

# World University Underwater Robot Competition – Multinational Underwater Robotics Competition Category ROV

*ROV - Remotely Operated Vehicle*

## General Information

This document is the main regulation for ROV categories of the International Underwater Robotics Competition (WUURC-MURC 2026).

Competition date: August 14-16, 2026

Venue: Water Sports Palace, 147 Moskovskaya St., Brest.

## Competition composition

- Specification Sheet - 10 points
- Pool mission performance - 190 points

TOTAL : 200 points.

## Age categories

- ROV - university students, school students grades 9-11
- Number of participants per team: 2-5 people

## Vehicle requirements

- ROV dimensions must allow it to fit within a 90×90×90 cm cube.
- ROV weight must not exceed 25 kg.
- The vehicle must not have any batteries or accumulators. The vehicle supply voltage must not exceed 48 V. The maximum current must not exceed 15 A.
- The vehicle must not have any installed parts (sharp or pointed objects, bare wires, etc.) that could damage the pool or cause injury to team members.

- The use of multiple ROVs to perform the mission or the use of a single vehicle by multiple teams is prohibited. Each team must prepare one vehicle capable of performing all mission tasks.
- Tether length. The tether length should be selected so that the vehicle can perform all tasks in the pool. Mock-ups may be located at depths up to 2 meters; all mock-ups are located within 6 meters from the ROV launch point.
- All propellers must be isolated and the blades must be covered with protective mesh. The mesh must have a cell size corresponding to IP-20 standards (protection level against solid particles 2). This IP code corresponds to cell size <math><12.5\text{ mm}</math>. If your finger can touch the propeller blade, it is not properly protected.

If the vehicle does not meet these requirements, it will not be allowed to perform the mission until all issues are resolved.

## Team Spec Sheet

Worth 10 points.

The Team Spec Sheet is intended to give the judges a brief overview of the team and its vehicle. The Spec Sheet must fit on one A4 page, be provided in PDF format, and be less than 2 MB in size.

The Spec Sheet must include the following information:

### About the team

- Name of the organization the team represents;
- City, region, country;
- History of participation in this competition (if any). If none, state that they are rookies.
- Team photo with caption (First name Last name, grade/level, role in the team, etc.). The photo must include all team members.

### About the ROV

- Vehicle name (if any);
- Vehicle cost (total cost of components);
- Vehicle size and weight;
- Total student-hours spent by team members on design, manufacturing, and assembly of the robot;
- Payload;
- Safety features;
- High-quality photo of the robot.

The Team Spec Sheet must be uploaded to the form by August 12, 2026 inclusive.

Specification Sheet evaluation criteria

Requirement	max
Is one page length	0.5
Submitted by the deadline	0.5
File name follows naming convention (see line below) (e.g. School or organization name_team name_Spec Sheet_2026.pdf)	0.5
About team	
Team name and school, club, or organization name	1
City, country	0.5
Distance traveled to the competition	0.5
History of WUURC competition participation (new or returning)	0.5
Team photo and caption with team members' names and roles	1
Range of grade/college levels represented by team members	0.5
About ROV	

ROV name (if applicable)	0.5
Total cost	0.5
Size and weight measurements	0.5
Total student-hours to design and build	0.5
Safety features (which ensures the safety of ROVs and operating personnel)	1
Special features (functions, devices, etc.)	1
Photo of the vehicle	0.5
TOTAL	10

## General rules

1. Before the competition, the organizers publish the schedule of practice sessions and runs. Team runs are carried out according to the schedule. On competition day, swapping time slots with other teams is prohibited. If a team does not show up for an attempt in the order of its performance, the team is awarded zero points for that attempt. No exceptions to this rule are provided.
2. On the first day of the competition, teams must pass a safety inspection to prove that their vehicle meets the ROV requirements. If a judge identifies a deviation of the vehicle's characteristics from the requirements, the team has the opportunity to correct the issues and undergo inspection again on the first practice day. Teams that do not pass the safety inspection will not be allowed into the mission performance area.
3. Team mentors may be present at the workstation during practice sessions. During competitive runs, the presence of mentors at the workstation is prohibited.

4. Participants from other teams MAY NOT be present at the workstation or assist members of another team.
5. Within the competition, each team has two attempts to complete the mission. The points from the BEST attempt count.
6. Manipulation of the tether to free it from underwater obstacles is allowed. However, pulling the tether to speed up object retrieval, manipulating the underwater vehicle's movement, or quickly returning the vehicle is not allowed and will result in penalty points (see Penalties section).
7. Teams are prohibited from leaving any trash in the pool. Any trash must be removed before the attempt time expires, otherwise the team receives penalty points. Trash includes: any parts of the ROV, weights, floats, any other items, used objects. Mission mock-ups are not considered trash unless otherwise stated in the regulations.
8. Communication between team members at the pool edge and team members who are ROV pilots is limited. Only tether management issues may be discussed. Team members are prohibited from communicating about the ROV's direction and position or about the mission execution process. Otherwise, penalty points are assessed (see Penalties section).
9. Mission judges, presentation judges, and other officials communicate only with team members regarding competition issues. If a team has an objection to the mission performance assessment, the team must immediately contact the judge before signing the score sheet. If the team signs the score sheet, the judges consider that the team agrees with the results and they cannot be disputed.

If a decision on a team's request cannot be made by the mission judges, they consult with the head judge and/or the competition technical director to reach a final decision.

After the head judge/technical director announces the decision on the team's request, that decision is final and not subject to appeal. If a team attempts to further appeal the decision, the team may be assessed penalty points.

## **Mock-ups**

1. Instructions for making mock-ups are provided in the category regulations in the "Mock-up Description" sections.
2. Tolerances on the pipe length specified in the regulations are allowed during mock-up manufacturing. The organizers recommend not using the mock-up dimensions specified in the regulations for calibrating measuring devices.
3. Warning: the instructions show mock-up versions without weights. The organizers reserve the right to adjust the placement of weights and buoyancy blocks and the dimensions of the structure at the competition venue.

## **Penalty points:**

Safety: during the mission, the team must follow the safety rules established at the venue. If they violate these rules, the team receives 5 penalty points

Tether tension: a team member may not pull the ROV tether to move or turn it. If this rule is violated for the first time, the judge issues a warning to the team. For subsequent violations, the team receives 5 penalty points.

Communication: during the mission, team members are prohibited from communicating with each other about the vehicle's location or the need to turn it. Communication between the pilot and the tether handler regarding the tether's position and slack is allowed. If this rule is violated for the first time, the team receives a warning. For subsequent violations, the team receives 5 penalty points.

Diver assistance: if a team requires a diver's help to lift and/or free the ROV, the team may request assistance. The attempt time does not stop during assistance. The team receives 5 penalty points.

**Teams are prohibited from leaving any trash in the pool. Any trash must be removed before the attempt time expires, otherwise the team receives penalty points. Trash includes: any parts of the ROV, weights, floats, any other items, used objects. Mission mock-ups are not considered trash unless otherwise stated in the regulations. [The team receives 5 penalty points per object].**

## Station

The station consists of a table and 2-3 chairs and a power outlet, located approximately 1 meter from the pool. The pool has a depth of about 2 m. The team must bring to the station the power supply, monitors, and other equipment necessary for operating the robot.

## Mission time

Each team will be given 2 attempts to complete the mission (set of underwater tasks), each lasting 20 minutes.

Each attempt consists of three parts:

- Equipment deployment at the station, preparation for the mission - 3 minutes
- Mission performance - 15 minutes
- Equipment "stowage", clearing the station - 2 minutes

During these three minutes, the team may deploy their equipment. They may test the vehicle on land. They may install payload on the vehicle if required. The vehicle may be placed in the water, but at least one team member must hold the robot by hand. If the team releases the robot, the mission time starts.

At any time during the mission, you may bring your vehicle to the surface to adjust buoyancy, change payload, or troubleshoot. The mission time does NOT stop; it continues to run.

The judge may stop the time and terminate the attempt early if it is clear that the vehicle problem cannot be resolved by the team's efforts or with the help of a diver.

End of attempt. The attempt ends when the mission time (15 minutes) has expired. The judge stops the time, records the maximum, and records the number of points earned.

Early termination of the attempt is possible if the vehicle, after completing the mission tasks, returns under its own power (via remote control) to the surface at the pool edge within the start zone. The judge stops the time after the vehicle surfaces and a team member touches the vehicle by hand.

## **Determining the final ranking**

1. In the final, winners are determined by the number of points. The best attempt and the time of that attempt are counted. If teams have the same number of points, the second attempt and the time of that attempt are taken into account.

## **Competition Legend**

The competitive mission tasks are based on real problems in the fields of energy and natural resource management that can currently be solved using underwater vehicles.

On the territory of the Republic of Belarus, there is an underwater crossing of a main pipeline laid along the bottom of a lake. According to regulations, a scheduled technical survey of the underwater section is carried out annually with the involvement of remotely operated underwater vehicles (ROVs).

Within the competition, teams are invited to perform a standard set of operations that are actually carried out during diagnostics and maintenance of underwater communications:

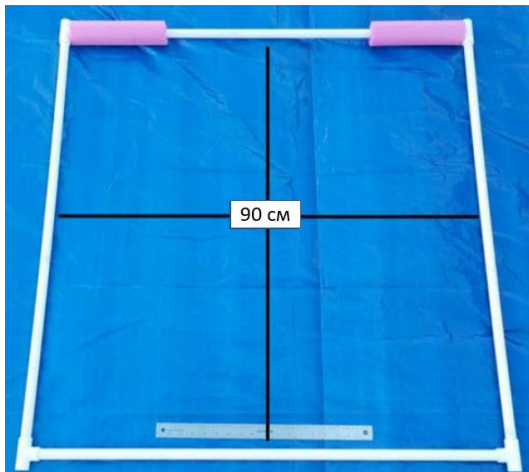
- Detection of hydrological anomalies – search for sources of groundwater pressure that could wash away the soil under the pipe.
- Environmental monitoring – checking the condition of drainage or adjacent collectors, preventing wastewater from entering the water area.
- Localization of a simulated spill – practicing skills in installing boom barriers (training alarm).
- Pipeline maintenance – cleaning from biofouling, connecting conventionally separated sections with a coupling (repair insert).

- Assessment of impact on the ecosystem – counting of mollusks, crayfish, algae in the pipeline area (biomonitoring).

## Starting position

Launch of the vehicle, installation and removal of mock-ups are carried out from the start zone.

Start zone – a square made of polypropylene pipes 90x90 cm.



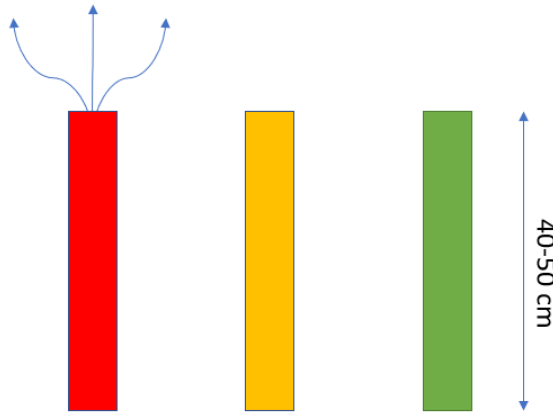
*Start frame (mounted on the pool edge).*

## Task 1. Water Research

1.1. Detect the source of groundwater (underwater spring)

At the bottom of the pool there are three pipes (red, yellow, and green). One of them is a groundwater source. The pipe length is 40-50 cm. Water will be supplied under pressure from one pipe.

The source is considered detected if the team demonstrates by any means the presence of water flow from the pipe (e.g., under water pressure the propeller blades begin to spin, a needle turns, etc.) and informs the judge which pipe contains the source.



Three pipes installed at the bottom. Water under pressure will be supplied from one pipe.

- Source detected - up to 15 points.

The step is considered successfully completed if the team demonstrates the presence of water flow from the pipe and reports the number of the pipe where the flow was detected. Guessing is prohibited.

The team must develop a special device that will allow recording the flow.

### 1.2. Classify the outfall pipe location.

At the bottom there is a sewer pipe with a diameter of 110 mm with a cap on one side. At the bottom of the pipe (inside) there is a colored marker that determines the type of waste coming out of this pipe. The pipe has no through holes, so note that the marker inside the pipe will need to be seen in the dark. It is necessary to demonstrate the detected marker to the judge and report the type of pollution.

- Red – domestic wastewater
- Black – oil waste
- White – chemical waste

Marker – 9x9 cm square.



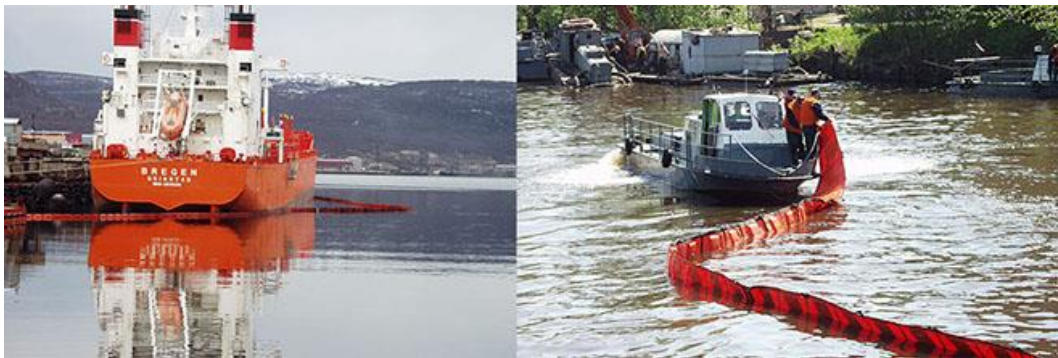
The pipe is located parallel to the bottom of the pool on a stand 40-50 cm high.

- Outfall type determined - 15 points

The step is considered successfully completed if the team demonstrated the colored marker located at the bottom of the pipe to the judge, reported its color, and determined the type of waste. Guessing is prohibited.

TOTAL for the task: 30 points

## Task 2. Installation and maintenance of boom barriers



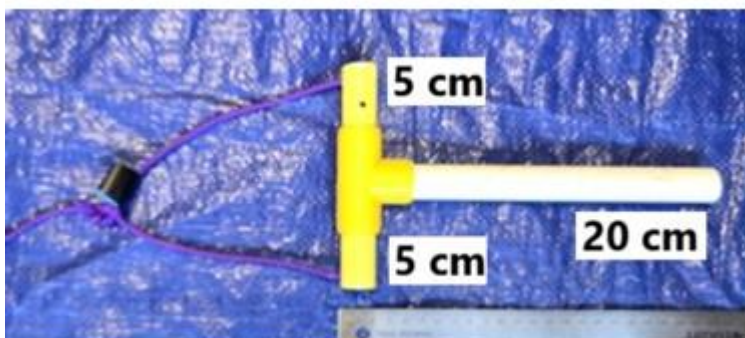
Pollution has been detected in the bay. It must be localized and enclosed with a boom barrier.

The pollution is simulated by ping-pong balls that will float inside a surface frame. Frame dimensions 90x90 cm.

The boom barrier is located in one of the corners of the pool and consists of floating pipe insulation and a skirt. One end of the barrier is tied to the pool edge. At the other end, a connector and a small square of Velcro (loops) are installed. This end is fixed to the pool wall on a pad with Velcro (hooks).

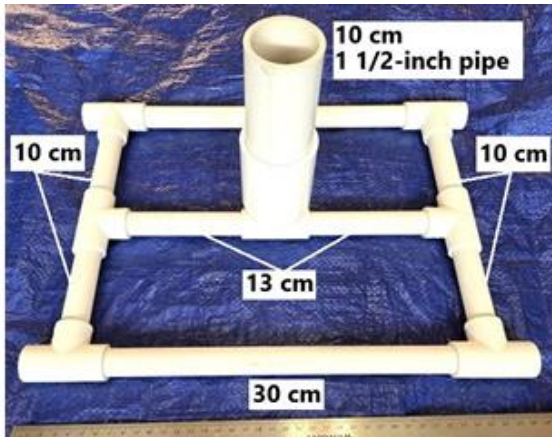
On the adjacent wall there is a port for attaching the boom barrier connector.

The boom barrier also has an anchor. The anchor is needed to prevent the barrier from being carried away by the current. The anchor is a T-pin, located underwater and attached to the boom barrier by a rope.



## Anchor

The anchor mounting point is located at the bottom and is a port made of 40mm diameter pipe.



## Anchor mounting point

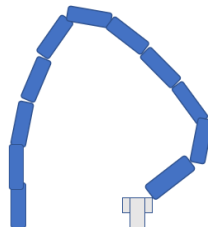
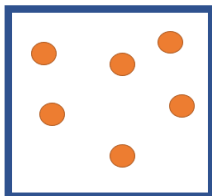
Boom barrier length - 3 meters.

A 25mm polypropylene tee with Velcro (loops) is used for attachment.



A 2x2 cm square of Velcro (loops) is glued to the tee

## 2.1 Pollution localization



**Balls simulating pollution are initially inside the frame.**



*Balls have been delivered to the pool corner and enclosed by the boom barrier.*

- **Boom barrier installed - 15 points**

The step is considered successfully completed if the end of the barrier with the connector is installed into the port on the adjacent pool edge.

- **Number of balls inside the barrier - up to 30 points (5 each)**

The step is considered successfully completed if the balls are moved from the frame to the pool corner where the boom barrier is located, and after the barrier is installed they end up inside it.

- **Anchor the barrier - 10 points**

The step is considered successfully completed if the T-connector is installed into the port located at the bottom of the pool.

TOTAL for the task: 50 points

### **Task 3. Maintenance of underwater communications**

**At the bottom there are two parts of a red corrugated pipe 50-70 mm. At the end of each pipe there is a cap with Velcro (loops).**

On the red pipes there are also biofouling (colored loops made of chenille stems).

It is necessary to clean the pipeline and repair it. For repair, a coupling must be lowered and the pipe ends connected to each side of the coupling. For connection, the ends of the coupling have areas with Velcro (hooks)



*Two pipelines are located at the bottom of the pool. Velcro is installed at the pipe ends. There is a loop for carrying the pipe. Biofouling are installed on the pipes and must be removed.*

*The coupling is located at the pool edge at the start of the mission. The vehicle must deliver the coupling to the bottom of the pool.*

- Biofouling removed - 15 points (3 points each)

The step is considered successfully completed if the biofouling is no longer in contact with the pipe and is delivered to the pool edge.



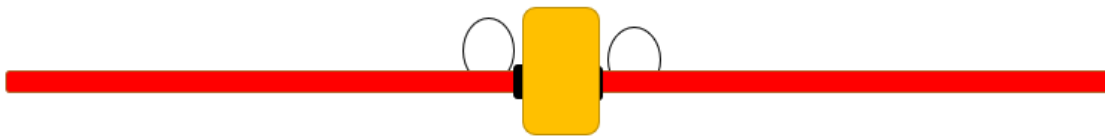
*Biofouling placed along the length of the red pipes (5 total)*

- Coupling delivered to the pipes - 5 points

The step is considered successfully completed if the coupling is delivered by the vehicle to the area between the two pipes.

- Pipes connected to the coupling - 30 points (15 each)

The step is considered successfully completed if the pipe end with Velcro makes reliable contact with the connection point on the coupling (the area with Velcro).



*Pipes cleaned and connected to the coupling*

TOTAL for the task: 50 points

## **Task 4. River biodiversity**

Collection and counting of organisms inhabiting the region's water bodies to study the ecological situation in the water area.

4.1. Determine the concentration of the mussel colony in the study area.

At the bottom there is a frame of 1.2 x 1.2 m. White round plates imitating mussels are mounted on the frame.



### *Mussel colony*

- Number of mussels in the sector determined - up to 15 points
  - Manually - 5 points
  - Using computer vision - 15 points

Teams must independently manufacture a square frame (square) and place it on the frame with mussels. The internal dimensions of the frame MUST be 50 cm x 50 cm. Teams whose frame deviates from these dimensions by more than 1 cm will not be able to complete the task. All edges of the frame must be completely inside the frame with mussels. No part of the frame may overhang the edge of the plate on which the mussels are attached. After the frame is installed, teams must count the number of mussels inside the frame.

The step is considered successfully completed if the team demonstrates the installed frame to the judge and reports the number of mussels inside it.

A mussel is counted if any part of it falls inside the frame.

Teams may count the mussels only once.

- Number of mussels in the colony determined - 10 points

The step is considered successfully completed if, based on the number of mussels contained in the 50cm x 50cm frame, the team was able to calculate how many mussels are contained in the entire colony in the 1.2 x 1.2 m frame. The determined value must be reported to the judge and differ from the actual value by no more than 5 mussels.

### 4.2. Retrieve crayfish for research

- Crayfish extracted - 10 points (5 each)

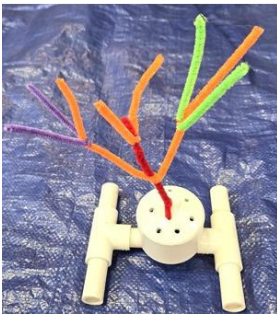
The step is considered successfully completed if the crayfish are delivered to the pool edge.



### *Crayfish*

- Algae samples extracted - up to 20 points (5 each)
  - Extracted by the base - 10 points
  - Extracted by the shoots - 5 points

Algae are considered collected by the base if, during movement and extraction to the pool edge, the vehicle's manipulator only touches the base, not the chenille stem simulating algae. Otherwise, the team receives fewer points for algae extraction.



### *Algae sample*

TOTAL for the task: 55 points

TOTAL for the mission: 190 points

## **Mock-up layout diagram**

