

As a part of the offer the Contractor shall prepare:

- a. Individual 3D visualizations of 18 exhibits (each separately), with close-ups on the interfaces of those, allowing the analysis of the main elements of each interface. These exhibits belong to two adjacent thematic groups:

Group 1.7: Ship design and construction

- 1.7.1. Shipyard
- 1.7.2. One ship's story
- 1.7.3. Ship designers
- 1.7.4. Little designers
- 1.7.5. A ship for every need
- 1.7.6. Can water cut steel?
- 1.7.7. Hull x-ray
- 1.7.8. How many hulls? What shape?
- 1.7.9. In the boat builder's workshop
- 1.7.10. Launching in... suspenders?
- 1.7.11. Ship's christening

Group 1.8: Port

- 1.8.1. Port – complex organism and gateway to the world
- 1.8.2. Gantry crane
- 1.8.3. How to load weight onto the ship?
- 1.8.4. Maintain your balance!
- 1.8.5. How much cargo does the ship carry?
- 1.8.6. Let's moor!
- 1.8.7. The mast

- b. Visualization of the exhibition area, where the mentioned above 18 exhibits are located as the part of two adjacent thematic groups, along with the accompanying scenery and elements of the visual information system. The visualization is to present a fragment of the exhibition from two different angles from the perspective of a standing adult. The angles shall be chosen in a way that will allow to show as many exhibits as possible.
- c. The horizontal projection (floor plan) of the above two thematic groups consisting of a total of 18 exhibits and scenography elements while maintaining the scale of all mapped elements. The floor plan is to show the shapes (contours) of exhibits and stage elements. All objects visible on the projection and communication passages between them shall be dimensioned.
- d. Description of the proposed materials of which the above exhibits will be made along with the description of the proposed materials of which the set and elements of the visual information system will be made in the area of the above thematic groups.

Group 1.7: Ship design and construction

1.7.1. Shipyard

Exhibit enables better understanding of how the shipyard is built and how it works. The stand consists of a large interactive mockup of the shipyard (with the historic Szczecin shipyard as an example), around of which two control panels (touch screens) are set. Using the panel, the visitor can select individual elements of the shipyard e.g. shipbuilding pools, docks, hull shop, workshops, mold loft, etc. The selected elements will be highlighted on the model and the screen displays a comment about the function of this element along with multimedia materials (e.g., historical photos and videos). Items that will be highlighted will be selected in consultation with the Contracting Authority at the prototyping stage. The Contracting Authority allows the use of the existing model of the shipyard, which shall be acquired by the Contracting Authority. Large exhibit.

1.7.2. One ship's story

Exhibit shows the course of work on the construction of the ship in the shipyard - from the design and location of the keel to raising the flag. The stand has the form of an marked on the wall interactive timeline, in which the movable reader is mounted (touch screen with a minimum diameter of 30 inches, mounted in a handle and installed on a horizontal rail or in a horizontal gap). Visitors move along the time line with the sensor. Reaching a specific point on the timeline will result in displaying the text, photos, animations and films regarding the events from the current stage of the ship's construction on the screen. The time line consists of individual key points with permanently marked names of a current stage of work, illustration and short textual information - which allows the use of the demonstration stand also for people who currently have no access to the reader-monitor. The reader is also equipped with a voice information system, which allows the blind to use the stand.

Size: medium, long.

1.7.3. Ship designers

The stand presents the work of watercraft designers as well as the integration of knowledge from many disciplines in order to create a precise and complex structure, which is a ship. The exhibit is stylized on a designer's stand from the 1960s. It consists of a drawing board, instruments for drawing, measuring, counting, exhibition of printed technical designs and a touch screen with a diagonal of at least 40 inches with an application presenting interactive ship designs, unit designers' expressions. Visitors can examine the printouts of individual parts of the project, i.e. construction design, designs of individual systems and installations, interior design and furnishing projects. Visitors can run on the monitor short videos with statements of ship designers talking about various stages of design and / or the units they designed and are especially important for them. Visitors can also launch a 3D visualization of the ship design and move it to view the ship from different angles and turn layers of individual systems / industries on and off. It is advisable to use in the exhibit the statements of designers working in the shipyards in Szczecin and the projects of the ships they create.

Large exhibit.

Scientific issues presented by the exhibit and accompanying descriptions and graphics: scale, proportion, angle, trigonometric functions, arithmetic, geometry.

1.7.4. Little designers

An exhibit allowing the youngest visitors to learn about the construction of various watercraft.

The stand is in the form of a large vertical board stylized as a drawing board placed within the reach of preschool children and puzzles - flat elements on which elements (sections) of different types of units are permanently attached. Visitors take on the role of a designer and place puzzle-pieces of the ship on the drawing board. Visitor can choose from many modules presenting different types of bow, midship and stern, creating a ship design according to the plans presented in the set design or their own design. That way, for example, a bulk carrier, tanker, container ship, passenger ferry, fishing boat, or aircraft carrier can be created - but also a multi-functional vessel that never existed before. Puzzles are kept on the board thanks to an electromagnet activated e.g. by a pressure sensor in the floor in front of the exhibit. Stepping away from the stand causes, after a while, the electromagnet to switch off and the puzzle to fall off into the tray below the board (and thus reset the position for the next visitor). Modules of all types should be able to be combined with each other, so they will not depict ships on the same scale. Puzzles that allow for putting together at least 6 different units must be created. The contractor provides 5 sets of puzzles for each type of ship.

Medium exhibit.

1.7.5. A ship for every need

The stand shall present the variety of vessels and the characteristic features of their construction resulting from the tasks they are to perform. The stand shall present models of at least 10 various vessels, with particular emphasis on those built in Szczecin. The Contracting Authority is responsible for obtaining the objects. The exhibition is accompanied by a set design presenting the water line and all silhouettes of the presented units in the same scale. For better visualization of unit sizes, the graphic shall also present on the same scale several silhouettes known from everyday life, e.g. a man, a passenger car, a city bus, a train.

Large exhibit.

1.7.6. Can water cut steel?

The stand presents various possibilities for cutting steel: water jet, laser, shields. The stand consists of three thick (minimum 1 cm, and in the case of laser as close to 1 cm as possible) steel fragments of the same dimensions, cut in order with: water jet, laser and shield, and a screen with a diagonal of min. 30 inches where the presentation is displayed. The cutting method that the visitor wants to see on the screen (by tapping the screen or pressing the button next to the selected piece of steel) is to be chosen by the visitor. This causes a movie to appear on the screen showing the cutting process in a given technique along with the device used for this purpose. In the case of steel cut with water and laser, the cut shall be taken along a curve, thus demonstrating the possibilities of this cutting

technique. It is advisable to allow the visitor to touch the cut pieces of steel, as long as there is no risk of injury.

Medium exhibit, long

Scientific issues presented by the exhibit, accompanying descriptions and graphics: pressure, laser, coherent light, beam, friction, hardness, Rockwell, Brinell and Vickers scale.

1.7.7. Hull x-ray

The exhibit presents the process of welding steel hulls and controlling the quality of welds. It consists of a large format photo showing a working welder, along with the weld line connecting two large planes of steel, which is the result of his work and a stylized ultrasonic or X-ray scanner equipped with a control head and monitor (can be integrated into one device). Visitors assume the role of a quality / safety inspector in the shipyard during construction or renovation of the ship. Moves the head along the weld while observing on the screen whether welding has been carried out correctly.

The manual shows views of the correct and incorrect welds, while markings are placed in several places where the image of the incorrect weld appears on the screen. After the examination, the visitor receives information on how many of the existing errors they have noticed and whether they have ensured the safety of the built / renovated unit. The stage layer contains information about x-rays / ultrasounds and curiosities, e.g. about the total length of welds on a ship of specific size.

Medium exhibit, long

Scientific issues that the exhibit represents, accompanying descriptions and graphics: electric arc, electrode, ultrasound, X-rays, electromagnetic radiation.

1.7.8. How many hulls? What shape?

The stand demonstrates the impact of the hull shape (cross-section) and the number of hulls on the nautical and operational properties of the vessel. The stand has the form of a flat tank filled with liquid in which two silhouettes (cross-sections) of sword-type yachts: single-hull and double-hull. Both models float on liquid, but are movably (rotatably) mounted on axles at the point where the mast connects with the deck. The mass and buoyancy of both models and the height of the mast are identical. By pressing the mast the visitor can compare the force needed to tilt a single- and a double- hull vessel. The cross-sections of yachts must have sufficient depth (thickness) to ensure sufficient buoyancy to carry out the experiment. The stand is accompanied by graphics and illustrations showing the forces acting on the yacht in heel and a comparison of forces acting on a single and double hull yacht. The advantages and disadvantages of single- and double-hull units are also discussed, as well as selected hull shapes (e.g. V-shaped, flat-bottomed, etc.).

Small exhibit.

Scientific issues presented by the exhibit, accompanying descriptions and graphics: hydrodynamics, resistance, aerodynamic force, tilting force, thrust, stability.

1.7.9. In the boatbuilder's workshop

The exhibit presents the craft of the boatbuilder and the technology of building small vessels from wood. The stand consists of arrangements showing the interior of a boatbuilding workshop and an experimental stand. In the workshop are wooden boats at various stages of production, various tools and materials. Można tu zrozumieć jak formuje się elementy z drewna, jaka jest różnica między typami poszycia (diagonalnym, stykowym, zakładkowym); zobaczyć elementy konstrukcji (wręgi, stępka, denniki), porównać fakturę i ciężar gatunków drewna (np. dąb, sosna, mahoń, tek, balsa) i zobaczyć, dlaczego część materiału zostaje odrzucona (np. ze względu na sęki, pęknięcia, twardzicę).

Each element in the workshop has a description presenting the tool, element, material and / or material or technology. Visitors watching the replica of the workshop, can touch and pick up wood samples. In the experimental stand, the visitor assembles a fragment of the boat structure from properly trimmed wooden elements (e.g. boards and frames with bevels). Visitors have several dozen elements at their disposal that allow them to assemble one structure without the use of nails or glue (it is allowed to join the elements together with a press and dowels). There are two sets of elements available for visitors to fold and unfold two different structures. The elements of each structure should be in different color.

Very large exhibit (approx. 8 m²)

1.7.10. Launching in... suspenders?

The exhibit presents the process of launching a ship using the patent of Szczecin shipyard workers, the so-called suspenders. The stand consists of a mockup- a wharf model for launching ships, a mobile ship model and a water tank. The tank ends with the second wharf - in the same way as for the Szczecin shipyards Nowa and Gryfia. The task of the visitor is to manually set the ship's model on wheelchairs on the ramp and attach the appropriate length of flexible braking ropes to the hull, suspenders(system developed by Antoni Rawski and Jerzy Gąska from the Szczecin shipyard). Visitors can choose ropes from many ropes of different lengths. If they choose too short, the ship will not slide into the water, if too long - it will hit the wharf opposite the ramp, and if the ropes attached on both sides are not the same length - the ship will turn and may also hit one of the wharfs. The scenery should refer to the authors of the braking system of launched vessels and the history of vessels launched with its use.

Reference:

<https://www.youtube.com/watch?v=eN-hALgEUYw>

<https://www.portalmorski.pl/stocznie-statki/7901-ostatni-odplywa>
Medium exhibit.

Scientific issues presented by the exhibit, accompanying descriptions and graphics: uniformly accelerated motion, variable motion, inclination, acceleration, resistance, force.

1.7.11. Ship's christening

The stand presents one of the most important maritime traditions: the ceremony of giving a ship its name. Jest to również atrakcyjne miejsce do robienia zdjęć przez odwiedzających. The stand consists of a large stage element presenting a fragment of the ship's side and bow, letters in the container and a flexible champagne bottle model hung on a cord. Visitors can select letters from the container and hang them on the side of the ship so that the letters form a new name for the ship. Then hits the side with the model of the bottle, what launches the application that plays sounds of: broken glass, applause and gala music. The scenery of the stand (and the silhouette of the ship) should include elements accompanying the christening ceremony: people dressed elegantly, flags, garlands of flowers, etc. Various methods of temporarily fastening letters on the ship's side are allowed: on slings, magnetically etc. Along with the exhibit, the Contractor provides six sets of letters of the alphabet with Polish characters.

Very large, long exhibit (about 5 m x 1 m).

Group 1.8: Port

1.8.1. Port – complex organism and gateway to the world

The exhibit gives the opportunity for better understanding of the importance of the port, its construction and the role of its parts. The station has the form of a large (min. 3 m²) interactive mockup of the port in Szczecin or Świnoujście, a mock-up around which two control panels are arranged (touch screens with a minimum diameter of 30 inches). The visitor selects individual elements of the port - e.g. warehouses, platforms, quays, overhead cranes e.t.c. - using the panel. The visitor - using the panel - selects individual elements of the port - e.g. warehouses, platforms, quays, overhead cranes e.t.c. Selected elements will be marked on the mock-up (e.g. by backlight), and the monitor will display a comment regarding the function of this element along with multimedia materials (e.g. graphics, photos, animations, films). The scenography of the station consists of two large-format maps presenting the location of ports in Szczecin and Świnoujście on a European and global scale. On the Europe map the European routes of ships arriving and departing to Szczecin / Świnoujście are marked as well as land and river transport routes for goods arriving at this port or picking up from the port. The routes of transoceanic units are marked on the world map. The Contracting Authority allows the use of the existing, non-interactive port mockup in the stand, which will be acquired by the Contracting Authority.

Very large exhibit (approx. 4.5 m²).

Scientific issues presented by the exhibit, accompanying descriptions and graphics: logistics, ergonomics, process optimization, mass, strength, work.

1.8.2. Gantry crane

The stand presents the process of loading and unloading a container ship, it is also a type of logical puzzle. It consists of a large gantry crane, control panel, the wharf and container ship mockup and models of containers of two lengths. Visitors must pack containers of varying lengths tightly on a ship or in a square. They use manipulators and buttons on the control panel and observe on the screen an image of the camera mounted at the gantry crane handle / hook. The gantry crane is electrically operated and can move along the ship, raise and lower containers and rotate them around its axis.

Medium and tall exhibit.

Scientific issues presented by the exhibit, accompanying descriptions and graphics: logic, mass, weight, strength, surface area.

1.8.3. How to load weight onto the ship?

The stand enables conducting an experiment with the transmission of force using a block and a pulley. The stand consists of three systems of ropes and pulleys on which bags of identical, large weight (about 20kg) are hung. The weight (approx. 20kg) is written on each bag. Each system differs in the number of pulleys through which the rope runs - and therefore differs also in gear ratio.

Visitors try to pick up each of the bags, discovering that repeatedly putting the rope through the pulleys makes the task easier to achieve. The first system consists of one disc, which gives no gain in

strength. The second system consists of two disks arranged in a raising to the power system. The third system consists of four discs arranged in the raising to power system. The rope and pulleys are to be selected so as to eliminate resistance as much as possible. Osiągnięty zysk na sile w trzecim układzie powinien być ok. 8-krotny. The bags resting place should be secured in case of a visitor being crushed by the bag. It is also necessary to use safeguards that prevent the visitor's hand from being pulled inside the pulley. The stand is accompanied by a large format photograph showing the loading of goods onto the ship using gantry cranes / davits.

Very large exhibit (about 4 m²).

Scientific issues presented by the exhibit, accompanying descriptions and graphics: mass, strength, simple machines, block, pulley block, translation.

1.8.4. Maintain your balance!

The exhibit explains what it is and why it is important to properly distribute and secure the cargo carried by the ship (so-called stowing). The stand consists of a cross-section model of the container ship's hull, movably mounted on an axis in the central part of the cross-section. The model's cargo space is divided into 16 identical vertical chambers. Next to the model there is a container for balls made of durable material. The balls are available in three colors, differing in weight (All balls of a given color carry the same weight). Visitors must fill individual chambers of the ship with balls - which reflects the process of placing containers on the ship. By throwing balls of the right mass into the appropriate chambers, the visitor arranges them in piles, ensuring that the model stays in balance, does not tilt to the side and does not "sink". In case of a tipper, the balls fall out of the chambers into the container. Visitors who find a loaded ship can empty it by themselves by turning the model upside down. A solution should be proposed to prevent visitors from taking or scattering the balls - e.g. guideways between the container and the ship's model. The scenographic part may contain diagrams with the location of containers in the ship's cargo space (projections, cross-sections and longitudinal sections) as well as spectacular photos of large container ships loaded. Along with the stand, the contractor provides balls in a number that allows to fill the model five times.

Reference:

<http://www.containerhandbuch.de/chbEe/stra/index.html?/chbEe/stra/straE01E03E03.html>
https://en.wikipedia.org/wiki/StowageEplanEforEcontainerEships_/media/File:Bay-row-ter.jpg

Small, flat exhibit.

Scientific issues presented by the exhibit, accompanying descriptions and graphics: mass, strength, center of gravity, balance, axis of rotation, ship stability.

1.8.5. How much cargo does the ship carry?

The stand gives the opportunity for understanding the difference in the amount of cargo that could have been transported by old ships, and can be transported by modern ships. The stand consists of a touch screen with a minimum diameter of 30 inches, on which the multimedia application is operated. The visitor selects the silhouette of a historical or contemporary ship on the screen, and then has to correctly assess its size by stretching or reducing it in relation to the objects shown on

the screen, e.g. the bus or Jerzy Łabuda bridge (next to the building of the science center). The next task is to assess the capacity of the unit: the visitor is to assess how much space the containers brought by this ship would take if they were stacked next to each other - this is done by marking the area of the center of Szczecin on the map, and then choosing the "Check" option. After checking, he receives information on how many people a given ship would bring a supply of consumer goods (e.g. apples or socks) - for students of one school, residents of a housing estate, city, and maybe all of Poland?

Medium size exhibit.

Scientific issues presented by the exhibit, accompanying descriptions and graphics: estimation, proportion.

1.8.6. Let's moor!

The station gives the opportunity to learn how to moor a ship. The station has the form of a mobile, durable model of the yacht standing at the wharf, in which bollards (mooring posts) are embedded. The visitor's task is to moor the yacht using a maximum of 6 ropes (head line; fore breast rope; fore spring; aft spring; aft breast rope; stern line). After completing this task, the visitor presses the "check" button and the ship model begins to move. If any ropes have not been used, or have been incorrectly fastened, the model begins to bump into the quay and the exhibit makes a warning sound. In the case of proper mooring, the model remains motionless and the exhibit emits sounds of appreciation (e.g. praise from the captain). After finishing the test, the bollars (bars) hide in the casing, shedding moors placed on them, and then return to the top again, enabling experience for the next visitor. The stand's scenography should present real mooring ropes of various sizes and authentic bollards. Also a large-format photograph of a moored ship or a close-up of a moor and a bollard can be used.

Medium size exhibit.

Scientific issues presented by the exhibit, accompanying descriptions and graphics: strength, distribution of forces, tensions, lever.

1.8.7. The Mast

Model of a large mast (reaching from the level of the ground floor to the vault of the second floor) on which a square sails (2 square rigs). Two interactive positions available from the second floor level are mounted on the mast. At the ground floor and first floor level, the mast functions as stage design: at the ground floor level it is cleated or coated with rope of different thickness and different color and on the upper part - sails: on one square rig the sail is unfolded and on the other coiled. A method for bringing the mast into the building shall be foreseen. It is possible to deliver the mast during construction period, or to assemble the mast from parts at a later date.

Medium size, very tall exhibit.