GLOBAL HYPERLOOP COMPETITION 2025

TRACK & TUBE DOCUMENTATION

Infrastructure and Associated Requirements

1 Test Track:

A customised track is installed in our 422m tube at IIT Madras' Discovery campus at Thaiyur, Chennai. The tracks supports vertical levitation, electromagnetic guidance and enables contactless propulsion.

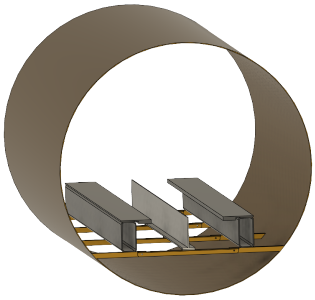

Figure 1: Track in our 422m tube

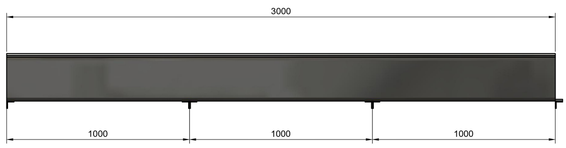

Figure 2: Side view of track (all values in mm)

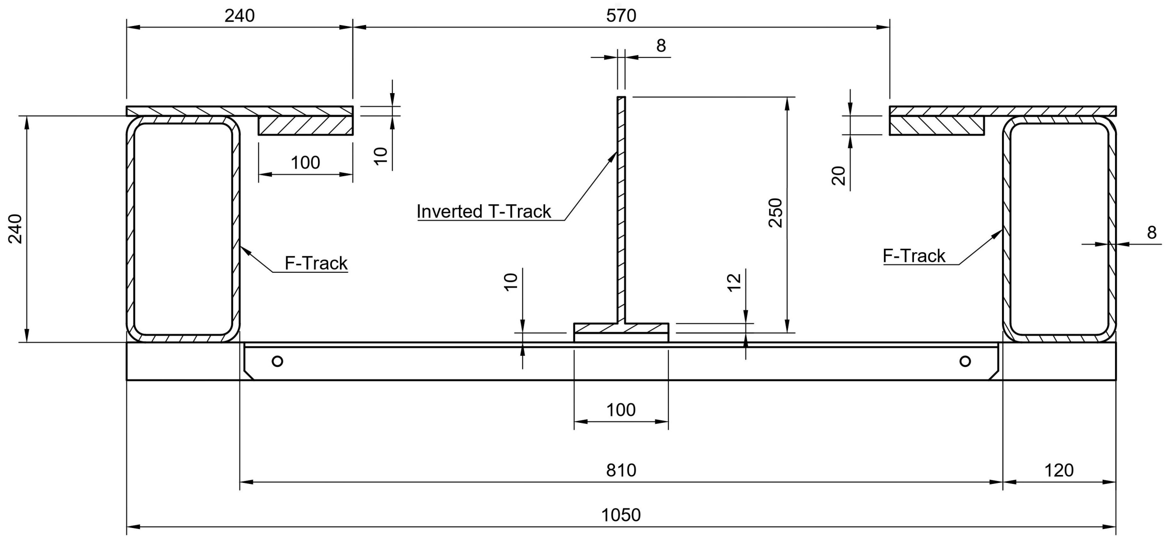

Figure 3: Cross-section of track (all values in mm)

1.1 Test Track Specifications:

Components	F-Track		Inverted T-Track
Thickness	10mm plate	20mm plate	8mm
Material	Mild Steel (**IS 2062 E250 GR. B)**		Aluminium (**Al6061 T6**)

- The track consists of 6m sections.
- The levitation track consists of an F-cross section with a 10mm thick top plate connected to a 20mm thick plate(ferromagnetic material) The F-track is bolted to a support block at every 6m.
- The inverted T-track is the propulsion track. The T-track is bolted to a support block or L-plates at every 1m.
- Vertical sections of the F-track are painted along the length with black and white stripes (figure 4) for the encoder to measure the speed of the pod.

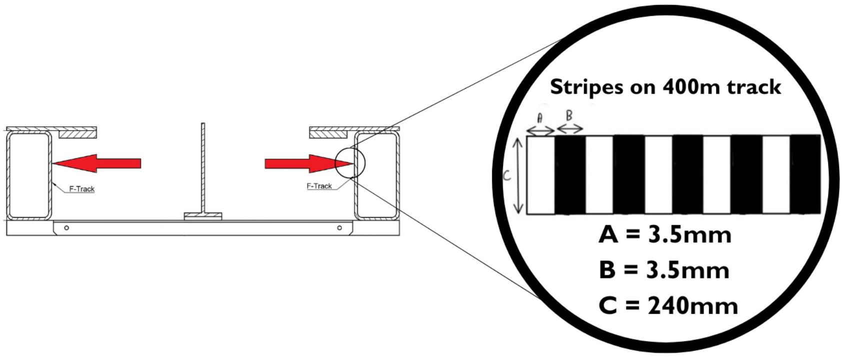

Figure 4: Stripes along the length of the track(red arrow indicates the location)

- Tolerances:
  (a) Lateral(F-track): ± 1mm
  (b) Vertical(F-track): ± 1 mm
  (c) T-track: ± 1 mm
  (d) Gap: gap of 3 mm between 2 track sections has been provided to account for thermal expansion.

1.2 Test Track Requirements:

In summary, the following requirements must be met in order to be allowed to operate any system on the test track.

1. The exhibitor must prove that the pod does not harm the test track infrastructure by any means. Thus, any (possible) contact point with the track should be made of significantly softer material than the test track.
2. Total dead load of the pod should be less than 1 tonne and forces on track (due to levitation, propulsion, braking, etc.) should be such that deformations in the track are insignificant ($<$ 1 mm). Simulations should be performed for these (in cases of static levitation and pod run either while levitating or on wheels) and should be included in the final safety document.
3. The braking system of the pod must not cause any harm or damage any surface of the track, either inverted aluminium T-track or mild-steel F-Track.
4. A designated yellow zone encompassing the loading/unloading area, and a specified distance from the track will be marked. No individuals are permitted within this yellow zone during the demonstration.

5. Loading and unloading of a pod must happen in the designated loading/unloading area.
6. The pod should be designed to move back and forth between the loading/unloading area and the opposite side of the track. Pods which might be stuck on the test track may only be pushed by hand to the loading/unloading area. The exhibitor must execute the power-off procedure and ensure there is a clear indication that the pod is safe to touch before anyone moves it to the desired location.
7. Modifications to the pod are strictly limited to resolving a stuck situation while it's on the test track. Any other alterations are only permissible when the pod is located either at the loading/unloading area.
8. The pod must halt prior to reaching a zone deemed dangerous, located 5 meters from the track's end.
9. A moving pod on the test track must use at least two independent and appropriate methods to measure its location or velocity.
10. Further details on the exact procedures for a demonstration on the Test Track will be provided at a later stage.

2 Vacuum Tube:

The 422m tube of 2m diameter is located at IIT Madras' Discovery campus at Thaiyur, Chennai.

2.1 Vacuum Tube specifications:

- Pressure: 1000 Pa
- Maximum payload: 2000 kg
- Material: IS 2062 E250 GR. B

2.2 Vacuum Tube Requirements:

1. The teams are required to design the pod or to modify its topology to fit the available vehicle zone (figure 5). Failure to comply with these clearance requirements will result in disapproval for the pod to conduct its run.
2. For demonstrations in vacuum, simulations (static and while running) on its compatibility should be provided. In case of static simulations, simulation on the pod for gradual decrease and increase of pressure between its compatible pressure limits should also be done. These simulations should prove the pod's compatibility with vacuum. Before running the pod in vacuum conditions, the pod must pass the physical vacuum test conducted within the provided tube.

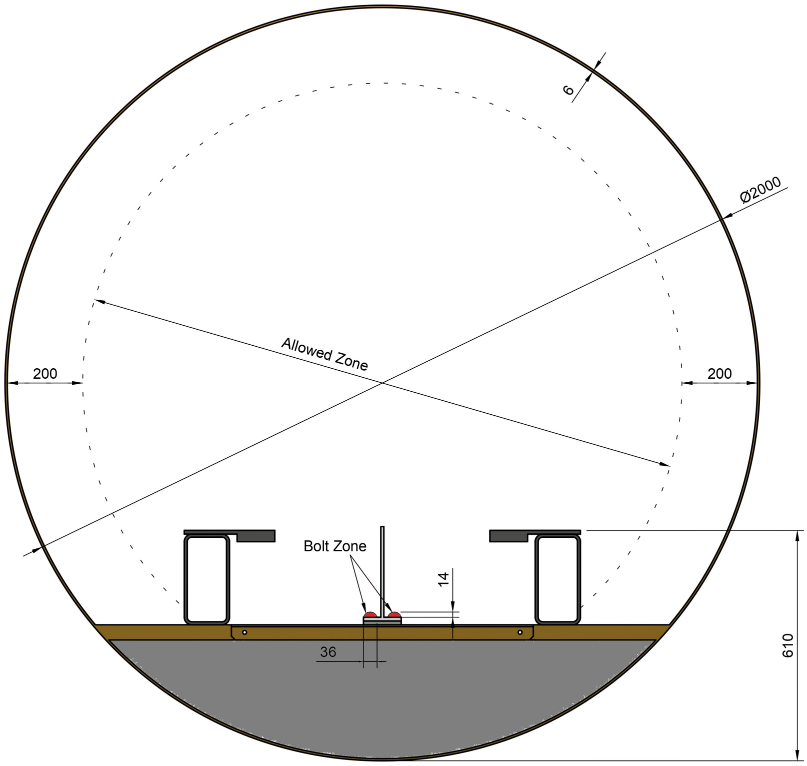

Figure 5: Cross-section of Vacuum tube (all values in mm)

3 Communications:

1. While a demonstration is being performed, the rest of the exhibitors should be disconnected from the GHC network, and any transmission equipment should be turned off so it cannot interfere.

2. The pod should be always under control, if a disconnection or other connectivity error that impedes continuous data flow and control is detected, the pod should enter in a safe state, stopping its trajectory.

4 Transport and Lifting Requirements:

1. Each pod needs a method to move around either by hand or on a transport cart.

2. Any transport cart must be tested prior to GHC with maximum payload.

3. Each pod shall provide the possibility of being lifted either by hand or with a forklift/small crane.

4. The exhibitor must prove that the lifting points of the demonstrator are dimensioned to its mass.

5. If a demonstrator is a hand-lifted, the allowable weight for each person is limited to 23kg.

6. A demonstrator must have as many lifting points as required to ensure the previous requirement to be allowed to be hand-lifted.

7. If a pod needs a forklift, please contact the GHC coordinator.

8. Unstable pods must have a straight base for the pod handling.

4.1 References

- Indian Standard HOT ROLLED MEDIUM AND HIGH TENSILE STRUCTURAL STEEL — SPECIFICATION (IS2062)