

Rules

The Tech Challenge 2025: Gravitate to Navigate

Scenario

There are many ways to get from here to there and back again. Some vehicles are powered by gasoline, electricity, hydrogen, or even solar. In this year's Challenge, teams will use gravity to power their devices. Is your team ready to build a vehicle that can go the distance and to document your journey?

2025 Challenge

Build a device that uses the power of gravity to traverse multiple tracks.

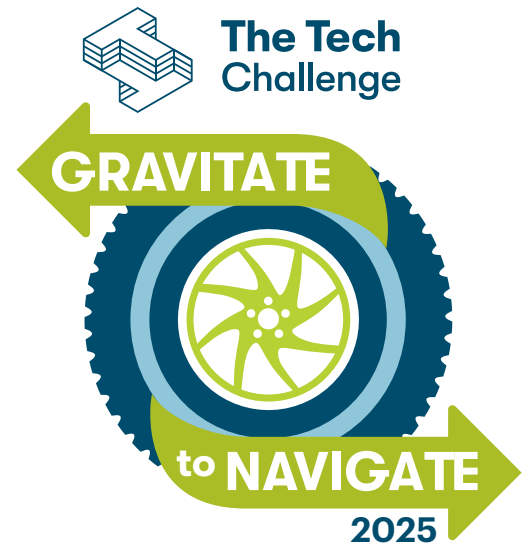
Summary

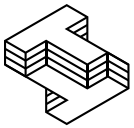
- The Tech will provide a rig with two tracks.
- Each team will:
 - Design and build a device to travel the length of each track, in both directions.
 - Document their entire journey in their journal.
- During the performance, teams will:
 - Position themselves with one or more team member(s) at each end of the tracks.
 - Load the device's potential energy before each run, then complete four runs on the two tracks (down and back on each track).

A message from the judges

We are looking for teams that model outstanding creativity, critical thinking, communication, and teamwork. The Tech Challenge is about challenging yourself. Show us what you can do!

- Work together, test lots of ideas, and keep trying when the going gets tough. Failures are a normal part of the process. Be ready to tell us about your journey, even the times when you felt like quitting.
- We value original thinking and encourage you to pursue surprising solutions that are better than anything we might imagine. However, simple solutions are often the best.
- We admire every team that takes on the challenge. Your solution does not need to be perfect to be amazing.
- Store-bought solutions are not in the Spirit of the Challenge. We are looking for teams to design and build devices using their own creativity.





Teamwork

We want teams to demonstrate cooperation, collaboration, communication, and planning. All team members should participate during the performance and interview. It is up to your team to show teamwork to the judges.

Rig (All dimensions are approximate)

The Tech will provide the rig for test trials and Showcase. Each rig has two tracks with start gates at each end. See Figure 1, Figure 2 and Figure 3 below. [Complete rig drawings can be found on our website.](#)

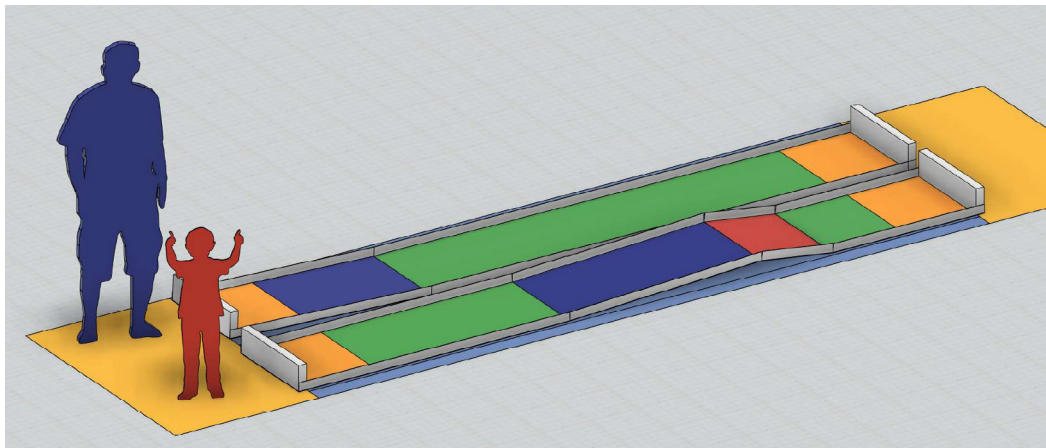


Figure 1. The Rig

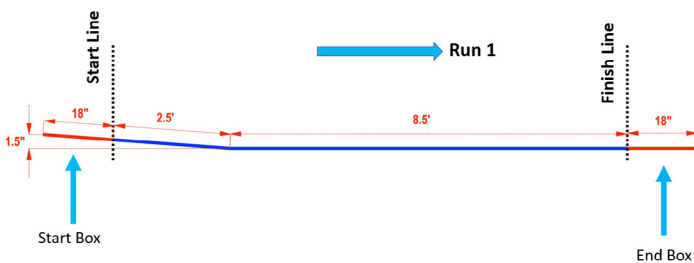


Figure 2a. Track A: Run 1



Figure 2b. Track A: Run 2

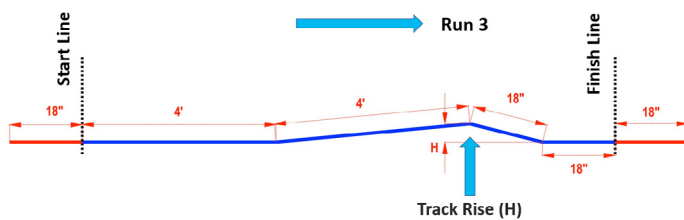


Figure 3a. Track B: Run 3

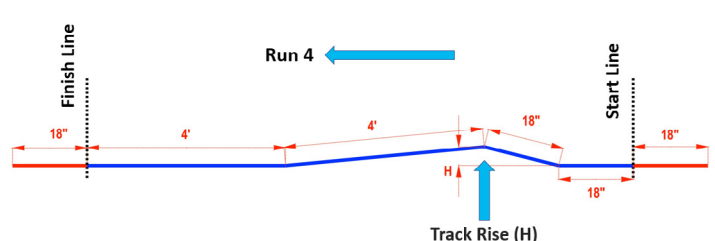
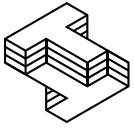


Figure 3b. Track B: Run 4



Rig specifications:

1. Start box = space before the start gate where teams set up their devices:
 - The start box is 18 in (45.7 cm) long and 23 in (58.4 cm) wide.
2. End box = space past the finish line:
 - The end box and start box are the same size, 18 in (45.7 cm) long and 23 in (58.4 cm) wide.
3. Track = space between the start box and end box.
 - The track is 11' (3.35 m) long.
4. Inside track width = 23" (58.4 cm).
5. Side rail height = 2" (5.1 cm) above the track surface.
6. End barrier height (foam covered) = 6" (15.2 cm) above the track surface.
7. Start gate height (located on start line) = 6" (15.2 cm) above the track surface.
8. Track A incline = 1.5" (3.8 cm) track rise starting at the end of the track.
9. Track B hill rise (H):

Grade	Track Rise (H)
4-6	2.5" (6.4cm)
7-8	3.5" (8.9cm)
9-12	4.5" (11.4cm)

Device

1. The team's device must include all the materials required to complete the four runs. This means that anything needed to complete all four runs must be carried on the device.
2. The source of forward movement must come from gravity.
3. The same device must be used for all four runs.
4. The lower part of your device must fit within the 18" x 23" (45.7 cm x 57.2 cm) start box and within the end barrier, start gate, and side rails.
5. The device must carry a payload of one standard tennis ball. The tennis ball must be placed so that it is easily visible, and it cannot come off the device during any portion of the runs.

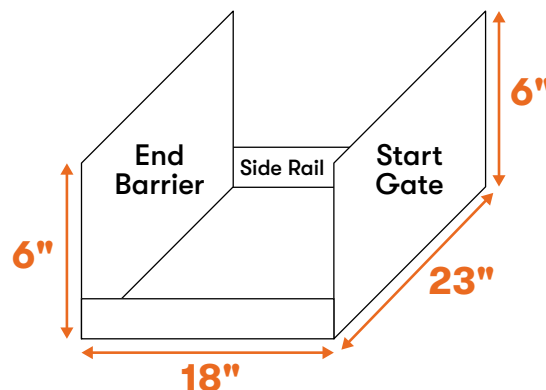
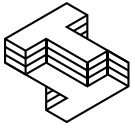


Figure 4: Start Box Interior Dimensions



6. The device must not damage the track or leave any residue on the track.
7. No unsafe devices (sharp edges, loose materials that could fly off track, etc.) will be allowed.
8. The device must be clearly marked with the team number.

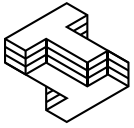
Performance

1. The total time allowed for the performance period, setup, and all four runs is five minutes.
2. The goal for each team is to complete four runs consisting of traveling down and back on both tracks. Figures 1 and 2 have arrows showing the direction of each run.
3. There must be at least one team member at each end of the track. Team members must stay in the safety areas at the end of the track during the runs.
4. Immediately before each run, the team loads the potential energy for their device. The energy may not be pre-loaded before the performance.
5. After the team places the device into the start box for each run, team members let go of the device. The start gate should be the only thing keeping the device in the start box. Team members may not touch the device again until the run ends.
6. Each run begins when the start gate opens.
7. The run ends when all forward motion of the device stops.
8. **Success criteria:** The run is a success if **the payload and** parts of the device touching the track cross the finish line into the end box.
9. No new materials may be added to the device between runs. Reconfigurations of existing materials between runs are allowed. The only materials that may be used for the next run are:
 - The parts of the device that have successfully crossed the finish line.
 - Any materials not touching the track that are carried on the device.
10. Resets are allowed if the device is unable to complete a run. To reset: retrieve the device and any materials on the track and start the run over. It is advantageous to minimize the number of resets.

Engineering Journal

As part of the challenge, teams will record their process and submit a team journal that will be reviewed by the judges.

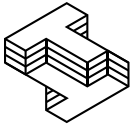
1. Start the journal when you first start thinking about and working on the Challenge.
2. How the team works together to research, brainstorm, build, test, evaluate, document, revise, and repeat (iterate) is as important as the solution itself. The engineering journal is a record of this process.
3. Record any problems you experienced and how you fixed them.
4. Great journals show someone exactly how to build your final solution.



5. Organized records should be kept of all team activities. The team's engineering journal is a living document.
6. Journals may be typed or handwritten. Legibility and organization are important.
7. For the Showcase, each team must submit only one PDF file for their engineering journal.
8. Teams may want to bring a hard copy of their journal or a part of their journal, such as drawings, sketches, photos, etc., with them to the Showcase to share with the interview judges.
9. More information on engineering journal requirements can be found in the Team Guide on The Tech Challenge website (https://www.thetech.org/media/mxlof1gz/ttc25-teamguide_v3.pdf).
10. For 2025 only: come up with three ideas of how gravity is used in the real world to accomplish a task and document these ideas in your journal.

Safety

1. Safety is the top priority during the entire The Tech Challenge project.
2. Teams will be judged on safe design, construction, testing, and operation.
3. Judges have full authority to stop any activity they view as unsafe. The judges' word is final.
4. Each team will identify a team member as its Safety Officer who will ensure safety throughout the project. All team members are responsible for safety.
5. Teams must be able to transport their device safely without the assistance of others, including parents, advisers, siblings, friends, etc. The use of carts, wagons, or other transport devices is encouraged.
6. Safety gear must be worn during tool use, device assembly, testing, etc. as appropriate.
 - a. Eye protection is required. Teams must provide their own ANSI-approved eye protection (e.g., glasses, goggles, mask, visor). Some eyewear does not provide the necessary level of eye protection and is not an acceptable substitute for ANSI-approved eye protection.
 - b. Head protection is required. Teams must provide their own head protection (e.g., bump hats, bicycle helmets, hardhats, or athletic helmets). Head protection must be worn at all times when in designated areas around the test rigs or when constructing/testing devices.
7. Long hair should be tied back or tucked into a hat during device build, assembly, and testing.
8. Teams may not use flammable liquids or gasses.
9. Teams may not use pressurized gasses greater than 5 psi. Teams using pressurized gas must be able to demonstrate to the judges by using a team-provided gauge that the pressure does not exceed 5 psi.
10. No use of animals is allowed.
11. Batteries must be sealed and in good condition.
12. The use of AC power is not permitted at test trials or Showcase.



13. Closed-toe shoes are highly recommended during tool use, building, testing, and Showcase.
14. Caution: Use of materials that could potentially be considered toxic, whether through ingestion, inhalation, or handling, should be avoided if at all possible. If such materials are used, team members must use the appropriate personal protective equipment (PPE).
15. For more information on safety, see The Tech Challenge Student Resources Page (<https://www.thetech.org/education/tech-challenge/tech-challenge/getting-started/#studentresources>).

Adviser

Teams must have an adult adviser. Team solutions must be designed, built, and tested by team members, not the adviser.

1. The adviser's role is to guide, facilitate, and encourage.
2. The adviser may not be a Tech Challenge judge.
3. An adviser may work with more than one team. However, it is important that advisers ensure that each team receives the necessary level of attention.
4. See the Adviser Guide (https://www.thetech.org/media/rmbpyhhi/ttc25-adviserguide_v3.pdf).

Spirit of the Challenge

The Tech Challenge emphasizes the importance of engineering solutions that are practical in real life. Test rigs involve small-scale representations of real-world conditions.

The Spirit of the Challenge is an important factor in scoring. The best engineering journals document an understanding of real-world factors. Teams should expect judges to ask questions such as "How can the ideas you've used for your solution be applied in real life?"

While store-bought solutions are not prohibited, they are not in the Spirit of the Challenge.

Important Note Regarding the Rules

Clarifications and additions to the rules may occur. Teams are encouraged to check the website for changes. When changes are made, registered Tech Challenge teams will be alerted by email. Changes in the rules will also be noted on The Tech Challenge website in **red type**.

The website includes answers to frequently asked questions (FAQs) which are posted and updated periodically (<https://www.thetech.org/core-programs/the-tech-challenge/faq/>).