Quality Control in Shipbuilding Process

By

Tanawat Sirisatien

Head of Quality Assurance / Control

Bangkok Dock 1957 Company Limited

Introduce

Lloyd's Register International (Thailand) Ltd.
Position: Senior Marine Surveyor
Service: 8 Years

Italthai Marine Limited
Position: Quality Control Manager
Service: 6 Years

Powerline Engineering PCL.
Position: Mechanical Engineer
Service: 4 Years

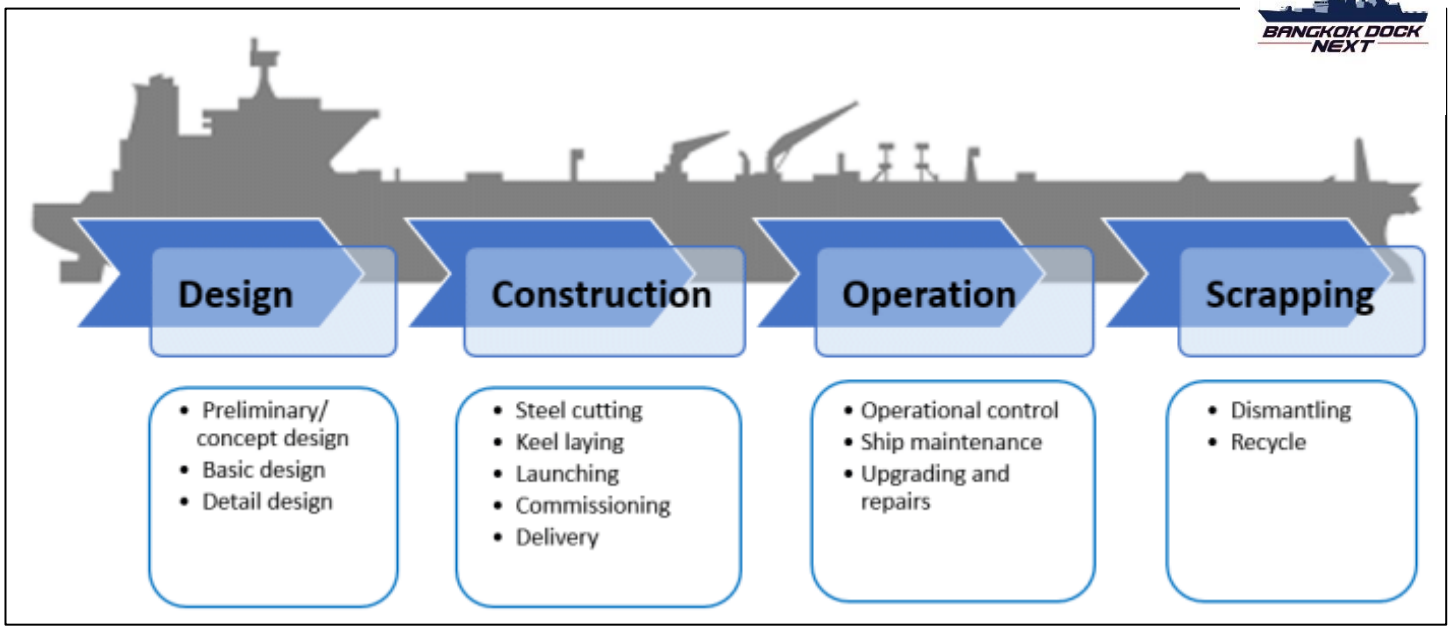
Graduation

King Mongkut's University of Technology North Bangkok, KMUTNB
Master degree: Welding Engineering
Khon Kaen University, KKU
Bachelor degree: Mechanical Engineering
Professional Engineer: สามัญวิศวกรเครื่องกล สก.3941

Agenda

1. Introduction quality control in Ship building and Ship repair
2. Quality control between Shipyard and Classification Society
   - Plan approval process
   - Material and equipment according to Class requirement
   - Type of certificate for material and equipment
   - Quality control
3. Quality control for Hull
4. Quality control for Machinery and Electrical
5. Quality control for Statutory
6. Ship entry to Class and Ship certificates
7. Ship in service and Classification Society

Introduction quality control in Shipbuilding and Ship repair



Ship Construction

- Plan control
- Material control
- Construction control
- NDE control
- Test and trial control
- Document control

Ship Repair

- Docking control
- Material control
- Method control
- NDE control
- Test and trial control
- Test report

Classification Society / IACS Member

Lloyd's Register

DNV·GL

BUREAU VERITAS

ABS

ClassNK

RINA

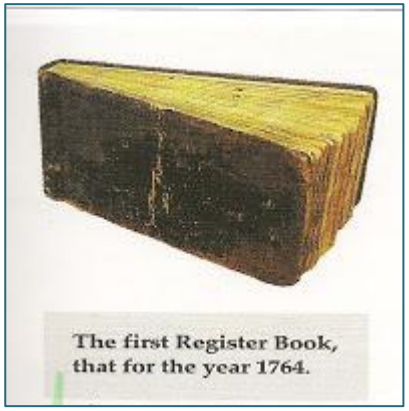
IRCLASS
Indian Register of Shipping

Classification Society History

Coffee House: Edward Lloyd, 1760

Classification Society Time Line

- The register society was formed in 1760 BC.
- First society is Lloyd's Register of Shipping (LR)
- The condition of the hull was classified A, E, I, O or U
- Equipment was G, M, or B
- G, M and B were replaced by 1, 2 and 3
- 'A1', meaning 'first or highest class
- 100 assigned to all ships considered suitable for sea-going service.
- **Hull Notation: +100A1, Oil Tanker, ESP, IWS, LI**
- **Machinery Notation: +LMC or [+]LMC or MCH**

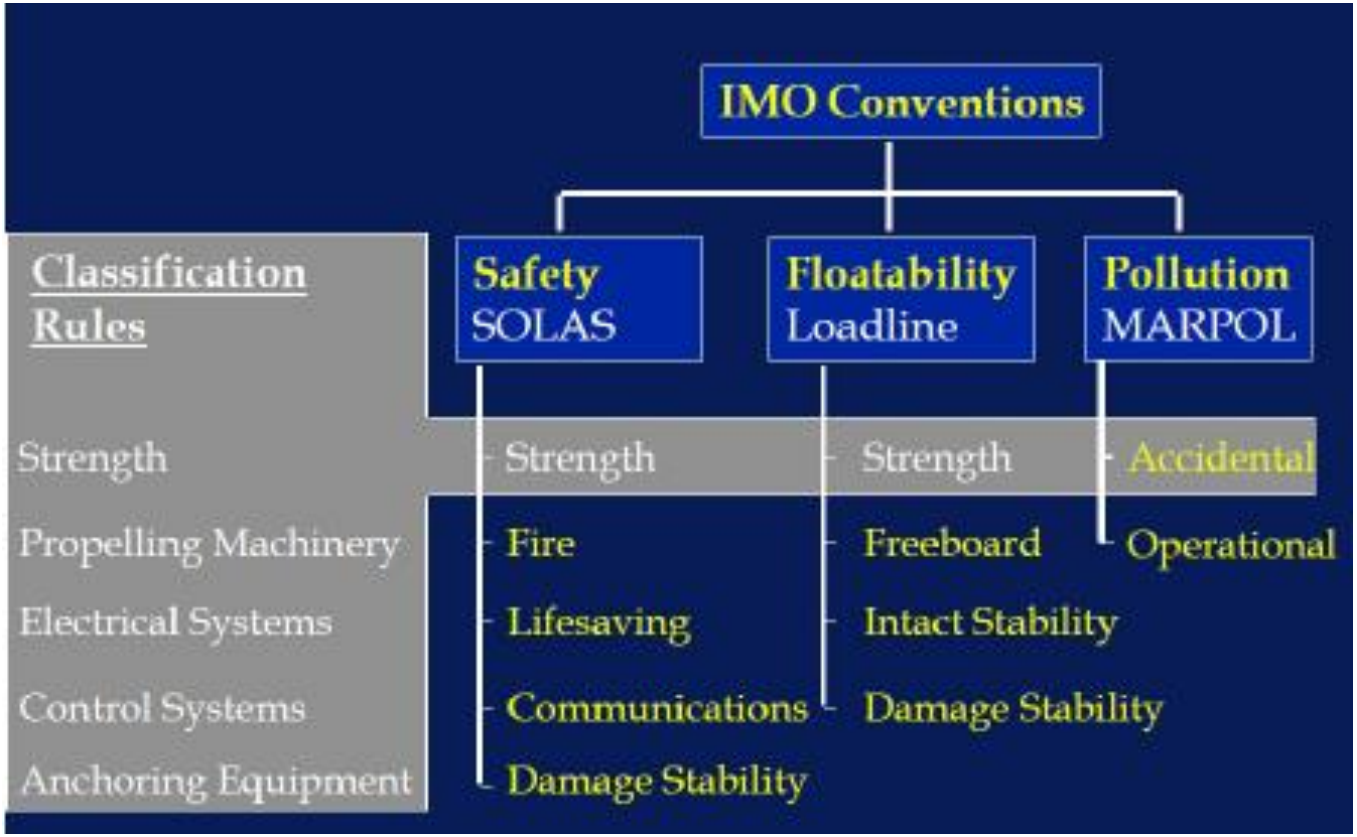

The first Register Book, that for the year 1764.

No.	Ships.	Masters.	Tons.	DIMENSIONS. Length.	Breadth.	Depth.	BUILD. Where.	When.	Owners.	Port belonging to.	Port of Survey and Destined Voyage.	Classification. No. Years first assigned.	Character for Hull&Stores
701 ✠	Colonial Empire S r.&YM.64	Ross pt I.B.	1305	198·5	38·4	22·5 w.r.&s.61	Quebec *Baldwin*	1861 5mo.	Th'mpsn&	Aberd'n	Lon.Austral	7	A 1
2	Colonist Bk pt I.B.	Doherty	437	131·5	29·7	16·9	N.Brns *Andrau*	1863 8mo.	Smith&Co	St.John	Cly.N.Amer	4	A 1 6,64
3	— Bk pt r.&s.59 YM.59 overpt I.B.	E.Ellis	594	132·0	26·0	19·0 w.r.&s.59	N.Brns	1852	Wilson&C.	Liverp'l	Cff.S. Amer.	4 C. 2	6,60
4	— Bk r.&YM.64 overpt I.B.	T.Gibson	579	152·0	31·4	17·0 w.r.&s.64 Srprs64	Bathrst *Smiths*	1857	Whitwill	Bristol S.S.64-5	Brs. yrs Cont.64-	7 2	A 1 11,64
5	— Sr r.&YM.61 overpt I.B.	M.M'Fie	105	76·6	20·1	10·5	Dmbtn *Rankin*	1861 10mo.	Denny&C.	Dumbtn	Cly. Coaster	7	A 1 10,61
✠6	Colorado Bk	W.Baikie	499	140·7	28·6	18·8	Sndrld	1863	J.Hay	London	Sld. Amer.	10	A 1

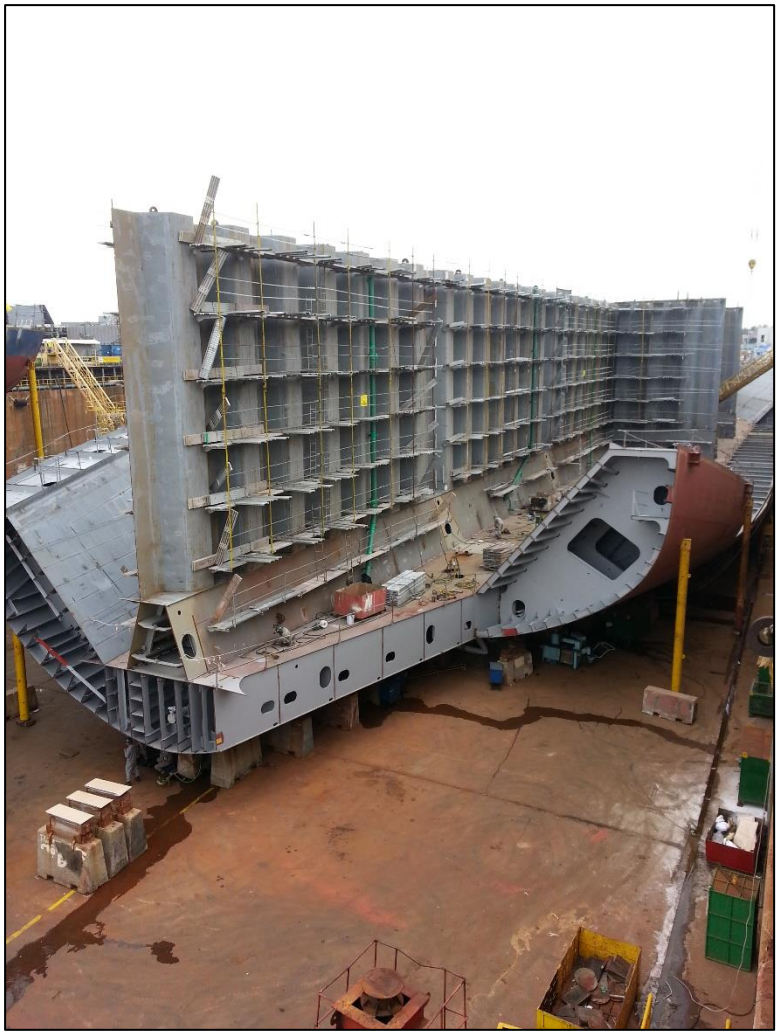
Classification Society Hull Notation

Society	Symbol
ABS	✠ A1
BV	I
CCS	★ CSA
CRS	★ 100A1
DNV GL	✠ 1A
IRS	卐 SUL
KR	✠ KRS1
LR	✠ 100A1
NK	NS ✳
PRS	✳ KM
RINA	100-A-1.1 or C
RS	KM✪

Classification and Statutory



Quality control between Shipyard and Classification Society



Plan Approval Process

Initial

Description of Vessel
- Hull number
- Dimension
- Principal characteristics

Performance
- Speed
- Deadweight
- FO consumption

Regulator requirements
- Classification and Statutory

Location
- Flag for registration of the vessel

List of documents
- Detailed specification
- Plans

All of above were stated in the construction contract

Assessment

Plans appraisal according to
- Contract
- Notation
- Statutory / Flag requirement
- Class rule and regulation requirement
- Hull
- Machinery and Electrical
- Statutory (Fire & Safety, Loadline, Solas, MARPOL, Etc.

Delivery

- Issue documents (DAD)
- State plan status: AQS, AQP
- AQP to be closed prior project completed

Plan Approval Process

What plan require for appraisal?

Hull

- Midship sections showing longitudinal and transverse material.
- Profile and decks.
- Shell expansion.
- Oil tight and watertight bulkheads.
- Propeller brackets.
- Double bottom construction.
- Pillars and girders.
- Aft end construction.
- Engine room construction.
- Engine and thrust seatings.
- Fore end construction.
- Hatch coamings
- Hatch cover construction.
- Welding.
- Bilge keels showing material grades, welded connections and detail design

And other according to Class requirement. (LR/Ship rule/Pt.3/Sec.5/Item 5.2)

Material and equipment according to Class requirement

Material approval process, normally depend on Society requirements.

For LR Manufacture have two schemes.

1. The Materials Survey Scheme
2. The Materials Quality Scheme

The Materials Survey Scheme

- Materials according to Ch. 3 to Ch. 10 of LR Material rules
- Chapter 3 Rolled Steel Plates, Strip, Sections and Bars
- Chapter 4 Steel Castings
- Chapter 5 Steel Forgings
- Chapter 6 Steel Pipes and Tubes
- Chapter 7 Iron Castings
- Chapter 8 Aluminium Alloys
- Chapter 9 Copper Alloys
- Chapter 10 Equipment for Mooring and Anchoring

BANGKOK DOCK NEXT

Material and equipment according to Class requirement

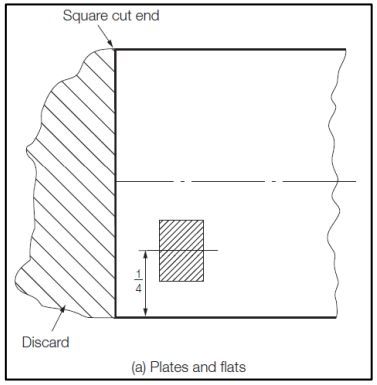
System certify of the Material Survey Scheme

1. Approved manufacturers are to request a survey

2. All mechanical tests required by these Rules are to be witnessed

3. The specified tests and examinations are to be carried out prior to the despatch of finished materials

4. Issue certificate under Manufacture certificatre



Material and equipment according to Class requirement

The Materials Quality Survey Scheme

System certify of Materials Quality Scheme

1. Manufacture approved similar of Material Survey Scheme
2. The manufacturer has a quality management system, which has been certified as meeting the requirements of ISO 9001
3. The manufacturer's name will appear on the List of Approved Manufacturers published by LR
4. Material Quality Scheme Certificate will be issued, which must be signed by an authorised representative of the manufacturer.

Material and equipment according to Class requirement

Type of LR Material Certificate

Material and equipment according to Class requirement

LR Certificate

This type of certificate is issued by LR based on the results of testing and inspection being satisfactorily.

Certificate no: BGK 1770008/01
Page 1 of 1

Certificate for A.C. Switchboard

Office
Bangkok
Client
The Bangkok Dock Company (1957) Limited.
174/1 Charoenkrung Road Yannawa
Bangkok
Manufacturer
Siemens Limited Thailand
Intended for
Main Switchboard No.1
First date of inspection
25 May 2017
Date
14 June 2017
Client order number
N/A
Order status
Complete
Type of ship
OFFSHORE PATROL VESSEL
Final date of inspection
26 May 2017

This certificate is issued to the above Client to certify that the switchboard particulars of which are given below has been inspected at the manufacturer's works. The construction, workmanship and materials are good, and the switchboard complies with the relevant requirements of the Rules and Regulations. On completion, the switchboard remains to be installed and tested to the attending Lloyd's Register Surveyor's satisfaction.

Particulars

Type
☒ Main Switchboard MSB ☐ Emergency Switchboard ☐ Distribution Switchboard ☐
System of supply and distribution
Choose system of supply and distribution.
Voltage: 380VAC
Frequency: 50Hz
Estimated symmetrical short-circuit capacity: 19.97 kA
Number of connected generators or supply circuits and their capacity: 2 Diesel Generator (486kW/Gen.) 1 Shore (700A)
Make and type of associated circuit breakers / fuses: ACB
Make and type of outgoing circuit breakers: MCCB
Make and type of outgoing fuses: N/A
Drawings: OPV2-552-MSB1
Letter of approval: SATS/ETS/0016597

Results of tests

Working test at: Thai Engineering & Service Co.,Ltd. workshop
Tests carried out on protective devices: YES
High voltage test volts ac for 1 minute: 19.6 (micro-amp)
Insulation resistance (megaohms): 313.8 (mega-ohms)
Test equipment calibration verified: ☒
Remarks / outstandings: None

Identification marks

Identification number (including office contraction code): BGK 1770008/01
Surveyor's initials: TWS

Bangkok Office Lloyd's Register Asia
Tanawat Sirisatien
Surveyor to Lloyd's Register Asia

a member of the Lloyd's Register group.

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Form 2495 (2014.05)

BANGKOK DOCK NEXT

Material and equipment according to Class requirement

Manufacturer's certificate validated by LR

- Under Material Survey Scheme
- Product certificate must authorise by attending Surveyor

APPROVED LR

Certificate No : MD00/2578/0008/1

LPN PLATE MILL PUBLIC COMPANY LIMITED
199/9 Moo 4 Suksawad Road
Pakklong Bangplakod
Prasamutjedee
Samutprakarn 10290
Thailand

has been approved as a manufacturer in accordance with the requirements of Lloyd's Register for :-

Steel Plates

This approval is subject to compliance with the Rules for the Manufacture, Testing and Certification of Materials. The full details of the processes and grades to which this approval applies are given in the Appendix of this certificate.

Lloyd's Register is to be notified of any change that may affect the validity of this Certificate.

This Certificate is issued to the above manufacturer and is valid until the date given below.

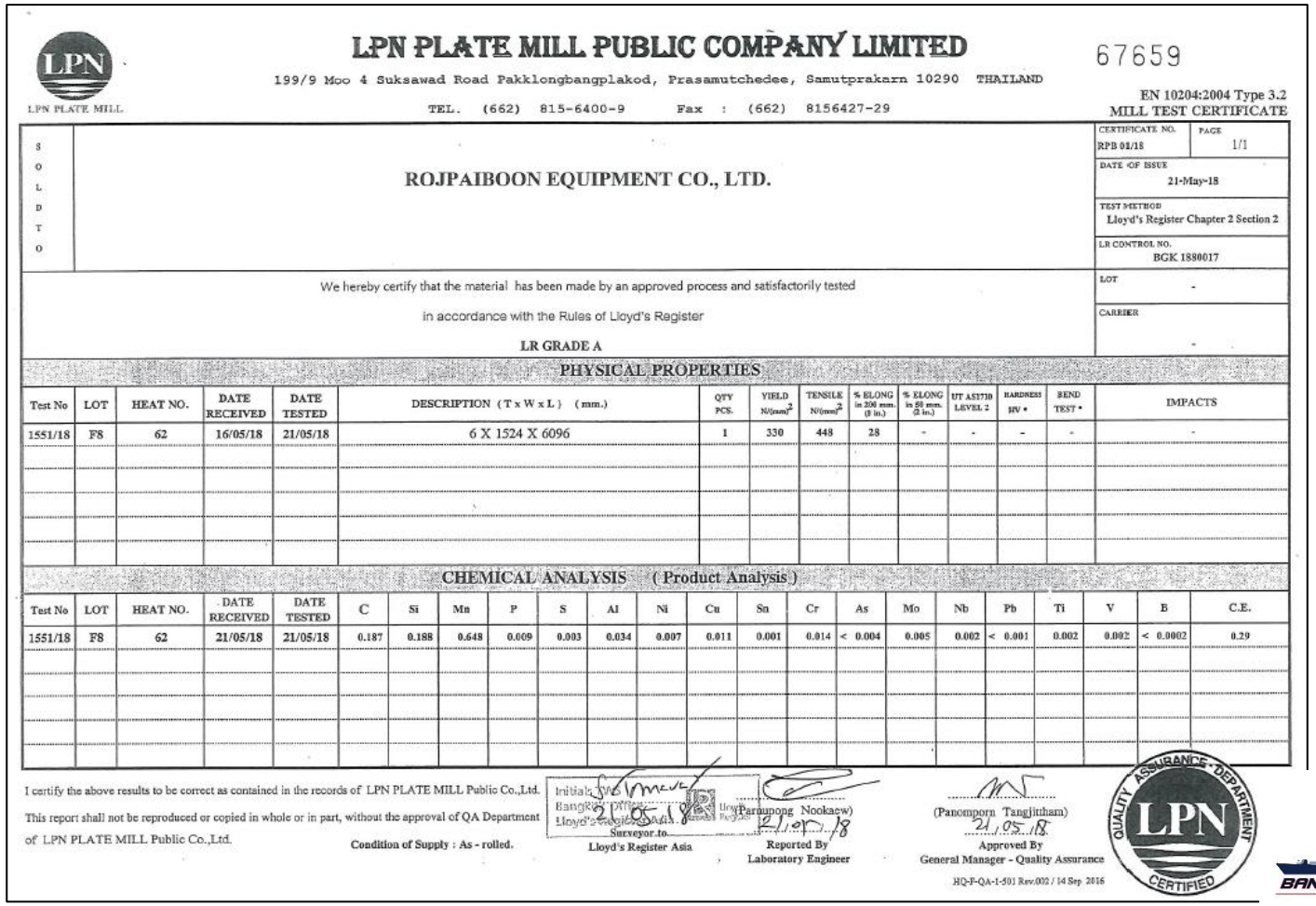
Valid Until : 31 August 2020
Date of Issue : 21 September 2017

Lili Hou
Senior Specialist to Lloyd's Register EMEA
A member of the Lloyd's Register group

BANGKOK DOCK NEXT

Material and equipment according to Class requirement

Manufacture certificate under material survey scheme



LPN PLATE MILL PUBLIC COMPANY LIMITED

67659

199/9 Moo 4 Suksawad Road Pakklongbangplakod, Prasamutchedee, Samutprakarn 10290 THAILAND

TEL. (662) 815-6400-9 Fax : (662) 8156427-29

LPN PLATE MILL

EN 10204:2004 Type 3.2
MILL TEST CERTIFICATE

SOLD TO: ROJPAIBOON EQUIPMENT CO., LTD.

CERTIFICATE NO. RPB 01/18 | PAGE 1/1
DATE OF ISSUE 21-May-18
TEST METHOD Lloyd's Register Chapter 2 Section 2
LR CONTROL NO. BGK 1880017
LOT -
CARRIER -

We hereby certify that the material has been made by an approved process and satisfactorily tested in accordance with the Rules of Lloyd's Register

LR GRADE A

PHYSICAL PROPERTIES

Test No	LOT	HEAT NO.	DATE RECEIVED	DATE TESTED	DESCRIPTION (T x W x L) (mm.)	QTY PCS.	YIELD N/(mm)^2	TENSILE N/(mm)^2	% ELONG in 200 mm. (5 in.)	% ELONG in 50 mm. (2 in.)	UT ASTM LEVEL 2	HARDNESS HV *	BEND TEST *	IMPACTS
1551/18	F8	62	16/05/18	21/05/18	6 X 1524 X 6096	1	330	448	28	-	-	-	-	-

CHEMICAL ANALYSIS (Product Analysis)

Test No	LOT	HEAT NO.	DATE RECEIVED	DATE TESTED	C	Si	Mn	P	S	Al	Ni	Cu	Sn	Cr	As	Mo	Nb	Pb	Ti	V	B	C.E.
1551/18	F8	62	21/05/18	21/05/18	0.187	0.188	0.648	0.009	0.003	0.034	0.007	0.011	0.001	0.014	< 0.004	0.005	0.002	< 0.001	0.002	0.002	< 0.0002	0.29

I certify the above results to be correct as contained in the records of LPN PLATE MILL Public Co.,Ltd.

This report shall not be reproduced or copied in whole or in part, without the approval of QA Department of LPN PLATE MILL Public Co.,Ltd.

Condition of Supply : As - rolled.

Initials Bangkok Office Lloyd's Register Asia Surveyor to Lloyd's Register Asia

(Parnupong Nookaew) 21/05/18 Reported By Laboratory Engineer

(Panomporn Tangjitham) 21/05/18 Approved By General Manager - Quality Assurance

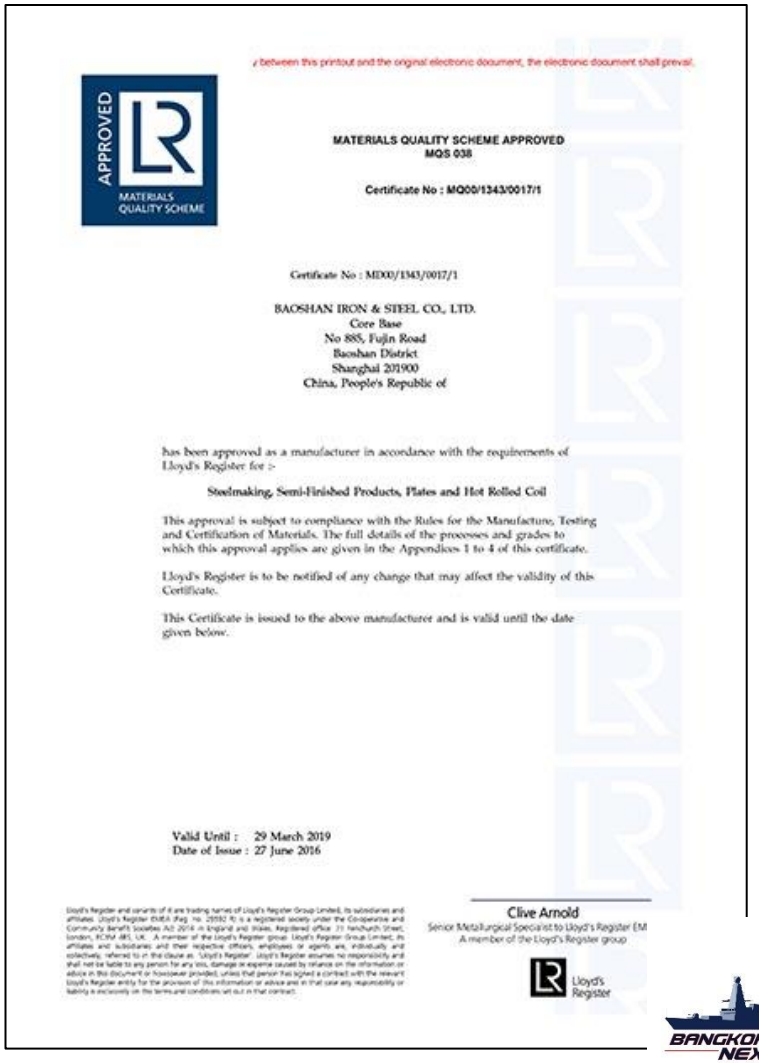
QUALITY ASSURANCE DEPARTMENT LPN CERTIFIED

HQ-F-QA-1-501 Rev.002 / 14 Sep 2016

BANGKOK DOCK NEXT

Material and equipment according to Class requirement

Manufacturer's certificate issued under the Materials Quality Scheme



between this printout and the original electronic document, the electronic document shall prevail.

APPROVED
MATERIALS QUALITY SCHEME

MATERIALS QUALITY SCHEME APPROVED
MQS 038

Certificate No : MQ00/1343/0017/1

Certificate No : MD00/1343/0017/1

BAOSHAN IRON & STEEL CO., LTD.
Core Base
No 885, Fujin Road
Baoshan District
Shanghai 201900
China, People's Republic of

has been approved as a manufacturer in accordance with the requirements of Lloyd's Register for :-

Steelmaking, Semi-Finished Products, Plates and Hot Rolled Coil

This approval is subject to compliance with the Rules for the Manufacture, Testing and Certification of Materials. The full details of the processes and grades to which this approval applies are given in the Appendices 1 to 4 of this certificate.

Lloyd's Register is to be notified of any change that may affect the validity of this Certificate.

This Certificate is issued to the above manufacturer and is valid until the date given below.

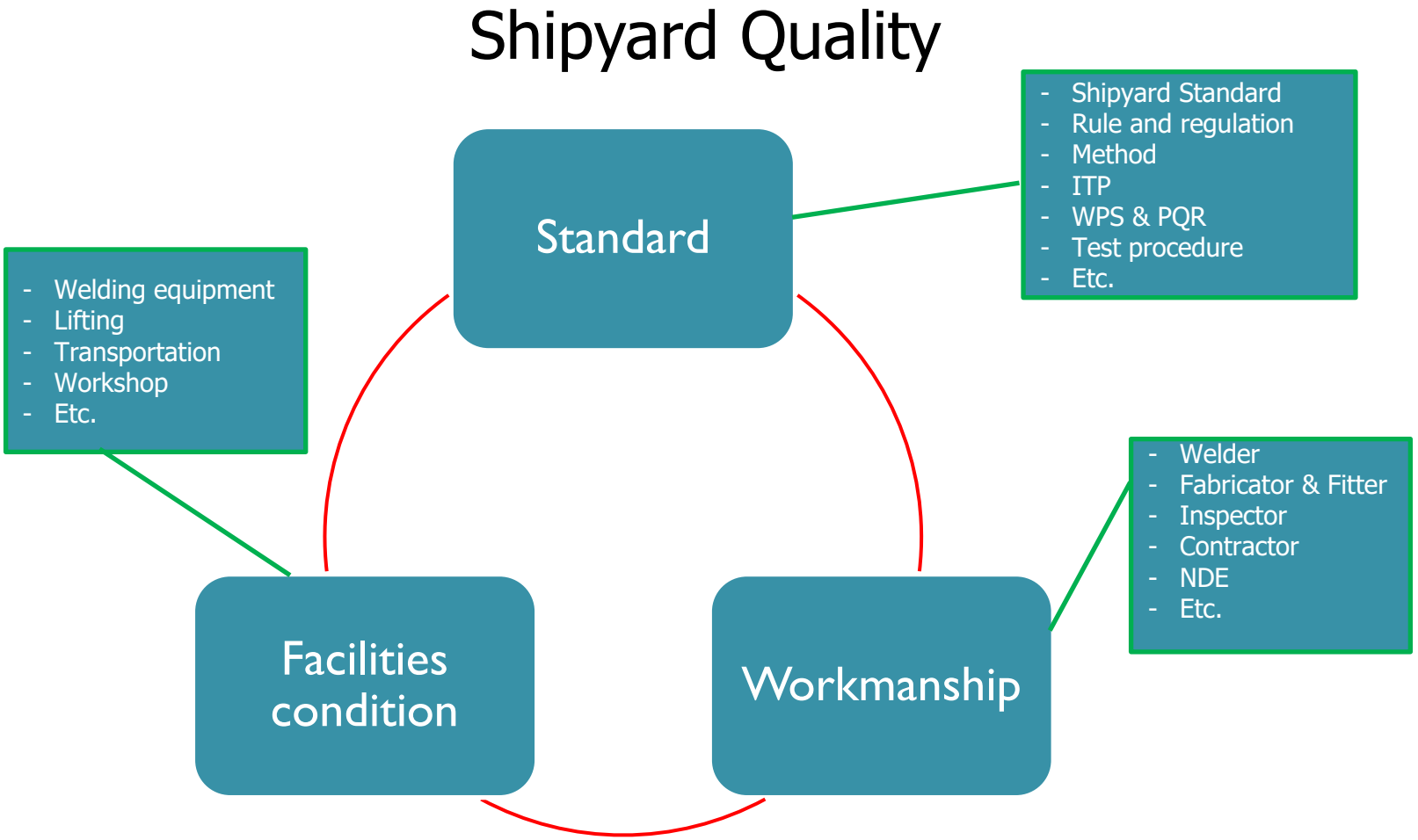
Valid Until : 29 March 2019
Date of Issue : 27 June 2016

Clive Arnold
Senior Metallurgical Specialist to Lloyd's Register EMEA
A member of the Lloyd's Register group

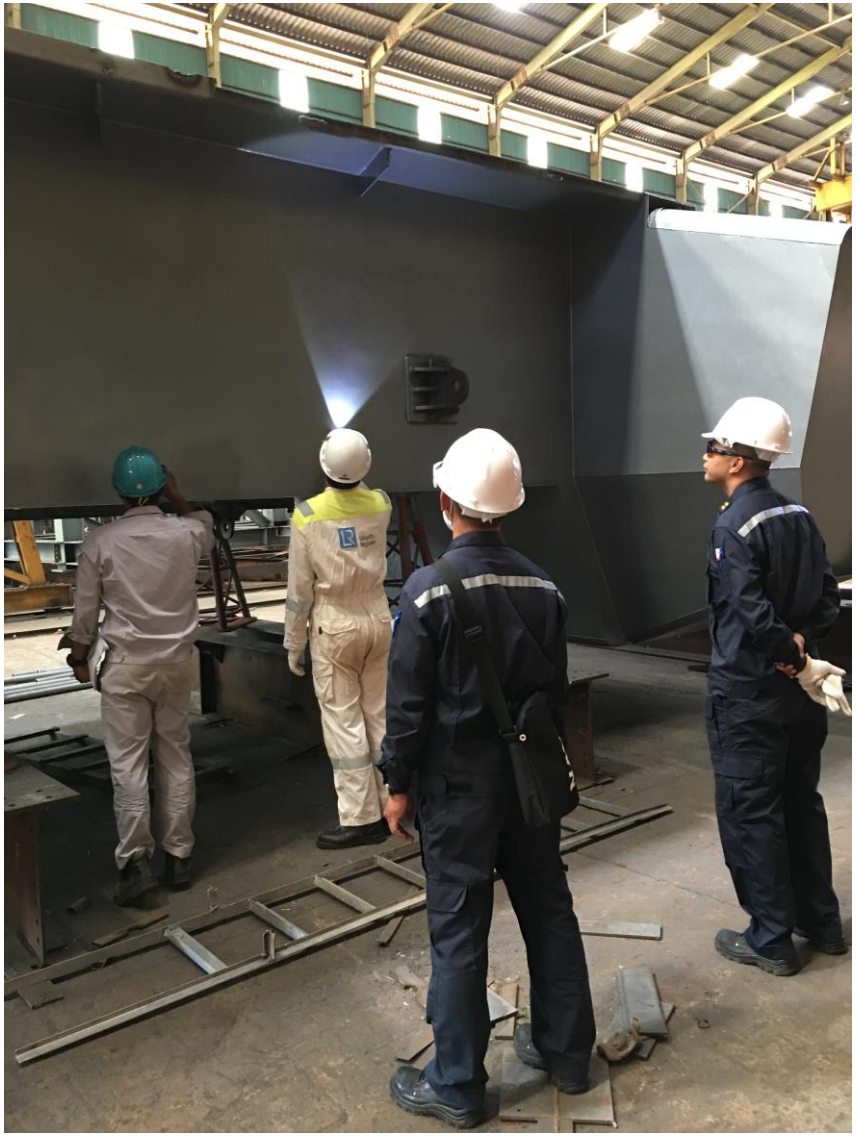
Lloyd's Register

BANGKOK DOCK NEXT

Quality Control During Construction Process (Shipyard Process)



Quality Control for Hull



Hull Survey

Before Construction

- Contract review
- Team member
- PSPM (Pre Site Project Manager) Note
- Survey budget

During Construction

- Material Survey
- Cutting, Assembly, Fabrication, Erection
- Plans and comment status control
- Structure and weld test: NDE, Tank test Etc.

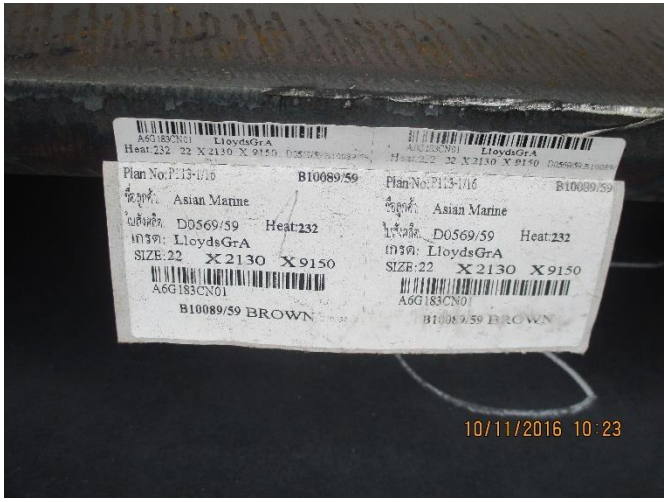
After Construction

- Certificates
- Budget summary
- All of hull report: NDE, Comment, DAD status etc.
- As built
- Service feedback

Material On Site Survey (Major)

Steel Plate

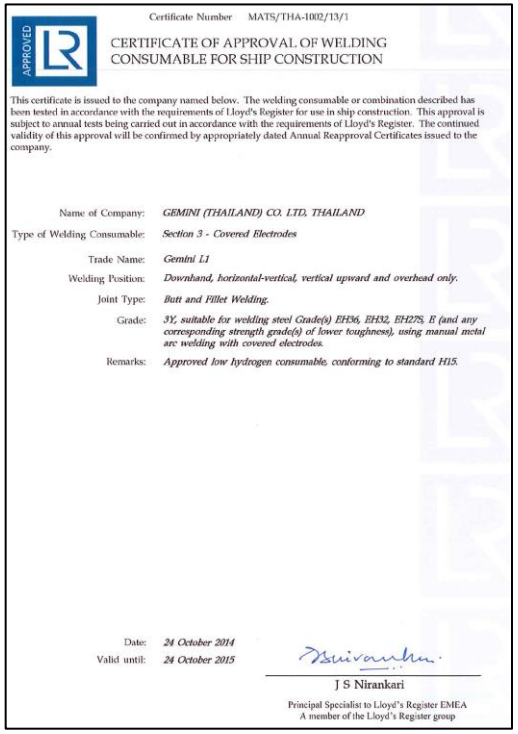
- Identify on plate compare with product certificates: Grade, heat no., size
- Stamp on plate
- General examination: damage, thickness, dimension, stock condition



Material On Site Survey (Major)

Welding Consumable

- IACS approved
- Appropriate grading
- Certificate



Certificate Number MATS/THA-1002/13/1

APPROVED

CERTIFICATE OF APPROVAL OF WELDING CONSUMABLE FOR SHIP CONSTRUCTION

This certificate is issued to the company named below. The welding consumable or combination described has been tested in accordance with the requirements of Lloyd's Register for use in ship construction. This approval is subject to annual tests being carried out in accordance with the requirements of Lloyd's Register. The continued validity of this approval will be confirmed by appropriately dated Annual Reapproval Certificates issued to the company.

Name of Company: *GEMINI (THAILAND) CO. LTD. THAILAND*

Type of Welding Consumable: *Section 3 - Covered Electrodes*

Trade Name: *Gemini L1*

Welding Position: *Downhand, horizontal-vertical, vertical upward and overhead only.*

Joint Type: *Butt and Fillet Welding.*

Grade: *3Y, suitable for welding steel Grade(s) EH36, EH32, EH275, E (and any corresponding strength grade(s) of lower toughness), using manual metal arc welding with covered electrodes.*

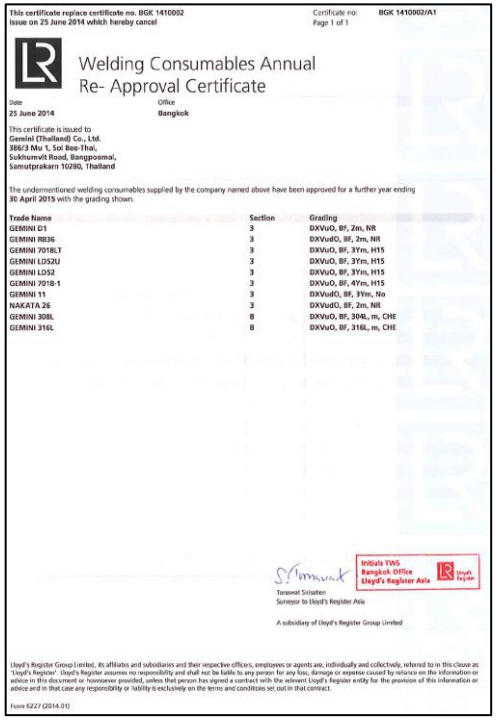
Remarks: *Approved low hydrogen consumable, conforming to standard H15.*

Date: *24 October 2014*

Valid until: *24 October 2015*

J S Nirankari

Principal Specialist to Lloyd's Register EMEA
A member of the Lloyd's Register group



This certificate replace certificate no. BGK 1410002 issue on 25 June 2014 which hereby cancel

Certificate no: BGK 1410002/A1

Page 1 of 1

Welding Consumables Annual Re- Approval Certificate

Date: 25 June 2014

Office: Bangkok

This certificate is issued to
Gemini (Thailand) Co., Ltd.
386/3 Mu 1, Soi Boo-Thai,
Sukhumvit Road, Bangpoomai,
Samutprakarn 10280, Thailand

The undermentioned welding consumables supplied by the company named above have been approved for a further year ending 30 April 2015 with the grading shown.

Trade Name	Section	Grading
GEMINI D1	3	DXVuO, BF, Zm, NR
GEMINI R836	3	DXVudO, BF, Zm, NR
GEMINI 7018LT	3	DXVuO, BF, 3Ym, H15
GEMINI LDS2U	3	DXVuO, BF, 3Ym, H15
GEMINI LDS2	3	DXVuO, BF, 3Ym, H15
GEMINI 7018-1	3	DXVuO, BF, 4Ym, H15
GEMINI 11	3	DXVudO, BF, 3Ym, No
NAKATA 26	3	DXVudO, BF, 2m, NR
GEMINI 308L	8	DXVuO, BF, 304L, m, CHE
GEMINI 316L	8	DXVuO, BF, 316L, m, CHE

Initials TWS
Bangkok Office
Lloyd's Register Asia

Tanawat Srisatien
Surveyor to Lloyd's Register Asia

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Form G227 (2014.01)

During Construction

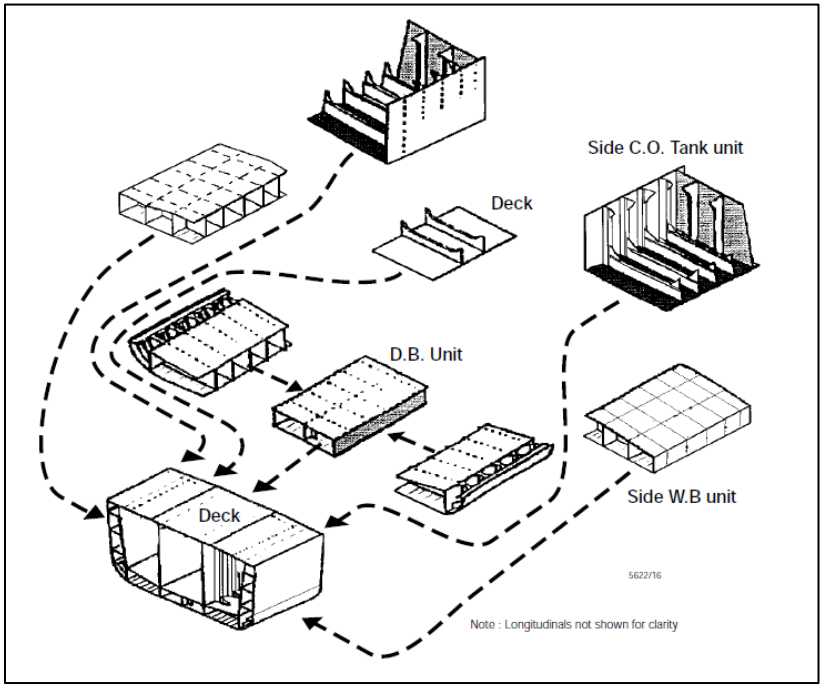
Support documents

1. Marine Design Appraisal Document, AQP & AQS
2. Plan updated
3. IACS No.47 (Shipbuilding and repair quality standard)
4. Shipyard standard
5. ITP (Inspection Test Plan)
6. Rule and regulation intend to survey

During Construction

Block Fit-Up and Assembly

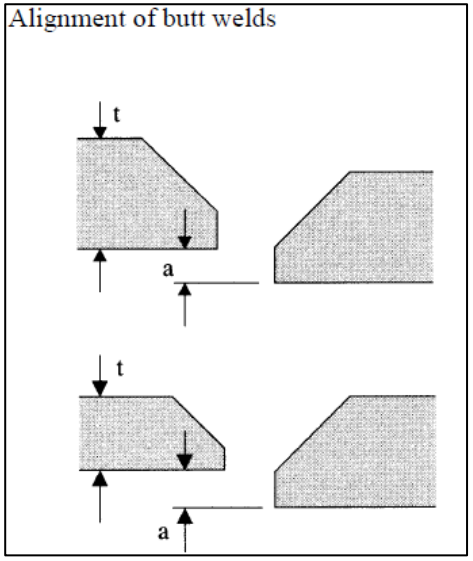
1. Edge preparation
2. Structure Alignment
3. Confirmation structure and member
4. Welding visual inspection before painting work
5. NDE (PT, RT, UT)
6. Forming
7. Dimension check

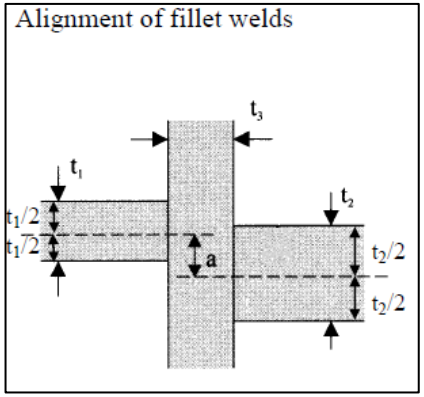


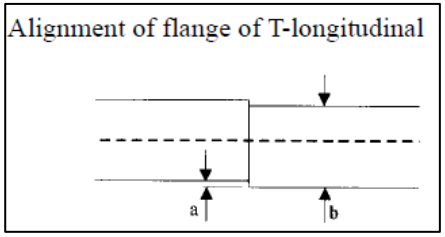
During Construction

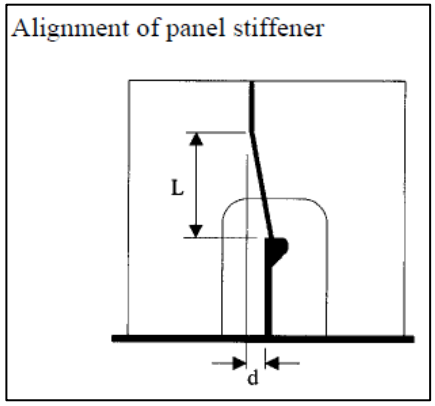
Hull Erection

1. Mismatch and Alignment of each structure member
2. Distortion and deformation
3. Welding and NDE
4. Finish work









During Construction

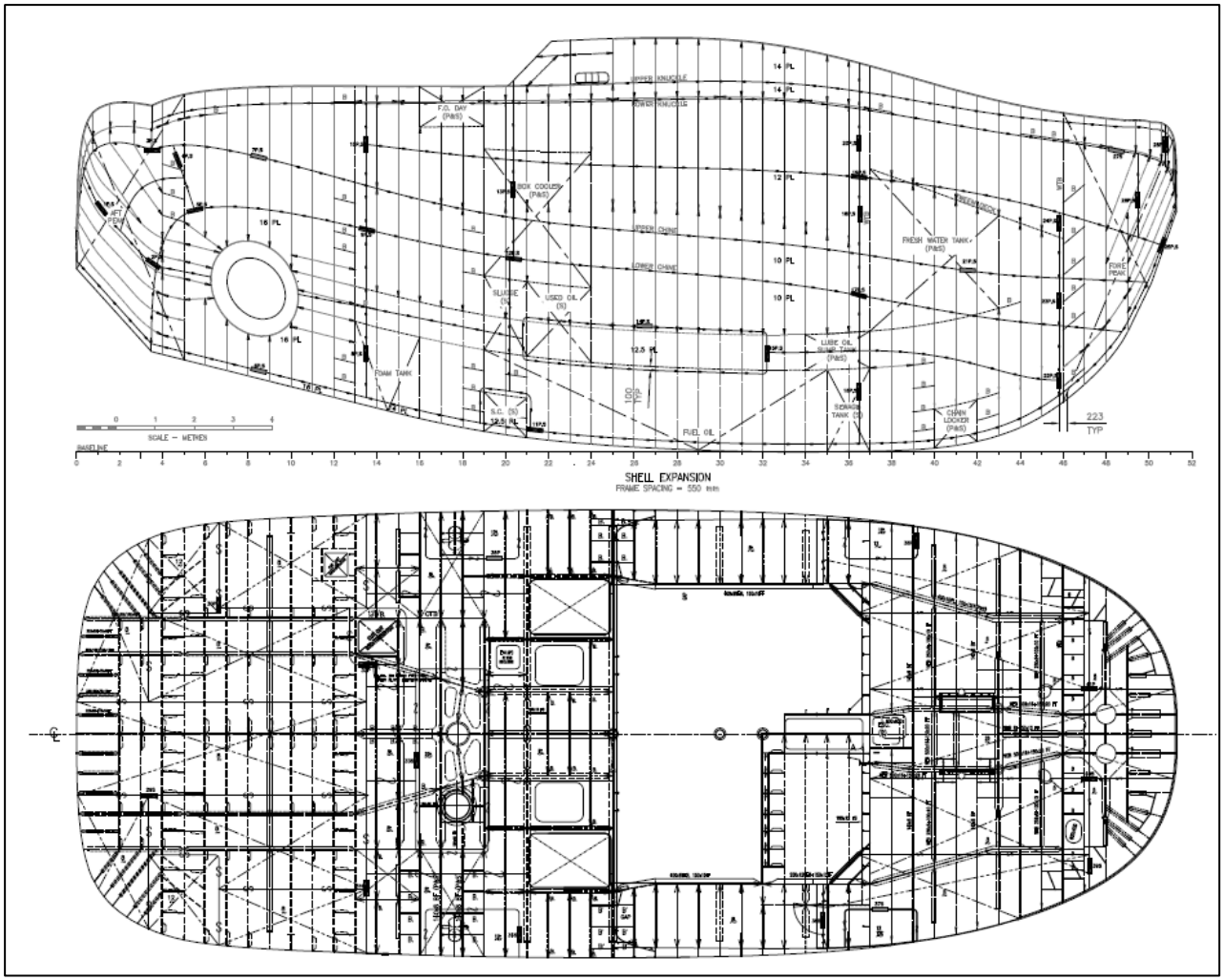
Welding and NDE

Essential things

- WPS and PQR
- WQT (Welder Qualification Test)
- NDE plan approved
- NDE procedure approved
- Appropriate NDE method
- NDE operator certificate (Level I, II and III)
- NDE report

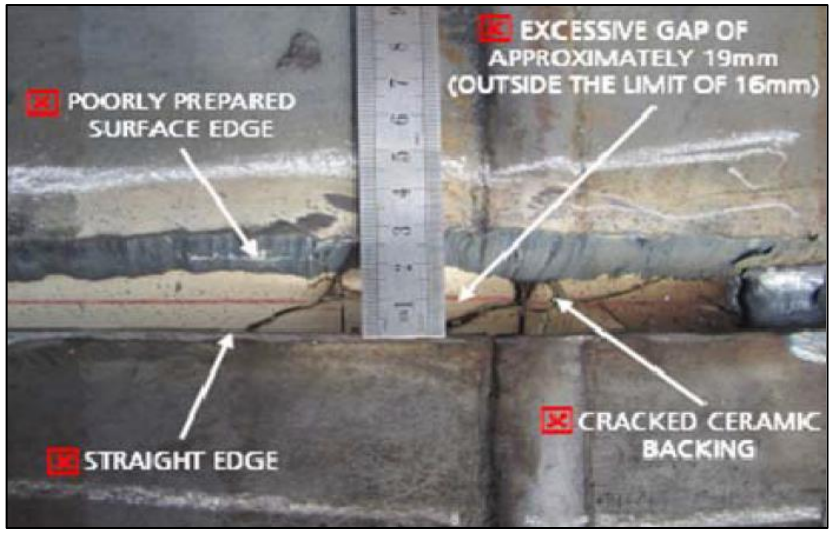
During Construction

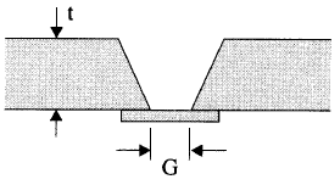
NDE Plan



During Construction

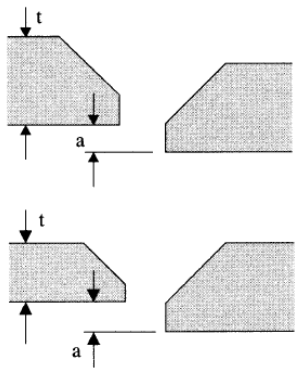
Hull survey failed-1



Detail	Standard	Limit
Single Vee butt, one side welding with backing strip (temporary or permanent) 	G = 3 to 9 mm	G = 16 mm

During Construction

Hull survey failed-2

Detail	Standard	Limit
Alignment of butt welds 		a ≤ 0.15t strength member a ≤ 0.2t other but maximum 4.0 mm

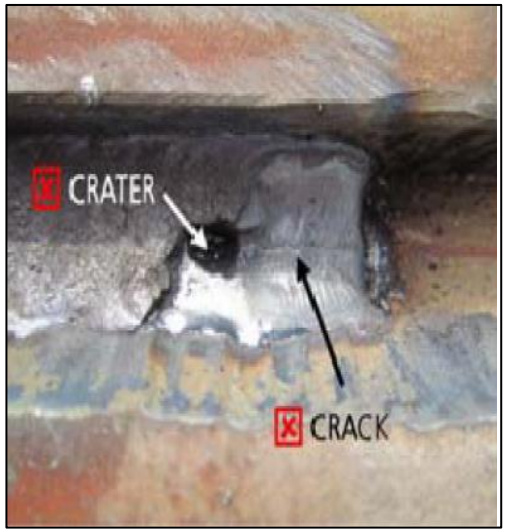
During Construction

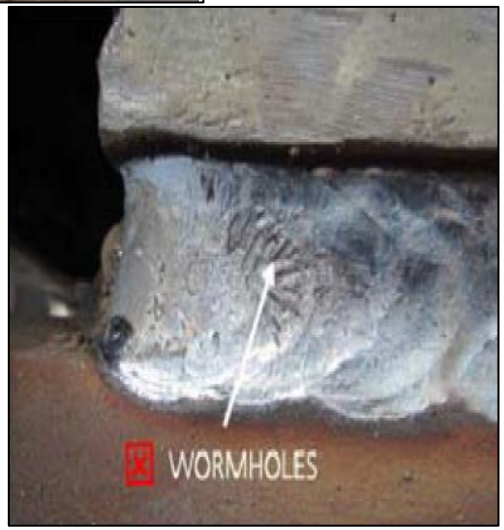
Joint preparation poor

Recommended minimum length of a tack weld bead for steel structures	
Plate thickness (mm)	**Min. bead length (mm)**
6 max	30
Over 6	40

During Construction

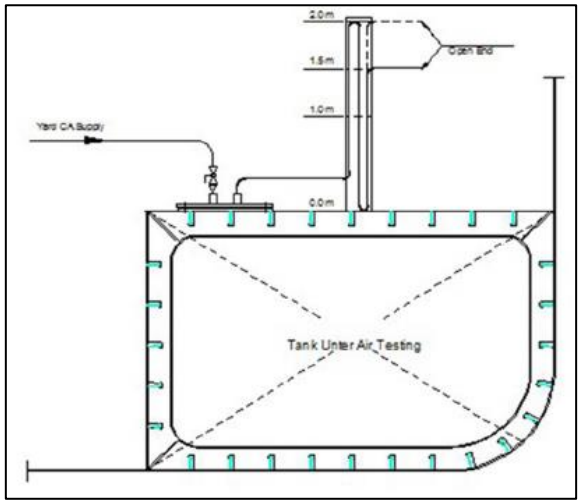
Welding defect



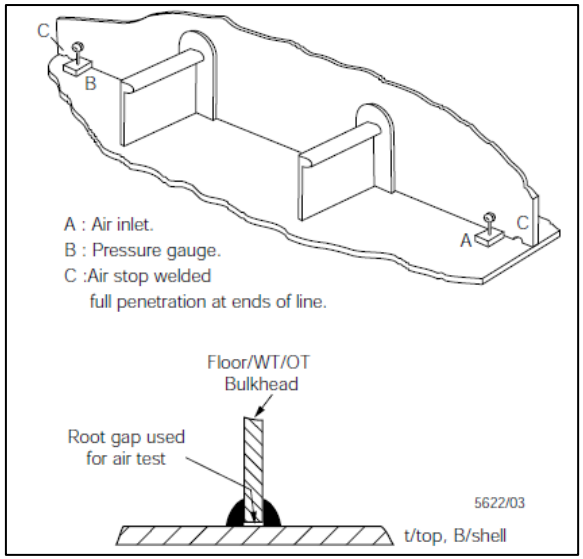


Structure Test

Tank leak test



Tank air test @ > 0.2 bar



Fillet weld air test

Quality control for Machinery and Electrical

Machinery under survey

- **Main propulsion engines** including their associated gearing, flexible couplings, scavenge blowers and superchargers.
- **Boilers** supplying steam for propulsion or for services essential for the safety or the operation of the ship at sea.
- **Auxiliary engines** which are the source of power for services essential for safety or for the operation of the ship at sea.
- **Steering machinery**.
- Athwartship **thrust units**, their prime movers and control mechanisms.
- **All pumps necessary for the operation** of main propulsion and essential machinery, e.g. boiler feed, cooling water circulating, condensate extraction, fuel oil and lubricating oil pumps.
- **All heat exchangers** necessary for the operation of main propulsion and essential machinery, e.g. air, water and lubricating oil coolers, fuel oil and feed water heaters, de-aerators and condensers, evaporators and distiller units.
- **Air compressors**, **air receivers** and other pressure vessels necessary for the operation of main propulsion and essential machinery.
- **All pumps essential for safety** of the ship, e.g. fire, bilge and ballast pumps.
- **Valves and other components** intended for installation in pressure piping systems having working pressures exceeding 7 bar.
- **Alarm and control equipment**
- **Electrical equipment and electrical propelling** machinery

BANGKOK DOCK NEXT

Quality control for Machinery and Electrical

Machinery Survey

BANGKOK DOCK NEXT

Quality control for Machinery and Electrical

Electrical under survey

"Electrical propelling machinery and associated equipment together with auxiliary services **essential** for the safety of the ship are to be installed in accordance with the relevant requirements of this rule, surveyed and have tests witnessed by the Surveyors"

air compressors for oil engines	electric starting systems for engines	thrusters
air pumps	feed water pumps	valves which are required to be remotely operated
automatic sprinkler systems	fire detection and alarm systems	ventilating fans for engine and boiler rooms
ballast pumps	lubricating oil pumps	watertight doors
bilge pumps	inert gas fans and scrubber	windlasses
cooling water pumps	lighting systems	power sources and supply systems for supplying
communication systems	oil separators	
electric propulsion equipment	steering gear	

BANGKOK DOCK NEXT

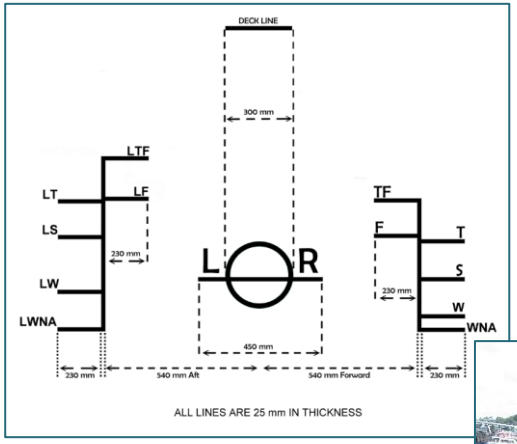
Quality control for Machinery and Electrical

Electrical Survey

Quality control for Statutory

Statutory Items

- Load Line: Ship length > 24 m.



Quality control for Statutory

- SOLAS: RMS Titanic Sink

BANGKOK DOCK NEXT

Quality control for Statutory

Chapter of SOLAS: Ship GT > 500 GT

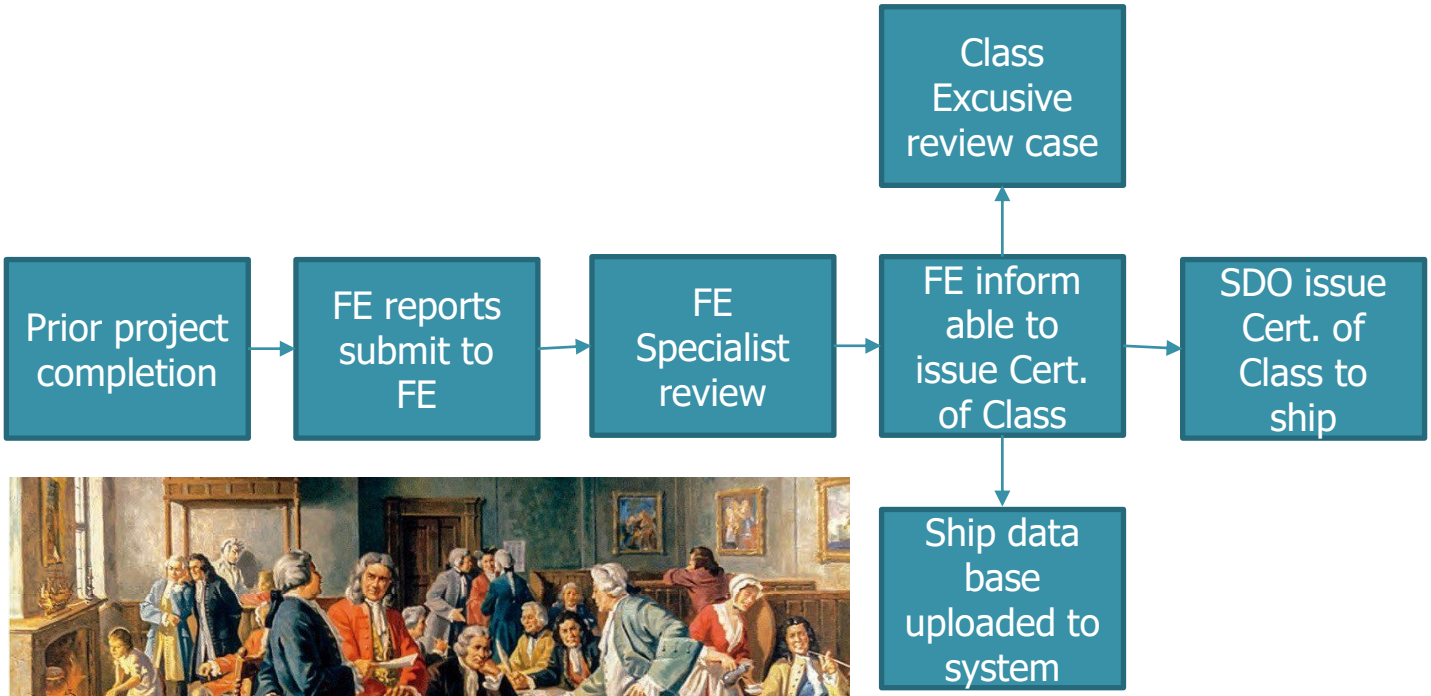
- Chapter I – General Provisions
- Chapter II-1 – Construction – Subdivision and stability, machinery and electrical installations
- Chapter II-2 – Fire protection, fire detection and fire extinction
- Chapter III – Life-saving appliances and arrangements
- Chapter IV – Radiocommunications
- Chapter V – Safety of navigation
- Chapter VI – Carriage of Cargoes
- Chapter VII – Carriage of dangerous goods
- Chapter VIII – Nuclear ships
- Chapter IX – Management for the Safe Operation of Ships
- Chapter X – Safety measures for high-speed craft
- Chapter XI-1 – Special measures to enhance maritime Safety
- Chapter XI-2 – Special measures to enhance maritime security (ISPS Code)
- Chapter XII – Additional safety measures for bulk carriers
- Chapter XIII - Verification of compliance
- Chapter XIV - Safety measures for ships operating in polar waters

Quality control for Statutory

- MARPOL
- Annex I: Prevention of pollution by oil & oily water
- Annex II: Control of pollution by noxious liquid substances in bulk
- Annex III: Prevention of pollution by harmful substances
- Annex IV: Pollution by sewage from ships
- Annex V: Pollution by garbage from ships
- Annex VI: Prevention of air pollution from ships

Ship Entry to Class

First Entry Process



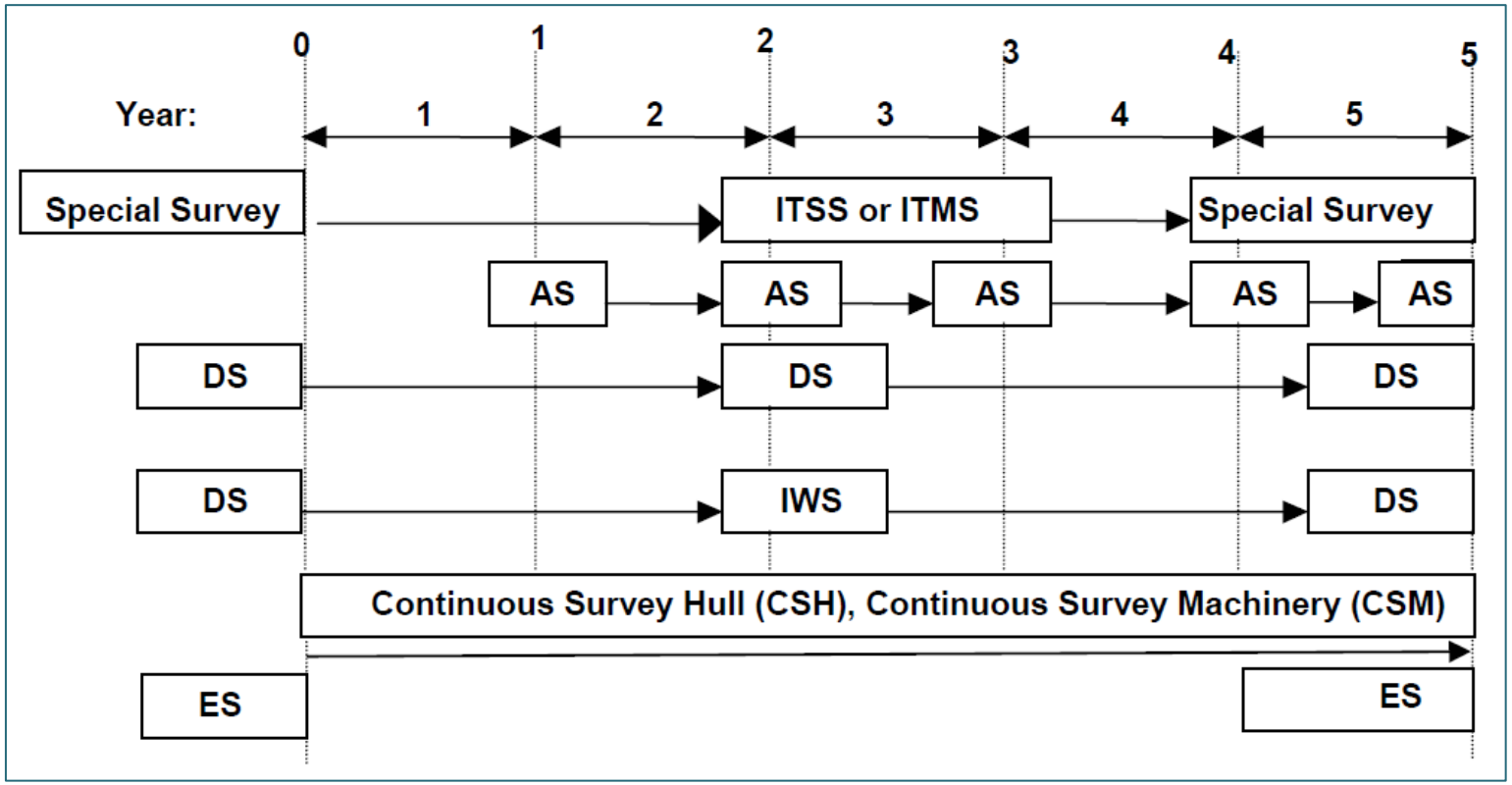
Ship Certificate

Type of Ship Certificate

Class Certificate	Statutory Certificate
1. Certificate of Class	1. Load Line Certificate
2. Lifting Appliance Certificate	2. SAFECON Certificate
3. Hull Completion Certificate	3. Safety Equipment Certificate
	4. Cargo Ship Safety Radio Cert.
	5. IAPP Certificate
	6. IOPP Certificate
	7. Other Flag Certificate
	8. Tonnage Certificate

Ship In Service

Periodical Cycle



Periodical Survey

- AS: Annual Survey
- DS: Docking Survey
- ES: Engine Survey
- ITMS: Intermediate Survey (ESP)
- ITSS: Intermediate Survey
- SS: Special Survey
- IWS: In Water Survey

(See details in attached sheet)

Survey for Existing Ship Preparation

Tool for survey

1. Ship window status (Survey System)
2. Memorandum and Condition of Class (COC)
3. Country file
4. Survey check list (AS, ITSS, DS, Statutory)
5. MTN (Marine Technical Notice)
6. E-mail communication
7. DCE and DCG instruction (if any)
8. Service supplier database (LSA, Radio, IWS, TM)

Docking Survey

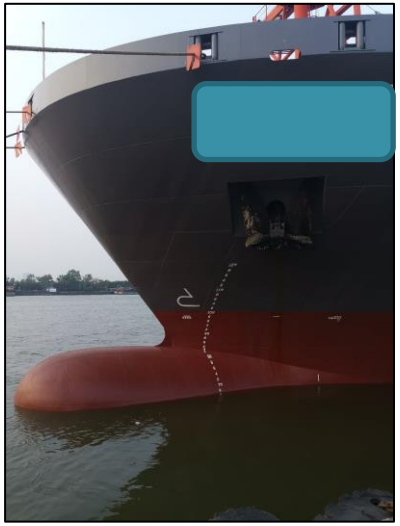
1. Anchors and chain cables
2. Forward area
3. Bottom and side shell
4. Tail shaft and propeller
5. Stern frame and rudder

Hull Damage Survey

Survey

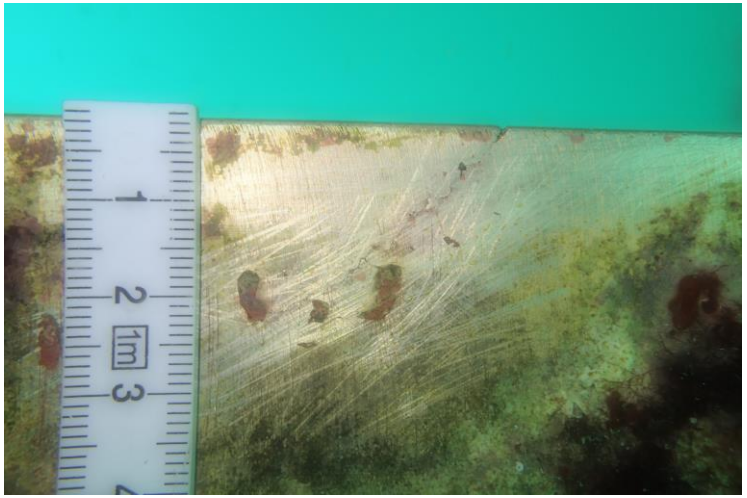
1. Damage verify at onboard
2. Master statement report
3. Surveyor consider: Repair or Not Repair
4. If not repair, COC 3 months to be imposed
5. If repair, Permanent or Temporary repair which one to be used
6. If temporary repair, watertight integrity need to be confirmed with imposed COC
7. If permanent repair, all material and welder certificate must approved by Class and NDE need to be carried out
8. Surveyor report to be issued to client

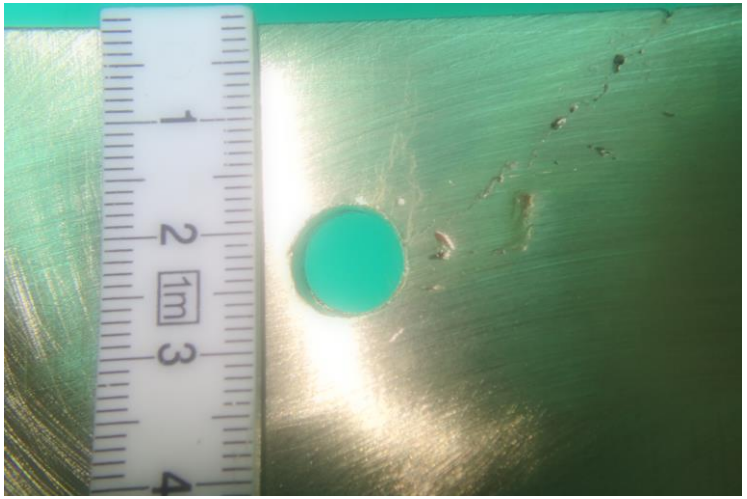
Hull Damage Case

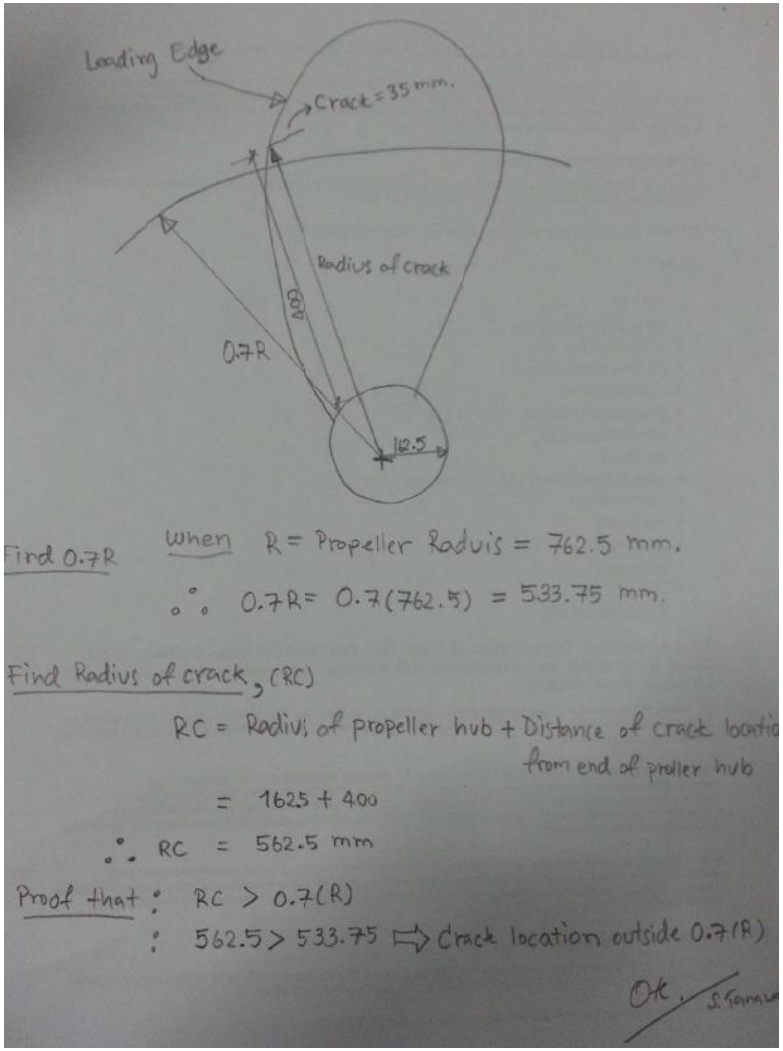


Machinery Damage

Propeller Crack Case







Find 0.7R When R = Propeller Raduis = 762.5 mm.

∴ 0.7R = 0.7(762.5) = 533.75 mm.

Find Radius of crack, (RC)

RC = Radius of propeller hub + Distance of crack location from end of propeller hub

= 1625 + 400

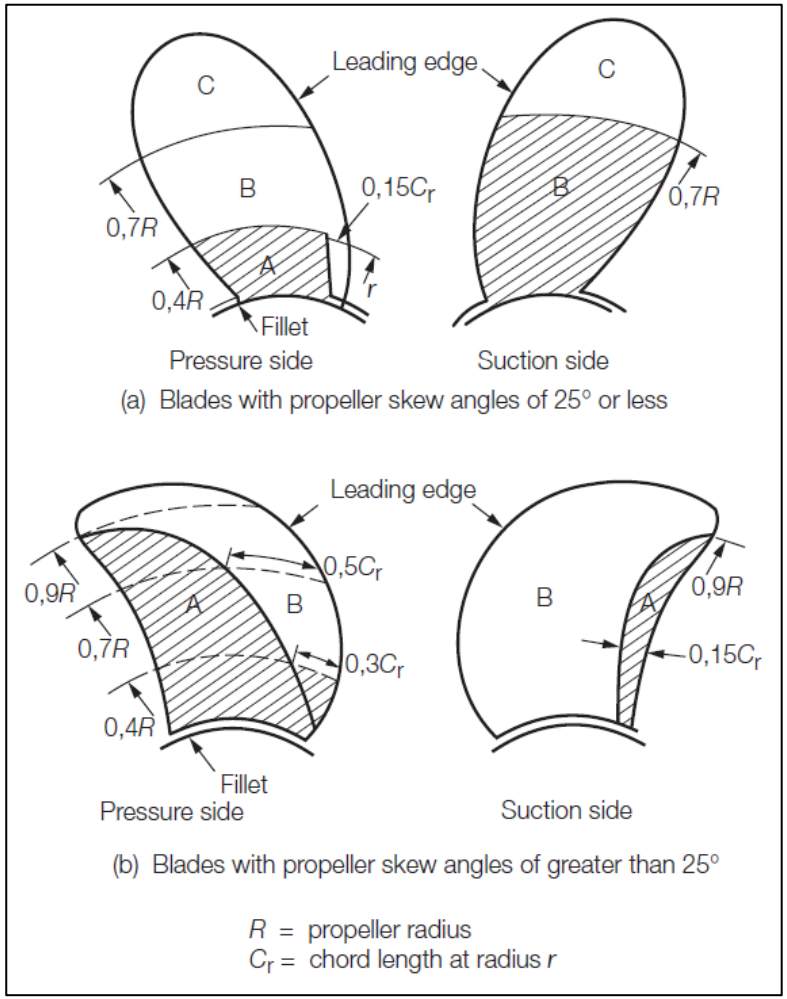
∴ RC = 562.5 mm

Proof that : RC > 0.7(R)

: 562.5 > 533.75 ⇨ Crack location outside 0.7(R)

Ok.

Propeller Repair Zone



Severity zone or region	Maximum individual area of repair	Maximum total area of repairs
Zone A	Weld repairs not generally permitted	
Zone B	Defects that are not deeper than (t/40) mm or 2 mm, whichever is greater, below the minimum local thickness are to be removed by grinding. Defects which are deeper than allowable for removal by grinding may be repaired by welding.	
Zone C	60 cm^2 or 0,6% x S whichever is the greater	200 cm^2 or 2% x S, whichever is the greater in combined Zones B and C but not more than 100 cm^2 or 0,8% x S, whichever is the greater, in Zone B on the pressure side
Other regions (*see* Note)	17 cm^2 or 1,5% area of the region which-ever is the greater	50 cm^2 or 5% x area of the region which-ever is the greater

Severity zones in all propeller blades

Survey Reporting

1. Attendance Surveyor survey report
   - Narrative with clearly wording
   - Action with ship memorandum
   - Docking and repair report
   - Flag and DCE/DCG agreement
   - Fee report
   - Survey checklist (If any)
   - Ship certificate in case of amend/re-issue/short term or full term
2. Survey report will review by Vetter Surveyor
3. Surveyor will release by Vetter Surveyor
4. Cert. check and error will issue by Vetter Surveyor
5. Survey report will update in Ship database and send to ship Client.

Q&A

Thank you for your attention