

Rules for PEP27 Workforce Development Competition (Autonomy Division)

Highlights:

- There are three **new** rules (#6, #11, and #12) and tweaks to other rules.
- If you have questions about a rule, ask early and judges can provide feedback.
- Be ready for more safety requirements and a 45-minute on-water limit on race day.

#	General Rules for PEP27 Competing Craft
1	Entry is open to any vessel, crewed or uncrewed, operating with an electric propulsion system.
2	Vessels shall have appropriate fit and finish to appear seaworthy; no “Frankenstein” vessels (the hull should be cohesive, there should be no seams or joints that may come apart while on the water).
3	All vessels must comply with USCG safety regulations. (Uncrewed hulls do not need to be registered. Many states have “experimental” registration for research manned craft.)
4	Gasoline engines, recharging via an onboard generator, sails, and manual propulsion are prohibited during the competition. Solar power and other renewable systems may be onboard to recharge.
5	Competitors will not have a charging station available to them on site.
6	ASNE will allow students to ride on a Navy craft to operate a kill switch if necessary.
7	There must be a main-power disconnect through which all current to the propulsion system must travel. If the disconnect is manually moved to Off, then all high-voltage electrical systems should cease. You will need to document where this disconnect is and how someone can turn off your craft. This disconnect must be accessible in less than 5 seconds when the vehicle is on the water. (Either on the exterior on the vessel or under a simple hatch that does not need tools to be opened.)
8	The container holding the battery must be able to secure the battery within the boat in the event is turned upside down.
9	For systems between 24V-55V, there must be a fuse through which all battery current must travel. The fuse should be rated to protect the high-voltage system wiring in the craft.
10	All craft must have a total voltage be at or below 55.5 Volts and a total capacity below 500 Ah.
11	A PEP team is comprised of students at a college, university, apprentice school, or invited organization. Any trophies, prizes, and in-kind donations are owned by the hosting organization.
12	<u>Teams will need to visually mark the lowest point on the boat where water can inundate the boat (downflooding point). During qualification, Judges will verify unmanned boats have a minimum of 3 inches from downflooding point to waterline when fully loaded in the water, and manned boats have a minimum of 6 inches from downflooding point to waterline when fully loaded (operator and payload, etc.)</u>
13	<u>Towing:</u> Boats must include a tow point on the centerline of the craft (either topside or the front of the bow) where a 2-inch-diameter loop can accommodate a 0.5-inch line. For

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	catamaran designs, there should be a towing bridle that connects to both hulls and is easily accessible to in-water support.
14	<u>Race-day guideline:</u> Team lead and captain must be members of their collegiate PEP team and attend the race-day safety meeting.
15	<u>Race-day guideline:</u> The propeller should remain off the craft when possible. If the team powers it on land, two cones must be placed on either side of the prop to ensure that a passersby cannot accidentally walk into this dangerous area.
16	<u>Uncrewed only:</u> Uncrewed teams will need positive buoyancy. Teams will need to trap air (in foam, watertight container(s) with air) in their craft so that it will float even if the boat completely fills with water.
17	<u>Uncrewed only:</u> Uncrewed Autonomy, Budget Warrior, and Over-the-Horizon division craft will carry a 30-pound removable payload.* The payload is a non-functioning package that can be removed and weighed. Teams are responsible for securing the payload while underway to prevent unplanned shift of weights.
18	<u>Autonomous:</u> Teams must demonstrate how the kill switch is engaged when navigation information (like GPS data) is missing or corrupted.
19	<u>Returning Teams:</u> When requesting funds, the team must describe 3 new innovations that justify the funding request. The new innovations' descriptions should demonstrate how each one will improve the craft's ability to address the race requirements.

* Teams must provide their own payload.

Each payload needs to be a unified whole, like a sandbag or container full of metal. The payload must be able to be quickly removed from the craft. Teams creating catamarans may put a 30-pound weight in each hull. Teams cannot subdivide ballast into smaller amounts than 15 pounds.

Safety checks involving each of these rules will be performed the day before the racing heats. The rules above will be provided to teams in March as a checklist. Teams will be able to return that checklist along with the white paper and presentation 3 weeks in advance of the event. Judges will have the checklist, see the team demo the kill switch, and review your craft with your team in the parking lot before your demo run.

Note that page 7 includes a race-day rule list that teams should use as a pack list. Please note that old shoes are great water shoes.

Returning Team Innovations

Teams can use this table or write a narrative that describes each innovation in similar detail.

Innovated System	Level of Innovation	Plan for PEP27
	☐ Dramatic improvement ☐ Completely new system	
	☐ Dramatic improvement ☐ Completely new system	
	☐ Dramatic improvement ☐ Completely new system	

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2026-2027 Competition Guidelines

The heart of PEP is building your careers through the excitement of a national competition. Documentation is at the heart of engineering important components, so the ONR judges are excited to review your white papers and videos submitted at least 3 weeks before the competition. The races will be managed by ASNE staff and Navy on-water support to ensure you have a safe, engaging race experience. Teams must attend the race even if the craft cannot compete. If teams do not show, the next year's team(s) from that school will not receive funding.

We are excited to host 3 national PEP competitions:

- a) Bremerton, WA: April 2, 2027 (PEP West; date is tentative)
- b) Panama City, FL: April 6, 2027 (PEP Gulf Coast event is tentative)
- c) Portsmouth, VA: April 13-16, 2027.

You will also see regional PEP events that are hosted with local industry and Build Submarines:

- d) PEP Ohio: Kickoff event on October 11, 2026 and Race on April 17, 2027.
- e) PEP Alabama: Competition on January 29, 2027 (part of Senior Bowl in Mobile)
- f) PEP North Carolina: Competition TBD

Pre-Built Motors & Kits

Teams cannot purchase a pre-built motor and cannot buy a kit. We define a pre-built motor as any device that has the motor, power control, wiring and gearing assemblies, shaft, and propeller pre-assembled. Torqeedo, Honda, Mercury, ePropulsion, and Elco all make pre-built motors that are not acceptable for PEP. In other words, you should expect to buy a motor, acquire a shaft, and then wire and gear your design as needed to create a unique electric propulsion system for your craft—no kits. Please note that for hulls, teams should expect to modify (or build from scratch) a hull that maximizes their propulsion design.

Schedule & Points

As PEP judges emphasize, documentation matters! Each team will submit the white paper (20 points) and video presentation (20 points) three weeks before the race. The Risk scoring is increased so teams can describe their testing regimen that guarantee success at competition. Teams earn 40 points for completing the race and up to 20 points for finishing in the top 5.

National PEP Events	Due Date	Race Start
PEP27 West – Bremerton, WA	Mar. 12, 2026	Apr. 2, 2027
PEP27 Gulf Coast – Panama City, FL (tentative)	Mar. 16, 2026	Apr. 6, 2027
PEP27 East – Portsmouth, VA	Mar. 23, 2026	Apr. 13, 2027

Regional PEP Events	Due Date	Race Start
PEP27 Alabama – Mobile, AL	Jan. 8, 2026	Jan. 29, 2027
PEP27 North Carolina – Raleigh, NC (tentative)	TBD	TBD
PEP27 Ohio – Springfield, OH	Mar. 27, 2026	Apr. 17, 2027

The subsequent sections define the objectives and rubrics for each competition component.

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White Paper Guidelines (20 points) – Documentation matters!

Three weeks before your competition, teams submit a white paper that **should not exceed 15 pages** that cites the research background and describes the design choices made by the team (15+ page papers will receive a deduction). Use diagrams and data to clarify designs and analyses. The title page (template on last page of this file) must include the name of the craft, the university, the race category, each student's name on the team, and a picture of the vessel and team.

The paper should include clearly-named sections that fully address each aspect of the rubric. Please note that reporting physical testing is a new focus in the Risk rubric.

	Meets	Partial Meets	Does not meet
Background 2 points	The background research into <u>maritime autonomy</u> is clear and creates a clear rationale for the original design utilized and proves this design is original.	The background research into <u>maritime autonomy</u> is not complete OR this research is comprehensive but not well connected to the design utilized.	The background research into <u>maritime autonomy</u> is not complete AND not well connected to the design utilized.
Design & Analysis 6 points	Design of the craft ensures the hull matches the propulsion system with autonomous controls, including code, calculations and simulations.	Design of the autonomous craft may ensure the hull will match the propulsion system for autonomous operation, but the evidence is not clearly supporting.	Design of the autonomous craft ensures the hull does not match the propulsion system for autonomous operation, nor provide calculations & simulations.
Overview of Build & Fabrication Processes 4 points	Each system (power storage, powertrain, code, controls, propulsion, propeller/jet) is clearly described and the build and testing processes are well documented to show how it is unique, safe, and well controlled.	Most of the systems (power storage, powertrain, code, controls, propulsion, propeller/jet) are clearly described and the build and testing processes are documented with some clarity.	Few of the systems (power storage, powertrain, code, controls, propulsion, propeller/jet) are clearly described and the build and testing processes are not well documented.
Risk 8 points	Clear description of the risks mitigated during the design, build, and coding, and a description of the risks that will be controlled during the race. (Half of these points will review real-world testing documentation.)	The risks are clearly described but the mitigation plans are incomplete OR some risks are described and mitigated but others are omitted.	Few risks are clearly described and/or the mitigation plans are incomplete.

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Video Presentation Guidelines (20 points)

Teams will submit a video presentation three weeks before the competition. It should not exceed 20 minutes. This presentation should clearly detail the design, build process, and risks. Be sure to show off what you learned. The presentation should thoroughly describe how these three systems (and any other systems) function together to propel the craft with torque and efficiency: power storage, controls, and propulsion system. Strong videos will prove the team learned how to engineer craft for today's environment by sharing calculations, models, and testing data to justify design choices. The start of the video must include the name of the craft, the university, the race category, each student's name on the team, and a picture of the vessel and team.

	Meets	Partial Meets	Does not meet
Design & Calculations 6 points	The data and decisions used to design the autonomous craft are clearly described, and robust enough to justify the design of the hull, propulsion system.	The data and decisions used to design the autonomous craft are partially described, and robust enough to justify the design of the hull, propulsion system.	The data and decisions used to design the autonomous craft are not well described, and robust enough to justify the design of the hull, propulsion system.
Hull 4 points	The hull is clearly presented and reflects a design that is safe and effective for electric propulsion over a two-mile race.	The hull is not clearly presented OR reflects a design that is not effective for electric propulsion over a two-mile race.	The hull design is not clear and/or it reflects a design that is not effective for electric propulsion over a two-mile race.
Propulsion 4 points	The propulsion system is clearly presented and reflects a design that is safe and effective for autonomous, electric propulsion over a two-mile race.	The propulsion system is not clearly presented OR reflects a design that is not effective for electric propulsion over a two-mile race.	The propulsion system design is not clear and/or it reflects a design that is not effective for electric propulsion over a two-mile race.
Autonomous Controls 4 points	The autonomy is clearly presented and reflects a design that is safe and effective. Extra points may be awarded for greater levels of autonomy.	The autonomous control system is not clearly presented OR reflects a design that is not effective for electric propulsion over a two-mile race.	The autonomous control system design is not clear and/or it reflects a design that is not effective for electric propulsion over a two-mile race.
Risk 2 points	Clear description of the risks mitigated during the design and build, and a description of the risks that will be controlled during the race.	The risks are clearly described but the mitigation plans are incomplete OR some risks are described and mitigated but others are omitted.	Few risks are clearly described and/or the mitigation plans are incomplete.

* Presentations need to describe where the motor, power control, wiring and gearing assemblies, shaft, and propeller are sourced and prove that they are not part of a pre-existing kit.

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Race Performance (60 points)

In 2026-2027, crewed craft will race for 5 miles and uncrewed craft will race for 2 miles.

- Crewed craft will earn 8 points for each complete one-mile lap.
- Uncrewed craft will earn 10 points for each completed half-mile distance.

In all competitions, 20 points will be awarded for first, 16 points for second, 12 points for third, 8 points for fourth, and 4 points for fifth place in both the manned and unmanned categories. Deductions may be assigned by PEP judges at any point during the competition.

To earn a timeslot during the demo and race days, a video must be submitted by two weeks in advance showing the craft operating for 200 meters or 2 minutes. The onsite qualifying run is a 100-meter run requiring the craft to turn around a buoy. In PEP27, we expect to allow teams 45 minutes in their race-day heats. Teams that are on the course after 45 minutes will return to dock.

At the boat ramp, teams will only have 5 minutes to launch and leave the dock. Teams must accomplish these steps in 5 minutes or less:

- a) Put the boat in the water.
 - b) Engage controls and motors.
 - c) Uncrewed boats will need to have the weight of their ballast verified by the judge.
 - d) Crewed boats will have to show the dockside manager their safety equipment.
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Competitors are required to pull their boats from the water at the conclusion of their heat. As noted in the rules, charging facilities are not available at the docks.

Before race day, ASNE will ask your team to sign and return acknowledgement of these rules, the release as described below and the photography release.

We hereby release the American Society of Naval Engineers (ASNE) and its board members, directors, officers, employees, or agents from any and all claims and damages, present and future, arising from or in any way associated with this contest. Additionally, each participant consents to being filmed, photographed and recorded during and in connection with the event and consents to the use or publication of such recordings in connection with any promotional, educational or professional purposes. Each participant releases ASNE and its board members, directors, officers, employees, or agents from any and all liability arising from the recordings or their uses, including for infringement of proprietary rights, invasion of privacy, defamation or any other cause of action, and waives any right to inspect or approve such recordings and any and all rights to payment of royalties in connection therewith. We have read, understand, and agree to all rules, regulations, and conditions set forth in this entry form and any other information related to this contest.

Captain Signature: _____ Date: _____ If minor, guardian signature:

Crew Members Signatures: _____ Date: _____

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Race-Day Requirements: Please think of the launch and race areas as a research lab, not a beach. Protective equipment, including closed-toed shoes and life preservers, are required so all participants remain safe.

Teams must bring and use:

1. Closed-toed shoes for each person that may need to walk in the water to launch the boat.
2. Appropriate attire for getting in the water (as needed) while talking with high-school STEM students visiting to see your enthusiasm.
3. (Manned teams) Oar and communication device to talk with team as desired.

ASNE will provide life preservers for all participants that need to go on the dock or a boat. In addition, ASNE provides this safety equipment at the boat ramp and the registration tent:

- | | |
|--|---|
| a. First-aid kits | e. Water for water bottles |
| b. Sunscreen | f. Storage container for unsafe batteries |
| c. Life preservers (must wear on dock) | g. Cones to surround propeller tests |
| d. Fire blankets | h. Airhorns for on-water signaling |

Teams will have a maximum of 5 minutes at the boat ramp to get their craft from the trailer to the open water. Craft that cannot enter the water in 5 minutes may be disqualified.

Following safety rules shall be adhered to while launching or recovering vessel:

- Clear Ramp Zone: To prevent the risk of injury, no personnel shall be positioned between the boat and the water while the craft is on the boat ramp.
- Closed-toe shoes are mandatory for any personnel in the water.
- Life-preservers (provided by ASNE) must be worn by all team members on the piers.
- Launching Manned Craft: Teams are responsible for safely launching their craft using their own team members and/or a team-owned towing vehicle. The use of dollies or push carts for launching manned craft is highly discouraged.

Parking Lot Safety

PEP judges will be circulating the parking lot and may disqualify teams that are working unsafely. The propeller should remain off the craft when on land. If the team must power the propeller on land for testing, two safety cones must be placed on either side of the prop to ensure a safe perimeter and prevent others from walking into the area.

Race-Day Safety Requirements

Unsafe behaviors that could result in disqualification:

- a. Failure to follow directions given by PEP judges and officials.
- b. Spinning a propeller without putting cones on either side and notifying all neighbors on that you will be testing the propeller. Please notify the teams when your test is complete.
- c. Working on electronics that are wet.
- d. Leaving the power disconnect in the connected position while the boat is not operating or during a short test.
- e. Moving too quickly around other teams or through high-traffic areas.
- f. Failing to give teams launching or recovering craft enough space.
- g. Leaving tools out in a way that could injure others.
- h. Operating aerial drones without express permission of PEP officials.

PEP27 White Paper Submission

School Name: _____

Team Name (if different): _____

Division (choose one):

☐ Crewed – Planing

☐ Crewed - Displacement

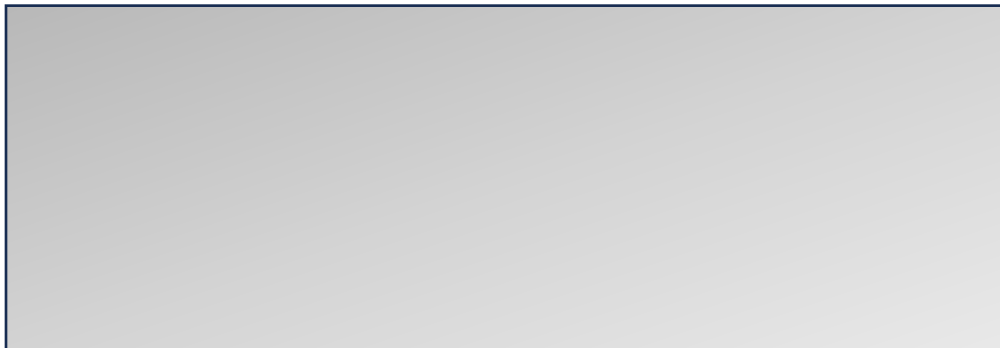
☐ Uncrewed – Autonomy

☐ Uncrewed – Over-the-Horizon

☐ Uncrewed – Open

☐ Uncrewed – Budget Warrior

Photo of Team with Boat:



List of Members on Team:

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