Co-funded by the
Erasmus+ Programme
of the European Union

Summer school

SUSTAINABLE DEVELOPMENT OF THE YACHTING AND CRUISE INDUSTRY

INFRASTRUCTURE AND SERVICES IN MARINAS - TYPES OF VESSELS AND THEIR SIGNIFICANT CHARACTERISTICS FOR ACCESS TO MARINAS - LOGISTICS SUPPORT IN THE ARRIVAL AND DEPARTURE OF YACHTS

Lecturer: Dr Zoran Kovačević and Dr Maja Škurić

Kotor, 22/7/2022

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Co-funded by the
Erasmus+ Programme
of the European Union

- **TYPES OF MARINAS**

- Marinas are the most represented type of tourist port in the world.
- Their development gave the initial impetus to the development of modern nautical tourism.
- The National Association of Engine and Boat Manufacturers Incorporated of America used the term marina for the first time in 1928.
- One of the shorter definitions of a marina reads: "It is a specialized harbour, or a water area protected from waves for the needs of nautical tourism and recreation".
- The types of marinas can be viewed on different bases: According to the type of construction; According to the position of the water area; According to the level of equipment; By location; According to ownership; By size.

Co-funded by the
Erasmus+ Programme
of the European Union

- **Marinas according to construction type**

- According to construction type, the American, European-Atlantic, and European-Mediterranean types are primary divisions of marinas.

- **American marine type**

- American marinas are mainly characterized by simple (standard), high-quality, and relatively cheap construction, functional arrangement of contents, good equipment, and efficient organization.

- **European - Atlantic type of marina**

- Like most European marinas, they do not have a unique architectural style of construction, but it is determined by the area in which the marina is built, and it can be pyramidal, stepped, high, ambient, etc. The average capacity of these marinas is lower than the American type. We can distinguish subtypes, e.g. the so-called Baltic marinas.

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Co-funded by the
Erasmus+ Programme
of the European Union

- European-Mediterranean type of marina

- Most often they are part of a tourist resort or are connected to it. Due to limited space, they generally do not have a many berths. They are also characterized by relatively small areas on land, with solid, environmentally acceptable construction of infrastructural facilities.

- In Italy, marinas of the Darsena type (surrounded by land on all sides) and so-called marinas have developed due to specific spatial conditions, there are also Canal harbours - port canals at the mouths of rivers and canals.

- Observed **according to the ownership** structure, we most often meet the following types of marinas: Private; Communal; Public; Private-public partnership

Mediterranean type of marina

Marina type Darsena - Italy

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Co-funded by the
Erasmus+ Programme
of the European Union

Open marina type - Marina Kaštela - Split

Semi-retracted marina type - Marina Vrsar - Vrsar

Retracted type of marina - Marina Novigrad

- Marinas according to the position of the water area

- According to the position of the water area about the land environment, the design and construction of the marina are adjusted. There are four basic types of marinas:
    - Open;
    - Semi-retracted;
    - Retracted;
    - Fully retracted.

Fully retracted type of marina – Marina Kremik

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Co-funded by the
Erasmus+ Programme
of the European Union

- Types of marinas **according to the location**: According to their location, there are the following types of marinas**: sea, canal, lake, and river**.

River type marina

- Type of marina **according to the size** - capacity of the water area about the number of moorings (number of vessels that can be accommodated):

  - Small – up to 150 berths;
  - Medium – up to 600 berths;
  - Large - over 600 berths.

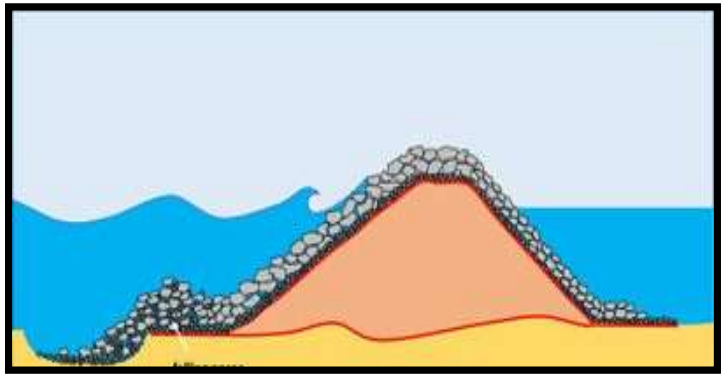
Marina Empuriabrava

- Types of marinas **according to user category**: Commercial; Communal; Sports.

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Co-funded by the
Erasmus+ Programme
of the European Union

- **The main elements of the marina project are related to:**
  - Breakwater;
  - Operational coast and coastal wall;
  - Gat;
  - Berth or mooring;
  - The waterway between the rows of moorings, the turnpike, and the entrance to the marina;
  - Communal infrastructure and superstructure;
  - Landscaping - free areas in the marina.



- When constructing a **breakwater**, it should be taken into account that:
  - Correctly positioned in relation to the direction of sea currents and winds;
  - Strong enough to withstand the force of the waves;
  - High enough to prevent the destructive effect of the waves, but not obstruct the view.

Co-funded by the
Erasmus+ Programme
of the European Union

- There are several ways of building and types of breakwaters

  - Embankments in the form of a triangular rampart;
  - A series of wooden scaffolding;
  - Concrete blocks or crates;
  - Steel columns;
  - Pontoons are built from floating beams or hoses.

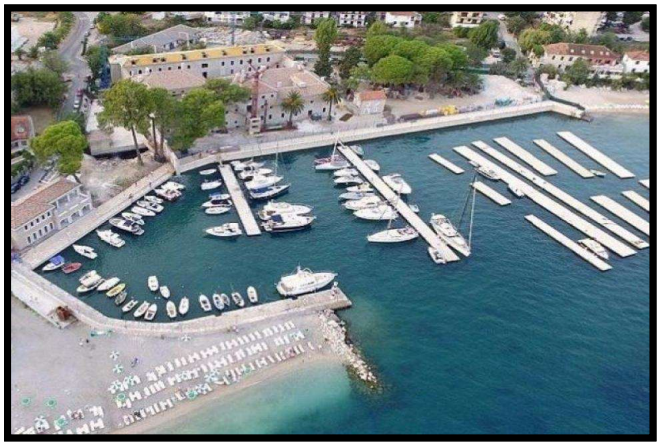
Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

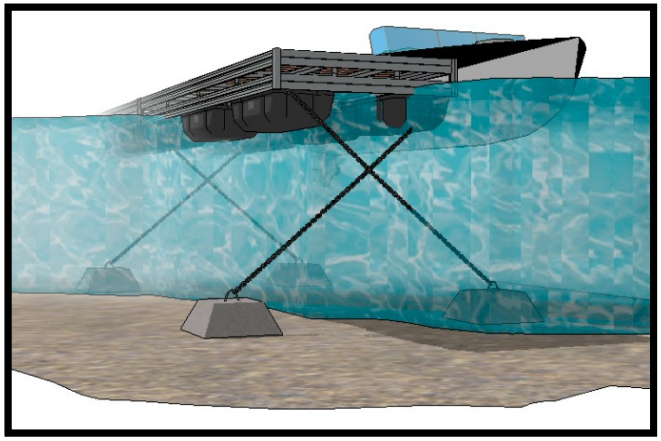
Co-funded by the
Erasmus+ Programme
of the European Union

- **Jetties** can be fixed or floating:

- Fixed jetties are built wherever it is technologically justified, because they are more stable, better withstand the impact of waves, cost less, are cheaper to maintain and are more durable than floating ones.

- Floating piers are usually a combination of several pontoons connected to each other.





Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

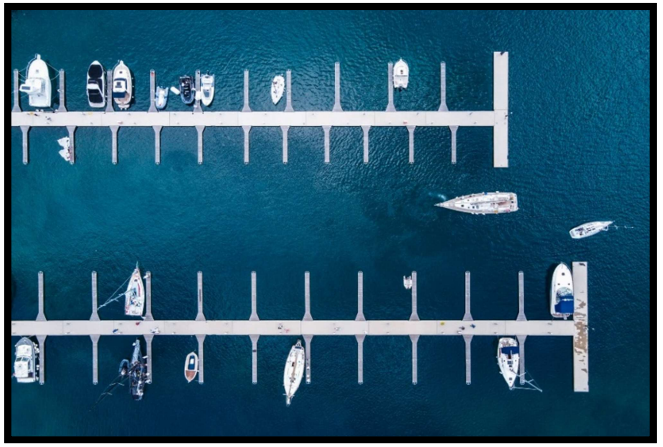
Co-funded by the
Erasmus+ Programme
of the European Union

- **Berth:**

- Mooring in the marina can be in water or on land.

- **Berth in the water:**
  - Moorings for vessels should face the direction of the sea current, not perpendicular to it;
  - Berths closer to the coast, due to their shallower depth, are usually intended for smaller vessels or vessels with a minor draft;
  - Vessels can be accommodated in the marina in the following ways: Tied to the wharf and placed between the piers in the marina dock;
  - Anchored to its own anchor and tied to the pier;
  - Brought to the so-called "colpo morto" (swaying anchor).

- Arranged on land or in a multi-storey warehouse - **dry berth.**



Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

UCG
University of Montenegro

Co-funded by the
Erasmus+ Programme
of the European Union

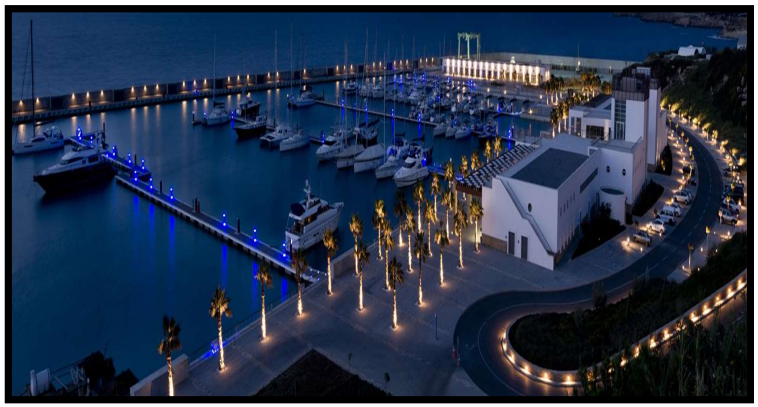
- **Infrastructural equipment of the marina**

- **The water and electrical network** is designed and built following the planned contents of the marina and possible future expansions.

- **Power/water supply pedestal** on the piers ensure vessels supply electricity of the appropriate voltage and freshwater of the specified quality through standard connections.

- **The fire protection equipment** must be in capacity and arranged in such a way as to ensure effective extinguishing and prevention of the spread of fire from vessel to vessel.

- **The lighting** of jetties and other parts of the marina must be arranged in such a way as to ensure normal functioning and safety in periods of reduced visibility, without interfering with a comfortable stay on the vessels.



Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Co-funded by the Erasmus+ Programme of the European Union

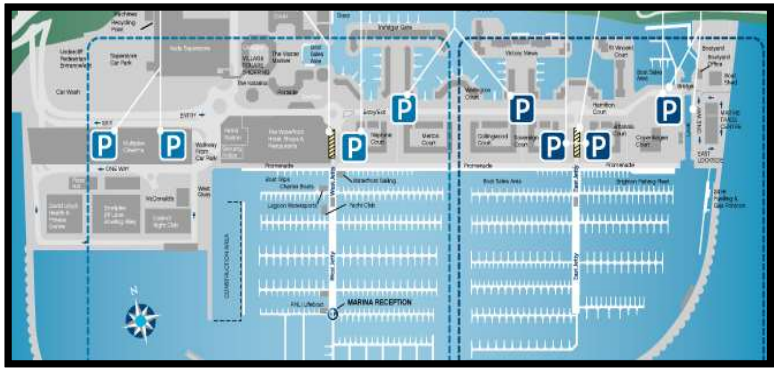
The sewage infrastructure in the marina is designed and built by its planned contents to ensure the drainage of wastewater to the appropriate systems for its purification in the marina or outside it. The method of sewage pipes is also installed on piers to fix "pump-out" devices.

Petrol stations - for supplying vessels with fuel, must be located in such a way as to provide comfortable access, safe mooring, and filling of fuel. Access roads to the station should provide access for vehicles with fuel. The equipment should be by fire protection standards and environmental protection standards for this type of facility.

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Co-funded by the
Erasmus+ Programme
of the European Union

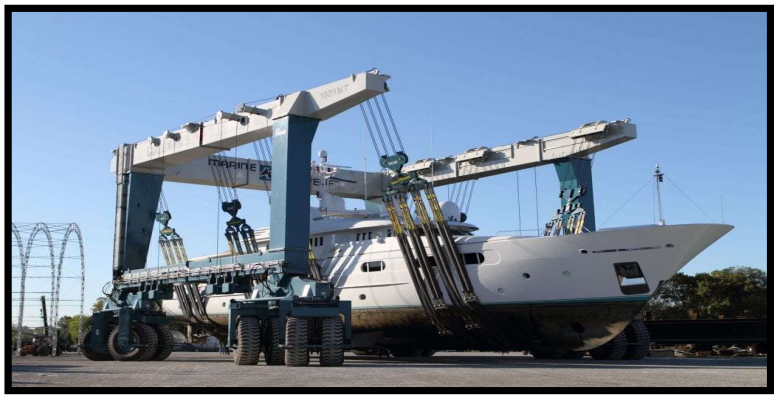
- **Parking** - the maximum distance of the parking lot from the moorings should not be more than 180m. If this is not possible, it is necessary to provide a space for disembarking passengers and equipment near the berths.
- In practice, one parking space is often planned per berth.
- Access roads and entrances should be average between 7.5 and 9 meters wide.



- **Equipment for moving vessels in the marina**

- In marinas where there are capacities for accommodation and maintenance of vessels on land, it is necessary to acquire and install equipment for lifting/lowering vessels from and into the water and moving vessels on land.

- Vessel moving equipment can be mobile or fixed.



Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

UCG
University of Montenegro

Co-funded by the
Erasmus+ Programme
of the European Union

Services in marinas:

- wet slip,
- dry berth (on land),
- supply of electricity and water to the berths, (in water and on dry land),
- cranes, travel-lift, etc.,
- forklift rental,
- underwater washing of vessels,
- vessel towing,
- towing vessels by land,
- service: ship, engine, assembly and disassembly of masts, etc.,
- divers-service for underwater works,
- sailors,
- washing and cleaning of vessels,
- supply of vessels with fuel and lubricants,
- vessel insurance,

- sales of used vessels,
- internet (and other communications, telephone, fax, etc.),
- toilet with showers,
- laundry room,
- transfer,
- hospitality (restaurants, cafes, pastry shops, etc.),
- accommodation (in basic and complementary capacities),
- commercial (food, boat equipment, consumer goods, etc.),
- sale of new vessels and propulsion devices,
- medical clinics,
- sports fields,
- swimming pools,
- beaches and beach furniture,
- children's playgrounds and children's animation,
- wellness,
- sailing, diving, etc. schools,
- agency (travel tickets, organization of excursions, etc.),
- charter vessels, etc.

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Co-funded by the
Erasmus+ Programme
of the European Union

- **RECREATIONAL VESSELS**

- Pleasure boats are conceptually based on the human need to experience sailing for recreational purposes and to realize pleasure during that activity.

- Historically speaking, the first step in producing specialized vessels exclusively for these purposes can relate to the appearance of yachts in the Netherlands in the 16th/17th century.

- **The term jaght (YACHT)** is of Dutch origin, it can be translated as hunting. Originally, it was used to describe the fast and light sailing ships that the Dutch Navy, at the time, used to hunt and chase pirate and other smugglers' ships.

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

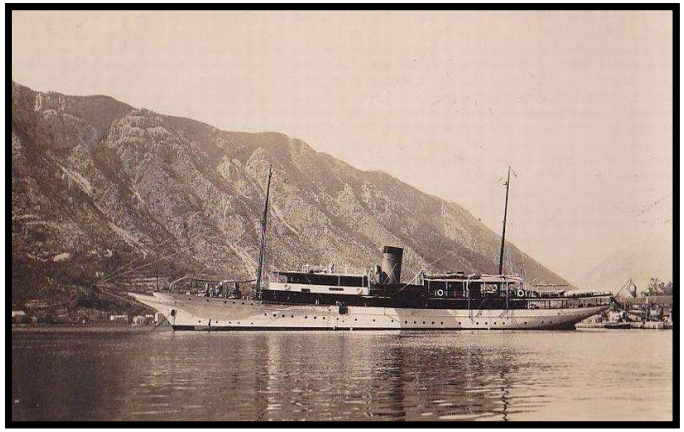
Co-funded by the
Erasmus+ Programme
of the European Union

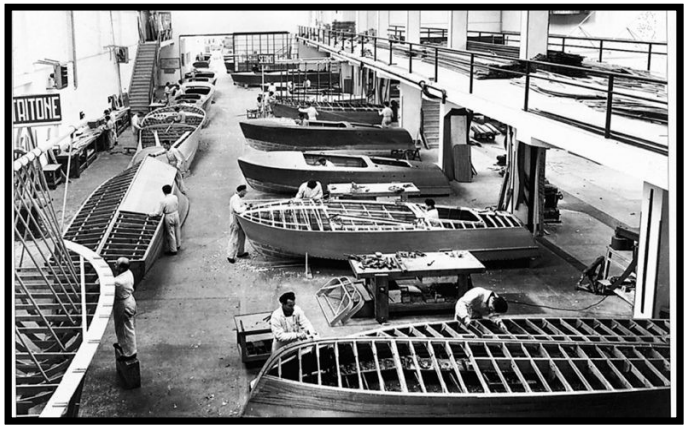
- A new era in the production of ships, including those intended for leisure, was initiated by the invention and application of steam propulsion devices.

- It will be recorded in the history of Montenegrin yachting that the first luxury yacht in this area was Rumija, which was owned by King Nikola.

- The history of serial production of vessels intended for sports and leisure can be shown through a retrospective of the development of one of the globally most famous brands in this industry, Riva-Ferretti.

- Pietro Riva, considered the brand's founder, established the production basis in 1842 as a good boat repairman, which his descendants later continued.





Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

UCG
University of Montenegro

Co-funded by the
Erasmus+ Programme
of the European Union

- **Mass serial production of vessels** intended for sport and leisure leads to the establishment of modern shipyards, which in their organizational content have implemented all the elements necessary to properly respond to the demands of the market in conditions of global competition.

- **The organization of serial production** of yachts in modern conditions includes fully computerized management systems, which integrate all parts of the process: design, production, procurement, warehouses, maintenance, administration, accounting, sales, distribution, guarantees, etc.

- In the modern shipbuilding industry, yacht production is used for the serial output of smaller yachts, while yacht construction is used for making individual projects of large yachts..

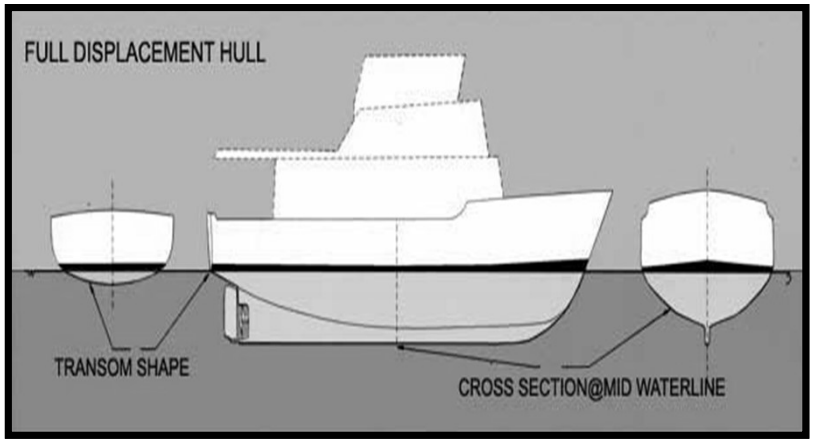
Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Co-funded by the
Erasmus+ Programme
of the European Union

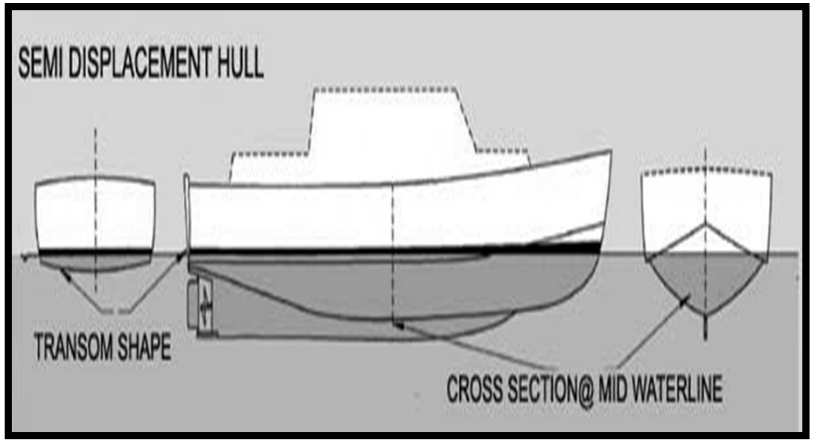
- **SHAPE OF THE HULL OF THE VESSEL**

- There are **four basic types** of vessel hulls:

1. **Full Displacement Hull** - Displacement hull is used in large cruise ships, sailboats, etc. The disadvantage of ships with this hull shape is relatively limited speed. Because of the hull trim, side stabilizers are often installed to reduce sway. The advantage of these vessels is the extra space inside.

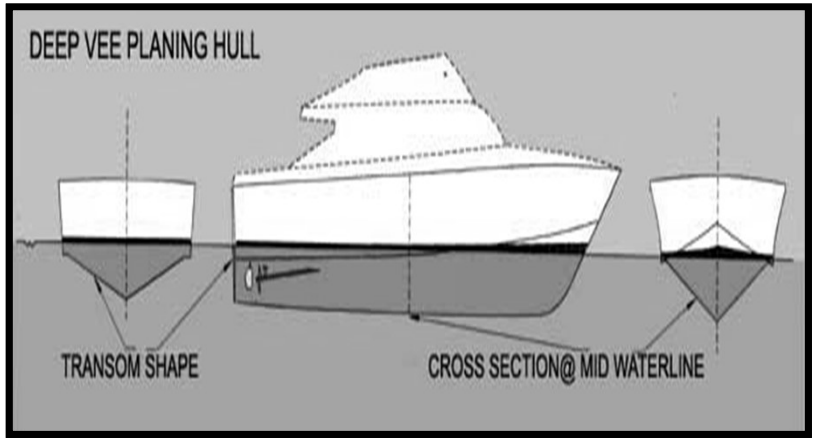


2. **Semi-displacement hull** - a semi-displacement hull, thanks to the flattening of the rear, can achieve higher speeds than full displacements. Due to the lining of the front part, they also have side stabilizers, to prevent swaying. In terms of overall performance, they are better used in fishing vessels than in sports and recreational vessels

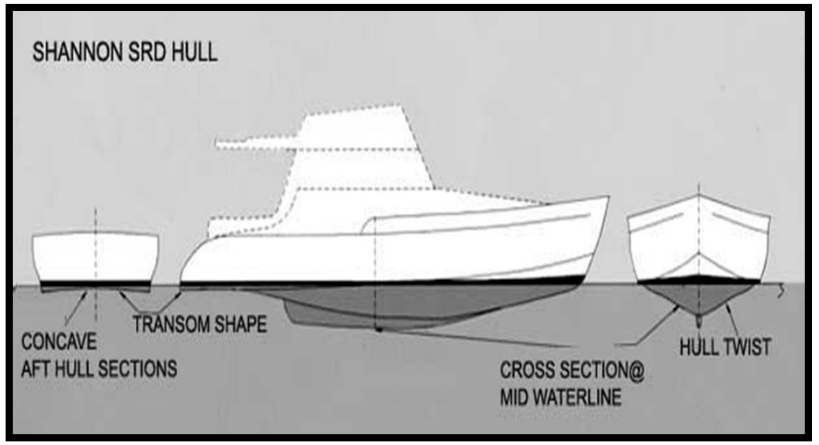


Co-funded by the
Erasmus+ Programme
of the European Union

3. Deep Vee Planning Hull - deep V or modified deep V. Vessels with a hull of this shape can reach high speeds because by increasing it, they rise above the water and reduce the underwater hull surface - they glide. The main disadvantages are poor manoeuvrability in rough seas, high fuel consumption, and exhaust gas emissions due to the need to install a high-power engine expressed in Hp.



4. Shannon SRD Hull – (Shulz Reverse Deadrise) is also called the 21st Century hull shape. The SRD represents a combination of the best features of the semi-displacement and V-hull. The front V part cuts waves perfectly, and the transition to the middle flattened part raises the hull's rear part, improving hydrodynamic flow, speed, and other sailing performance. Walter Shulz patented it in 2006.



Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

UCG
University of Montenegro

Co-funded by the
Erasmus+ Programme
of the European Union

Full Displacement Hull

Semi Displacement Hull

Deep VEE Planning Hull

Shanon SRD Hull – SRD

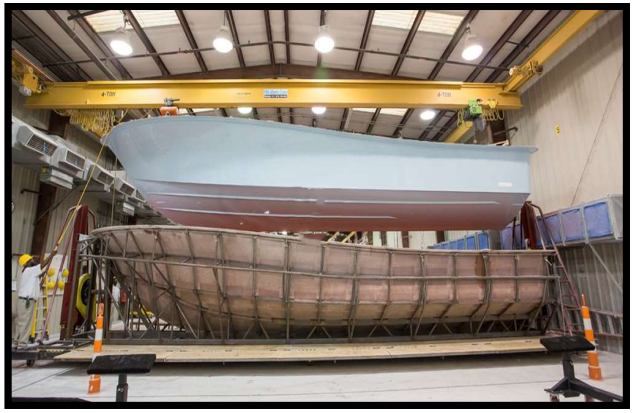
Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Co-funded by the
Erasmus+ Programme
of the European Union

- **The hull of a sports and leisure vessel is most often made of composite materials - fiberglass; steel sheets; aluminum and wood.**

- **Composite materials** have been used in ship construction since 1945. The construction process is significantly different from the construction of ship structures with previously used materials because in this type of construction, a new material (composite) and the structure itself are created.

- The basis of the construction is a laminate, which consists of layers of fibrous (most often glass) reinforcement, which are impregnated with resin, and which hardens after a chemical reaction and after the so-called process. "ripening" results in the final product (shape).



- Construction of objects using this type of material can be done with the help of molds or using simple templates, which determine the future shape of the vessel's hull.

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Co-funded by the
Erasmus+ Programme
of the European Union

- **Vessels built of metal**, most often mean objects - structures built of steel or aluminum. Or the so-called - bimetal (hull-steel combinations, superstructure-aluminum).

- **Vessels built of wood** have a thousand-year tradition of production, and as mentioned earlier, it was precisely on this type of vessel that the first pleasure trips were of wood.

ZK1

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

ZK10 Until the sixties of the last century, when composite materials began to take precedence, in the production of larger vessels for sports and leisure, steel was the most common material.

Today, although heavy and subject to corrosion, yachts are still made of metal. Their advantage is in their strength and easier repair of damage caused by side impacts and partial stranding.

The application of computer technologies, CAD programs and CNC machines in sheet metal cutting have enabled shipbuilders to have a high degree of automation in the production process of metal vessels.

New technologies in the process of welding sheet metal parts have improved the final appearance of yachts made of steel and/or aluminum.
Ship structures can be produced entirely from wood or combined with steel or composite ribs, and with wooden formwork and/or laminated plywood.

The advantages of wood as a material for building vessels are that it is lighter and more structurally efficient than most modern materials; with tensile strength and stiffness per kilogram higher than some composite materials.
Disadvantages of vessels built of wood, due to which they are less and less produced, are reflected in the following characteristics of wood: it rots when it gets too wet; it is poorly resistant to wear; it is very soft; it has a low density, which is why it takes up a lot of space when building a vessel; it is easily flammable; it is attacked by various living organisms such as worms, ants, fungi, etc.; it is complicated for serial production, etc.

Wooden vessels are still produced mainly for prestige, based on a charming appearance.
More about this source textSource text required for additional translation information
Send feedback
Side panels
Zoran Kovacevic, 04/07/2022

Co-funded by the
Erasmus+ Programme
of the European Union

- **TYPES OF PROPULSION in recreational vessels**

- Vessels intended for sports and leisure can be motor-driven, sail-wind-powered and/or combined.

- **Outboard propulsion units**
- They are usually intended for smaller vessels.

- For their installation, there must be adequate preparation on the stern of the vessel, reinforcement for fastening, as well as the surrounding space required for unhindered turning and lifting of the outboard propulsion unit. Recently, the system of installing outboard motors completely outside the structure of the stern of the vessel has also been applied, especially when installing a large number of high-power outboard motors, over 200 HP.

- Outboard motors, except for some models of low power, which are electric motors, are mostly gasoline, originating from the motorcycle and car industry.

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

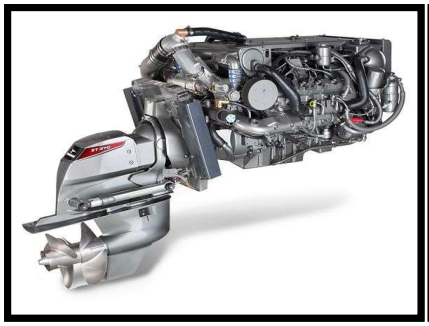
Co-funded by the
Erasmus+ Programme
of the European Union

- **SternDrive propulsion**

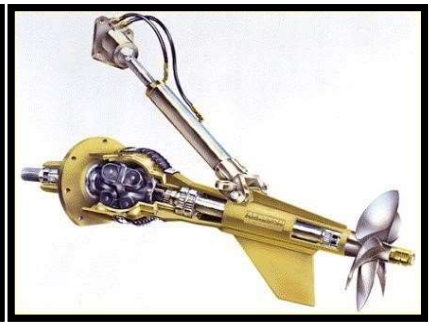
- In contrast to outboard propulsion units, SternDrive propulsion assemblies are installed in the inner part of the stern - the engine room, while their transmission assembly is on the outer stern part of the vessel, which must be flat.

- **The most commonly used portable scopes are:**
  - Z-drive – transmission connected to the engine;
  - Arenson articulated transmission;
  - Castoldi jet-powered transmission;
  - IPS system Volvo Penta transmission.

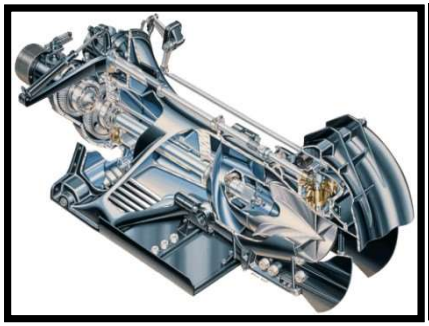
- They are installed mainly on vessels intended for higher speeds.



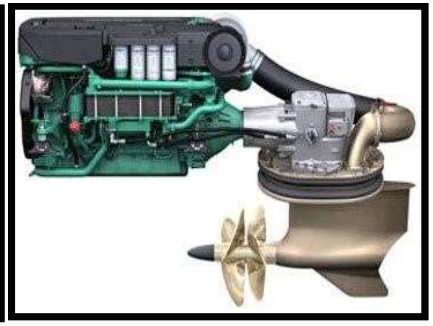
Z-drive



Arenson



Castoldi Jet



Volvo Penta IPS system

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

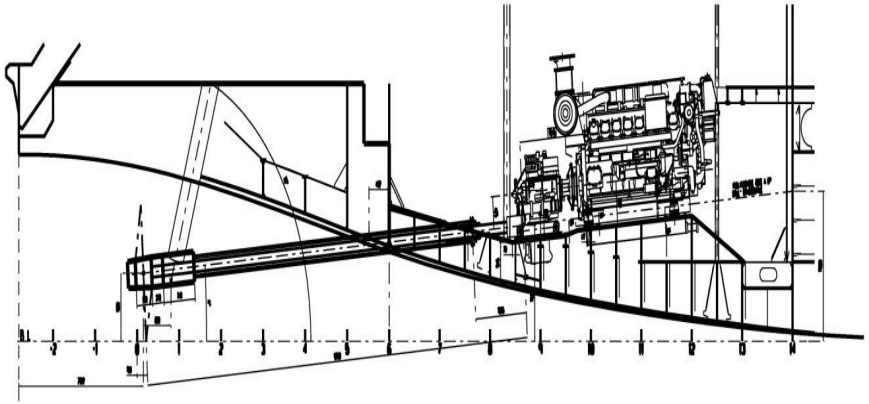
Co-funded by the
Erasmus+ Programme
of the European Union

- **Inboard engines**

- They are represented in motor-powered vessels intended for sports and recreation, but also in sailboats as an auxiliary means of propulsion.

- They are quite simple, and their transmission system does not differ from those on large ships.

- In the chain of each drive unit, there is a propeller with fixed or movable blades, a shaft that passes through the hull with a standpipe and is connected to the engine through a reducer and SAE bell or Cardan.
- This type of inboard motor is the most common, cheapest, and most reliable drive unit.



- CAT, MAN, MTU, Volvo Penta, and Cummins are the most famous brands in the yachting industry.

Co-funded by the
Erasmus+ Programme
of the European Union

- **The arrival of a foreign yacht in Montenegro**

- According to Montenegrin regulations, a person who manages a foreign yacht when entering Montenegrin territorial waters must take the shortest route to the port of destination open for international traffic, perform border control, obtain a Vignette and certify the list of crew and passengers.

- **Ports open for international traffic in Montenegro are:**
  - Zelenika,
  - Porto Novi;
  - Kotor;
  - Porto Montenegro;
  - Budva;
  - Bar.

- The Vignette is issued by the Port Authority or its Branch after reviewing the documentation (request for obtaining a vignette, certificate of registration, certificate of a person's ability to operate a vessel, liability insurance policy for damage caused to third parties, etc.)

Co-funded by the
Erasmus+ Programme
of the European Union

NAJAVA DOLASKA STRANOG PLOVNOG OBJEKTA U CRNU GORU
PRE-ARRIVAL INFORMATION FORM FOR ENTERING MONTENEGRO

Podaci o plovnom objektu
Particulars of the vessel

IMO broj (number)		Naziv plovnog objekta (Name of vessel)	
Luka upisa (Port of registry)		Zastava (Flag State)	
Vrsta plovnog objekta (Type of vessel)		Pozivni znak (Call sign)	
Bruto tonaža (Gross tonnage)			
Luka dolaska (Port of arrival)		Očekivano vrijeme dolaska (Expected date and time of arrival)	

Lista posljednjih uplovljenja i dana provedenih na moru u poslednjih 15 dana (List of last port calls and days spend at sea in 15 days by chronological order (starting from most recent))

No	Datum od (Date from (dd/mm/yyyy))	Datum do (Date to (dd/mm/yyyy))	Luka ticanja (Port of call)	Država/na moru (Country / at sea)
1				
2				
3				
4				
5				

Naziv pomorskog agenta
Name of the appointed agency:

Potpis zapovjednika ili autorizovanog lica
Master or authorized representative signature:

Datum, vrijeme i mjesto (Date/time/place of completion of report)

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Detalji posade (Crew details)			Registar boravka u poslednjih 15 dana (Travelling record in the last 15 days)	
No	Ime I prezime (Name / surname)	Nacionalnost (Nationality)	Na plovnom objektu (On board)	Boravak u zemljama u poslednjih 15 dana (Countries visited (including transit) – if on board less than 15 days)
1				
2				
3				
4				
5				
6				
7				

Podaci o putniku (Guest details)			Registar boravka u poslednjih 15 dana (Travelling record in the last 15 days)	
No	Ime I prezime (Name / surname)	Nacionalnost (Nationality)	Na plovnom objektu (On board)	Boravak u zemljama u poslednjih 15 dana (Countries visited (including transit) – if on board less than 15 days)
1				
2				
3				
4				
5				
6				
7				

- If period from the last joining date to arrival date in Montenegro is shorter than 15 days, Authorities require to declare travelling of those persons during the last 15 days. This might be subject to different measures on arrival according to Plan.

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP

Co-funded by the
Erasmus+ Programme
of the European Union

Thank you for your attention!

Project no. 609675-EPP-1-2019-1-ME-EPPKA2-CBHE-SP