

CCS PERFORMANCES AND SERVICES ON ORE CARRIER

CCS
CHINA CLASSIFICATION SOCIETY
中国船级社

Overview

By sticking to the policy of "building first-class international classification society with own characteristics and with technology as the foundation and credibility as the cornerstone", CCS improves continuously its image and value in the ore carrier sector through advanced technology and quality service and is widely and highly recognized by the industry.

Ammonia fuel power system Ready; methanol fuel power system ready;Wind assisted propulsion systems installed on seagoing ships.

In recent years, CCS has carried out in-depth technical research on ore carriers with regard to structural safety, easy loading, ore (water content) feature, natural gas power system ready, vibration and noise, shafting alignment, emission control solutions, structural arrangement optimization and energy efficiency optimization, etc. These techniques have been applied onboard ships and helped to upgrade the technical service capability of ore carriers. A group of advanced ore carriers have been classed with CCS.

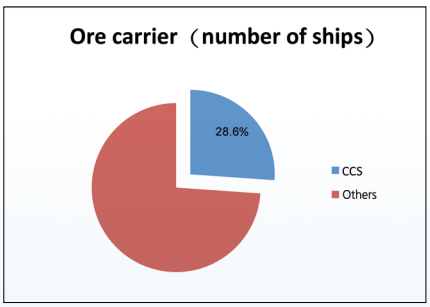
By committing to the mission of "safety, environmental protection and creating value for clients and society" and based on over 90 offices distributed across the globe, CCS provides 7 X 24 survey and technology support services to ship owners. Relying on its highly efficient service system structure, CCS continuously provides comprehensive support for conducting survey activities, safeguarding ship safety and emergency response to accidents. CCS has continuously achieved outstanding performance in three main MoUs and witnessed healthy and steady increase of its fleet size.

CCS ore carrier fleet Performance

1) Full coverage of ships: Ship types of different sizes varying from 230,000 tonnage to 400,000 tonnage are all covered.

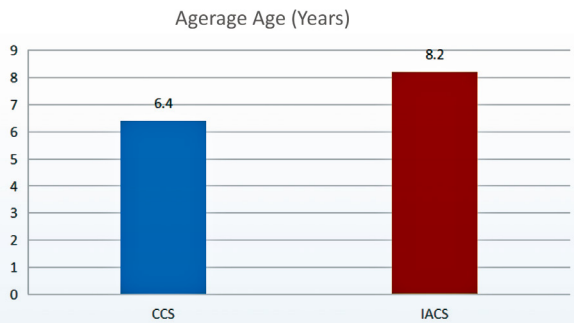


2) Large size of fleet: The total number of CCS-classed ore carriers occupies 28.6% of the total number in IACS, taking the lead in both scale and increasing rate among IACS.



CCS-classed ore carrier fleet VS global ore carrier fleet (unit: number of ships)

3) Low average ship age: The average ship age is 6.4 years, ranking as the youngest ore feet within IACS.



3) Typical ship type and performance:

- 400,000 DWT VLOC: 35 ships in total;
- 325,000 DWT VLOC: 21 ships in total;
- 300,000 DWT VLOC: 20 ships in total;
- 250,000 DWT VLOC: 7 ships in total.

The VLOC with 9 holds and 9 hatches was ranked as "the world best ship in 2015" by the magazine *Significant Ships* published by British Royal Naval College.



1st generation 400,000 tonnage ore carrier "Yuan Zhen Hai"



2nd generation 400,000 tonnage ore carrier "Ming Hui"



300,000 tonnage ore carrier "Yu Hua Hai"



250,000 tonnage ore carrier "Shandong He Xie"

Ore carrier ship trade routes and main ship types

Australia and Brazil are the major exporters of iron ore in the world, occupying 56.2% and 25.8% respectively, altogether accounting for 82.0% of the total iron ore export in the world. China is the main iron ore consumer globally, accounting for about 73.4% annually. Then is Japan and South Korea, with the amount of import occupying 8.6% and 4.9% respectively. Iron ore import in the Far East area accounts for 86.9% of the global iron ore export.

The geography of the major importers has determined relatively stable trade routes of ore carriers. The main routes include Australia to China, Japan and South Korea; Brazil to China, Japan and South Korea, etc. Such stable trade routes lead to relatively stable ship types. In order to load as much as possible and improve transport efficiency and economy, ship owners will normally choose to build an ore carrier that is maximum in size and meanwhile can meet the limit of the intended ports. Typical iron ore trade routes and corresponding ship types are as follows:

◆ From Australia to China, Japan and South Korea

Australia ports have limited conditions for iron ore export. For example, port Hedland can normally allow visits and loading of ships at overall length of not more than 325m and of draft at approximately 18.1m. Deadweight of ore carriers of such scantling is about 250,000 tonnage.



Port Hedland

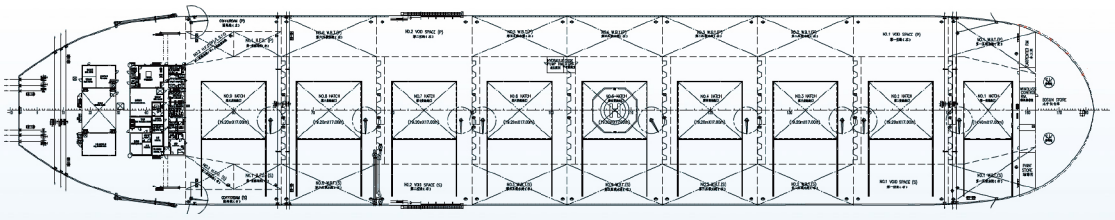
FIC & FID		
Maximum LOA of vessel	325m	
Maximum Beam of vessel	57m	
Maximum Berthing Displacement	150,000 tonnes*	
Maximum DWT	250,000 tonnes	
Length	680m (combined)	
Depth	FI C 18.4m	FI D 19.2m

Port Hedland FIC and FID

Port Limitation for ship visits (source: port requirements)

Typical parameters of ore carriers of 250,000 tonnage

Loa（m）	B（m）	D（m）	T（m）
325.0	57.0	25.0	18.7



Typical structural arrangement of ore carriers of 250,000 tonnage

◆ From Brazil to China, Japan and South Korea

Brazil port can allow calling of ore carriers of over 300,000 tonnage. The two biggest ports PDM and Tubarao of Brazil can allow calling of 400,000 tonnage ore carriers. The third biggest port GIT can allow calling of 325,000 tonnage ore carriers.

Deadweight	405.000 MT
Maximum Length	365 meters
Maximum Breadth	66 meters

Maximum Depth: 22,30 plus tide, limited to 23 meters.

Port Tubarao

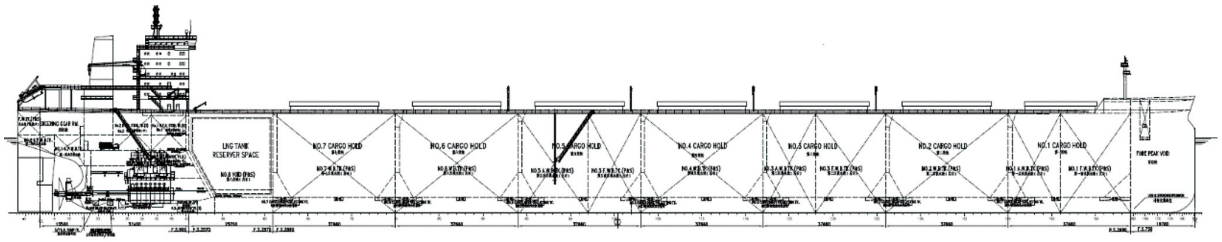
operational length of the pier: 490.00 meters
maximum mooring dock: 342.00 meters
total length of the vessels: 365.00 meters
maximum breadth of the vessels: 66.00 meters
minimum depth of the berth: 23.00m + height of the tide
deadweight (DWT) maximum of 420,000 mt

Port PDM

Port Limitation for ship visits (source: port requirements)

Typical parameters of ore carriers of 400,000 tonnage

Loa（m）	B（m）	D（m）	T（m）
361.9	65.0	30.4	23.0



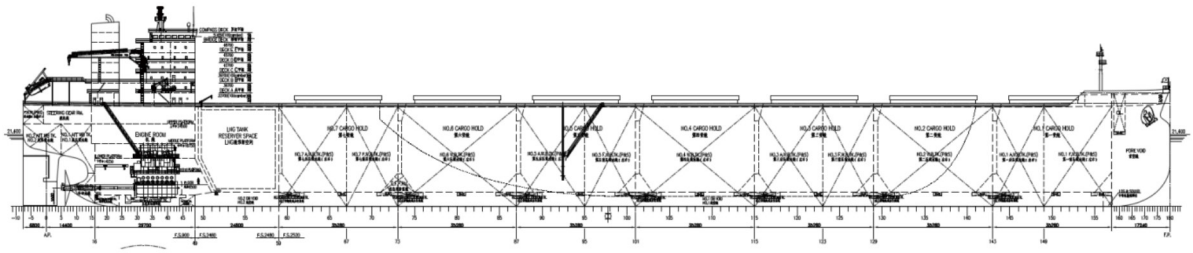
Typical structural arrangement of ore carriers of 400,000 tonnage

maximum mooring dock: 340,00 meters
maximum length of the vessel: 340,00 meters
maximum breadth of the vessel: 62,00 meters
maximum depth of the berth: 20,40m + height of the tide
minimum depth of the berth: 22,50m + tide
deadweight (DWT) maximum of 350,000 mt

Limitation of Port GIT for visits of ships（source: port requirements）

Typical parameters of ore carriers of 325,000 tonnage

Loa（m）	B（m）	D（m）	T（m）
340.0	62.0	29.5	21.4



Typical structural arrangement of ore carriers of 325,000 tonnage

Ore carriers belong to dedicated ship types in fixed routes. New ore carriers are normally built as largest as possible depending on the limits of loading/unloading ports and wharfs, so as to be most economical. CCS can help ship owners to develop reasonable ship types according to their operation plans. When developing new ore carrier types, attention is to be paid to the following limitations of ports and wharfs:

（1）maximum deadweight of vessels allowed to berth;

（2）overall length of the vessel allowed to berth;

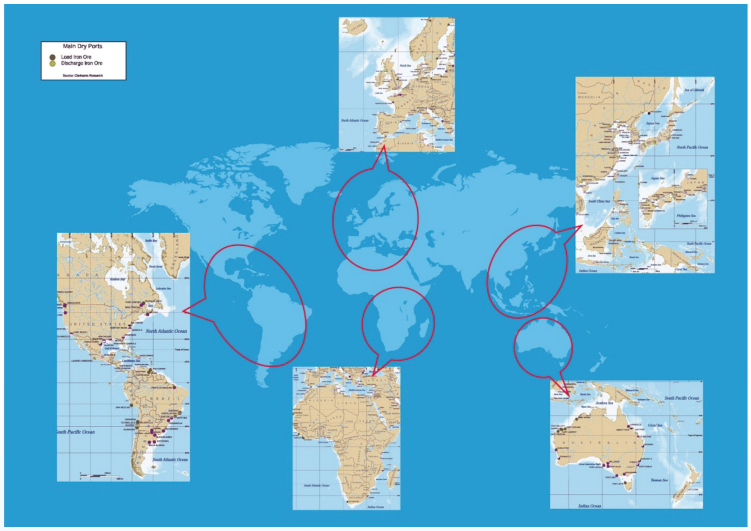
（3）maximum draft of vessels allowed by the water course and wharfs;

（4）limitation of wharf loading equipment on air draft of ships (height from ship cargo hold hatch to waterlines);

（5）quantity and grabbing capacity of wharf loading/unloading equipment;

（6）loading speed of loading machines;

（7）limitation of wharf loading/unloading equipment on ship width.

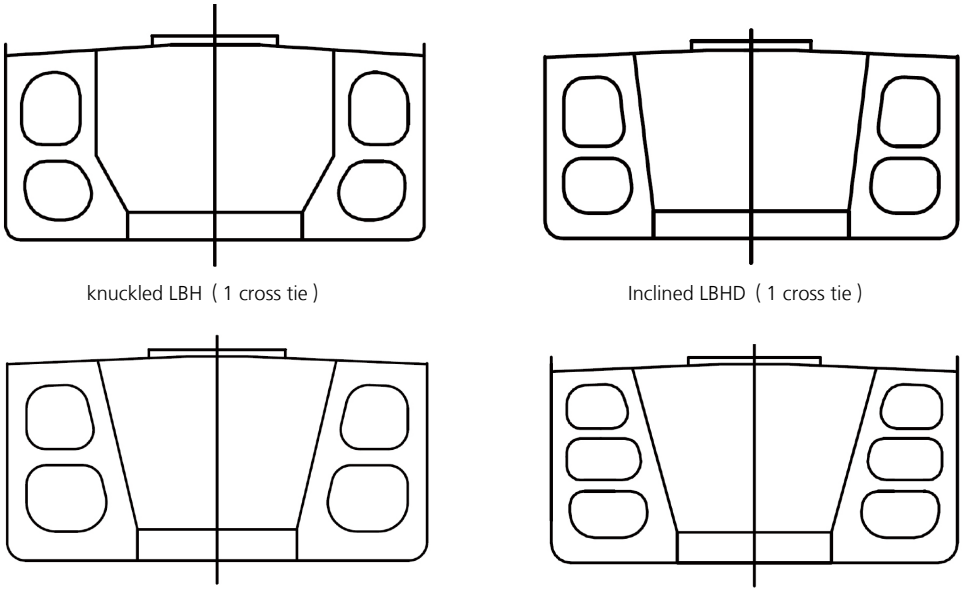


Global major ore carrier loading/unloading ports

Ship type features

◆ Typical features

Ore carrier cargo hold area normally consists of cargo hold and wing ballast tank. Typical cross sections are illustrated below. Longitudinal bulkhead is normally knuckled or inclined. Comparison between these two types of longitudinal bulkheads is listed in the table below. Depending on the size, non-watertight web frames in wing ballast tanks can be categorized into one cross tie or two cross ties.



knuckled LBH（1 cross tie）

Inclined LBHD（1 cross tie）

1st generation 400,000 tonnage（inclined LBHD 1 cross tie）

2st generation 400,000 tonnage（inclined LBHD 2 cross ties）

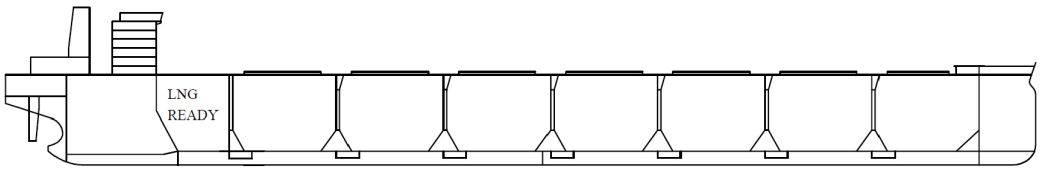
Typical cross section of ore carriers

Comparison between two types of longitudinal bulkheads of cargo holds

type / feature	Inclined	Knuckled
Difficulty of construction	relatively easy to construct	an additional knuckle is required in construction
Cargo hold capacity	smaller hold capacity; higher stack of cargo	Bigger hold capacity; lower stack of cargo
Ballast tank capacity	larger wing ballast tank(or void tank) capacity	smaller wing ballast tank(or void tank) capacity
Inner bottom size	Smaller inner bottom width, not easy to grab and unload	wider inner bottom, easy to grab and unload
Engine room arrangement	Inclined longitudinal bulkhead extended in engine room, causing difficulty for engine room arrangement	Vertical longitudinal bulkhead extended in engine room, easy for engine room arrangement

◆ VLOC with special design requirements

In order to fulfil the global sulfur emission control requirements in 2020, LNG Ready design is applied to both new types of 400,000 tonnage and 325,000 tonnage ore carriers, i.e., space for LNG fuel storage tank is reserved between engine room and cargo hold. LNG fuel tank will be installed after 2020, and power system will be modified in order that ships can burn LNG and reduce SOx emission to fulfill emission control requirements. CCS will assign such ships class notation DFDR, and will ensure, through relevant technical requirements, that conversion into dual fuel power system in the future is feasible and ship structure is safe.



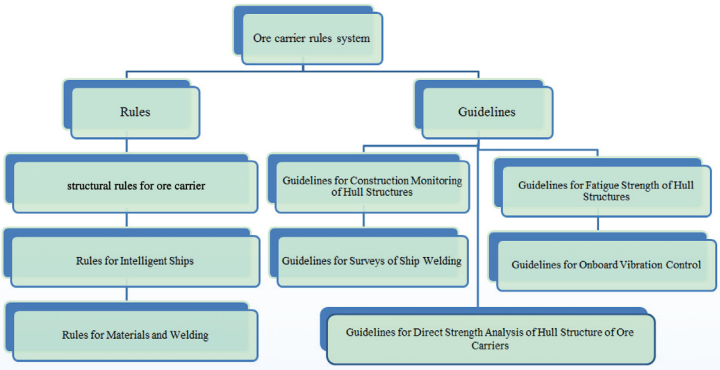
LNG Ready design for 400,000 tonnage ore carriers

In order to improve loading efficiency, high speed loading machines can be used to load the cargo hold 100% at one time. Easy loading brings potential risks for double bottom strength and side structural strength during loading. CCS can assign the class notation EL100 to safeguard ship safety during easy loading.



Rule system and calculation software

◆ Rule system



◆ Calculation software

- Rules calculation： Compass-SDP
- Direct analysis： Compass-VLOC-DSA
- Entire ship direct analysis： Compass-WALCS-Basic
- springing and whipping： Compass-WALCS-LE/NE
- Other requirements： Compass-Rules

Character of classification and class notations

★ CSA Ore Carrier; Strengthened for Heavy Cargoes; COMPASS (R, D, F); Grab*(30); PSPC(B,D); Loading Computer (S, I); FL(25); ESP; In-Water Survey; EL100; TOFD/PAUT(40%); CM; HMS(G4,O1,A1,B1,W1,N1,C1); i-Ship(N,M,E,I)

★ CSM AUT-0; SCM; G-ECO(CDx, BWM(T,Ef)); G-EP(GPR,GWC); DFDR (H， m)/Dual fuel

Class notation	Description
Ore Carrier	class notation for ore carriers
Strengthened for Heavy Cargoes	Double bottom in cargo area, strengthening for bottom framing for heavy cargos
COMPASS	For ships the design of which has been checked using CCS COMPASS-Structure software, one or more of the following suffixes R, D and F are to be added. Meanings of the suffixes are as follows: R: for ships the check of which against rules has been performed using COMPASS-Structure; D: for ships of which hull structure direct analysis has been performed using COMPASS-Structure; F: for ships of which hull structure fatigue strength assessment has been performed using COMPASS-Structure.
Grab*(30)	Strengthening of inner bottom plating, lower strake of hopper tank sloping plate and transverse lower stool plating for holds designed for loading/unloading by grabs having a maximum weight up to 30 tons
PSPC	Ships of which specific spaces comply with IMO Performance Standard for Protective Coatings may be assigned this notation, with one or more of suffixes B, C and V being added thereafter. Meanings of the suffixes are as follows: B: protective coatings applied in dedicated seawater ballast tanks; C: protective coatings applied in cargo oil tank spaces of crude oil tankers; V: protective coatings applied in void spaces. Note: B, C and V can operate both separately and together
Loading Computer	Ships provided with approved loading computers are to be assigned this notation, with one or more of suffixes OA, S, I and D being added thereafter. Meanings of the suffixes are as follows: OA: Capable of calculating optimal trim curve in each loading condition and creating optimal energy-saving loading plan by automatic optimization; S: Capable of calculating and checking hull strength under various loading conditions; I: Capable of calculating and checking intact stability; D: Capable of calculating and checking damage stability Note: OA, S, I and D can operate both separately and together
FL	Minimum fatigue design life. Where a ship is designed for a minimum design fatigue life of 25 years or more,the class notation FL may be assigned at 5-year intervals starting from the 25th year,e.g.FL(25),FL(30).
ESP	Enhanced survey programme. This notation is required for ore carriers engaged on international voyages.
In-Water Survey	For ships suitable for in-water surveys, this notation may be assigned

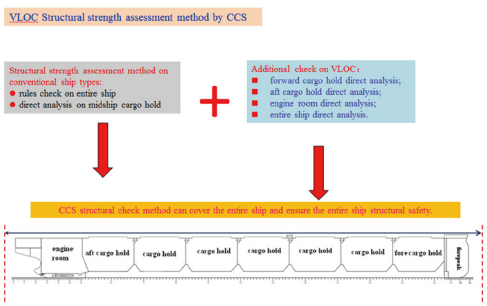
Class notation	Description
EL100	Ore carriers meeting the requirements for easy loading may be assigned this notation
TOFD/PAUT(40%)	Combined Inspection of time-of-flight diffraction (TOFD) Technique and phased array ultrasonic testing (PAUT) TOFD/PAUT(40%): the percentage of welds inspected by TOFD/PAUT is more than 40%
CM	Ships for which the control of structural precision (Construction Monitor) at critical locations of hull (including alignment, fitting-up, edge treatment and technological standards) is in accordance with an approved plan.
HMS (G4,O1,A1,B1,W1,N1,C1)	Hull Monitoring System Gn: Sensor monitoring the global hull strain Dn: Sensor monitoring the local hull strain On: Sensor monitoring the propulsion shaft(s) output An: Sensor monitoring the axial acceleration Mn: Device for monitoring of hull rigid body motions (six degrees of freedom)
i-Ship	Intelligent ship is a development trend for shipping industry. This class notation is assigned with one or more of suffixes N, H, M, E, C and I being added thereafter. Meanings of the suffixes are as follows: N – functional notation for intelligent navigation; H – functional notation for intelligent hull; M – functional notation for intelligent machinery; E – functional notation for intelligent energy efficiency management; C – functional notation for intelligent cargo management; I – functional notation for intelligent integration platform
AUT-0	Main propulsion machinery remotely controlled from BCS, machinery space including CCS periodically unattended
SCM	Oil-lubricated or water-lubricated propeller shafts fitted with approved shaft seals
G-ECO, G-EP	Green ships

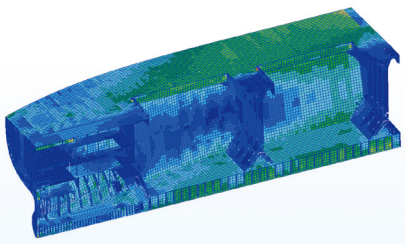
Class notation	Description
DFDR	A ship assigned with the class notation of DFDR may has one or more suffix(es) of XN. The intention of XN is as follows: H: the hull structures have been strengthened in accordance with the relevant requirements of natural gas fuel powered ships T: the natural gas fuel containment system (bunkers/fuel tanks) and its supporting members have been installed M: the main engine installed in ship's construction is a dual fuel engine m: main engine installed in ship's construction may be converted to a dual fuel engine in future A: the auxiliary engine installed in ship's construction is a dual fuel engine a: the auxiliary engine installed in ship's construction may be converted to a dual fuel engine in future B: the boiler installed in ship's construction is a dual fuel boiler P: the arrangement in ship's construction has been considered the approaching installation of natural gas fuel supply system and related to, including the arrangement of piping, bunkering station, compressor room, gas valve unit, fire-fighting system, etc. E: the power distribution system has been reserved for the equipment related to natural gas fuel powered system in ship's construction D: the gas dangerous zones have been taken into consideration in ship's construction Note: It must be alternative to the suffixes M or m; it is optional for the other suffixes.
Dual Fuel	This notation may be added for ships which not only use natural gas as fuel but also burn fuel oil, or burn fuel oil and natural gas fuel at the same time
AFD Ready 1	Methanol/ Ethanol Fuel;WAP(ROTOR)

Key technology

◆ Structural safety

As ore carriers become increasingly larger, more comprehensive and advanced requirements are posed on structural assessment. To cater for the requirements of the Industry in development and design of large ore carriers, CCS have carried out research on various types of ore carriers and get feedbacks from plan approval and ship operation sectors. CCS presents structural strength requirements covering the entire ship in order to ensure structural safety of ore carriers. Also CCS provides a series of advanced calculation methods to further improve structural safety of ore carriers. The structural strength assessment software developed by CCS includes all calculation modules and is efficient, accurate, user-friendly, stable and integrated, providing a strong tool support for safeguarding ship structural safety.

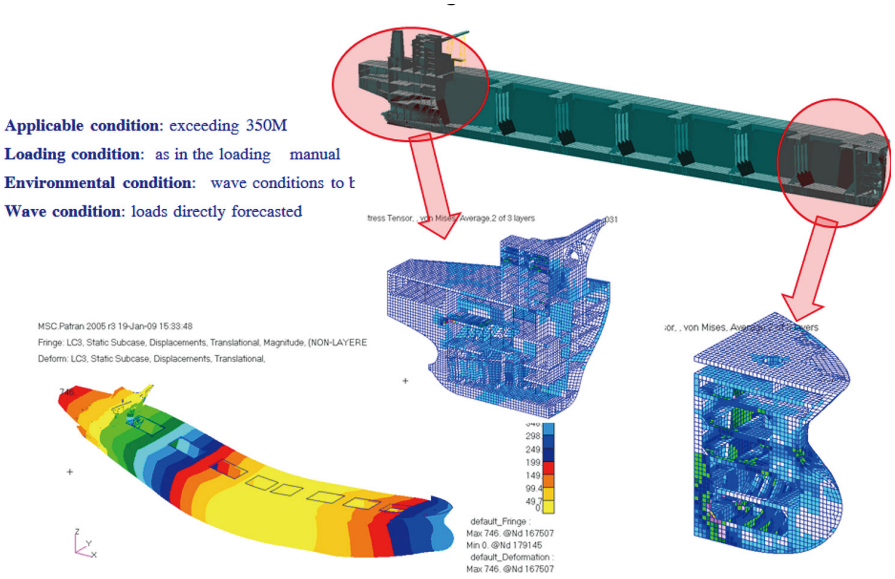




Aft cargo hold FE

◎ **Structural strength requirements covering the entire ship**

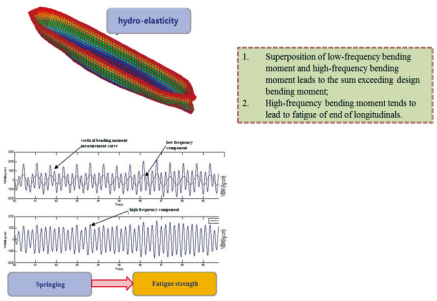
- rules check covering the entire ship
- cargo area and engine room FE analysis
- global FE analysis



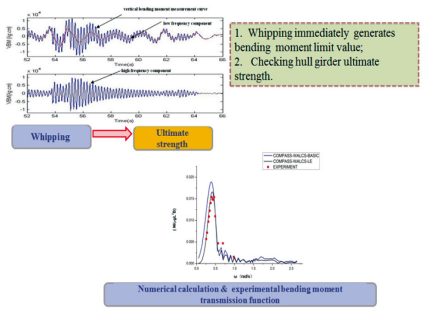
Entire ship FE

◎ **Advanced calculation method:**

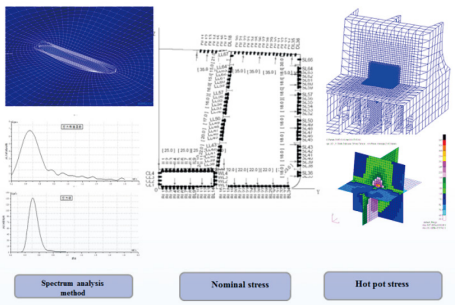
- springing and whipping
- fatigue spectrum analysis
- vibration and noise analysis



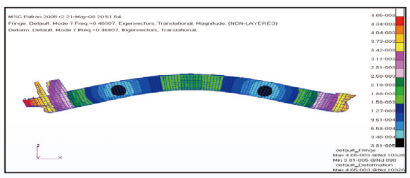
Springing

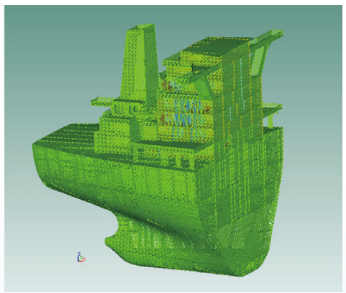


Whipping



Fatigue spectrum analysis

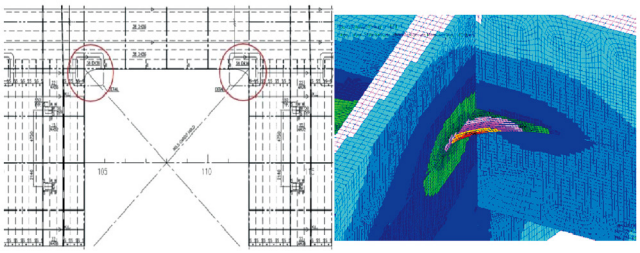




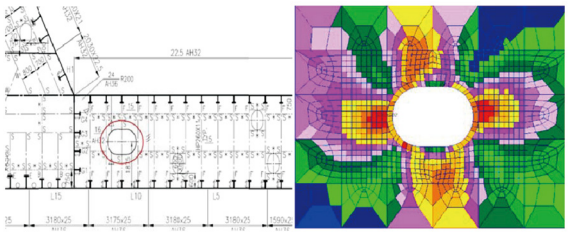
Entire ship vibration calculation & analysis and engine room noise forecast & analysis

◆ Critical area

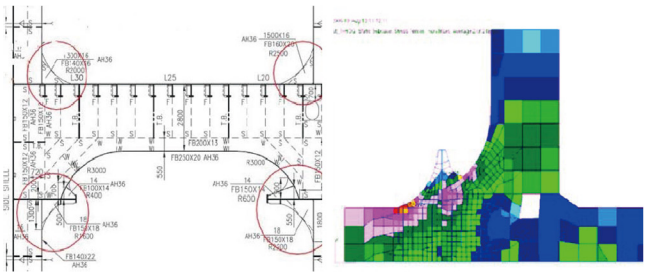
By identifying critical areas of hull structures, FE analysis is performed in the design and plan approval stage to control the stress in critical areas; in the ship building stage, construction quality of critical areas will be controlled; in ship operation stage, attention will be given to surveys of critical areas.



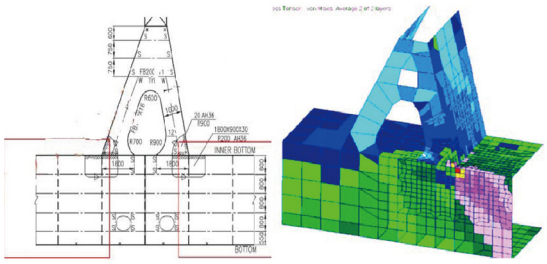
Hatch corner



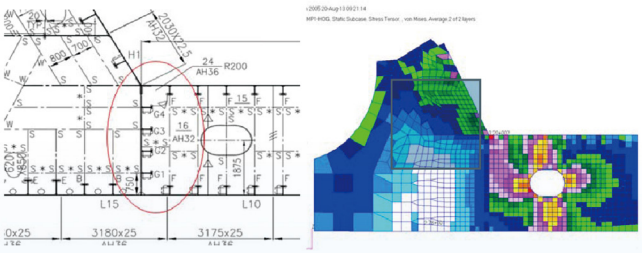
Opening in double bottom floors



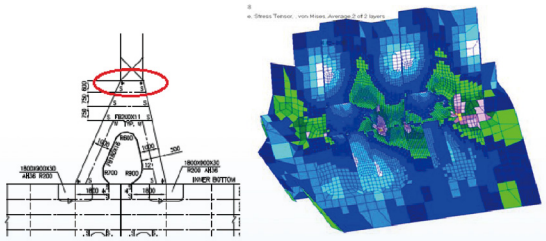
Ends of horizontal stringer cross tie



Connection between central girder and lower stool sloping plate



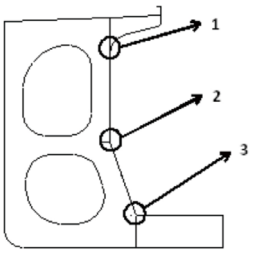
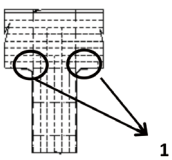
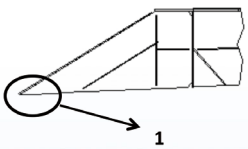
Connection between longitudinal bulkhead and double bottom floor

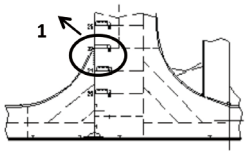
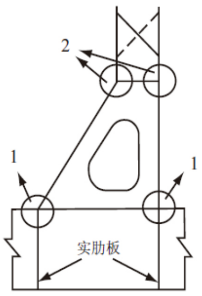
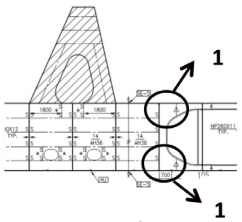
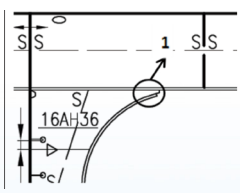


Connection between corrugated knuckle and lower stool

◆ Construction monitoring

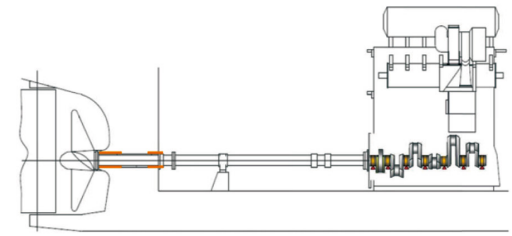
The quality of hull construction determines the operational reliability and usage life of hull structures. Monitoring of material preparation, alignment and fit-up of structural members, groove preparation and welding procedures of critical locations of the hull structures is performed to ensure that the critical locations are built in accordance with strict construction procedures and in compliance with relevant quality standards.

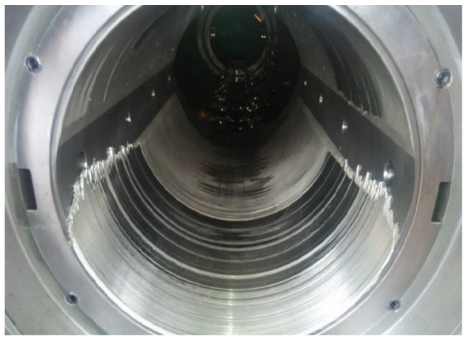
Critical locations of hull structures	Major control measures	
 Figure A	Location 1	a. confirming toe material and shape b. confirming alignment of toe web and side tank inner structure c. confirming weld grooves and gaps d. confirming welding environment e. visual inspection after welding and NDT
	Location 2	a. confirming usage of material b. confirming weld grooves and gaps c. checking structural alignment through profile gauge d. confirming quality of fixing and welding environment e. visual inspection after welding and NDT
	Location 3	a. confirming usage of material b. confirming weld grooves and gaps c. checking structural alignment using offset marking and profile gauge methods d. grinding of welds at web frame fatigue node e. visual inspection after welding and NDT f. confirming quality of fixing and welding environment and welding sequence
 Figure B	Location 1	a. confirming hatch corner material b. confirming arc shape of hatch corner c. confirming smooth edge of hatch corner plating d. confirming protective measures for hatch corners
 Figure C	Location 1	a. confirming toe material and shape b. confirming alignment of toe web and underdeck structure using offset marking method c. confirming welding environment d. visual inspection after welding and NDT e. confirming weld grooves and gaps

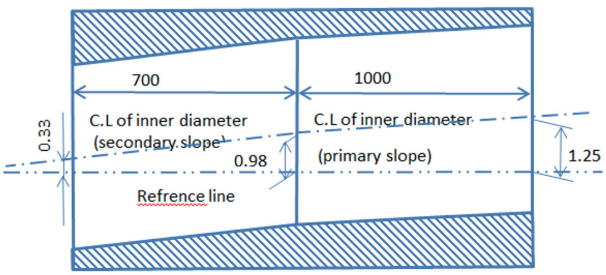
Critical locations of hull structures	Major control measures	
 Figure D	Location 1	a. confirming toe material and shape b. confirming alignment of toe web and plane transverse bulkhead horizontal stringer c. confirming weld grooves and gaps d. confirming welding environment e. visual inspection after welding and NDT
 Figure F	Location 1	a. confirming alignment of lower stool side plate and double bottom solid floor using offset marking method b. confirming alignment of lower stool vertical diaphragm and double bottom longitudinal girder c. confirming connection between lower stool vertical web and inner bottom plating and lower stool side plating d. confirming weld grooves and gaps e. confirming welding environment f. visual inspection after welding and NDT
	Location 2	a. confirming alignment of corrugated bulkhead plating and lower stool side plating using offset marking and profile gauge methods b. confirming connection between lower stool vertical diaphragm and lower stool top plating c. confirming weld grooves and gaps d. confirming welding environment e. visual inspection after welding and NDT
 Figure G	Location 1	a. confirming materials and shapes of connecting bracket or connecting structures b. confirming alignment of bottom longitudinals, inner bottom longitudinals and connecting brackets and local short girders c. confirming transition between connecting bracket and longitudinals d. confirming weld grooves and gaps e. confirming welding environment f. visual inspection after welding and NDT
 Figure H	Location 1	a. confirming toe material and shape b. confirming alignment of toe web and shell plating horizontal stringer c. confirming weld grooves and gaps d. confirming welding environment e. visual inspection after welding and NDT

◆ Shafting vibration and alignment

Analysis and assessment of shafting alignment and vibration characteristics is carried out and technical support is provided on shafting arrangement and alignment procedures, so as to effectively avoid damage and overheating of shafting. Analysis of failure cause is also carried out and solutions are presented.





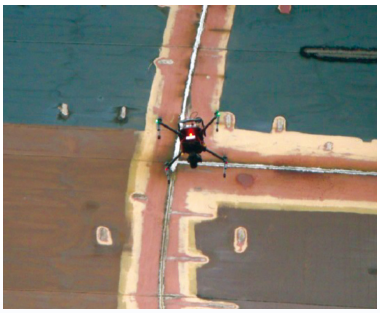




◆ Survey by means of unmanned aerial vehicle (UAV)

During ship surveys, UAVs may be used by CCS to take close-up photos, scanning hull structures automatically or by manual control. In this way, defect screening can be achieved through image recognition technology. UAV can be used as an alternative or supplementary way for survey of those hull structures that are not easy to be accessed or in areas of poor visibility, thus helping to improve survey quality and efficiency, increase survey safety and reduce cost.

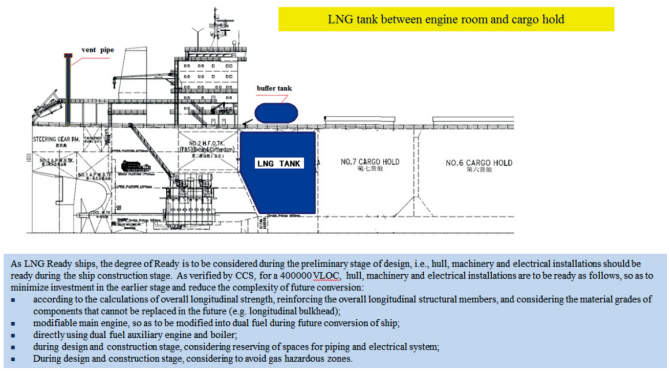




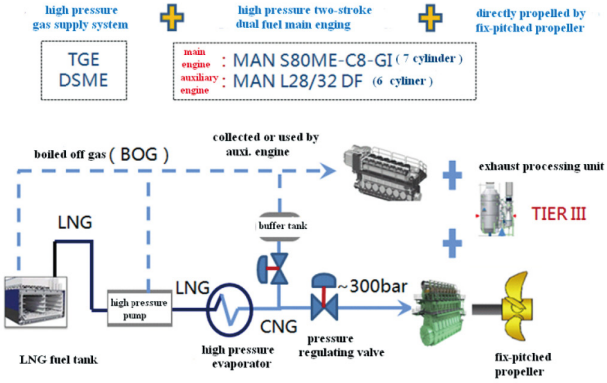
Key technology

◆ LNG Ready

For ore carriers provided with LNG Ready design, CCS will carry out assessment on its arrangement plan, power system and structural strength, which can ensure that conversion into dual fuel power system in the future is feasible and economic, and ensure safe usage of LNG fuel onboard.



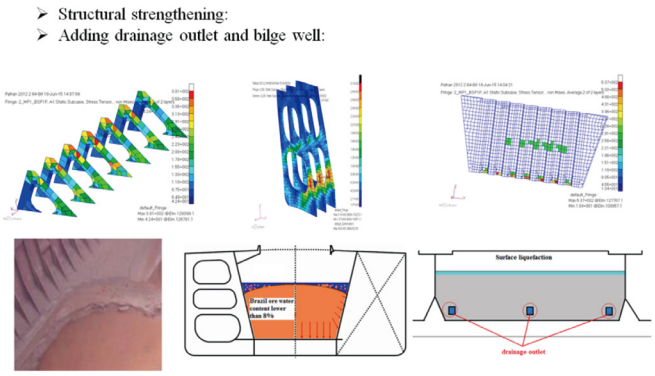
400,000 tonnage VLOC LNG Ready requirements



Dual fuel power system after conversion for LNG Ready

◆ Ore liquefaction

If water content in ore exceeds the limit of water appropriate for carriage, water may be separated out during operation causing hazards to ship stability and strength. During ship design and review stage, influence of water content in ore on ships can be assessed and improvement be made as appropriate, so as to reduce such influence and ensure safe operation of ships.



◆ Easy loading

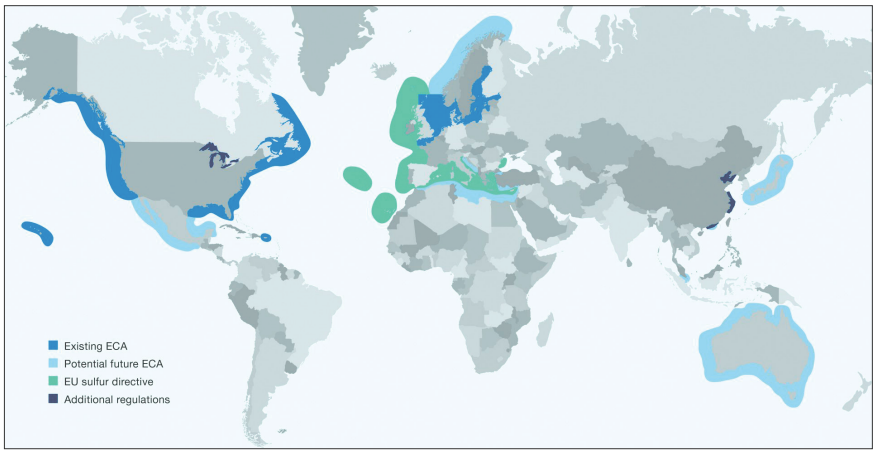
When easy loading is applied, loading is faster and cargo hold will be 100% loaded at one time. This presents higher requirements for double bottom strength and transverse bulkhead side structural strength, and also requires that the speed of ballast water discharge from ballast tanks can match the loading speed. Through assigning the class notation EL100 by CCS, ship easy loading conditions, ballast water discharge system, tank sounding system and ship draught are assessed, double bottom strength and transverse bulkhead side structural strength are checked, so that safety is ensured during easy loading.

◆ SOx emission solution

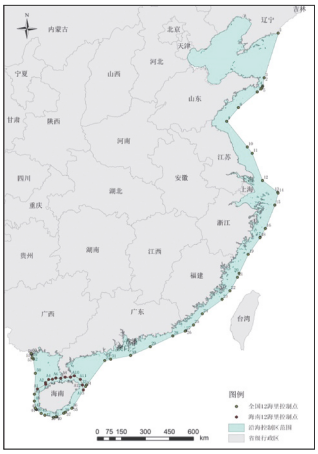
As the international conventions and relevant countries and regions pose increasingly stricter requirements on control of air pollution from ships, CCS has been devoted to the research on techniques and methods to effectively reduce emission of SOx/NOx from ships. For SOx emission, there are the following solutions:

- Low sulfur oil;
- Dual fuel power system;
- EGC system.

According to the features of ship types and routes, SOx emission control solutions are provided to the clients through feasibility and economy analysis, and guidance may also be provided to ships in service on how to control emissions.



a) Global ECAs



b) China ECAs

◆ Intelligent ships

Ship intelligentizing can make ships more economical, more reliable, safer and more environmentally-friendly. In 2015 CCS released the Rules on Intelligent Ships, the first of its kind in the world, which have been applied on various ships. Class notations for intelligent ships include: i-Ship (Nx, Hx, Mx, Ex, Cx, Ix) .

- N-- functional notation for intelligent navigation;
- H-- functional notation for intelligent hull;
- M-- functional notation for intelligent machinery;
- E-- functional notation for intelligent energy efficiency management;
- C-- functional notation for intelligent cargo management;
- I-- functional notation for intelligent integration platform;
- x-- additional notation for optional function.

Class notations recommended for intelligent ore carriers: i-Ship (N, E, M, I)

◆ Ship energy efficiency



Due to the double pressure of environment and operational cost, the shipbuilding and shipping industries have focused their attention on ship's energy saving and emission reduction. By means of evaluation of ship's resistance reduction and efficiency improvement technology based on experience, test and CFD, CCS can provide guidance on ship's weight control technology and carry out evaluation of comprehensive energy efficiency in full load and/or ballast and/or partial load conditions in accordance with ship type, logistics and route characteristics, including ship resistance reduction technique (profile optimization), high efficient propulsion system, energy saving device, light ship weight control, machinery and electric equipment and system optimization, optimum trim, new energy utilization technique, online intelligent energy efficiency management system and other energy saving technical services, so as to improve ship energy efficiency, save energy and save operational cost. CCS has successfully provided energy optimization plans for various types of ore carriers.

CCS ship type service:

◆ Joint development of ship type

Ship type is jointly developed in conjunction with the shipyard and designer. By making use of CCS advantage in information and technology, based on comprehensive information such as route, port and channel and by means of advanced technical rules, technical economic analysis, and structural and performance calculation analysis, effective technical solutions are provided in order to jointly develop top quality ship type.

◆ Optimization and upgrading of ship type

Reliable structural optimization and upgrading solutions are provided by means of scientifically reasonable quantitative and qualitative analysis and research based on current characteristics of ship type, so as to provide strong support for ship type upgrading, making the ship safer, more environmentally friendly, more economical and more efficient.

◆ Approval of ship type

Compliance evaluation is carried out on ship types provided by shipyards and designers in accordance with agreed rules and conventions, and ship type approval certificate is issued to lay the foundation for ship type promotion and plan approval in the future.

◆ Recommendation of ship type

Excellent and reasonable ship type is recommended in accordance with the basic needs of the clients and based on CCS ship type performance accumulation and advantage in technical experience, covering main scantling, structural arrangement, type selection of main engine, energy efficiency indicator, emission scheme and intelligentizing scheme.

◆ Technical training of clients

Based on the needs of the clients, CCS can provide comprehensive and customized technical training service related to rules, software and technical solutions.

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CHINA CLASSIFICATION SOCIETY
中国船级社

Contact information:

Technical support: Xu Wei
Tel: 021-61089265
E-mail: xuwei@ccs.org.cn

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