

# THE FORTH FRONTIER

## Brief Overview

The Forth Frontier is a proposal for a new maritime crossing between Kirkcaldy and Leith using a hydrofoil, a faster, smoother, and more efficient method than ever thought possible on this route.

The project would see two derelict existing buildings, situated in the harbours of each location, transformed into transportation terminals for a commuter route. The service would then expand into a tourist route, visiting other locations in the Forth Estuary.

The project seeks to reduce the heavy traffic and congestion in Edinburgh and over the Queensferry crossing by primarily targeting commuters. It would however, also present an opportunity for wildlife tourism around the Forth Estuary, opening up more of Scotland to tourists.

The project would run entirely on renewable energy, preserving the Forth Estuary's fragile ecosystems.

## Concept

The driving concept used throughout the project is **The Ever Rising Tide**.

This pertains to various aspects of the project but primarily and most obviously, the location of the existing buildings.

These sites have both been shaped by harsh weather conditions of their locations and the ebb and flow of the strong tides of the Forth.

By embedding the tides at the heart of this project, this should ensure that the character and soul of the existing buildings will not be lost throughout the design process.

**The Ever Rising Tide** also makes reference to the human caused rising of global sea levels and Scotland North Sea oil production. The Forth hosts Hound Point, one of Scotland's largest Oil tanker depots. The design of the buildings in response to this facility and the damage resulting damage to surrounding ecosystems.



HOUND POINT



LOCAL WILDLIFE



PHYSICAL MODEL - 1:50

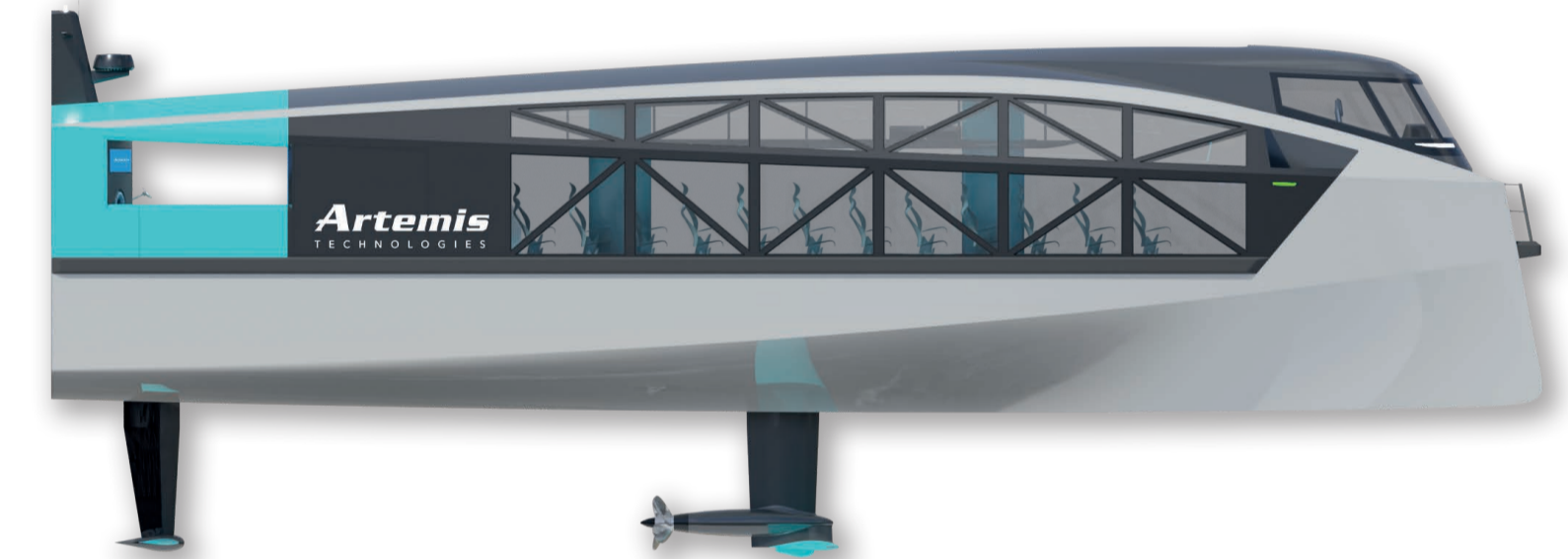
## The Vessel

For the route, I am proposing the use of the EF-24 Hydrofoil by Artemis Technology. (RIGHT)

The hydrofoil uses underwater wings to lift itself out of the water, dramatically reducing friction. These wings are retractable, allowing it to operate in shallow waters.

This would allow the hydrofoil to make the crossing in less that 15 minutes, using 85% less energy whilst being considerably smother than a traditional alternative, mitigating sea sickness.

These speeds and efficiency gains mean that the vessel can be run entirely from renewable energy making the whole project carbon neutral.



ARTEMIS TECHNOLOGIES EF-24 HYDROFOIL

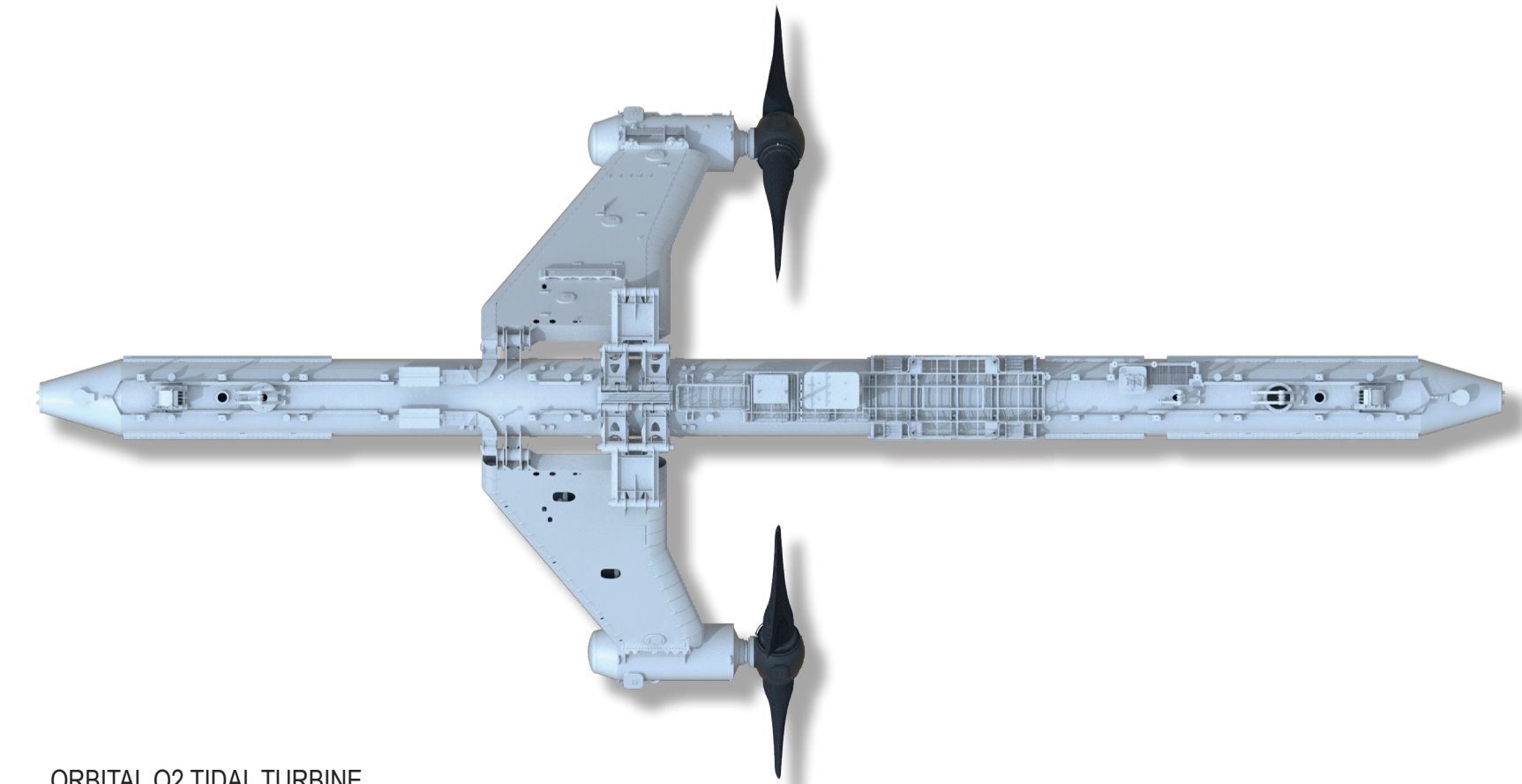
## Renewable Strategy

Powering the hydrofoil and both terminals would be a version of the Orbital O2 tidal turbine. (RIGHT)

Scotland is one of the worlds leaders in tidal energy technology, and currently hosts the largest tidal turbine in the world, just off the coast of Orkney.

The full sized turbine is capable of producing enough energy to power over 2000 UK homes. A small portion of this power would be used to charge the hydrofoils and run both Terminals.

As part of the Leith site, there would an exhibit including a live feed of the turbine and, informing the public of Scotland's renewable potential.



ORBITAL O2 TIDAL TURBINE



SITE PLAN

## Routes

The hydrofoil would begin as a commuter route, travelling from Kirkcaldy to Edinburgh. After a successful roll-out, this could be expanded to a tourist route, visiting seaside sites throughout the Forth Estuary. (LEFT)

# LEITH WEST BREAKWATER LIGHTHOUSE

The concept behind the form of the Lighthouse comes from the use of **The Ever Rising Tide** and is inspired by the distinctive strata like patterns formed by the tides around both buildings. Based on these, I then split the existing levels up and have inserted a new floor between each, creating a series of horizontal lines. This is then juxtaposed by the curvaceous form of the main roof, inspired by waves themselves and by the sea birds of the local area.

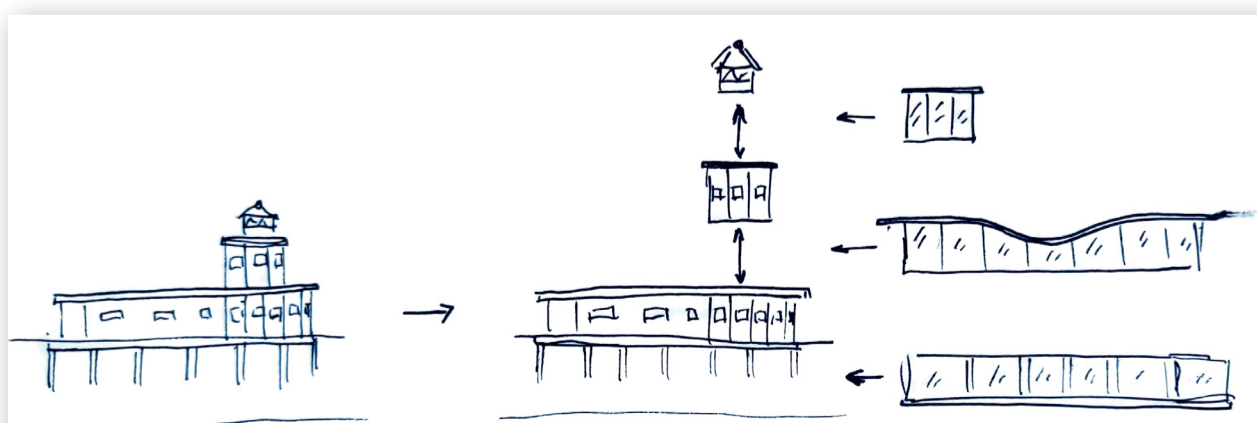
This also had the practical effect of increasing the floor area, allowing for a floor that dips below the high water line to be used as exhibit space to showcase the project and the marvels of tidal energy.

From a more infrastructural perspective, I have excavated the breakwater, allowing the hydrofoil direct access to the terminal, regardless of tide height, using a lifting platform.

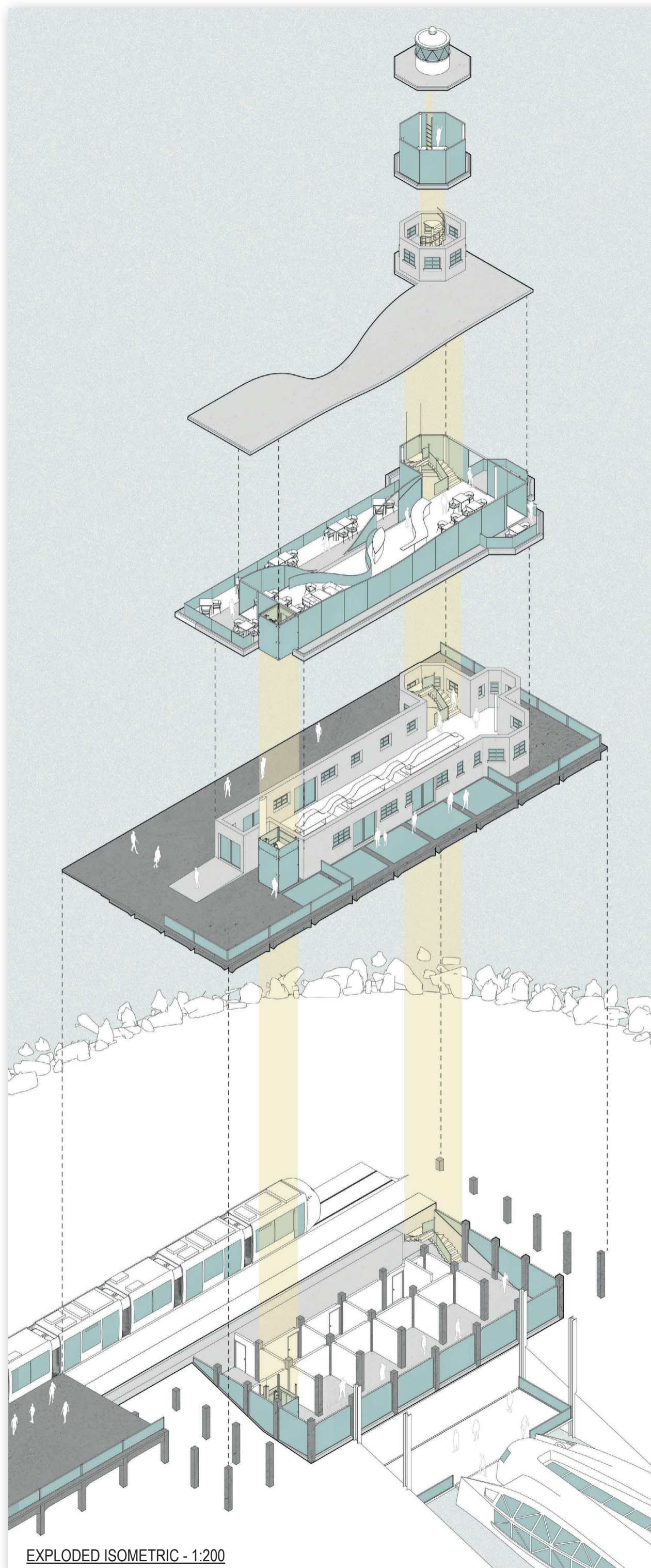
I have then also proposed that the recently completed Newhaven tram line be extended to the terminal, so that commuters might have a direct, frictionless link to Leith, the city centre and Edinburgh Airport, thereby increasing the usability of the route.



STRATA-LIKE PATTERN ON LEITH WEST BREAKWATER.



CONCEPT DIAGRAM.



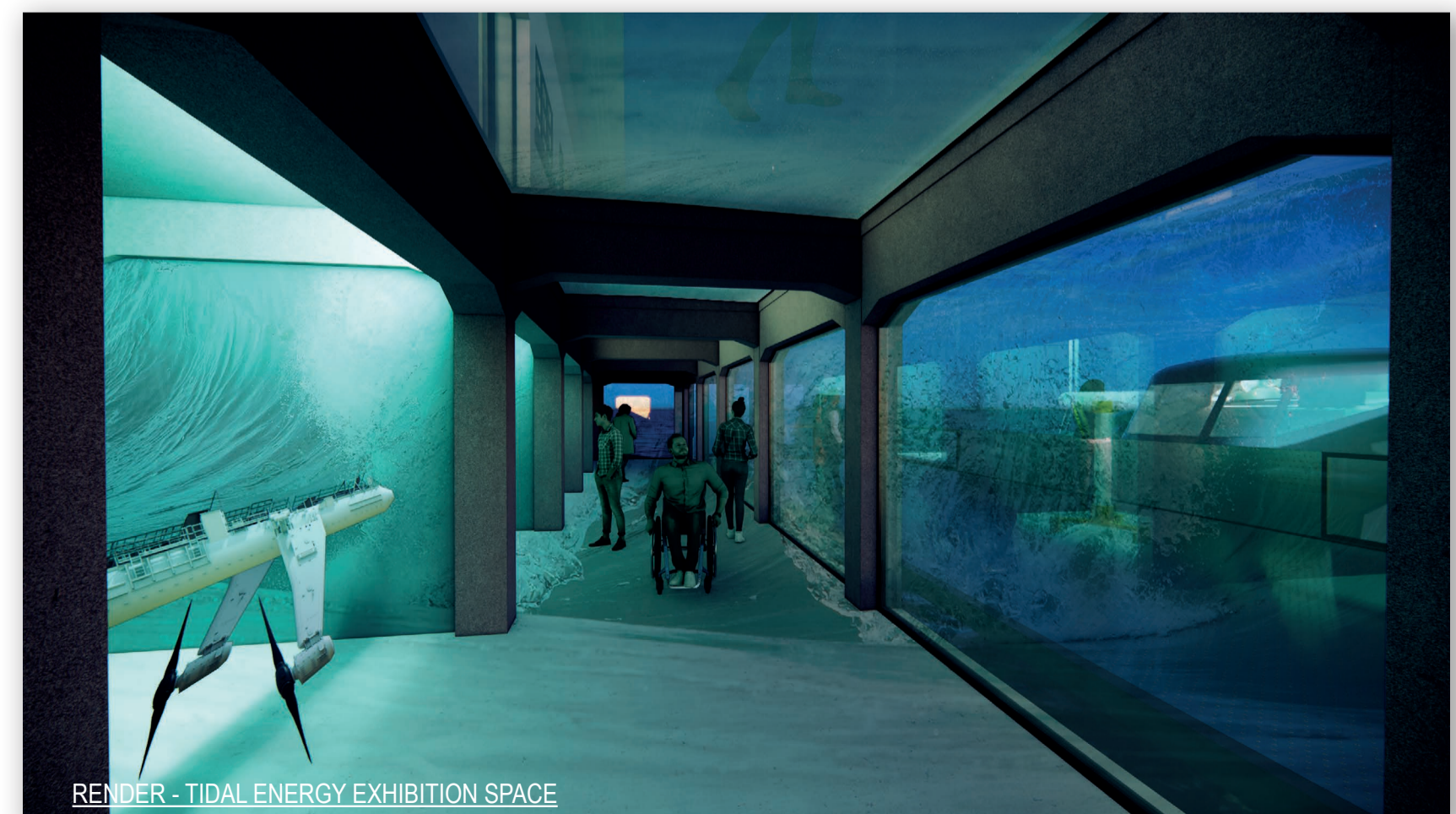
EXPLODED ISOMETRIC - 1:200



RENDER - FIRST FLOOR CAFE AND VIEWING DECK



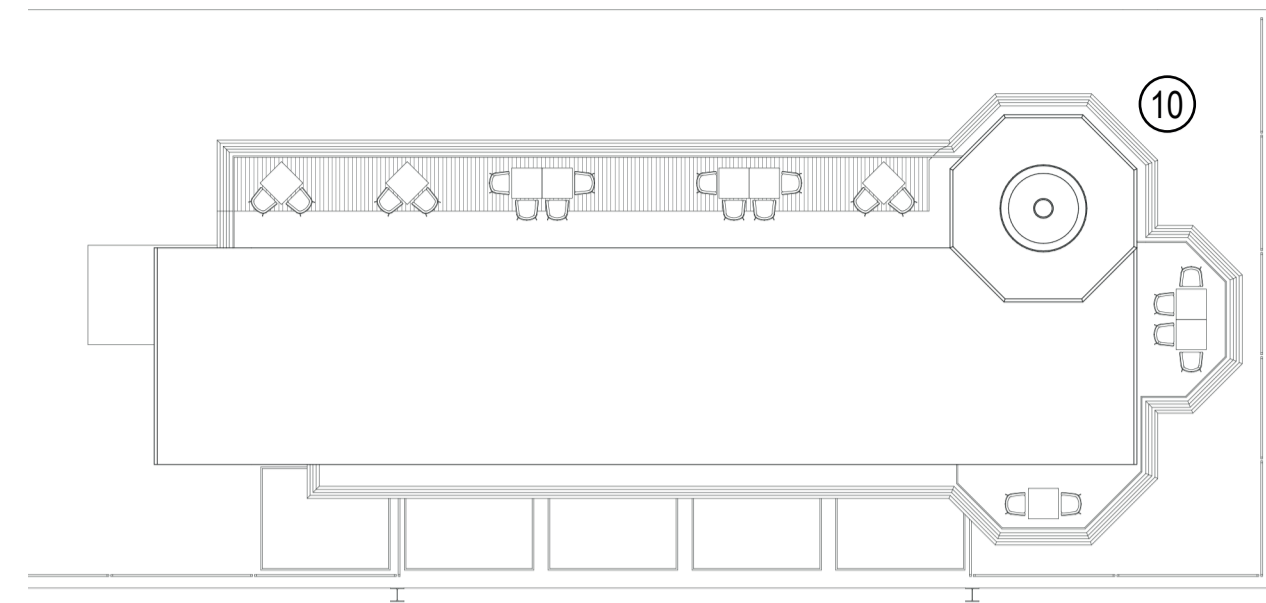
RENDER - GROUND FLOOR WAITING AREA



RENDER - TIDAL ENERGY EXHIBITION SPACE

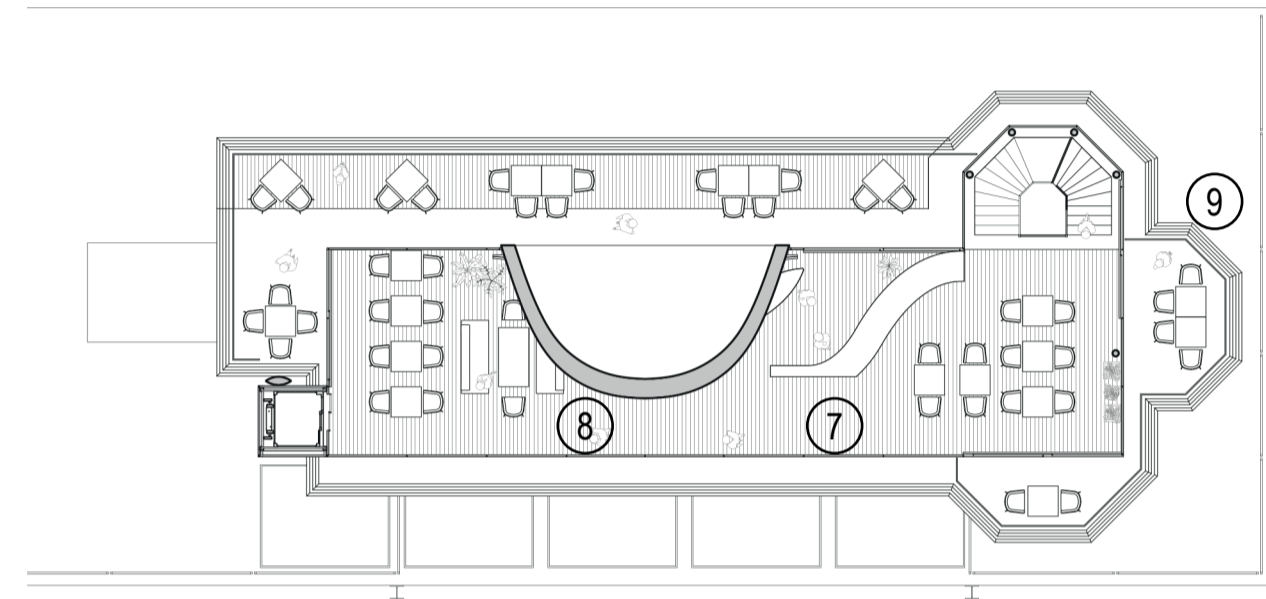


RENDER - SOUTHERN APPROACH TO LEITH TERMINAL



ROOF PLAN - 1:200

⑩ Lighthouse forms lookout tower, lantern reinstated



FIRST FLOOR PLAN - 1:200

⑨ Balcony's form lookout points.

⑧ Additional upstairs seating.

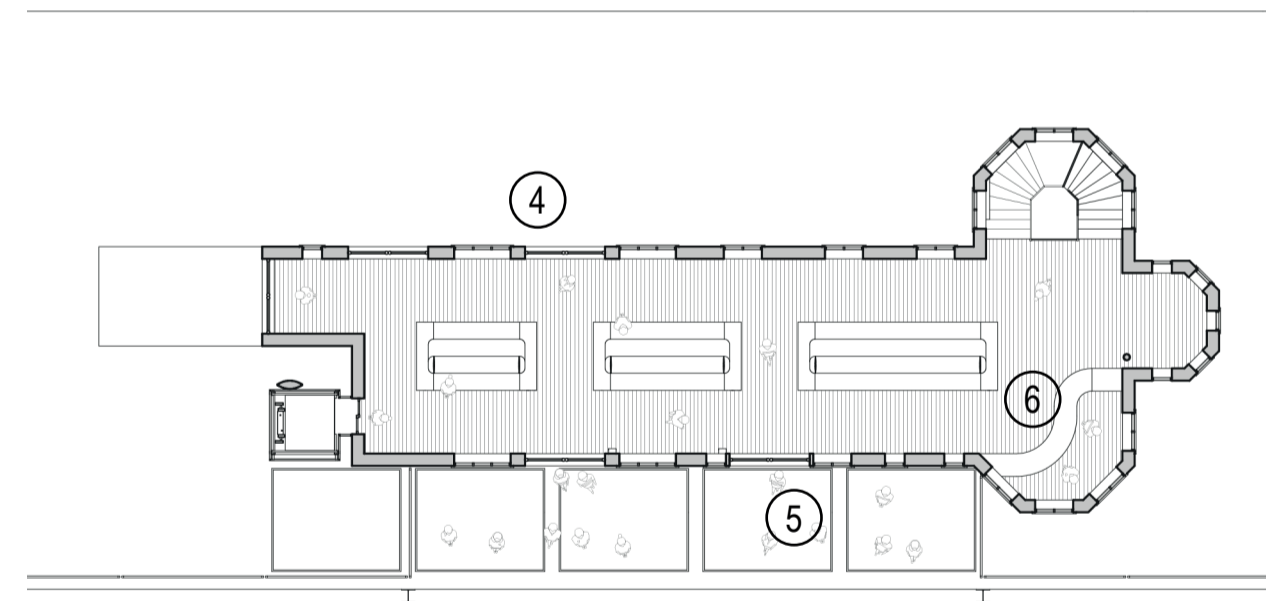
⑦ Cafe counter.



PHYSICAL MODEL - 1:50  
VIEW OF TRAM ENTRANCE



PERSPECTIVE SECTION - 1:100

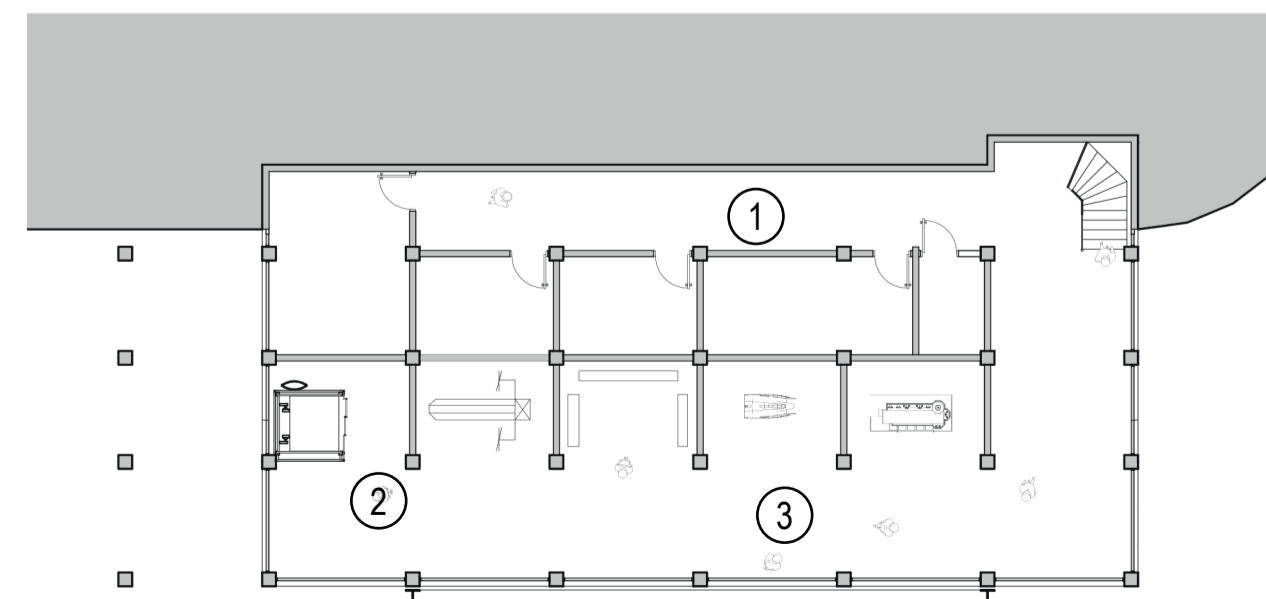


GROUND FLOOR PLAN - 1:200

⑥ Ticket desk.

⑤ Hydrofoil boarding platform.

④ Entry from Tram stop to main waiting area.



BASEMENT PLAN - 1:200

③ Tidal energy exhibition space.

② Elevator servicing three main floors.

① Toilets, staff room and plant room.

# KIRKCALDY HARBOUR WAREHOUSE

Contrary to the Lighthouse, Kirkcaldy Harbour warehouse is very utilitarian. In order to maintain the character of the harbour, I opted to make no changes to the external walls facing the harbour itself.

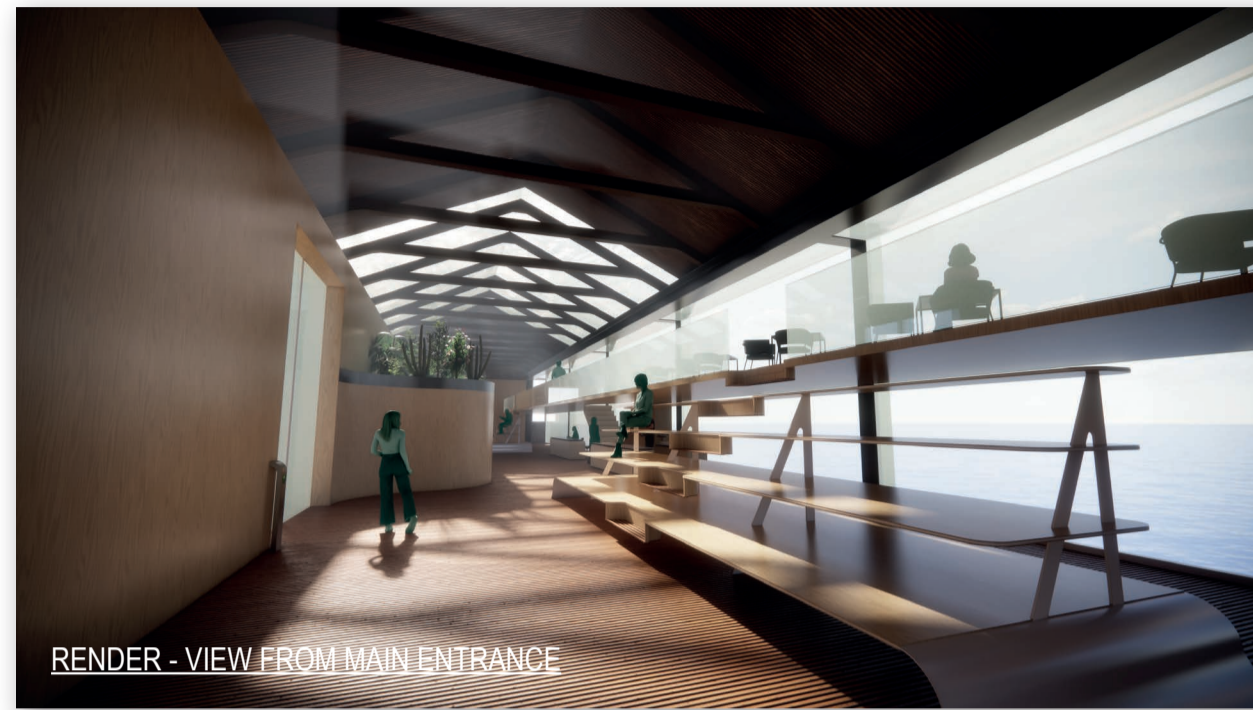
I did however, entirely remove the South wall facing the Forth and Edinburgh in order to allow light into the building where there previously was none.

I also removed the central third of the roof and replaced it with glazing to allow additional light in.

In keeping with the design choices on the Leith site, I decided to add a mezzanine floor along the length of the glazed wall.

Additionally, the design of the bleacher style seating is again inspired by the concept of **The Ever Rising Tide**. Each tier of this is designed to be as slim as possible, reflecting the horizontal staining on the harbour wall.

The feet of the seating then forms a curve, blending into the floor. The bleacher seating also forms a staircase, allowing access to the mezzanine.



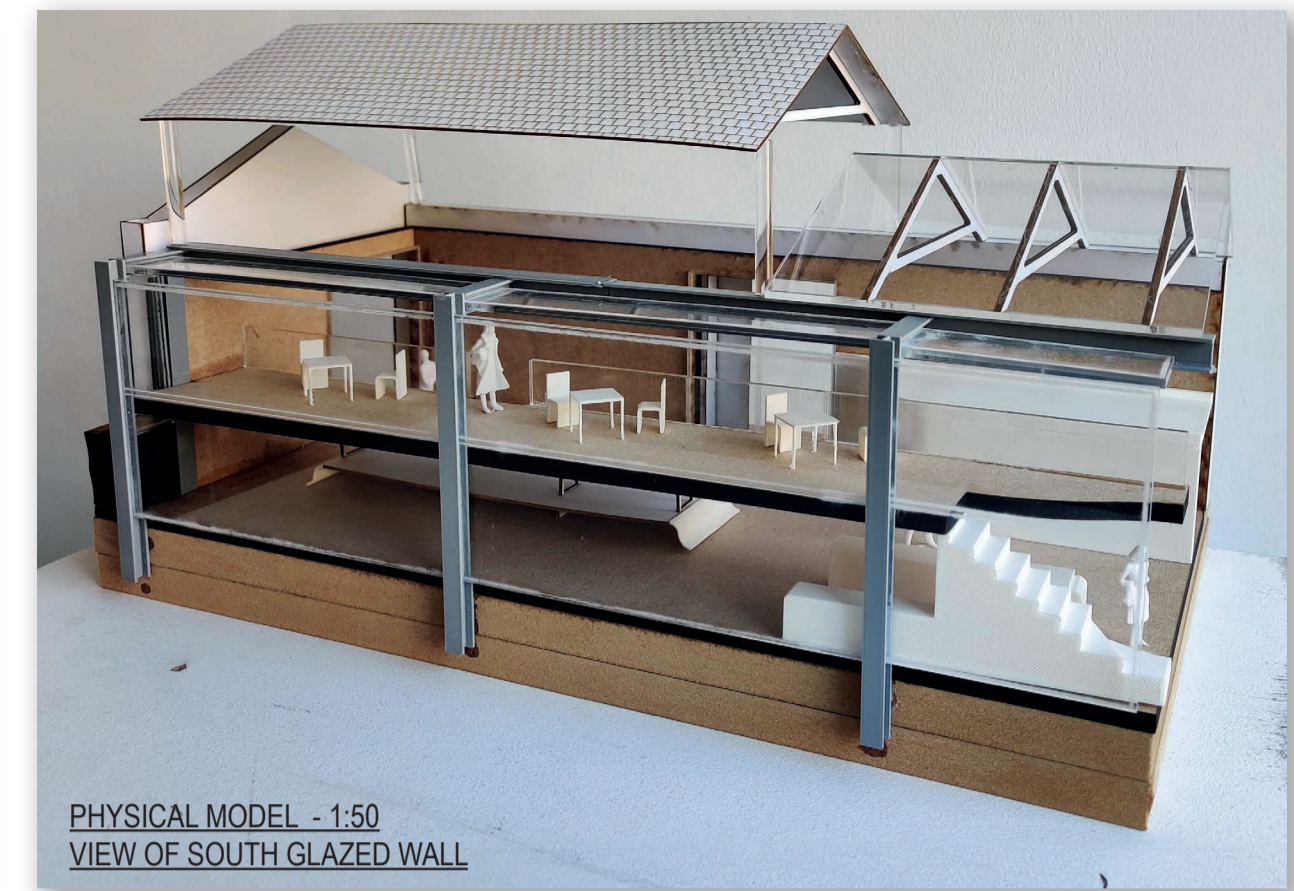
RENDER - VIEW FROM MAIN ENTRANCE



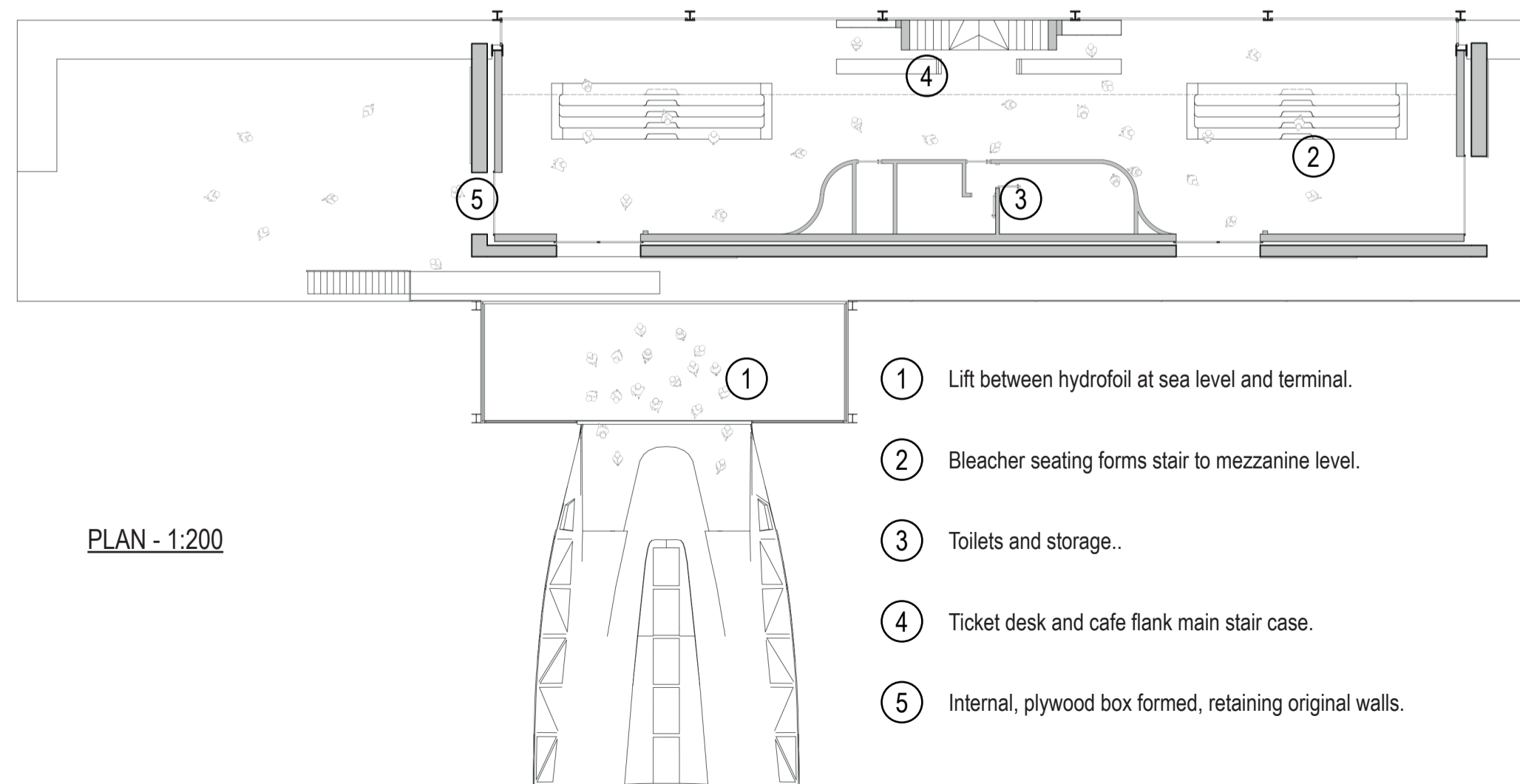
RENDER - VIEW FROM MEZZANINE FLOOR



PHYSICAL MODEL - 1:50  
VIEW OF BLEACHER SEATING

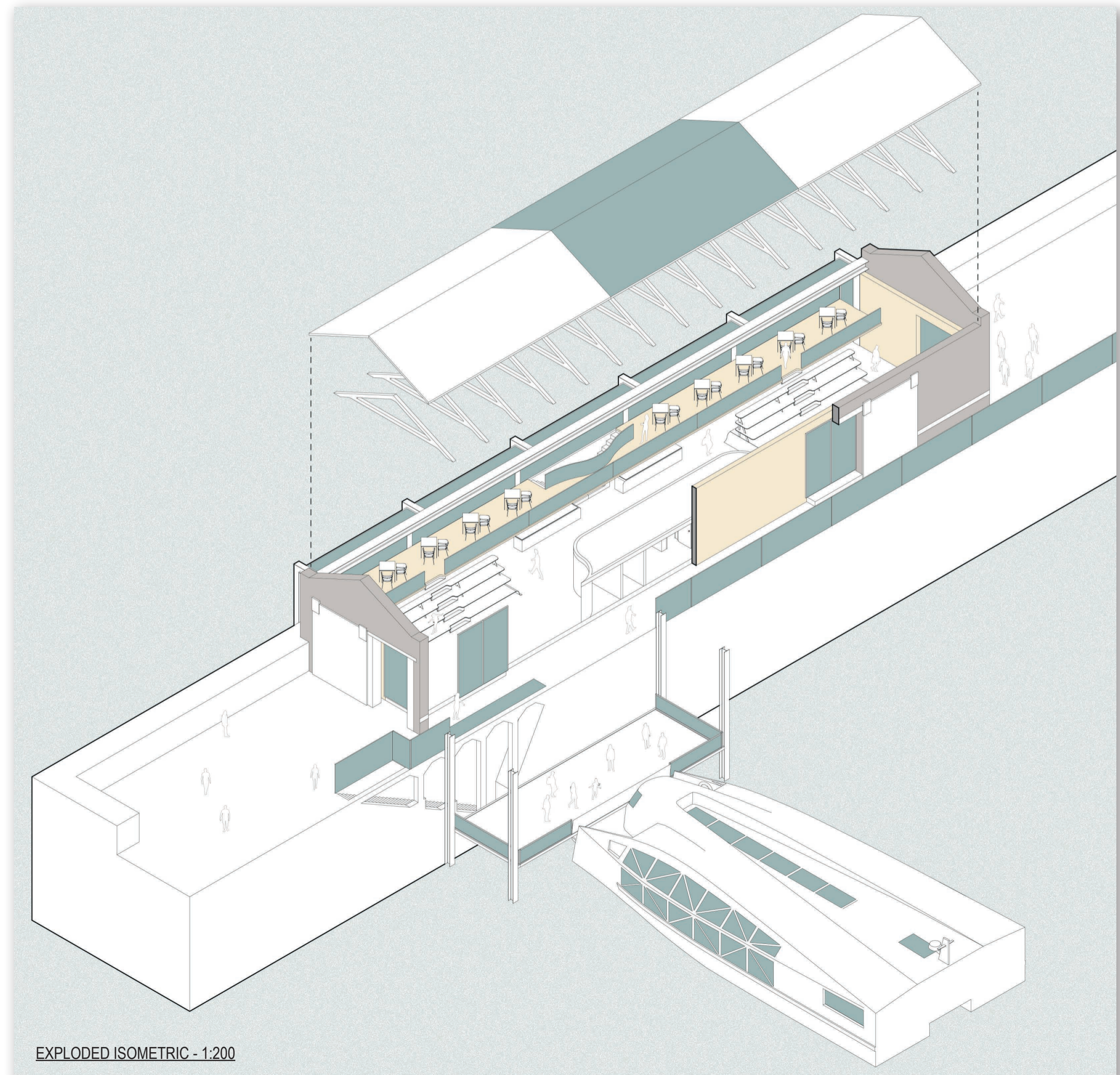


PHYSICAL MODEL - 1:50  
VIEW OF SOUTH GLAZED WALL



PLAN - 1:200

- ① Lift between hydrofoil at sea level and terminal.
- ② Bleacher seating forms stair to mezzanine level.
- ③ Toilets and storage..
- ④ Ticket desk and cafe flank main stair case.
- ⑤ Internal, plywood box formed, retaining original walls.



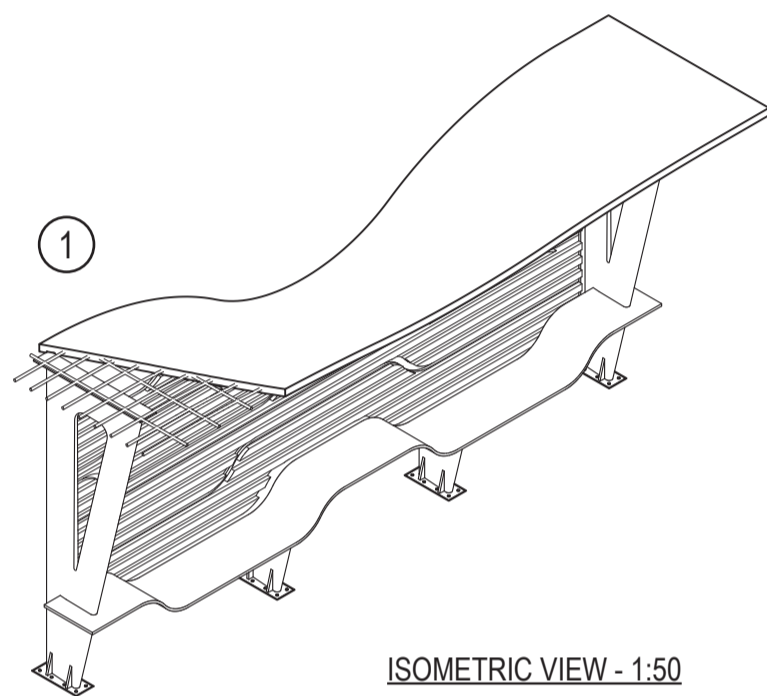
EXPLODED ISOMETRIC - 1:200

# BOAT SHELTER - DETAIL

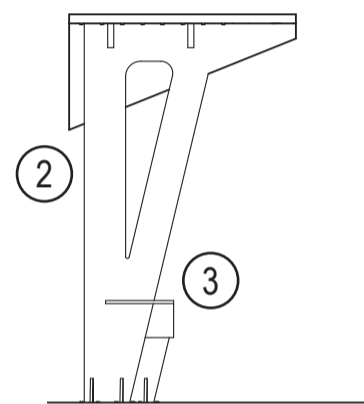
Rather than having a terminal in every small location village/ island location, the tourist route would act more like a bus service, with longer routes picking fewer people up on much more regular intervals. To accommodate this, boat shelters would be installed in each of the additional Forth locations.

The design takes queues from each of it's parent buildings. The roof, is a scaled version of the sea-bird inspired roof in Leith, whilst the seat is derived from the bleacher seating in both terminal locations and the columns and feet are based on the hydrofoil's underwater wings.

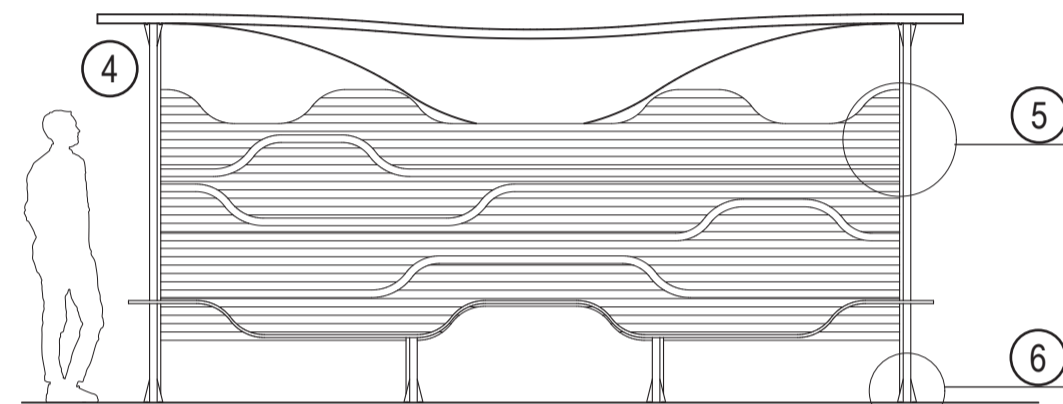
The pattern on the wooden backboard is inspired by the patterns of waves, and by tide levels. It also references the Lothian buses logo, the hydrofoil could very well be operated by them if it is to work in tandem with their trams.



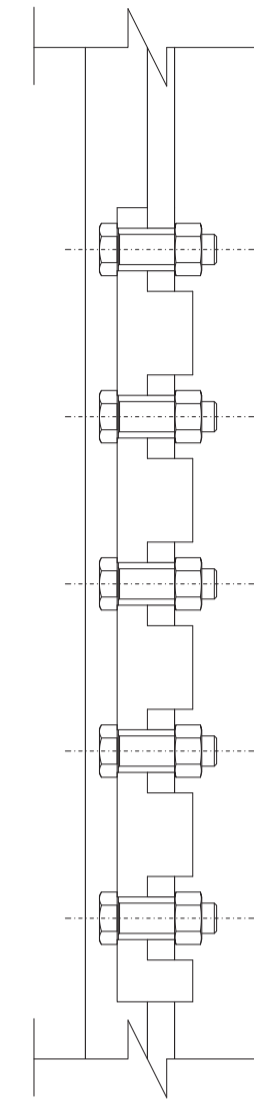
ISOMETRIC VIEW - 1:50



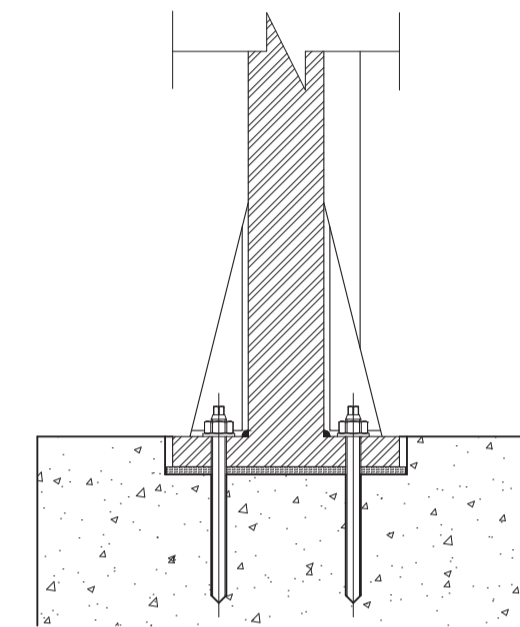
LEFT ELEVATION - 1:50



FRONT ELEVATION - 1:50



DETAIL (5) - 1:5

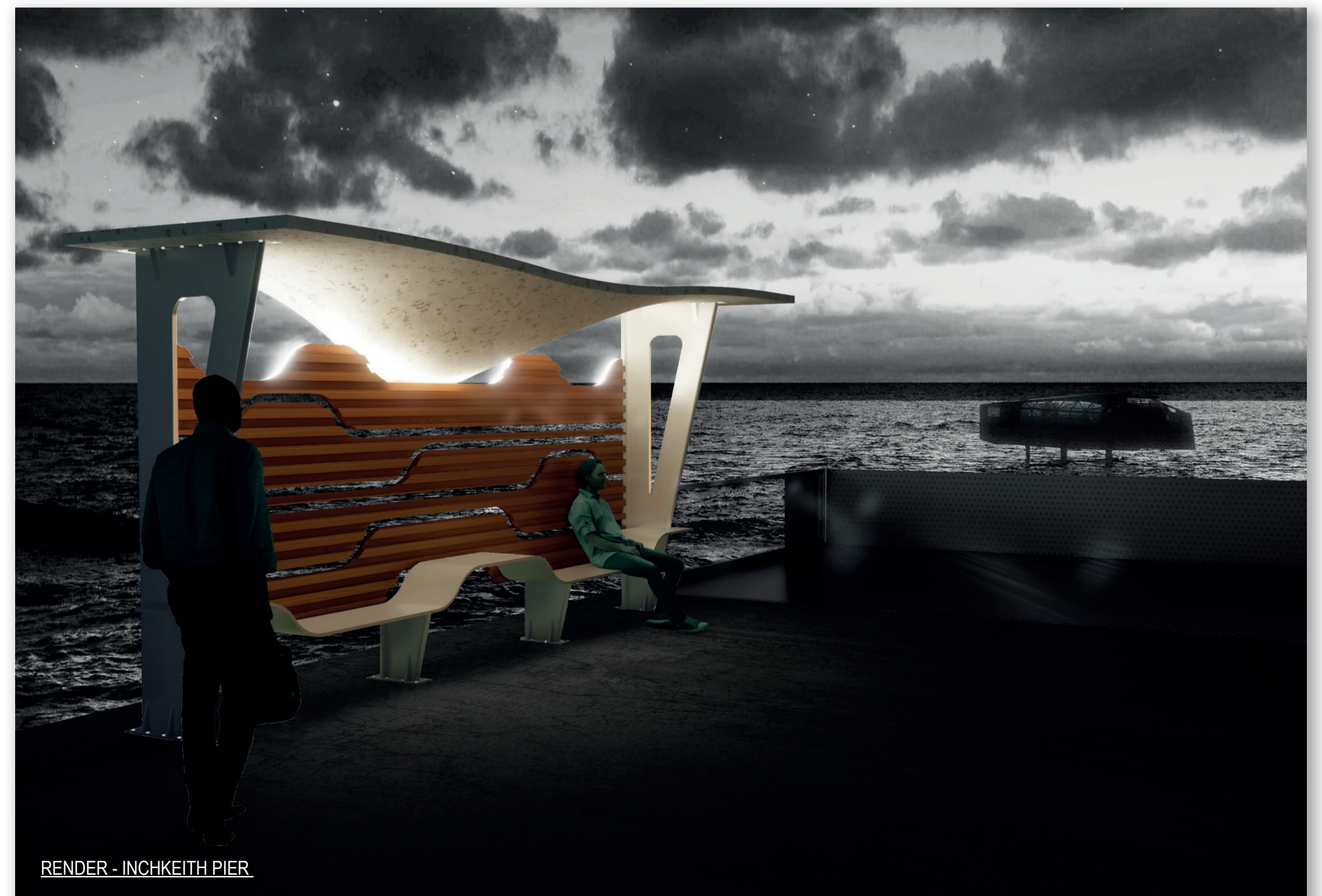


DETAIL (6) - 1:5

- ① Concrete roof, pre-cast with reinforcement bar.
- ② Steel columns with cut outs to reduce weight and allow wind to pass through structure.
- ③ Steel benches, welded to columns and feet for maximum strength.
- ④ Wooden backboard gaps allow wind to pass through. Shape inspired by Lothian Bus logo.
- ⑤ Wooden backboard fixed to steel columns using M20, 70mm Set Screws and bolts.
- ⑥ Steel Columns welded to foot with steel webbing, then fixed to concrete slab using 8x M10, 130mm Resin Anchors.



PHYSICAL MODEL - 1:20



RENDER - INCHKEITH PIER