

N F P A
Fluid Power
VEHICLE
Challenge

2024-25 NFPA Fluid Power Vehicle Challenge

FINAL COMPETITION - April 23-25, 2025

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NFPA
Education and
Technology
Foundation

FINAL COMPETITION

The NFPA Fluid Power Vehicle Challenge final competition will be hosted by Danfoss Power Solutions, a donor to the NFPA Foundation's Pascal Society, from April 23-25, 2025.

“Danfoss is pleased to once again welcome students, advisors, and judges to our Application Development Center for the NFPA Fluid Power Vehicle Challenge. We look forward to seeing the results from the creativity, calculations, and practical hands-on problem-solving that each of the student teams has been challenged to deliver to this unique application of fluid power. I wish you all safe travels to Ames and best of luck in your preparations!”

-Jeff Herrin, SVP Research & Development

The final competition will be an exciting event where students, advisors, industry supporters, and other invited guests experience the final leg of this dynamic undergraduate engineering design challenge. Students will present and demonstrate their designs; industry supporters will judge their work and winners will emerge.

The nature of the final competition is a three-day endeavor. Student teams travel to Danfoss in Ames, Iowa to assemble their vehicle on the first day. All program participants will attend a welcome dinner reception that evening. The race events are scheduled for the second day of the event.* The day starts with team presentations describing the design phase, concepts, component identification, testing, analysis, and assembly of the vehicle. A panel of industry supporters assesses the vehicles for their design concept, reliability, safety, durability, craftsmanship, and robustness and these scores are incorporated into the final team tally.

Immediately following the final presentations and design review, the four competition events commence. These include the sprint race, efficiency race, endurance race, and regenerative braking demonstration. Student teams and industry members are invited to an evening networking reception on the second day. On the event's final day, Competition events continue on the event's final day with a vehicle performance roundtable and facility tour. Then judges deliberate while teams disassemble and crate their vehicles. To wrap up the event, everyone gathers for the final awards ceremony lunch. Teams travel home that afternoon.

*This schedule may be adapted in response to weather conditions.

IMPORTANT DATES and DEADLINES *(see additional details below)*

Registration by: March 3, 2025

Proof of working vehicle by: April 4, 2025

Hotel reservations by: April 14, 2025

Vehicle Pick Up Date: April 11, 2025

Final Presentation & All Mentor Summaries by: April 21, 2025

If driving, deliver vehicle by: April 23, 2025 between 12:00 - 4:00 PM

Travel Reimbursement and Award Delegation documentation by: May 27, 2025

[Click Here For a Map of Important Event Locations](#)

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This document is intended to provide more specific details related to the final competition event. Participants should carefully review the Overview, Rules and Awards document to ensure they understand program details and procedures.

FPVC Website

For the most up to date details and documentation, refer to the [Vehicle Challenge website](#).

SOCIAL MEDIA HASHTAG

The Vehicle Challenge hashtag is **#FPVC**. Please use this on all of your social media posts about your project and the event. And don't forget to take and share lots of photos! Show the world your vehicle, your team, and all your favorite parts of the Challenge (like your travel to Ames, the nightly events, and the Competition). Remember to tag the NFPA and Danfoss Power Solutions on your posts (see table below) and use the hashtags: #FPVC2025, #DanfossMoment2025.

	Facebook	LinkedIn	Instagram
NFPA		@TheNFPA	@the_nfpa
Danfoss Power Solutions	@Danfoss Power Solutions	@Danfoss Power Solutions	@danfosspowersolutions

REGISTRATION

All general attendees including student teams, faculty advisors, industry supporters, judges, marshals and guests will register by **March 3, 2025**. [Register here](#).

Advisors will be asked to:

- Indicate whether the team will be shipping or driving and delivering their competition bike to Danfoss.

TRAVEL AND OTHER EXPENSE REIMBURSEMENT

For travel and qualifying expenses related to the final competition, NFPA will reimburse up to a total of \$5,000 directly to universities for one faculty advisor and up to seven students, participating in the event. Advisors or university faculty will be required to submit the [Travel Reimbursement Form](#) in excel format and one PDF file of all receipts and supporting documents to NFPA Office Manager, Carrie Berger at cberger@nfpa.com. no later than May 27th. NFPA reserves the right to deny reimbursement if expenses are unrelated to the final competition or not a qualified expense. **Travel reimbursement will be paid directly to universities, not to individuals, no exceptions will be made.** Receipts are required for every expense item, no exceptions. *If travel creates a personal or institutional financial hardship, please inform Mary.*

Team Accommodations

Student teams and advisors are to make hotel reservations following these instructions:

Quality Inn & Suites

2601 East 13th Street

Ames, IA 50010

Phone: 515-232-9260

Check in: 3:00 PM

Check out: 11:00 AM

Group Name: NFPA National Fluid Power ASSN

\$99.99 + tax

Cut-off Date: April 14, 2025

<https://www.choicehotels.com/reservations/groups/AG24K3>

Qualifying Reimbursable Expenses:

- Team Accommodations at the hotel that NFPA designates.
- Team Transportation
 - Airfare (coach/economy flights only)
 - Auto rental
 - Trailer rental
 - Personal vehicle mileage
- Travel Related Expenses
 - Meals not provided by NFPA or Vehicle Challenge event host.
 - Taxi, Uber, Lyft, Tollways, Parking, etc.
 - Other qualifying expenses as determined by NFPA.

PROOF of WORKING VEHICLE & PHOTO

It is required that teams demonstrate your vehicle is in working condition by submitting a YouTube video to the website indicating your intent to participate in the final event. The footage must:

- Confirm that the vehicle is safe and operational with a team member riding it at least one-half of a block or better.
- Verify stored energy working off the accumulator.
- Confirm the use of pressure indicators and test point.
- Your proof of a working vehicle must be received by **April 4th**. Teams can manage who can view content through privacy settings of YouTube videos. [Learn how here](#). Teams are also required to submit one photo of only their vehicle for judges to refer to during the final competition. [Submit your video here!](#)

VEHICLE TRANSPORT LOGISTICS

There are two options for transport and delivery of the vehicles. 1) Drive and deliver to Danfoss, 2) Ship. Vehicles should be crated no matter which delivery method is chosen, although not required for drive and delivery if properly secured in a trailer. **Be sure the crate is forklift compatible.** Teams may build a crate from scratch or use a crate from a previous year. Crates must be sturdy and able to withstand rough handling. Vehicles and any other items must be secured inside of the crate. [Here](#) is an example of a well-made crate from last year's competition. If shipping, release all oil pressure and lower the nitrogen pressure to 50 PSI. **Do not empty the accumulator all the way and let air into it.** Keep 50 PSI in the accumulator (plus or minus 25 PSI is okay but aim for 50 PSI). If not shipping, you may keep your accumulator charged.

DRIVE AND DELIVER

If you choose to drive and deliver your vehicle to Danfoss, be sure it is secure in every possible way during transport and delivery. The vehicle drop-off and assembly window is **strictly Wednesday, April 24th, 12:00 PM to 4:00 PM**. If driving, teams must bring environmentally friendly fluid from Lubrizol to Danfoss.

SHIPPING

SHIPPING via eShipping

If you choose to ship, each university will be asked for a contact name, phone number, pick-up / return address and any special instructions. Each team will be creating shipping labels and scheduling a pick-up for themselves. Competition bikes will be picked up 10 days before the Welcome Ceremony. Arrange for shipping as soon as possible.

- Each team will be required to print the Bill of Lading to accompany their crate.
- The crate must be forklift compatible.

- Environmentally friendly fluids from Lubrizol and nitrogen will be provided on-site. Teams do not need to ship fluid or nitrogen.
- NFPA will not pay for expedited shipping. **If the vehicle needs to be shipped back to your university by a certain date, the university will be responsible for this expense, and it will not be reimbursed.**

PROCESS: OUTBOUND FROM THE UNIVERSITY

Teams that ship vehicles will need to schedule their pickup online via pickups.eShipping.biz. You will be filling out an online form. Here is the information you need:

- a. Shipper: Full school address where the crate will be picked up and primary contact for the pickup.
- b. Who is paying for this shipment? Enter "NFPA".
- c. Recipient: Danfoss Power Solutions (ATTN: Tim Huxford/ADC)
- d. 2800 E. 13th St., Ames, IA 50010
- e. The pickup window will be 1-5 pm in your time zone.
- e. Freight Item
 - i. Freight Type: Crate
 - ii. Quantity 1
 - iii. Team to provide the estimated weight of the vehicle/supplies including the crate, as well as the length, width, and height of the crate.
 - iv. Is the freight stackable? Select "No"
 - v. Product Details
 1. Is the product Hazmat? Select "No".
 2. Package Type
 3. Freight Class: 250
 4. Quantity: 1
 - a. NMFC: 189800
 5. Product Description – Bicycles, NOI
 6. Is the product new? Select "New".
- f. Insurance
 - i. Does this shipment require insurance?
 1. Select "Decline Insurance".
- g. Other Instructions
 - i. Does this shipment need a guaranteed delivery date? Select "No".
 1. We do not need a guaranteed delivery date if you ship by **April 11**.
 - ii. Reference Details:
 1. PO Number Required for Pick up? Enter "NFPA"
 2. Reference number required for pick up? Select "No".
 - iii. Notes and Instructions: N/A
 - iv. Accessorials
 1. Only select "Limited Access Pickup".

April 11th will be the pick-up day for teams that choose to ship their competition bikes.

- Note: NFPA will not support expedited shipping. **If the bike needs to be shipped back to your university by a certain date, the university will be responsible for this expense, and it will not be reimbursed.** If you need to make these arrangements, contact Mary at mpluta@nfpa.com.
- If shipping, teams do not need to ship fluid or nitrogen.

MATERIALS, EQUIPMENT, AND SUPPLIES

It is required that you bring your own tools, extra equipment or supplies and environmentally friendly fluid from Lubrizol (if driving). Environmentally friendly fluids from Lubrizol and nitrogen will be provided on-site. Teams do not need to ship nitrogen. Depending on how you travel, decide which is a better method of transporting extra tools, equipment, and supplies. Packing the tools in the vehicle crate is a good option; be sure to properly secure any additional materials. Bring all extra items to the Danfoss site as participants will not be allowed to leave the facility to collect supplies left behind.

WEIGHING VEHICLE

Your vehicle will be weighed using two to four household scales, depending on vehicle configuration.

ARRIVAL

TUESDAY, APRIL 22nd

Tuesday is considered a travel day as needed and will qualify as a reimbursable expense. Please see the details for hotel accommodation above. Check in is at 3:00 PM. *Note: All teams are expected to arrive at Danfoss during the 12:00 PM-4:00 PM drop-off window on Wednesday, April 23rd to conduct their vehicle assembly.*

WEDNESDAY, APRIL 23rd

STUDENT TEAMS:

Vehicle drop-off and final assembly will be from 12 pm to 4 pm. Teams will not have access to the facility before 12:00 PM. See instructions above. There will be a welcome reception at 6:00 PM with dinner and beverages for participants held at [Prairie Moon Winery](#). The address is: Prairie Moon Winery: 3801 W 190th St, Ames, IA 50014. You are responsible for your own transportation.

JUDGES & VOLUNTEERS:

If arriving on Wednesday, April 23rd, judges, and volunteers are welcome to join student teams and advisors at the welcome reception for dinner and beverages at 6 pm.

THURSDAY, APRIL 24th

STUDENT TEAMS:

Upon arrival, student teams and advisors will collect additional registration materials and personal protective equipment. The teams will be split into groups and escorted to the ADC garage for vehicle assembly, design review and races. There will be a networking reception with dinner and beverages at 4:30 PM at [Reiman Gardens](#) at Iowa State University. Their address is 1407 University Blvd., Ames, IA 50011. You are responsible for your own transportation.

INDUSTRY REPRESENTATIVES:

If possible, judges are invited to arrive at Danfoss at 7:30 AM to check in and attend a safety and orientation presentation before attending the Judges' Orientation Meeting at 8:00 AM.

EVERYONE:

There will be a networking reception with dinner and beverages at 4:30 PM at [Reiman Gardens](#) at Iowa State University. Their address is 1407 University Blvd., Ames, IA 50011.

FRIDAY, APRIL 25th

Teams and judges will arrive at Danfoss at 7:45 AM for a vehicle performance roundtable, facility/vehicle tour, and to disassemble their vehicle and prepare it for transport. Judges will attend a final meeting after the presentations have concluded. The luncheon and award ceremony will take place at [Gatherings](#). Their address is 1024 6th St., Nevada, IA 50201. There will be space for luggage storage if needed. You are responsible for your own transportation.

ON-SITE PARKING

Danfoss is conveniently located near the intersection of Interstate 35 and Highway 30. Complimentary parking is available on-site. Watch for signs directing you to the Vehicle Challenge parking area. If needed, there will be parking for trailers by the Danfoss ADC garage or another designated spot on campus.

DRESS CODE

The dress code for non-competition events is business casual. Explicitly, the dress code is less formal than traditional business wear, but it is intended to give a professional and business-like impression. The dress code for competition events is informal and casual, however, **no shorts or skirts are permitted for safety reasons**. Remember, there will be long periods of time when teams are outside, dress accordingly and plan for the weather. The wind can be very strong on the competition track. Students are encouraged to wear university-branded shirts to identify different teams during the event. NFPA issues stipends can be used for this purpose.

SAFETY

During the competition events and/or tours, personal protective equipment is required:

- Footwear: Participants are to wear reasonable footwear for the event. No open-toed shoes, sandals, heels, or thick-soled shoes. Steel toe shoes are recommended. NFPA stipend funds can be used to purchase these if you do not own them.
- Eyewear: Safety glasses (with side shields) will be required. Either bring your own or Danfoss will provide.
- Riders must bring and securely fasten a CPSC-approved bike or motorcycle helmet during the competition events. See photos below.
- Attire to avoid: shorts, loose-fitting clothing like dresses/skirts, loose necklaces/bracelets.
- Long hair must be tied back.

Note: CPSC Approved Helmets have this sticker. Photo Credit: Beactivedecatur.com



PRESENTATION

The final presentation (in PPT) is due no later than **Monday, April 21st by 11 AM CDT** on the Vehicle Challenge [website](#).

EVENT RACES

The event races will demonstrate the various elements of the vehicle design. For additional information, please see the [Track Map with elevations](#).

JUDGING and MARSHALS PROTOCOLS

The final competition relies on the volunteer commitment by many industry representatives.

Judging Committee

A team of industry judges is responsible for assessing the vehicle on-site and the documentation in advance. The nature of the assessment is described in the FPVC Assessment Rubric.

Two responsibilities that we ask Judges to cover are:

Marshals

A team of marshals will be responsible for ensuring teams are operating in a safe and sportsmanlike way during the entire event, and during the four competitions (sprint race, efficiency race, endurance race, and regen race). Marshals may choose to engage directly with the competitors or observe from a distance.

Marshals may walk, jog, run, or cycle alongside the vehicle during a competition event. Marshals will provide input to the judging committee on the vehicle performance and teamwork of the event participants.

Timekeepers

A small team of timekeepers will be responsible for the clock, recording time, and submitting data to the Program Manager.

AWARDS

The Judging Committee determines final award winners based on a number of factors, including the overall assessment of (1) the Design and Specification Midway Review, (2) the competition results,

(3) final presentations and (4) Interaction with Industry Mentors. The decisions of the judging panel are final.

WI-FI ACCESS

There are various Danfoss building locations that have poor cellular service for particular carriers. Danfoss will provide one guest Wi-Fi access per student team and for all industry representatives. Name and email will be provided to Danfoss for access. Cellular service is sufficient outside of the building and on the Danfoss Test Track.

HUMAN RESOURCES

Danfoss ambassadors and talent scouts may be available during lunches as an opportunity for students to network with fellow engineers and ask questions in an informal setting. Please bring a printed copy of your resume if you are still looking for a job.

GUESTS

No guests are permitted at the competition.

RESTROOMS

Please avoid touring the facility in search of restrooms. Restrooms that are to be used by Fluid Power Vehicle Challenge participants will be clearly marked with signage. There will be portable restrooms for use during the outside competition events.

NFPA FPVC POLICIES

During the final event, any participant demonstrating unsportsmanlike or unsafe conduct will be disqualified from the Challenge and forfeit any and all awards. Driving under the influence is automatic elimination. The same rules apply as driving a motor vehicle on the highway. It is expected all participants honor the Host Site's local zero-tolerance policies.

DANFOSS POLICIES

Danfoss Power Solutions has a zero-tolerance weapon, alcohol, and tobacco-free campus policy. E-cigarettes and vaping devices are also prohibited. Participants are subject to elimination and being removed from campus for violating these stated policies.

FINAL THOUGHTS

Let's make a great impression on Danfoss and the other industry representatives. Both personally, and professionally, you can never have too many friends.