![seaperch logo]

SeaPerch International Challenge 2025

Arab Republic Of Egypt

February 8-10, 2025

HANDBOOK

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2025 North Africa SeaPerch Challenge

Introduction

Welcome to the North Africa SeaPerch Challenge!

This Team Handbook contains information that teams need to compete at the North Africa SeaPerch Challenge. It includes task descriptions, rules and requirements, and other guidance and specifications. Teams are encouraged to read this document for a thorough understanding of what is necessary to compete effectively.

These instructions apply specifically to participation in the 2024 North Africa SeaPerch Challenge. Please check with your local regional competition coordinator for rules and required submissions related to that event which may differ from the regional or International Seaperch Challenge.

Why compete in the North Africa SeaPerch Challenge?

The annual SeaPerch Challenge is an invitation-only event open to teams that excel at registered regional competitions and earn a slot to compete in the season's culminating event.

On land, teams show off their engineering skills through technical papers and presentations. In the pool, they navigate their SeaPerch remotely operated vehicle (ROV) through a series of obstacles inspired by the real world that test maneuverability, control, and utility. Each season has a new theme and a new set of competition tasks, challenging teams to expand on their original vehicle design.

Beyond the friendly rivalry, all competitions bring students together from different schools, states, and countries to form a supportive community.

Why robotics competitions?

The goals of the RoboNation student competitions are to provide opportunities for students to experience real-world engineering challenges and to develop the skills needed to solve those challenges. The objective is to produce the people who will push the envelope in the future. Competitors gain an appreciation for the tradeoffs inherent in any system design and the lessons learned in transitioning from a working bench prototype to operating reliably in the real world.

SECTION 1: Competition Overview

1.1. Dates & Venue

The 2025 North Africa SeaPerch Challenge will be conducted 8-10 February 2025 at ████ ███████████

1.2. 2025 Theme

The 2025 theme is Environmental Monitoring: Coral Restoration. Coral reefs provide coastal protection for communities, habitat for fish, and millions of dollars in recreation and tourism, among other benefits. But corals are also severely threatened by rapidly worsening environmental conditions. Efforts to help corals recover include the following activities:

- Planting nursery-grown corals back onto reefs.
- Making sure habitat is suitable for natural coral growth, including the removal of invasive species.
- Building coral resilience to threats like climate change

1.3. Design Documentation & On-Site Elements

The 2025 North Africa SeaPerch Challenge includes pre-event online submissions as well as on-site events.

1.3.1. Design Documentation

Technical Design Report (Required)

A Technical Design Report (TDR) succinctly describes your unique SeaPerch ROV and the engineering design process, providing insight into the iterative design process and allowing for data analysis that supports the final ROV design.

Meet the Team (Required)
We want to get to know you! Share your team or school's logo, an overview of what your team is all about, and social media information so we can share it with the SeaPerch community. This is your chance to introduce us to your team and team's personality.

Real-World Innovation Poster (Optional)
This event challenges teams to explore real-world applications for underwater ROVs. Teams are invited to identify a real-world issue and design a SeaPerch ROV to address the

issue. To present their project, teams will create a virtual poster. These posters may include anything from a conceptual design to a full project conducted in the real world.

Community Outreach Project (Optional)
Whether you volunteer your time in your community, or your team finds a way to connect and offer support online, we want to hear about it.

1.3.2. On-site Elements

Pool Courses
- Obstacle Course: The Obstacle Course tests high-speed maneuverability and requires the SeaPerch ROV to navigate the course as quickly as possible.
- Mission Course: The Mission Course incorporates a mission that teams must complete with their SeaPerch ROV related to Deep-Sea Exploration.

On-site Team Presentation
Presentations are a great opportunity for teams to share their SeaPerch experience and practice their academic presentation skills.

1.4. Season Schedule/Timeline

Event	Date
Registration	1 DEC 2024 - 20 JAN 2025
Training	10 DEC 2024 - 1 JAN 2025
Regional Competition	8 FEB 2025 - 10 FEB 2025

1.5. Eligibility & Qualification

The annual International SeaPerch Challenge is an invitation-only event open to student teams from anywhere in the world that have been awarded a slot by winning at an approved regional competition or by earning a Wild Card space. Elementary School, Middle School, and High School students are eligible to compete.

1.5.1. Age Level Eligibility

The annual International SeaPerch Challenge is an invitation-only event open to student teams from anywhere in the world that have been awarded a slot by winning at an approved regional

competition or by earning a Wild Card space. Elementary School, Middle School, and High School students are eligible to compete.

1.5.2. Qualifying at Regional Competitions

SeaPerch regional competitions are planned, hosted, and executed by local SeaPerch advocates, mentors, and regional coordinators around the world. These events range from local exposition events to approved regional competitions that allocate qualifying spaces for top teams to compete at the annual International SeaPerch Challenge.

1.6. Team Registration

1.6.1. Competition Classes

The 2025 International SeaPerch Challenge will include three (3) competition classes.

Middle School Stock Class:

- Teams include students in 8th grade and below
- The total cost of modifications to the final ROV must be $25 or less
- Frame built using only PVC, CPVC, PEX pipe and fittings. Any size pipes and pipe fittings may be used. Pipes and pipe fittings may be modified using hand and power tools, but may not be machined using CNC or other automated processes.
- Must only use simple on/off switches for thruster controls
- May use PWM, microcontrollers, or other devices for non-thruster controls
- May use a fixed or variable resistor to reduce voltage

High School Stock Class:

- Teams include students in 9th grade and above
- The total cost of modifications to the final ROV must be $25 or less
- Frame built using only PVC, CPVC, PEX pipe and fittings. Any size pipes and pipe fittings may be used Pipes and pipe fittings may be modified using hand and power tools, but may not be machined using CNC or other automated processes.
- Must only use simple on/off switches for thruster controls
- May use PWM, microcontrollers, or other devices for non-thruster controls
- May use a fixed or variable resistor to reduce voltage

1.6.2. Registration Components

All teams who receive an invitation to compete at the 2025 International SeaPerch Challenge will be required to register by ███████████████████████████████████████. Teams are encouraged to start registration as soon as possible after receiving instructions as it is a multi-step process; the registration deadline of ████████████ is firm. Note that each team must

register and bring a unique chaperone. A single chaperone cannot bring multiple teams to the International SeaPerch Challenge.

1.6.3. Registration Fees

To complete the North Africa SeaPerch Challenge registration, teams must pay the registration fees and register each competitor. Teams are limited to 4 students and 1 Supervisor.

- ROV Registration Fee: $450 USD per team including registration and full kit.

1.7. Spectator Tickets

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1.8. Communications

1.8.1. 2025 SeaPerch Challenge Website

The official competition website is the 2025 SeaPerch Season. This website includes all official documents and a detailed list of the registered Challenge teams. Helpful resources, past competition results, and other engagement opportunities can be found on this website. Information and documents are updated regularly, and it is the team's responsibility to check the website for updates.

1.8.2. Points of Contact

SeaPerch Questions: info@seaperchnorthafrica.org

SECTION 2: Pool Courses

2.1. Pool Course Events Overview

The competition will include two in-pool courses:

- The Obstacle Course tests high-speed maneuverability and requires the SeaPerch ROV to navigate the course as quickly as possible.
- The Mission Course incorporates a mission that teams must complete related to underwater environmental monitoring and coral reef restoration.

2.2. Lane Setup

Courses will be suspended from the pool's lane dividers with the lower course frames approximately 5-6 feet below the water surface and 5-6 feet from the side of the pool.

The obstacle course and mission course will be arranged beside each other and considered a single competition lane. The pool will include eight (8) competition lanes to accommodate eight (8) teams simultaneously. Competition lanes will be separated by a vacant pool lane (i.e. no course). Each team will have sole use of their assigned competition lane for their allotted time slot.
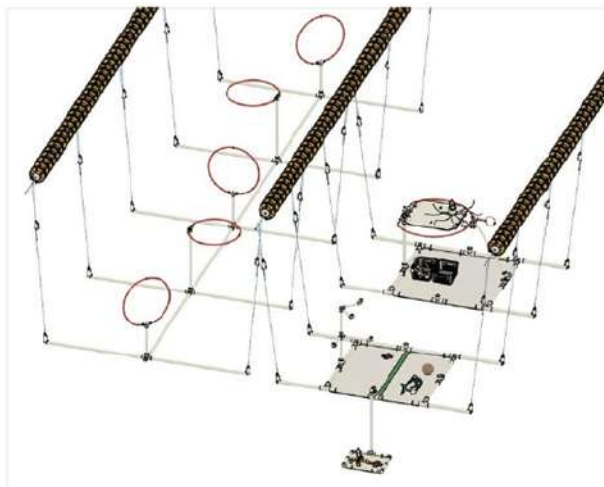
Competition Lane Setup (Surface Vessel not shown)
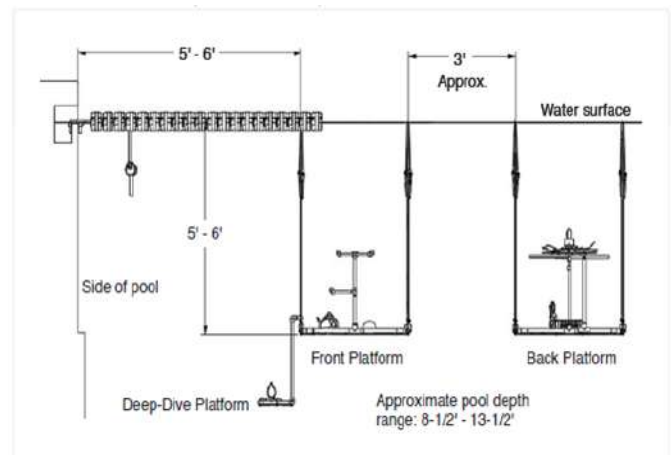
Course Layout Diagram

2.3. ROV Power

12-volt direct current (VDC) power connections for the standard SeaPerch power cable alligator clips will be supplied for each competition lane. See 2.7.2.

ROV Power Connection

Inside ROV Power Connection

Auxiliary Equipment, Batteries, and Power Supplies for more information.

2.4. Timing

Teams have 20 minutes to complete Pool Course runs. After the course judge verifies the team and provides instructions, a 20-minute course timer will start. Teams are responsible for managing their time and may take as much time as needed for setup and reset within the twenty minutes allocated. When the course timer expires and reaches zero, the team must depart the Pool Course.

Runs will be timed using a run timer. The run timer starts when the run starts and records the official run times. Teams may start subsequent runs immediately after completing a prior run but receive a start signal from the judge to ensure the run will be scored. Teams may abort runs at any time without completing the course if they are experiencing problems and want to ensure they have enough time for subsequent runs. A run ends when the run time expires, the team has aborted the run, or the team has completed the course (whichever comes first). Guidelines for obstacle course and mission course runs are below.

2.4.1. Obstacle Course Timing

- Teams may attempt up to two (2) runs.
- Each run is limited to four (4) minutes maximum.

2.4.2. Mission Course Timing

- Teams may attempt one (1) run on the mission course.
- The mission course time limit is eight (8) minutes maximum.

2.5. Obstacle Course

The Obstacle Course consists of five 18" hoops oriented at different angles and suspended 5-6 feet below the water surface.
Please note that there is no guarantee of the position of the hoops when the course is deployed in the pool at the International SeaPerch Challenge and may not appear as pictured below. Operators should not try to memorize actions such as in playing a video game but should instead practice a variety of general high-speed maneuvers.
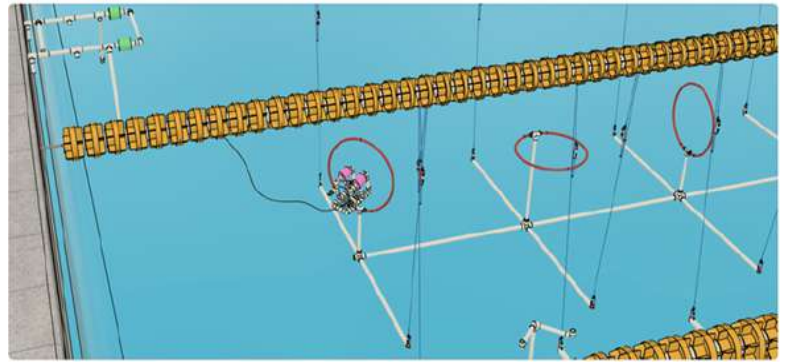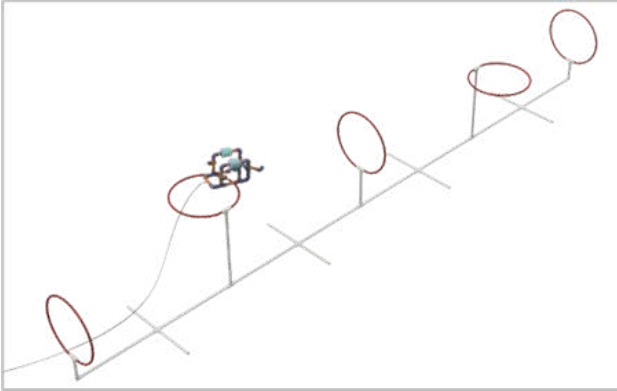
Suspended Obstacle Course
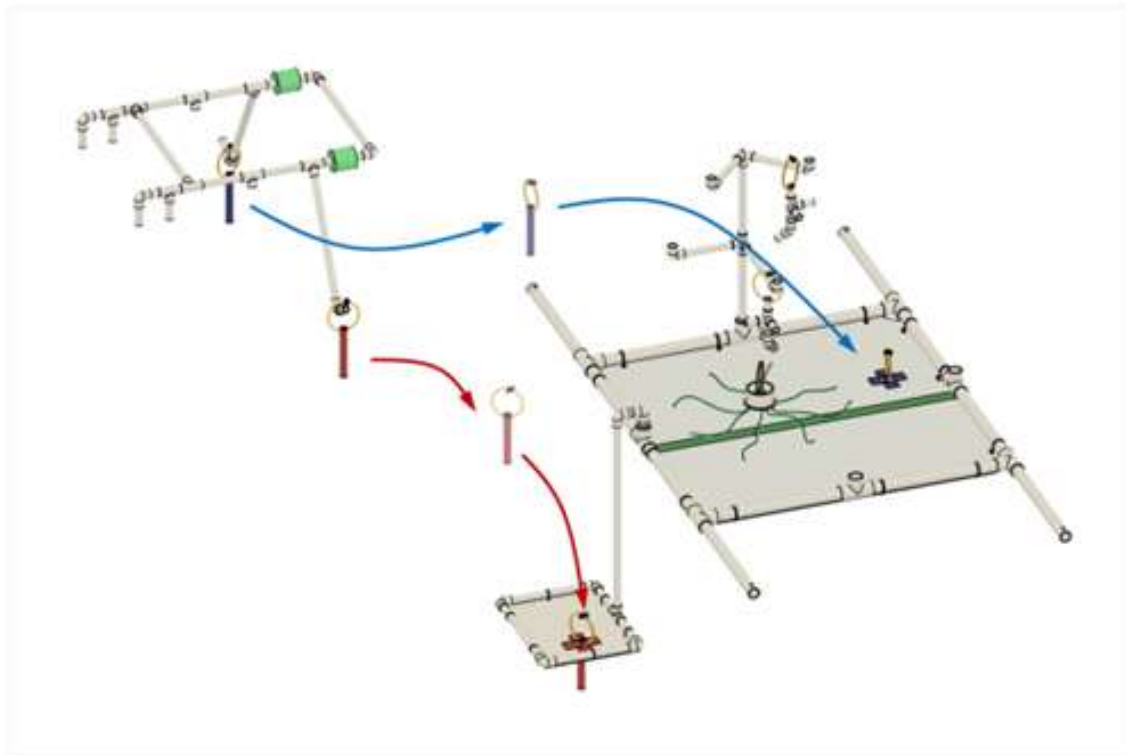
Placement of sensors in their respective sensing location.

2.5.1 Navigation Overview

- Start of run: The ROV must be under its own power and surfaced within the outline of the surface vehicle. Team members are not allowed to touch the ROV after the lane judge begins the countdown to start the run.
- The ROV is required to pass through each of the five obstacle course hoops in order starting at the hoop closest to the pool wall.
- The ROV must surface after clearing the hoop furthest from the pool wall. Surfacing is considered complete when any part of the ROV breaks the surface of the water.
- The ROV must re-submerge and head back to the pool wall by passing through each of the five hoops in reverse order.
- End of run: The run is complete with the ROV surfaces (any part of the ROV breaks the surface of the water) within the outline of the surface vehicle located next to the pool wall. The run will end if the allotted time expires even if the ROV has not completed the course.
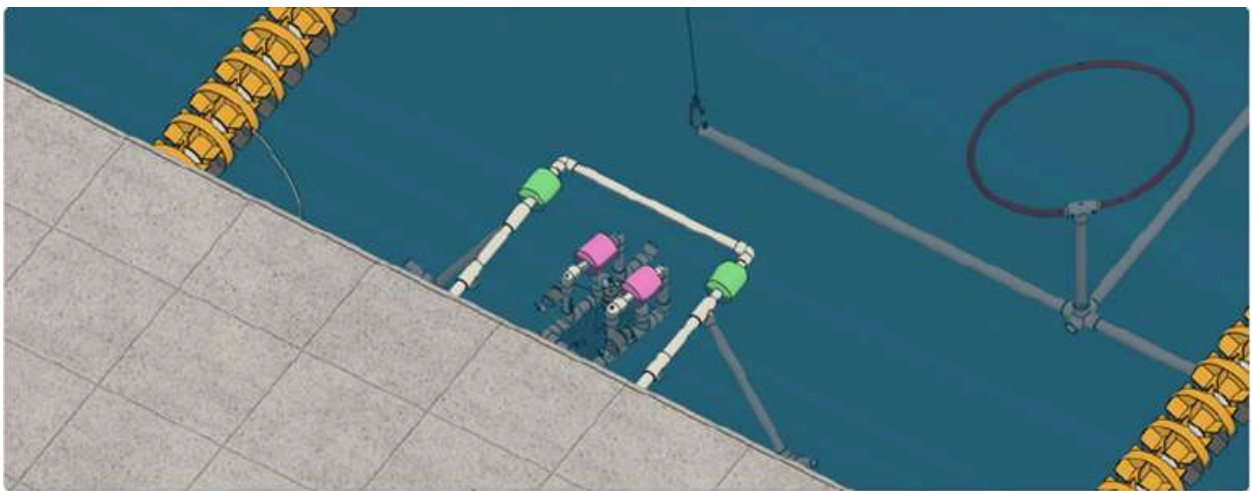
Start of Run

Not Surfaced
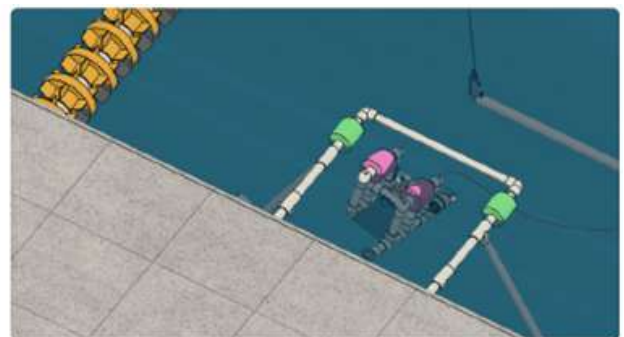
End of Run - ROV Surfaced

Teams are ranked based on time. The obstacle course scoresheet is available in Appendix A: Competition Scoresheets and Rubrics

2.6. Mission Course

The Mission Course consists of six tasks across two task frames and will be suspended 5-6 feet below the water surface (see course layout on next page). Tasks are described in detail below and include:

- **Task 1**: Bio-Bucket Access
- **Task 2**: Marine Life Management
- **Task 3**: Coral Restoration
- **Task 4**: Coral Sample Collection
- **Task 5**: Marine Monitoring

2.6.1. Course Layout

The Mission Course consists of a surface vehicle located next to the pool wall, two task frames that will be suspended 5-6 feet below the water surface, and a smaller task frame suspended below the front frame.
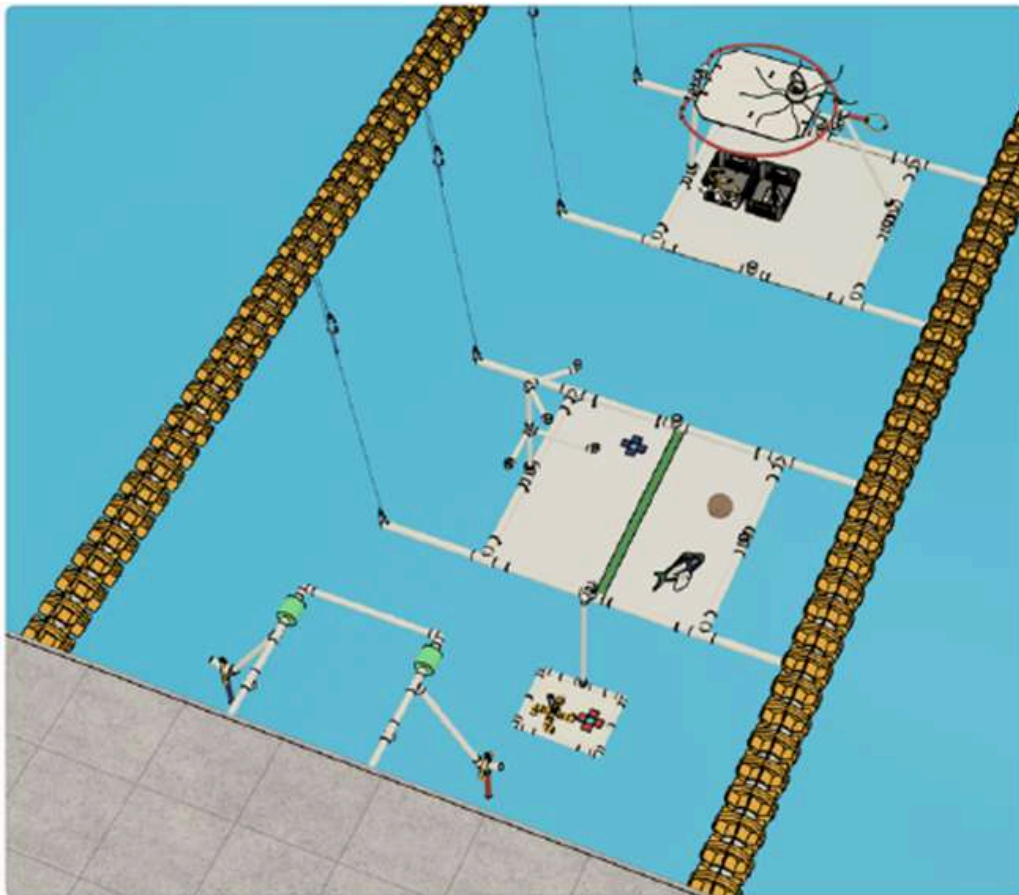
Surface Vehicle

 A PVC structure representing a surface vehicle will be placed by the pool wall where team members and judges are positioned. This structure will serve as the start and end point of Mission Course runs.

Two sensors (Task 5) will hang below the surface vehicle structure.
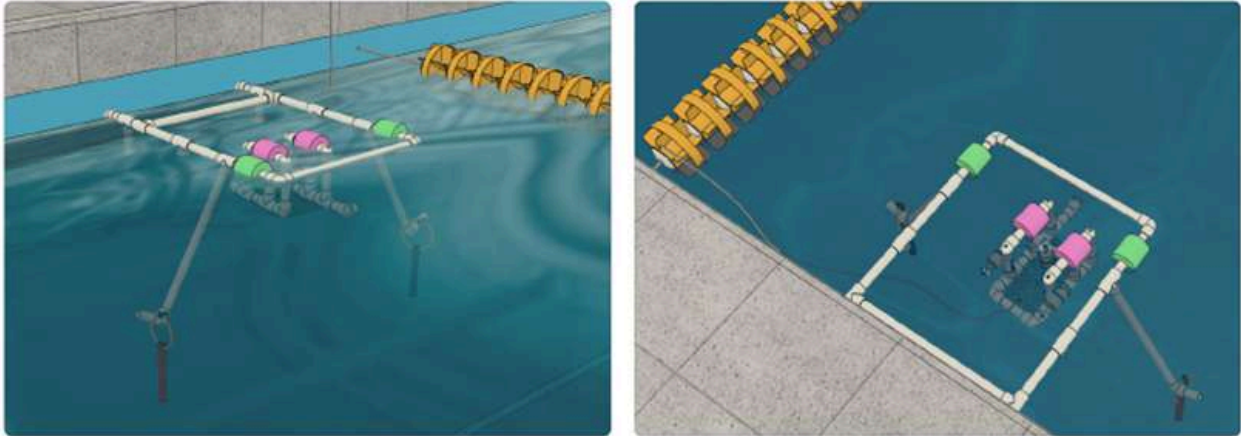
Front Platform

 The front platform is the platform closest to the pool wall. This platform includes a coral tree (Task 3), seagrass area (Task 2), and the sensing location for Sensor #1(Task 5).
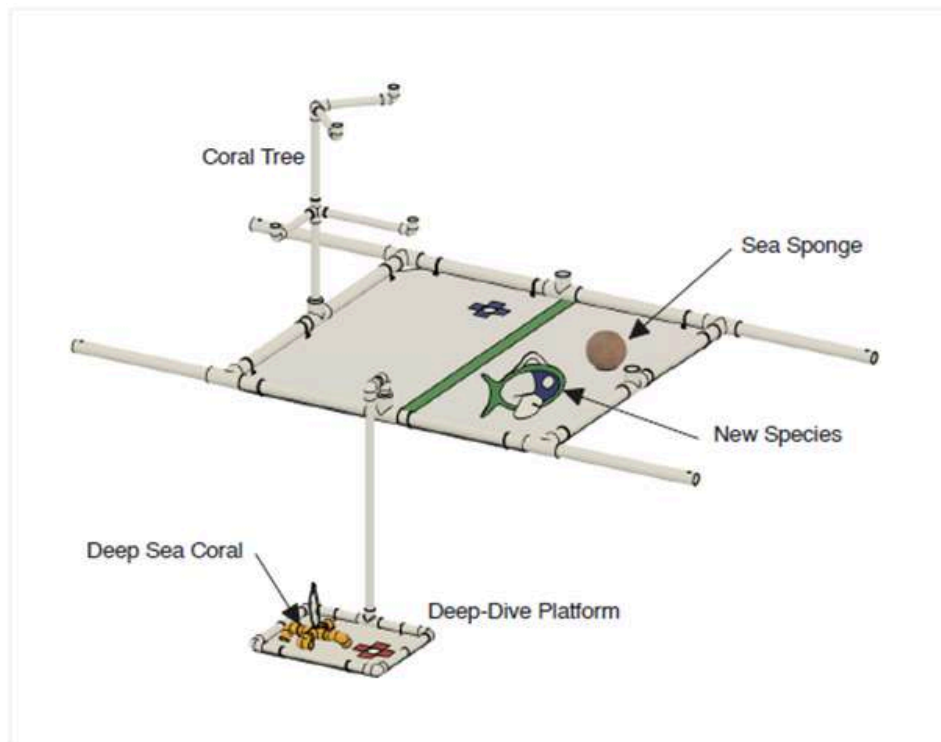
Front Platform

The deep dive platform will hang below the front platform. This platform includes the sensing location for Sensor #2 (Task 5). At the start of the run, deep-sea coral will be positioned on this platform (Task 4).

Back Platform

The back platform includes a closed hatch (Task 1) that can be used to access thebio-bucket (Tasks 2, 3 & 4). One or two bio-buckets may be included in the course and if multiple are available, they may be utilized interchangeably.

At the start of the run, marine life will be positioned on top of the hatch (Task 2).

Back Platform
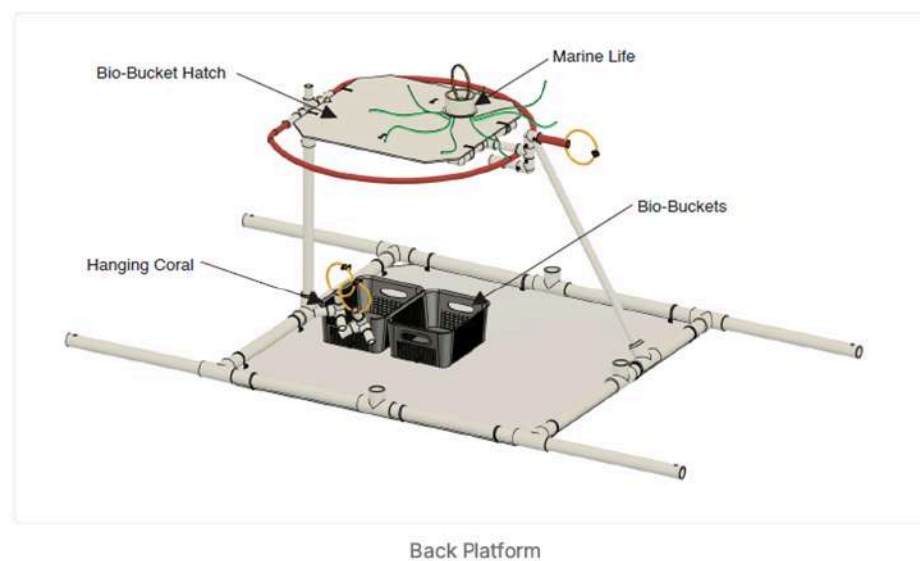
2.6.2. Navigation Overview

- Start of run: The ROV must be under its own power and surfaced within the outline of the surface vehicle. Team members are not allowed to touch the ROV after the lane judge begins the countdown to start the run. The tether cable does not have to go through the open area of the surface vehicle. Teams are allowed to position the surface vehicle along the wall within the lane.
- Objects falling past the suspended task frames are out of play and the ROV is not allowed to attempt to retrieve them.
- End of run: The run is complete with the ROV surfaces (any part of the ROV breaks the surface of the water) within the outline of the surface vehicle located next to the pool wall.

The run will end if the allotted time expires even if the ROV has not completed the course.
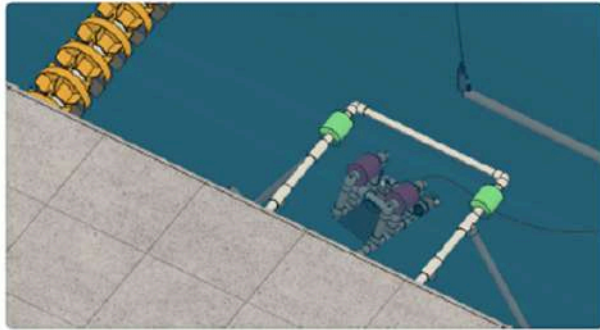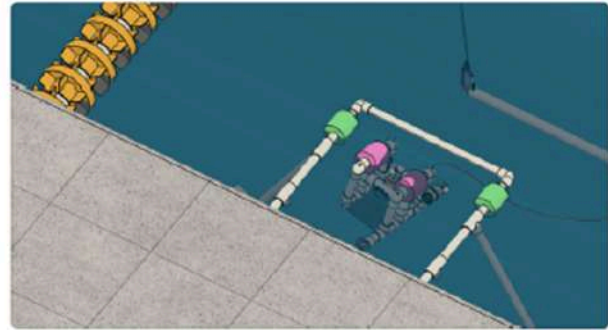
ROV Not Surfaced   End of Run - ROV Surfaced

The ROV may transport multiple objects simultaneously. Objects may be moved between platforms for staging without completing the task. (For example, the coral samples can be moved to the bin after completing other tasks.)
Tasks may be completed in any order <u>with the following exceptions</u>:

- To receive points for opening the hatch door (Task 1), it must be opened before removing or placing objects in the bio-basket. If a team fails to open the hatch, objects may still be removed from or placed in the basket; however, points will not be awarded for opening the hatch.
- To receive points for moving the marine life from the hatch (Task 2), it must be removed from the hatch prior to opening the hatch. If a team fails to move the marine life, the hatch may be opened; however, points will not be awarded for moving the marine life.

2.6.3. Scoring Overview

A maximum of 110 points can be earned on the Mission Course through successfully completing tasks with bonus points awarded for completion of the course under a time limit. Points are not official until verified by the master scorekeeper.

Task Points

Tasks can be completed for a total of 100 points divided across the tasks as follows:

- **Task 1**: Bio-Bucket Access has a max of 14 points
- **Task 2**: Marine Life Management has a max of 25 points
- **Task 3**: Coral Restoration has a max of 21 points
- **Task 4**: Coral Sample Collection has a max of 24 points
- **Task 5**: Marine Monitoring has a max of 16 points

Points will be earned at completion of each task action. If tasks are disturbed in subsequent actions, teams will still earn the points for completion.

Time Bonus Points

Teams may earn bonus points for successfully completing all tasks in less than 6 minutes. Bonus points are based on adjusted finished time including any time penalties incurred during the run. Bonus points are applied for:
- Finish times less than 4 minutes earn teams 10 points
- Finish times less than 6 minutes earn teams 5 points

Scoresheet

The mission course scoresheet is available in Appendix A: Competition Scoresheets & Rubric-Mission Course Scoresheet

2.6.4.Task 1: Bucket Access

At the start of the run, the bio-buckets will be placed under a closed hatch. This task includes two actions to earn points.

Task 1.1: The ROV must open a hatch to expose the bio-buckets (simulated in the image by the small baskets).
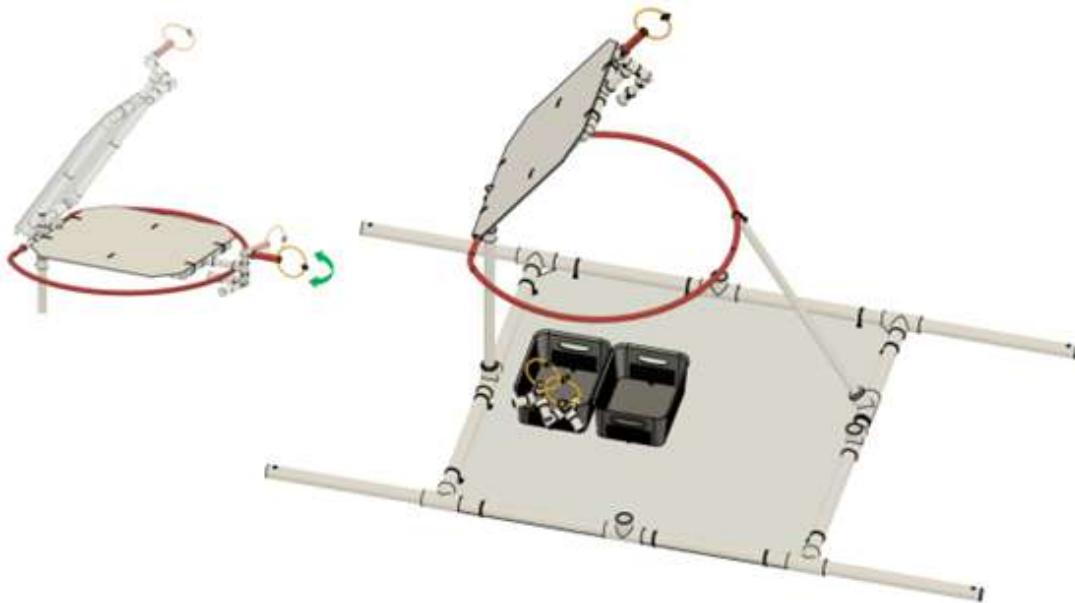
Task 1.2: The ROV must close and lock the hatch to secure the bio-buckets. To collect points for opening the hatch, it must be completed prior to placing or removing objects in the bio-buckets (see Navigation Overview). The hatch may be closed at any time during the run to collect points.
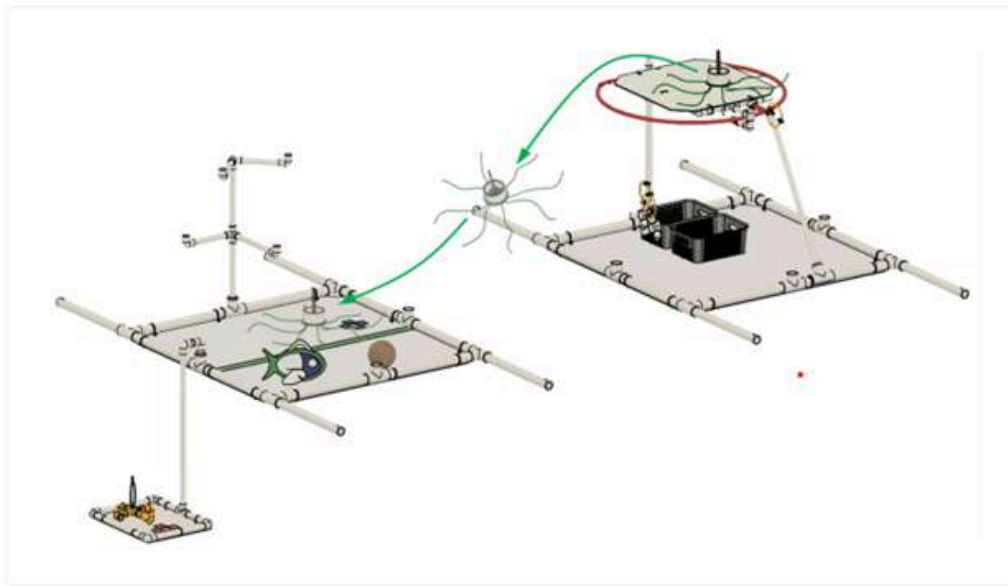
Scoring: A maximum of 14 points can be earned in this task. This is a multi-step task and teams will earn points for completing each step of the task, including:
- Four (4) points for opening the hatch
- Ten (10) points for closing and latching the hatch.

2.6.5. Task 2: Marine Life Management

This task includes multiple actions related to marine life.

Task 2.1: At the start of the run, marine life will be located on top of the hatch on the back platform. The ROV must move marine life from the top of the hatch to the front platform

Task 2.2: The ROV must retrieve a new species from the seagrass area on the front platform and place it in the bio-bucket on the back platform. The ROV may maneuver through the open hatch for additional points.

ROV maneuvers through hatch with the new species.
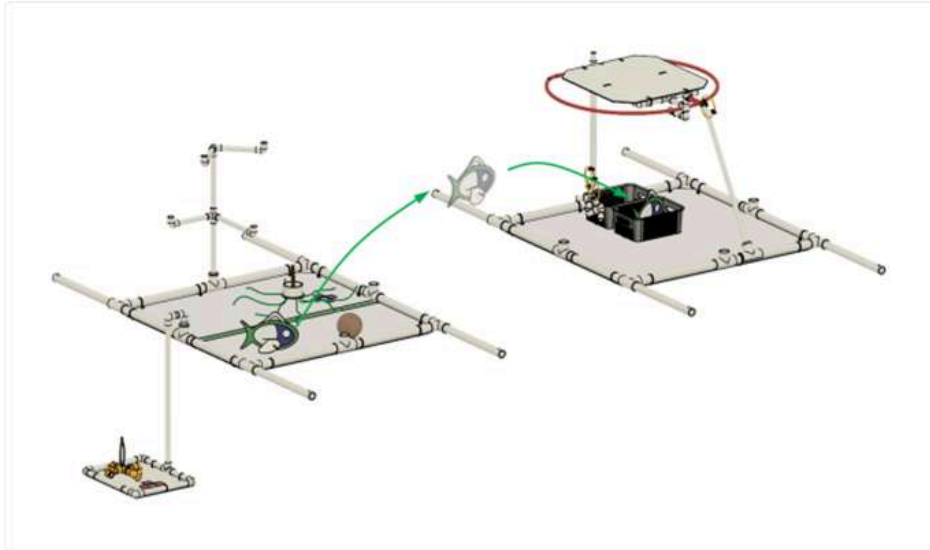
ROV places new species in bio-bucket without maneuvering through the hatch.

Scoring: A maximum of 25 points can be earned in this task. This is a multi-step task and teams will earn points for completing each step of the task, including:

- Three (3) points for removing the marine life from the hatch
- Six (6) points for placing the marine life on the front platform
- Ten (10) points for placing the new species in the bio-bucket
- Six (6) points for maneuvering through the hatch to place the new species (these points will only apply if the new species is placed in the bio-bucket)

2.6.6. Task 3: Coral Restoration

The ROV must remove two coral samples from the bio-bucket on the back platform and hang each sample onto the coral tree on the front platform. Coral may be hung on any branch of the coral tree and additional points will be earned for placing both samples on different branches.
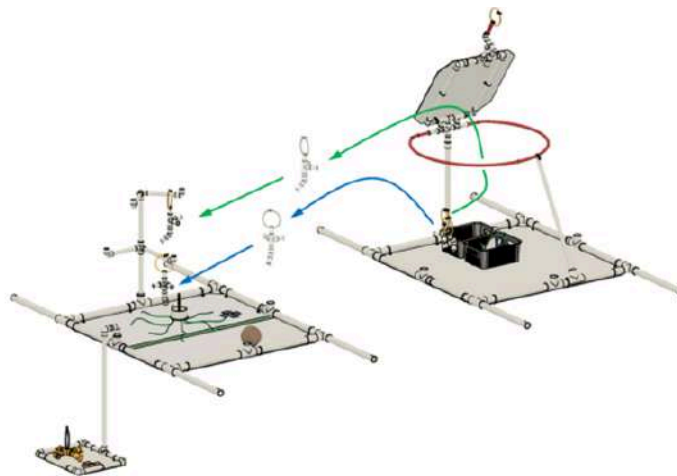
Green line shows path of ROV maneuvering through the hatch with a coral sample. Blue line shows path of ROV not maneuvering through the hatch.

Scoring: A maximum of 21 points can be earned in this task. This is a multi-step task and teams will earn points for completing each step of the task, including:

- Three (3) points for maneuvering through the hatch with each coral sample (6 points total)
- Six (6) points for hanging each coral sample on the coral tree (12 points total)
- Three (3) points for hanging both coral samples on different branches of the coral tree

2.6.7. Task 4: Coral Sample Collection

This task includes multiple actions related to coral samples.

Task 4.1: The ROV must collect the sea sponge from the front platform and place it in one of the bio-bucket on the back platform. The ROV may maneuver through the open hatch for additional points.

Task 4.2: The ROV must collect the deep-sea coral sample from the deep dive platform and place it in the bio-bucket on the back platform. The ROV may maneuver through the open hatch for additional points.
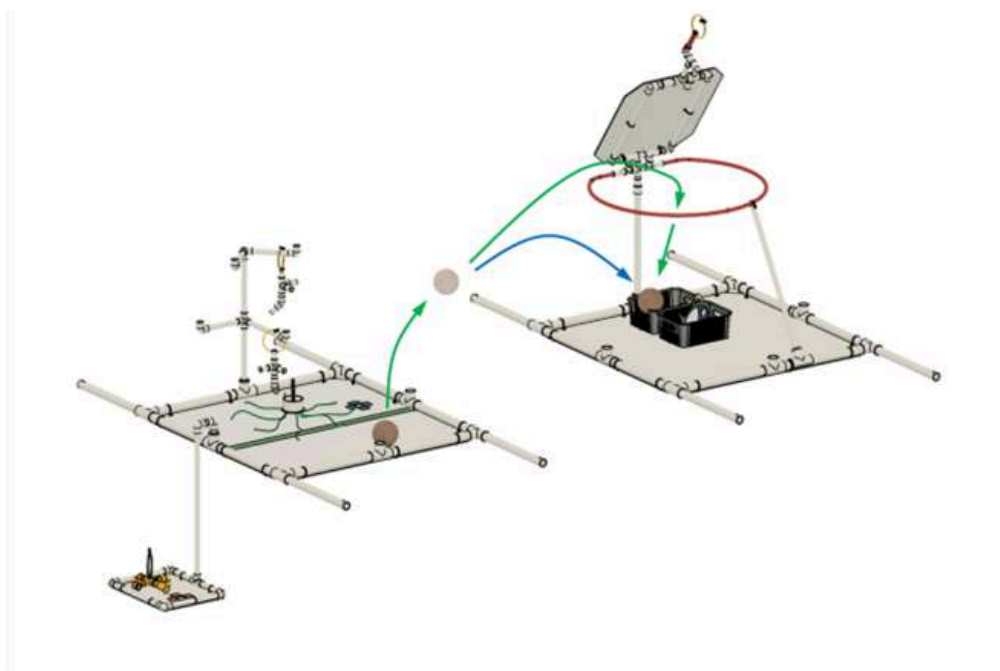
Green line shows path of ROV maneuvering through the hatch with the sea sponge. Blue line shows path of ROV not maneuvering through the hatch.

Scoring: maximum of 24 points can be earned in this task. This is a multi-step task and teams will earn points for completing each step of the task, including:
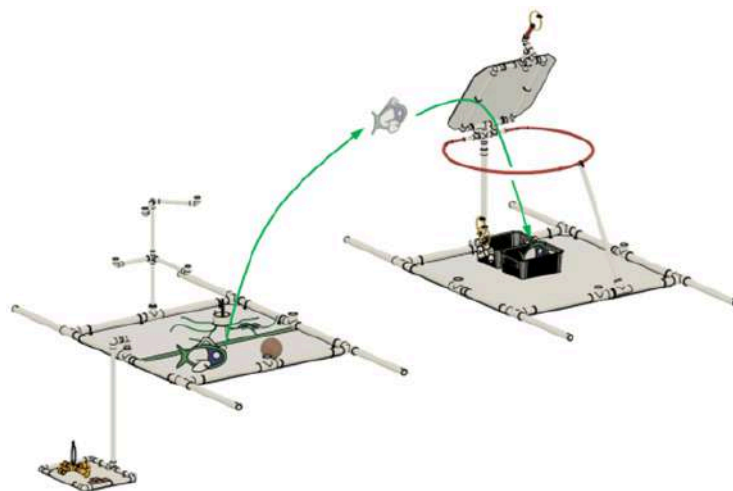- Ten (10) points for placing the sea sponge in the bio-bucket
- Three (3) points for maneuvering through the hatch with the sea sponge (these points will only apply if the sea sponge is placed in the bio-bucket)
- Eight (8) points for placing the deep-sea coral sample in the bio-bucket
- Three (3) points for maneuvering through the hatch with the deep-sea coral sample (these points will only apply if the deep-sea coral is placed in the biobucket)

2.6.8. Task 5: Marine Monitoring

The ROV must retrieve two sensors from the surface vehicle and place each sensor in the sensing location located on the front platform and the deep-dive platform. Sensor #1 (**blue**) should be placed in the marked sensing location on the front platform. Sensor #2 (**red**) should be placed in the marked sensing location on the deep-dive platform.
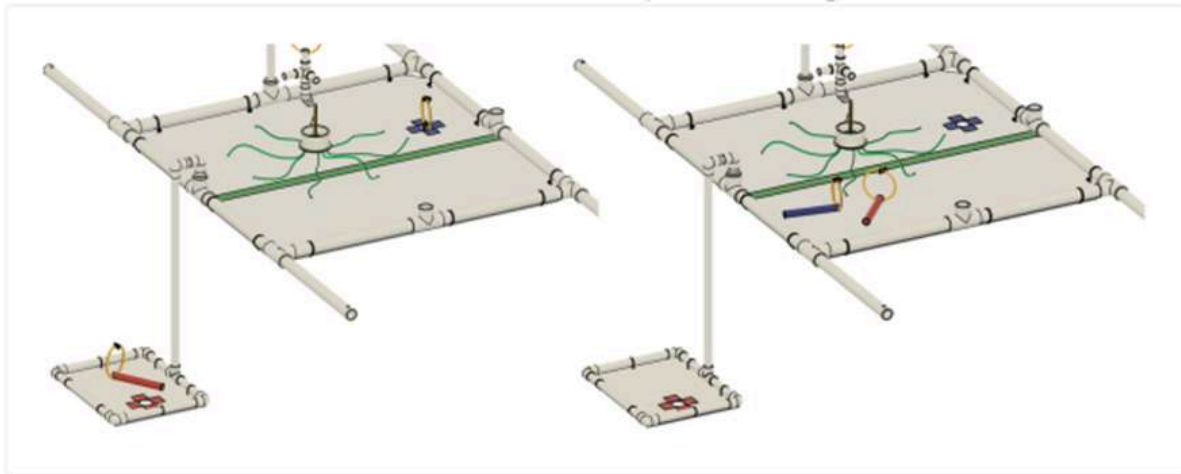
(Left) Placement of sensor #1 (blue) in its sensing location with sensor #2 (red) placed on the deep–dive platform. (Right) Placement of both sensors on front platform.

Scoring: A maximum of 16 points can be earned in this task. This is a multi-step task and teams will earn points for completing each step of the task, including:

- Six (6) points for placing Sensor #1 (**blue**) in the sensing location on the front platform
- Ten (10) points for placing Sensor #2 (**red**) in the sensing location on the deep dive platform
- Partial points will be earned on this task if the ROV places a sensor on the platform but not in the defined sensing location:

  -Three (3) points for placing a sensor on the front platform (6 total for both sensors)
  - Six (6) points for placing a sensor on the deep-dive platforms (max of 1 sensor)

2.7. General Pool Events Rules

These rules are preliminary for the International SeaPerch Challenge and may be updated prior to the competition. Any updates will be posted here with notations of changes

2.7.1. ROV, Spare Parts, and Adjustments

1. The team must use the same ROV that was presented at compliance for both pool events.
2. Each team must have their own ROV – teams are not allowed to share an ROV.
3. Teams are not allowed to share ROV attachments or devices.
4. Spare parts are allowed; however, spare ROVs are not allowed.
5. Any design or structural modifications made to the ROV after a compliance check requires the team to re-submit the ROV for a compliance check.

6. No parts or materials, except as noted in this section, may be added to or removed from the ROV between pool events. The ROV must compete in both pool events with the same attachments and parts connected. Violations will result in disqualification.

7. Attachments and parts may be repositioned (I.e., rotated or swiveled) between the two pool events. Attachments or parts may not be disconnected and relocated; they must remain connected to the same point on the ROV when they are repositioned.

8. The ROV may be worked on or adjusted during competition. This may include adjusting buoyancy by adding or removing buoyancy materials or adding materials like tape or cable ties necessary to secure parts. However, the run timer will continue.

9. Replacement of failed or damaged parts is permitted. Teams replacing failed or damaged parts must re-submit their ROV for a compliance check conducted by staff at the Triage or ROV Poolside First Aid Station.

10. Passing compliance checks does not guarantee the right to compete. Lead judges in the competition area have the final say on safety and compliance issues and may

require teams that have already passed the compliance check to fix issues prior to competing.

2.7.2. Auxiliary Equipment, Batteries, and Power Supply

1. 12-volt direct current (VDC) power connections for the standard SeaPerch power cable alligator clips will be supplied for each competition lane. This power connection is for the ROV only and is limited to 10 amps; no auxiliary equipment may be connected to this power connection.

2. Teams may provide their own battery for the ROV.

3. Teams may provide an additional battery for auxiliary equipment such as cameras, advanced controllers, and electromechanical ROV attachments.
4. Team supplied batteries must not be larger than 6.5" long x 3" wide x 4" high and must be 12 VDC maximum with a 9-amp hour maximum rating.
5. Teams may not bring anything to the pool deck that requires 110-volt or any other alternating current (AC) power. Laptop computers are allowed if they are battery powered and do not need to be plugged into 110-volt power.

2.7.3. Diver Assistance and ROV Tether Handling

1. The ROV must move only under its own power. The tether may not be pulled to expedite the ROV's navigation of the course.

2. If the ROV or tether becomes tangled on the course structure or is otherwise unable to move on its own power, a team member must notify the judge that they would like to try to free the ROV by pulling on the tether. Under this circumstance teams may gently pull on the tether; however, the run timer will continue. If the ROV is pulled by the tether, the ROV must be returned (driven) to the location that it was moved from before it may continue competing.
3. The team may ask the judge for diver assistance. If diver assistance is requested the judge will pause the run timer and call for a diver. The judge will restart the run timer when the diver arrives at the lane and begins assisting. There is no longer a two-minute diver assistance penalty. If the ROV is moved, it must be returned to the location that it was moved from before it may continue competing.

2.7.4. On Deck

1. Prior arrangements are required for waivers to any of the following rules to accommodate students' special needs. Any special accommodations must be made in

advance of the starting date of the International SeaPerch Challenge by contacting seaperch@robonation.org

2. All team members and spectators are expected to be respectful of other competitors, spectators, volunteers, judges, and staff.

3. Instructions from judges, volunteers, and event staff must be followed at all times on the pool deck. Those not complying with instructions from judges, volunteers, or event staff will be asked to leave the pool area and may risk disqualification of their team from the event.

4. Pool passes are required to enter the pool area.

5. A maximum of five (5) pool passes will be issued for each team. Any team with more than six members in the pool area without special accommodations risks disqualification from the event.

6. Only four (4) student team members are allowed at the competition lane. Only two (2) team members are allowed to participate in the ROV operation at one time. These two (2) team members are considered the competing team members.

7. Only competing team members are allowed to communicate with the judges.

8. The four team members at the competition lane may switch drivers at any time and as many times as they choose. The lane judge will not stop the timers.

9. The remaining two passes are for pool area spectators and can be used by other students (competing later in either the obstacle or mission course), parents, coaches, teachers, or chaperones.

10. Once a pool event run starts the pool area team spectator may not enter the competition lane.

11. The pool area team spectators must sit or stand behind the designated barrier ribbon.

12. Any student team members who are pool area team spectators may switch with the team members at the competition lane between the pool event runs (obstacle and mission course).

13. All team members must wear shoes with rubber soles while on the pool deck.

14. All team members may help with setup but must exit to their assigned spots before the course run starts. During this set-up period, teams should adjust the ROV's buoyancy and make any other necessary adjustments

2.7.5. Equipment Failure

1. In the event of equipment failure between pool events, a team will be allowed to work on their ROV at an ROV First Aid Station or at Triage.

  a)The ROV First Aid Station is intended for quick repairs that can be accomplished in 15 minutes or less. The station will not be equipped with electrical power, so soldering is not allowed.

  b)After successful repairs, the team will reenter the competition queue in the front of the line.

  c)If repairs are not accomplished within the 15-minute time limit, the team must proceed to the pool check-in station and notify the staff that they require Triage.

Teams completing repairs in Triage will check-in at the pool check-in station and enter the staging area.

2. While competition staff will attempt to accommodate all participants, teams not completing repairs by the last pool event time slots may not be able to compete.

3. If an ROV or equipment malfunctions before attempting the first mission task or passing the first obstacle course hoop, the team may elect to stop their run without incurring a time penalty. The team will be allowed to make repairs as described in item 1 of this section.

4. If an ROV or equipment malfunctions after attempting the first mission task or passing through the first obstacle course hoop, the team may elect to stop their run. The judge will record the current run time and notify the lead judge. The lead judge or technical director will evaluate the issue and decide a course of action. If the team is allowed to make repairs and restart their run, they may incur a time penalty equal to their initial run time at the time they stopped their initial run.

2.7.6. Disputes, Challenges, and Redress Request

1. Portsmanship is always expected.

2. Team members and advisors are responsible for the conduct of all members and adults accompanying the team. Unsportsmanlike conduct of registered student team members or chaperones is grounds for the disqualification of a team.

3. Teams may not raise questions concerning other competing vehicles or other teams' scores.

4. Only the two competing team members may approach or speak to lane judges. Exceptions to this rule are only allowed if prior arrangements have been made to accommodate special needs.

5. Team members, chaperones, or spectators may not speak to the divers.

6. Team members will verify the time on the scoresheet reflects the time on the stopwatch. If there is a discrepancy, a team member may ask the lane judge for a second opinion. Timing disputes such as a team member claiming the judge did not start or stop the stopwatch at the correct time are not allowable disputes.

7. Disputes should be resolved at the time the alleged grievance occurs. However, if students are not able to articulate the alleged grievance, they may ask to speak to the lead course judge. The lead course judge will provide a redress request card that will allow the student and adult team members to meet with the technical director or lead judge to resolve the dispute. Decisions of the technical director or lead judge are final, and the same dispute will not be heard again.

8. If an ROV or the course is inadvertently interfered with during the competition, the competing team members should alert the lane judge and ask for a ruling by the lead judge or technical director. These situations will be addressed on a case-by-case basis.

SECTION 3: Design Documentation

2025 International SeaPerch Challenge

The design documentation for 2025 North Africa Regional Competition is delivered before
31 January, 2025

Required Documentation:
- Technical Design Report
- Meet The Team

Optional Documentation
- Real-world Innovation Poster
- Community Outreach Project

3.1. Technical Design Report

A Technical Design Report (TDR) succinctly describes your unique SeaPerch ROV and the engineering design process, providing insight into the iterative design process and allowing for data analysis that supports the final ROV design.

3.1.1. Overview

The TDR consists of seven mandatory sections and two mandatory appendices. The format of the written paper shall adhere to the following guidelines:
- 5 page limit (excluding Acknowledgements, References, and Appendices)
- 8.5 x 11 in. page size
- Margins ≥ 0.8 in.
- Font: Times New Roman 12pt.
- Header on every page including Team Id, Team Name, and Page Number
- Submitted in pdf format

PRO TIP: Teams are encouraged to start and keep an Engineering Notebook at the beginning of their SeaPerch build. Submitting an Engineering Notebook is not required for participation in the International SeaPerch Challenge but does help form the basis for creating a well-written TDR.
Need some inspiration? Visit https://seaperch.org/resources/design-process/ for a few helpful resources.

3.1.2. Report Contents

Abstract

A well-written abstract should concisely explain the key points or essence of your paper and quickly explain to the reader what the paper is about.

Task Overview

This section should include an overview of the task(s) your ROV will attempt and should discuss the characteristics and features of the tasks that affected the final design. Avoid directly quoting course descriptions or problem statements for real-world applications and instead use your own words to describe what your ROV will/would do within the application

Design Approach

Given the tasks described in the previous section, describe your team's strategy and approach to developing a novel SeaPerch design. Novelty may occur at various levels of the design and build process including specific components, collections of components, or even team approaches to the process. Focus attention on the creative aspects of your system and how your team conceived of, refined, and implemented these ideas. Describe your experience in making design decisions and how prospective ideas were considered among the team. Include engineering and scientific terms and concepts to demonstrate the team's understanding of the challenges of constructing and operating an underwater ROV.

Experimental Results

This section should describe various tests accomplished in-water and/or in simulation. What were your results? How did these tests impact your team's subsequent design(s)? Include images, charts, and figures to demonstrate your results.

Reflection & Next Steps

Reflect on this season's experience. What did you learn? Were there aspects of the project that you particularly enjoyed or that challenged you? How do you think that your new knowledge or experience will assist you in future endeavors? Include a discussion of next steps for the team and/or the team's ROV.

Acknowledgements

Participating in the competition involves identifying resources and support beyond the efforts of individual team members. This support can take many forms, such as technical advice, labor, equipment, facilities, and monetary contributions. Acknowledging those who have supported your efforts is important.

References

As with any technical publication, original ideas and content not generated by the paper's authors should be properly cited. While there are many citation styles, the American Psychological Association (APA) style guide should be used. Use in-text citations, where appropriate

Budget

Include all components included in your SeaPerch design and their costs. This budget does not need to include components included in a standard SeaPerch ROV kit. Add as many rows as necessary to complete your budget.

This information may be utilized during compliance checks to determine appropriate competition class and should reflect the total materials cost of your ROV. Costs for 3D printed parts should be priced at $0.05 per gram.

Component	Vendor	How was component used?	Cost (in USD)
		TOTAL COST OF SEAPERCH COMPONENTS	$

3.1.3. Scoring

This submission is worth 100 points. Guidelines are available in Appendix A: Competition scoresheets and Rubric.

- Abstract – 10 points max
- Task Overview – 10 points max
- Design Approach – 26 points max
- Experimental Results – 14 points max
- Reflection & Next Steps – 10 points max
- Acknowledgements – 4 points max
- References – 8 points max
- Budget – 4 points max
- Writing Skills – 8 points max
- Paper format – 6 points max

3.2. Meet the team

Connecting with your community is important. We want to get to know you! This is your chance to introduce us to your team and team's personality.

3.2.1. Overview

Reach out and share your team or school's logo, an overview of what your team isall about, and social media information so we can share it with the SeaPerch community.

3.2.2. Content

Teams will be asked to submit the following information:
- Team Name, organization, and location
- Team/School/Organization logo/icon (submitted as PNG image)
- One paragraph (100 words max) team bio/overview

NOTE: Team bios will not be edited to correct any spelling and/or grammatical errors before posting, so put your best foot forward and proofread your entry carefully.

Fact Sheet (PowerPoint slide template, please save as PDF for registration):
- Image or drawing of the team's SeaPerch ROV design
- Competition Class (i.e., Middle School Stock Class, High School Stock Class, Open Class)
- Overview of SeaPerch Design: Provide a high-level explanation of your SeaPerch design
- Number of years your team has participated in the SeaPerch program (this should include years that you have been involved in building a SeaPerch and/or competed in a SeaPerch competition)
- Number of times your team has competed at the International SeaPerch Challenge including your anticipated participation at the 2025 Challenge (i.e., Put 1 year if this is your 1st year)
- Complete the statement "Our SeaPerch is unique because…"; highlight what you think makes your design innovative
- Complete the statement "Our biggest takeaway this season is…"; focus on your team's experience and what you learned from working together on your design

· Website link (optional)*
· Organization's social media link (Facebook, Twitter, Instagram, LinkedIn) (optional)*

*Acknowledgement certifying that photographs or videos given as part of this entry only include team members who have submitted a Photographic Release Form signed by a parent/guardian.

3.2.3. Scoring

This is not a scoring event. We will include this information on the 2025 International SeaPerch Challenge webpage.

Optional Templates

3.3. Real-World Innovation Poster (Optional)

The Real-World Innovation Poster is an **optional** component of the International SeaPerch Challenge.

This event challenges teams to explore real-world applications for underwater ROVs. Teams are invited to identify a real-world issue and design a SeaPerch ROV to address the issue. To present their project, teams will create a virtual poster. These posters may include anything from a conceptual design to a full project conducted in the real world.

3.3.1. Overview

Teams that choose to participate in this optional event must submit a virtual PDF poster. The following rules apply for this poster submission:

- Posters should have dimensions of 4'wide x 3'tall and must be submitted in PDF format.
- Optional templates are provided below for teams to use; however, teams are encouraged to create their own templates or modify these to best communicate their respective projects.
- There are no specific requirements for section headers or space allocated for each section.

3.3.2. Content

Posters will be rated on the following areas:

- Project Overview: An overview of their project, approach, and findings
- Background & Rationale: The team's motivations for conducting the project
- Approach: Justification for the team's approach to the project
- Discussion & Reasoning: Evidence supporting the team's approach and modifications to their project
- Next Steps: Thoughtful consideration of new questions and next steps for the team's project
- Use of Graphics: Use of images, charts, and figures to support the poster's text
- Organization: Content organization

- Creativity: The creativity of the project and innovative approach to a real-world issue
- Overall Quality: The poster effectively conveys the project and approach
- Optional Template
- Document

3.3.3. Scoring

Top scoring posters will receive awards. Submitted posters will also be open for public voting and will be eligible for "Fan Favorites" awards.

- Posters should have dimensions of 4'wide x 3'tall and must be submitted in PDF format.
- Optional templates are provided below for teams to use; however, teams are encouraged to create their own templates or modify these to best communicate their respective projects.
- There are no specific requirements for section headers or space allocated for each section.

3.4. Community Outreach Project (Optional)

The Community and Outreach event is an **optional** component of the International SeaPerch Challenge.

3.4.1. Overview

Giving back to your community can take many forms. Find a good fit between what you are passionate about (or good at) and how that can meet a need in your community. Increase awareness of a topic that you care about. Get others excited about your cause or unite them in support of a common goal.

3.4.2. Content

Share your special skills and interests with others who could benefit from them. In the process, you will hone your communication skills, deepen your own understanding and appreciation, and feel a personal sense of pride and accomplishment. You may even inspire others to join you!

STEM-Related Ideas:
- Serve as a near-peer virtual mentor or tutor to other students who are building SeaPerch ROVs or who need extra help in other STEM areas
- Volunteer to be a student assistant in a robotics or STEM enrichment club at your school

- Help develop an exhibit for a science museum or STEM center
- Create a website for people to learn more about ROVs and their real-world applications
- Volunteer to participate in the clean-up of a local waterway
- Write an article for your local newspaper highlighting your team and how you have made it to this year's International SeaPerch Challenge

General Ideas:
- Volunteer at a local animal shelter
- Collect canned/non-perishable goods for donation to a local food bank
- Send cards or letters to nursing home residents
- Contact your local community center and inquire about available volunteer opportunities
- Create a social media post or a team promo video to highlight your effort or get the word out

3.4.3. Submission Instructions

Teams that choose to participate in this optional give back event and outreach will be asked to submit the following resources:

- **Description of the team's activity** (one-page max, submitted as PDF):To capture important details, think about the 5 Ws as you write, explaining, at a minimum, the Who, What, When, Where, and Why of your outreach activity. What inspired you? Why was this important to you? You might also tell us about any future plans you have or share the impact of your efforts.
- **Supporting photos or documents*** (optional with three file uploads max.)
- **Supporting reference link to a video, website, article, etc.** (optional)

*Acknowledgement certifying that photographs or videos given as part of this entry only include team members who have submitted a Photographic Release Form signed by a parent/guardian.

3.4.4. Scoring

Submissions will not be scored but may be considered for a special award.

SECTION 4: On-site Pitching

Each team will be required to perform a 5-minute pitch presenting their work, the pitch will be followed by 10 minutes of Q&A for evaluation by the judging panel.

Overview

Each team will be asked to present a pitching to a judging panel within 5 minutes, and the judges have 10 minutes for questions and evaluation.

- The competition will provide a data show for presenting.
- The team can use any software or hardware requirements to help them in the purpose of the pitching.
- The team may present in Arabic or English with no additional score.

Content

- **Problem/ opportunity:** in which the team describes the problems that they solve in the competition
- **Your solution description:** in which the team gives an overall description of your solution
- **Solution features:** in which the team shows their vehicle features to solve the problem and how the solution is special.
- **Progress status:** in which the team shows the progress of their solution, vehicle,
- **Future plan:** in which the team give a brief on where they are going to forward in the development of the solution
- **The team:** by showing the team members, their field of experience and their roles in the team

Scoring

This submission is worth 20 points. Guidelines are available in Appendix A: Competition Scoresheets and Rubric.

SECTION 5: Scoring & Awards

5.1. Competition Awards

Awards will be given to top performers in each class as well as those who have demonstrated exemplary skills in special award categories.

Class Champions:

Top team in each class (1 per class) (3 total awards)

Competition Events (TDR/Mission/Obstacle):

TDR (1st, 2nd, 3rd for each competition class) (9 awards)

Mission Course (1st, 2nd, 3rd for each competition class) (9 awards)

Obstacle Course (1st, 2nd, 3rd for each competition class) (9 awards)

Real-World Innovation Poster:

Top teams in the Real-World Innovation event - First, second, third (3 total awards)

Fan Favorites - middle school and high school teams from public judging (2 total awards)

Community & Outreach

Top team in the Community and Outreach event – not related to class (1 total award)

5.2. Special Awards

Teams may be nominated for Special awards during pre-event submission judging and on-site at the competition. A nomination form will be available on-site for all participants, advisors, volunteers, staff, and spectators to nominate teams for these awards.

Sportsmanship Award
This award recognizes individuals or teams who demonstrate a commitment to fair play, ethical behavior and integrity, and general goodwill towards others. Recipients of this award may be coaches, team members, parents, officials or anyone else that tournament officials or directors feel exhibit these traits.

Resiliency and Grit Award

As the name implies, this award is given to an individual or team who displays the dynamic ability to recover quickly from challenges. Recipients maintain control of a difficult situation and devise new ways to tackle a problem, all while showing courage and resolve or strength of character.

Ingenuity
This award is given for a team's exceptional creativity, either through some aspect of their ROV, or an extraordinary idea beyond the standard build. This award acknowledges and encourages creative thinking and risk-taking; recipients embody the principle of "thinking outside the box" to solve engineering problems.

SECTION 6: Appendices

2025 International SeaPerch Challenge

- **Appendix A: Competition Score Sheets & Rubrics**
- **Appendix B: Compliance Checklist**
- **Appendix C: Competition Classes Overview**

6.1. Appendix A: Competition Scoresheets & Rubrics

Pool Course Scoresheets – Mission Course
Document Link
Pool Course Scoresheets – Obstacle Course
Document Link
Onsite Pitching Scoresheets
Document Link
Technical Design Report Scoring Rubric
Document Link
Real-World Innovation Scoring Rubric
Document Link

6.2. Appendix B: Compliance Checklist

TEAM NUMBER (if used)	
Team	
ORG/SCHOOL	
CLASS/DIVISION	
JUDGE	

No parts or attachments (except buoyancy material) may be removed or added after the compliance check, but attachments may be repositioned.

Design must follow Competition Classes and Design Rules.

6.2.1. Design Compliance

Stock and Open Classes

- Requires only one standard power source for propulsion. Battery limited to one12VDC, 9Ah max battery no larger than standard SeaPerch battery.
- Uses no more than one additional external battery of 12VDC, 9Ah max no larger than standard SeaPerch battery for auxiliary equipment
- Uses only standard SeaPerch kit motors or exact replacement for propulsion

Stock Classes Specific

- Maximum of 3 standard motors for propulsion
- ROV meets maximum $25 (value) budget limit for modifications

Safety

- No exposed live wires on controllers, SeaPerch ROV or tether cable
- No sharp edges or potentially hazardous parts
- Motors are sealed (waterproofed)
- Power cable has insulated covers on alligator clips or terminals
- Construction
- No loose parts that could potentially fall off during competition
- Tether cable is secured to ROV

As team captain/coach, I agree to assure that my team will not make modifications to the ROV system after the compliance check.

Team Captain or Coach's Name: _____

Signature: _____

6.3. Appendix C: Competition Classes Overview

The 2025 International SeaPerch Challenge will include three (3) competition classes. These classes are updated from past years so please review the chart below carefully. Please note, stock classes are limited to PVC, CPVC, and PEX pipe for the ROV frame and may not include 3D printed frames, or frame parts. Frame parts are any parts that add structural integrity to the frame or connect frame parts together. For stock classes, 3D printed parts may not extend the frame to attach other 3D printed parts, this will be considered a frame part.

Rules	Middle School Stock Class	High School Stock Class	Open Class
BUDGET*			
The total cost of modifications to the final ROV must be $25 or less	X	X	
The cost of modifications may exceed $25			X
MATERIALS			
Frame built using only PVC, CPVC, PEX pipe and fittings. Any size pipes and pipe fittings may be used. Pipes and pipe fittings may be modified using hand and power tools, but may not be machined using CNC or other automated processes.	X	X	
Frame may include 3D printed or additive manufactured parts as well as other materials, and may be made using CNC machinery or other automated processes.			X
Attachments and non-frame parts (i.e., hook, gripper, propeller shroud) may be made from various materials to include 3D printed or additive manufactured parts. For stock classes, the majority of the parts used must be pipes and pipe fittings. Using a single pipe fitting with 3D printed motor mounts is classified as open class.	X	X	X
POWER SUPPLY			
Must design for and utilize a 12-volt power source	X	X	X
May utilize a second power source (no more than 12-volts) to power auxiliary equipment	X	X	X
MOTORS			
All motors must be waterproofed	X	X	X
Must use ONLY stock SeaPerch motors (Jameco Electronics 232022) for propulsion**	X	X	X
Additional non-stock motors may be used for non-propulsion uses	X	X	X
May include more than 3 thrusters (i.e., motor and propeller assembly)			X

Rules	Middle School Stock Class	High School Stock Class	Open Class
CONTROLLERS			
Must only use simple on/off switches for thruster controls	X	X	
May use power conditioning or pulse-width modulation (PWM) controls for thruster controls			X
May use PWM, microcontrollers, or other devices for non-thruster controls	X	X	X
May use a fixed or variable resistor to reduce voltage	X	X	X
STRUCTURE/SIZE			
Must fit through 18" diameter hoop	X	X	X
COMPETITION CRITERIA			
ROV must not be modified after compliance check (except for buoyancy)	X	X	X
The same ROV must be used for both pool events	X	X	X
Team may include a student in 8th grade or below	X		X
Team may include a student in 9th grade or above		X	X

*Budget Guidelines include:

- Donated material will be assessed at what the cost would be to procure the material.
- Spare parts and tools are not included in this budget.
- Materials used on earlier prototypes are not included in this budget. Only materials and supplies used on the competition ROV and controllers that are not part of the standard SeaPerch ROV kit should be included.
- Proof of budget compliance must be made available to the compliance inspection/judges upon request.
- 3D printed parts will be costed out at $0.02 per gram.

** Thrusters used for propulsion are thrusters that directly exert force against the water causing the ROV to move in any direction.