OBLIQUE INCLINATIONS
Re-establishing the Function of the Oblique

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Abstract

This research thesis explores the way architectural performance can be increased through the pleasure of moments on the oblique in an urban realm dominated by orthogonality and verticality. The thesis analyses and explores the different applications of oblique planes and their surface conditions and the experiential conditions they produce.

A paradigm shift occurred in the design and use of urban spaces initiated by the Industrial Revolution and made prevalent after World War 2. Urban spaces in contemporary cities have been taken over by the infrastructure and architecture built for the movement and storage of vehicles. As a result, architecture and urban design is being designed to the scale for fast moving traffic rather than the scale for human movement and the potential richness of urban experience has diminished.

Precedent analysis and observations realised a set of rules to ensure a hierarchy of movement and stopping zones. Architecture Principe’s exploration of the oblique was also analysed, from which a range of inclinations were selected and an adhesion table formulated in regards to surface conditions setting up a design methodology to articulate a hierarchy of movement. Additionally, the Three Part Inclination Method was used to derive the chosen range of inclinations and movement.

An analysis of Auckland city, focusing on the infrastructure and architecture used for the movement and storage of vehicles showed a lack of designated public space which drove the site selection. The car park was chosen as it is a unique architectural typology that directly relates to the issue of dislocation from the ground plane. Choosing a car park for the research project ensures that the architecture is dominated by orthogonality and verticality and also ensured that the users of the oblique are affected by the issue of dislocation from the ground plane. The site includes three buildings starting with the Auckland City Downtown Car Park on the corner of Hobson and Quay Street, the Copthorne Hotel, and the ANZ building opposite the Copthorne Hotel. The rules from the precedent analysis, the adhesion table and the Three Part Inclination Method are applied to the overall site allowing the oblique to penetrate all three buildings and feed off the circulation, programs and surrounding context. The application of the oblique activates a journey promoting a range of movement, embodied experiences and moments within an architectural context ending with a public space that meets the water by Princess Wharf.

Future projections for Auckland city’s growth as well as statistics on Auckland’s reliance on the motor vehicle prove that Auckland is and will remain affected by the issues caused by dislocation from the ground plane. The application of the oblique is the missing link to balance the dominance of orthogonality and verticality in the urban realm and is a step towards resolving the issues of dislocation from the ground plane created by reliance on the motor vehicle.
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Introduction

This research thesis analyses the way architectural performance can be increased through the pleasure of the moment on the oblique and explores the different applications of oblique planes and surface conditions, deriving methods to design with the oblique to bring about a spatial awareness of the user with the ground plane. The proposal is a declaration of the importance of the addition of a third discipline (the oblique) of equal importance to the horizontal and vertical axes adding to variety of experience. A site and building were chosen for their relevance to the issues of vertical and orthogonal dominance and as well as playing a role in the reliance of people on cars and the daily commute; activities which support dislocation from the ground plane. The site selection acknowledges the dominance of the car in the present day urban context.

In my other life I am a professional snowboarder. Having a career based on the process of a constant negotiation with particular conditions of ground planes has resulted in an instinctive awareness of the body moving over and around sloping surfaces. How then can this instinctive awareness of the ground plane generate a design method that raises a person’s awareness of themselves in the urban realm dominated by orthogonal, vertical and linear architecture that is prioritising the movement of vehicles over people on foot? Additionally, how does this impact a user of the urban realm experientially and how can an embodied architectural experience be reclaimed? For this reason, this research project aims to explore and implement the pleasure of the moments on the oblique in an urban realm dominated by orthogonality, verticality and infrastructure that prioritises the movement of vehicles over people.
A Paradigm Shift

Contemporary cities have evolved through political and economic processes driven by consumerism and capitalism. A common urban scenario follows a familiar series of events; a capitalist economy induces internal immigration to cities increasing density of which two outcomes emerge. Firstly, horizontal floor slabs are repetitively stacked to accommodate the increasing need for habitable space, thus creating cities dominated by orthogonality and verticality which in turn dislocates the human being from the ground plane. Secondly, the lack of and need for space raises the cost of living, inducing a reverse of central immigration; suburban sprawl. Working in the city, living in the suburbs and a slave to the daily commute is more often than not the status quo for human existence in a contemporary city. Therefore, dislocation from the ground plane and a slave to the commute are two symptoms of a contemporary city that this research project will aim to challenge.

Amid the complex web of a contemporary city exists the prioritisation of space for an infrastructure built solely for the moving and parking of motor vehicles. A range of symptoms emerge that reduce access to urban spaces and suppress foot traffic. A paradigm shift occurred with the invasion of the car and the availability of cheap petroleum initiated by the Industrial Revolution and made prevalent after World War 2. Previous to this, the use of craftsmen and traditional building techniques ensured that meeting spaces, market places and urban connections were built and designed appropriate to that of the human scale, resulting in frequent human interaction on foot. However post World War 2, most urban spaces have instead been tarmacked for the high-speed movement of cars, creating lineal architecture devoid of streetscapes and dedicated for high-speed movement. One of the outcomes is a change in the scale of architecture which was previously limited to a human scale for pedestrian movement (5km/hr) to that of the average movement of a vehicle (60km/hr). With this in mind, where does the human belong in this scenario and how does it affect social behaviour in a contemporary city where the car has become centre stage?

The infrastructure consuming contemporary cities and the way in which it is compensated for (long daily commutes) feeds into the issue of dislocation from the ground plane. It is the goal of the research project to put human activity and movement back in to the ordinary pattern of peoples lives.

In regards to an experiential aspect, we have arrived to a disposition of being reliant on cars rather than movement on foot as architect Jahn Gehl explains, human activity and movement (on foot) has been taken out of the daily routine.

Figure 1. A Michael Wolf Photograph shows the domination of verticality and orthogonality in the central Hong Kong residential area.

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2 Ibid.
4 Gehl, “Cities for People”.
Figure 1. A Michael Wolf Photograph shows the domination of verticality and orthogonality in the central Hong Kong residential area.
Experience

Experience can be defined through practical contact and observation of an event, or an occurrence that leaves an impression on someone. A career spanning over a decade of experiencing oblique planes through a process of analysing their surface conditions and inclinations before and while moving over them has brought about an instinctive awareness of elements that embody an overall experience. The intention of this project is to design the articulation of atmosphere and experience through a network of inclined planes and surfaces considering textures and materials to bring about an active interaction between the user and the ground plane and create an awareness of oneself in an architectural setting.

“Memorable architecture involves an embodied experience, determined by the reach and grasp of our hand, the touch of our fingers, the feeling of heat and cold on our skin, the sounds of our footsteps, the stance we have taken and the position of our eye.”

Architecturally, the position of the user with the ground plane (stance, position of our eye) influences the elements that encompass an overall embodied experience. More often buildings are experienced using isolated senses (typically vision) making architecture more of a spectacle whose novelty is often exhausted in an initial visit. Therefore, how can a corporeal dimension within the context of a contemporary city be assimilated in regards to the implementation of the oblique?

The oblique will perform as an inventory of movement and a series of experiential moments. These moments will be reacting to its surrounding context and conditions. Specific conditions need to be explored and implemented in the design of the final project including elements of movement (fast, slow, meandering), interactions, shadows and light, lines of sight and perception in regards to foreground, mid ground and back ground, self awareness and awareness of others and context and random encounters.

Due to the domination of orthogonality and verticality in the urban realm, the authenticity of experience in regards to architecture (daily interactions, negotiation of the body with the ground and the built environment) has been lost. Additionally, the potential richness (and some argue the traditional richness) of urban experience has been diminished as a result of the adaptation of the urban realm for the movement and storage of vehicles.

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7 Ibid.
Figure 2. Pallasmaa describes how the use of perception, object and field, materiality and light and shadows can be assembled to create an embodied experience.
Aims and objectives

This project acknowledges the dominance of the car in the present day urban context. The aim of the project is to analyse the way architectural performance can be increased through the pleasure of the moments on the oblique.

A third discipline of equal importance to the horizontal and vertical axes must be introduced adding to variety of experience. The oblique plane is the missing link between the horizontal and vertical axes that will (in its implementation) exponentially increase the richness of experience in the urban realm. In this respect the dynamic nature of human movement over the oblique in regards to habitation and circulation must be understood and incorporated in architecture and urban design.

Auckland’s present and future issues in regards to architecture and urban design stem from the need to accommodate for an increase in population growth and adapt to Auckland’s proposed densification strategy. 80% of Auckland commute to work by car with only 5% commuting on foot compared to 31% of people commuting to work by car in Vienna and 29% of people commuting to work by foot in Berlin. These statistics amongst others prove that Auckland city is a viable site for the application of the research project as it is affected by the same set of issues relevant to a contemporary city as previously discussed in ’A Paradigm Shift’ and ’Experience’. Therefore, oblique planes (and their surface conditions) will be applied and tested on a viable site in Auckland.

Architectural Research Problems:

How can the oblique be adapted and applied within a contemporary urban context?

How can architecture be designed with the oblique so as to re-establish a connection with the ground plane, lost as a result of the priority of infrastructure for the movement and storage of cars?

Find an Auckland site (affected by issues regarding dislocation from the ground plane, verticality and orthogonality) to test and apply conclusions of analysis, and that accommodates complex architectural resolutions.

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10 Ibid.
Current Knowledge

Negotiated Studies

Two Negotiated Studies lead to the basis of this research project. Initially, the differing surface conditions of ice and snow and the effect that those conditions have on the experience of movement across those surfaces were explored. Two conditions (surface materiality and inclination) transferred as tools to inform architectural design to generate a negotiation between the user and the ground plane. Therefore, the conclusions of the report aid in design consciousness using ground surface conditions and inclined planes benefitting the overall architectural performance. In addition, surface conditions and applications of inclined planes in two architectural precedents were analysed; Rem Koolhaas’s Kunst Museum in Rotterdam and Snohetta’s Opera House in Oslo. The inclined planes in the buildings were explored through analytical drawings in regards to surface conditions, degree of inclination, circulation and the programs feeding off and on the inclined planes.
Negotiated Study #1

The aim of the first Negotiated Study was to explore the differing surface conditions of ice and snow and the effect that those conditions (ice, snow and anywhere in between) have on the experience of movement across those surfaces. The first stage of the report analyses different conditions of snow and ice and the variables that affect them, which in turn influence factors related to movement over those surfaces including fluidity, control, and speed. The second stage of the report analyses movement over the different surface conditions in regards to my snowboarding experience on a chosen route during a big mountain competition on the Pinnacles mountain range on Whakapapa, New Zealand.

Different surface conditions of ice and snow and how they affect movement over them were discussed and transferred architecturally in regards to ground plane and surface design. Movement over surfaces (snowboarding) is influenced largely by the degree of inclination of the ground plane. Degree of inclination is discussed in architectural terms as an approach to combat level change on foot. Finally, the combination of the two conditions (surface materiality and inclination) will be used as a tool to inform architectural design and create a negotiation between the user and the ground plane. Architects are constantly faced with design issues such as level changes and the application of ground surface conditions to control how people negotiate architecture. The conclusions of the report (which include a breakdown of degrees of inclination and speed of movement over those inclinations, as well as the way in which the conditions of those surfaces affect movement over them) aid design consciousness.
Figure 3. Negotiated Study #1. Exploring the different conditions of snow at a molecular level and how they affect movement over their surfaces.
Architecture Principe

The conclusions of the first Negotiated Study led to a discovery of a much discussed architectural movement in 1960’s France founded on the exploration into the application of inclined planes referred to as ‘Function of the Oblique’. The architect-theorist duo Claude Parent and Paul Virilio led the movement and published their ideologies of the oblique (a plane or surface inclined at other than a right angle) in a ten-chapter manifesto titled Function of the Oblique further discussed in ‘Current Knowledge’.

Architecture Principe introduced the function of the oblique with the intent to throw the modern man into action\textsuperscript{11}. Architecturally, the oblique plane was the consideration of fluidity and continuity, (combining mechanical and pedestrian circulation) and mobilized the habitat through the opening of transfer spaces. Paul Virilio defined the architectural, urban and economic issues of France in the 1960-70’s as being in a state of neutrality where society was turning into consumers, obsessed with comfort and status. These issues are relevant to the current status of contemporary cities as discussed in ‘A Paradigm Shift.’ Subsequently Architecture Principe opposed orthogonal vertical forms; a strong statement in their time which was and still is dominated by verticality and orthogonality sky scrapers and habitable high-rises. Architecture Principe’s concepts were applied decades later by architects Jean Nouvel and Rem Koolhaas and architecture firms such as Snohetta.

Figure 4. An illustration of Architecture Principe's ideologies on the oblique; exponentially raising the quality of experience in an urban realm dominated by orthogonality and verticality.
The second Negotiated Study is an analysis of two buildings designed by architects influenced by Architecture Principe’s ideologies; Rem Koolhaas’s Kunsthall Museum in Rotterdam and Snohetta’s Opera House in Oslo. The analysis methodology was through analytical drawings. Elements including function and program on and around the oblique planes, materiality, relationship between the oblique and circulation, relationship between the oblique and the horizontal planes as well as overall building form were analysed to inform how they influenced the overall architectural performance. The results of the analysis provided a methodology for designing with the oblique. Results of the analysis include combining programs and circulation on oblique planes, blurring the distinction between exterior and interior, activating the building by introducing lines of sight and natural light and the different methods of meeting the horizontal with the oblique planes as well as methods of dealing with different inclinations meeting one another.
Figure 5. Oblique planes and their conditions in the Kunsthal Museum.

Figure 6. Oblique planes and their conditions in the Oslo Opera House.
Literature Survey

The following literature survey is a summary of the relevant information taken from the current knowledge available on the topics of the oblique, methods of designing for corporeal dimensions and urban design.
Architecture Principe 1966 and 1996
*Paul Virilio and Claude Parent*

Architecture Principe’s Manifesto discusses the potential of the oblique function. New human components of the function of occupation of space are broken down as follows:

- **Activation:** The exercise of choice with respect to place in function of the gravitational potential: a directional vector of supply or expenditure of energy.

- **Vertigo:** The position of psyche faced with the relinquishment of the traditional system of reference in term of vertical and horizontal.

- **Clausturation:** The psychological reaction before ‘cryptic’ interior spaces without direct exterior views.

- **Deplorization:** The intervention of habit modifications with respect to solar orientation.

- **Canalization:** The exploration of visualisation in views from above, from ground angles or overhangs or vista views, the panoramic view from the summits.

- **The continuum:** The realization of the appurtenance of the continuous architectural world, without a solution of continuity, without partitioning, in permanent unfolding.¹²

- **Fluidity and water:** The oblique is the architectural support of spatial continuity and links all movements in nature including humans and fluids. It allows water its full potential and humans to create function-spectacles in regards to water with no mechanical intervention.¹³

- **Fluidity and humans:** In regards to humans the oblique grants the choice and freedom of travel with spontaneity of meetings and groupings. Additionally Architecture Principe states that the liberation from the constraints of the oblique will come naturally by increasing the development and research into the conditions of the upper surfaces and solutions in regards to the spaces underneath the oblique.

- **The Threshold of Re-establishment:** Architecture Principe acknowledges the horizontal as a necessary presence for the oblique and will be used as a constant reference for the users of the oblique. However where those thresholds of oblique-horizontal successfully lie is open for discussion¹⁴.

- **Habitable Circulation:** Population mass has reached a density so high that it has become an unimaginable force of inertia. Therefore, an urbanism must be designed with architecture in which humans will be thrown into movement by the very profile of their habitat. Thereby the city becomes a gigantic projector, a cascade for every activity and fluidity and mobilising the city by the oblique function.

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¹³ Ibid, XVI.

¹⁴ Ibid.
The Human Scale
* A documentary by Gehl Architects

- Suburbs are built to scale for the movement of vehicles at 60km/hr and this has merged to the urban realm where previously established cities were built at a scale of 5 km/hr. These established cities are sensual and interesting with acoustics, smells and details appropriate to the human scale.

- A loop exists in regards to large profits made between governments, banks, car manufacturing companies and companies involved in the building of infrastructure for the movement of cars. These are part of the unavoidable negative forces of economic colonialism.

- Foundation of good health is fresh air, exercise and meeting people. Tall buildings mean boring lives and less people on the streets, how do we get people out and moving around and meeting people?

- Currently at 3.6 billion people in cities which is 50% of the total population. By 2050 the total of people living in cities will be 6.5 billion. Therefore the urban capacity will have to double in infrastructure. 4 billion people live in 3rd world countries therefore what happens when they catch up to the western way of living. 200 years ago there was 1 billion people. Presently there are 7 billion people and at the end of this century there will be 10 billion people, of which 80% will live in cities. How can architectural strategies be implemented in the urban realm now, to ensure foundations of good health in the future?

How Roads Kill Cities
* Hermann Knoflacher; Philipp Rode and Geetam Tiwari

- Travelling collectively maintains social interaction. Public transport plays a complimentary role and reinforces its social structure and circulation for pedestrians.

- Motor vehicles became more and more intrusive on the public realm initiated by the Industrial Revolution and made prevalent post World War 2. Therefore, there was and still is prioritisation of urban space for cars versus space for pedestrians.

- Architecture is then adapted for the new infrastructure required for high speed movement resulting in a lack of sympathy for design quality and the human scale.

- Cities built around the movement of motor vehicles results in the reduction of access to urban spaces. Traffic flow reduces social interactions of neighbourhoods.
Figure 7. An image from Gehl Architects documentary “The Human Scale” showing the prioritisation of infrastructure for the movement of vehicles in a contemporary urban realm.
Questions of Perception

Steven Holl, Juhani Pallasmaa and Alberto Perez-Gomez

• In regards to architecture and space there needs to be a focus on the subject of senses and reawakening consciousness. Pallasma states that the task of architecture is to create an embodied experience.\textsuperscript{15}

• Architecture is initially understood as a series of partial experiences, rather than a totality however, there needs to be an amalgamation of all senses through the combination of a range of elements.\textsuperscript{16} All elements of the senses are broken down into elements that all interrelate to each other. Vision through the use of materiality, patina, perception and spatial awareness relates to the senses of touch and smell. Architecture in regards to acoustics is based on the desire to create a sense of tranquillity through those elements of materiality.

• Phenomenal zones. A breakdown of elements that can be used in regards to phenomenal architecture. Connecting spaces through the use of reflected light, patterns of moving water are projected on the undersides of ceiling and soffits.\textsuperscript{17} Using light and shadow, colour and perception (object and field and perspective space).

• Creating an embodied experience to re-establish users with the ground plane is a primary aim of the research project. Therefore elements will be taken out Pallasma’s breakdown of how to create an embodied experience and used in the design process.

\textsuperscript{16} Ibid, 42.
\textsuperscript{17} Ibid, 81.

Eyes of the Skin

Juhani Pallasmaa

• Pallasmaa makes a proclamation of a sensory architecture in opposition to the prevailing visual understanding of architecture\textsuperscript{18}. The author states the need for architecture to be designed to combine all senses. These elements will be used to structure the precedent analysis and will implemented in the final design.

• The sense of touch relates to materiality which gives a sense of spatial depth sensing weight and resistance.\textsuperscript{19}

• The use of natural light and shadow is referenced as an important element to incorporate in the design affecting perception influencing materiality and special awareness.\textsuperscript{20}

• “Light isolates whereas sounds incorporates. Vision is directional whereas sound is omnidirectional. The contemporary city has lost its echo, the wide open spaces do not return sound.”\textsuperscript{21}

• Details have been designed for that are of a human scale in regards to spatial surroundings, width of the oblique and its boundaries. Additionally the sounds of movement and interaction of fluids on the oblique surfaces have been used not only for acoustics but for touch and reflected light.

\textsuperscript{19} Ibid, 29.
\textsuperscript{20} Ibid, 32.
\textsuperscript{21} Ibid, 35.
Details have been applied to the final design in regards to the oblique being used as pedestrian thoroughfares and circulation. Those design details include:

- A network of streets and paths all running at right angles to the streets. Walkways that cross over streets or run parallel are raised to make the user feel secure and establish differentiation between the two differing circulation types. Add canopies to mark crossover points and make the area swell to accommodate other programs. For pedestrian streets, ensure that the indoor and outdoor spaces look onto the street.  

- Allow 600mm for each person in a thoroughfare or laneway or 2.7m for four people.  

- Lower heights towards the edge of places of activity and high for indoor streets (3.5-4.8m). Entrances to be continuous and wide.  

- There must be a continuation of the circulation outside of the building.  

Guidelines for pedestrian streets have been applied to the final design in regards to thoroughfares and circulation. Those elements include:

- Interplay between the length of the street and the quality of the route, both with regard to protection and stimulation.  

- The goal is always in the line of sight. The edge is the most important to be designed for and can be created by columns. A series of benches or seating is required every 100m along a walking route and should be backed up by secondary forms of seating.  

- Linear walking routes also need to be broken up into spatial sequences to promote interest along the journey.
Precedent Survey

The following seven precedents were analysed at three different scales, building, building complex and city. Four buildings were analysed based on the application of oblique planes on the interior as well as on the site and in regards to surrounding context if relevant to the application of the oblique. It was necessary to choose precedents built in a chronological sequence so as to get an idea as to how the applications of oblique planes varied over time. Method of analysis is through analytical drawing and diagrams.
The Church of Sainte Bernadette or commonly known “Nevers” symbolizes the identity of Architecture Principe’s investigation of the oblique. Therefore, a thorough analysis of the building and its oblique planes is important in order to gain an understanding of Architecture Principe’s exploration with the oblique plane. Parent and Virilio define Nevers as circulatory architecture and describe the function of the oblique in the building as the generator of activity and the merging of circulation and dwelling. Exploded axonometric drawings are used as methodology of analysis.

The conditions of circulation in the Nevers building are true horizontal, oblique and stairs. Oblique planes are used as circulation and seating (Figure 9). The degree of inclination of the oblique aisle that leads to the altar is duplicated either side and used for seating the church congregation. The analytical drawings show that there are two axis lines of circulation informing the planning as well as the envelope form (Figure 14).

Figure 11 illustrates the primary axis of the building in regards to circulation. When approaching the entrance of the church the user already begins the journey on an oblique plane, mirrored by the overhang of the cantilevered floor plate above. After passing through the main entrance, a wide set of stairs lead up to the second level and after arriving at the top of those stairs, the user finds themselves in the centre of a vast naturally lit space with an oblique plane that leads to the altar.

In Parent and Virilio’s monograph of the Nevers building there is a

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Figure 8. The Nevers building with its oblique planes shaded in red.
Figure 9. The two main axes of The Nevers building driving circulation and form.
A - primary circulation axis. B - Ontological fault line.
Figure 10. The Nevers buildings primary circulation axis.

Figure 11. The Nevers buildings ontological fault line.
reference to a fracture of the monolith (monolith being the overall monolithic form of the building) or an ontological fault line. This fracture or fault line is the secondary axis of circulation (Figure 12). The ontological fault line feeds the secondary entrances on the north and south side of the building. This circulation route consisting of both oblique and true horizontal planes crosses over the main axis. Diverging access routes lead to the church pews and confessionals. Not only is this ontological fault line activated by the movement of the users of the church but is also lit by the primary source of natural light entering from the ceiling putting the procession of human movement on show (Figure 13).

The envelope of Nevers (Figure 14) is an architectural application and reinterpretation of a post-war bunker; a fascination of Parent Virilio’s at the time. The heavy mass engulfs and protects the building, a contrast to the lightness and vastness of the upper interior space. In regards to structure, the oblique planes holding the church pews sit on a system of columns and sheer walls. The structural strength of the oblique planes derives from the thickness in the floor plate which differs on each of the two planes. A thicker floor plate supports the rear pews allowing less structural support from below freeing space underneath and enabling a larger cantilever. The primary structural elements ascertained through the analytical drawings is the centre axes supporting the oblique planes where they meet the top of the ground level (Figure 15 centre axis) and the hollow structural plinths that support the outer edges of each plane.
Figure 13. Nevers building envelope.

Figure 14. Nevers building structural layout
Kunsthal Museum and Museumpark

Rotterdam, Netherlands, 1992
OMA

Kunsthal Museumpark

The Kunsthal Museum is part of a 5 sequence Museum Park by OMA. The 5 sequence park consists of two buildings, The Netherlands Architecture Institute and the Kunsthal Museum and the remaining three sequences are allocated in a strip of area between the Institute and the museum (Figure 16). The buffer zone between the Museum and the Architecture Institute holds the three remaining sequences, each having its own set of conditions reacting and relating to its surrounding context and the sequences either side. The sequence closest to the Museum (Figure 16 Zone A) is a park with an elevated walkway rising and falling through the park. The middle sequence is an open sealed tarmac space with an electric grid built into the ground allowing music and art events to take place. This brings a constantly changing space to the sequence. The third sequence (Figure 16 Zone C) is an outdoor lobby area for both the Boymans Museum and the Architecture Institute. It includes an apple orchard which is placed on an off axis grid. The sequences are part of a journey with different conditions linking the Kunst Museum and the Architecture Institute.

Kunsthal Museum
Figure 15. Kunsthal Site Map
The Kunst Museum uses a series of oblique planes both internally as well as exposed to the exterior elements. These oblique planes are used primarily for circulation and has programs placed on those circulation routes, blurring the distinction between the two. It is important to note that two of the primary oblique planes are exposed to the exterior elements although they are found on the interior of the building. There is a series of three primary ramps distributing the users of the building directly through, slicing the building in half and exposing the building to exterior elements of sun, wind and rain. The planes activate the museum due to the function of circulation and the implementation of natural light and lines of sight.

Each of the primary planes differ in regards to conditions (materials and inclination). The concrete Plane A (Figure 17) is exposed to the exterior and slices through the building, distributing users throughout the building from the ground floor to the main road level.

This plane activates the interior of the building providing lines of sight to the interior of the building and the main road.

Plane B (Figure 17) is an interior plane used for circulation and has a lecture/meeting hall and links this space to the third primary plane. Plane C connects users from the interior middle levels of the building to the upper exterior level of the building. The oblique is exposed to the exterior elements, it includes stairs along the perimeter as well as a green strip and leads users to rooftop exhibitions.

The ways in which the oblique are used in the Kunsthall include:

- Bringing exterior elements into the centre open air area of the building including light, noise, fresh air and lines of sight.
- Entry and exit points to different levels of the museum.
- Perception (mid ground, foreground, background) of the user is constantly changing as they travel along the plane, creating a sense of orientation of themselves within the building. The user sees a series of different scales of the building when standing in one position.
- Blurring the distinction between spaces for circulation and other programs.

Opera House
Figure 16. A breakdown of the internal oblique planes in the Kuunsthal Museum and their conditions and programs.
Oslo, Norway, 2007
Snohetta

The Oslo Opera House in Norway uses oblique planes to create a public plaza that activates the exterior of the building and is used as a formal monumental statement as an urban space. The oblique planes not only activate and create a public space but also acts as a passive barrier between the building and the sea.

Plane A (Figure 19) is the grounding plane which slowly enters the sea acting as a passive barrier and allowing the users to interact directly with the water. Plane B connects to Plane A, and introduces lines of sight into the Opera House. These lines of sight activates the interior of the building and introduces natural light. Plane C connects Plane A to the top floor of the building allowing the public to walk up and rest on the top horizontal plane, giving a view of the sea and the surrounding site.

All three concrete oblique planes are exposed to exterior elements which, in Oslo, can change the experience on those planes dramatically. In the winter it snows bringing a completely new dynamic to the experience on those planes, similar to being on a snow covered mountain. Additionally the oblique surfaces showcase the movement of fluids while raining.
Figure 17. Oslo Opera House site map
Figure 18. A break down of the oblique planes and their conditions in the Oslo Opera House.

Plane B introduces lines of sight to the interior of the Opera House.

Plane C is used as a public space.

Plane A is used as open public space and meets the sea with a gradual incline.
Conclusions from analysis include:

- The relevance of the oblique in regards to public space and the ways in which it can be used to meet different types of horizontal surfaces, in this case the sea.

- The oblique on the outside of a building can activate the interior of a building by introducing lines of sight and natural light as well as showcasing movement of people and fluids over their surfaces.
Two Cities

Hong Kong and Auckland are two cities analysed for the use and application of the oblique in pedestrian streets. In the Hong Kong central area there is a covered pedestrian escalator system; an infrastructure built for the movement of people on foot. Hong Kong’s mid-level escalator system was analysed in order to explore the ways in which the oblique was used. Additionally, three pedestrian streets located in Auckland city were measured for degrees of inclination and observed in regards to hierarchies of movement and stopping and the architectural elements that drive those behaviours. The entire discussion of analysis and observations of each city precedent is located in the appendix.
Figure 19. Hong Kong Central Mid-Level escalator system
Hong Kong, China  
Mid-Level Escalators

Hong Kong was analysed due to its high density of people and skyscrapers and its unique topography. The mid-level escalators is an infrastructure built to facilitate the movement of people up the steep slopes of the central area of Hong Kong by the Highways Department in 1994.\(^{31}\) The system moves up to 45,000 people a day from the residential area down to the business district and has a total vertical drop of 134 metres.\(^{32}\) (Figure 20) Additionally, there is a system in place where public transport credit is given to those users of the escalators every time they use the system ensuring a decrease in bus and taxi use, resulting in less congestion on the roads. The implementation of the system has increased the retail value of the properties that boarder and feed off it and there is also an increase use of public space in a 95 metre perimeter around the escalators. In regards to oblique planes, there are a series of ramped exit and entry points that follow the moving escalator system down the steep slopes. These planes and the ways in which they induce a hierarchy of movement and dwelling spaces are analysed.


\(^{32}\) Ibid.
Figure 20. A: Entry point from residential area above Conduit Road.

Figure 21. B: The mid-level escalator system passing over Robinson Road.
Figure 22. B: An example of the system of stairs feeding off the pedestrian walkways.

Figure 23. D: The escalator system meeting Staunton Street and its hierarchy of pedestrian streets running alongside.
Full discussion of analysis found in Appendix A. Conclusions taken out of the analysis as illustrated in figures 21 to 27 include:

- Ramped walkways are always unobstructed from above.

- There are no obstructions along the ramped walkways promoting fluid movement of users and only obstructed by the roads that pass through them at cross sections.

- Where the walkways meet a vehicular street with low levels of activity and program, the walkway will pass over the street avoiding interrupting pedestrian flow. In these cases there are exit and entry points to the walkway and streets figure 22-24.

- The ramped walkways are always organised with pedestrian streets either side acting as service lanes or buffer zones to the adjacent buildings and provide either partial or full cover. The pedestrian stepped streets on either side of the ramped walkways are used as short term or long term stopping areas for the users of the ramped walkways.
Figure 24. Sectional analysis of Figure 161 in Appendix A 

Figure 25. Sectional analysis of Figure 159 in Appendix A. 

Figure 26. Sectional analysis of Figure 160 in Appendix A.
Auckland City Pedestrian Walkways

Three oblique pedestrian walkways were analysed in Auckland City. It is important to analyse these sites in person in order to observe the types of movement the different inclinations generate and measure the specific angles being used for those planes.

Figure 27. Swanson Lane analysis illustrating formal seating that creates longer term dwelling on the oblique. Located on Swanson Lane Site Map (B) Figure 29.
Figure 28. Swanson Lane Site Map

Figure 29. Swanson Lane inclination measurements and behaviour analysis
Swanson Lane

Swanson Lane is a pedestrian walkway that merges into Swanson Street and is situated between Mills Lane and Queen Street.

Conclusions taken out of the analysis include:

• Main ramped walkway is unobstructed along and from above as illustrated in figure 31, creating a main central thoroughfare bordered by service lanes and lanes used for circulating users to the adjacent buildings.

• Different zones for users of the ramped walkway to stop. Those stopping zones included short term standing and seated for longer periods of time figure 28.

• All stopping zones and service lanes provided partial to full coverage.

• Degree of inclination is a consistent 8-9 degrees. This does not include the buffer zones where the degree of inclination subsides as it meets the horizontal.

• Buffer zones exist between the main thoroughfare inclination of 8-9 degrees and true horizontal. In this buffer zone of between 1-4 metres, the inclination subsides from 8-9 degrees to of a final inclination of 3 degrees section.
Constitution Hill

Constitution Hill links Churchill and Symonds Street and is used mostly by people leaving or making their way to the Auckland University precinct along Symonds Street.

The thoroughfare consists of a pedestrian laneway that leads up the hill through trees and surrounded by grass.

There is also a winding street adjacent of which is not used as a throughway by vehicles anymore. Both street and pedestrian walkways are used on foot therefore both were analysed in regards to inclinations used and the speed of movement they promote.
Figure 31. Constitution Hill sketch analysis and inclination measurements.

Figure 32. Constitution Hill Site Map
Figure 33. Constitution Hill sketched analytical observations of stopping hierarchies, seating, inclination measurements and textures.
Conclusions taken out of the analysis include:

• Pedestrian walkway separated into three zones by two sets of stairs which make up for the large part of the height level change enabling a gradual inclination.

• All zones have an inclination of around 5-6 degrees.

• Park benches with partial cover from trees located within a 10-20 metre distance from the main route.

• Equal amount of bi-traffic suggests that users are not discouraged to walk up hill.

• The vehicular street is used by half the amount of people that use the walkway.

• Vehicular street consists of a winding pattern maintaining a wide range of inclinations that repeats itself until it meets Churchill Road.
Figure 34. Fanshaw and Sturdee Street inclination measurements and surface conditions.

Figure 35. Pedestrian walkway between Fanshaw and Sturdee Street.
Fanshaw and Sturdee Street

The pedestrian walkway between Fanshaw and Sturdee Street feeds foot traffic from Hobson and Federal street down to Sturdee street. The pedestrian walkway is interesting to analyse as it is an island isolated and stranded amongst main roads which are congested at peak hour times. Movement in regards to pedestrian flow is limited as the walkway is difficult to reach due to vehicle congestion on the roads. However, when on the walkway the area and space is a desirable experience. The flyover crossing at a right angle overhead for vehicles exiting the car park creates a sense of partial enclosure along with the trees. The walkway maintains a gentle slope beginning with 3 degrees and steepening to 5 degrees in the centre and decreases to 2 degrees before reaching horizontal as illustrated in analysis sketch figure 35.

Conclusions taken out of the analysis include:

- A hierarchy of three different conditions, a cobbledstoned wider pathway on the inner perimeter, a poured concrete narrower lane on the outer perimeter and a planted area through the centre.

- It was observed that although entry stairs lead users of walkway towards the narrower poured concrete lane, users were prone to use the cobbledstoned lane running along the wall which was overgrown with climbers and greenery.
Design Development

Design Process

Using drawing as a methodology for analysis of the precedent buildings, the next step is to move to physical modelling of those oblique elements. Therefore the following chapter presents an exploration of the precedent analysis through physical modelling exercises. The iteration models aided in achieving an understanding of the many different approaches of the implementation of the oblique and prompted a return to Architecture Principe’s underlying basis of their exploration of the oblique. From this analysis a formulae for adhesion was produced and applied to a ‘belt’ or ‘strip’ of movement, which was used as a basis in the final design project.
Figure 36. Architecture Principles explorations into the oblique. The "Third Order Urbaine" from their manifesto was a dystopian vertically dynamic solution to freeing up congestion on the ground plane.
Exploration of Precedent Analysis

Third Order Urbain

The physical model shown in Figure one is based on a series of drawings from Architecture Principe’s Manifesto on the Third Order. Architecture Principe defines the oblique design as a mediator between the ground and space. The dystopian scale of which it is designed in the manifesto however conflicts with a pure analysis of the objective of the use of the Oblique. Making a physical model of the design eradicated any sense of scale. Architecture Principe describes the idea of each “springboard-like” element leading into each other, without the two elements acting as a whole the model is unsuccessful. This solution frees up congestion on the ground plane as well as creating vertically dynamic spaces for all manners of habitation. It is also interesting to note that AP describes this element as always obstructing from above, which leads to the question – how to deal with the issue of program and function underneath the oblique to the ground planes advantage? Finally AP discusses this exploration of the oblique in relation to the overall issues of their time including urban sprawl as a solution to over-concentration of centralized urban areas.

Nevers Building

It is important to physically model the two major obliquities found in the analytical drawings of Architecture Principe’s building Never’s as it is one of their fundamental buildings representing their explorations of the oblique. The first model figure 40 isolates the main axis of circulation and replaces the main entry stairs with an oblique plane. The model shows the journey starting with a gentle oblique plane with a wide footprint. As this journey unfolds, the widths and angles of the oblique planes change to suit the programs leading over and off the journey. The journey becomes more constricted in width as it reaches the final destination; the altar.

The second analytical model figure 39 is of the oblique planes was used to carry the church pews. It is important to get a physical representation of the two main planes in isolation from the heavy mass of the concrete envelope. In Architecture Principe’s publication on the Nevers building, it explains the use of the planes for the pews to not only broaden the view in the church but also to represent the dynamic nature of the church when filled with a congregation.34 When isolated the planes are dynamic and look as though they are to take flight, a contrast compared to when it is analysed in its context.

Oslo Opera House

The physical model *figure 41* represents the Oslo Opera House and focuses on the use of two planes at different angles meeting each other and ending (as it does in the building) with an unhurried plunge into the final horizontal axis; the sea. It is important to note how the two different degrees of oblique planes intersect. In the Opera House the converging angled planes blend into each other to make the change in angles as seamless as possible for the user of the building. If the architect of the building wanted to promote movement and avoid any degree of spatial separation then the subtleness in the diverging planes is justified. However what happens when that point of divergence is amplified by a large or small step? This can be used for separating areas and promoting different levels of habitation. This method of meeting different inclinations can be used directly into the design process.

The process of converging oblique and horizontal planes (as represented by the sea in the first model of the Oslo Opera House planes) structured the second iteration model *figure 42* of the Oslo Opera House. Here a horizontal axis is met on either side by a series of planes creating spaces that could architecturally transfer as circulation, dwelling and methods of separating spaces.
Kunsthal Museum

The Kunsthal Museum consists of a series of circulation routes passing at right angles or passing over each other to reach different levels. A series of ramps intersect each other and zigzag upwards creating dynamic spaces that overlap through the use of natural light and lines of sight. Additionally, thresholds are used to add to the richness of the experience on the ramps (*figure 43*). These techniques of overlapping space refers to Architecture Principe’s human components in regards to the function of human occupation of space. It can be argued that all elements of human occupation of space (Activation, Vertigo, Claustraction, Deplorization and Calanization) are resolved in the articulation of those oblique planes.

The second model is a fusion of the thresholds in the Kunsthal model and the oblique axis model in *figure 44*. Inserting a series of thresholds on one oblique axis on which the inclinations change will control the users experience, leading them through interior and exterior spaces. All elements of experiential space (as discussed in *Questions of Perception* in the Literature Survey) can be brought together to ‘belt’ of movement and circulation.

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The process of building the physical models as abstract representations of the analytical drawings raised questions regarding the exploration and implementation of oblique planes.

• How does the application of the oblique plane influence and change the space underneath the plane whether that space underneath sits on a horizontal or oblique axis?

• How do spaces with oblique planes lead from one to another?

• How to approach different degrees of inclined planes meeting each other or a horizontal plane?

• What is the origin and destination? This question exists in every iteration model and will play a large role in the program and site selection of the final project.

• What activity and program occupies or feeds off the oblique plane, and what measures of control can be used to manipulate the experience along the plane such as inclination, width, scale, materials and thresholds.

All questions raised from the process of physical modelling verified complexities involved in the implementation of oblique planes within architecture and prompted a return to the core of Architecture Principe’s explorations to help structure a design methodology.
Adhesion Formula

In Architecture Principe’s Manifesto differing slope angles are classified into levels of adhesion based on human and vehicular occupation of those slopes figure 45. A range of three degrees of inclination were needed to structure the ranges of speed that the planes could potentially generate; fast, medium and slow. The choosing of the angles of inclination were made based on the results of the onsite observations and measurement in the Auckland City precedent analysis as well as Architecture Principe’s adhesion table as illustrated in figure 46.
Figure 44. Architecture Principle's breakdown of inclinations in regards to adhesion
17-20 degrees:

A range between 17 and 20 degrees is chosen as the inclination used to generate fast movement. The movement and experience on this incline vary considering the condition of the surface. If the user of the plane is subjected to a condition with low adhesion (marble, polished concrete, perforated rubber) then the user will travel slower, tentatively and less confident. However, if the surface condition has a high level of adhesion (in situ concrete/grass) then the user will travel over the surface with more confidence resulting in more generated speed.

Architecture Principe’s adhesion chart illustrates that the 16-30 degree range is more suitable for vehicles. However while analysing the varying inclinations on the site visit at Constitution Hill (see precedent analysis Auckland), the steepest inclination was 20 degrees with a more consistent 15 degrees for the steeper inclines. The surface was sealed tarmac on a warm, dry, sunny day therefore adhesion was high and the experience on the surface was fast and confident. It is necessary to choose the higher inclination of 20 degrees to reach the desired range of experiences for the research project.
**10-13 degree range:**

A 10 degree slope is the mid-range inclination used as well as the mediator between the steep and gradual inclined planes. This inclination, when paired with steep and gentle slopes and differing surfaces conditions, works as a recipe for controlling a range of movement and experiences.

This inclination was found as a constant middle range used in both Swanson Lane and Constitution Hill (see precedent analysis Auckland).

**5 degrees:**

Architecture Principe’s adhesion chart illustrates that any angle under 3 degrees cannot be noticed by a user of the plane on foot. AP have also designated the inclination of 8 degrees as the gentle slope to mediate between that of the Nevers building and the non-visible slope. However after measuring and analysing the angles of both site visits in Auckland (Constitution Hill and Swanson Lane), the 8-11 degree range was used commonly for faster moving areas, and the 3-5 degree ranges were used as the buffer zones between those faster moving planes and true horizontal. For these reasons, the inclination of 5 degrees was chosen for the gentle slope range.

After precedent analysis and observations it was decided that it had the potential to create a calm meandering experience useful as a buffer and preparation for the horizontal.

*Figure 45. The three chosen angle ranges: 5, 10-13, 17-20 degrees*
The process of controlling movement over a plane (or adhesion to the slope) relies not only on the angle of the slope but on the conditions or materiality of that slope which therefore affect a person’s adhesion to the surface. For example, at what rate or speed will a person walk down a 20-degree oblique plane of grass compared to a slope at the same obliquity made of polished marble?

Figure 47 illustrates the different ways in which conditions can be applied to a series of three chosen inclination ranges (assembled from fast movement to slow) that will affect the level of adhesion on that surface. Figure 47A illustrates the three chosen inclinations combined with the conditions of high adhesion across all three surfaces. This combination promotes fast confident movement over all three planes allowing the maximum potential of speed for the inclinations. Additionally, the momentum that the user has gained from the steepest and midrange inclinations gradually wears off on the longer gentle slope.

What happens however, as shown in Figure 47B, when the steepest inclination has low levels of adhesion? It is assumed that the user will use the surface tentatively and slower welcoming the change in surface condition on the second plane to regain adhesion. Consequently there will be less momentum from the initial steeper inclination meaning the user is more aware of and focused on themselves on the plane. Additionally, in the scenario of Figure 47C the user will move over the steep inclination with confidence and speed and approaching the mid-range inclination with more generated speed. This scenario has the potential to throw the user off balance, or put the user in a state of unease because of the difficulty of moving confidently over a surface and having to adjust to a surface with less control. Another method to explore as shown in Figure 47D is to merge the surface conditions into one another over the differing surface inclinations. This allows smoother transitions of speed and less spatial differentiation caused by the change in inclination.

It is important to consider how both processes of descending and ascending oblique planes affect the experience of the user. While analysing the three Auckland precedent sites there was little to no difference in numbers in regards to bi-directional traffic. This suggests that although more energy is needed to move up the inclinations, users are still ascending those walkways.
Figure 46. An exploration of a series of conditions affecting rate of movement over surfaces of chosen inclination ranges
A difficulty that comes with designing with oblique planes is compensating the distances or angles of obliqueness with the change in height level. In some cases there is either too much or not enough change in height to balance the length needed for the desired oblique plane. Therefore manipulating the conditions of the oblique plane will be used as a tool to make the user move slower, faster or more confidently over the desired oblique plane in those instances where there is little substitute for the chosen inclinations.

With these factors in mind, the three angle ranges are tabulated (Inclination Adhesion and Conditions Table Figure 48 along with a breakdown of the distinctive conditions that change a user’s adhesion to the ground. It is important to note that only a select number of ground conditions are included in the table; it is merely a broad breakdown of the overall conditions that affect a user’s adhesion and experience on the oblique. The table shows the different stages in which the design was approached.

Stage One:
Choosing one of the three inclinations determined by the level change, desired speed and experience.

Stage Two:
Implementation of surface conditions determined by the desired experience, speed and relevance to chosen context and program.

Stage Three:
Intensity of boundary, enclosure or threshold determined by the desired spatial experience, program and context.
Inclined Planes

Surface Conditions

a - polished concrete
b - poured concrete
c - insitu concrete

Boundary/Enclosure
(Spatial Experience)

Figure 47. Adhesion Table including Adhesion Variables, Conditions and Boundaries.
Three Part Inclination Method (TPIM)

A three part inclination method was used as the basis for the application of the oblique to the chosen site. For the remainder of this explanatory document the Three Part Inclination Method will be referenced to as TPIM. This method emerged naturally from analysis in regards to the desire to promote a series of movement beginning from fast to slow. Additionally, the TPIM promotes bi-directional movement over the oblique allowing the user to willingly initiate their ascend of the oblique on a gradual incline with only the last part of their journey with a short steep inclination.

The three stages of movement (fast, medium and meander) are calculated as a ratio of the horizontal length of a journey. The steeper inclines are $\frac{1}{4}$th of the overall length of the journey, the gradual incline is half of the journey and the length of the medium incline is the remaining distance between the steep and gradual incline. All three stages of movement work together (and when applied is combined with the adhesion table and enclosure) to bring back an instinctive awareness of people and the ground plane.
Figure 48. Two journeys consisting of two different movement paths.

Figure 49. Figure 49 broken down into three different journeys by allocating low and high points and ranges of movement which are further modelled in computer software and card.
Application of Adhesion Formula

The *Inclination Adhesion and Enclosure Table* needs testing now that there is a formula for design. Three journeys are developed with differing inclinations and analysed.

*Figure 49A* shows a journey consisting of bi-directional movement. *Figure 49B* involves movement from either ends to the centre and back to either end. These two moments were then allocated high and low points as illustrated in *Figure 50*. A pink dot indicates high points and the final low point is marked by an arrow also indicating direction of movement. These directional lines are broken into a series of dashes and dots, the longer and stronger the line, the faster the movement and the least solid lines indicates slower movement. Origins and destinations are a natural result of the allocation of high and low points and in these cases it is assured each origin starts from a high point and ends (destination) at a low point.

As in *Figure 51* each of these three moments are given dimensions and a neutral zone D, red and blue indicating direction, red = right to left, blue = left to right) the allocated high points are on opposite sides of each other. In regards to speed of movement, each path is broken down into the possible inclinations in regards to the *Inclination Adhesion and Enclosure Table*. After a range of movement belts were explored in coded plan, three of them were then modelled in card *Figure 52*. Further Models were then made using 3d modelling software, enabling the manipulation and diffusion of the centre line separating each of the two journeys. Both card and computer models raised questions in regards to designing with the oblique including:
In the case of applying oblique planes to a site the issue of level change will be a natural outcome of the application of oblique planes. Therefore, a site that provides a range of level changes will be necessary. This will be a high priority during site selection considering that the issues needing to be resolved in the project will involve verticality and dislocation from the ground plane. Additionally, where the level change occurs in relation to the ground plane is an important factor to consider in regards to orientating the user with the oblique and the ground plane creating special awareness and orientation.

- Origin and destination. An origin and destination is a consideration for a journey and plays a major role in regards to the future chosen programs. Before any program or site is considered the origin and destination for the journeys will be referred to as nodes.

- What occurs on either side or between the two opposing journeys and how does the centre line become diffused?

- What occurs underneath the oblique planes?
Figure 50. Further development of journeys in figure 50. The journeys are allocated dimensions and adhesions as per the Adhesion Table in figure 48.

Figure 51. Three iteration models taken from figure 51 are modelled in card and analysed in elevation view.
Figure 52. A single node illustrating the potential of capturing, filtering and spitting out (humans).
Nodes

In order to apply the previously discussed card model explorations to a chosen site, the types of nodes (node defined as an architectural human filter, program/building) were determined to inform the transition spaces between and within the nodes. Figure 53 illustrates how a node captures and spits people out of it. Adding an extra node Figure 54, enables people to partake on a journey consisting of an origin and destination; it is here where the belt of movement can exist.

Precedents analysed were revisited with an analysis through a ‘nodal’ lens to answer questions including what conditions implement the nodes and where/what are the dynamic zones within which the oblique has been applied? Additionally, what then occurs in those transition zones and how do people enter and exit those zones? Finally, the role of the oblique in those nodes and transition zones was analysed.

Figure 53. A diagram of the potential of the ability of two nodes to capture people creating a transition zone.
The Kunsthal Museum works as a two-part nodal system. Figure 55. Three sequential spaces exist between the nodes holding a series of conditions. OMA\textsuperscript{36} describes the area between the two nodes as having conflicting demands of serenity and sensation, movement and stillness and acts as buffer zones and connectors of the nodes.

Oblique planes are used in the pathway that leads from the Kunsthal Museum through the park to the tarmac sequence. The path can be described as a preparation tool for arrival to the museum. The oblique slowly journeys through the park and eventually penetrates through the museum splitting it in half (see Kunsthall precedent analysis). The journey through the park is elevated off the ground plane giving the user a view of the greenery, lines of sight to the Museum and the orchard situated on the sequence by the Architecture Institute. The oblique plane angles itself only slightly off the horizontal plane (5-8 degrees), ensuring a calm and meandering pace.


Figure 56 illustrates the Oslo Opera House is the destination from the Oslo central train station. The large car park acts as a subsidiary node on the south west side. The Opera House sits like an island isolated between the coastal main road and the sea, making the car park an important node that feeds people to the Opera House. The road acts as a barrier against ease of access for the users on foot. Connecting users between the train station and the Opera House (origin and destination) is a pedestrian bridge. Other important buildings are situated around the Opera House including the Kunsthal Museum, Norsk Museum and the main bus depot. All potentially feeding into the pedestrian bridge originating from the central station.

The oblique has been applied in the transition zone between the two nodes elevating itself up and over the road. The enclosed oblique pathway begins from the train station on a raised platform with stairs leading off of the platform. From here it slowly raises itself up three quarters of the way over the main road and then levels off to horizontal before pedestrians use a set of stairs to make their way down to the Museum. The pathway responds to a distinct set of conditions, the journey is enclosed to protect the users from the elements of a main road (noise, wind and polluted air) and elements of coastal weather.
In the case of Hong Kong’s mid level escalator system there exists a series of nodes either directly on the route (the escalator system either penetrates or wraps around buildings) or feeding the route from pedestrian access off of road intersections. Therefore the nodes act as generators of activity for the transition zones between the nodes as illustrated in Figure 57.

The route itself (or transition zones between nodes) is oblique and adapts in inclination to suit the different level changes morphing into stairs and consistently meeting horizontal. The transition zones change in materiality and envelope as it adapts to the different conditions of the nodes and surrounding context be it over a road, residential, hospitality, markets and the business district.
Design Outcome

In order to gain an understanding of the implications of designing with oblique planes it was important to choose a site which I could investigate in person to understand its experiential elements. Initially, a test site in Auckland city was selected for its topography and program. The assumptions made as to why the site would be appropriate proved to be incorrect (full discussion in Appendix B), however the test application brought about a series of questions that prompted further analysis of Auckland. Issues of dislocation from the ground plane and its proponent (a slave to the daily commute) were revisited. The second chapter of design discusses the second site analysis of Auckland city and evaluates the stages of the design leading to the final design and the methods that will be used to refine the final design.
Auckland City Site Analysis and Selection

A site analysis of Auckland was made considering the issues discussed in ‘A Paradigm Shift’ and ‘Experience’. Taking into account the current commuting statistics for the Auckland central area as discussed in ‘Aims and Objectives’ paired with the future population projections (in 2006 there were 4,600 people per km² in central Auckland and the projections for 2031 is 13,300 people per km² just under triple in 25 years), it is clear that people in Auckland are giving precedence to commuting by cars. Additionally, central Auckland shares 8% of open public space with another 9% undesignated open space equating to 17% compared to 50% in Vienna and 35% in Helsinki. Therefore priority of the use of cars and lack of designated public space were focused on during site selection.

A figure ground analysis Figure 59 illustrates the streets and motorways in the Auckland city area prompting an enquiry into where those main roads lead the vehicles to; the car parks. The roads and motorways act similar to rivers disconnecting residential areas from the urban realm as well as taking over any areas that could be allocated for shared public space. Figure 58 illustrates the car park buildings and areas in central Auckland. The city centre alone holds over 80 buildings and packages of land that are used solely for the parking of cars, owned primarily by the Auckland City Council and Wilsons Car Parks. Considering that the prioritisation of the infrastructure built around the movement of cars is a main symptom of the issue of being disconnected with the ground plane, car parks were chosen to analyse as a starting point for a site.

The 2012 Auckland Master Plan states that “Auckland’s active foreshore and harbour offer great potential for promenades, living space and recreational activity. The space creates a special social atmosphere and the marinas accommodate many yachts and host international maritime events. With the upgrade and subsequent success of the Viaduct Harbour, Silo Park and North Wharf, these are perfect examples of the potential that the harbour holds for the city.”

Additionally, Auckland’s primary cruise ship terminal will be operational on Queens Wharf for the next 15 years. A car park with viable size and space that was close to the harbour with a potential for public space was chosen.

Auckland City Council’s downtown car park on the corner of Hobson Street and Customs Street West provides 1,350 car parks over 9 levels and has a foot print of over 600m². The site is fed with vehicles coming off the Northern Motorway via Fanshawe Street on its south side with Quay Street on its northern perimeter which subsequently runs parallel to Auckland’s city harbour. The site is located in the ‘engine room’ of the city as stated in the 2012 Auckland Master Plan validating the sites significance in central Auckland. Additionally, there is a new laneways circuit proposed in the 2012 Auckland Master Plan with the aim to enhance primary streets creating a better balance between vehicles and pedestrians and allowing greater opportunities for socialising, recreation and promenading. Figure 60 illustrates the sites prominent location on the proposed laneways further justifying selection of the site.
Figure 57. Central Aucklands buildings/spaces allocated solely for the storage of cars.

Figure 58. Central Aucklands roads analysis.
Figure 59. Two of the laneways proposed in the 2012 Auckland Master Plan run alongside and through the selected site.
Figure 60. Auckland City Council Downtown Car Park surrounding programs

A - Downtown Car Park
B - Copthorne Hotel
C - ANZ Building
D - Ferry Terminal Piers
E - Hilton Hotel
F - National Maritime Museum
G - National Maritime Museum
H - Hospitality
I - The Sebel Hotel + Hospitality
J - Tepid Baths
K - Foster's Building
L - Tower Insurance Building
M - West Plaza Business Centre
N - AMP Building
O - PWC Tower
Axis Lines

The initial stages of design was choosing a series of axes to activate and promote circulation in which the TPIM will be applied to. Each axis and their amendments will be discussed.

The new laneways circuit proposed in the 2012 Auckland Master Plan will be the driver of prominent axis lines which will run alongside and cut through the downtown car park referred to as axis B and C Figure 62. These axis lines were used as subsidiary oblique circulation routes feeding the main oblique plane axis A which begins inside the car park and ends in the harbour.
Axis A

The main axis line/oblique plane was used as a tool to reconnect the users of the cars to the ground plane. The car park was used as the filter node that embodies the issue of dislocation from the ground plane dominated by orthogonality and verticality. The users will have arrived to the chosen car park after having undergone a commute from their home (most probably located in the outer suburbs) using the infrastructure prioritised for the movement of cars over people. From here the users of the vehicles and the car park begin a journey starting with a state of dislocation from the ground plane, and moving through a series of architectural experiences and moments on foot to finally relocate themselves through a series of embodied experiences. The journey starts with an individual experience that gradually ends with a social space by the water.

The main focus points for Axis A will be how the user enters the oblique planes, and how to deal with the areas where the oblique planes will need to meet the horizontal planes of the car park as it descends. The planning of the car park and its vehicular and pedestrian circulation is investigated as well as the structural layout. Another important element with Axis A is to ensure that those areas where the pedestrian ‘street’ meets the vehicular street are designed in a manner appropriate to findings stated in Current Knowledge ‘A Pattern Language’ and ‘Life Between Buildings’.

Axis B

The second axis informed by the new laneways circuit in the 2012 Auckland Master Plan will run alongside the car park (illustrated in Figure 63) and will circulate users from upper central Auckland (Federal Square and surrounding businesses) down to the destination at the end of axis A (the foreshore/harbour area and Queens wharf area). This axis will not only be a way to feed people from the upper areas of Federal Square down but enable the users of the car park to exit the building if they require to head to the east or south east areas of Auckland city.

Unlike axis A, axis B is not dominated by the orthogonality and verticality of the interior of the car park building but is reacting to other important elements such as surrounding context and conditions. An important element of this subsidiary pedestrian street will be how it connects and crosses with axis A and axis C. Information on methods of dealing with intersections of pedestrian walkways and vehicular street crossings along with analysis from Auckland City precedents will be used to inform design decisions.
Axis C

The final axis which is also informed by the 2012 Auckland Master Plan new laneways circuit leads from Britomart through to the viaduct restaurants. In the initial stages of design the pedestrian street sliced through the downtown car park Figure 63 however was subject to design amendments as discussed further. The programs from origin (britomart) to destination (Auckland viaduct) will aid to inform program and conditions along the axis.

The three axes will act as transition zones between the nodes. These axes will be affected by program and react to the surrounding conditions it passes.
Axis Design Amendments

As the details of the transition zones were designed, amendments were made to the zones affecting the complexity to programs along and beside the oblique planes.

A key amendment of axis A was made changing its position in plan in regards to it being at an inclination to the organisation of the car park. Figure 64 illustrates how axis A was originally placed to run at an angle across the orthogonal grid layout of the building. However axis A was already running obliquely to the planning of the building vertically (in section). Therefore, to emphasise the contrasting relationship of the oblique plane to the orthogonal planning of the car park, it was placed at right angles to the organisation of the car park in plan. This amendment also ensures the pedestrian and vehicular streets run at right angles, a necessary design tool taken out of ‘A Pattern Language’. The amendment to this axis also allows the Copthorne Hotel to pass the oblique at a right angle. Initially the Copthorne Hotel was to be removed or the program replaced, however the final decision for the program to remain enhances the function of the oblique plane as a circulation activator and opener of transfer spaces (as stated by Architecture Principe as a principle result of the application of the oblique). Therefore the oblique will act as a circulation enhancer for both the Copthorne Hotel and the car park.

Axis B initially fed users over Fanshawe Street to run alongside the car park and the Copthorne Hotel and converge with axis A as it moved over Quay Street before meeting the final horizontal of the sea. However after

Figure 63. Initial stages of the oblique primary axis A running at an oblique through the orthogonal organisation of the car park with attempts to design entry points from each level.
axis A had been modified to run at right angles with the planning of the

the area between the hotel and the car park as a usable volume of space for
circulation protected from the elements of coastal wind and rain, congested
traffic and exposure to the sun in the summer months. The amendments
identifies axis A as the more important axis and ensures that axis B is a
subsidiary axis along with axis C and removes any prominence it initially
had.

Axis C was repositioned from inside the car park to the space between the
car park and the Copthorne Hotel, insuring the interior planning of the car
park is affected only by Axis A enhancing the prominence of that axis in
the building and in the overall project. Moving Axis C to run alongside the
backside of the Copthorne Hotel activates the axis with people from the
south west and south east of the city as well as the users of the Copthorne
Hotel. This junction between the Copthorne Hotel and car park is now an
important zone of the project with a series of different circulation nodes
crossing over each other.

Figure 64. Downtown car park Initial design stages with Axis A running oblique to the planning of the car
park and Axis C cutting through the building as per the Auckland Master Plan Laneways Circuit
proposal.

Figure 65. Downtown car park axis lines design amendments. Axis A now runs at right angles with the car
park planning and Axis C is moved to the space between the Copthorne Hotel and the car park.
During the design amendments of the axes important issues in regards to the design emerged:

- A series of zones naturally emerge from the buildings on the site (Figure 71). These zones are defined by their environmental conditions, materiality and programs which aid in structuring hierarchies of movement and dwelling that the oblique will react to. There will be a sequence of experiential moments relating to the program of each zone, focusing particularly on each of the elements that relate to creating an embodied experience (touch/materiality, smell, sound, light, nature of envelopment of the space).

- Each level of the car park that axis A meets on its descent will need to be considered in regards to how the user of the building will enter and exit the oblique plane. Experientially, this will be a defining moment in the project. Building conditions and materiality will need to be explored and implemented. Methods used to resolve these issues will be implemented in the zones where the oblique penetrates the Copthorne Hotel, the ANZ building and the shoreline. Elements used to create an embodied architectural experience outlined in ‘Questions of Perception’ and ‘Eyes of the Skin’ will be used.

- Focus of the design is on circulation and crossings for pedestrian only areas as well as vehicular and pedestrian crossings. Architectural elements found in the Hong Kong and Auckland city precedent analysis in regards to hierarchy of movement and stopping is implemented to promote certain uses of those prominent areas as well as information found in ‘A Pattern Language’ and ‘Life Between Buildings’ such as spaces swelling in size at main crossing points.

- An important zone for the main axis is the transition zone between the Copthorne Hotel and the ANZ building where it crosses Quay Street. The decision needed to be made on whether the plane should pass the users over the street, or meet the street and the main questions driving the decision to that issue is what are the site conditions in which the users of the oblique will be exposed to? Environmental conditions for this zone are largely due to coastal weather and heavy traffic bringing noise and wind. These issues were found in the precedent analysis of the Oslo Opera House and Hong Kong where the envelope of the oblique would change and be fully enclosed. However, how could the issues of dealing with the unique climatic conditions of this zone be resolved in a way that promotes awareness of the traffic below in a way that highlights the issues that is an overall driver of the research project? Therefore this zone will be designed in a way that protects the users form those climatic conditions but also making the users aware of the traffic below.

- The ANZ building located on Quay Street and opposite the Copthorne Hotel will be added to the third and final destination node activating axis A. The structural layout and services core of the building will drive the design promoting and activating circulation between the
National Maritime Museum, Viaduct and the bottom of Queen Street. Additionally, the introduction of this final building brings potential for a public space for Princess Wharf and the downtown city area.

- The final destination where the oblique meets the horizontal (the harbour sea line) will need to be addressed with the same methods used for the car park and the Copthorne Hotel. The oblique will be used to generate a public space on the waterfront and will have no barriers allowing the public to be exposed and enable an interaction with the water. How the condition of water will relate and cooperate with axis A will need to be resolved as well as how it will relate to the ANZ building. *Figure 67* illustrates a way the oblique can be used to meet the sea. Other methods were explored during the initial test application on the Emily Place site (series of images in *figures 84-85* in Appendix B). Additionally, users of the public space will not only be coming from Axis A (car park, Copthorne Hotel and the ANZ building), but from the bottom of Queen Street, Quay Street, National Maritime Museum and the surrounding Viaduct area. How the oblique will deal with users entering directly from Quay street will be designed for using the methods and design solutions realised in the design of the axes in the car park and Copthorne Hotel zones.

- What goes down must come up. Another important element is how the issue of ascending the oblique plane will be resolved in a way so as to promote equal bi-traffic. This issue is previously discussed in the formation of the TPIM, ensuring users are willing to ascend the axes by
using a longer gradual plane as the first process of ascent.

**Adhesion Formula and TPIM**

The adhesion formula and the TPIM is implemented after the axes are organised on the plan. The TPIM was applied three different ways to the axis A with the last approach implemented.

**Level to level**

The TPIM was initially applied for each level (*figure 68*). However this process lacked the distance and change in height to produce a process where the user can change from a state of dislocation from the ground plane to have an embodied experience to reconnect them with the ground. The lack of height in level change made the TPIM too rushed, cluttered, and repetitive.

**Entire Car Park**

The TPIM was then applied to the entire car park with the objective that this process would then be applied to both zones connecting the car park with the Copthorne Hotel and the addition of the ANZ building as a node activating axis A. However difficulties were found creating consistencies of movement in regards to the different zones (Down Town Car Park, Copthorne Hotel, ANZ Building and the foreshore) and in regards to passing over the road. The resolution was that one datum point needed to be decided to ensure the TPIM is applied successfully while keeping an appropriate height to cross over Quay Street.

**ANZ Building as a Datum**

The threshold of the ANZ building was chosen as the datum for the TPIM. The car park being the beginning (high point) of the three part inclination, with the second part of the three part inclination located inside the car park and the final part beginning with the Copthorne Hotel (*figure 69*) and ending at the threshold of the ANZ building. The three part inclination method will then resume again from the ANZ building threshold and will end below sea level.

Choosing to apply the end (low point) of the TPIM to a further distance from the origin allows for more change in height resulting in a longer distance of travel for the TPIM. The conditions of the oblique plane will change in regards to the desired experience and also in regards to the context that the oblique descends by and penetrates. Additionally, the users entering the main axis that are closer to the ground plane enter with less of a dramatic inclination. This works as a way to penalise users who travel higher off the ground plane. Although users entering the oblique plane at lower levels arrive with less of a dramatic inclination, the difference is compensated for through the use of conditions and architectural elements that heighten the spatial experience before arriving on that axis.
Figure 67. Sections of two attempts of implementing the TPIM to each level of the car park.
Figure 68. Section of the site where the TPIM is applied with the ANZ building threshold as the datum. Colour coding is used to differentiate the three inclinations and will be used throughout the remainder of the document.

The TPIM will restart in the interior of the ANZ building and end with the horizontal axis of the water.

The ascend out of the car park, an important element of Axis A and further discussed in Design Part Two “Axis A Ascend.”
Figure 69. A sketched axonometric proposal of the oblique penetrating the three chosen buildings with a rough breakdown of the zones it will be implementing.
Subsidiary Axes

Now that a primary plane has been established with an origin and destination, the two remaining axes (axis B and axis C) will circulate users of the plane from the primary plane to either Fanshawe, Sturdee, Quay or Hobson Street. If the user leaves the primary plane before reaching the intended destination (the foreshore) to take a subsidiary route, the user will then restart the three part inclination method process. Once the user enters on to the oblique, the user will then not depart without having gone through the entire experiential process (reestablishment with the ground plane) enabled by the TPIM.

Additionally, there are subsidiary series of oblique planes running alongside the main axis feeding users of the lower levels of the car park up and on to axis A. Designing for the ascent from the car park to axis A differs from the descent from the upper levels and is further discussed in Design Outcome. Signage, spatial layering, introducing natural light and lines of sight are
Figure 70. Initial design of the oblige implemented on site with the TPIM. From here a series of zones are recognised and the car park and the Copthorne Hotel zones are designed in more detail.
used to activate the axes from the car park users.

Structural Analysis

The structural grid of all three buildings on the site is used as a point of reference for the user of the oblique as they descend or ascend (figure 72). The primary structural columns are exposed to enable spatial orientation in regards to the users and the ground plane. The structural grid was also used to compose a new structural grid for the transition zone (passing over Quay Street) between the Copthorne Hotel and the ANZ building. The unique structural layout of the ANZ building will be used to articulate the design of the circulation and public space within the ANZ building and the public space which meets the water.

Figure 71. The structural grid for all three buildings of the project.
Design Outcome

Methods used for the final design solutions are discussed specifically in regards to axis A within the car park and the Copthorne Hotel. The main pedestrian circulation crossing located between the car park and the Copthorne hotel is discussed so as to derive a method of design for the final destination of the ANZ building and the waterfront by the Princess Wharf.

Page 112a, site plan at 1:500 illustrates the final overall design of the research project thus far indicating the TPIM in colour coding and the different zones of which the oblique will be activating in regards to circulation and reacting to in regards to environmental conditions and materiality.

Page 112b, plan at 1:200 illustrates the planning of the car park and Copthorne Hotel zones at a larger scale. Elements such as differing surface conditions of each inclination are shown as well as the surface conditions of the transition zones between the car park and the exit zones between the car park and the oblique.

The car park zone of Axis A is made up of two primary journeys; a descend from the upper levels and an ascend from the lower levels. The first journey is the descent from the higher car park levels leading down to the Copthorne Hotel. The second journey is an ascent from the lower levels of the car park leading up to the Copthorne Hotel. Each journey is designed in regards to the TPIM while having different conditions relating to entering the oblique with a descent and entering the oblique with an ascent. Additionally, the subsidiary exit (axis C) as well as the circulation route for the Copthorne hotel will be discussed in further detail.
Figure 72. Entry points of the descent of Axis A are determined by the oblique opening at the height level of 2.5m. Different inclinations and height levels then inform the opening forms (A). Openings highlighted in red were chosen to promote a meandering journey as shown in (B). Final design of the descend of Axis A is placed in the context of the carpark (C).
Entering Axis A with a Descent

The surface conditions in the beginning stage of the TPIM promotes high adhesion ensuring that the user enters the 20° plane with confidence generating speed for the beginning stages of the journey. The surface condition then bleeds over the second stage of the TPIM until it merges into a surface condition that generates a medium adhesion rate to create more awareness of the users surroundings and help slow down the generated speed from the steeper inclination. Subtle protrusions are present in the transition zone between the car park and the oblique plane and merge on to the oblique plane acting as a guide to lead the users from the car park on to the plane and further adding to adhesion levels during the first few metres of arrival on the oblique. A wall protrudes up from the openings of each entry point on the descend of axis A, which highlights the openings as well as for safety from falling.

Before each opening, the angled perimeter of the opening wall continues until it reaches the perimeter of the walkway and has a covered 5° slope promoting stopping zones (as shown in 1:200 plan) warranting the use of the walls of the openings as informal seating as well. A rule derived from the research and analysis of the main walkway to be unobstructed from above however with partial to full coverage along the perimeter. For this reason there will always be partial full cover along each perimeter of the walkways, and the edge/boundary of each walkway will be designed in a way to promote short term stopping.

The oblique plane opens up on each level allowing the users to enter axis A. Figure 73A illustrates how each opening on each level differs from each other. When the height from horizontal level on the inside of the car park reaches 2.5 metres before entering the oblique, the oblique opens from above. The more gradual the inclination on exit the longer and narrower or ‘stretched out’ this opening is. If the user is entering the oblique starting with a steeper inclination then the opening is more harsh and sudden, a subtle reprimand for the higher the vehicle travels from the ground plane. Figure 73B illustrates how each entry path has an unobstructed view and line of sight down the pathway as it subtly criss-crosses and encourages the users to meander. Additionally, the users of the ascending plane have a line of sight to the exit that leads users to Quay Street ensuring this subsidiary axis is not missed. “Section A-A descend” in Figure 74 illustrates the entry points and it’s surrounding context.
Figure 73. Section A-A. Axis A descent with correlating colour coding for inclinations on section cut.
Entering Axis A with an Ascent

Although entering the main axis from the lower levels will have a different design method as it is entering with an ascent, the TPIM still applies as illustrated in Figure 75. The use in conditions in regards to the adhesion levels also applies to the users of the car park making the ascend from the lower levels with higher adhesion levels on the steeper inclines to aid in the ease of the ascend as well as promote movement down to the car parks lower levels. Protrusion on the ground surfaces of the horizontal transition zone before the oblique plane starts is used as a guide for the users to lead to the entry points. Each of the three levels that the ascent caters for has its own separate journey and feeds off of the primary plane that leads down to the lowest level. The same rules also apply in regards to being free from obstruction from above and along the main thoroughfare, therefore all floor slabs of the upper car park levels open up introducing natural light. Additionally there will be partial cover along the perimeter as discussed in Entering Axis A with a Descend. “Section B-B Ascend” illustrates the entry points and their surrounding context Figure 76.
Figure 74. The design process of Axis A Ascend was initiated by a main strip (A) and refined to suit the required dimensions (B). Finally (C) it is placed in the context of the car park and beside the space for Axis A Descend.
Figure 75. Section B-B. Axis A ascent with correlating colour coding on section cut.
Axis C and the Copthorne Hotel

The circulation for the Copthorne Hotel will cross over axis A horizontally and will have a surface condition promoting low adhesion levels (polished concrete). This is applied to contrast against the surface conditions of high adhesion for those bisecting planes on the perimeter of the hotel's circulation route and will have a buffer zone either side with high adhesion levels and an inclination of 5°. There will also be a two-part ramped transition zone 5° to 8° in the Copthorne Hotel circulation of 3 metres with high adhesion rates before the circulation route passes over axis A. This method is used to make up for the height difference where the oblique meets the Copthorne Hotel circulation.

The subsidiary route that leads users down to Quay Street initiates from the descending plane of axis A that leads the users up from the lower levels of the car park, and passes under the descent plane of axis A (illustrated in Figure 77). The same TPIM rules apply with this route so the TPIM restarts with a buffer zone between the 20° inclination of axis it exits off.
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Summary of Design

This research thesis analysed the way architectural performance can be increased through the pleasure of the moment on the oblique and explored the different applications of oblique planes and surface conditions, deriving a method to design with the oblique to bring about a spatial awareness of the user with the ground plane. The proposal is a declaration of the importance of the addition of a third discipline (the oblique) of equal importance to the horizontal and vertical axes adding to variety of experience. In order to do so a site and buildings were chosen for their relevance to the issues of domination of verticality and orthogonality as well as playing a role in the reliance of people on cars and the daily commute supporting the state of humans dislocation from the ground plane. The site selection acknowledges the dominance of the car in the present day urban context.

The primary questions proposed include:

• How can the oblique be adapted and applied within a contemporary urban context?

• How can architecture be designed with the oblique to re-establish a connection with the ground plane, lost as a result of the priority of infrastructure for the movement and storage of cars?

• Find an Auckland site (affected by issues regarding dislocation from the ground plane, verticality and orthogonality) to test and apply conclusions of analysis, and that accommodates complex architectural resolutions.

Therefore, oblique planes (and their surface conditions) were analysed in buildings as well as cities through analytical drawing and modelling which quickly exposed the difficulties of designing with oblique planes in regards to height level change and length of distance required to do so. From this research and analysis came a set of rules, an adhesion table and the Three Part Inclination Method used to drive the design of the oblique and promote a range of movement and embodied experiences within an architectural context.

The rules, adhesion table and the Three Part Inclination Method were then applied and tested on a site in Auckland that consist of a series of buildings beginning with Auckland City Councils Down Town car park, through the Copthorne Hotel, over Quay street, through the ANZ building and finally ending with meeting true horizontal of the water in the Princess Wharf area. Applying the Three Part Inclination Method to the overall site was problematic as it needed to be applied in a way that re-established users to the ground plane and make up for the distance in height level change, a key factor in this was passing over Quay Street. The solution to the issue merely brought richness to designing with the oblique plane in regards to ascending and descending out of the car park building.

The aims of the research was achieved in regards to developing a design methodology and process through the use of rules and the Three Part Inclination Method as well as the achievement of the oblique being applied within an urban context having those issues unique to a contemporary city. However whether the users of the oblique will end their oblique journey with an embodied experience and be re-established with the ground
plane will never be known. The best that can be done to achieve this is to synthesis those experiential elements found through the research and analysis, as well as pay particular detail to designing for the human scale to promote as much of an embodied experience through architecture as possible.

Future projections for Auckland city’s growth as well as the statistics proving the reliance on the vehicle prove that Auckland is and will remain to be affected by the issues that embody dislocation from the ground plane. Additionally, Auckland city’s high prioritisation of its infrastructure for moving and storing cars adds to the issue of dislocation from the ground plane. The new oblique application methods can be the missing link creating a balance to the dominance of orthogonality and verticality and could possibly be a step towards solving the issues of dislocation from the ground plane and create an overall awareness of ones reliance on the vehicle. If not, the project is a statement in itself of the reliance of cars in contemporary cities and the implications of this urban symptom.

This research thesis is part of a large series of questions on how the quality of living in a contemporary urban realm is affected by issues of dislocation from the ground plane through the priority of public space and infrastructure for cars. Methods of designing with the oblique can be applied to suburban areas isolated from the urban realm or the surrounding public spaces through the presence of roads and cars. The methods could also be applied to sites that have dwellings in high rise buildings. There would be many difficulties in regards to designing with the oblique in this setting however in the end, the oblique can only exponentially raise the quality living in those architectural settings.
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Appendix A
Precedent analysis discussion

Hong Kong, China
Mid-Level Escalator Analysis

The escalator begins high in the central Hong Kong residential area linking with a road that leads up to the remaining residential towers (figure XXX). As the system makes its way down the central Hong Kong area, the walkway moves over main roads (figure XXX) ensuring pedestrian movement is not obstructed by vehicular traffic. Stairs and ramps diverge off the system at the cross sections with the roads creating a series of staircases and ramps working as exit and entry points figures XX and XXX.

In the cases where the pedestrian walkway does meet a road there are a series of different lanes running parallel to it. Figure XXXX shows a scenario where the escalator system meets the road and three lanes run parallel to it, feeding into the street that cross at right angles to the moving walkway. A service lane consisting of a series of stairs and ramps is situated on the perimeter of the zone and a main ramped walkway sits directly off the escalator system. In this scenario there are a number of different situations taking place. The covered moving walkway holds fast moving pedestrian traffic, the ramped walkway ensures people have the choice to move beside the escalator on foot and out of cover. Two service lanes running along each perimeter are used less frequently and are partially providing stopping zones and access points to the surrounding buildings.

The series of sketches and sections in figures XX and XX are of two intersections where the mid-level escalators meet the roads to enable an understanding of the spaces that are occurring. Figure XX illustrates the series of streets which produce a hierarchy of pedestrian movement. An uncovered and unobstructed ramp in the centre has service lanes on either side providing partial coverage and areas for stopping. Figure XXX is a more complex series of streets consisting of 5 lanes. Lanes 1 and 5 are partially covered service lanes feeding people into the businesses alongside the walkways. Lane 2 is a covered staircase that feeds people directly in and out of the moving escalator. Lane 3 is a covered buffer zone between the stair case and the ramped walkway which has been utilised as a longer stopping zone providing seating and planting. Finally Lane 4 is the ramped walkway running parallel to the walkway. This lane provides the opportunity for people to choose not to use the covered escalator system and walk at a slower pace than that of the moving escalator. This lane also connects to the shops, service lanes and the two roads that it meets above and below.

A ramped street market in central Hong Kong feeds off and under the escalator system (figure XX). In this example there is a three part hierarchy system to the pedestrian street. A main uncovered ramp in the centre and two partly covered service lanes on either side provides short term stopping zones as well as acts as a buffer zone to the stalls and shops on either side. Swanson Lane Analysis

The lane consists of different zones creating a hierarchy of short term and long term stopping points with a main thoroughfare through the centre which, as found in the previous Hong Kong analysis, is unobstructed along the ramp as well as from above. Figure XXX illustrates the buffer zone
either side of the ramped walkway serving the adjacent buildings. Lane A is a series of steps and ramps used more by the workers of the building adjacent. A zone providing seating and greenery runs along one side of the walkway creating a buffer zone between Lane A and Lane B. It is interesting to note that users of the walkway were found to be stopping while standing for shorter periods on Lane C across from the seated area (to check phones, or speak with their company). Therefore the analysis of Swanson Lane provided a breakdown on the different zones that promote different hierarchies of people stopping.

Onsite observations showed that the covered service lane directly beside the main ramped walkway promoted short term standing stopping zones (to text, make a phone call or talk to their company). The seating areas buffering Lane A and Lane B provided longer term seated stopping zones for the users of the walkway.

In terms of the inclination of the planes, there was a consistent 8-9 degree range used for the whole length of the walkway. Where the oblique met the horizontal there is a buffer zone of roughly 4 metres in length with an angle range that decreases from 8-3 degrees. This method of meeting the horizontal was also used in Lane A (figure xxx).
Constitution Hill Analysis

The pedestrian laneway is separated into three zones divided by two sets of stairs. The provision of stairs along the route makes up for the height difference along the path allowing a gentler slope for the oblique walkways in between the stairs. All zones are in the 5 degree range slope until it meets Churchill Road where it changes to an average of 3 degrees before it meets horizontal (figure XXX). Each park bench of the four situated along the route has partial cover from a nearby tree and are located within a 10-20 metre distance from the main route. The journey had equal amounts of bi-traffic suggesting that the 130 metre journey with a difference of 24 metres in verticality was just as pleasurable walking up as it was walking down.

The winding street nearby the pedestrian route was used at half the rate compared to the pedestrian walkway. The fact that the street was being used at all suggests that it is a desirable option for walkers who do not want to use the stepped route nearby. Figure XX illustrates a breakdown of the inclination change as the route winds its way down. The streets inclination is gentle as it runs along the hill and as it turns the inclinations increase in intensity and then regains gentleness. This pattern repeats itself until it meets Churchill Road.
Appendix B

Emily Place Site Selection

The test site in Auckland city was selected for its topography and program, the site had an interesting mix of program and context to adapt and react to (flat areas and steep areas, the harbour/water, a series of changing hierarchy in regards to roads and a mix of residential, hospitality and businesses). The assumptions made as to why the site would be appropriate proved to be incorrect, however the test application brought about a series of questions that prompted further analysis of Auckland, revisiting issues discussed earlier in the thesis of dislocation from the ground plane and the proponent of that issue; a slave to the daily commute. Therefore, the following is a discussion of the test application of an oblique journey beginning from Emily Place and ending in the wharves.

Program and topography were two factors that influenced site selection. Additionally, the fact that the destination/end of journey, or the point at which the oblique plane would meet horizontal would potentially be in the water/bay/ocean introduced an interesting element to the journey, a possible public space. Also, the oblique journey was subject to a thirty metre height change. There was an initial assumption that level change in regards to topography or the ground plane was necessary to create a dynamic architectural response with the application of an oblique plane. Alongside this was the wide range of program that was available to feed people on to the journey. As shown in the program analysis residential
buildings surround the journey potentially providing a constant stream of users. Additionally the journey passes one of the exits from Britomart train station potentially feeding users from the station up to the business area at the origin of the journey. Finally, the journey ends meeting the sea, potentially creating a public space for users in the city to enjoy the sea.

figure 83 illustrates the analysis of the different conditions that the journey will be reacting to including roads, a park, the sea and how the different areas will be affecting how people enter the journey. Zone A; the origin, will be reacting to a park. Zone B will be reacting to a busy road junction, and Zone C will be reacting to the wharf harbour and dealing with how the oblique plane meets the horizontal. A series of models and sketches were made to test a journey, figure 84-86.

The test application of oblique planes on the Emily Place site failed for a number of reasons. Overall the application was approached in a sense of a journey. Additionally, the 30 metre height level change prompted the selection of the site, however it is now apparent that a change in topography of the ground plane is not a necessary factor to consider.

Why it failed?

- Didn’t provide the ideal conditions in regards to program.
- Kept referring to it as a journey rather than an architectural application.
- Not responding to its surrounding context enough.
- Not a convincing origin.
- Thinking that a large change in height level of topography was necessary.
Figure 91. The mid-level escalator system intersects with a street market on Gage Street.
Figure 92. The mid-level escalator system intersects with a street market on Gage Street.
Figure 93. Iterations of methods of the oblique entering the water at the destination of the Emily Place site
Figure 94. Iterations of methods of the oblique entering the water at the destination of the Emily Place site
Figure 95. Iterations of methods of the oblique entering the water at the destination of the Emily Place site