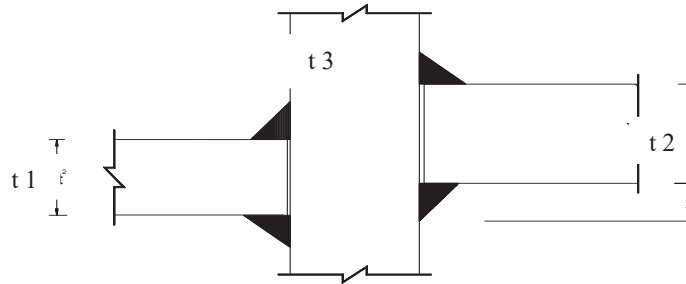
5.5.7 Edge Preparation and Fitted Tolerances

The edge preparation is to be accurate and uniform and the parts to be welded are to be fitted in accordance with the approved joint detail. Means are to be provided for maintaining the parts to be welded in correct position and alignment during the welding operation.

Occasional misalignment of joints fitted for welding shall not exceed dimensional tolerances detailed in CSA Standards W59 and W59.2 for steel and aluminum, respectively, and this Specification.

5.5.8 Intercostals

The occasional misalignment of intercostals for steel structures shall not exceed the limitations illustrated in Figure 5.2.



(X) = misalignment measured on the heel line; Where t 3 is less than t 1, then t 3 should be substituted for t 1		
For Strength Members:	- When (X) \leq t ¹ /3	Increase Fillet Leg Size Equal to Offset
	- When (X) > t ¹ /3	Release and Re-Align
For Other Members:	- When (X) \leq t ¹ /2	Increase Fillet Leg Size Equal to Offset
	- When (X) > t ¹ /2	Release and Re-Align

Figure 5.2 Intercostals

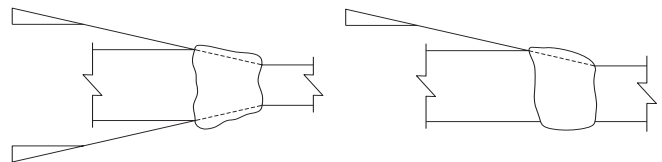
Misalignment of intercostals is not permitted in aluminum structures.

5.5.9 Dissimilar Plate Thickness

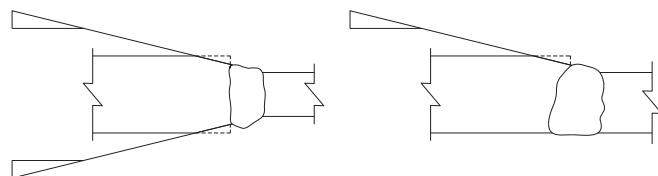
Plates of different thicknesses that are groove welded require a transition as follows:

- Exterior Shell Plating of Ice Transiting Steel Ships, 1 in 4
- Other, 1 in 3

When the difference in thickness is less than or equal to 5 mm and 3 mm for steel and aluminum, respectively, the transition may be created by welding as illustrated in Figure 5.3

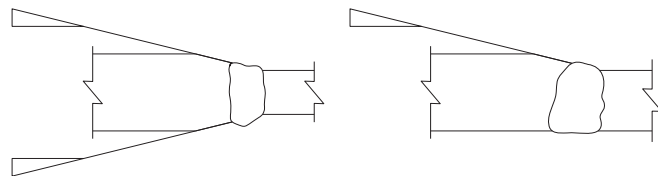


TRANSITION BY SLOPING WELD SURFACE
Figure 5.3 Sloping Weld



TRANSITION BY SLOPING WELD SURFACE AND CHAMFERING AFTER WELDING

When the difference in thickness exceeds 5 mm and 3 mm for steel and aluminum, respectively, the transition may be achieved by chamfering or a combination of chamfering and welding as illustrated in Figure 5.4.



TRANSITION BY CHAMFERING THICKER PART PRIOR TO WELDING

Figure 5.4 Chamfering

5.5.10 Flush Tolerance

Surfaces of welds required to be flush shall meet requirements of CSA Standards W59 and W59.2 for steel and aluminum, respectively. In addition, for aluminum the weld shall be finished so as not to reduce the cross section below the base metal's mill tolerance set by the material's compliance standard.

5.5.11 Smooth Tolerance

Surfaces of groove welds required to be smooth shall be finished so as to ensure that the weld reinforcement does not exceed 1.5 mm. There shall be no valleys or grooves between individual weld beads and weld toes shall blend smoothly into the base metal without undercut or overlap.

5.5.12 Preparation of Welds for the Application of Coatings or Paints

Completed welds shall be prepared to the requirements of the coating and/or paint manufacturer prior to the materials being applied.

5.5.13 Distortion and Residual Stress

Welding of structures, sub-assemblies and parts shall progress symmetrically to minimize distortion. Members should remain unrestrained during welding to minimize stresses. Welds shall be deposited in a sequence that shall balance the heat applied throughout the welding process. Welds shall progress from points where the parts are relatively fixed in position towards points where they have relatively greater freedom of movement.

It should be noted, plain carbon steels are more forgiving than aluminum. The thermal expansion coefficient of aluminum is about twice that of steel. The total amount of thermal expansion varies inversely with the welding speed. As a result, fixtures should be designed so plate alignment will accommodate twice the dimensional change normally expected for welding a similar steel component.

Unlike steel, restrictions apply to correcting distortions in aluminum caused by welding. In addition, as-deposited weld metal elongation properties are 5 - 7% on average rendering weld deposits more prone to cracking under restraint.

Weld sizes shall be kept to a minimum. Excessive weld cross sections and over welding shall be avoided. Joints anticipated to cause significant shrinkage shall be welded first.

5.5.13.1 Submission of Welding Sequence

All Contractors shall submit a welding sequence to the Delegated Representative prior to performing any welding work. Welding sequences shall be developed for the method of construction (block or frame and plate) and for insert plates.

For block construction, a sequence for assembling blocks and erecting and welding blocks to each other at the berth is required.

For frame and plate construction, a sequence for welding shell butts and seams, frames and bulkheads to shell plating, tank top to inner bottom framing and "A" frames and stern tubes and other critical components is required.

5.5.13.2 Restrained Joints

When welding joints that are restrained and/or where significant shrinkage is anticipated, welding shall be carried out continuously or to a point that shall ensure freedom from cracking after the joint has cooled below the interpass temperature. Root passes shall be of adequate size to withstand shrinkage stress. Block welding or cascade welding techniques should be used wherever practicable.

5.5.13.3 Jigs and Fixtures

Jigs, fixtures, clamping and strong backs shall be used in such a manner as to avoid restraint during welding. Strong backs welded on one side of the joint and wedged on the other are preferred. When removing strong backs, care shall be taken not to scar the material to which they are welded. Repair of scars to base plates shall be in accordance with approved procedures.

5.5.13.4 Progression

Frames, stiffeners or intercostals should be welded to each other before they are welded to the plating. When joining sub-assemblies to each other, joints connecting plating should be welded prior to welding the butt joints of the sub-assembly framing.

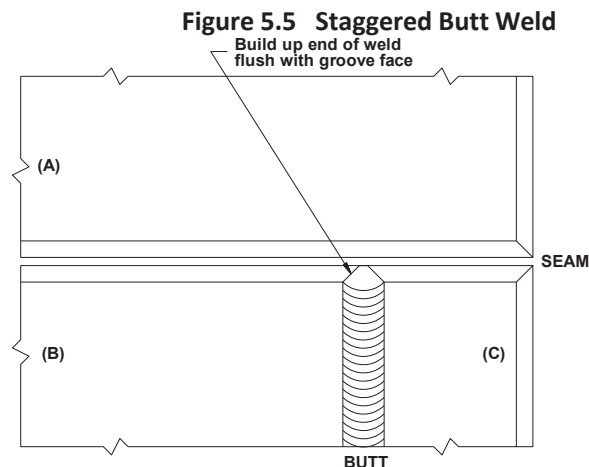
Welding should be started in the centre of the ship and progress outward, forward and aft. Sub-assemblies should be welded in the same manner starting in the centre, progressing outward.

Transverse butts in plating should be welded prior to longitudinal seams.

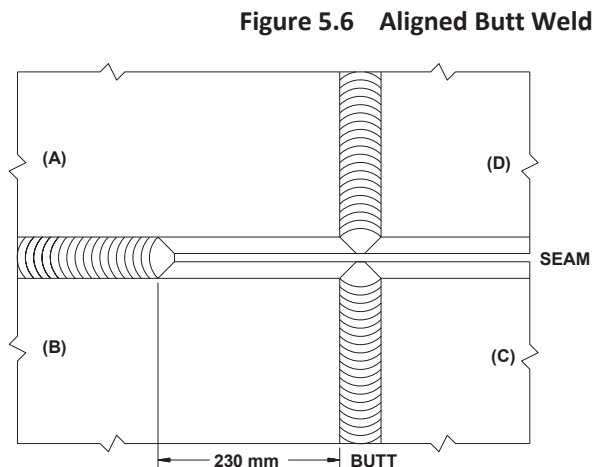
5.5.13.5 Intersections and Release Distance

Care shall be taken when welding intersecting butts and seams. The techniques illustrated in Figure 5.5 and Figure 5.6 shall be followed.

1. Weld the butt between (B) and (C) and then the weld seam between (A) and (B).



- 1) Weld seam between (A) and (B) to within 230 mm of butt.
- 2) Weld butt between (B) and (C).
- 3) Weld butt between (A) and (D).
- 4) Complete welding seam to within 230 mm of next butt.



Stiffeners fillet welded to plating that traverse butts or seams shall be released and remain unwelded for a distance of at least 230 mm in each direction until butts or seams they traverse have been fully welded. For plates ≥ 19 mm in thickness, release distance shall be increased to 300 mm minimum.

5.5.14 Repair of Distortion

When distortion of plating between stiffeners exceeds the limits detailed in Table 6.10 of IACS No. 47, Shipbuilding and Repair Quality Standard as reproduced below, straightening shall be required.

Members distorted by welding shall be straightened by carefully following the procedures approved by the Delegated Representative following the methods and controls offered in CSA Standards W59 and W59.2 for steel and aluminum, respectively, and this Specification.

Item	Standard	Limit	Item	Standard	Limit
Shell plate			Forecastle & Poop deck		
• Parallel part (side & bottom shell)	4 mm	8 mm	• Bare part	4 mm	8 mm
• Fore and aft part	5 mm	8 mm	• Covered part	6 mm	9 mm
Tank top plate	4 mm	8 mm	Super structure deck		
			• Bare part	4 mm	6 mm
			• Covered part	7 mm	9 mm
Bulkhead			House wall		
• Longl. Bulkhead			• Outside wall	4 mm	6 mm
• Trans. Bulkhead	6 mm	8 mm	• Inside wall	6 mm	8 mm
• Swash Bulkhead			• Covered part	7 mm	9 mm
Strength deck			Interior member (web of girder, etc.)	5 mm	7 mm
• Parallel part	4 mm	8 mm			
• Covered part	6 mm	9 mm			
• Fore and aft part	7 mm	9 mm			
Second deck			Floor and girder in double bottom	5 mm	8 mm
• Bare part	6 mm	8 mm			
• Covered part	7 mm	9 mm			

5.5.15 Temporary Welds and Lug Removal

5.5.15.1 Temporary Welds

Temporary welds shall not be located on a welded butt or seam.
Temporary welds shall only be made using approved weld procedures.

5.5.15.2 Lug and Temporary Attachments

For the hull exterior, exposed bulkheads, decks, panels, superstructure, walkways, bulwarks, fairleads, bollards, and any other zone deemed necessary to avoid operational hazards and to provide a good cosmetic appearance to the vessel, all lugs, temporary fairing aids, studs, etc., shall be removed to render a flush and smooth surface.

5.5.15.3 Removal of Temporary Welds, Lugs and Attachments

Temporary welds shall be removed and the surface restored flush with the original surface.
Hammering or other mechanical means that will result in scars to base material shall be avoided.
Scars in plate surfaces shall be repaired by welding with approved procedures.

Welding electrodes and consumables for repairing scars in exterior shell plating shall be corrosion resistant in sea water and completed welds shall meet the acceptance criterion of this Specification.

Repair welds shall be ground flush or smooth as required by the Delegated Representative.

5.5.16 Arc Strikes

Arc strikes outside the area of welds should be avoided following the requirements of CSA Standards W59 and W59.2 for steel and aluminum, respectively, and of this Specification.

When an arc strike occurs in a location deemed critical by the Delegated Representative, the surface shall be lightly ground and inspected with the appropriate non-destructive inspection methods.

Repair of arc strikes shall be to the satisfaction of the Delegated Representative.

5.6 WELD INSPECTION REQUIREMENTS

All non-destructive inspections required in this Specification shall be considered the minimum requirements of the Owner and performed by a qualified third party retained by the contractor. The method and location of inspections shall be determined by the Delegated Representative. Inspection test results shall be returned to the Delegated Representative within requested time frame. No interpretation report or radiograph shall be destroyed or discarded.

The minimum number of locations ordered for examination at one time shall be a combination of any method cumulatively totalling 10, unless otherwise agreed to by the Delegated Representative.

Contractors desiring to use ultrasonic inspection in lieu of radiographic inspection to examine welds located in steel structures shall submit a detailed proposal to the Delegated Representative to consider. At the Delegated Representatives' discretion, ultrasonic inspection may be accepted in lieu of radiographic inspection if the length of inspection is as required for ultrasonic inspection in Table 5.7 herein and the ultrasonic inspection procedures and techniques are proven accurate and repeatable by 30% spot radiography of the first fifteen locations examined by ultrasonic methods. Substitute inspection methods are not permitted for examining welds located in aluminum structures.

5.6.1 Facility Welding Audits

In addition to the CWB biannual audits required to maintain certification to CSA Standards W47.1 and W47.2, at its own expense, the Owner shall retain the services of the CWB to perform audits of the contractor at a frequency deemed necessary by the Owner. The Owner's CWB auditor will not be the Certification Services Representative performing the contractor's biannual certification audits. The Owner's CWB audits shall measure the contractor's compliance with the requirements of this Specification and include as a minimum a pre-weld, weld, post weld and contractor third party inspection documentation review and check.

5.6.2 Non Destructive Inspection Audits

The Owner reserves the right to retain the services of the National Non Destructive Testing Certification Body of Natural Resources Canada (NRCAN) or another organization acceptable to the Owner to perform review and audits of NDT personnel qualifications, procedures, inspection activities and reported results. Audits shall measure the contractor's compliance with the requirements of this Specification.

5.6.3 Selection of Non Destructive Inspection Methods

The method of inspection shall be appropriate to depict discontinuities dependent on the material, joint and weld type, the orientation of potential discontinuities within the weld cross section and access to the part in need of inspection. All welds shall be examined by visual inspection.

Full penetration welds shall be selectively sampled by radiographic and ultrasonic inspection methods. Radiographic inspection shall be used for full penetration groove welds in butt joints. Ultrasonic inspection shall be used for full penetration groove welds in tee and corner joints.

Fillet welds in steel structures shall be selectively sampled by liquid penetrant and magnetic particle inspection. Fillet welds in aluminum structures shall be selectively sampled by liquid penetrant inspection.

5.6.4 Locations Subjected to Inspection

Welds subjected to non-destructive inspection shall include, but will not necessarily be limited to, the following locations:

Table 5.6 Locations Subjected to Inspection

Strength members	<ul style="list-style-type: none"> ○ Flat and vertical keel; ○ Tank margin plates; ○ Sheer strake; ○ Bilge strake; ○ Deck stringer plates.
Shell plating:	<ul style="list-style-type: none"> ○ Intersection of butts and seams; ○ Transverse butts; ○ Longitudinal seams.
Other:	<ul style="list-style-type: none"> ○ Inserts and closure plates; ○ Cruciform welds; ○ Terminal welds.

The exact position of inspections shall be determined by the Delegated Representative

5.6.5 Extent of Inspections

5.6.5.1 Visual Inspection:

All welds shall be visually inspected their entire length.

5.6.5.2 NDE Methods – New Construction

For new construction, in addition to the requirements of Section 5.6.5.1 herein, the number of locations inspected by liquid penetrant, magnetic particle, radiographic and ultrasonic test methods shall be in accordance with the calculated requirements of Table 5.7a or Table 5.7b herein.

Table 5.7a Quantity of Inspections – New Construction Vessels ≥ 12 m LOA

Inspection Method	Formula for Determining the Number Required	
	Steel Vessels	Aluminum Vessels
UT Inspections	$= 0.25 \times (L+B+D)$	= N/A
MT or PT Inspections	$= 0.50 \times (L+B+D)$	= N/A for MT = $0.75 \times (L+B+D)$ for PT
RT Inspections	$= 0.75 \times (L+B+D)$	= $1.25 \times (L+B+D)$
Where: PT= Penetrant Inspections, MT= Magnetic Particle Inspections, RT= Radiographic Inspections, UT= Ultrasonic Inspections and L= Overall Length in meters, B= Greatest Moulded Breadth in meters and D= Moulded Depth at Side, in meters, measured at L/2.		

For example following the requirements of Table 5.7a: A lifeboat 15 meters in length having a breadth of 4.5 meters and a moulded depth of 2 meters will require:

Inspection Method	Formula for Determining the Number Required	
	Steel Vessels	Aluminum Vessels
UT Inspections - 1000 mm – butts or seams - 500 mm x 500 mm– intersecting butts & seams	= 6	= N/A
MT or PT Inspections - 1000 mm	= 11	= N/A for MT = 16 for PT
RT Inspections - 440 mm – butts or seams - 300 mm x 300 mm – intersecting butts & seams	= 16	= 26

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Table 5.7b Quantity of Inspections – New Construction Vessels <12 m LOA

Inspection Method	Formula for Determining the Number Required	
	Steel Vessels	Aluminum Vessels
UT Inspections - 1000 mm – butts or seams - 500 mm x 500 mm– intersecting butts & seams	= $0.25 \times (L+B+D)$	= N/A
MT or PT Inspections - 1000 mm	= $0.50 \times (L+B+D)$	= N/A for MT = $0.50 \times (L+B+D)$ for PT
RT Inspections - 440 mm – butts or seams - 300 mm x 300 mm – intersecting butts & seams	= $0.75 \times (L+B+D)$	= $1.00 \times (L+B+D)$
Where: PT= Penetrant Inspections, MT= Magnetic Particle Inspections, RT= Radiographic Inspections, UT= Ultrasonic Inspections and L= Overall Length in meters, B= Greatest Moulded Breadth in meters and D= Moulded Depth at Side, in meters, measured at L/2.		

For example following the requirements of Table 5.7b: A service craft 10 meters in length having a breadth of 3.0 meters and a moulded depth of 1.00 meter will require:

Inspection Method	Formula for Determining the Number Required	
	Steel Vessels	Aluminum Vessels
UT Inspections	= 4	= N/A
MT or PT Inspections	= 8	= N/A for MT = 8 for PT
RT Inspections	= 10	= 14

When access does not permit the use of 300 mm by 300 mm film size at intersecting butts and seams, a series of films shall be positioned to offer examination of 150 mm of weld in all directions.

5.6.5.3 NDE Methods - Other

For work packages other than new construction, in addition to the requirements of Section 5.5.6.1 herein, the number of locations inspected by liquid penetrant, magnetic particle, radiographic and ultrasonic test methods shall be in accordance with the requirements of Table 5.8 herein.

Table 5.8 Quantity of Inspections – Other

Item	Method	Number
Entire Plate Renewal – Butts & Seams (shell, decks, bulkheads, tanktop etc)	RT	6 per plate
Entire Plate Renewal – Butts & Seams (secondary structure)	RT	2 per plate
Partial Plate Renewal – Butts & Seams (primary & secondary structure)	RT	See inserts herein
Insert – Butt & Groove Welds (shell, decks, bulkheads, tanktop etc.)	RT	4 per insert
Insert – Groove Welds (other primary structure)	RT	2 per insert
Insert – Groove Welds (secondary structure)	RT	1 per insert
Hull Penetration – Pipe or Plate to Shell Plate Opening (below waterline)	UT	Entire Weld Length
Pressure Pipe Girth Welds	RT	1 of each 5 welds Full Circumference

5.6.6 Surface Preparation Prior to Inspection

Prior to inspection by any method, welds and adjacent areas shall be cleaned so as to be free from all rust, scale, primer, paint, weld spatter and other foreign matter to enable accurate interpretation of the area of interest (weld zone). Staging and lighting shall be provided to permit safe access for inspection.

For liquid penetrant, magnetic particle and radiographic inspections weld profiles and contours shall be sufficiently smooth to ensure that geometric conditions do not cause false indications.

For ultrasonic inspection, the contact surfaces shall be smooth to the extent that the finish does not interfere with the inspection. Tests performed on rough surfaces shall require special calibration procedures.

5.6.7 Delayed Inspection

When testing welds subject to high restraint and/or when the steel yield strength is greater than 360 MPa, tests shall be delayed at least 48 hours after weld completion.

5.6.8 Inspection Personnel Qualifications and Certificates

5.6.8.1 Visual Inspection

Individuals performing and interpreting visual inspection shall be currently certified by the CWB in accordance with CSA Standard W178.2, Certification of Welding Inspectors. The individual shall be Level 2 or Level 3 and shall maintain the following Code endorsement categories: Ships and Marine Structures; and Buildings and Industrial Structures. Level 1 personnel may only observe and/or assist Level 2 and Level 3 personnel perform the inspections.

5.6.8.2 Other Inspection Methods

Individuals performing and interpreting liquid penetrant, magnetic particle, radiographic and ultrasonic inspections shall be currently qualified by the National Non Destructive Testing Certification Body of Natural Resources Canada (NRCAN) to CAN/CGSB 48.9712 Level 2 or Level 3. Level 1 personnel may only observe and/or assist Level 2 and Level 3 personnel perform the inspections.

5.6.8.3 Certificates

For each inspection method, a copy of the examining individual's current year qualification certificate shall be attached to the initial interpretation or verification report supplied to the Delegated Representative. If a new validation year is entered or if a different individual is used, new qualification certificates shall be supplied with any subsequent interpretation report being submitted.

5.6.9 Steel Structures

5.6.9.1 Inspection Procedures

Inspection procedures and techniques are to be prepared by Level 3 personnel for each inspection method required by this Specification and submitted to the Delegated Representative prior to performing any inspections of completed work. Procedures for visual inspection shall follow the requirements of Clause 7 of CSA Standard W59 and ASME Section V. Procedures for liquid penetrant and magnetic particle inspections shall follow the requirements of Clause 7 of CSA Standard W59. Procedures for radiographic and ultrasonic inspections shall follow the requirements of Clauses 7 and 8 of CSA Standard W59.

5.6.9.2 Acceptance Criterion

Visual and liquid penetrant inspection acceptance criterion shall be in accordance with Clause 12.5.4.1 of CSA Standard W59, except as modified by this Specification and the following:

- For welds in material thicknesses less than 5 mm, undercut must not exceed 0.5 mm.
- For welds in material thicknesses greater than or equal to 5 mm, undercut must not exceed 1.0 mm
- Pores open to the surface are not permitted in any weld of the primary structure as well as any weld of the secondary structure exposed to weather elements and fluids of any type.

The magnetic particle inspection acceptance criterion shall be in accordance with Clause 12.5.4.1 or 12.5.4.3 of CSA Standard W59. The radiographic inspection acceptance criterion shall be in accordance with Clause 12.5.4.3 of CSA Standard W59. The ultrasonic inspection acceptance criterion shall be in accordance with Clause 12.5.4.4 of CSA Standard W59.

5.6.9.3 Radiographic Inspection

5.6.9.3.1 Source of Radiation

Radiographs shall be made by either x-ray or gamma ray as follows:

- x-ray shall be used for material less than 6 mm in thickness.
- the minimum material thickness inspected by gamma ray shall be 6 mm.
- the maximum material thickness inspected by gamma ray shall be 50 mm. Material thicknesses greater than 50 mm shall be examined by ultrasonic methods.
- for gamma ray applications, the source of radiation shall be Iridium 192.

5.6.9.3.2 Radiographic Film

The class of film is dependent on material thickness, source of radiation and required sensitivity. The following shall apply:

- for x-ray on material thickness less than 6 mm, class II film may be used providing the 2-2(t) hole is clearly visible on the radiograph. Otherwise, class I film shall be used;
- when the material thickness is greater than or equal to 6 mm and less than 12 mm, class I film and iridium 192 gamma radiation shall be used;
- when the material thickness is greater than or equal to 12 mm, class I or class II film and iridium 192 gamma radiation may be used.

5.6.9.3.3 Display of Information and IQI Essential Holes

The exposed radiograph shall show the outline of the "Hole Type" Image Quality Indicator (IQI), shims, IQI identification number, essential hole, radiograph identification number, location markers, date it was taken, reference to the contract number or vessel identification and radiographer's initials.

- When x-ray is used on materials thicknesses < 6 mm, the image of the 2-2(t) hole shall appear clearly on the radiograph.
- When iridium 192 gamma radiation is used on material thicknesses ≥ 6 mm but < 12 mm where class 1 film is required, the image of the 2-2(t) hole shall appear clearly on the radiograph.
- When iridium 192 gamma radiation is used on material thicknesses ≥ 12 mm but ≤ 30 mm, the image of the 2-4(t) hole shall appear clearly on the radiograph.
- When iridium 192 gamma radiation is used on material thicknesses greater than 30 mm, the image of the 2-2(t) hole shall appear clearly on the radiograph.

5.6.9.3.4 Intensification Screens

Intensification screens shall not be used. If adequate contrast cannot be achieved with a single film when examining unequal thicknesses, a dual exposure technique shall be used.

5.6.10 Aluminum Structures

5.6.10.1.1 Inspection Procedures

Inspection procedures and techniques are to be prepared by Level 3 personnel for each inspection method required by this Specification and submitted to the Delegated Representative for approval prior to use.

Procedures for visual inspection shall follow the requirements of Clause 7 of CSA Standard W59.2 and ASME Section V. Procedures for liquid penetrant, radiographic and ultrasonic inspections shall follow the requirements of Clause 7 of CSA Standard W59.2, and of this Specification.

5.6.10.2 Acceptance Criterion

The visual, liquid penetrant, radiographic and ultrasonic inspection acceptance criterion shall be in accordance with Clause 6 of CSA Standard W59.2, except as modified by this Specification and the following:

- For welds in material thicknesses less than 5 mm, no undercut is permitted.
- For welds in material thicknesses greater than or equal to 5 mm, undercut must not exceed 0.5 mm.
- Pores open to the surface are not permitted in any weld of the primary structure as well as any weld of the secondary structure exposed to weather elements and fluids of any type.

If visual inspection reveals melt-through or suck-back, the affected weld metal or material shall be dressed by mechanical methods, repair welded if required and examined by liquid penetrant inspection its entire length.

5.6.10.3 Radiographic Inspection

5.6.10.3.1 Source of Radiation

Radiographs shall be made by x-ray. The maximum permissible kilovoltages shall be as shown in Table 5.9

Table 5.9 Thickness vs. Maximum Kilovoltage

Thickness	Max Kilovolts
Up to 6 mm	80
6 mm to 13 mm	80 to 120
13 mm to 19 mm	120 to 130
19 mm to 25 mm	130 to 150
Greater than 25 mm	170 maximum

5.6.10.3.2 Radiographic Film

All radiographic film shall be class I only.

5.6.10.3.3 Display of Information and IQI Essential Holes

The exposed radiograph shall show the outline of the "Hole Type" Image Quality Indicator (IQI), shims, IQI identification number, essential hole, radiograph identification number, location markers, the date it was taken, reference to the contract number or vessel identification and the radiographer's initials.

For material thickness less than 5 mm the 2-1 (t) essential hole shall appear clearly on the radiograph. For material thickness 5 mm and over, the image of the 2-2 (t) essential hole shall appear clearly on the radiograph.

5.6.10.3.4 Intensification Screens

Intensification screens shall not be used. If adequate contrast cannot be achieved with a single film when examining unequal thicknesses, a dual exposure technique shall be used.

5.6.11 Double Loaded Film Requirement

All radiographic inspection shall be taken with a double loaded film technique so that two film negatives are obtained for each inspection. One film negative shall be sent to the Director, Marine Engineering and the other film negative shall remain at the work site in the possession of the onsite Delegated Representative. At contract completion, the film negatives stored at the work site shall be sent to the Director, Marine Engineering.

5.6.12 Radiographic Film Viewer

The Contractor shall have a professional radiographic film high intensity viewer capable of penetrating film densities of 1.5 to 4.5. The viewer shall be kept at the work site and available for use by the Contractor and Delegated Representatives for the entire duration of the contract and warranty period.

5.6.13 Inspection Reports

Inspection reports shall record the date of inspection, builder/Contractor's name, vessel type and hull number, Owner's name, inspection organizations name, inspection procedure number, interpretation report number, item, location, all discontinuities including single and accumulated indications, weld acceptance criteria, location of discontinuities and the name, qualification, level and signature of the individuals performing the inspection and interpretation. Inspection reports shall reference material type, thickness, joint type and geometry.

When a portion of a weld is to be inspected by liquid penetrant, magnetic particle, radiographic or ultrasonic methods, the location shall be subjected to visual inspection in advance of the other inspection method. Interpretation reports are required for both inspection methods.

5.6.13.1 Visual Inspection

For block assembly new construction methods, a visual inspection verification report is required for each fabricated block and joining of blocks to each other.

For frame and plate new construction methods or work packages other than new construction, a verification report is required for each fabricated compartment (e.g. between two adjacent bulkheads/engine room compartment).

The verification report shall be a statement signed off by the Contractor's qualified inspector which states all welds have been inspected and they conform to requirements of this Specification. Verification reports shall be presented to the Delegated Representative prior to the Owner's scheduled audit date.

5.6.13.2 Radiographic Inspection

In addition to the requirements of Sections 5.6.13 and 5.6.13.1, radiographic interpretation reports shall reference IQI design and identification number, source of radiation, source to film distance, angle of incident radiation, film type and intensification screen design (if permitted) and, material type, thickness, joint type and geometry.

Each interpretation report shall contain a report number. The report number shall include the Contractor's hull number (i.e. #1-218, etc.) and/or ship's name. Each location listed on the report shall be identified with an Inspection number (i.e., location #50 port is Inspection #3).

For radiographs, each film and its duplicate shall be submitted in a paper protective folder. The identification to appear on each folder shall be Inspection #, Report # and Hull # as illustrated below.

<u>Inspection #</u>		<u>Report #</u>		<u>Hull #</u>
3	-	1	-	218

Each repaired location shall reference the original report of the rejected location, for example:

Location #50	-	Port R1	-	See 3-1-218
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5.6.13.3 Inspection Arrangement Drawings

The Contractor shall prepare an adequate number of non-destructive inspection arrangement drawings and sketches that accurately document the location of the inspections.

The inspection method, weld identification number and abbreviations for each inspection shall be accurately recorded on a progressive basis (e.g. UT #75-R1, RT # 150 - adjacent - aft, etc). A legend detailing the identification symbols used by the Contractor shall appear on each arrangement drawing.

The Contractor shall supply updated arrangement drawings to the Delegated Representative on a regular basis throughout the contract period. Three copies of the final drawings shall be supplied to the Delegated Representative at contract completion.

5.6.14 Overlapping Inspection

When a discontinuity extends to either or both ends of a location being inspected, additional overlapping inspection shall be required. The overlapping inspection shall show a portion of the original end.

When an overlapping inspection displays unacceptable discontinuities at either or both ends, the entire weld length shall be considered unacceptable unless proven otherwise by the Contractor. Under this condition, welds shall be repaired to the extent required by the Delegated Representative.

All overlapping inspections shall be taken prior to repair of the originally rejected location. If repair has occurred prior to overlapping inspections and the entire weld length has not been repaired, the overlapping inspections shall be placed to overlap the start and finish of the repair.

The Contractor shall be responsible for all costs associated with performing overlapping inspections.

5.6.15 Rejected Weld or Part

When a portion of a weld contains discontinuities not meeting the acceptance criteria of this Specification, corrective action may be taken providing the Delegated Representative has reviewed the extent of unacceptable discontinuities and is in agreement with the repair procedure.

The repaired area shall be inspected by at least the same non-destructive inspection method used for the original inspection. Care shall be taken to ensure that the inspection of the repaired area is accurately located so that it measures the original location that was rejected.

For each failed location, one new location shall be examined. All new locations shall be selected by the Delegated Representative. Each new location shall be considered in addition to the requirements of this Section. All costs associated with performing the additional inspections shall be at the Contractor's expense.

When an entire weld, base material, entire part or entire section contains unacceptable discontinuities as specified herein, no corrective action shall be taken until the repair procedure has been approved by the Delegated Representative and other interested parties.

Section 6 WELDING STRUCTURAL STAINLESS STEEL

6.1 SCOPE

The requirements of this Section shall apply to welding and inspection of all structural stainless steels.

6.2 DESIGN AND DRAWINGS

Weld design shall be to the Rules of a Classification Society that is an approved Recognized Organization by Transport Canada Marine Safety and Security.

Unless to the otherwise approved by the Delegated Representative, the following conditions shall be met:

- all groove welds in butt joints shall be full penetration; and,
- all corner joints shall be full penetration groove welds combined with a single continuous fillet weld.

A weld design schedule shall be submitted to the Delegated Representative in drawing form for review prior to commencing any welding work.

6.3 CERTIFICATION

Contractors undertaking the welding of stainless steel within the scope of this Specification shall be certified by the CWB to the requirements of CSA Standard W47.1 Division 1 or 2.

Welders, welding operators and welding procedures shall meet the requirements of CSA Standard W47.1, and of AWS D1.6 as permitted by CSA Standard W47.1.

6.4 WELDING ELECTRODES AND CONSUMABLES

Welding electrodes and consumables shall be selected following the requirements of AWS D1.6.

Welding electrodes and consumables for welding of stainless steel shall be certified by the CWB to the requirements of CSA Standard W48 or the applicable AWS A5 series of standards.

6.5 WORKMANSHIP

Welding shall meet the requirements of CSA Standard W47.1 and AWS D1.6, and of this Specification.

6.6 INSPECTION

All examination and inspection of structural stainless steel shall comply with the requirements of AWS D1.6

6.6.1 Personnel

All inspection personnel shall meet the requirements of Chapter 5.0, Section 5.6.8 of this Specification.

6.6.2 Inspections

All welds shall be visually examined along 100% of their length for correct size, profile and the presence of visible defects. Unacceptable conditions or defects shall be repaired to the satisfaction of the Delegated Representative.

Full penetration welds shall be selectively sampled. Radiographic inspection shall be used for full penetration groove welds in butt joints. Ultrasonic inspection shall be used for full penetration groove welds in tee and corner joints.

Fillet welds shall be selectively sampled by liquid penetrant and/or magnetic particle inspection.

All of the requirements of Section 5.5 of this Specification shall be met unless otherwise specified in this Chapter.

6.6.3 Acceptance Criterion

The visual inspection acceptance criterion shall be in accordance with Clauses 5.11 and 6.29.1 of AWS D1.6.

The liquid penetrant inspection acceptance criterion shall be in accordance with Clauses 6.7.6 and 6.29.4 of AWS D1.6.

The magnetic particle inspection acceptance criterion shall be in accordance with Clauses 6.7.7 and 6.29.2 of AWS D1.6.

The radiographic inspection acceptance criterion shall be in accordance with Clauses 6.9, 6.10 and 6.29.2 of AWS D1.6.

The ultrasonic inspection acceptance criterion shall be in accordance with Clause 6, Part "C" and Clause 6.29.3 of AWS D1.6.

Section 7 OTHER STRUCTURAL MATERIALS

7.1 SCOPE

The requirements of this Section shall apply to welding and inspection of all structural materials other than those included in the scope of CSA Standards W47.1, W59, W47.2 and W59.2 and AWS D1.6.

7.2 DESIGN AND DRAWINGS

Weld design shall be to the Rules of a Classification Society that is an approved Recognized Organization by Transport Canada Marine Safety and Security.

Unless otherwise approved by the Delegated Representative, the following conditions shall be met:

- all groove welds in butt joints shall be full penetration; and,
- all corner joints shall be full penetration groove welds combined with a single continuous fillet weld.

A weld design schedule shall be submitted to the Delegated Representative in drawing form for review prior to commencing any welding work.

7.3 CERTIFICATION

Welders, welding operators and welding procedures shall meet the requirements of ASME Section IX or other suitable standard(s) approved for use by the Designated Representative and the CWB.

All tests shall be fully witnessed and documented by the CWB.

7.4 WELDING ELECTRODES AND CONSUMABLES

Welding electrodes and consumables shall be selected following the requirements of ASME Section IX or other suitable standard(s) approved for use by the Designated Representative and the CWB.

Welding electrodes and consumables shall conform to the requirements of ASME Section IX and the applicable AWS A5 series of standards or other suitable standard(s) approved for use by the Designated Representative and the CWB.

7.5 WORKMANSHIP

Welding shall meet the requirements of CSA Standard W59, and of this Specification.

7.6 INSPECTION

7.6.1 Personnel

All inspection personnel shall meet the requirements of Chapter 5.0, Section 5.6.8 of this Specification.

7.6.2 Inspections

All welds shall be visually examined along 100% of their length for correct size, profile and the presence of visible defects. Unacceptable conditions or defects shall be repaired to the satisfaction of the Delegated Representative.

Full penetration welds shall be selectively sampled. Radiographic inspection shall be used for full penetration groove welds in butt joints. Ultrasonic inspection shall be used for full penetration groove welds in tee and corner joints.

Fillet welds shall be selectively sampled by liquid penetrant and/or magnetic particle inspection.

All of the requirements of Section 5.5 of this Specification shall be met unless otherwise specified in this Chapter.

7.6.3 Acceptance Criterion

The visual and liquid penetrant inspection acceptance criterion shall be in accordance with Clause 12.5.4.1 of CSA Standard W59.

The magnetic particle inspection acceptance criterion shall be in accordance with Clause 12.5.4.1 or 12.5.4.3 of CSA Standard W59.

The radiographic inspection acceptance criterion shall be in accordance with Clause 12.5.4.3 of CSA Standard W59.

The ultrasonic inspection acceptance criterion shall be in accordance with Clause 12.5.4.4 of CSA Standard W59.

Section 8 PRESSURE PIPE WELDING

8.1 SCOPE

The requirements of this Chapter shall apply to welding and inspection of all pressure piping in the absence of Classification Society oversight.

8.2 DESIGN AND DRAWINGS

Weld design for pressure piping shall be in accordance with ASME Code B31.1 - Power Piping. A weld design schedule for pressure piping shall be submitted to the Delegated Representative in drawing form for review prior to commencing any welding work.

8.3 WELDING ELECTRODES AND CONSUMABLES

All welding electrodes and consumables shall comply with ASME IX and ASME B31.1. Electrodes and consumables not covered by ASME Section IX may be used provided a weld procedure qualification test is successfully completed prior to performing any work. Tests shall reflect the requirements of ASME Section IX.

8.4 PERSONNEL QUALIFICATIONS

Qualification of welders and welding operators shall comply with the requirements of ASME Section IX and ASME B31.1. Testing and approval shall be administered by the local Provincial Pressure Vessel Authority. Personnel qualification records shall be forwarded to the Delegated Representative prior to welding.

8.5 QUALIFICATION OF WELD PROCEDURES

Welding procedures shall be qualified in accordance with ASME Section IX and ASME B31.1. Testing and approval shall be administered by the local Provincial Pressure Vessel Authority. Weld procedure qualification records shall be forwarded to the Delegated Representative prior to welding.

8.6 WORKMANSHIP

All workmanship shall be in accordance with the requirements of ASME B31.1.

8.7 INSPECTION

All examination and inspection of pressure piping, pressure vessels and pressure containment systems shall comply with the requirements of ASME B31.1.

8.7.1 Personnel

All inspection personnel shall meet the requirements of Chapter 5.0, Section 5.6.8 of this Specification.

8.7.2 Inspections

All welds in pressure piping and pressure containment systems shall be visually examined along 100% of their length for correct size, profile and the presence of visible defects. Unacceptable conditions or defects shall be repaired to the satisfaction of the Delegated Representative.

Full penetration groove welds shall be sampled by spot radiography at a frequency of one in every five welds produced by each welder. Welders shall be assigned a unique identification number that shall be stamped on each full penetration connection welded. If a radiograph reveals gross defects, one additional joint shall be inspected by radiography. If the new radiograph reveals gross defects, the remaining three welds shall be radiographed

Repair of defects shall be performed following procedures accepted by the Delegated Representative. Second repair attempts shall not be permitted without due consideration of the conditions and agreed to by the Delegated Representative.

8.7.3 Acceptance Criterion

For all inspection methods, welds shall be evaluated in accordance with the acceptance standards of ASME B31.1.

Annex A REFERENCED CODES, PUBLICATIONS AND STANDARDS

A.1 LIST OF CODES, PUBLICATIONS AND STANDARDS

ASME	B31.1	Power Piping
	Section V	Boiler and Pressure Vessel Code, Non-destructive Examination
	Section IX	Boiler and Pressure Vessel Code, Welding and Brazing Qualifications
AWS	A5 Series	Specifications for Filler Metals and Consumables
	A5.10	Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods
	D1.6	Structural Welding Code – Stainless Steel
CAN/CGSB	48.9712	Qualification and Certification of Non-Destructive Testing Personnel
CAN/ISO	14341:XX	Welding consumables – Wire electrodes and deposits for gas shielded metal arc welding of non-alloy and fine grain steels - Classification
CSA	G40.21	Structural Quality Steel
	W47.1	Certification of Companies for Fusion Welding of Steel
	W47.2	Certification of Companies for Fusion Welding of Aluminum
	W48	Filler Metals and Allied Materials for Metal Arc Welding
	W59	Welded Steel Construction (Metal Arc Welding)
	W59.2	Welded Aluminum Construction
	W178.2	Certification of Welding Inspectors

Annex B TESTS FOR RATING CORROSION RESISTANCE OF CARBON STEEL WELD METALS IN SEA WATER

B.1 SCOPE

When required by Section 5.4.1.9 and 5.4.1.10 of this Specification, weld metals shall be tested for corrosion resistance in sea water following the procedures detailed herein. This Annex specifies the requirements for welding and testing plate assemblages. Organizations performing machining, mechanical testing of welds and corrosion tests shall be approved by the Delegated Representative in advance of any tests. Welding of test assemblies shall be fully witnessed and documented by the CWB.

B.2 TEST ASSEMBLY

Test assemblies shall be made in accordance with the requirements of Figure B1 herein.

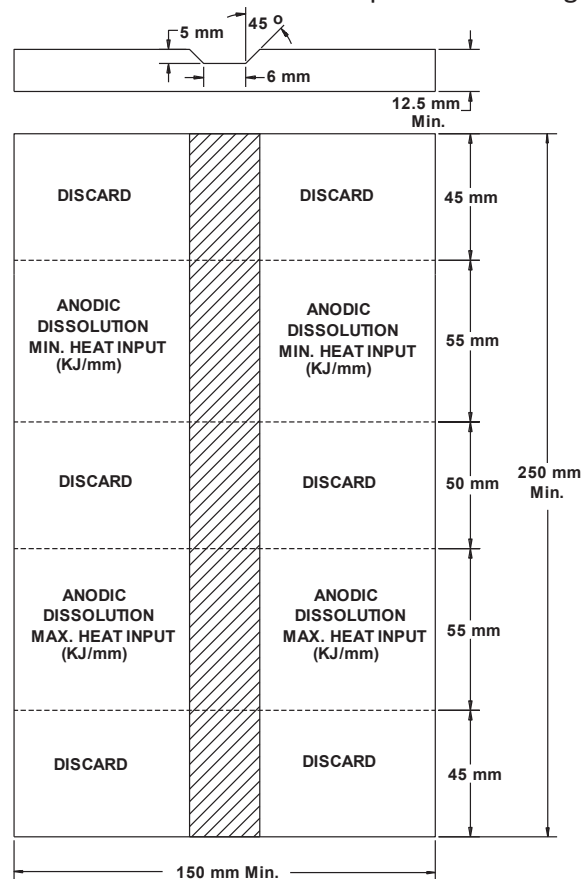


Figure B1 Anodic Dissolution Test Plate Assembly

Welds shall be deposited following a stringer temper bead sequence at the lowest and highest heat input (kj/mm) planned for production as illustrated in Fig. B2 herein. The centre 50 mm discard portion of the test assembly shall be used as a transition between low and high heat input welds (stop/starts).

For automatic welding using the submerged arc welding process, two test assemblies may be used; one for high heat input and the other for low heat input welds. Bead and layer sequences shall be adjusted to offer split layer finish to the weld.

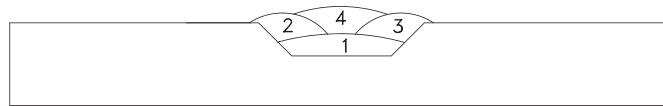


Figure B2 Bead Sequence

B.3 ANODIC DISSOLUTION TESTING

Specimens removed from the test assemblages detailed in Section B2.0 of this Annex shall be prepared by machining as illustrated in Figure B3 herein.

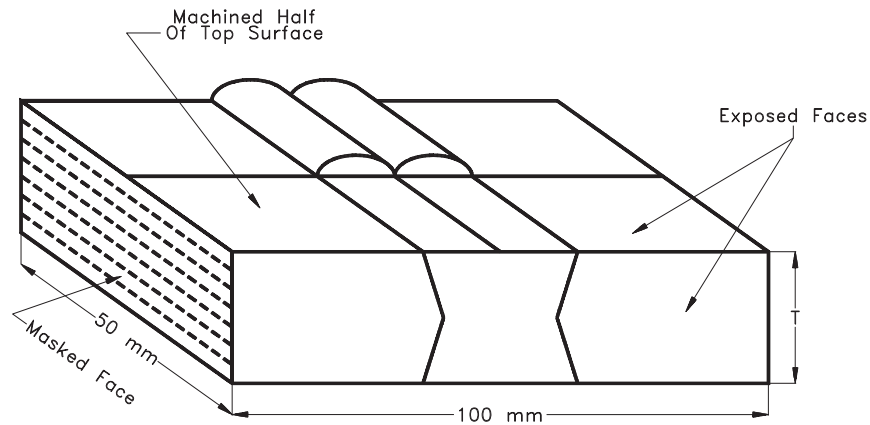


Figure B3 Anodic Dissolution Test Specimen

Each of the specimens shall be corroded at room temperature at a nominal current density of 0.88 mA/cm² for a period of 15 days. The test solution shall be 3.5% NaCl. Intermixing of the anolyte and catholyte shall be prevented by placing a membrane over the opening to the cathode compartment. The test system shall be as illustrated in Figure B4 herein.

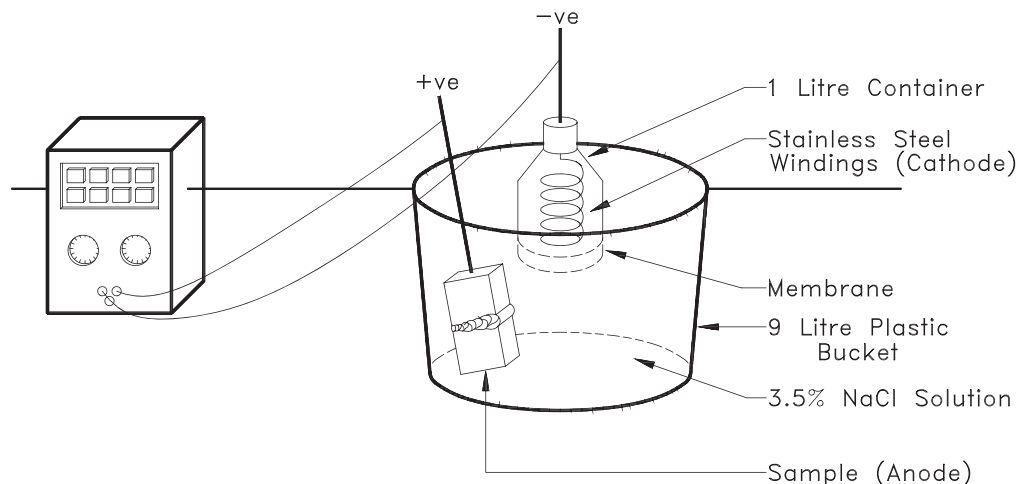


Figure B4 Anodic Dissolution Test System

Anolyte and catholyte pH shall be monitored daily to ensure the membrane is not leaking. Anolyte pH should be in the range of 6 to 8.5 units and anode potentials should be in the range of -600 to -560 mV vs. SCE which are potentials typical of unprotected steel in sea water. When the potential is > -600 mV vs. SCE, daily stirring shall occur to avoid pH stratification of the anolyte.

B.4 REPORTING TEST RESULTS

Mechanical test results, base plate and weld metal chemistries shall be recorded on weld procedure qualification record forms.

Corrosion test results shall be accurately documented and supported by colour photographs and black and white macro examination photo records at 5X magnification.

Corrosion loss shall be quantified by taking a series of profile measurements across the weld zone using a profilometer system having resolution in the "Z" direction of ± 0.0125 mm. The depth of attack shall be well documented for each area of interest in the weld zone; unaffected base plate, heat affected zone and weld metal.

Three copies of the test result reports shall be provided to the Delegated Representative for review and approval of the optimum corrosion resistant weld metal.

Annex C FORMING & THERMAL REQUIREMENTS - ALUMINUM

C.1 HOT FORMING

All hot forming procedures shall be approved by the Delegated Representative in advance of hot forming operations.

The majority of aluminum sections can be formed cold. For severe forming, heat may be used. Maximum holding times for the forming of aluminum alloys at various temperatures are given in Table C1.

Hot forming of 5000 series aluminum alloys is generally conducted at temperatures between 260°C and 425°C. Appropriate temperature control methods are to be used in all hot forming and stress relieving operations. In hot forming or stress relieving, exposure of the 5000 Series alloys to the 65°C to 200°C temperature range is to be minimized by the use of appropriate cooling techniques.

Table C1 Maximum Heat Exposure Time at Temperature Preparatory to Forming Aluminum Alloys

Holding Temperature (Note 1) 0°C	6061-T4, T5 6061-T5, 6063-T5, 356.0-T4, (Note 2)	5454 (Note 3)	5083, 5086, 5154, 5254, 5456
430	NR(4)	50 Hours	50 Hours
260	NR(4)	50 Hours	50 Hours
230	5 Minutes	50 Hours	50 Hours
220	15 Minutes	50 Hours	50 Hours
205	30 Minutes	50 Hours	50 Hours
190	1-2 Hours	50 Hours	NR(4)
175	8-10 Hours	50 Hours	NR(4)
120-165	50 Hours	50 Hours	NR(4)

NOTES:

- Equal formability may be obtained with shorter periods of heating at correspondingly higher temperatures. Time at temperature for clad alloys should be kept at a minimum to prevent diffusion of the cladding into the core alloy. Heating should be as rapid as possible, particularly for temperatures 205°C and above. Excessive time to approach the desired temperatures can have deleterious effects similar to those resulting from excess time at temperature.*
- Losses in strength for these alloys in the T6 temper will not exceed about 5% when heated at the temperature and for the periods shown. Strength of the T4 temper alloys will increase.*
- These alloys will be annealed at 345°C and above.*
- NR = Not Recommended*

C.2 COLD FORMING

Cold forming of 5000 series aluminum alloys is to be conducted at temperatures below 50°C, except for the 5454 alloy, where the maximum temperature may be 150°C. When the extent of cold forming is such that base plate properties are changed beyond acceptable limits, appropriate re-heat or stress relief treatments are to be used to re-establish acceptable properties.