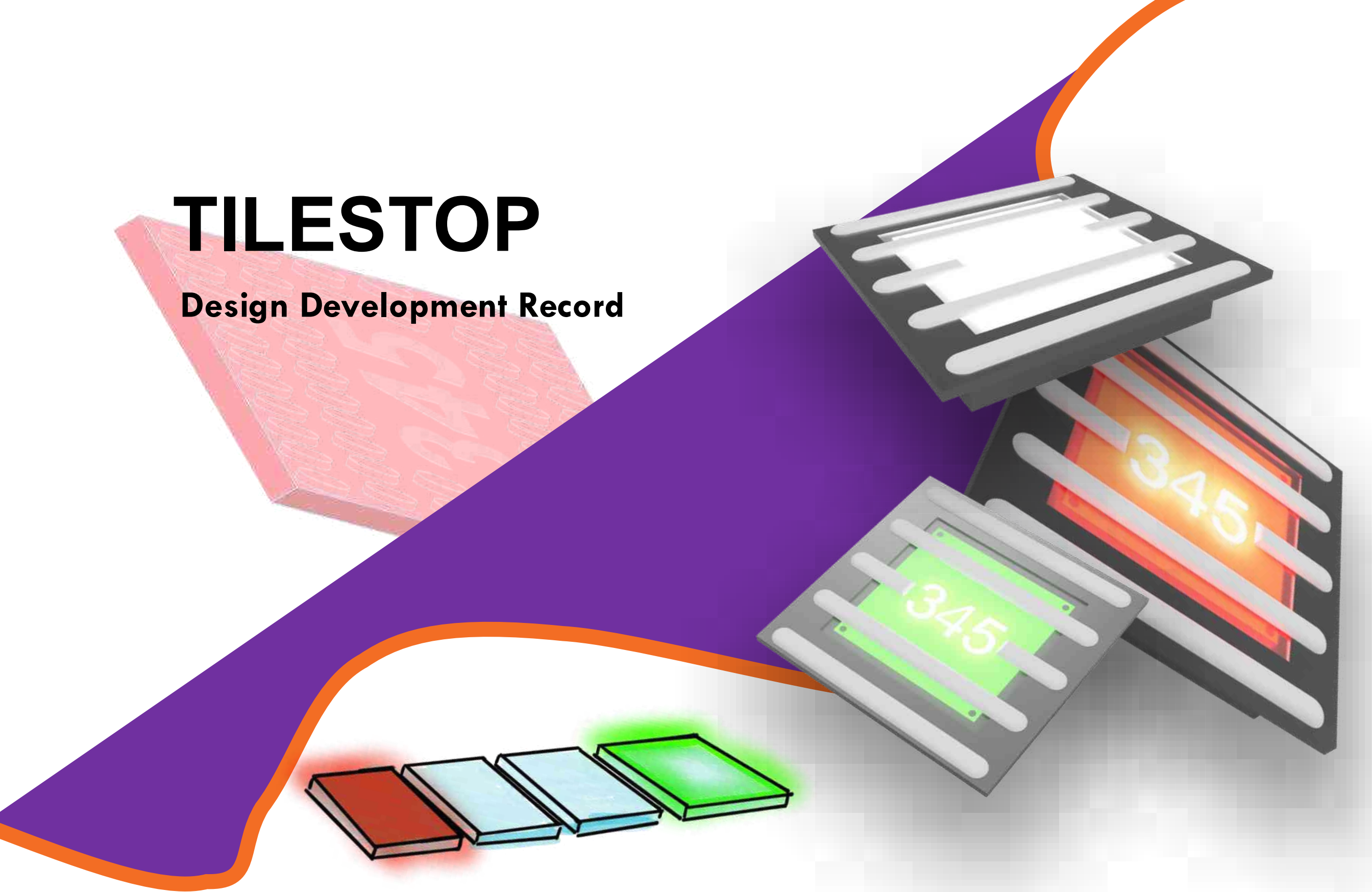


# TILESTOP

Design Development Record



A cluster of five semi-transparent purple circles of varying sizes in the top-left corner.

# Authenticity Statement

## ***Authenticity Statement***

*This is to certify that to the best of my knowledge, the content of this presentation is my own work. This presentation has not been submitted for any subject or for other purposes. I certify that the intellectual content of this presentation and design is the product of my own work and that all the assistance received in preparing this report and sources have been acknowledged.*

Your name: Aaron Mathew

Student number:



Date: 31/11/12

# Topic - Examine how infrastructure at public bus stops might be improved to facilitate real-time communication especially tourists

**The objective** is to provide a human centred solution that reconciles the dynamic nature of public transportation



The purpose of this research is to investigate how Brisbane bus stop communication technologies affect tourists' experiences getting about the city. Tourists are frequently unfamiliar with routes, destinations, and cultural transportation conventions, in contrast to everyday commuters. This study investigates the ways in which digital information systems, schedules, and signage can either help or hinder travellers as they travel between transportation hubs, lodging options, and attractions. Finding chances for better communication design that boost accessibility, self-assurance, and travel convenience for tourists is the final objective.

# User Interaction PACT Analysis

| P                                                                                                                                                                                                                                                                                                                                                                                                                                 | A                                                                                                                                                                                                                                                  | C                                                                                                                                                                                                                                                                                                                        | T                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The main users are senior passengers, international students, and commuters (workers, students).</p> <p>Bus drivers and cyclists/pedestrians crossing close to stops are examples of secondary users.</p> <p>Clear information, secure waiting, real-time updates, and accessibility are needed. Reliance on phones, congregating close to poles, and asking friends for directions are some examples of these behaviours.</p> | <p>Waiting (usually 5 to 20 minutes). Examining schedules and signage. Verifying arrival timings on phones. Clustering and queuing. - Getting on and off buses. Handling a lot of foot traffic in Kelvin Grove, the central business district.</p> | <p>Physical: busy central business district, suburban roadside (limited), and hubs such as Chermside (organised, best practice). Environmental factors include traffic, noise, exposure to the elements, and dim nighttime lighting. Social: a mix of foreign and local pupils with differing levels of familiarity.</p> | <p>Printed schedules (not always visible). Pole signs (obstructed, small print). Only at key hubs like are there real-time PIDs available. - Google Maps and the TransLink app (high dependence). The Brisbane PTIM criteria are not always followed.</p> |
| <p>Make accommodations for a range of language and literacy skills. Features that are inclusive to those with hearing or vision impairments. Improve public displays to lessen reliance on phones.</p>                                                                                                                                                                                                                            | <p>Enhance waiting comfort by providing shade, chairs, and shelter. To prevent congestion, the queue should be well-organized. Multi-channel communication (phone, print, and digital).</p>                                                        | <p>Weatherproof design (rain cover, shade). - Safer layouts (clear zones, illumination). Context-driven solutions (suburban stops versus hubs).</p>                                                                                                                                                                      | <p>Expanded use of real-time displays, even in minor locations. Improved signpost design (uniform placement, strong contrast, and clarity). Incorporate NFC or QR codes for digital information access.</p>                                               |

# Why would This Topic be good to Explore?

## Report finds 2032 Brisbane Olympic and Paralympic Games could bring \$70 billion in economic opportunities

By state political reporter Alex Brewster

Olympic Games

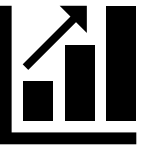
Tue 22 Jul



The report expects the games to create almost \$40 billion in economic growth for south-east Queensland. (Supplied)

### Economic Opportunity

“It estimated over that period, south-east Queensland could see growth of almost \$40 billion, with a further \$31 billion in positive impacts for regional Queensland and Australia”



### Accessibility & Social Impact

The initiative aligns with user-centered research in navigation, tourism, and public transportation by providing possibilities for community engagement, accessibility improvements, and inclusive public design.



## New Brisbane stadium to be built at Victoria Park for 2032 Olympic and Paralympic Games

By state political reporter Jack McKay and Claudia Williams

Olympic Games Venues

Tue 25 Mar



Queensland government unveils 2032 Olympic plans (Supplied)

### Infrastructure Development & Urban Regeneration

Brisbane's metropolitan landscape will change because of significant improvements like the Victoria Park Stadium and transportation hubs. Investigating this subject offers insights into innovative public spaces, smart mobility, and sustainable design in the vicinity of Olympic precincts.



### Eco-Friendly City Legacy

By encouraging the use of public transportation, eco-friendly products, and renewable energy integration, the Games hope to leave a long-lasting, inclusive, and green urban legacy. For designers looking into sustainable futures, this makes it a crucial subject.



# Background Research – Real time Information Systems

This study investigates the ways in which intelligent transport systems (ITS) and real-time passenger information (RTI) enhance the general effectiveness of bus operations. It focuses especially on accessibility at major metropolitan route stations, dwell-time reduction, and user confidence—all of which are extremely pertinent to Brisbane's Olympic transport plans.

## Bus Dwell-Time Model of Main Urban Route Stops Case Study in Madrid, Spain

Emilio Moreno González, Manuel G. Romana, and Oscar Martínez Álvaro

A scoping assessment of 28 studies demonstrates the significant improvements in perceived service quality, reliability, accessibility, comfort, safety, and overall satisfaction that can be achieved using real-time passenger information (RTI), particularly when augmented with AI and ITS.

Bus ridership rose by 2% to 3% because of real-time information systems, which also enhanced passenger confidence, particularly among infrequent and new users who were not familiar with the routes. This emphasizes how crucial real-time displays are for visitors who are unfamiliar with the system.

### Findings

- 100% A meta-analysis of 28 studies found that RTI enhances perceived safety, comfort, and service quality.
- RTI boosts ridership by 2-3%, particularly with new or infrequent customers.
- RTI + AI + ITS systems increase public transportation reliability and satisfaction.

### Design Applicability

- encourages the use of real-time displays at bus stations.
- draws attention to the necessity of information systems that are inclusive of travellers and foreign guests.
- highlights the significance of mobility systems with AI integration for major events like the Olympics.



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## TRANSPORTATION RESEARCH

*AN INTERNATIONAL JOURNAL*

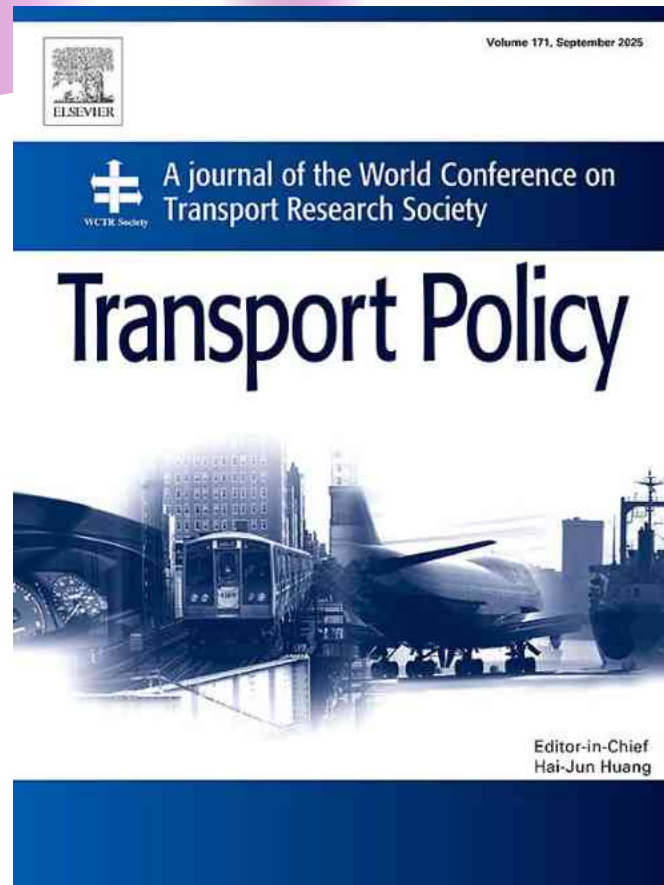
Part C: Emerging Technologies



Editor-in-Chief: Nikolas Geroliminis

# Background Research – Wayfinding & Signage Clarity In Public Transport

This study looked at how better wayfinding and signage can improve the experience of travellers and lower navigation errors in congested transit terminals. The study concentrated on readability, consistency, and visual accessibility in urban mobility networks.



Transport Policy Journal, Vol. 171 (2025)

Wayfinding charts and clear signs greatly decreased boarding errors. High-contrast, consistent signage that decreased reliance on local knowledge was especially beneficial to tourists and new users.



## Key Findings

- Clear signage and wayfinding charts significantly reduced boarding errors.
- Consistent, high-contrast signage decreased the need for local knowledge, which was notably advantageous for visitors and first-time users.

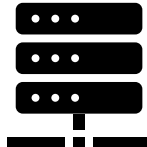
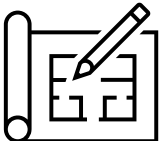
## Design Applicability

- supports the idea that signs should be high contrast and clear for tourists from other countries.
- emphasises how important navigational clarity is to visitors' confidence when boarding and navigating.
- corresponds with Brisbane 2032's universal accessibility goals.



# Research - PTIM

The Department of Transport and Main Roads (TransLink) in Queensland created the Public Transport Infrastructure Manual (PTIM, Nov 2020), which sets design and planning guidelines for bus stops and other public transportation facilities throughout the state. When considering tourists and international students as first-time users of Brisbane's bus system, the rules are especially pertinent because they set a standard for accessibility, safety, signage, and uniformity throughout the network.

| <b>Accessibility</b><br>                                                                                                                                                               | <b>Directions and Signage</b><br>                                                                                        | <b>Comfort and Safety for Users</b><br>                                                                                                                                                          | <b>Combining Digital Services</b><br>                                                                                                                                     | <b>Principles of Universal Design</b><br>                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>must adhere to the Disability Standards for Accessible Public Transport (2002), which call for clear access routes, suitable kerb heights, and tactile indications.</p> <p><b>Benefits for tourists or overseas students who have mobility issues or baggage</b></p> | <p>To lessen dependency on English, universal symbols, colour coding, and consistent branding are emphasised.</p> <p><b>facilitates first-time system navigation for non-native English speakers.</b></p> | <p>incorporates the open design, illumination, and visibility concepts of Crime Prevention Through Environmental Design (CPTED).</p> <p><b>guarantees that chairs and shelters fulfil minimal comfort requirements</b>, which is crucial for patrons waiting in strange places.</p> | <p>Real-time passenger information systems (such as NFC-enabled stops and mobile updates) are supported by physical infrastructure.</p> <p><b>draws attention to the chance to connect digital and physical data for a more user-friendly interface.</b></p> | <p>Infrastructure is made to accommodate as many people as possible, irrespective of their age, skill level, or cultural background.</p> <p><b>meets the demands of visitors and international students who are not familiar with the local systems.</b></p> |

The PTIM establishes the minimum requirements for Queensland's bus stop infrastructure, guaranteeing a consistent, safe, and readable design. Although physical accessibility and signage are covered by these principles, they also allow for improved digital services (such as bilingual real-time data and app-free access) to further enhance the experience of new and non-local users.

# Cross River rail – Transforming Brisbane's Transport Network

A significant infrastructure project that is changing South East Queensland's metropolitan connection, accessibility, and passenger experience.



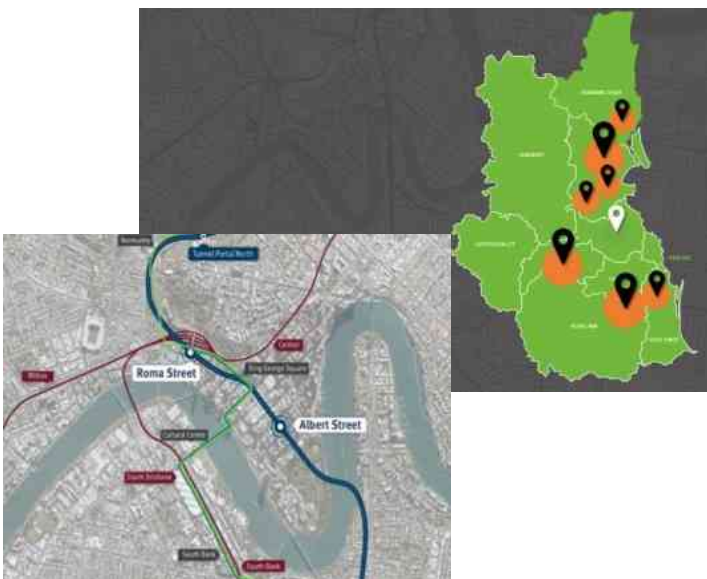
The 10.2 km Cross River Rail project includes 5.9 km of twin tunnels beneath the CBD and Brisbane River. It forms an essential new transit corridor for South East Queensland by connecting important precincts such as Boggo Road, Woolloongabba, Albert Street, Roma Street, and Exhibition.

## Impact on the Economy and Urban Regeneration

- It is anticipated to create up to 35,000 additional employment.
- Over the next 20 to 30 years, Queensland's Gross State Product (GSP) is expected to increase by \$15 to \$20 billion.
- encourages urban renewal in important neighbourhoods, including as Roma Street and Woolloongabba.

## Rail Connectivity and Efficiency

- able to handle 24 trains per hour in each direction, which improves dependability and eases traffic.
- reduces the strain on current lines by adding a second river crossing.
- encourages quicker travel times throughout Southeast Queensland and the construction of stations in the future.
- promotes the use of public transportation, which lessens reliance on personal vehicles and traffic.



To boost train service frequency, especially on match days, the upgrade will involve extending the current platform while maintaining the 2029 Cross River Rail operation deadline. Modernising the station is a component of the State's larger investment plan for the 2032 Summer Olympics in Brisbane, which aims to improve infrastructure in strategic urban zones.



# Cross River Rail - Enhancing Brisbane's Passenger Experience



The goal of Cross River Rail is to improve connectivity, speed, and ease of transit within Brisbane. The project reduces travel time and streamlines city transport for commuters, students, tourists, and medical professionals by adding more underground stations and better transfer sites.



## Commuters

- avoids lengthy walks from older stations and traffic jams in the inner city.
- saves up to fifteen minutes on the commute to the southern central business district.



## Sports Enthusiasts

- Event transport is more efficient because to the new Gabba connection, which cuts the trip from South Bank by up to 20 minutes.



## Customers and Guests

- Walking time is cut by about ten minutes thanks to the new Albert Street Station, which provides direct underground access to Queen Street Mall and the central business district.



## Medical Professionals

- Reduced travel time from 15 to 10 minutes to Royal Brisbane and Women's Hospital (RBWH).
- There are now safer and more dependable ways to get to Exhibition Station thanks to improved pedestrian connections.



## Students

- Major educational hubs are now more easily accessible thanks to the new Boggo Road Station's direct connections to Brisbane Metro and UQ St Lucia.

## Outcomes

- commutes throughout Brisbane that are quicker and more effective.
- increased coordination between the bus, metro, and train networks.
- enhanced usability for a wide range of users, including residents and tourists from other countries.

The goal of a linked, easily accessible, and user-friendly transportation system in Brisbane is supported by this infrastructure architecture. It highlights how crucial smooth multimodal connectivity, unambiguous signage, and real-time digital wayfinding are—all of which directly contribute to this project's emphasis on inclusive transportation design for visitors and users from other countries.

# Transport Infrastructure 2032 Getting Ready for Worldwide Mobility and Massive Movement

The 2032 Olympic and Paralympic Games in Brisbane will draw thousands of tourists, putting a tremendous strain on the city's transportation infrastructure. To guarantee that people can move between events, hotels, and important locations quickly and safely, a well-designed, easily accessible infrastructural network will be essential.



Before, during, and after the Games, the Queensland government wants to provide a reliable, sustainable, and inclusive transportation system. The accelerated initiatives listed in the 2032 Delivery Plan include:

- The Wave is a high-speed rail line that runs between the Sunshine Coast Airport and Brisbane.
- Brisbane Metro extension and new stations. enhanced ties to important regional hubs and the Gold Coast.
- significant improvements to highways, such as the Bruce Highway.

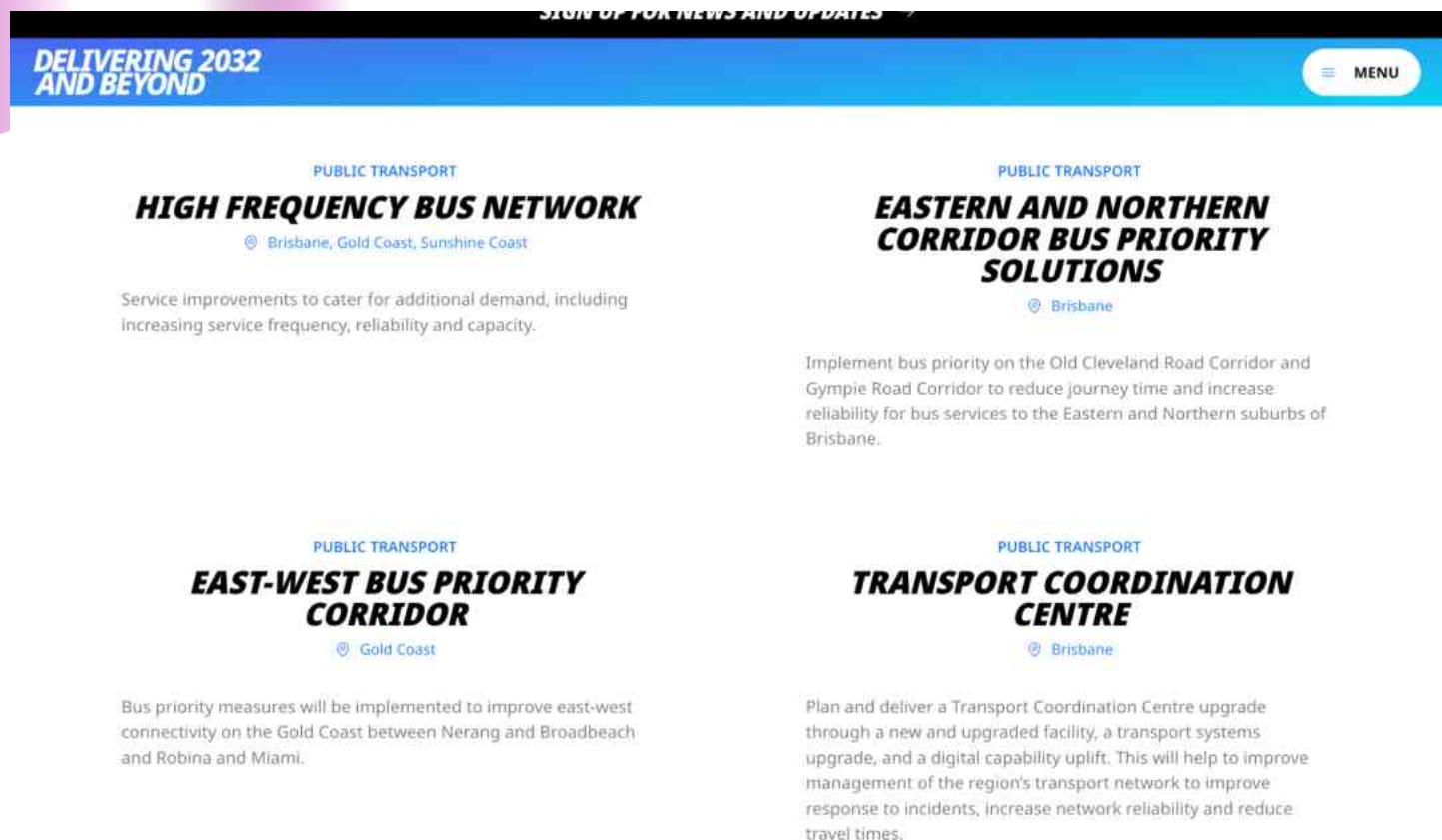
## Implications for Brisbane 2032 Design

- Wayfinding Clarity: Using visual aids and multilingual, clear signage to direct sizable visitor groups.
- Mapping Systems: Tools for real-time navigation that combine busways, metros, and trains.
- Crowd Flow Management: At large event locations, infrastructure designs that effectively manage peak surges.
- Inclusive Access: Options for athletes, travellers, and those with special needs.

To manage the worldwide flow of people during and after Brisbane 2032, these trends underscore the necessity of scalable, easily accessible, and clearly marked transportation experiences.

# Brisbane 2032 Transport Upgrades: Intelligent Bus Coordination and Infrastructure

The Queensland government is making investments in a more intelligent and sustainable transportation system as part of its 2032 Olympic legacy. Increased bus frequency, less traffic, and better digital coordination throughout Brisbane, the Gold Coast, and the Sunshine Coast are the goals of these improvements.



- **Frequency-High Bus Network**

To satisfy the increased demand in Brisbane, the Gold Coast, and the Sunshine Coast, service frequency and dependability are being increased.

- Bus-priority solutions on Old Cleveland and Gympie Roads to shorten travel times and increase dependability are the Eastern and Northern Corridor Priority Solutions.
- Faster east-west bus services connect Nerang, Broadbeach, Robina, and Miami via the Gold Coast's East-West Bus Priority Corridor.

- **Upgrade of the Transport Coordination**

Centre a single digital centre for regional network coordination, incident management, and route optimisation.

## Design Pertinence to the Smart Bus Stop Initiative

- gives smart bus stop concepts contextual evaluation because real-time data integration is a primary priority for the Olympic Delivery Plan and the PTIM.
- The interactive system design of your suggestion is in line with the government's digital coordination enhancements.
- validates Queensland's expenditure on bus technology and infrastructure, giving your plan legitimacy and viability.

# Observations and Differences in the Current Public Transportation Infrastructure

The public transport systems in Brisbane's suburbs and cities differ greatly from one another. Many minor stops lack shelter, accessibility, and clear wayfinding, even if big centres like King George Square and the Cultural Centre have excellent architectural and spatial design. These findings show that future infrastructure must be inclusive, consistent, and digitally integrated.



Near the kerb is a modest suburban bus stop featuring tactile paving, a solitary bench, and a green metal shelter. It is situated in the middle of vegetation on a peaceful residential street.



Buses arrive at the Cultural Centre busway station, which has a spacious, contemporary canopy and broad walkways for pedestrians. The station's signage is conspicuous and easy to see.



An unguarded suburban bus stop featuring a yellow pole sign advertising the bus route and a basic wooden bench. There are buildings and trees next to the stop, which is next to a two-lane road.



Brisbane's central business district is home to the King George Square busway station an underground hub that uses a specific bus only routes to travel connecting to cultural Station



A bus shelter made of green metal with a white ceiling and seating. The stop has a yellow route sign pole and is situated next to residential structures on a suburban roadway.



## Way finding Signage

a computerized solar powered display that stands alone and shows the current time of bus arrivals. Mounted atop a pole next to a walkway surrounded with trees, the screen is black with white LED letters.

Timetables and maps are printed on TransLink information pillar. It is situated on a sidewalk in front of each bus stops.

Brisbane's present transportation system is made of sturdy steel, aluminium, concrete, and glass, and its practical colour scheme is silver, orange, and white for urban hubs and green, grey, and yellow for suburban stops. For weather protection, shelters and signage are laminated or powder-coated, while TransLink's recurring use of orange and blue branding guarantees easy navigation and visual consistency throughout the network.

# Current Transportation Technologies — Overview of the TransLink System



Ticketing and Payment Contactless smart payments and reloadable "Go Cards" are available for trams, buses, trains, and ferries. Passenger Information in Real Time Continuous e-paper timetable trials, big LED countdown screens, and NFC tags for tap-based real-time updates. Services for Accessibility accessible maps, tactile ground markings, and the Assisted Travel Programme, which is reserved for travellers with impairments. Network Integration Digital alerts for disruptions are provided by a unified SEQ-wide ticketing system that links bus, train, boat, and tram services. Assistance & Client Support Information centres at important locations, such King George Square. Assistance via phone and app is available, although linguistic accessibility is still restricted.

Ticketing and Payment TransLink currently accepts contactless payments by credit, debit, and smart devices—a process known as smart ticketing—and employs reloadable smart cards called Go Cards. These systems provide a uniform SEQ-wide payment experience for all major means of transportation, such as buses, trains, ferries, and trams.



Knowledge and Planning Timetables, route maps, a journey planner, and service alerts are all available on the TransLink website and mobile app. Both the app and the phone service (13 12 30), which is presently only available in English, provide real-time trip information, such as bus tracking, stop maps, and fare information.



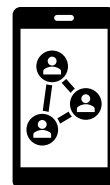
Passenger Information in Real Time Next-bus are shown in real time on large LED countdown screens at busways and crossroads. While e-paper displays (now in trial) are solar-powered timetables that automatically refresh to reflect schedule changes, NFC tags at some stops enable users to tap for real-time updates.



Assistance & Client Support Important stations, like King George Square, provide information desks where travellers can get printed documents and in-person help. Basic assistance is given by drivers and employees, although limited multilingual communication may provide difficulties for non-native English speakers.



Integration of Networks One SEQ-wide ticketing and information system connects all types of transportation. Real-time service warnings are distributed through the app, website, and social media, and bus, train, ferry, and tram services all share common trip planning facilities.



Services for Accessibility Braille panels, accessible maps, and tactile ground surface indications are available at some stops. Additionally, TransLink offers passengers with cognitive or mobility impairments prearranged assistance and support through its Assisted Travel Programme.



## Pertinence to Travellers and Visitors

While digital tools are extensive, real-time integration and language signage are frequently absent at physical stops. Although Smart Ticketing is effective, new users who are not familiar with the Go Card system may find it confusing. Since many tourists rarely find an information centre, bus stop signage continues to be the primary source of information for them. Despite TransLink's excellent network integration, foreign customers still receive inconsistent orientation, which suggests a need to improve both digital and physical assistance.

# Current Technology: TransLink NFC Data System



Translink is the public transport agency in the State of Queensland, Australia, and a division of the Department of Transport and Main Roads. Translink was first introduced by the Queensland Government in June 2003 to orchestrate train, bus, ferry and tram services.



Translink stated in December 2022 that more than 15,000 bus stops throughout Queensland would be receiving NFC-enabled service information. Through this effort, travellers can tap an NFC-capable smartphone right on a tag at the stop **to obtain real-time arrival info, schedules, and service updates**. Crucially, the interaction automatically reroutes the user to a browser-based information page tailored to that stop, negating the need for an application download.

| Feature               | Information                                                                                                    |
|-----------------------|----------------------------------------------------------------------------------------------------------------|
| Technology            | At bus stations, NFC tags allow you to tap your phone to get information.                                      |
| Coverage area         | Aiming for more than 15,000 urban bus stops throughout Queensland                                              |
| Available information | Arrivals, timetables, service interruptions, and notifications in real time                                    |
| Access to phone       | Information opens on the web with an NFC tap; no software is needed.                                           |
| Accessibility         | Designed to be user-friendly, even for non-native English speakers or those who are blind or visually impaired |

Passengers in a pilot program in Brisbane (2019–2022) reported that the NFC system was **convenient and easy to use**, indicating good user uptake. When the distribution was finished in March 2023, more than 250,000 scans from 70,000 distinct users had been logged. By lowering language and literacy barriers, the method improves accessibility and provides a more straightforward engagement than looking up information online or browsing printed schedules.

An important step towards digitally connected transportation systems is represented by this invention. It emphasizes how low-cost technology like NFC may enhance the traveler experience, lessen uncertainty, and promote the use of public transportation. Additionally, the service offers a helpful standard by which to measure future bus stop design interventions, especially those pertaining to accessibility, real-time communication, and user engagement.

# Existing Technologies – Smart Bus

Exterior of a Smart Bus (Green Electric Bus) In Singapore, a MAN A22 electric bus serves as a testbed. outfitted with sophisticated sensors and intelligent display panels

- displays arrival timings, route progress, and bus stop information in real time. provides commuters with service notices, anticipated travel times, and information about forthcoming stops.
- Smart display that is transparent (bus window) bus windows with a transparent heads-up display.
- offers real-time passenger data, ads, or route specifics without obstructing vision.
- External LED and E-Paper Signage shows destinations and route numbers on energy-efficient, vivid screens.
- Better readability under all lighting conditions is made possible by e-paper and LED technologies.
- Cameras and sensors on board Above the door areas are cameras that are used for: counting of passengers (boarding/alighting data).



Real-time updates both inside and outside the bus are provided by **passenger information systems, or PIS.**

**Smart sensors:** facilitating demand-responsive services, enhancing scheduling, and counting passengers.



**Accessibility Focus:** Provides riders who are not locals, tourists, or the elderly with consistent, understandable information.



Transparent OLED/E-Paper Displays: An accessible and **energy-efficient** way to present information.

# Existing Technologies – Translink E Paper Display

Two proof-of-concept (PoC) projects were initiated by TransLink in South East Queensland in November 2019 to investigate:

- NFC tags will allow for real-time route updates and take the role of printed timetables.
- E-paper (e-ink) displays: to give users without mobile devices access to the most recent information.

To get around the drawbacks of static timetables, the Proof-of-Concept initiatives used digital displays that update dynamically through real-time APIs.



- At bus stations, printed, static timetables are manually placed.
- need to be physically replaced and reprinted frequently when schedules change.
- high expenses for manpower and materials when updating huge networks.
- susceptible to fading over time, vandalism, and weather damage.
- Don't provide any service notifications or real-time updates.
- restricted accessibility for non-native English speakers and people with visual impairments.



- screens with digital connections that automatically update through real-time APIs.
- Low energy usage and solar power make it appropriate for outdoor use.
- removes the need for reprinting and cuts down on physical effort.
- readable with a high contrast, much like paper, in direct sunshine. able to display real-time service alerts, delays, and arrival times.
- More inclusive—usable by those without internet connection or smartphones

# Existing technologies – linkNYC kiosks

Beginning with 29 units in Park Slope, New York City started displaying MTA bus arrival times on LinkNYC kiosks back in April 2018. The city's advanced Wi-Fi kiosks, known as "Links," were initially designed to take the place of pay phones and offer public services like free Wi-Fi, phone calls, and digital screens. Users could see real-time bus arrivals for stops within a three-tenths of a mile radius on the kiosk display thanks to the trial.

Digital signs, phone calling, charging outlets, touchscreen displays, and integrated Wi-Fi are all characteristics of each kiosk.

They use integrated MTA APIs to provide real-time transit information within 400 metres. Additionally, audio announcements are supported by the system, guaranteeing accessibility for users with visual impairments.

Through inclusive real-time communication, this system demonstrates how shared, street-level digital infrastructure may enhance urban accessibility and lessen dependency on personal devices.

LinkNYC serves as an example of how digitally networked public infrastructure may make it easier for commuters and tourists to access information. Like TransLink's continuous digital activities, this strategy supports Brisbane's objective of developing more interactive and widely accessible transport systems.



# Existing Technologies – Bus Aunty



Bus Aunty is a fun, low-tech gadget that uses a clear, power-efficient e ink display to indicate the current bus arrival times. It integrates useful transit information into your everyday routine—no phones, no fuss—and was created with families in mind.

Perfect For:

**School Mornings:** Kids learn time management without phone dependency

**Commuters:** Check bus times while having breakfast

**Seniors:** Easy-to-read display, no apps to learn

**Families:** Everyone stays informed at a glance



Feedback from the public emphasises how easy and helpful Bus Aunty is for families in managing everyday schedules.

What Our Customers Say

★★★★★  
"Thanks so much! I have the 2 bus timings! Loves the e ink display! You are a genius!"  
- Chai Lan

★★★★★  
"I HAVE his bus timer and it has removed any sort of anxiety of missing the bus."  
- Zat

★★★★★  
"Received them and loving it!!! Well built... jia you!"  
- WK

★★★★★  
"Received it today and my parents love it!"  
- Moon

★★★★★  
"Ah. Love the design and the finishing!"  
- Xiao Ding

Displays bus service numbers and real-time arrival times using e-ink/e-paper technology, like what is found on Kindle screens. The display uses relatively little energy to operate constantly, installed indoors, such as in lobbies, workplaces, or residences, to allow users to view bus schedules prior to departing for the stop. Features for personalisation, such as selecting stops, directions ("Downstairs" vs. "Opposite"), or changing the screen, are suggested via the remote and switches above it.

This product is a prime example of how accessible and inclusive transport data can be made using straightforward, screen-based information tools, especially for individuals who might find it difficult to use complicated systems or apps. It backs up the notion that sophisticated digital networks like TransLink's NFC or E-paper systems can coexist with low-tech, context-aware architecture.

# Existing Technologies – Coach Sound



CoachSound system is an in-car audio announcement system that is activated by GPS and is intended to automatically alert passengers about impending bus stops as the bus gets closer.

## Features

- GPS-activated announcements: Plays "Next Stop" messages that have been pre-recorded at a certain distance from each stop.
- makes use of the current bus audio system: No additional network distribution is needed because it integrates with existing speakers.
- Supports various routes and updates: Route announcements can be readily stored and updated from a PC via a USB connection.
- improves the enjoyment of passengers and driving safety: With fewer distractions, drivers maintain their attention on the road.
- provides real-time alerts to travellers with visual impairments and visitors who are not familiar with the routes.



GPS Triggered



Easy to use and  
update software



Plays Through  
Existing Bus  
Speakers



Next Stop Audio  
Announcements



Maintenance Free



Hearing Impaired



For all languages

CoachSound shows how audio-based warnings, which provide important information without the need for visual displays, can increase accessibility on public transportation. Accessibility throughout Brisbane's bus stop network might be improved by incorporating comparable real-time, multimodal input.

# Existing Technologies – Jurong Smart bus Station



Wifi



Community Engagement



Real Time Displays



Charging Stations



Solar Powered

DP Architects created the Jurong Smart Bus Station, a socially, environmentally, and technologically integrated prototype that was introduced in 2016 as part of Singapore's Architecture & Urban Design Excellence (AUDE) initiative. By fusing digital connectivity, cultural enrichment, and environmental initiatives, it transforms the bus stop into a community centre that enhances both public involvement and commuter experiences.

## Features

- Mobile charging stations and free Wi-Fi are integrated for commuter connectivity.
- In addition to QR codes that connect to e-books through the National Library Board, **interactive smart boards** provide real-time bus timetables, local maps, news, weather, and tools for planning trips.
- An constructed planter with a rainwater funnel for irrigation is used to plant a live, mature tree that is three metres tall through the roof, together with **solar panels and vertical flora**.
- The waiting experience is enhanced by communal and recreational amenities like a swing, bike parking, and a book exchange section.
- displayed regional illustrations by Lee Xin Li, which provided **both visual appeal and cultural context**.

By combining smart systems, sustainability, and user engagement into a single, coherent design, this example shows how transportation infrastructure may go beyond functionality. It offers a useful standard for Brisbane's transportation future, where comfort, community identity, and digital accessibility can all live in one system.



# Existing Technologies – Seoul Smart Shelters

The Seoul Metropolitan Government (SMG) is responsible for the design and installation of Smart Shelters. The final bus stop design chosen by the SMG is called "Beauty of Korea," and it is a contemporary take on the traditional Korean "hanok" roofs. By the end of October 2020, the pilot project installation will get underway.

**Climate-Controlled Environment:** Outfitted with heating, cooling, and air purifiers to provide comfort all year round, even during severe weather and periods of high pollution.

**AI-Driven IoT Management:** Using Seoul's TOPIS transport data system, this approach leverages AI and IoT systems to operate all integrated equipment in real-time, including shelter climate, screen doors, and bus boarding guidance.

Air quality sensors, UV air curtains, hand sanitizers, temperature scanning, and emergency warning systems with direct police connection are among **the health and safety enhancements** that are meant to reduce the dangers of COVID-19 and other safety issues.



**Sustainability Features:** The eco-friendly and energy-efficient shelter is constructed with solar panels, energy monitoring, and low-power Internet of Things devices.

**Universal Design & Accessibility:** Incorporates inclusive features including voice assistance for the blind, foreign language support, and alert buttons for vulnerable users that signal drivers of low-floor buses that are waiting.

**Cultural and Aesthetic Integration:** The design incorporates vertical vegetation and urban art components, and it reflects the "Beauty of Korea" by emulating the elegant curves of hanok eaves.

# Personal Notes/reminders/feedback

- BENCH MARK TABLE -
- USER PERSONA/JOURNEY MAP
- SUSTainable goals
- Survey questions
- Time, date, sheet, location, weather conditions
- Paper with those details where I am sitting, drawing the area.
- Sit for 10 mins understand where they are coming from, endpoint- start points.
- Kelvingrove bus stop busy and hard to navigate too
- To look for – consistent patterns ie bus arrival patterns where are they standing, what are they doing when they're standing, looking around
- Look at it as a whole – interesting/unique activities
- Things that seem to be a pattern
- 3-5 bustops – avoid side street – Chermshire hubs, you could do side street – justify why?
- Map out the space, 5 concept underlays,
- In the report the areas of the space

# Benchmarking Bus Stop Technologies

Although Jurong Smart Bus Station and Singapore's Smart Bus testbed demonstrate the promise of transportation infrastructure in the future, their limited deployment and complexity make them less immediately accessible to tourists.

**Technology (low-high)**

**High Tech + Low Consistency  
(Innovative but limited)**



**High tech + High Consistency  
(Best but \$\$)**



(High Innovation + High Accessibility): New York's LinkNYC kiosks and Seoul's Smart Shelters show how cutting-edge technology can still be user-friendly by providing comfort, multilingual, and real-time features that ease first users' concerns.

**Low Tech + Low Consistency  
(poor performances)**



Early E-Paper pilots and Bus Aunty serve as examples of low-value solutions that don't adequately assist travellers or enhance communication.

**Low tech + high consistency  
(simple but reliable)**



Though they lack the creativity and size to consistently reassure visitors, Brisbane's TransLink hubs and GPS-based Coach Sound offer straightforward, easy-to-use options.

**Consistency (low -> high)**

# Gaps & Opportunities

The current situation in Brisbane (bottom right): NFC tags and TransLink hubs are functional for locals, but they are low-tech, only available in English, and inconsistent throughout the network. Are dependent on phones

Seoul, LinkNYC, and Jurong demonstrate consistent, inclusive, multilingual, real-time, high-tech solutions. These systems help visitors feel more at ease and make public transportation seem more natural.

Brisbane's bus stop infrastructure has a glaring market gap, according to the benchmarking report. Although some information is provided by the current systems (TransLink hubs, NFC, and e-paper pilots), they are either too primitive to assist tourists or too sporadically implemented to be trustworthy. International best practices demonstrate that regular rollout of real-time, multilingual, and accessible features is a key component of tourist-friendly solutions. This gap offers a chance to create a creative and widely understandable communication system for Brisbane bus stops, especially for first-time passengers and international students.

## The Gap

Innovation That Is Accessible to Visitors in Brisbane: There isn't a middle-ground option in Brisbane that incorporates: High accessibility (universal design, multilingual, and simple to grasp) Medium-high level of innovation (real-time, digital, affordable, scalable technology) At the moment, Brisbane either provides: Basic yet straightforward (suburban poles, NFC, printed schedules) --> insufficient for tourists. PID boards and e-paper trials are examples of isolated innovation that is inconsistent and sporadic around the city.

# UN Sustainability Development Goals

By placing the project within the SDGs, Brisbane's transport system is connected to global norms for sustainability, accessibility, and inclusivity, highlighting the global relevance of a local design intervention at bus stops.

The UN Sustainable Development Goals, especially SDG 11: Sustainable Cities and Communities, are closely aligned with this project.

Brisbane's disjointed and irregular bus stop infrastructure requires attention to accommodate tourists and international users. To ensure that public transportation is inclusive for all passengers, this project tackles SDGs 9 (Innovation & Infrastructure) and 10 (Reduced Inequalities) by creating a more accessible, user-friendly, and consistent communication system.

By promoting a greater reliance on buses rather than private vehicles, it also indirectly supports SDG 13 (Climate Action).

11 SUSTAINABLE CITIES AND COMMUNITIES



The most immediately applicable objective is this one. By improving communication at bus stops, Brisbane's public transport system becomes more accessible and user-friendly for visitors, international students, and first-time passengers, lowering the need for private vehicles.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



Inconsistencies and lack of functionality in Brisbane's bus stop infrastructure are seen. The project supports the objective of developing sustainable urban infrastructure by suggesting scalable, easily accessible, and tourist-friendly communication technologies.

10 REDUCED INEQUALITIES



English-only, app-dependent systems frequently disfavour tourists and international users. The initiative fills the accessibility and inclusivity deficiencies in Brisbane's transport system by implementing multilingual and user-friendly solutions.

13 CLIMATE ACTION



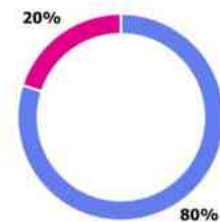
Promoting increased usage of public transportation lowers carbon emissions by providing a viable substitute for driving a private vehicle. Therefore, better bus stop communication indirectly supports Brisbane's climate goals, especially as it gets ready for the 2032 Olympics.

# Survey Questions – Data

2. Before arriving in Australia, had you ever used a public bus service?

[More details](#)

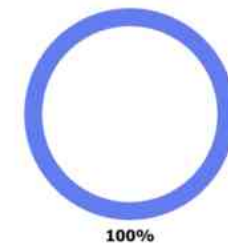
|                |    |
|----------------|----|
| Yes, regularly | 12 |
| Occasionally   | 3  |
| Never          | 0  |



5. Did you have to use your phone or another device to help you catch the bus?

[More details](#)

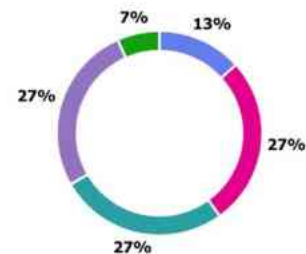
|                                      |    |
|--------------------------------------|----|
| Yes (apps, maps, translations, etc.) | 15 |
| No                                   | 0  |



3. How would you describe your very first experience catching a bus in Brisbane?

[More details](#)

|                |   |
|----------------|---|
| Very easy      | 2 |
| Easy           | 4 |
| Neutral        | 4 |
| Difficult      | 4 |
| Very difficult | 1 |



6. If yes, which tools/apps did you use for your first bus journey?

[More details](#)

10  
Responses

Latest Responses  
...

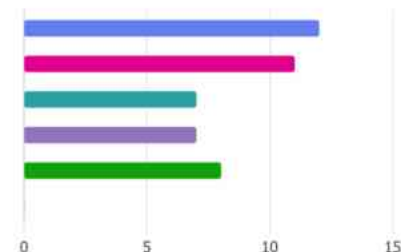
5 respondents (50%) answered translink for this question.

**translink** Google maps  
Apple Maps

4. What was the most challenging part of catching a bus for the first time?  
(Select all that apply)

[More details](#)

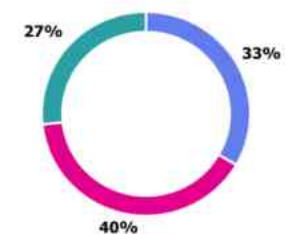
|                                   |    |
|-----------------------------------|----|
| Finding the right bus stop        | 12 |
| Understanding the timetable       | 11 |
| Knowing the right bus number      | 7  |
| Paying for the fair/using go-card | 7  |
| Communicating with the driver     | 8  |
| Other                             | 0  |



7. Did you feel confident that the bus would stop at the correct stop?

[More details](#)

|       |   |
|-------|---|
| Yes   | 5 |
| No    | 6 |
| Maybe | 4 |



# Survey Questions – Data

8. What information would have made your first bus journey easier?

[More details](#)

7  
Responses

Latest Responses  
...

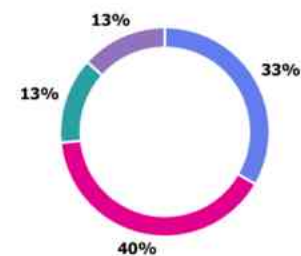
2 respondents (29%) answered Bus routes for this question.

stop locations navigation/map driver contract  
**start Bus routes stop**  
personalised trip stops along the route bus stop

9. How often do you use the public bus?

[More details](#)

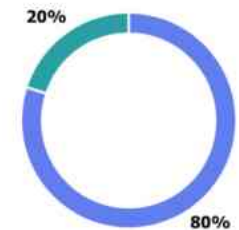
|                       |   |
|-----------------------|---|
| Daily                 | 5 |
| Several times a week  | 6 |
| Once a week           | 2 |
| Less than once a week | 2 |
| Never                 | 0 |



10. What is your main reason for using the bus?

[More details](#)

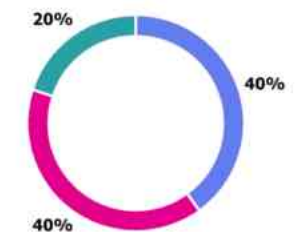
|                    |    |
|--------------------|----|
| Work/Study commute | 12 |
| Shopping           | 0  |
| Social/Leisure     | 3  |
| Other              | 0  |



11. Could you get to your destination without having your phone?

[More details](#)

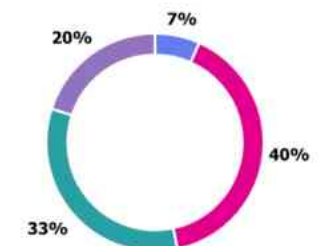
|       |   |
|-------|---|
| No    | 6 |
| Maybe | 6 |
| Yes   | 3 |



12. How confident are you in knowing when your bus will arrive?

[More details](#)

|                         |   |
|-------------------------|---|
| Extremely confident     | 1 |
| Somewhat confident      | 6 |
| Neutral                 | 5 |
| Somewhat not confident  | 3 |
| Extremely not confident | 0 |

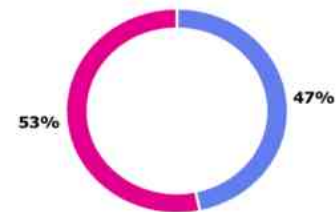


# Survey Questions – Data

13. Have you ever missed a bus because of incorrect or unclear timing information?

[More details](#)

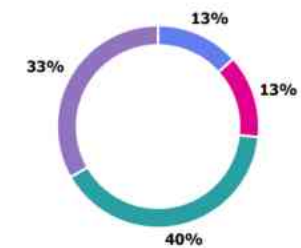
|                   |   |
|-------------------|---|
| Yes, often        | 7 |
| Yes, occasionally | 8 |
| No                | 0 |



16. How easy is it to understand which buses travel to your intended destination from your usual stop?

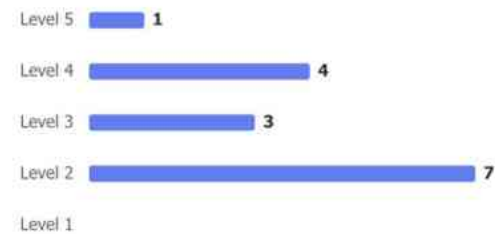
[More details](#)

|                |   |
|----------------|---|
| Extremely easy | 2 |
| Somewhat easy  | 2 |
| Neutral        | 6 |
| difficult      | 5 |
| Very Difficult | 0 |



14. How satisfied are you with the information available at your regular bus stop?

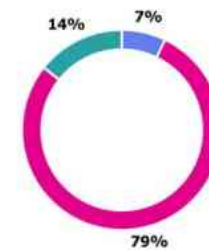
[More details](#)



17. Does your bus stop provide adequate shelter from weather conditions?

[More details](#)

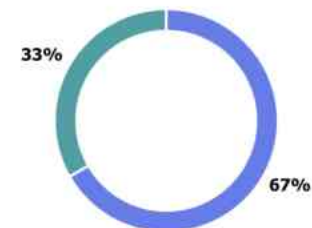
|             |    |
|-------------|----|
| Yes, Always | 1  |
| Sometimes   | 11 |
| Rarely      | 2  |
| Never       | 0  |



15. Would you find it useful if you could tap your bus number at the stop to alert the driver?

[More details](#)

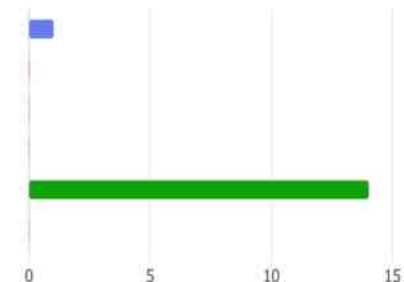
|                  |    |
|------------------|----|
| Yes              | 10 |
| No               | 0  |
| Maybe / not sure | 5  |



18. Which of the following improvements would make you feel more comfortable or confident while waiting?

[More details](#)

|                                       |    |
|---------------------------------------|----|
| Real-time bus arrival updates         | 1  |
| A different Method of Hailing the Bus | 0  |
| Clear Bus Routes                      | 0  |
| Improved bus stop design              | 0  |
| All of the above                      | 14 |
| Other                                 | 0  |



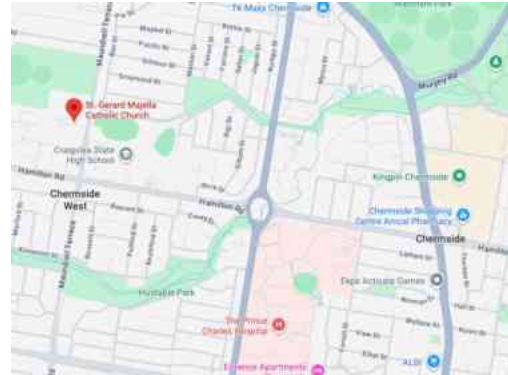
# Observations: Maundrell Tce at St Gerards, stop 45/46

**Date:** 23/08/2025

**Time:** 5:30

**Location:** Maundrell Tce at St Gerards, stop 45/46

**Weather Condition:** Sunny day



## Physical

- Very basic: only one pole with TransLink branding, a timetable case, and stop ID.
- There is no overhead cover or shelter on this little bench with two seats.
- situated near a residential road on a little concrete walkway.
- There are no maps, no real-time passenger information (PID), and no lighting.
- completely exposed to the rain, wind, and sun.

## Behaviours

- Off-peak: Usually deserted; when occupied, one or two residents are seated or standing close to the pole.
- Peak: no more than three to five people, seated if there are benches available or huddled along the pole.
- Most rely heavily on Google Maps and the TransLink app to check their phones for live arrivals.
- To check for oncoming buses, some people take a small step into the side of the road.

## Trends

- A quiet suburban stop has a low noise, yet if people are not standing clearly close to the kerb, they could still be missed by cars.
- Due to the lack of a comfortable waiting area, users usually come just before the bus is scheduled to depart.
- "check your phone and when you see a bus, get up, and proceed." is behaviour.

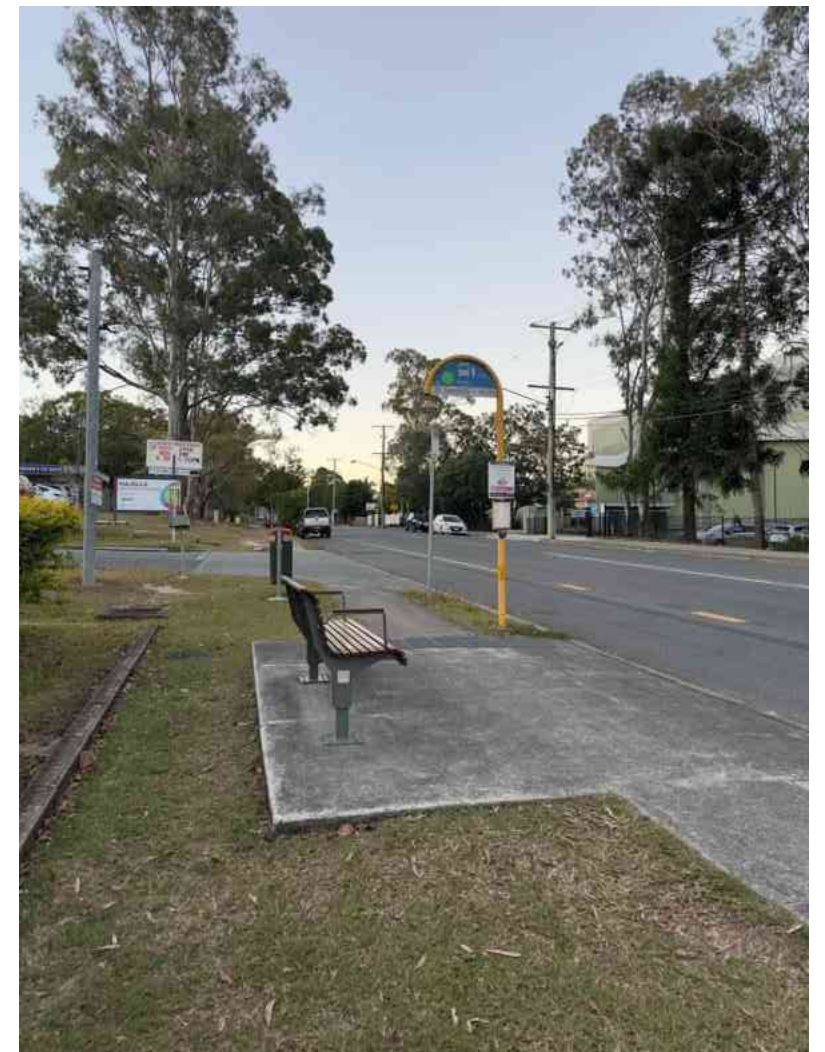


# Pain Points Maundrell Tce at St Gerards, stop 45/46

| Problems and Pain Points                       | Impact                                                                          | Relevance to Tourists                                                                                   |
|------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Lack of shelter or protection from the weather | Users are completely vulnerable to wind, rain, and sun.                         | While waiting, unfamiliar visitors might not be ready for the weather.                                  |
| No features for visibility or illumination     | When travelling in the evening or at night,                                     | tourists may choose to avoid the stop entirely because it is difficult to find or feel safe after dark. |
| No real-time display (PID) or maps             | Users are unable to verify the arrival time of the following bus.               | Visitors could not see buses or wonder if they are at the right stop.                                   |
| Very little seating—just two chairs            | Insufficient comfort when waiting, particularly during busy school hours;       | visitors may have to stand for extended amounts of time while carrying their bags                       |
| An over dependence on mobile applications      | Without cell data, people must rely on luck or other people to get information. | Visitors from other countries might not be familiar with the apps or have internet access.              |
| Poor street integration and kerb visibility    | If you stand in the wrong spot, approaching buses can miss you                  | Visitors might be unaware that in order to guarantee collection, they must stand close to the kerb.     |
| No visual or multilingual instructions         | The entire experience is dependent on prior knowledge or fluency in English.    | There is a significant learning curve for those who are not native English speakers.                    |

Both regular commuters and visitors are significantly impacted by a number of accessibility and usability problems at the Maundrell Terrace stop at St Gerards. While there is little seating and inadequate kerb integration lower convenience and safety, the absence of shelter, sight, and real-time information causes unease and confusion. Those without internet connection or app knowledge, particularly foreign tourists, are further isolated by a heavy reliance on mobile applications. These difficulties, along with the lack of multilingual signage, make the stop confusing and exclusive for visitors who are not locals, underscoring the need for a more user-friendly and inclusive infrastructure design.

# Maundrell Tce at St Gerards, stop 45/46 Images



# Observations: Maundrell Tce at Craigslea, stop 44, Chermside West

**Date:** 27/08/2025

**Time:** 4:30pm

**Location:** Maundrell Tce at Craigslea, stop 44, Chermside West

**Weather:** Sunny day

## Physical

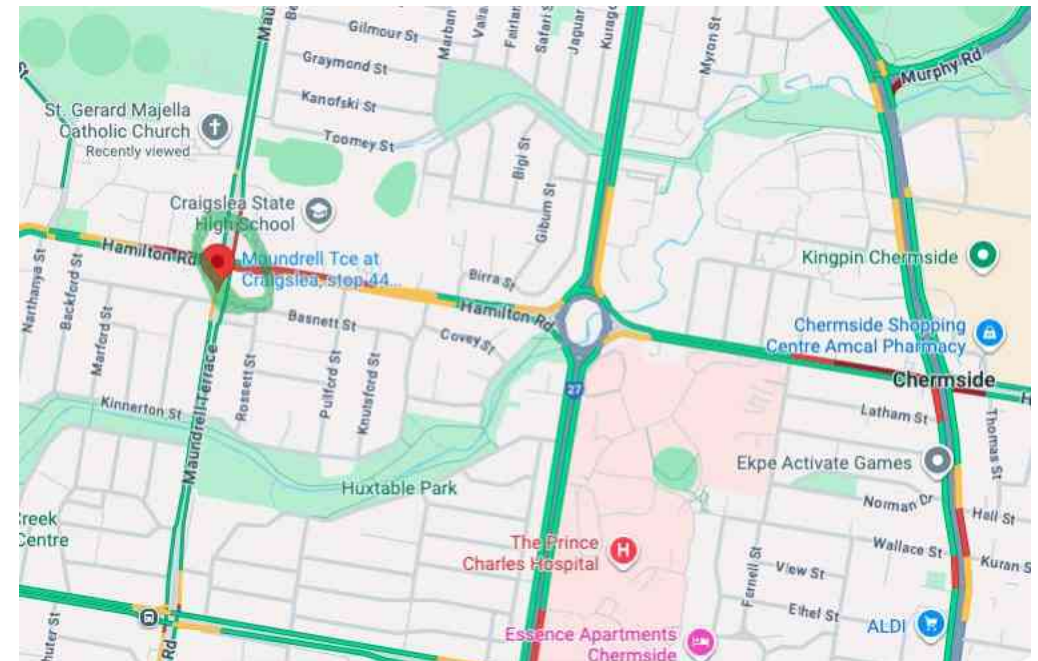
- bench seats and a covered shelter. In front is a narrow concrete walkway.
- There is less room for congestion since residential fencing constricts the area.
- Stop name and number (Craigslea – 44) on a pole-mounted sign.
- Simple written schedule only; no digital display in real time.

## Behaviours

- Off-peak: 1–2 users at a time, mostly quiet.
- Peak school hours: Packed with pupils, with excess standing on the grass or sidewalk.
- seen user possibly might be heading towards further north
- Is standing probably due to not seeing the bus – cannot see past hill
- Bus tracking in real time is heavily dependent on phones.

## Trends

- Shade and weather protection are provided by the shelter, however the small space makes gathering uncomfortable.
- A loose line forms along the shelter and fence.
- People keep an eye out for buses and move to the side of the road when one comes



# Pain points Maundrell Tce at Craigslea, stop 44, Chermside West

| Problems and Pain Points                    | Impact                                                 | Relevance to Tourists                                                       |
|---------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------|
| No real time data information displayed     | No information regarding arrivals or delays            | Due to uncertainty, tourists may get lost or miss transportation.           |
| Problems with visibility (hill)             | Buses are hidden from view until they are quite close. | Non-locals find it challenging to determine when and where to get ready.    |
| Crowding during peak hours (schoolchildren) | The patio and benches get packed and boisterous.       | Visitors could feel overwhelmed or out of place – no space, outside of stop |

The commuter experience is disrupted by significant visibility and accessibility issues at the Maundrell Terrace station in Craigslea. The stop's hilltop location hides arriving buses until the last second, and users are left in the dark regarding arrivals or delays due to the lack of real-time information. Crowding significantly diminishes comfort and spatial clarity during the busiest school hours. For visitors or non-locals who depend on timely and visual clues, these conditions are especially troublesome. They can cause confusion, missing buses, and a feeling of alienation from the commuter environment.

# Maundrell Tce at Craigslea, stop 44, Chermside West images



# Observations: Kelvin Grove Rd near McCaskie Park, stop 12

**Date:** 25/08/2025

**Time:** 10:30am

**Location:** Kelvin Grove Rd near McCaskie Park, stop 12

**Weather:** Sunny Day

## Physical

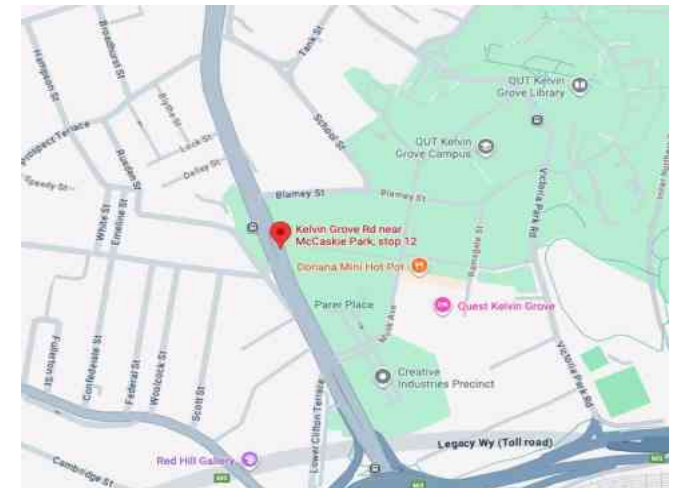
- unique contemporary shelter made of steel and glass with an angled canopy.
- Benches are covered.
- Large roadside trees provide shade for the spacious asphalt waiting area.
- TransLink's standard signage (timetable + stop ID).
- Real-time bus arrivals are displayed on a solar-powered LED board called the Passenger Information Display (PID).

## Behaviours

- Three to six individuals are seated, waiting close to a pole, or watching a digital screen during off-peak hours.
- An individual was sitting at the stop and had to rush to hail the bus as there was a 6-8m gap between the stop and seating.
- Lady is also seen to be standing near the stop, possibly to hail the bus quicker.
- Peak (commuting/school hours): 15–20 passengers; space fills up fast, spilling onto the sidewalk.
- Even if phones are still widely utilised, many people check PID for real-time arrival times.

## Trends

- Seating is encouraged until the bus is visible thanks to the shelter and benches.
- People change their behaviour (move forward immediately before arrival) because of the real-time board becoming a shared reference point.
- Compared to suburban stops, queuing is more organised but still casual.



# Pain Points in Kelvin Grove Rd near McCaskie Park, stop 12

| Problems and Pain Points                  | Impact                                                                                      | Relevance to Tourists                                                  |
|-------------------------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Bus-seating distance (6–8m)               | To hail the bus, people must stand or risk it passing them.                                 | Tourists are confused; they don't know where or when to wait.          |
| Crowding during busy times                | Overcrowding, particularly at schools and on commutes                                       | Travellers may find it difficult to find space or feel overloaded.     |
| Location and line of sight of the shelter | Some people stand aside to notice buses sooner because PID visibility is partially limited. | may result in confusion or missed buses if visitors remain motionless. |
| Unofficial queuing practices              | During high hours, a casual system could cause confusion or line-cutting.                   | Travellers could be unclear about proper etiquette or boarding order.  |

The problems found show how bus stop behaviour and spatial arrangement can negatively impact the user experience, particularly for first-time or foreign visitors. In addition to crowded and poor queue etiquette creating confusion and discomfort at peak times, the significant distance between seating and the bus lane encourages people to stand or risk missing their bus. Shelters' poor visibility makes people less mindful of approaching buses. All of these elements work together to make the stop ineffective and difficult to use, especially for visitors who might not be aware of local commuter customs.

# Kelvin Grove Rd near McCaskie Park, stop 12 images



# Observations: George Street Stop 114 near Alice St

**Date:** 25/08/2025

**Time:** 4:00pm

**Location:** George Street Stop 114 near Alice St

**Weather:** Sunny Day

## Physical

- A straightforward roadside pole stop featuring a stop ID and a tiny timetable case.
- No shade (completely exposed), no sitting, and no shelter.
- a small sidewalk at the kerb, right next to a busy road.
- surrounded by construction signage and historic structures, which adds visual clutter.

## Behaviours

- Off-peak: two to six people, mostly standing and looking at their phones.
- Peak (university students and commuters): 15–25+ people swarming the kerb.
- When several buses come, the loose line breaks apart.
- Pedestrians and waiting passengers frequently collide in through traffic, resulting in unpleasant weaving.

## Trends

- lack of digital signs and a heavy reliance on apps for real-time information.
- Groups usually congregate at a pole or bus stop.
- Due to the absence of countdown screens, passengers frequently gaze up nervously at approaching buses.

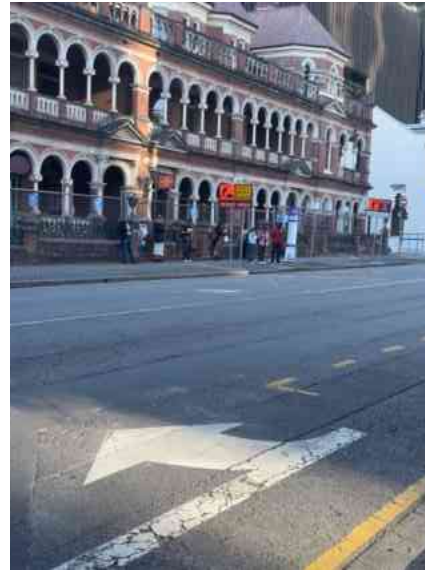


## Pain Points: George Street Stop 114 near Alice St

| Problems and Pain Points                      | Impact                                                                | Relevance to Tourists                                                            |
|-----------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Absence of Seating or Shelter                 | Without any shelter from the weather, commuters wait outside          | discomfort and a bad experience, particularly when it's hot and rainy.           |
| A narrow path close to a busy road            | Crowding causes traffic jams, weaving, and possible safety hazards.   | can feel frightening and chaotic, especially for elderly people or families.     |
| Absence of signage                            | Passengers must utilise their phones; there are no real-time updates. | Travellers might not be comfortable reading schedules or know which apps to use. |
| Uncertain queue structure                     | When several buses collapse on loose lines, chaos erupts.             | Etiquette-challenged tourists risk missing buses or cutting lines.               |
| Visual cluttered Amidst buildings and signage | the bus stop disappears into the backdrop.                            | When coming from a distance or while walking, it is simple to overlook the stop. |

A number of user experience issues at George Street Stop 114 close to Alice Street have a big influence on commuter accessibility and comfort. Confusion and discomfort are caused by the absence of chairs, shelter, and obvious information, especially for those who are not familiar with the system. Passengers are forced to rely entirely on their gadgets due to the lack of real-time updates and the congested, small path next to a busy road, which increases safety hazards. These elements, along with ambiguous line layouts and an aesthetically disorganised setting, make the stop challenging to locate and use, which causes tension, inefficiency, and a negative impression of public transportation for both residents and tourists.

# George Street Stop 114 near Alice St Images



# Observations: Alice Street Stop 102 at George St

**Date:** 25/08/2025

**Time:** 4:20pm

**Location:** Alice Street Stop 102 at George St

**Weather:** Sunny Day

## Physical

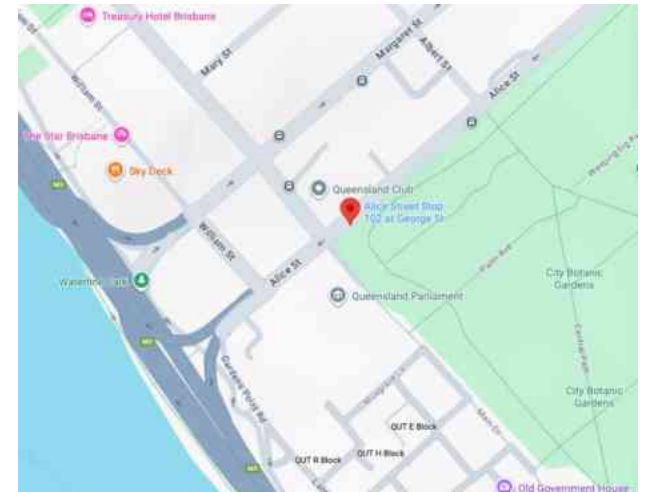
- A stop with seating, timetable poles, and shelter 6m forward another stop without any seating or shelter (just a pole, schedule, and signage).
- There is a broad walkway, but it is limited by the gate of the Botanic Gardens on one side and the busy Alice Street on the other.
- No digital display in real time throughout the cluster. Large trees provide natural shade, but comfort varies.

## Behaviours

- Off-peak: 5–10 people each stop, scattered among benches or a fence.
- Peak (rush hour commuters and QUT class changes): 50–70+ people dispersed around the cluster.
- While waiting, the majority lean against the Botanic Gardens fence, forming a lengthy "wall" of travellers.
- Apps like Google Maps and TransLink are widely used by travellers to verify arrivals. Crowds rush forward when several buses arrive, occasionally obstructing pedestrian traffic.

## Trends

- Waiting passengers are pressed up against the barrier, while pedestrians are squeezing through the remaining walkway space.
- Instead of a systematic bay system, there is unofficial "sideways queueing" along the barrier.
- Stress results from crowds, particularly at the central pole stop without shelter.
- Students make up most users due to their high volume, quick turnover, and consistent habits.

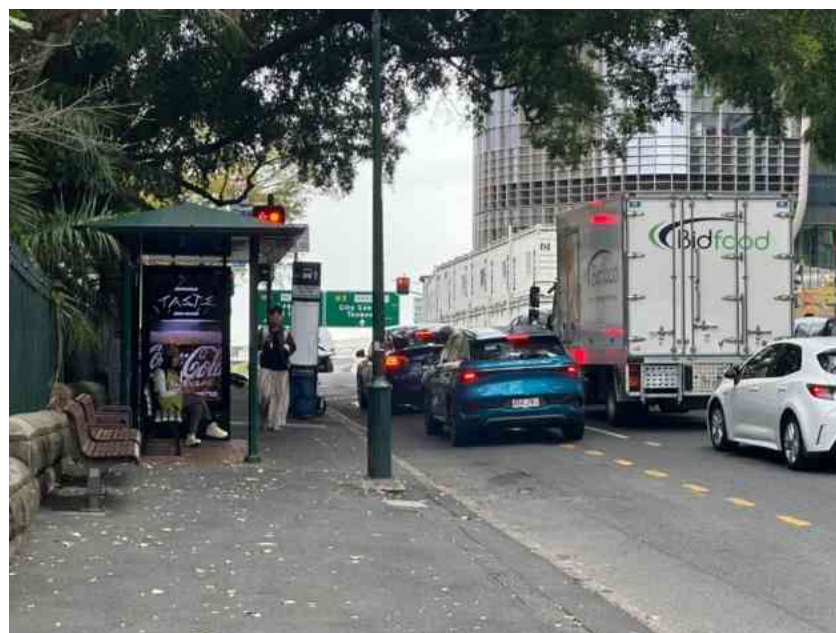


# Pain Points: Alice Street Stop 102 at George St

| Problems and Pain Points             | Impact                                                                                       | Relevance to Tourists                                                                     |
|--------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Disjointed stop layout:              | Some stops lack seating or cover, while others are dispersed with irregular characteristics. | Travellers might not know where to wait or can completely miss their transport.           |
| Absence of a live digital display    | Only mobile apps provide arrival information.                                                | Visitors without data access or who are not familiar with TransLink may become perplexed. |
| limited common walkway               | During peak hours, crowds obstruct pedestrian pathways,                                      | making it feel daunting and hectic for new users with children or bags.                   |
| "Sideways queuing" informally        | Crowd rushes are caused by unclear boarding orders.                                          | Uncomfortable lines or unintentional line-cutting may result from unfamiliar queuing.     |
| excessive dependence on app tracking | People keep checking their phones to see when the bus will arrive.                           | Visitors may experience anxiety, uncertainty, or reliance on locals.                      |

This group of bus stops is situated on Alice Street, just outside QUT Gardens Point. Because Stop 101 is a QUT-only shuttle stop and has neither seating nor shelter, it frequently confuses new users or visitors. Stop 102 (at George Street), which is adjacent to it and is a part of the normal Translink network, has little seating and little shade, but it is situated in a busy pedestrian area close to QUT's main entrance. Particularly during periods of high class transition, this leads to severe crowding, standing congestion, and restricted mobility. Due to the lack of waiting amenities, crowded areas, and imprecise information, visitors and first-time users may find the setting intimidating.

# Alice Street Stop 102 at George St Images



# Observations: Chermside Westfield bus hub

**Date:** 23/08/2025

**Time:** 5:00pm

**Location:** Chermside Westfield bus hub

**Weather:** Sunny Day

## Physical

- Bus hub in a major suburb that serves several routes.
- Shelter & Seating: There are plenty of covered spaces with seats, leaning rails, and several bays.
- Digital infrastructure includes electronic timetable boards that display bus arrivals and departures in real time.
- Most areas are well-lit, however some side bays are not as well-lit.
- Signage: Limited capability for many languages, but clear route numbers.
- Accessibility: There are tactile paving and ramps for the blind and visually impaired, however congested walkways may make them less useful.
- The Westfield Chermside Shopping Centre is right next door, making it a busy location with lots of pedestrian crossings and parking spaces close by.

## Behaviour

- Especially during peak hours, there are a lot of commuters, students, shoppers, and elderly passengers.
- Walking Patterns: Congestion is caused by passengers congregating close to bus bay openings.
- Pedestrians traverse the lanes to go to other bays and weave between people who are waiting.
- Indicators for Tourists and International Students: Travellers were noticed having trouble figuring out which harbour their bus was leaving from; several of them were seen consulting Google Maps or the Translink applications.

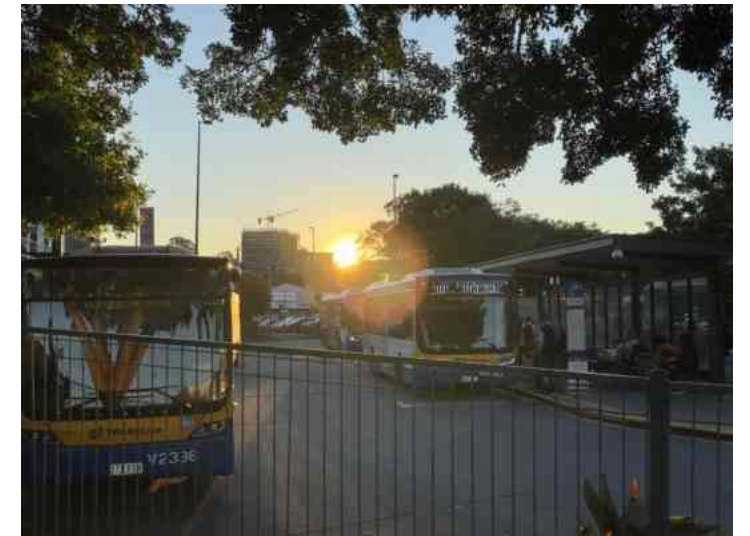


# Pain Points at Chermside Westfield bus hub

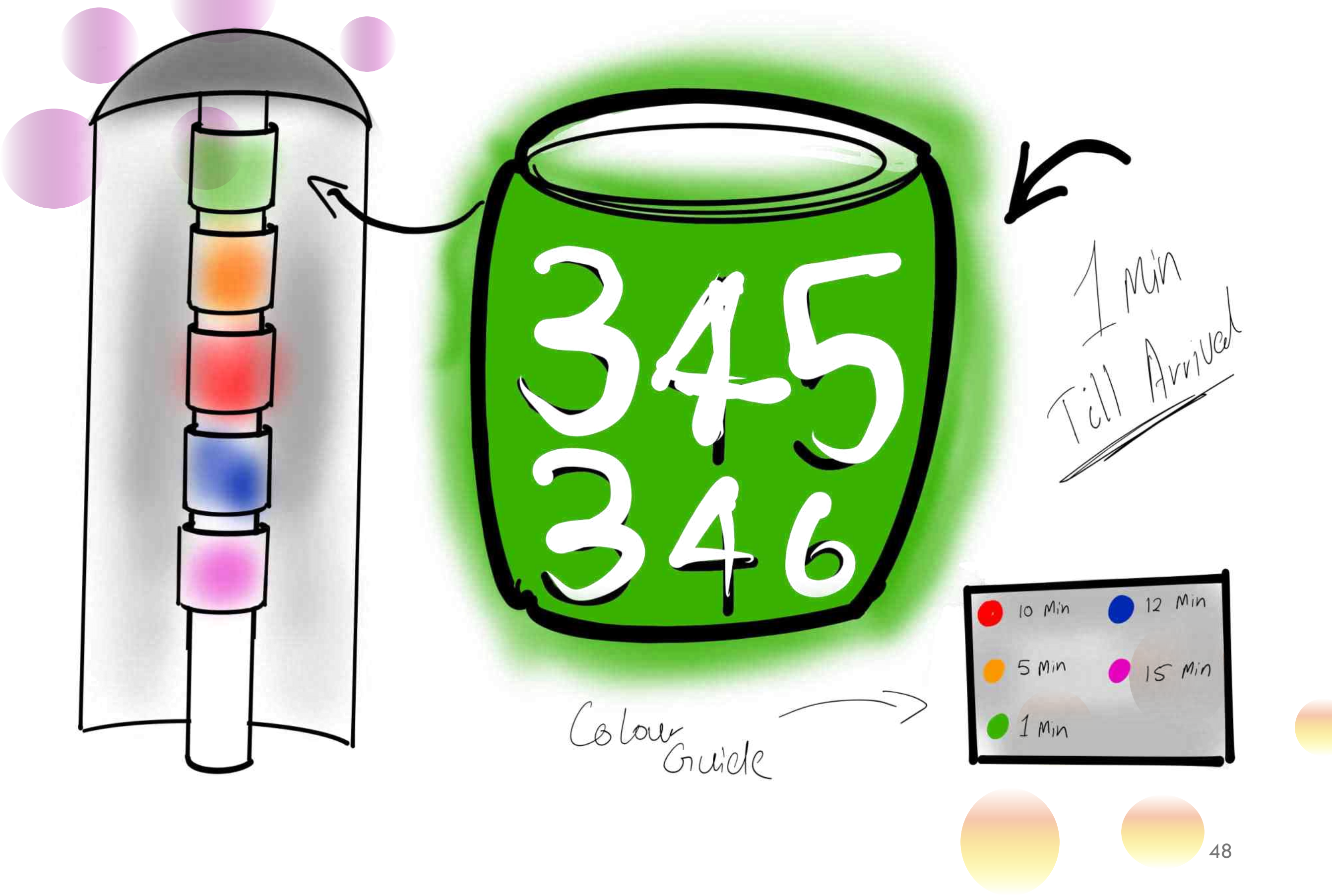
| Problems and Pain Points                  | Impact                                                                                                  | Relevance to Tourists                                                                                     |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Absence of signage in several languages   | Navigation could be challenging for non-native English speakers.                                        | Non-English speaking tourists run the risk of missing buses or becoming lost.                             |
| A confusing arrangement of several bays   | People who don't know where each bus leaves from were observed utilising devices to find the right bay, | which caused delays.                                                                                      |
| Several bays and imprecise mapping        | It's challenging to swiftly find the right stop                                                         | Missing buses is likely                                                                                   |
| Traffic jams close to bay entrances       | Movement obstructions that are difficult for others to navigate                                         | could make newcomers feel overwhelmed or disorganised.                                                    |
| directing pedestrian traffic              | It is dangerous to cross active lanes.                                                                  | Visitors who are not familiar with the layout could choose dangerous routes.                              |
| Accessibility is not entirely functional. | Although there is tactile paving, its benefits are diminished by congested walkways.                    | Travellers who are visually impaired or have limited mobility may find it difficult to navigate securely. |
| The side bays are poorly illuminated.     | Diminished comfort and visibility                                                                       | particularly at night Feeling frightened or perplexed during late hours                                   |

Chermside draws attention to the difference between CBD stops and outlying transportation hubs: More seats, shelters, and digital updates are all results of improved infrastructure. Greater difficulty navigating due to numerous bays, high foot traffic, and intricate layouts

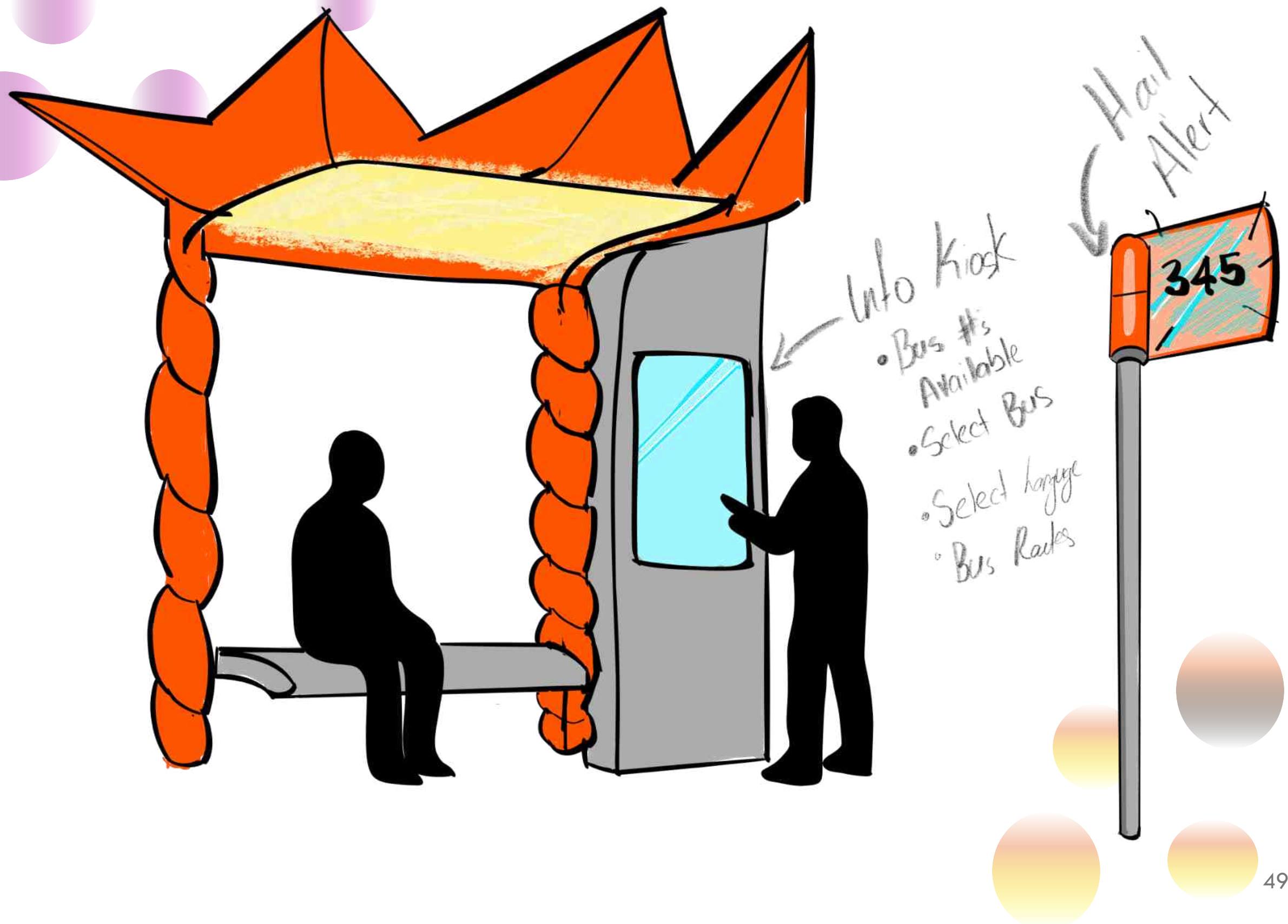
# Chermside Westfield bus hub Images



# Initial Concept Drawing



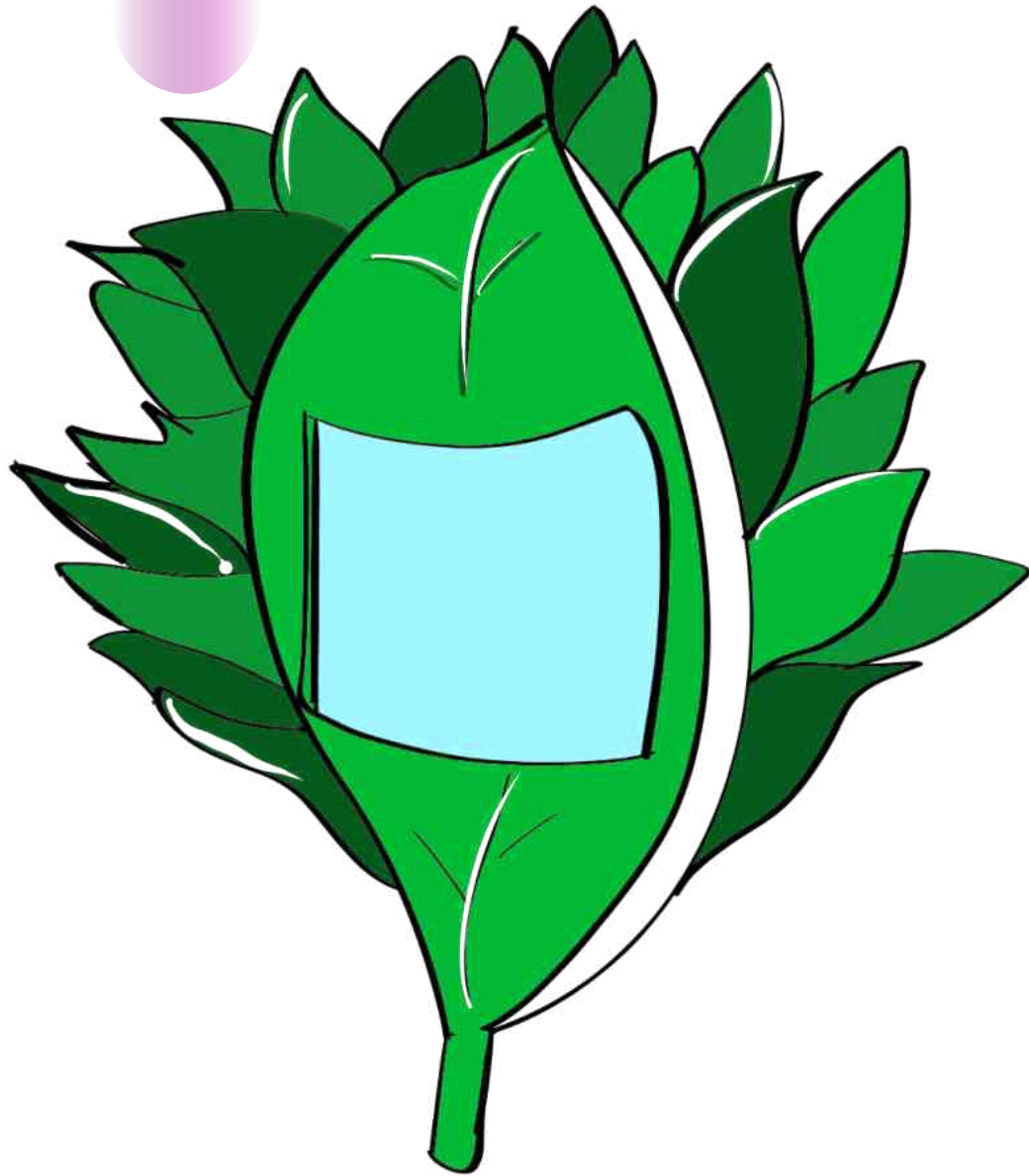
# Initials Concept Drawing



# Initial Concept Drawings



# Initial Concept Drawings

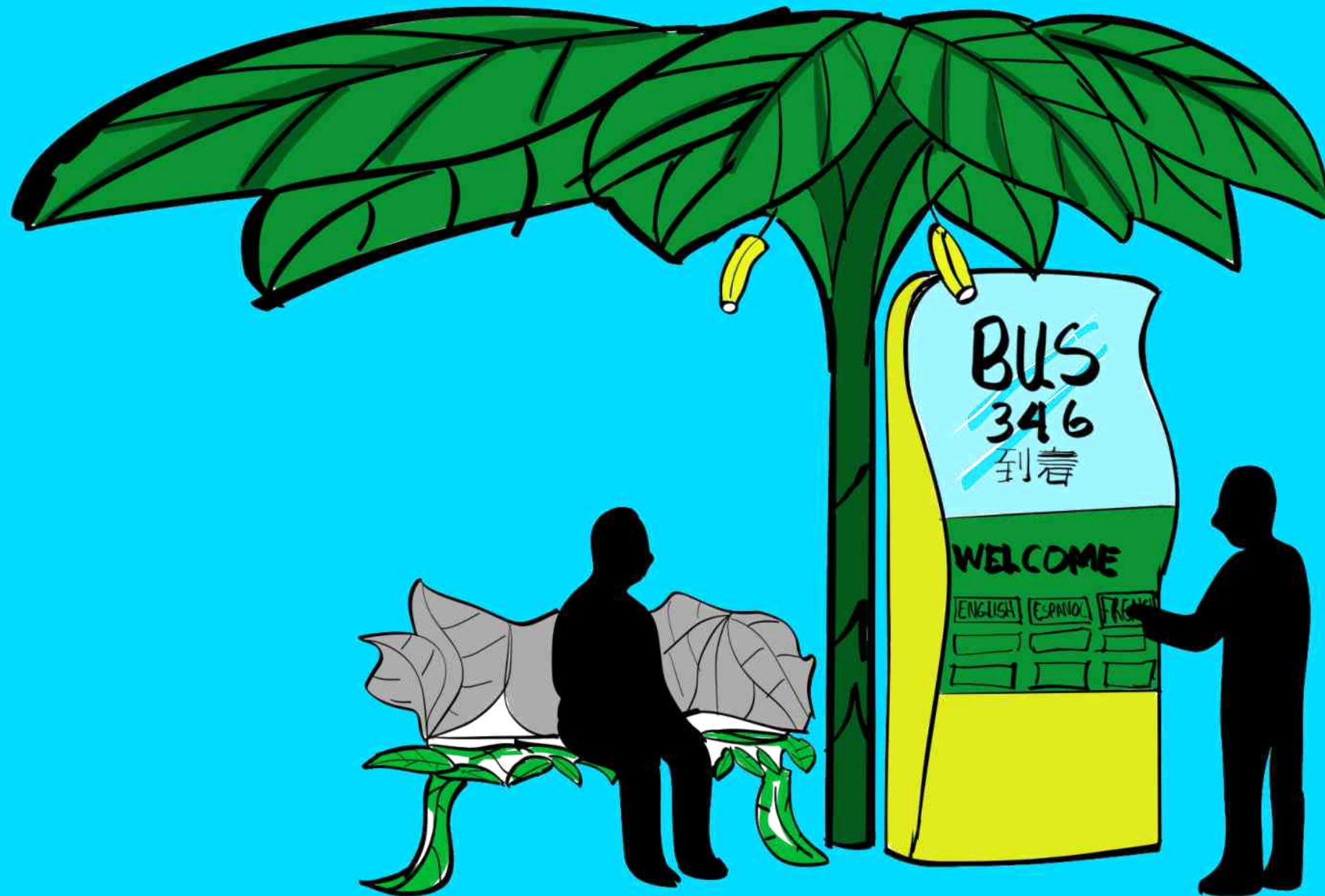


The interface element  
the interface

- the Actual Product  
Timer - Countdown  
Pole

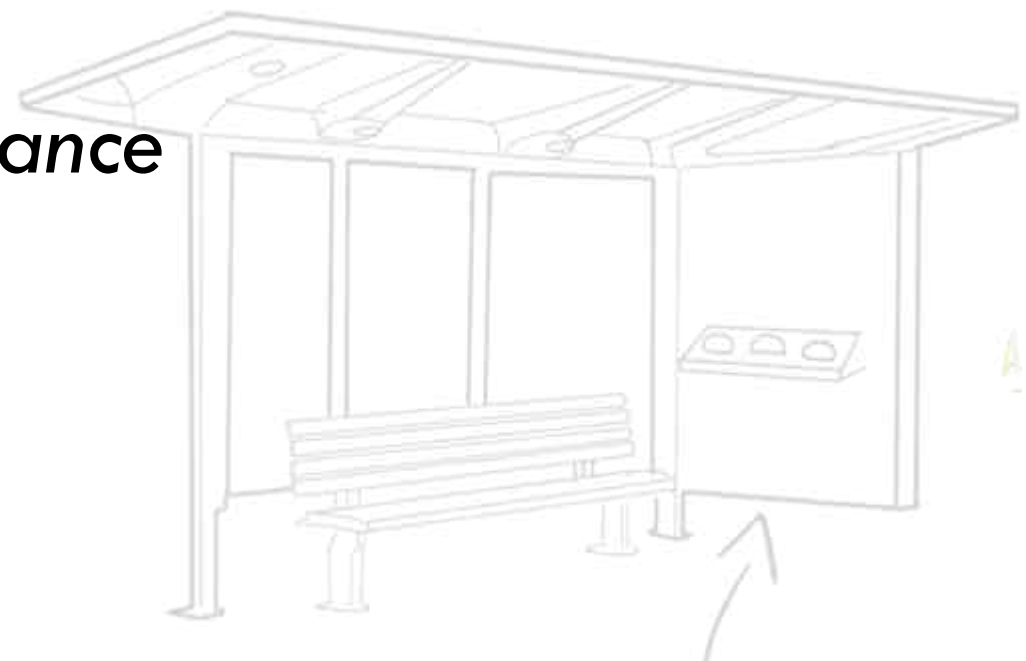
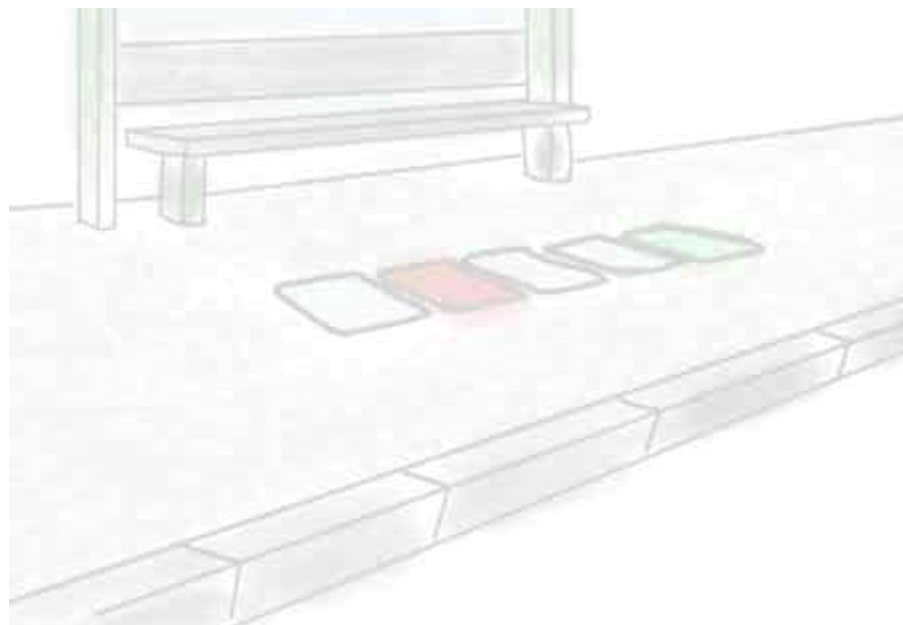
- The lights send the  
lights as signals  
value & money

# Initial Concept Drawings



# *Improving Bus Stop Design To Enhance Communication*

DNB311 | Aaron Mathew



**ID 7 Initial Concepts**

**Topic:** The project investigates the difficulties faced by tourist users at bus stops.

**Aim:** Reduced anxiety, increased clarity, and the development of intuitive signifiers are the goals.

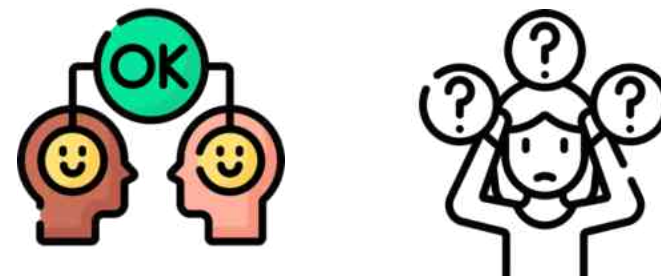


### Currently

- Shelter if you're lucky
- NFC & paper Timetable
- Bench

### Findings

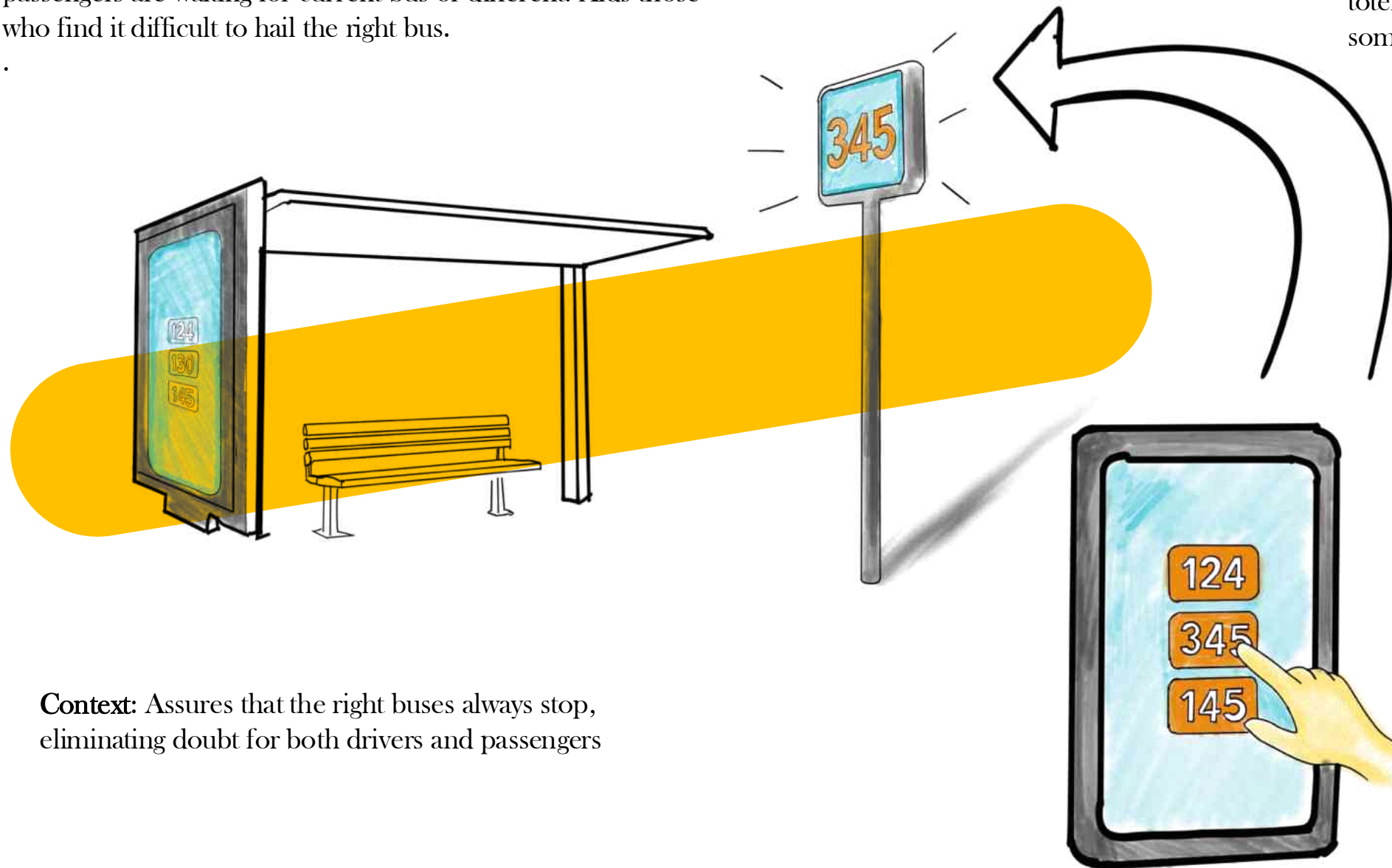
I discovered from observations, surveying, benchmarking, and a brief literature research that tourists and first-time bus passengers encounter three primary obstacles: trouble understanding timetables, a lack of clarity regarding buses available, and fear of missing the bus. These results demonstrated the potential for natural, languageless signifiers that both soothe passengers and provide drivers with unambiguous signals.



# Echo Pole

**Issue:** If the stop is busy, drivers frequently don't know whether passengers are waiting for current bus or different. Aids those who find it difficult to hail the right bus.

**Solution:** The passenger's chosen bus number is displayed on a towering, lit totem, making it obvious to the driver that someone is waiting for their service.



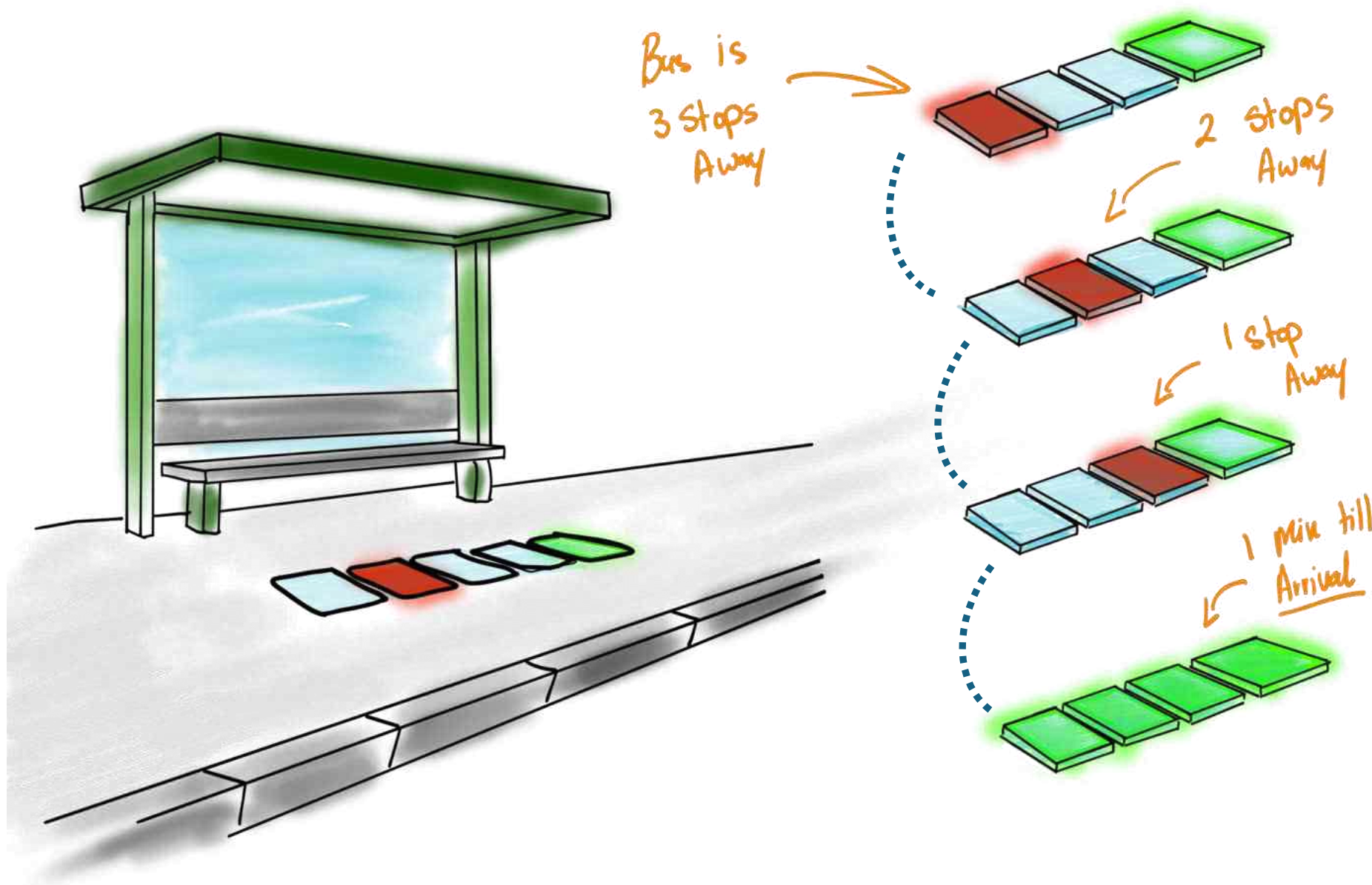
**Context:** Assures that the right buses always stop, eliminating doubt for both drivers and passengers

**Features:** The bus route is chosen by the passenger via an interactive display. When viewed from a distance, the totem rotates and illuminates with bus number. Direct communication between the driver and the passenger.

# Journey Tiles

**Issue:** tourists and new users frequently worry about when their bus will arrive – with this Realtime countdown passengers feel confident their bus is imminent. Depending on however many buses travel that route the rows of tiles increase - ideal for suburban environments

## Process



**Context:** When drivers notice the glowing arrival tile, they know someone is waiting, and passengers feel more secure tracking their bus.

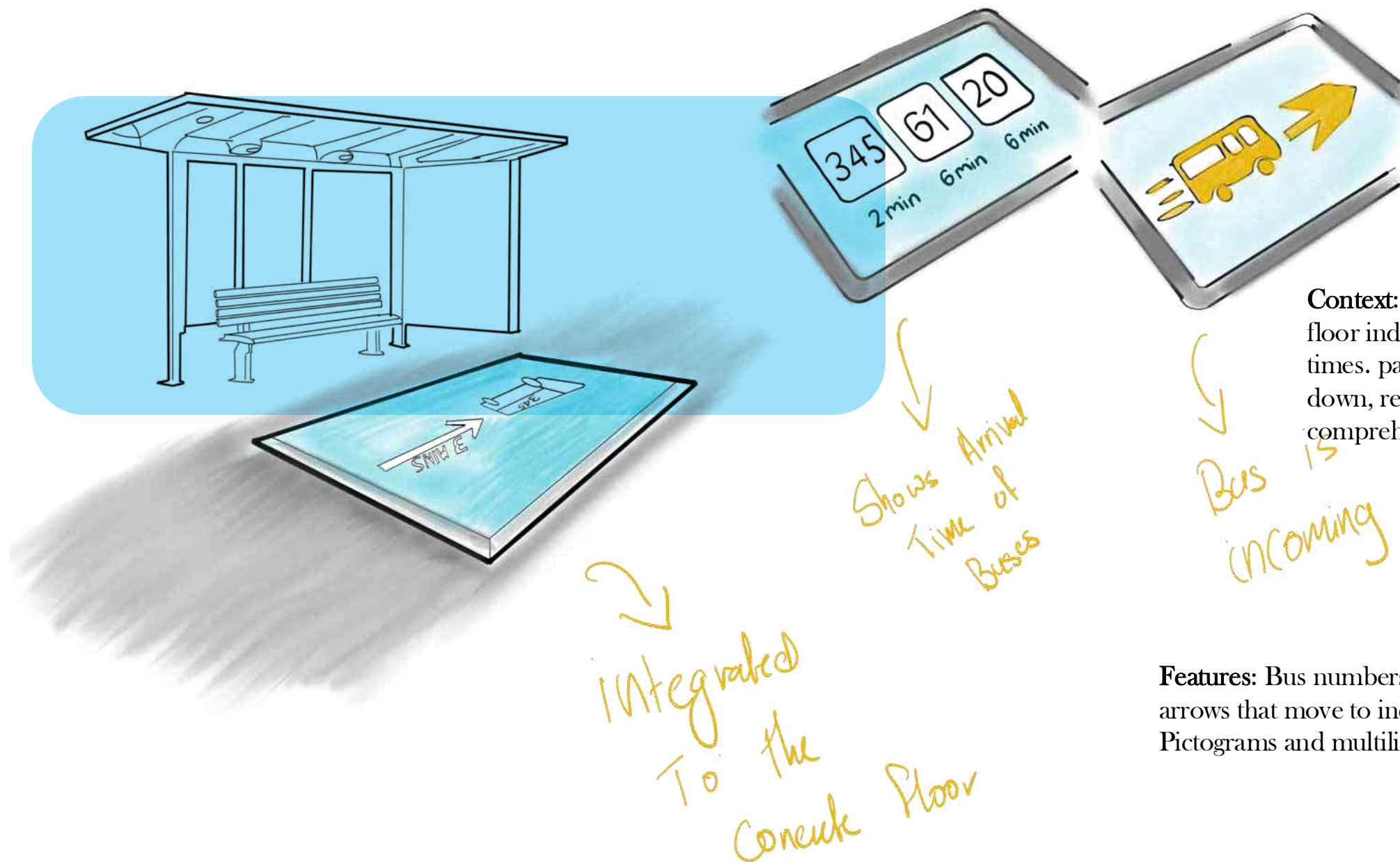
**Solution:** To display the bus's movement, stop by stop, ground-embedded tiles light up in succession. The last tile fully illuminates upon the bus's arrival, indicating that the passengers are present and prepared to board.

**Features:** A clear countdown indicates that each tile is one stop away. Bus arrival = final tile => powerful visual cue. Easy, universal, and languageless.

# Transit Floor

**Issue:** Drivers may ignore waiting passengers in packed stops, and tourists struggle with schedules and language barriers.

**Solution:** Live bus information is shown on a digital floor screen set into the pavement, complete with big numbers, arrows, and animations. As the bus approaches, the screen may light or pulse, providing drivers and passengers with a strong visual cue.



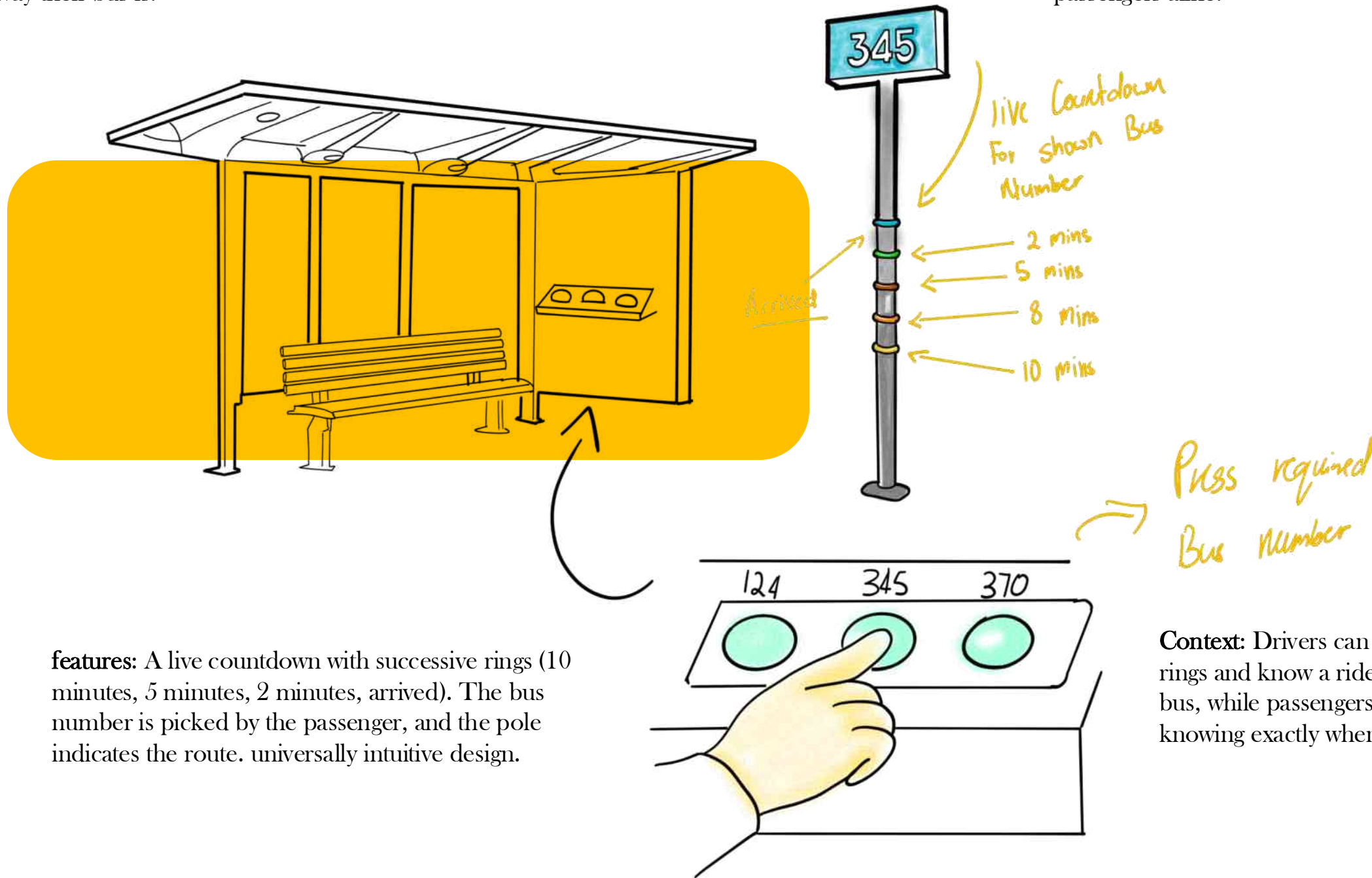
**Context:** passengers observe the bright floor indicator, allow to know arrival times. passengers automatically glance down, resulting in instant comprehension.

**Features:** Bus numbers within real time arrivals. arrows that move to indicate where to stand. Pictograms and multilingual help promote inclusion.

# Pole in Progress

**Issue:** Drivers are sometimes unable to determine which passengers are waiting for which service, and passengers are unaware of how far away their bus is.

**Solution:** As the bus gets closer, a slender vertical pole with stacked lighting rings illuminates more. Upon arrival, the last ring illuminates brightly, warning drivers and passengers alike.

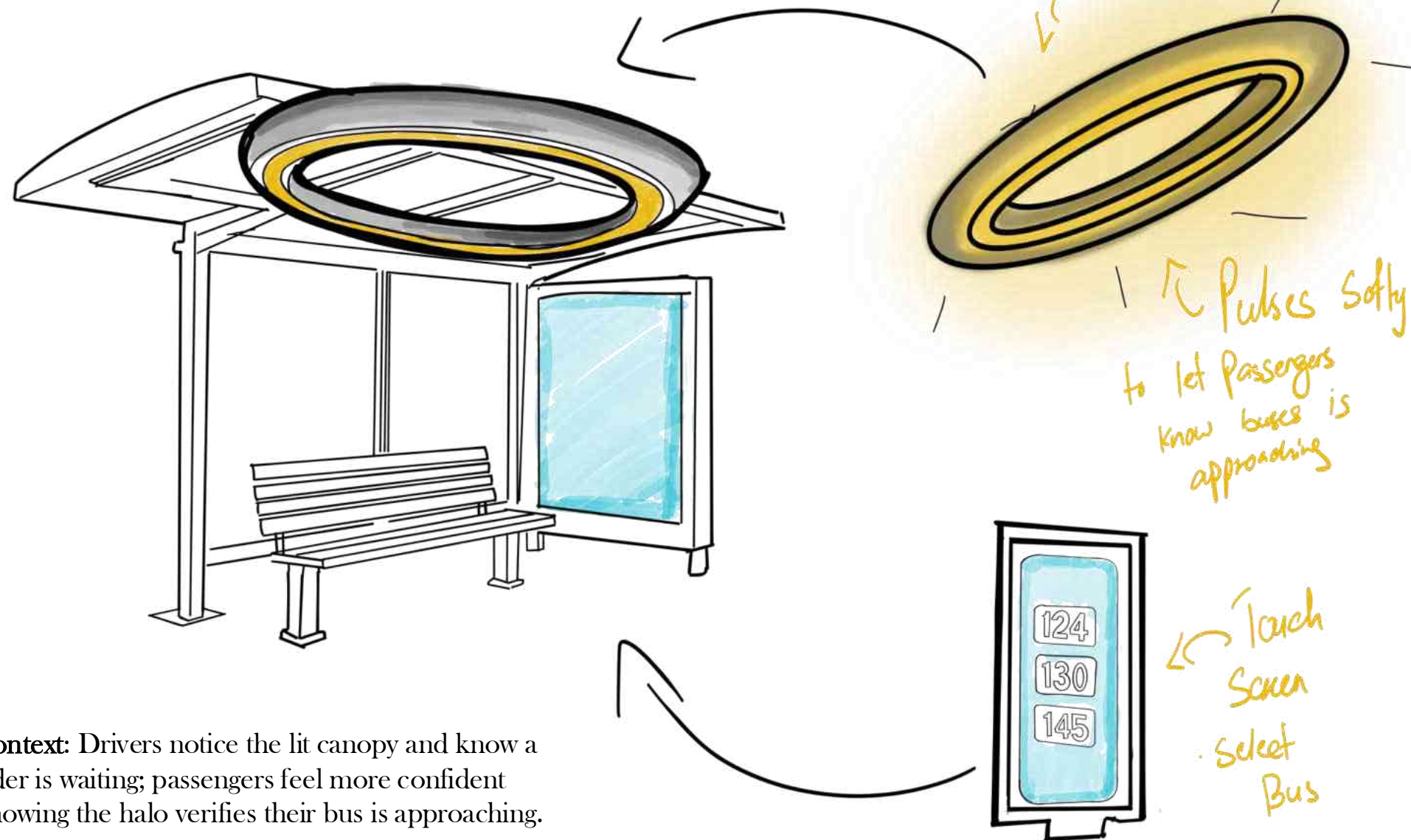


**features:** A live countdown with successive rings (10 minutes, 5 minutes, 2 minutes, arrived). The bus number is picked by the passenger, and the pole indicates the route. universally intuitive design.

**Context:** Drivers can see the illuminated rings and know a rider is waiting for that bus, while passengers can feel more at ease knowing exactly when their bus will come.

# Halo Stop

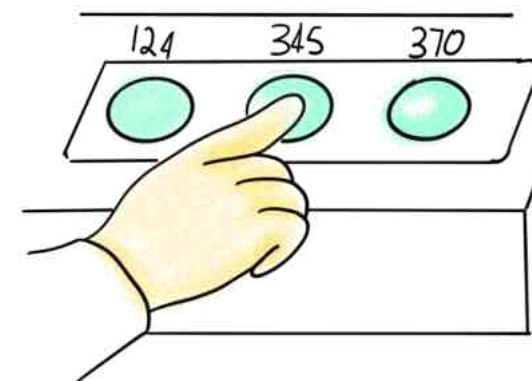
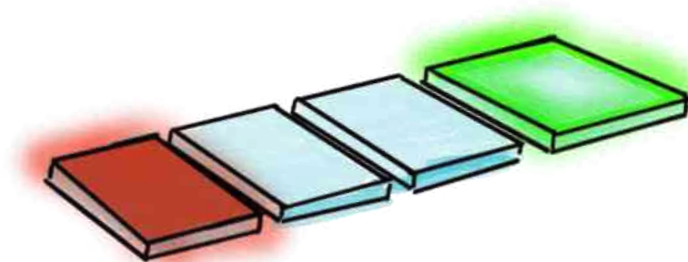
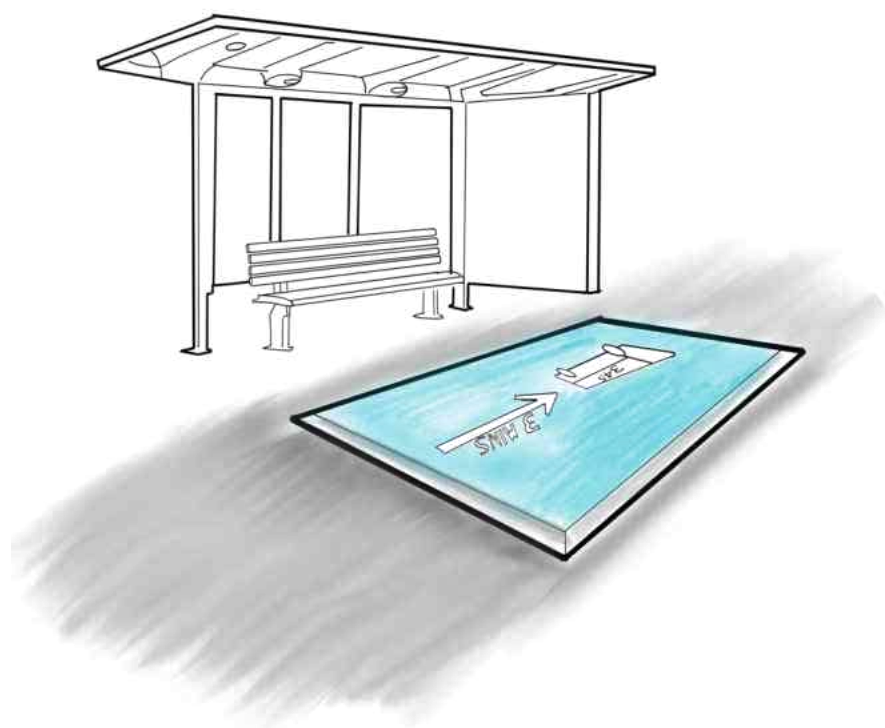
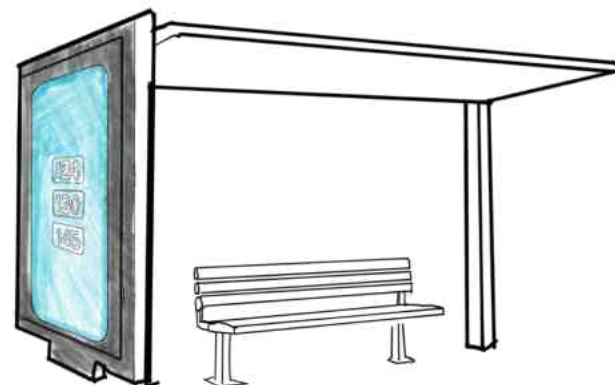
**Issue:** In crowded transit terminals, tourists may feel overloaded and unsure of their whereabouts. Signals may also be missed by drivers in congested or dimly lit areas.



**Solution:** The stop itself becomes a striking, noticeable landmark for both drivers and passengers as a luminous halo built into the shelter roof pulses brighter as the chosen bus approaches.

**Features:** Halo signal and bus route are linked by touchscreen choosing. As the bus gets closer, the pulse becomes more intense, gives the stop a distinct visual character.

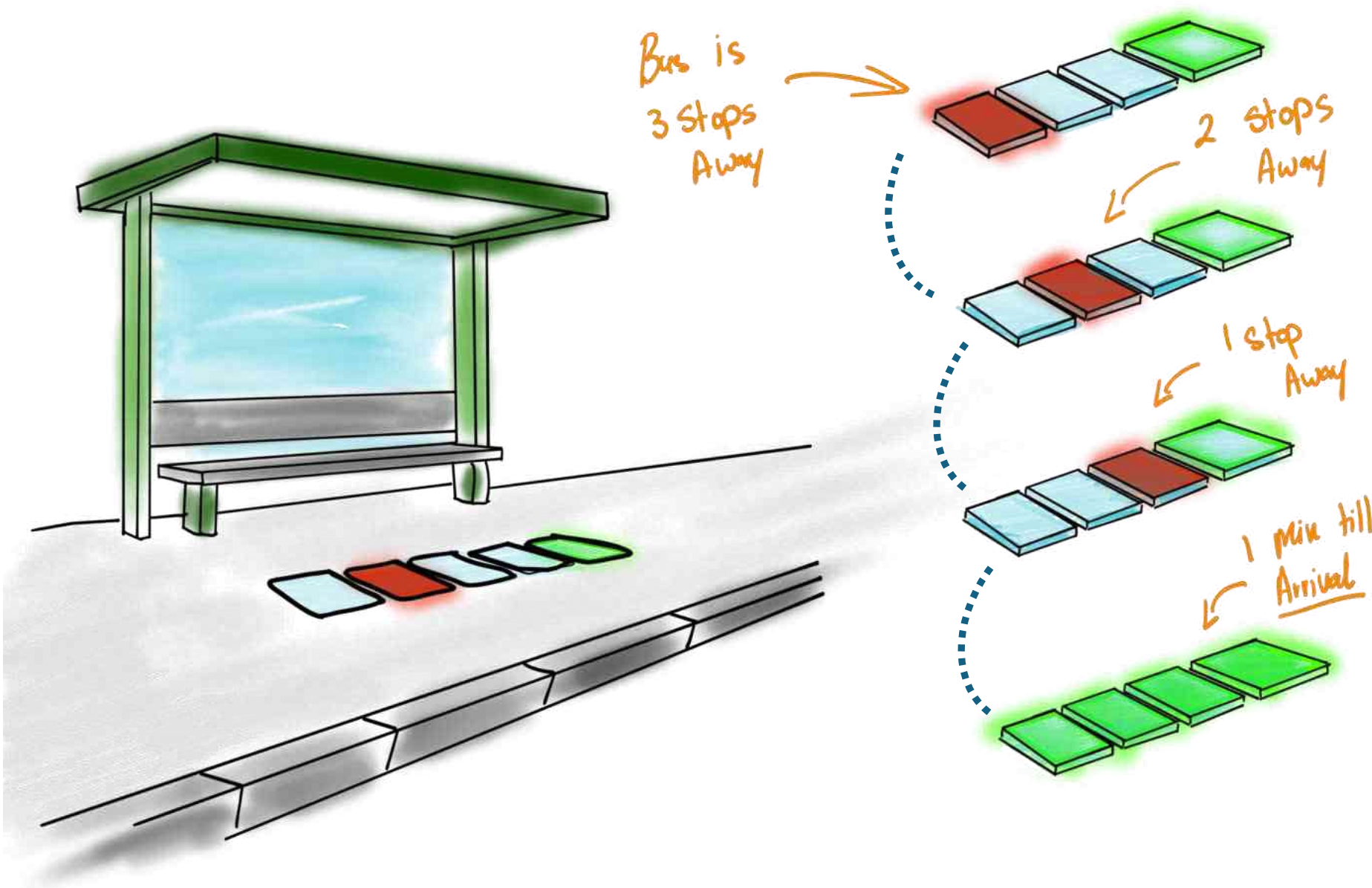
**Context:** Drivers notice the lit canopy and know a rider is waiting; passengers feel more confident knowing the halo verifies their bus is approaching.



# Preferred Concept Direction - Journey Tiles

**Issue:** tourists and new users frequently worry about when their bus will arrive – with this Realtime countdown passengers feel confident their bus is imminent. Depending on however many buses travel that route the rows of tiles increase - ideal for suburban environments

## Process

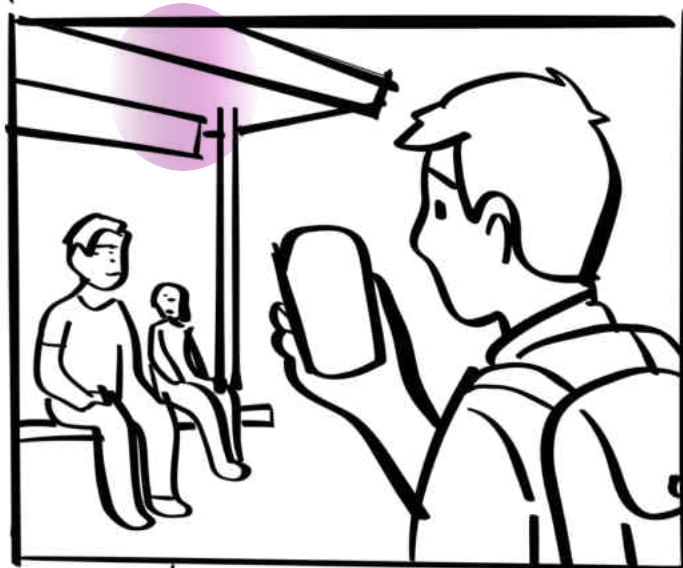


**Context:** When drivers notice the glowing arrival tile, they know someone is waiting, and passengers feel more secure tracking their bus.

**Solution:** To display the bus's movement, stop by stop, ground-embedded tiles light up in succession. The last tile fully illuminates upon the bus's arrival, indicating that the passengers are present and prepared to board.

**Features:** A clear countdown indicates that each tile is one stop away. Bus arrival = final tile => powerful visual cue. Easy, universal, and languageless.

# Story Board



okay, this is the stop the App is saying I should be at.



"Damn this is on in English"  
"I can't understand this"



I'll just wait &  
Hopefully it Comes



"it's been Over 20 mins"  
"does it usually take this long?"



"AlGh My Phone died"



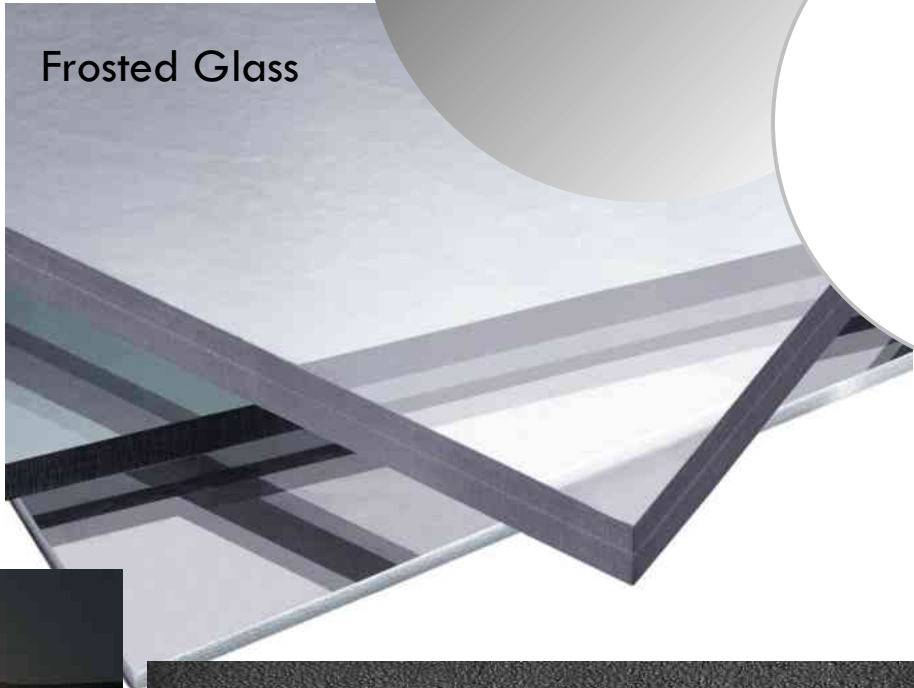
IDK WHAT TO DO!  
It's been 30 Mins!!

# Mood Board

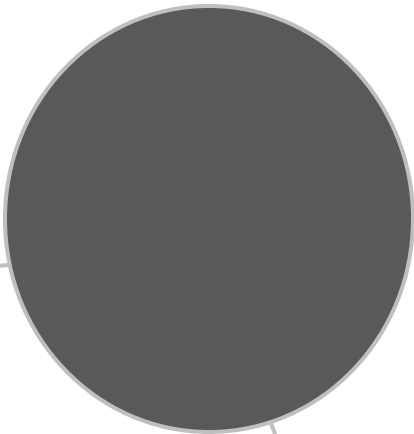
Material Steel



Frosted Glass



Colours



Diffused Light



Grip Textured

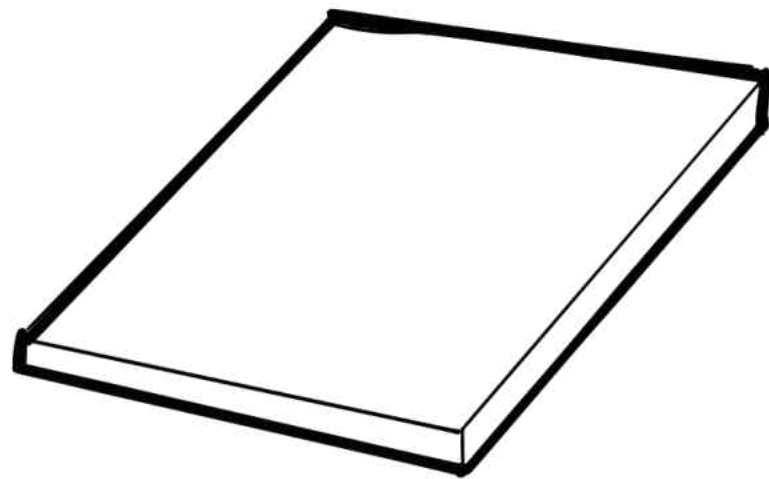


Textiles

# In Context initial Sketches



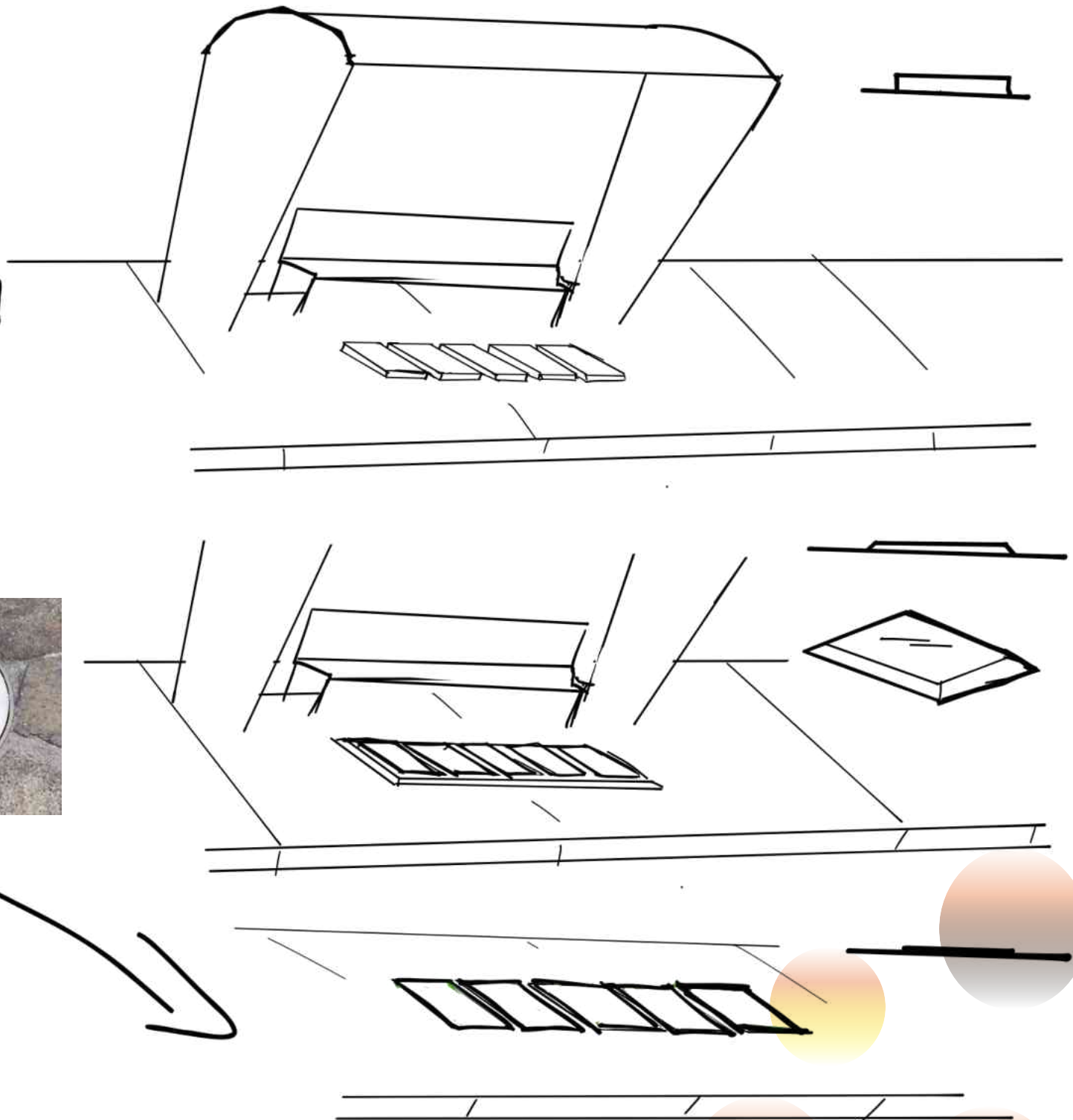
# Tile placement in pavement



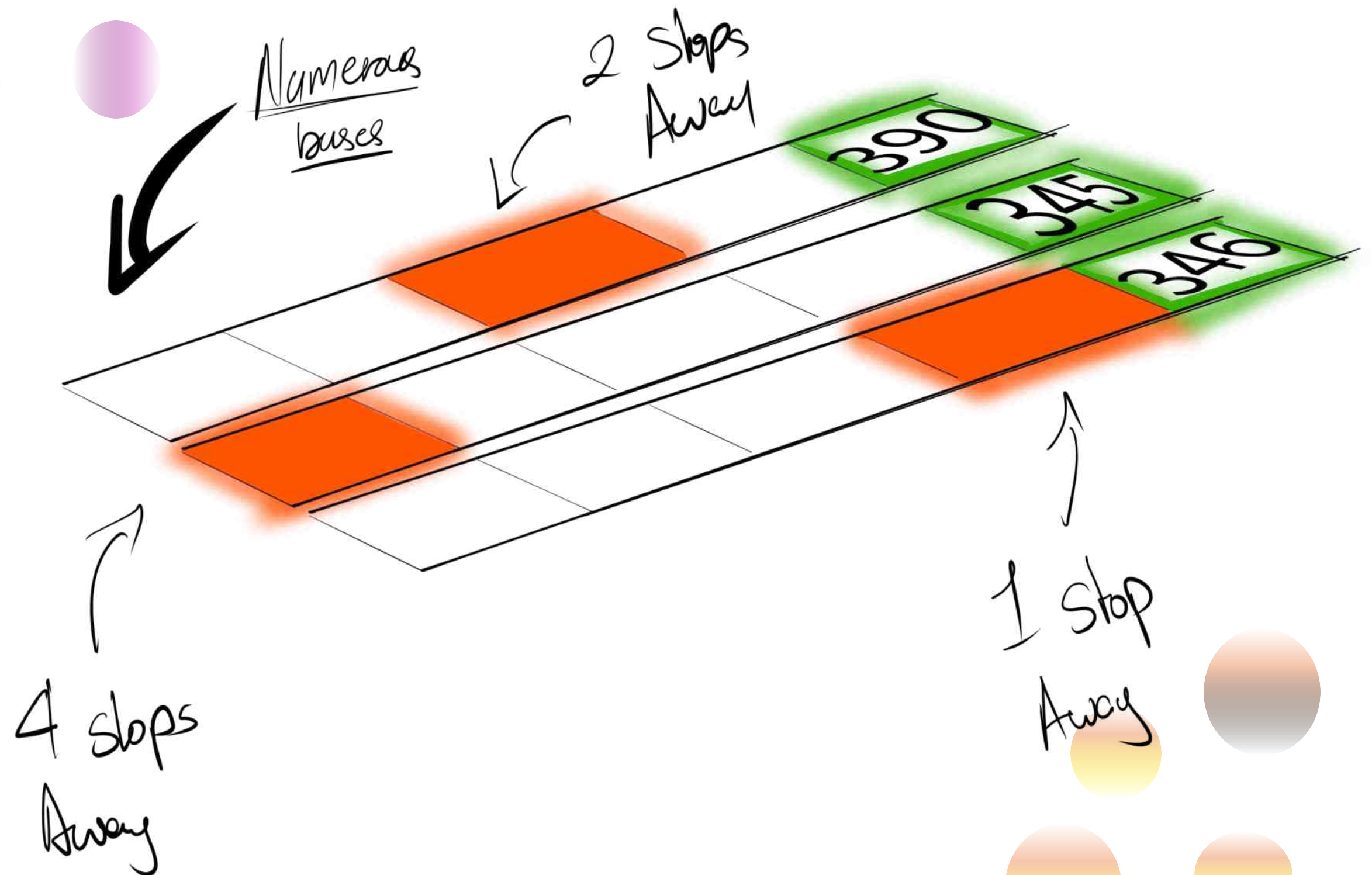
Just like this



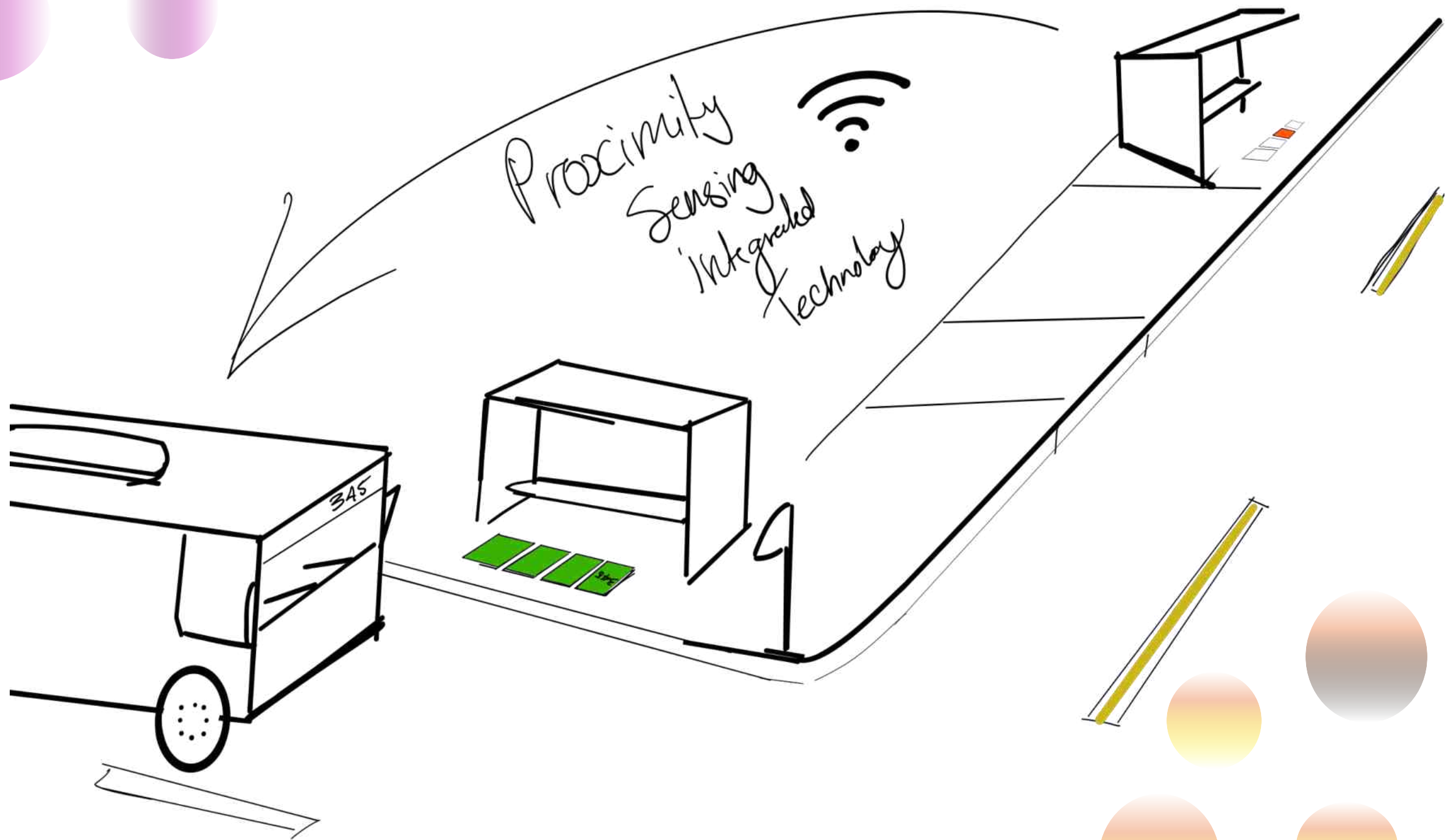
Keeps tiles  
Flush & Prevents  
Trips &



# Tiles Function



# How it works with other stops



# Tutor feedback

Tutor feedback:

Great design – effective

Tiles how they help the disable people

Blind people with stick tactile features

look at environment conditions

How the tile helps the connectivity tactile tile.

Materials

Shape

Tech inside

How is it charged

Succinct clever way to explain to the

Story board or features and functions, still images

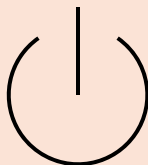
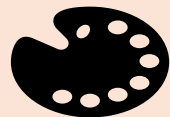
Next week. The technical parts of the object and technology that could be integrated



Bus is Approaching

Green tiles  
are lit up  
signifying Bus is  
Nearby Get ready

# Requirements for Lighting—Interactive Bus Stop Tiles



| Requirements        | Specifications                            | Justification                                                       |
|---------------------|-------------------------------------------|---------------------------------------------------------------------|
| Brightness          | $\geq 1000$ lumens                        | guarantees visibility both during the day and at night.             |
| Colour              | RGB/RGBW                                  | allows for mode change and dynamic colour effects.                  |
| Water proofing      | IP67–IP68                                 | Completely protected and impervious to exposure to outdoor weather. |
| Power               | Energy-efficient for continuous operation | with a power draw of 10 to 20 W.                                    |
| Strength/durability | Metal base and tempered glass lens        | Safe for foot traffic; resistant to scratches and impacts           |
| voltage             | 24 V DC input                             | Suitable for shared bus-tile power systems.                         |

# Material Stainless Steel 316

**Material:** extruded or sheeted 316 marine-grade stainless steel with a thickness of 2-3 mm

**Goal:** Gives the LED light module structural support and a corrosion-proof inclosure.

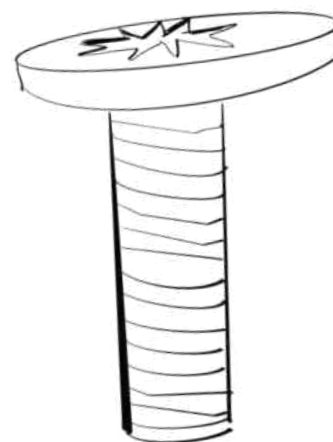
**Reason:** Because it is weatherproof, stiff, and long-lasting, it is ideal for outdoor applications where the housing is encased in concrete and subjected to heat, rain, and foot traffic.

## Screws

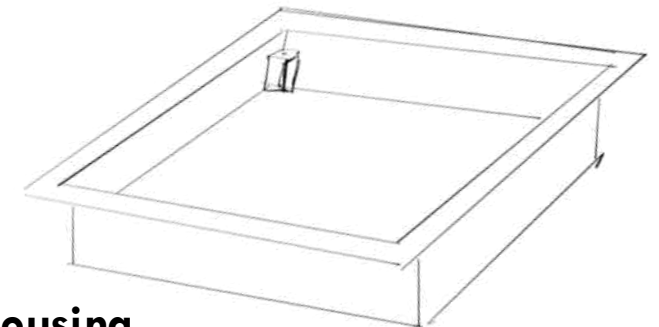
M6 × 16 mm countersunk flat-head socket screws with EPDM washers that sit flush with the pavement surface are used for the top panel screws. To

o lessen vibration and PCB stress, use M4 × 10 mm pan-head machine screws with nylon washers on the internal light board. For safe, reliable maintenance access, threaded brass or stainless steel inserts are set into the housing.

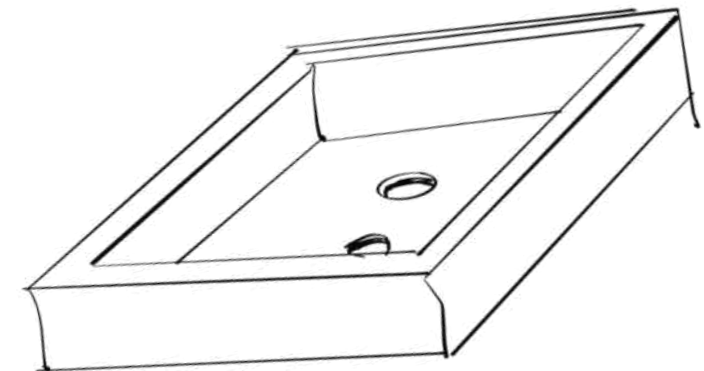
## Screws



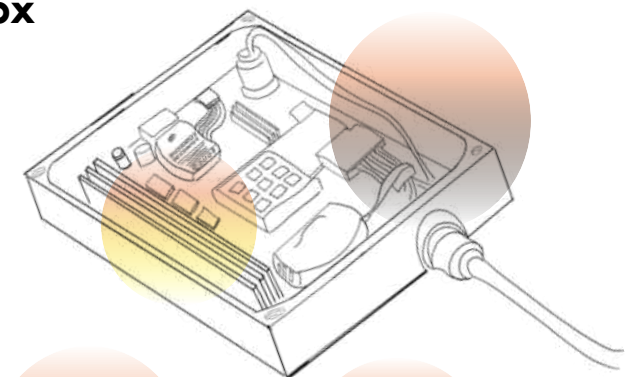
## Light Housing



## Tile Housing



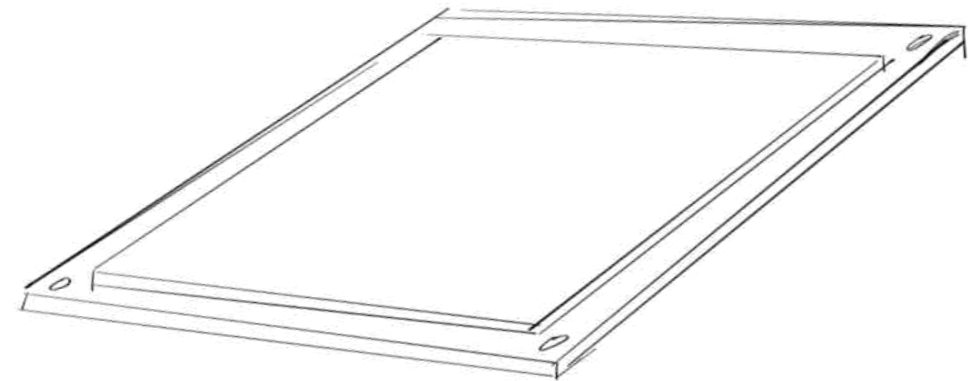
## Service Box



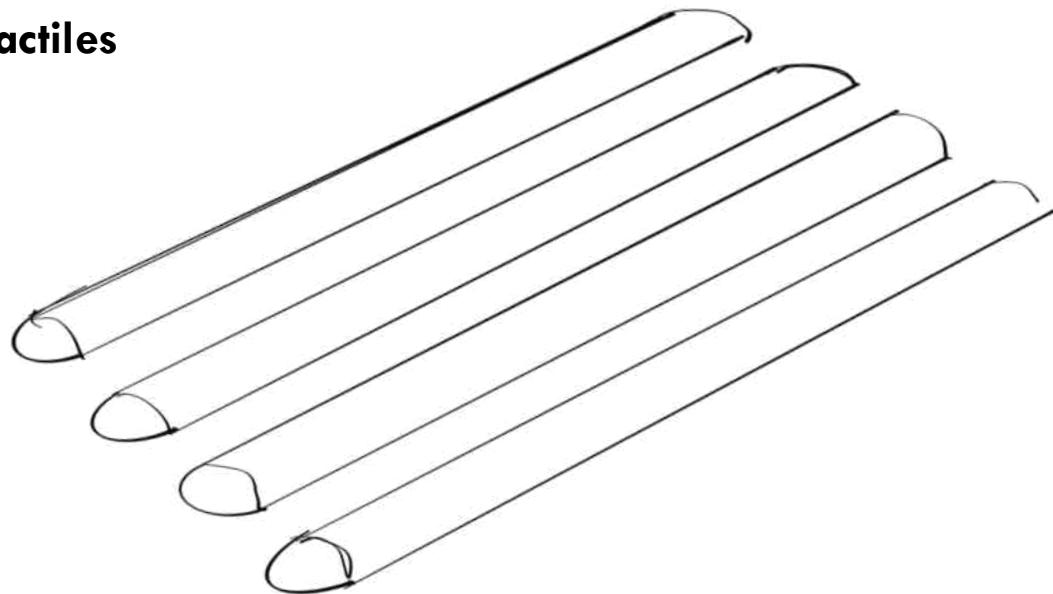
# Material: Polycarbonate

Moulded polycarbonate, chosen for its high impact resistance, optical clarity, and UV stability, is used to create the top surface. It preserves structural integrity when pedestrian loads are applied while enabling uniform diffusion of light from the RGB LED board. The moulded surface incorporates tactile indications directly to meet AS/NZS 1428.4.1 accessibility requirements. This increases durability and lowers maintenance by doing away with the requirement for separate tactile overlays. An anti-slip coating is applied to the polycarbonate to guarantee safety in damp environments.

## Frost top Lens



## Tactiles

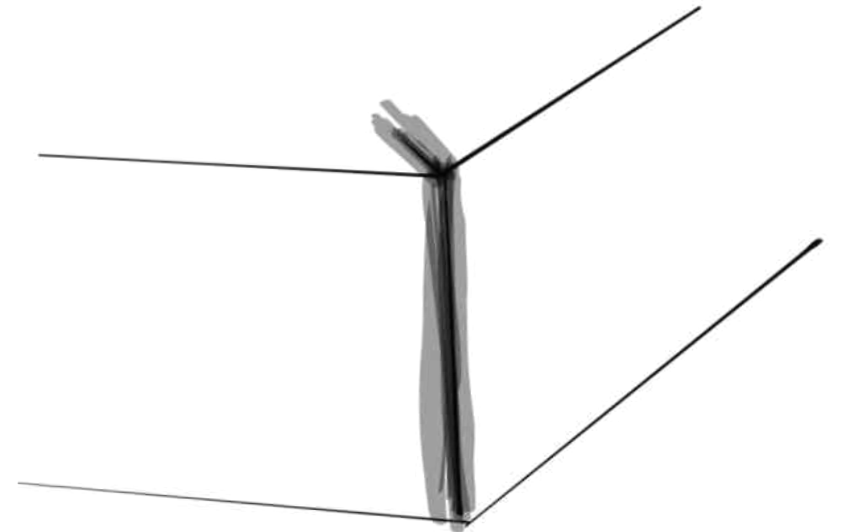


Raised domes or bars (TGSi pattern) are used to sculpt the tactile features into the polycarbonate lens. These are  $5 \pm 0.5$  mm high and give persons with vision impairments haptic input that can be felt underfoot or with a cane. TPU or stainless-steel inlays may be used on the tactile surface to improve tactile and visual contrast, guaranteeing adherence to accessibility guidelines while preserving the tile's illumination capabilities.

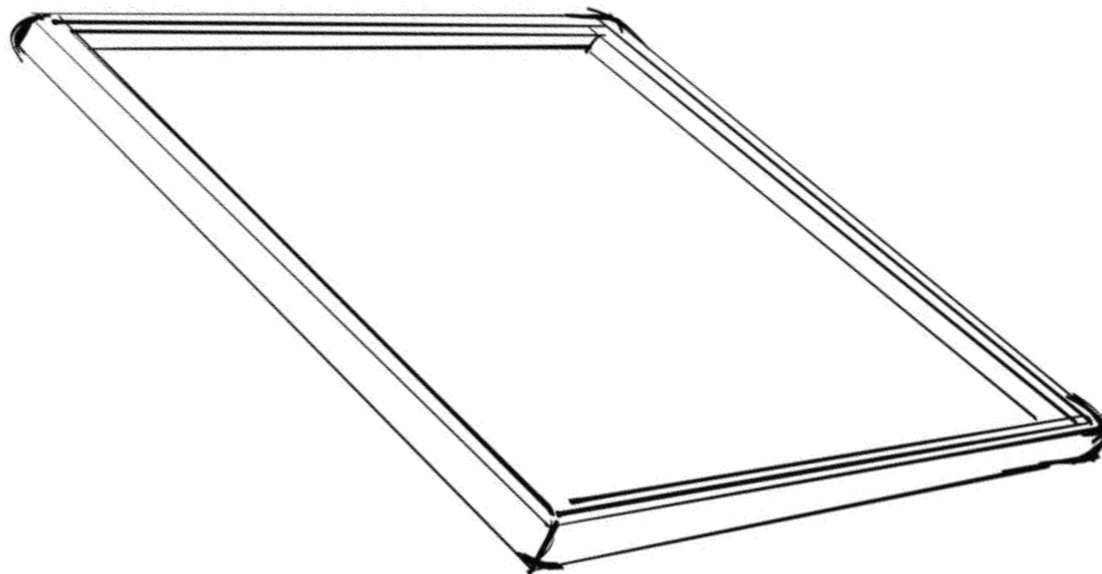
# Material: Silicone

The polycarbonate top lens and stainless-steel housing are separated by silicone or EPDM gaskets to provide an IP67 waterproof rating. Because of their superior resistance to heat, UV light, and moisture, these materials keep out dust and water. A silicone-based sealant is used to seal all screw holes and joints, ensuring long-term environmental protection without sacrificing serviceability.

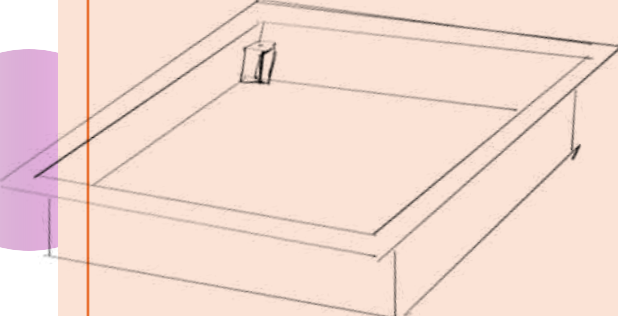
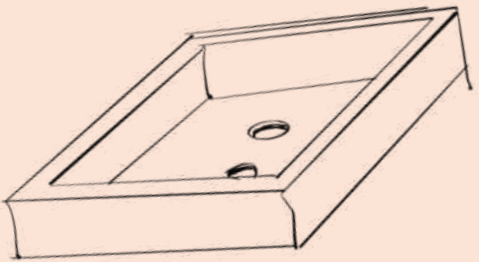
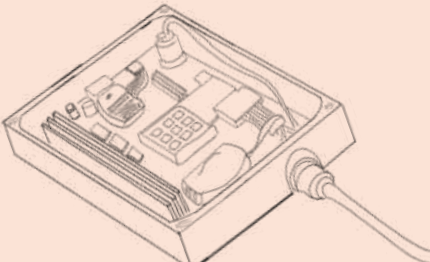
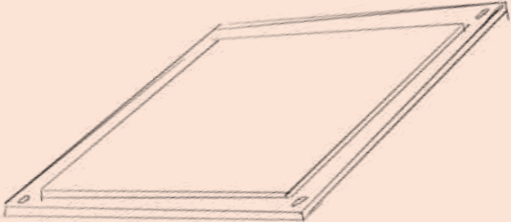
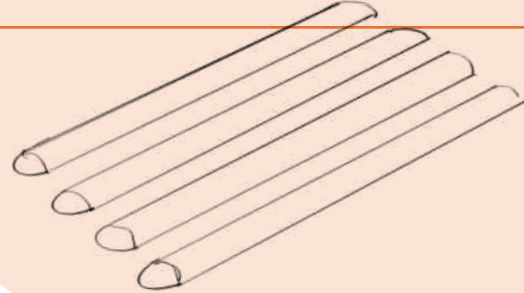
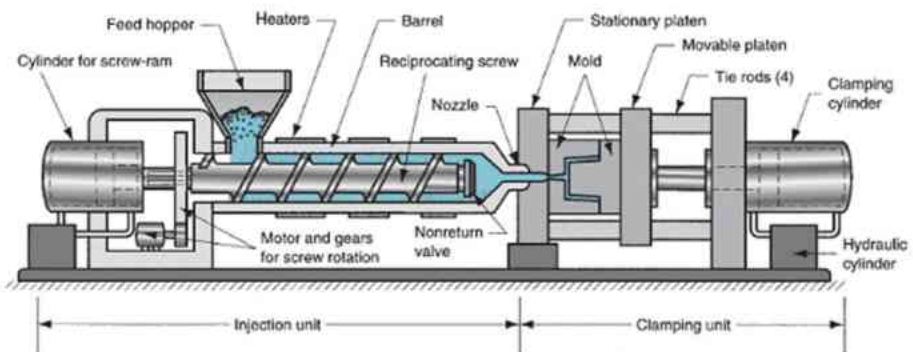
## Silicone



## Gasket



# Manufacturing Process

| Component                                                                           | Manufacturing Process                                                                                                                  |                                                                                       |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|     | <p><b><u>Tile Housing</u></b></p> <p>For a precise fit, die-cast stainless steel 316 is followed by <b>CNC cutting</b>.</p>            |                                                                                       |
|   | <p><b><u>Concrete Cavity Housing</u></b></p> <p>For a precise fit, die-cast stainless steel 316 is followed by <b>CNC cutting</b>.</p> |                                                                                       |
|  | <p><b><u>Service Box</u></b></p> <p>laser-cut steel sheet inclosure, followed by <b>CNC cutting</b>.</p>                               |                                                                                       |
|  | <p><b><u>Polycarbonate Lens</u></b></p> <p>Polycarbonate that is <b>injection-molded (PC)</b></p>                                      |   |
|  | <p><b><u>Tactile layer</u></b></p> <p>Polycarbonate that is <b>injection-molded (PC)</b></p>                                           |  |

# Bus Components required for Tiles

Buses can provide real-time location and arrival data to interactive bus stop tiles thanks to the following components. Every module has a distinct purpose in guaranteeing dependable, low-power connectivity and synchronised system functioning.

|                                   |                                                                                     |                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SAM-M10Q module</b>            |    | u-blox M10 standard precision GNSS antenna module<br><b>Ultra-low-power GNSS antenna module for easiest integration</b>                                                       | <ul style="list-style-type: none"> <li>establishes the precise location of the bus along its journey.</li> <li>The GNSS coordinates cause the LoRa transmitter to send an arrival signal to the tile unit at a stop when the bus enters its geofenced radius.</li> <li>reduces false triggers by ensuring precision so that each stop is only alerted when the bus is close.</li> </ul>                                                                                                                               |
| <b>ESP32 Receiver/Node</b>        |   | An ESP32 is a low-cost microcontroller (MCU) with integrated Wi-Fi and Bluetooth capabilities, designed by Espressif Systems for Internet of Things (IoT) and mobile devices. | <ul style="list-style-type: none"> <li>gathers information from the GNSS and regulates the timing of LoRa transmissions. oversees the protocols for wireless communication (Wi-Fi, Bluetooth, or UWB).</li> <li>enables the bus to transmit structured, encrypted data packets to neighbouring stops, including the route number, bus ID, and anticipated arrival time.</li> <li>allows for future scalability by allowing the same controller to control diagnostics, lighting controls, and sensor data.</li> </ul> |
| <b>RFM95CW 915MHz LoRa Module</b> |  | a high-performance, ultra-low-power transceiver that enables long-range, low-bandwidth wireless communication using the LoRa>> technology at the 915 MHz frequency.           | <ul style="list-style-type: none"> <li>serves as the voice of the bus, broadcasting a brief data packet with real-time route and location information every few seconds.</li> <li>Every smart tile keeps an ear out for these packets and adjusts its illumination or display (e.g., countdown animation, colour change) accordingly.</li> <li>operates effectively over hundreds of metres, so live updates can still reach stops in remote areas or with poor connectivity.</li> </ul>                              |

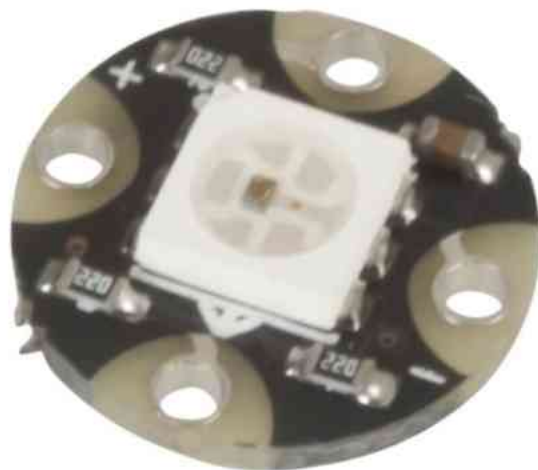
The system is built as a closed, local network; instead of depending on internet or cloud connectivity, buses employ LoRa transmission to communicate directly with neighboring tiles. This method eliminates the need for external data infrastructure and guarantees dependability, privacy, and quick response. These elements work together to form a low-energy, self-contained communication network. As the bus's voice, the LoRa module broadcasts brief information packets to nearby bus stops on a regular basis, including arrival updates. Even in places with poor connectivity, this configuration guarantees consistent communication.

# Stop Components required for Tiles

|                                               |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>UWB<br/>DW3000</b>                         |    | Qorvo created the DW3000, an Ultra-Wideband (UWB) transceiver with accurate real-time location and range capabilities. It uses radio signals' time-of-flight to determine distance, with an accuracy of 10–30 cm. Supporting IEEE 802.15.4z standards, the module provides high-precision, low-power wireless communication that is perfect for asset tracking, indoor positioning, and proximity sensing.                            | <ul style="list-style-type: none"> <li>• uses distance-based triggers to confirm the arrival of the bus.</li> <li>• turns tiles green, initiating the last "arrival" lighting sequence.</li> <li>• It can be integrated into the ESP32 DW3000 or utilised as a stand-alone UWB node.</li> </ul>                                              |
| <b>MAX485</b>                                 |   | Standard TTL serial transmissions (UART) can be converted into RS-485 differential signals using the low-power transceiver MAX485. Using twisted-pair wires, it facilitates half-duplex communication over great distances, offering reliable data transfer and strong noise immunity. It facilitates dependable communication between several devices on a single bus line and is frequently utilised in industrial control systems. | <ul style="list-style-type: none"> <li>• All tile units are connected to the ESP32 controller via a twisted-pair RS-485 wire, guarantees that up to five tiles receive synchronised lighting modifications at the same time.</li> <li>• offers industrial-grade dependability for solar control systems, elevators, and lighting.</li> </ul> |
| <b>ESP32</b>                                  |  | An ESP32 is a low-cost microcontroller (MCU) with integrated Wi-Fi and Bluetooth capabilities, designed by Espressif Systems for Internet of Things (IoT) and mobile devices.                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• determines the bus's distance in stops and modifies the tile lighting appropriately.</li> <li>• connects to the UWB module to verify closeness.</li> <li>• provides passengers with real-time visual feedback by controlling all lighting and sensor responses at the stop.</li> </ul>              |
| <b>RFM95CW<br/>915MHz<br/>LoRa<br/>Module</b> |  | a high-performance, ultra-low-power transceiver that enables long-range, low-bandwidth wireless communication using the LoRa>> technology at the 915 MHz frequency.                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>• gets broadcast packets from the bus that is coming.</li> <li>• allows for dependable wireless connection independent of the internet.</li> <li>• keeps communication open between several stops in the same hallway.</li> </ul>                                                                     |

As a receiver and control centre, the stop uses UWB distance data to confirm arrival and locally interprets LoRa packets from neighbouring buses. All commands are controlled by the ESP32, and synchronised signals are sent to every tile by the MAX485. These parts work together to create a low-power, offline system that ensures dependable tile communication even in the absence of network connectivity.

# Light Setup



24 V IP67



Each tile contains an **RGB LED light engine** — a lighting module that can emit **any colour** (Red, Green, Blue, or White) under control of your **ESP32** via the **RS-485 bus**.

RGB Light strip

Five tiles serve as distance indicators at each stop. The bus's route number and current stop ID are sent over LoRa to the stop's ESP32. To let passengers know which bus is coming and how many stops away it is, it determines the bus's distance and illuminates the matching distance tile in RED. At the same time, the route number (such as "333") is superimposed on the tile. All the tiles change green when the bus stops (as indicated by the proximity of the UWB). Each tile is controlled by an RS-485, and the power source is 24 V DC (mains with solar backup). Internet access is not necessary.

# Australian Standards & Regulations

## **IP67-based Ingress Protection (AS/IEC 60529)**

specifies the levels of protection against water and dust intrusion. guarantees that the tile housing and LED parts are waterproof and dust-tight, making them appropriate for outdoor public spaces.

**Essential Safety Standards for Electrical Equipment (AS/NZS 3820:2020)** guarantees that every electrical part, including power supply, control boards, and LED drivers, satisfies the safety requirements for low-voltage devices.

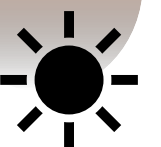
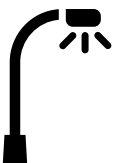
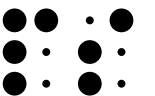
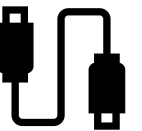
**AS/NZS 3000:2018: Guidelines for Wiring** outlines **safety standards** for electrical installations, such as grounding and low-voltage DC systems, which are pertinent to the 24 V DC circuit and service enclosure.

**2009's AS/NZS 1428.4.1:** Tactile Ground Surface Indicators (TGSi) ensure proper layout, contrast, and detectability for visually impaired users by covering tactile compliance and accessibility.

Road Lighting for Pedestrian Areas, **AS/NZS 1158.3.1:2020** establishes **standards for safety visibility, glare reduction, and lighting levels** at bus stops and pedestrian crossings.

The polycarbonate lens's **UL94 V-0 Flammability Rating**, which indicates the plastic's fire resistance, guarantees that the LED lens is self-extinguishing and suitable for public installation.

**ASTM G154: Outdoor Durability & UV Stability** guarantees that, even after extended exposure to sunlight, the polycarbonate or glass cover will retain its mechanical integrity and clarity.



# Tactile ground surface indicators (TGSIs)



Blister Paving



Hazard Paving



Lozenge Paving



Offset Blister



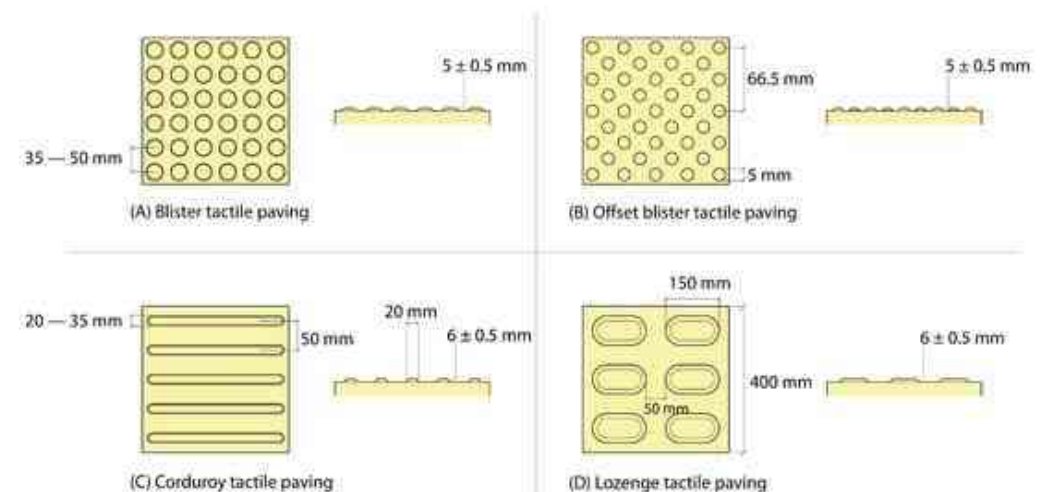
Cycleway Paving



Guidance Paving

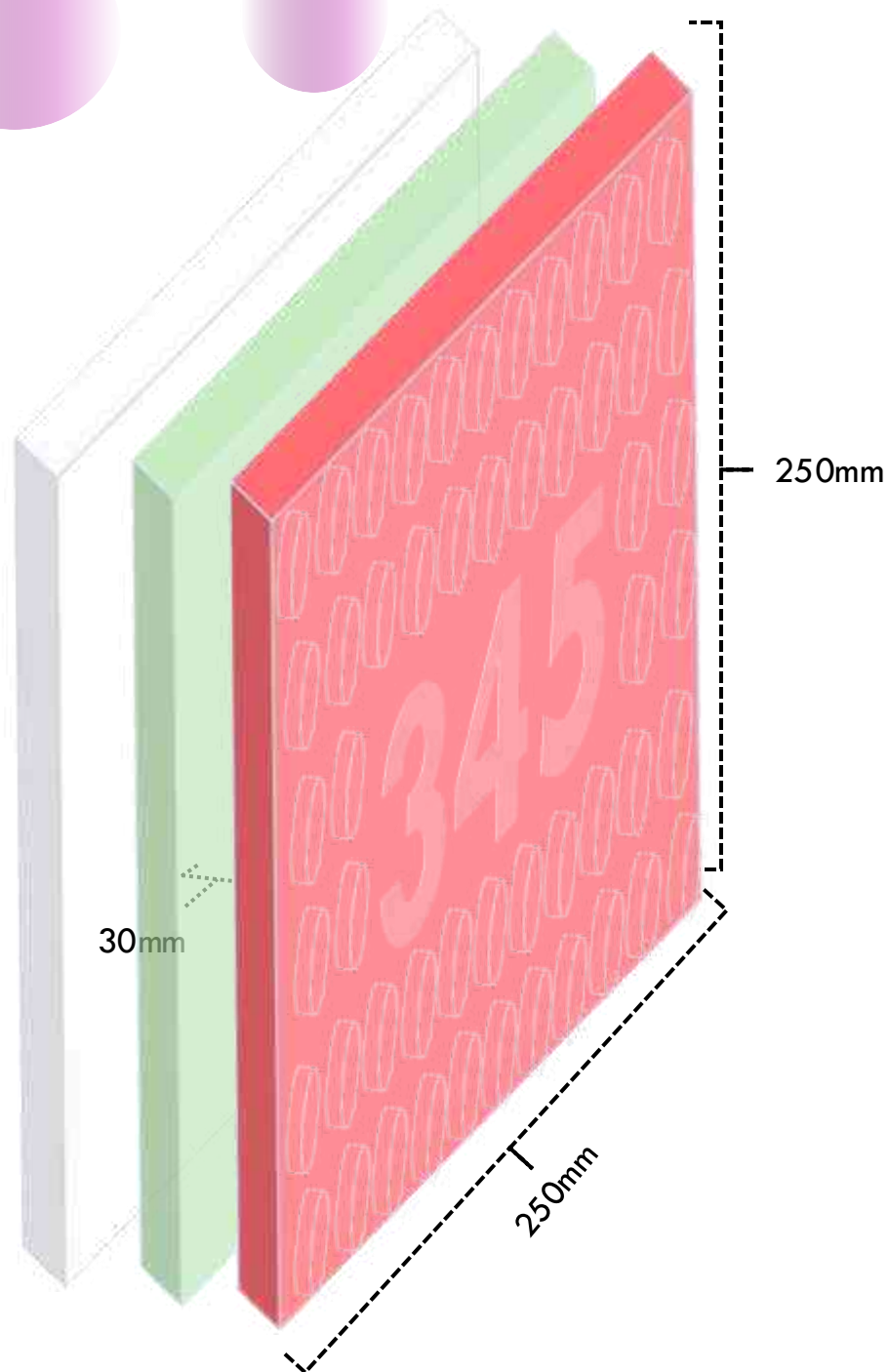
various tactile paving patterns along with their specified measurements according to AS/NZS 1428.4.1:2009. Every form of paving has a distinct function for visually impaired walkers in terms of warning or navigation. The size, height, and spacing needed for compliance are shown in the diagrams on the right.

Lozenge tactile paving is the best option for the bus stop tile system. At bus stops when passengers change from pavement to roadway, it offers a definite hazard warning texture that indicates a possible edge or boarding place, precisely matching the tactile and safety criteria. In addition to meeting AS/NZS 1428.4.1:2009 compliance and providing clear underfoot input, the lozenge profile can be visually contrasted with the surrounding concrete for improved visibility



. To securely direct visually impaired individuals towards the bus boarding area while preserving orientation along the pathway, Guidance (Corduroy) pavement may also be incorporated in front of the tiles. When combined, these tactile surfaces guarantee that the design supports user safety, visual contrast, and universal accessibility in the transportation setting.

# Tile Overview



## Power

shared bus powered by 24 V DC (from mains + solar backup) All tiles share a common supply line

## Systems for Visual Output

- RGB COB LED Strip with IP67 and 24 V LEDs with continuous phosphor on chips creates a full-tile colour wash that is smooth (white for idle, red for distance, and green for arrival).
- Display of Bus Numbers Small 16x16 RGB matrix or 3x7-Segment Modules (5 V, IP67) displays the bus route number on the active tile, such as "333."
- Analogue brightness response from an ambient light sensor (LDR 5528) permits automatic dimming of the day and night.

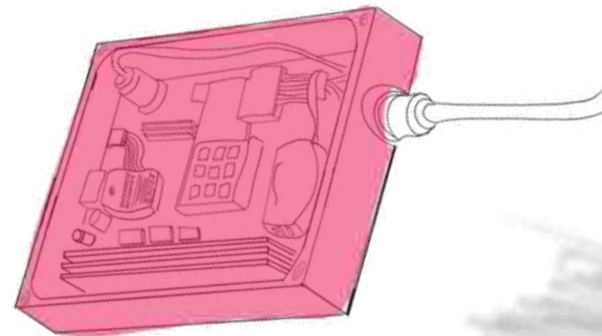
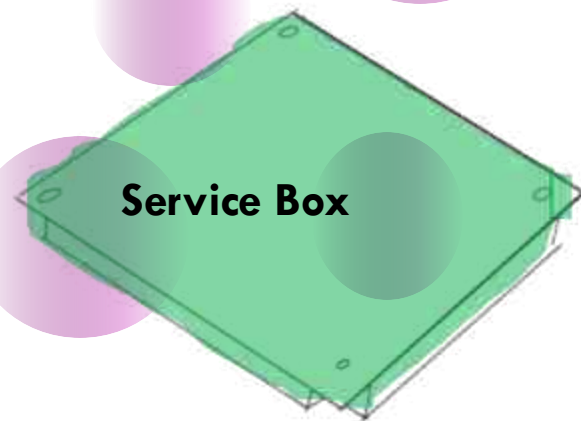
## Protection & Structure

- Primary Housing Stainless steel 316 serves as an LED heat sink and offers strength, resistance to corrosion, and accurate measurements.
- Top Lens/Diffuser: Made of injection-molded frosted polycarbonate (Makrolon/Lexan) with a number window, anti-slip matte texture, and tactile TGSi pattern.
- Gasket + silicone O-ring sealing system During maintenance, it is interchangeable for IP67 waterproofing.
- Method of Assembly Serviceable inclosure that is latched or screwed enables the top lens to be removed for maintenance by specialists.

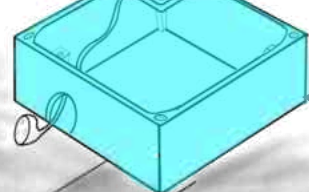
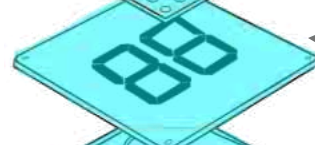
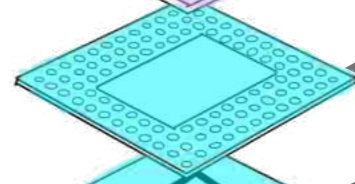
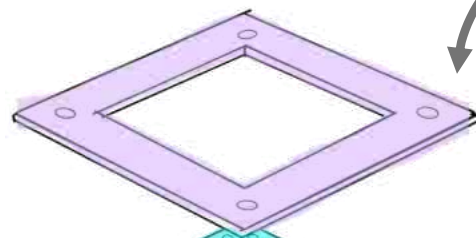
## Electronics

- Every connector has an IP67 rating (waterproof M12/JST).

# Tilestop Assembly & Disassembly



The **Service Box** serves as the smart tile system's centralised control and power module. It combines logic, communication, and voltage management into a single, easily accessible unit by housing all essential electronics, such as the ESP32 microcontroller, MAX485 transceiver, LoRa receiver, DC-DC converter, and power distribution board. Each of the five display tiles, which merely include an LED panel and a numerical display. The service box ensures a reliable, scalable, and field-serviceable architecture by streamlining wiring, lowering maintenance, and offering a single location for system upgrades and diagnostics.



## Top Mount Aluminium Frame/Bezel with gasket included underneath

- An anti-slip, textured aluminium ring resting on the pavement
- A perimeter of flush countersunk screws tighten onto the lower housing's threaded inserts.
- For drainage and tolerance, the pavement edge slightly overlaps. Offers a crisp, visible edge and R11 slide resistance. keeps all repairs reachable from above.

## Polycarbonate Frosted Tile (Lens) sits in the recess beneath the bezel.

- For accessibility, the surface features tactile dots.
  - evenly disperses the light from the RGB panel
  - A silicone compression gasket is used to seal the edge.
- Gasket-based IP67 waterproofing & Smooth lighting that blends in with the bezel

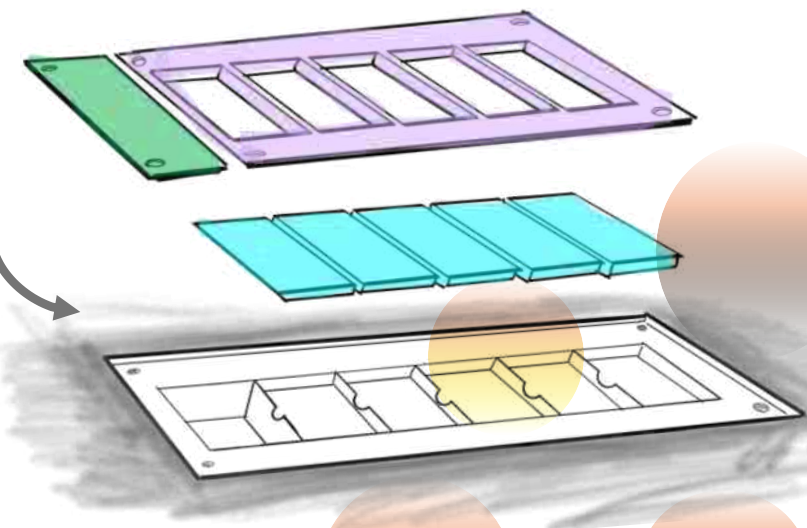
## Bus Number Display + RGB LED Board

- mounted on a carrier plate made of aluminum
  - directly beneath the lens for consistent illumination
- Simple module switching while in service

## main body of the tile housing LEDs in a square aluminum cavity

- threaded inserts for top screws in the internal posts.
- has cable routeing side channels.
- securely fastened to a concrete tray that is recessed Strong solid framework

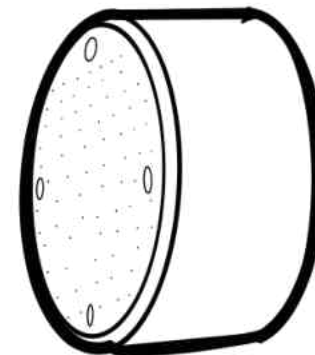
- **Mounting Tray/Cavity**  
Recessed anchored in the pavement
- Allows drop-ins for housing  
Rubber shims for height adjustment could be included.



# Accessibility Features

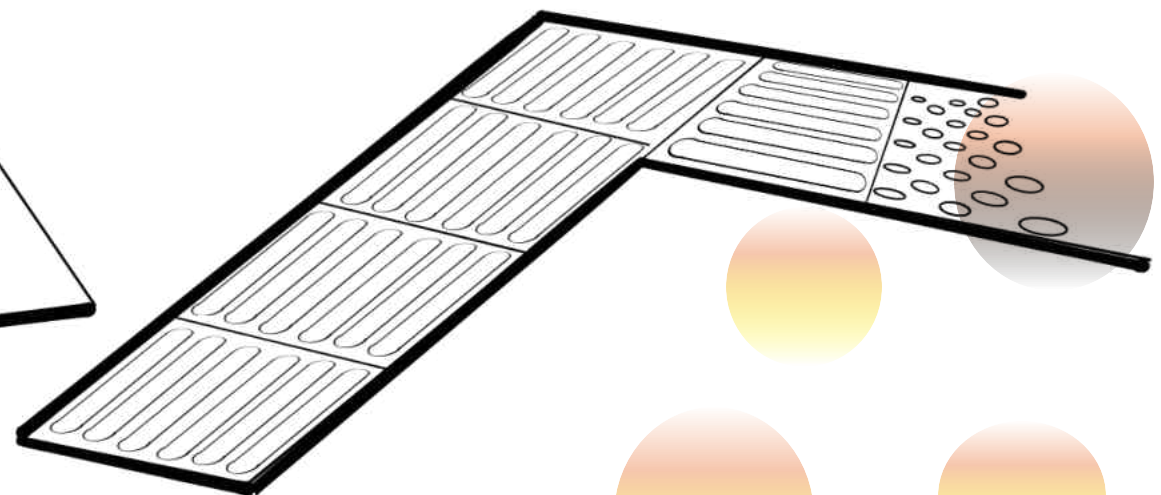
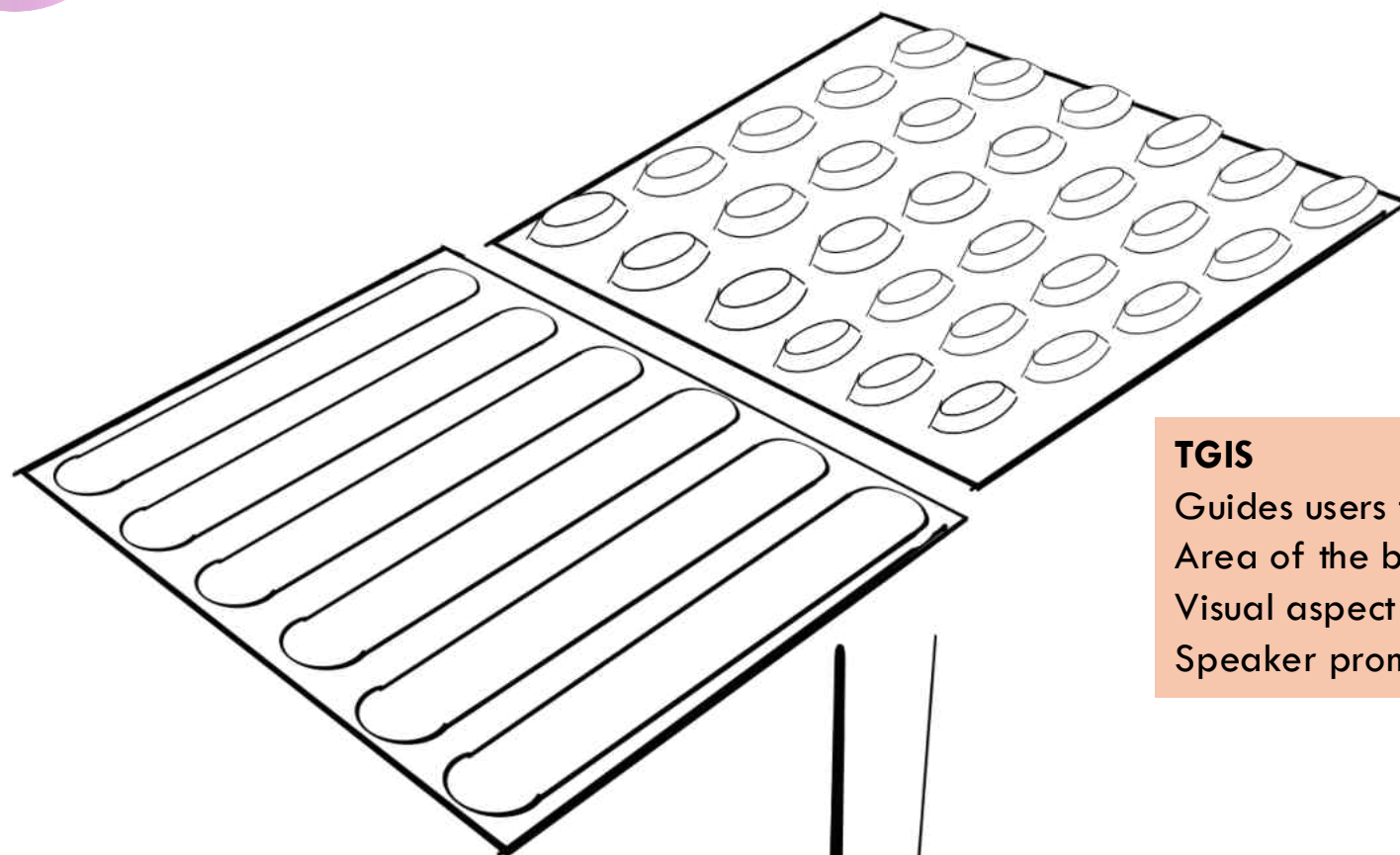
## Speaker

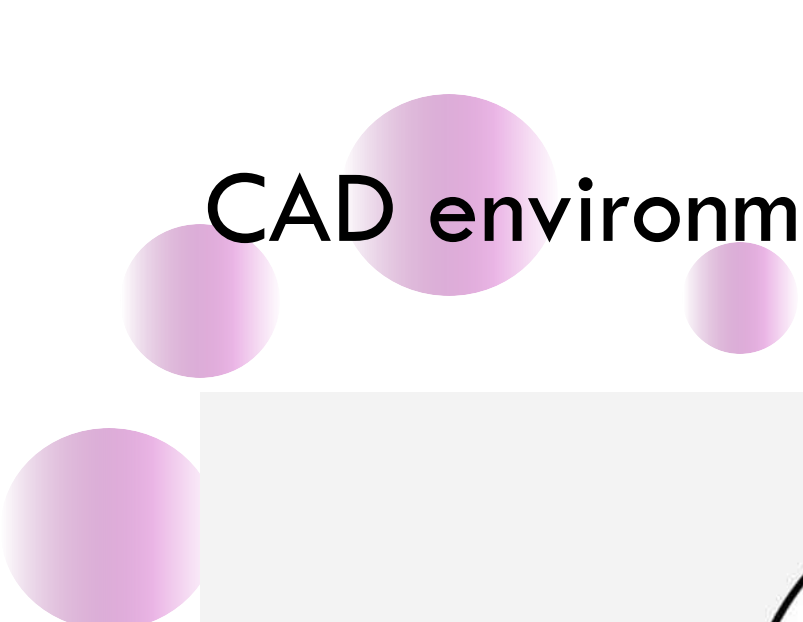
Alerts blind users  
With audio by saying the  
Bus number approaching



## TGIS

Guides users to the boarding  
Area of the bus, those who can not see the  
Visual aspect of the tiles will hear from the  
Speaker prompt





# CAD environm



# Prototype 1

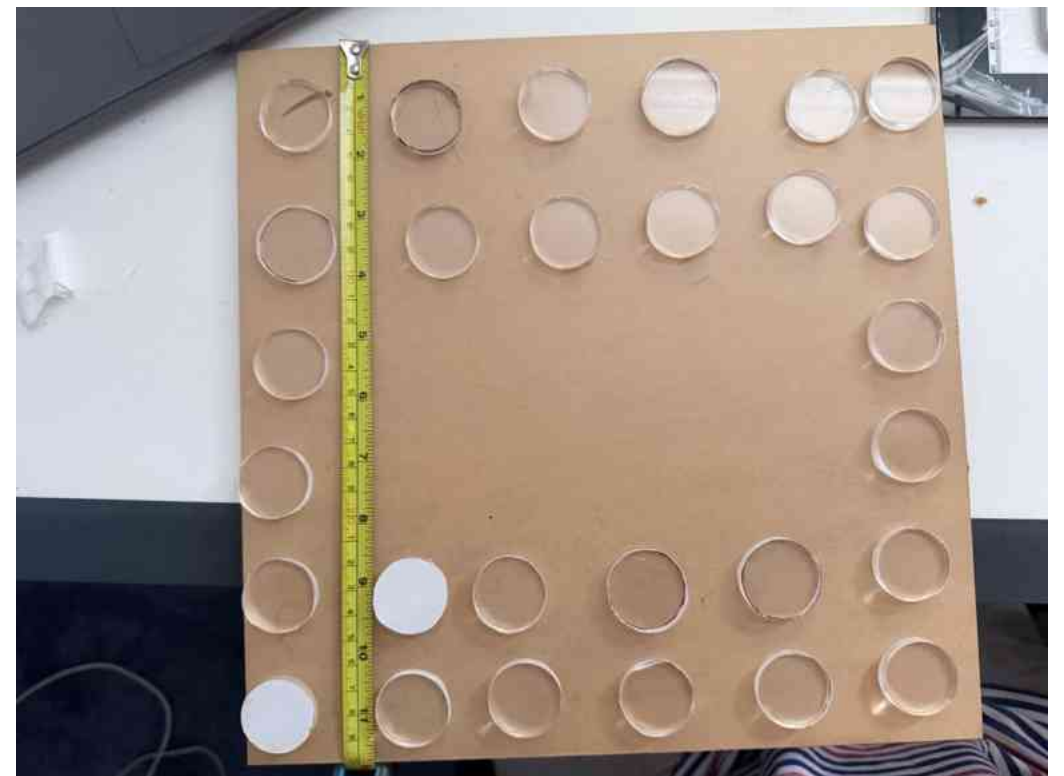
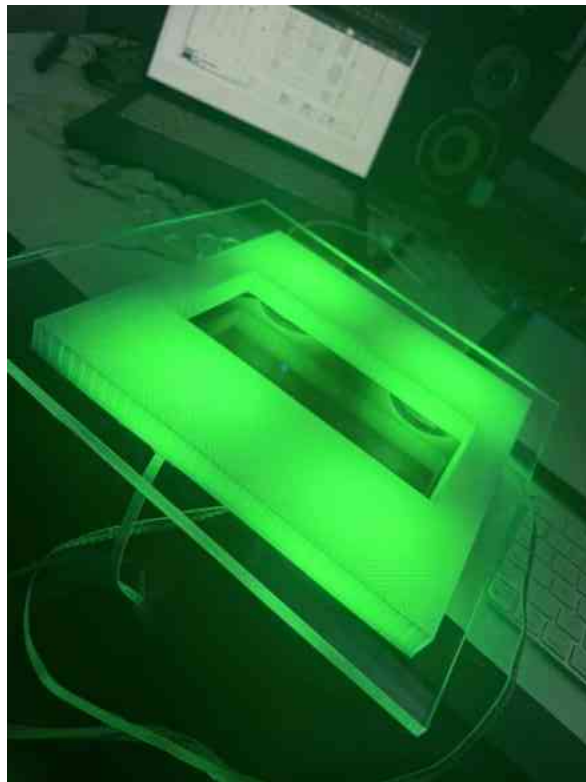
Had initially thought about Having a prototype that will light up the tiles depending on the proximity of the bus. As the bus approaches the stop all the lights will turn green and the following stop will have the lights move on to the next tile However, realized that this wasn't as effective as having a 1:1 scaled tile for presentation, so this considered as a prototype



These models were made from CAD and 3D printed and painted to give visual Depth and create an environmental scenario of users waiting at the bus stop

Tiles can be be various lengths can have multiple rows of tiles depending on how busy the route and frequency of buses that come along the route

# Prototyping



Tactile Cutouts and acrylic sheet with laser cutter  
Leaving gap in between about 100m for digit display

# Prototyping



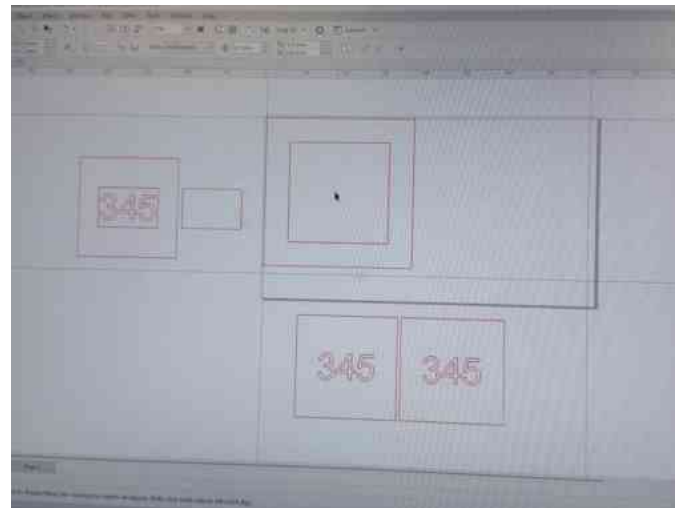
This was a prototype created to see Whether clear PLA would diffuse the light. It did an okay job however the Surface finish wasn't right as there were ridges and wavy lines. This didn't provide a clean look as the filament was clear but not frosted as I wanted it to be. The number cutout was created however the light did not shine through the numbers how I wanted it to.

# Gluing housing and top layer bracket



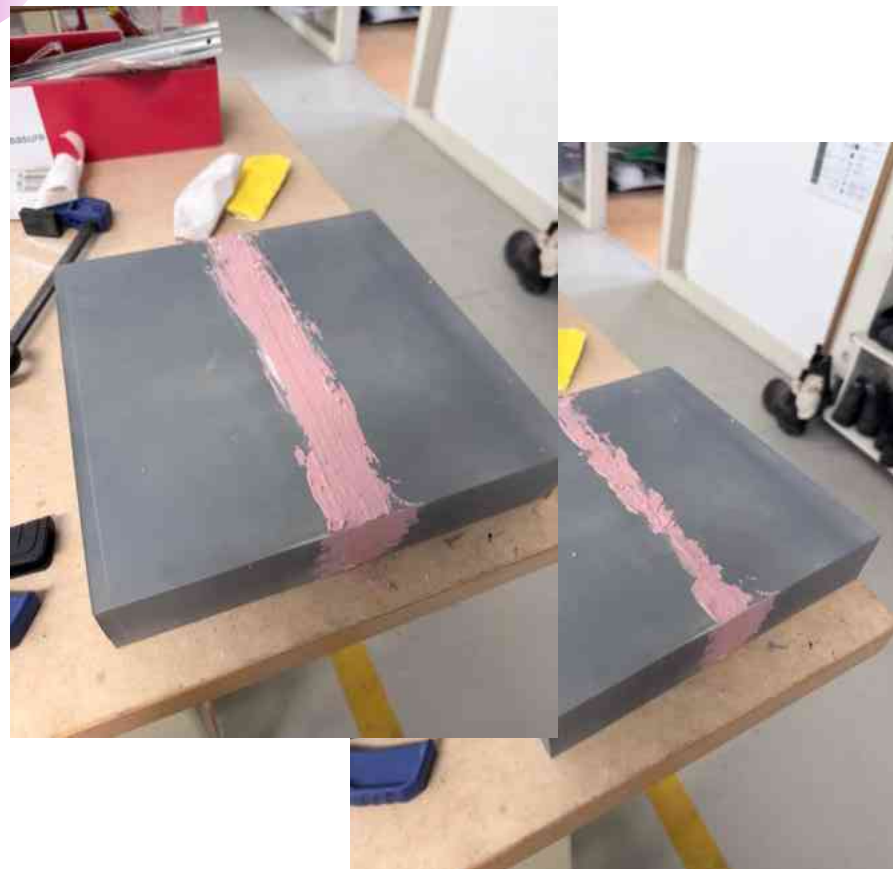
The overall housing has been made from PLA by a 3D printer using the CAD file however because the bed of the printer could not Accomodate 250 x 250 they had to be printed in sections and glued together. Before gluing, the components were Sanded down primed 2 times for a smooth finish and a clean surface.

# Laser Cutting Process



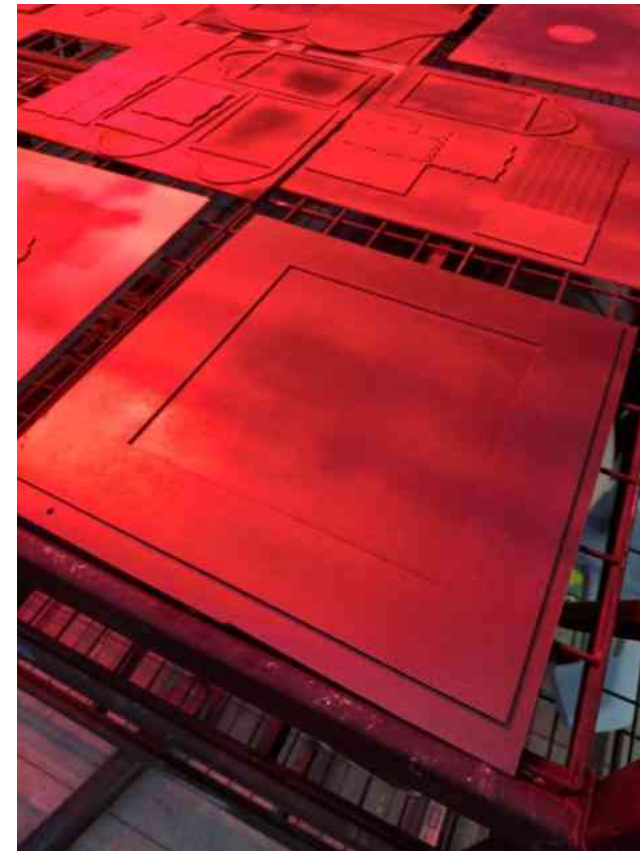
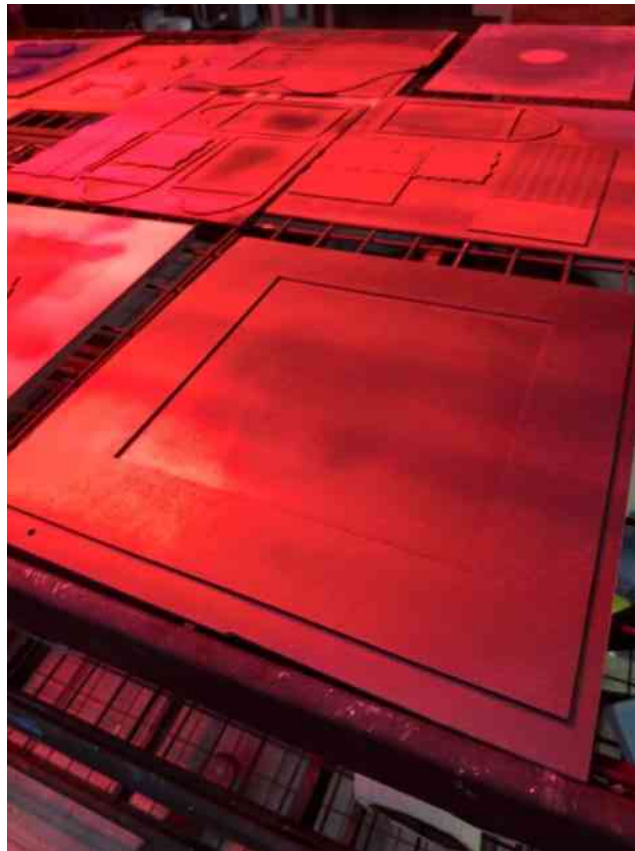
The top panel and the frosted sheet was created in Corel draw to be laser cut to fit proper to the housing dimensions I had cut sheets with the “345” cutout so that the light could be emitted with brightness. However, realized that it wouldn't Look clean at the top so created a top sheet with no cutouts which allowed for a clean outward appearance

# Housing Putty process



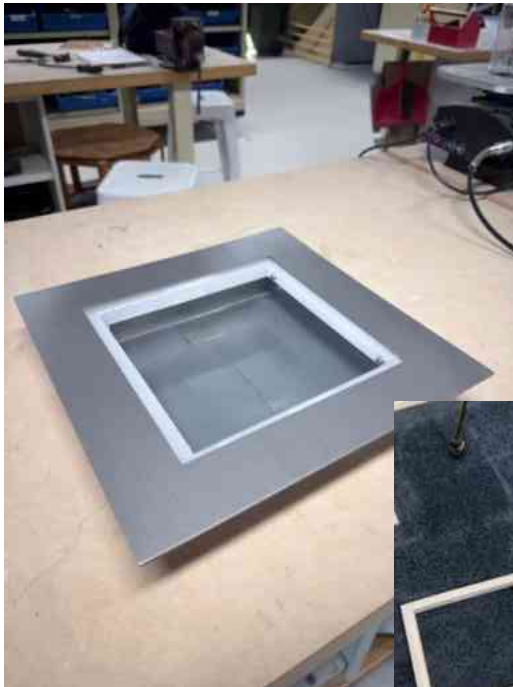
The housing had to be puttied for a smooth finish and so that the joint won't be seen later sanded down to remove Any lumps and excess putty

# Top Layer Process



Top layer was cut using the laser cutter with 2mm layer wood this was then primed and then spray painted With metallic paint. I ended going this route as the technicians did not want to handle steel bending and cutting. Would've of been ideal if a plasma cutter was available to achieve better metallic finish.

# Components gluing process



With everything cutout and spray painted it was ready to be glued together the top layer and the frosted sheet were inline with the middle of the bracket so that the glue can spread to both sides and it can all be one piece. Objects were placed Ontop so that setting can be proper, used Armalite glue for strength.

# Lighting Adjustability Process



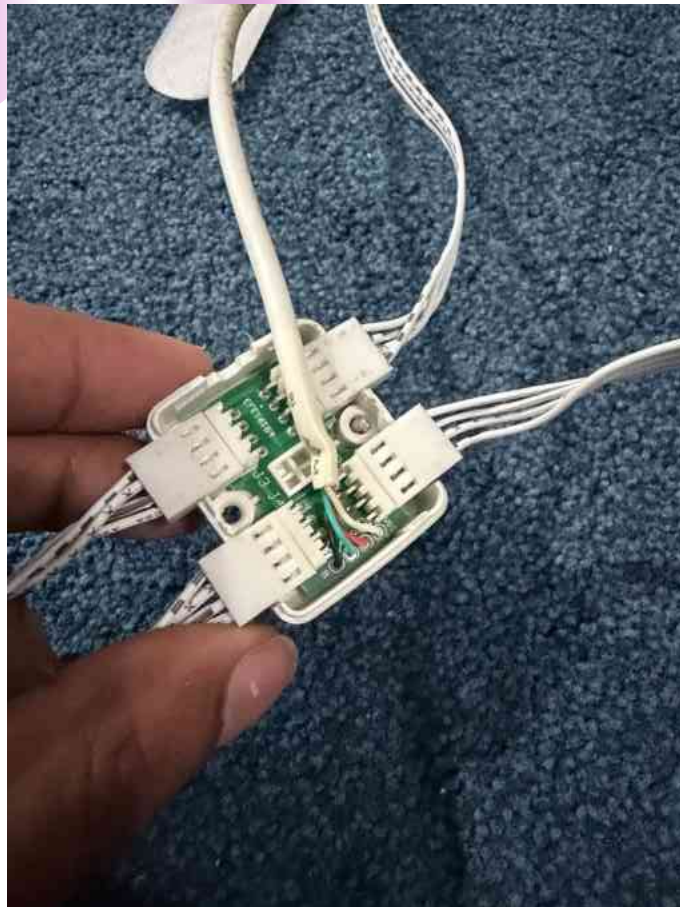
After everything has been put together the light were fixed in temporary positions to visualize overall lighting effect And was seen that diffusion of the light wasn't consistent in the left images and so the lights had to be given a gap so That diffusion could be consistent (right image).

# The Number lighting Process



Had to create a lighting number system so that the numbers can be displayed more effectively, I had fixed the numbers to “345” as the choice of number printed by PLA. This will sit under the frosted sheet to allow diffusion of light. 2 AA batteries were used to emit the light through the numbers. But the light was too harsh and so the lights also needed to be So frosted sheets were cut into the numbers and this allowed proper diffusion (the right image).

# Number Light power Process



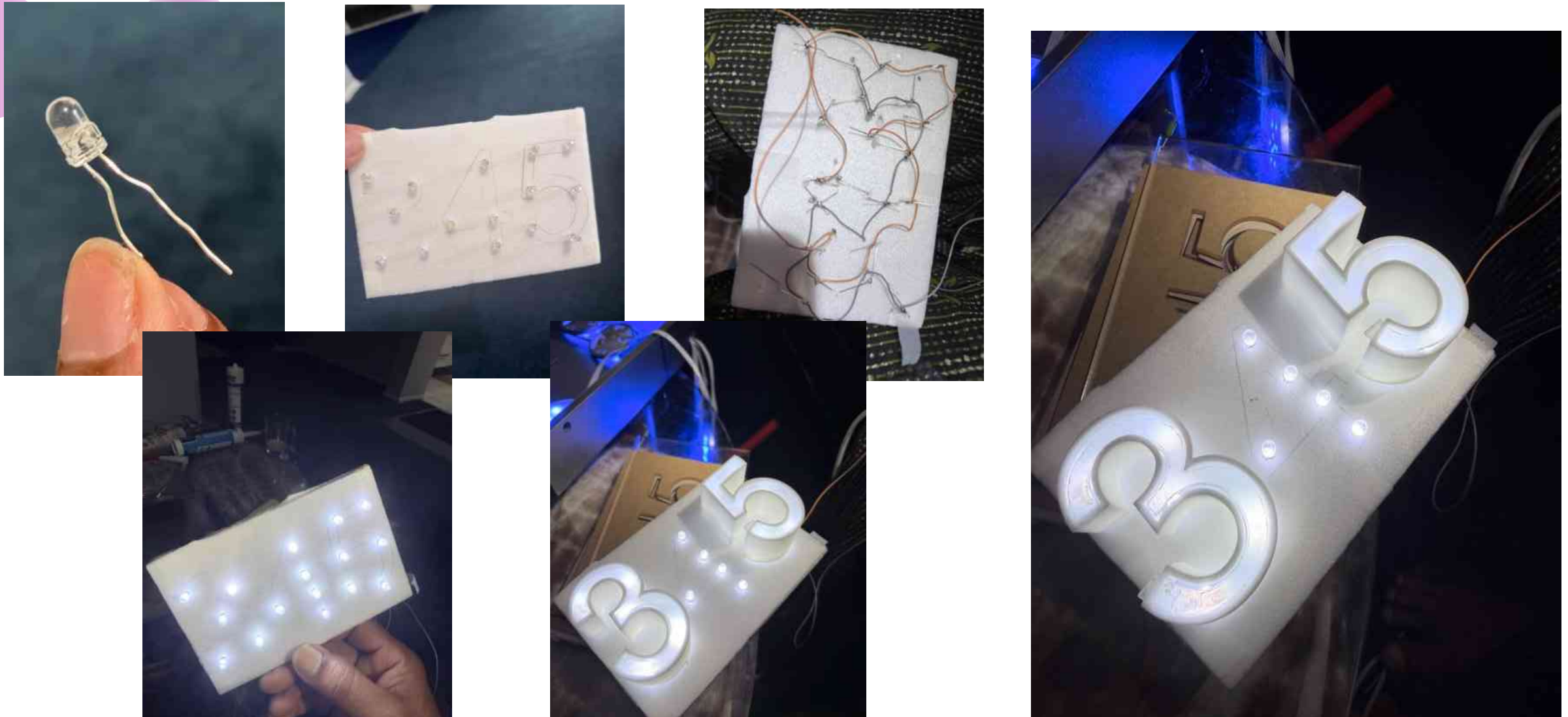
The colored lights were 12v power and so drawing a power line from the module was effective to get the number lights to be powered. The placement of the light pad were placed evenly so that the light was not wasted on the walls Of the housing.

# Tactile feature Process



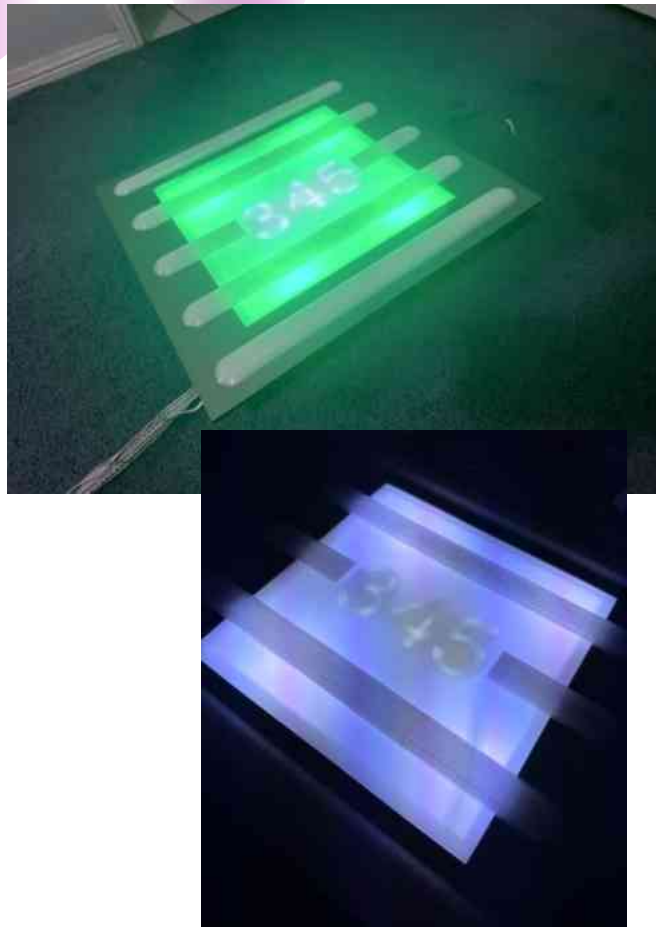
The tactile features were created by clear TPU so that light still can be emitted and there will be a soft Spongy feeling, these were made from the 3D printer and were taped on the tile with double sided tape this was to Reduced any over spillage if super glue was used.

# LED Number Setup Process



The light system was quite complex and took a lot of time as there was a fair bit of electronic mishaps making sure that the LEDs could handle this and not overloading them. The layout of the numbers were first drawn up so that positions of the LEDs can be identified and placed correctly underneath the number housings. Styrofoam was used to fix the LEDs.

# Tile Testing Process



The top layer was pinned to the housing for easy accessibility, tested if everything was in line especially the number Setup, this was glued down to prevent it from moving around. The tile prototype was good to go and everything was ready To present for presentation day

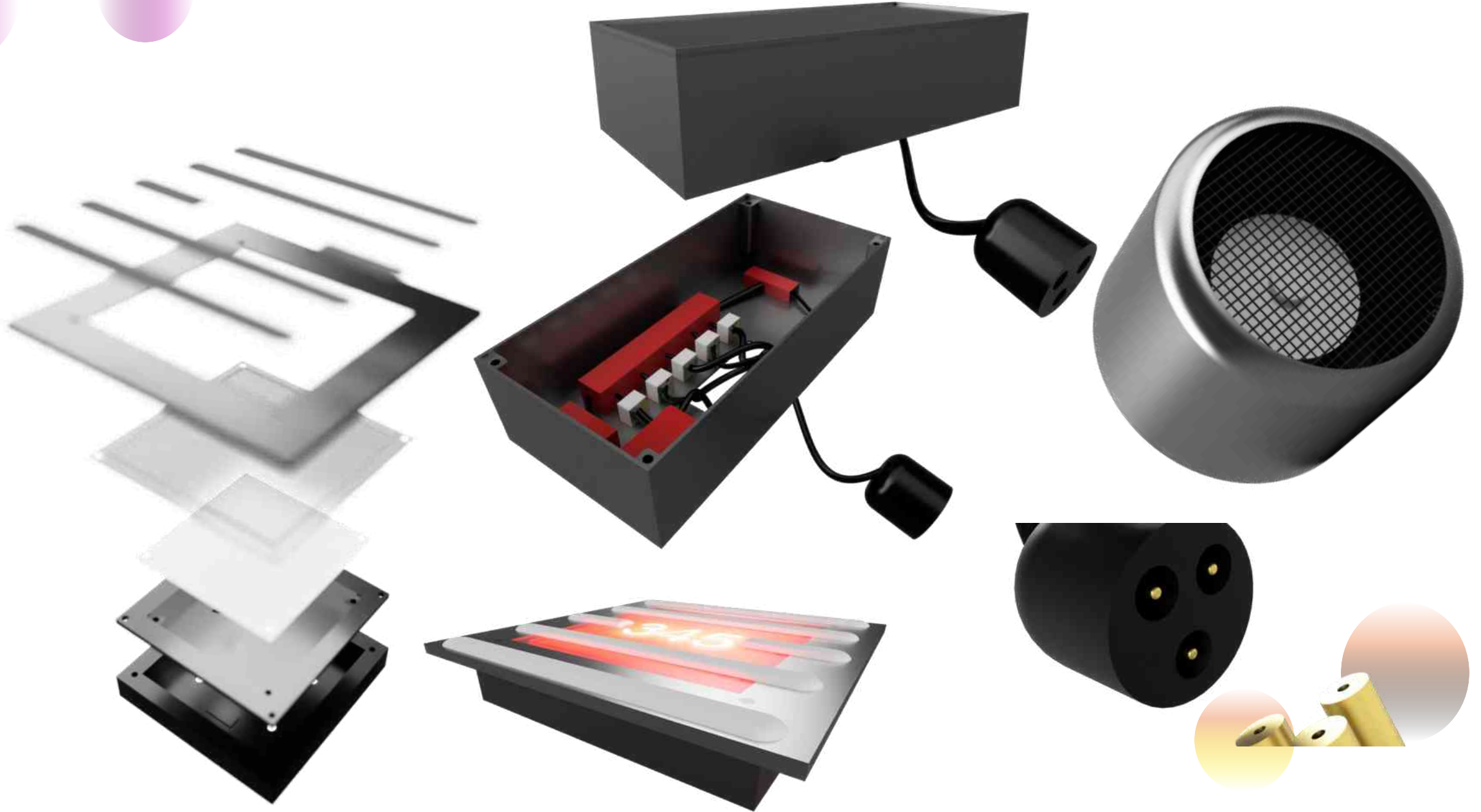
# Final Prototype Images



# CAD Renders



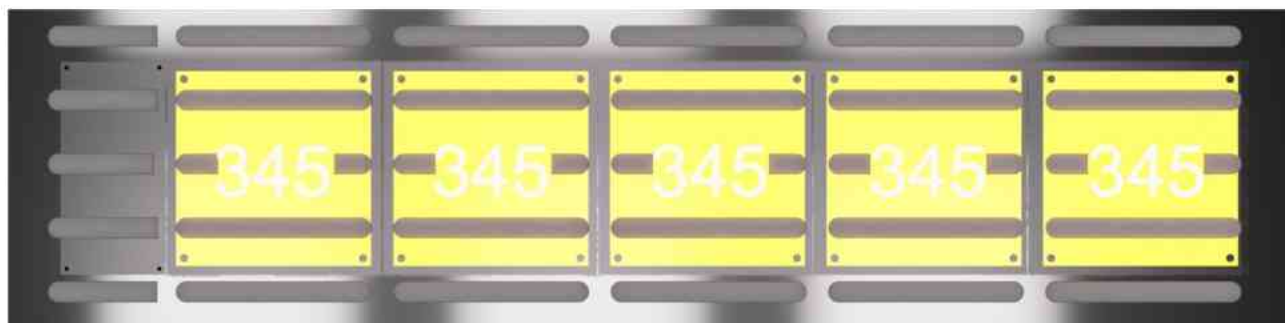
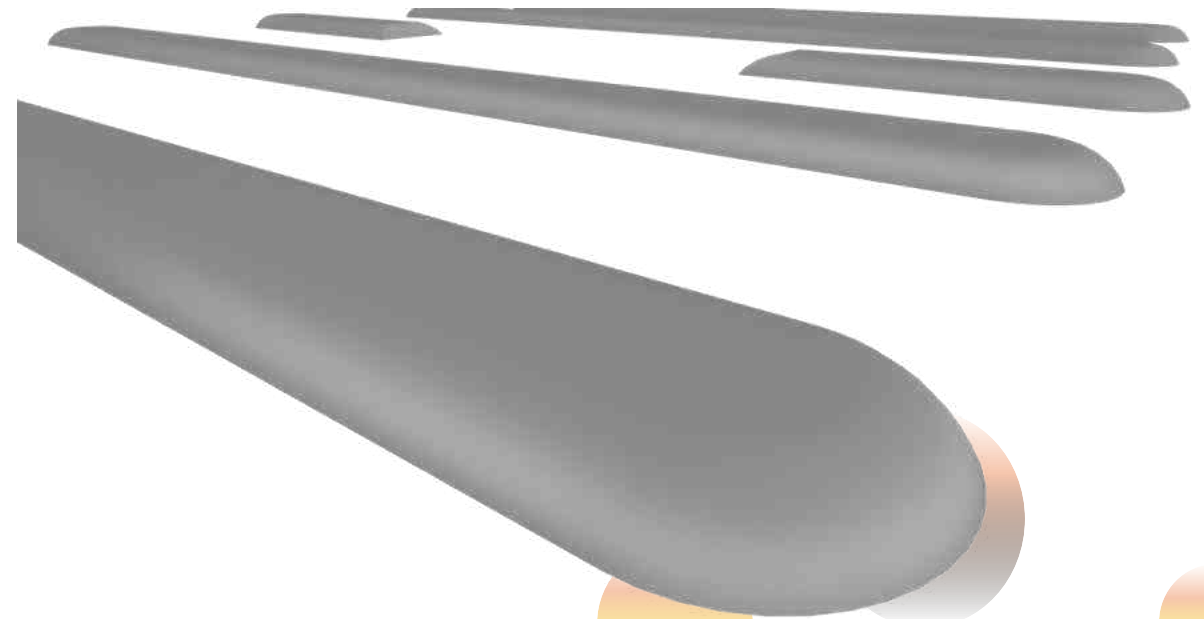
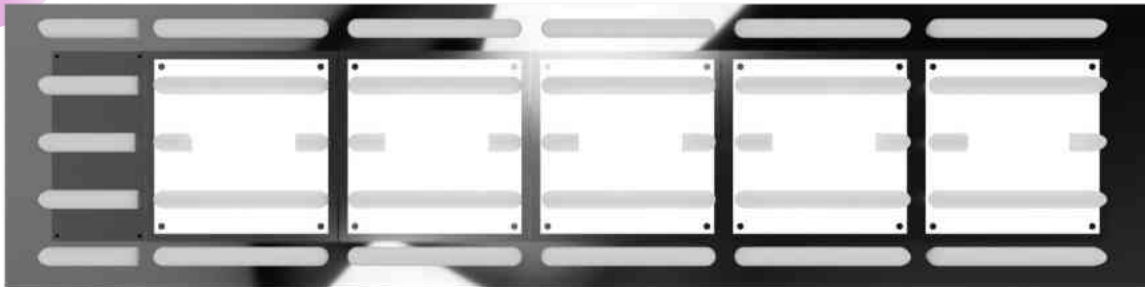
# CAD Renders



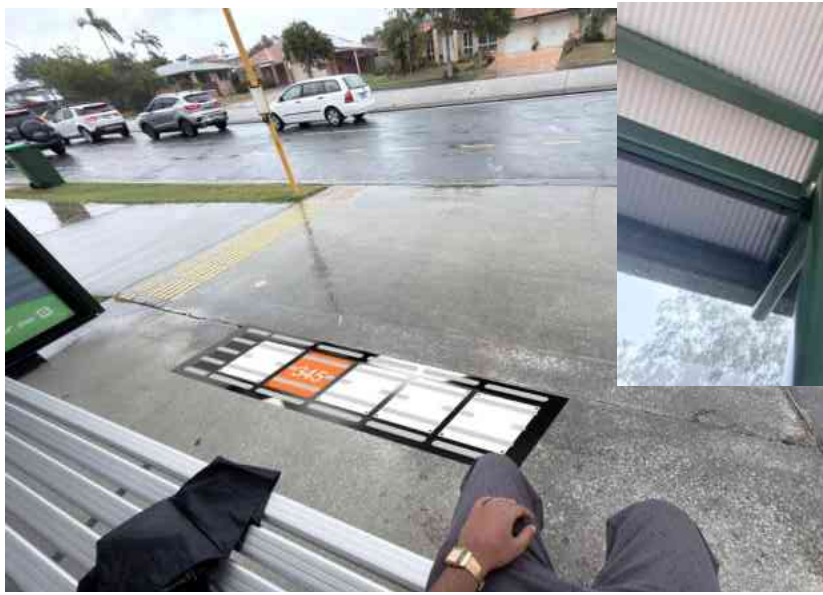
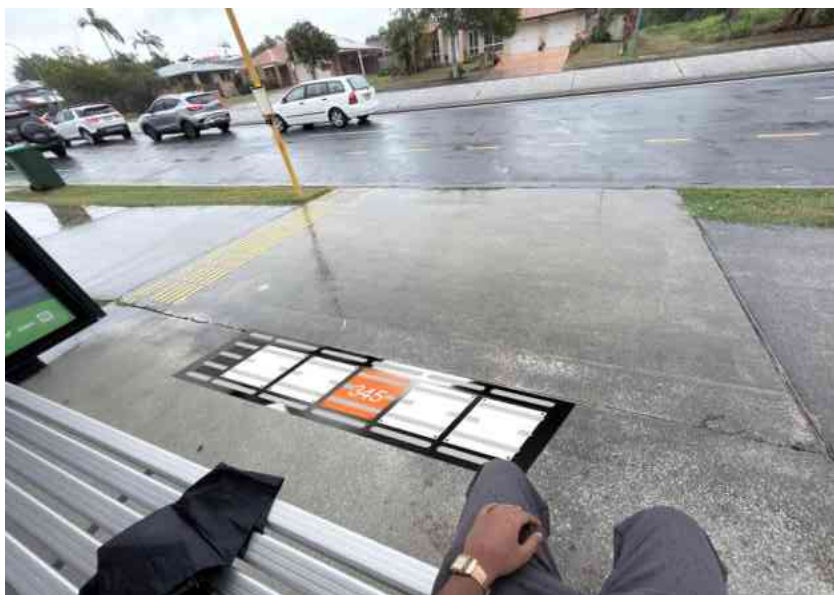
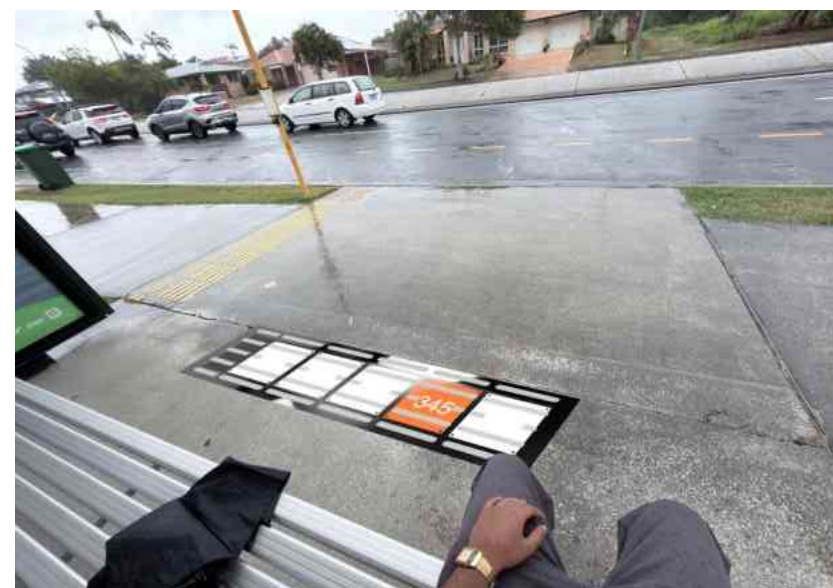
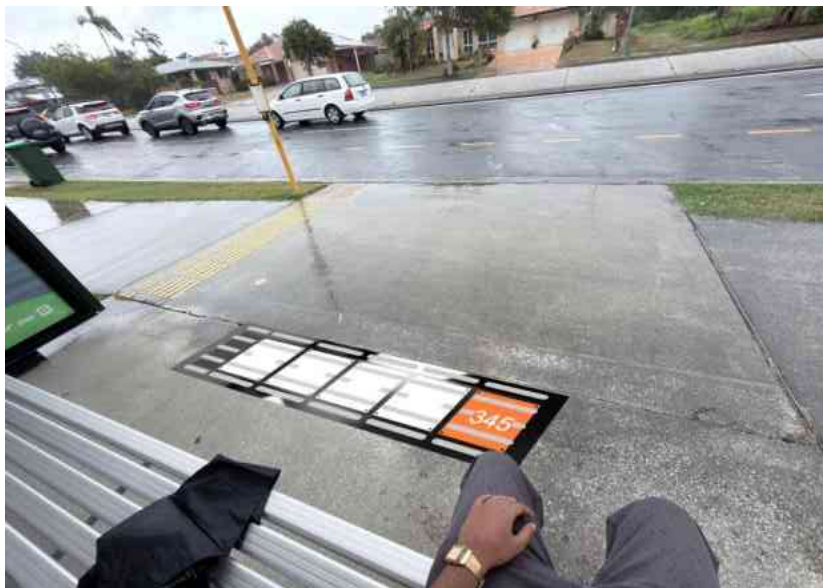
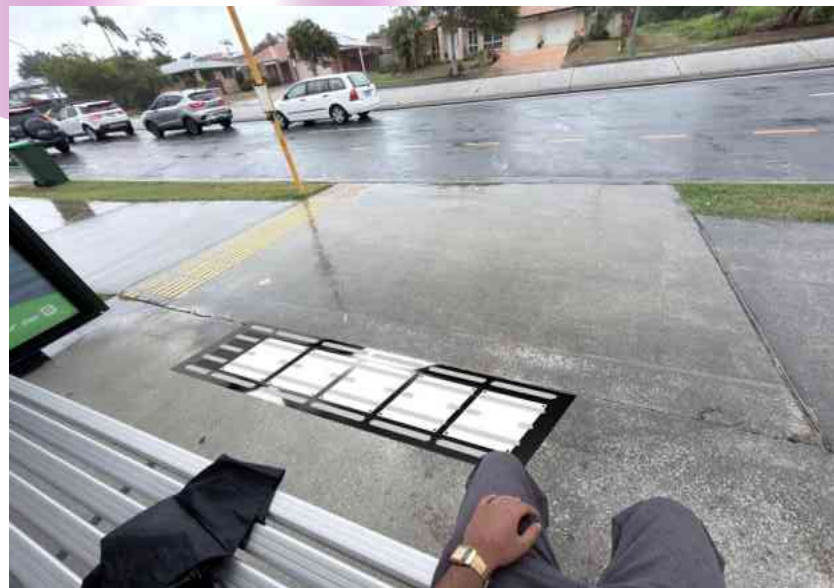
The image displays a variety of 3D CAD renders of mechanical and electrical components. At the top center is a black rectangular box. Below it, a disassembled assembly shows multiple layers, including a black frame, a white layer, and a black base. To the right, a black cylindrical component with a mesh screen is shown. Below this, a black cylindrical component with three gold pins is visible. At the bottom center, a black rectangular component with three red heating elements is shown. The background is white with several purple and yellow spheres scattered around.

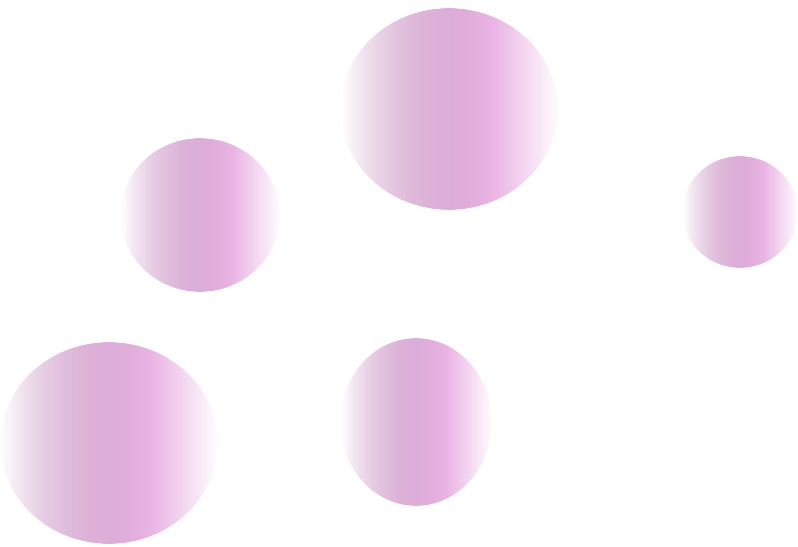


# CAD Renders

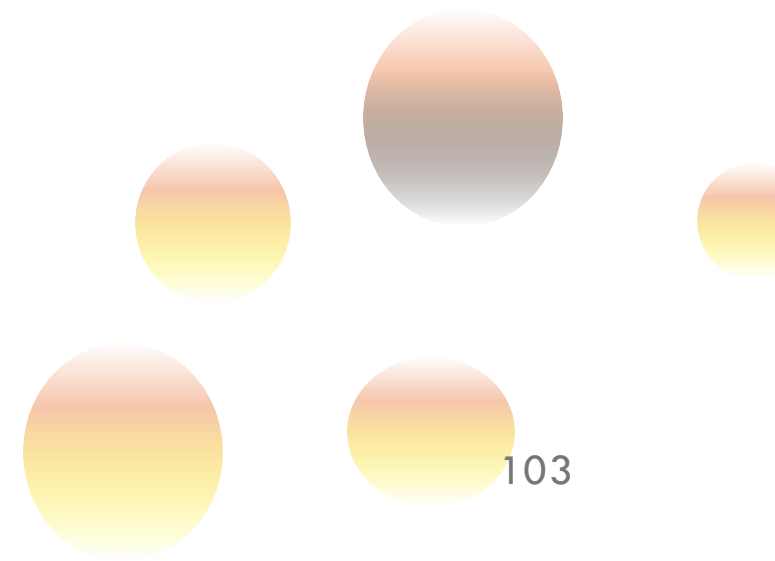


# In Context Renders



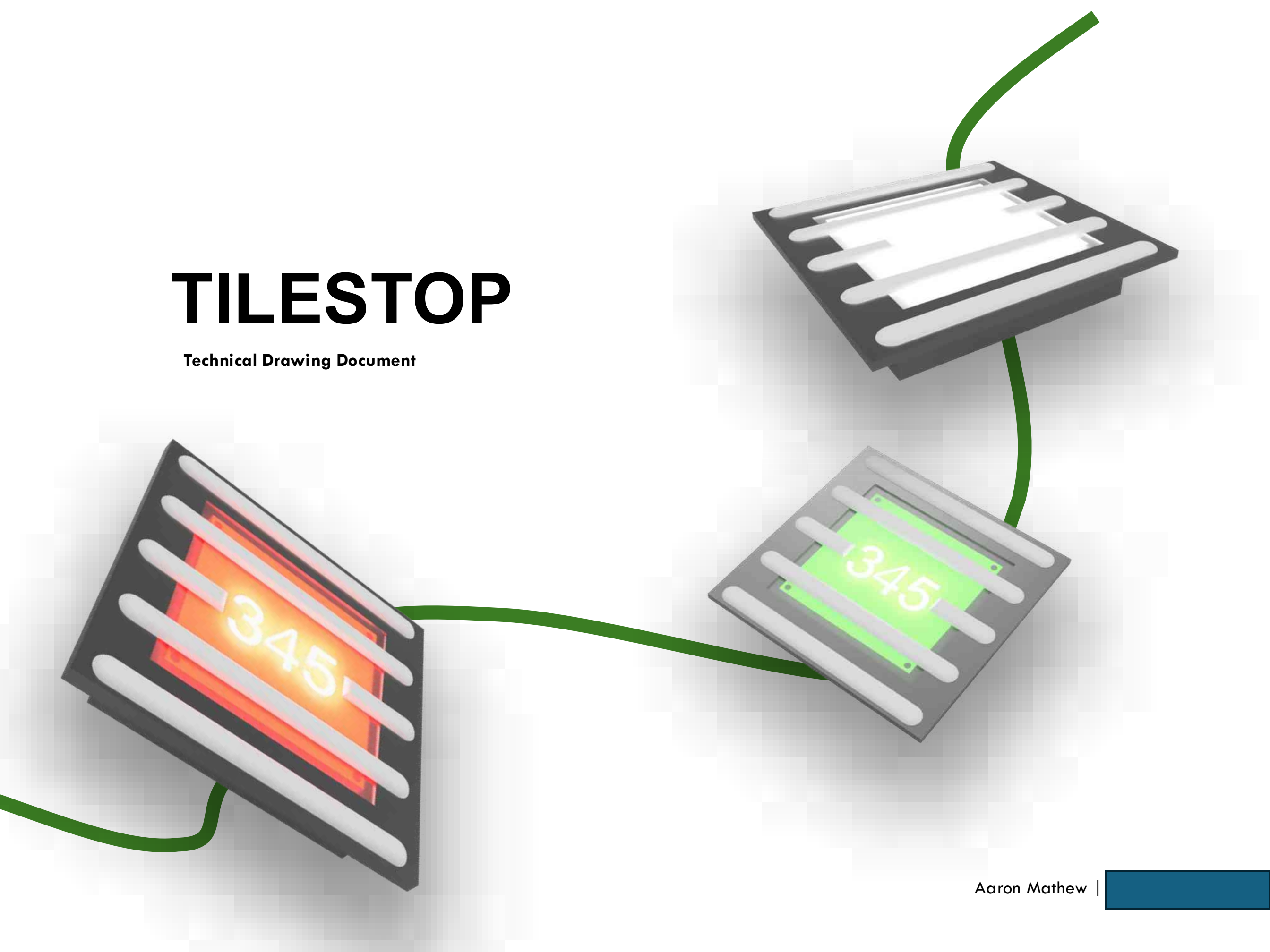


# Technical Drawings



# TILESTOP

Technical Drawing Document



A

B

C

D

E

F

G

H

A

B

C

D

E

G

H

1

1

2

2

3

3

4

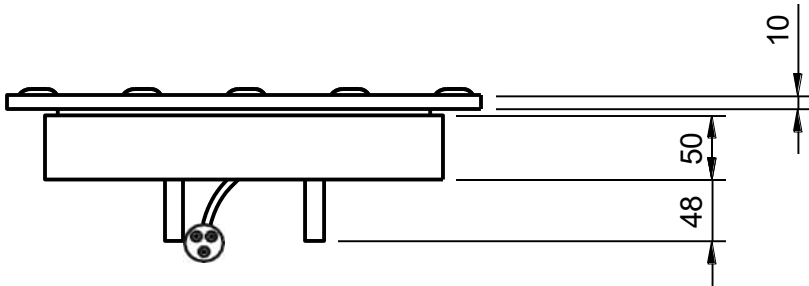
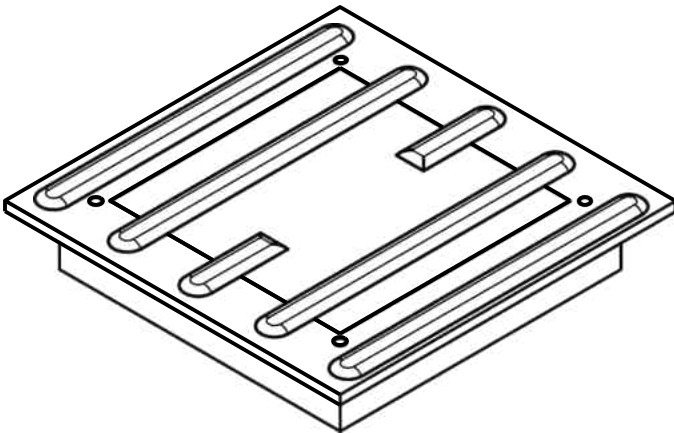
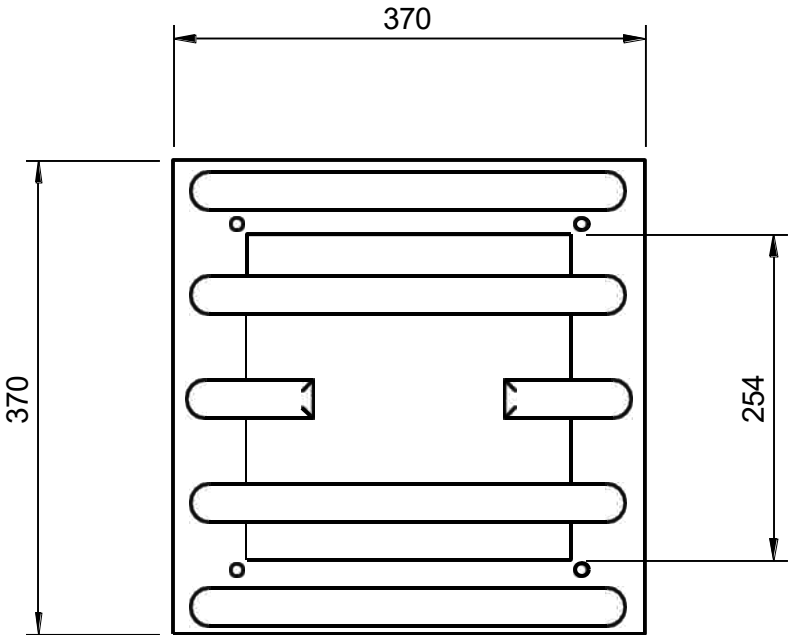
4

5

5

6

6



TITLE  
**TILESTOP**

PART/ASSY  
NUMBER

REV. **1**

SHEET **1 OF 10**

MATERIAL  
**316 Stainless**  
COLOUR  
Natural Material (silver)

FINISH  
**Satin**

DRAWN BY  
**Aaron Mathew**

DATE  
27/10/25

DRAWING NO.

GENERA  
L  
TOLERANCE  
S  
0.000  
5  
0.00  
0.0  
0  
ANGLE 0.5

**1:5**

**A3**

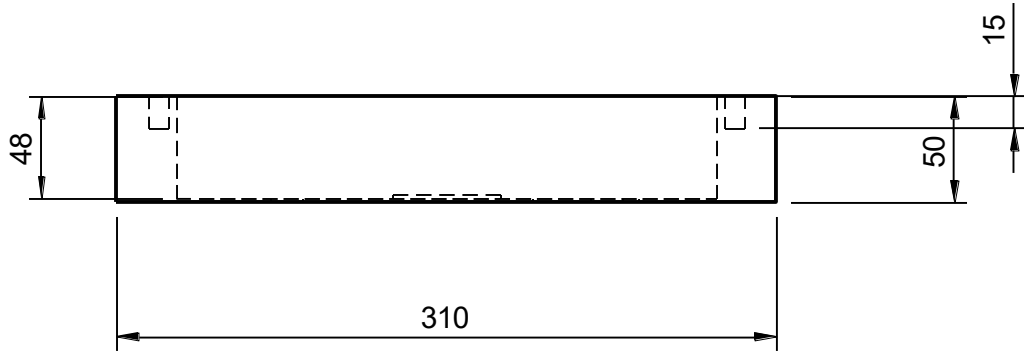
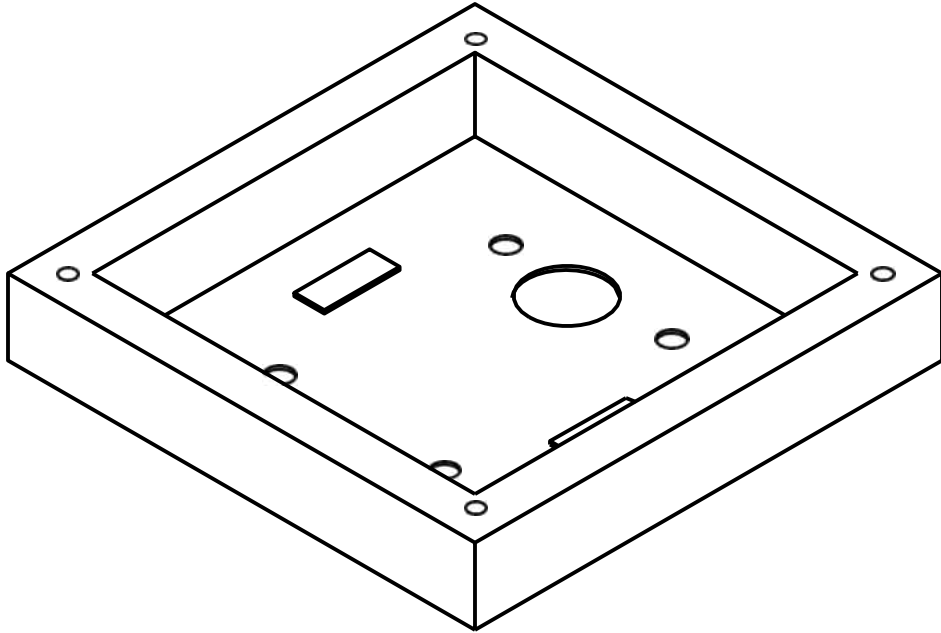
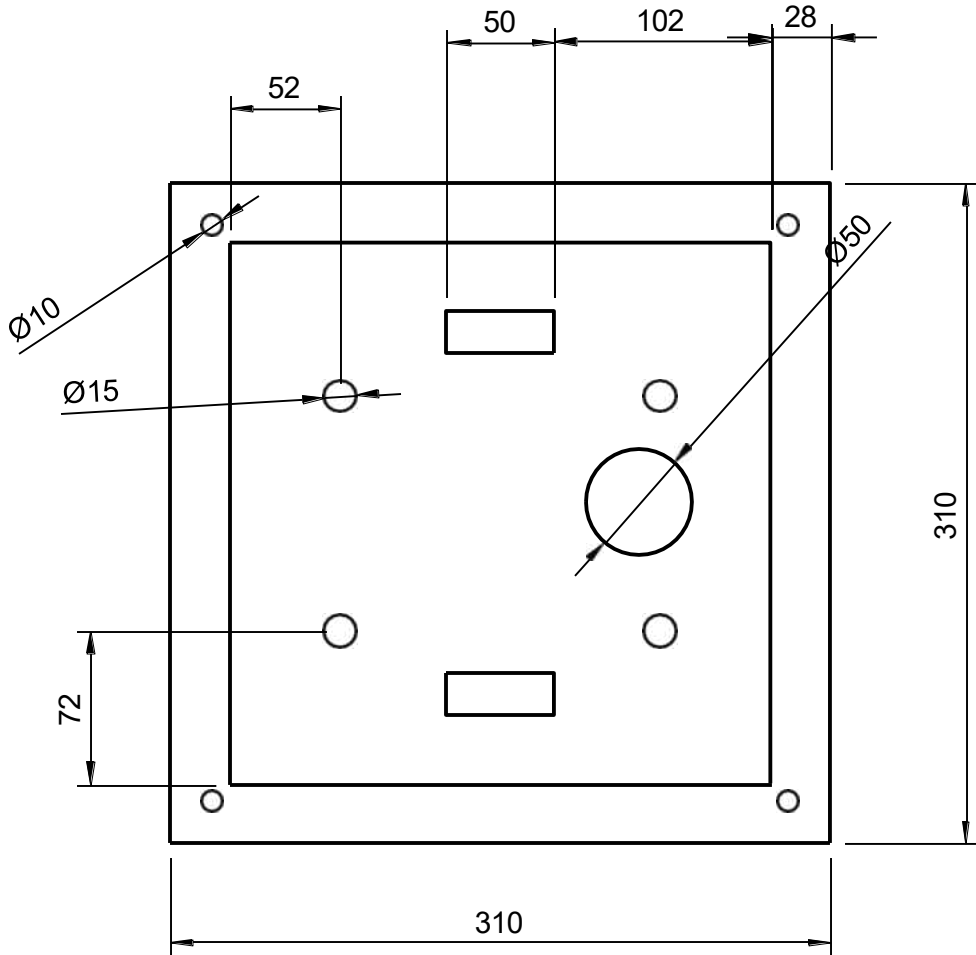
DO  
NOT  
SCALE  
DRAWIN  
G

C **Aaron Mathew**



ALL  
DIMS.  
IN  
MM





|                                 |               |                      |
|---------------------------------|---------------|----------------------|
| TITLE<br><b>TILE HOUSING</b>    |               |                      |
| PART/ASSY<br>NUMBER<br><b>9</b> | REV. <b>1</b> | SHEET <b>2 OF 10</b> |

|                                     |
|-------------------------------------|
| MATERIAL<br><b>316 Stainless</b>    |
| COLOUR<br>Natural Material (silver) |
| FINISH<br><b>Satin</b>              |

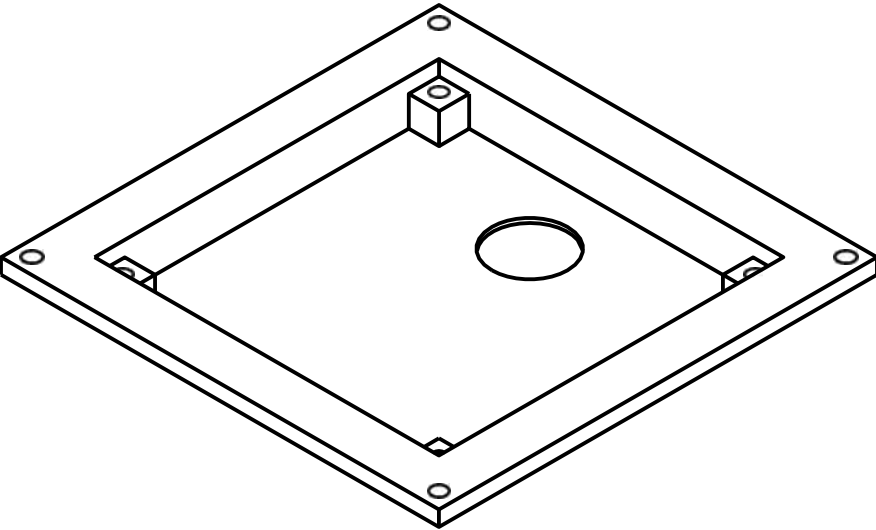
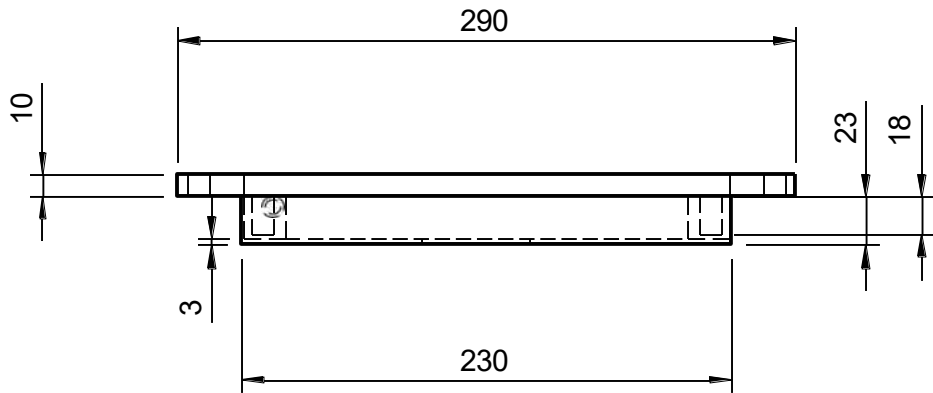
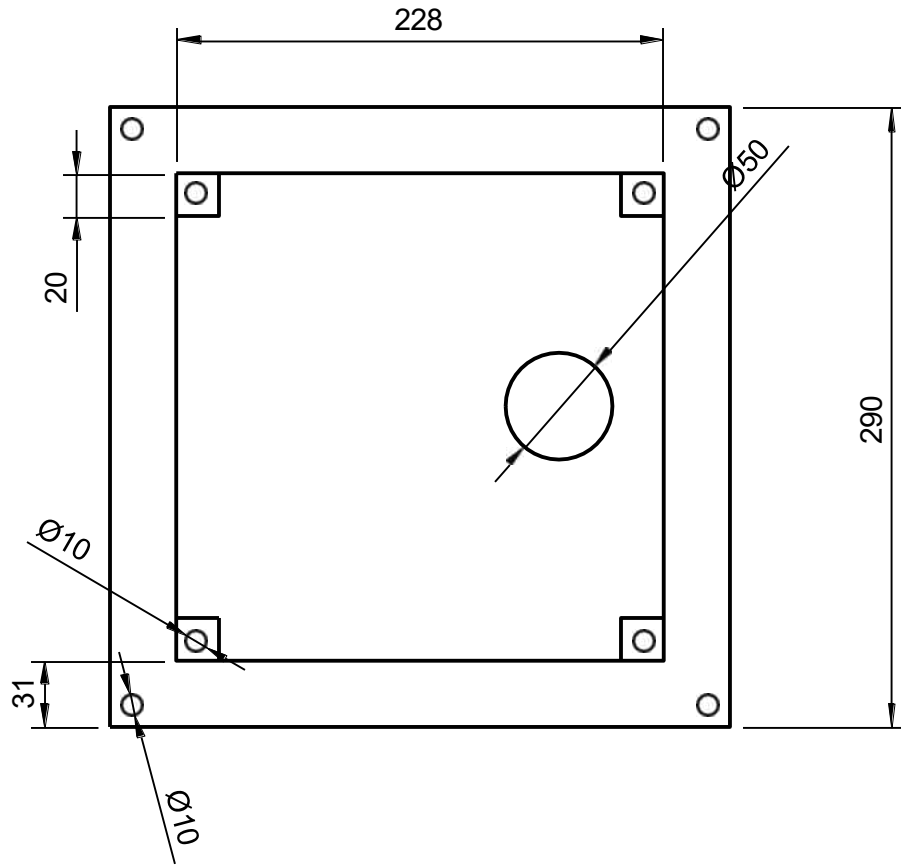
|                                 |
|---------------------------------|
| DRAWN BY<br><b>Aaron Mathew</b> |
| DATE<br>27/10/25                |
| DRAWING NO.<br>2                |

|                              |
|------------------------------|
| GENERAL TOLERANCES           |
| 0.000                        |
| 5 0.00 0.0 0 0.1 0.2 0.5 0.5 |
| ANGLE                        |

|                 |
|-----------------|
| <b>1:3</b>      |
| <b>A3</b>       |
| ALL DIMS. IN MM |

|                      |
|----------------------|
| DO NOT SCALE DRAWING |
|                      |

|                       |
|-----------------------|
| C <b>Aaron Mathew</b> |
|                       |



|                     |        |               |
|---------------------|--------|---------------|
| TITLE               |        |               |
| LIGHT HOUSING       |        |               |
| PART/ASSY<br>NUMBER | REV. 1 | SHEET 3 OF 10 |
| 7                   |        |               |

|          |                           |
|----------|---------------------------|
| MATERIAL | 316 Stainless             |
| COLOUR   | Natural Material (silver) |
| FINISH   | Satin                     |

|             |              |
|-------------|--------------|
| DRAWN BY    | Aaron Mathew |
| DATE        | 27/10/25     |
| DRAWING NO. | 7            |

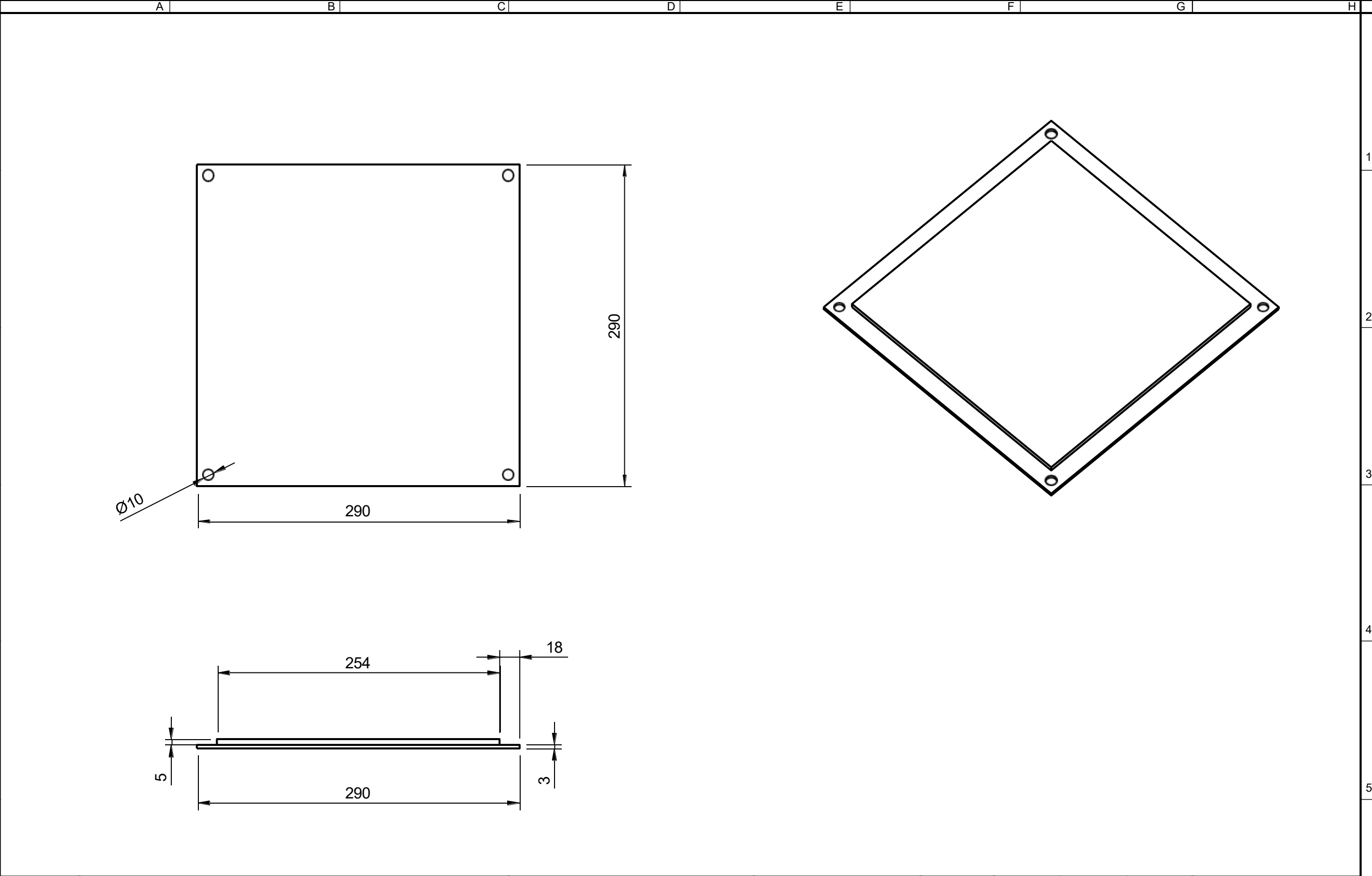
|                    |       |
|--------------------|-------|
| GENERAL TOLERANCES |       |
| SIZE               | 0.000 |
| 5                  | ± 0.0 |
| 0.00               | ± 0.1 |
| 0.0                | ± 0.2 |
| 0                  | ± 0.5 |
| ANGLE              | 0.5   |

|     |
|-----|
| 1:3 |
|     |

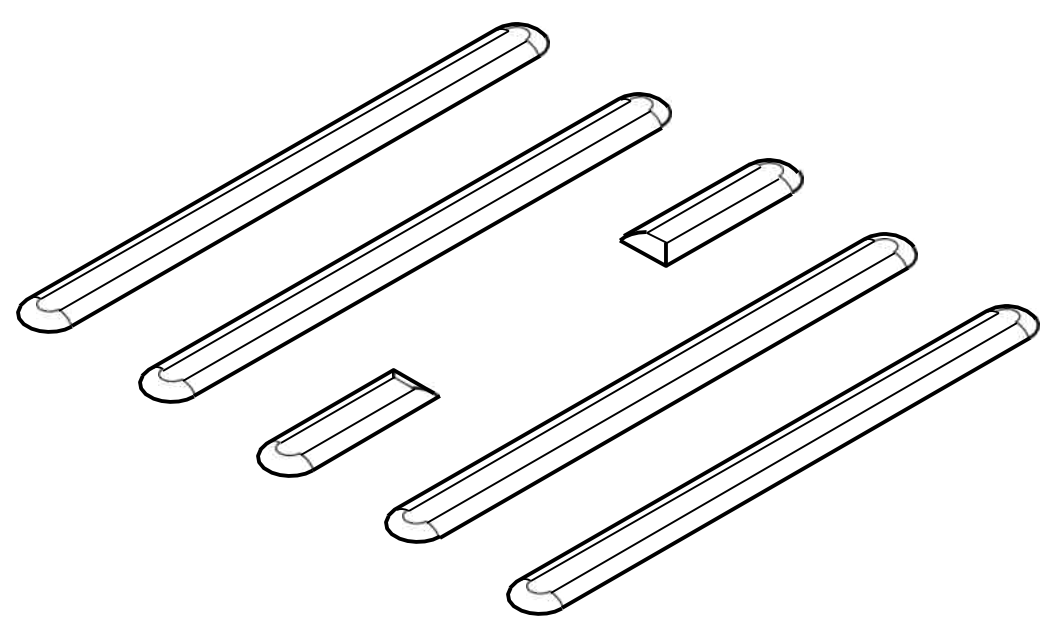
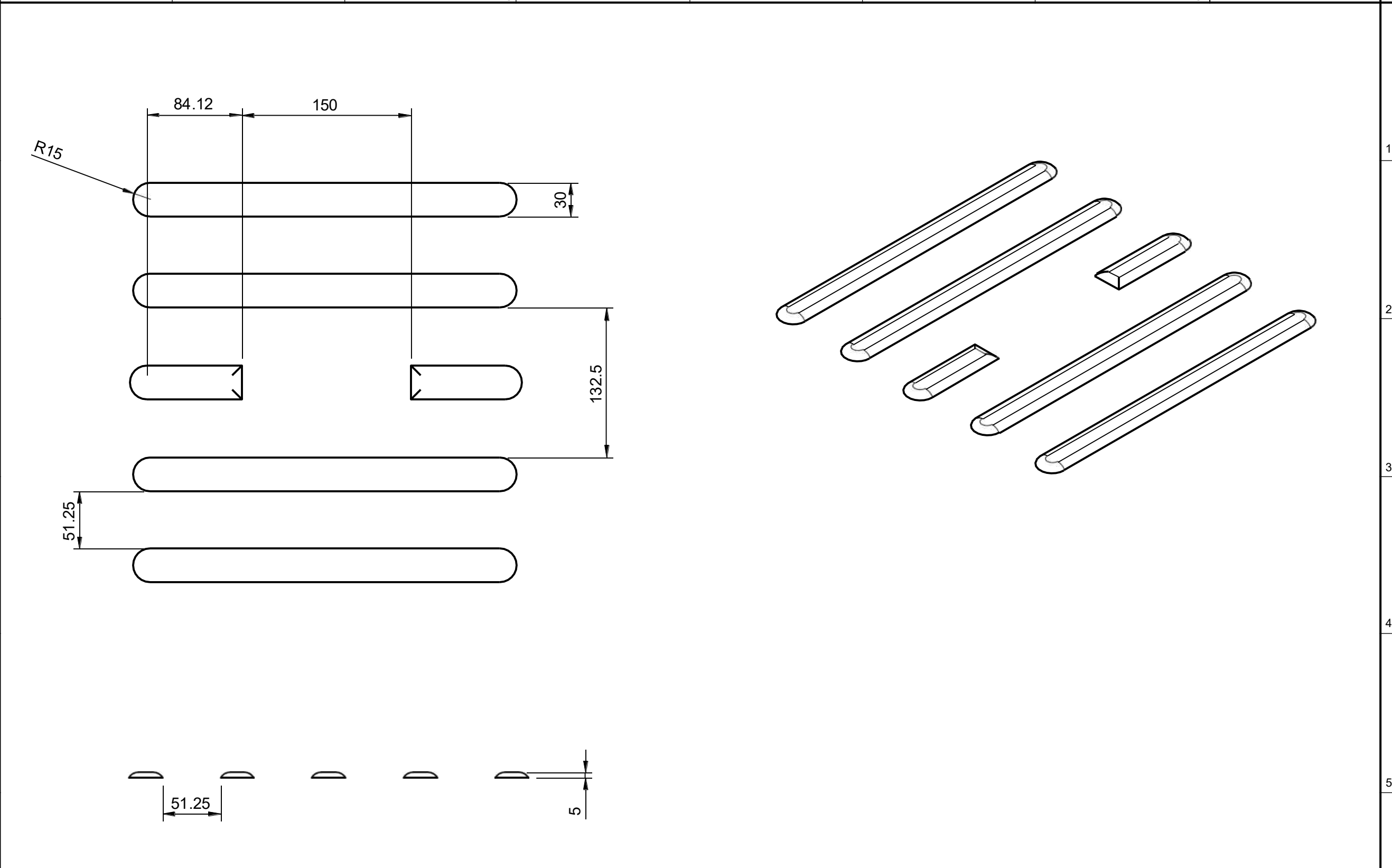
|                    |
|--------------------|
| A3                 |
| ALL DIMS.<br>IN MM |

|                            |
|----------------------------|
| DO NOT<br>SCALE<br>DRAWING |
|                            |

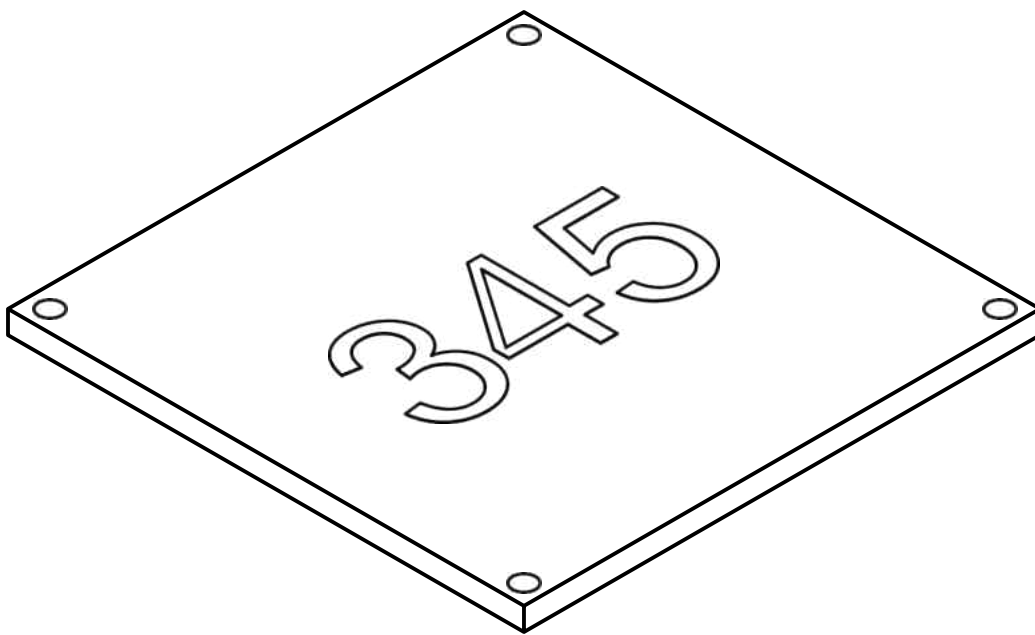
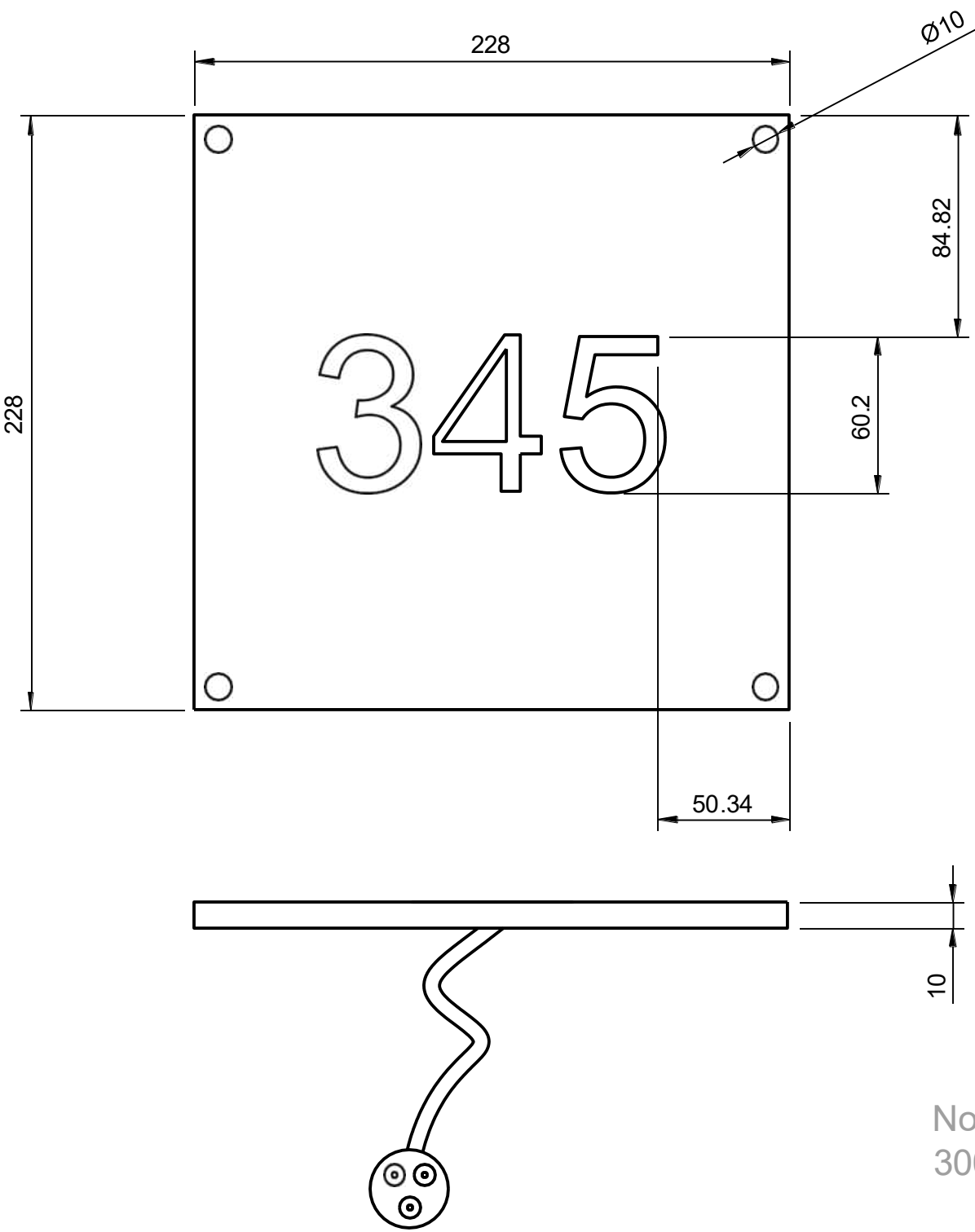
|                |
|----------------|
| C Aaron Mathew |
|                |



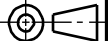
|                                                                                    |                     |      |         |               |              |                               |     |    |                               |                                                                                       |                                                                                       |
|------------------------------------------------------------------------------------|---------------------|------|---------|---------------|--------------|-------------------------------|-----|----|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  | TITLE               |      |         | MATERIAL      | DRAWN BY     | GENERA<br>L<br>TOLERANCE<br>S | 1:3 | A3 | DO<br>NOT<br>SCALE<br>DRAWING |  |  |
|                                                                                    | POLYCARBONATE LENS  |      |         | Polycarbonate | Aaron Mathew |                               |     |    |                               |                                                                                       |                                                                                       |
|                                                                                    | PART/ASSY<br>NUMBER | REV. | SHEET   | COLOUR        | DATE         |                               |     |    |                               |                                                                                       |                                                                                       |
|                                                                                    | 4                   | 1    | 4 OF 10 | translucent   | 27/10/25     | 0.000                         |     |    |                               |                                                                                       |                                                                                       |
|                                                                                    |                     |      |         | FINISH        | DRAWING NO.  | 5                             |     |    |                               |                                                                                       |                                                                                       |
|                                                                                    |                     |      |         | Frosted       | 4            | 0.00                          |     |    |                               |                                                                                       |                                                                                       |
|                                                                                    |                     |      |         |               |              | 0.0                           |     |    |                               |                                                                                       |                                                                                       |
|                                                                                    |                     |      |         |               |              | 0                             |     |    |                               |                                                                                       |                                                                                       |
|                                                                                    |                     |      |         |               |              | ANGLE                         | 0.5 |    |                               |                                                                                       |                                                                                       |

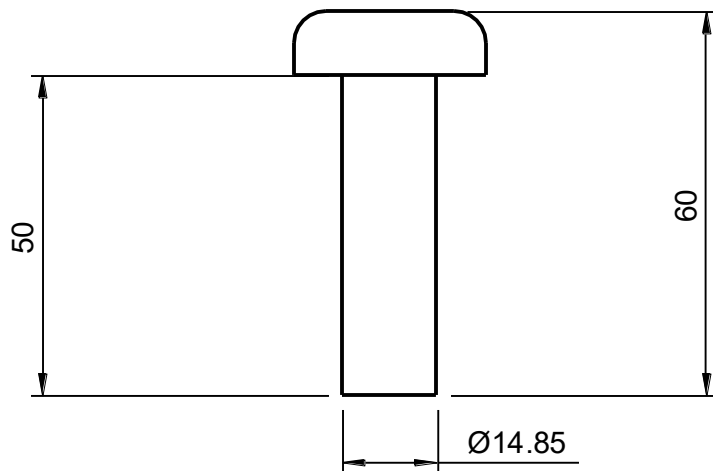
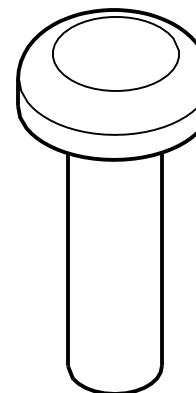
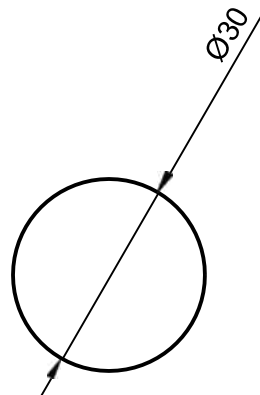


|                                                                                    |              |  |        |                           |        |              |             |                    |     |    |                      |                                                                                       |                                                                                       |  |
|------------------------------------------------------------------------------------|--------------|--|--------|---------------------------|--------|--------------|-------------|--------------------|-----|----|----------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|
|  | TITLE        |  |        | MATERIAL                  |        | DRAWN BY     |             | GENERAL TOLERANCES | 1:3 | A3 | DO NOT SCALE DRAWING |  |  |  |
|                                                                                    | TACTILE PADS |  |        | TPU                       |        | Aaron Mathew |             |                    |     |    |                      |                                                                                       |                                                                                       |  |
|                                                                                    |              |  |        | COLOUR                    |        | DATE         |             |                    |     |    |                      |                                                                                       |                                                                                       |  |
|                                                                                    |              |  |        | Natural Material (silver) |        | 27/10/25     |             |                    |     |    |                      |                                                                                       |                                                                                       |  |
| PART/ASSY NUMBER                                                                   |              |  | REV. 1 | SHEET 5 OF 10             | FINISH |              | DRAWING NO. |                    |     |    |                      |                                                                                       |                                                                                       |  |
| 1                                                                                  |              |  |        |                           | Satin  |              | 5           |                    |     |    |                      |                                                                                       |                                                                                       |  |
| A                                                                                  |              |  | B      |                           | C      |              | D           |                    | E   |    | G                    |                                                                                       | H                                                                                     |  |
|                                                                                    |              |  |        |                           |        |              |             |                    | F   |    |                      |                                                                                       |                                                                                       |  |



Note\* wire lead is about 300mm

|                                                                                    |                     |  |  |               |               |                 |  |                               |                  |    |                                   |                          |                         |                                                                                       |                                                                                       |
|------------------------------------------------------------------------------------|---------------------|--|--|---------------|---------------|-----------------|--|-------------------------------|------------------|----|-----------------------------------|--------------------------|-------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  | TITLE               |  |  | MATERIAL      |               | DRAWN BY        |  | GENERA<br>L<br>TOLERANCE<br>S | 1:2              | A3 | DO<br>NOT<br>SCALE<br>DRAWIN<br>G | C Aaron Mathew           |                         |                                                                                       |                                                                                       |
|                                                                                    | LED LIGHT BOARD     |  |  | 316 Stainless |               | Aaron Mathew    |  |                               |                  |    |                                   |                          |                         |                                                                                       |                                                                                       |
|                                                                                    | PART/ASSY<br>NUMBER |  |  | REV. 1        | SHEET 6 OF 10 | COLOUR<br>RGB   |  |                               | DATE             |    | 5<br>0.00<br>0.0<br>0<br>ANGLE    | 0.0<br>0.1<br>0.2<br>0.5 | ALL<br>DMS.<br>IN<br>MM |  |  |
|                                                                                    | 6                   |  |  |               |               | FINISH<br>Satin |  |                               | DRAWING NO.<br>6 |    |                                   |                          |                         |                                                                                       |                                                                                       |



TITLE

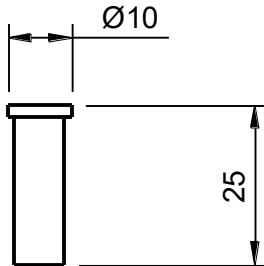
# CONCRETE 316 ANCHOR SCREW

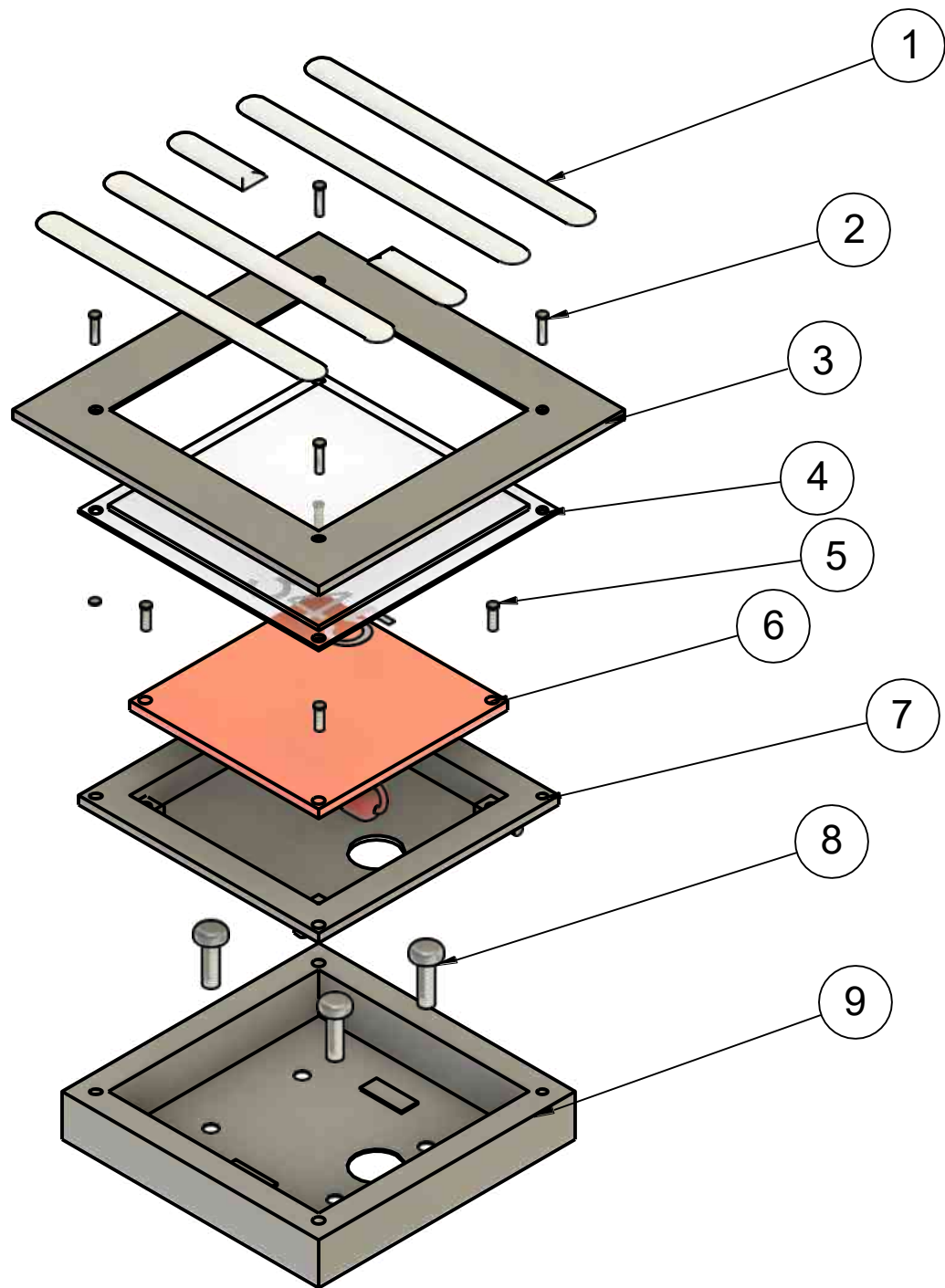
|                                 |               |                      |
|---------------------------------|---------------|----------------------|
| PART/ASSY<br>NUMBER<br><b>8</b> | REV. <b>1</b> | SHEET <b>7 OF 10</b> |
|---------------------------------|---------------|----------------------|

|                                     |                                 |
|-------------------------------------|---------------------------------|
| MATERIAL<br><b>316 Stainless</b>    | DRAWN BY<br><b>Aaron Mathew</b> |
| COLOUR<br>Natural Material (silver) | DATE<br>27/10/25                |
| FINISH<br><b>Satin</b>              | DRAWING NO.<br>7                |

|                                         |                          |                          |                                                                                       |                                                                                       |
|-----------------------------------------|--------------------------|--------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| GENERAL<br>L<br>TOLERANCE<br>S<br>0.000 | 1:1                      | A3                       | DO NOT<br>SCALE<br>DRAWING                                                            | C Aaron Mathew                                                                        |
| 0.0<br>5<br>0.00<br>0.0<br>0            | 0.0<br>0.1<br>0.2<br>0:5 | ALL<br>DIMS.<br>IN<br>MM |  |  |

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| BILL OF MATERIALS |                                |                     |          |
|-------------------|--------------------------------|---------------------|----------|
| PART #            | PART NAME                      | MATERIAL            | QUANTITY |
| 1                 | Tactile Pads                   | TPU                 | 5        |
| 2                 | M6 Countersunk Flush Top Panel | Stainless Steel     | 4        |
| 3                 | Top Flush Housing              | 316 Stainless Steel | 1        |
| 4                 | PolyCarbonate lens             | Polycarbonate       | 1        |
| 5                 | 316 M4 .12mm Light Fix Screws  | Stainless Steel     | 4        |
| 6                 | Llight Board                   |                     | 1        |
| 7                 | Tile Housing                   | 316 Stainless Steel | 1        |
| 8                 | 316 Concrete Anchor Screw      | Stainless Steel     | 4        |
| 9                 | TILE                           | 316 Stainless Steel | 1        |
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| TITLE             |        |                |
| BILL OF MATERIALS |        |                |
| PART/ASSY NUMBER  | REV. 1 | SHEET 10 OF 10 |

|          |               |
|----------|---------------|
| MATERIAL | 316 Stainless |
| COLOUR   |               |
| FINISH   | Satin         |

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| DRAWN BY    | Aaron Mathew |
| DATE        | 27/10/25     |
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| GENERAL TOLERANCES |
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| 0.00 ± 0.1         |
| 0.0 ± 0.2          |
| 0 ± 0.5            |
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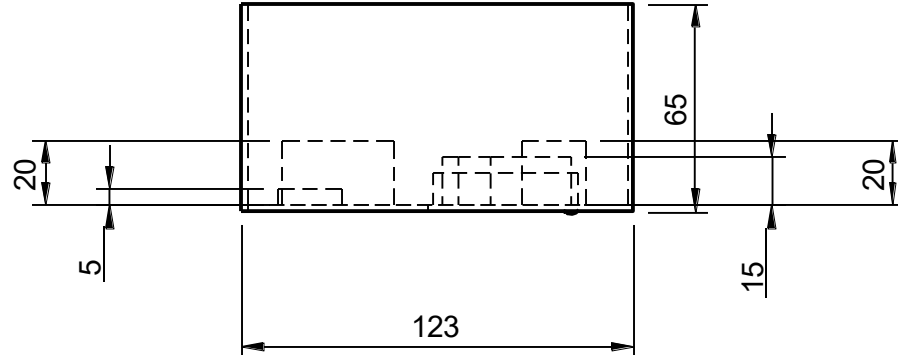
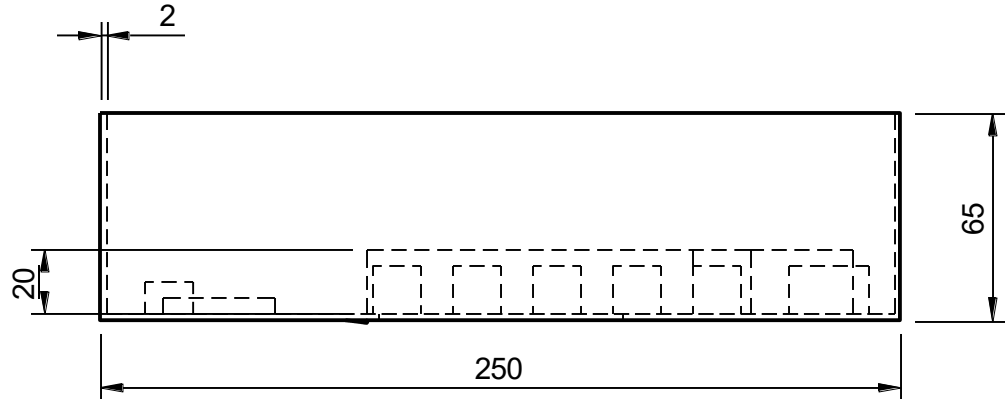
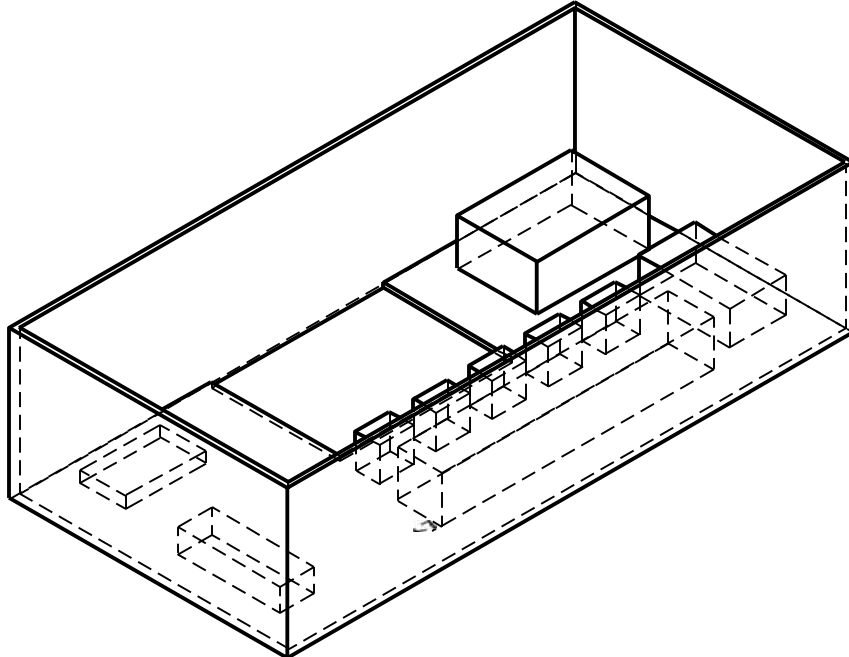
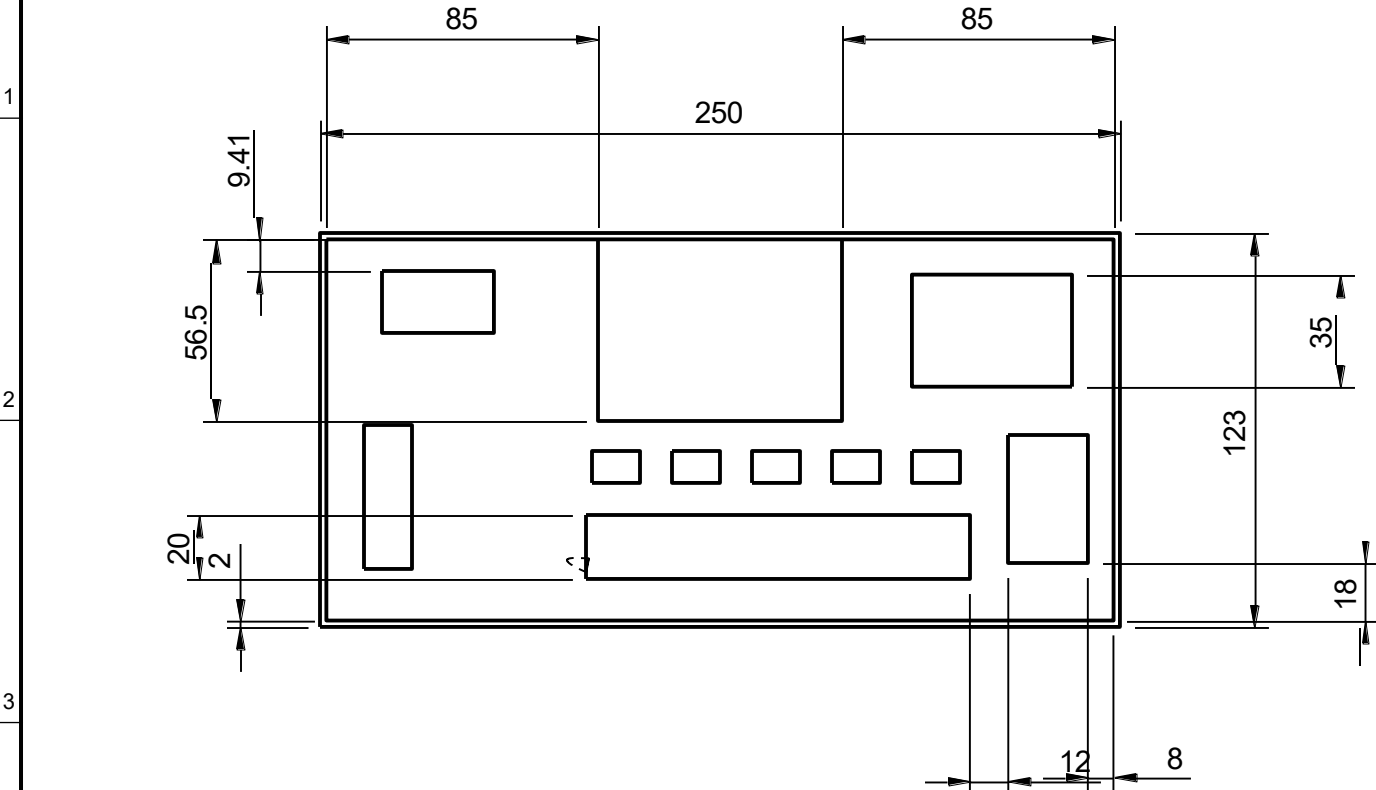
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| TITLE            |        |                |
| SERVICE BOX      |        |                |
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|----------|---------------------------|
| MATERIAL | 316 Stainless             |
| COLOUR   | Natural Material (silver) |
| FINISH   | Satin                     |

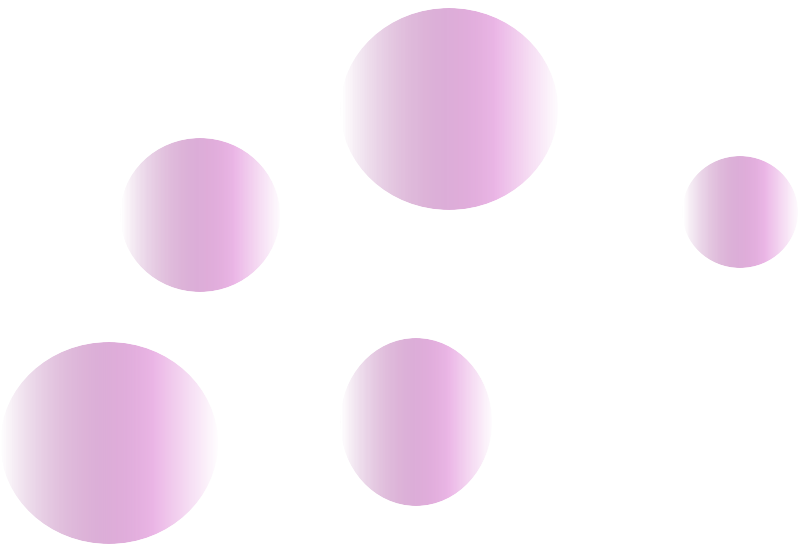
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| DRAWN BY    | Aaron Mathew |
| DATE        | 27/10/25     |
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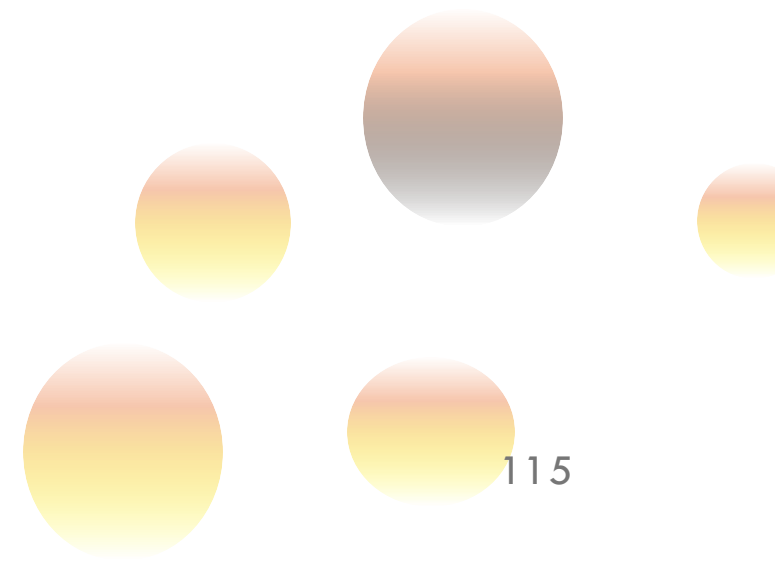
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# Presentation Slides

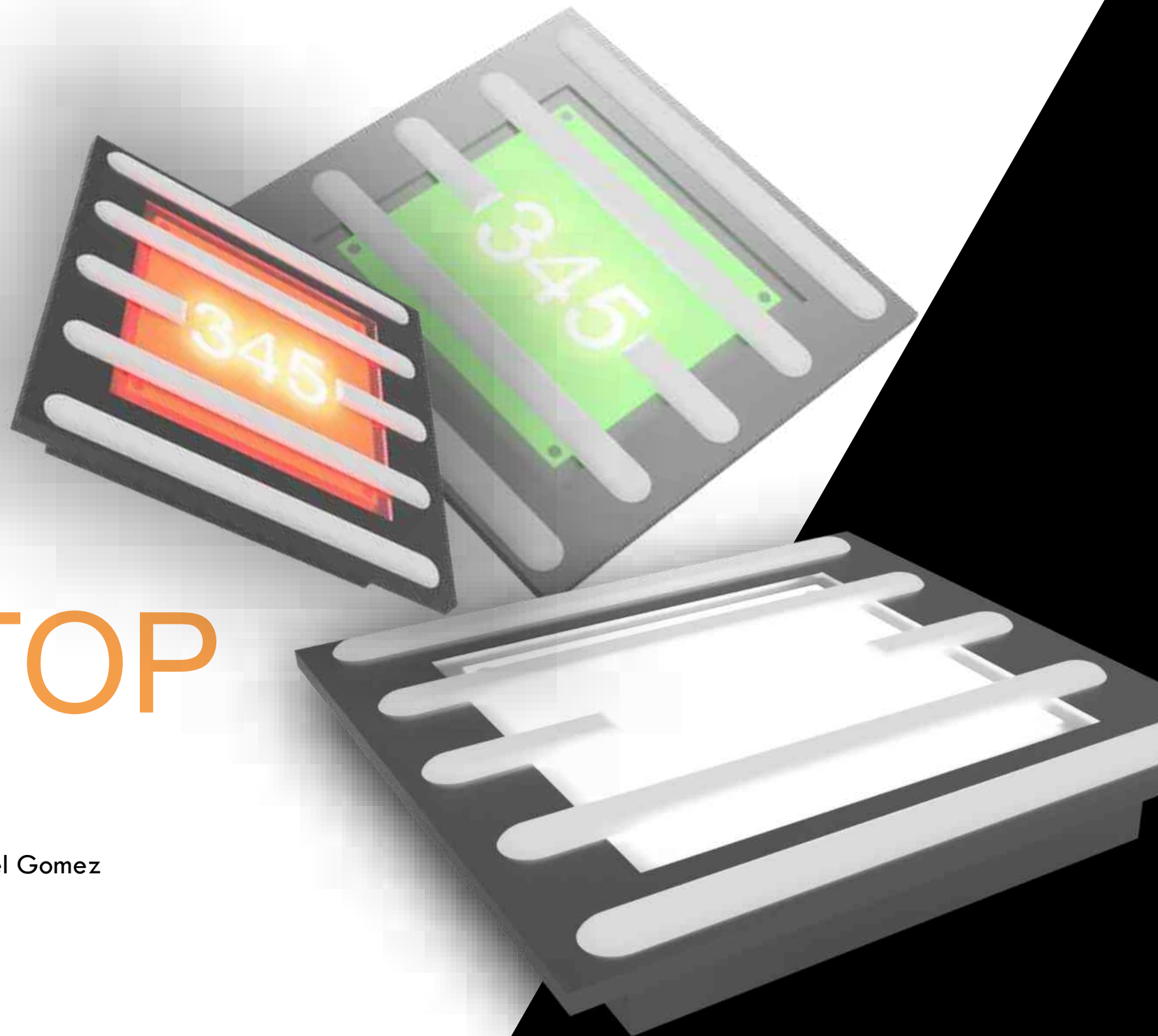


# TILESTOP

Aaron Mathew



Rafael Gomez



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# City Vs Suburbs



# Why is It needed?

## Tourism Surge



Millions of tourists will travel to attend the 2032 Olympics in Brisbane. tourists will use public transportation but will encounter language problems and foreign navigation systems.

## Population Density



The expanding population will put strain on the city's transportation infrastructure. greater need for infrastructure dependability and clear information.

## Traffic Congestion



traffic on the roads to cater for visitors. Promoting the usage of public transportation is crucial for lowering emissions and traffic.

## Suburban Stops



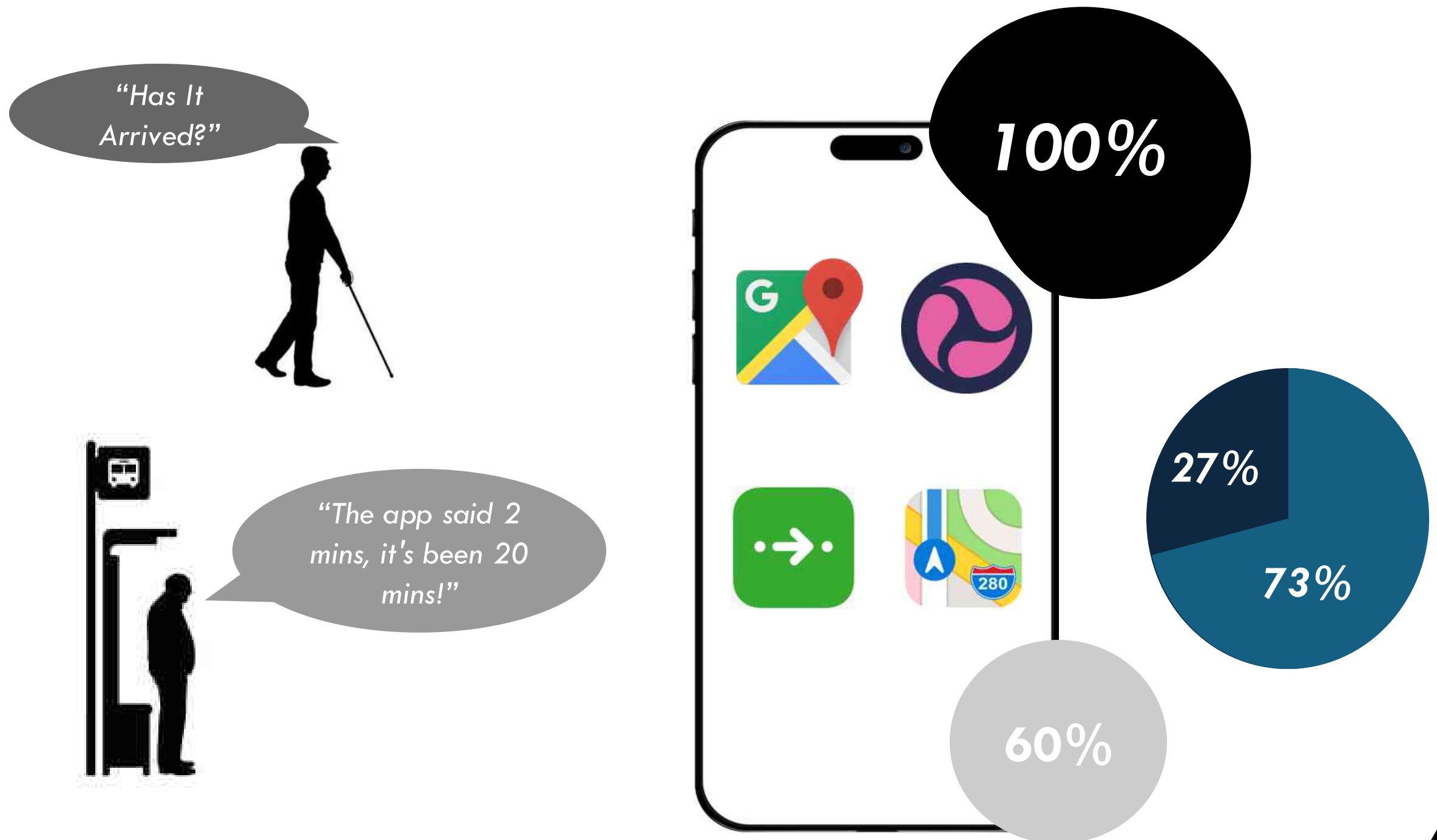
The infrastructure in suburban regions lacks accessible features and real-time data. These flaws will be exacerbated by the Olympic influx, placing strain on current systems.

## Suburbs



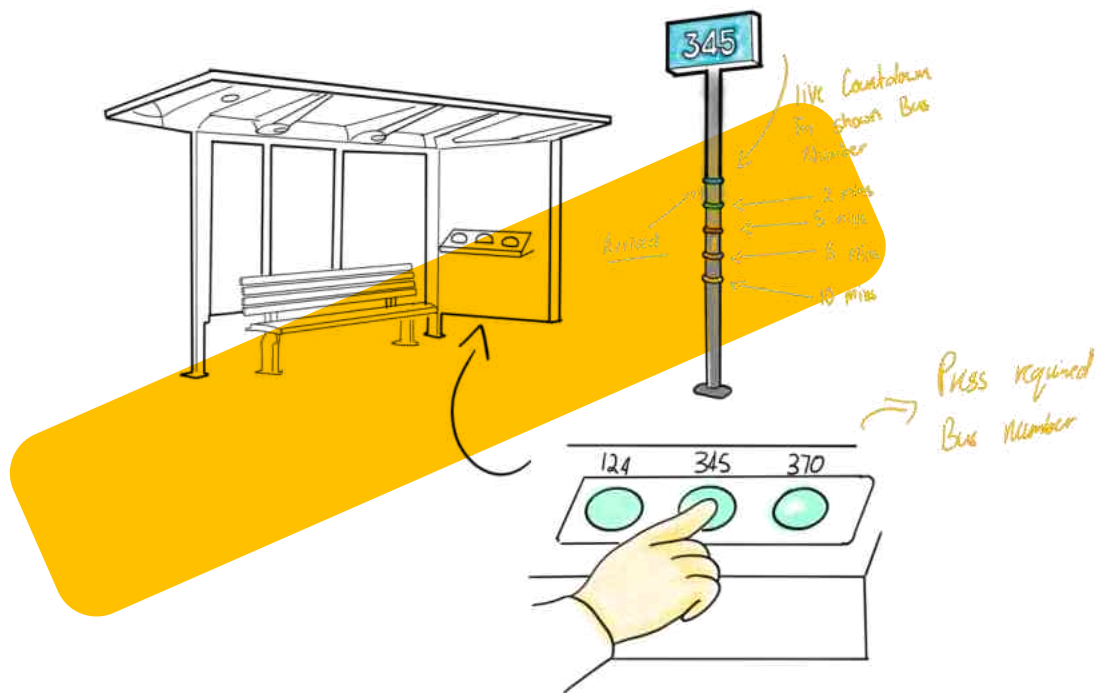
Tourists will go into the suburbs when the city centre gets crowded these regions are underdeveloped and have little signage, challenging for new users to navigate their way around

# Research Summary

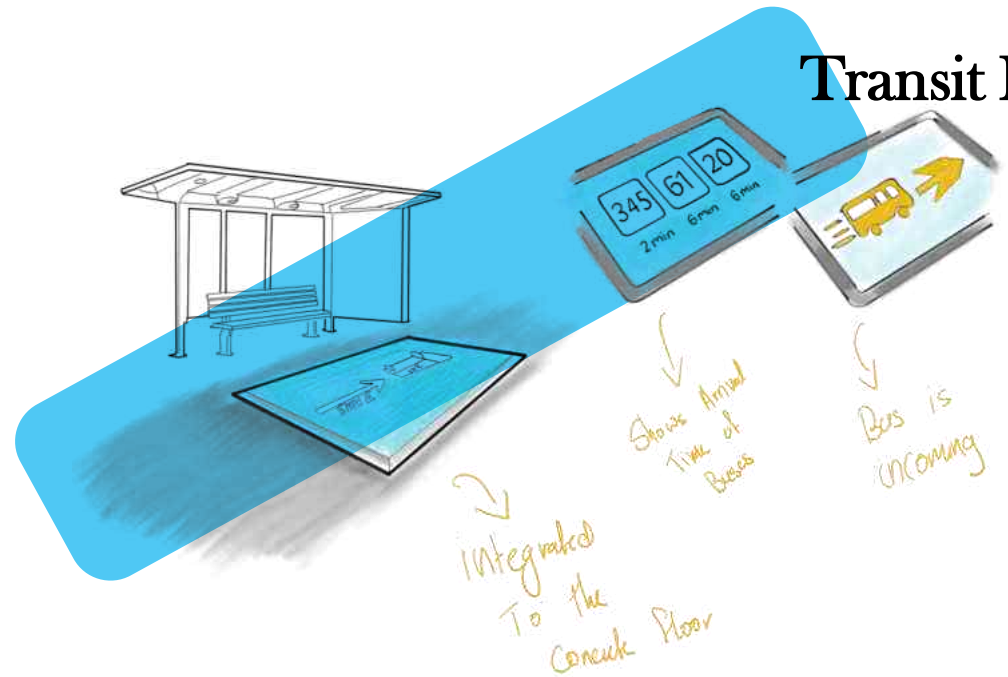


# Possible Design Solutions

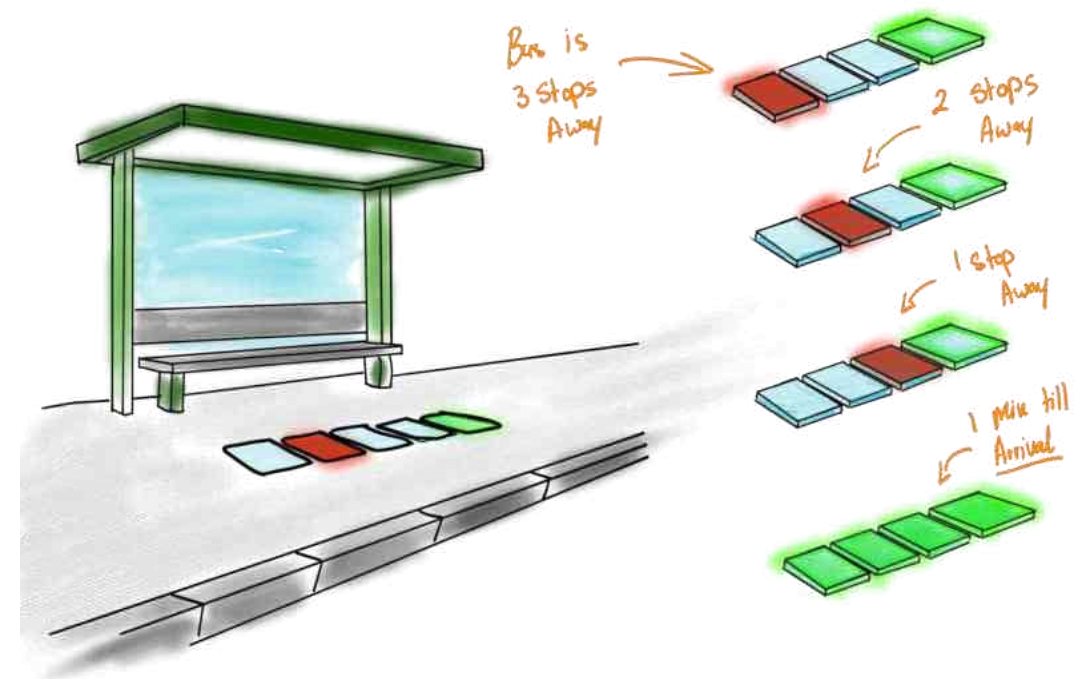
Pole in Progress



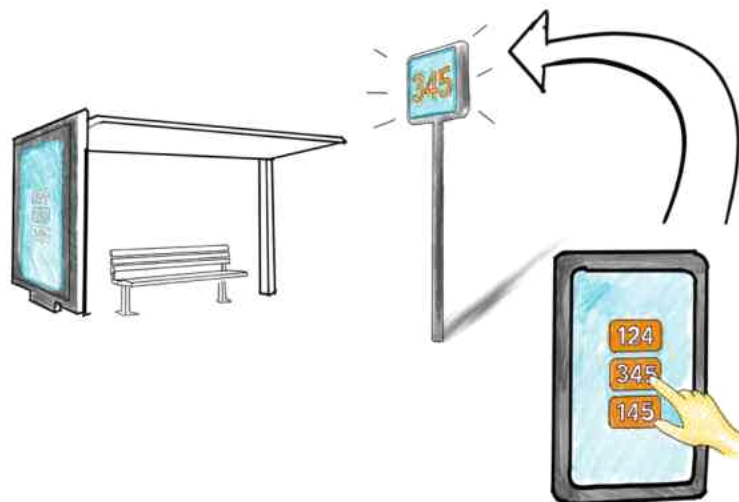
Transit Floor



Journey Tiles



Echo Pole



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# TILESTOP

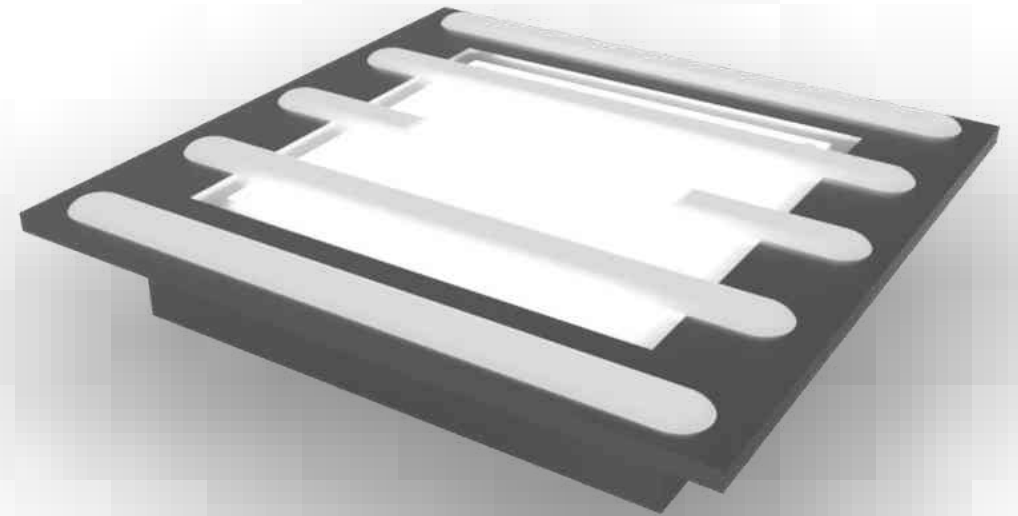


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# Colours & Layout

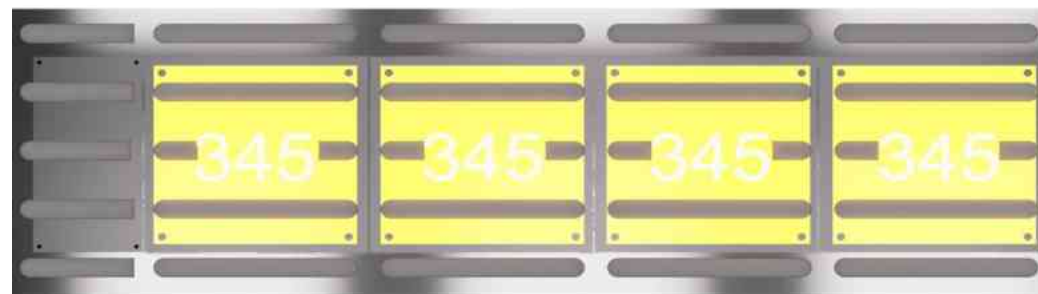
## Standby

indicates that the tile system is operational. The white light indicates that the system is ready for use by confirming that power and network connectivity have been established.



## Current Stop

Indicates when the bus has arrived at this stop.



## Service Ended

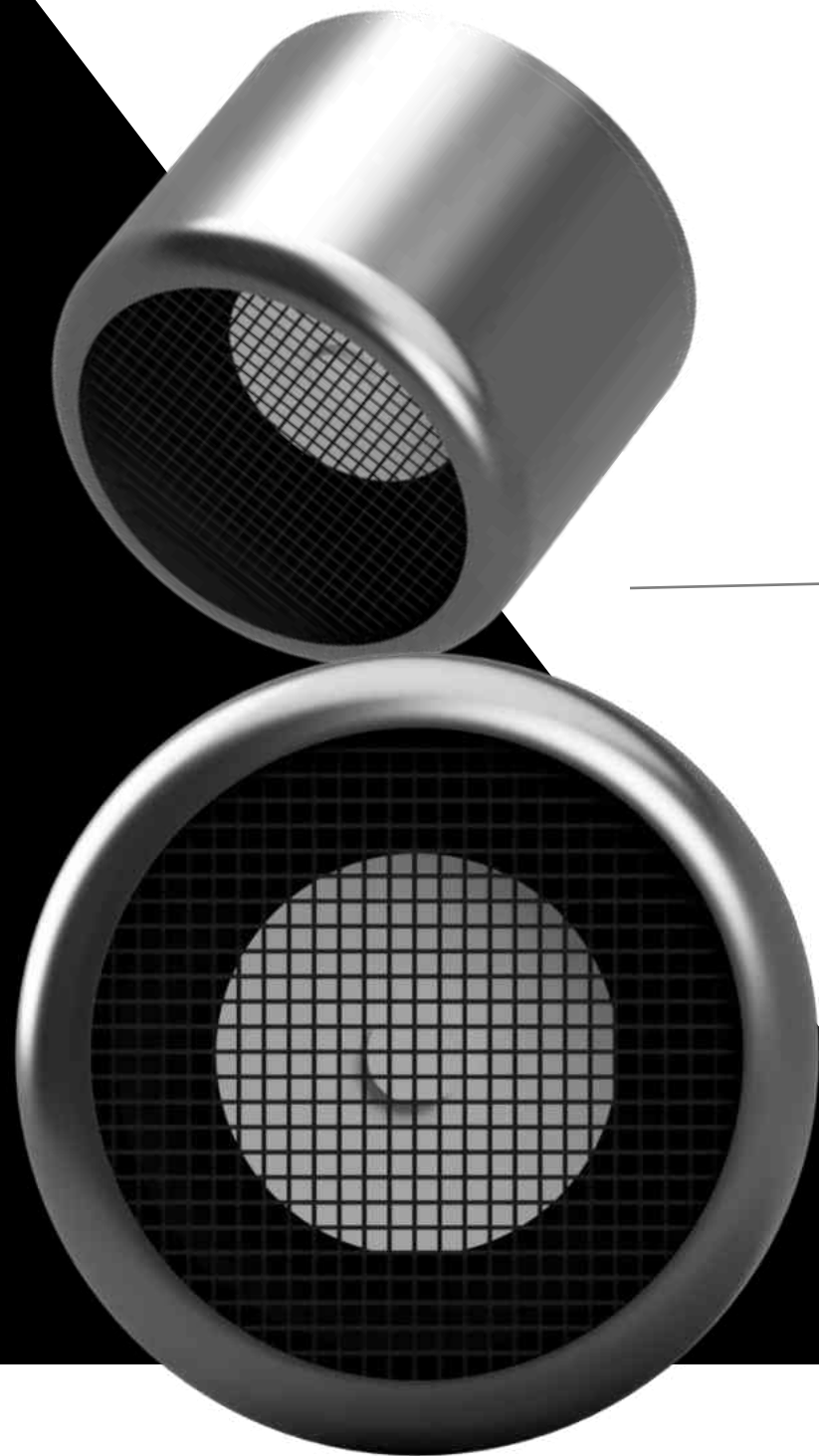
Yellow "Inactive" or "Service Ended" denotes that the bus has finished its service or is no longer travelling.



## Arrived

lights up when the bus is about to arrive

# Accessibility

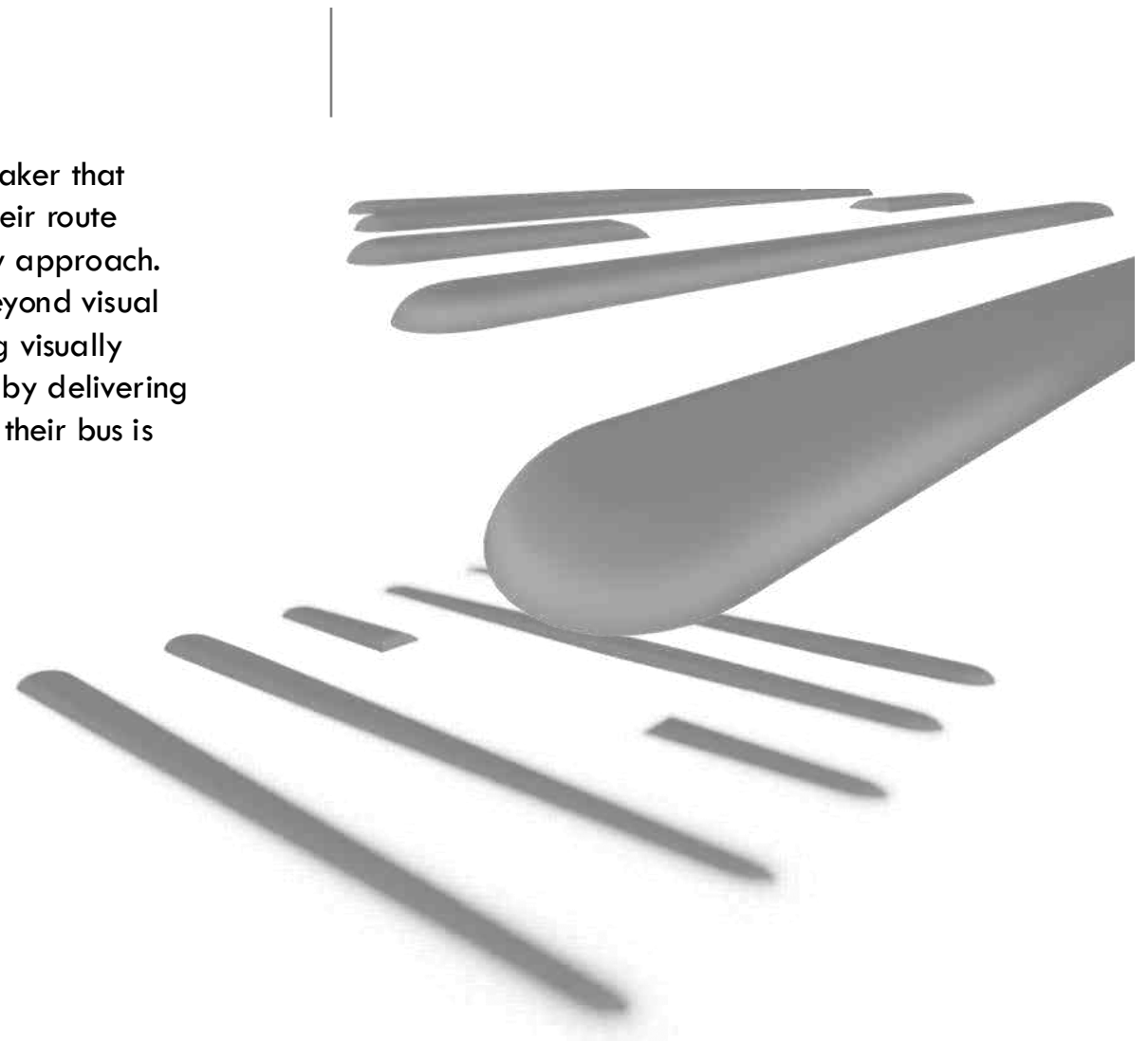


## **Audio Notification**

featuring an inbuilt speaker that announces buses and their route numbers vocally as they approach. This ensures inclusion beyond visual indicators by supporting visually challenged passengers by delivering an auditory alert when their bus is arriving.

## **Tactile Ground Indicators**

Users are directed securely towards the accessible waiting area and bus stop entry point by raised directional bars. designed to help blind or low-vision individuals make their way about in compliance with the Disability Standards for Accessible Public Transport (PTIM 2020).



# Materials

## **Stainless steel 316**

ensure durability and corrosion resistance by sealing the upper surface and sitting flush with the pavement.

## **UV-stabilized frosted polycarbonate**

diffuse LED illumination for consistent output - high impact and weather resistance.

**Frosted Polycarbonate (Textured Finish)**  
diffuses the LED light underneath and gives visually challenged users tactile feedback.

## **RGB LED Board**

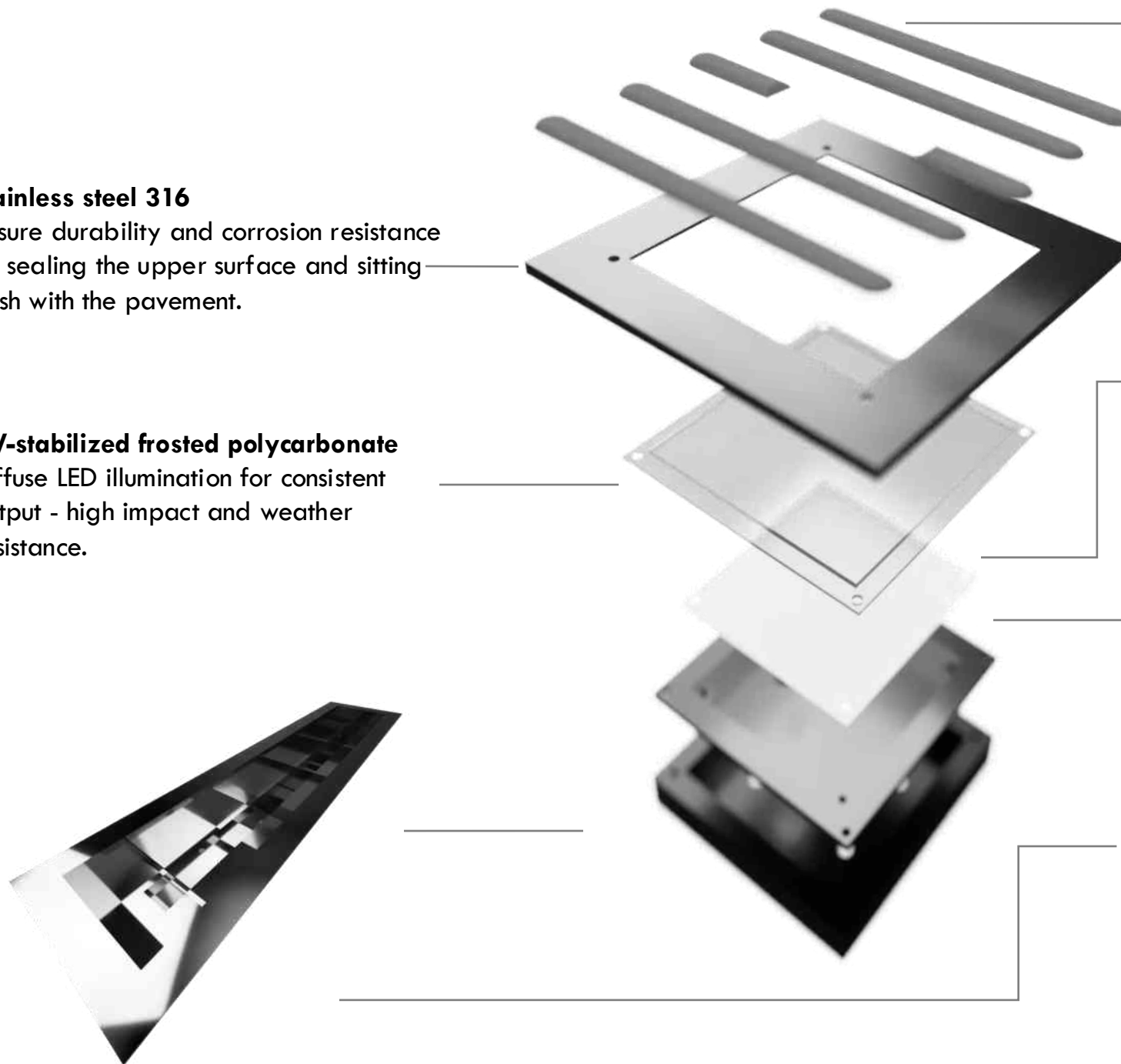
bus number and the sequence colours (red, yellow, green 7 white)

## **316 Stainless Steel I**

used to house the components above

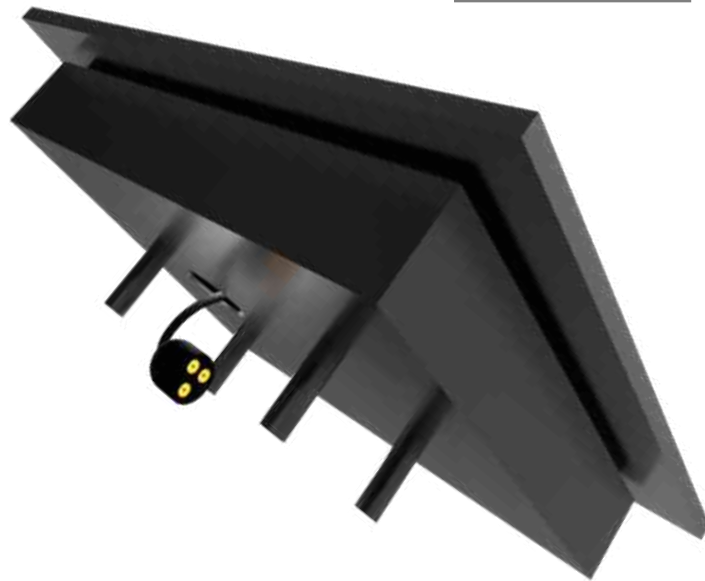
## **316 Stainless Steel**

reinforced inclosure in concrete to house components inside a sealed stainless steel frame that is cast into fiber-reinforced concrete (FRC). keeps water out, maintains mechanical stability, and permits modular maintenance without causing damage to other tiles.



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# Maintenance



## Housing for LED Tile

The LED display board that shows bus numbers and color-coded statuses (green, yellow, white and red) is housed in this square housing.

With a plug-and-play connector, each module may be separately removed from the pavement surface, enabling prompt repair in the event of lighting or display problems without having to remove the entire system.



## Quick-Connect

The gold-plated connectors, which are IP67 rated for resistance to dust and moisture, offer safe data and power transfer.

eliminates the need for rewiring by allowing personnel to easily unplug a broken LED module and replace it.



## Service Box Unit Centralised

The MAX485 controller, power driver, fuse components, and LoRa communication board are all housed in this module. A single wiring harness connects each LED tile module to this box, enabling personnel to change electrical components or conduct diagnostics in a single, easily accessible compartment.

There will be little downtime because the service box may be replaced as a complete unit.

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# After 2032?

## Elders



The tactile surface and lit tiles help older persons navigate safely, especially in low light. At suburban stops, audio and visual signals help to ease uncertainty and anxiety.

## Kids



Students benefit from the clear, real-time lighting sequence, especially those who are younger or are new users. Without using smartphones, bus arrivals may be easily understood briefly thanks to the color-coded signals.

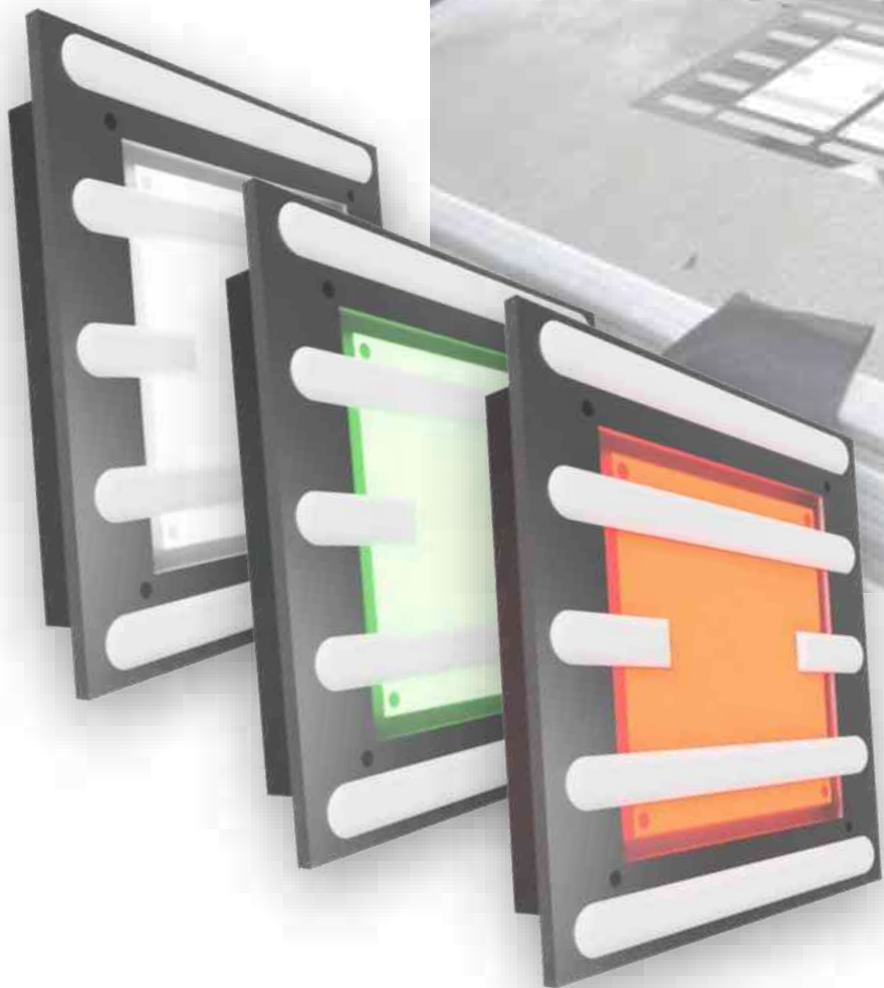
## Locals



Frequent commuters benefit from their everyday experience, decreased waiting uncertainty, and increased reliability. The system promotes a more dependable, interconnected suburban transportation system in Brisbane.

*The Bus Stop Tile System improves inclusivity, safety, and dependability for all Brisbane citizens, even outside of the 2032 Olympics, turning daily travels into accessible, self-assured experiences.*

# TILESTOP



*For Everyone.*

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