

# **Merchant Ships Division Overview of the Engineering Department**

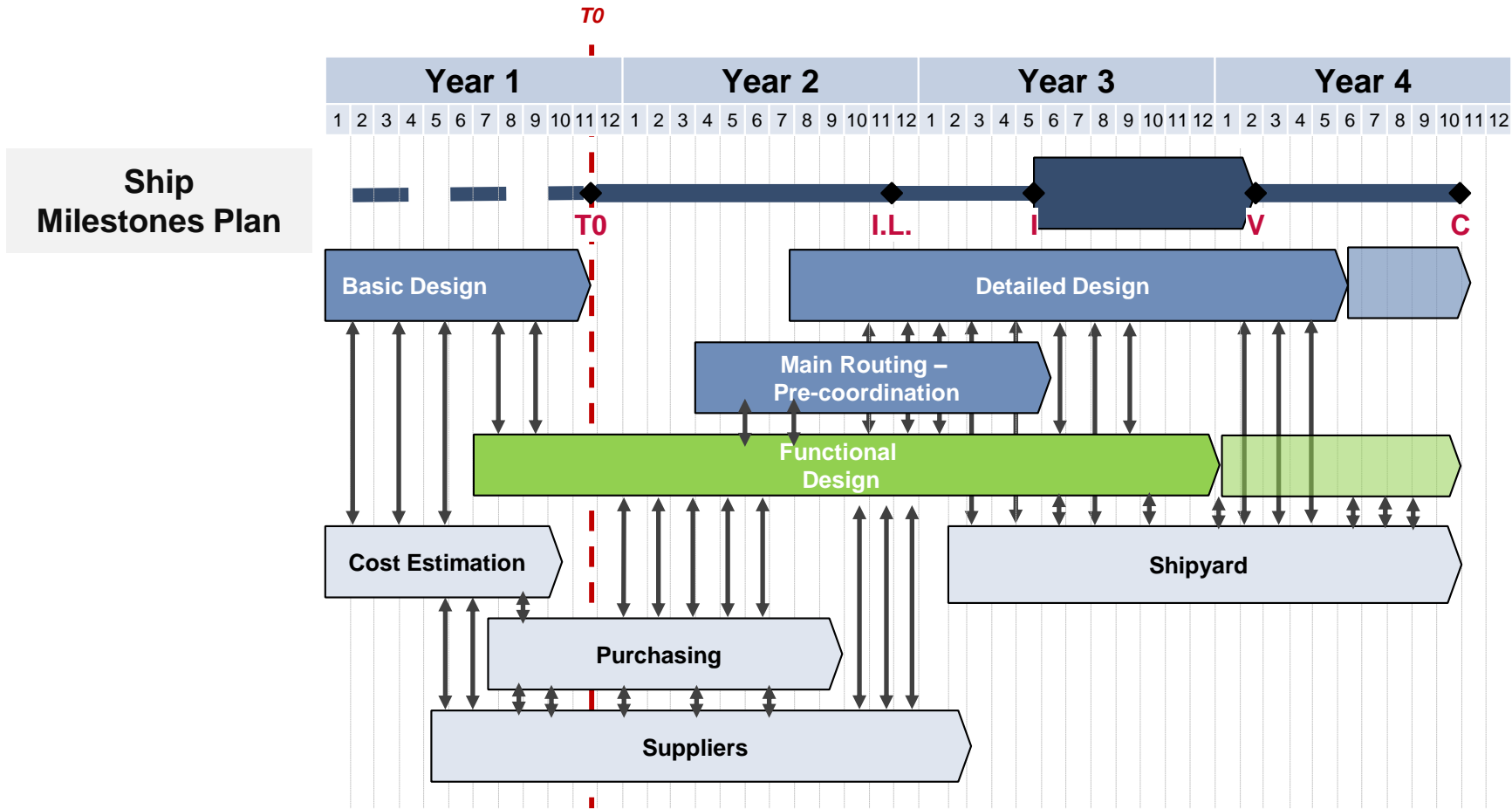
**Ing. Pierluigi Punter - Senior Vice President**

Trieste - December 16<sup>th</sup>, 2021

**FINCANTIERI**  
The sea ahead



# Typical Engineering Process and Schedule

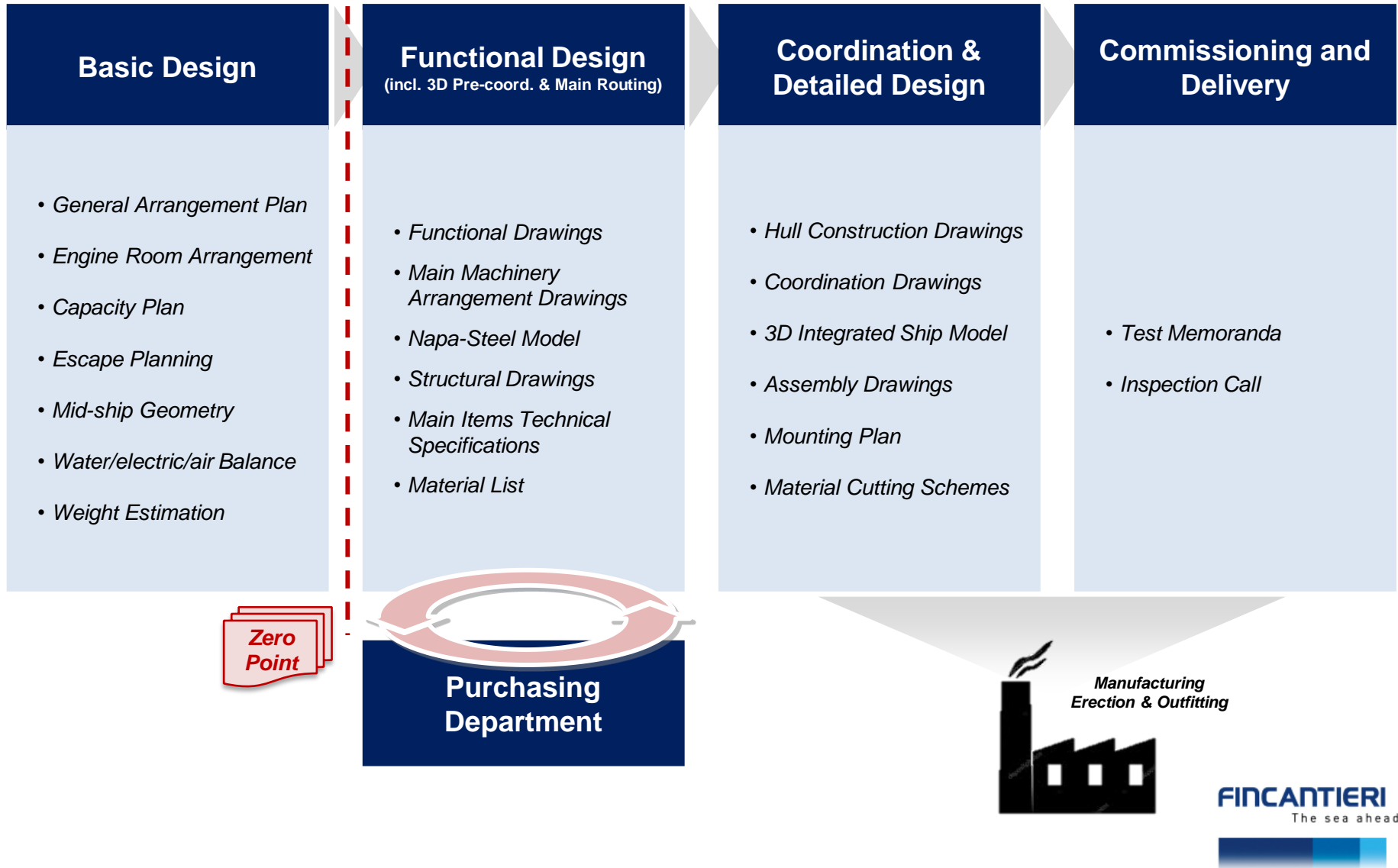


## Definitions

- T0** Hand-over between Basic Design and Functional Design
- I.L.** Steel cutting
- I** Keel Laying
- V** Ship Launch
- C** Delivery



# Engineering process: overview



# Basic Design Department

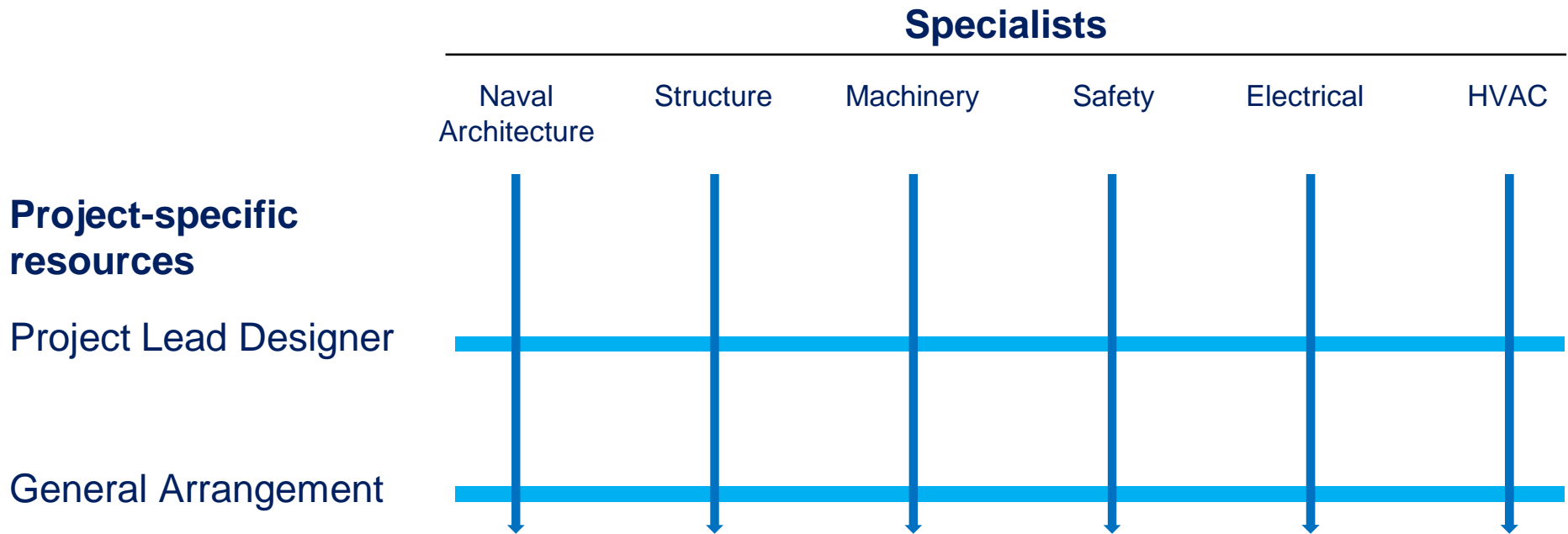
## Responsibilities

- Discussion with Owner about ship main requirement and performances
- Promote innovative and efficient designs
- Develop and release the contractual technical documentation (General Arrangement and Technical Specification)
- Co-ordinate other departments and external suppliers
- Provide technical data for the cost estimation



# Basic Design Department

## Organisation



# Basic Design Department

## Main tasks and capabilities

- General Arrangement Plan
- Naval architecture (hydrostatics & hydrodynamics)
- Structural arrangements and analysis
- Weight estimation and monitoring
- Main plants (machinery, Electrical, Air Conditioning, etc.)
- Escape calculation
- Feasibility study with preliminary 3D modelling
- Energy efficiency analyses
- Application of innovative solutions



# Functional Design: the Role

**The role** of the Functional Design is to **transform and traduce concepts and requirements** developed during the pre-contractual phase by Basic Design in:

- Technical Specification
- Schemes
- Arrangements
- Control logics
- Material Lists
- ...

**in a integrated manner.**

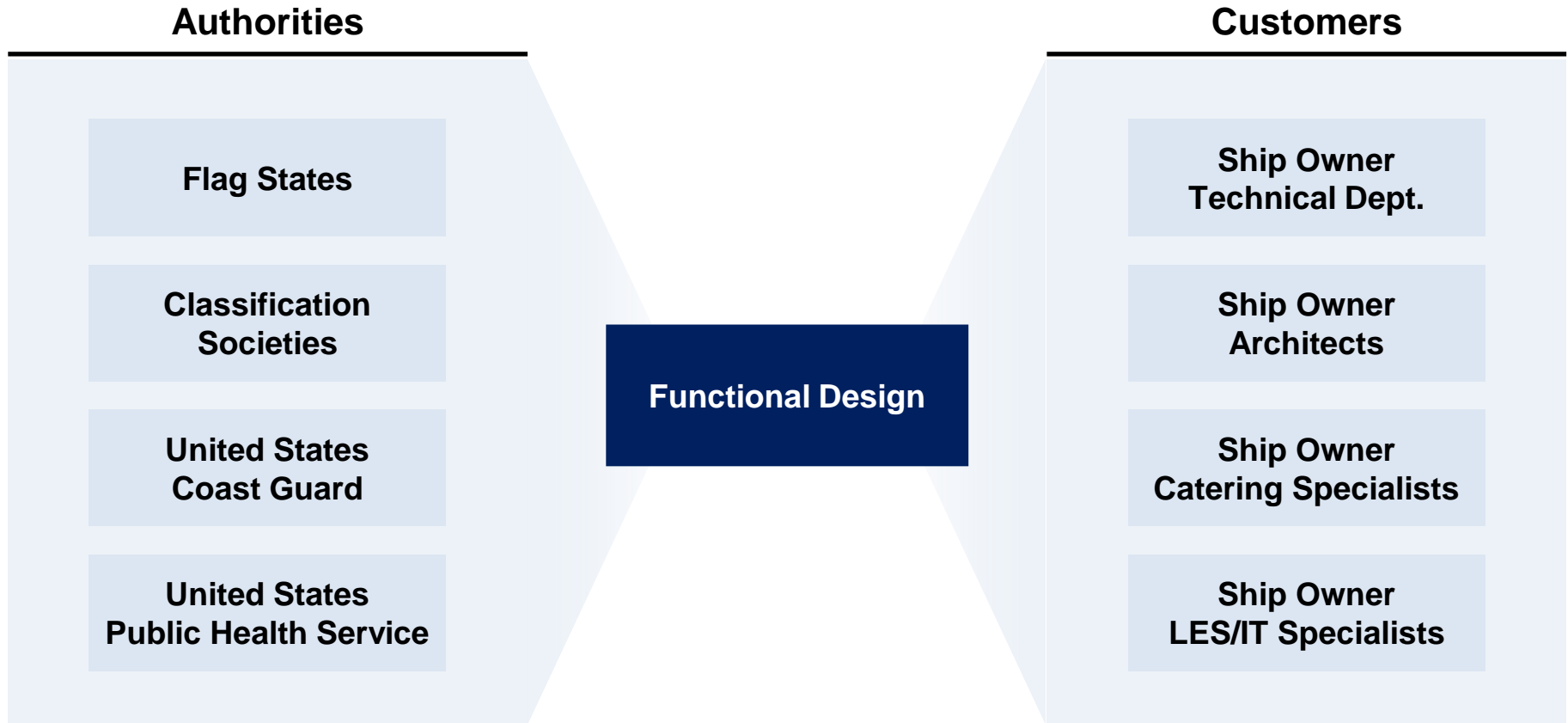
Considering the above, it is **continuously evaluated in a “make or buy” logic what is valuable to be designed internally** and what is **preferable to be designed by third parties.**

**The documentation produced** by the Functional Design **has the aim to:**

- **Define the product** in all its parties
- **Guarantee its integrated development** during the following phases

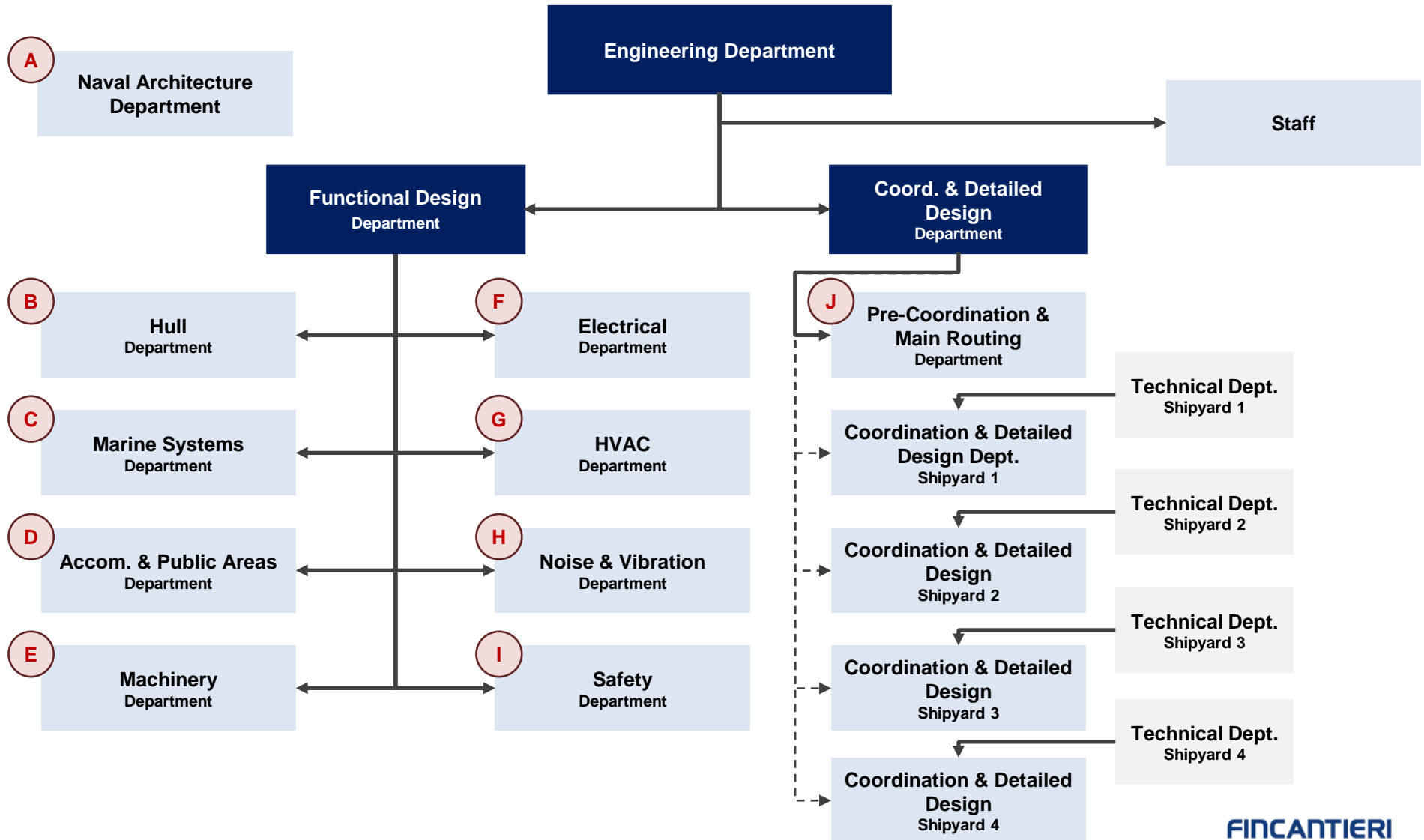


# Functional Design: other entities interfaced





# Engineering Department: the Organization Chart



**.** Overview and examples in next slides

# Activities of Naval Architecture Department

1

## Pre-Contractual Phase

- Main hydrodynamic characteristics (e.g. propulsion and maneuvering)
- Preliminary hull forms
- Basic stability requirements

2

## Design Development Phase

- Hull forms, appendages and propeller
- Hydrodynamic calculations and model tests
- Stability calculations
- Capacity plan

3

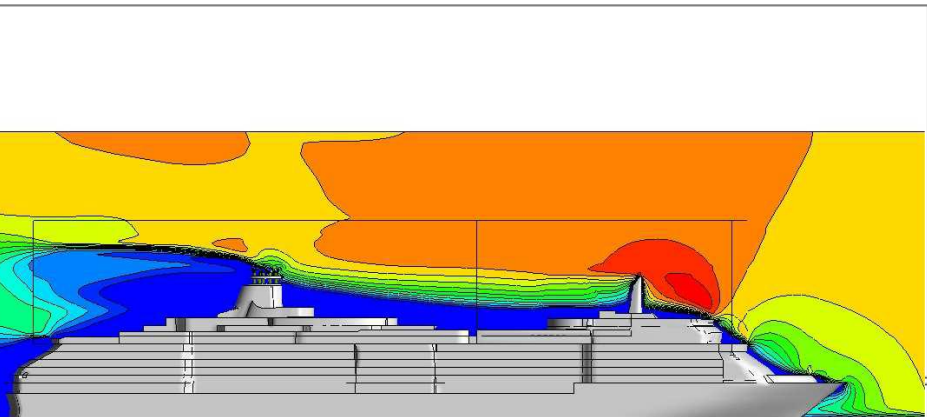
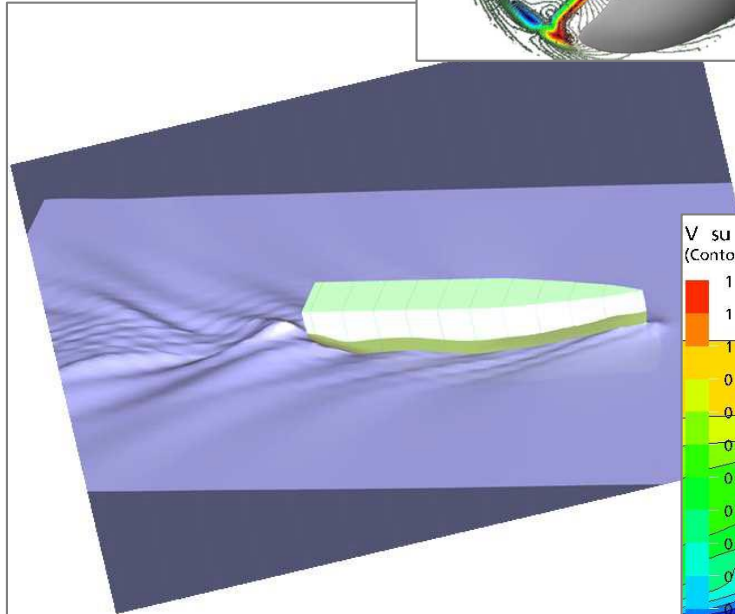
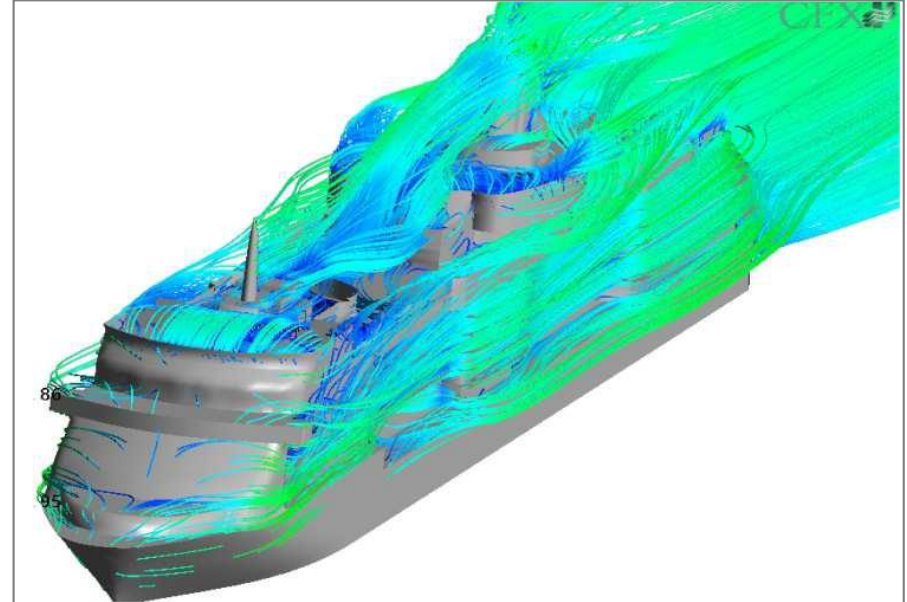
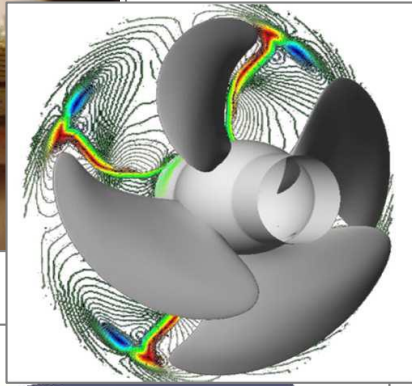
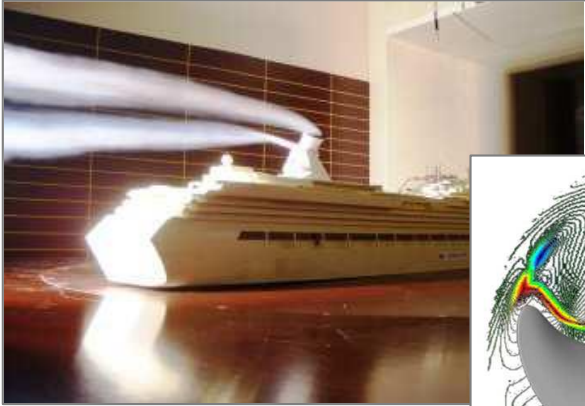
## Delivery Phase

- Sea trials and inclining test
- Final delivery documents approved by Class and National Authority



A

# Examples of activities of Naval Architecture Department



## **B** Activities of Hull Department

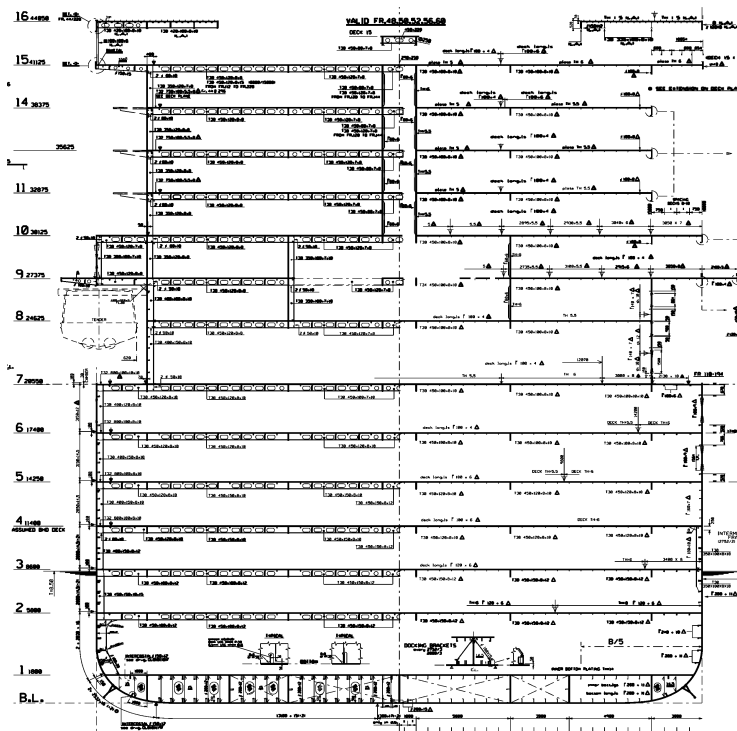
### **Design Development Phase**

1

- Structural Configuration for General Arrangement Plan
- Midship Section: Main Scantlings, preliminary assessment of Longitudinal Strength
- Hull structure modelling and design
- Global finite elements model



## Output of Hull Department



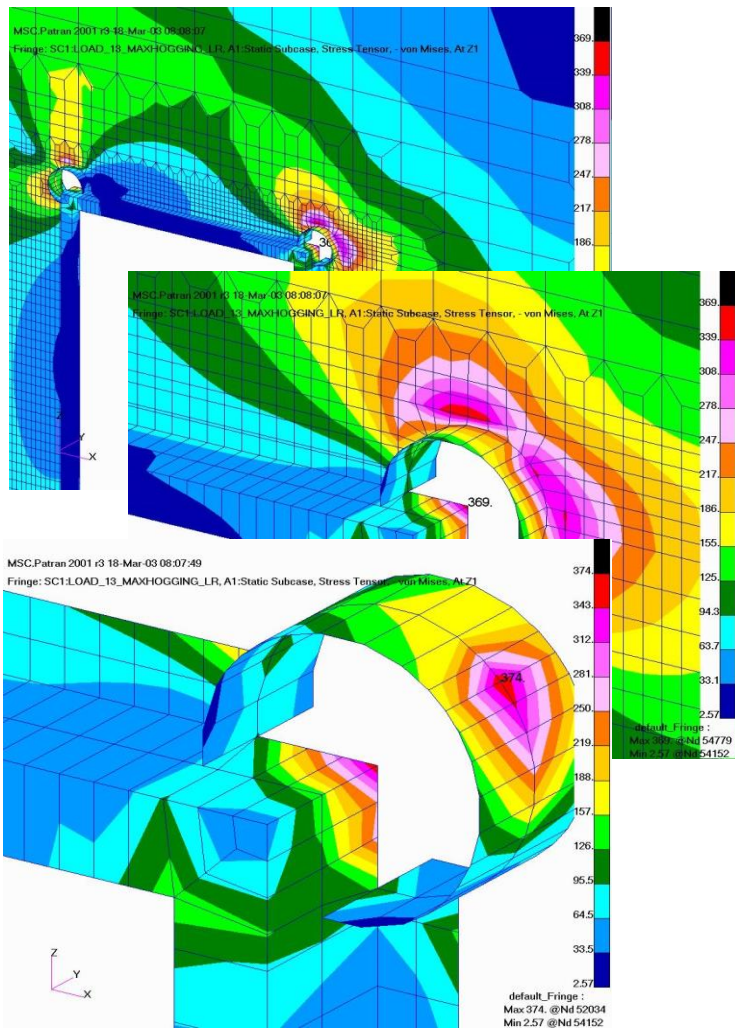
## Result at Shipyard site



# Examples of activities of Hull Department (2/2)

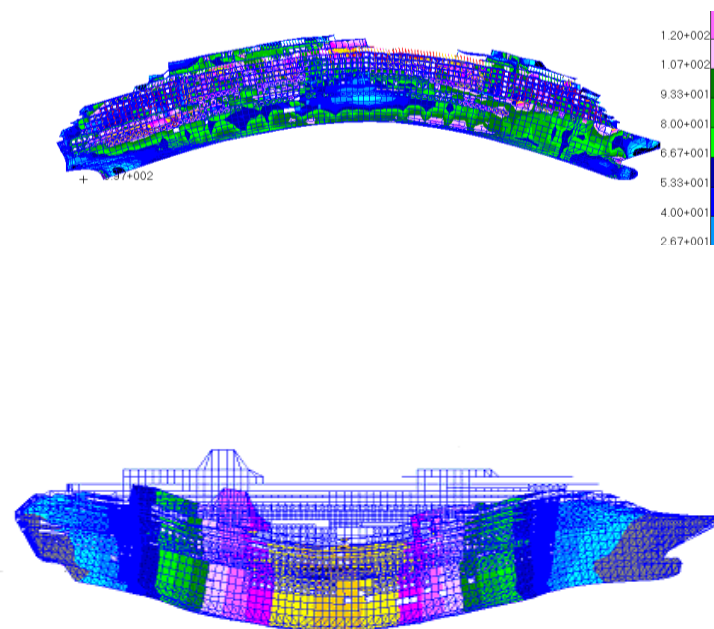
## Local Strength analysis

Example: balcony door frame



## Global Strength analysis

Example: side shell



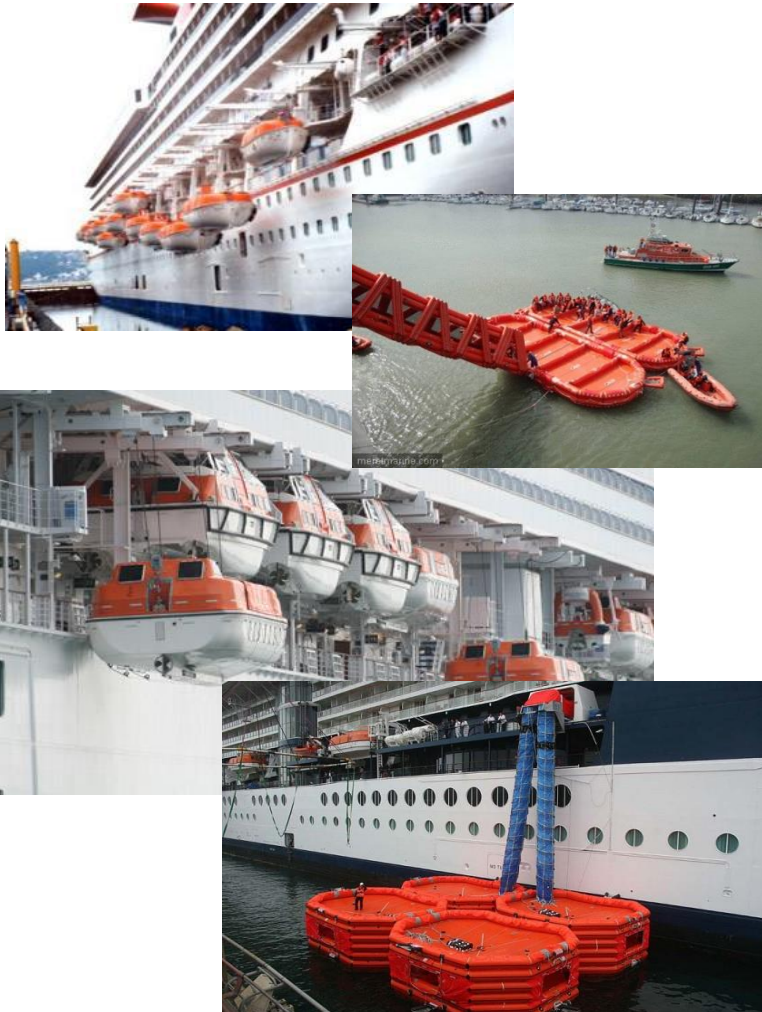


## Design Development Phase

- Mooring Arrangements
- Lifesaving appliances Arrangements and Calculations
- Technical Specification for Main Equipment (side doors, fin stabilizers, thrusters, steering gear, etc.)

# Examples of activities of Marine Systems Department

## Lifesaving Appliances



## Thruster, evacuation platform and sliding covers





## Activities of Accommodation & Public Areas Department

1

### Accommodation Design Development Phase

- Passenger and Crew cabins Layout and Arrangements
  - Catering & Laundry Layout and Arrangements
  - Offices and Stores Layout and Arrangement
  - Energy efficient solutions (e.g. led lights, key-card holder, fan coil, etc.)
  - Technical Specification for Main Equipment
- In-house expertise for the whole life cycle, including design, purchasing, installation, commissioning and delivery

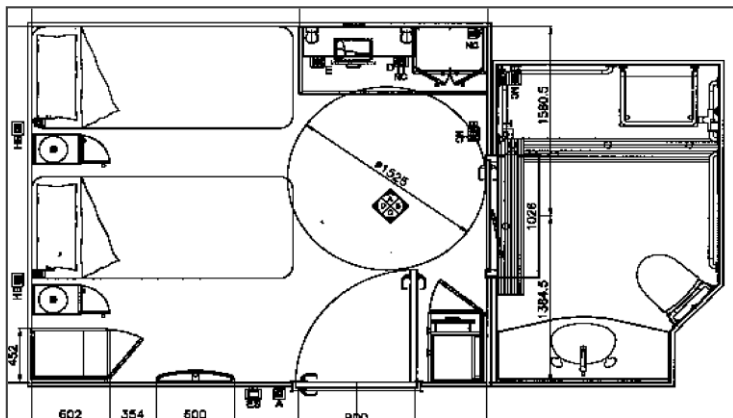
2

### Public Areas Design Development Phase

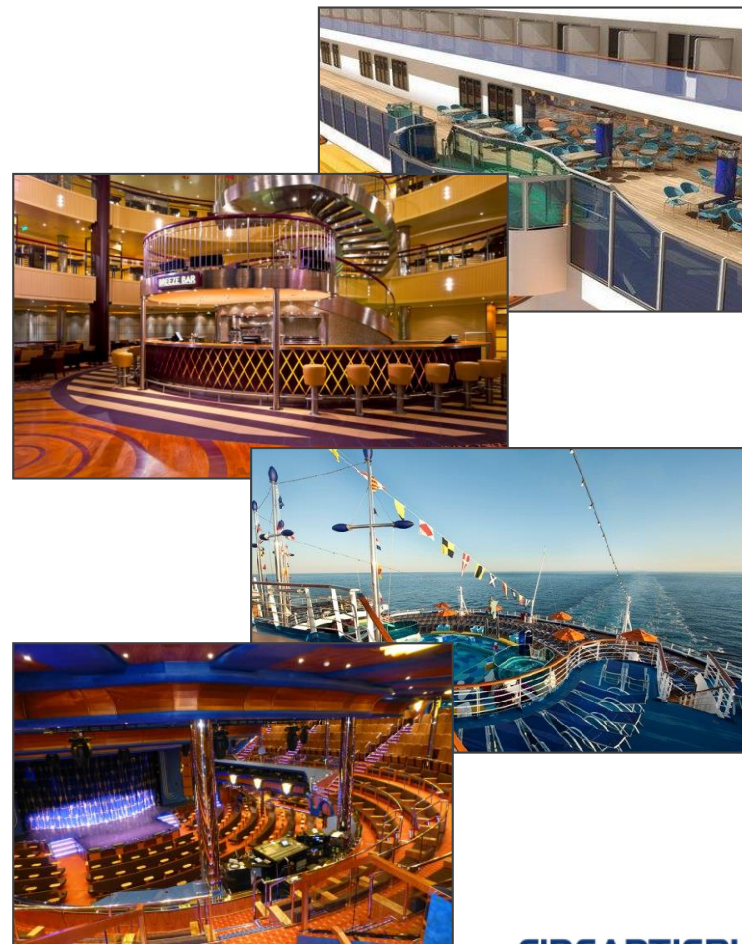
- Concept design, integration design between interior and outfitting
  - Technical Specification for Main Equipment
- In-house expertise for the whole life cycle, including design, purchasing, installation and delivery

# Examples of activities of Accommodation & Public Areas Department

## Accommodation Layout and example



## Public Areas Examples

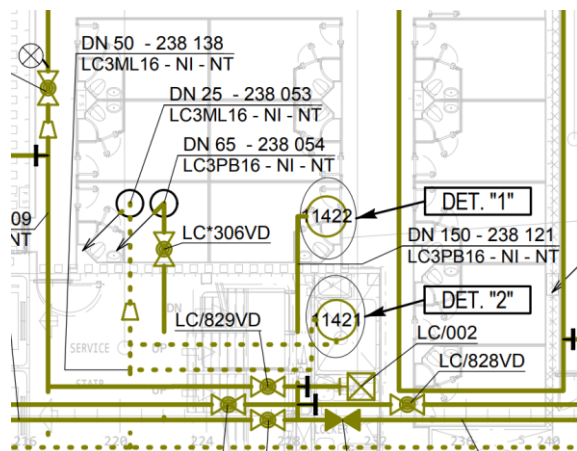
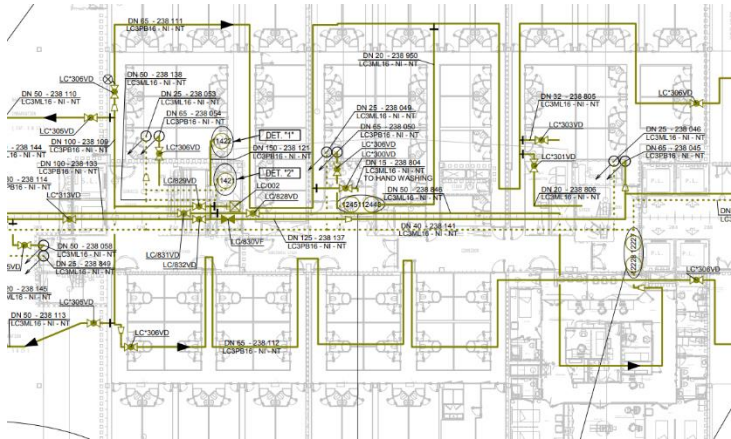


## Design Development Phase

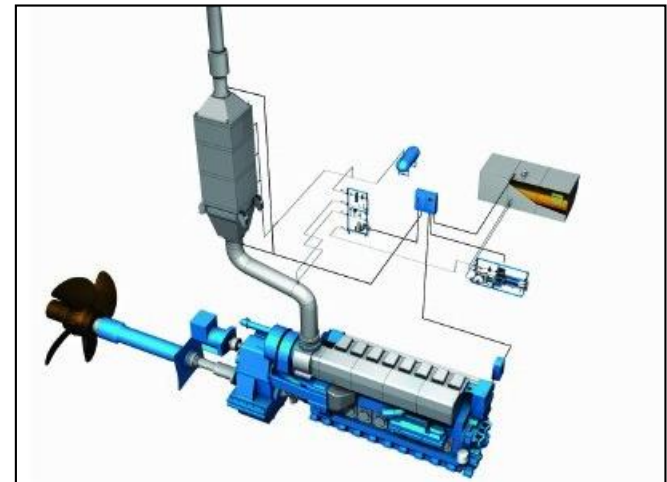
- Engine Room Arrangement
- Thermal Mass Balances
- Energy efficient solutions (e.g. waste heat recovery system, steam turbine, etc.)
- Environmental solutions (e.g. scrubbers, advanced waste water treatment, etc.)
- Process Flow Diagrams and P&ID
- Technical Specification for Main Equipment

# Examples of activities of Machinery Department

## P&ID - components details



## Machinery room example



# F Activities of Electrical Department

1

## Design Development Phase

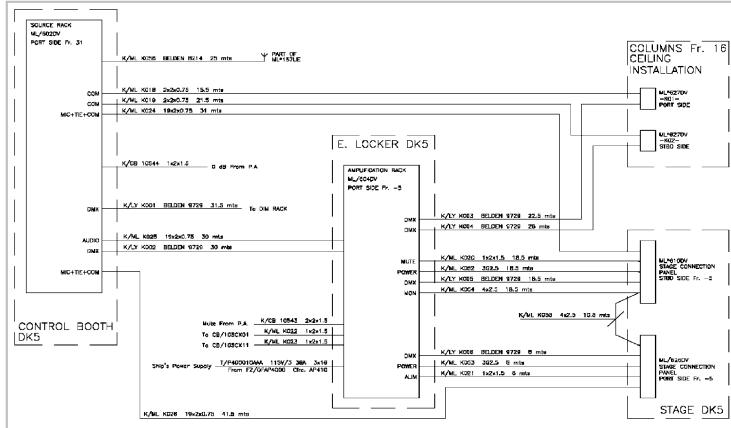
- Power Plant architecture design and arrangement
- Electrical Load Analysis
- Energy efficient solutions (e.g. led light, frequency converters, high efficiency electric motors, etc.)
- Energy Management & Fuel Consumption tool
- Local Entertainment
- Communication, navigation system
- Technical Specification for main equipment



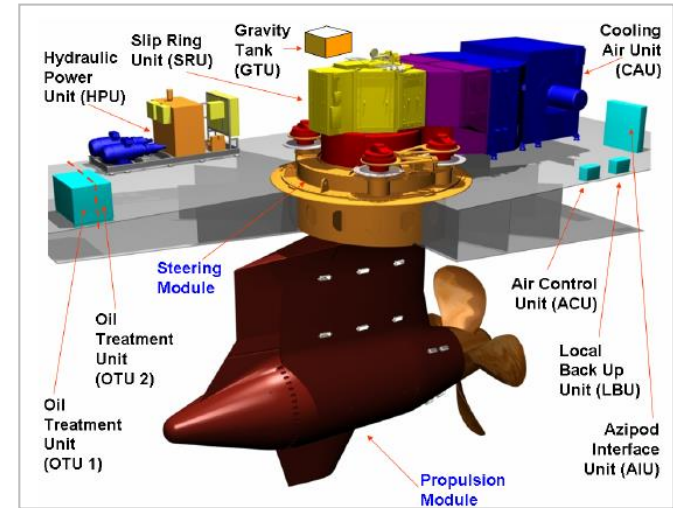


# F Examples of Electrical Department

## One Line Diagram and switchboard



## POD Arrangement



1

## Design Development Phase

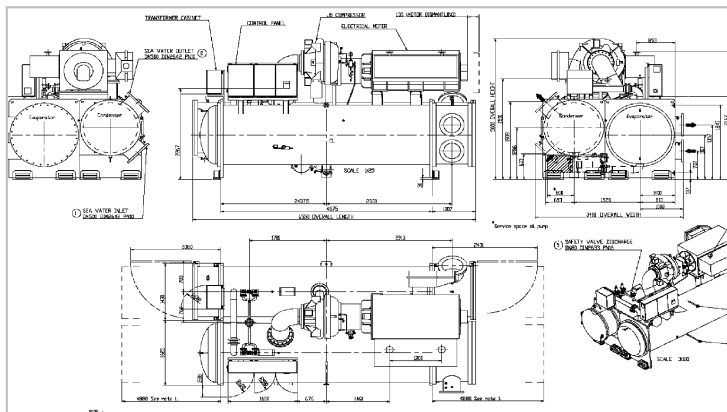
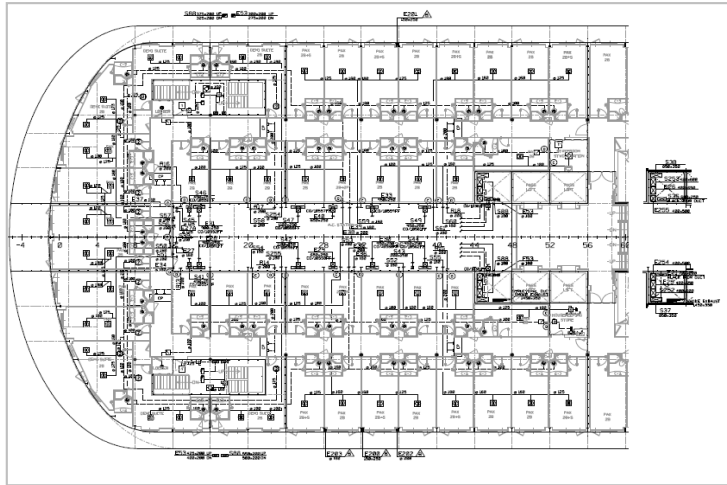
- AC Station Arrangements
- Thermal Calculations
- Process Flow Diagrams and P&ID
- Energy efficient solutions (e.g. fan coil, frequency drivers, ect.)
- Technical Specification for Main Equipments

In-house expertise for the whole life cycle, including design, purchasing, installation, commissioning and delivery



# Examples of activities of HVAC Department

## HVAC One Line Diagram and chillers main dimensions



## Fan coil in-cabin technical space





1

## Design Development Phase

- FEM calculation for noise and vibration prediction
- Insulation plans
- Technical specification for main equipments (noise and vibration parts)
- Test on board

1

## Design Development Phase

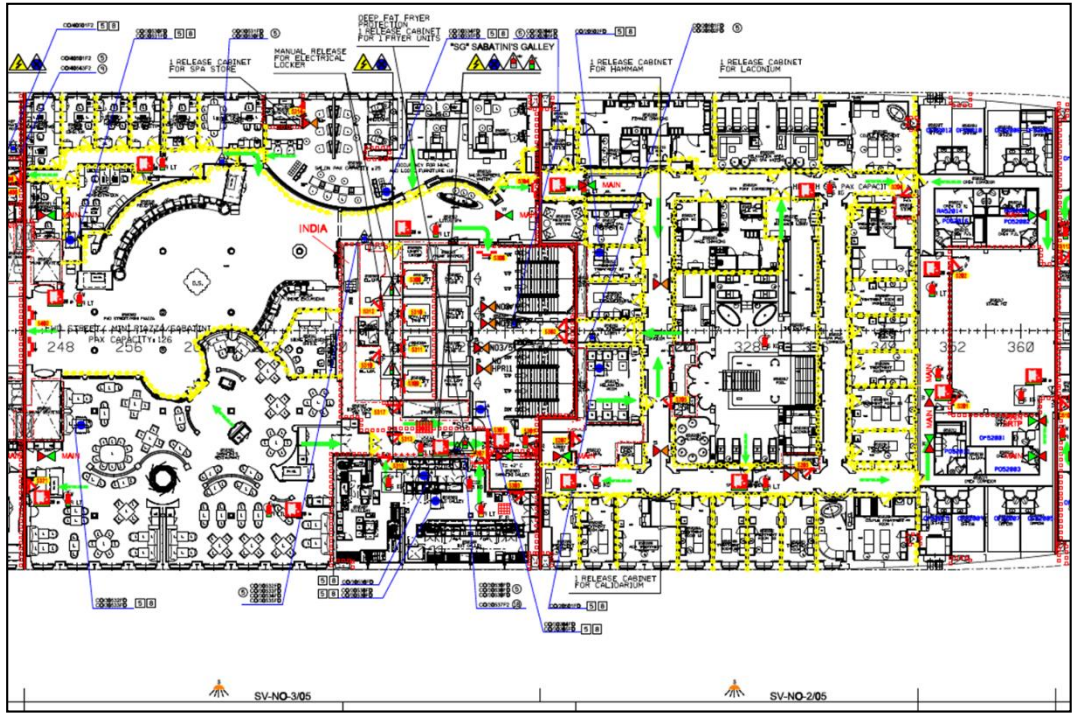
- Compliance with the latest Rules and Regulation
- Safety Plans
- Relation with National and International Authorities
- Alternative Design case studies





# Examples of activities of Safety Department

## Example of Safety Plan



## Legenda

IMO SYMBOLS FOR FIRE CONTROL PLAN		Res. A.952(23)	
	REMOTE CONTROL FOR FIRE DOORS		1- A CLASS HINGED SELF CLOSING FIRE DOOR 2- A CLASS HINGED SLIDING FIRE DOOR 3- A CLASS SELF CLOSING SLIDING FIRE DOOR 4- RELEVANT NUMBERING
	REMOTE CONTROL FOR WATER TIGHT DOORS		1- SPLASH TIGHT DOOR A CLASS 2- WATER TIGHT DOOR A CLASS 3- RELEVANT NUMBERING
	FIRE DAMPER FOR ACCOMMODATION OR MACHINERY SPACES		1- B CLASS HINGED SELF CLOSING FIRE DOOR 2- B CLASS HINGED SLIDING FIRE DOOR 3- B CLASS SELF CLOSING SLIDING FIRE DOOR
	FIRE DAMPER FOR VENTILATION INLET / OUTLET FOR ACCOMMODATION OR MACHINERY SPACES		1- SPLASH TIGHT DOOR B CLASS 2- WATER TIGHT DOOR B CLASS
	LOCAL OR REMOTE CONTROL FOR FIRE DAMPER IN ACCOMMODATION SPACES/MACHINERY SPACES		FIRE HOSE AND NOZZLE WITH FIRE HYDRANT 15 MT MACHINERY AREA 30 MT ACCOMMODATION AREA
	LOCAL OR REMOTE CONTROL FOR CLOSING DEVICE FOR VENTILATION INLET/OUTLET ACCOMMODATION OR MACHINERY		ROLLING SHUTTER
	"A" 30" CLASS DIVISION "A" 30" CLASS DIVISION "A" 15" CLASS DIVISION "A" 0" CLASS DIVISION		REMOTE CONTROL FOR FUEL OIL VALVES
	"B" 15" CLASS DIV. "B" 0" CLASS DIV. (used in Deck)		REMOTE CONTROL FOR LUBE OIL VALVES
	MAIN VERTICAL ZONE		SPACE COVERED WITH WATER MIST SYSTEM
	WATER MIST SKID UNITS		SPACE COVERED BY CO2 SYSTEM
	INTERNATIONAL SHORE CONNECTION		CO2 FIRE EXTINGUISHER - 6 KG
	FIRE BLANKET		FOAM FIRE EXTINGUISHER - 6 LT
	FIRE BLANKET		FOAM FIRE EXTINGUISHER - 6 LT
	FIRE BLANKET		FOAM FIRE EXTINGUISHER - 6 LT
	FOAM BULB SPECIAL PROTECTION - VALVE MAIN - MACHINERY MSE - MACHINERY SPACES INFRANT BOTH EXTERNAL BYPASSANT BOTH INLET / OUTLET		FOAM FIRE EXTINGUISHER - 6 LT
	FOAM BULB SPECIAL PROTECTION - VALVE POAM BULB SPECIAL PROTECTION - UNIT		WATER FIRE EXTINGUISHER - 6 LT
	SPRINKLER - WATER MIST SECTION VALVE		CO2 WHEELED FIRE EXTINGUISHER - 30 KG
	CO2 REMOTE RELEASE STATION		FOAM WHEELED FIRE EXTINGUISHER - 45 LT
	CO2 FORD FIRE-EXTINGUISHING BATTERY		FOAM WHEELED FIRE EXTINGUISHER - 136 LT

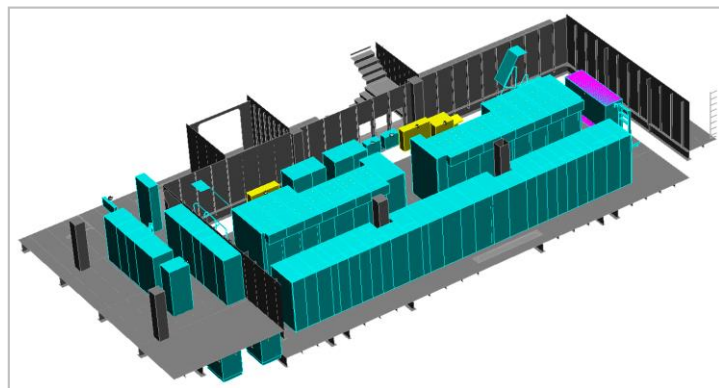
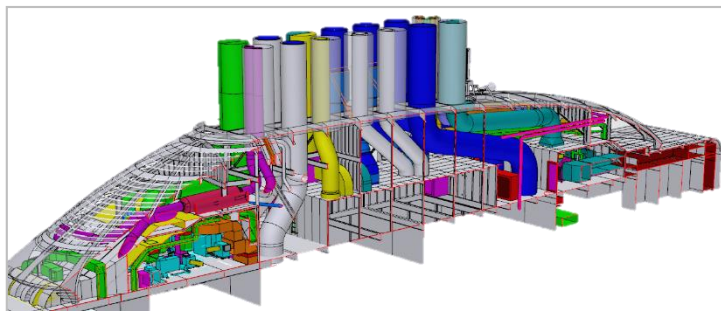
1

## Design Development Phase

- Main routing Piping, Air Ducts, Cable Runs
- Preliminary 3D Plant Integration
- Feasibility studies for cabin plants, funnel
- AC Station Arrangement and Pre-Coordination
- Electrical Stations and Lockers Arrangement

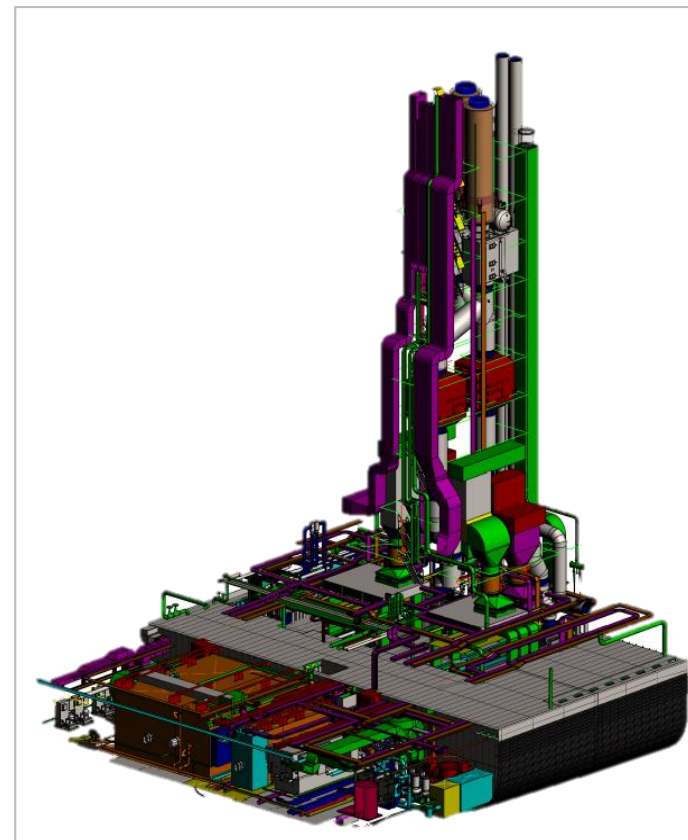
## Main Routing example

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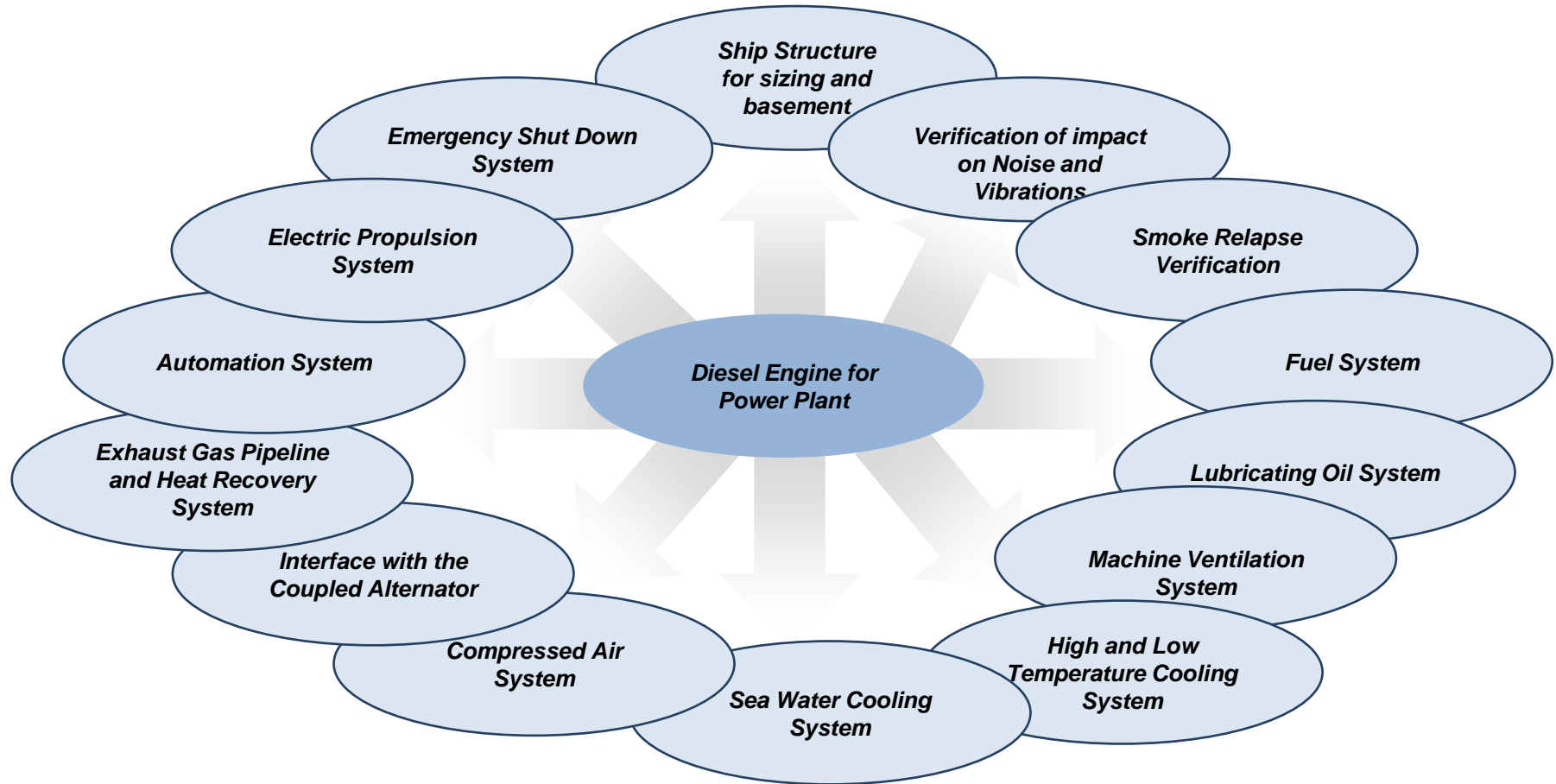


## Pre-coordination

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# Integration Example



# Integration in Functional Design

From a Functional Engineering standpoint, can be identified **four macro cases of integration**:

- **Hull integration** - such as the main machinery and the main plant distribution influences the design of the structure
- **Integration on the Arrangements** of the ship's locals
- **Integration of “usages”**
- **Integration of the different logics**

*Example in next slide*

# Examples of Integration of the Arrangements

4.500 locals per ship

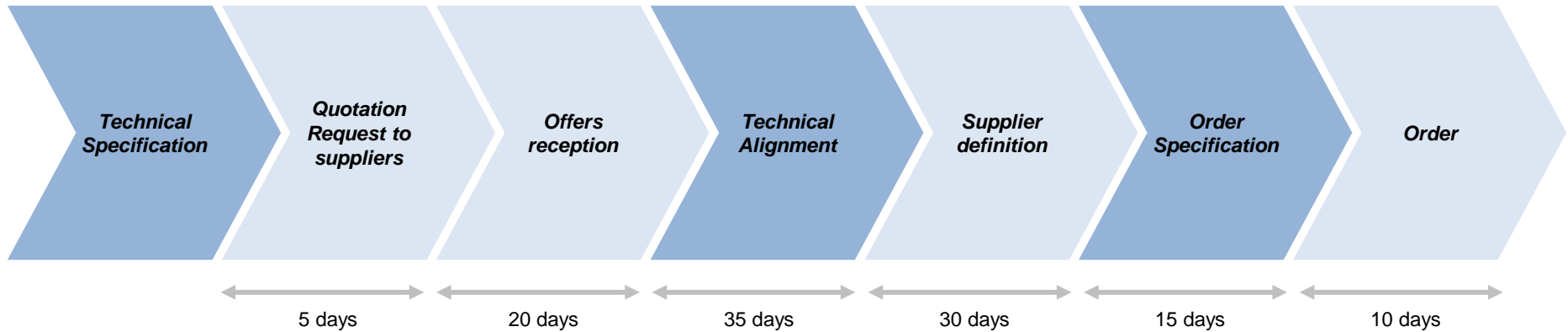
	Local 1	Local 2	Local 3	...	Local n
Equipment A				X	
Equipment B	X				X
Equipment C			X		
...					
Equipment N				X	

9k equipment to be arranged, on a total of 37k per ship





# Standard Procurement Process



## Phase accountability

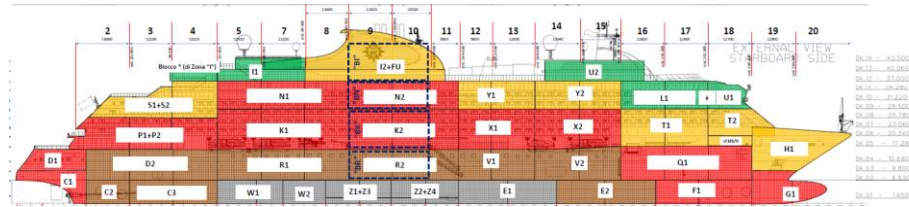
 *Engineering Department*

 *Purchasing Department*



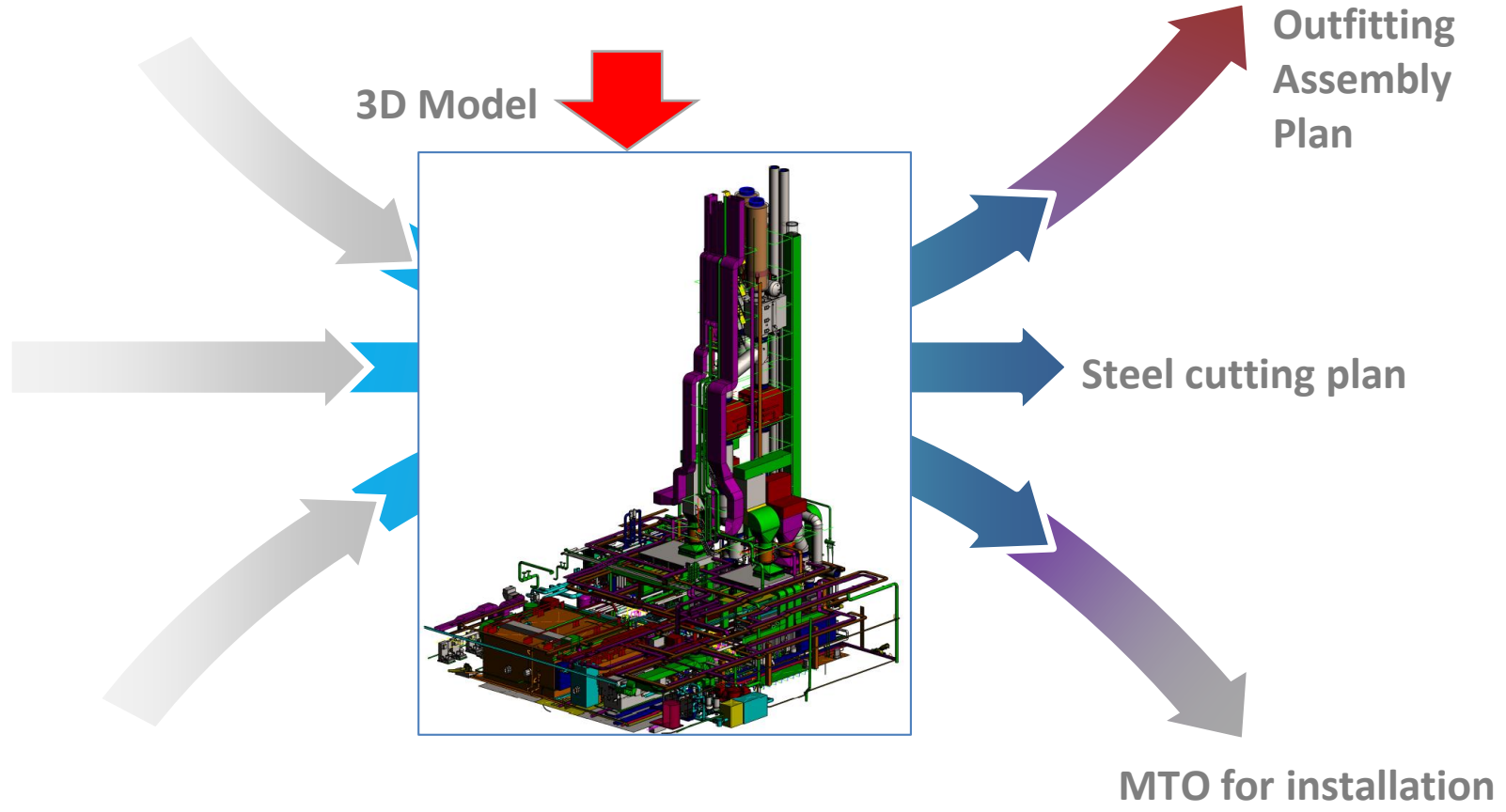
# Detailed Design

# Production Engineering



## Functional input by system

- Bilge system
- Ballast system
- Technical water
- Cold/hot potable water system
- Water mist system
- .....
- Air vent and overflow system



Detail Design output by ship volume

Outfitting Assembly Plan

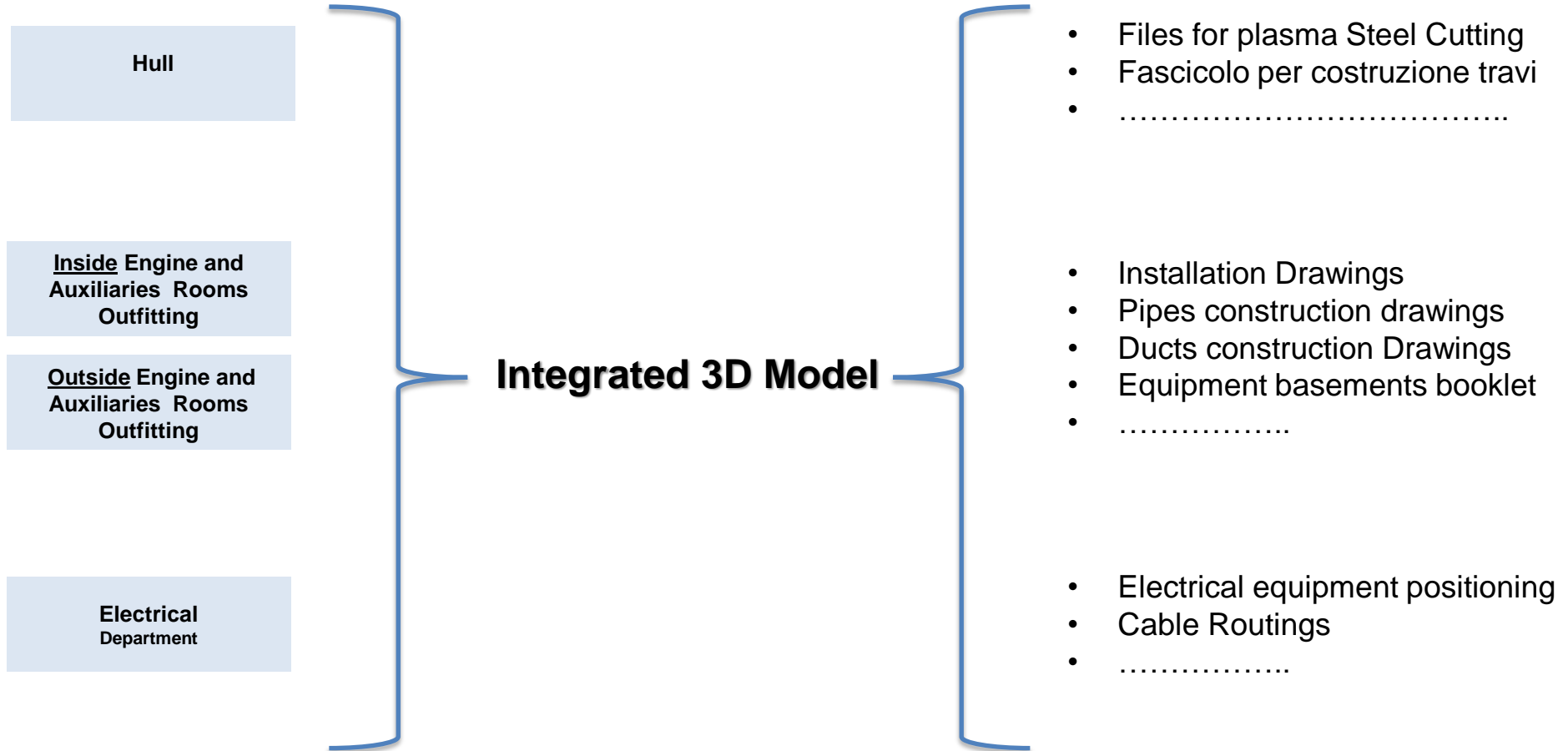
Steel cutting plan

MTO for installation



# Coordination and Detail Design Dept.

## Main Outputs



# Coordination and Detail Design Dept.

## Functional Inputs

## Coordination and Detail Design Department Activities

