



FERNÁNDEZ JOVE

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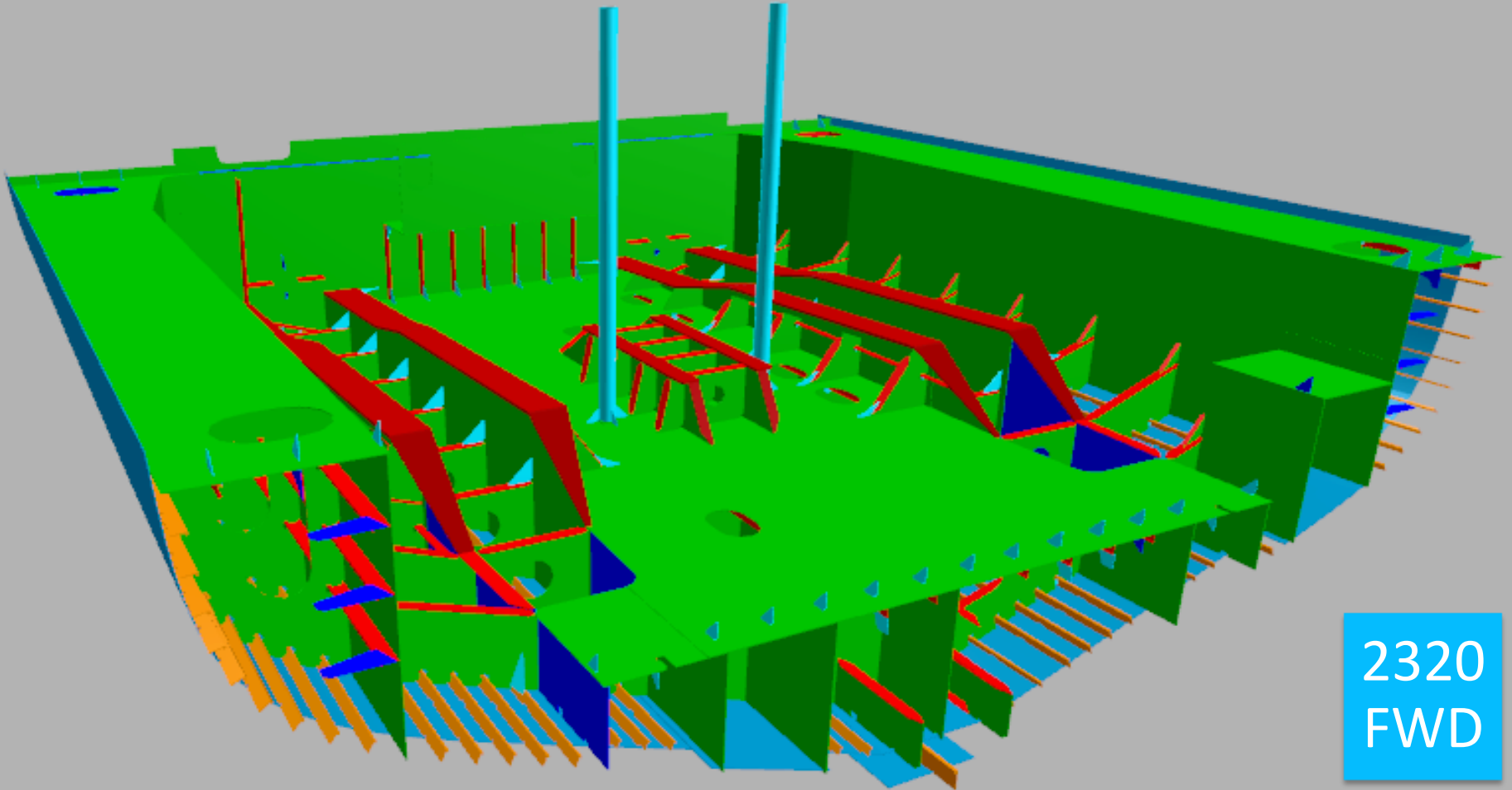
TECHNICAL AND PRACTICAL CONSIDERATIONS IN MACHINERY ROOM DESIGN

MAIN TOPICS

- 1. GENERAL PROBLEM OF MACHINERY ROOM DESIGN**
- 2. FUNCTIONALITY OF MACHINERY ROOMS**
- 3. ORGANIZATION AND BUILDING STRATEGY**
- 4. INTEGRATION DESIGN**
- 5. ORGANIZATION OF SURFACES AND SPACES**
- 6. EQUIPMENT ARRANGEMENT ORGANIZATION**
- 7. PIPING ARRANGEMENT ORGANIZATION**
- 8. PIPING COMPONENTS ARRANGEMENT ORGANIZATION**
- 9. ELECTRICAL COMPONENTS ARRANGEMENT ORGANIZATION**
- 10. VENTILATION DUCTING ARRANGEMENT ORGANIZATION**
- 11. HOW CAN WE HANDLE ALL THIS?**
- 12. THE COMPOSITE DRAWING**

1- GENERAL PROBLEM IN MACHINERY ROOM DESIGN (a)

1. DESIGNER IS FACING THE MACHINERY ROOM EMPTY SPACE LIKE A WRITER THE FIRST PAGE OF HIS BOOK
2. MACHINERY ROOM (MR) IS THE FINGER PRINT OF PLANING, ORGANIZATION AND TECHNICAL SKILLS
3. REDUCED COMPARTMENT WHERE STRUCTURE, EQUIPMENT & OUTFITTING COMPETE FOR SPACE



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1- GENERAL PROBLEM IN MACHINERY ROOM DESIGN (b)

- 1. COMPLETE KNOWLEDGE OF ALL DOMAINS INVOLVED IS REQUIRED**
- 2. DESIGNER NEEDS TO DEVELOP A CLEAR PICTURE OF HOW THE MR SHOULD BE AT THE END**
- 3. DESIGNER SHOULD PLAN WITH VERY DETAIL WHAT TO DO TO REACH HIS OBJECTIVE**



2- FUNCTIONALITY OF MACHINERY ROOMS (a)

- 1. GENERAL FUNCTIONALITY OF MACHINERY ROOM AS A WHOLE IS THE MAIN OBJECTIVE**
- 2. OFF COURSE: SYSTEMS FUNCTIONALITY IS ALSO REQUIRED**
- 3. MACHINERY-OPERATOR INTERFACES SHOULD BE TAKEN INTO ACCOUNT VERY CAREFULLY**



2- FUNCTIONALITY OF MACHINERY ROOMS (b)

1. ACCESS FOR INSPECTION AND PROPER MAINTENANCE IS OF MAXIMUM IMPORTANCE
2. INSTALLATION AND REMOVAL (I&R) OF MAIN EQUIPMENT IS ALSO A KEY FUNCTIONALITY
3. PROPER ORGANIZATION IS ALSO A FUNCTIONAL REQUIREMENT AND A GOAL TO BE REACH



3- MACHINERY ROOM ORGANIZATION AND BUILDING STRATEGY (a)

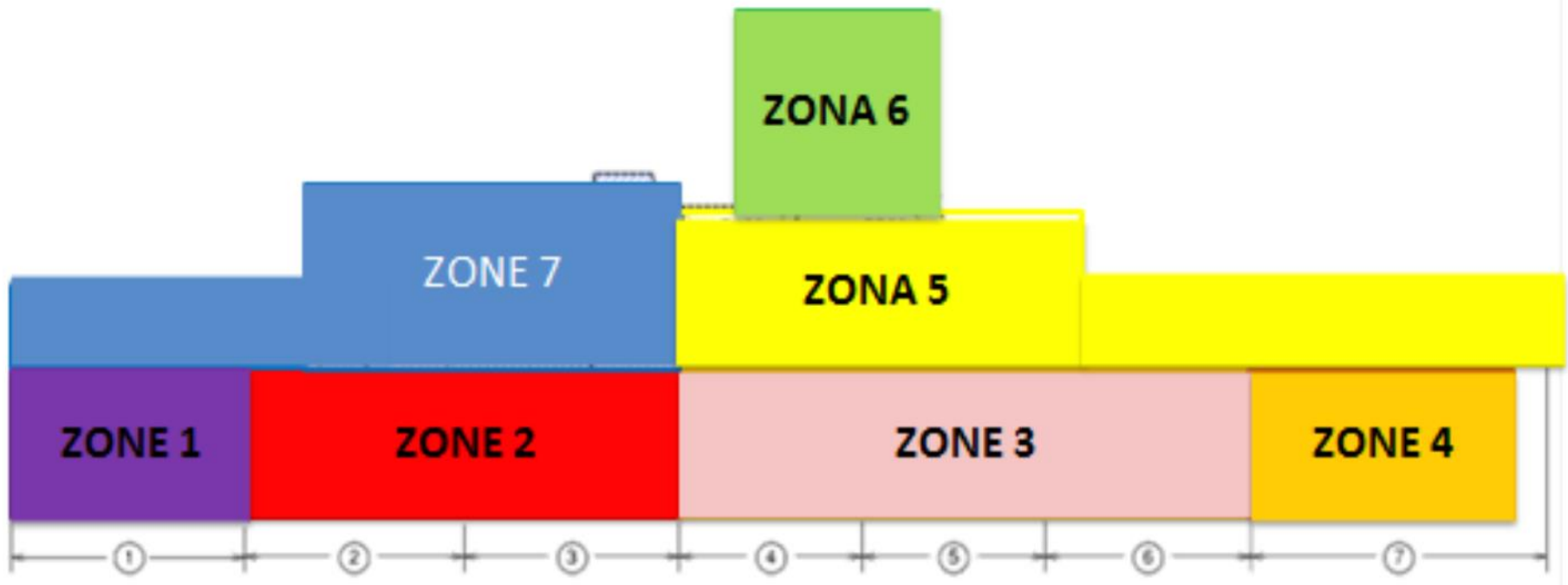
- 1. MR DESIGN SHOULD MATCH WITH BUILDING STRATEGY (BS) OF VESSEL CONSTRUCTION**
- 2. BUILDING STRATEGY ALSO DEPENDS OF HOW MAIN EQUIPMENT SHOULD BE FITTED ON BOARD**
- 3. SELECTION OF MATERIALS AND FABRICATION PROCESSES USUALLY MAKES A BIG IMPACT**



3- MACHINERY ROOM ORGANIZATION AND BUILDING STRATEGY (b)

1. PHYSICAL DISPOSITION OF COMPONENTS DEPENDS ON CONSTRUCTION STAGE FOR FITTING OUT:

- BLOCK STAGE PRE-OUTFITTING (HOT OUTFITTING)
- MEGA BLOCK STAGE PRE-OUTFITTING (ZONE OUT-FITTING)
- GENERAL ASSEMBLY OUT-FITTING
- FINAL OUTFITTING BEFORE COMMISSIONING



4- INTEGRATION DESIGN

- 1. MACHINERY ROOM DESIGN IS A MAIN PART OF DETAIL DESIGN INFORMATION PACKAGE**
- 2. DESIGNER SHOULD WORK USING INFORMATION FROM BASIC DESIGN**
- 3. BUT BASIC DESIGN INFORMATION IS NOT ENOUGH**
- 4. THEN, INTEGRATION (ALSO KNOWN AS TRANSITIONAL) DESIGN IS REQUIRED**

INTEGRATION DESIGN SHOULD BE IN CHARGE OF THE FOLLOWING GOALS:

- FINAL LOCATION OF MAIN EQUIPMENT**
- LOCATION OF MAIN PASSAGE WAYS**
- LOCATION OF MAIN CONTROL ELEMENTS LIKE VALVES AND MANIFOLDS**
- ADJUSTED LOCATION OF MAN HOLES**
- ADJUSTED LOCATION OF TANK PENETRATIONS**
- ORGANIZATION OF VOLUMES AND SURFACES**
- DESIGN OF PENETRATIONS (SIZE AND LOCATION) FOR PIPING AND CABLING**
- ORGANIZATION OF VERTICAL LAYERS FOR RUNNING OF PIPES, CABLE TRAYS AND DUCTING**
- DEFINITION OF STANDARDS OF PIPE AND CABLE TRAYS SUPPORTS.**
- DEFINITION OF DESIGN CONSTRAINTS ACCORDING WITH TECHNICAL SPECIFICATION**

5- ORGANIZATION OF SURFACES AND VOLUMES (a)

- 1. IT IS THE MOST ESSENTIAL TASK FOR PROPER MACHINERY ROOM DESIGN**
- 2. EQUIPMENT AND OUTFITTING COMPONENTS ARE NOT LYING FREELY IN THE OPEN SPACE**
- 3. ALL MACHINERY ROOM COMPONENTS SHOULD BE DEFINED AS RELATED TO A SURFACE**
- 4. THEN: THERE IS A COMPETITION FOR SURFACE SPACE WHILE VOLUME IS CONSUMED**



5- ORGANIZATION OF SURFACES AND VOLUMES (b)

- 1. ALL PIPING, DUCTING AND CABLING SHOULD BE RELATED TO A SURFACE OF REFERENCE**
- 2. SUPPORTS FOR PIPES, DUCTS AND CABLE TRAYS SHOULD ALWAYS BE ATTACHED TO A SURFACE**
- 3. ANY EQUIPMENT REQUIRES ONE OR TWO SURFACES OF REFERENCE**



5- ORGANIZATION OF SURFACES AND VOLUMES (c)

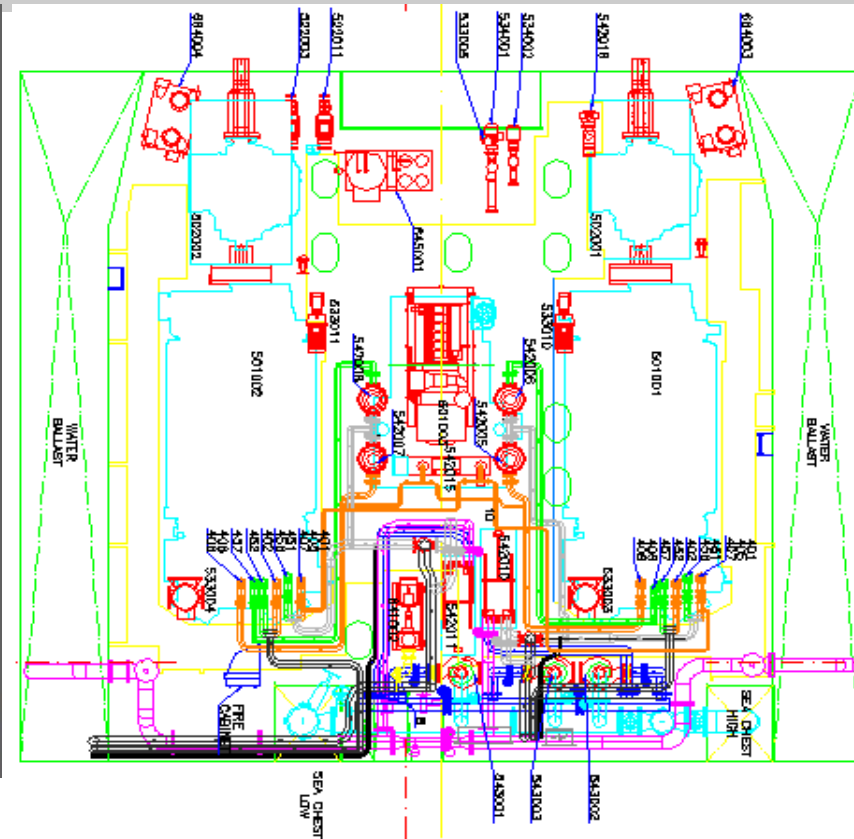
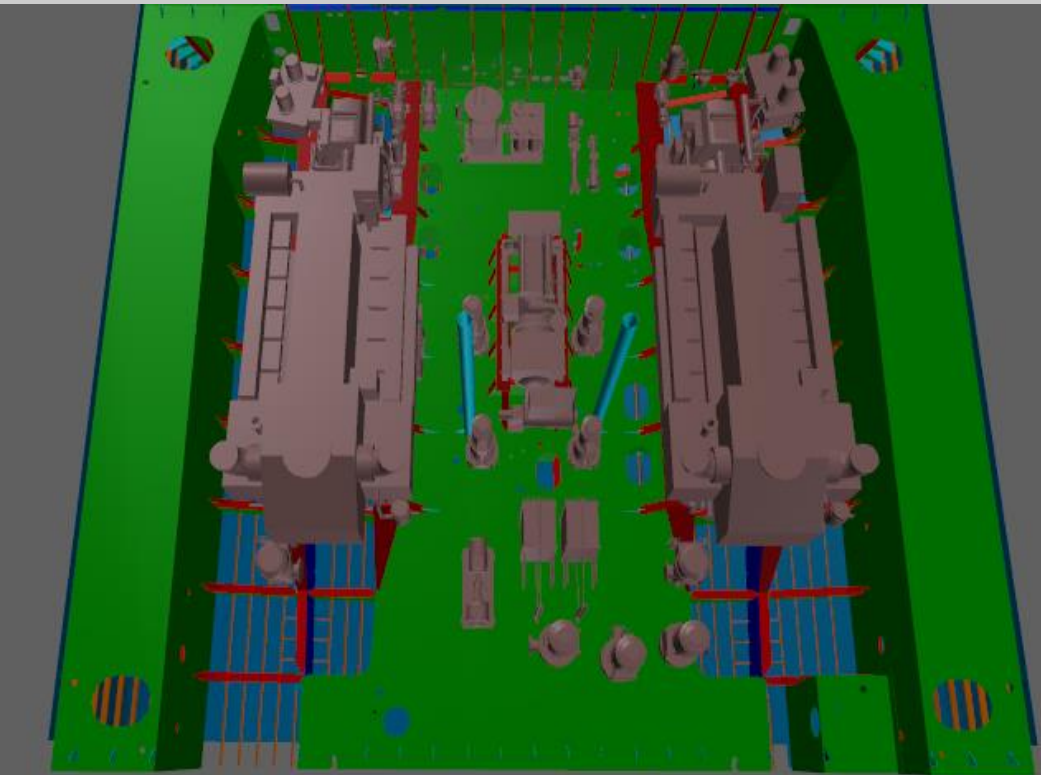
1. A LIST OF VOLUME CONSUMERS IS REQUIRED:

- **MAIN PROPULSION EQUIPMENT AND ITS SPACE FOR I&R AND MAINTENANCE**
- **AUXILIARY MACHINERY AND ITS SPACE FOR I&R AND MAINTENANCE**
- **MANIFOLDS AND ITS SPACE OF OPERATION**
- **TANK INSPECTION MAN HOLES AND ITS TRUNK OF ACCESS**
- **TANK PENETRATIONS AND ITS TRUNK OF MAINTENANCE**
- **VENTILATION DUCTS AND CRITICAL LOUVERS LOCATION**
- **PASSAGE WAYS AND SCAPE WAYS**



6- EQUIPMENT ARRANGEMENT ORGANIZATION (a)

1. CRITICAL ANALYSIS OF PRELIMINARY EQUIPMENT LOCATION IS ALWAYS REQUIRED
2. EQUIPMENT CONNECTIONS ARE VERY CRITICAL AND THE REASON OF MANY PROBLEMS
3. AUXILIARY EQUIPMENT SHOULD BE LOCATED CONSIDERING MAIN EQUIPMENT CONNECTIONS



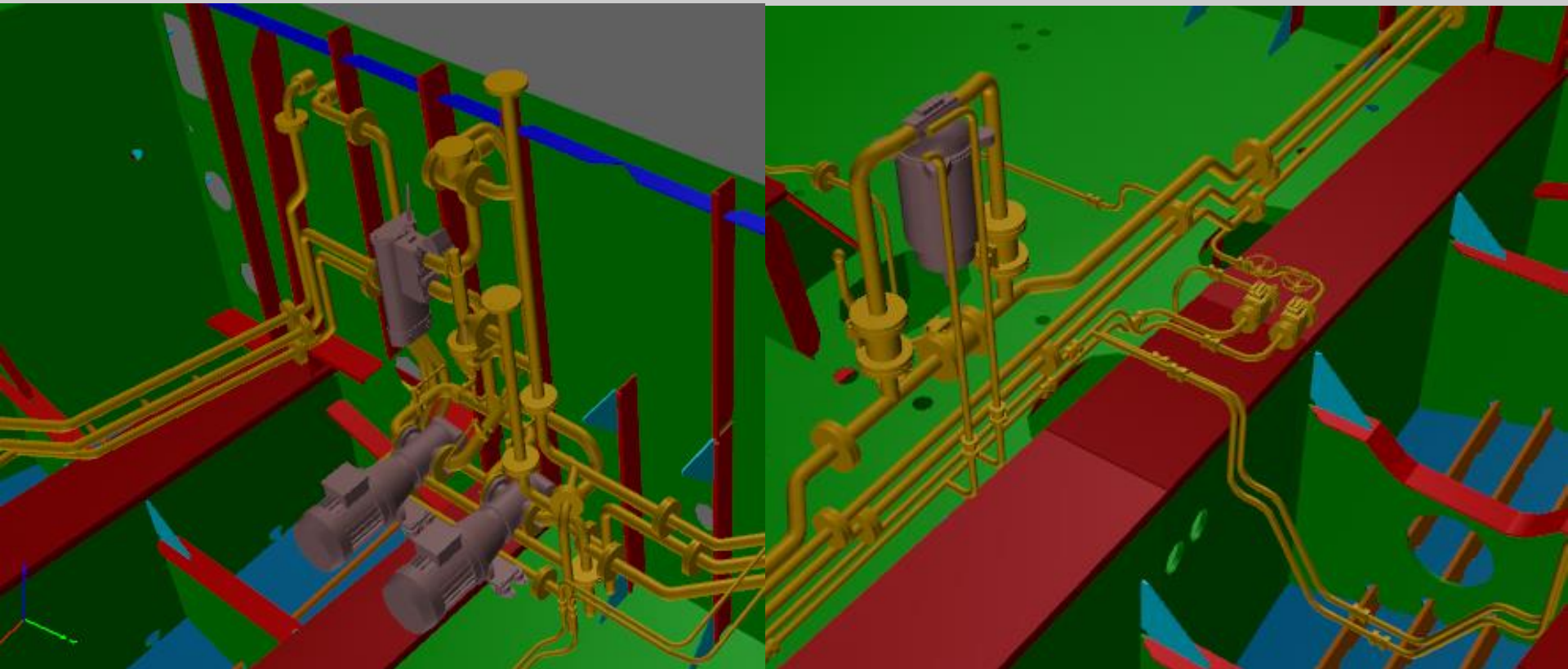
6- EQUIPMENT ARRANGEMENT ORGANIZATION (b)

- 1. EQUIPMENT LOCATION SHOULD BE ALSO RELATED WITH MAIN TANKS AND MAIN VALVES**
- 2. SEVERAL ALTERNATIVES OF EQUIPMENT LOCATION SHOULD BE EVALUATED**
- 3. OPEN MIND TO CHANGE PRELIMINARY EQUIPMENT LOCATION IS REQUIRED**



7- PIPING ARRANGEMENT ORGANIZATION (a)

1. PIPING LAY-OUT SHOULD BE ALWAYS RELATED TO A SURFACE
2. SURFACES COULD BE HORIZONTAL, VERTICAL LONGITUDINAL AND VERTICAL TRANSVERSAL
3. FOR EACH SURFACE, PIPING SHOULD BE ORGANIZED BY LAYERS
4. MAIN PIPES OF BIGGER DIAMETER SHOULD BE ALWAYS AS CLOSE AS POSSIBLE TO THE SURFACE
5. MINOR PIPES SHOULD BE IN THE OUTER LAYERS
6. PIPES WITH VERY SMALL DIAMETER SHOULD BE LOCATED IN CORNER AREAS FOR PROTECTION
7. INSULATION AND CABLE TRAYS SHOULD NOT BE FORGOT (PLEASE)



7- PIPING ARRANGEMENT ORGANIZATION (b)

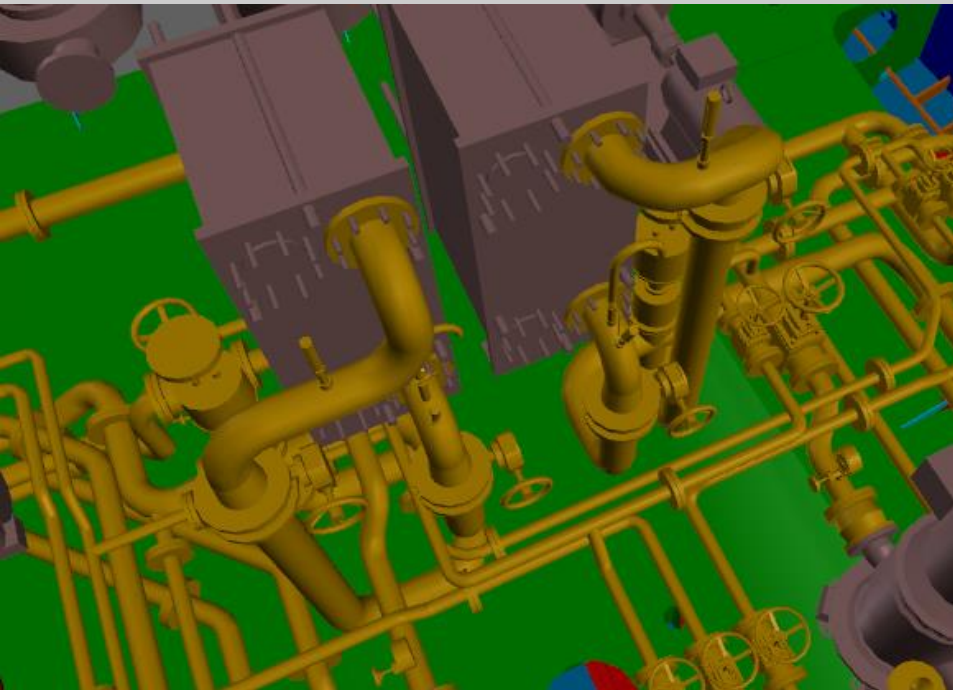
PIPING ORGANIZATION STEPS:

- 1. SELECTION OF THE SURFACE WITH TYPICAL PIPING FOR EACH SURFACE:**
 - **HORIZONTAL BOTTOM:** Ballast and bilge , Cooling sea water
 - **VERTICAL TRANSVERSAL & DECK:** Fire-fighting, Compressed air, Hydraulic oil, B&G water,etc
- 2. DEFINITION OF GROUPS OF PIPING ORGANIZED BY LAYERS WITH STRAIGHT AND PARALLEL RUNS**
- 3. PIPING SUPPORTS SHOULD BE DESIGNED ACCORDING WITH PIPING ORGANIZATION.**



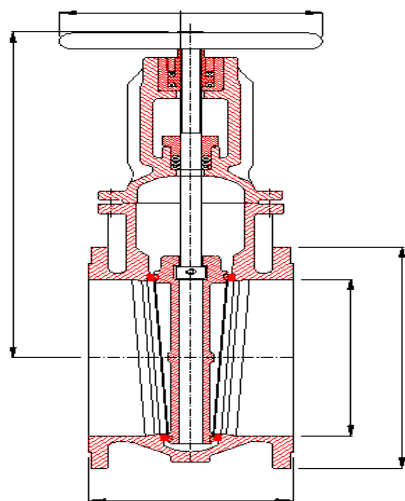
8- PIPING COMPONENTS ARRANGEMENT ORGANIZATION (b)

1. CIRCUIT COMPONENTS SHOULD BE ORGANIZED AFTER EQUIPMENT AND PIPING
2. COMPONENTS LOCATION TO BE ACCORDING WITH MAIN EQUIPMENT AND SYSTEM BIFURCATIONS
3. COMPONENTS TO BE ACCESSIBLE FOR CHECKING AND MAINTENANCE FROM CLOSEST PASSAGE-WAY
4. LOCATION OF VALVES BELOW FLOORS SHOULD BE AVOIDED AS MUCH AS POSSIBLE
5. VALVES AND SENSORS FLANGED TO THE TANK SHOULD HAVE FREE ACCESS FOR MAINTENANCE
6. EQUIPMENT ISOLATION VALVES TO HAVE MAXIMUM PREFERENCE AND LOCATE AS CLOSE AS POSSIBLE
7. MAIN OPERATIONAL VALVES OF CIRCUITS TO BE LOCATED IN RELEVANT POSITION WITH EASY ACCESS



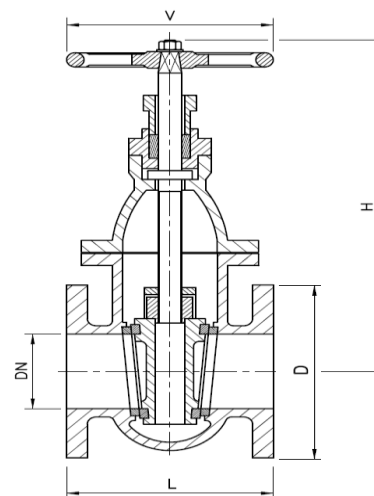
8- PIPING COMPONENTS ARRANGEMENT ORGANIZATION (a)

1. COMPONENTS STANDARDS SHOULD BE SELECTED ACCORDING WITH IMPACT IN VOLUME & WEIGHT
2. DIN STANDARD HAS LESS IMPACT IN VOLUME AND WEIGHT THAN ANSI



DIMENSIONES/DIMENSIONS

DN	L	H	V	Peso(Kg)Weight
50	216	375	178	25
65	241	413	178	36
80	283	483	229	50
100	305	559	254	78
150	403	686	406	147
200	419	908	470	246
250	457	1083	610	400
300	502	1232	610	540



DIMENSIONES/DIMENSIONS

DN	D PN10/ 16	L	V	H	Peso (Kg) Weight
40	150	140	140	220	14
50	165	150	140	236	15
65	185	170	160	275	20
80	200	180	160	300	24
100	220	190	200	367	32
125	250	200	200	422	45
150	285	210	200	445	56
175	315	220	200	525	75
200	340	230	250	614	92
250	395/ 405	250	315	705	150
300	445	270	315	815	214

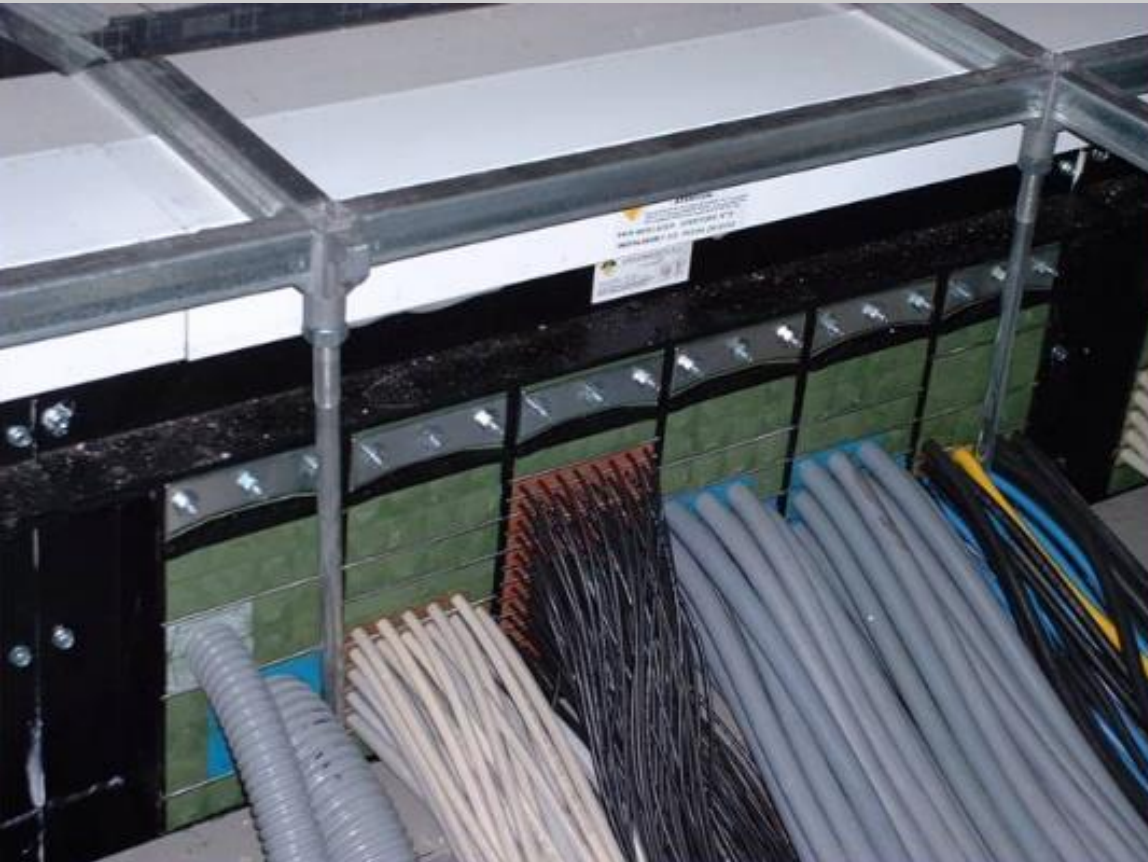
9- ELECTRICAL CABLE TRAYS ARRANGEMENT ORGANIZATION (a)

- 1. ELECTRICAL SWITCHBOARDS SHOULD BE ORGANIZED AS GENERAL EQUIPMENT VOLUME CONSUMER**
- 2. SWITCHBOARD ENVELOPE FOR MAINTENANCE AND OPENING OF THE DOOR SHOULD BE CONSIDERED**
- 3. POSITION OF DOOR HINGES AND ENTRANCE OF CABLES IN SWITCHBOARD SHOULD BE DEFINED AND DRAFTED**
- 4. CABLE TRAYS SHOULD BE LOCATED ALWAYS AS THE CLOSEST ELEMENT TO SURFACE OF REFERENCE**
- 5. NO CABLE TRAYS TO BE LOCATED IN OUTER LAYERS THAN PIPING**
- 6. EXTREME CARE OF INTERFERENCE BETWEEN PIPING FLANGES AND ELECTRICAL EQUIPMENT**



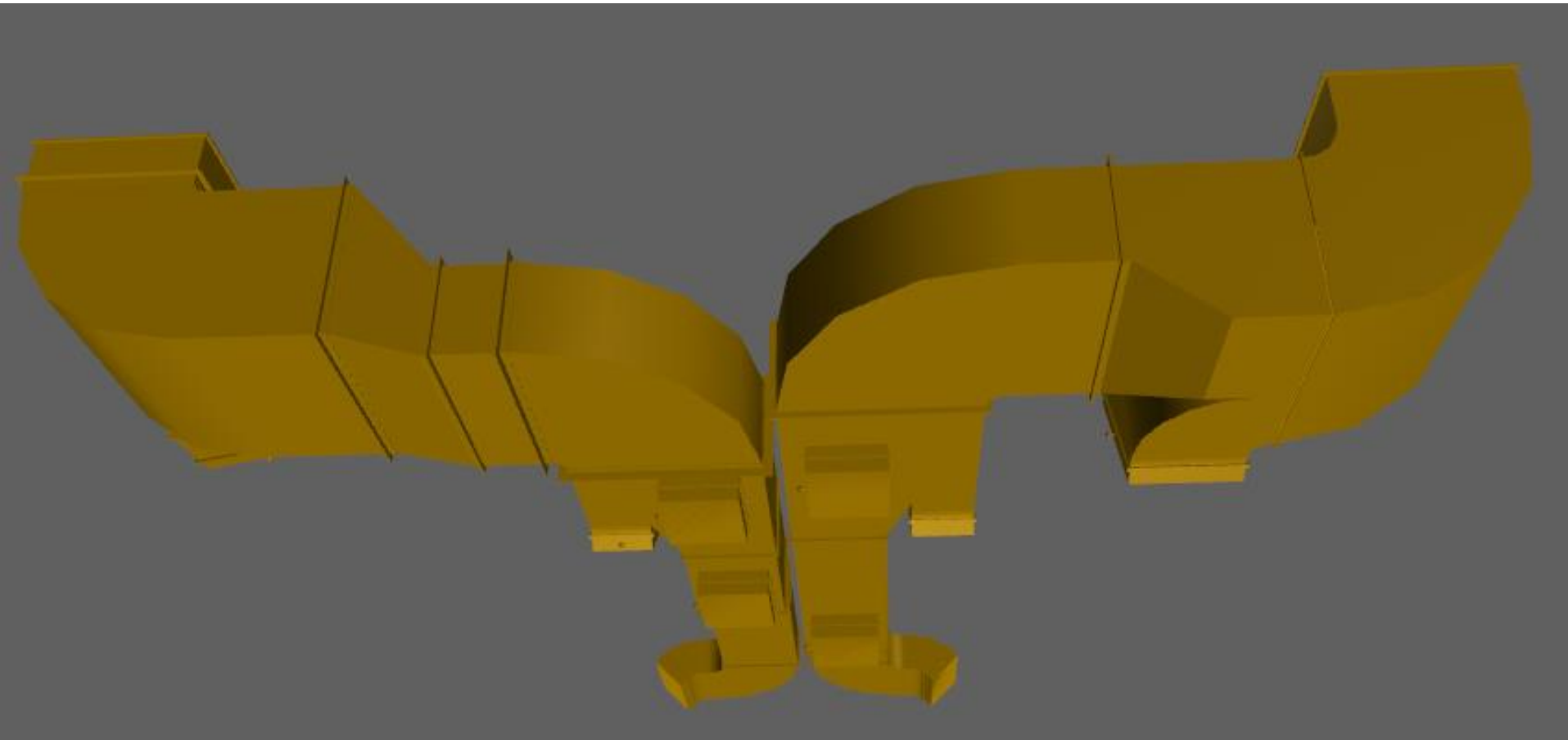
9- ELECTRICAL CABLE TRAYS ARRANGEMENT ORGANIZATION (b)

- 1. CABLE STRUCTURAL PENETRATIONS ARE VERY CRITICAL SPACE CONSUMERS**
- 2. SELECTION OF PROPER STANDARD FOR CABLE PENETRATIONS IS CRITICAL FOR SPACE ORGANIZATION**
- 3. BUILDING STRATEGY, INSTALLATION REQUIREMENTS AND GOOD MAINTENACE ARE ALSO CRITICAL**
- 4. INDIVIDUAL CABLE PENETRATION SYSTEMS FULLY ADAPTABLE ARE THE BEST OPTION**
- 5. NO CABLE TRAYS TO BE LOCATED IN OUTER LAYERS THAN PIPING**



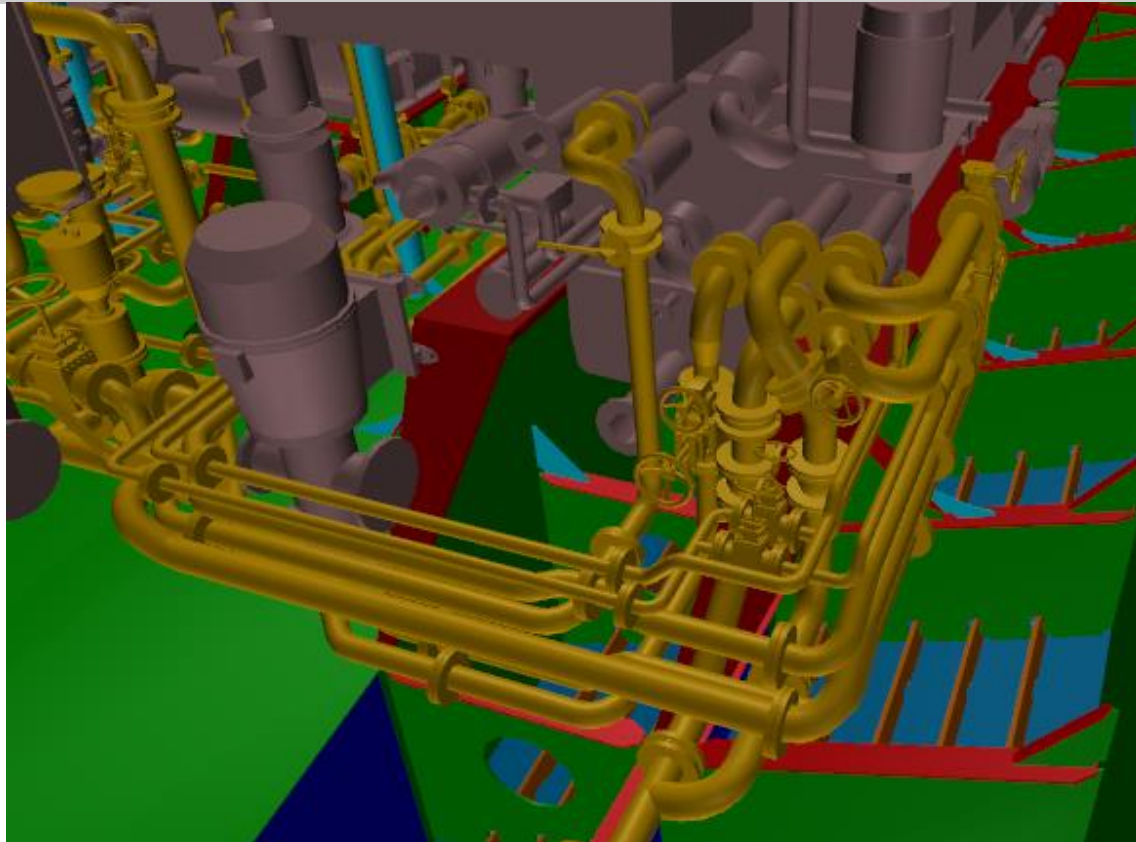
10- VENTILATION DUCTING ARRANGEMENT ORGANIZATION (a)

- 1. MACHINERY ROOM VENTILATION DUCTING IS A BIG CONSUMER OF VOLUME**
- 2. VENTILATION LOUVERS LOCATION ARE CRITICAL FOR MAIN EQUIPMENT (MAXIMUM PREFERENCE)**
- 3. SPACE RESERVATION ON ABOVE DECK SURFACE IS VERY CRITICAL**
- 4. NO PIPE FLANGES SHOULD BE COVERED BY VENTILATION DUCTS**



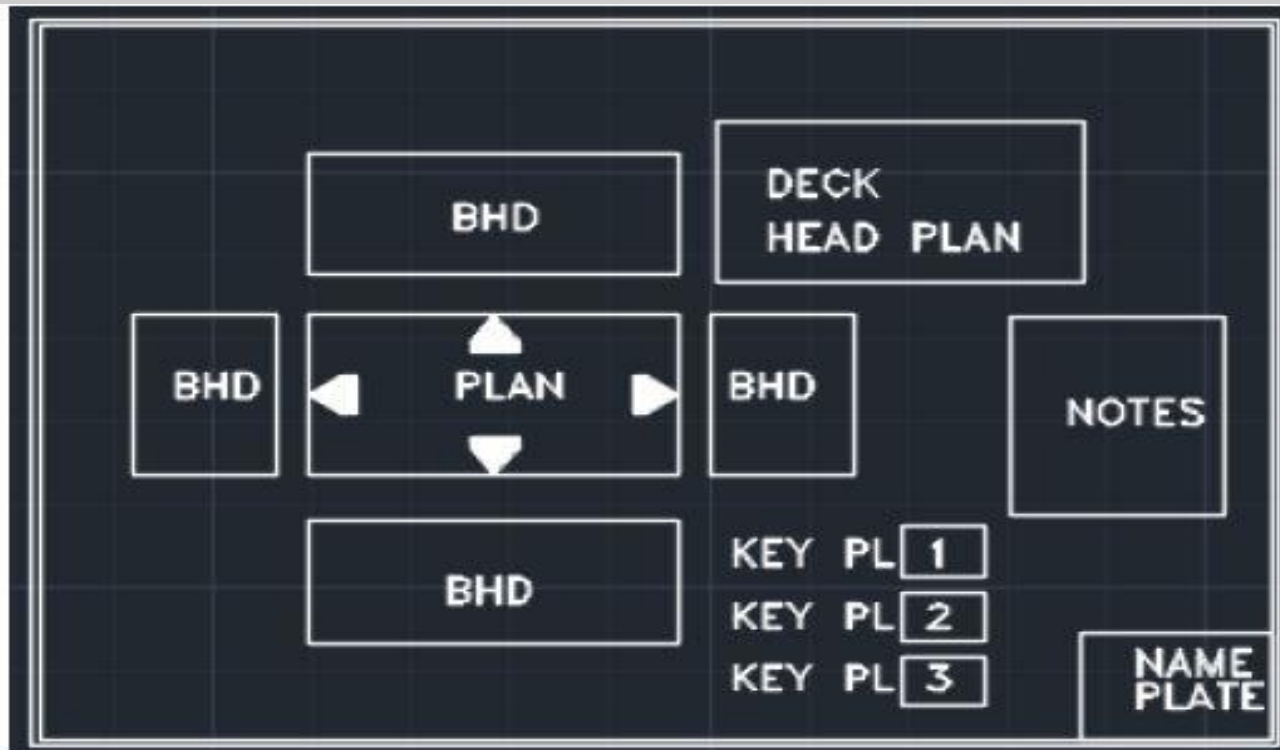
11- HOW CAN WE HANDLE ALL THIS?

1. CRITICAL POINTS: INTEGRATION, COMPATIBILITY AND FUNCTIONALITY
2. THE AMOUNT OF INFORMATION TO BE MANAGED AT THE SAME TIME IS REALLY VERY EXTENSE
3. IT IS EASY TO GET LOST AND FUSTRATED BECAUSE AMOUNT OF INFORMATION AND CONSTREINTS
4. ITERATIVE SPIRAL PROCESS IS REQUIRED
5. IT IS IMPOSIBLE TO FIX A COMPLETE MACHINERY ROOM WITH ONLY ONE TURN OF THE SPIRAL
6. A PROCEDURE FOR HANDLING AND RECORDING THE DESIGN STAGES IS REQUIRED.

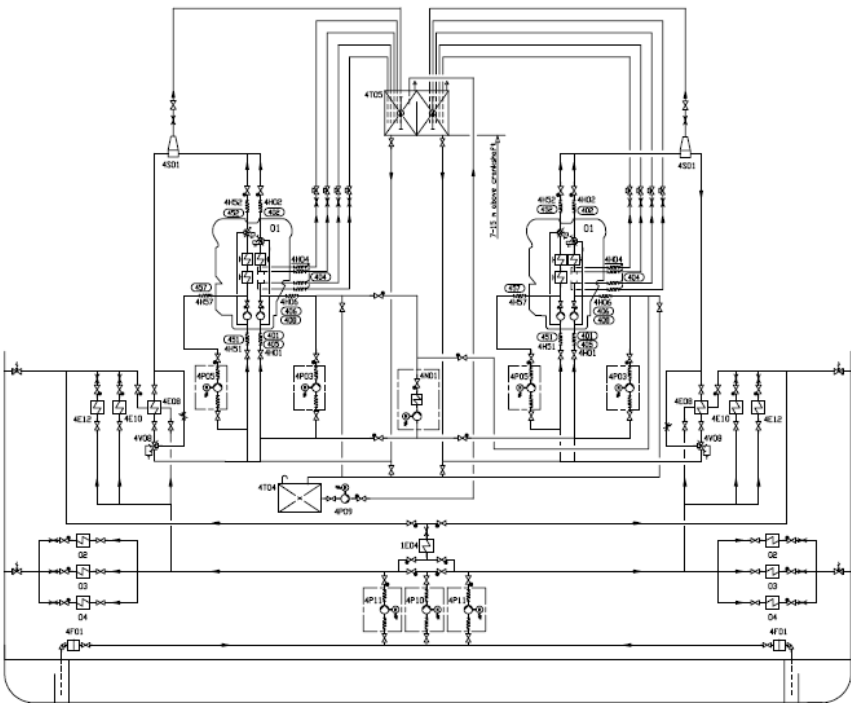
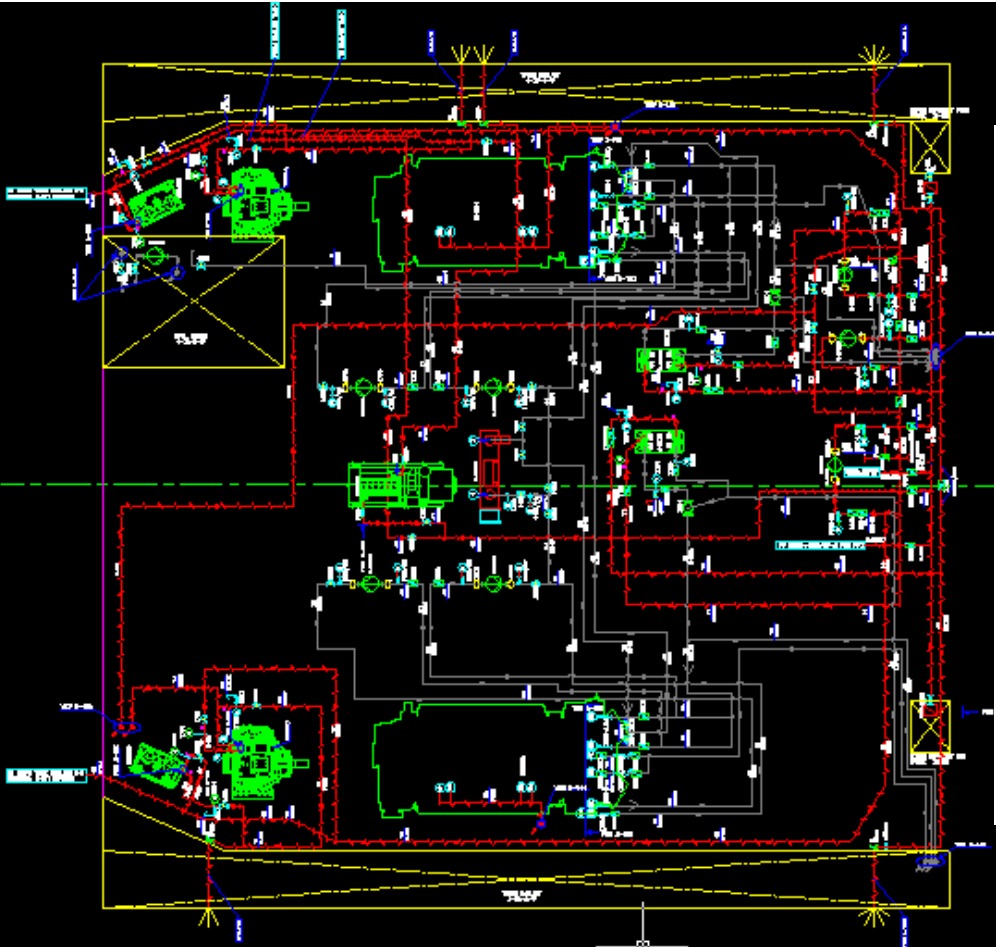


12- THE ANSWER: THE COMPOSITE DRAWING

1. IT IS A NON STANDARD REPRESENTATION OF MACHINERY ROOM VOLUMES AND SURFACE
2. DRAWING DETAILS ARE 2D VIEWS BUT THE LAY-OUT OF ALL OF THEM ALLOWS TO CREATE A 3D IMAGE
3. IT IS FOCUSED IN THE REPRESENTATION OF SURFACES AND BOUNDARIES INSTEAD OF DRAWING VIEW
4. IT SHOULD ALLOW THE COMBINED REPRESENTATION AND INTEGRATION OF STRUCTURAL ELEMENTS, PIPING, DUCTING, CABLE TRAYS, BULKHEAD AND DECK PENETRATIONS, INSULATION AND LINING, ELECTRICAL EQUIPMENT AND FITTINGS, MAINTENANCE TRUNKS.
5. THE PURPOSE OF THE DRAWING IS TO GUIDE THE YARD IN COMPLETING THE COMPARTMENT IN ALL ASPECTS (INTEGRATION, DETAIL DESIGN , INSTALLATION AND FITTING OUT).



12- THE ANSWER: POSITIONAL DRAWING / SCHEMATIC DRAWING



WHAT CAN FERNANDEZ JOVE GROUP DO FOR YOU?



COTECMAR OPV80

PZE 46 ARC “20 de Julio” (2012)
PZE 47 ARC “7 de Agosto” (2014)
PZE 48 ARC “Victoria” (2017)



GRACIAS POR SU ATENCIÓN



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